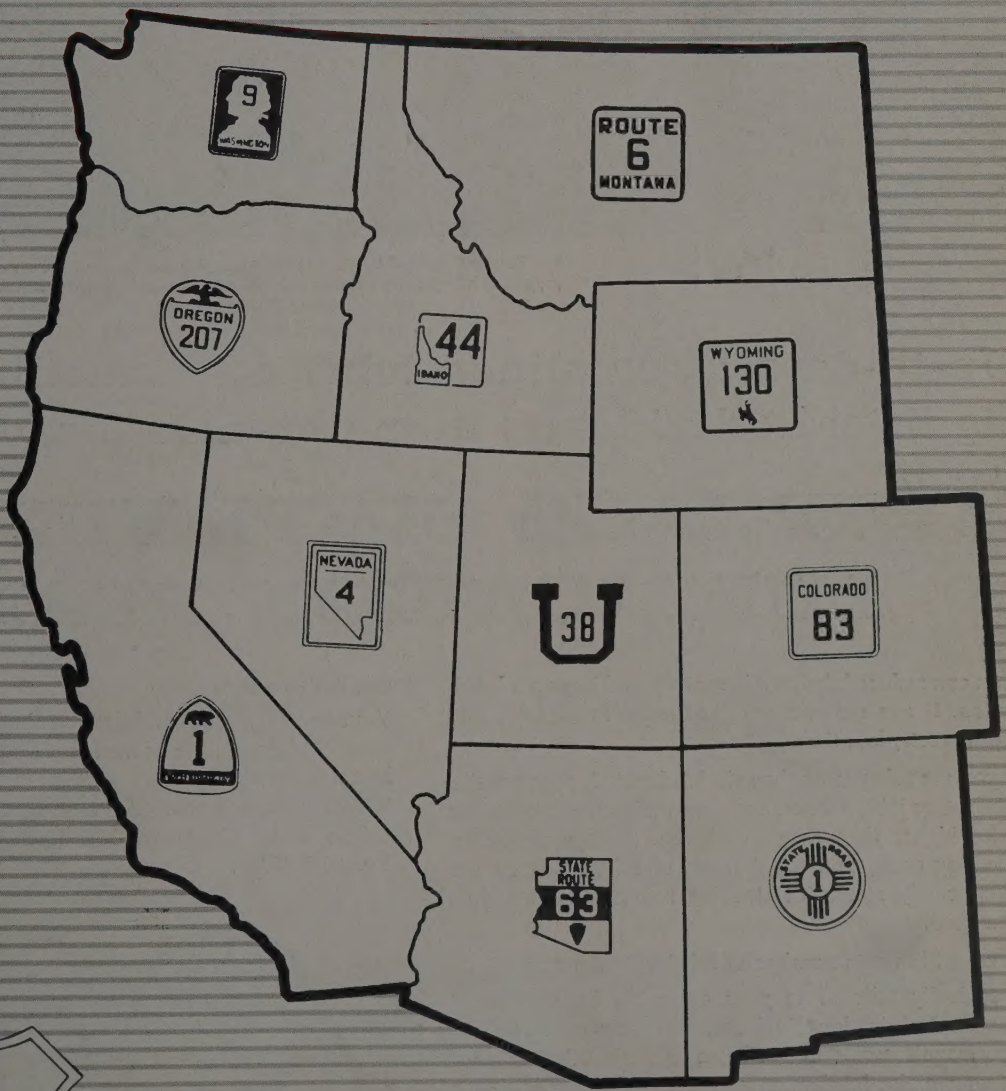
WESTERN CONSTRUCTION



ANNUAL

HIGHWAY ISSUE

JUNE 1958

The Texaco Simplified Lubrication Plan is saving maintenance dollars on this big power hous project. This impressive excavation is over 4,000 feet long and between 40 and 90 feet deep

Up-to-date, streamlined lubrication method pays significant dividends in maintenance savings:

TEXACO SIMPLIFIED LUBRICATION PLAN

Plan can reduce lubricant inventory and improve lubrication. It can mean more productive manhours, less repair costs, less time lost

If you are using more than six lubricants for your major lubricating jobs, chances are your maintenance costs are a lot higher than they should be. Storage problems, handling costs, and the dangers of misapplication are often costly results of stocking more lubricants than you need.

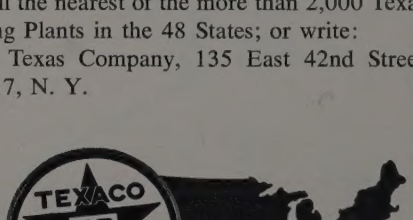
Texaco Plan cuts number of lubricants needed

Specifically tailored to your operation by your local Texaco Lubrication Engineer, this new plan can cut your requirements to not more than six lubricants for *all* your major lubrication needs. Yet the Plan is simple to put into action; it works smoothly; and above all, it will save you a significant amount of money.

Get the complete story

Your nearest Texaco Lubrication Engineer can give you complete information on the Simplified Lubrication Plan. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States; or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

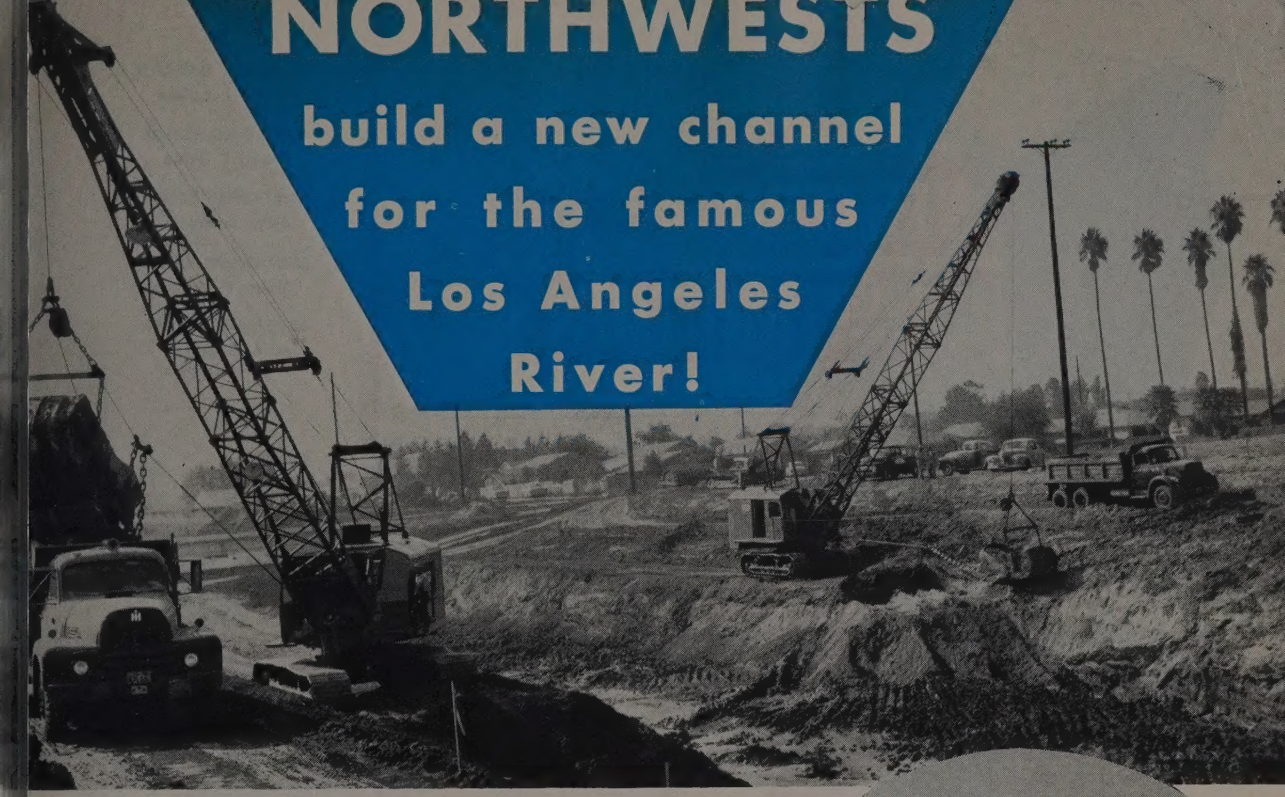


LUBRICATION IS A MAJOR FACTOR IN COST CONTROL

(PARTS, INVENTORY, PRODUCTION, DOWNTIME, MAINTENANCE)

. . . for more details, circle No. 1 on Reader Service Postcard

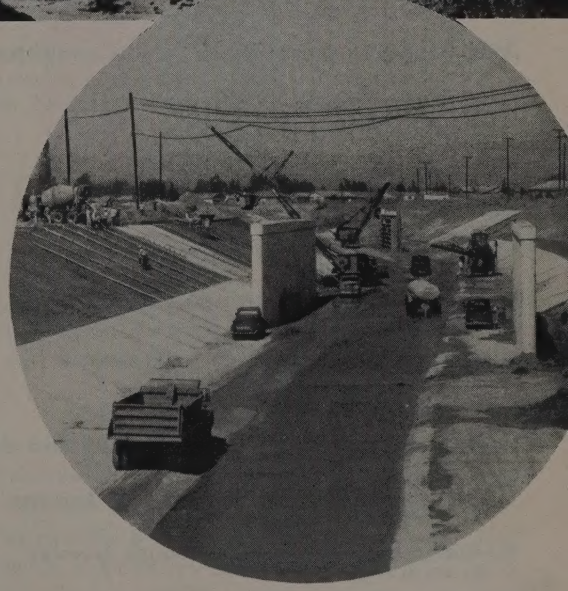
NORTHWESTS build a new channel for the famous Los Angeles River!



EVERYONE in the construction industry knows A. Teichert & Son Inc. and C. J. Rounds Co. Both these Contractors are old time Northwest users. C. J. Rounds Co. has had 22 Northwests. Here are some of them on the famous Los Angeles River, 4½ million dollar flood control job at Canoga Park, Calif. being used by A. Teichert & Sons Inc. A Teichert & Sons Inc. are using five of the C. J. Rounds Northwests, two 80-D Draglines, a 95 Dragline, a Model 6 and a Model 25 Truck Crane to put this job through in fast time.

Northwests bring you every advantage for smooth handling, smooth booming and high production. There is a wide range of boom hoist equipment. You can have booming independent of all other operations with power both up and down. The 3rd Drum gives you three load lines. Uniform Pressure Swing Clutches eliminate the grabs and jerks that make spotting the load both unsafe and difficult. The "Feather-Touch" Clutch Control assures ease of operation without resorting to pumps, compressors and other delicate mechanisms; but more than that, it retains the *feel of the load* which gives the operator greater accuracy at the "hook."

Mast type gantries and folding gantries under power, solve the clearance problems. Removable counterweight, telescopic boom struts, jibs, extended boom point sheave shafts, sectional boom hoist rigging, are all available to suit your needs. Ask for full details and, remember, that counterweight doesn't make a crane and there is no better testimonial to performance than a repeat order.



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WESTERN CONSTRUCTION

KING PUBLICATION

June
1958
Vol. 33 No. 6

SPECIAL FEATURES

ARTICLES

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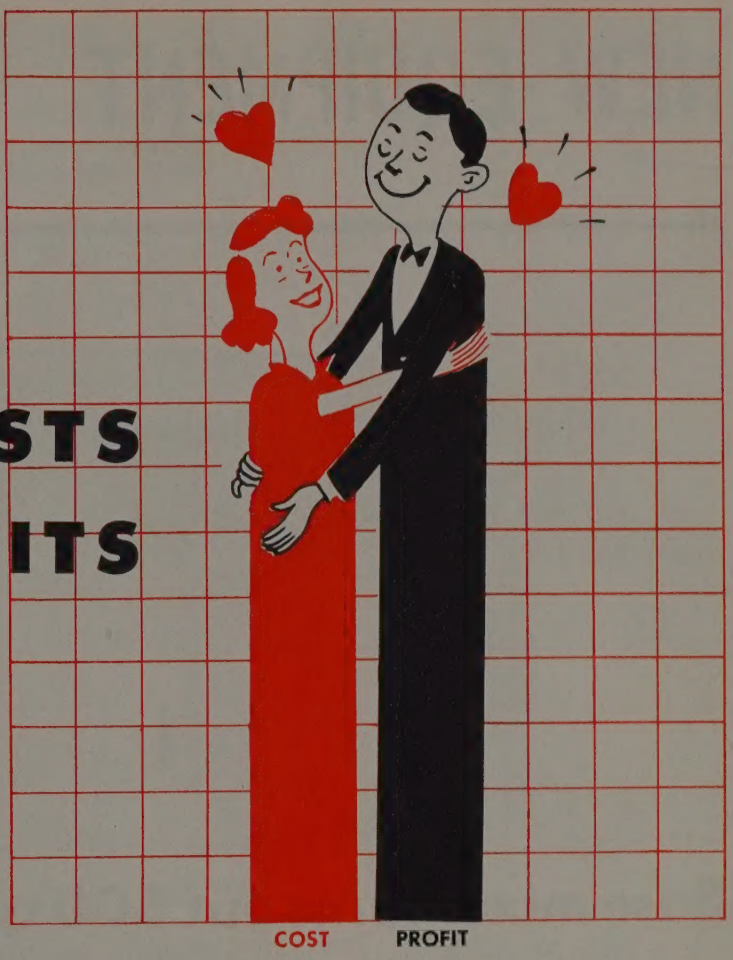
For 32 years serving the construction needs of the 11 Western States

COSTS AND PROFITS

are getting pretty cozy



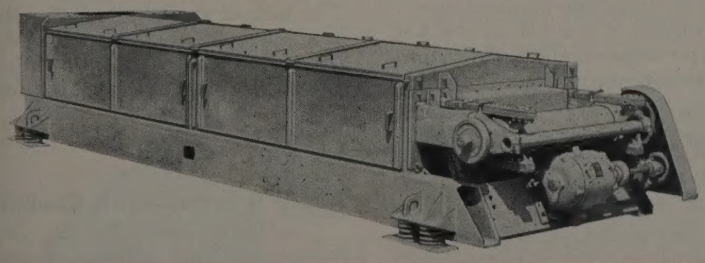
If spiraling costs could be offset with higher bids, your profit problem would vanish. But costs are absorbing too much of today's narrowing profit margins. Most users of Symons Screens are major contractors. They're holding the line on *controllable costs*, with SYMONS SCREENS.

What Are Controllable Costs?

Little can be done to reduce fixed costs, such as labor and overhead. However, it's sheer waste to use screens of inadequate capacity. This is a controllable cost. Are your materials being rejected because of inaccurate screening? This is a controllable cost. Both of these costs can be reduced—with SYMONS SCREENS.

Ask Your Accountant!

Your accountant will tell you this: *"To let controllable costs get any cozier with profit, is dangerous."* May we consider with you, from your viewpoint, just how much a SYMONS SCREEN can increase your profit?



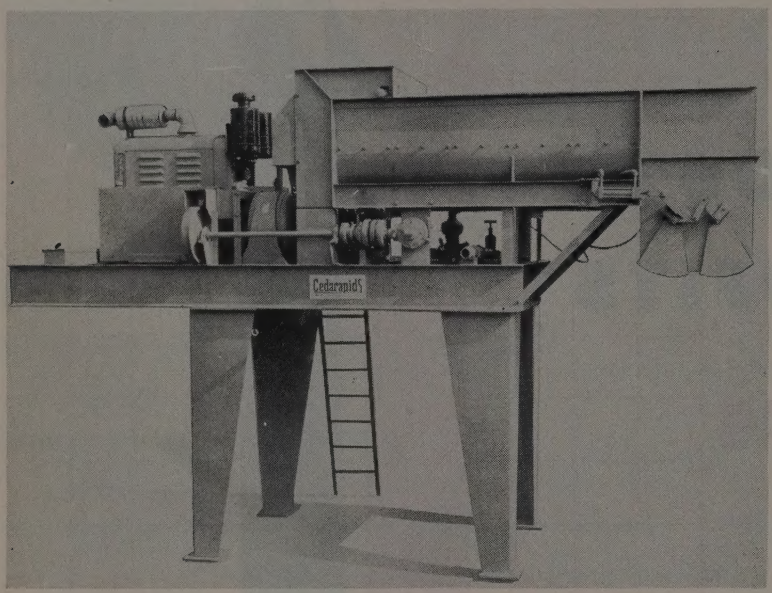
Manufactured by
SYMONS BROTHERS CO., P.O. Box 770, 11551 Hart Street, North Hollywood, California—Telephone: STanley 7-1396

SYMONS SCREENS

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

NEW EQUIPMENT

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



Base mixer turns out 500 tph.

From 300 to 500 tons per hr. of aggregate thoroughly mixed with water, and calcium chloride when desired, is provided by a new stabilized base mixer that has been announced by **Iowa Manufacturing Co.** Aggregate treated in this manner is being used more and more as stabilized base material for bituminous and gravel roads.

The new unit, designated the Model 2 Twin Shaft Stabilized Base Mixer, consists of a twin shaft mixer, discharge hopper, self- priming pump and meter, all mounted on a steel frame and supported by steel legs which bring it to truck-loading height. It includes drives, speed reduction and controls. Front and rear running gear are available to support the frame without legs on between-job moves. A calcium chloride feeder unit with metering gate, screw conveyor and drives is also available as optional equipment.

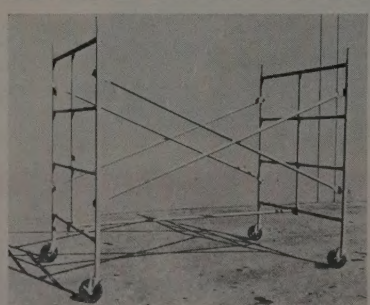
In operation, aggregate is fed into one end of the mixer by a conveyor. As it enters the mixer the proper amount of water is sprayed on it through nozzles. The water is controlled by a 3-in. self-priming centrifugal pump and water meter. (An optional water meter with electric flow indicator is available). The 60 paddles on the two shafts thoroughly mix the material to the correct moisture density and move it to the discharge hopper. The 2½-yd. discharge hopper has clam-type gates for dumping directly into trucks.

. . . Circle No. 151

Scaffold has casters for easy mobility

Superior Scaffold Co.'s lightweight tubular steel scaffold is winning wide acceptance as a versatile, general utility rolling scaffold in the fields of light-duty construction and building maintenance.

It consists of 4 x 4-ft. or 4 x 5-ft. box-type frames and standard Auto-Lock tubular cross braces and horizontals. Also included is a set of 6-in. casters (with brakes) specifically designed for this scaffold to facilitate easy movement from job to job.



Of particular interest is the price which is pegged at some 30% lower than the cost of a standard rolling scaffold of heavy duty construction.

. . . Circle No. 152

242-lb. tamper produces 2,300-lb. impact

Vibro - Plus Products, Inc., has developed the CM-15 Tamper, a unit which eliminates the need for the traditional 4 or 5-man air tamp crew, or 10-ton roller. Weighing

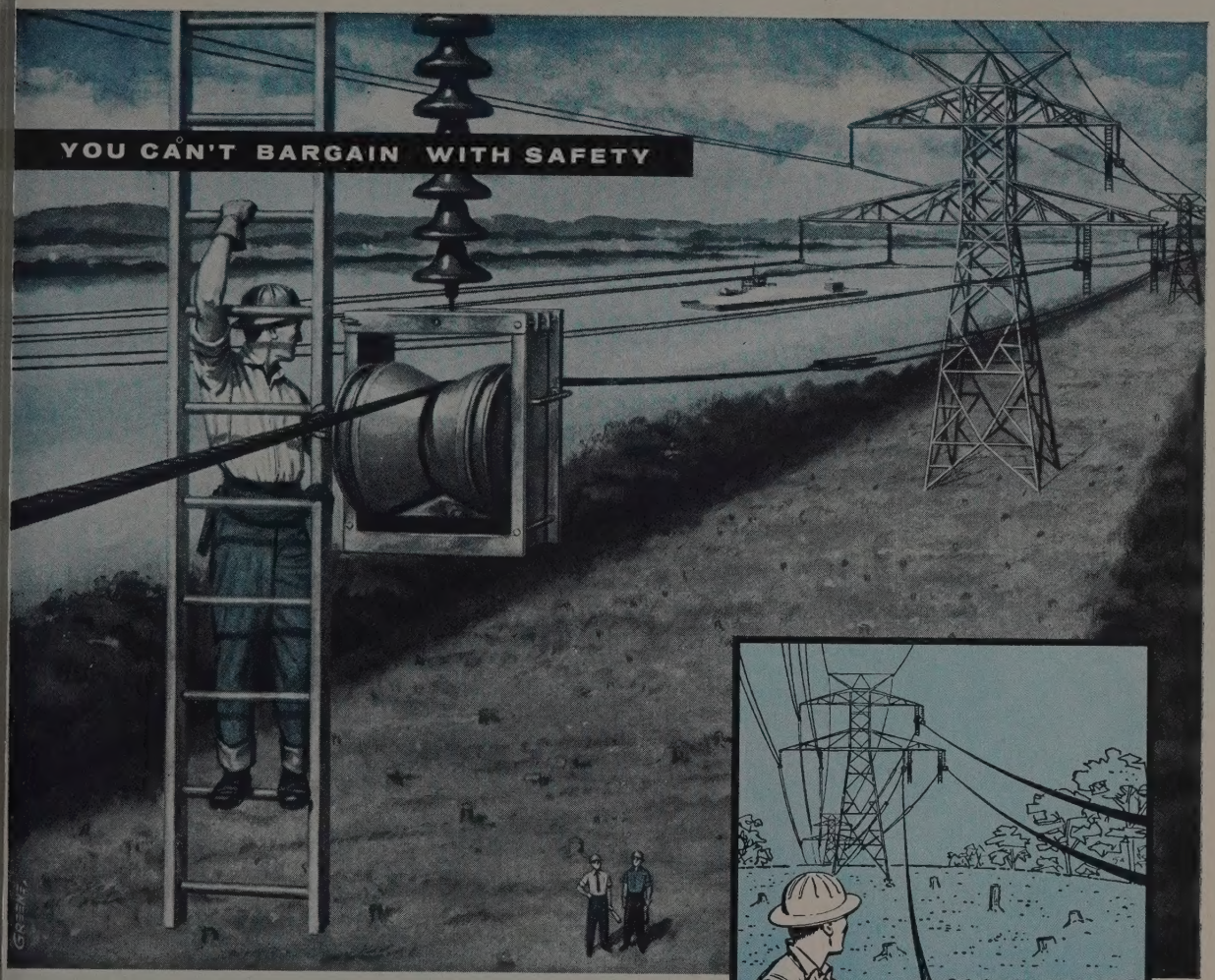
only 242 lb., CM-15 produces a 2,300-lb. impact with 2,350 vibrations per min., is self propelled and travels up to 55 ft. per min. A special carburetor prevents starting difficulties and assures continuous operation. The handle vibration of CM-15 is reduced as two sets of shock absorbers are used. The base of the handle is mounted in a newly designed shock absorber. Instead of using hydraulic fluid to absorb the shock, two opposing springs do the work.

. . . Circle No. 153

Apply it faster—with Caulk-Flo

Caulking and glazing compounds, roofing cement, mastics, sealants, putties, adhesives and similar materials can now be applied faster at less cost with Caulk-Flo, a device just introduced by **Force-Flo, Inc.**

The new unit consists of a high



Stringing conductors on towers carrying a live 330,000 volt circuit is a tough job. Hoosier Engineering Company of Columbus, Ohio, does it by threading conductors up to 1¾" through a tension machine and pulling them over sheaves on the tower arms with 9000 foot lengths of Wickwire Wire Rope. On jobs like this, where men's lives are at stake . . .

rope failure can be fatal

Whether you're stringing power lines, pulling drill pipe, or handling other hazardous hoisting jobs—don't bargain with safety. "Bargain" wire rope can cause more trouble and expense than you expect. Buy wire rope on the basis of *quality* . . . buy Wickwire Rope.

For extra strength—buy Wickwire's Double Gray IWRC extra improved plow steel wire rope

CF&I

LOOK FOR THE **YELLOW** *TRIANGLE*

PRODUCT OF WICKWIRE SPENCER STEEL DIVISION
THE COLORADO FUEL AND IRON CORPORATION

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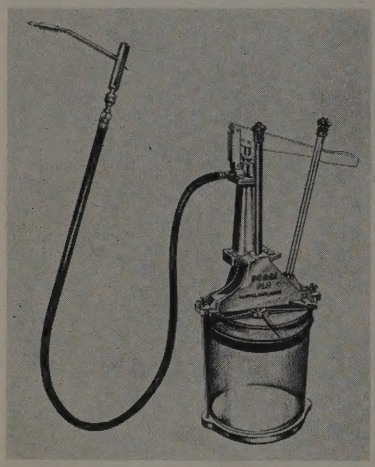
5924

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

volume pressure system and a high pressure pumping mechanism, complete with a hose and nozzle assembly. By placing the unit on a 50-lb. or 5-gal. standard bucket, the material may be applied directly from the original container to the point of application. Because material is taken directly



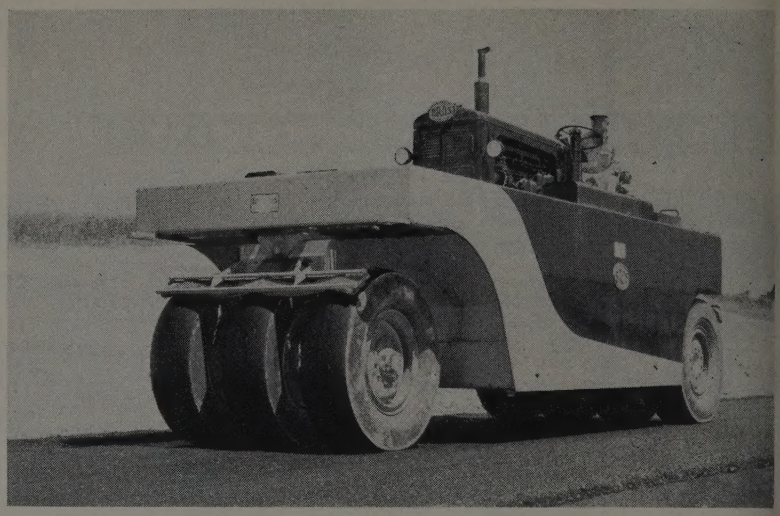
from bulk containers and applied through the unit's nozzle assembly without caulking guns and expensive cartridges, there is a definite savings. The time consuming process of filling a caulking gun approximately fifty times from the material contained in a 5-gal. bucket is entirely eliminated.

The device is placed in operation by placing the pumping mechanism on top of the material in the original container. Clamps on the Caulk-Flo unit securely hold the unit in place. Three strokes of the handle, actuating a manually operated large neoprene piston, pressurizes the pail to prime approximately 5 lb. of material. This assures a constant supply of material to the high pressure pump. By actuating the high pressure pump handle, material is delivered through the unit nozzle to the point of application, at the rate of one-third ounce of material per stroke. . . . ***Circle No. 154***

Asphalt roller needs only two passes

Densities from 101.5% to 103% in one to two passes have been averaged by a new asphalt roller on controlled state tests. Designated the SP-730, the 30-ton self-propelled roller for asphalt, base and subgrade compaction work is a product of **Bros Inc.**

On base aggregate compaction tests, the same roller obtained the



95% densities specified by the state in two passes.

Further, is is considered possible to change earthfill procedures by using the Bros SP-730 to compact lifts into a smooth course, thus allowing scrapers to travel in high gear over fill materials. In this manner, scrapers could speed up hauling and spreading of fill materials.

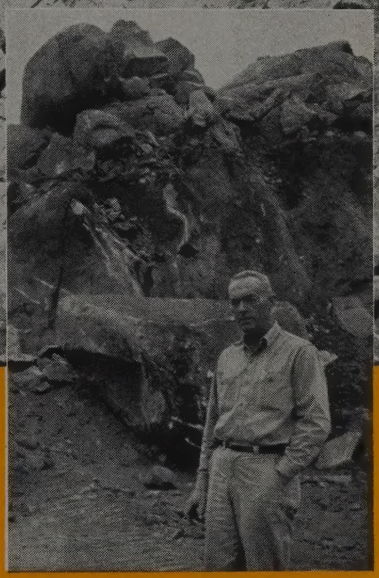
Design of this roller features three wheels in front and four wheels in the rear, with full oscillation to provide even flow of compaction pressures. Rear wheel pairs have positive chain drive from power take-off.

The SP-730 is equipped with torque converter drive to provide smooth, even transmission of power to the drive wheels. It is powered by a 95-hp. diesel engine which develops 1,800 rpm. at operating speeds. Standard equipment includes front and rear lights; and cocoa mats.

. . . ***Circle No. 155***

COMPLETE COVERAGE in the small crane and excavator field has been accomplished by *Little Giant Crane and Shovel, Inc.* with their three new models, rated at 7, 10½, to 15-ton capacities. All sizes feature the Ball Bearing Turntable. Distinctive improvements incorporated on all models include relocated controls, special hydraulic track shoe adjustment, and cut teeth on swing pinions and bull gears. Pictured is the Model 32, a 10½-ton truck-mounted crane. . . . ***Circle No. 156***

30-Ton Rocks moved with *Athey* Rear Dumps in California



Contractor E. C. Young. The huge boulders in the background are being moved with Cat-Athey Rear Dumps.

An 8-lane extension of U. S. Highway #80, the main route between San Diego and El Centro, California, is being constructed by contractors, E. C. Young and Young & Arrieta.

A total of 1½ million yards of rock and earth is to be moved. The section will be 2 miles long in La Mesa, a thriving San Diego suburb.

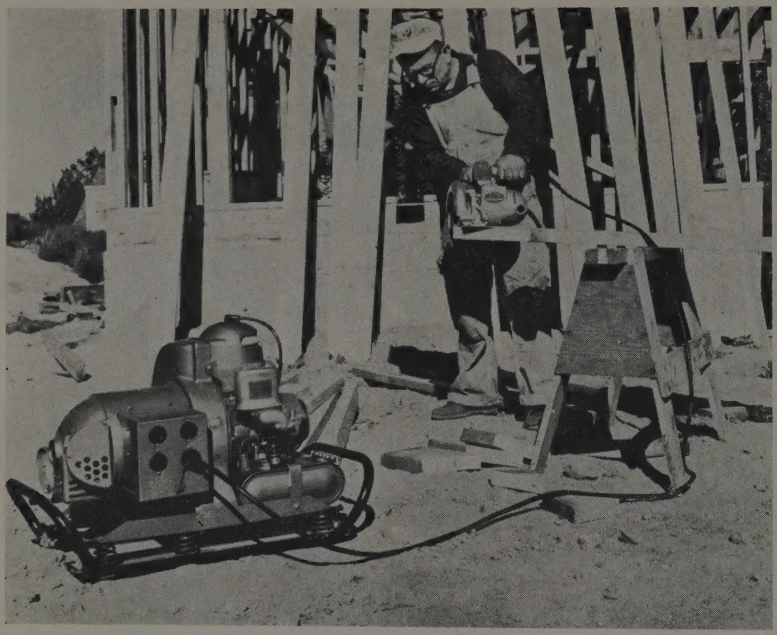
Cat-Athey DW21-PR21 Rear Dump Trailer Units were selected for the job because they are built for heavy rock work. Their sturdy, rugged design and highest quality construction solved the rock problem and their easy loading and fast dumping are helping the contractors meet a tight production schedule.

You can keep your job moving on schedule, too, with an Athey-Cat Tractor-Trailer team perfectly suited to your job. Your Athey-Caterpillar Dealer can help you select the best rig for your particular needs. Or, write Athey Products Corporation, 5631 West 65th Street, Chicago 38, Illinois.

Agile DW21s-PR21s are quickly moved into place for loading.

The only complete Tractor-Trailer Line... by the leaders **Athey**

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



Homelight provides dependable power source

Designed for use by contractors and builders are two 3,000-watt, gasoline-engine-driven generators, announced by **Homelite.** These new units, the 115-volt, 60-cycle Model 8A115 and the 115/230-volt, 60-cycle Model 8A115/230, provide a dependable source of power for operating electric drills, saws, concrete vibrators, floodlights, and other power tools on the construction site.

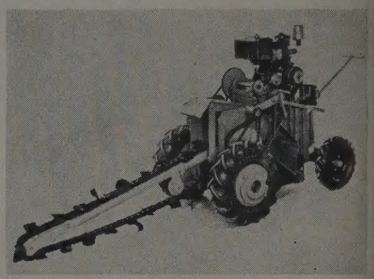
Weighing only 140 lb., these compact generators can be carried easily to the job and used anywhere on the job. Both generators feature 4% voltage regulation and a generous overload capacity to assure top performance, less maintenance and longer life for power tools, floodlights, and other electric equipment. Exclusive generator design eliminates DC brushes, commutator and DC armature windings to reduce maintenance costs to a minimum. Power is provided by a Homelite 2-cycle gasoline engine directly coupled to the armature shaft.

. . . Circle No. 157

TANDEM RIPPER DEVELOPED BY SHEPHERD MACHINERY CO.
The 20,000-lb. hydraulically controlled tandem ripper developed by *Shepherd Machinery Co.*, is easily attached to one Caterpillar D9 tractor, and is pushed by a second D9. For heavy rock ripping, a single center 4 x 16-in. tooth is used, producing down pressures in excess of 105,000 lb., and ripping pressures in excess of 160,000 lb. It can be concentrated on a single 4½-in. point, which is considered sufficient to fracture and rip the majority of rock found in the Western states. *. . . Circle No. 158*

Lightweight trencher

The **Arps Corp.** announces the development of a new one-man operated trencher, the Trench-Devil, Model M. Designed for workers requiring a low cost, heavy-



duty trencher for a wide variety of jobs, Model M weighs approximately 815 lb. The unit can be easily skid-loaded on pickup trucks or small trailers, or it may be transported for short distances under its own power, at 2½ mi. per hr. There are four digging widths, 2¾ in., 4 in., 6 in., and 8 in., up to 42 in. deep. Digging speed is variable from 0 to 1,200 ft. per hr. At the 30-in. depth, digging speed averages 120 ft. per hr. with an 8-in. width. A 24-in. depth increases digging speed to 800 ft. per hr. at the 4-in. width.

. . . Circle No. 159

Mortar and concrete solvent kind to skin and equipment

Morgen Cleaner, a chemical compound that removes mortar and concrete from equipment and masonry without harm to skin or equipment, is being introduced nationally by **Morgen Manufacturing Co.** While it was originated for safely cleaning up masonry work, the cleaner has been found equally effective for removing hardened concrete and mortar from tools, forms, hardware, cranes, buckets, conveyors and concrete mixers. No special application equipment is required. Morgen Cleaner is so safe it is shipped in ordinary 30 and 55-gal. metal drums instead of carboys. Smaller sizes—1 gal. and 5-gal.—come in break-proof plastic bags packed in corrugated cartons. A spout in the bag and finger-grip perforations in the cartons make the cleaner easy to pour.

. . . Circle No. 160

(Turn to page 162 for more New Equipment. Best manuals on pavers and finishers can be found on page 148.)

Half the West Belongs to the U.S.

APPLYING FEDERAL PLANS and policies to this Western region is distinctly different from their application to other sections of the U. S. Almost one-half the area of the Western states is owned by the Federal Government. This compares to an area of one-tenth that amount in the other 37 states. As a result, such problems as communication, transportation, resource development, water supply and recreation considered at the national level have a different impact on the West.

Details of Federal land ownership are complex because of the many agencies involved and the differing types of control. However, one summary table from a Federal agency lists the following:

State	Federally-owned Land (acres)	(percent)
California	47,174,500	47.0
Oregon	31,601,560	51.3
Washington	12,787,755	29.9
Arizona	32,321,202	44.5
Idaho	34,547,174	65.2
Nevada	61,175,902	87.1
Utah	37,000,418	70.2
Colorado	24,120,413	36.3
Montana	27,952,429	29.9
New Mexico	26,218,480	33.7
Wyoming	29,851,313	47.8
Total for 11 Western states	364,746,000	
Average of 11 Western states		49.4%

This total acreage is slightly more than 10 times the Federal land ownership in all of the other 37 states combined. Further, the general average of 49.4% in the West compares to a figure of 4.5% as an average in the other states. To make this comparison really startling, it is only necessary to add in Alaska, which could be our next Western state, and include its 365,062,391 ac. of Federally-owned land, or 99.9% of its total area.

How does this situation relate to Federal plans and policies that have a bearing on construction activity in this region? Any regulation affecting highways, land use or water conservation could be of small concern to Maine or Pennsylvania, but might affect the entire economy or future of any Western state.

This regional impact has special significance in the highway field. Present formulas for allotting Federal funds include elements based on land ownership but fall short of being realistic. Further, there is no allowance for the fact that highway costs are always disproportionately high in Western states. The relative construction cost-per-mile ratio deserves consideration, even though the answer is extremely difficult.

It was the common regional problems of financing, administration and construction that created the need for establishing the Western Association of State Highway Officials some 37 years ago. The purpose and accomplishments of WASHO become more pronounced as population growth increases highway problems where half the region belongs to the nation. WASHO continues to serve its vital function as a forum for the exchange of ideas and information on highway development in these Western states.

Jim Ballard

Driver's position—ahead of the hopper but above and slightly behind the gutter broom—provides the operator with simultaneous view of traffic, obstructions and gutter broom operations. Here the Model 60 (4+ cubic yard capacity) is shown cleaning up a new road surface prior to seal coating.

Full-vision Austin-Western Motor Sweepers mean extra safety, more efficient operation

Safety and efficiency are featured in both models of Austin-Western Motor Sweepers. The only sweepers combining the advantages of front-wheel steer and rear-mounted hopper, they give the operator an unobstructed view of both gutter brooms at all times. He can work closer to cars and curbs, can get every bit of debris into the hopper. A further safety factor is the low tire loading of the A-W machines—far below that of competitive machines. And because they discharge the debris at the back between the wheels, dumping is faster and more efficient.

Here are some of the other reasons why A-W Motor Sweepers outperform:

Fast broom adjustment—Broom pressure can be quickly changed to meet all surface conditions.

Bump-proof broom—Full-floating, 5-point mounting allows the broom to follow every contour of street and curb.

Positive drive—Both rear wheels are driven, giving excellent hill-climbing capacity.

Tailor-made transmission—Specially designed for sweeper operation—not a truck transmission. Enables machine to work all day in low or second gear at full engine torque. Low gear gives a powerful scouring action for extra-stubborn dirt.

Spray bars—Exclusive lever controls allow operator to regulate the amount of water supplied to sectional spray bars.

Long life clutch—Cera-metallic button type for long, trouble-free life.

Both the A-W Model 60 (4+ cu. yd.) and Model 40 (2 cu. yd.) Motor Sweepers can be purchased with a single gutter broom, and the second broom can be added later at low cost if the need arises. Leaf broom attachment, cab and windshield are also available. Write us for further information or see your nearby A-W distributor.

A-W Model 40 (2 cu. yd. capacity) showing how machine dumps to the rear—machine stays in the sweeping lane—does not need to back up or maneuver around pile.

Austin-Western

Construction Equipment Division
Aurora, Ill.

BALDWIN BLH LIMA-HAMILTON

ARIZONA—
WESTERN MACHINERY COMPANY ..... Phoenix
CALIFORNIA—
EDWARD R. BACON COMPANY ..... San Francisco 10
SMITH BOOTH USHER COMPANY ..... Los Angeles 54
COLORADO—
MACDONALD EQUIPMENT COMPANY ..... Denver 16
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MONTANA—
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LEVENTH ANNUAL HIGHWAY ISSUE

KING PUBLICATION

WESTERN CONSTRUCTION

JUNE 1958

Progress on the Interstate System

HERE IS NO simple answer to the question, "Is he Interstate Highway System ahead or behind schedle?" The answer depends on how you evaluate curent activity, and whose original schedule you use. ut two things can be said definitely: Construction ctivity on the gigantic freeway network is increasing, nd the eleven Western states are strongly represented n the national picture. In terms of miles of construcion under way, according to figures released by the ureau of Public Roads this year, Texas leads the ation followed by North Carolina, California, Wyoning, Colorado and New Mexico in that order.

In order to get an up-to-date view of what's going n and what's coming up in the eleven Western tates, WESTERN CONSTRUCTION contacted each State Highway Department. The main features of that surey are given in this article and are summarized in the ccompanying table and map. An idea of how the onstruction pace is quickening can be gained by an xamination of the table, which lists not only the figres for this year, but the estimates given a year go for the calendar year 1957.

Three major changes have taken place in the map f the network in the eleven Western states since a ear ago. A 547-mi. route has been added between Denver and Cove Fort, Utah; 132 mi. has been added etween Ellensburg, Wash., and Pendleton, Ore.; nd a route has been added between Ogden, Utah nd a point near the Colorado state line. This milege is about one-third of the total added to the naional system as a result of more direct locations.

The program received a shot in the arm in April f 1958 when the Federal Government approved legslation sponsored by George H. Fallon and Albert Gore, chairman of the House and Senate Roads Subommittees respectively. The bill adds $200,000,000 o the authorization for Interstate Highway construcion (extended on a 90% federal—10% state matching asis) in fiscal 1959, to be apportioned immediately, nd $300,000,000 additional annually for fiscal 1960 nd 1961. The 1960 funds are expected to be apporioned this July or sooner.

When completed, the 41,000-mi. National System f Interstate and Defense highways will link 90% of ll cities of 50,000 population or more. It is designed o handle 1975 traffic volumes, when 50% more cars, rucks and buses are anticipated. The System will include only about 1% of the nation's total mileage f roads and streets, but will carry 20% of all traffic.

Following is a brief look at the Western states.

Arizona

There are about 1,200 mi. of the Interstate System in Arizona of which 18 are already up to standards. There will be 150 mi. under active construction by the end of 1958, representing about $25,000,000. It is estimated that 125 mi. now in the active planning stage will go into construction during the calendar year 1959.

California

Interstate System mileage in California is 2,135, of which 178 are under construction and 63 are up to standards. Total estimated construction cost of current Interstate jobs is $170,000,000. Budgeted 1958-59 fiscal year but not yet under construction: 56 mi.

The California Highway Commission now has under consideration the adoption of freeway routings for the southerly 212 mi. of the Westside Freeway, which is located on the west side of the San Joaquin Valley. Also under consideration is the Junipero Serra Freeway on the San Francisco peninsula.

On the accompanying map the proposed Westside Freeway is shown by a dotted line.

Colorado

Because Colorado's State Highway budget is now being made up by the State Highway Commission for presentation to the Governor, accurate estimates are not available for new projects which may be under way by the end of the year.

With the additional allotment of the 280 mi. west of Denver, Colorado's portion of the Interstate System now totals 960 mi. Of this, about 30 mi. are up to full Interstate standards.

The construction budget for the 1959 fiscal year will include about $35,000,000 for the Interstate System. Projects will be set up on U.S. 87 and on U.S. 6-40 west of Denver between Idaho Springs and Empire Junction.

Idaho

There are 611 mi. of the Interstate System in Idaho of which 89 will be under active construction by the end of 1958, representing $23,000,000. There are 103 mi. in the active planning stage which will probably go into construction in 1959.

Montana

There are 1,240 mi. in Montana of which 75 have or will have been under active construction by the end of 1958, totaling $26,500,000. There are 90 mi. of Interstate Highway in the active planning stage for letting in 1959.

Nevada

In Nevada there are 533 mi. of which 5 are up to standards. Fifty-eight miles will be under active construction during 1958, representing $19,000,000. About 47 mi. are in the active planning state at the present time for awarding next year.

New Mexico

The proposed Interstate System in New Mexico totals 1,003 mi. Construction jobs under way starting during the 1958 calendar year amount to 172 mi., involving $46,000,000. In the active planning stage during the present time for letting next year are 74 mi.

Oregon

Oregon has completed 64 of 715 mi. of the Interstate System within its borders. The 1958 calendar year will see 126 mi. under construction totaling $55,000,000. To be contracted in 1959 are 100 mi.

Utah

There are 950 mi. of the Interstate System in Utah. At present, 22 mi. are under construction and by the end of the year this will be increased to about 45 mi involving an estimated contract amount of $30,000 000. Next year it is expected that an additional 5 mi. will be under construction.

Utah's Interstate program has been delayed by th problem of resolving locations through the urba areas of Salt Lake City, Provo and Ogden. Resolvin differences of opinion has made necessary many d tailed studies and over 20 public informational mee ings and hearings. The major obstacles have bee overcome, however, and the program should pick u momentum rapidly from now on.

Washington

In Washington there are 595 mi. of the Interstat on U. S. 99 and U. S. 10. The length of the new se tion in Washington between Ellensburg and Pendl ton, Ore., is about 110 mi.

Washington has 40 mi. already up to Interstate sta dards with quite a bit more mileage needing oni wider shoulders or additional grade separation stru tures to bring it up to standards.

About 120 mi. will be under active construction b the end of this year, involving $48,000,000.

Active planning for work expected to go into co struction between January 1, 1959 and June 30, 195 totals 13 mi.

Wyoming

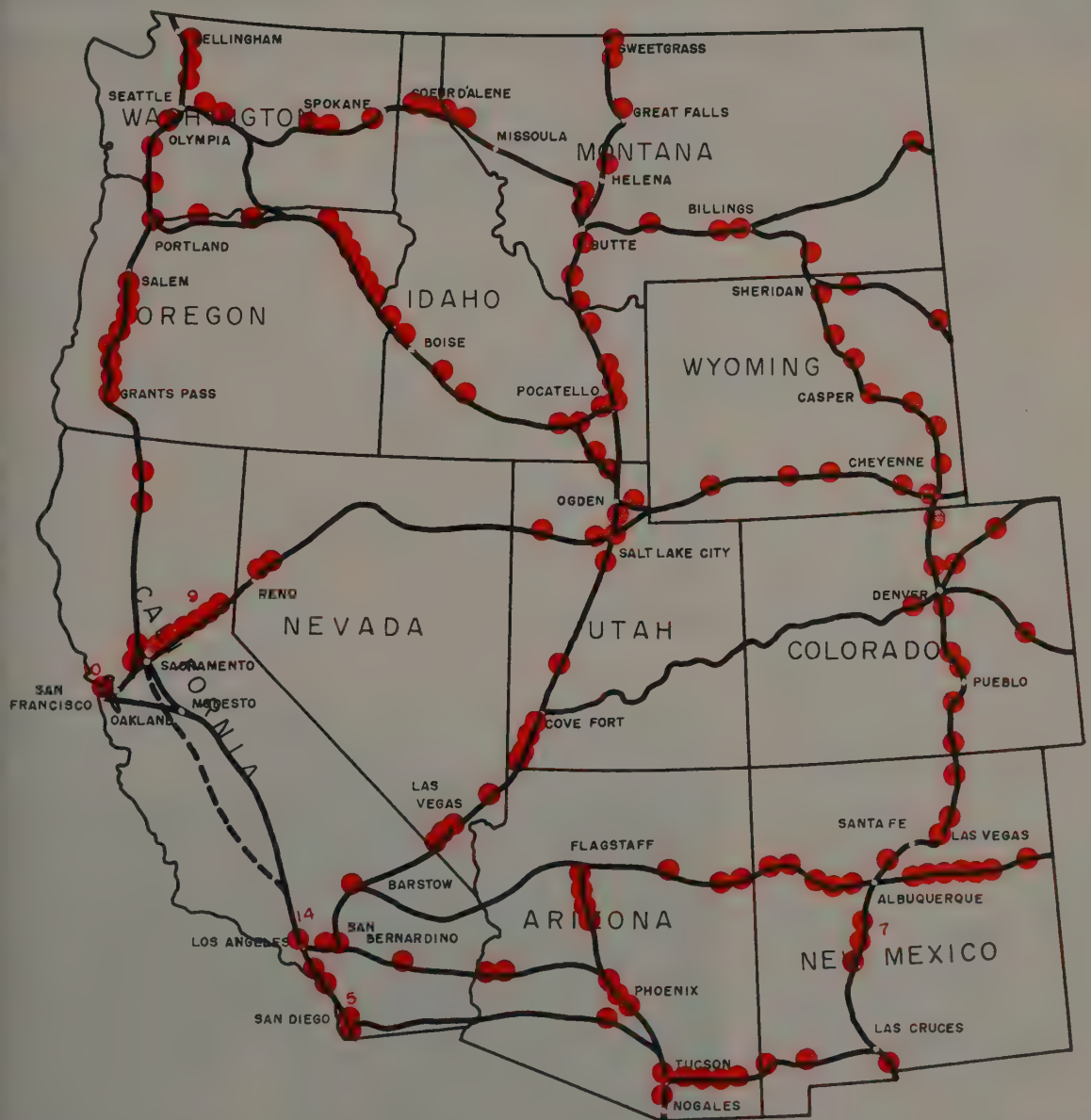
Of the 1,007 mi. in Wyoming about 91 are unde contract, with another 150 in the active plannin stage. Approximately $26,000,000 is involved in th construction presently under contract.

The Interstate Highway System in the West

	Total (mi.)		Under Contract (mi.)		Contract Value (millions of dollars)		Completed (mi.) To date	To be let in 1959 (mi.)
	1957	1958	1957	1958	1957	1958		
Arizona	1,200	1,200	112	150	20	25	18	125
California	2,172	2,135	160	178	158	170	63	*56
Colorado	600	960	109	100	26	20	30	. .
Idaho	609	611	63	89	17	23	0	103
Montana	1,240	1,240	52	75	7	26	0	90
Nevada	543	533	21	58	9	19	5	47
New Mexico	1,008	1,003	155	172	40	46	0	74
Oregon	715	715	70	126	30	55	64	100
Utah	643	950	. .	45	. .	30	0	55
Washington	596	705	45	120	25	48	39	*13
Wyoming	1,007	1,007		91	. .	26	. .	150
TOTALS	10,333	11,059	787	1,204	332	488	219	

ONLY 2% of the West's total allotment of mileage on the Interstate System is completed, but nearly 11% is under construction. This compares with less than 8% reported last year. The contract value is 47% higher than last year. As the table shows, the total mileage in some states is different from last year. This is due partly to new apportionments and partly to new locations. The figures listed und 1958 are estimates given in May for the entire calendar year. Und 1957 are given estimates made in May of 1957 for the 1957 calend year. Right-hand column lists mileage expected to be awarded 1959, based on work being planned. Asterisks indicate fiscal year fig

Project locations for 1958 on the Western Interstate System



EACH RED DOT on this map shows the approximate location of a construction project under way or to be started by the end of 1958 on the Interstate System. Because of the scale, red numbers are used to indicate the number of projects under way in certain areas of concentrated activity. Changes from last year's map include a route from Denver, Colo., to Cove Fort, Utah, and from Ellensburg, Wash., to Pendleton, Ore. The dotted line in California is the Westside Freeway, the location of the southerly 212 mi. of which is now under consideration by the Highway Commission. The Western states lead the nation in terms of mileage under construction.

UTAH—Highways for industry and tourists

Southeastern Utah—rich in mineral resources and scenery—is being opened up with the current highway program. Runaway ferry cuts state route. Access route rushed to Glen Canyon Dam. State gets another Interstate connection.

By **HORACE J. GUNN**
Information Officer
Utah State Road Commission
Salt Lake City, Utah

LATE THIS spring in Utah highway engineers found themselves with a navy, at least they had a ferry on their hands. A further peculiar aspect of this situation was that the U.S.S. (Utah State Ship) was situated at Hite on the Colorado River, a location that is in one of the state's most remote sections, a distance of some 300 mi. from Salt Lake City.

Utah Route No. 95 from Hanksville to Blanding Junction goes through Hite. It is shown on the official State Road Commission map as a dirt road, and a footnote even warns motorists to carry water. The road reaches the Colorado at Hite, where an 800-ft. river crossing must be made. But, during the spring of this year, the distance was 324 mi. if a vehicle wanted to reach the other side. The reason was that the ferry was a casualty when a quick overnight rise brought the river up 8 ft. The ferry was carried away by the mighty Colorado and later found badly damaged several miles down the river. This meant that a motorist had to return to Hanksville, drive to Green River, then on Highway No. 160 to Monticello, thence to Blanding, and back on highway No. 95 to reach the opposite bank of the river—distance 324 mi.

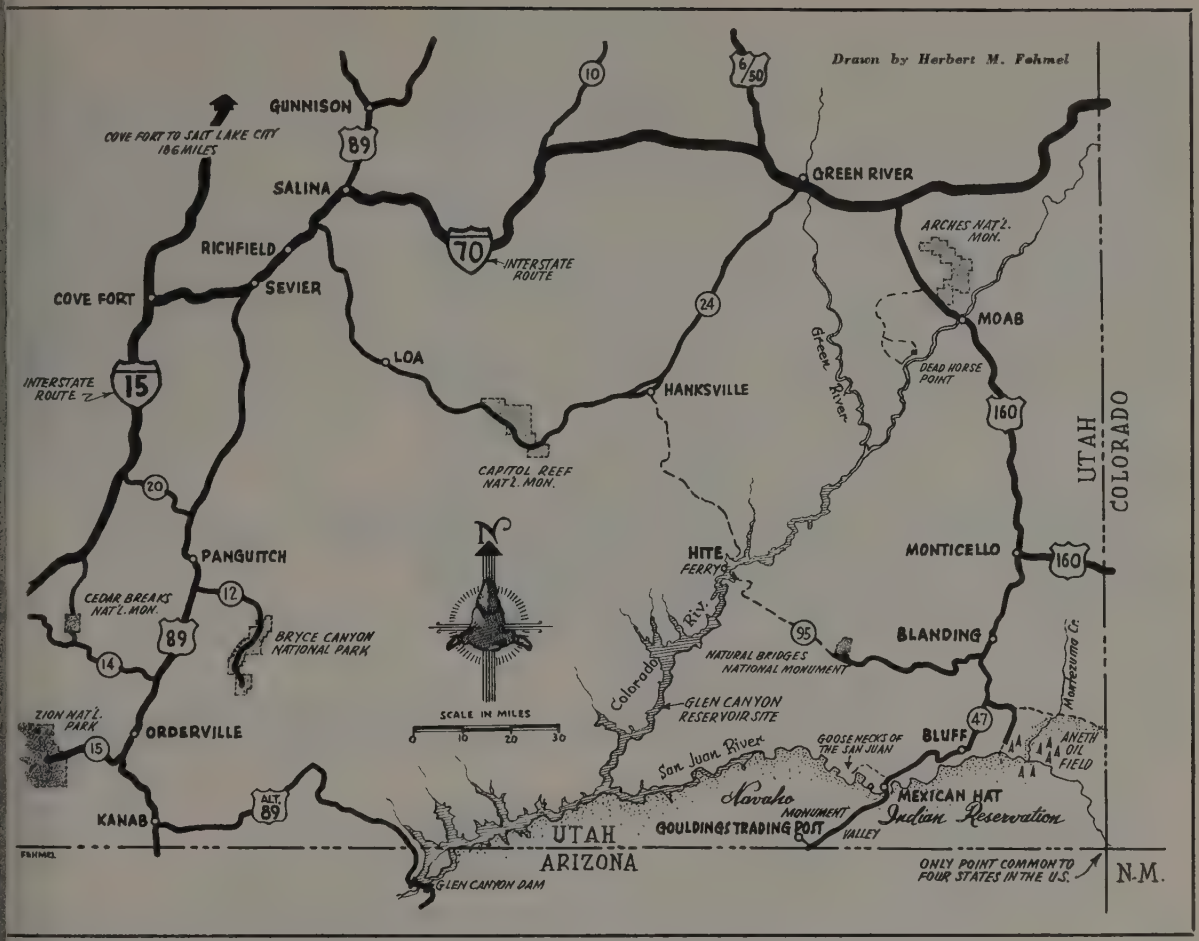
The vast southeastern section of Utah, until the invasion of uranium hunters, was considered the most unexplored territory of the United States. The Colorado River cuts across this desolate area, and with the completion of the Glen Canyon Dam project, water will back up to the ferry site and reach a depth of 150 to 200 ft. This means at this point the alternates are to either construct a bridge or provide another ferry. The state now has under preliminary study plans to construct a bridge across a narrow portion of the reservoir.

Route to Monument Valley

Such problems are one of the many confronting Ellis L. Armstrong, Director of Utah Highways, who is just completing his first year in the new office created by the reorganization of the State Road Commission. Utah has an area of some 84,000 sq. mi. This compares to twice that of Virginia, for example. Construction and maintenance problems vary from handling slides in ski areas where snow reaches depths of over 20 ft. to a section known as the state's Dixie, which is almost semitropical.

One project which is nearing completion in this immense, sparsely populated area of southeastern Utah is a new hard-surfaced road from Mexican Hat (population shown on the 1950 census, two people) to the Arizona state line. The new highway covers 21 mi. through one of the state's most scenic sections. This is Monument Valley, a land of towering stone

WHEN AN 8-ft. overnight rise of the Colorado River swept this ferry away it meant a highway journey of 324 mi. to get from one side of the river to the other. This site will be under 15 ft. of water when the Glen Canyon reservoir is filled.



SOUTHEASTERN UTAH WHERE HIGHWAYS ARE THE KEY TO DEVELOPMENT

onoliths of many brilliant colors. o enable travelers to see this beauful panorama, look-out points are eing provided at several locations long the route. They extend some 00 ft. from the highway and alw a vantage point view and turn round.

The new road traverses the heart the Utah portion of the interestg Navajo Indian Reservation. onfronted with the everlasting roblem of water like the Navajo, e Utah road builders designed a ovel means for solving the situaon. Rather than haul water on dusty road from the San Juan iver with a one-way trip of over 0 mi., the engineers constructed ams to catch run-off from the dry, arren area for use on the road. redit goes to Utah engineers Jack . Skewes, Jim West, and Edwin . Lovelace for the idea. Three arth dams were built, each of hich would hold over 1,000,000 al. of water. The dams, costing total of $2,500 for all three, have ved the state an estimated $80,-00 in costs that would have been incurred, had the long haul been necessary. After completion of construction of the road, the dams will remain to provide stock ponds for the Navajos.

ELLIS L. ARMSTRONG, Director of Highways, Utah State Road Commission, has recently completed his first year in office.

At an early meeting this year, Utah's five-man policy road commission took action to speed up work to the Aneth Oil fields. The fields are situated near the famed Four Corners, the only spot common to four states in the United States. The first crude oil from this field began to flow into refinery tanks at Los Angeles during April. It is being transported by pipe line through a 750-mi. system.

The Utah Highway Department is building a road to the Aneth Fields, construction of which is already well under way, the project will cost about $600,000 and will be a 24-ft. width bituminous surfaced road. It will commence on Utah Highway No. 47 at a point about 11 mi. north of Bluff extending easterly and southerly 20 mi. to the Aneth Oil fields.

Access to Glen Canyon

One of the biggest projects undertaken recently by the Utah Road Commission is the construction of an access road to Glen Can-

yon Dam. Director Armstrong has said, "We are very pleased with the progress being made on the new highway from Kanab, Utah, to the Arizona state line. This means that during the construction phase of the Glen Canyon Project, Utah will have a fine, hard-surfaced road which will provide access to this big construction job."

Utah already had an 8-mi. stretch of hard-surfaced road out from Kanab. Work is now active, with completion expected by this fall on the 57 mi. of new road to the state line. The remaining 8½ mi. to the dam have been improved and hard-surfaced by the Bureau of Reclamation. Costs to Utah on the access road to the dam will reach almost $6,000,000. One of the problems of highway building in this very arid section is water. There is either the customary lack of water or a sudden down-pour with resulting floods. Another construction problem has been drifting blow sand and wind with its hazards to road crews and equipment.

One of the tough jobs on this big project is through the Cock's Comb area. Here one of the contractors is making a cut 180 ft. deep and 800 ft. long through solid sandstone. Previously, the road in this area could be considered just a trail or jeep road. It was first hacked out in the 1940's into this isolated red rock country. It was used by stockmen and since by uranium hunters. This picturesque area has been the setting for several different Western movies.

In development of the resources of the state, dam building plays an important part. To build these great Western projects, new roads

(Continued on page 73)

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

THIS MONTH, at the annual WASHO Conference in Salt Lake City, another highway engineer of the West will be honored as the recipient of the "Dr. L. I. Hewes Award" for 1958. Following is a list of the previous winners and a brief description of the award.

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 statewide 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."

●

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.

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.

METHODS HIGHLIGHTS

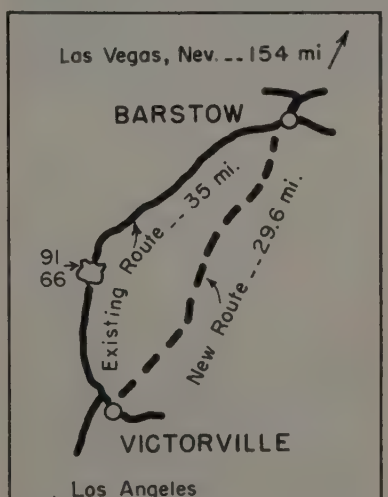
Battleship chain clears and trims—pipeline brings water 24 mi.—four types of rippers reduce blasting—tires toughened to resist sharp rocks—D9s and D8s push in tandem—experimental engines power 24-yd. scrapers—nine types of compactors meet varying conditions— steel strapping for column forms—two belt-loaders in pit—two batch plants load surge hoppers—skid fixers control windrows—conveyors load pavers.

Latest methods for desert freeway

Fast construction operations are possible on 30-mi. trail-breaking freeway, longest ever let in California. Overcoming isolated desert conditions to finish five months early requires new machines and methods, skilled workmen, and sharp job planning and control.

A PROJECT is under way on the Interstate System in Southern California which will be remembered for a long time by the construction men participating in it. The project runs for 29.3 mi. across a desolate section of the Mojave Desert, saving 5 mi. of driving distance between Victorville and Barstow on U. S. Highway 66-91, on the route from Los Angeles to Las Vegas, Nev.

The contract includes everything from initial land clearing to final paving and is the longest contract in miles ever awarded by the State of California. In the entire length of the job there is not a tree, a house, a road, or a drop of water. There is only sage brush, cactus, and a dozen kinds of dirt and rock. The rock yields to modern rippers, winning the contractor's biggest bet, but fractures in a jagged way which is extremely damaging to tires and equipment. Considered as a prototype of future large-scale contracts on the Interstate System, the project is a valuable one to study. Add to this the fact that the contractor, Fredericksen & Kasler of Sacramento, Calif., is executing the work in an intelligently progressive manner, and you have the West's outstanding highway job. The project is a model of sharp job planning and job control and is a proving ground for new methods and equipment. Completion target date is December 1958, six months in advance of the State's original schedule.



OLD ROUTE carries 7,300 vehicles per day, twists and winds along Mojave River. New location is straighter, wider, and shorter.

Preparing the bid

The table of bid price information on page 44 shows that Fredericksen & Kasler's offer of $5,750,655 was nearly $1,000,000 under the second low bidder. An examination of the unit bids shows that much of F & K's margin over the other bidders is based on their low estimate on roadway excavation and imported material. They were 11¢ lower than the second bidder on the 3,420,000 cu. yd. of roadway excavation; 26½¢ lower on the 1,285,000 tons of imported borrow; 15¢ per ton lower on the 530,000 tons of imported base material.

These low unit bids can be traced to one factor: exhaustive pre-bid job site exploration. For

PUSH PLATE on rear of Cat D9 used for tandem pushing of scrapers is product of Shepherd Machinery Co. Skilled operators keep contact shocks low during loading without time loss.

WATER TRUCKS were loaded from truck-mounted pumps capable of discharging 3,000 gpm. Temporary reservoirs fed by pipeline were spaced every 2 mi. along length of project.

fully a month before making up the bid two F & K engineers roamed over the job location (it took 6 hours just to drive from one end to the other in a jeep) making numerous test borings with a rented drill rig. The data they brought in from the field were studied by the most experienced men in the organization. The main decisions reached were these: The big rock cuts could be ripped instead of blasted; and, rather than use the several small borrow pits spaced along the job on which data were given in the specs, a large borrow pit located at the mid-point of the job could supply all necessary imported materials. F & K took over 50 test borings in this ½-mi. diameter pit before coming to this conclusion. The pit has now been mapped to show the locations and depths at which the base course and plant-mix aggregates can be found.

The bid opening was a big victory for the philosophy that thorough pre-bid field investigations pay off.

Details on how the big pit will be worked will be given later in this article.

When the job got under way last August F & K made sure it would be a success by bringing in well trained supervisors, foremen and equipment operators, even though by doing so several less important jobs were slowed down slightly. It was also decided to finish the job in December of 1958 rather than the scheduled June of 1959, thereby escaping one rainy season and gaining the increased efficiency which comes with a larger equipment fleet. The equipment spread consists of 12 Euclid scrapers, 1 Caterpillar D8s and 2 D9s.

Battleship anchor chain

F & K carried out the initial land clearing in a way they have used successfully on other jobs: an 80-ft length of battleship anchor chain was dragged across the land by two D8s. This is very effective in areas where the shrubs and small trees do not have extensive root systems.

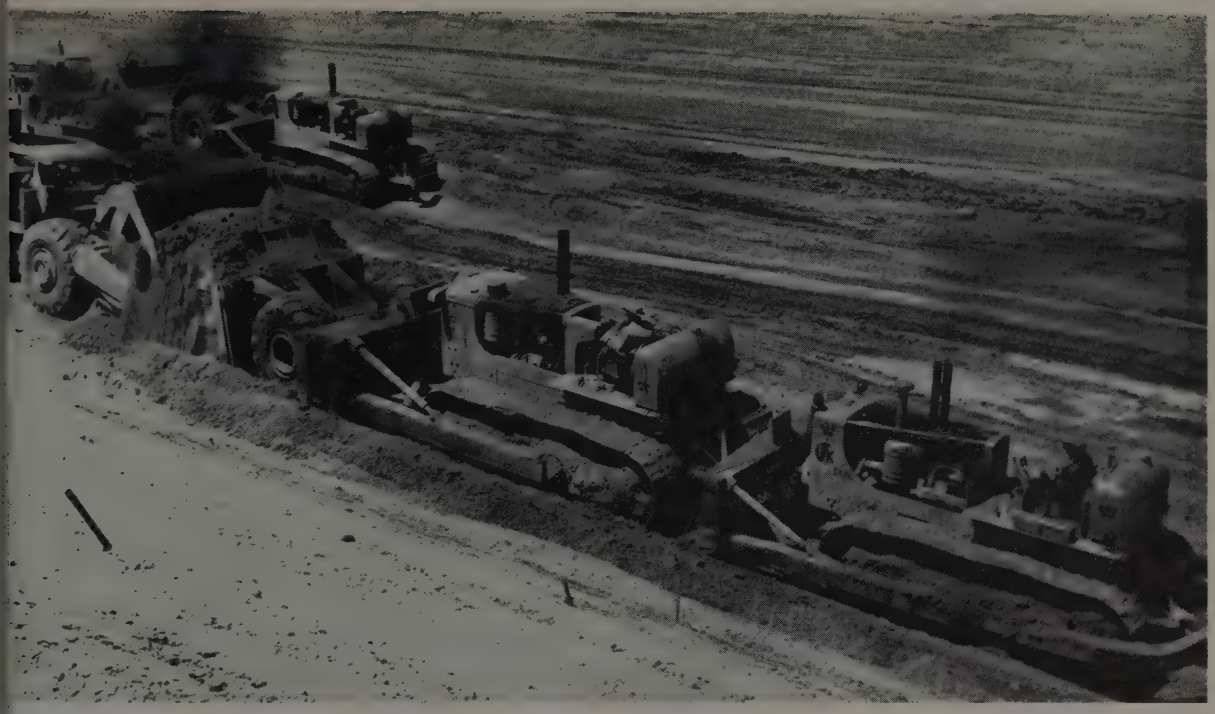
The chain is also being used to drag the finished cut slopes. This is done by one crawler moving along the top of a cut, with the chain trailing down the slope. A headache ball is sometimes added to the end of the chain to keep the end at the bottom of the slope.

The shortage of water is extreme, and included in F & K's bid is nearly $500,000 for developing the water supply, furnishing watering equipment, and applying it. The only water is located in the Mojave River at the Victorville end of the project. A 160-ft deep well constructed of 16-in. casing was sunk near the river. From there an 8-in. pipeline was laid along 26 mi. of the project. The last few miles are supplied from the limited water supply system of the city of Barstow. The pipeline cost $150,000.

The pump is an electric 300-hp high pressure, 22-stage Fairbanks Morse with an increment starter. Pressure on the line runs as high as 520 psi. with a discharge at the far end of 700 gpm.

The 500-kw. substation at the pumphouse was constructed by California Electric Power Co. The electric bill to power the pumps runs to $2,000 a month.

Every 2 mi. along the project a 200,000-gal. temporary reservoir was constructed by dozing a hole in clayey material, which is nearly impervious and requires no lining. The only significant water loss is through evaporation. Sprinkling trucks are loaded directly from the reservoirs by truck-mounted pumps operating at 3,000 gpm. Water is supplied to the reservoirs from the



TANDEM PUSHING was done whenever possible to keep loading time at a minimum. In photo a D9 and D8 quickly give a Euc scraper a heaping load, while in the background a D9 does the job alone. Tandem pushing was a result of contractor's time studies.

pipeline continuously; water is withdrawn only during the daylight hours.

The job features extensive use of large aluminum sprinklers made by the Rain Bird Mfg. Corp. for applying water to the grade. Most of the wetting effort is applied in the cuts rather than the fills. Moist material loads more easily, compacts more readily, tends to cool down ripping teeth. This is a tangible factor in some of the rocky cuts where ripping teeth last only 30 min.

However, prewetting has its disadvantages too. The dirt is increased slightly in weight and a wet rock can cut into a wet tire more readily than if both were dry.

Tire maintenance

The sharpness of the ripped rocks has made tire maintenance one of the major job maintenance expenses. At $3,000 per tire, costs mount rapidly. As the earthmoving phase nears completion something over $70,000 has been spent on rubber.

The four Euclid SS24 scrapers use the biggest tires on the job, 33.5-33 tubeless, 32-ply, wide base Firestones which stand 100 in. high. Four are used on each of the big rigs. Normal inflation pressure is 45 psi., but on this job 50-psi. pressure is used to compensate for longer-than-normal hauls and higher running speeds. Speeds are higher because two of the big Euclids have experimental Cummins 375 engines, making the big scrapers the fastest on the job.

The tires, too, are experimental, developed by Firestone because of the exceptionally abusive nature of the work. The new tires have resulted in a lowering of operating temperatures by 25 deg.

The Firestone dealer servicing the job, Helmick's of Los Angeles, is using a service truck designed to enable one man to change the largest tires. Costing about $9,500, the truck has an overhead frame mounting an I-beam rail over a Ford chassis. A compressor powers air tools and a trolley hoist which runs on the rail.

Mobile maintenance

The earthmoving fleet, consisting of 4 Euclid SS24s and 8 Euclid SS18s, with 18 Cat D8s and 2 Cat D9s, was kept massed and tackled each cut one at a time from one end of the project to the other.

When the machines finish one cut and move to the next, the maintenance yard moves along with them. This is not as hard as it sounds because almost all maintenance equipment and spare parts are mounted on rubber in the form of seven semitrailers. Each trailer carries one type of equipment and parts and can be quickly moved to wherever it is needed. The categories are: Euclid, D8 and D9, general, carpenter, crusher, hot plant, and Barber-Greene. On an isolated job like this it is essential to be self sufficient and highly mobile to reduce maintenance expenses.

Four kinds of rippers

Five years ago perhaps 400,000 cu. yd. of the rock on this project would have been drilled and blasted. But by full use of the latest rippers F & K was able to reduce the amount which required blasting to 75,000 cu. yd. The biggest ripper used was a 20,000-lb. hydraulically controlled giant mounted on a Caterpillar D9. Developed by Shepherd Machinery Co., it produces a down pressure of 105,000 lb. and a ripping pressure of 160,000 lb. In the heaviest rock F & K used a single center 4 x 16-in. tooth carrying a 4½-in. point. The second D9 pushed when needed.

Also in use are Ateco and Kelley rippers and the new Double J breaker. In F & K's experience, the Double J, characterized by a small horizontal fin near the bot-

FINISH GRADING is done with Cat No. 12s followed by pictured light scraper which loads by means of a conveyor. Rig is pulled by John Deere industrial wheel tractor.

tom of the shank, greatly extends fracturing in granitic rock.

Tandem pushing

The effort which was put into the investigation of the economics of tandem pushing is a good example of the high quality of job control being shown by the contractor on this project. As the earthmoving progressed, extensive time studies were made on both short and long hauls, on both the SS24s and the SS18s, push-loaded by two D9s, a D9 and a D8, a D8 and a D9, and two D8s. The data obtained were plotted on graphs and the dirt foremen now know not only what is the most efficient combination, but what is second best and third best in any given situation.

(A detailed description of how to make a tandem pusher analysis was presented on page 35 of the March 1958 issue of WESTERN CONSTRUCTION.) The tractors engaged in tandem pushing mount heavy-duty pivoting push blocks provided by Shepherd Machinery Co. The comparatively expensive rubber push-blocks designed to lessen shocks are not being used on this project because the great skill of the operators makes them unnecessary.

The position of the double pushers in the cut determines for the scraper operator where he will begin loading. It is a real treat to watch the two crawlers race up behind the scraper as if controlled by one mind, decelerate at the last instant to reduce the contact shock, and then accelerate quickly to load the scraper in the fewest possible seconds and send him on his way. Scraper gears are disengaged during loading to prevent tire spinning in rocky material.

Most scrapers have 1-ft. sideboards.

JOB _____ PAGE NO. _____
DATE _____ 19____ WEATHER _____
TEMP. _____
From AM. PM. to AM. PM. _____ loads @ _____ cy
Cut Sta. _____ to Fill Sta. _____

Haul Spread:	Cycle Time:
Eucs (SS-18) _____	Pit Time _____
Eucs (SS-24) _____	Dump Time _____
Push Cats _____	Travel Time _____
D-8 Rippers _____	Total Cycle _____
D-9 Rippers _____	
Blades _____	Type Mtl. _____
Cats & Can _____	Haul Rd. _____

Fill Spread:
D-8 & Sheepsfoot _____
DW-21 & 50 Ton _____
Kompactors _____
Other _____
Remarks (down time, equipt. moves, etc.):
SIGNED:
TITLE:

SIMPLE FORM used by dirt superintendents gives close control of dirt moving operation and provides useful data for preparing bids.

Hard haul roads

The contract calls for the construction of four lanes, separated by a depressed median strip. Right-of-way has been acquired for the eventual addition of two additional lanes. The contractor is using the median strip for equipment movement.

The embankment material compacts comparatively easily, providing a hard surface on which scrapers can move at top speed. Unfortunately, a sharp rock on the hard surface spells trouble for the tire, and keeping the surface of the haul road clear of debris has been of major concern. The most effective rig to accomplish this has been a jeep mounting a diagonal blade at the rear which shoots rocks off to the side. The speed of the jeep enables it to operate without interference to the movement of the other equipment.

Operators of the scrapers are instructed to keep their aprons tightly closed at all times to eliminate spillage on the haul road.

The hauls from cuts to fills are in places as long as 3 mi.

Compaction

Every type of compacting machine and method imaginable is at work on this job to meet the various soil conditions. On the embankment one of the main considerations is driving loose rocks into the ground to eliminate hazards to tires. Steel wheels are best for this and the contractor uses a Buffalo Springfield Kompactor, a Huber Warco 3-wheel roller, and several 5x5-ft. sheepsfoot rollers with the feet burned off to provide a smooth steel drum. These machines are also being used on the 1-ft. thick imported sub-base layer, along with a 50-ton Southwest pneumatic roller.

Conventional crawler-drawn sheepsfoot rollers are also used.

About 42,000 lin. ft. of corrugated drainage pipe will be placed throughout the project. All pipe trenches were dug with a Warner & Swazey Gradall, which performed in a highly satisfactory manner. The Gradall also lowered pipe sections into the trench. Satisfactory compaction of structural backfill has been difficult because the best select material on a project just barely passes the specifications. The material has a sand equivalent of about 38 while the minimum specified is 30. The difficulty has resulted in many types of compactors being used for a structural backfill, including Buffalo sick vibratory rollers and Barco rammers. Wheel rolling with a Caterpillar motor patrol and ponding are also used. In addition the water con-

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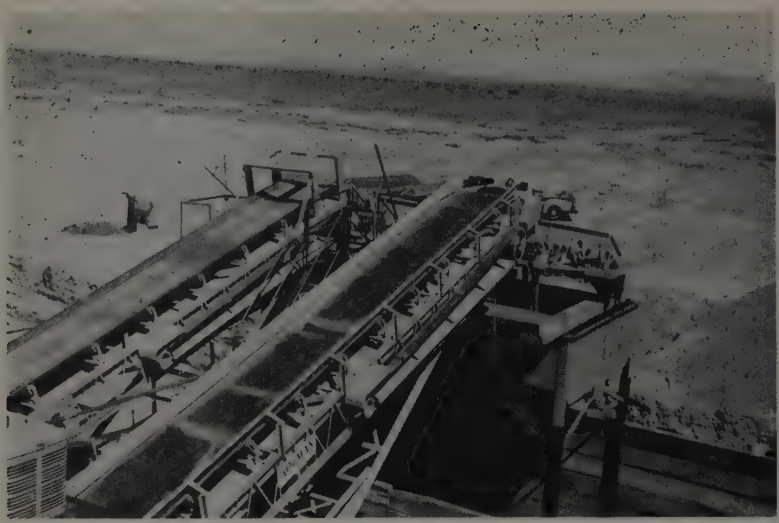

TWIN KOLMAN LOADERS in base material pit will produce at a tremendous rate. One man located between belts will control speeds of both belts and both surge hopper gates. Vibrating screens will shunt oversize to Pioneer crusher now being assembled.

tains an additive to decrease its viscosity.

Geometrical design

A typical cross section of the freeway shows that above the embankment is 1 ft. of imported sub-base material where basement soils have an R value of less than 50, 0.67 ft. of imported base material (0.5 ft. of which receives class C cement treatment), and 0.25 ft. of dense graded plant-mixed surfacing, with 0.04 ft. of open graded plant-mixed surfacing on the traffic lanes.

The imported sub-base was taken from borrow pits spaced along the length of the work. Scrapers were weighed on a special Murphy scale which could take loads up to 80 tons. Weights were flashed on a screen which allowed weighing in as little as 5 sec.

Specifications state that for the imported sub-base 100% must pass the 2½-in. screen and between 2 and 20% must pass a No. 200 screen. Sand equivalent is 25 minimum; plasticity index is 6 maximum.

Finish grading

At present, 2 x 2-in. stakes set by the State on the edge of the embankment 1 ft. higher than the finished grade serve as the basis for all calculations.

The first plan to carry out finished grading was to use a string line and motor patrols with automatic blade controls. It was found, however, that the automatic device did not react quickly enough to permit operation in third gear, and operators had difficulty following the string line at that speed. So, string lines and automatic controls were removed and conventional fine grading methods were used, with the motor patrols operating in third gear.

Cement-treated base

As this appears in print the cement-treated base operation is getting under way. This consists of a 6-in. layer containing 1½% by weight of cement. Two Pettibone-Wood self-propelled model 54 traveling mixers will be used. The machines will travel side by side each covering a 13-ft. lane. The machines will have to stay within 30 ft. of each other so that they can be supplied with water from the same truck. Months ago F & K devoted considerable time to determine the most economical size and number of windrows to place before the traveling mixers. This had to be determined far in advance because 200,000 tons of material will be deposited in windrows on the grade before the mixers begin operation. As a result of field tests it was decided that one windrow for each machine would give a greater tonnage than any other number, even though the machines will not be able to advance at their top speed.

Hot plant operations

Asphalt surfacing will be turned out by two Standard Steel batch plants, one a 5,000-lb. capacity model R-M owned by the contractor and the other a 6,000-lb. capacity model R-M owned and operated for the contractor by Industrial Asphalt Co. The plants will be located side by side at the pit near the middle of the project, and will serve the entire project from that point. The plants will load into a conveyor which will deposit material in a surge bin thus eliminating batching delays.

Plant-mixed surfacing

Three weeks after the cement treated base operation starts, the plant-mix surfacing phase will begin. Asphalt will be deposited on the grade by means of bottom dump trucks and windrow sizers. The sizers are being made by Koehring of California in Stockton. The sizer is a simple metal box 42 in. wide and 8 ft. long and high enough to be engaged by the gates of the bottom dump trucks when they are open. As the truck moves along the sizer is dragged forward by the gates leaving a windrow behind of a predetermined size. When the truck gates are closed the truck is free of the sizer and drives away for another load leaving the sizer on the grade for the next truck. The sizers are adjustable from a windrow of 3.5 cu. ft. per lin. ft. down to any size desired.

The paving will be done by two Barber-Greenes working into the windrows. The windrowed material will be picked up and deposited in the paver hopper by a conveyor-type feeder manufactured by Koehring Co. of California. This method provides for continuous operations since no delays are experienced at the paver while the truck loads into it. The feeder, which hooks onto the front of the paver and is pushed along by it, weighs 3,580 lb. and is 46 in. wide. A 22½ hp. Wisconsin engine powers the conveyor. The capacity of the machine under normal conditions is about 150 tons per hr.

Base material operations

The base material pit, which is about ½ mi. across and is located near the midpoint of the project will be taken down about 12 ft. Heart of the operation will be two high-production Kolman hopper type belt-loaders discharging into two surge bins. One man will control the operations, governing the belt speed of each loader and the

Low bidders and selected unit bids

The Victorville-Barstow freeway project includes 29.3 mi. of grading and plant-mixed surfacing on cement-treated base and imported base material and construction of 6 pairs of parallel bridge structures. Thirteen firms submitted bids. Only the lowest four are described here, and only 15 of 70 bid items. See comments on page 37, column 3.

(1) Fredericksen & Kasler, Sacramento, Calif. $5,750,655
(2) Gordon H. Ball, Gordon H. Ball, Inc., and M & N Construction Co. (joint venture), Danville, Calif. 6,679,707
(3) E. L. Yeager Co., E. L. Yeager Construction Co., Inc., Bert C. Altfillisch, Altfillisch Construction Co., and Lowe & Watson (joint venture), Riverside, Calif. 6,875,034
(4) McCammon-Wunderlich Co., Wunderlich Construction Co., and Madonna Construction Co., Palo Alto, Calif. 7,099,302
R. A. Westbrook, Inc., and Morrison-Knudsen, Inc. (joint venture), Sacramento, Calif. 7,245,973

		(1)	(2)	(3)	(4)
Lump sum	Clearing and grubbing	$400,000	$400,000	$259,000	$297,000
Lump sum	Developing water supply and furnishing watering equipment	$300,000	$465,000	$294,000	$525,000
213,500 M gal.	Apply water	.90	.10	1.00	.10
3,420,000 cu. yd.	Roadway excavation	.32	.43	.44	.50
1,235,000 ton	Imported borrow	.19	.355	.25	.30
125,000 ton	Imported subbase material	.40	.45	.65	.40
530,000 ton	Imported base material	.60	.75	1.15	1.40
905,000 sq. yd.	Mix, spread, and compact cement-treated base	.14	.163	.12	.12
12,400 ton	Paving asphalt, plantmix surface	27.00	28.60	32.00	4.50
204,500 ton	Mineral aggregate	2.40	3.00	3.05	4.50
Lump sum	Bridge concrete (5,550 cu. yd.)	$315,000	$333,000	$345,000	$333,000
Lump sum	Bridge re-steel (1,160,000 lb.)	$145,000	$129,000	$144,000	$139,200
Lump sum	Structural steel (535,000 lb.)	$100,000	$136,000	$145,000	$127,000
58 mi.	New property fence	$1,500	$1,630	$1,870	$1,500
16,632 lin. ft.	48-in. corr. metal pipe, 12-gage	$14.70	$16.00	$14.90	$17.88

surge bin discharge gates. Tandem trailer bottom dump trucks will be loaded from both surge bins simultaneously. Charging the grizzly over the loading hopper will be five scrapers working with four Cat D8 pushers.

Over the surge bins will be 5x12-ft. Kolman scalping screens which will shunt the oversize to a Pioneer triple-roll crusher. The discharge from the crusher will be returned to the top of the surge bin screens and incorporated into the mix.

Two-way radios

Because of the excessive length of the project the State of California has authorized for the first time the use of two-way radios by its own personnel. Four State vehicles are equipped.

About 20 of the contractor's vehicles have Motorola two-way radios. The project's length is too great, however, for sending and receiving from one end of the job to the other. To call the other end of the project, a booster atop a nearby mountain picks up the signal, relays it to the Fredericksen & Kasler branch office at Fontana, 40 mi. away, which in turn relays it through its powerful transmitter to the other end of the job.

The mountain-top relay has been in place for several years to serve F & K projects in the area.

Good pay means good men

One reason that F & K has been able to get and keep top quality men on the project is the fact that the dirt moving operation is carried out on a 10-hr. shift over a 5-day week, with a $6.00 per day subsistence provision. This amounts to over $200 a week for some workers.

Mechanics and oilers put in a 10-hr. shift at night, greasing, oiling, hard-facing and bit changing.

Total employment has been running around 150 men.

Steel straps for forms

The project includes six parallel bridge structures varying in length from 24 to 302 ft. One of these structures, a small railroad overcrossing, called for concrete columns 5½ ft. in diameer, circular in cross section.

Project engineer Dick Brown designed forms in the shape of 2 half cylinders. Two-by-fours were nailed vertically inside semicircular templates made of 2 x 12s spaced about every 5 ft. The two halves were lined with ¼-in. Masonite, raised into position and tied firmly together by steel strapping, a technique common in industry but which has only recently found its way into construction. Straps and tools were supplied by Acme Steel. The straps were spaced every few inches apart at the bottom and about a foot apart at the top, more than enough to resist full hydrostatic loading.

Stripping is very fast with this method and the straps can be used again for bundling lumber, tying loads to truck, or for other forms.

Personnel

C. V. Kane is District VIII engineer for the California Division of Highways. Operation engineer is E. G. Bower. H. C. Prentice is construction engineer. Resident engineer is Ed Walker, assisted by H. F. Strahm.

For Fredericksen & Kasler, Jeff Kasler is project manager and Roland Beadles is general superintendent. Chuck Mullins is structural superintendent, Clarence Buck is dirt superintendent, Dick Brown is project engineer, and M. E. Burk is office manager. Slim Ransdell is equipment superintendent. Hot plant superintendent is George Bell and Smoky Marks is crusher foreman.

Labor foreman is Bill Jones, pipe foreman is Deon Wilburn. Dirt foremen are Andy Hernandez, Jim Fair, and Jim Farrar. Carpenter foremen are Tom Harrigan, Archie Campbell and John Campbell.

Field engineer for Industrial Asphalt will be Neil Borquist.

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High strength concrete for girders

Bridge at Everett, Wash., with 100-ft. main span has pretensioned members with strength of 9,000 lb. at 28 days. Structure eliminates traffic barrier.

By HOMER M. HADLEY
Consulting Engineer
Seattle, Washington

SITUATED 30 MI. north of Seattle, the city of Everett occupies a lengthy peninsula about 5 mi. long, 2 mi. wide. It lies between Port Gardner, an arm of Puget Sound, on the west, and the northward-flowing Snohomish River on the east. Its numerous industries are largely distributed along the salt-water and river frontages. Dredging and filling has reclaimed quite a wide area of the Port Gardner waterfront.

For many years, Norton Avenue, the main street serving the northerly end of this area, has been a culde-sac over 2 mi. in length from the southerly point at which it is entered, lacking connection to city streets at its northerly end where the peninsula terminates and the river discharges into Port Gardner. At this point the tracks of the Great Northern Railway's Coast Line and a steep-sided bluff, about 75 ft. high, have acted as barriers to its further extension.

In late 1956 a municipal bond issue provided funds for this and several other badly needed projects in the city. It finally became possible to make the long-discussed connection of Norton Avenue to the upper level streets. The necessary funds for this project were sufficient for a 2-lane roadway only. The fact that 4 lanes for a city bridge are preferable to 2 lanes is widely recognized but here as elsewhere, "half a loaf is better than none," particularly when hunger is acute and when acquisition of the full loaf is at some indefinite time in the future. When that time comes, an additional 2-lane structure will be provided here on the inner side of the curve.

The entire bridge is on a 6% grade and, being 800 ft. long, accounts for most of the necessary ascent from lower levels to upper. A small amount of grading at the low end and a quite considerable amount at the upper end completes the connection. In alignment it is mostly on curve: 222 ft. of 10-deg. curve, flanked by 200-ft. spirals.

Structure on tangent at the low end is of only nominal length—22 ft. Roadway width is 24 ft. on tangents; 26 ft. on full curve; varies proportionately on spirals. A 4-ft. wide sidewalk is placed on the high, superelevated side of the deck. The main spans are of prestressed concrete; approach spans are of precast concrete units, 20 ft. long, carried on creosoted piles which are capped and braced with Wolmanized timbers. About 60 ft. of retaining abutment and wall at the high end completes the structure.

Just as "Gentlemen prefer blondes," so do railroads prefer structural steel above their tracks. In the fall of 1956, however, steel deliveries appeared remote and far off and consequently it came about that prestressed concrete was permitted and employed in the main spans of this bridge. These spans are three in number: 80 ft., 100 ft., 80 ft. They cross a service road, present and future tracks.

Because of the sharp skew, single column shafts, 5 ft. in diameter, with cap girders set at right angles to the roadway were particularly serviceable. Their footings are carried on creosoted piles, most of whose length is permanently saturated by ground-water. An excellent view of these spans appears in one of the accompanying illustrations.

These prestressed girders are of the pretensioned type and were fabricated by the Concrete Technology Corp. of Tacoma of which Arthur R. Anderson, one of the country's pioneers in prestressing, is president. They were designed with the 5-in. webs and the flat flange slopes which his firm has employed since its beginning and which, with the quality of concrete that they produce and place, have proven thoroughly satisfactory.

The Puget Sound basin contains widespread deposits of rounded

SUPPORTED ON 5-ft. diameter column shafts the three main spans are 80-100-80 ft. Center span crosses present and future railroad tracks. Timber approaches were in the interest of economy. Grade is 6% and overall length is 800 ft.

and subangular glacial sands and gravels from which all soft and friable materials have been ground up and removed and only the hardest materials remain. Aggregates of this character are available and are used. The mix was 8 1/3 sacks of early-strength, Type 3 cement, 3½ to 3¾ gal. of water per sack, and 2 to 3 min. of mixing in a flat-bed mixer of English manufacture with about 1-in. slump. Placement in steel forms vibrated by form-mounted vibrators developing 6,500 to 7,000 rpm. results in concrete of indeed superior quality.

That the same results would be obtained with different cements and different aggregates is improbable but not impossible; at least these results can be approached. This concrete in properly made cylinders develops a 24-hr. strength of 5,000 to 6,000 psi., a 28-day strength of 8,500 to 9,000 psi. or better. Beams made on one day have forms stripped and are removed to the curing yard on the next day. No steam curing is employed. It is concrete of this quality and placement that does permit the use of narrow webs and flat-sloped flanges without any of the dire consequences predicted for them.

If concrete did not weigh 1.04 lb. for every square-inch prism, 12-in. long, thin webs and flat flange slopes would have little purpose, but under existing conditions they are not unintelligent. They were successfully employed in this bridge. No shear keys were used to connect roadway slab to beam flanges but the latter were rough textured and projecting stirrup ends held the two in contact.

Use of creosoted and Wolmanized wood elsewhere in this structure in conjunction with the precast concrete roadway units was a matter of economy. The only hazard attendant on this use of treated lumber is that of fire which in this location and with the concrete deck is only to be regarded as remote. Apart from this one hazard a long life is to be expected for the combination. The concrete deck units are 4 ft. wide and on the tangents seven of them provided roadway and sidewalk.

As the roadway widens to 26 ft. on the spirals, the increased breadth was provided by a solid central strip of concrete poured to the full 20-in. depth of the units. Elsewhere the units were keyed together by filling the recesses formed in their sides. Reinforcement in these continuous recesses tied the units together over each supporting bent. Lateral displacement of the units was prevented at their ends where there were ⅝-in. round spiral drift bolts, 2 ft. long and at 2-ft. centers along the caps and in the 4-in. transverse space between the adjoining spans. When this space was filled with concrete which bore snugly against the end diaphragms of the units lateral spreading of the units became impossible.

The only other features deserving of mention are the covered expansion joints. Anyone familiar with some of the standard expansion joints realizes they are exceedingly serious affairs to fabricate and install and although they function well, one can but ask "What price, glory?" For these installations in the Norton Avenue Bridge a welded T section—12 x 1 flange plate, 8 x ⅜ stem plate—was centered in the 4-in. mean joint opening. The flange plate terminates ½ in. short of the roadway curbs; the web or stem plate extends through the curb and sidewalk and 4 in. beyond the outer faces of the concrete. Here it snugly underlies the 2 x ¼-in. spring plates welded to the underside of the outstanding leg of 6 x 4-in. angles bolted to the outside of the deck. With spring hold-downs at the ends of the stem and (JM No. 60) packing bearings beneath the flange plate, a very simple and effective joint, closed against the entrance of dirt and foreign matter was obtained.

The steel railings have wide flange posts, channel rails, the top rail having a semicircular bent plate welded to the top of its channel. At the posts similar semi-circular bent plate welded to the top of the post flanges covers the ends of the top rails.

American Pile Driving Co. of Everett was general contractor for the work. Supervision was by Rodney Colvin, city engineer of Everett, and his staff. Design was by the writer.

AGC-Highway Dept. cooperation is advancing Western road building

Joint committees at the state level have

- **Improved specifications**
- **Clarified interpretations**
- **Provided for free discussions**
- **Reduced areas of misunderstanding**
- **Increased equipment efficiency**
- **Lowered highway costs**

Exchange of information on the work and discussions of the AGC-Highway Department joint committees can help in advancing their objectives. Comments and ideas have been secured by WESTERN CONSTRUCTION from both sides of these committees and have been organized and presented in this review. As an interested third party we have been able to bring an objective and all-Western approach to the topics where opinions are most divergent. It is hoped that this method of exchange will help in reducing areas now unreconciled, and further the advantage of developing uniformity among the Western states.

WESTERN highway building benefits through mutual understanding between parties signing construction contracts. The accelerated pace of today and tomorrow places greater emphasis on the importance of understanding. It is a means of reducing areas of friction, and friction generates heat without advancing accomplishments.

For several years the chapters of the Associated General Contractors and the state highway departments of this Western region have had joint committees organized to discuss subjects of mutual concern and areas of disagreement in highway contract work. The subjects extended all the way from basic problems to the specific wording of specifications and their interpretation.

The ages of these committees vary and their methods of procedure are different, but the objective is the same for all states. There is equal agreement as to the mutual benefits which have resulted at the job site, and both sides attest to improved personal relations.

Originally the usual procedure was to have an annual conference on an informal basis to discuss points of disagreement that developed during the preceding season, and to try to apply corrective measures to the contracts of the new year. The advantages of such exchanges were obvious.

Gradually more formal organizations and procedures evolved to suit conditions in the different states. The AGC chapters recognized from the beginning that these conferences should not develop into individual gripe sessions. As a result in almost all states the contractors meet in prior session where they are free to air and discuss any subject. Then, those having broad application for many members are placed on the committee agenda. Likewise the highway departments agree on subjects which justify joint discussion.

The meetings of the joint committees, now frequently held several times a year, cover these approved topics. Agreement may be reached on some, others are set forward for further discussion, while others are referred to sub-committees representing both sides for more detailed study.

A more recent development, designed to broaden the base for these mutual exchanges of ideas, has been the holding of these meetings at the district level. This provides for a larger group to have the benefit of active participation.

A particular purpose of this review is in the interest of developing uniformity in these areas of discussion. Obviously there is advantage for all concerned to have as much uniformity as possible extend across state lines. Contractors operate in two or more states and the more the rules and regulations are uniform the less the areas of possible disagreement.

Information, comments and ideas have been secured from the AGC chapters and the state highway departments. These have been organized under major headings, with no identity indicated for obvious reasons.

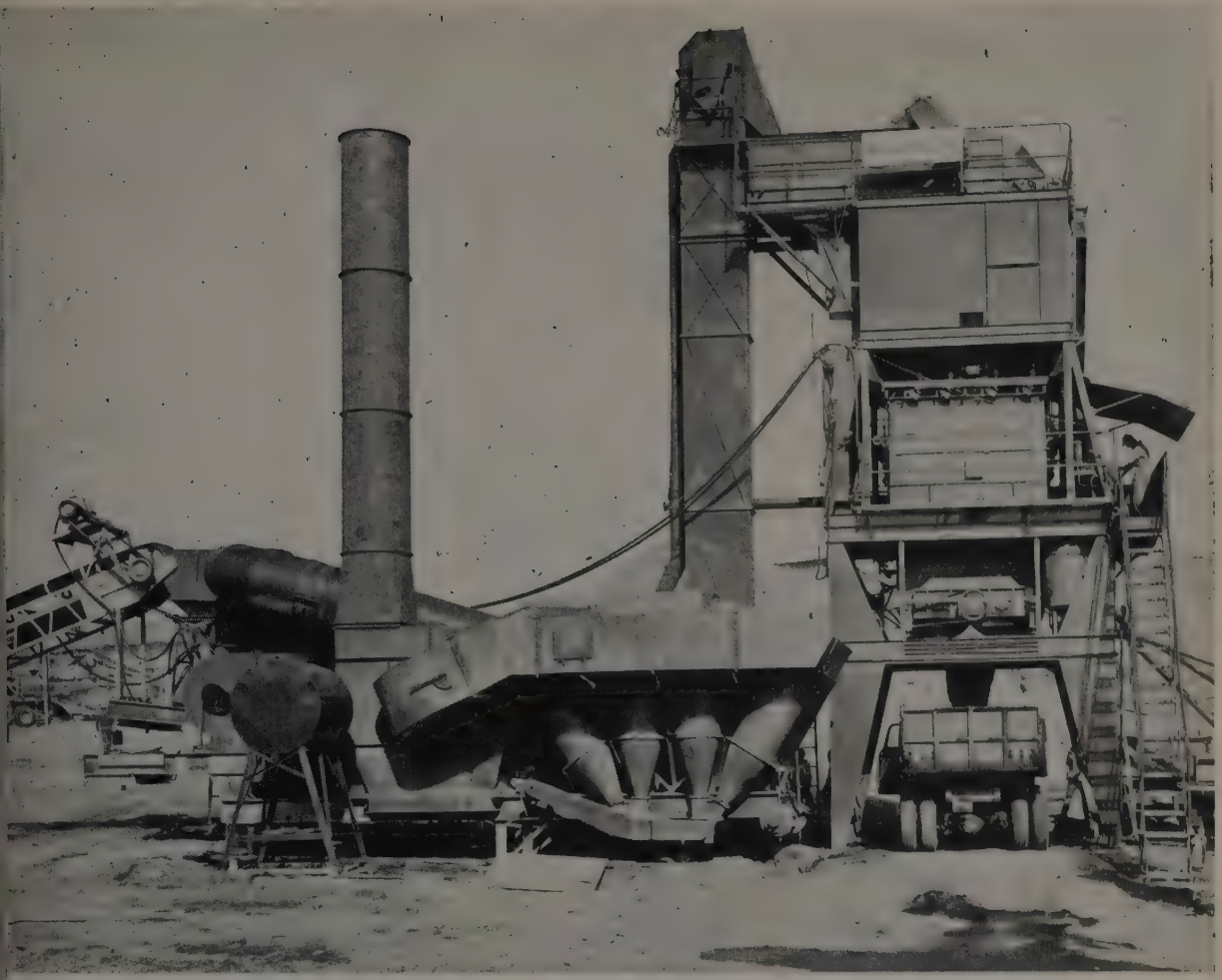
RETAINERS AND FINAL PAYMENT

". . . eliminate hold-back after job is 50% done . . . legal requirements are a problem . . . test results on adequacy take time . . . more approval by the resident . . . contractors fail to fill out forms."

Judging from the number of references and the extent of the discussion, the subject of the final payment for a road-building job is an area where opinions are approaching better understanding.

Committee discussions have centered around two points: (1) The amount and process for progress payments, and (2) the expediting of final payment. An objective frequently proposed by the contracting members of the joint committees is to have retainers eliminated after 50% of the job is complete, provided the job is moving according to time schedule. In other words the usual 10% retainer would stop during the second half of the job and would automatically reduce to a 5% holdback at the time the project was completed.

Principal advantage to contractors would be the faster replenishment of their working capital, permitting them to enter competition for new jobs with shorter delay. Advantages to the responsible heads



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of state highway departments are not quite so obvious, since they must continually consider the protection of public funds. This relates particularly to the interim payments and the possibility that tests on materials and results could develop serious discrepancies which would require costly replacements as the job was nearing its final stage. A conservative attitude on this possibility would result in continuing a high retention. On the other hand, highway engineers are well aware of the advantage of having many qualified contractors bidding in competition. This is the advantage they must balance against the purpose of the retained funds.

Expediting final payment, a different problem

The expediting of final payment is a somewhat different problem, since it involves department organization, procedure and possible red tape. The resident engineer, assuming he has been on the job from the beginning, is the department man best qualified to know when the job has been completed according to specifications. In some cases his final report must go through channels, with corresponding time lag to receive necessary top approval. Some states let this final approval be decided at the district engineer level in the interest of expediency.

Contractors often change superintendents near the end of a job leaving a man who is not familiar with the work required to finish the project. Also superintendents are sometimes inclined to call for final inspection when they know that the job is not ready. Lastly, with the proper attitude of cooperation between the resident engineer and the superintendent it is possible for obvious deficiencies to be pointed out prior to, and not during the final inspection trip. Final approval and acceptance by the district engineer is considered to be final and any additional work required by the BPR should be an additional payment.

In addition to official notification as to the original superintendent by the contractor, the highway department should also be informed in writing of any change in superintendents. At the time of a changeover the old and the new superintendents should join the project engineer in a joint inspection to reach an understanding on the status of the job.

Failure to fill out BPR forms

Another complaint from the highway department relates to the failure of the contractor to submit various required forms of the BPR properly executed. These are essential, and sometimes final approval may be delayed for weeks because of the contractor's own negligence in not submitting these forms. This is a delay which is not the responsibility of the highway department.

One state reports that final payment is made promptly as soon as final estimate and completed records are received at state headquarters, withholding the legal retained percentage for 30 days. One state sends final acceptance information from district to headquarters level by telegraph or teletype to expedite final payment to the contractor.

In many cases state law requires that final approval go all the way to the top for the OK where final authority rests. In one case suggestions have been made for a change in the existing law to leave delegation of authority to the discretion of the state highway engineer. He could then place this authority in the hands of an engineer who would make final inspection and have authority to tell the contractor the job was "completed".

Another state, believing that the resident engineer is the best qualified to know when the job is completed, authorizes this individual to accept the job immediately after he is assured that all work items are complete.

In still another state 2 or 3-weeks advance notice is given by a resident engineer to the district engineer so that arrangements can be made for final joint inspection by all interested authorities. If possible these individuals would include the resident engineer, the district engineer, construction engineer of the department and a representative of the BPR together with the contractor or his superintendent.

If this inspection indicates that additional work is necessary the contractor will be instructed at that time as to the work to be done. It is up to the district engineer to determine whether a second inspection will be required prior to final acceptance. If this second inspection is not considered necessary the resident will notify the district engineer when the required work has been carried out and state the date.

TRANSPORTING OVERSIZE EQUIPMENT

". . . problem getting worse . . . the limit has about been reached . . . departments have a public responsibility . . . equipment designed for quick dismantling . . . exceptions for contractors will open the door for others."

This problem, serious enough at the present time, is destined to grow worse. Several state departments acknowledge the fact they are doing all they can to expedite the movement of contractors equipment with reasonable relaxing of the normal restrictions. However, they point out that equipment continues to get larger in size and heavier in weight to the point where it has about reached its maximum for highway moves without dismantling. At this point the manufacturers come into the picture with the realization that larger units of the future will have to be designed for the fast and convenient removal of certain elements to get the machine down to meet the over-the-road requirements of highway departments.

This is one of the areas of friction where the pressure is almost all in one direction. Departments resist the requests of contractors based on allowable highway and bridge loads, proper consideration of spring weather conditions, and safety requirements for the traveling public. The reasonable needs of contractors are recognized, but the departments are approaching the ultimate limit and will be justified in resisting further requests.

Concessions are reaching the limit

Comments from several of the highway departments are typical and indicate both attitude and ability to meet the demands of contractors.

In general, spokesmen for the departments indicate this problem has been up for discussion and consideration since the joint committees were first founded. Concessions have been won by contractors in several of the states and the departments feel that they are doing their utmost to cooperate in meeting the prob-

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lem. One state indicates that "on any equipment that can be hauled without damaging the highway structures" contractors can readily obtain the necessary permits. Another indicates that they are meeting with representatives of adjoining states to see if requirements can develop uniformity which will be important in expediting equipment movements.

Another department considers this to be a problem to be solved jointly by contractors and equipment manufacturers. The state highway engineers, according to this department, should not be embarrassed with requests for special permits that represent definite overloads. This position is based on the logic that when such permits are given to contractors it increases the demands placed upon the department by other industries. This engineer indicates that he has seen too many examples of damaged bridges and road surfaces to be enthused about extending special privilege. Advancement and improvement in road construction equipment should be encouraged, but within the recognized highway load limitations.

Railroad facilities in the West are extremely limited making it necessary, according to another department, for most equipment to move over the highway system. This state system is extremely vulnerable to heavy loads during spring months and it is necessary to place load restrictions on many of the routes with no overload permits written under any circumstances. This makes for a difficult situation since it is the time of year when grading and crushing equipment is normally being moved out to job locations. There is no ready solution to this particular problem, with the one possible idea of awarding more contracts in the fall so that equipment could be moved before spring.

Larger sizes will require dismantling

A change which will permit oversize and overweight loads for the movement of most construction equipment with a minimum of dismantling has been recently placed in effect in another Western state. On tractors the size of the D-9 it will be necessary to remove dozer blades and rippers, but the D-8 size tractor may be used without such dismantling if it can be loaded so that specified axle weights are not exceeded. In this case, however, the blade of the dozer is required to be propped up to a height of 6½ ft. above the roadway. This same department indicates that if equipment gets any heavier than today's maximum sizes it will be necessary for the manufacturer to design it for some fast dismantling as the limit of overloads has definitely been reached, mainly on bridges.

Another state, although admitting the problem is becoming more acute, merely requires contractors "to comply with the state laws."

Contractors in one state suggested the possibility of issuing permits for particular pieces of equipment for specified lengths of time rather than for individual moves. No action was taken on this suggestion.

One final comment by a department indicates that this subject is under constant study with a recent loosening of regulations regarding overloads for construction equipment. Further changes in the regulations may result from this continuing study.

It is obvious from these comments from Western highway departments that the limit is being rapidly reached and that further concessions will be limited. At this point it will be necessary for contractors to give serious thought to working with manufacturers in a different solution to the problem.

DEVELOPMENT AND USE OF WATER

". . . a serious problem in the West . . . early payment for developing, or pay as applied . . . what if requirements far exceed estimate . . . most states pay as it is applied . . . lump-sum development costs advantage to contractor."

Western highway construction has a common and serious problem in providing the water required for all phases of the work, with particular reference to the large volumes required for proper compaction of dry materials. As it is applied, water can be conveniently measured and thus lends itself to unit bidding, but the development of adequate amounts and the transportation to points of use represent a contracting hazard filled with uncertainties.

One obvious procedure is to ask contractors to bid on water in 1,000-gal. units as applied, with cost of development, production and distribution allocated to this unit price. Another procedure is to permit the contractor to bid a lump sum for developing the necessary water supply and furnishing required equipment, with a unit bid confined to the application cost.

Estimating error can mean trouble

Uncertainty over the total amount of water to be needed as well as the corresponding uncertainty of sources, adequacy and development costs makes this item a potential source of irritation on both sides. Should a water supply be developed which is considered adequate for the job and the water requirements exceed this amount it would be necessary for the contractor to develop an auxiliary source which would not have been considered in the original unit bid. Further, the application of the total cost to the unit price, as applied, means that the contractor does not get his development costs repaid until the last water is applied. The development cost may run heavy and must be completed as one of the first work items.

The other procedure where development is a lump sum item places more responsibility for an adequate supply on the contractor, but permits him to recover his development cost immediately. This method admittedly results in loading costs onto water development, but the procedure is merely a modification of loading some of the initial job costs onto other early items which are usually lump sum, such as clearing and grubbing.

As an indication of the extent and cost of developing and supplying water to a major Western highway job, one California freeway project required a deep well, more than 25 mi. of 8-in. delivery line with temporary small reservoirs at 2-mi. intervals along the project. This project and its water supply are described on another page in this issue. Indicating the size of the water problem, the lump sum bid for development on this job was $300,000 and when the unit price for application is added the total figure is close to $500,000.

Most states pay as it is applied

Apparently, the majority of states use the principle of paying for water by the 1,000 gal. as required on the job. This leaves development cost up to the contractor based on the amount of water specified in the bid call. If the required quantity exceeds this amount

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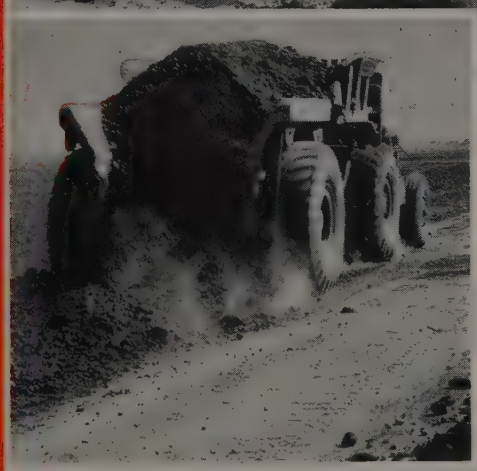

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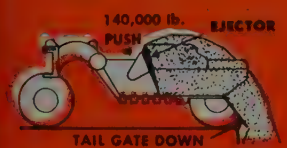
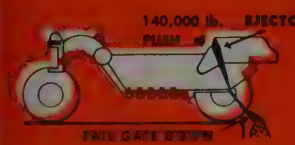
LOADED — The big target, big capacity body carries its load low, maintaining high ground clearance since frame and body are integral and compact.



DUMPING — Level body offers no gravity resistance, with potential 140,000 lb. ejector push assuring complete positive discharge with minimum use of power.



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by a wide margin it may result in the need to develop another source or heavier equipment. The departments indicate that this is an uncertainty which must be faced by the contractor and taken care of in the unit price. States point out that weather conditions may have an important effect on the amount of water required for any project and this is a factor which cannot be controlled. Likewise, the type of materials used on the job may represent an equally important factor on the amount of water required.

A state which pays for development as a lump sum item and for application at a unit price has this to say. "Payment for water is tied closely to the cost of developing the supply and this is paid for as a lump sum. It is one of the early pay items by which the contractor can recover his initial job costs, along with clearing and grubbing, and these are invariably overbalanced in bids. The department recognizes that the job should begin to carry itself as soon as possible and the present system seems to cover both first costs as well as taking care of variations in amounts required."

The joint committee in one state handled a situation which resulted from the desire of the department to require pressure pumps and spray bars on water trucks. Contractors on the committee determined that AGC members were not opposed to this development but would like to have adequate notice before the change was ordered. This was agreed to by the department and the change was made without difficulty.

THE PERENNIAL COMPACTION PROBLEM

". . . specifying end-results or methods argued both ways . . . test results must precede approval . . . compaction problems are as different as materials . . . specs on results promote new equipment ideas."

"We are now specifying results for embankment compaction and leaving the choice of equipment to the contractor," reports one highway department. This would appear to represent a trend although it is by no means uniform and, surprisingly enough, some contractors appear to prefer getting paid for work items rather than final results.

For example, one state which specifies in detail the type of rolling equipment that must be used and its method of operation finds that contractors are definitely split on proposed changes to a result type of specification. This state indicated that adoption of a result type of specification for both subgrade and surfacing will be carried out shortly.

AGC members are definitely opposed to the specifying of a degree of compacion in another state, even with payment to be provided on a cubic yard unit.

Of those states using a well defined result specification one state provides for a "minimum density for embankments and subgrades at a unit price per yard, with compaction method and equipment left entirely in the hands of the contractor." On the introduction of this policy there was some resistance from contractors but this has now changed to approval with no pressure to return to the older policy. This department points out that the system opens the field wide for use of all types of new equipment with pressure on manufacturers to produce better and better compaction machines.

The other side of this long-debated question is well expressed by a highway department representative as follows: "The specifying of end results seems to have the AGC in its grip, but we are sure that no contractor in this state wants to be faced with the possibility of ripping up several miles of concrete paving if it is found to be lacking in some respects of meeting specifications. We have refrained from end-result specifications until we have developed a test that will allow the contractor to proceed at a normal pace and know that his work is acceptable as he goes. So far we have used end specifications with good results on compaction and have developed specifications for finishing portland cement concrete pavement based on a single 'rideability' test. We shall continue to strive for end result specifications consistent with furnishing a rapid criterion by which to work."

Coarse material is testing problem

Again, on the side of end results another department indicates they are paying for compaction by the yard and specifying density required. This, the department agrees, makes them an advocate for providing results rather than methods in its specifications. However, the department has found it is not practical in some instances where coarse material is involved to make density tests and in these cases methods of operation must be outlined. Several years ago this same department paid for compaction by the hour but now finds that the specifying of results is preferable since it permits a contractor to select the type of equipment he prefers to use.

Taking the other side, again, another department states that compaction is paid for on the basis of roller time used, and this is the bid item. This state, wishing to follow the precedent set by several Western departments in specifying results, questioned its local contractors and they expressed definite opposition to making any such change in the specifications for such compaction. Still another state is about ready to ask its contractors their desires on this same subject and whether they would like to switch to a result specifications from the methods that are now specified.

New ideas for equipment favor "results"

The above comments are enough to indicate the divergence of opinion on this subject, both among highway departments and contractors. Aside from the problem of developing prompt tests with accurate results on the sufficiency of compaction it would seem that progress is in the direction of specifying results since this will permit more latitude in the development and use of new types of equipment.

AGGREGATE SOURCE NOT ADEQUATE

". . . sources must produce both quantity and quality . . . specs getting tougher . . . who pays cost of moving to another source . . . 'guarantee' is an inflexible word . . . most states pay for increased costs."

Contractors appear to be in a favorable bargaining position in regard to a cooperative approach to the problem of aggregate sources that are not adequate. Highway departments indicate sources of material available for highway jobs, including material for base, subbase and surfacing. These sources involve the question of both quantity and quality based on

exploration and tests which are relatively standard among departments. Obviously, on the larger projects and when sources are more difficult the investigations will be more extensive and resulting information more elaborate.

It would be the exceptional case when a contractor makes parallel investigations on his own to confirm these findings or to select a new source, although this has been done on occasion.

As highway specifications for all types of aggregate become more severe a contractor must prepare for unforeseen developments and for flexible operations. The modern, portable crushing and screening plant is an important advantage in this situation.

Natural deposits defy exact tests

In spite of standard explorations, natural deposits of materials have a way of avoiding the tests holes and resulting averages. Occasions are all too frequent where contractors have started in a pit or source of material which was indicated as adequate in both quality and quantity only to find that the material was not reaching specifications, with high wastage or complete exhaustion of the source. In these cases some relief has been considered fair and proper. Almost every one of the joint committees has this subject under consideration and some definite rules have been established which are reducing this area of friction.

Contractors are being warned in one state as to all possible problems they may face in using material from the indicated sources for the particular contract to be carried out. In cases where the pit does not prove satisfactory either for quality or quantity the department provides a fixed compensation for moving from one pit to another depending on the size of the plant involved. Payment is also made for additional haul that may be necessary as well as for the clearing and stripping of the new pit. These additional payments are made when the change is ordered in writing by the resident engineer.

Specifying of admixtures—cement, limestone dust, lime, and other binder materials—is the method used by one state as a rational approach to designating a pit which is known to be below standard. As a result there is no particular problem relative to added costs since the department predetermines the process for bringing the aggregate up to proper quality and writes the specifications accordingly. Of course, this becomes a matter of economics where the cost of the treatment with an admixture is about equal to the longer haul to a better source of material. The problem is met by a simple rule offered by another state: "If a designated pit should prove unsatisfactory either because of quality or quantity, the contractor is reimbursed for any necessary added costs."

State pays for move and longer haul

Compensation is paid to contractors in another state if the required specifications cannot be met by using the sources indicated. In this case the state provides another source and pays all costs involved in moving the plant, and for the change in haul distance. However, if a contractor elects to use another source which may appear to be more economical the department may extend permission to do so, provided the quality is adequate, and the contractor assumes all costs of moving his plant, developing the new source and the increase in haul distance.

Many hours of discussion have extended over many months in another cooperative committee on this perplexing problem. The committee finally arrived at a satisfactory compromised solution which provides that the department will guarantee 75% of the quantity which the plans state as coming from a designated pit. For example, if the pit produces only 50% of the quantity as estimated by the department, it will pay for equipment moves and additional haul at rates stipulated in the specifications on 25% of the quantity estimated to be in the pit.

A similar arrangement is common in another Western state where pit materials do not prove up to the investigations. In these cases the department pays the contractor for the additional expense incurred in any excessive stripping, excessive pre-wasting or for the development and providing of additional filler material. If the plans show that the specified pit is going to require a volume of rejects, according to another state the contractor is required to stand the expense of rejecting this material.

"Guarantee of quantities in pits"

"Guarantee of quantities in pits" was the position taken by contractors in another state when the subject first came to the attention of the joint committee. In this situation contractors objected strenuously to the existing specifications claiming that they were forced to take the entire gamble on quality and quantity in specified pits. In reply, the department proposed to defer action, but the contractors expressed disappointment and requested immediate consideration of the basic problem. They suggested that top officials from the department attend the next meeting so that the matter could be discussed directly. Reports indicated that the next meeting was one of lively discussion from both sides.

Several decisions were reached which apparently were considered equitable and more realistic. These included a provision for paying for plant move and additional haul where material proved unsatisfactory, and the engineer should be the final judge of the quantity remaining in the specified pits. It was suggested that the word "sources" be changed to the word "source" so that it would refer to each individual pit. It was also agreed that the quantity of material available in each pit should be stated with the elimination of a clause which then stated that the contractor should satisfy himself as to the amount of material available. Tentative changes in the specifications for that state were prepared as a result of this committee session.

The changes in specifications received further committee discussion, the contractors believing that an improvement had been made but the results were still unsatisfactory. The word "guarantee" was still actively promoted by contractors. A report from this committee meeting indicated that "this subject has been the most confused and most contentious of any subject which has yet been taken up by the committee and it is felt that considerable study should be made of this subject."

. . . and what have you to say?

Many of the subjects covered in this review will bear further discussion. This is particularly true in the interest of securing the advantages of uniformity among the Western states. Constructive ideas would be helpful and the pages of WESTERN CONSTRUCTION are open for such comments.

(Continued on page 60)

On this portable crushing operation, producing materials for use on a grading and drainage contract for the Missouri Freeway construction project near Joplin, Mo., the W. J. Menefee Construction Co. uses 3 Cat Engines to power this crusher.

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TRAFFIC CONTROL AND ITS COSTS

". . . opportunity for effective cooperation . . . contractor provides control system and resident directs it . . . mutual responsibility suggests sharing costs."

A perfect illustration of a subject having mutual interest for both the highway department and contractors with adequate grounds for effective compromise is the handling of traffic during construction and the costs involved. Both sides have definite responsibilities as well as definite advantages in working out a satisfactory solution. The subject increases in size and costs as traffic gets heavier and construction equipment bigger and faster. Naturally each side would like to reduce its responsibility.

The problem is broad, ranging all the way from signs, temporary lights, temporary traffic signals and flagmen, to pilot cars. In general, contractors would like to have pay items on all of these elements so that compensation would be related to the requirements that are put in effect by the resident engineer. The contractor's contention points out that engineers have considerable latitude in authorizing traffic control and it should be paid for accordingly.

On the other side, the departments take the position that traffic direction and control relate rather directly to the operations of the contractor and he should plan for the cost accordingly as part of his overhead. From these widely divergent positions, discussion, mutual understanding and a willingness to compromise have been evident in many committee deliberations, with considerable progress made. Obviously whichever party controls this aspect of the job assumes considerable responsibility in the eyes of the public.

Higher type employee for flagman

Some specific suggestions made by departments relate to the advisability of contractors using a higher type of individual for the position of flagmen since this represents an important factor in public relations. Also, contractors could exercise more control over their own hauling equipment for the benefit of the traveling public. If the contractor considers it necessary he should request a speed limit sign through sections of the project as required, and should move these signs as the work advances. Posting these signs at the two ends of the overall job is not adequate.

In one state, after extended committee discussion the contractor is now being reimbursed for one-half of the wages of flagmen used in connection with traffic control. This state also provides the contractor with necessary traffic control signs, with the responsibility for control left up to the resident engineer in charge of the project. Viewed broadly, traffic control is considered by this department to be a cooperative effort and the dividing of the cost of control has made it more effective than when it was left entirely to the responsibility of the contractor. That situation tended to place responsibility on the contractor with the authority placed in the hands of the resident engineer, which was not a harmonious situation.

A definite position is established by one state with a statement from an administrator to the effect that "costs of flagging and traffic control will be borne by the state except over detours established at the request of the contractor and for temporary bottlenecks or hazards caused by the contractor's operations." Another state is paying a stipulated lump sum on each project for the flagging and traffic control.

Contractors in one state feel that the department should pay one-half the cost of any temporary signal installation due to the fact that such equipment is used so seldom that the cost to a contractor is rather prohibitive. This same AGC group believes that the state should share in the cost of flagging and pilot cars due to the fact that contractors are directed by the resident engineer and this exercise of authority should be accepted with a corresponding willingness to compensate.

MISCELLANEOUS POINTS OF DISCUSSION

A common complaint of contractors relates to the lack of experience among inspectors and younger resident engineers. The degree of this complaint probably varies depending on the most recent experience of the individual contractor.

Highway department engineers are inclined to agree with this complaint in principle. However, the years of experience and the ability to fulfill adequately the function of inspector, or junior resident engineer do not coincide with this level of engineering employment.

Although never brought up with as much vigor, there is the other side of this picture which can point out that all contractor superintendents are not up to the top level of experience and ability. Naturally, the average size highway contract does not justify a superintendent or staff which is at the highest price level. The net result may be a superintendent lacking in adequate experience, and an inspector or resident of corresponding background. This situation can only result in a headache for both highway department and contractor.

Data made available to the contractors prior to bidding, which includes sub-surface conditions and sources of aggregate, is a subject of limited disagreement. This pre-bid information is costly and there is no limit to possible detail, except for justifiable cost. Highway departments find that whereas one or two bidders may use all available information and have an earnest desire for more, other bidders will not use the material presented, which would then appear to be an economic waste. The extent of this information must be balanced against the size of the job and the average interest of bidders.

"Reading the fine print" usually develops on jobs where the bid has cut the profit margin particularly thin. Oftentimes such a reading indicates loopholes which would have a distinct advantage to the contractor. However, such combing usually produces similar reading on the part of the resident and inspectors. The net result is of mutual benefit.

Contractors frequently complain that inspectors and residents are not familiar with equipment and its use. Again this is a function of experience and the older inspectors are more familiar with these construction tools. One highway department has made a distinct effort to correct this situation with the issuing of a series of bulletins sent out to members of their field forces. The bulletins describe in detail various pieces of new construction equipment with information on operating characteristics, capacities, adjustments and particular features to be watched. In general, the state highway departments would like to have their field forces thoroughly familiar with construction equipment.

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IN Missoula, Mont., when a small amount of mix was needed it was prepared on this off-street mixing table. Hot bitumen was added to the flattened windrow and the Trav-L-Plant took over. City Manager W. R. L. Taylor rides the hood as he checks the mix.

Low-cost streets are mixed-in-place

Freeways are making news, but citizens are more concerned with the streets in front of their homes. Those costs are direct and really serious. They want a well constructed street at a rock-bottom price. The answer can be mixed-in-place material, stabilized and surfaced.

TO THE AVERAGE property owner of Missoula, Mont., the most important contemporary road building advancement isn't the Federal Aid Highway Program; it's the paved street in front of his home. Complete with concrete curb and gutter, grade restoration, sub-base construction and asphalt pavement, the street cost Missoula's John Q. Property Owner only $3.30 per frontage foot.

Hundreds of miles to the northeast, Canadian taxpayers in Swift Current, Saskatoon and Regina smile with satisfaction at their new streets, similarly constructed. They, too, are free from dust, mud, drainage problems and noise. Low-cost street building has boosted their property values.

Jump south to Torrington, Wyo., and you find a bustling city whose traffic rolls on one of the most modern street systems in the Rocky Mountain West. Torrington used to be dusty, too, until it solved its problem with soil-cement stabilization.

Talk to officials of these and many another city, and an ironic common note emerges in every case. It's this: The average taxpayer will cheerfully endorse multi-million dollar state highway construction, because somehow it's a detached matter to him. But a street program in his own block is different. It involves dollars which come directly from his pocket. Here is something he can see; something on which his opinions are fixed. The result is a universal demand for soundly constructed modern surfacing at rock-bottom cost.

"In Place" streets

City officials in many communities have found the mix-in-place method an excellent answer to this demand for economy. Machines such as those used in the Missoula, Torrington, and Canadian work are capable of developing good mixes without moving or re-handling the material. The method is unbeatable where streets lie over, or close to good, well-graded gravel with a low PI. Such materials, mixed with asphalt, portland cement or calcium chloride, make strong, traffic-resistant surfaces.

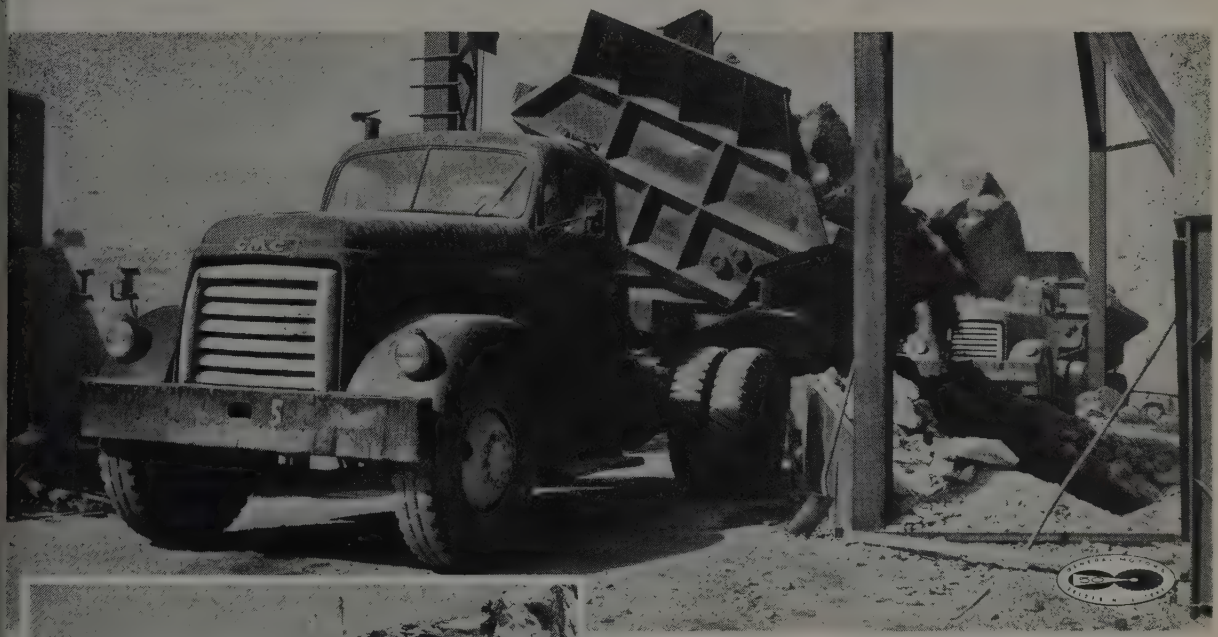
Programmed efficiently through the hot summer months, mixed-in-place construction can move fast enough to keep pace with what most city budgets will bear. One city did its 20-block annual construction program in only a month. Another, with a much more extensive program, worked from June through September. In little cities like Swift Current, for example, where paved streets are just getting started off the main through-highway, mixing in place can be programmed with the weather with utmost efficiency. In cities whose environs expand slowly with new housing, shorter paving programs are indicated.

Long-range advantages

While the mixed-in-place job is not the highest type, it is excellent construction for many reasons. First of all, it delivers a job that may be adequate in most cases for 15-25 years. It's an excellent part of stage construction if long-range plans call for ultimate pavement types later on. It serves to minimize dust, keeps streets from getting muddy, and softens traffic noise. Cost-wise, it's about half that of higher-type pavements.

"It takes a lot of truck to handle 25- to 30-ton loads!"

—says W. B. Couch, superintendent of the Campbell Limestone Co., Beverly, S. C., in reporting on their GMC Diesels



SOME OF THE HUGE BOULDERS THAT HURTLE DOWN into Campbell's GMC's are half the size of a sedan. In fact, the specially built dump bodies are of 1-inch steel plate. And underneath is the GMC brand of super-stamina that shrugs off this kind of punishment—for years.

OFF-THE-ROAD HAULING THAT'S TOO HEAVY FOR LEGAL HIGHWAY TRAVEL is rugged business. Yet Campbell Limestone's GMC Diesels do this day after day—running 10-hour days in the summer. They've never required any pampering—even after the equivalent of 100,000 miles of this work. It's the pay-off on GMC's *all-truck* construction—as the world's largest exclusive commercial vehicle manufacturer can supply it.

EVEN CLIMBING THE STEEP RAMPS with their huge loads is easy for these GMC's. They've got the power reserve to keep rolling where other trucks can't make the grade. You can thank those high-torque 2-cycle Diesels for that!

GMC TRUCK & COACH—*A General Motors Division*

GMC-America's Ablest Trucks ½ to 45 tons

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Occasionally a city engineer will try to combine mixed-in-place ease and economy with the outside appearance of a higher-class product. For example, two years ago the city engineer of a Western community tried it. A small asphalt plant was purchased, and set up in a bank-run alluvial deposit at the edge of town. No attempt was made to screen or grade the bank-run gravel. It was scooped up, fed through the plant dryer, and mixed with asphalt of the same grade which would have been used in mixed-in-place work. "The public was favorably impressed," said this city engineer later, "but I know I was kidding myself. We still had to haul the material to the streets. We still had an ungraded product. Our production was lower, and our plant setup was far less mobile than mixed-in-place equipment. We had extra expense in a plant oiler, which we wouldn't have had otherwise. We also had four times the investment in equipment."

How Missoula does it

How Missoula builds low-cost streets is a model for many cities similarly situated. Missoula, with 22,000 population, is Montana's fourth largest city. The 240-mi. street system overlies a pervious gravel formation which, ages ago, was part of a lake bed. Parts of this street system are half a century old.

One of the serious deficiencies of early street construction is being cured with the present construction programs. It's the matter of drainage. Up until a few years ago, Missoula had no storm sewers. Rain and snow waters ponded in the streets. No pavement can stand that type of abuse. Ironically, all it took were shallow dry wells to drain water down into the deep, pervious underlying formation.

Missoula's proximity to good street-building materials was in its favor. Engineers who studied the situation planned a simple remedy: Rip up the old potholed surfaces, rebuild the granular bases where necessary, improve the drainage grades and install dry wells at strategic seepage points.

Finances were a problem

Financing the program was a serious problem. Montana law prevents cities from taxing motor vehicles. Special assessment district tax levies raised a net of only $70,000 for the whole 240-mi. system. State motor fuel tax revenues are

STEP 1—Motor grader rips up the next-to-curb lanes of base material placed a few years before. These parking lanes will be mixed-in-place; the center of the street will be surfaced with 2½ in. of plant mix. The base is crushed and screened gravel. This work was at Regina.

STEP 2—The Seaman-Andwall Trav-L-Plant is making a dry run through the scarified material to break it down and pulverize it prior to adding the oil. This base material had received an oil pallitive treatment when placed, a few years before, as a first stage.

STEP 3—Asphalt emulsion from the distributor is metered by the pump on the Trav-L-Plant. Cost of street work was $128 per 50-ft. lot. Initial mixing takes place when the asphalt is injected into the material under the hood. The asphalt is Type SS-1.

returned on a pro-rata basis to counties, not cities. Missoula solved that problem in the best grass-roots tradition of democracy. If the majority of property owners on any block petition for street restoration, the work is programmed. The "full treatment": pavement restoration, correction of grade, sub-base rebuilding, drainage well construction, costs $3.30 per property front foot. A sealcoat job over adequate street costs only 60¢ a front foot. Practically all of Missoula's citizens have been receptive to this plan.

Available funds from the $70,000 net income have been programmed for a key network of arterial streets leading from downtown to all parts of the city. "Property-owner money" then is used to expand, block by block, this key arterial system.

The initial modest expansion of Missoula's equipment included purchase of a new Seaman-Andwall Trav-L-Plant for roadmixing in place, two Caterpillar 12 motor graders, pneumatic and steel wheel rollers, four dump trucks of 12-ton payload capacity, and a pair of tractor loaders.

Step-by-step operations

Rebuilding a street starts with initial ripping by the scarifier teeth of the motor graders. The old bituminous material is windrowed for salvage. Grades are then rebuilt to better drainage standards by motor graders. Labor crews, sometimes from local contractors' staffs, build the concrete curbs and gutters and place the inlet structures for drainage wells.

WELL blended mix on the street completed by the traveling plant and ready for rolling.

After the compacted subgrade is shaped, ¾-in. minus cushion course material is placed and compacted to a finished tolerance of ¼ in. in 10 ft. This leveling course material is an excellent product: it's produced commercially under contract to specifications similar to those the Montana State Highway Department uses for the same material. It is a much better product than bank run material, and does not cost very much more. Graded crushed gravel for the roadmix filler also is produced in this manner.

A four man city Crew, using the Seaman-Andwall Trav-L-Plant, has developed such efficiency that a 600-ton, 450-cu. yd. windrow can be completely mixed with 6,000 gal. of MC-3 or MC-5 asphalt in about 6 hr.

Usual method is to deliver the bitumen from Farmers Union Refinery at Laurel, Mont. in transport trucks at application temperature, to hook these transports direct to the metering and pump equipment on the Trav-L-Plant, and to put the oil down in a single pass through windrows separated properly by the motor graders. Because the oil is so delivered, Missoula has no railhead problems, reheating expense, or storage crews. The oil is ordered when it's needed.

Mixing away from street

It's sometimes necessary, when small amounts of bituminous surfacing are needed, to use a mixing table away from the street area. In such a case, the hot bitumen is placed on flattened windrows, and the Trav-L-Plant picks up the job from there. The machine finishes the mixing job in conjunction with one or both motor graders. In hot summer weather where the oil can be injected through the Trav-L-Plant's own system, only five additional passes are needed for a perfect mix. If mixing is done directly on the street, motor graders blade the finished material out to final lines, and pneumatic and steel wheel rolling is done. If a mixing table arrangement is used, the mix is loaded out by front-end loaders and trucked to the street site to be laid down similarly. When the surface texture is right, a sealcoat of asphalt and rock chips is applied.

This simple roadmixing program has worked well for Missoula. Real speed has been developed during the few hot summer months when speed is needed. One by one the pot-holed old streets are disappearing, and beautiful modern thoroughfares are taking their place. And costs are only 50% what they would be with plant-mixed pavements.

Other cities follow suit

Other cities are joining Missoula's example. When Torrington, Wyo. decided to revamp its street system, it picked portland cement as the stabilizing agent because its underlying soil condition was much more on the plastic side. But work methods were very much the same. After grades had been shaped and drainage problems taken care of, the cement was spread on the filler material in volumes up to 6%. A Seaman-Andwall Trav-L-Plant also was used by that city for doing the mixing job.

In western Canada, where economy is absolutely vital, roadmixed asphalt street pavements cost a 50-ft.-front property owner only $128. Regina, Sask. has developed such low costs under interesting conditions. That city is underlaid with soft plastic clay: so soft that 12 to 15 in. of gravel sub-base normally would be required. But that's been cut to 6 in.—4 in. next to curb lines—by stabilizing the hauled-in granular ballast with Type SS-1 asphalt emulsion.

Regina uses a stage construction plan, first outlining the street limits with concrete curbs, or curb and gutter. Crushed, screened base material then is hauled in, bladed, rolled, and given an oil pallitive treatment of SS-1, cut back 7:1. In about three years, 8-ft. strips along both curb lines are ripped up and asphalt stabilized by the city's Trav-L-Plant. Final step is a 2½-in. mat of plant-mixed asphalt.

Smaller communities

Smaller communities, like the little town of Swift Current or Moose Jaw, are doing the entire street job with local screened gravels, trucked in oil, and the Seaman-Andwall mixer. MC-0 and SS-1 oils are popular here. The mixing depth of 4 in. is expected to produce streets which will serve traffic for years to come.

In these and many other communities, where engineers are faced with money shortages and economy-minded citizens, a good long look at street planning usually indicates that there *is* a low cost paving answer available, and that this answer lies in great measure in mobile mix-in-place equipment.

re comes a 75 Paywagon with a 15 cu yd load hauling ypical gumbo conditions. "These 2-axle units will pull through soft fills much better than any others we've used," states William agney, Jr., President, Contracting Material Co.

vailability oll road!

wagon speed and "off-road" mobility enable the con- tor to keep ahead of schedule on sub-base spreading with only "75" units! The toll road will accommodate six 12' traffic lanes. contract involves building 16 traffic interchange structures!

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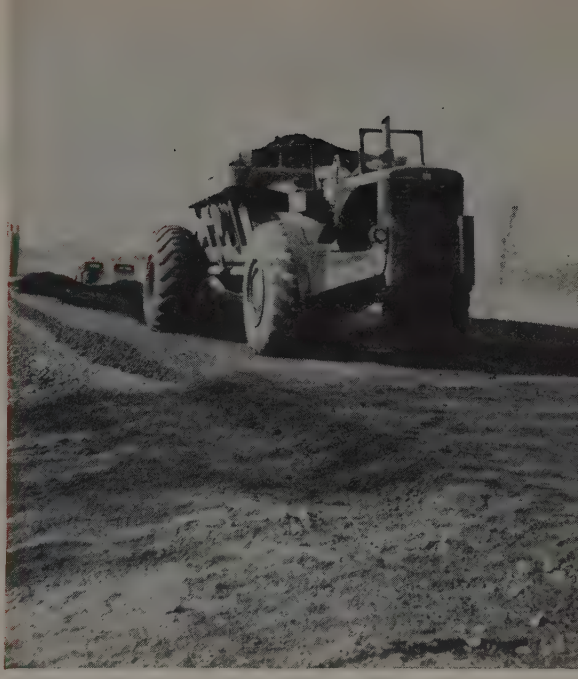

How Paywagon controlled dumping lays sub-base to engineer's specs!

Paywagon design provides simple, one-cable door control. An ingenious cable sheave arrangement, plus geared-together clam-action door design gives a simple, trouble-free Paywagon dumping mechanism.

This positive door-opening control permits the operator to windrow material accurately, or spot his full load exactly where desired.

High Paywagon clearance of 41 inches gives ample room to straddle dumped loads. The clam doors open out and up—leaving no dangling projections to foul up in windrows or fills.

Only the International Paywagon gives you this positive controlled dumping.

Dragline-loaded Paywagons haul select sub-base material — precision spread it with controlled dumping for blading and compacting in 5-inch lifts. Sketch shows how cable controlled clam doors permit placing 15 cu yd loads with dump-truck accuracy. Motor grader spreads the material.

To admit new methods and materials—

Montana revises highway specs

New edition replaces one published in 1946. New methods and materials incorporated. AASHO standards used. Interstate System requires several new sections. Item numbers will be consistent on all contracts permitting easier accounting, computations and cost statistics.

By **CHARLES S. KING**
Specifications Engineer
Montana Highway Department
Helena, Montana

FOR THE PAST several years the Montana Highway Department has been letting and completing highway construction projects under specifications published early in 1946. During that time numerous special provisions have been put into effect, many of which were continued year after year. This procedure has required the insertion of numerous loose-leaf additions to every executed contract. During the last few years many of these contract documents became quite voluminous, due to the number of special provisions, many of which were actually supplemental specifications.

This inconvenience, together with the fact that the Department had practically no specification books on hand, made mandatory the issuance of a new publication. The 1958 edition is now available and has proven interesting to contractors, material suppliers, and engineers. The 1958 edition has some 500 pages, which is many more than were in the 1946 edition; the size of the pages is about the same.

New organization

Changing times and many new items of work, brought about by the requirements of the Interstate System, contributed somewhat to the change in the volume of the book. The 1958 edition has been compiled and prepared in a considerably different manner from the previous edition, and some persons have expressed the opinion that perhaps information is somewhat easier to find under the new arrangements, although this is a matter of personal opinion.

The table of contents lists sections, subsections, titles, and page numbers only, and there is no breakdown as to major divisions, as is quite customary in many books of specifications. Future use will determine the practicability of that system.

Years of preliminary work

The 1958 edition was actually started as early as 1954. Numerous meetings of department heads and committees were held during that year and the two succeeding years. Round-table discussions were held concerning proposed changes and amendments, additions, and deletions. Several meetings were held with a committee representing the Associated General Contractors. A tentative draft was submitted to the Bureau of Public Roads in the spring of 1956, and their comments and recommendations were incorporated in another draft.

The revision was resubmitted to the Bureau of Public Roads and this time there were very few recommendations involving amendments. The proposition then lay dormant for about a year, until one person was assigned the specific job of formulating the 1958 book. It was necessary, under the circumstances, to expedite the compilation of the book, due to the necessity of having such specifications for the pending March letting, the first in 1958. It was known at the time that the book would contain many "bugs" and that it would undoubtedly be subject to many amendments before the 1958 construction season would be terminated.

New terms defined

Section 1 contains many new definitions of terms peculiar to highway development, most of which were adapted from AASHO recommendations. Section 7 provides for more stringent requirements concerning insurance that must be carried by contractors, and considerably more thought has been given to the protection of the public in general as concerns facilities owned by public utilities. Special attention has been directed to underground facilities. Those changes are the most significant of the changes made in the general provisions relating to contract work.

The balance of the book is divided into sections and subsections, most of which are specifications for contract work and some two or three in the back of the book are set up for administrative and accounting purposes only.

Use of the terms "section" and "subsection" should be explained briefly. For example, Section 10 is entitled, "Clearance of Right-of-Way." That, in turn, is divided into four subsections entitled, "Clearing," "Grubbing," "Clearing and Grubbing," and "Roadside Clean-up."

Sections combined

Whenever it was practicable to do so, some of the sections of the 1946 book were combined into one section in the new book, and the same principle was applied with new specifications recently entering the picture. Many of the sections of the 1958 edition are practically the same as they were in the 1946 edition.

Section 11, "Excavation and Embankment" combines several whole sections into only a few in the new book. The principal change, aside from this combination, occurs in the Embankment subsection, wherein three different methods of compaction are prescribed. Method I pertains to the compaction of dirt and small granular material, stat-

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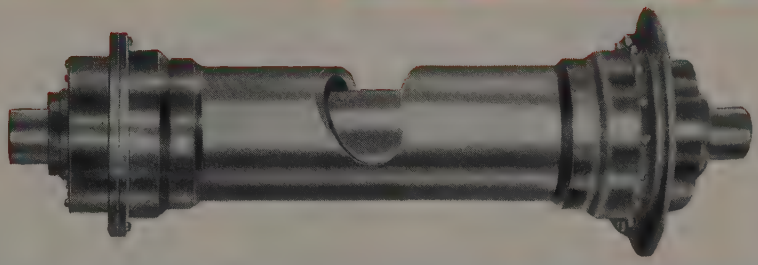

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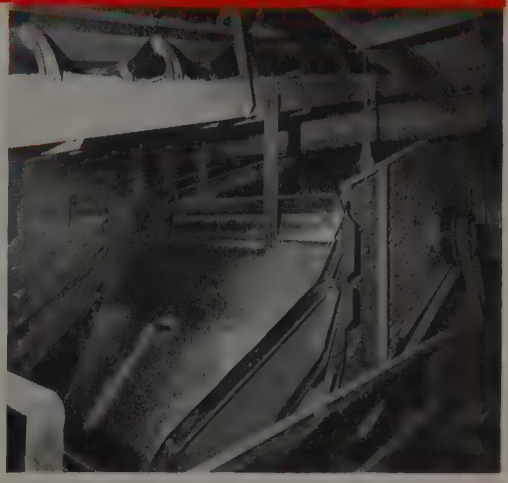

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ing that layers shall not exceed 8 in. in thickness and shall be spread to the full width of the embankment as it goes up. Method II pertains to material containing more than 25%, by volume, of rock larger than the equivalent of 6 in. in diameter; providing that each layer shall be equivalent in thickness to the maximum thickness of the rocks but not to exceed 24 in. Rocks larger than 24 in. equivalent diameter may be used but must be distributed evenly throughout the embankment area.

Pay for watering

Under Methods I and II the contractor shall be paid for watering and rolling as bid items and must meet a specified density. He is paid for excavating the material from its original position but not for placing it in the embankment. The methods of watering and rolling, as well as the type of equipment to be used, are specified in this section and also in the Watering and Rolling sections. Overhaul is also paid for. Method III leaves the manner of compaction and the type of equipment the contractor would use entirely to his choice, and merely prescribes the density of material that is required. No special payment would be made under Watering and Rolling when this method is prescribed. Method III has not been used in Montana, although it is being given consideration. Along with this consideration is the possibility that the contractor will be paid a price for "Compaction".

Separate sections have been provided for "Overhaul" and "Haul" of various materials.

Section 16 is a new section concerning contingent construction and operations. It particularly pertains to equipment use or rental, preparation of existing roadway surfaces for a new highway under a reconstruction program, the removal of existing roadway surfaces where necessary, and a provision for payment to the contractor for maintaining traffic services, such as flagmen and pilot cars.

Section 17 is a new section pertaining to seeding or turfing and fertilizing. This section has not been put to use as yet, but it is expected to be used on the Interstate System in median areas.

Section 20 contains instructions and specifications for the preparation and placing of all aggregates for surfacing courses. The succeeding sections in the 20 category deal specifically with various surface types. Subsection 22.30 is a new specification concerning "Soil Cement Stabilization." Section 28 pertains to stockpiled aggregates.

Bituminous specs changed

Section 30 contains instructions, information, and specifications concerning all bituminous materials used in surfacing courses. The types of materials are tied directly to AASHO specifications. Several succeeding sections deal particularly with each type of bituminous surface treatment used in Montana. The 1958 edition reflects a very pronounced change from the provisions of the 1946 edition in the construction of bituminous surfacing courses.

Section 39 is a new specification in Montana and concerns portland cement concrete pavement. It will be interesting to many states to realize that Montana has practically no concrete pavement in rural areas. Some 20 mi. were placed about 1920 and all have been abandoned at this date. We are, however, using concrete pavement in urban areas, at underpasses, and other particular sections of highway where the traffic justifies that type of surfacing.

Sections 40 to 53, inclusive, pertain to specifications for bridges, overpasses, underpasses, and associated work. Probably the outstanding change in specifications for structures is the use of air entraining agents in some types of concrete and the use of prestressed precast concrete beams.

Section 60 contains general instructions concerning the materials for and installation of pipe culverts and similar structures. Succeeding sections deal with each of various types. Again, AASHO specifications have been referred to as much as possible. One special section has been set up for bituminous treated or asbestos bonded pipe culverts.

Section 74 pertains to curbs, gutters, sidewalks, headwalls, and similar small concrete structures. The section is broken into subsections pertaining to each of the various types.

Section 79 is a new section to the Montana specifications and pertains to fencing. It was brought about because of the requirements of the Interstate Highway Program. This section contains specifications concerning barbed wire fence, woven wire fence, a combination of the two, stock or cattle guards, and wire mesh fence.

A tentative specification concerning highway signals, lighting and signing is being used and has not been incorporated into the book. It is expected that when these specifications are finally adopted, they will be placed in the 80-90 category in the next book.

All of the following sections are new as far as our 1958 edition is concerned: Remove and Reset Fence, Adjust Existing Structures, Miscellaneous Items, Public Utility Moves, and Non-participating Items. These sections were established to tie in to our item numbering system.

New numbering system adopted

The matter of assigning definite and permanent item numbers to various items of contract work, with the exception of a few miscellaneous and infrequently occurring items, is completely new with the Montana Highway Department. Practice in the past was to number contract items from 1 to 10, 20, 30, 40, or whatever was necessary for each particular contract. The new system establishes a permanent number for each of those particular items and such numbers are designated at the end of each pertinent section of the specifications.

For example, Unclassified Excavation is now numbered 1104. Overhaul of Unclassified Excavation will be numbered 1254; Rolling Embankment—1401; RC-5 Cutback Asphalt—3025 by the gallon, and 3125 by the ton; Portland Cement Concrete Pavement, 6 in. thick—3906. The first two digits are the Section number—the last two pertain to the item. Such numbers have been established for accounting and electronic tabulation purposes. With the establishment of these numbers it will be relatively easy to compute average unit prices for any bid item in any area of the state for any month or annual period. We will be able to make determinations in categories that were extremely impractical to make before the adoption of this system.

Approval expected soon

The 1958 edition is now being reviewed for approval by the Bureau of Public Roads. Tentative approval and permission to use the sections as written has been given and final approval and possible recommendations for revisions, in some instances, is expected in the near future.

UTAH ROADS

(Continued from page 36)

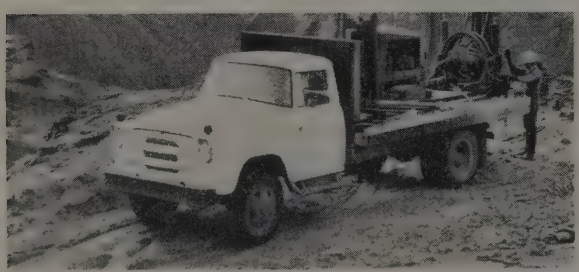
pen up areas previously almost naccessible. Another project for which contract will be let during he summer is the Flaming Gorge Dam on the Green River in eastrn Utah, near the Wyoming line. The dam will cost an estimated $65,-00,000. Utah has already awarded contracts on the first phase of a 6-ni. stretch of road leading to the lam site in the high rugged counry north of Vernal.

This vast, tremendous area of eastern Utah was untouched by the original 640 mi. awarded to the tate under the Interstate Highway System. In this big section was an rea huge enough to place the tates of New Hampshire, Vermont, Massachusetts, Connecticut, and Rhode Island, a territory as big as New England, yet was to be unouched by this National Defense System. This deficiency has since been corrected when a new link was added extending from Denver west to Cove Fort (see map), where unction is made with north-south nterstate Route 15.

Now this great area will have a major route leading to this big territory so rich in natural resources and scenic beauty. As the desert s being tamed by mammoth dam projects, so Utah will see a big construction program on its Interstate and other highway systems. Its resources expect their greatest development and the Interstate network together with the state's system will be a big force in this program.

The new director

As Utah gets under way on its $30,000,000 construction year for he Interstate System alone, it is fortunate to have as its director of highways, Ellis L. Armstrong. He s a native son who left his big assignment with the St. Lawrence Power Project to tackle Utah's huge highway program. Since his position as project engineer and assistant project manager for the consulting engineers overseeing the planning, designing, and construction of the $700,000,000 seaway was well under control, he looked upon he Utah highway directorship as a challenging opportunity in his own home state. He came at the request of George D. Clyde, Governor of Utah, and an engineer himself, who had been Armstrong's professor at Utah State University.



You pick the job—drilling post holes for electrical transmission lines, on-the-spot maintenance, or pickup and delivery of men and materials—there's an INTERNATIONAL ready to help complete it quicker at least cost. Conventional or cab-forward design with three or six-man cab options. Dump, flatbed, stake, or specialized bodies, on single rear-axle chassis with GVW up to 36,000 lbs., to meet any requirement anywhere.

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Slide and slipout control by drains

Deeper cuts and higher fills focus attention on adequate drainage. Drilling equipment has been evolving to provide more power and control of direction. Drilling and casing with one operation is the next step. Maintenance of drains is essential for their proper operation.

By G. V. STAFFORD and W. C. GRAY
Foundation Section,
Materials and Research Dept.
California Division of Highways

HORIZONTAL DRAIN flowing at a rate of 500,000 gal. per day. An auger flight rig is shown at work in the background.

OF THE MANY problems which confront the modern highway engineer and construction man, one of the most worrisome is the control of landslides and potential fill slipouts. Modern alignment standards, required on present day highways, necessarily demand the construction of many high cuts and heavy fills. The result is an increase in the number of landslides and much attention has been given in recent years to means of foreseeing, preventing and controlling these movements.

The cost of excavating and placing such large quantities of earth is a major item. This requires the design engineer to constantly weigh the cost of excavating additional material required to produce relatively stable flat slopes against the possibility of steeper slopes failing.

A number of different treatments are used to control landslides, usually in combinations since no single treatment has yet been devised which is positive under all conditions. Since water is one of the chief causes of slides and slipouts nearly every treatment aimed at preventing or correcting an earth movement, that is not classed as a rock slide, will incorporate some means of removing water from the subsurface area involved.

The first step where an unstable area or active slide or roadway slipout is involved is a field review by competent experienced engineers. It may be necessary to make a foundation investigation to further study and evaluate the conditions to determine the most economical and practical solution of the problem.

Ten corrective methods

The following things are considered to determine corrective treatment:

1. Change of alignment to avoid the slide area;
2. Change of grade either to avoid the area or to allow the placing of an embankment over the pushup areas to add surcharge weight at the toe of the slide;
3. Toe support and surcharging;
4. Slope flattening and benching;
5. Retaining walls, bulkheads and piling;
6. Stripping and removal of inadequate or unsuitable material;
7. Placing a blanket of pervious material to allow free subsurface drainage;
8. Underdrains and drainage trenches of various types to fit the conditions involved;
9. Installation of horizontal drains;
10. No corrective treatment (living with the condition).

While this article deals primarily with horizontal drains, the foregoing methods of treatment are mentioned to indicate the complexity of the problem usually involved in considering corrective treatment. It should also be emphasized, as mentioned before, that any sound plan usually consists of some combination of these treatments.

Where ground-water is the cause of instability horizontal drains have been demonstrated to be one of the best means of controlling this subsurface water in slide and slipout areas. The method has been largely pioneered and developed by the California Division of Highways beginning in 1939 on Cuesta Grade near San Luis Obispo. Since that time adaptations of the method have been employed throughout the United States and several foreign countries.

Defining the term

The term "horizontal drains" as used in California highway parlance denotes 2-in. perforated metal pipe drains installed in holes drilled in cut or fill slopes on slight plus grades. The drain pipe itself is perforated along three of the quarter points. A good butt weld is used to join the pipe in the field so that alignment of the perforations is assured. The perforations are placed upward to assure complete removal from the slide area of any water which enters the drain.

Horizontal drains may be installed directly into the sliding mass or in adjacent areas to intercept the subsurface water before it reaches the trouble zone. Thousands of feet of drain are now being installed in cut slopes during construction as a preventive measure rather than corrective.

The first horizontal drains were installed with light weight air-powered drilling machines. The air motor was attached to a racked frame and advanced manually by means of a lever and ratchet assembly. This type of machine functioned satisfactorily for twelve years and during that time in-

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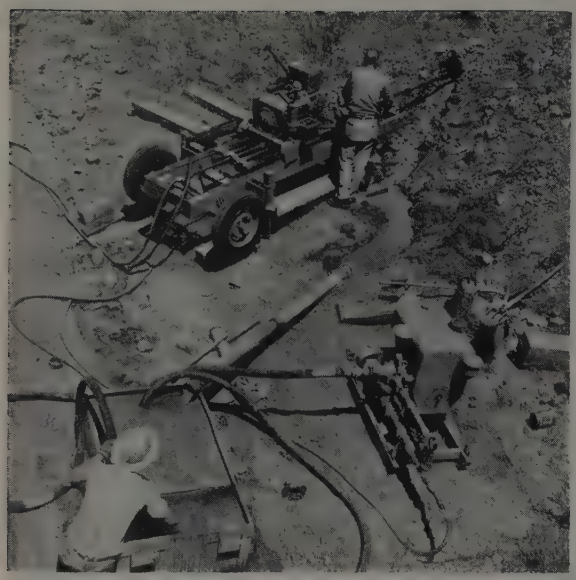
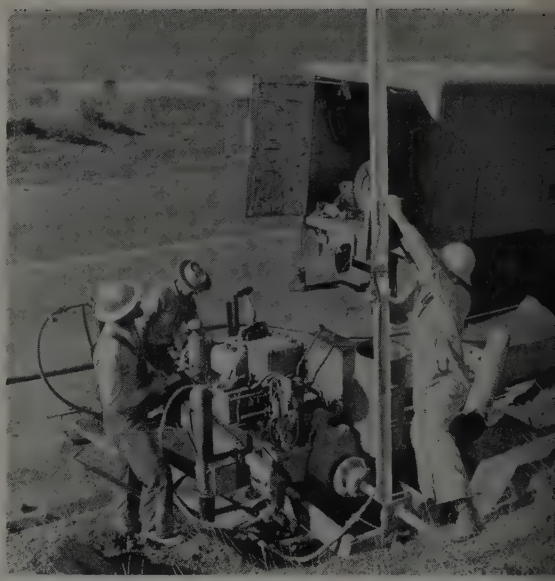


DRILLING SET-UP showing the California Division of Highways drill working on a horizontal drain hole. Note the recirculating tank and the mud pump. Drill was designed for power and control.



CHANGE IN grade as the hole is advanced is checked by the simp but effective procedure of filling the drill rod with water an measuring the height of the column in a vertical plastic hose.

stalled nearly 200,000 ft. of drain. Some modifying of the original equipment was done, but the main advance was in bit development, culminating in the use of roller rock bits when a size small enough to be practical first became available in 1948.

Larger machine required

With the horizontal drains proving to be a practical means for subsurface drainage an increasing number of locations were encountered where holes could not be drilled deep enough or where time loss due to difficult drilling was excessive. The need for larger, more powerful, drilling equipment was obvious.

In 1951 the Division of Highways purchased a self-propelled drill equipped with a 60-hp. motor and hydraulic feed. This machine was designed to use continuous flight augers, and 8-in. helical augers were originally purchased for use with it. The auger flights proved to be capable of very rapid drilling in the softer materials such as silts and clays, but they could not penetrate hard rock.

Considerable directional control trouble was experienced apparently due to the sloppy fit of the couplings. This lack of directional control was so extreme that several sharp bends often developed in one hole. The repeated flexing of auger flights rotating in such crooked holes caused considerable breakage due primarily to coupling fatigue. Breakage increased rapidly as hole depth increased and eventually a practical maximum of 125 ft. was established for this type of drilling.

Even though auger flights drilled more economically than rotary methods few locations were found where soft material and short 100-ft. drains could be combined to provide a satisfactory installation. As a result auger flights were little used while advances in rotary drilling techniques and equipment rapidly progressed.

Recently the adoption of 6-in. augers with a different style coupling and the manufacture of greatly improved bits, designed especially for horizontal drilling, have resulted in the installation of numerous drains exceeding 200 ft. in length. While augers can now be used for much of the work, rotary drilling is still the reliable work horse.

Shortly after the purchase of the larger rig it was modified and adapted to rotary drilling using diamond N drill rods and roller rock bits. The additional power immediately proved itself. Drains could be installed to much greater depths in the more difficult materials and many of the difficulties experienced with the lighter drills were now inconsequential.

Over the years this drill rig has proven itself to be a rugged and reliable machine. However, it does have several deficiencies when used for this particular type of wor the principal one being the inabi ity to pass full lengths of casin through the chuck. The use short lengths of casing requires large number of field welds. Th drill can be shifted to one side an the casing passed alongside the ma chine but this method does not al low for the rotation of the casin as it is forced into the hole, a neces sity for casing partially caved hol

Need for an improved rig

A definite need was felt for drill rig designed especially for i stalling horizontal drains and ove coming the deficiencies of existin equipment. No equipment on th market exactly fitted the require ments. Many core drills are cap ble of drilling horizontally but al left much to be desired from th standpoints of maximum efficienc in installing horizontal drains.

Accordingly, a drill rig was d signed specifically for this wor and fabricated by the Division Highways equipment shop in Sa ramento. A few modifications the original design have been mad and most of the bugs ironed ou The 20-hp. engine was coupled a 4-speed transmission with a flui coupling, hydraulic feed, standar core drill type chuck and pow takeoff winch. A removable re axle and wheels were arranged allow over-all lowering for stabi ity on steep grades. These featur combine to form a very efficie

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SLIPOUT OF a highway fill in Trinity County. The corrective treatment to be applied will include the installation of a system of horizontal drains.

A SYSTEM of horizontal drains flow into an 8-in. collector line which empties into a drop inlet. The 2-in. drain pipe is perforated along 3 of the 4 quarter points.

piece of equipment for installing horizontal drains. Diamond N-rod and 2-in. pipe have the same outside diameter allowing one chuck to serve for both drilling and casing.

Since the design and fabrication of the California drill some manufacturers have placed on the market drills designed for installing horizontal drains and several contractors will fabricate rigs of their own design on special order.

Much of the horizontal drain work now being performed on California highways is done under contract. Many contractors in the allied drilling fields have expanded to include horizontal drains. However, the Division of Highways still maintains and operates several pieces of drilling equipment for use on exploratory work, maintenance, and for developing and experimenting with new techniques. methods and designs for use in the industry.

Casing is the problem

The chief area of development at the present time is the search for an efficient method of drilling and casing in one operation. Horizontal drains are obviously installed primarily in areas where the material has been loosened and disturbed due to slipping and sliding. Caving of the hole during or after drilling and before the casing can be installed is by far the main cau of a lost hole. Straight ahead pro ress is nearly always possible if th driller does not need to be co cerned with maintaining an ope hole.

Many methods of drilling an casing in one operation have bee experimented with. The metho which shows the greatest promi of success is the use of a drill ro large enough to allow the casin to pass through the inside and devise designed to drop the bit the bottom of the hole. Using th scheme drilling progresses as ra idly as possible without regard maintaining an open hole. Whe the required depth is reached th casing is inserted inside the dri rod and the drill rod is then r tracted from around the casin minus the bit, leaving the borin cased its full length.

The one major drawback to th use of this method is the lack sufficient power of the present dri rigs to properly handle the large drill rod. The use of smaller casin is a necessity to keep the size of th drill rod and the horsepower r quired within practical limits. E periments using PK rod and 1-i casing have been encouraging bu a California drill of about 60 h would be required for efficient o eration with larger drill rod an 1½-in. casing.

Maintenance problem

Horizontal drains require som care if they are to continue to fun tion efficiently over the years. Roo growth inside the drains is prob ably the major problem and somewhat relieved by the use of length of nonperforated galvanize pipe at the outlet. The drain ou lets are sometimes bent and broke by maintenance crews engaged i cleaning gutters, by vehicles tha depart from the traveled way an by construction equipment wor ing in the area. The drains r quire cleaning with power equi ment and flushing with water u der high pressure every 5 to l years.

It would be well to repeat tha horizontal drains are definitely n a cure-all and any attempt to us them as such will, in many case lead to failure. This method h been developed until it has no become a reliable and efficien means of controlling ground-wat contributing to slipping and sli ing of earth masses and when pro erly and intelligently applied spe tacular results have been achieve

Arizona takes another look at truck-passing bays

Building the Interstate routes that will carry heavy truck traffic places different economic value on this highway design feature pioneered in this state.

By R. E. LAWRENCE
Assistant State Engineer
Arizona Highway Department
Phoenix, Arizona

ARIZONA HAS spent considerable time and engineering effort studying the problem of slow trucks moving up long curving mountain grades. At least, the initial investigation of traffic problems resulting from this hazard so typical of the West was started in 1948-49. Today, the design and building of the Interstate System brings a new aspect to this program. The factors which made truck-passing bays feasible and economical must now be applied to Interstate routes in Arizona.

The four conditions which made feasible the introduction of truck-passing bays on mountain grades are: (1) total traffic from 1,000 to 3,000 vehicles per day, (2) long and sustained grades with poor sight distance, (3) a high percentage of slow commercial traffic, possibly 25% or more, and (4) no anticipated increase in volume to reach the need for a 4-lane facility within 20 years or more. These are the criteria which were developed during the years when the subject was under active study.

A word of history

The study of this traffic problem common in Western states with long climbing grades and crawling trucks began when the Arizona Highway Department entered into an agreement with the U. S. Bureau of Public Roads (1948-49) to investigate this subject. During the course of field observations connected with this study the delays which were imposed upon the faster vehicles were observed. When translated into delays in hours per year, the total was staggering.

As a direct result of this study it is believed that the idea of providing passing bays to relieve this traffic congestion was first suggested by the U. S. Bureau of Public Roads and the Engineering Division of the Arizona Highway Department. William E. Willey, who is presently Arizona State Highway Engineer, presented a paper on the subject at the annual meeting of the National Highway Research Board in December 1949.

Specific situations corrected

Arizona had several long grades from 4 to 6 mi. in length at that time which were being utilized by heavy trucking rigs. These routes were on 1929-30 standards of location and design. They contained horizontal curvature with as little as 50-ft. radius and sight distances of less than 150 ft. Grades of 6%, uncompensated, were common with an available surface width not greater than 22 ft.

Some of these situations have been corrected as the sections of highway were replaced with modern facilities but there are two locations still in existence which represent what might be considered a standard arrangement and design for truck passing bays. A brief description of one of these situations will illustrate the problem and solution.

Yarnell Hill is on U. S. 89 between Congress Junction and Prescott. It was constructed in 1926 and has design characteristics of that period. This section comprises about 4.5 mi. of tight 6% grade. To realign and widen this section of highway would require an investment ranging all the way from $100,000 to $200,000 per mi. Further, the anticipated increase in traffic did not indicate the necessity for major improvements for at least a number of years—probably ten. On the other hand the delay to fast moving traffic and particularly the hazardous passing movements which could not be stopped required some form of relief.

Detailed studies were made by the Planning Survey Division of the congestion on Yarnell Hill. These studies showed that the construction of three widened sections, each about 1,200 to 1,500 ft. long, would alleviate about 70% of all the congestion along the 4½-mi. grade. These three passing bays were constructed in 1954. The original 22-ft. surface was widened to represent three 12-ft. lanes (two uphill and one downhill) with an 8-ft. shoulder on the climbing side.

Subsequent studies of traffic verified the estimate of the anticipated relief which was secured with the building of the passing bays.

Impact of the Interstate

Arizona has no immediate plans for constructing any additional passing bays at the present time. As already mentioned the economic needs for this particular highway design feature are four in number. When these requirements are applied to traffic needs on Arizona highways it is found that the grades acquiring relief fall generally on the proposed Interstate System, or on sections of the primary and secondary systems which must be realigned and widened for their entire length. Thus, the building of the Interstate in Arizona and the accelerating improvement of our primary system will tend to elimi-

(Continued on page 95)

The Dalon Team sets the stage for t

Biggest Shoppin

Against a background announcing the multi-million dollar center, C.I.T. division vice president Edward Mayer and contractor Lam Dalon discuss job progress.

A Dalon wagon drill prepares a shot in a rocky stretch terrain. The job site included many areas of heavy roc and earth mixtures.

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ld his high-capacity fleet over the past 12 years.
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lon purchase over $200,000 of heavy equipment.
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a Cat DW21 teams up with a model 470 scraper to
a rocky patch of ground.

Contractor Lam Dalon shows C.I.T.'s Georgia representative R. E. "Bus" Wilson how he proposes to use his new equipment to complete the job on schedule.

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SKETCH OF THE proposed bridge to carry the Seattle Freeway over the Lake Washington Ship Canal. The two-deck design (see upper right) will accommodate 12 lanes, with the 4 lanes of the lower deck reversible to take care of rush-hour loads. View looks north with the campus of the University of Washington out of the picture at the upper right. Contract for the piers will be let this year.

Washington's north-south freeway

The state's heaviest traveled route is being rushed to Interstate standards. U.S. 99 from Oregon to British Columbia is 276 mi. through important urban areas. Improvement started with two bond issues will be accelerated by the Federal program.

By W. A. BUGGE
Director of Highways
Washington Department of Highways

MOST heavily traveled highway route in Washington is U.S. 99. It carries over its 276-mi. length, more cars, trucks, and buses than any other portion of the state highway network.

Running north and south on the western side of the Cascade Mountains, it carries vehicles from the Oregon border at Vancouver, Wash. to the Canadian border at Blaine. It passes through the urbanized Tacoma, Seattle, Everett area. It's a busy highway.

State highway officials realized some years ago that improvement was needed on this key north-south route. Prompt action was required if the highway was to make its proper contribution to the economic growth of the state.

Washington did not wait for the Federal-Aid Highway Act of 1956. In 1951 the legislature voted a bond issue for a U.S. 99 construction program to provide for needed improvements which could not be financed out of funds available from current revenues. In 1953 another bond issue was approved by the legislature, making an extra $7,000,000 available for work on this same route.

At the time the bond issues were approved, U.S. 99 was four-laned only from South Tacoma north through Seattle to Everett, about 65 mi. The rest was two-lane highway. Thus, the first task was to four-lane the gaps, although the four-lane sections in the urbanized area from Tacoma through Seattle and Everett were also in need of improvement.

As a result of those bond issues 124 mi. of high-type, four-lane highway were added to western Washington's main north-south highway before passage of the Federal-Aid Highway Act of 1956.

The 3-mi. Vancouver Freeway was opened in March 1955. Four-lane highway was completed for the 96 mi. from Salmon Creek, north of Vancouver, north to Tumwater, just south of Olympia, by April 1956. Preliminary contracts were awarded for grading and bridge construction on the Olympia Freeway as a further step. Nine miles of new highway were completed in August 1956 from Everett north, bypassing Marysville, to Stimson Crossing. In June 1957, 10 mi. of new four-lane highway were completed from Conway Junction, south of Mount Vernon, north to Chuckanut Drive, just north of Burlington. In addition two-lane roadway was added to the existing two lanes for the 6 mi. from Bellingham north to Ferndale. All these sections were built with bond funds totaling $56,250,000.

But passage of the 1956 Highway Act provided real impetus to the program. For the first time, improvement of the section from Tacoma through Seattle and Everett was assured. Enough money was made available to get a good start.

More than $1,000,000 in six contracts has been awarded to construct new Interstate highway between the Vancouver Freeway and Salmon Creek, just a few miles north. Contract prices for three jobs to construct traffic separation bridges along the 96-mi. completed highway between Salmon Creek and Tumwater total $450,000. The high Interstate Standards adopted after this roadway was constructed made the elimination of some grade crossings necessary on this section. Contract prices for median and shoulder work on the same highway total nearly $700,000.

IRST FREEWAY in the state of Washington was around Vancouver, t the southern end of U.S. 99. Picture looking north and taken when the freeway was opened shows the Columbia River Bridge (now paralleled by a second crossing) and the old route swinging left.

On the Olympia Freeway to be pened in late 1958, contract prices or Interstate System work, includng that obligated with bond funds, otal more than $7,900,000. East of Olympia, a new 3-mi. section of highway through Fort Lewis was onstructed to Interstate standards ith contract prices totaling $1,-57,000. Contract prices total $2,-50,000 for work on the south end of the Tacoma Freeway, the first ection of the 65-mi. Tacoma-Seatle-Everett Freeway.

From north of Everett and Marysville, where bond funds left off at Stimson Crossing, north to Conway Junction, contract prices for grading and bridge construction and one section of paving total more than $3,300,000. On the Bellingham Freeway the total of contract prices for grading and construction of numerous traffic separation structures is $3,000,000.

Paving and more grading must be done to complete the Interstate Highway from the Vancouver Freeway north to Salmon Creek. Signing must be done on the Olympia Freeway. Grading, bridge construction and paving on new alignment are yet to be begun from the Olympia Freeway east to Fort Lewis. All paving and much more clearing, grading and bridge construction are needed on the Tacoma Freeway. Work is yet to be started on the new alignment of U.S. 99 between Tacoma and Seattle, on the Seattle Freeway, between Seattle and Everett and on an Everett freeway. New alignment is yet to be constructed between Burlington and the Bellingham Freeway. And the highway must be built between Ferndale north of Bellingham and Blaine at the British Columbia border.

A start has been made on the alternate to U.S. 99, a highway around the east side of Lake Washington, but much more work is needed to complete this Interstate section. More than $12,000,000 in location and construction work is planned during the next year, the final 12 months of the 1957-1959 biennium. Interchange and bridge construction is planned north of Vancouver. Interchanges between Salmon Creek and Tumwater are slated and work on the Bellingham Freeway is planned.

Nearly $4,500,000 in grading, paving and bridge construction is scheduled for the Tacoma Freeway. More than $90,000 is allocated for location work on the same facility. Grading, paving and bridge construction is planned south of Seattle on nearly 9 mi. of Interstate highway. Location for more than 13½ mi. of the Seattle Freeway on the new Interstate highway is planned for an early start.

Paving will be begun on 9 mi. of the highway from the already completed section south of Mount Vernon south. An interchange will be constructed north of Burlington where Chuckanut Drive joins U.S. 99. And paving of the Bellingham Freeway, estimated to cost $2,000,000, will begin during the year, as will location for Interstate highway from Bellingham north to the international boundary at Blaine. And grading, surfacing and paving will start on another 2½-mi. section of the Interstate alternate east of Lake Washington.

This brief review shows that much work has been done on western Washington's main north-south highway, much is now under way and a great deal more is planned in the future. Completion of this vital highway to Interstate standards will be of value to the whole state, and indeed to the nation. Traffic on the north-south Interstate highway will be able to travel from Oregon through Washington to British Columbia on comfortable safe highways with wide, sweeping turns, gentle grades, and the absence of traffic lights and grade crossings. Commerce, national defense, and the ordinary tourist who wants a speedy, comfortable trip, will all be assisted by the construction of this highway.

Washington motorists look forward to the day when the 276-mi. length of U.S. 99 will be built to modern standards adequate to provide efficient highway transportation services.

Aggregates for freeway concrete

Interstate route (U. S. 80) near San Diego is built with materials that meet exacting California highway specifications. Detail review of the production plants, their equipment and operation.

U. S. 80 BEGINS in San Diego and heads east as part of the Interstate System. The 176-mi. section to Yuma, Ariz., at the present time is undergoing a freeway face lifting job.

The route is carrying heavy interstate traffic along its entire length, but the metropolitan traffic demands near San Diego and its satellite communities focus attention on the section from the city to El Cajon. This section is already carrying an average daily traffic load of about 50,000 vehicles and the California Division of Highways estimates that by 1975 the figure may be doubled.

One section of active work is represented by a $3,594,000 contract, a joint venture of Kenneth H. Golden, Inc., M. H. Golden Construction Co., E. C. Young, and Young & Arrieta. This job extends for a distance of 2 mi. from La Mesa into El Cajon.

Other active contracts on this section of U. S. 80 include a major interchange at Fairmount Ave. in San Diego and another at the intersection of U. S. 80 and U. S. 395. These interchange structures will not be completed until the fall of 1959. More structures and additional miles of grading and surfacing remain to be done to fill in gaps on this section of U. S. 80 and bring it to full freeway status. When completed the route will provide for six and eight lanes of divided freeway with 8-ft. shoulders in the median area and 10-ft. shoulders on the outside.

The 8 in. of concrete pavement is supported by a 4-in. thickness of cement-treated base laid on a 6 to 12-in. thickness of compacted but untreated subbase. The base and subbase material is principally disintegrated granite (D-G). There are no expansion joints provided in the pavement except adjoining the structures. Temperature movement is provided for by sawed weakened plane joints.

The concrete is designed to meet the standard specifications of the Division of Highways and is a 5-sack mix with a 2½-in. maximum size of aggregate. As deposited the concrete must have a maximum 2-in. slump as determined by a Kelly Ball test.

Contractors on this section of freeway work are fortunate in having many available sources of all types of aggregate. In the Mission Valley and the San Diego River Valley there are 11 commercial plants that supply both concrete

AGGREGATE FOR bridge piers is produced at Caudell and Johnson plant from conglomerate dug from a hillside pit. Complex washing and grading operations include the use of special equipment to meet all state specifications.

id bituminous aggregate for high-
ay work. All of these plants are
ithin convenient hauling distance
the sites of present construction
tivity.

The raw aggregates come from
vo basic sources: (1) a conglomer-
e from hills and stream beds and
2) ledge rock. The conglomerates
e chiefly rhyolite and andesite
orphyries with quartzite and some
anitic particles in a clay matrix.
ze ranges from 6-in. plus boul-
ers down to fines. The ledge rock
usually andesite and rhyolite
eccia.

Production cost for processing
ther the rock or the conglomerate
aterial is about the same. The
sts for blasting, excavating and
ushing the quarried rock is about
fset by the additional costs for
ashing the conglomerates to re-
ove undesirable clay material.

In most cases the disintegrated
anite used for subbases and
eated bases comes from separate
posits which are not identified
ith those providing the raw ma-
rial for the paving.

The D-G material has been
und to be well suited for soil
ment base coarse and the follow-
g grading specification has been
tablished.

Size	Percent Passing
1½-in.	100
1-in.	85 to 100
⅜-in.	70 to 100
No. 8	45 to 80
200-mesh	3 to 15

Two tests developed by the Cali-
rnia Division of Highways are
sponsible for upgrading paving
aterials. The Sand Equivalent
est is effective in cleaning up the
ne aggregates and the more re-
ntly developed test for evaluat-
g cleanness of coarse aggregates
es a similar service in establish-
g quality for the coarse aggre-
tes. Both of these tests tended
introduce new operating prob-
ms for the producers of aggre-
te, but during the last two years
ost plants have been equipped
produce materials to meet the
gher specifications. The clean-
ss test relating to the coarse ag-
egates outlines the procedure and
e equipment for testing aggre-
tes from 2½ in. down to No. 16
ze to determine the amount, fine-
ss, and the character of clay-like
aterials including coatings of the
rticles.

The Monarch plant of H. G.
nton Material Co. has the sub-
ntract to supply concrete aggre-

PAVING AGGREGATE at the Monarch plant is shown going through a Wemco sand washer and classifier, with the rock going through an Eagle Iron Works washer. After another screening the sand is re-washed before going to stockpiles for dewatering.

gates. Aggregates from the plant are trucked to a C-A 150 Noble dry batch plant operated by Fenton near the construction site. This entirely automatic plant has a capacity of 150 yd. per hr. Cement for the batching plant is supplied by Fenton's own bulk cement haulage units. Seven trucks, each with four compartments (2½-in. rock, 1½-in. rock, 1-in. rock, sand and cement), haul the batched material to the paver.

The mixed and placed concrete is leveled with a Blaw-Knox spreader, and finished with a Blaw-Knox finisher followed by a Johnson float machine. W. T. Rhodes is resident engineer for the California Division of Highways on this job.

Aggregates from Fenton's Monarch plant are produced from a stream deposit. Material is excavated by a 2½-yd. Northwest shovel and trucked to the plant where it is dumped to a hopper over a Syntron grizzly feeder which rejects 3-in. oversize that drops to a 15 x 38-in. Pacific jaw crusher. Grizzly throughs and the product of the crusher are joined on a belt conveyor to a 4 x 8-ft. Symons, two-deck scalping screen. When paving materials are being made, a 2½-in. mesh is used on the top deck and ½-in. on the bottom deck.

Oversize from the top deck goes to a 3-ft. Symons standard cone crusher and oversize from the bottom deck goes to a 3-ft. Symons short head crusher. The crushed product is returned by belt conveyor in closed circuit to the scalping screen.

Sand from the screen goes to a Wemco sand washer and classifier and the rock goes to an Eagle Iron Works washer. Both products go to a finish screen which is a 4 x 14-ft. Symons 2½-deck unit. Finished rock from this screen is placed in bunkers. The finished sand goes to a Wemco washer for further cleaning and then to a storage pile for dewatering. The rock is now being trucked to storage, but a tunnel conveyor, now being built, will carry material into storage. The plant capacity ranges between 150 to 200 tons per hr.

The Monarch plant of H. G. Fenton Material Co. also supplies sand to the hot mix plant of Kenneth H. Golden Co., Inc., a short distance away. George Portlock is superintendent of the Monarch plant.

Aggregates for structures

Aggregates for concrete bridge piers and railings are produced at the Mission Valley plant of Caudell and Johnson, the concrete being supplied by its affiliate, San Diego Transit Mixed Concrete Co. This plant, which has a production capacity between 250 and 300 tons per hr. of finished products, has developed some interesting washing equipment of its own to supplement standard types of machinery. The resulting finished products meet all the standard state specifications including the Sand Equivalent Test and Cleanness Test for Coarse Aggregates.

The deposit is a conglomerate material which is excavated from a hillside pit by Carryalls and Tournapulls and hauled to the primary crusher located at an elevation above the main plant on the valley floor. The haulage units dump to a hopper over a pan feeder which carries material

(Continued on page 96)

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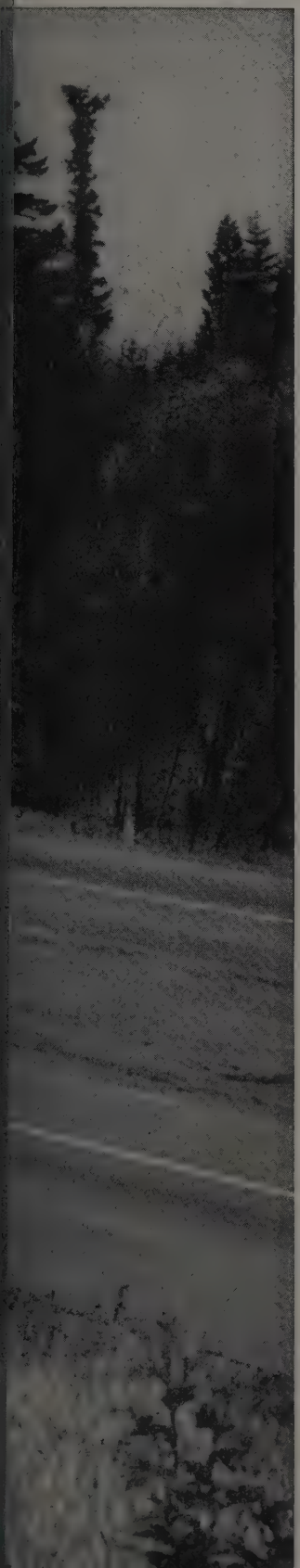

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Selecting binders for seal coats

A review of the considerations involved in choosing the proper bituminous binder for seal coats under various conditions.

By W. R. LOVERING
District Engineer
The Asphalt Institute
Sacramento, California

IN SPITE of the fact that a number of excellent articles covering all phases of seal coat construction have been published in recent years, most seal coats are still placed by "rule of thumb" methods. This is due, in part, to the fact that there are still sizeable gaps in the technology of seal coat construction but it is also due to the failure of engineers and construction men to avail themselves of the latest information and data.

It is true that most of the present information does not assign definite values or provide a means by which values can be calculated precisely. We can, however, calculate the rate of spread suitable for any given grading of screenings and we can calculate the application of binder required to hold those screenings on the pavement, with the exception of the quantity of binder that will be absorbed by the pavement. The allowance for absorption by the pavement still must be estimated. We can also establish general limits for the type or grade of binder and for the size of screenings suitable for any given set of circumstances.

Engineers, like all people, acquire prejudices and preferences that shape their decisions. All too frequently these same prejudices determine the grade or type of binder chosen for a particular seal coat without any thought being given to an analysis of the factors involved. One engineer will not use emulsion because in 1931 he was resident engineer on a job using emulsion that was a complete fizzle. Another engineer, on the other hand, will use nothing but emulsified asphalt because in 1937 he was connected with a project using emulsified asphalt that has been the pride of his career. Neither man bothered to analyze what particular circumstances actually contributed to the failure or success.

Before recommending a bituminous binder for a project, you must carefully consider the individual factors peculiar to the location. Ask the questions, "What type of binder is suitable *to this location*? What grade is required *for these conditions*?"

Your decision will be based on an evaluation of the following:

1. Probable pavement temperature
2. Size of chips to be used
3. Type and speed of traffic
4. Curvature of alignment
5. Probable air temperature

These variables must be considered and evaluated so that the bituminous binder chosen will be sufficiently fluid, at the temperature of the pavement when it is applied, to adhere to both the screenings and the pavement surface; and yet develop, within a relatively short time, a sufficient viscosity to hold the screenings at any subsequent temperature of the pavement. The bitumen, the road surface, and the screenings should have a mutual affinity in order to resist the action of water. Further the binder should not become too brittle at low temperatures, or through aging, to prevent the loss of chips by abrasion or severe impact forces.

Now let us consider these variables individually and decide what the important criteria are for each.

1. Pavement temperature

Pavement temperature is, I believe, the most important single factor. Screenings will not adhere to the pavement unless they are "wetted" by the binder and this will not occur if the viscosity of the binder is too high when the screenings come in contact with it. The temperature of the binder is controlled directly by the temperature of the pavement and thus the pavement temperature is of prime importance in determining whether the screenings will adhere. If the pavement temperature is high, the viscosity of the binder may be too low and may not have sufficient strength to hold the screenings, particularly on steep grades or under fast traffic.

Attempts to offset a low pavement temperature by applying the asphalt at a temperature above normal will prove futile and the high temperature may damage the asphalt. Temperature measurements on the street, both before and after applying the binder, show that within one minute after application, the binder had reached the same temperature as the pavement.

We have talked here in generalities, but what does this add up to in terms of grade of binder to be used? Considering now only the factor of pavement temperature: the temperature is high, either an emulsified asphalt or a paving grade asphalt should be used; if the pavement temperature is low, say 90 deg. F to 120 deg. F, an RC cutback or an MC cutback should normally be satisfactory. The excep

CONSTRUCTION MEN should be aware of the many factors that make up good seal coating practice. On the road shown, use of 200-300 penetration paving asphalt during cool weather resulted in loss of seal coat screenings in the traffic wheel tracks.

on to this will occur in areas of riable climate where a seal coat aced on a cool day may be subcted to high temperatures before e solvent has had a chance to ave the cutback. Under these contions the screenings may be lost cause of too low a viscosity of e binder.

At this point I would like to terpose by own prejudices or prefences. For low pavement temperares, I prefer the RC to the MC tbacks because they set up more ickly. RC cutbacks should also pply a harder residual asphalt in shorter period of time than will obtained with MC. For high vement temperatures, I prefer nulsified asphalt to paving grade phalt because I feel that it will ore readily wet the screenings. It ust be remembered, however, that nulsions require favorable drying nditions.

Size of chips

If we are eventually successful devising precise controls for the acement of seal coats, a working scosity range will be established r the binder. The low limit of is range will be that required the binder for first contact with e chips, i.e., the low viscosity necsary to wet the chips with the nder, and the upper limit will that required to prevent loss of e chips under normal traffic. his upper limit will vary with the ze of the chips, as the larger reenings require a greater rength of binder for retention an do the smaller chips. This is e to the fact that the contact tween the pavement and the irgular surface of the large chip is t nearly as intimate as the conct between the pavement and an ual area of smaller chips, while e force tending to remove the rge chip is as great per unit of ea as that of the small chip, posbly greater because of the greater lief of the large chip.

The lower viscosity limit will reain the same, or nearly the same, gardless of the size of chips used t the upper limit will have to be creased for larger chips. This nge in viscosity actually repreents a change that must occur in e binder in the time interval beveen application of the binder and lease of the completed seal to fast affic. It is readily apparent from is why it is more difficult to obin satisfactory retention of large reenings than small screenings.

Smaller screenings on the other and will tolerate less variation in the amount of binder than will large screenings. A very slight excess of bituminous binder with the ¼ x No. 10 screenings will submerge the screenings and result in bleeding and skid hazard.

3. Type and speed of traffic

Fast traffic with heavy wheel loads or tandem axle trucks on curves, regardless of speed, is the most destructive to seal coats. Heavier grades of asphalt are required to hold screenings under severe traffic conditions and this must be considered in selecting the bituminous binder for a project. If conditions are too severe it may be advisable to select some other type of asphalt treatment.

4. Curvature of alignment

This is particularly important if an appreciable number of tandem axle trucks are included in the traffic stream.

5. Air temperature and humidity

Atmospheric conditions may be a more descriptive term. Pavement temperature is the controlling factor as far as placement of the binder is concerned but for curing of the binder, humidity and air movement must also be considered. An emulsified asphalt should not be used in a location where drying conditions are not favorable. If most of the water has not been evaporated before the seal is opened to fast traffic, loss of screenings will probably occur. You have perhaps noticed seal coats where loss of screenings has occurred only in areas that were shaded in the afternoon.

It might also be well to mention that emulsion seals should not be placed late in the day, that is, if the seal includes a cover of screenings, because of the poorer nighttime drying conditions.

Summary

Let us see now if we can sum this up into a little more concise statement of the controlling factors so that we may actually arrive at a selection given conditions.

First, the bituminous binder must be sufficiently fluid after it is in contact with the pavement to intimately coat the screenings at the areas of contact with the asphaltic binder.

Second, the binder must harden in the shortest possible time and develop sufficient viscosity or strength to firmly hold the screenings in place under the conditions of temperature and traffic.

To me, the two binders that most nearly meet these requirements are the RC cutbacks, grades 4 and 5 for the cooler areas where drying conditions are not favorable, and emulsified asphalt for the hot areas where drying conditions are good and a heavy residual asphalt is required before the road can be opened to normal traffic.

I don't say, "always use these grades," but for normal conditions they should prove satisfactory. If large chips are used, a paving grade asphalt may be advisable or for a sand seal placed primarily to rejuvenate an old pavement the lighter grades of liquid asphalt, even the SC grades, may be indicated.

In selecting the grade of asphalt to use be sure your decision is based on an evaluation of the particular conditions for the project under consideration. Also, the need for additional data cannot be overemphasized. The collection of data for improvement of procedures and control of construction is not a monopoly of the research engineer. In many cases the field engineer is in the best position to obtain the information necessary for refinement of techniques.

PASSING LANES

(Continued from page 83)

nate sections which would previously have been susceptible to the passing bay method of relief.

However, this does not depreciate the obvious value of the passing bay as a highway design feature whenever the section meets the basic four requirements, particularly on the lesser levels of the highway system. Wherever warranted the design would probably be modified to some extent due to further study and the experience records on those in service for several years. The passing bays would probably consist of a 12-ft. lane and an 8-ft. shoulder on the downhill side and a 12-ft. lane and 10-ft. lane with 4-ft. shoulder on the uphill side, the 12-ft. lane being on the inside.

In conclusion, Arizona believes that the passing bays, pioneered in this state and demonstrated in two specific locations, have more than paid for themselves in relieving the operating costs, the annoyances and congestion and traffic hazards occasioned by trailing a truck at crawl speed up a long and winding grade.

TYPICAL of the complex interchanges which will integrate the Interstate System with existing highways in the proposed Olympia-Tumwater-Capitol Lake structure in Thurston County, Washington. Olympia's Capitol Building is visible in this rendering.

AGGREGATES

(Continued from page 91)

to a vibrating grizzly that rejects plus 6-in. The oversize rock drops to a 20 x 36-in. Diamond jaw crusher. The product of the crusher plus the throughs from the grizzly are joined on a belt conveyor that moves the material to a 4 x 8-ft. two-deck wet-operated screen having a 1⅝-in. mesh deck and a 1-in. mesh deck. Oversize from the top deck goes to a 15 x 38-in. Wheeling jaw crusher.

The materials from the second deck of the 4 x 8-ft. screen go to two sand deslimers. The sand deslimers are double wheels with buckets revolving in a tank to which fresh water has been added. Deslimers remove a substantial part of the clay and dewater the product as it is lifted out and placed on a belt conveyor. The product of the Wheeling jaw crusher also is joined on the belt with the material from the deslimers and carried to a surge pile.

From the surge pile, a reclaiming tunnel belt conveyor moves the material to a belt feeder over a 4 x 12-ft. Cedarapids two-deck, wet-operated screen, the top deck having 1½-in. mesh and the bottom deck 5/16-in. Oversize from the top deck goes to a 4¼-ft. Symons cone crusher with the throughs going by belt to a 4 x 8-ft. two-deck screen with 1½-in. mesh on top deck. Rejects from this deck are returned to a roll crusher. All throughs from both decks go by belt conveyor to a 24-ft. log washer having two shafts with 48-in. diameter paddles.

Oversize from the second deck of the 4x12-ft. Cedarapids screen, having 5/16-in. mesh, goes to dewatering wheels operating in a tank with added fresh water, from which the material is discharged to a belt that carries it to a Garfield-Allis-Chalmers roll crusher. From this crusher the material goes to another 4x8-ft. two-deck screen. The product of this screen joins the material from the first 4x8-ft. screen to be carried by belt to the log washer.

The minus 5/16-in. material from the 4x12-ft. Cedarapids screen is the concrete sand. This material goes to a specially-designed pug-mill with rubber paddles to give the sand a thorough washing. The pug-mill discharges to a double wheel derinser from which it is carried by belt conveyor to stockpile. Overflow from the derinser is pumped to a Cottrell liquid cyclone to remove fines which are placed on the belt going to concrete sand stockpile.

Coarse aggregates, after a thorough scrubbing in the log washer, are moved by belt conveyor and split to two 4x8-ft. three-deck, wet-operated screens. These screens have a 1⅛-in. mesh top deck, ¾-in. second deck, and a ⅜ or 5/16-in. third deck. The materials on and passing the first two decks go to a belt conveyor to be moved to the 4x8-ft. two-deck finished product screen, having 1⅛-in. and ¾-in. mesh decks. Three stockpiling conveyors carry the products of this screen to stockpiles over reclaiming tunnel belt conveyors. The top deck product becomes 1½ x 1-in. rock, the second deck produces 1-in. x ¾-in. rock, and the throughs become the ¾x⅜-in. product.

Returning to the two 4x8-ft. wet-operated screens, the throughs from the ⅜-in. decks go by belt conveyor to a pea gravel bin or they may be by-passed to a 4-ft. Symons short head cone crusher to make a special concrete block aggregate.

To conserve water used in washing operations, all the silt-laden water is drained to a desilting basin. A hydro-separater at this point recovers any remaining fines which are suitable for subbase material. Clarified water from the basin is reused in the washing operations. Clifford Ward is superintendent of the Caudell and Johnson aggregates plant, and Bob Martin is plant engineer.

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Highway construction bid figures

Bid figures are the foundation of highway costs. They represent, in the aggregate and with proper averaging, the contractors' appraisal of direct and indirect cost factors.

The following seven pages contain a wide selection of unit bid summaries. They have been condensed by eliminating some minor items.

ARIZONA

Arizona — Pinal County — State. Tiffany Construction Co. has been awarded a $174,031 contract for 9.5 mi. of highway southeast of Maricopa.

(1)	Tiffany Construction Co.	$174,031
(2)	L. & M. Construction & Engr. Co.	186,451
	Phoenix-Tempe Stone Co.	188,886
	Tanner Bros. Contracting Co., Inc.	193,322

		(1)	(2)
200 cu. yd.	Structural excavation	$ 1.50	$ 1.50
10,000 cu. yd.	Borrow (CIP)	.63	.30
Lump sum	Provide water supply	750.00	750.00
4,600 M gal.	Apply water	2.00	1.30
1,050 hr.	Rolling	8.00	8.00
69,450 ton	Select material (CIP)	.45	.48
1,782 ton	Cov. mat. for seal coat (mod. Type B) (CIP)	5.50	6.00
24,850 ton	Bit. stab. base (CIP except cost of liq. asph.)	.70	.94
1,590 ton	Liq. asph. for stabilized base and flush coat (gr. RC-2, RC-3 or RC-4) (CIP)	46.00	52.00
168 ton	Liq. asph. for seal coat (gr. MC-5) (CIP)	48.00	50.00
294 lin. ft.	30 in. C.M.P. (CIP except excavation)	7.50	9.00
360 lin. ft.	29 in. x 18 in. arch type C.M.P. (CIP except excavation)	7.00	7.00
164 lin. ft.	36 in. x 22 in. arch type C.M.P. (CIP except excavation)	12.00	10.00
350 lin. ft.	Rd. grd. (std. C-7) (Type "A" or "B") (CIP)	6.00	6.00
36 ea.	Guide posts (std. C-8) (Type BR) (CIP)	6.00	8.00
60 ea.	R/W markers (std. C-1) (Type "B" or "C") (CIP)	7.00	6.00

●

Arizona—Maricopa County—State. A low bid of $430,462 was submitted by the Isbell Construction Co. for grading and surfacing 5 mi. of highway northeast of Mesa.

(1)	Isbell Construction Co.	$430,462
(2)	Western Constructors, Inc.	437,426
	Dale F. Payne, Contractor	456,488
	Copper State Construction Co.	456,905

		(1)	(2)
236,000 cu. yd.	Roadway excavation	$ .50	$ .66
4,000 cu. yd.	Overbreakage	.375	.495
2,000 cu. yd.	Slides	.25	.33
2,000 cu. yd.	Drainage excavation	.50	.50
12,300 lin. ft.	Grader ditches	.10	.06
500 lin. ft.	Crown ditches	.30	.22
2,700 cu. yd.	Structural excavation	3.00	2.50
2,500 cu. yd. mi.	Overhaul	.25	.25
2,000 cu. yd.	Borrow (CIP)	.50	.47
Lump sum	Provide water supply	1,000.00	1,000.00
13,000 M gal.	Apply water	2.00	1.60
2,200 hr.	Rolling	9.00	8.25
70,400 ton	Select material (CIP)	.64	.49
13,200 ton	Aggregrate base (CIP)	1.25	1.00
830 ton	Blotter material for B.S.T. (special) (CIP)	4.85	6.65
210 ton	Blotter material for B.S.T. (standard) (CIP)	4.00	2.95
170 ton	Liquid asphalt for B.S.T. (gr. MC-2 or MC-3) (CIP)	51.00	52.00
120 ton	Emulsified asphalt for B.S.T. (gr. B) (CIP)	52.00	53.00
82,000 lb.	Structural steel (CIP)	.25	.245
284 lin. ft.	Handrail (CIP)	9.00	9.00
1,750 cu. yd.	Class "A" concrete (CIP)	50.00	45.50
186,900 lb.	Reinforcing steel (bars) (CIP)	.15	.14
26 lin. ft.	12 in. C.M.P. (CIP exc. excav.)	3.50	2.75
320 lin. ft.	18 in. C.M.P. (CIP exc. excav.)	4.00	3.80
Lump sum	Misc. removal and other work	750.00	1,500.00
2 ea.	Cattle guard (4-unit) (std. C-14) (CIP exc. excav. & concrete)	1,400.00	1,100.00
100 lin. ft.	Road guard (std. C-7) (Type A or B) (CIP)	4.50	4.25
88 ea.	Guide posts (std. C-8, Type "BR") (CIP)	6.50	8.00
30 ea.	R/W markers (std. C-1) (Type C or D) (CIP)	12.00	10.00
18,800 lin. ft.	Line fence (std. C-15 or C-16) (CIP)	.22	.25
135 lin. ft.	Bank prot. (std. C-23) (Type A) (CIP)	23.00	18.50

●

Arizona—Maricopa County—State. A $323,433 contract has been awarded to W. J. Henson, Contr., for the widening of 2¼ mi. of highway, on U. S. Route 60-70-89.

(1)	W. J. Henson, Contr.	$323,433
(2)	Tanner Bros. Constr. Co., Inc.	345,753
	Phoenix-Tempe Stone Co.	339,709
	Wallace & Wallace	367,434

		(1)	(2)
73,700 cu. yd.	Roadway excavation	$ .35	$ .42
1,300 cu. yd.	Drainage excavation	.35	.47
3,500 lin. ft.	Crown ditches	.15	.11
1,000 cu. yd.	Structural excavation	2.00	1.80
6,700 cu. yd.	Overhaul	.35	.25
17,000 ton	Borrow (CIP)	.38	.45
Lump sum	Provide water supply	1,000.00	1,000.00
9,000 M gal.	Apply water (CIP)	1.50	1.75
1,200 hr.	Rolling	8.50	9.00
42,200 ton	Select material (CIP)	.44	.42
14,200 ton	Aggregrate base (CIP)	.90	1.10
180 ton	Cover material (Type B) (CIP)	5.00	6.00
8,600 ton	Bit. mix (Cl. II-plant mix) (CIP) except paving asphalt	2.80	2.90
2,530 ton	Plant mix seal coat (CIP) except paving asphalt)	5.50	5.00
495 ton	Paving asphalt for bit. mix and plant mix seal coat (Gr. 120-150 pen.) (CIP)	38.00	42.00
190 ton	Liq. asph. for prime coat (Gr. MC-2 or MC-3) (CIP)	44.00	50.00
30 ton	Liq. asph. for first tack coat Gr. MC-2 or MC-3) (CIP)	80.00	90.00
30 ton	Emulsified asphalt for second tack coat (Gr. A) (CIP)	85.00	95.00
25 ton	Emul. asph. for seal coat on shoulders (Gr. B) (CIP)	48.00	55.00
249 lin. ft.	Aluminum handrail (CIP)	13.00	14.00
506 cu. yd.	Class A concrete (CIP)	46.00	47.00
410 cu. yd.	Class D concrete (CIP)	46.00	52.00
144,800 lb.	Reinforcing steel (bars) (CIP)	.15	.16
92 lin. ft.	18-in. Culvert pipe (plain or reinforced) conc. or corr. metal (CIP) except excavation	4.50	4.20
1,116 lin. ft.	24-in. Culvert pipe (reinf. conc. or corr. metal) (CIP except excavation	7.00	6.50
50 lin. ft.	Furn. and drive concrete test pile (steel shell or precast) (CIP)	20.00	13.50
2,430 lin. ft.	Furn. and drive concrete pile (steel shell or precast) (CIP)	8.50	9.50
150 lin. ft.	Pile cutoff (steel shell or precast conc.)	3.50	3.50
40 cu. yd.	Removal of structure concrete	25.00	18.00
60 ea.	Place dowels (CIP)	2.00	2.00
Lump sum	Misc. removal and other work	2,500.00	4,000.00
5,480 lin. ft.	Road guards (Std. C-7) (CIP)	3.40	3.60
29 ea.	Guide posts (std. C-8, type BR) (CIP)	6.00	6.00
15 ea.	R/W markers (std. C-1 type, C) (CIP)	9.00	7.00
14,200 lin. ft.	Line fence (std. C-16) (CIP)	.20	.24
3,535 lin. ft.	Combined curb & gutter (std. C-20, type A) (CIP)	2.90	2.45
733 sq. ft.	Conc. sidewalk (std. C-20) (CIP)	.50	.50
350 lin. ft.	Bank protection (std. C-23, type A) (CIP)	17.50	19.00
310 lin. ft.	Bank protection (std. BR-2) (CIP)	27.50	32.00
4,700 lni. ft.	Placing bit. mixed curbs (std. C-3)	.10	.13
700 lin. ft.	Placing bit. mixed gutters (std. C-3) (CIP)	1.50	.95
Lump sum	Remove & salvage steel girder bridge	2,500.00	1,600.00

IDAHO

Idaho—Bonner County—State. A $609,009 contract has been awarded to Kiely Construction Co. for construction of roadway and bituminous surfacing on 4.7 mi.

(1)	Kiely Construction Co.	$609,009
(2)	Carbon Bros. Construction	660,629
	N. A. Degerstrom and Chas. A. Power	672,961
	James Crick & Sons Construction	713,960

		(1)	(2)
358,000 cu. yd.	Unclass. excav.	$ .53	$ .86
1,025 cu. yd.	Excav. for structs.	3.00	2.00
66,500 cu. yd.	Selected borrow, Class "A"	.85	.30
48,500 y. u.	Haul	.36	.50
10,750 M gal.	Watering embankments	1.50	.10
2,900 M gal.	Watering base & surf. courses	2.00	2.00
500 hr.	Rolling, power roller	8.00	7.00
1,800 hr.	Rolling, tamping roller	10.00	.10

2,500 hr.	Rolling, pneumatic tire roller	8.00	.10
1,850 cu. yd.	Mech. tamping	3.00	2.50
320 lin. ft.	Small ditches	.50	1.00
30 sta.	Oblit. of old road, Class II	18.00	50.00
9,800 ton	Cr. gr. base, type "B" ¾ n. max.	1.46	1.47
1,500 gal.	RC-1 asph. rd. mat. for prime	.20	.21
690 ton	Blotter material, Class "B"	4.00	3.00
850 ton	120-150 Pen. asph. rd. mat.	45.00	40.00
7,000 ton	Plmix bit. surf., Class "C"	3.70	4.35
12 cu. yd.	Conc., Class "A"	115.00	200.00
830 lb.	Metal reinf.	.26	.20
100 lin. ft.	Pipe handrail	10.00	4.00
0.08 mfbm	Timb. untr. F-1200 str. gr.	400.00	500.00
3,250 lin .ft	12 in. pipe culv.	2.50	3.00
170 lin. ft.	18 in. pipe culv.	4.50	5.00
1,380 lin. ft.	24 in. pipe culv.	6.25	7.00
290 lin. ft.	30 in. pipe culv. (10 ga.) or ext. str.	12.00	14.00
220 lin. ft.	36 in. pipe culv. (10 ga.) or ext. str.	16.00	16.00
1,320 lin. ft.	Comb. curb and gutter, type "A"	3.00	2.75
3,775 lin. ft.	Steel beam type guard rail	3.75	3.05
50 ea.	Guide posts, type 4	9.00	5.00
20,000 lin. ft.	Wire fence, type 1-A	.40	.21
1,750 lin. ft.	Wire fence, type 3-A	.45	.29
36 ea.	8 ft. steel gates	135.00	39.50
1 ea.	10 ft. steel gates	145.00	52.00
6 ea.	12 ft. steel gates	155.00	55.00
4 ea.	14 ft. steel gates	165.00	61.00
530 sq. yd.	Conc. sidewalks	5.50	4.50
66 cu. yd.	Spec. backfill, Class "A"	3.00	5.00
2 ea.	Project markers	30.00	20.00
100 ea.	Right-of-way markers	8.00	8.00
4 ea.	12 in. aprons for pipe culv.	10.00	20.00
30 ea.	24 in. aprons for pipe culv.	55.00	42.00
1 ea.	30 in. aprons for pipe culv.	75.00	60.00
2 ea.	36 in. aprons for pipe culv.	125.00	110.00
3,800 cu. yd.	Pl. salv. topsoil	.45	2.00
840 lin. ft.	Reconst. fence	.50	.28
1,050 lin. ft.	2 in. welded galv. tubing	1.00	9.00
3 ea.	16 ft. cattle guard	1,000.00	750.00
1 ea.	24 ft. cattle guard	1,250.00	900.00
170 lin. ft.	Move and reconst. fence	1.50	.26
1,500 lin. ft.	Move and reconst. fence	.50	.26
1 ea.	Move and reset gate	50.00	15.00
130 lin. ft.	6 in. helical corr. met. pipe	2.00	2.00
120 lin. ft.	Move and relay 1 in. water pipe	3.85	2.00
910 lin. ft.	12 in. reinf. conc. sewer pipe	3.00	3.00
8 ea.	Catch basins, type 2	3.50	140.00
5 ea.	Manholes, type "B"	450.00	250.00
170 sq. yd.	Conc. driveways, type "A"	5.50	5.20
2,200 ton	Pl. pl. mix bit. surf. on appr.	1.00	5.35

Idaho—Clearwater County—State. A low bid of $165,043 was submitted by Goodfellow Bros., Inc., for the construction of 2.27 mi. of roadway and a crushed rock base.

(1) Goodfellow Bros., Inc.	$165,043
(2) Carl Hohner	183,992
Carbon Bros.	301,693
James Crick & Sons	305,418

		(1)	(2)
31,000 cu. yd.	Unclassified excavation	$65.00	$70.00
540 cu. yd.	Excavation for structures	2.50	3.00
1,600 y. u.	Haul	60.00	1.00
2,700 M gal.	Watering embankments	10.00	1.00
770 M gal.	Watering base and surface courses	1.50	1.00
1,085 hr.	Rolling, tamping roller	10.00	8.00
310 hr.	Rolling, pneumatic tire roller	7.00	6.00
650 cu. yd.	Mechanical tamping	2.00	3.00
35 lin. ft.	Small ditches	10.00	50.00
16,500 ton	Crushed rock base course 2 in. max.	1.75	1.90
7,850 ton	Cr. rock base course Type "A", ¾ in. max.	1.85	1.90
6,300 ton	Cr. rock base course, Type "B", ¾ in. max.	1.95	1.90
930 lin. ft.	18 in. pipe culvert	5.00	4.25
240 lin. ft.	24 in. pipe culvert	8.00	6.50
50 lni. ft.	30 in. pipe culvert	10.00	7.00
55 lin. ft.	36 in. pipe culvert	15.00	12.00
236 lin. ft.	Salvage 12 in.-24 in. corrugated metal pipe	2.00	2.00
2,650 lin. ft.	Loose riprap	2.00	2.00
100 lin. ft.	6 in. corrugated metal pipe u. d.	3.00	2.00
200 ea.	Guide posts, Type 3	9.00	6.00
1 ea.	Project markers	20.00	25.00
95 ea.	Right-of-way markers	8.00	12.00

Idaho—Butte and Bingham Counties—State. A $112,216 contract was awarded Holmes Construction Co. for reconditioning shoulders and seal coating 11 mi. of U. S. Highways 20 and 26, constructing a roadmix bituminous surface on 4 mi. and seal coating 33 mi. of U. S. Highway 26.

(1) Holmes Construction Co.	$112,216
(2) Carl E. Nelson Construction Co.	119,581
Mountain States Construction Co.	120,048
Fife Construction Co.	120,307

		(1)	(2)
240 M gal.	Watering base and surf. courses	$ 1.50	$ 3.00
65 hr.	Rolling, power roller	6.00	10.00
50,800 gal.	MC-1 asph. rd. mat. for prime	17.00	750.00
4,952 mi.	Mix. finish. & roll Class "A"	1,000.00	750.00
310 ton	MC-3 asph. rd. mat. for roadmix	35.50	39.75
39,000 gal.	RC-5 asph. rd. mat. for seal	17.00	.17
9,350 ton	Cov. ct. mat. Class 3	2.95	3.15
3,100 ton	Cov. ct. mat. Class 3	3.30	3.50
11,172 mi.	Recond. exist. shoulders	100.00	300.00
4,952 mi.	Tear up exist. bit. surf. & recond. exist. rdbed.	500.00	500.00
3,800 ton	Rejects in stockpile	5.00	50.00

CALIFORNIA

California—Contra Costa County—State. Bos Construction Co. has been awarded a $347,325 contract for surfacing 1 mi. of highway and constructing a reinforced concrete bridge.

(1) Bos Construction Co.	$347,325
(2) George Pollock Co.	347,635
The Pacific Co., Engineers & Builders	349,276
Ball and Simpson	349,817

		(1)	(2)
Lump sum	Remov conc.	$ 500.00	$ 1,100.00
Lump sum	Clear & grub	1,000.00	900.00
2,000 M gal.	Furnish. & apply. water	2.50	2.20
14,000 cu. yd.	Roadway excav.	.32	.50
1,200 cu. yd.	Struct. excav.	4.60	1.50
5,000 cu. yd.	Struct. backfill	2.60	3.25
60,000 cu. yd.	Imported borrow	.53	.70
4 ton	Straw	71.50	110.00
200 lb.	Seed	.22	.35
1 ton	Commercial fertilizer	137.50	155.00
9,300 ton	Untr. base	2.49	3.00
35 ton	Liq. asph., SC-1 (pr. ct.)	35.40	35.00
180 ton	Pav. asph., (P.M.S.)	6.00	6.50
3,520 ton	Mineral aggr. (P.M.S.)	6.00	6.50
2,300 lin. ft.	Placing P.M.S. dikes	.41	.90
10 ton	Asph. emulsion (sl. ct.)	40.00	55.00
60 ton	Screenings (fine sl. ct.)	6.00	11.00
140 cu. yd.	Class "A" conc. (struct.)	60.00	60.00
Cont. sum	Class "A" conc. (bridge) (575 cu. yd.)	40,000.00	35,000.00
290 lin. ft.	Rubber waterstops	1.60	3.00
15,000 lb.	Bar reinf. steel	.17	.16
Cont. sum	Bar reinf. steel (bridge) (73,000 lb.)	11,000.00	11,500.00
250 lin. ft.	20 in. conc. caissons	21.50	11.00
230 lin. ft.	36 in. conc. caissons	37.00	34.00
	Struct. steel (400,000 lb.)	78,000.00	71,000.00
200 lb.	Miscel. iron & steel	.40	.50
Lump sum	Clean. & paint, struct. steel	6,800.00	7,500.00
5 cu. yd.	Class "B" conc. (curbs & gutters)	40.00	55.00
280 lin. ft.	Metal guard rail	4.25	5.00
978 lin. ft.	Steel rail	11.00	11.00
50 ea.	Guide posts & culv. markers	7.50	8.00
690 lin. ft.	New prop. fence	.86	1.00
220 lin. ft.	42 in. chain link fence	1.69	2.00
530 lin. ft.	Remov. & reconstr. 72 in. chain link fence	1.50	1.50
60 lin. ft.	12 in. C.M.P. (16 ga.)	3.13	4.00
110 lin. ft.	18 in. C.M.P. (16 ga.)	3.79	5.50
Lump sum	Metal bin-type retain. walls	59,000.00	53,000.00
40 lin. ft.	8 in. C.M.F. downdrains	2.50	4.00
3 ea.	Flared end sections for 12 in met. pipe	46.50	45.00
4 ea.	Downdrain pipe anchors	27.50	22.00
3 ea.	Adjust. manholes to grade	110.00	110.00
5 ea.	Adjust. valve covers to grade	35.50	40.00
9 ea.	Remov. & reset. mailboxes	15.00	11.00
Lump sum	Finish roadway	1,200.00	110.00

California—Shasta County—State. A low bid of $224,771, was submitted by B. C. Richter Contracting Co. for about 0.8 mi. of highway to be graded and surfaced with plant-mixed surfacing on untreated base, and a welded steel plate girder and reinforced concrete deck bridge to be constructed.

(1) B. C. Richter Contracting Co.	$224,771
(2) J. H. Trisdale, Inc.	242,222
Johnson, Drake & Piper, Inc.	242,630
Thomas Construction Co.	248,521

		(1)	(2)
Lump sum	Clearing & Grubbing	$14,800.00	$10,000.00
Lump sum	Dev. wat. sup. & furn. wat. equip.	3,160.00	12,800.00
2,240 M gal.	Apply. water	1.00	2.00
59,000 cu. yd.	Roadway excavation	.495	.70
130 cu. yd.	Struct. excav. Type "A"	18.00	10.00
970 cu. yd.	Struct. excavation	3.00	3.25
500 cu. yd.	Struct. backfill	3.50	5.00
3,400 cu. yd.	Ditch & channel excav.	1.45	1.00
8,200 ton	Untreated base	2.52	2.45
12 ton	Liq. asph. SC-2 (pr. ct.)	60.00	50.00
80 ton	Paving asph. (P.M.S.)	6.27	6.25
1,600 ton	Mineral aggr. (P.M.S.)	6.27	6.25
2,000 lin. ft.	Placing P.M.S. dikes	.35	.35
100 sq. yd.	Placing P.M.S. ditches	2.00	2.00
70 cu. yd.	Class "A" conc. (footing block)	45.00	40.00
10 cu. yd.	Class "A" (struct.)	100.00	71.50
Cont. sum	Class "A" conc. (bridge) (560 cu. yd.)	41,960.00	40,040.00
1,000 lb.	Bar reinforcing steel	.16	.15
	Bar reinf. steel (bridge) (90,000 lb.)	12,200.00	11,400.00
250 sq. yd.	Mesh reinforcement	1.00	.80
Cont. sum	Struct. steel (150,000 lb.)	35,000.00	41,157.62
Lump sum	Clean & paint. struct. steel	2,900.00	3,000.00
45 ea.	Right-of-way monuments	8.00	7.00
300 cu. yd.	Sacked concrete riprap	40.00	35.00
28 cu. yd.	Class "B" conc. (ditch lining)	40.00	50.00
515 lin. ft.	Metal beam bridge rail	7.50	7.50
100 lin. ft.	Metal beam guard rail	5.88	4.25
40 ea.	Guide posts & culv. markers	8.00	6.50
7,920 lin. ft.	New prop. fence	.64	.48
13 ea.	14 ft. prop. fence gates	60.00	60.00
1 ea.	16 ft. prop. fence gates	65.00	60.00
1 ea.	Prop. fence walk gate	40.00	30.00

60 lin. ft.	6 in. C.M.P. (16 ga.)	2.50	2.00
212 lin. ft.	12 in. C.M.P. (16 ga.)	3.70	3.75
294 lin. ft.	18 in. C.M.P. (16 ga.)	4.75	4.25
46 lin. ft.	42 in. C.M.P. (12 ga.)	14.50	15.00
42 lin. ft.	22 in. x 13 in. C.M.P. arch (16 ga.)	4.76	6.00
62 lin. ft.	25 in. x 16 in. C.M.P. arch (14 ga.)	6.20	7.50
80 lin. ft.	29 in. x 18 in. C.M.P. arch (14 ga.)	7.00	9.00
88 lin. ft.	18 in. corr. met. siphon, asph. ctd. & clo. riv. (16 ga.)	7.00	10.00
3 ea.	Flared end sections for 18 in. metal pipe	28.58	40.00
2 ea.	Flarend end sections for 25 in. x 16 in. metal pipe arch	30.36	50.00
520 lin. ft.	8 in. P.M.P. underdrains	2.30	2.00
70 cu. yd.	Filter material	7.00	7.00
3 ea.	Spillway assemblies	48.00	45.00
160 lin. ft.	8 in. C.M.P. downdrains	2.75	2.50
3 ea.	Downdrain slip joints	27.64	30.00
7 ea.	8 in. downdrain pipe anchors, Type B"	28.00	20.00
1 ea.	24 in. x 18 in. entrance taper	83.68	60.00
302 lin. ft.	4 in. galv. steel pipe	3.50	3.50

California—El Dorado County—State. A $243,659 contract was awarded H. Earl Parker, Inc., for 2.4 m. of grading and construction of drainage facilities near Coloma.

(1) H. Earl Parker, Inc. $243,659
(2) Los Gatos Construction Co. 248,955
Lee Steffens 254,301
McCammon-Wunderlich Co. & Wunderlich Construction Co. 257,734

		(1)	(2)
Lump sum	Clearing and grubbing	$25,000.00	$53,385.00
Lump sum	Dev. wat. cup. & fur. wat. equip.	6,000.00	4,001.45
7,000 M gal.	Applying water	1.00	.50
223,000 cu. yd.	Roadway excavation	.75	.71
980 cu. yd.	Structure excavation	3.50	5.00
700 cu. yd.	Structure backfill	4.00	3.00
260 cu. yd.	Ditch and channel excavation	1.70	5.00
1,277,000 sta. yd.	Overhaul	.01	.005
176 lin. ft.	12 in. C.M.P. (16 gal.)	3.20	2.75
714 lin. ft.	18 in. C.M.P. (16 gal.)	4.30	3.60
986 lin. ft.	24 in. C.M.P. (14 gal.)	6.90	5.75
310 lin. ft.	30 in. C.M.P. (14 gal.)	8.00	7.00
232 lin. ft.	36 in. C.M.P. (12 gal.)	13.10	10.85
52 lin. ft.	36 in. x 22 in. C.M.P. arch (12 gal.)	11.70	9.85
5 ea.	Flared end sect. for 18 in. met. pipe	37.00	38.30
7 ea.	Flared end sect. for 24 in. met. pipe	53.00	53.80
2 ea.	Flared end sect. for 30 in. met. pipe	77.00	75.00
2 ea.	Flared end sect. for 36 in. met. pipe	124.00	122.00
1 ea.	Flared end sect. for 36 in. x 22 in. met. pipe arch	65.00	68.50
Lump sum	Finishing roadway	1,380.00	100.00

California—Kern County—State. C. B. Tuttle has been awarded a $221,478 contract for the construction of three bridges and two culverts on County Route 887.

(1) C. B. Tuttle $221,478
(2) Walter Raucher 224,712
Hermreck & Easter 231,125
Tumblin Co. 232,790

		(1)	(2)
655 cu. yd.	Struct. excavation	$ 5.00	$ 3.00
350 cu. yd.	Struct. backfill	4.00	2.50
Cont. sum	Class "A" conc. (brgs.) (1,750 cu. yd.)	113,549.00	105,000.00
Cont. sum	Bar reinf. steel (bridges) (372,000 lb.)	45,574.00	50,000.00
3,475 lin. ft.	Furn. conc. piling	4.25	4.20
124 ea.	Driv. conc. piles	68.00	190.00
2,000 lb.	Misc. iron and steel	.35	.50
622 lin. ft.	Remov. & resett. bridge rail	1.40	3.00
1,125 sq. ft.	Wire mesh	.60	.60
1,547 lin. ft.	Mtl. beam bridge rail	5.40	8.00
8 ea.	Furn. precast prestr. conc. deck units	2,517.00	1,450.00
8 ea.	Erect. precast prestr. conc. deck units	368.00	150.00

California—Humboldt County—State. A $459,955 contract has been awarded to Mercer, Fraser Co., Inc., and Mercer, Fraser Gas Co., Inc., for 0.6 mi. of bridge approaches to be graded and surfaced and a bridge to be constructed across Mad River.

(1) Mercer, Fraser Co., Inc. & Mercer, Fraser Gas Co., Inc. .. $459,955
(2) Arthur B. Siri, Inc. 467,381
Bos Construction Co. 469,728
Peter Kiewit Sons 478,000

		(1)	(2)
7 ac.	Clearing and grubbing	$ 500.00	$ 350.00
Lump sum	Dev. wat. sup. & furn. wat. equip.	1,700.00	17,500.00
300 M gal.	Applying water	3.00	2.00
800 cu. yd.	Roadway excavation	1.00	.55
925 cu. yd.	Struct. excav., Type "A"	28.00	19.50
141 cu. yd.	Struct. excav.	5.00	5.00
66 cu. yd.	Struct. backfill	6.00	5.00
35,600 cu. yd.	Imported borrow	.87	1.00
5,800 ton	Imp. subb. mat.	1.50	.95
7,000 ton	Untrea. base	1.70	1.80
5 ton	Asph. emulsion (pnt. bndr. & fog sl. ct.)	75.00	50.00
11 ton	Lip. asph., SC-2 (pr. ct.)	60.00	50.00
100 ton	Paving asph. (P.M.S.)	6.75	6.00
1,900 ton	Mineral aggr. (P.M.S.)	6.75	6.00
2,510 lin. ft.	Placing P.M.S. dikes	.30	.20
210 cu. yd.	Class "A" conc. (footing block)	30.00	34.00
Cont. sum	Class "A" conc. (bridge) (1,770 cu. yd.)	120,000.00	110,000.00
1,500 lin. ft.	Conc. rail	7.00	7.90
Cont. sum	Bar reinf. steel (bridge) (312,000 lb.)	52,825.00	50,000.00
4,610 lin. ft.	Furn. conc. piling	4.00	5.70
128 ea.	Driving piles	135.00	175.00
Cont. sum	Struct. steel (558,000 lb.)	115,000.00	116,980.00
700 lb.	Miscell. iron and steel	1.00	.60
Lump sum	Clean. and paint struct. steel	8,660.00	7,875.00
6 ea.	Right-of-way monuments	10.00	7.00
76 lin. ft.	Metal plate guard rail	6.00	5.00
103 lin. ft.	Remov. & reconstr. guard rail	3.50	3.00
125 ea.	Guide posts, culvt. markers and cl. markers	8.00	7.00
2,600 lin. ft.	New prop. fence	.85	.70
88 lin. ft.	36 in. R.C.P. (std. str.)	13.00	12.00
2 ea.	Entrance tapers	58.00	50.00
16 lin. ft.	8 in. C.M.P. downdrains	3.00	3.00
Lump sum	Finish roadway	2,000.00	500.00
810 lin. ft.	Raised traffic bars	2.50	2.00

California—Riverside—State. A $872,046 contract was awarded to W. F. Maxwell Co. for construction of a four-lane precast, prestressed concrete girder bridge, across Santa Ana River, about 0.6 mi. in length to be graded and surfaced.

(1) W. F. Maxwell Co. ..... $ 872,046
(2) E. L. Yeager Co. 993,361
Chas. MacClosky Co. 1,006,834
Robert E. L. Parker Co. 1,040,201

		(1)	(2)
Lump sum	Removing existing bridge	$ 26,000.00	$ 25,000.00
Lump sum	Clearing and grubbing	15,000.00	60,000.00
Lump sum	Dev. wat. sup. & furn. wat. equip.	1,000.00	5,500.00
5,250 M gal.	Applying water	1.75	1.00
4,500 sq. yd.	Compacting original ground	.07	.10
29,000 cu. yd.	Roadway excavation	.38	.55
5,200 cu. yd.	Structure excavation, Type A	5.00	3.00
440 cu. yd.	Structure excavation	3.00	2.00
180 cu. yd.	Structure backfill	3.00	5.00
160,000 ton	Imported borrow	.25	.34
10 ton	Straw	70.00	75.00
450 lb.	Seed	.60	.60
95 cu. yd.	Steer manure	7.00	9.00
6,600 ton	Untreated base	2.18	2.00
10 ton	Asph. emuls. (pt. bndr. & fog sl. ct.)	50.00	60.00
20 ton	Liq. asph. SC-2 (pr. ct.)	40.00	40.00
165 ton	Pav. asph. (P.M.S.)	5.50	28.50
3,000 ton	Min. aggr. (type B P.M.S.)	5.50	3.90
175 ton	Min. aggr. (open graded P.M.S.)	6.60	3.90
45 sq. yd.	Plac. P.M.S. spillway downdrains	2.20	3.00
200 sq. yd.	Plac. P.M.S. median gutters	1.65	2.00
2,100 lin. ft.	Plac. P.M.S. dikes	.40	.40
1,080 cu. yd.	Class A conc. (footing block)	25.00	22.50
18 cu. yd.	Class A conc. (structures)	100.00	100.00
Cont. sum	Cl. A conc. (bridge) (3,270 cu. yd.)	205,000.00	215,000.00
2,900 lb.	Bar reinforcing steel	.12	.15
Cont. sum	Bar reinf. steel (bridge) (560,000 lb.)	70,000.00	69,000.00
99 ea.	Furn. precast, prestressed concrete girders	2,550.00	3,000.00
99 ea.	Erect precast, prestressed concrete girders	150.00	300.00
10,410 lin. ft.	Furn. conc. piling	3.40	4.00
397 ea.	Driving piles	120.00	100.00
29,400 lb.	Misc. iron and steel	.30	.35
140 cu. yd.	Class B concrete (curbs, gutters and sidewalks)	33.00	34.00
100 ea.	Curb dowels	1.10	1.50
13 ea.	Survey monuments	13.00	30.00
279 lin. ft.	Metal plate guard railing	4.50	5.50
2,267 lin. ft.	Steel railing	8.00	8.25
56 ea.	Gde. pst. mkr. & hor. refl. units	7.00	10.00
675 lin. ft.	New property fence	1.50	3.00
600 lin. ft.	Reconstruction property fences	1.50	2.00
150 lin. ft.	18-in. C.M.P. (16 gal.)	6.00	4.25
64 lin. ft.	24-in. C.M.P. (14 gal.)	8.00	6.50
128 lin. ft.	Salvage exist. pipe culverts	5.00	2.00
Lump sum	Finishing roadway	660.00	2,000.00
Lump sum	Highway lighting	11,900.00	13,000.00

California—Tehama County—State. Jesse H. Harrison was awarded a $613,779 contract for 5.7 mi. of grading and applying seal coat to un treated base.

(1) Jesse H. Harrison $613,779
(2) J. H. Trisdale, Inc. 654,182
H. Earl Parker, Inc. 663,145
Frederickson & Watson Construction Co. 680,955
John Delphia 709,979

		(1)	(2)
67 ac.	Clearing and grubbing	$ 500.00	$ 800.00
Lump sum	Dev. water sup. & furn. wat. equip.	34,200.00	33,000.00
8,000 M Gal.	Applying water	.10	1.50
437,600 cu. yd.	Roadway excavation	.48	.55
5,130 cu. yd.	Structure excavation	2.50	4.00
3,300 cu. yd.	Structure backfill	3.00	4.50
3,780 cu. yd.	Ditch & channel excav (Type "A")	2.50	.90
14,000 cu. yd.	Ditch & channel excav (Type "B")	.75	.80

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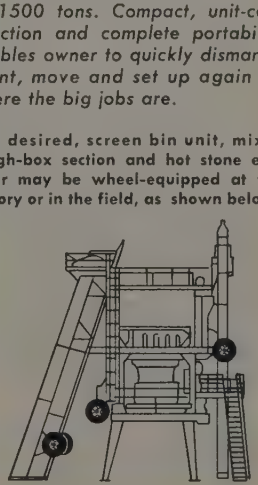
● **If desired, screen bin unit, mixer weigh-box section and hot stone elevator may be wheel-equipped at the factory or in the field, as shown below.**



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Reno Equipment Sales Company ..... 1700 West 4th Street, Reno, Nevada
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4,043,000 sta. yd.	Overhaul	.005	.005
5,900 cu. yd.	Selected rock slope protection	1.50	1.50
15 stat.	Scarifying & reshaping roadbed	25.00	100.00
38,700 ton	Untreated base	1.80	1.55
112 ton	Liquid asphalt, SC-2 (prime ct.)	50.00	45.00
500 ton	Sand cover (prime coat)	5.00	4.00
100 ton	Pav. asph., gr. 200-300 (med. sl. ct..)	50.00	45.00
1,200 ton	Screenings (medium seal coat)	6.00	6.50
139 cu. yd.	Class "A" concrete (structures)	135.00	78.00
13,600 lb.	Bar reinforcing steel	.20	.20
3 ea.	Frames and grates	150.00	160.00
102 ea.	Right-of-way monuments	10.00	8.50
45 ea.	Survey monuments	35.00	20.00
420 cu. yd.	Light stone riprap	13.50	4.00
2,080 lin. ft.	Metal plate guard railing	5.50	5.00
176 ea.	Guide posts and markers	7.00	6.50
1 mi.	New property fence	2,500.00	650.00
1 ea.	14 ft. prdoperty fence gate	75.00	65.00
2 ea.	16 ft. property fence gates	90.00	65.00
142 lin. ft.	96 in. field assem. pl. cul. (512-15)	62.59	60.00
130 lin. ft.	96 in. field assem. pl. cul. (510-18)	64.29	62.00
52 lin. ft.	96 in. field assem. pl. cul. (510-15)	67.20	64.00
74 lin. ft.	96 in. field assem. pl. cul. (57-15	73.24	68.00
6,636 lin ft.	8 in. P.M.P. underdrains	2.50	2.00
950 cu. yd.	Filter material	6.00	8.00
28 ea.	Entrance tapers	49.00	44.00
262 lin. ft.	8 in. C.M.P. downdrains	3.00	2.25
14 ea.	Downdrain slip joints	30.00	27.50
15 ea.	Downdrain pipe anchors	25.00	25.00
	Finishing roadway	6.000.00	3,500.00

California—Marin & Sonoma Counties—State. A $2,309,498 contract was awarded Ben C. Gerwick, Inc., and J. H. Pomeroy & Co., Inc., for construction of a combination reinforced concrete and structural steel bridge over Petaluma Creek near Black Point, construction of detours and grading of bridge approaches.

(1) Ben C. Gerwick, Inc., and H. H. Pomeroy & Co., Inc.	$2,309,498
(2) Judson Pacific Murphy-Kiewit	2,670,890
Chas. L. Harney	2,710,166

		(1)	(2)
25 ea.	Portable timber barricades	$ 40.00	$ 20.00
1,000 lin. ft.	Removing traffic stripes	.50	.20
Lump sum	Removing existing bridge	20,000.00	115,000.00
Lump sum	Clearing & Grubbing	10,000.00	42,000.00
Lump sum	Dev. wat. sup. furn. wat. equip.	6,000.00	6,000.00
2,700 M gal.	Applying water	3.00	.05
71,880 cu. yd.	Roadway excavation	.50	.72
990 cu. yd.	Structure excavation (Type "A")	20.00	11.00
545 cu. yd.	Structure excavation	6.00	3.75
100 cu. yd.	Structure backfill	5.00	5.50
2,600 cu. yd.	Ditch & channel excavation	1.00	1.10
335,000 sta. yd.	Overhaul	.01	.005
3,800 ton	Imported subbase material	4.00	3.25
8,600 sq. yd.	Mix., spreading and compacting C.T.B.	.40	.33
440 bbl.	Portland cement	6.00	6.40
20 ton	Asph. emul. (curing sl., pt. bdr. & med. sl. ct.)	70.00	55.00
55 ton	Screenings (seal coat)	10.00	8.60
165 ton	Paving asphalt (P.M.S.)	40.00	8.80
3,315 ton	Mineral aggregate (P.M.S.)	10.00	8.80
130 cu. yd.	Class "A" conc. (footing block)	50.00	55.00
Cont. sum	Class "A" concrete (bridge) (3,400 cu. yd.)	225,000.00	253,120.00
Lump sum	Class "A" conc. (fts. bents 6 to 25, incl. & caps, bents 26 to 29 incl.)	129,500.00	115,000.00
264 ea.	Furn. precast prestr. conc. girders	2,305.00	2,320.00
44 ea.	Furn. precast concrete girders	830.00	900.00
2 ea.	Furn. precast prestress. conc. caps (bents 7 & 8)	7,000.00	9,000.00
22 ea.	Furn. precast prestress conc. caps (bents 2 to 6 incl. & bents 9 to 25 incl.)	5,500.00	7,100.00
8 ea.	Furn. precast conc. caps struts	1,600.00	1,500.00
264 ea.	Erect. precast prestress. conc. girders	200.00	340.00
44 ea.	Erecting precast conc. girders	100.00	125.00
24 ea.	Erect. precast prestress, conc. caps	1,500.00	400.00
8 ea.	Erecting precast conc. cap struts	500.00	230.00
4,407 lin. ft.	Concrete railing	6.00	7.00
1 ea.	Drop inlet Type A2	300.00	300.00
1 ea.	Drop inlet Type J	300.00	400.00
Cont. sum	Bar reinf. steel (bridge) (940,000 lb.)	132,000.00	150,000.00
518 lin. ft.	Furn. 10 in. steel piling	4.00	5.25
20,630 lin. ft.	Furn. 200-ton bearing piling	18.00	20.00
12 ea.	Driving 10 in steel piles	100.00	240.00
187 ea.	Driving 200-ton bearing piles	70.00	635.00
Lump sum	Load test 200-ton bearing pile	12,000.00	10,000.00
Cont. sum	Structural steel (530,000 lb.)	100,000.00	175,000.00
90,000 lb.	Miscel, iron & Steel	.40	.60
Lump sum	Clean. & paint. structural steel	6,000.00	10,000.00
Lump sum	Treated timber fenders	50,000.00	85,000.00
288 lin. ft.	Rem. & recon. met. plate guard rail	4.00	2.00
3,700 lin ft.	New property fence	.60	1.00
69 lin. ft.	12 in. C.M.P. downdrains (16 gage)	4.00	5.00
2 ea.	Downdrain slip joints	50.00	50.00
2 ea.	Downdrain pipe anchors	30.00	55.00
Lump sum	Finishing roadway	2,000.00	1,100.00
1,040 lin. ft.	Raised traffic bars	2.00	2.10
Lump sum	Safety equipment	1,000.00	900.00
Lump sum	Relocat. drawbridge warn. system	1,000.00	500.00
Lump sum	Navigation lighting equipment	5,000.00	4,000.00

NEW MEXICO

New Mexico—Lincoln County—State. A $366,740 contract was awarded to Haake Construction Co. for construction of 2.7 mi. of highway.

(1) Haake Construction Co.	$366,740
(2) Imperial Paving Co.	392,443
Wayne A. Lowdermilk	415,300
Allison & Haney	435,118

		(1)	(2)
Lump sum	Removal of old structures	$9,000.00	$7,000.00
Lump sum	Removal of obstructions	300.00	2,500.00
Lump sum	Clearing and grubbing	3,500.00	8,000.00
168,758 cu. yd.	Excavation — unclassified	.33	.32
637 cu. yd.	Excavation for structures	3.00	2.00
938 cu. yd.	Excavation for pipe culverts	2.00	2.00
10,184 M gal.	Watering	.30	.35
472 hr.	Rolling (tamping roller)	8.00	8.00
587 hr.	Rolling (pneumatic tired)	5.00	5.00
322 hr.	Rolling (steel tired)	7.00	8.00
612 hr.	Fifty (50) ton roller operation	8.00	12.00
855 hr.	Mechanical tamping	4.00	6.50
354,458 sta. yd.	Station yard overhaul	.015	.01
99,868 ¼ mi. yd.	Quarter mile yard haul	.05	.04
87,876 ton mi.	Ton mile overhaul	.07	.08
2.4 mi.	Obliterating old road	300.00	210.00
100 lin. ft.	Contour ditches	.30	.25
291 cu. yd.	Wire enclosed riprap	9.00	10.00
5,490 lb.	Wire fabric for riprap	.35	.15
126 cu. yd.	Excavation for riprap	2.00	2.75
180 lin. ft.	Steel stakes for riprap	2.50	2.80
4 ea.	Cattle guard—18-in. roadway	1,600.00	1,800.00
865 lin. ft.	Steel plate guard fence	4.50	4.00
16,329 lin. ft.	Galvanized barbed wire fence	.20	.21
23 ea.	Gates—Texas type	7.00	20.00
9 ea.	Gates—standard type—14-ft.	40.00	45.00
1 ea.	Gates—standard type—6-ft.	30.00	25.00
122 ea.	Bracing	8.00	10.00
9,811 lin. ft.	Galv. woven wire farm fence	.35	.35
74 ea.	Right of way markers	6.00	8.00
2 ea.	Std. Fed. Aid proj. markers, Type I	60.00	150.00
116 ea.	Treated tmbr. warn. posts, refl. (6-in. diam.)	8.00	6.58
32,395 ton	Controlled graduation, sub-base	.70	.70
14,570 ton	Base course	95	.90
614 bbl.	Bituminous material, Type MC-1	7.50	6.25
92 bbl.	Emulsified asphalt AE-3	8.50	7.50
182 bbl.	Bituminous material, Type 120-150	7.00	7.30
319 ton	Cover material	5.00	5.25
9,068 ton	Plant mix surface course	3.80	5.20
3,051 bbl.	Bit. mat., Type 85-100 (plant mix.)	7.00	6.55
251 bbl.	Bit. mat., Type 85-100 (tack coat)	7.00	6.55
415 cu. yd.	Class "A" concrete	55.00	48.00
46 sq. yd.	Class "A" concrete for blankets	10.00	39.50
117,869 lb.	Reinforcement for concrete structures	.15	.15
1,050 lb.	Wire fabric for concrete blankets	.40	.15
9 cu. yd.	Grouted rock retards	25.00	20.00
1,392 lin. ft.	Corr. metal culv. pipe—24-in. diam.	6.00	7.00
448 lin. ft.	Corr. metal culv. pipe—30-in. diam.	7.00	9.00
472 lin. ft.	Chain link fence	4.00	2.50
1 ea.	Chain link drive gate—12 ft. wide	180.00	100.00
21 cu. yd.	Excavation for structures (bridges)	10.00	2.50
241.62 cu. yd.	Class "A" conc.—bridge superstructure	75.00	85.00
96.32 cu. yd.	Class "A" conc.—bridge substructure	70.00	66.00
41.5 cu. yd.	Class "A" concrete for piling	35.00	35.00
16,878 lb.	Structural steel	.37	.40
1,368 lin. ft.	Closed-end steel pipe piles	9.50	10.00

New Mexico—McKinley County—State. A $156,055 contract was awarded Haake Construction Co., Inc., for 9.538 mi. of grading and paving and construction of one bridge on the Zuni-Ramah Road.

(1) Haake Construction Co.	$156,055
(2) C. R. Davis Construction Co.	178,777
W. A. Hamilton Jr. Construction Co.	181,044
Henry Thygesen & Co.	181,481

		(1)	(2)
Lump sum	Removal of old structures	$2,500.00	$3,500.00
8,500 cu. yd.	Excavation—unclassified	.40	.47
697 cu. yd.	Excavation for pipe culverts	3.00	1.50
1,820 M gal.	Watering	.50	.50
65 hr.	Rolling (tamping roller)	9.00	13.50
325 hr.	Rolling (pneumatic tired)	5.00	5.00
115 hr.	Rolling (steel tired)	6.00	8.00
290 hr.	Fifty (50) ton roller operation	8.00	13.50
347 hr.	Mechanical tamping	5.00	5.00
341,355 ton mi.	Ton mile haul	.05	.03
5.09 mi.	Grading	2,800.00	3,500.00
4,401 mi.	Blading and reshaping	300.00	150.00
21,100 lin. ft.	Galvanized barbed wire fence	.19	.20
9 ea.	Gates—Texas type	5.00	10.00
80 ea.	Bracing	8.00	14.00
54 ea.	Right-of-way markers	7.00	8.00
85 ea.	Trtd. tmbr. warn. posts, refl. (6 in. dia.)	8.00	6.00
14,815 ton	Controlled graduation subbase	.80	1.25
11,170 ton	Base course	1.00	1.46
1,285 bbl.	Bituminous material, Type MC-1	7.50	7.50

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960 bbl.	Bituminous material, Type 120-150..	8.00	8.20
1,680 ton	Cover material.....	4.50	5.00
674 lin. ft.	Corr. metal culv. pipe—24 in. diam..	5.50	6.50
1,298 lin. ft.	Corr. metal culv. pipe—30 in. diam..	6.75	8.00
52 lin. ft.	Corr. metal culv. pipe—36 in. diam..	12.00	12.00
330 lin. ft.	Corr. metal culv. pipe—60 in. diam..	25.00	26.00
24 cu. yd.	Excavation for structures (bridges)..	8.00	4.00
217 cu. yd.	Wire enclosed riprap	8.00	12.00
3,829 lb.	Wire fabric for riprap	.30	.40
175 lin. ft.	Steel stakes for riprap.....	2.00	.75
88.40 cu. yd.	Concrete for precast bridge units....	90.00	100.00
35.08 cu. yd.	Class "A" concrete bridge substructure	85.00	78.00
32,564 lb.	Reinforcement for concrete structures	.15	.17
13,720 lb.	Structural steel	.40	.35
697 lin. ft.	Structural steel piles in place.....	9.50	9.50
90 lin. ft.	Drilling holes for bearing piles.....	7.00	10.00

●

New Mexico—Valencia and McKinley Counties—State. A $571,386 contract was awarded Skousen Construction Co. for construction of 21.6 mi. of highway and one combination concrete and structural steel bridge.

(1) Skousen Construction Co.	$571,386
(2) Jack Adams	636,133
Allison & Haney	651,782
O. D. Cowart	652,393

		(1)	(2)
Lump sum	Removal of old structures	$9,000.00	$2,500.00
Lump sum	Removal of obstructions	200.00	1,000.00
154,625 cu. yd.	Excavation—unclassified	.20	.22
135 cu. yd.	Excavation for structures	2.00	2.00
1,045 cu. yd.	Excavation for pipe culverts	2.00	2.00
11,856 M gal.	Watering	.50	2.00
575 hr.	Rolling (tamping roller)	6.00	6.00
1,367 hr.	Rolling (pneumatic tired)	4.00	3.00
823 hr.	Rolling (steel tired)	6.00	5.00
875 hr.	Fifty (50) ton roller operation	6.00	10.00
325 hr.	Mechanical tamping	6.00	5.00
220,255 sta. yd.	Station yard overhaul	.01	.02
75,162 ¼ mi. yd.	Quarter mile yard haul	.05	.04
766,474 ton mi.	Ton mile haul	.06	.06
2.5 mi.	Obliterating old road	100.00	100.00
13.86 mi.	Grading	2,500.00	2,000.00
12,800 lin. ft.	Contour ditches	.08	.10
363 cu. yd.	Wire enclosed riprap	9.00	12.00
6,664 lb.	Wire fabric	.30	.35
83 cu. yd.	Excavation for riprap	2.00	5.00
205 lin. ft.	Steel stakes	4.00	2.00
1 ea.	Cattle guard—12 ft. roadway	1,200.00	1,200.00
1 ea.	Cattle guard—18 ft. roadway	1,700.00	1,400.00
10 ea.	Cattle guard—24 ft. roadway	2,000.00	1,600.00
66,345 lin. ft.	Galvanized barbed wire fence	.28	.20
17 ea.	Gates—Texas type	20.00	10.00
130 ea.	Bracing	10.00	10.00
132 ea.	Right-of-way markers	7.00	7.00
3 ea.	Std. Fed. and proj. markers, Type 1	50.00	50.00
75 ea.	Trtd. tmbr. warn. posts, refl. (6 in. dia.)	7.00	7.00
72,305 ton	Controlled gradation sub-base	.70	1.20
29,655 ton	Base course	1.25	1.30
34,395 ton	Stabilized base course	1.15	1.30
1,875 bbl.	Bituminous material, Type MC-1.	7.00	7.50
2,196 ton	Plant mix surface course	3.35	3.60
6,205 bbl.	Bit. mat., Type 120-150 (plant mix)	6.50	7.00
472 bbl.	Bit. mat., Type 120-150 (track coat)	8.00	8.00
119.0 cu. yd.	Class "A" concrete	50.00	70.00
202 cu. yd.	Class "B" concrete	48.00	60.00
51,113 lin. ft.	Reinforcement for concrete structures	.15	.18
54 cu. yd.	Grouted rock retards	20.00	15.00
842 lin. ft.	Culvert pipe—24 in. diam.	6.00	7.00
764 lin. ft.	Culvert pipe—30 in. diam.	7.50	8.00
1,072 lin. ft.	Culvert pipe—36 in. diam.	10.75	11.50
594 lin ft.	Culvert pipe—42 in. diam.	14.00	14.00
350 lin. ft.	Culvert pipe—48 in. diam.	16.50	16.00
60 lin.ft.	Culvert pipe—54 in. diam.	23.00	19.00
472 bbl.	H.V.M.S. emul. asph. for seal coat	9.00	10.00
45 ea.	Removing, resetting & repaint. right-of-way markers	6.00	6.00
	BRIDGE ITEMS		
24 cu. yd.	Excavation for structures (bridges)	5.00	10.00
70.18 cu. yd.	Class "A" conc. bridge substructure	85.00	80.00
44.62 cu. yd.	Class "C" concrete (piling)	50.00	50.00
110.40 cu. yd.	Concrete for precast bridge units...	90.00	110.00
13,445 lb.	Structural steel	.40	.50
1,472	Closed-end steel pipe piles	10.00	9.00

UTAH

Utah—Utah County—State. A low bid of $353,066 was submitted by Thorn Construction Co., Inc., for 1.26 mi. of bituminous surfaced road and 1 concrete structure over 20-ft. span.

(1) Thorn Construction Co., Inc.	$353,066
(2) W. W. Clyde & Co.	361,857
Strong Co.	455,931

		(1)	(2)
16,500 ton	Plant mix bit. surface, Type "A".	$ 2.50	$ 2.60
900 ton	Bit. material, Type 85-100 penetration	30.00	32.00
127 ton	Bit. material, Type MC-1 or MC-2	36.00	35.50
75 ton	Bit. material, Type RC-1 or RC-2	40.00	37.00
10,500 ton	Gravel surface, Type "B"	1.00	1.03
17,000 ton	Gravel base course	1.00	.98
5,000 cu. yd.	Unclassified roadway excavation..	.40	.33
71,500 cu. yd.	Imported borrow	.50	.33
361,000 sta. yd.	Class "A" overhaul	.005	.01
115,000 yd. mi.	Class "B" overhaul	.05	.10
4,000 1,000 gal.	Watering	1.00	1.25
500 hr.	Rolling, tamping roller	8.00	9.00
1,850 hr.	Rolling, pneumatic tire or power roller	6.00	7.00
139 lin. ft.	15 in. reinforced concrete pipe	4.50	3.60
648 lin. ft.	18 in. reinforced concrete pipe	5.00	4.35
50 lin. ft.	24 in. reinforced concrete pipe	7.00	5.90
68 lin. ft.	Relaying 18 in. reinf. concrete pipe	3.00	1.50
118 lin. ft.	C.M. pipe arches 18 in. x 11 in.	4.00	3.60
426 lin. ft.	C.M. pipe arches 29 in. x 18 in.	6.50	6.45
312 lin. ft.	C.M. pipe arches 43 in. x 27 in.	12.00	12.35
2,000 lin. ft.	Concrete curb, Type 1-E	1.40	1.50
575 lin. ft.	Concrete curb, Type 1-F	1.40	1.50
295 sq. yd.	Concrete sidewalk 4 in. thick	3.60	3.60
300 sq. yd.	Removal of existing pavement	1.00	.75
570 sq. yd.	Removal of existing sidewalk	.50	.50
500 lin. ft.	Removal of existing curb & gutter	2.50	.40
283 cu. yd.	Concrete, Class "A"	60.00	80.00
19 cu. yd.	Concrete, Class "AA"	75.00	100.00
50,600 lb.	Reinforcing steel	.14	.15
5,400 lb.	Structural steel	.40	.30
1,000 cu. yd.	Excavation for structures, unclassified	2.00	2.00
50 ea.	Removal of trees	50.00	40.00
Lump sum	Clearing and grubbing	10,000.00	1,500.00
70 hr.	Mechanical tamping	6.00	6.00
100 cu. yd.	Small ditch excavation	3.00	1.00
794 lin. ft.	Deep beam highway guard rail (concrete posts)	4.00	3.50
64 ea.	Guide posts	7.00	7.00
5 ea.	Reconstr. cleanout, manhole and monument boxes	50.00	50.00
4,650 lin. ft.	Right-of-way fence, Type "B"	.35	.35
10 ea.	12 ft. gates	35.00	40.00
6 ea.	14 ft. gates	40.00	45.00
22 ea.	Right-of-way markers	7.00	7.00
2 ea.	F.A.P. markers	30.00	25.00
Lump sum	Furnishing water equipment	2,000.00	2,000.00
Lump sum	Furnishing construction signs	2,000.00	1,000.00
1 CONCRETE STRUCTURE 82.57 FT. 0. TO 0. STA. 12+58.78			
610 cu. yd.	Excavation for structures, unclassified	5.00	3.00
866 cu. yd.	Concrete, Class "A"	55.00	72.00
133,000 lb.	Reinforcing steel	.14	.145
6,140 lin. ft.	Piles (other than timber)	6.00	6.00
337 lin. ft.	Steel handrail	14.00	12.50
Lump sum	Furnishing pile driving equipment	3,000.00	2,500.00

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Utah—Arches National Park, Grand County—Bureau of Public Roads. A $639,114 contract was awarded to the Strong Company for grading and surfacing 9.2 mi. of road.

(1) Strong Company	$639,114
(2) W. W. Clyde & Co.	720,954
Germer, Abbott and Waldron	738,228
James Reed, Contractor	788,436

		(1)	(2)
Cont. sum	Miscellaneous force account work	$5,000.00	$5,000.00
185,000 cu. yd.	Unclassified excavation	1.13	1.60
30,000 cu. yd.	Borrow excavation, Case 1	.50	.40
19,000 lin. ft.	Furrow ditches	.20	.15
510 cu. yd.	Excavation for structures	5.00	.300
350 cu. yd.	Excavation for structures (bridges)	8.00	4.00
141,000 sta. yd.	Overhaul	.02	.03
850 yd. mi.	Overhaul	.20	.25
76,500 yd. mi.	Overhaul or borrow, Case 1	.20	.20
4,300 unit	Watering	2.50	4.50
Lump sum	Prov. & maint. water plant or plants	7,500.00	5,000.00
810 hr.	Rolling	10.00	15.00
55,600 ton	Crushed aggregate base, grading E	1.85	2.25
161,550 sq. yd.	Processing bituminous base	.10	.10
219,200 gal.	Asph., gr. MC-0, MC-1, MC-2, or MC-3	.19	.195
370 gal.	Bitu. additive (concentrated grade)	5.00	4.20
705 cu. yd.	Class "A" concrete	80.00	120.00
54 cu. yd.	Class "B" concrete	80.00	100.00
116,000 lb.	Reinforcement steel	.17	.16
432 lin. ft.	Steel bridge railing	16.00	16.00
112 lin. ft.	6 in. corrugated galvanized metal pipe	1.85	2.00
1,962 lin. ft.	18 in. corrugated galvanized metal pipe	4.73	4.30
1,350 lin. ft.	24 in. corrugated galvanized metal pipe	7.25	6.70
408 lin. ft.	36 in. corrugated galvanized metal pipe	13.25	12.80
142 lin. ft.	48 in. corrugated galvanized metal pipe	18.50	17.40
26 ea.	Metal end sections for 18 in pipe culvert	37.50	28.00
19 ea.	Metal end sections for 24 in. pipe culvert	60.00	42.40
2 ea.	Metal end sections for 36 in. pipe culvert	130.00	100.00
130 cu. yd.	Hand-laid rock embankment	16.00	25.00
140 cu. yd.	Derrick-placed rock	16.00	20.00
1 ea.	Inlets (18 in. pipe)	375.00	150.00
2 ea.	Inlets (24 in. pipe)	400.00	200.00
3 pair	Metal frames and gratings	160.00	150.00
3 ea.	Spillway inlet assemblies	65.00	105.00
1,960 lin. ft.	Concrete curb and gutter, 6 in. depth	3.75	3.50
905 lin. ft.	Bituminous curb	1.50	1.50
180 sq. yd.	Concrete sidewalk	8.00	4.00
135 sq. yd.	Bituminous sidewalk	7.00	2.50
114 ea.	Guide posts (treated)	12.00	10.00

Baltrusch Construction Co.

HAVRE, MONTANA

owner of 2 LORAINS reports on its 15-ton MOTO-CRANE

Erection time for the sides, interior walls and roof of this prefabricated house, with 816 sq. ft. of floor space, totaled 6½ hours, with only 4 hours of crane work. Baltrusch Construction Co., Havre, Montana, used its 15-ton Lorain Moto-Crane to unload and erect the pre-fab sections. Baltrusch owns two Lorains.

Seventeen sizes and types of "Lorains-on-rubber" are available—ranging from the low-cost 7-ton SP-107 to the giant 75-ton MC-875. Many choices of drives and axle combinations. Ask your Thew-Lorain Distributor about on-the-spot Lorain parts and service facilities that have such an important plus value when you buy Lorain.

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HT-WC-5

Utah—Kane County—State. W. W. Clyde & Co. was awarded a $1,091,369 contract for 18.65 mi. of 2½-in. road mixed bituminous surfacing east of Johnson Junction.

(1) W. W. Clyde & Co.	$1,091,369
(2) Morrison-Knudsen Co., Inc.	1,138,911
Wella-Stewart Construction Co., Inc.	1,185,483
Strong Co.	1,259,622

		(1)	(2)
2,625 ton	Bituminous material, Type MC-3	$ 42.00	$ 47.50
581 ton	Bituminous mat., Type MC-1 or MC-2	42.50	47.50
382 ton	Bituminous material, Type RC-4	46.05	48.00
882 gal.	Bituminous additive	2.25	2.20
18,972 mi.	Scarifying and mixing	1,200.00	1,200.00
4,400 ton	Cover material Type "A"	4.40	4.00
4,400 ton	Cover material Type "A" in stockpile	2.00	3.00
146,600 ton	Gravel surface Type "B"	1.51	1.40
78,600 ton	Gravel base course	1.26	1.30
139,500 cu. yd.	Selected material base course	.78	.86
452,000 cu. yd.	Unclassified "roadway" excavation	.28	.35
735,000 sta. yd.	Class "A" overhaul	.01	.02
10,000 yd. mi.	Class "B" overhaul	.20	.20
12,000 M gal.	Watering	3.00	3.00
4,000 hr.	Rolling, tamping roller	10.00	10.00
1,500 hr.	Rolling, pneumatic tire or power roller	8.00	8.00
82 lin ft.	84 in. struct. plate pipe 10-gage paint and asphalt coating	70.40	71.00
122 cu. yd.	Concrete Class "A"	90.00	86.00
15,400 lb.	Reinforcing steel	.16	.18
13,250 lb.	Structural steel	.25	.26
0.250 M fbm.	Lumber (treated)	500.00	250.00
3,400 cu. yd.	Excavation for structures "unclassified"	2.00	1.00
1,400 cu. yd.	Small ditch excavation	1.00	.50
600 hr.	Mechanical tamping	6.00	4.00
832 lin. ft.	Deep beam hiwy. grd. rail (conc. posts)	3.75	3.60
380 ea.	Guide posts	7.00	7.00
200 ea.	Right-ow-way marker	7.00	7.00
69,300 lin ft.	Right-of-way fence Type "B"	.35	.33
15 ea.	16 ft. gates	50.00	60.00
5,000 lin ft.	Surface ditches	.08	.20
200 ac.	Clearing and grubbing	70.00	50.00
Lump sum	Furnishing water equipment	12,000.00	12,000.00
Lump sum	Furnishing construction signs	1,000.00	1,500.00

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Utah—Uintah & Daggett Counties — Bureau of Public Roads. A $353,000 contract has been awarded to Germer, Abbott & Waldron for 19.2 mi. of highway in Ashley National Forest.

(1) Germer, Abbott & Waldron	$353,000
(2) Engineer's estimate	350,000

		(1)	(2)
11,000 cu. yd.	Unclassified excavation	$ .90	$ .80
9,200 cu. yd.	Borrow excavation, case 2	.33	.50
250 cu. yd.	Excavation for structures	4.50	3.00
43,000 ton	Special subbase, grading B	1.26	1.40
64,000 sta. yd.	Overhaul	.02	.03
3,900 yd. mi.	Overhaul	.30	.30
2,800 units	Water (1,000 gal. unit)	2.50	3.00
Lump sum	Providing and maintaining water plant or plants	5,000.00	2,000.00
200 hr.	Rolling	12.00	12.00
68,500 ton	Crushed aggregate base, grading D	1.60	1.55
348,600 sq. yd.	Processing bituminized base	.09	.08
1,640 ton	Asphalt, grade MC-0, 1, 2, or 3	42.25	41.00
145 ton	Asphalt, grade RC-2 or 3	46.00	42.00
6.5 ton	Bituminous additive	735.00	1,100.00
10 lin. ft.	18-in. Galv. corr. metal pipe	4.30	5.50
370 lin. ft.	24-in. Galv. corr. metal pipe	6.50	7.00
182 lin. ft.	Removing, cleaning and relaying salvaged culvert pipe	4.00	4.00
10 cu. yd.	Hand-laid rock embankment	15.00	20.00
352 lin. ft.	8-in. perf. corr. metal pipe underdrain	2.10	1.75
110 cu. yd.	Porous back-fill mat. pipe underdrain	10.00	5.00
16 ea.	Remove and reset timber guide posts	4.00	3.00

WYOMING

Wyoming—Park County—State. A $107,601 contract has been awarded to Forgey Bros. Co. for grading, draining, and miscellaneous work on 6.2 mi. of the Greybull River road in Park County.

(1) Forgey Bros.	$107,601
(2) C. A. Reeves Construction Co.	114,626
Knisely-Moore Co.	121,376
Jones, Hinckley & Jones, Inc.	125,403

		(1)	(2)
205,500 cu. yd.	Excavation	$ .18	$ .215
21,800 cu. yd. mi.	Cubic yard mile haul	.16	.20
1,174 lin. ft.	18 in. C.M.P.	4.25	4.00
544 lin. ft.	24 in. C.M.P.	6.00	6.25
532 lin. ft.	36 in. C.M.P.	11.00	11.50
212 lin. ft.	36 in. x 22 in. C.M.P. arch culverts	7.50	8.00
65 lin. ft.	72 in. x 44 in. C.M.P. arch culverts	25.00	25.00
850 cu. yd.	Excavation for pipe culverts	2.00	1.50
440 hr.	Mechanical tamping	7.00	6.00
14 ea.	18 in. C.M.P. flared end section	25.00	27.50
2 ea.	24 in. C.M.P. flared end section	35.00	45.00
9.2 cu. yd.	Class "C" concrete	80.00	65.00
720 lb.	Reinforcing steel	.20	.20
9,140 lb.	Structural steel	.25	.17
3,100 M gal.	Watering	1.75	1.50
20 cu. yd.	Structural excavation	3.00	2.50
4,100 lin. ft.	Barbed wire fence (4 wire)	.22	.21
7,500 lin. ft.	Barbed wire fence (5 wire)	.23	.22
7,400 lin. ft.	36 in. woven and 3 barb. wire fence	.32	.25
30 ea.	End panels	14.00	15.00
25 ea.	Brace panels	12.00	12.00
2.94 mi.	Old road obliteration	100.00	100.00
Cont. sum	Miscellaneous force account items	2,000.00	2,000.00
300 cu. yd.	Grouted riprap	15.00	18.00
150 cu. yd.	Class 1 riprap	12.00	5.00
670 hr.	Sheep's foot roller operation	11.00	12.00

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Wyoming—Laramie County—State. A contract for $856,529 has been awarded to Schmidt Construction, Inc., for 11 mi. of crushed gravel base course, bituminous stabilized base course, and plant mixed surface course. Also miscellaneous work to be done on 6.6 mi. of shoulders and 4.4 mi. of service roads.

(1) Schmidt Construction Co.	$856,529
(2) Big Horn Construction Co.	872,126
Western Paving Construction Co.	875,978
Richardson Construction Co., Inc.	876,607

		(1)	(2)
3,100 cu. yd.	Excavation	$ 1.00	$ .40
350 cu. yd. mi.	Cubic yard mile haul	.20	.40
1,141 M gal.	Watering	2.00	2.00
5 hr.	Sheep's foot roller operation	11.00	20.00
305 hr.	Pneumatic tired roller oper.	8.00	5.00
55 hr.	Smoth steel roller operation	10.00	10.00
2,700 ton	Selected mat. surf., type I	1.00	.60
50,895 ton	Cr. gr. base course (¾ in. max.)	.60	1.00
77,600 ton	Plant mixed base course (stab.)	2.55	2.60
50,410 ton	Plant mixed surface course	3.00	3.10
3,250 ton	Stone chips, type B	6.00	6.00
1,106,140 ton mi.	Haul of surfacing material	.07	.08
369 ton	Asphaltic mat. MC, prime	26.00	33.00
265 ton	Asphaltic mat. RCF, 3 seal	30.00	41.00
6,181 ton	Asphaltic mat. AC (85-100)	26.00	26.00
79 ton	Asphaltic mat. RC-2 tack coat	28.00	40.00
106 ton	Asphaltic mat. RC-2 fog seal	30.00	45.00
12,120 lin. ft.	Metal plate guard fence	2.70	2.50
1,380 ea.	Reflec. guide posts, type B	8.00	9.00
365 ea.	Reflec. guide posts, type E	6.00	5.00
39,664 lin. ft.	Wood portable snow fence	2.50	2.00
Lump sum	Permanent signs and markers	40,000.00	30,000.00

WASHINGTON

Washington — King County — State. A $218,679 contract has been awarded to N. Fiorito Co. for 2.2 mi. of construction on the East Lake Sammamish road in King County.

(1) N. Fiorito Co.	$218,679
(2) Fiorito Bros.	226,090
Northwest Construction Co.	239,959
Erickson Paving Co.	261,171

		(1)	(2)
Lump sum	Clearing and grubbing	$450.00	$5,000.00
41,360 cu. yd.	Common excavation incl. haul	.60	.80
705 cu. yd.	Common trench excavation incl. haul	2.50	2.00
1,400 cu. yd.	Excav. of unsuit. founda. mat. incl. haul	.75	2.25
1,405 cu. yd.	Structure excavation	2.50	3.00
288 hr.	Pneumatic tired roller	8.00	7.00
128 hr.	Mechanical tamper	7.00	7.00
115 sta.	Finishing roadway	15.00	12.00
115 M gal.	Water	3.00	2.00
24 cu. yd.	Gravel backfill for foundations	7.00	7.00
50 cu. yd.	Gravel backfill for drains	7.00	8.00
23,750 ton	Selected roadway borrow	.80	.72
3,820 ton	Furn. & plac. crushed stone surf. top course, Type I-1 asp. conc. pavement	3.25	2.50
100 ton	Class "B", one course conc. pavement	10.00	8.00
28,057 sq. yd.	Cement conc. pavt. std. 14 day, 5 sack mix 7 in. section	3.70	3.60
516 sq. yd.	Cement conc. pavt. std. 4 day, 5 sack mix, 7 in. section	4.70	5.00
12,696 lb.	Pavement reinforcement, Type 2	.18	.15
902 ea.	Dowel bars with rubber caps	.60	.50
6 ea.	Temporary bridge across pavt., takedown type, other items	150.00	150.00
17 cu. yd.	Concrete, Class "A"	100.00	250.00
298 cu. yd.	Concrete, Class "G"	48.00	52.00
3,340 lb.	Steel reinforcing bars	.20	.15
126 lin. ft.	Perforated conc. drain pipe 6 in. diam.	1.00	1.15
108 lin. ft.	Plain conc. culvert pipe 12 in. diameter	2.25	2.25
711 lin. ft.	Std. reinf. conc. culvert pipe 18 in. diam.	4.50	5.00
273 lin. ft.	Std. reinf. conc. culvert pipe 24 in. diam.	7.00	7.00
124 lin. ft.	Corr. struc. plt. pipe-arch 84 in. span, 10 ga.	58.00	70.00
90 lin. ft.	Relay. conc. culvert pipe 12 in. diameter	2.00	2.00
54 lin. ft.	Reinforced conc. cribbing, special headers, 5 in. x 8 in. x 6 ft.-0 in.	3.00	3.25
222 lin. ft.	Reinforced concrete cribbing, headers, 5 in. x 8 in. x 6 ft.-0 in.	3.00	3.25
108 lin. ft.	Reinforced concrete cribbing, headers, 5 in. x 6 in. x 4 ft.-0 in.	2.60	2.75

144 lin. ft.	Reinforced concrete cribbing, stretchers, 6 in. x 10 in. x 6 ft.-0 in.	2.40	2.60
492 lin. ft.	Reinforced concrete cribbing, stretchers, 6 in. x 8 in. x 6 ft.-0 in.	2.30	2.50
336 lin. ft.	Reinforced concrete cribbing, stretchers, 6 in. x 6 in. x 6 ft.-0 in.	2.20	2.40
18 ea.	Reinf. conc. cribbing, pillow blocks	2.00	2.00
98 ea.	Guide posts	5.50	6.00
24 cu. yd.	Hand placed riprap	25.00	30.00
Lump sum	Remov. portions of conc. box culvert	500.00	500.00
4 ea.	Remov. & stkpiling exist. conc. spot posts	1.00	5.00
est.	Flagging, est. $300.00	300.00	300.00

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Washington—Cowlitz County—State. A $143,941 contract was let to ay J. Norris for 2.2 mi. of grading and crushed stone surfacing in owlitz County, Wash.

) Guy J. Norris	$143,941
) Smith Bros., Inc.	146,473
Archie Radakobich	154,994
Strong & MacDonald, Inc.	156,522

		(1)	(2)
12 ac.	Clearing	$450.00	$700.00
12 ac.	Grubbing	450.00	750.00
,830 cu. yd.	Common excavation incl. haul of 600 ft.	.50	.45
,100 cu. yd.	Solid rock excavation incl. haul of 600 ft.	.50	1.75
255 cu. yd.	Common trench excavation incl. haul of 600 ft.	1.50	3.00
380 unit	Overhaul	1.50	3.00
,250 cu. yd.	Stripping borrow & surfacing pit incl. haul	.40	.80
900 cu. yd.	Structure excavation	.20	.60
200 hr.	Smooth wheeled power roller	3.50	3.00
200 hr.	Pneumaitc tired roller	6.50	8.00
240 hr.	Mechanical tamper	6.50	9.00
116 sta.	Finishing roadway	5.00	5.00
100 M gal.	Water	15.00	14.00
195 cu. yd.	Gravel backfill for foundations	3.00	3.00
,560 ton	Ballast	6.00	7.50
,030 ton	Crushed stone surfacing base course	2.20	1.75
,330 ton	Crushed stone surfacing top course	2.20	1.90
74 cu. yd.	Concrete Class "A"	2.20	2.00
,350 lb.	Steel reinforcing bars	64.00	70.00
159 lin. ft.	Plain concrete culvert pipe 12 in. diameter	.15	.17
978 lin. ft.	Std. reinforced conc. culv. pipe 18 in. dia.	2.75	3.00
60 lin ft.	Galvanized iron water pipe ½ in. diameter	4.00	4.50
,400 ton	Crushed stone surfacing base course in stockpl.	1.00	2.00
,500 ton	Crushed cover stone in stockpile	1.60	1.65
,700 ton	Crushed stone surfacing top course in stockpl.	1.60	1.70

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Washington—Grays Harbor County—State. Andy Johnson & Co. has ceived a $168,205 contract for construction of a reinforced concrete idge, .21 mi. in length.

) Andy Johnson & Co.	$168,205
) Grays Harbor Construction Co.	171,390
Quigg Bros.	173,020
Owens Bros.	173,844

		(1)	(2)
5,000 cu. yd.	Unclassified borrow inc. haul	1.55	$ 1.15
1,220 cu. yd.	Common trench excav. inc. haul	1.65	1.65
890 cu. yd.	Structure excavation	3.50	1.95
42 hr.	Mechanical tamper	9.00	9.00
6.5 sta.	Finishing roadway	16.50	17.00
50 M gal.	Water	4.00	4.20
10 cu. yd.	Gravel backfill for foundations	9.00	6.00
660 cu. yd.	Selected roadway borrow	4.50	3.25
250 cu. yd.	Furn. & pl. cr. stone surf. top course	5.80	4.50
120 lin. ft.	Bit. ctd. corr. met. pipe 36 in. dia. #12 gage, Type #2	19.00	14.00
1 ea.	Tide gate 36 in. diameter	200.00	205.00
840 lin. ft.	¼ in. steel plate water pipe, 28 in. diameter	23.00	20.85
672 cu. yd.	Structure excavation	3.25	4.00
10 ton	Type I-1 asph. conc. pave., Class "B"	34.10	34.00
Lump sum	Shoring and cribs	6,820.00	16,655.00
350 cu. yd.	Concrete Class "A"	71.50	83.00
154 cu. yd.	Concrete Class "B"	72.50	57.00
64 cu. yd.	Concrete Class "D"	87.50	42.00
7,700 sq. ft.	Precast concrete bridge deck	3.85	4.10
1,500 lb.	Steel reinforcing bars	.16	.127
838 lin. ft.	Steel bridge rail	7.50	7.18
9.6 m.b.m.	Timb. & lumber (creosote treated)	300.00	465.00
2,880 lin. ft.	Furn. timber piling (untreated)	.65	.75
3,420 lin. ft.	Furn. tbr. piling (creosote treated)	2.00	2.40
72 ea.	Driving timber piles (untreated)	50.00	38.50
57 ea.	Driving tbr. piles (creosote treated)	55.00	63.00
2 ea.	Furn. & driving tbr. test piles	575.00	1,104.00
2,500 lb.	Structural carbon steel	.30	.23

COLORADO

Colorado — Delta County — Bureau of Public Roads. A $1,100,860 ntract has been awarded to Colorado Constructors, Inc. for grading 6.2 i. of 30-ft. wide road in Grand Mesa National Forest.

) Colorado Constructors, Inc.	$1,100,860
) Schmidt Construction Co.	1,118,729
Z. H. Lowdermilk, Inc.	1,155,051
J. P. Elliott & Co.	1,313,931

		(1)	(2)
Cont. sum	Miscellaneous force account	$2,500.00	$2,500.00
78 ac.	Clearing and grubbing	1,000.00	800.00
590,000 cu. yd.	Unclassified excavation	1.20	1.25
21,000 cu. yd.	Borrow excavation, case 1	1.00	.70
2,700 cu. yd.	Excavation for structures	4.50	4.00
61,600 ton	Special subbase, grading B	1.75	2.00
1,000,000 sta. yd.	Overhaul	.02	.02
8,000 yd. mi.	Overhaul	.30	.20
2,600 units	Watering	1.00	.50
Lump sum	Prov. and maint. water plant or plants	2,500.00	5,000.00
1,800 hr.	Rolling	12.00	10.00
101 cu. yd.	Class "A" concrete	125.00	120.00
5,190 lin. ft.	24 in. G.C.M. pipe (14-gage)	7.00	7.00
234 lin. ft.	24 in. G.C.M. pipe (12-gage)	9.00	9.00
112 lin. ft.	30 in. G.C.M. pipe	8.50	8.50
358 lin. ft.	36 in. G.C.M. pipe	13.00	13.00
204 lin. ft.	48 in. G.C.M. pipe (12-gage)	16.50	20.00
156 lin. ft.	48 in. G.C.M. pipe (10-gage)	20.00	24.00
74 lin. ft.	60 in. G.C.M. pipe (10-gage)	27.00	30.00
128 lin. ft.	65 in. x 40 in. C.M. pipe-arch	23.00	24.00
96 lin. ft.	Structural-plate pipe 120 in. dia.	80.00	76.00
84 lin. ft.	Struct.-plate pipe-arch, 5 ft.-10 in. span, 7 ft.-7 in. rise	55.00	50.00
18 ea.	Met. end sec. for 24 in. pipe culv.	55.00	50.00
4 ea.	Met. end sec. for 30 in. pipe culv.	80.00	80.00
2 ea.	Met. end sec. for 36 in. pipe culv.	115.00	125.00
4 ea.	Met. end sec. for 65 in. x 40 in. pipe-arch culverts	225.00	250.00
3,600 lin. ft.	6 in. Perf. C.M.P. underdrain	7.00	7.00
34 ea.	Maintenance marker posts	25.00	15.00
2 ea.	Cattle guards (30 ft.)	3,000.00	3,500.00
16,500 lin. ft.	Barbed wire fence, Type 1 or Type 3	.45	.35

MONTANA

Montana — Meagher County — State. A $165,147 contract has been awarded to Richardson Construction Co. for 7.4 mi. of plant mix and seal coat oil highway.

(1) Richardson Construction Co., Inc.	$165,147
(2) Northwestern Engineering Co.	167,879
S. Birch, Inc. & S. Birch & Sons	168,489
Peter Kiewit Sons' Co.	170,049

		(1)	(2)
1,358 ton	Crushed gravel cover mat., ⅜ in.	$ 9.00	$ 9.00
17,877 ton	Type II plant mix	5.65	6.35
231,361 gal.	150/200 pen. asph. cem.	.18	.14
30,670 gal.	Applying RS-2 emuls. asph.	.20	.18
263 gal.	Applying RC-1 liq. asph.	.30	.50
10,813 gal.	Applying RC-1 liq. asph.	.20	.18
40 hr.	Watering	10.00	10.00
Lump sum	Furn. and maint. water pl.	1,000.00	1,250.00
50 unit	Rolling	10.00	10.00

OREGON

Oregon—Douglas County—State. A $1,049,843 contract was let to Kuckenberg Construction Co. for grading work in Douglas County, Ore.

(1) Kuckenberg Construction Co.	$1,049,843
(2) Roy L. Houck Sons	1,138,307
Earl L. McNutt Co.	1,154,825
G. D. Dennis & Sons	1,174,712

		(1)	(2)
All spec.	Clearing and grubbing	$84,100.00	$156,000.00
2,800 cu. yd.	Drainage excavation, unclassified	2.00	3.50
3,600 cu. yd.	Spec. ditch excava., unclassified	3.00	.50
360,000 cu. yd.	Gen. excav., loc. "A" unclassified	.40	.38
541,000 cu. yd.	Gen. excav., loc. "B" unclassified	1.00	1.00
2,500 cu. yd.	Channel chg. excav., solid rock	3.00	5.00
3,109,000 yd. sta.	Short overhaul	.01	.01
300,000 cu. yd. st.	Long overhaul	.25	.40
18,000 cu. yd.	Excavating and placing topsoil	1.50	.50
All spec.	Finishing roadbed and slopes		
4,300 lin. ft.	Rounding cutbanks	.15	.15
800 lin. ft.	12 in. concrete pipe	2.15	2.30
2,500 lin. ft.	18. in. concrete pipe	3.80	3.60
600 lin. ft.	24 in. concrete pipe	6.00	4.95
180 lin. ft.	36 in. concrete pipe	10.00	9.00
500 lin. ft.	60 in. corrugated metal pipe	25.00	30.00
900 lin. ft.	8 in. sewer pipe	1.50	1.50
10 only	18 in. metal end sections coated	35.00	40.00
4 only	24 in. metal end sections coated	60.00	50.00
1 only	18 in. metal tide gates	100.00	90.00
2 only	Concrete catch basins	100.00	75.00
160 cu. yd.	Class "A" concrete	65.00	60.00
25,000 lb.	Metal reinforcement	.15	.14
2,100 rod	Type 2 fence	5.50	5.00
10,000 cu. yd.	Coarse crushed material in base	2.50	2.35
2,200 cu. yd.	¾ in. — 0 material in base	3.25	3.00
400 M gal.	Sprinkling	3.00	2.50
1,150 cu. yd.	Furnishing and placing aggregates	5.00	4.75
80 ton	120-150 asphalt	50.00	48.00
34 ton	RS-1 asphalt	52.00	50.00
All spec.	Detour structure	19,000.00	20,000.00

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Each year *Western Construction* features a summary of the year's unit bids on Western highway jobs. For the monthly bid section, turn to page 191.

Arizona leads Interstate progress

ARIZONA PLACED first among the eleven Western states and seventh nationally in mileage programmed on the Interstate System as of March 31, the State Highway Department has announced. This is based on a tabulation prepared by the Bureau of Public Roads and released by the Secretary of Commerce. It shows that, as of the end of March, Arizona had programmed 213.3 mi. of Interstate projects which will represent a total cost of $49,789,000.

The report also showed that, at the end of March, Arizona held 9th place in the nation for all construction under way on the Interstate System with 79.7 mi. These will cost $11,961,000.

The national summary showed that Arizona was 6th of the Western states and 13th nationally for mileage of Interstate System construction contracts awarded since July 1, 1956, when the Federal Aid roadbuilding program began. The state's mileage in this category at the end of March was 121.4 mi., which will cost $18,685,000.

Arizona also placed 13th nationally for mileage completed on the Interstate System. Arizona's completed mileage on the expressway network totaled 46.8 mi.

Rain-making to be tried by City Light on Skagit River

A RAIN-MAKING contract has been signed by City Light of Seattle in an effort to cut down its power purchases. The contract, with the Water Resources Development Corp. of Denver, Colo., extends from now to the end of August.

Supt. Paul J. Raver explained that the snow pack in the Skagit watershed is only 62% of normal and that City Light is faced with the purchase of $1,000,000 of power between now and the end of August. The rain-making contract has been entered into in an effort to reduce power purchases and to further assure refilling of Ross Reservoir for next winter's needs.

Past experience of the corporation, headed by Dr. Irving Krick, shows that their operations have increased rainfall 10 to 20%. Normally, from the first of May to the end of June the upper Skagit area has about 5 in. of rainfall. If the operation is successful it will add another inch of rainfall to the upper Skagit Basin. This would result in approximately 60,000 ac. ft. of additional water. At the present time Ross Lake has space for storing more than 800,000 ac. ft.

The activities will be centered back of Ross Dam so that any additional rainfall will drain into Ross Lake where it can be stored.

MONTANA COMPLETES NEW BUILDING FOR HIGHWAY DEPARTMENT

THE MONTANA HIGHWAY Department's new Scott Hart Building was officially dedicated April 25. *Governor J. Hugo Aronson* praised the former state highway engineer's many years of service with the department. *Scott Hart*, in accepting the dedication, paid tribute to *Fred Quinnell, Jr.*, present state highway engineer, to those who preceded him in office, and the 1,565 employees.

Lapel buttons were presented to forty-five members of the headquarters staff who had served 25 years or longer. *Mark Hopkins*, senior assistant bridge engineer, who has been with the department since its inception, received a gold certificate and lapel pin for his forty-three years of continuous service. Mr. Hopkins retired on May 1.

For the first time in many years, the entire department, with the exception of the laboratory, is under one roof. The sixth floor will be occupied by the Montana Division offices of the U. S. Bureau of Public Roads, moving from Missoula to Helena July 1.

Cement contract is awarded for Glen Canyon Dam project

CONTRACT to supply 3,000,000 barrels of cement for construction of the Glen Canyon Dam has been awarded by the Bureau of Reclamation to the American Cement Corp. of Los Angeles. The low bid of the several submitted was for a price of slightly less than $3.25 a barrel or $9,740,000 for the total. The second low bidder was Arizona Portland Cement Co., with a price of $3.33 a barrel. According to present construction plans the cement will be delivered over a five year period beginning in August, 1959. It is understood that the American Cement Corp. plans to build a new mill at Clarkdale, Arizona.

An interesting feature of the cement delivery is the fact that the site for Glen Canyon Dam is 130 mi. from the nearest railroad at Flagstaff, Ariz. All cement must be trucked from this railhead or from a plant which is closer to the site.

600,000 YARDS TO MOVE IN 30 DAYS...

150,000 MOVED IN FIRST 4 DAYS!

"I didn't believe it, but it's true," says R. D. McDougal, Jr., of McDougal-Hartmann Co., in speaking about the performance of his equipment spread operating in Illinois. "For example, our DW15s made 75 trips each in four hours over an 800-foot haul. They averaged 12-13 bay yards a trip. This machine really has the power and balance to keep it from getting hung up."

Mr. McDougal is talking about the performance of four Caterpillar DW15 (Series E) Tractors with No. 428 LOWBOWL Scrapers, part of his fleet of 22 big yellow machines moving sandy clay for a factory site. The machines, including D9 and D8 Tractors, No. 12 Motor Graders and other Cat wheel Tractor-Scrapers, kept going 10 hours a day. In four days 150,000 cu. yd. of earth were moved, one-fourth of a project that was expected to take 30 days!

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

The Cat DW15 packs 200 HP (maximum output), clocks 37.2 MPH, delivers a maximum rimpull of 27,500 lb. It's fast, maneuverable, tough. Works well with the No. 428 LOWBOWL Scraper (13 cu. yd. struck, 18 heaped), or with the Athey PR15 Rear Dump Trailer (14.1 cu. yd. struck, 22-ton capacity). But if you're like Mr. McDougal, you have to see it to believe it. So call your Caterpillar Dealer. See this fast yellow team in action . . . *right on your own job.*

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ALASKA Newsletter

By CLIFFORD S. CERNICK, Anchorage

EARLY SEASON—An early spring—and balmy weather—are giving an unexpected boost to Alaska's 1958 construction activity. Contractors are optimistic, but a few clouds have appeared in the sunny Alaskan horizon, principally labor difficulties. Alaskans from the Arctic to Ketchikan report they've never seen nicer weather and Alaskan newspapers take pleasure in comparing pleasant Northern weather with the floods, snowstorms, tornadoes and rains reported by various areas in the states. Construction wheels in Alaska are turning at an ever-increasing pace. Though the volume of construction is down somewhat, hopes are high that this will be another banner year.

SUMMIT MEETING—The Alaska representative of the Associated General Contractors, officials of the Patti-MacDonald Construction Co. and the Anchorage carpenters' union are having their own "summit meetings" as this is written. At a Nike missile site known as "Site Summit," the carpenters staged a walkout late in April which threatened to put the brakes on construction progress in the area. The jurisdictional dispute, which is being watched closely in the construction industry, arose when a superintendent on the job discharged a carpenter foreman who refused to direct a laborer working closely with carpenters on the job. More than 50 men were thrown out of work by the stoppage.

NEW CLAUSE WITH CLAWS—The walkout apparently was a move to put claws into a new clause in the carpenters' union by-laws which provides that members of that union cannot direct the activities of any other craft on the job. Heretofore, laborers carrying lumber, nails and the like had been assigned to assist the carpenters and had been directed by the carpenters. The new clause which caused the dispute has been interpreted to mean that any person doing laborer-type work in connection with a carpentry-type job must also be a carpenter. To enforce this clause would have the effect of giving the carpenters jurisdiction over jobs formerly in the laborers' domain—and would give more employment to carpenters at the expense of the laborers. This would, of course, make the carpenters' union happy, but is not calculated to evoke much joy in the laborers' camp. In this dispute, the laborers indicated their sympathies lie with the contractors who refuse to give in to the new carpenters' union edict.

AGC COMMENTS—Larry Moore, Alaska manager for the Associated General Contractors, commented bluntly on the carpenters' walkout: "It's deplorable that the carpenters should walk out at a time when there are so many men unemployed and after such a hard winter. The sad thing is that the walkout is throwing many men out of work in other crafts, through no fault of their own, and is jeopardizing vital defense construction." Moore pointed out that the dispute was making Alaskan contractors delay the beginning of work on their projects until the matter was settled. When no agreement on the dispute could be reached, it was referred to the joint board for settlement of jurisdictional disputes, in Washington, D. C.

HOUSING JOBS BOOMING—Housing construction in the Anchorage area is booming despite the carpenters' walkout. Walter J. Hickel, head of the Hickel Construction Co. in Anchorage, said work on his $1,200,000 project got under way this year "the earliest for as far back as I can remember." Hickel figures that his crews got started this year about a month earlier than last. He plans construction of 41 homes next year at a cost of about $1,700,000 in addition to the 30 homes on which construction is now proceeding. Several other large housing projects are in the planning stage in Anchorage.

$60,000,000 PROGRAM — The scope of the 1958 construction effort is gradually emerging. One recent guidepost to just how much work will be completed this season is the announcement by Col. P. V. Kieffer, Jr., Alaska District Engineer, that the estimate of his headquarters is $60,000,000. The $60,000,000, he pointed out, is about evenly divided between Anchorage, Fairbanks, and remote site projects. Colonel Kieffer cited civil works projects as one of the government's primary operations in Alaska. He reported that a total of 24 projects, costing more than $9,000,000, have been completed in the Territory since the program was launched. There are five more projects now under way to cost about $5,000,000.

EMPLOYMENT AGENCY RACKET?—R. F. (Monty) Pryce, manager of the new Dew Line regional office for the Federal Electric Corp., is investigating a former Alaska worker's charge that a New York employment agency is "selling" Alaskan jobs. Thomas Jones wrote a letter to Tom Canafax, president of the Fairbanks Central Labor Council, declaring that a New York employment agent offered to "line up" a lucrative defense job for a fee of $500. Pryce took exception to several allegations made by Jones and added that a full investigation of the matter is being made. Pryce pointed out that a large percentage of the hiring by Federal Electric is done in Alaska and that the only man ever referred to Federal Electric by the employment agency mentioned by Jones was not hired.

CONSTRUCTION NEWS NUGGETS — Work on Alaska's first nuclear power plant gets under way this summer at Fort Greely under a $4,737,217 contract. . . A $1,000,000 brewery is planned for Anchorage by a newly-organized corporation. . . The District safety council appointed by the Alaska district engineer has recommended stricter enforcement of safety regulations on and off the job by contractors and sub-contractors. Penalties were urged for violations of safety regulations and awards to contractors with outstanding safety records. . . Some $548,000 will be spent in remodeling the Anchorage federal building. . . The Whittier, Alaska sawmill has resumed operation for the season with a crew of 40 men and has plans for cutting 7,000,000 board feet of lumber for contractors and material yards in the railbelt area. . . A new service club to cost between $800,000 and $900,000 is being planned for construction at Elmendorf Air Force Base. Housing vacancies in the Anchorage area have shown a perceptible decline since mid-winter, reflecting the mounting influx of construction workers and contractors' personnel for the current construction season.

HAWAII Report

By ALAN GOODFADER, Honolulu

HIGHWAY MONEY COMING—The President's signature of an anti-recession highway construction bill means the Territory will get $1,890,000 in federal funds for road work. To this, the Territory must add $945,000.

OTHER FEDERAL AID — The federal government also has promised to put up $3,999,597 toward the $10,737,800 Honolulu downtown slum clearance project. Construction by private developers in the project area won't start until present buildings are razed and the land is sold by the Honolulu Redevelopment Agency. The agency is seeking $5,000,000 worth of federal aid for a second downtown slum clearance project.

UNIVERSITY PLANS—The University of Hawaii has scheduled a capital improvement program calling for $12,200,000 worth of construction over the next six years. In the program will be $4,500,000 worth of new class buildings, evenly split over the three bienniums. Schedule for the next biennium also calls for an $85,000 president's residence, $450,000 women's dormitory, $600,000 cafeteria, $155,000 cafetorium for the university high school and $504,000 military science building. Proposed for 1961-63 are a $45,000 men's dormitory, $150,000 in road, drainage, and utility improvements and $50,000 for off-street parking. In 1963-65, the university plans $150,000 in additions to the music building and a $512,000 swimming pool. Meanwhile, the federal government has approved the university's preliminary application for a $437,000 loan for a 116-bed men's dormitory. Construction is planned to start this fall.

PROBLEMS APPEAR SOLVED—The Territory's sand and dynamite shortage problems appeared solved recently when the Board of Harbor Commissioners approved construction of a $700,000 barge harbor at Lono Point, Molokai, by the Honolulu Construction and Draying Co. It is planned to ship dynamite by barge from the Mainland to Molokai for storage and trans-shipment to Honolulu in small lots as needed. HC&D also plans to take a million cubic yards of sand from West Molokai's Papohaku Beach during the next 16 years for construction use. Besides sand, the harbor will be a shipment point for Molokai gravel and cinder.

CONTRACTORS NAMED— The Standard Oil Co. recently named the Hawaiian Dredging Co., the Bechtel Corp., and E. E. Black, Ltd., as contractors for the $40,000,000 oil refinery it will construct at Barber's Point, Oahu. Completion date for the refinery is set for late 1960 or early 1961, with preliminary design and engineering work now under way. Hawaiian Dredging and Bechtel will handle processing equipment and E. E. Black will build the office, warehouse, shop and laboratory. For the reception of crude oil, a 10,000-foot underwater pipeline reaching a depth of 60 ft. will be built.

SCHOOL PLANS CLEARED—Governor Quinn recently cleared the way for uninterrupted construction of Honolulu schools this year and next by announcing that he expects to provide $4,300,000 for the program. The money is borrowed by the Territory but repaid by the City. It had been feared the Territory would not put up the funds because it is near its debt ceiling and wants to conserve borrowing power for Territorial public works. Besides that money, the City has been told it will have $2,200,000 in federal grants that will build some 150 classrooms in rural Oahu. The money comes from a federal program of assistance in the construction of schools where there are large numbers of military dependents. Contracts for school facilities which must be built by September 1959 are being let now and will continue to be let up to about the end of the year.

LOW BIDDERS—Hawaiian Dredging and Construction Co. submitted the low bid of $960,000 to build the Territorial Highway Department's five-story office building. Isemoto Contracting Co., Ltd., of Hilo, Hawaii, was low bidder with an offer of $47,924 for construction of a 1,500,000-gal. water system at Kilauea, Hawaii. James W. Glover, Ltd., was low bidder on an $80,000 radio and communications reception center the Air Force is building near South Point, Hawaii.

STRIKE EFFECT—Hawaii's sugar strike, three months old as this is written, has been feeding new workers into Oahu's booming construction industry. Strikers have been reported taking temporary jobs as carpenters and electrical workers.

TERRITORY PROMOTES—Melvin E. Lepine, advance planning engineer for the Territorial Highway Department, has been named to succeed Harold W. Butzine as assistant superintendent of the Territorial Department of Public Works. Butzine left the department to become assistant manager and chief engineer for the Board of Harbor Commissioners. Named to Lepine's old job was Albert C. Zane, former Oahu assistant district engineer for the DPW.

TRANSFER — Lloyd B. Osborne, Hawaiian Dredging Co.'s Midway contract personnel officer, has been transferred to Honolulu as Hawaiian Dredging and Construction Co.'s merchants' construction coordinator on the Ala Moana Shopping Center project.

MILITARY LOOMS LARGE—Military spending continues as a mainstay of the Territory's construction industry. The Army, Navy, and Air Force figure to spend $101,200,000 here this year, of which $83,400,000 is for housing. Biggest military spender for the year is the Navy with $44,500,000 worth of housing and $14,200,000 worth of other construction scheduled for a total of $58,700,000. The Army will spend $31,900,000 of which $29,300,000 will go for housing. Air Force construction is expected to reach $10,600,000, of which all but $1,000,000 is for housing. In all, the military expects to build 4,988 housing units here this year at an average cost of $16,700. The military construction schedule represents a boost of $82,500,000 over what the services spent for building here last year.

VETO COSTS — President Eisenhower's veto of a $1,704,028,300 rivers and harbors bill included a $23,000 beach erosion and flood control project for the Waimea-Hanapepe bay area in Kauai.

During construction of vital Interstate Highway section, Campanella and Cardi's 22½-ton Mack dumpers once again proved that they are built to get the tough jobs done, with little or no down time and only routine servicing.

Vital highway links

Maneuverability and ease of handling pay off in the tight spots. On the Division Street project in Pawtucket, R. I., space was at a premium. Spotting, dumping, or traveling over busy city streets, the combination of Mack maneuverability, and the positive traction provided by Mack's exclusive Balanced Bogie with Power Divider, materially speeded up work cycles on this project.

"We finished off the Interstate Highway job in record time, thanks to our Macks." Campanella and Cardi set new records for a job of this type, which included relocating the channel of the Big River, excavating for bridge construction, and hauling in heavy materials.

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Plans advanced for Wanapum Dam

FORMAL ACTION toward the start of construction of Wanapum Dam, 18 mi. upstream from Priest Rapids, has been taken. Grant County PUD Commissioners passed a motion to notify the Priest Rapids power purchasers that the PUD intends to go ahead with the development.

Glenn Smothers, manager of the Grant County PUD, said Wanapum would be a modified Z-shaped structure about 9,000 ft. long. An earthen embankment across the river will form the top of the Z, the powerhouse will parallel the present course of the river, and the spillways will form the bottom of the Z. The powerhouse and spillways will be built on dry land and after completion of the structures the river will be diverted around through them.

The powerhouse will contain eight generators initially with two extra bays and six skeleton bays. Initial capacity of the dam will be approximately 617,000 kw.

A $200,000,000 revenue bond issue would be floated to finance the development. Construction cost is estimated at about $125,000,000, with the difference being used for financing costs, interest during construction, contingency funds, right-of-way, and engineering fees.

The PUD manager said the tentative schedule for Wanapum would have the call for bids issued in December of this year, with the bids opened in February of 1959 and the contract awarded in March, with actual start of construction in May of 1959. The completion date for Wanapum Dam is expected to be about May 1964.

Steam power plant in Utah will involve building dam

A $34,000,000 steam generating plant is planned by the Utah Power & Light Co. The plant would be built near Kemmerer, Wyo., and would use strip-mined coal for fuel.

The project would have an initial capacity of 150,000 kw. and would also include a dam and storage facilities on Hams Fork River as a source of cooling water. Preliminary construction on the dam is expected to start this year with the plant scheduled for initial operation in 1963. Supplies of coal and water are adequate to operate three 150,000-kw. units in the ultimate plan. The first unit would burn approximately 500,000 tons of coal a year and 35,000,000 tons have been set aside as a fuel supply for the plant. Power would be delivered to Evanston, Wyoming, and to load centers at Ogden, Utah.

Another natural gas line will cost $138,500,000

NATURAL GAS pipeline construction estimated to cost about $138,500,000 has been approved by the Federal Power Commission. The facilities will enable the El Paso Natural Gas Co. to deliver 185,000,000 cu. ft. per day to present customers in Arizona and California. The construction work authorized would include 216 mi. of main pipeline, 59,000 hp. in compressor capacity. In addition, field facilities will total 533 mi. of line and 27,850 hp. in compressor stations. The work would be located in Arizona, New Mexico and Texas. The supply would augment the deliveries now being made from these same sources to California.

$12,000,000 shopping center

HAAS AND HAYNIE, San Francisco general contractor, has announced start of construction of a $12,000,000 apartment and shopping center. Contract was negotiated by Haas - Haynie - Frandsen, Beverly Hills affiliate of Haas and Haynie, and developer S. G. Wilson, for the first three of 12 five-story luxury apartment buildings. The development is in Pacific Palisades adjacent to Highway 101 just north of Santa Monica, and will be known as Wilson Park Apartments.

Processing plant in Nevada

KAISER ENGINEERS has announced construction started on a diatomaceous earth plant for The Eagle-Picher Co. at Lovelock, Nev. The plant, designed earlier and now being built by Kaiser Engineers, will be valued at more than $2,000,000 when completed in Aug. 1958. Machinery and equipment to be installed, among other things, include a 9 x 120-ft. rotary kiln.

PRO OF THE PUSHLOADERS:
THE MIGHTY D9

nbeatable road building team by Caterpillar: DW21 Tractor with No. 470 LOWBOWL Scraper is pushloaded by D9 Tractor

When Ivan Dement, Inc., Amarillo, Texas, contracted o build an 11-mile farm-to-market road in Paloduro anyon, they knew that the territory was rough and at they'd have to contend with heavy rock and exemely steep grades. But they also knew that their big llow Caterpillar-built machines thrive on the *hard* ork. "We have used Cat equipment for 16 years," mments Murray Gray, vice-president and general pt., "and think it's tops for long life and economy. We lso like the service we get from our Caterpillar Dealer."

The D9 is the "big boy" of the Cat Diesel Tractor ne. Put the power-packed D9 with 320 HP available t its flywheel behind the 25 cu. yd. heaped-rated W21-No. 470 Scraper and you've got a road building team that is packed with profit-making power.

Power-boosted controls and excellent visibility make the giant D9 easy to operate. And it's available with torque converter or direct drive with oil clutch. See your Caterpillar Dealer. He'll show you actual performance records of this pro of the pushloaders and explain how it offers greater production at lower cost per yard. He'll give you a demonstration that will prove it on your job. Service? You'll get the best, as well as expertly made Cat parts you can trust.

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ASCE meets in Portland

AT THE National Convention of the American Society of Civil Engineers to be held in Portland, Ore., June 23 to 27, the technical papers and discussions will center around the two items of water and work. These subjects are intimately related to the present activity and future growth of the Northwest.

Among the topics which relate to water will be papers on the subject of state-wide planning and conservation, in addition to more technical talks on control gates and lock valves. On the subject of wood, the convention will listen to papers covering such uses as the design of highway and railroad bridges in timber and the use of this material in buildings.

Airport fill completed

THE PORT OF OAKLAND's land reclamation project for the $17,500,000 expansion of Metropolitan Oakland International Airport has been completed. Utah Construction Company's dredge "Franciscan" pumped in the last of 14,100,000 cu. yd. of sand fill from the Bay bottom to complete a 15-month job costing $5,000,000.

The reclamation project is the largest in the Bay area in many years. Sand for the airport project was pumped distances of 5 mi. from borrow pits southwest of the airport. The dredge pumped day and night at the rate of 1,800 cu. yd. an hour for most of the 15-month period beginning Dec. 1956.

Low bids and contract awards

ARIZONA

Heiskell Construction Co. of Phoenix submitted a low bid of $145,383 for grading and surfacing near Casa Grande in Pinal County. **Construction Materials Co.**, Tucson, submitted a low bid of $178,188 for grading and surfacing in city of Tucson, Pima County.

CALIFORNIA

Guy F. Atkinson Co., South San Francisco, received a $6,946,853 contract for grading, surfacing and three structures on U. S. 99, north of Grapevine Station in Kern County. A $5,169,810 contract was received by **Piombo Construction Co., M & K Corp.** and **Connolly Pacific Co.** of San Carlos, for grading, paving, bridge construction and widening one bridge in and near city of Richmond, Alameda and Contra Costa Counties. A contract for $1,611,881 was received by **Clifford C. Bong & Co.**, Arcadia, for grading and surfacing 5 mi. of two-lane highway on Route 150 east of Santa Ana Creek in Ventura County. **Fredrickson and Watson Construction Co.** and **Ransome Co.**, Oakland, received a $1,374,930 contract for grading and surfacing 8.4 mi. of Route 89 and construction of one bridge north of Tahoe City in Placer and Nevada Counties. **Isbell Construction Co.**, Reno, submitted a low bid of $1,282,944 for 7.3 mi. of grading and surfacing and bridge construction between Placer County Line and south of Rattle Snake Creek in Nevada County. **Pacific Bridge Co.**, Alameda, received a $1,176,625 contract for Remedial Measures, Increment No. 2, U. S. Naval Shipyard. Work consists of paving, storm drain system and dike wall on Pier 6 and raising the outboard end of Dry Dock No. 2. A $956,500 contract was received by **Ralph T. Viola Co.** and **R. T. Viola** of Oxnard for construction of steam cleaning facility and spray paint facility, Naval Construction Battalion Center, Port Hueneme. **Stolte, Inc.** of Oakland received a $439,837 contract for constructing two bridges and approach of roadways south of Escalon in Stanislaus and San Joaquin Counties. **Darman Construction Co.** of Vancouver, Wash. submitted a low bid of $371,576 for grading and surfacing portions of highway between Ravendale and Madeline in Lassen County. **Matich Construction Co.**, Colton, received a $213,375 contract for grading and surfacing portions of highway in San Bernardino and Los Angeles Counties.

COLORADO

Smith & Lucas Construction Co., Colorado Springs, submitted a low bid of $161,016 for grading, structures and surfacing between Kiowa and Riverbend on S. H. No. 86 in Elbert County. **Gardner Construction Co.** of Glenwood Springs submitted a low bid of $1,286,510 for grading, structures and paving on Colorado Springs Freeway in El Paso County. A low bid of $261,357 was submitted by **Latimer Construction Co.** of Denver for widening along Colorado Boulevard in Denver and Arapahoe Counties. **Western Paving Construction Co.**, Denver, submitted a low bid of $277,988 for construction of terminal area ground transportation facilities at Stapleton Airfield, city and county of Denver. A low bid of $437,768 was submitted by **Northwestern Engineering Co.**, Denver, for grading and structures between Wyoming State Line and Virginia Dale in Larimer County. **Colorado Constructors, Inc.** of Denver submitted a low bid of $295,700 for grading and surfacing in city and county of Pueblo.

IDAHO

A $1,357,779 contract was received by **Farnsworth & Chambers Co., Inc.** of Houston, Texas, to construct the gas cooled reactor experiment at the Atomic Energy Commission's National Reactor Testing Station. **Holmes Construction Co.**, Heyburn, received a $591,135 contract for grading, surfacing and structures on 2 mi. of U. S. Highway No. 30 and 2.6 mi. of State Rte. No. 27, in and near Burley, Cassia County. **Robert V. Burgraff**, Idaho Falls, received a $244,288 contract for construction of roadway, concrete bridge and surfacing on 2 mi. of U. S. Highway No. 20, from Arco-West in Butte County. **Morrison-Knudsen Co., Inc.** of Boise received a $432,846 contract for reconstruction and reconditioning the existing roadbed on 10.6 mi. of State Highway 21, Lucky Peak Dam-North in Ada and Boise Counties. **Eagle Construction Co., Inc.**, Boise, submitted a low bid of $113,400 to produce and stockpile concrete aggregates at the Atomic Energy Commission's National Reactor Testing Station. A $1,210,631 contract was received by **Detweilers, Inc.** of Twin Falls for expansion of hot water distribution system, Mountain Home Air Force Base. **Watkins Construction Co.** of Boise submitted a low bid of $316,019 for modification of the engine test facility, Aircraft Nuclear Propulsion project at the Atomic Energy Commission's National Reactor Testing Station. **Cherf Bros.** and **Sandkay Bros., Inc.** of Ephrata, Wash. received a $1,537,359 contract for grading, surfacing and construction of overpasses in Power County.

MONTANA

F & S Contracting Co., Butte, received two contracts for roadwork in Beaverhead and Silver Bow

ounties: $918,343 for 4.9 mi. of ading and surfacing the Idaho-illon Highway in Beaverhead ounty and $527,230 for 7.5 mi. grading and surfacing on Upper ine Mile Highway in Silver Bow ounty. Two contracts were re-ived by **Albert Lalonde Co.** of dney for work in Park and oosevelt Counties: $805,256 for ading and surfacing and con-ruction of one bridge on the ivingston-Big Timber Highway Park County and $483,938 for mi. of grading and surfacing west Wolf Point, near the Dakota ine in Roosevelt County. A $458,-42 contract was received by Kiely onstruction Co., Butte, for 8.8 mi. grading and surfacing in Lewis nd Clark and Jefferson Counties. **F. England's Sons, Inc.** and **R. A.** illard of Rapid City, South Da-ota, received a $437,338 contract r grading and surfacing 12.6 mi. n the Armells Creek-Hays-Har-m highway in Blaine County. A 213,007 contract was received by **V. R. Cahoon Construction Co.** of ocatello, Idaho, for construction bridge on the Idaho Line-Dillon ighway in Beaverhead County. **else Mortensen & Co., Inc.,** North eattle, Wash. received a $1,373,214 ontract for constructing family ousing units at the Glasgow Air orce Base, Glasgow.

NEVADA

Dodge Construction Co. of Fal-n received a $298,437 contract for mi. of grading and surfacing near ickison Summit in Lander and ureka Counties. A $264,904 con-act was received by **Silver State onstruction Co.,** Fallon, for 6 mi. grading and surfacing on U. S. ighway No. 50 in Churchill ounty. **Hoops Construction Co.,** lko, received a $375,138 contract r 11.1 mi. of grading and surfac-ng near Welcome on U. S. High-ay 40 in Elko County.

NEW MEXICO

J. W. Jones Construction Co., lbuquerque, received a $960,894 ontract for 3.9 mi. of grading and rfacing on the Bernardo-South oad in Socorro County. **Adams onstruction Co., Inc.** of Santa Fe eceived a $177,896 contract for onstruction of Flying "C" Inter-hange on US-66 in Torrance ounty. **Wayne A. Lowdermilk,** nc. of Espanola received a $1,-82,621 contract for 7.4 mi. of grad-ng and surfacing on the Silver

City-Central Road in Grant County. A $194,270 contract was received by **Leslie Wheeler** of Gallup for 3.4 mi. of grading and surfacing north of Gallup in McKinley County. A $224,248 contract was received by **Imperial Paving Co.**, Oklahoma City, Okla. for construction of Blanco Bridge and approaches on SR-17 in San Juan County.

OREGON

General Construction Co., Portland, received a $2,993,995 contract for construction of Portland-Vancouver Interstate (East) Bridge over the Columbia River on Pacific Highway in Multnomah County. **Hoffman Construction Co.** of Portland received a $720,492 contract for bridge construction over Snake River, south of Ontario on Old Oregon Trail in Malheur County. A $700,365 contract was received by **Hamilton & Thoms**, Eugene, for bridge construction over McKenzie River on the relocated Pacific Highway, south of Coburg in Lane County. **J. N. Conley**, Portland, received a $818,721 contract for 5 mi. of grading and surfacing the Lebanon Road Section of the Pacific Highway, near the city of Albany in Linn County. **Morse Bros.**, Lebanon, received a $207,151 contract for 3.2 mi. of grading and paving the Newberg-Gearin Section of the Hillsboro-Silverton Highway south from Newberg in Yamhill and Marion Counties. A low bid of $295,492 was submitted by **Roy L. Houck & Roy L. Houck Sons Corp.**, Salem, for grading and surfacing on the Columbia River Highway in Wasco County. **Rogers Construction Inc.**, Portland, submitted a low bid of $509,343 for 6.6 mi. of grading on the Rooster Rock-Multnomah Falls Section of the Columbia River Highway in Multnomah County. **C. R. O'Neil**, Creswell, submitted a low bid of $300,483 for 1.7 mi. of grading and paving and construction of one bridge, on the Shady-Roberts Creek Section of the Pacific Highway in Douglas County. A low bid of $1,318,441 was submitted by **Peter Kiewit Sons' Co.** of Medford for 3.5 mi. of grading and surfacing on the Burnt Hill-Hooskanaden Creek Section of the Oregon Coast Highway, south of Gold Beach in Curry County. **Hall-Atwater, Inc.** of Seattle, Wash. submitted a low bid of $1,399,880 for building and utilities at the Kingsley Air Force Base.

UTAH

Hilton & Carr, Ogden, submitted a low bid of $983,662 for pipe lines, bench lathers and earthwork, Weber Aqueduct. **Nelson Brothers** of Salt Lake City submitted a low bid of $134,244 for constructing access roads, parking areas and surfacing at the Wanship Reservoir. **Wheelwright Construction Co.**, Ogden, submitted a low bid of $212,486 for 5.3 mi. of grading and surfacing and construction of one bridge on State Road No. 121, from Neola East in Uintah and Duchesne Counties. **Germer, Abbott & Waldron** of Tremonton submitted a low bid of $226,123 for grading and surfacing 6.8 mi. of State Highway 209 in Uintah County.

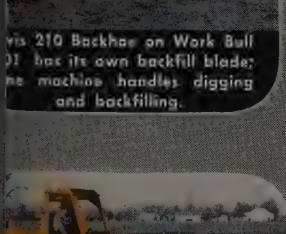
WASHINGTON

Cawdrey & Vemo, Inc., Seattle, received a $2,000,000 contract to construct the Head Office annex to the National Bank of Commerce in Seattle. **Sather and Sons**, Yardley, received a $1,793,019 contract for grading and paving State Highway No. 2 near Hyak and along Lake Keechelus, to the top of Easton Hill, on the Snoqualmie Pass Highway in Kittitas County. A $871,000 contract was received by **N. A. Degerstrom Co.**, Spokane, for 3.6 mi. of grading and surfacing, Washington to Hatch Road in Spokane County. **Erickson Paving Co.** of Bellevue received a $804,274 contract for 6.7 mi. of grading and surfacing PSH No. 11, Ritzville to Tokio Unit 2 in Adams County. **Manson Construction & Engineering Co.**, Seattle, received a $776,927 contract for construction of the Skagit River Bridge in Skagit County. **Peter Kiewit Sons' Co.**, Vancouver, received a $562,602 contract for grading and paving for interchanges to use the new bridges across State Highway 1 in Chehalis, Lewis County. **Vernie Jarl** of Gresham, Oregon, received a $498,381 contract for 6.2 mi. of grading and surfacing PSH No. 8, Chapman Creek to Wood Creek in Klickitat County. A $410,609 contract was received by **F. R. Hewett Co.** of Spokane for 4.6 mi. of grading and surfacing, Ewan to Cottonwood Creek and Pleasant Valley Creek, bridge and approaches in Whitman County. **Wilder Construction Co., Inc.**, Bellingham, received a $373,462 contract for 3.7 mi. of grading and paving Stimson Road to Portage Creek in Snohomish County. **Henry Hagman**, Spokane, received a $359,384 contra for 1.3 mi. of grading and surfa ing on State Highway 2 and co struction of railroad bridge east Dryden in Chelan County. A $285 831 contract was received by **Stron & MacDonald Inc.**, Tacoma, f grading and surfacing 3.7 mi. soutl east of Leavenworth south in Ch lan County. **Richard L. Martin** Oswego, Oregon, received a $225 605 contract for construction Northern Pacific R. R. undercros ing at Lakeview in Pierce Count **Max J. Kuney Co.**, Spokane, r ceived a $225,091 contract for 5. mi. of grading and paving east Zillah on State Highway 3 an State Highway 8 to Marion Drai in Yakima County. A $214,022 co tract was received by **Woodwort and Co., Inc.**, Tacoma, for 8.8 m of grading and paving portions State Highway 5 in city of Tac ma, Pierce County. **Associated San and Gravel Co.**, Everett, received $213,636 contract for 4.6 mi. grading and paving near Lake St vens north to the Getchell Road i Snohomish County. **Quigg Bros McDonald Inc.**, Hoquiam, receive a $169,874 contract for construct ing the Little Hoquiam Rive Bridge and approaches on PS No. 9 in Grays Harbor County. $168,694 contract was received b **Grant Construction Co.**, Coue D'Alene, Idaho, for grading an surfacing portions of Adams an Morrison roads in Grant County **Lake City Gravel and Material Inc.**, Seattle, received a $163,47 contract for 1.1 mi. of grading an surfacing the Willapa River Bridg approaches in Pacific County. **Lig Dickson Co.** of Tacoma receive two contracts for bridge construc tion in Kitsap County. A $319,33 contract for the Port Washingto Narrows Bridge South Approac and $278,578 for the North Ap proach.

ALASKA

Burgess Construction Co., Fai banks, submitted a low bid of $2 217,230 for construction of th composite building for the Unive sity of Alaska at College. **B-E-C-I Constructors** of Seattle, Wash. sub mitted a low bid of $375,300 fo construction of tilt-up concret base armament and electronic shop at Eielson Air Force Base **Sam Bergeson** of Tacoma, Wash received two contracts for modifi cation of radar towers, $338,000 fo tower at Tin City and $361,000 fo Cape Lisburne.

vis 210 Backhoe on Work Bull
01 has its own backfill blade;
ne machine handles digging
and backfilling.



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Unequalled versatility of the Work Bull 1001 obsoletes single-purpose machines that sit idle most of the time. This top-quality 60.3 h. p. rig converts from a ⅞ cubic yard Loader to a Pick-up Sweeper, Backhoe (with its own backfill blade), Fork Lift, Crane, Angle Dozer, Rotary Broom, and back to a Loader and Scarifier right in the field!

Instant Reversing Without Shifting lets you change direction simply by switching your foot from the forward acceleration pedal to the reverse acceleration pedal. No gears or levers to move. Other features include power steering, torque converter, 5-speeds either direction, and left-right turning brakes.

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Low Price Package – It costs you less to own a Work Bull 1001 with the multi-purpose attachments you need than you normally pay for just one single-purpose machine.

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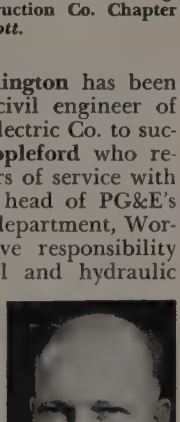
ENGINEERS and CONTRACTORS

GEORGE A. NUGENT, Peter Kiewit Sons' Co., Sheridan, Wyo., newly elected president of the Associated General Contractors of Wyoming. Serving with him as vice president is *William Carruth* of George M. Carruth & Son Construction Co. *Harold O. Kester* of Eagle Construction Co., is secretary-treasurer. Reelected to the Board of Directors is *H. W. Read*, Read Construction Co., and *L. W. Taggart*, Taggart Construction Co. Chapter manager is *Jack Knott*.

J. Dean Worthington has been appointed chief civil engineer of Pacific Gas and Electric Co. to succeed **Carl W. Appleford** who retired after 38 years of service with the company. As head of PG&E's civil engineering department, Worthington will have responsibility for the structural and hydraulic design of hydroelectric, steam-electric and other large construction projects in the utility's continuing expansion program in the West.



J. Dean Worthington

Appleford joined PG&E in 1920 following graduation. During his career he has been responsible for structural and hydraulic design of all of the company's large steam-electric power plants. He has also directed the design for high voltage substations and transmission lines, and has participated in the design of the large hydroelectric developments on rivers throughout Northern and Central California.

The retirement of Appleford and Worthington's promotion were announced by **Walter Dreyer**, vice president and chief engineer of PG&E.

* * *

Key men for Tuttle Engineering, Inc., Arcadia, Calif., firm currently providing surveying-engineering services for a U. S. Army Engineer project in central Alaska, are **James S. Scott**, resident manager at Anchorage, and **D. W. Devine**, resident manager at Fairbanks.

* * *

Edgar F. Kaiser, president of Kaiser Industries, has been elected president of the San Francisco Bay Area Council. **David D. Bohannon**, building contractor, was elected vice president.

* * *

Rodney P. Ryker recently accepted a position as assistant county engineer of Pierce County, Wash., of which **Keith Jones** is the county engineer. His activities principally entail supervision of construction work, with most of his time spent in the field on the many county jobs under way. Before going back into county work, Ryker was with The Asphalt Institute as district engineer in Seattle.

* * *

Floyd E. Dominy has been advanced to a new position in the Bureau of Reclamation, that of associate commissioner. He was formerly assistant commissioner, and in his new post will be second in authority to Commissioner Dexheimer.

Another career USBR employee was made an assistant commissioner. **Alfred R. Golze** succeeds **Stanley W. Crosthwait** who retired after more than 40 years of Federal service. Golze's prior post as chief of the division of program coordination and finance has been taken over by **Bruce G. Davis.**

* * *

Fred R. McCormick, chief engineer of power plant construction for Idaho Power Co., died suddenly of a heart attack in Boise. At the time of his death he was in direct charge of construction of Brownlee and Oxbow dams.

* * *

Albert L. Reeves has been named vice president of Utah Construction Co. His duties will include general administration and contract negotiations for the international engineering and contracting firm. President and General Manager **Allen D. Christensen** announced.

* * *

George C. Bestor, civil engineer and surveyor of Carmel, Calif., is president for 1958 of the California Council of Civil Engineers and Land Surveyors. The Council is the state association of practicing firms in these fields and is composed of eleven local associations. At the American Congress on Survey and Mapping annual convention in Washington, D. C., recently, Bestor was installed national vice president of this organization.

* * *

J. A. Thompson, prominent Southern California contractor, has been appointed to the Los Angeles Municipal Water and Power Commission. He fills a vacancy created by the recent resignation of **William B. Himrod.**

* * *

Paul L. Nichols and Associates have opened offices as registered professional engineers at 224 Rosenberg Bldg., Santa Rosa, Calif., with a branch office at Kailua, Hawaii.

* * *

Johannessen & Girand, consulting engineers of Phoenix, Ariz., have moved their offices to 3500 North Central Avenue.

* * *

Daniel F. Casey, Jr., formerly of Portland, Ore., was recently appointed as safety inspector by the U. S. Army Engineer District, Alaska. His appointment is in line with the District's strict enforcement of safety measures to prevent accidents on all construction supervised by the Alaska district engineer.

Col. Paul H. Symbol will become district engineer for the Corps of Engineers in Walla Walla, Wash., when **Col. Myron E. Page, Jr.**, the present district engineer, leaves for Washington in July to accept an assignment in the Office of the Chief of Engineers. During 1949 and 1950 Colonel Symbol was executive officer to the Seattle district engineer.

* * *

Nine outstanding county engineers have agreed to serve as consultants to the Bureau of Public Roads, **Bertram D. Tallamy,** Federal Highway Administrator, announces. This board will provide the Bureau with a highly qualified consultant from each geographic area of the United States. Representing the West are **Walter A. Burg,** Pima County Engineer, Tucson, Ariz., **Donald B. West,** Chelan County Engineer, Wenatchee, Wash., and **Lamont B. Gunderson,** Chairman of the Board of County Commissioners of Salt Lake County, Salt Lake City, Utah.

* * *

Col. Jackson Graham, Portland district engineer, has been selected to attend the 1958-59 course of the National War College in Washington, D. C. When he leaves Portland in late summer, **Col. Walter L. Winegar** is scheduled to succeed him.

* * *

Douglas McHenry, Portland Cement Association, and **Joseph W. Kelly,** professor and vice-chairman, Department of Civil Engineering at the University of California, Berkeley, were named president and vice president of the American Concrete Institute at its annual convention.

* * *

Brig. Gen. William F. Cassidy, Division Engineer, South Pacific Division, has been assigned to the Eighth Army in Korea. General Cassidy came to San Francisco in June 1954 as assistant division engineer, becoming division engineer the following June. He will join the Eighth Army in July and will be succeeded as division engineer by **Brig. Gen. Robert G. MacDonnell** who presently serves as assistant commandant at the U. S. Army Engineer School, Fort Belvoir, Va.

* * *

Jean M. Allen, 79, well known consulting engineer and Naval architect, died April 12 in Los Angeles following a stroke. A registered professional engineer in California, he was a life member both of the American Society of Civil Engineers and the American Society of Mechanical Engineers, and a member of the Society of American Military Engineers and of Naval Architects and Marine Engineers.

* * *

Two civilian engineers, **Walter R. Putz** and **John E. Ott,** of the Corps of Engineers, South Pacific Division in San Francisco, have been assigned to temporary duty in Formosa. Both men are construction engineers and will be inspecting airfield construction.

* * *

The retirement of **Col. Richard F. Ebbs,** deputy division engineer of the North Pacific Division, Corps of Engineers, since July 1956, retired May 31 following 30 years' Government service. During his period of duty with the North Pacific Division, Colonel Ebbs was second ranking engineer officer in the Division area comprising Oregon, Washington, Idaho, western Montana, part of Wyoming, and Alaska.

* * *

Kenneth B. Keener, chief designing engineer of the Bureau of Reclamation at Denver, Colo., retired May 1 after 47 years of service to the Bureau, and **Louis G. Puls** succeeds him. As chief designing engineer since 1952, Keener has directed the design of many of the West's largest dams and power

Keener

Puls

and pumping plants, and canals, including Glen Canyon Dam now under construction in Arizona, Flaming Gorge in Utah, and Navajo Dam in New Mexico. He also directed design of the world's highest earthfill structure, the 537-ft. high Trinity Dam now being constructed in Northern California.

In taking over the post of chief designing engineer, Puls occupies one of the major engineering positions in the Bureau as principal assistant to the assistant commissioner and chief engineer in all design matters in the 17 Western states and Alaska. He has served as assistant chief designing engineer since 1956. Prior to that he was head of the concrete dams section. Before joining USBR, Puls was with the Corps of Engineers and served some time in two private engineering firms.

* * *

Ed Nasburg, Ephrata, Wash., has been elected to succeed **Ken Norrie** as president of the Spokane Section, American Society of Civil Engineers. Nasburg has been with the Bureau of Reclamation since 1945 and is presently in the Operations Division of the Columbia Basin Irrigation Project. Elected to serve as vice president are **John Esvelt,** consulting engineer, and **Professor Loren Almy,** Washington State College.

* * *

H. H. Brown, formerly office engineer for the Arizona Highway Department, has been named engineering assistant to **C. B. Browning,** assistant state engineer of construction and maintenance. In making the announcement, **Wm. E. Willey,** State Highway Engineer, also reported the appointment of **Carl Winikka** as his own administrative assistant, replacing **Charles I. Smith, Jr.,** who became manager of the planning survey division. Appointed assistant to **J. B. Mertz,** engineer in charge of contracts and specifications, is **Clifford B. Potts.**

CALENDAR

June 11-14 — National Society of Professional Engineers, annual meeting, Chase-Park Plaza Hotels, St. Louis, Mo.

June 15-18 — Western Area Public Works Conference, San Diego, Calif.

June 22-28 — American Society of Civil Engineers, national convention, Portland, Ore.

Sept. 15-20—International Congress on Large Dams, Statler Hotel, New York, N. Y.

Oct. 13-17—American Society of Civil Engineers, national convention, New York, N. Y.

SUPERVISING the jobs

TOP MEN on the Fredericksen & Kasler freeway project between Victorville and Barstow in Southern California (see article on page 37) are *Roland Beadles*, left, superintendent, and *Jeff Kasler*, project manager, shown watching a backfilling operation. The job involves about 8 mi. of corrugated drainage pipe. Also on the project are *"Chuck" Mullins*, structural superintendent; *Clarence Buck*, dirt superintendent; *Dick Brown*, project engineer; *M. E. Burke*, office manager; *"Slim" Ransdell*, equipment superintendent. Hot plant superintendent is *George Bell*; *"Smoky" Marks* is crusher foreman; *Deon Wilburn*, pipe foreman; *Bill Jones*, labor foreman. Carpenter foremen are *Tom Harrigan*, *Archie Campbell*, and *John Campbell*. Dirt foremen are *Andy Hernandez*, *Jim Fair*, and *Jim Farrar*.

Harold "Hap" Johnson is superintendent for William D. Greschner, successful bidder at $1,385,400 for erection of Juvenile Hall at Santa Ana, Calif. Assistant superintendent on this project is **Robert Friedman.** Job started about the middle of March and will be complete about April 1959.

* * *

Frank Hynek is superintending construction of buildings and facilities for the Shield Test Pool Facility in the Aircraft Nuclear Propulsion area of NRTS, in Idaho. W. R. Cahoon Construction Co. is doing the work at a cost of $773,047. Scheduled for March 1959 completion, work started here last March.

* * *

Theron Johnson, pile driver foreman, and **B. M. Minor,** steel foreman, are key men for Walter G. Meyers & Son, contractor currently erecting a 300-ft. steel truss span called the Naches River Bridge in Yakima County, Wash. Work on the $203,765 structure began the first of March and is expected to be complete Oct. 1.

* * *

Joe Solaegui, grading foreman, and **M. N. Gustavson,** foreman, are head men for Silver State Construction Co., contractor now completing grading, resurfacing and erection of one bridge on Route 3 between Yerington and 10 mi. south in Lyon County, Nev. Work here has been going on since February. Bid price was $187,388.

* * *

J. V. Beach, superintendent, is being assisted by **J. J. Montrose,** grading foreman, and **S. J. Maffi,** foreman, on another road contract in Nevada which went to Silver State Construction Co. on a low bid of $186,463. This is a 1.9 mi. stretch in Churchill County, on State Route 1-A between State Route 2 in Fallon and 2 mi. north, and covers widening, grading and surfacing and two bridges. This job is scheduled for June completion.

* * *

Eric Lindstrom, superintendent, **Lee Lamb,** assistant superintendent, and **Herb Neff,** engineer, comprise the top men on Baugh Construction Co.'s project at Ballard High School, Seattle. The $1,068,000 contract involves four new buildings and extensive remodeling of existing school. Baugh started work in February and expects to have it finished about June next year.

* * *

Arnold Olson, superintendent for Wick Construction Co., is in charge of construction of Northwest Junior High School, Seattle. Assistant superintendent on the project is **Les Holte.** Of reinforced concrete and structural steel construction, the award for the structure went to Wick on a bid of $1,436,339. Work has been under way since February and will continue until July of next year.

* * *

Richard A. Mortensen is superintending a $1,142,973 contract which has been under way since February on Pacific Highway in Portland, Ore. Kuckenberg Construction Co. is the contractor on the 2.7 mi. of grading and surfacing of the Harbor Drive-county line section. Assisting as foremen are **William Arenz, Don L. Baty,** and **Edward Emerson.**

* * *

A. W. Sabbe, superintendent, and **R. W. Engelhardt,** foreman, are W. P. Roscoe Co.'s key men on construction of overpass on the Garrison-Helena highway in Powell County, Mont., a $172,714 job which has been under way since mid-March and scheduled for completion the end of June, 1959.

* * *

Eugene Hill, as general superintendent for L. W. Vail Co., is in charge of $450,378 construction near Kennewick, Wash., involving 10.5 mi. of grading and surfacing. Other important supervisors here are **Oral Chaney,** paving superintendent, and **Clarence Nelsen,** grading superintendent. The job started Feb. 20 and will be finished about Oct. 1.

LOOK AT THE No. 977 LOAD OVER 8 TONS IN 4 MINUTES— ALL DAY LONG!

his is a road construction job between Durham and hapel Hill, N. C. Loading sand for Nello L. Teer Co. this Caterpillar No. 977 Traxcavator, averaging 18.4 ns per load. Its load time per truck is 4 minutes, med right on the job. Supt. R. G. Moore states tly: "Best truck loader there is."

A few reasons: the No. 977's track roller frames are tended for better stability; its 2¼ cu. yd. bucket ts back 40 degrees at ground level, giving leverage the cutting edge and preventing spillage; operator ts high and comfortable, out of the dust, with all ntrols conveniently at hand.

New with the No. 977: a Side Dump Bucket attachment (2¼ cu. yd.) that dumps to the left as well as forward and is directly interchangeable (same pins, bolts, nuts) with the standard bucket.

But don't just look at pictures—look at the dirt fly on your own job when a Cat No. 977 Traxcavator digs in. Call your Caterpillar Dealer right now and set up an eye-opening, truck-filling demonstration.

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

CATERPILLAR

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FOR FAST LOADING

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R. A. PAYNE (left) is serving as project manager on the construction of the 209-unit Capehart housing project at the Yuma Test Station in Arizona. Other important personnel with Payne are (l. to r.) *C. M. Daniels,* comptroller; *Chris Gervasia,* project superintendent, and *D. L. Bradley,* president of the D. & L. Construction Corp., contractor who received the job on a bid of $3,305,278. *F. E. Hazeltine* is in charge of purchasing. Concrete superintendent is *J. Hallmark,* and *K. Jones* is carpenter superintendent. Slated for completion in February 1959, work started in March.

Earl Rook, superintendent, aided by **Francis Rook,** carpenter foreman, is in charge of a bridge construction on the Libby - Rexford highway in Lincoln County, Mont., for N. A. Nelson Construction Co. which is doing the work at a cost of $687,696. Under way since mid-January, the job will be complete the end of 1959.

R. L. Sawyer, superintenden and **Les H. Ballif,** engineer, are ke men on the $241,900 expansion c steam plant, Aircraft Nuclear Pr pulsion area of NRTS, Idaho, co tract for which has been under wa by W. R. Cahoon Construction C since mid-January. Cahoon figure to have the project finished b July 23.

* * *

Henry Eberhardt, superintenden for Northwestern Engineering Co is in charge of grading, stabiliz tion, and structures on 3.8 mi Mancos east and west, Montezum County, Colo., a $339,998 job whic got under way in February. Fiel accountant is **Marvin Jensen.**

* * *

Ernest Kissee is supervising con struction of heavy support sho and related utilities for NIKE in stallations at Fort Richardson Alaska. Other important men o this concrete tilt-up constructio are **Ray Michlig,** assistant superin tendent, and **William Neve,** fiel auditor. The Lease Company wa the successful bidder at $324,69 on this job which got under wa in April and is earmarked for finis the end of October.

Ben Lowdermilk is supervising for H. & E. Lowdermilk, contractor, a $1,055,566 award for grading, stabilization, and surfacing 6.5 mi. of State Highway 10 in Archuleta County, Colo. Foreman is **Glenn Blacker,** and timekeeper is **L. L. Guilliams.** Construction work started in February and will probably end this August.

* * *

Walter C. Ewers is supervising a contract for J. H. Marshall who successfully bid the job at $534,416. Work is in Curry County, N. Mex., and is for 12.3 mi. of grading, surfacing and structures on the Grady-Broadview and South road. Other key contractor men are **John H. Marshall, Jr.,** and **David W. Neirk,** bookkeepers; **Malcolm E. Coburn,** general foreman, and **Fred Anderson,** grade foreman. The work has been going since Jan. 12 and is expected to be finished Aug. 9.

* * *

J. R. Warner, project manager, **Jim Wade,** general superintendent, and **Cal Harling,** general mechanical superintendent, are Swinerton & Walberg Co.'s top trio on construction of a pulp and paper mill at Wallalu, Wash. A $15,000,000 project, work started Mar. 10 and the job is expected to be finished in February 1959.

* * *

John W. Fuller, bridge superintendent for J. F. England Sons, Inc., is in charge of grading and surfacing on 1.3 mi. of the Sussex-Linch Road including the construction of a bridge across the Powder River in Johnson County, Wyo. England was awarded the job on low bid of $275,067, started work in March, and aims to have it finished about November this year.

* * *

E. J. Munro, superintendent, with the aid of **Odell Anderson,** grade foreman, is in charge of road construction from Robin to Hawkins Valley, Idaho, for Wangsgaard Construction Co., which received the contract for the 7-mi. grading and surfacing at a cost of $127,527. Work got under way in mid-March and according to **R. B. Crookston,** general superintendent for the contractor, the job should be finished about June 1.

* * *

I. L. Buttram, superintendent, and **Earl Nelson,** also superintendent, head the construction crew working for Martin Construction Co., contractor doing 3 mi. of grading, surfacing and other work on the Sonita-Mountain View highway in Pima County, Ariz. Grade foreman is **Bill Christy.** This $426,639 job got under way in March, with September the target date.

Roy L. Newman is superintending Fred S. MaComber's contract at Fresno State College in California covering construction of three 3-story, brick, masonry, and concrete residence halls including site development. A year-long job, the project started April 10.

CONSTRUCTION BRIEFS

Backhoe has permanent installation

RALPH MAXWELL, of Sonora, California, has found an unusual and profitable application for a Model W-30 Wagner backhoe in his lime quarry near the historic Columbia State Park. The backhoe is mounted solidly on the upper framework around a hopper feeding a jaw crusher. It is driven by a 5-hp. electric motor, and has its own oil reservoir mounted just below the controls. The nature and size of the chunks of limestone as they are dumped into the hopper are such that controlled feeding into the primary crusher is required. The limestone must be introduced into the crusher at a steady rate, but not so fast as to overload the jaws. Chunks that may be too large must be broken up to allow them to enter the mouth of the crusher.

This job was originally accomplished by 3 to 4 men, using long bars and sledge hammers. Maximum average production with this method was 25 to 30 tons per hour.

The backhoe has eliminated all hand labor, requiring only one man to operate it. It easily scoops the material into the mouth of the crusher, and breaks up any pieces which are too large. Most important, it can easily maintain a steady feeding of the crusher, and keep up with the truckloads of raw material as they arrive from the quarry. Capacity has been increased by 4 times—to 100 tons per hour, coordinating the mean capacity of the entire operation.

Portable sprinklers to protect key locations

CONSTRUCTION JOBS seldom provide sprinkler systems. However, almost any size job has at least two vulnerable spots that can and should be protected against fire by sprinklers. They are the blueprint racks and the oil shanty, both highly susceptible to flash fires. It is rare indeed when sprinkling equipment is considered even in these two areas. Apparently, the hazards don't warrant the cost. But what about portable sprinklers?

A job must be of large size to warrant installation of the standard sprinkler system in temporary buildings. But, even in knock-down portable shanties, adequate protection can be given by installing portable sprinklers. There are several types. One consists of a 1-gal. glass container of carbon tetrachloride, suspended from the ceiling, with a fusible sprinkler release attached. Release will occur at a predetermined temperature. The equipment can be hung over hazardous points. The number needed will depend on the area to be protected.

A feature is that the extinguishing agent is nonfreezing, and that there is no maintenance problem.

If not damaged, such equipment is simple to remove and transport from job to job.

(National Safety Council)

Giant truck hauls 80-ton loads

THE SIZE of construction equipment seems to have no limit and the latest evidence to support this view is shown in the photograph above. This giant rig was developed by Kenworth Motor Trucks to carry 80-ton loads of iron ore at the Marcona Mining Co. installation at San Juan Bay, Peru. The rig was sold and delivered by the J. T. Jenkins Co. In addition to its tremendous carrying capacity the machine is interesting because of its use of a Parkesburg Hydro-tarder mounted over the rear trailer axles for additional braking action.

The tractor unit is a Kenworth Model 848, equipped with a Model NRTO Cummins 335-hp. turbocharged diesel engine. The 80-ton bottom-dump gondola was made by Fruehauf Trailer Co., with the fabrication by Western Iron & Body Works.

OLIVER

OC-126 1½-YD. LOADER WITH POWER-TURN

"A fast, dependable machine—adds extra income,"

says excavating contractor

OC-126 Loader demonstrates its versatility by pouring concrete in the tight spots. Rollback bucket raises to 14'4" for easy clearance. POWER-TURN gives it amazing maneuverability with *full power on both tracks at all times.* Oliver's great super-torque diesel gives it plenty of power and the lowest operating costs of any tractor of its size.

On this 150-unit housing project at Roxborough, Pa., the Kearney Construction Company digs basements for semidetached ranch homes with garage in basement. The hilly terrain makes it necessary to excavate from 1′ to 7′, depending on the contour of the earth.

"On the steep inclines I particularly like the POWER-TURN feature because it is extremely easy to swing on the hills," says Edward C. Kearney, partner in the firm handling the excavating and cement work. The OC-126 is used for digging, loading trucks and backfilling. And in addition, it averages about 1½ hours per day pouring concrete in forms which can't be reached by the ready-mix truck due to mud, water and dirt piles. "This item alone accounts for a saving of $23.50 a day," states Mr. Kearney.

Operating costs on this job are only $5 per hour, which includes all costs—fuel, oil, maintenance, depreciation, insurance and operator's wages. This is a typical example of the versatility and low production costs for the OC-126. Why not get all the facts from your dependable Oliver distributor? Ask for a demonstration of the OC-126.

OLIVER

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a complete line of industrial wheel and crawler tractors and matched allied equipment

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Auger mounted in a pile driver lead speeds storm-drain excavation

A 63-FT. LONG earth auger suspended in a pile driver lead and handled by a Lorain (35-ton) Moto-Crane, has been a tremendous problem-solver on the $8,500,000 Slauson Relief Storm Drain project in Los Angeles, California. The 4-mi. long job is held by a joint venture of Peter Kiewit Sons' Co. and Fred J. Early, Jr. Co., Inc.

The finished sewer will consist of 10,200 lin. ft. of 11 x 14½-ft. double box structure and more than 9,000 lin. ft. of 14½ x 19½-ft. single-box. The biggest difficulty faced by Kiewit-Early when planning the project was the excessive depth required for the trench—most of it varies from 25 to 57 ft. deep.

A tough problem calls for an imaginative solution. A specially-developed earth auger drills holes on 4-ft. centers along each side of the trench to be excavated. H-beams 12 in. wide weighing 74 lb. to the foot are driven down with a 10,000-lb. steam hammer. As the excavation between the piles proceeds, timber lagging is fitted behind the flanges to retain the soil.

They took a 35-ton Lorain Moto-Crane, Model MC-530W, and replaced the rear counter weight with a small platform on which was mounted a General Motors 6-110 diesel engine, driving a hydraulic pump with a capacity of 120 gal. per min.

The auger was suspended from a pile driver lead hung on the crane boom and rotated by a hydraulic motor at the top of the auger consisting of three 120-gal.-per-min. pumps acting on an integral ring gear.

In beginning a hole the operator of the crane has full control over the precise positioning of the auger by virtue of 2 hydraulic rams connected to the bottom of the leads. These two horizontal cylinders are visible in the photo. Spirit levels and plumb bobs make sure the auger is vertical before drilling begins. When the signal to proceed is given the auger is lowered on the hoist line and the hydraulic motors begin the rotation.

Drilling speeds vary widely depending on the hardness of the soil and the number and sizes of cobbles.

For 50-ft. piling, holes were drilled to a 43-ft. depth, with a 14-in. diameter auger. For 60-ft. piling, a 15-in. diameter auger is used. The average hole is 30 ft. deep.

Excavation is handled by a clamshell assisted by a crawler tractor working at the bottom of the cut.

The auger is not the only example of ingenuity on this project. For pulling the piles, a high A-frame, capable of withstanding a 500-ton pull, was used. The A-frame is positioned by a truck crane. The driving-extracting operation is planned so that the rig can work at 6 different locations.

The steel forms for the interior of the box sewer are 50 ft. long and are moved ahead about twice a week.

Despite the hazards connected with deep-trench work the project has achieved an outstanding accident prevention record. By the end of 1957 over 250,000 man hours were recorded without a lost-time injury.

The project is scheduled for completion by mid-summer of 1959.

For the Los Angeles County Flood Control District, Colonel H. E. Hedger is chief engineer, W. B. Tracy is head construction superintendent, G. V. Bittman is chief construction superintendent, Dave Beakley is division construction superintendent, Howard Baright is resident engineer, and Herman Berkowitz is senior inspector.

The Kiewit-Early organization is headed by Ward White, superintendent, Ray Gully, assistant project superintendent, John McLaughlin, project engineer, and John Hay, office manager.

Concrete forms—

A proper maintenance program can extend the life of factory-built forms, and save money for contractors.

By JOHN G. SYMONS
President
Symons Clamp & Mfg. Co.
Chicago, Ill.

THE PURCHASE of a set of factory-built forms represents a substantial investment on the part of a contractor. If he is to reap the maximum return on this investment, it is imperative that he be familiar with methods of maintaining this equipment and impress his crews with the importance of this maintenance. In the past this phase of forming procedure has been looked upon as a kind of "busy work"—something to give a good crew during the slack periods to hold them together, but actually it should be a part of the year round daily routine—done so often that it becomes habit forming.

Cleaning the forms is the most important part of this routine. The frames and metal parts, if any, on the forms should be thoroughly scraped to remove any concrete

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We'd like to work with you on your job. If it's already designed—call us for estimates. If we can help plan it—our sales engineers are at your service.

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deposits which may have accumulated. This is especially true for an all-metal frame. A clean form is very important for efficient performance. Inspect the frames also for wear and tear. On a wood frame look for the possibility of split or damaged lumber that should be replaced.

Next the plywood face should be cleaned. A good scraper is the best tool here. But care must be taken to avoid gouging or damaging the face. When the plywood face is thoroughly cleaned, a good oil preservative should be applied. This will not only increase the life of the forms as much as 50%, but it will decrease stripping time and greatly improve the appearance of the pour.

Once the forms have been cleaned and an oil preservative applied, they should be stored in a clean, dry place and at a slight pitch for run-off. Ideally, strips of wood should be placed between forms to promote the evaporation of moisture.

If it is necessary to reverse or replace the plywood, here is the procedure we recommend for a wood-ply form. First remove bolts or rivets from the rear of the forms. Next, drive a mason's chisel between plywood and frame where nailed. A 3-lb. sledge is suggested to hammer the chisel. After several nails have been cut this way, insert wooden wedges between plywood and frame to speed the operation. In re-nailing the plywood, figure three nails per square foot or one pound of nails per 26 sq. ft. Drive nails every 6 in. along the frame. Drive the rivets or add bolts last. Plywood may be reversed or changed at low cost using this method and by doing it contractors can get as many as 500 or more uses out of a frame.

Maintenance is not something that should be done after a job is completed. Like safety, it should be practiced during every working hour. During a pouring operation, for example, forms should never be dumped or thrown from a truck—always passed from man to man or to the stack.

Reputable form manufacturers are constantly seeking new materials which will lengthen the life of their products. This saving can be passed on to contractors and their crews who are willing to take the time to maintain their forms properly.

HOW TO SELECT RUBBER-TIRED TRACTOR SHOVELS

By JOHN E. BECKER
The Yale & Towne Manufacturing Co.
San Leandro, Calif.

HERE ARE a few items to consider before making a choice of a pneumatic tire tractor shovel. The first and most important step is to determine job application requirements. Where and on what type of job will the loader be used? Rough terrain, in mud, concrete surface, digging, loading light or heavy material?

How large a loader? Two or four wheel drive? What type of power — gasoline or diesel? Stability, safety, dumping height, dumping reach, tire size, turning radius, bucket size and last but not least, serious engine damage like scored lifting capacity. These decisions can be checked against specification sheets or an on-the-job demonstration. I strongly suggest the demonstration as some specification sheets do not tell the whole story.

Consider the ease of operation from the operator's standpoint. Are the controls safely and conveniently located? Are quick shifts (forward and reverse) in all speeds available? Is it necessary to stop the machine in order to select a new gear range?

Appearance is the most vague but a most important feature to evaluate. Appearance reflects a quality of the design. A neat, clean look generally indicates a good design.

On performance comparison, be sure to check the overall length, wheel base width and turning radius which might affect the stability of the loader.

Check the weight distribution on front and rear axles. Generally speaking, the longer the wheel base, the better the weight distribution and stability.

Compare the maximum dumping height of the bucket; also, the maximum reach into a truck at maximum dump. The true reach of the bucket is from the **front of the tires**—not the grill.

Check the speed of lift and dump. Minutes become dollars fast in construction.

Investigate the fuel consumption of the engine you select.

Can the operator get in and out easily?

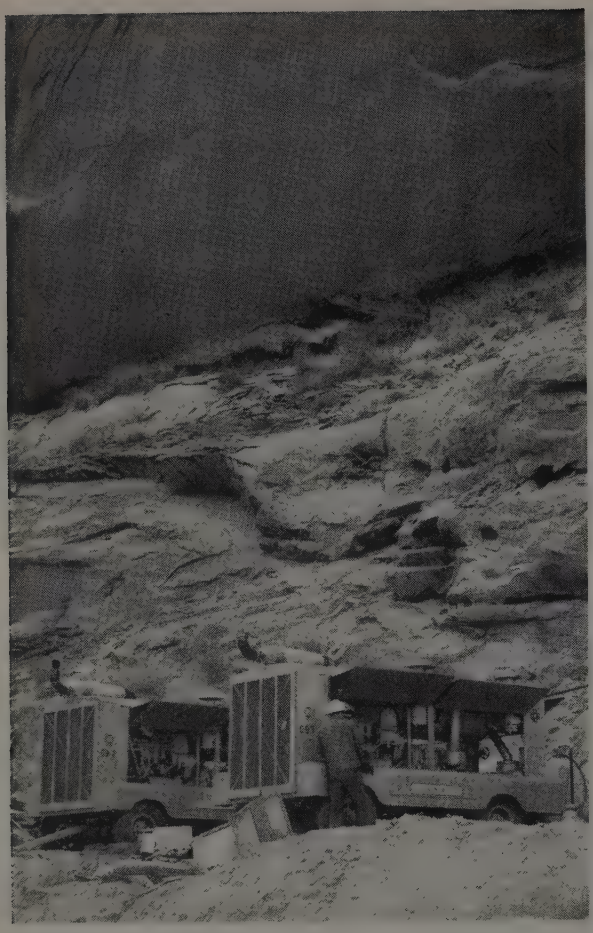
Consider the visibility of the operator in a complete cycle of the lifting arms; does he have full 360-deg. vision at all times?

Check the loader for safety of operator and load. Are guards needed to keep the operator from getting hurt? Compensation insurance will cost less with a safe tractor shovel.

Durability should be given consideration. Check the construction, design and the various components.

And finally, availability of repair parts and service is also an important item. Be sure you can get them not only from the dealer who sells you the equipment, but also make sure there is a factory parts depot within a reasonable distance from your operation.

If you are in the market for a tractor shovel, check the above questions against the specifications furnished by competitive manufacturers. Select the competitive loaders which seem best to meet these requirements, and ask for a **competitive demonstration.** Then judge for yourself which loader will do the most work for you at the lowest capital investment and maintenance expense.



Gardner-Denver RP900 rotary portables. G-D rotaries are available in five sizes, from 125 to 900 cfm.

Here's a hard-hitting percussion drill with a 5½" hamm the Gardner-Denver DH143 crawler-mounted drilling

Quality equipment costs less to use.

Gardner-Denver sinker drills come in a complete range of sizes. A size and model for any type of rock.

Break it up fast with a lightweight, heavy-duty Gardner-Denver paving breaker. Hard-hitting models available in three weight groups.

Other quality equip in the Gardner-Den line includes:

"Air Trac"®
Drifter Drills
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Trench Diggers
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Air Hoists
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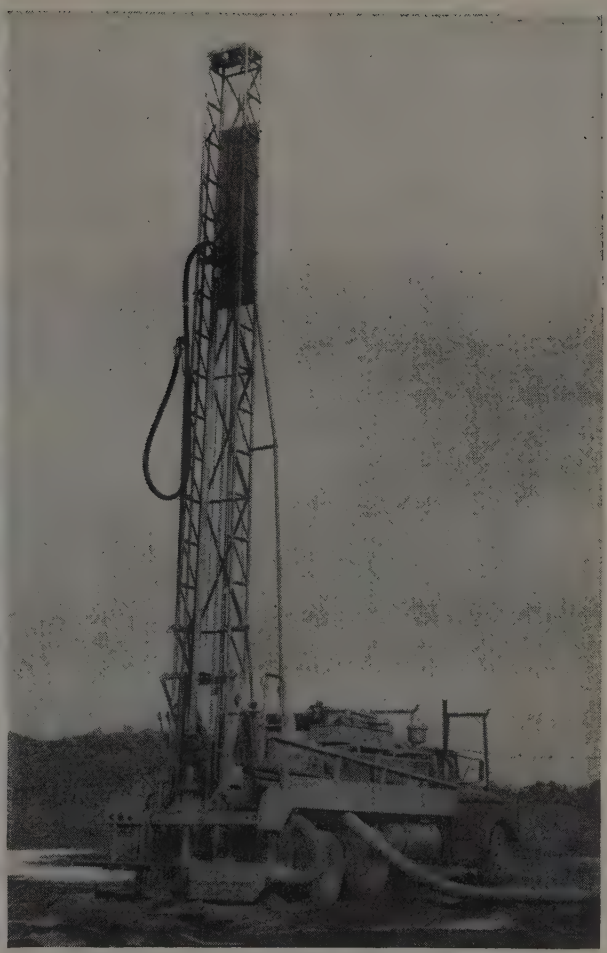
Carburized Drill Ste

is deluxe model "Air Trac"® provides complete wer positioning for all vertical, horizontal and flat er holes.



Drill big bore hole in a hurry with the Gardner-Denver "Mole-Dril"*. It follows the bit down the hole, delivers more foot-pounds of energy to the bit than any other drill of its size.

*T.M.

at's why heavy-rock contractors go GARDNER-DENVER

When it comes to moving mountains of rock, contractors rely on Gardner-Denver. These men know how Gardner-Denver equipment performs on the rough jobs. They know it's built to last longer . . . stands the gaff with minimum maintenance . . . gets the job finished faster at lowest cost. Drop in and see your nearest Gardner-Denver distributor soon.

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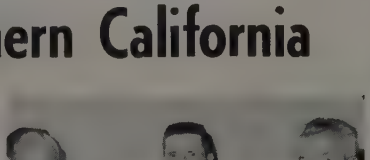
MASTER MECHANIC®

Construction master mechanics organize in Southern California

Under the name Equipment Maintenance Supervisors Association, the master mechanics of several important contractors founded their own group to study problems relating to the care and repair of modern equipment.

IN SEPTEMBER 1954, at an Associated General Contractors dinner, seven men with common interests were seated by chance at the same table. These men were all master mechanics for various contractors. The conversation turned to the subject of a need for an association of their own. An association that would provide informal social gatherings, stimulating talks and discussions on subjects relative to equipment maintenance, and an exchange of ideas and information that would serve to further their own profession.

On January 6, 1955 the first organizational meeting was held in Los Angeles by these seven men.



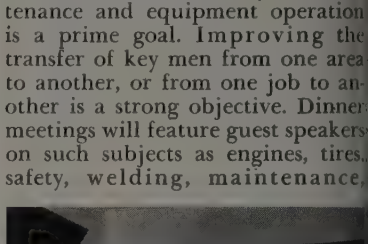
THESE are past presidents and founders of EMSA (l. to r.) Paul Fertig, Macco Corp.; Leo W. Ryser, Peter Kiewit Son's Co.; and David J. Moodie, J. A. Thompson & Son.

The association today numbers 110 members, with one chapter in San Diego and another starting in Oakland, Calif. According to Leo Ryser of Peter Kiewit Son's Co., plans are being made to expand the association throughout the Western states.

At its inception, the Equipment Maintenance Supervisors Association was faced with many problems inherent in a new organization. The minutes of the first meeting reflect the serious discussion involved. A constitution and by-laws had to be set up. Goals of the organization were discussed.

It was decided that membership would be open to any person engaged in the supervision, maintenance and repair of construction equipment. Any person indirectly engaged in these activities may be elected as an associate member. Qualification for regular or associate membership will be determined at the time of application. Some of the fields now represented include: research, oil, machinery, rubber and equipment distributors.

The association is dedicated to better informed shop foremen and master mechanics. Safety in maintenance and equipment operation is a prime goal. Improving the transfer of key men from one area to another, or from one job to another is a strong objective. Dinner meetings will feature guest speakers on such subjects as engines, tires, safety, welding, maintenance,



JOE JOHNSON (middle), earthmoving representative from Caterpillar Tractor was guest speaker at a recent meeting. He is shown talking to T. I. Gibson (l) president of EMSA, and T. W. Shepherd.

brakes, lubrication, etc. For information on membership in the association or for starting a chapter in your own local area contact or write to **T. I. Gibson,** President EMSA, P.O. Box 548, Alhambra, Calif.

More news about EMSA

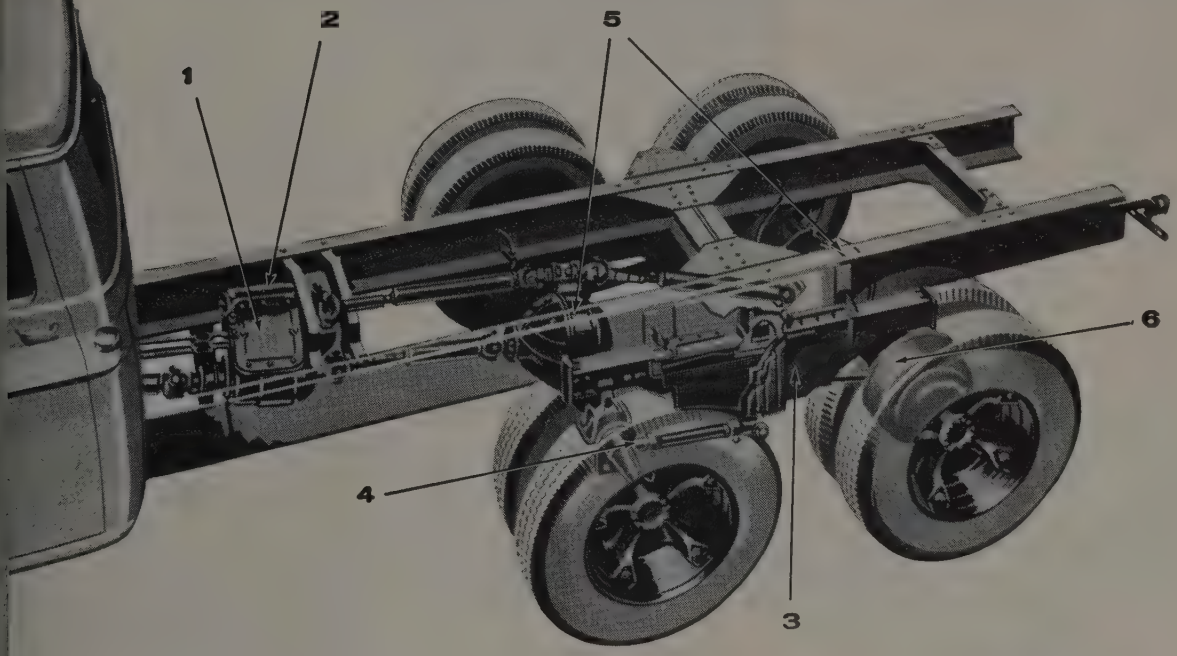
News of the association and its members will appear in issues of WESTERN CONSTRUCTION. Articles and items of interest to master mechanics and maintenance supervisors will appear in this section—Master Mechanic.

WESTERN CONSTRUCTION has always considered the master mechanic an important part of the industry. He represents a key function in any contracting organization and is equally important in the operations of construction equipment distributors. His position is growing in importance as our industry becomes more mechanized with machines that each year become more complex.

SEATED AROUND the table are new officers for 1958 (l. to r.): James H. Miller, Shepherd Machinery Co., treasurer; Ira S. Shull, Shull Tire Service, secretary; T. I. Gibson, Griffith Co., president; Sam Weatherbie, first vice president; Robert R. Moodie, J. A. Thompson & Son, second vice president.

CHEVROLET'S NEW TANDEMS

bring you special features for beating big jobs!



Because of their unique features, Chevrolet's new Triple-Torque tandems are more economical to operate. They're designed to bull their way through the tough spots with tremendous traction . . . with less stress and wear on parts!

Here are some of the design advantages that make Chevrolet tandems tops on big, tough jobs:

1. Chevrolet's exclusive TRIPLE-TORQUE DRIVE is provided by individual propeller shafts driven from a 3-speed auxiliary transmission right in the power divider.

2. Integral 3-SPEED POWER DIVIDER can be shifted instantly to single axle drive for economy or dual axle drive for full traction over rugged roads.

3. The Triple-Torque tandem's articulated WALKING BEAM assures owners of greater ground clearance . . . the utmost flexibility for operation on rough terrain.

4. "TRACKING" WHEELS, because of Chevrolet's rubber-bushed steering torque rods and walking beam ends, stay in alignment on straight roads, follow curves. Increase tire life, driver control.

5. Two built-for-work 15,000-LB.-CAPACITY AXLES with 7.20 to 1 ratios! Choice of standard 7,000-lb. or extra-cost 9,000-lb.-capacity front axle.

6. BIG TWIN-ACTION BRAKES are designed to last! Extra braking power with heavy-duty Hydrovac power brake. Full-Air or Air-Hydraulic brakes optional at extra cost.

Let your Chevrolet dealer show you these, and the many more exclusive tandem features designed to get your big jobs done quickly, dependably and economically! . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

CHEVROLET TASK·FORCE TRUCKS

. . . for more details, circle No. 68 on Reader Service Postcard

Mechanics Manuals

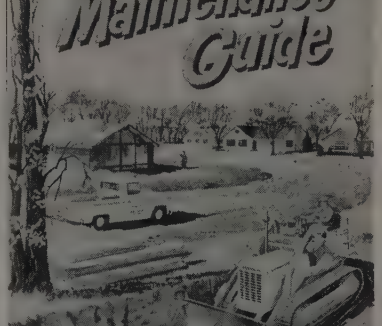
Maintenance guide available for Traxcavators

Preventive maintenance as well as good operating techniques pay off in top machine performance. A Maintenance Guide for Caterpillar No. 933, No. 955 and No. 977 Traxcavators, a new booklet, is intended to supplement the more detailed information found in Caterpillar "Operation and Maintenance Instructions."

The Maintenance Guide is filled with 106 full-color illustrations of useful service tips. Written in narrative form, the 30-page booklet explains how one Traxcavator owner improved machine performance and longevity through good maintenance practices. Cartoons are used to simplify explanations.

Fuel system care and fuel storage methods are discussed in detail. Recommendations are given for lubricants and hourly service intervals. Schematic drawings trace the flow of the lube oil throughout the diesel engine and the advantages of additive-type oils are pointed out.

Bucket linkage and track component lubrication are reviewed.



The booklet gives lubrication recommendations for both normal and severe operating conditions. Drawings show how to properly service air cleaners and pre-cleaners. Recommendations are given for care of the hydraulic system. The changing of filters, filling the hydraulic tank with fluid, care of hoses and operation instructions during cold weather are discussed. Step-by-step drawings point out proper method of starting the diesel engine of each Traxcavator model.

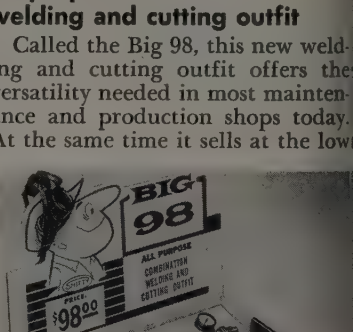
Cartoons tell how

Cartoons show how improperly adjusted tracks cause excessive wear to pins, bushings, sprockets and idlers. The amount of track tension, movement of levers, steering clutch and brake adjustment are discussed.

Other points considered are the oil clutch, cooling system, stopping the diesel, and rebuilding of worn parts. . . . *Circle No. 161*

All-purpose welding and cutting outfit

Called the Big 98, this new welding and cutting outfit offers the versatility needed in most maintenance and production shops today. At the same time it sells at the low



price of $98. This double duty outfit does multiple jobs such as welding, cutting, heating, brazing, soldering. With special tips, an operator can also do scarifying, rivet cutting and gouging. Welding range with three tips supplied is 1/32 in. to 3/8 in., but nine other tips increase welding capacity to 7/8 in. Cutting range is from 1/8 in. to 4 in. (with correct accessory tips). Ingenious features of the set include "slip-in" tips which can be changed in 6 sec. and an exclusive diaphragm which stops causes of back fire, eliminates seat burn-out, and reduces downtime. Smith Welding Equipment Corp. . . . *Circle No. 162*

Easy to get . . .

These manuals, and those described on page 140, can be easily secured by circling the indicated numbers on the Reader Service Card.

69,000 LBS. AT 13 FEET

Loading a 69,000 lb. major part of a big diesel engine is a routine job for this 40-ton Marion 43-M Truck Crane. Such features as power raising and lowering of the gantry and ballast make it easier to get ready for such a job. When the lift begins, such features as the torque converter and Marionair Control give the operator big advantages, whether the load is heavy or light. See your Marion Distributor.

You get **MORE** *with* **MARION**

ODAY'S MARIONS GIVE YOU MORE IN USTAINED, LOW-COST PERFORMANCE

Shovel Capacity	AVAILABLE AS . .			
	Hoe	Crawler Crane	Truck Crane	Special Crane
¾	Yes	Yes	Yes	——
1	Yes	Yes	Yes	——
1½	Yes	Yes	——	Yes
2½	Yes	Yes	——	Yes
3	——	Yes	——	——
4	——	Yes	——	——

MARION POWER SHOVEL CO. • MARION, OHI

A Division of Universal Marion Corporation

Send me information about MARION ..... yard shovels, ... ya
hoes and ..... ton cranes (☐ crawler mounted ☐ truck mounted
☐ Have a salesman call.

Name ..... Title .....

Company .....

Street .....

Manuals on Pavers and Finishers

A brief roundup of the best literature published by the manufacturers of concrete and bituminous pavers and finishers. All publications are available on request.

Barber-Greene

The manuals published by **Barber-Greene Co.** describing its many models and types of construction equipment are always among the very best available. An example is the company's latest Operation and Service manual on its widely known bituminous finisher. Although directed primarily toward users of the Model 879-B, the 60-page publication contains a wealth of information of interest to anyone involved in asphalt paving. The operating principles of the machine are explained in detail to further the operator's understanding not only of "what" is going on, but "why" and "how" as well. There is a valuable 4-page section on unsatisfactory conditions, why they occur and how to correct them. The lubrication section is particularly detailed and includes comparisons of products of more than 40 refineries, enabling operators all over the world to select the lubricants from those products obtainable locally. Complete unloading instructions as well as those covering initial operation are incorporated into the book. Throughout, cartoons point up various facts which the company feels need extra stressing. Large keyed photographs and drawings help illustrate the easy-to-read text. An excellent manual.

. . . Circle No. 163

Cedarapids

The Cedarapids bituminous paver built by **Iowa Mfg. Co.** is described in a fine 20-page manual. The most important feature of the paver is the principle of paving by use of an electric vibrating screed which irons the bituminous material. This reduces the possibility of tearing the mat or causing voids. Electrical controls for torches, screeds and heaters eliminate many wearing parts. One page of the manual lists 33 features of the machine. Large photographs, keyed diagrams and exploded views are used to illustrate the text. Complete specifications are given on the paver, the tractor unit, and the optional equipment.

. . . Circle No. 164

Pioneer

An 8-page booklet is available from **Pioneer Engineering** describing its bituminous paver. The Pioneer paver utilizes a vibratory screed which acts as a strike-off bar and pre-compactor to meter out the required amount of material and fill in the voids across the width of the mat being laid. A high speed vibratory compactor, heated across its full width, follows the screed to iron out the surface of the mat. The publication discusses 15 features of the equipment, including depth control, crown adjustment, uniformity of joints, operator comfort, maneuverability, attachments, and maintenance. Full specifications are given.

. . . Circle No. 165

Koehring

Koehring has published a 14-page brochure on its popular 34-E Twin Batch concrete paver. The 34-E is a double-compartment machine that can produce 86.7 batches an hour, on 60-sec. mixing time. Large photographs and drawings explain the three-point suspension mounting, the skip, the water measuring system, the air-operated transfer chute, the two compartment mixing drum and other features of the machine. Also available is an 8-page booklet describing the 16-E Twin Batch paver which is also a double drum paver, but mounted on rubber tires.

. . . Circle No. 166

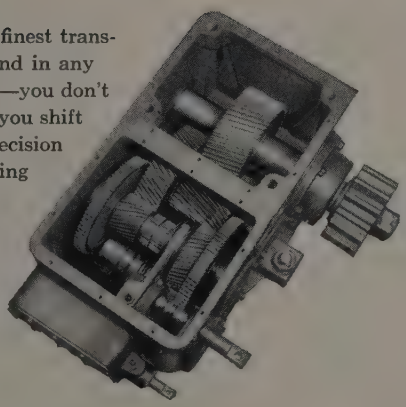
Blaw-Knox

One of the latest pieces of literature published by **Blaw-Knox Co.** describes the PF-90 bituminous paver-finisher. The brochure illustrates many of the various application possibilities of the machine. General specifications are provided on the hopper, screed, travel, traction transmission, conveyer auger control transmission, controls,

NEAT TRICK... if you can do it!

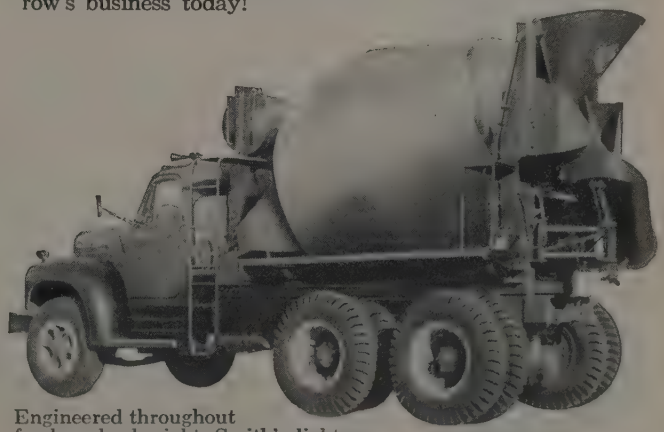
Ever try it when you were about this fellow's age . . . rubbing your stomach with one hand while moving the other up and down over your head? It's tough to control these *two different* hand motions *simultaneously*. It's tough too, keeping mixer drum speeds going *at just the right* speed for *inspection* type *mix*, while truck engine speeds vary with the travel demands put on it . . . but it's a neat trick SMITH *"can do"* for you! Multi speed transmissions in the mixer drive keep the drum rotating at just the right number of r.p.m.'s . . . whether you drive 30 m.p.h. or 50 m.p.h. . . . whether your length of haul is 5 miles or 20! . . . With a SMITH, you can depend on getting concrete mixed to the N.R.M.C.A., maximum-minimum, drum revolution limits.

Smith's "concrete factories on wheels" with multi speed transmission and patented T-shaped blades give absolute control over the mix . . . *double mix* all materials to produce high quality "inspection type" concrete needed on tomorrow's jobs. *And profit wise contractors* look to the Smith equipped ready mix operator to handle tomorrow's business today!



In this, the finest transmission found in any truck mixer—you don't shift gears, you shift clutches. Precision manufacturing includes tolerances to one ten-thousandth of an inch.

- **LOW MAINTENANCE COST**
  Manten steel drums and patented T shaped mixing blades.
- **BIGGER PAYLOADS**
  Better weight distribution puts more weight forward
- **CHOICE OF SIZES**
  4 yd. thru 9 yd. mixers—up to 12½ yd. agitators, PTO or separate engine drive



Engineered throughout for less deadweight, Smith's light weight makes bigger payloads possible.

Since 1900, the pioneer designer and foremost manufacturer of the world's finest mixers

THE T. L. SMITH COMPANY • Milwaukee 1, Wisconsin • Lufkin, Texas

affiliated with Essick Manufacturing Company, Los Angeles, California.

. . . for more details, circle No. 72 on Reader Service Postcard

power plant, master clutch, front wheels, tandem drive wheels and dimensions. In addition the bulletin contains information on the company's PF-45 blacktop paver, designed for small asphalt jobs. *. . . Circle No. 167*

Cmetco

Cmetco (Creative Metals Corp.) has published a group of bulletins and folders describing the Rola Paver, a truck-mounted paver for resurfacing and maintenance work. The unit works behind a rear dump truck and can handle twenty 10-ton trucks hourly. Models are available which are adjustable from 1-ft. to 9-ft. paving widths.. A full floating screed eliminates wheel and shoe marks and 90% of working. The literature includes reprints of two magazine articles which describe how the unit was used for street work in Merced and Anaheim, Calif. *. . . Circle No. 168*

Johnson

The Johnson float finisher, built by **Madsen Works, Baldwin-Lima-Hamilton Corp.,** is described in an 8-page brochure now available. Shown is a Planeometer graph made by a state highway department on a Western job which shows that a pavement finished by the Johnson machine had a variation of less than .05 in. per 10 ft. The machine consists of a rigid steel chassis equipped with wheels and an adjustable subframe on which a pattern of hardwood floats is suspended. An 8-in. roller runs the full width of the machine. Photographs and exploded views clearly describe operating principles. *. . . Circle No. 169*

Littleford

A 4-page folder is available from **Littleford** describing the True-Lay paver-spreader, a machine which is attached to the rear of a dump truck. The patented design places the weight of the material and unit on a compaction screed so that the roller can get on the surface quicker. Pneumatic tires float over the surface, preventing side shifting of unit. The machine will lay a mat from 4 ft. to 10 ft. in width up to 6 in. in depth. The

machine is described with photographs and drawings and full specifications are given.

. . . Circle No. 170

Clary

Clary Mfg. Co. has two 4-page folders available, one describing its self-propelled vibrating roller screed for strike-off and compaction of concrete slabs, and the other describing a self-propelled concrete finisher. The self-propelled vibrating roller screed can strike-off over 9,000 sq. ft. of concrete per hr. and prepare it for final finishing. Rollers come in sizes from 10 ft. to 27½ ft. They travel both forward and in reverse, requiring no special rails, simply riding on top of the headers. The unit is described and illustrated in detail.

The Clary finisher was designed to meet runway specifications. The operator can control the rate of roller speed to accommodate the harshness of the mix being used. The amount of variation in the strike-off is ¼ the variation in the form. *. . . Circle No. 171*

Stow

For bridge decks, short sections of highway, and floors is a small vibrating screed described in a 4-page folder by **Stow Mfg. Co.** For contractors who want to build their own beam, Stow furnishes a 2½-hp. vibrating unit, brackets for engine mounting, a pair of end rollers, handles, and bolts. The folder is fully illustrated and contains complete data on exactly how to use the Stow screed on various types of paving work. Information on how to order the unit is also given.

. . . Circle No. 172

Flex-Plane

Flex-Plane (**Flexible Road Joint Machine Co.**) has two 8-page manuals available describing two of its many concrete finishing machines. The float-finisher combines two Detroit frames into one unit to provide the operations of a transverse finisher and a longitudinal straight edge. Elevations of the rear screed and float are determined according to the 16-ft. straight edge, not by the forms upon which the machine is traveling. The folder describing this machine is fully illustrated and includes specifications. The other folder describes the Flex-Plane self-widening finisher which is ideal for variable pavement widths. As pavement width changes the frame of the machine widens, not the wheels. Triple-lap frame construction provides rigidity even when completely expanded. Movement of a lever converts the machine into its own trailer which can be attached to any truck. Job photographs show the machine at work.

. . . Circle No. 173

Burch

The Burch Corp. has available a number of bulletins describing its products, which include mix-in-place pavers and resurfacers, road wideners, bituminous spreaders, and maintainers. The bulletins are illustrated, include specifications, and are brief and to the point.

. . . Circle No. 174

Vibro-Plus

A 2-page bulletin describes a brand new machine being introduced by **Vibro-Plus Products, Inc.** The machine is a hand-propelled paver for small construction jobs. The paving machine is moved by means of two big hand wheels, one on each side of the machine, and is equipped with two working members, a cross movement screed for leveling the concrete and a vibrating screed for compaction. The machine works between widths of 10 and 16 ft. A 6-hp. engine drives the screeds. Specifications are included in the bulletin.

. . . Circle No. 175

• • •

Western Construction

A 12-page reprint of two articles which appeared in WESTERN CONSTRUCTION are available while a limited supply lasts. The author is Vaughn Marker, of The Pacific Coast Division of The Asphalt Institute. The article is entitled "Asphalt Paving, Inspection, Control and Workmanship". The article is a very practical and valuable description of asphalt paving, the do's and don'ts, the tricks of the trade. Especially valuable is a discussion of what to watch out for and how to properly operate several of the major types of pavers. An excellent treatment of the field problems of asphalt paving from an impartial viewpoint.

. . . Circle No. 176

NEW LITERATURE

Soil-cement data

Pettibone Wood Manufacturing Co. is offering a new book, titled "The ABC's of Soil-Cement Stabilization." Complete in every detail, this colorful 36-page work is a fully illustrated, easy-to-read treatment of every practical aspect of soil cement stabilization, as related to street, highway, super-highway, parking lot and airport construction. What is soil cement? Where is it used? How is it best processed? What are the best operational procedures? These are some of the questions answered and illustrated with helpful charts and typical job examples. *. . . Circle No. 177*

The heart of the plant

Emphasis is placed on the importance of the screening section of sand, gravel, and crushed rocks plants in two **El-Jay Manufacturing Co.** booklets—"Screening at its Best," and "Vibramatic, the Automatic Self-balancing Screen." Pictures of El-Jays on the job, photographs, and diagrams give a rounded account of the company's products. Also presented is the El-Jay Gyrajaw, a dual opening crusher, and the gravel washer.

. . . Circle No. 178

Curing compounds and air entraining agent

Two products are discussed in a bulletin recently produced by the **Presstite - Keystone Engineering Products Co.** The first product, the Kapco Concrete Curing Compound, is described as a membrane-type liquid designed to produce the proper hydration of the cement in newly-laid concrete surfaces. How it can be spray-applied and how it is

Heltzel Flex-Plan

UNITIZED BATCHING PLANTS to further speed set-up and dismantling time . . . to give you even greater on-the-job flexibility. The new Heltzel Unitized Plant—like these on a G. Toccalino & Son job in Detroit—is designed in three easy-to-handle sections that go together in minutes. This installation is set up as push-button drive-through for extra fast service. Batcher and scale unit is integral part of center section . . . a real time-saving innovation. (Note new Heltzel E-4 twin-batcher cement plant.)

2202

THE HELTZEL STEEL FORM AND IRON

PLANE COMBINATION FINISHER-FLOAT does two jobs in one, re- ing crew time to an absolute minimum. The combining hese two jobs is a natural—results in a better finish in er time. This new machine was thoroughly tested on ral jobs last season. Contractors report 4000 feet of oot pavement was floated and finished in a normal day but two or three hand finishers required. Get the facts his profit maker before submitting too many quotations.

ngineering

rings you unitized batching, improved rms and a new way to finish concrete

Modern highway design demands top efficiency in highway construction machinery. Portable . . . versatile . . . automatic . . . *fast.*

That's why Heltzel Flex-Plane Engineering works to give you the most modern road-building equipment obtainable. Up-to-date engineering, for example, has produced a definite contractors' preference for Flex-Plane over all other makes. This preference is based, of course, on proved performance.

Find out now what Heltzel Flex-Plane Engineering can mean to you — call on actual users of Heltzel and Flex-Plane equipment, and prove to your own satisfaction that this is the *modern* equipment for modern highway construction.

HELTZEL DUAL DUTY FORMS, such as those shown in use on the Plattsburg SAC base, have been redesigned to assure fast setting and stripping with maximum strength-weight ratio. Sizes available to exactly suit your job requirements.

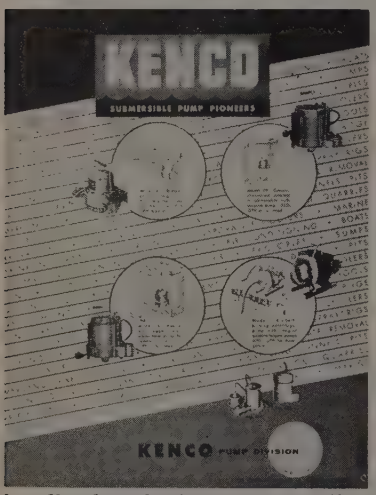
MPANY • Warren, Ohio

. . . for more details, circle No. 74 on Reader Service Postcard

packaged are two of the subjects covered by the literature. The other product, Kapco Air Entraining Agent, is identified as a wetting agent with excellent dispersement properties useful to the easier placement and workability of concrete. . . . *Circle No. 179*

Kenco pump catalog

Kenco's complete line of domestic and industrial submersible pumps with illustrated applications of their use are featured in a new



handbook. The 8-page catalog lists physical dimensions, pumping capacities, electrical data, and specific features for each pump as well as detailed engineer's specifications forms as handy guides for specifying Kenco pumps. In addition, the company's exchange pump plan and service policy are outlined together with a list of service centers where parts and service are available. **Kenco Pump Division.**
. . . *Circle No. 180*

Aggregate drier maintenance

Operators of black top plants realize the severe conditions imposed on the combustion chamber of their aggregate driers. **Saverite Engineering Co.** has recently published a complete bulletin on the maintenance of these units which describes how through the use of special refractory coatings, high temperature patching mortars and preventive maintenance, appreciable economies can be enforced. Factors such as flame impingement, thermal shock, proper refractory bricklaying and combustion control are dealt with. . . . *Circle No. 181*

For safety on the job

The **National Safety Council** has two new publications available for industry, one for employees, the other for foremen. The publication, "Rules for Safety" and Book 8 in a series of "Five Minute Safety Talks for Foremen", are designed to promote safety in industry. Rules for Safety, the Council says, is the biggest and best safety rules booklet ever compiled—40 pages covering accident prevention do's and dont's, how's and why's. The booklet gives safety rules for using power tools, stacking material and lifting and carrying.

The book of safety talks for foremen is a compilation of talks that appeared in earlier books in the series. The 52 talks in Book 8 provide full and balanced coverage of all the major types of occupational accidents. Talks in Book 8 range from Why We Have a Safety Program to Bumping into People and Things. . . . *Circle No. 182*

Hose and conveyor belting for construction jobs

"Acme Rubber Products For Every Construction Job," an eight-page catalog, is available from Acme. It describes and illustrates 26 types of Acme hose and 4 types of conveyor belting. For each type, information is given on the products: (1) application, (2) composition, and (3) lengths and/or sizes available. Also given are complete tabular listings of diameters, working pressures, weights and plies. Copies are available without cost from **Acme Rubber Manufacturing Co. Div.**, Acme-Hamilton Manufacturing Corp. . . . *Circle No. 183*

Leschen crushing bulletin

Leschen Wire Rope Division, H. K. Porter Co., Inc., announces an illustrated 4-page folder on the subject of crushing as a common hazard to wire rope. All of the major causes of crushing are described, including overloading, quick starts, wrong sheave sizes, and others as well as actual mechanical crushing. The folder provides many suggestions for recognizing this source of wire rope troubles and for lessening or eliminating them altogether.
. . . *Circle No. 184*

Culvert handbook

The complete line of Wheeling's galvanized corrugated metal culvert pipe and accessories is graphically described in a comprehensive 28-page Culvert handbook, recently released by the **Wheeling Corrugating Co.** The line is detailed through the medium of tables, graphs and technical illustrations. Special emphasis is stressed for those applications requiring the use of pipe arch, perforated, bituminous and nestable type metal culverts. Fittings and accessories are also described. . . . *Circle No. 185*

Nothing like it on tracks...

in design or PERFORMANCE

12 PAYLOADER®

rs of Hough development and testing bring you this model 12 YLOADER" that is years ahead of the field. It's the first built-as-a- tractor-shovel, completely designed for shovel work instead of actor attachment. It outperforms much larger units and is a er's dream in ease-of-operation, easy riding, visibility and safety.

LANCE Engine-at-rear is the basic difference. It spreads the ght of the machine and load over the entire track lengths instead oncentrating it on the front idlers. Result — more traction for ging, more stability for faster carrying, smoother riding, less k maintenance . . . PLUS the ability to work in soft spots re others would bog down.

ED Power-shift transmission and power-steer permit instant he-go shifting and steering that is fast and almost effortless. re's no pulling and pushing, no foot brakes. There is instant onse and speeds up to 10 mph forward *and* reverse.

IBILITY Driver is comfortably seated up front where he can what his bucket is doing and where he is going. He is also ed the bouncing action of conventional rear-seated locations.

For tractor-shovel performance and ease of handling like you've r seen before, ask your Hough Distributor about the model 12 YLOADER". Ask him about Hough Purchase and Lease Plans too.

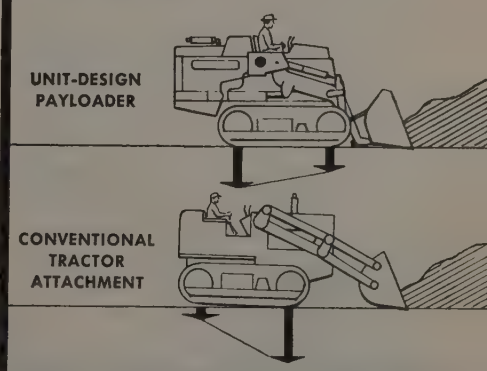
Modern Materials Handling Equipment

THE FRANK G. HOUGH CO.

LIBERTYVILLE, ILLINOIS

SUBSIDIARY, INTERNATIONAL HARVESTER COMPANY

Rear engine mounting distributes weigh over entire track length . . . gives you mor traction and stability for digging, carryin and dumping.



THE FRANK G. HOUGH CO.

707 Sunnyside Ave., Libertyville, Ill.

Please send more information on the outstanding 1 cu. yd. model 12 "PAYLOADER".

Name

Title

Company

Street

Ingersoll-Rand wagon drill flier

Ingersoll-Rand's new flier describes the company's three models of wagon drills—the FM-4 Wagon Drill, the FM-4 Rotary and the lightweight JHM Wagonjack mounting. The manufacturer describes the FM-4 Wagon Drill as the workhorse of the three. It is a percussion drill designed for tough, sustained work on road building, general construction, foundation and quarry jobs.

The FM-4 Rotary is used for fast drilling with fishtail bits in soft formations where percussion drilling isn't practical. For locations where weight is a problem the lighter JHM "Wagonjack" is recommended. All three drills can work in almost any position and are one-man operated. The flier also lists drill accessories.

. . . Circle No. 186

Compaction questions answered

To help fill in the gaps in basic knowledge about compaction, Bros Inc. have published a 52-page booklet on the subject of modern-day compaction methods. Included among the chapters, all of which are written by experts in the field, are papers and reprints on rubber-tire rolling, the compaction of asphalt mixes, practical aspects of vibratory compaction, and many others, including a glossary of commonly used compaction terms. Well illustrated with numerous photographs and tables.

. . . Circle No. 187

PM's new line of generators and flashers

Pacific Mercury has completed and made available a 28-page catalog detailing specifications, service, and maintenance data on the company's new lines of generator and flasher lights. Generator models, including a.c., d.c., and diesel-powered electric plants, occupy five sections of the catalog. Information on how to select a generator for specific applications is included, along with accessory equipment for both generators and flasher lights. Sales policies, distributor and sales warranty data are also covered.

. . . Circle No. 188

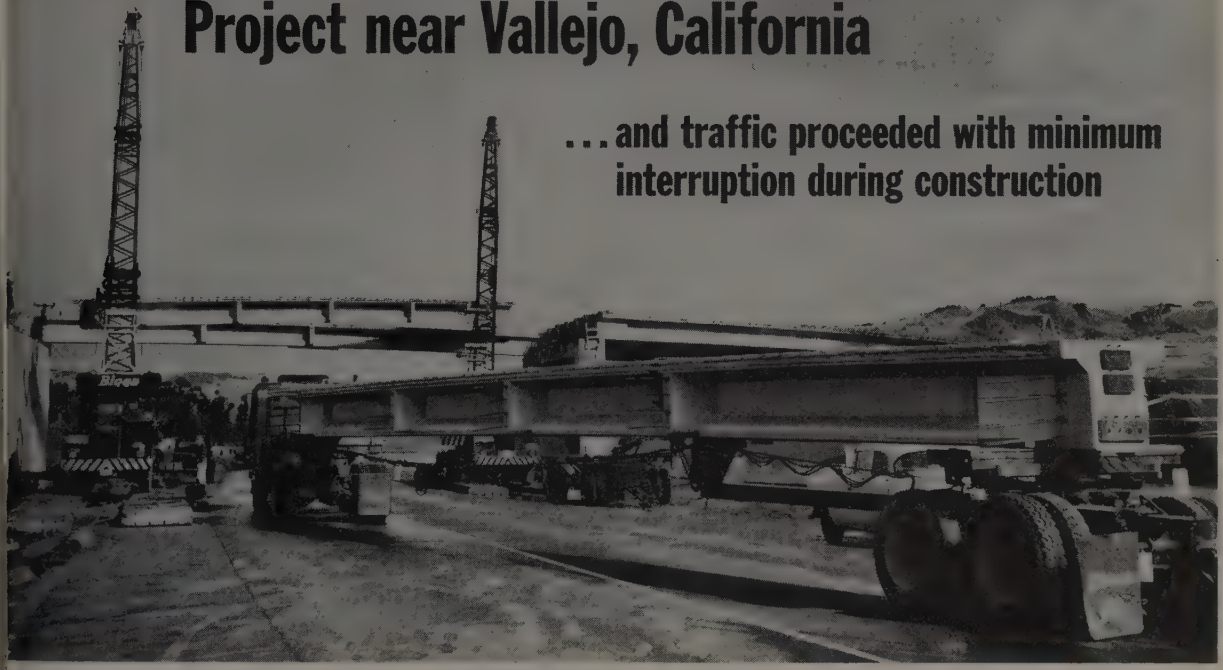
Portable prestressing bed

The Heltzel Steel Form and Iron Co.'s latest bulletin on prestressed concrete is now available on request. The bulletin features the company's latest idea for a packaged and portable prestressed concrete plant, complete with all component parts — double tee forms, jacking unit, strand vice, jacking plate, reel stand, and steam curing boiler. Instead of a costly jacking arrangement and casting bed, which is more or less permanent, this simple portable setup is offered which eliminates expensive abutments because jacking is done directly against the sturdy form. It is to be noted that pulling rods and frames are eliminated with this new system, and that the bed can expand and contract and still maintain alignment. Easy access is provided for inserts and depressing hold-downs.

. . . Circle No. 189

BASALT provides 227 plant cast, prestressed concrete "T" Girders for the 7 structures on the U. S. Highway 40 Freeway Project near Vallejo, California

...and traffic proceeded with minimum interruption during construction



BASALT plant cast, prestressed concrete "T" girders were furnished for seven highway structures on the U. S. Highway 40 Freeway Project. Ranging in length from 43 to 83 feet, these girders were cast, cured and stored at the Basalt Plant in Napa, California and were delivered to the job as needed for quick, immediate erection. Construction of the structures is being completed with maximum speed — and with minimum interruption to traffic.

EFFICIENCY—RIGHT!

This is efficiency born of engineering and technical skill, precision manufacturing methods, unlimited plant area and excellent delivery facilities. Depending upon the location of your job, Basalt delivers by highway, rail or water — whichever is most feasible and economical. For complete information on Basalt structural concrete components and Basalt's ability to deliver on schedule, write or phone BASALT ROCK COMPANY, INC., Structural Concrete Products Division, Napa, California. Telephone BAldwin 6-7411.

GENERAL CONTRACTORS:
Syar and Harms and Erickson, Phillips and Weisberg

ERECTION:
Bigge Rigging and Drayage Company

DESIGN:
Division of Highways, Department of Public Works, State of Calif.

Basalt
ROCK CO., INC.

BASALT DELIVERS ON SCHEDULE... by highway, rail or water

On a siding near the Basalt Napa Plant, plant cast, prestressed concrete "T" Girders are loaded and ready for rail delivery.

... for more details, circle No. 78 on Reader Service Postcard

Engineering data on new crane hook blocks

A bulletin describing the complete line of Max-Lift crane hook blocks has been released by **The Upson-Walton Co.** This bulletin includes the newest development to

the Max-Lift line, a 35-ton block. Only 39¾ in. in over-all height, this new crane hook block increases lifting height of cranes when compared with conventional crane blocks. A low center of gravity also eliminates toppling, making for safer and easier handling. Complete specifications are given. Engineering data includes number of sheaves, sheave diameter, rope diameter, type and number of bearings; weights and dimensions for each size from 5 to 35-ton capacity.

. . . Circle No. 190

Foundation pipe piles

Comprehensive information on Foster's Taylor Forge spiral-weld foundation pipe piles is presented in a 24-page booklet offered by **L. B. Foster Co.** In addition to detailed specifications, the photo-illustrated booklet describes a number of pipe-pile installations and includes typical driving logs. A special feature of the new booklet is a table giving complete specifications of all popular pile hammers, including new diesels. It lists the make, type, style, energy, blows per minute, weights and dimensions. *. . . Circle No. 191*

IH TD-6 booklet

International TD-6 Diesel Crawler now delivering 42.3-drawbar hp., is described in every detail in a 16-page booklet just released by **International Harvester Co.** Smallest of the International diesel crawler line, the popular TD-6 is more versatile than ever with a number of new attachments and accessories.

. . . Circle No. 192

78 pages of forming information

Three information-packed forming booklets are now available from **Richmond Screw Anchor Co., Inc.** "How to Plan Forms in Detail" offers 15 pages of tables, diagrams, and instructions for the form builder. The 17-page "Snap-Ty Form Book" is a handbook of panel designs for the building of forms for concrete wall construction. The third bulletin is the company's 46-page 1958 Handbook of engineered tying devices, anchorages and accessories for concrete construction. Booklets are well-illustrated and punched for binder insertion.

. . . Circle No. 193

53-page handbook lists truck size restrictions

The 1958 edition of "Truck and Trailer Size and Weight Restrictions," a pocket-size booklet compiling the regulating laws of all 48 states and the District of Columbia, has been prepared by the research department of **The Four Wheel Drive Auto Co.** The 53-page handbook has been prepared with the assistance of state officials who have checked and approved the regulations and interpretations relative to their individual states. Data presented in most cases are likely to hold until mid-1959.

. . . Circle No. 194

Hopto excavator booklet

A 12-page illustrated catalog has been issued by the **Badger Division of The Warner & Swasey Co.** Designed to provide distributors with a comprehensive reference piece on the full Hopto line of hydraulic excavators, this catalog will be of considerable interest to contractors and individuals with excavating problems of any size. Illustrations show graphically the working ranges and specifications on all five Hopto models that range in size from ⅛ to ½-yd. capacity and from complete truck-mounted excavators to backhoes for mounting on tractors. *. . . Circle No. 19*

Parsons offers bulletin on compact 77 model

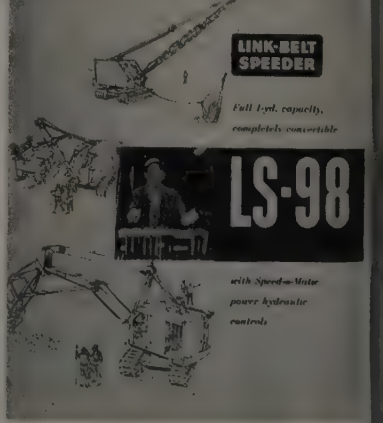
Big trenching machine features incorporated in a low cost, exceedingly compact unit, are the subject of a 4-page bulletin on the recently introduced **Parsons Co.'s** 7

Trenchliner. Photos show how the narrow width of 3 ft. 10 in. and height of 5 ft. 8 in. permit the new ladder-type trencher to operate in close quarter areas. A few of the 77's features explained in the bulletin include the crumber used to assure clean trench bottoms, telescopic boom and berm scraper.

. . . Circle No. 19

Link-Belt catalog on LS-98 shovel-cranes

A 24-page catalog covering the 1-yd. LS-98 shovel, crane, dragline and hoe has been released by **Link-**



Lima Austin-Western 111 Crushing and Screening Plant, owned by Ronald Weaver, Dansville, Mich. High-grade specification material is being produced at an average rate of 1000 cu. yd. per 9 hr. shift.

"Lima Austin-Western will outlast and outproduce"

Says Ronald Weaver

Ronald Weaver, Dansville, Mich., has owned and operated a Lima Austin-Western 111 Crushing and Screening Plant since January, 1953. With his 4-man crew, he works all year 'round, producing specification material meeting county and State requirements.

Mr. Weaver says: "I have owned and operated other plants, and I am convinced that over a period of time a Lima Austin-Western will outlast and outproduce other comparable machines. I depend on this plant to show a reasonable profit, and it has produced all that can be expected.

"It is truly a portable machine. Not long ago I moved the 111, power plant, feeder, two dump trucks, dragline, bulldozer and other miscellaneous equipment 20 miles. The time involved in dismantling the equipment, loading, setting up, and resuming operation was only 3 hours.

"The quality of the equipment is shown by the fact that it has never required a major overhaul since it went into operation 5 years ago. But the most obvious reason for buying and using Lima-Austin-Western is the fine relationship and cooperation between not only the dealer and the operator, but more important, the manufacturer, the dealer and the operator."

Get the high-tonnage, low-cost Lima Austin-Western story from your nearby distributor . . . or write direct.

LIMA AUSTIN-WESTERN Crushing, Screening and Washing Equipment

BALDWIN · LIMA · HAMILTON

CONSTRUCTION EQUIPMENT DIVISION • LIMA, OHIO

5829

Edward R Bacon Company, San Francisco, California; **Columbia Equipment Company,** Portland, Oregon, Seattle, Washington, Spokane, Washington; **N. C. Ribble Company,** Albuquerque, New Mexico; **Smith Booth Usher Company,** Los Angeles, California; **Western Machinery Company,** Salt Lake City, Utah; **Western Machinery Company,** San Francisco, California; **Keremi Tractor & Equipment Company,** Cheyenne, Wyoming, Casper, Wyoming; **Hall-Perry Machinery Company,** Billings, Montana, Butte, Montana, Great Falls, Montana; Missoula, Montana; **Engineering Sales Service, Inc.,** Boise, Idaho; **Macdonald Equipment Company,** Denver, Colorado; **Graid Equipment Company,** Reno, Nevada; **Western Machinery Company,** Phoenix, Arizona, Tucson, Arizona.

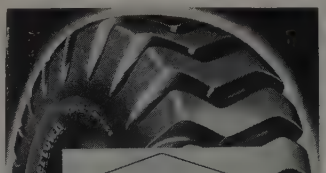
. . . for more details, circle No. 79 on Reader Service Postcard

Belt Speeder Corp. Large photographs and descriptive copy depict the LS-98 in detail from the crawler tracks to the upper machinery and the various front end attachments. Standard and optional features, such as power hydraulic controls, usable horsepower, independent swing and travel, are described.

. . . *Circle No. 197*

52-page catalog on off-road tires

How equipment operators and owners can get maximum service out of off-the-road tires is described in a new 52-page handbook published by **The B. F. Goodrich Tire Co.** Four factors in off-the-road tires, all within control



of the equipment operator or owner, are discussed. The factors are: load, inflation, operating conditions and tire care. Also described is the Goodrich complete line of off-the-road tires, and data is given on load and inflation, weights and measures, tire specifications for 1957 motor graders, and self-propelled scrapers. Valve and rim information is included. . . . *Circle No. 198*

Acme for ideas

"Reinforcing Concrete Forms with Steel Strapping" is the title of an 8-page foldout from **Acme Steel Co.** Included are diagrams of form construction and recommendations for strap placement, a strapping data chart, many good illustrations, and an illustrated list of tools and equipment for use in strapping.

. . . *Circle No. 199*

Literature Briefs

DIAPHRAGM PUMP — Specifications for and plenty of on-the-job photos of the Layton pump make up a 4-page leaflet published by **Layton Co., Inc.** . . . *Circle No. 200*

MATERIALS REDUCER — Processing material on the roadbed with **Bros Inc.'s** Preparator is discussed in a 6-page foldout. . . . *Circle No. 201*

DISTRIBUTOR—The new model Thriftline bituminous distributor introduced by **Municipal Supply Co.** is described in a 2-color catalog. . . . *Circle No. 202*

PORTABLE CONVEYOR — Universal Engineering Corp.'s powerlift portable conveyor is detailed in an illustrated 4-page folder. . . . *Circle No. 203*

POLYETHYLENE FILM — Illustrated data sheet describes Plypane, a polyethylene covering for equipment and supplies. **Glas-Kraft, Inc.** . . . *Circle No. 204*

KAISER ALUMINUM—Industrial building products by **Kaiser Aluminum** are presented in a 16-page brochure. . . . *Circle No. 205*

DIESEL TRACTOR — Operating advantages and engineering features of the HD-6 diesel-powered crawler tractor are described in a 14-page catalog by **Allis-Chalmers Manufacturing Co.** . . *Circle No. 206*

PAVER—General specifications on **Blaw-Knox Co.'s** new bituminous paver finisher are given in a 2-color illustrated bulletin. . . . *Circle No. 207*

TRUCK SELECTION — To assist you in choosing the proper truck for your needs, **Ford Motor Co.** has prepared a 16-page booklet on their expanded line of 1958 construction trucks. . . . *Circle No. 208*

POST TENSIONING — A 14-page brochure covers history and development of prestressed concrete and explains Prescon system of post-tensioning. **The Prescon Corp.** . . . *Circle No. 209*

CAT ATTACHMENTS — Attachments for Cat crawlers, wheel units, Traxcavators and motor graders are covered in **Caterpillar Tractor Co.'s** new brochure. . . *Circle No. 210*

TRACTOR SCRAPERS — Three Michigan models are detailed in a nicely illustrated booklet. **Clark Equipment Co.** . . . *Circle No. 211*

HERE'S WHY

Expressway Builders PREFER Armco Foundation Pipe

Get Exactly the Lengths You Need

INDIANA TOLL ROAD

When you know lengths in advance, you can order exactly what you need. This means reduced splicing in the field; fewer pieces to haul and handle. Lengths of Armco Pipe Piling are limited only by what can be shipped conveniently. Photo shows length of Armco Piling being driven for Indiana Toll Road bridge.

Easy to Inspect After Driving

CONGRESS STREET EXPRESSWAY

Because Armco Pipe Piling is cast after driving, you can see where it has been driven; check it for watertightness and alignment with a drop light or mirror. Pictured is one of the many structures on Chicago's Congress Street Expressway that rest on Armco Foundations.

Variety of Products for Different Conditions

PENNSYLVANIA TURNPIKE

Armco HEL-COR® Pile Shells were driven for the abutments on this bridge for the N. E. Extension of the Pennsylvania Turnpike. Armco Pile Shells are a lightweight, helically corrugated shell that is driven with a mandrel. In some cases they are used as the top portion of composite piles in combination with Armco Pipe Piles. In addition, there are large diameter, heavy walled Armco Caissons to round out a wide selection of Armco Foundation Pipe to meet your varying design and construction conditions.

Write for Dimensions and Physical Data on Armco Foundation Pipe

ARMCO DRAINAGE & METAL PRODUCTS, INC.

CALCO AND NORTH PACIFIC DIVISIONS

Berkeley • Los Angeles

Portland • Seattle • Spokane

ARMCO®

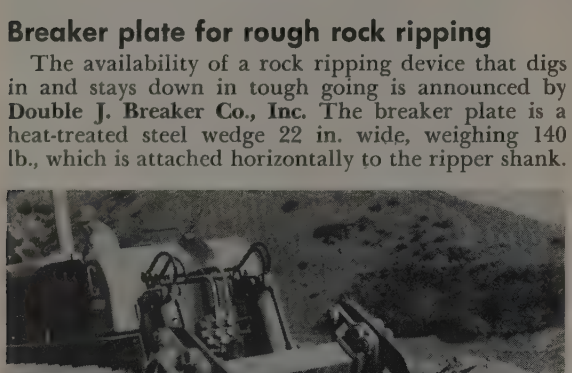
. . . for more details, circle No. 81 on Reader Service Postcard

NEW EQUIPMENT

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

Breaker plate for rough rock ripping

The availability of a rock ripping device that digs in and stays down in tough going is announced by **Double J. Breaker Co., Inc.** The breaker plate is a heat-treated steel wedge 22 in. wide, weighing 140 lb., which is attached horizontally to the ripper shank.



The plate's uplifting action extends the fracturing caused by the tooth point and enables the point to move through rock more easily. The angle of the plate is controlled by an adjustable shoe mounted by means of a standard bolt and nut. The entire tool weighs 950 lb., is of heat-treated billet steel, and attaches to the tractor's ripper bar. Models are available for nearly all heavy duty tractor-mounted rippers. Specifications and application data are available from the manufacturer.

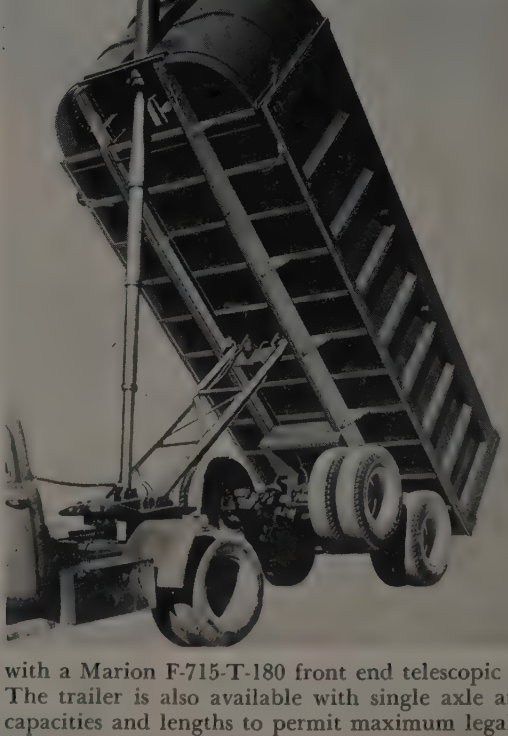
On page 29 of the April 1957 issue of WESTERN CONSTRUCTION, is a description of the device as it was being used on the Carquinez project in Northern California. *. . . Circle No. 212*

Cable changes made fast and simple

The Double Wedge Load Socket now provides a quick and easy method of removing the load cable from the socket. Its unique design virtually eliminates all of the downtime and trouble formerly experienced in removing cable from the load socket. With this new socket, one man, equipped with a hammer or small sledge, can easily release the cable in a few minutes' time. The new design employs two wedges instead of the single wedge type now in common use. The bottom and smaller wedge is not removable, but slides forward and back on a pin and slot arrangement. The top wedge is completely removable and is large enough so that the cable can be wrapped around without difficulty. With the cable in place and pull applied, the two wedges slide forward and securely hold the cable in place. To release, it is only necessary to give either wedge a sharp tap with a hammer. This slides the bottom wedge back in its slot, releasing the pressure, and the top wedge can then be lifted out and the cable removed. **Page Engineering Co.** *. . . Circle No. 213*

Frameless dump hauls more payload

Latest addition to the line of dump bodies and hydraulic hoists designed and manufactured by **Marion Metal Products Co.** is a new frameless dump trailer, which provides a lighter weight unit than with conventional type trailer dump outfits. The FDT-270 is a 27-cu. yd. capacity, 24-ft. tandem axle body raised



with a Marion F-715-T-180 front end telescopic hoist. The trailer is also available with single axle and in capacities and lengths to permit maximum legal payloads. The weight savings is in the absence of a con-

"These S-12's are just right for my jobs on secondary and two-lane work."

SAYS CONTRACTOR FREEMAN HUNTLEY OF ROCK SPRINGS, WYOMING

• On a farm-to-market road job . . .

With hauls of 2200′ maximum and 950′ average, Huntley's three S-12 "Eucs" put 64,000 bank yards in place in only 10 working days on a two shift basis—a total of 17 hours per day. Each Euclid averaged 125 yds. per hour during this period.

Pat Burns, the General Superintendent for Huntley Construction Company, reports "On this job with all of the wet irrigation ditches and borrow pits to pull through, I have never seen a machine that will pull through and compare under these conditions with the S-12".

It takes outstanding performance to prompt such praise for a piece of equipment, but contractors on all kinds of jobs have found that they can get more work done at lower cost with the Model S-12 Euclid Scraper. It gets around like a 7-yard rig and with 218 h.p. and 17 yd. heaped capacity it piles up the yardage.

Why not get an S-12 production-cost estimate from your Euclid dealer and compare it with the figures on your present scrapers? It won't cost you a penny and may show a way to improve your profit picture—one of the reasons why ***Euclids are your best investment.***

EUCLID DIVISION GENERAL MOTORS CORPORATION, Cleveland 17, Ohio

GM GENERAL MOTORS EUCLID

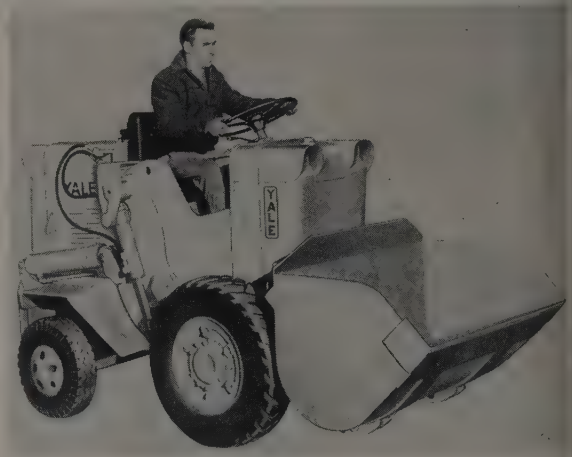
EUCLID EQUIPMENT

FOR MOVING EARTH, ROCK, COAL AND ORE

ventional type trailer frame under the dump body. This permits the hauling of greater payloads than with the conventional type trailers, depending upon the laws of the various states. In many states, payloads from 12 to 15 tons with single axle and from 12 to 22 with tandem axle, are permissible with this type unit. The principle of operation is quite similar to that of the cable dump trailer, except the body in this case is raised hydraulically. Two control arms connect the upper fifth wheel of the tractor and the underside of the trailer body. The front end telescopic hoist provides the lifting power. . . . *Circle No. 214*

Yale enters bulk materials handling field

The introduction of an industrial tractor shovel marks the entry into the field of bulk materials handling by Yale Materials Handling Division of **The Yale & Towne Manufacturing Co.** Designated the Y-18, the new shovel has a 25% greater work capacity



than units presently available from this company. The greater capacity of the Y-18 is due in part to a 2,500-lb. carrying capacity, 6-ft. dumping clearance, fully automatic Yale Torque transmission, rapid acceleration, and a 45-deg. bucket tip-back at ground level, providing the best possible loading action and low level carrying position. The new model is being introduced with a range of bucket capacities from 10 to 27 cu. ft. . . . *Circle No. 215*

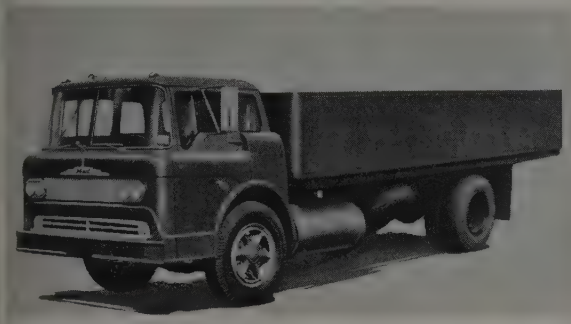
Digger attachment for Pitman Hydra-Lift

Designed especially for utility company construction and maintenance work is the **Pitman** Hydra-Lift, a multi-purpose piece of equipment, now supplied with a hydraulic digger attachment. It offers, in a single

self-contained unit, a piece of equipment that can lift loads of all kinds, dig a hole, and transport men, tools and materials to and from a job. Powered by the same hydraulic system that powers the Hydra-Lift itself, the digger attachment handles augers with diameters up to 24 in. With the digger on the unit's swinging boom, the operator can dig a hole at any point within a 180-deg. 26-ft. radius of the truck. No need to move the truck when you want to dig a hole across a ditch, over a fence or on a slope. . . . *Circle No. 216*

Versatile new Mack series

Development of a versatile cab-forward type truck, featuring several engineering advances, has been announced by **Mack Trucks, Inc.** It is adaptable both for light and heavy hauling in the city or over the road. The new cab-forward models will be produced



for use either as four- or six-wheel trucks or tractors, and will be available with either gasoline or diesel engines. The vehicle will be the first cab-forward type with set-back front axle capable of accommodating a diesel engine over 200 hp. The new line, designated the N-Group, is divided into two series. The 40-series, for lighter hauling, registers a maximum gross vehicle weight of 28,000 lb. and a gross combination weight on tractors of 40,000 to 53,000 lb. The 60-series, for heavier work, has a maximum gross vehicle weight of 30,000 lb. and a gross combination weight rating on tractors of 50,000 to 65,000 lb. . . . *Circle No. 217*

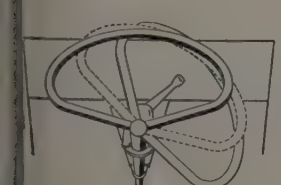
NOT ONLY can this gigantic electric hoist lift 20 elephants to the height of an 8-story building, but it can perform the task with needle-threading precision. Weighing approximately 16,650 lb. and costing about $1 per lb., the super-heavy-duty unit was designed and built by *R. G. LeTourneau, Inc.*
. . . *Circle No. 218*

n motor scrapers

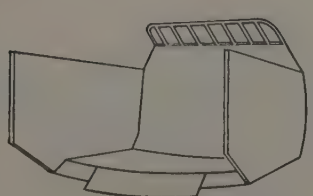
S-260 A new measure of performance in this size range . . . 200 hp . . . 14 yd . . . full 90-degree turning.

TS-160 True versatility and economy in a utility machine . . . 155 hp . . . 9½ yd . . . turns non-stop in less than 25 ft.

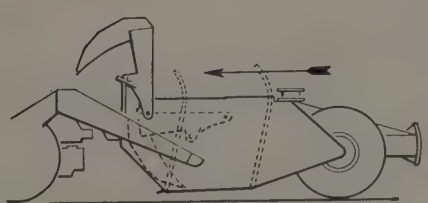
e only line with all these basic advantages in every size . . .



tive Hydraulic Steering . . . ate, sure control at any speed ast, full-swing steering with degree turn of the steering right or left.



Low, Wide Bowl . . . loads full — fast — with low resistance, live action.



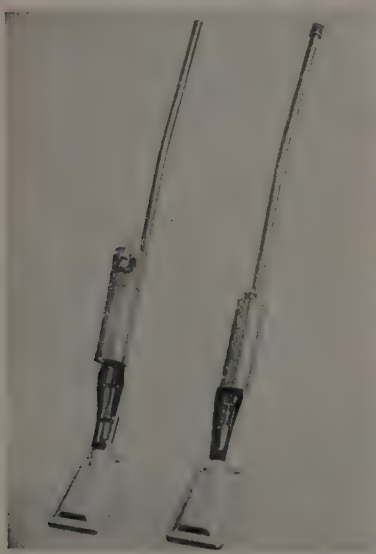
Positive Forced Ejection with High Apron Lift . . . speeds unloading cycles. Apron opens high as positive ejector dozes out the load . . . clean and quick.

. . . for more details, circle No. 85 on Reader Service Postcard

**THIS ALBINA 48-in. x 24-ft. G.E. 3-71 diesel-operated Trap-loader fills 12-yd. trucks in 45 sec. The unit is owned and operated by the *Donald M. Drake Co.* on the Spokane Freeway project and was built under specifications of Donald G. Drake and Ernie Hill of the firm. *Albina Engine & Machine Works* of Portland, Ore. produced the unit. The loader, which han-dles aggregate at a rate of 900 cu. ft. per hr., is transported from one site to another without a special hauling permit by a trailer axle with dual wheels. The 10 x 10-ft. steel hopper can be broken down into two sections. . . . *Circle No. 21*

40-lb. asphalt iron replaces heavy equipment

Designed for finishing and patching asphalt paving is a self-heating asphalt smoothing iron, now being manufactured by **Calweld, Inc.**



This smoothing iron heats to operating temperature in 10 min. and maintains this heat all day. It is especially economical because it replaces two old style irons and a heavy, unwieldly furnace. It completely eliminates the problems of transporting and tending the furnace and the hazard of fire. Weighing only 40 lb., the iron is easy to carry. Two models are available: a gasoline-fired type and an LP-gas fired type. . . . *Circle No. 220*

Portable plant for cement treated base

Cement and aggregates for cement treated base in highway construction are accurately batched by **The Noble Co.'s** new portable plant, featuring minimum transportation and erection costs. Plant includes a 350-bbl. per hr. vertical cement screw, large overhead storage of cement and aggregates to reduce frequency and cost of recharging materials, separate and simultaneous automatic batching of cement and aggregates, a 4,000 or 6,000-lb. pug mill, and automatic volumetric water batching. Aggregate bin loading equipment to suit individual job requirements is optional. . . . *Circle No. 22*

New channel forms from Blaw-Knox

Two new steel forms for producing prestressed concrete channels and post-tensioned I-beams provide versatility and economy. Designed by the Steel Forms Department of **Blaw-Knox Co.**, one form makes channels up to 12 in. deep x 32 in. wide. The channel form has a fixed width soffit. Adjustment from a maximum 12-in. depth is made by removing side wall leg inserts. Width adjustment is made by sliding wall panels either in or out from the soffit. A key feature of the form is the method employed by the manufacturer to strip it. By removing only one bolt per side at the ends of each 10-ft. section, the panel can be angled back so that the cast channel can

be removed. Adjustability of the length of the I-beam form is achieved by changing center panels, which were furnished by the manufacturer in 10, 5, and 3-ft. lengths.

. . . Circle No. 222

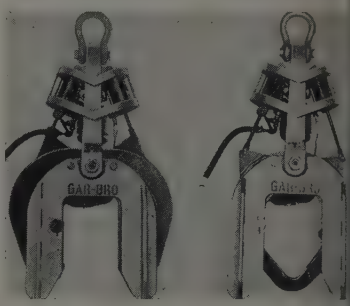
Full-Diesel En Bloc compressor announced by Schramm

The 125 Pneumadiesel, a full-diesel engine-driven air compressor of en bloc construction, delivering 125 cfm., has been announced by **Schramm, Inc.** Features of the 125 include a fuel pump of the latest design distributor type, the use of 12-volt starting equipment, using the well-known principle of starting on gasoline, preheating the entire engine and then switching to full diesel. Unit is available in skidded and two-wheel mountings and also as an integral part of the new diesel Pneumatractors and diesel Pneumatractor Rotodrills, produced by Schramm.

. . . Circle No. 223

Gar-Bro crane hook pneumatically triggered

A crane hook that opens an closes pneumatically and is trigge actuated has just been announce



by **Gar-Bro Manufacturing C** This heavy-duty hook, with a c pacity of 12 tons, is especially d signed for handling 2-, 3- and cu. yd. concrete buckets and is als useful for other lifting work. Th crane operator simply lowers th hook so that the mechanical trigg within the hook circle contacts th bucket ball, which actuates th ratchet type air valve that contro the opening or closing of the hoo Overlapping lifting tongs provid an important safety factor; the hoo cannot open under any load.

. . . Circle No. 2

Enclosed gears on Eagle washer cuts maintenance cos

The Eagle Iron Works announc that all Eagle Washers are no equipped with totally enclose gears, running in an oil bath, lik an auto transmission. This appli

to Eagle fine material washers-clas ifiers-dehydrators, coarse materi washers-dewaterers, and log was ers. The totally enclosed gea greatly reduce maintenance costs b eliminating need for frequent lu rication and by keeping out mo ture, grit and dust. On the wash shown, steel, helical cut gears a employed. This gear train is drive through a V-belt drive. Speed the screw flights can be change to meet various material specific tions by quickly changing th sheaves on the drive. Further d tails sent on request.

. . . Circle No. 2

Texas Contractor Cuts Costs, Adds Safety to Construction on Mile-Long Highway Bridge

with Dixie-Designed Hydraulic Traveler and Forms

F. & C. ENGINEERING CO., of Houston, Texas, contractors on the mile-long Angelina River bridge in East Texas, used the engineering and fabricating facilities of Dixie Form & Steel Co. to design and fabricate this safe, practical and low-cost forming method for the 28-ft. roadway bridge deck and three-ft. curb and sidewalk overhangs.

The Angelina bridge spans a marsh area and reaches a height of approximately 90 ft. at its highest point. The concrete deck of the bridge is over 4' 6" deep prestressed concrete girders.

The steel forms, designed and fabricated by Dixie Form & Steel Co., are 35-ft. long sections for the deck and overhang. Forms are supported by needle beams which attach to the underside of the girders.

The form and needle beam assemblies remain intact at all times and are stripped, moved and reset by the hydraulic-operated traveler shown above. The traveler, operating on rails placed on slab or girders, moves into position by a chain drive and work platforms are swung into position from both sides of the bridge. Working on platform, workmen remove major anchors in needle beams, then platforms are raised hydraulically to support the needle beam assembly while minor anchors are removed. Beams and steel forms are then lowered on the platform to clear the girders—swung out by hydraulic power to clear piers and pier caps and are moved ahead to be reset in new location.

* * *

This is a typical example of the engineering ability and fabricating facilities that are supplied to construction firms all over the world by Dixie Forms. Write, wire or phone Dixie Form & Steel Co. for the solution to *your* forming problem *—FAST!*

DIXIE FORM & STEEL CO.

P. O. BOX 1997 • SAN ANTONIO, TEXAS

Highway 81, North—Phone TAylor 6-6347

. . . for more details, circle No. 88 on Reader Service Postcard

Concrete job pays extra profits for careful planning of concrete handling

Concrete construction on this 300′ x 600′ airplane hangar required two types of concrete handling—(1) bulk handling for columns, foundation and 17″ thick walls and (2) slower paced handling for thin finished floor slabs. The problem was—how to prevent delays and inefficiencies in one or both placement jobs.

The answer here was to divide the work and use two separate crews and two concrete handling methods simultaneously.

First, two Gar-Bro Buckets per crane were used for the bulk placing. While one bucket was being filled, the other was placing concrete. Thus with a minimum crew, a fast pace was maintained.

Second, Gar-Bro Floor Hoppers and a fleet of Concrete Carts supplied the slab work. The concrete buckets load the floor hoppers for cart charging and alternate for direct column pouring, thus holding the balance of the operation.

In this way there were no delays and no interruptions of work. A steady delivery of concrete by ready mix trucks provided maximum efficiency.

Since every wasted minute costs money on a concrete job and delays cost more than equipment, it pays to plan each job properly. Many similar innovations are described in the regular issues of Gar-Bro Concrete News and the Gar-Bro Concrete Manual, available on request.

GAR-BRO MANUFACTURING CO.
Los Angeles, California • Peoria, Illinois
General Offices:
2415 East Washington Blvd.
Los Angeles 21, California

GAR-BRO *The world's most complete line of* **CONCRETE HANDLING EQUIPMENT**

EQUIPMENT · GAR-BRO · ENGINEERING SERVICE

. . . for more details, circle No. 89 on Reader Service Postcard

Ammo Studgun drives all pins

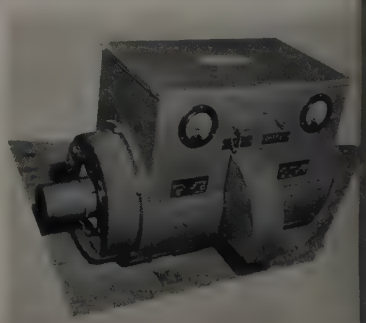
This efficient tool, called th Ammo Studgun, presents a ne concept in the powder-actuate fastening field, combining all th functions of light, medium, an

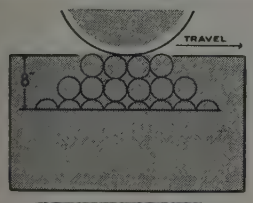
heavy-duty models into one com pact unit. The tool, with its thre quickly interchangeable barrels, al lows one to drive all sizes of pin and saves on fastening costs, sinc it is possible to use the most ec nomical cartridge-pin combinatio for each job. Noise is minimize with this new design; loading an inspection made easy. A produc of **Ammo Products, Inc.**

. . . Circle No. 22

D.c. to 400-cycle a.c.

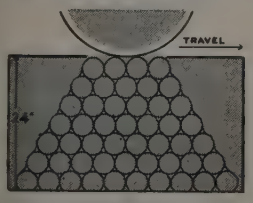
This small motor-generator s was developed recently by the r search department of **Kato Eng neering Co.** The generator portio of the unit produces an exact fr quency of 400 cycles per sec. It single phase and rated at 1,10 watts. Generator is self-regulate with voltage change kept withi 5% from no load to full load. Th direct current motor is mounte on the same shaft, within the sam frame as the alternator and equipped with a speed governo





CONVENTIONAL STATIC COMPACTION

Static rollers, relying on weight alone, produce friction forces between soil particles causing bridges to form. Terrapacs break bridges for deep compaction.



TERRAPAC DYNAMIC COMPACTION

Vibratory energy breaks frictional forces binding soil particles together, allows soil to sift down producing uniform densities at greater depths.

A Terrapac Roller Hits 95% Modified Density in 2-3 Passes on Federal Contract in California

When Fresno Paving Co. was awarded the Federal contract for recompacting the slopes and bottom of the Madera irrigation canal, between Madera and Fresno, (for the Bureau of Reclamation) William C. Wehner and Frank Pozar chose the CH-30 as the most efficient and economical compaction tool for the job. . . . 80,000 yards of canal lining had to be ripped to a depth of 9"-12" and recompacted to 95% Modified density. . . . The soil varied, with a large proportion of it clay, with volcanic ash, shale and large rock present. . . . The slopes were 20-23 feet deep and ranged in angle between 1:1 and 2:1. . . . Using a dragline, the 95% density was obtained in 2 or 3 passes. . . . In addition, the roller "buried" the rock and left a smooth, polished surface. . . . Mr. Wehner also said, "The CH-30 saved the job for us." Testimonials are wonderful, but we suggest that you satisfy yourself by asking for a Terrapac CH-30 demonstration today!

Ad 41-54

VIBRO-PLUS PRODUCTS, INC. **STANHOPE, NEW JERSEY**

VIBRO-PLUS VB TERRAPAC

Western Machinery Company
Phoenix, Arizona

Smith Booth Usher Company
Los Angeles, California

West Coast Engine & Eqpt. Co.
Berkeley, California

Air Rentals, Inc.
Denver, Colorado

Sawtooth Company
Boise, Twin Falls, Idaho Falls, Idaho

Seitz Machinery Co., Inc.
Billings & Great Falls, Montana

Andrews & Andrews Equipment Co.
Portland, Oregon

Foulger Equipment Co.
Salt Lake City, Utah

Andrews Equipment Service
Spokane, Washington

Moss Equipment & Supply Co.
Casper, Wyoming

. . . for more details, circle No. 90 on Reader Service Postcard

which maintains constant speed despite load variations. The straddle-mounted outlet box and control panel contains the necessary input and output lead wires and receptacles, voltmeter, ammeter, and d.c. motor starter.

. . . Circle No. 228

Tough ducting for tunnel air systems

Spiratube for flexible ducting and Ayrtube for straightline installations are a lightweight, quick-coupling, durable ducting designed for exhaust, blower and reversible tunnel air systems. Both ducts are made of neoprene-coated nylon and are resistant to heat, humidity, dust and alkali fumes. Temperature range is minus 40 deg. to plus 250 deg. F. No tools are required for coupling and sections of either Spiratube or Ayrtube link together or detach in 10 sec. Specifications, prices, and a 4-page illustrated leaflet are available. A product of **Flexible Tubing Corp.**

. . . Circle No. 229

Easy to handle

Recently put on the market by **Stow Manufacturing Co.** is a rugged 60-cycle motor-in-head vibrator. The model YU consists of a 2⅝-in. vibrator head with a universal motor in it, a casing which acts as a handle, a completely covered off-on switch 7 ft. from the head, and a 25-ft. electric cable that plugs into regular a.c. or d.c. 115-volt current. The YU is available in casing lengths of 7, 14, or 21 ft. Heart of the vibrator is the head which is completely sealed. The Universal motor powers the head at 12,000 to 15,000 vibrations per min. The 4-ply neoprene covered rugged casing which carries the wire back to the cable is extremely strong and is specifically made for maximum flexibility and ease in handling on the job.

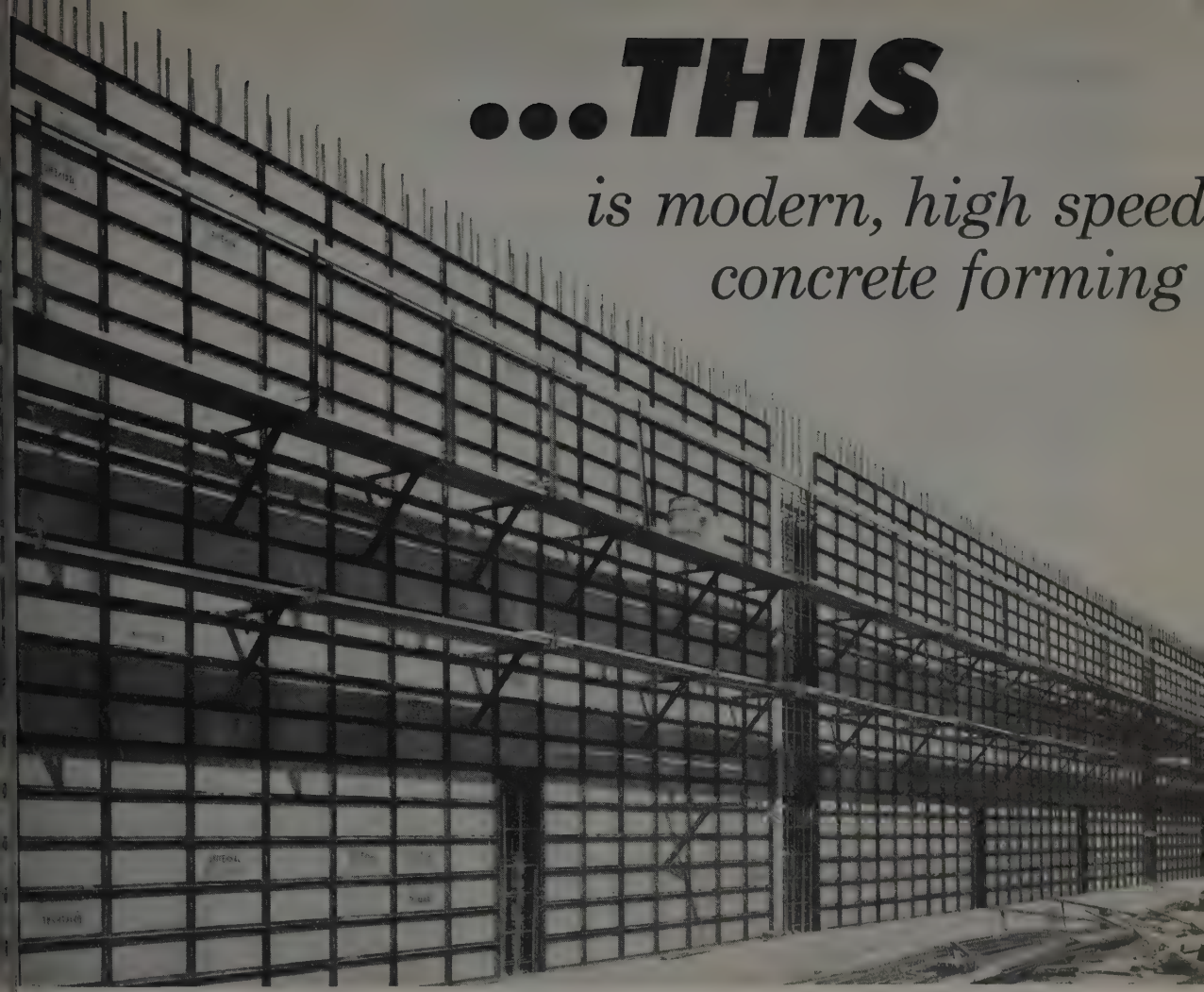
. . . Circle No. 2

Use forms again and again

Horn Formsaver is a coating to be applied by brushing, spraying or dipping, to plywood concrete forms to permit them to be used over and over again without loss of effectiveness. It prevents water moisture absorption, delamination of the plywood, checking and warping, by coating and sealing the face and the edges of the forms. Th

...THIS

is modern, high speed concrete forming



S IS UNI-FORMING... THE FASTEST GROUND-TO-GROUND SYSTEM

of concrete forming capable of handling virtually any type of poured concrete structure. UNI-FORMING is faster because assembly of UNI-FORM Panels with UNI-FORM Ties and Tie Keys is a simple mechanical (and automatically accurate) process . . . faster because minimum alignment and bracing is required on 1 side only . . . faster because every forming requirement is engineered into the system. In addition to its speed you'll find that the UNI-FORM System of concrete forming has many other advantages you can use to save time, money and labor.

NI-FORMING HAS 3 SIC ELEMENTS

1.

The UNI-FORM Panel is plywood faced, steel framed to provide strength and rigidity plus all the advantages of a nailing surface. Made in standard heights from 1 ft. to 8 ft.; widths 2 ft., 18".

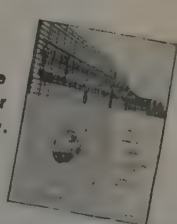
2.

UNI-FORM Ties lock and spread UNI-FORM Panels. Made for all wall sizes. Special ties available.

3.

UNI-FORM Tie Keys securely lock Panels and Ties together.

Want more information on the UNI-FORM System? Write for new full line catalog today.



NIVERSAL FORM CLAMP CO.

1238 N. KOSTNER • CHICAGO 51, ILLINOIS

CONCRETE FORM SPECIALISTS SINCE 1912

DISTRIBUTORS

UNIVERSAL EQUIPMENT CO.
1549 EASTLAKE AVENUE

UNIVERSAL FORM CLAMP CO.
13210 SOUTH FIGUEROA AVENUE

UNIVERSAL FORM CLAMP CO.
2051 WILLIAMS STREET

new coating, a product of **A. C Horn Co.**, costs less than 1½¢ pe sq. ft. or 1/25 the cost of new ply wood forms. Formsaver requires n thinner and 1 gal. covers 200 sq ft. It is quick drying, so forms ma be stacked at once without risk o sticking. Literature giving full de tails is available.

. . . Circle No. 23

Lightweight breaker from Le Roi

Designed for durability and lo maintenance is a 35-lb. class break er, manufactured by the **Le Ro Division of Westinghouse Ai Brake Co.** Featuring a new latc type steel retainer and a simplifie

swivel "O" ring air connection, th LB35 is available with a clay spad handle or a trench digger handl It is well balanced and its air cush ioned hammer action makes it eas to hold and operate. The ne breaker is especially suited for ligh demolition work, horizontal break ing, digging trenches, breaking fr zen ground or trimming. Throug use of a new taper bolt and nu construction, the latch-type ste retainer provides long tool life. I is easy to open for changing mo points or chisels.

. . . Circle No. 2

New curing membrane for concrete

Crete-Cure, a white pigmente concrete curing membrane havin high dispersion characteristics, ha been developed by **Thiem Product**

Inc. Heretofore materials used in the manufacture of such membranes have had a tendency to settle, or separate. In Crete-Cure, the compounded particles of materials are dispersed, or given greater suspension. The result is a heat reflecting concrete curing agent that offers the maximum in moisture retention, of more uniform consistence, which flows freely and is less apt to clog or contaminate spraying equipment. The membrane is custom mixed on order to meet the specifications of each State Highway Department.

. . . Circle No. 233

Shunk push block absorbs powerful shocks

Production of a new push block designed to minimize shocks and stresses between scrapers and pusher tractors is in progress at **Shunk Manufacturing Co.** Called the

Shunk - Winget Spring Cushion Push Block, the new tractor accessory incorporates powerful coil springs that absorb destructive contact shocks. It relieves the problem of broken scraper goosenecks and frequent and unnecessary damage to final drives, transmissions and "C" frames. On the largest model of the push block, a tractive force of 58,000 lb. is required to compress the springs the 3 in. between stops. All models are of heavy welded steel reinforced at points of stress. Current production includes push blocks for crawler tractors in the 150 to 250-hp. class.

. . . Circle No. 234

Unload in a hurry

An electric vibrator designed to speed the unloading of dry cement, sand and other types of powdered or granular materials has been introduced by **Engineered Equipment, Inc.** The unit utilizes the rotary eccentric. The Vibramat can be attached to the unloading hopper of railroad freight cars or other

. . . for more details, circle No. 94 on Reader Service Card →

transporting equipment. It sets up a concentrated vibration alleviating the need for sledge-hammer pounding to loosen jammed or packed materials. When used on concrete forms, the Vibramat causes the wet concrete to settle smoothly into the form without hand rodding or pounding. The vibrator is available with either a rigid or swinging base and with 1/6-hp., 1/3-hp., or 1-hp. motor. Rigid base models are used on concrete pipe forms and other applications where vibration in all directions is desired. Swinging base models are used on vibrating tables and other applications where a concentrated reciprocal vibration is desired. *. . . Circle No. 235*

Portable conveyors for solids and bulk

Easily carried on car, trailer or pickup truck, both Palmer E-Z-Lift conveyor models feature strength, easy handling and low price. Stan-

dard lengths include 16, 21, 23½, 26, 28½, 31 and 33½ ft., with special sizes on order. Complete with engine, E-Z-Lifts operate from 0 to 60 deg., move 720 units or from 20 to 30 cu. yd. per hour. Exclusive feature prevents concrete and mud build-up under cleats. Companion hopper, chute, and other accessories available. **A. Palmer Scaffolding Co.** *. . . Circle No. 236*

Easy stake removal

A simplified stake puller, designed for the quick removal of Symons steel construction stakes, is now being offered by **Symons Clamp & Mfg. Co.** The stake puller easily removes steel stakes from hard or frozen soil. This is accom-

Now is the time to overcome every obstacle to greater earnings!

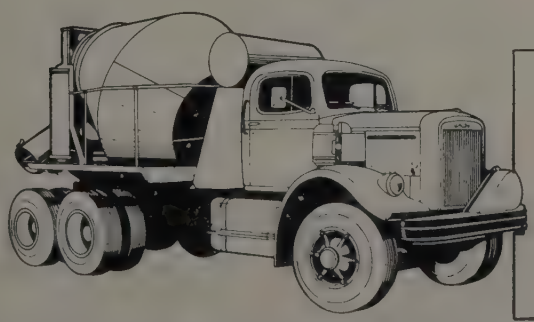
For the full measure of hauling profits, specify WHITE TRUCKS!

The S. H. Bacon Materials Company found their winning combination in the White 4000T. Hauling sand and gravel from El Monte, California to their batch plants at nearby Huntington Park and Montebello, a relatively short haul through city traffic, Bacon gained greater efficiency in hauling...lower maintenance with these payload-proved options: White 470 Mustang gasoline engine, 517B Main transmission, 7231 Auxiliary transmission, 60D front axle, 235C White rear axle, and disc wheels. With 60′ overall length, Bacon's White 4000Ts and hopper trailers produced a payload of 25½ tons.

Top payloads invariably result when you get the efficient White combination of engine, axles, transmissions and frame to fit your particular requirement. Learn how so many western truck operators trim hauling costs and better their profit picture with the switch to White. Your White representative has actual facts and figures . . . so why not get in touch with him right now?

White

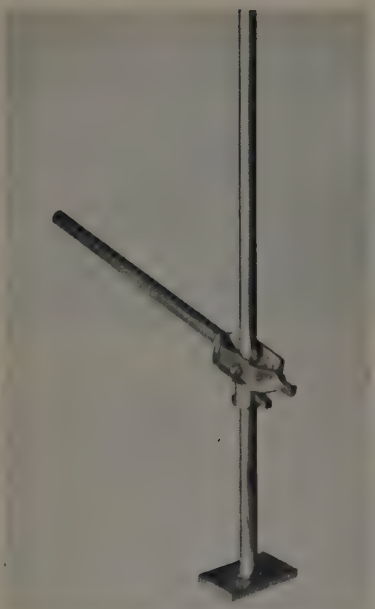
THE WHITE MOTOR COMPANY
CLEVELAND 1, OHIO
Factory Branches, Distributors & Dealers Everywhere



For the West's rapidly-expanding ready mixed concrete industry, the White 9064 is the payload number. Call your White man for recently-released factual engineering data on the profit-proved applications of this truck.

FOR MORE THAN 55 YEARS THE GREATEST NAME IN TRUCKS

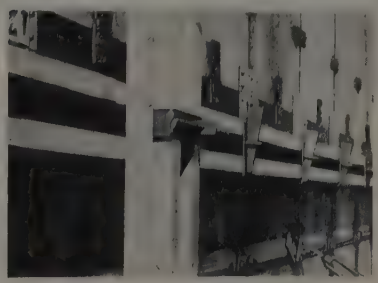
. . . for more details, circle No. 96 on Reader Service Postcard

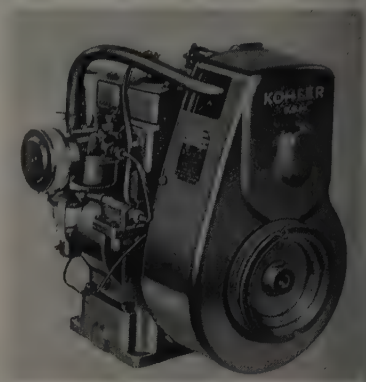


plished by inserting the hooked lever arm of the puller through a rectangular slot in the top of the stakes. The puller operates in a manner similar to that used on an automobile bumper jack. It can remove stakes which are as long as 36 in. and it has a mechanical advantage of 7:1. Because it is made of steel pipe, it weighs only 10 lb. complete. . . . *Circle No. 237*

New hardware adapts Simplex forms to heavier applications

Now, with a new development in stack plate hardware, it is possible to economically adapt standard Simplex forms to heavier applications. The new method, tested and proven in the field, is adaptable to poured walls or foundations up to 10 ft. and may, in some cases, be recommended for heights up to 12 ft. The recent development utilizes stamped, heavy gauge steel plates which are mounted in sets. A female plate is attached to the bottom corner of each panel or to the top corner of the mating panel, if preferred. A corresponding male plate, equipped with a locking wedge, is attached opposite the female plate. To secure the forms and permit running tie wires between the panels for greater strength, standard Simplex locking levers are mounted vertically between the stacked panels. **Simplex Forms System, Inc.** . . . *Circle No. 238*





FOR APPLICATIONS where cooling air is limited and quiet operation is desired, *Kohler Co.* is now offering a compact, lightweight, water-cooled engine developing 6.5 hp. The new engine, L160, can be installed wherever bulk water or city water is available. . . . *Circle No. 239*

. . . *for more details, circle No. 97 on Reader Service Postca*

New from Worthington in '58

2 HEAVY-DUTY MIXERS

ith these new truck mixers, you get a choice of Worthington heavy duty transmissions — and u get a choice of price. The FLEETMASTER has all-new Worthington designed and manu- ctured multi-disc transmission. The FLEETBUILDER features all-new Worthington designed d manufactured sliding gear transmission. It's the only heavy duty unit at an economy price. odels available in 4, 5, 5½, 6, 6½, 7, 8 and 9 cu. yd. sizes — and with separate engine drive or ont end power take off. Phone or write for a Mixerama demonstration today. 65-7

Western Equipment Co.
1360 West First Avenue
Eugene, Oregon
Phone: Diamond 4-4265

Western Equipment Co.
2244 N. W. Savier Street
Portland, Oregon
Phone: Capitol 8-4128

. . . for more details, circle No. 98 on Reader Service Postcard

News of DISTRIBUTORS

ASSOCIATED EQUIPMENT DISTRIBUTORS' newly appointed head of Region XII is *J. T. Hatten.* This Region comprises the states of Idaho, Montana, Oregon and Washington. The new regional director was elected at the AED national convention to fill the post left vacant when *F. R. Cooper* became a vice president of the organization. Hatten is president of Hatten Machinery Co. of Seattle.

L. B. Foster Co. to handle Dresser couplings

L. B. Foster Co. has been appointed an official distributor for Dresser couplings. The company will maintain large stocks of couplings for contractors, municipalities, utilities and other buyers at the Los Angeles regional office.

Fray Equipment Co. named Oliver's Seattle outlet

A recent distributor change under the Portland, Ore., branch of The Oliver Corporation was the naming of Fray Equipment Co., Inc., at Seattle, Wash., as the authorized industrial sales outlet. Manager at Oliver's Portland branch is Denzil Whittington. He has been a member of the Oliver organization for nineteen years, much of the time as sales representative and branch manager in eastern United States.

Moto-Bug distributor named

Kroeger Equipment Co., El Cajon, Calif., has been named by Kwik-Mix Company, Port Washington, Wis., to handle its full line of construction equipment throughout San Diego county. Kwik-Mix products include two sizes of the Moto-Bug, a big capacity power wheelbarrow.

Stratton joins Hatten force

H. V. "Whitey" Stratton has recently joined the sales force of the Hatten Machinery Co., Seattle, and will cover the western Washington

H. V. Stratton

area, working out of the Seattle main office, according to an announcement by J. T. Hatten, president. Stratton, who was formerly with the Ford Motor Co. in Seattle, has had extensive experience in the construction business.

Heil appoints Los Angeles firm as exclusive distributor

The Heil Company, through Len C. Andersen, district manager at Los Angeles, announces the appointment of Standard Auto Body Co., Inc., 4900 South Soto St., Los Angeles, as exclusive distributor in the Southern California area for Heil bodies, hoists, power tailgates and Colectomatic refuse units.

C. B. Follett and Al Hoop form Gar Wood distributorship

Gar Wood Industries, Inc., Wayne, Mich., announces the appointment of Gar Wood-Los Angeles Truck Equipment, Inc., 4515 South Soto St., Vernon, Calif., as authorized Gar Wood Truck Equipment distributor in the Los Angeles area. They will serve the customers formerly taken care of by the Gar Wood Los Angeles branch which has been closed. Gar Wood-Los Angeles Truck Equipment has been formed by C. B. "Barney" Follett as president, and Gar Wood's former branch manager, Al F. Hoop, as vice president. The new distributorship is staffed by the same experienced personnel who were formerly with the Los Angeles branch.

McCarty-Sherman adds to its equipment lines

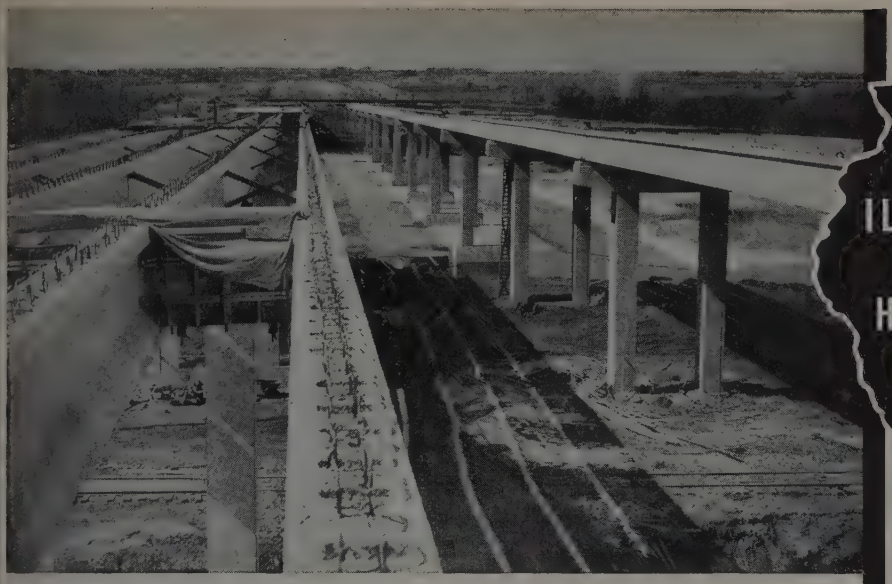
McCarty-Sherman Distributing Corp., Denver, Colo., announces the addition of the Schmeiser Till an Pak to its equipment lines.

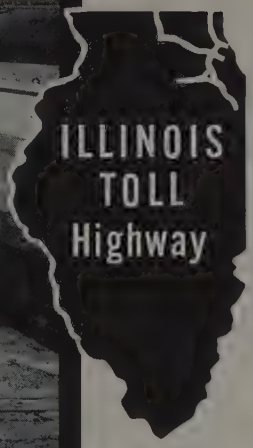
Butler Bin equipment handled by Salt Lake distributor

Butler Bin Co., Waukesha, Wis., announces the appointment of Lang Construction Equipment Co., Salt Lake City, as distributor in Utah, southwestern Wyoming, southeastern Idaho, and eastern Nevada. Butler is a leading manufacturer of concrete mixing plants, aggregate and cement storage and handling equipment, batching plants, aggregate and cement batching equipment, block plants, etc.

Western Machinery Co. named Lima distributor in Arizona

Baldwin-Lima-Hamilton Corp. Construction Equipment Division recently appointed Western Machinery Co., with offices in Phoenix and Tucson, Ariz., as distributor for Lima shovels, cranes, draglines and pullshovels, and the Lima Roadpacker vibratory compactor. The distributorship will cover the entire state of Arizona. Western Machinery is also distributor for





Fabricators of Prestressed Concrete:

American-Marietta Co.
Hodgkins, Illinois

Material Service Co.
Algonquin, Illinois

Midwest Prestressed Concrete Co.
Rochelle, Illinois

Consumers Co.
McCook, Illinois

On the Illinois Toll Highway, now under construction, 219 of a total of 265 bridges use prestressed concrete girders. This represents a total of 6,872 prestressed girders varying in length from 40 to 90 ft. . . . Being used in *all* of the 219 bridges are SUPERIOR "HOLD DOWNS" for restraining the cables in the girders now being produced by the fabricators listed above.

SUPERIOR Form Ties, Hangers, Screed Supports, and "Hold Downs" Speed Construction....

Whether it's Form Hangers for deck work, Coil Ties for retaining walls, heavy-duty Screed Supports for use with heavy screeding equipment, or "Hold Downs" in prestressed beams, you'll find SUPERIOR accessories on the job to help speed the Illinois Toll Highway program in northern Illinois.

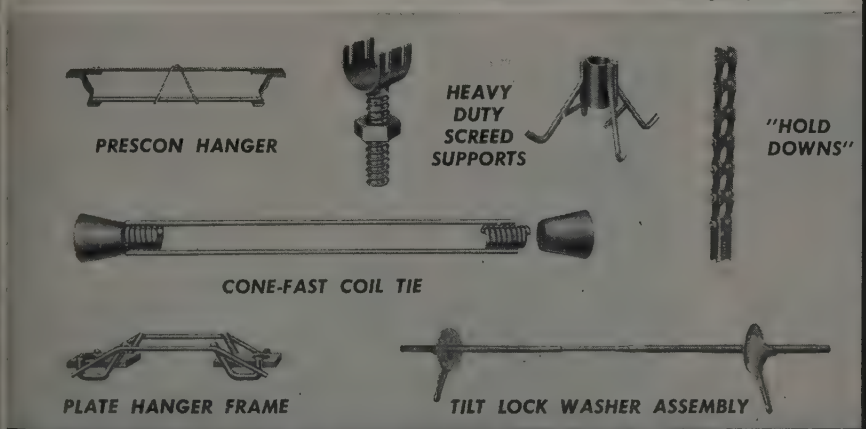
With increasingly keen competition for this type of work, contractors have discovered that the efficient forming methods of SUPERIOR accessories offer all-important bidding advantages.

Whenever you are planning any type of form work . . . Superior's experienced engineering service is available to prepare form layouts, estimates and quotations. This comprehensive service is offered without charge.

A new 6 PAGE BULLETIN is available—Describes the SUPERIOR items for use in form work for bridges and allied projects.

Photo Credits—Illinois Toll Highway Comm.

FOX RIVER BRIDGE near Elgin, Ill. Photo shows progress of work by Arcole-Midwest Co., using SUPERIOR products.



OVERPASS and BRIDGE CONSTRUCTION progressing close to schedule—Entire system is slated for completion Dec. 31, 1958, although some portions will open this summer.

SUPERIOR Concrete Accessories, Inc., 9301 King St., Franklin Park, Ill. (A Suburb of Chicago)

NEW YORK OFFICE
1775 Broadway, N.Y. 19, N.Y.

HOUSTON OFFICE
4101 San Jacinto, Houston 4, Tex.

PACIFIC COAST PLANT
2100 Williams St., San Leandro, Calif.

. . . for more details, circle No. 99 on Reader Service Postcard

Lima Austin-Western crushing equipment manufactured at the Lima, Ohio, plant.

Sales engineer assignments announced by Rucker Company

Two staff transfers are reported by The Rucker Company, manufacturer and distributor of fluid power systems. Wesley A. Krueger, for the past three years Rucker's senior Los Angeles field engineer, has been transferred to the Oakland home office to head up the company's Northern California field engineering force. Robert Cameron, a specialist in hydraulic and pneumatic control circuits in the engineering department in Oakland, will join the firm's Seattle sales office.

Michigan distributor adds to sales force in Southern California

Buran Equipment Co., Norwalk, Calif., branch for Michigan sales and service, has added a new sales representative: Ed Wetterau, who will cover Ventura and Santa Barbara counties, and the San Fernando Valley area. Wetterau has had primary experience in the contracting field as project manager and job supervisor. Buran Equipment Co., with headquarters at Oakland, is distributor for the complete line of the Construction Machinery Division of Clark Equipment Co.

Beal Shaw honored by AED

Beal Shaw, president of Shaw Sales & Service Co., Los Angeles, was recently honored and presented with a diamond ring in recognition

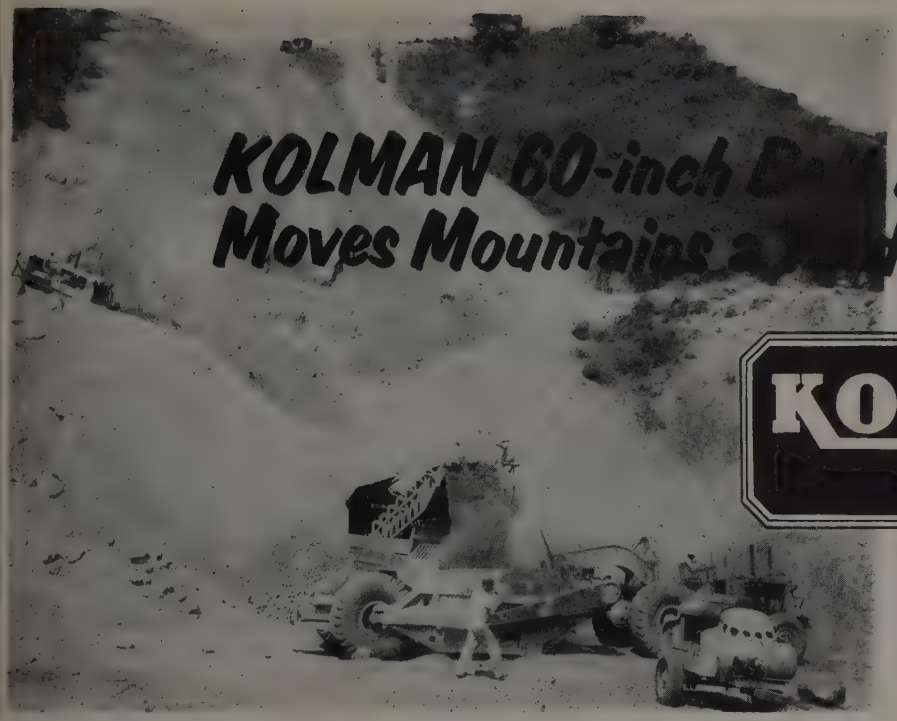
of his nine years as regional director of Region 11 of Associated Equipment Distributors. In making the presentation at a special meeting of the Southern California AED members, Herbert J. Mayer (right), vice president of Western Machinery Co., San Francisco, paid tribute to Shaw's untiring efforts in behalf of Region 11. Mayer is the new Region 11 director recently installed at the national convention in Chicago. He was presented with the regional perpetual trophy for the AED Tri-Regional Golf Tournament which Region 11 now holds.

Bert Lowe ties up with Crook Co.

H. E. "Bert" Lowe has joined Crook Company, Los Angeles, as a general line salesman specializing on Bucyrus-Erie products. Lowe was formerly Southern California representative for B-E for 17 years until his retirement Mar. 31, 1958.

Buffalo-Springfield holds distributor conference

Buffalo-Springfield Roller Co., division of Koehring Company, recently held a two-day national sales conference for more than a hundred of its distributors and their sales personnel. In conjunction with informative talks, the Buffalo-Springfield line of rollers and Kompactors was presented along with a brief forecast of the aims and desires of the company.



KOLMAN 60-inch [illegible] Loader Moves Mountains a[illegible]d a Second!

KOLMAN 303

6,500,000 Yard Job in Beverly Hills Development Moves at Record Pace With KOLMAN 303 Conveyor - Loader

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 tired 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.

It is available either with wheels and tires or as a skid-mounted unit.

Feeder-trap view. Trap and tunnel are 29 feet long.

Rock going over end of loader above estimated to weigh over a ton.

SEE YOUR NEAREST KOLMAN DEALER NOW

CALIFORNIA
LOS ANGELES, BAKERSFIELD, SAN DIEGO, SANTA BARBARA—Brown-Bevis Industrial Equip Co.
OAKLAND—Spears-Wells Machinery Co.

COLORADO
DENVER—Faris-Moritz Equipment Co.

IDAHO
BOISE, POCATELLO—Intermountain Equipment Co.

MONTANA
BUTTE, BILLINGS, GREAT FALLS and MISSOULA—Hall-Perry Machinery Co.

NEW MEXICO
ALBUQUERQUE—Construction Machinery Co.

NEVADA
ELKO—A-D Machinery Co., 251 W. Commercial St.

OREGON
PORTLAND—Balzer Machinery Co.

UTAH
SALT LAKE—Rasmussen Equipment & Supply Co.

WASHINGTON
SEATTLE—Sahlberg Equip., Inc. 5950 4th Ave. So.
SPOKANE—Intermountain Equipment Co.

WYOMING
CHEYENNE, CASPER, ROCK SPRINGS and SHERIDAN—Wortham Machinery Co.

ALASKA
FAIRBANKS, ANCHORAGE—The Carrington Co.

Western Representative
S. A. MADRID, 1739 32nd Ave., San Francisco 22

KOLMAN MANUFACTURING CO.
5670 W. 12th St. **Sioux Falls, S. D.**

. . . for more details, circle No. 102 on Reader Service Postcard

Promotions at managerial level

Promotions at Howard-Cooper Corp. have brought a new assistant sales manager to the home office in Portland, and a new manager to the Coquille branch. Donald C. Wilson, Coquille branch manager, has moved to Portland as assistant sales manager. He has been a member of the Howard-Cooper organization since 1946. Robert B. McLean is the new manager at Coquille. He joined Howard-Cooper in 1950 and recently served as sales manager in the Aberdeen area.

Feenaughty sales appointments

Feenaughty Machinery Co., Portland and Seattle equipment distributor, has named Walter Lowblad as new representative to specialize in the sale and service of FWD utility and fire trucks in the western Oregon and western Washington areas. Lowblad has long been associated with the sale of general equipment lines, particularly in the Northern California area. Allan Jenkins, who formerly handled the FWD line for Feenaughty, will now take over the company's general equipment lines, according to announcement by M. B. Mack, general sales manager. Charles McHenry, who has been covering the Portland territory, has had his territory shifted to southern Oregon from Eugene south, but he will continue to be based in the Portland office.

Buffalo-Springfield appoints dealer for New Mexico

Appointment of Contractors Equipment & Supply Co., Albuquerque, as Buffalo-Springfield dealer for most of New Mexico is announced by Buffalo-Springfield Roller Co., Division of Koehring Co., Springfield, Ohio. President of the newly appointed dealership is John W. Schoen who purchased the company from David U. Rakestraw, Sr. Schoen is widely known in the construction equipment industry, having spent more than thirteen years in this field.

Prime-Mover names Southwest rep

The Prime-Mover Co., Muscatine, Iowa, has appointed R. J. Sedgwick, Arcadia, Calif., as district representative for California, Arizona, Utah, and Nevada. Prime-Mover manufactures powered carts and a fork lift for handling concrete, masonry and building supplies.

Rental Machinery opens branch

Announcement is made of the opening of the Hi-Line branch of the Rental Machinery Co. at 15655 Pacific Highway South, Seattle. Hi-Line Tool Rentals, formerly at this address and owned by John E. Denney, has been purchased by A. H. Cox who reopened it as the Hi-Line branch. This is the second new branch opened by Rental Machinery division this spring, the prior one in Everett.

O. W. Carpenter succeeds McKnight as president

O. W. Carpenter has been elected president of Chain Belt Co., Milwaukee, Wis., succeeding L. B. McKnight who has been president of the company since 1953. Carpenter joined Chain Belt in 1943. In 1956 he became responsible for the operation of the firm's Construction Machinery Section as vice-president, construction machinery and finance, and in 1957 he was elected executive vice president. McKnight is retiring as president in line with the company's retirement policy, but will continue as a director, as chairman of the executive committee and management consultant.

A "NATURAL" For Road Building Jobs

BIG PAYLOADS 20-35 Tons

FASTER OPERATION Load and Unload In Seconds

GREATER PROFIT On Your Investment

The tough, rugged C-B Bottom Dump Trailer provides the road builder with a new, low-cost, highly efficient method of hauling bulk material. A lightweight model is engineered for high-legal, high-speed "over-the-highway" hauling. It will carry 23-27 ton payloads (legal in most states) under all modern traffic conditions. A heavy duty model for "off - the - highway" work has a physical payload capacity in excess of 35 Tons.

FAST LOADING from either a stationary or moving belt type loader. Full loads are "on the way" in less than 45 seconds.

FAST UNLOADING "on the move" spreading from air actuated gates as it goes. Complete unloading can be accomplished in less than 10 seconds.

GREATER PROFIT Compare the cost of this equipment with other type equipment of similar capacity. You'll immediately realize the vast potential in both profit and job application.

unloading "on the move"

See the COOK BROS. BOTTOM DUMP SEMI TRAILER IN ACTION!

CB COOK BROS.

3334 San Fernando Road • Los Angeles 65 • CLinton 6-3151

Manufacturers of: Stabilift End Dump Trailers, Bottom Dump Trailers, Transfer Trailers

Distributed by:

CALIFORNIA — COOK BROS., Los Angeles*, Oakland*
OREGON — CRAMER MACHINERY CO., Portland
WASHINGTON — REO WASHINGTON SALES, Seattle; ANDREWS EQUIPMENT SERVICE, Spokane
ARIZONA — COOK BROS., Phoenix*
IDAHO — ENGINEERING SALES & SERVICE, Boise
MONTANA — SEITZ MACHINERY CO., Billings; ROBERTS TRUCK & PARTS, Butte
UTAH — HARRIS TRUCK & EQUIP., Tremonton
COLORADO — JACOBS KERR & CO., Denver

*Factory Branch

. . . for more details, circle No. 105 on Reader Service Postcard

Stow names western Canada rep

Stow Manufacturing Co., Binghamton, N. Y. has named Watson Jack-Hopkins, Ltd., Vancouver, B. C., to handle its complete line of universal electric and gasoline concrete vibrators, vibrating screeds, portable concrete grinders, as well as the Stow CG ceiling grinder.

Sherman Products names their "Dealer of Distinction"

Frank Weeks, manager of Cascade Tractor Co. branches in Everett and Seattle, Wash., has been honored as "Dealer of Distinction" by Sherman Products, Inc., Royal Oak, Mich. Weeks has been manager of Cascade Tractor Co. since it was started in Everett in 1952. The Seattle branch was added last year.

Wylie Manufacturing Co. announces new Western dealers

Several new distributorships in the West for the products of Wylie Manufacturing Co., Inc., Oklahoma City, Okla., were recently named, according to Doug Gibson, Western representative with headquarters at Boise, Idaho. Air Mac, Inc., Seattle, for the state of Washington; Spears-Wells Machinery Co., Oakland, dealer for the Northern California territory; Cal-Ore Machinery Co., Medford, new dealer for the state of Oregon; and Southern Idaho Equipment Co., Idaho Falls, for the southern section of Idaho.

Southern California outlet for warning lights

Ja. R Engine & Supply Co., Alhambra, Calif., has been appointed an authorized distributor for Pacific Mercury flasher warning lights. The supply company, which also handles Briggs & Stratton, Wisconsin Motors, Clinton, Zenith carburetors and Lauson, will handle the complete line of seven flasher light models manufactured by Pacific Mercury.

Northwest distributing firm receives sweeper account

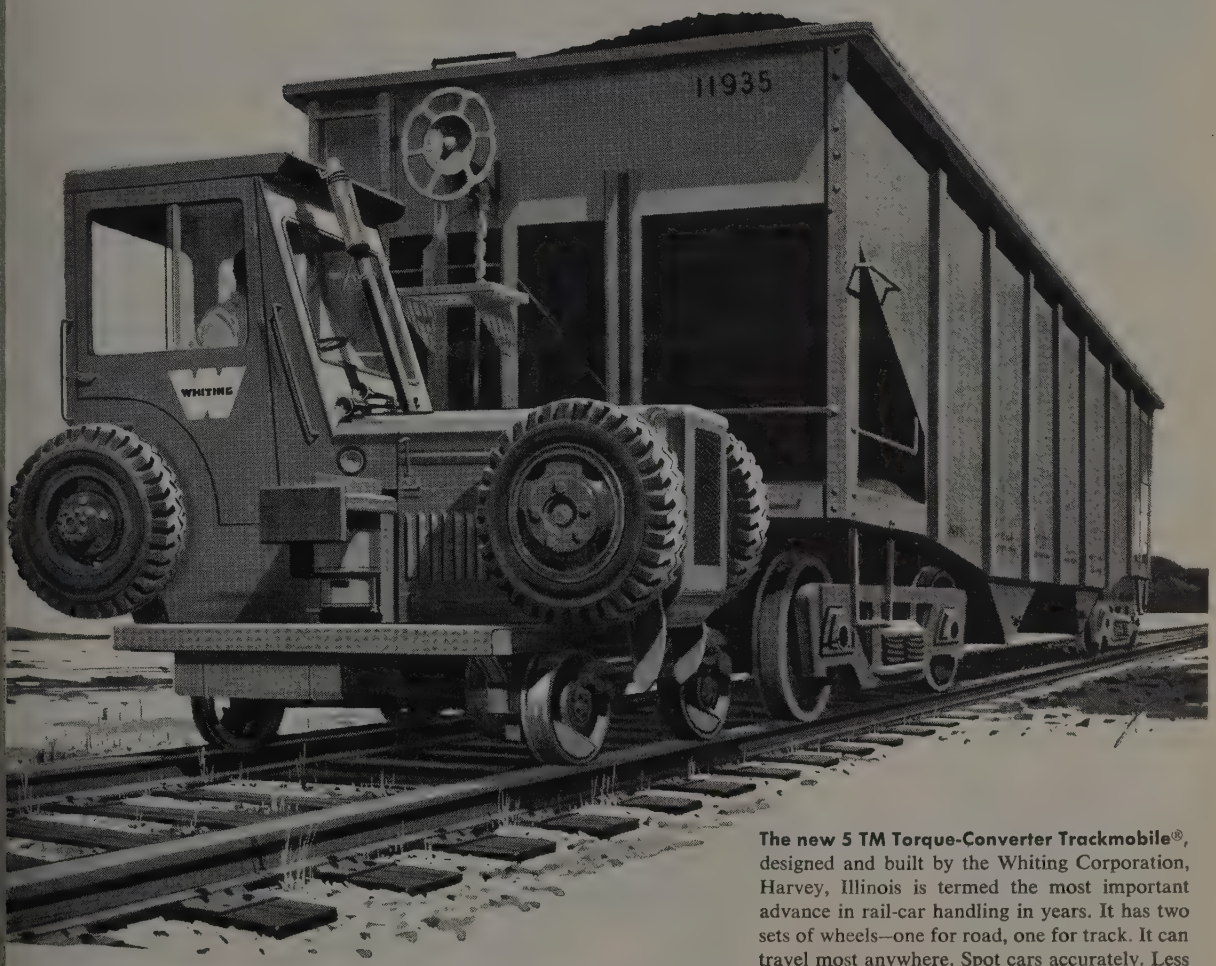
Air Mac, Inc., has been appointed exclusive distributor for power sweepers manufactured by Clarke Sanding Machine Co., Muskegon, Mich. With head office in Seattle, and branches in Spokane, Tacoma, and Yakima, Wash., and Portland and Eugene, Ore., Air Mac will cover for Clarke the territory embracing Washington, Oregon, Idaho, Montana, and Alaska.

Horace Church is consultant on earthmoving problems

Shepherd Machinery Co., Los Angeles, announces the affiliation of Horace K. Church with their organization in the capacity of earthmoving consultant. He is well

known in the construction industry and brings vast engineering and earthmoving experience into his new position. This experience includes employment as a highway engineer with the Bureau of Public Roads, district representative and sales engineer with Euclid Road Machinery Co., sales manager for Brandeis Machinery & Supply, civil engineer for Willard Concrete Machinery Co.

Ingenious Whiting Trackmobile uses **Allison Torqmatic Drive**

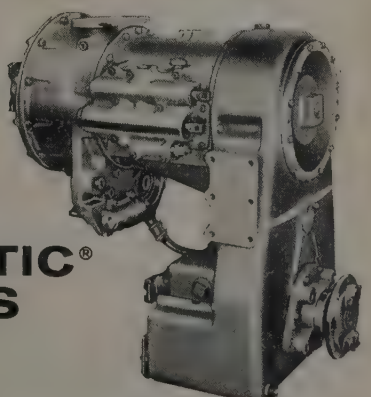


The new 5 TM Torque-Converter Trackmobile®, designed and built by the Whiting Corporation, Harvey, Illinois is termed the most important advance in rail-car handling in years. It has two sets of wheels—one for road, one for track. It can travel most anywhere. Spot cars accurately. Less waiting for work crews. Patented jacking coupler shifts freight car's weight to Trackmobile's wheels for needed traction. Allison TORQMATIC DRIVE provides smooth fluid power needed for moving many times Trackmobile's weight.

Allison TORQMATIC Converter-Transmissions are delivering the goods in hundreds of industrial applications—such as this small but mighty Trackmobile.

Time-tested and proved, the TORQMATIC DRIVE eliminates clutch manipulation. Simplifies vehicle operation. Provides full-power range shifts in either direction, plus additional multiplication of the TORQMATIC Converter. Permits operator to concentrate on load handling alone. Gets more work done at lower cost, higher profit.

Take a tip from Whiting and more than 80 other equipment manufacturers—send for the complete TORQMATIC story today. ALLISON DIVISION OF GENERAL MOTORS, Indianapolis 6, Indiana.



Allison TORQMATIC® **DRIVES**

. . . for more details, circle No. 107 on Reader Service Postcard

MANUFACTURERS

A. C. Horn expands Western home

According to Stanford R. Horn, Pacific Coast manager of The A. C. Horn Co., manufacturer and distributor of products for construction and maintenance, the company is moving its Western division to larger quarters located at 550 Third St., San Francisco.

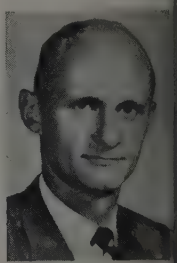
John Deere Industrial progress

John Deere Industrial Division, 651 Brannan St., San Francisco, announces the addition of new sales representatives. R. Stanley Hill, who has been on the job with the Deere dealers for the past two years, is now being assisted by Ron Guptill in the Southern California area, and by Tony Oliviera in Northern California. Guptill has had considerable experience with California contractors and will make his headquarters at Riverside, Calif. Oliviera's experience lies in the light industrial field. Both men are able and experienced in both sales and operations.

A series of three introductory meetings were recently held at Phoenix, Ariz., at Pomona, and Sacramento in California, for all John Deere dealers in Arizona, California and Nevada. Besides the new 440 series tractors, an impressive array of loaders, dozers and related equipment was announced at the meetings.

Hyster names Herz chief engineer

Glenn Herz, well known nationally in heavy machinery design work, has been made chief engineer



Glenn Herz

of the Hyster Company at Portland Ore. He replaces Al Zwald who has announced his retirement. Herz has been with Hyster for twelve years and has been assistant chief engineer for five years. Prior to joining Hyster he was with Caterpillar Tractor Co.

New Euclid appointments

R. G. Armington, general manager of Euclid Division, General Motors Corp., announces the appointment of George M. Perry as director of sales, and V. L. Snow as director of engineering. George E. Armington, one of Euclid's founders who has made outstanding contributions to the company's growth in engineering and manufacturing positions, is resigning as director of engineering to develop other business interests.

A. H. Tetrick dies in accident

Arthur H. Tetrick, an employee of Wooldridge Manufacturing Co. Sunnyvale, Calif., was killed at Camp Pendleton, Marine Corps Base in California, on Mar. 6. He was well known among the trade as a representative for Wooldridge in this country, Mexico and part of Canada.

Joy representation at Salt Lake City

The Salt Lake City, Utah, district office of Joy Manufacturing Co. is in charge of W. R. Swiler successor to K. A. Lehner. H. F. Felgenhauer is sales representative in the area for the construction equipment company. Office manager is Arden Jones.

Tool boxes are big enough to hold a full set of tools. Radiator shutters adjust to every kind of weather.

Constant full pressure behind breakers, tampers and other tools keeps them operating at top efficiency, speeds job progress.

All tanks are protected by heavy-A-frame.

Note stable mounting; standard as shown.

They're good, says Hood

43 JAEGER COMPRESSORS speed West Coast work for this pipeline contractor

Hood Construction Company is a major user of portable air compressors, handling pipeline projects throughout the Western states and Hawaii. Their preference for Jaeger is based on wide experience with the advantages of the Jaeger Air Plus Roto unit on construction work:

Higher efficiency (only 1700 rpm full load speed compared with 1800 rpm or more in other compressors) which directly saves fuel and wear.

More uniform air pressure maintained by instantaneous air delivery and smooth, stepless speed control.

Easy handling portability, full size tool boxes, 8-hour fuel tanks, and retractable pneumatic tired dolly wheel standard on all 2-wheel models in sizes up to and including 250 cfm.

Your Jaeger distributor will be glad to demonstrate the cost-saving advantages of these more modern compressors—Or let us send you Specification JCR8.

Sold and Serviced by:

EDWARD R. BACON CO.	San Francisco 10
NELSON EQUIPMENT CO.	Portland 14
WESTERN MACHINERY CO.	Salt Lake City, Denver 4, Spokane 2 and Idaho Falls
WESTERN MACHINERY COMPANY	Phoenix, Arizona
J. D. COGGINS & CO.	Albuquerque
CASHMAN EQUIPMENT COMPANY	Las Vegas, Nevada
SMITH BOOTH USHER CO.	Los Angeles 54
A. H. COX & CO.	Seattle 4 and Tacoma
THE SAWTOOTH CO.	Boise and Twin Falls, Idaho
TRACTOR & EQUIPMENT CO.	Sidney, Miles City, Glasgow
CENTRAL MACHINERY COMPANY	Great Falls and Havre
WORTHAM MACHINERY CO.	Cheyenne, Wyo.

. . . for more details, circle No. 110 on Reader Service Postcard

K. N. Cundall named I.B.E. prex

Appointment of K. N. Cundall as president of International Bitumen Emulsions Corp. is announced

K. N. Cundall

by C. W. Turner, president of American Bitumuls & Asphalt Co. San Francisco. I.B.E. is a subsidiary of American Bitumuls. Cundall replaces Wayne Summers who retired after a 42-year career in asphalt marketing.

Top level appointments at Portland branch

Appointment of top management for the Portland, Ore., branch of Massey-Ferguson Industrial Division, Wichita, Kan., is announced by C. J. Davis, general manager. Named to head the Portland branch as industrial sales manager is Ray E. Arnold, formerly in charge of sales for Viking Equipment Co. A graduate civil engineer, with experience in highway engineering, Arnold has a broad background in the industrial equipment industry. Laurence W. Evans has been named industrial technician. He was formerly associated with Western Farm Equipment Co. and Viking Equipment Co., Portland, where he dealt in demonstration, service and sales of Davis equipment in Washington, Oregon and the Idaho panhandle.

C. J. Kee assigned to new post

Calvin J. Kee is representing the Wire Rope Division of John A. Roebling's Sons Corp. in the Southern California area, which includes the harbor areas of San Pedro, Wilmington, and Long Beach. He was recently assigned to his new post by James C. Barney, the division's Los Angeles district manager.

Sherman Products promotes Froehlich as group mgr.

Appointment of H. F. Froehlich as group manager responsible for the manufacturing, engineering and purchasing-production control departments, is announced by W. A. Romain, president of Sherman Products, Inc. of Royal Oak, Mich. Froehlich has been manager of purchasing and production control since March 1957.

DFPA adds to Western field promotion staff

Eleven men have been added to the staff of Douglas Fir Plywood Association's field promotion department. Through ten regional offices, these men function in promotion of volume use of fir plywood through personal calls on specifiers and large users chiefly in the construction and industrial fields. Appointed to the regional headquarters in San Francisco is Ralph McGreal recently of Denver, Colo.

Horn opens Portland, Ore., branch

A. C. Horn Co., Inc., Long Island City, N. Y., has opened a branch plant in Portland, Ore., to serve the Pacific Northwest. The new plant will serve Oregon, Washington, and parts of Idaho and Montana in the manufacture, sales and distribution of concrete additives, water repellent materials, expansion joint compounds, etc. James P. Durcan, formerly West Coast sales manager at San Francisco, has been named to head the Northwest operation. Horn's other West Coast branches are located at San Francisco and Los Angeles.

D. R. Thomas joins Raybestos-Manhattan, San Francisco

Donald R. Thomas recently joined Raybestos-Manhattan, Inc., in San Francisco. He takes on the responsibilities of office manager for this sales district. Formerly with a large equipment concern, Thomas brings to his new position a fine background of experience.

B & B sales executives promoted

Broderick & Bascom Rope Co. reports that J. J. "Bus" Sieber has been elevated to vice president in charge of sales for this nation-wide organization. K. B. "Ken" Britt, formerly assistant sales manager, succeeds Sieber as sales manager. Britt's extensive experience in wire rope includes both manufacturing and sales.

Clark to acquire Brown Trailers

Clark Equipment Co., leading manufacturer of materials handling equipment, announces its agreement to acquire all the capital stock of Brown Trailers, Inc. The Brown firm has been building trailers for 20 years, and has general offices in Spokane, Wash., a plant at Spokane, another at Denver, Colo., and plants in Pennsylvania and Illinois.

United Concrete Pipe Corp's Northwest expansion

A new pipe production sectio nearing completion at United C crete Pipe Corp.'s Auburn, Was plant, according to Lloyd Ea president of the firm. Represe ing an investment of more th $1,000,000, the new facility w produce steel pipe and Shot-C concrete cylinder pipe, and w also make available for the fi time in the Northwest a ceme mortar lining and coating servi for other steel pipe manufactur and government agencies.

Case appoints chief engineer

Appointment of Carl von Li sowe as chief engineer of the J. Case Co. Crawler Tractor Wor in Churubusco, Inc., is announce He fills the vacancy occasion when T. A. Haller moved up Racine to direct Case's new en neering research center. Von Li sowe had been 17 years with Ge eral Motors before joining the Ca organization.

B. F. Goodrich builds new plant at Phoenix

A new retread plant under co struction by B. F. Goodrich Ti Co. at Phoenix, Ariz., will soon b ready for occupancy. The ne plant will serve a four-state are comprising Arizona, New Mexic Nevada and Utah.

Kenworth buys Dart Truck

Kenworth Motor Truck Divisio of Pacific Car & Foundry Co., S attle, Wash., has completed neg tiations to purchase substantial all of the assets of Dart Truck C of Kansas City, Mo. Operations the newly formed KW-Dart Truc Co. will continue at Kansas Cit where a new manufacturing an administrative facility will be co structed. Kenworth plans to mov its rock-and-ore-mover productio to Kansas City. All other Ke worth truck production for high way and other transportation fiel will remain on the West Coast i Seattle and Vancouver, B. C. R. I O'Brien, who has been named pres dent of the KW-Dart firm, will co tinue as vice president and gener manager of Kenworth Motor Truc Co. Most of his time will continu to be spent in Seattle.

Case forms sales department for Utility tractor

Formation of a separate depart ment to handle sales of its expand ing Utility wheel and crawler lin is announced by W. C. Duesler, vic

esident-sales, J. I. Case Co., Ra-ne, Wis. Supplementing the com-ny's larger wheel and crawler its, the new line of smaller ma-ines will be sold and serviced by broad network of dealers to pro-de the intensive market coverage quired. Heading up the new Util-sales operation is William J. hlapman, a veteran of seventeen ars in the construction equip-ent industry. Assistant sales man-er, Utility line, is W. H. Vogel th a background of eighteen ars in this field.

uy Roll made sales manager; mes Irwin in S. F. post

Guy F. Roll is returning to Chi-go where he has been appointed omestic sales manager of Athey roducts Corp. Roll has been with

Roll

Irwin

they for 17 years, the past eleven ars as district representative in he Northwest and Southwest. He as headquartered in San Francisco or the past two years. Chosen to eplace Roll in the West is James . Irwin, according to W. D. Lease, xecutive vice president, who made he announcement. Formerly with heavy equipment dealer in the ast, Irwin resides in San Francisco.

Merger adds to sales efficiency

Dart Mfg. & Sales Co. of Denver, olo., announces its association ith Superior Cement Tool Corp., ynwood, Calif. Under the merger, art will be the exclusive national les outlet for the new Superior art Lo-boy.

H. A. RADZIKOWSKI (left), chief of the development division of the Bureau of Public Roads, and *W. K. Cox*, sales promotion manager, Caterpillar Tractor Co., discuss the road program in a recent meeting at Caterpillar in Peoria, Ill.

SHOWN is architect's model of the new Pacific Coast Division headquarters of The Asphalt Institute in Berkeley, Calif. Construction is under way and the building is expected to be ready for occupancy in the fall. Division Managing Engineer *B. A. Vallerga*, a former engineering professor at the University of California, presently has offices in San Francisco and directs Institute engineering service in the states of Washington, Oregon, California and Arizona.

Huge U. S. contract goes to "Quick-Way" Shovel Co.

"Quick-Way" Truck Shovel Co., Denver, Colo., recently received an order from the U. S. Army for 400 truck-mounted power shovels. Announcement of the $12,000,000 award was made by Walter O. Lampl, vice president and general manager of "Quick-Way". Contract calls for delivery of the truck shovels to the Corps of Engineers between January 1959 and August 1960, but final destination of the equipment is undisclosed. Lampl noted that the contract represents the largest peacetime purchase of such equipment ever made by the Army.

Friction Materials Co. opens new branch in Southern California

According to announcement by J. R. Davison, president, Friction Materials Co., Los Angeles, Calif., a leading West Coast specialist in friction materials, brake linings, etc., climaxes twenty-two years of progress with the opening of a new branch, El Monte Friction Materials, 2904 North Durfee Road, El Monte, Calif. Lynn Baker was appointed manager. Their third branch, Valley Friction Materials, 11817 Sherman Way, North Hollywood, is managed by Fred Hunziker.

Ottawa attachments available for Napco tractor

Napco Industries, Inc., Minneapolis, Minn., manufacturer of the four-wheel steer, four-wheel drive Crab Tractor, announces that Ottawa Steel, Ottawa, Kans., has been recognized as a Napco approved attachment manufacturer. To date Ottawa has designed two attachments specifically for this tractor: a ¾-yd. front-end loader, Model SS-44, and a backhoe, Model LX-44, which digs 12½ ft. deep. The attachments are available at all Napco dealers.

Allis-Chalmers promotes Mellish

T. L. Mellish is appointed manager, parts sales, for the Construction Machinery Division, Allis-Chalmers Manufacturing Co. He has been assistant manager since February 1956.

(Continued on page 195)

UNIT PRICES

Selected abstracts for Western projects

HIGHWAY — Construction of .137 mi. of road in Washington

Washington—Skagit County—State. Louis Elterich Co. has received a $470,536 contract for construction of .137 mi. of Skagit County road.

(1) Louis Elterich Co. $470,536
(2) Neukirch Bros. 488,263
C. B. Croy 568,126
S. S. Mullen, Inc. 614,157

		(1)	(2)
Lump sum	Clearing and grubbing	$ 8,000.00	$ 1,000.00
1,930 cu. yd.	Structure excavation	4.00	6.00
Lump sum	Shoring and cribs	80,880.00	40,500.00
32 hr.	Mechanical tamper	10.00	50.00
1,927 cu. yd.	Concrete class "A"	60.00	85.00
940 cu. yd.	Concrete class "F"	40.00	54.00
477 cu. yd.	Concrete class "H"	40.00	35.00
448,000 lb.	Steel reinforcing bars	.15	.14
351,400 lb.	Structural carbon steel	.26	.26
4,200 lb.	Cast steel	.90	.50
16 ea.	Bridge drains	70.00	70.00
1,426 lin. ft.	Aluminum bridge railing	8.50	10.25
9 mbm.	Timber & lumber (creosote treated)	400.00	350.00
7,110 lin. ft.	Furnishing tbr. piling (untreated)	.70	.75
237 ea.	Driving timber piles (untreated)	30.00	50.00
2,080 lin. ft.	Furnishing timber piling (creosote treated)	1.80	1.50
32 ea.	Driving timber piles (creosote treated)	70.00	50.00
3 ea.	Furnishing and driving timber test piles	500.00	800.00
Lump sum	Navigation and pier lights	1,500.00	2,500.00
80 ea.	Galvanized concrete inserts	7.00	2.00
1 mbm.	Timber & lumber (salts treated)	500.00	300.00

HIGHWAY—8.8 mi. of highway in Arizona

Arizona—Conchise County—State. Southern Arizona Contracting Co. has been awarded a $834,206 contract for the construction of 8.8 mi. of highway. Work consists of grading and draining roadway; furnishing and placing select material, aggregate base and bituminous plant mix; furnishing and applying a seal coat and other incidental work. There were 16 bidders on the project.

(1) Southern Arizona Contracting Co. $834,206
(2) Phoenix-Tempe Stone Co. 834,833
Western Constructors, Inc. 836,813
San Xavier Rock & Sand Co. 837,247

		(1)	(2)
9,100 cu. yd.	Roadway excavation	$ .40	$ .28
4,800 cu. yd.	Drainage excavation	.25	.28
3,200 cu. yd.	Structural excavation	1.00	1.45
198,400 ton	Borrow (CIP)	.22	.20
30,000 cu. yd.	Stripping pits	.15	.16
Lump sum	Provide water supply	1,000.00	1,000.00
29,200 M gal.	Apply water	1.15	1.50
5,000 hr.	Rolling	8.00	8.50
59,900 ton	Select material (CIP)	.57	.52
48,500 ton	Aggregate base (CIP)	1.20	1.25
2,250 ton	Cover material for seal coat (type B) (CIP)	5.00	5.00
35,425 ton	Bit. mix (cl. II-plant mix) (CIP except cost of paving asphalt)	2.80	2.60
1,600 ton	Paving asph. for bit. mix (gr. 200-300 penet) (CIP)	43.45	43.00
504 ton	Liquid asphalt for prime coat (gr. MC-2 or MC-3) (CIP)	53.00	54.00
169 ton	Liquid asphalt for tack coat (gr. MC-2 or MC-3) (CIP)	90.00	92.00
45 ton	Liquid asphalt for flush coat (gr. RC-2) (CIP)	52.25	54.00
256 ton	Emulsified asphalt for seal coat (gr. B) (CIP)	53.00	54.00
99,900 lb.	Structural steel (CIP)	.17	.16
492 lin. ft.	Aluminum handrail (CIP)	12.50	12.00
2,250 cu. yd.	Class A concrete (CIP)	39.00	44.00
288,350 lb.	Reinf. steel (bars) (CIP)	.125	.135
60 lin. ft.	24-in. bit. coated C.M.P. (CIP except excavation)	6.00	6.00
1,624 lin. ft.	29-in. x 18 in. arch-type bit. coated C.M.P. (CIP except excav.)	6.25	7.00
208 lin. ft.	43-in. x 27-in. arch-type bit. coated C.M.P. (CIP except excav.)	11.00	11.00
180 lin. ft.	36-in. x 22-in. bit. coated C.M.P. (CIP except excav.)	9.25	10.00
540 lin. ft.	Furn. & del. piles (steel H-column) (10-in. x 42-in.)	4.00	4.45
18 ea.	Driving piles (CIP)	100.00	93.00
5 ea.	Splicing piles (steel H-column)	30.00	25.00
10 cu. yd.	Remov. of structural concrete	20.00	30.00
56 ea.	Place dowels	2.00	2.00
Lump sum	Misc. remov. & other work (I 002-5 (6)	6,000.00	3,350.00
Lump sum	Misc. remov. & other work (F 102-5 (1)	1,000.00	800.00

1 ea.	Cattle guard ranch type (Std. C-14X) (CIP except excavation and concrete)	675.00	700.00
4,020 lin. ft.	Road guard (Std. C-7) (CIP)	2.80	3.00
875 lin. ft.	Road guard for bridges (special) (RG-1) (CIP)	3.50	3.05
290 lin. ft.	Road Guard (Std. C-7) (Precured) (CIP)	3.50	4.25
162 ea.	Guide post (Std. C-8) type BR & BL) (CIP)	6.00	6.50
19 ea.	R/W markers (Std. C-1) (CIP)	7.00	10.00
55,400 lin. ft.	Line fence (Std. C-16) (CIP)	.20	.19
7 ea.	Steel fence gates (Std. C-16) (type 1) (CIP)	50.00	80.00
208 lin. ft.	Single curb (Std. C-20) (type 1) (CIP)	2.00	1.95
688 lin. ft.	Single curb (Std. C-20) (type G) (CIP)	2.25	2.00
1,346 lin. ft.	24-in. culvert pipe CIP except excavation)	5.75	6.00
1,600 lin. ft.	30-in. culvert pipe (CIP except excavation)	7.50	7.00
626 lin. ft.	36-in. culvert pipe (CIP except excavation)	10.50	11.00
144 ea.	Barrier posts (CIP)	7.00	8.00
11,540 lin. ft.	Placing bit. mixed curbs	.10	.10
1,200 lin. ft.	Placing bit. mixed gutters	1.25	1.60

HIGHWAY—4.6 mi. of roadbed in Idaho

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

		(1)	(2)
10,250 cu. yd.	Uncl. Exc.	$ .40	$ .3
470 cu. yd.	Exc. for strs.	1.50	2.0
12,800 cu. yd.	Sel. borr. Class "A"	.70	1.1
1,750 M gal.	Watering base & surf. courses	2.00	1.5
250 hr.	Rolling, power roller	8.00	6.5
290 hr.	Rolling, pneu. tire roller	8.00	6.0
37,000 ton	Cr. Gr. base course, type "B", ¼" maximum	1.00	1.0
9,800 ton	Cr. Gr. in windrows, ¼" max.	.95	1.0
5,000 ton	Cr. Gr. in stkp., ⅜" max.	.90	.7
33,000 gal.	MC-1 asph. rd. material for prime coat	.17	.1
275 ton	Blotter material, class "C"	1.50	3.0
4,630 mi.	Mix. fin. & roll, class "A"	1,000.00	900.0
440 ton	MC-3 asph. rd. mat. for roadmix	39.50	41.0
45 ton	Mix & plac. bit. surface for appr. roads	6.00	6.0
26,000 gal.	RC-5 asph. road material for seal coat	.18	.1
1,300 ton	Cover coat material, class 3	3.50	3.7
680 lin. ft.	8-in. corr. metal pipe underdrain	2.00	2.5
570 cu. yd.	Special backfill, class "B"	1.00	5.0
4,630 mi.	Recond. & reshape exist. roadbed	700.00	600.0
525 ton	Rejects in stockpile	.50	.6
2,300 lin. ft.	Move and reset guard rail	1.50	2.0
70 ea.	Move and reset guide posts	5.00	3.0

BRIDGE—Construction of a concrete bridge and approaches in California

California—Solano and Sacramento counties—State. A $2,146,870 contract has been awarded to Judson Pacific-Murphy Corp. for construction of a reinforced concrete bridge and a steel superstructure for a bridge, approaches and connections to be graded and surfaced with plant-mixed surfacing.

(1) Judson Pacific-Murphy Corp.	$2,146,870
(2) The Duncanson-Harrelson Co.	2,619,040
Harms Bros., C. M. Syar & Erickson, Phillips and Wiseberg	2,748,669
United States Steel Corp.	2,894,245

		(1)	(2)
570 cu. yd.	Remove concrete pavement	$ 2.60	$ 2.5
Lump sum	Clearing and grubbing	4,240.00	5,000.0
Lump sum	Dev. water sup. & furn. water equipment	2,544.00	3,500.0
4,050 M gal.	Applying water	1.40	1.
15,960 sq. yd.	Compact. original ground	.048	.0
18,600 cu. yd.	Roadway excavation	.41	.
550 cu. yd.	Structure excavation	3.02	5.
375 cu. yd.	Structure backfill	3.13	4.
59 cu. yd.	Ditch & channel excavation	1.06	1.
33,500 ton	Imported borrow	.64	.
7,500 ton	Untreated base	2.88	2.
11 ton	Asph. emulsion (pnt. bdr. & sl. cts.)	54.60	55.0
27 ton	Lig. asph. SC-2 (prime coat)	42.10	40.0
182 ton	Paving asphalt (PMS)	6.25	6.
3,700 ton	Mineral aggregate (PMS)	6.25	6.
61 ton	Screenings (seal coat)	9.00	9.0
9 cu. yd.	Class A concrete (structures)	63.60	100.0
Cont. sum	Class A conc. (bridges X1, 180 C. Y.)	81,302.00	150,000.0
173 cu. yd.	Lightweight concrete	76.32	135.
263 cu. yd.	Heavyweight concrete	153.70	180.0
900 lb.	Bar reinforcing steel	.14	.
Cont. sum	Bar reinf. steel (bridges) (224,000 lb.)	26,880.00	40,000.

2,570 lin. ft.	Furnishing concrete piling ..	3.90	3.50
54 ea.	Driving concrete piles	153.70	220.00
Cont. sum	Struc. steel (4,440,000 lbs.)..	874,781.44	1,150,000.00
6,500 lb.	Stainless steel rails	2.20	3.00
4,200 lb.	Miscell. iron & steel.....	.77	.50
Lump sum	Cleaning & paint struct. steel.	89,578.00	105,000.00
Lump sum	Treated timber fenders	115,994.00	125,000.00
373 cu. yd.	Class B concrete (curbs & gutters).....	30.20	38.00
26 ea.	Right of way monuments....	7.95	9.00
160 cu. yd.	Light stone riprap	12.72	12.50
300 cu. yd.	Broken concrete riprap	6.36	6.00
110 lin. ft.	Metal plate guard railing....	5.67	6.00
2,570 lin. ft.	Steel railing	10.92	11.50
Cont. sum	Pipe hand railing (towers)...	10,660.00	12,000.00
90 ea.	Culvt. mrkrs., guide posts and hor. reflect. units	6.55	7.00
90 lin. ft.	8 in. CMP (16 gage).....	2.65	3.00
52 lin. ft.	12 in. CMP (16 gage).....	3.45	3.50
4 ea.	Flared end sections for 18 in. mtl. pipe.....	37.00	40.00
2 ea.	18 in. automatic drainage gates	53.00	55.00
Lump sum	Finishing roadway	1,060.00	1,500.00
65 lin. ft.	Raised traffic bars	2.90	3.00
Lump sum	Crossover No. 2.....	21,000.00	75,000.00
Lump sum	Remov. port. of exist. bridge.	165,748.00	130,000.00
Lump sum	Re-erect portions of exist. steel truss	1,668.00	8,000.00
Lump sum	Machinery houses	40,249.71	30,000.00
Lump sum	Control house	9,567.00	20,000.00
Lump sum	Bridge operating system	469,254.92	500,000.00
Lump sum	Highway lighting system	6,671.00	70,000.00

BRIDGE—An .084-mi. bridge to be built in Washington

Washington—Chelan County—State. Henry Hagman has been awarded $306,261 contract for construction of an .084-mi. bridge over the Wenatchee River.

1) Henry Hagman $306,261
2) John E. Alexander, Inc..... 346,004
Hannan Bros. Co..... 371,161
Marshall Construction Co..... 393,293

		(1)	(2)
2,200 cu. yd.	Structure excavation .....$	4.00	$ 6.00
.12 hr.	Mechanical tamper	7.00	6.00
Lump sum	Shoring & cribs or extra excav...	20,000.00	50,000.00
Lump sum	Superstructure	207,000.00	200,000.00
1,752 lin. ft.	Stand. bridge railing type No. 1..	6.00	6.00
270 cu. yd.	Concrete Class A.....	62.00	60.00
205 cu. yd.	Concrete Class B.....	57.00	60.00
590 cu. yd.	Concrete Class H.....	15.00	30.00
3,000 lb	Steel reinforcing bars.....	.13	.14
Lump sum	Structural carbon steel	5,500.00	8,000.00
Lump sum	Expansion bearings	5,000.00	5,000.00

HIGHWAY—Work on 21.2 mi. of highway in Wyoming

Wyoming—Converse County—State. Big Horn Construction Co. has received a $709,351 contract for putting a cement stabilized base course on 6.5 mi. and a plant mixed surface course, stone chip seal coat and misc. work on 14.5 mi. of road. There were 15 bidders on this project.

1) Big Horn Construction Co..... $709,351
2) Taggart Construction Co. 728,654
Schmidt Construction Co. 745,777
Western Paving Construction Co. 768,010

		(1)	(2)
36,500,000 cu. yd.	Excavation ..... $	180	$ 230
260,000 hr.	Mechanical tamping	8,000	5,000
5,260,000 M. gal.	Watering	1,500	2,200
130,000 cu. yd.	Exc. for pipe culverts	2,000	3,000
10,000 cu. yd.	Subexcavation	5,000	2,000
3,900,000 cu. yd. mi.	Cubic yard mile haul	100	200
100 mi.	Old road obliteration	500,000	500,000
100 mi.	Detour obliteration	500,000	500,000
16,000 hr.	Pneum. tired roller operation ..	6,000	7,000
100,000 hr.	Smooth steel roller operation ...	7,000	7,000
330,000 hr.	Pneum. tired roll. op. Type VII	13,000	15,000
10,000 ac.	Seeding crested wheat grass ...	20,000	100,000
20,000 ton	Mulch	50,000	60,000
70,000 hr.	Road leveler operation	25,000	15,000
93,900,000 ton	Selected matl. surf. Type 1	300	440
97,600,000 ton	Crushed gravel BC 1 in max. ..	400	560
3,620,000 ton	Asphaltic material AC PM ...	20,000	18,000
130,000 ton	Asphaltic material AC seal ...	23,000	24,000
220,000 ton	Asphaltic material RC cure ...	25,000	36,000
610,000 ton	Asphaltic material RCF seal ..	28,000	30,000
115,000 ton	Asphaltic materialMC prime ..	23,000	27,000
60,300,000 ton	Plant mixed surface course	2,950	2,900
6,620,000 ton	Stone chips, type B	4,000	4,500
19,500,000 lin. ft.	Shaping and tamping curb	400	400
76,100,000 ton mi.	Haul of surfacing material	60	90
8,600,000 ton	Binder	700	300
32,400,000 sq. yd.	Processing cement stab BC ...	250	170
20,700,000 bbl.	Cement	4,500	4,850
754,000 lin. ft.	15-in. CMP	6,000	6,000
232,000 lin. ft.	84-in. CMP	60,000	36,000
50,000 ea.	12-in. CMP FE section	25,000	10,000
Lump sum	Removing existing structures ..	500,000	500,000
5,000 cu. yd.	Class 1 riprap	20,000	20,000
50,000 cu. yd.	Grouted riprap	25,000	25,000
12,700,000 lin. ft.	Metal plate guard fence	2,750	2,750
3,200,000 lin. ft.	Wood portable snow fence	2,000	2,250
2,000 ea.	7 ft., 9 in. x 24 ft. H D cattle guards	1,000,000	800,000
810,000 ea.	Type A reflect guide posts	8,000	6,000
930,000 ea.	Type E reflect guide posts	5,000	2,500

HIGHWAY—15 mi. of highway to be constructed in New Mexico

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	Clearing and grubbing	$17,000.00	$38,000.0
267,800 cu. yd.	Excavation—unclassified	.31	.2
251,294 cu. yd.	Ordinary borrow	.21	.2
33,530 M gal.	Watering	.35	.1
1,580 hr.	Rolling (tamping roller)	9.00	6.0
1,940 hr.	Rolling (pneumatic tired)	4.50	3.0
1,070 hr.	Rolling (steel tired)	6.00	4.0
1,775 hr.	Fifty (50) ton roller operation	11.00	6.0
1,653 hr.	Mechanical tamping	4.00	5.0
1,176,865 sta. yd.	Station yard overhaul	.01	.0
608,107 ¼ mi. yd.	Quarter mile yard haul	.035	.0
920,433 ton mi.	Ton mile haul	.055	.0
3.39 mi.	Grading	2,000.00	2,000.0
3,385 lin. ft.	Contour ditches	.10	.1
3 ea.	Cattle guard—18 ft. roadway	1,800.00	1,500.0
4 ea.	Cattle guard—24 ft. roadway	2,200.00	1,750.0
132,900 lin. ft.	Galvanized barbed wire fence	.20	.2
25 ea.	Gates—standard type	40.00	50.0
130 ea.	Bracing	5.00	10.0
95 ea.	Right of way markers	6.00	7.0
3 ea.	Stand. fed. aid project markers, type I	50.00	50.0
50 ea.	Treated tmbr. warn. posts, refl. (6 in. diam.)	6.00	7.0
28,300 ton	Selected borrow sub-base	.43	.4
19,300 ton	Selected material, controlled gradation	.51	.4
41,600 ton	Crushed stone, 2 in. max. size	11.09	1.2
35,600 ton	Crushed stone, 1 in. max. size	1.31	1.4
2,825 bbl.	Bituminous mat., type MC-1	6.85	7.5
425 bbl.	Emulsified asphalt, AE-3	9.00	7.5
1,000 bbl.	Bit. mat., type 120-150	7.85	7.5
1,500 ton	Cover material	4.00	5.0
28,150 ton	Plant mix surface course	3.35	3.5
9,530 bbl.	Bit. mat., type 120-150 (plant mix)	7.30	7.5
710 bbl.	Bit. mat., type 120-150 (tack coat)	8.50	7.5
129.41 cu. yd.	Class "A" concrete	65.00	50.0
1026.20 sq. yd.	Class "A" concrete for blankets	9.00	6.0
5,202 lb.	Reinf. for concrete structures	.30	.3
3,882 lb.	Wire fabric reinforcement	.25	.3
71 cu. yd.	Grouted rock retards	20.00	10.0
884 lin. ft.	Culvert pipe—30 in. diam.	5.80	7.0
620 lin. ft.	Culvert pipe—42 in. diam.	9.10	10.2
142 lin. ft.	Culvert pipe—54 in. diam.	12.50	14.0
132 lin ft.	Corr. metal culv. pipe—66 in. diam., bevel 2:1	20.00	19.0
78 lin. ft.	Corr. metal culv. pipe—90 in. diam., bevel 2:1	37.60	32.0
86 lin ft.	Struc. plate pipe—132 in. diam., bevel 2:1, gage 710-18	73.60	75.0

HIGHWAY—Construction of 3.7 mi. in Utah

Utah—Duchesne County—State. L. A. Young Construction Co. and Vernal Sand & Gravel Co. have received a $142,908 contract for construction of 3.7 mi. of 2½-in. road mixed bituminous surfaced road.

(1) L. A. Young Construction Co. & Vernal Sand & Gravel Co. $142,908
(2) Roberts & Anderson Construction Co. 148,766
Olof Nelson Construction Co. 157,660
Wheelwright Construction Co. 169,138

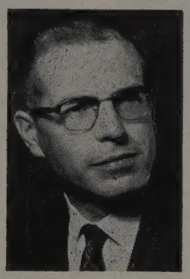
		(1)	(2)
468 ton	Bituminous material, type MC-3	$ 37.00	$ 39.00
82 ton	Bit. mat., type MC-1 or MC-2	37.00	39.00
54 ton	Bituminous material, type RC-4	40.00	44.00
125 gal.	Bit. additive (commercial grade)	2.00	2.50
3,723 mi.	Scarifying and mixing	800.00	900.00
625 ton	Cover material, type "A"	4.50	4.50
625 ton	Cover material, type "A" (in stockpile)	3.00	3.00
21,300 ton	Gravel surface, type "B"	1.00	.80
18,200 ton	Gravel base course	1.00	.75
20,000 cu. yd.	Unclassified roadway excav.	.30	.30
36,000 cu. yd.	Imported borrow	.30	.40
215,000 sta. yd.	Class "A" overhaul	.01	.01
12,500 yd. mi.	Class "B" overhaul	.12	.15
1,950 M gal.	Watering	.50	1.50
625 hr.	Rolling, tamping roller	6.00	9.00
70 hr.	Rolling, pneumatic tire or power roller	8.00	8.00
70 hr.	Self propelled pneu. tired roller	10.00	10.00
195 lin. ft.	18-in. C.M. pipe	4.00	4.00
18 lin. ft.	36-in. C.M. pipe	12.00	10.7
180 lin. ft.	C.M. pipe-arches, 22-in. x 13-in.	4.00	6.00
108 lin. ft.	C.M. pipe-arches, 36-in. x 22-in.	8.00	7.5
90 lin. ft.	C.M. pipe-arches, 58-in. x 36-in.	18.00	17.5
109 cu. yd.	Concrete, class "A"	80.00	80.00
16,000 lb.	Reinforcing steel	.15	.1
200 lb.	Structural steel	.50	.7
900 cu. yd.	Excav. for structures, unclass.	2.00	2.5
700 cu. yd.	Small ditch excavation	2.00	.7
100 ea.	Guide posts	10.00	7.0
2 ea.	F.A.P. markers	50.00	35.0
70 hr.	Mechanical tamping	8.00	7.0
54 ea.	Right of way markers	10.00	7.0
2,500 cu. yd.	Loose riprap	2.00	4.0
7,100 lin. ft.	Right of way fence, type "B"	.35	.3
10 ea.	16-ft. gates	50.00	45.0
Lump sum	Furnishing water equipment	1,000.00	1,500.0
Lump sum	Furnishing construction signs	1,975.00	1,000.0

MANUFACTURERS

(Continued from page 190)

New West Coast sales head for Roebling division

Lloyd F. Stansbury has been made West Coast supervisor for the Construction Materials Division, John A. Roebling's Sons Corp., replacing the late Robert J. Cole. The division specializes in tension-



Lloyd F. Stansbury

ng materials for prestressed concrete, and Stansbury will have harge of sales in the eleven Western states, Alaska and Hawaii. He has been associated with the Seattle district office of the Roebling firm or the past eight years. His new headquarters are at the San Francisco district offices, 1740 Seventeenth St.

Modern new plant for Brunner & Lay in Sacramento

Complete facilities for the manufacture and servicing of drill steel have been installed in the new, modernly equipped plant of Brunner & Lay in Sacramento, Calif. Claude Thomas will be plant superintendent, and Wayne Banks, sales engineer. Large stocks of carbide Rok-Bits and allied tools will be maintained at 7500 Fourteenth Ave.

J. I. Case elects new president

At the annual meeting of the Board of Directors of J. I. Case Co., Racine, Wis., Marc B. Rojtman, executive vice president, was elected president of the company. John T. Brown was reelected chairman of the board.

N. J. Richart named California LeT-WesCo representative

Norman J. Richart has been appointed LeTourneau-Westinghouse district representative for California, according to announcement by W. E. Hendricks, domestic sales manager at the firm's Peoria, Ill., headquarters. Coming from the Eastern sales division, Richart will work with two LeT-WesCo distributors: Blakemore Equipment Co. of Oakland, and Crook Company of Los Angeles. He replaces Lee E. Jorgenson who has been transferred to the central sales division.

H. A. Price becomes Freyssinet's West Coast representative

Randall M. Dubois, president of the Freyssinet Company, Inc., consultants in prestressed concrete construction, announces the appointment of Harold A. Price as representative on the West Coast. Formerly associated with Basalt Rock of Napa, Calif., Price is vice president and a director of the Prestressed Concrete Institute. He will make his headquarters in Napa, Calif.

Smith-Blair opens another plant

Smith-Blair, Inc., South San Francisco manufacturer of pipeline couplings, clamps, etc., has opened a new 6,000-sq. ft. plant, warehouse, and regional sales office in Henderson, Tex.

Western Machinery to handle Michigan line

Western Machinery Co., Spokane, Wash., has been appointed to sell and service the "Michigan" products of the Construction Machinery Division of Clark Equipment Co. The distributor's territory in the state of Idaho covers the nine northern counties, and Idaho County north of the Salmon River, and in Washington the counties east of and including Okanogan, Douglas, Grant and Benton.

Republic Supply establishes contractor department

A new contractor department has been established by the Republic Supply Co. of California, Los Angeles, with Joseph W. Coffy manager. It is designed to provide a highly specialized service for its contractor customers. Experienced specialists in the new department are Chester Horstmann, F. Joseph Young, Jr., Axel Hallberg, and Robert McCann.

Hyster acquires Martin

Merger of the Hyster Company of Portland, Ore., with Martin Machine Co. of Kewanee, Ill., is announced by Philip S. Hill, Hyster executive vice president. The corporate change will have no effect on the operation of the present facilities and no personnel changes are contemplated. Dealer relationships remain unaffected, according to Hill.

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