

DECEMBER 1955



FLOATING ON RAFTS, workmen fasten 6x12-in. blocks to the piles by tightening 1-in. bolts. All formwork is supported by the blocks.

After the concrete deck is poured and cured the forms are dropped into the water and floated ahead for use on the next 30-ft. section.

It's 50 mi. from casting bed to job site for – **2000 pretensioned piles**

PRETENSIONED CONCRETE piles are being used in a big way between Piers 15 and 17 in San Francisco. Over 2,000 are being driven into the muddy bottom of the Bay to serve as a foundation for a concrete loading deck with an asphalt surface. Some will be 131½ ft. long, believed to be the longest pretensioned concrete piling ever made. Contractor Ben C. Gerwick, Inc., awarded the \$1,313,870 contract March 3, 1955, brings all the piles to the job by barge from his Petaluma, Calif., casting yard, 50 mi. away. The job is scheduled for completion in February 1956.

The project is similar to work which was done on Piers 30 and 32 in 1951 (*Western Construction*, Oct. 1951, p. 65-68). More room must be provided for the big truck-and-trailer combinations which carry materials

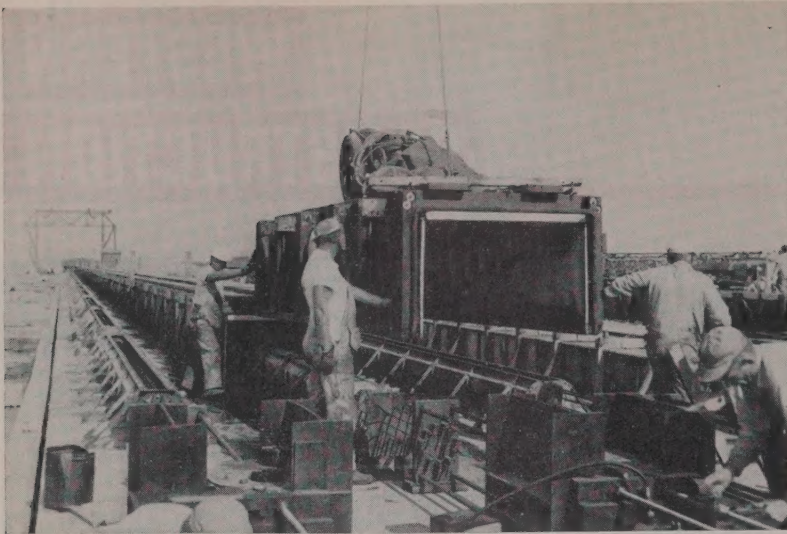
to and from the waterfront. The existing piers and warehouses, with closely spaced columns supporting the roof, are 160 ft. wide and extend 800 ft. from the shore. The piers, separated by 200 ft. of open water, provide berthing space for four vessels.

When the present contract is completed the area between the piers will have a reinforced concrete deck with an asphalt surface 3½ ft. lower than the floor level of the adjacent piers. The total area of the new deck will be 160,000 sq. ft., plenty of maneuvering room for trucks. Two railroad spurs are being provided, one on each side of the deck. There still will be berthing space for three vessels, and the difference in floor levels will greatly speed up loading and unloading of truck trailers and railroad cars. Experience at Piers 30 and 32

has shown that handling time for each arrival and departure can be cut down as much as a day.

There will be two types of pretensioned piles used on this job. Now being driven are 1,863 composite timber-concrete piles consisting of timber sections up to 104 ft. long with a 14-in. solid octagonal pretensioned concrete top, 23 to 28 ft. long. There will be 139 of the other type, to be made early in January, which will be 20-in. octagonal with an 11-in. hollow core, 131½ ft. long.

Both of these piles were alternates in the bidding. The 14-in. octagonal top was an alternate to a gunited timber pile, while the 20-in. octagonal was an alternate to a regular precast concrete pile. The pretensioned piles were selected by the Gerwick company and approved by the State Board of Harbor Commissioners.



STEAM HOODS are being removed after a curing period of 24 hr. and placed over freshly poured concrete on the adjacent line. In the lower right strand tension is being released.



FORM STRIPPERS are close behind as the end of the 500-ft. line is reached. Next step will be to cut the strands between the piles with a torch and load the piles on a barge for trip to job.

As a result of their low bid a 500-ft. long, 4-line pretensioning bed was built at the Gerwick yards during March-April of this year. In addition to piles, various types of girders, beams, and slabs can be manufactured on this bed. Productive capacity has since been increased by the addition of a 340-ft. long 3-line bed in June. A 100-ft. long, 1-line bed was the first bed installed (November 1954) and was used for tests and experiments which led to the successful bid for the Pier 15-17 project.

The 14-in. solid octagonal piles have eleven $\frac{3}{8}$ -in. diameter high tensile steel strands—the 20-in. octagonal piles with the hollow core have eighteen $\frac{3}{8}$ -in. strands. The strands, furnished by John A. Roebling's Sons Corp., contain seven wires. Eleven reels, each holding 15,000 ft. of strand, are mounted on spindles at one end of the casting bed. Eleven strands are pulled the full length of the bed in one operation.

After the strands are properly anchored in the distribution plates, they are tensioned by a hydraulic jack up to 175,000 psi. which is 70% of the ultimate strand strength. Concrete supplied by the nearby Petaluma Ready-mix Co. is then poured into the forms at the rate of about 10 cu. yd. per hr. Internal vibration aids in compaction and gives the concrete a smooth finish.

Steam Curing

When the concrete has been poured and the top side of the octagonal pile has been finished steam hoods are lifted into place with a crane and fastened tightly together for the full length of the casting bed. The piles are steam cured for 24 hr. at a temperature of 140 deg. and air cured for an additional 16 hr.

After the steam hoods and forms are removed the tension on the strands is released uniformly by means of the hydraulic jack. The strands between each pile are cut with an acetylene torch, with 24 in. left extending from the top of each pile for tying into the cast-in-place concrete deck. Sixteen 23- to 28-ft. piles are manufactured daily by this method and are either stored or loaded on a barge for shipment to the site. The barge trip takes 8 hr.

Before any pile-driving began, an underwater rock-fill dam was built across the slip near the end of the piers by Healy-Tibbitts Construction Co. on a \$59,000 contract awarded in February 1955. Behind this dam dredged material which is usually wasted by the Harbor Commission was dumped, changing the depth of the water at low tide from 35 ft. to 9 ft. This was done to reduce the unsupported length of the piles and also to enable the prestressed concrete section of the pile to be shorter. The head of the timber section is driven 10 ft. below the mud line to make sure no deterioration or infestation of the wood takes place.

The pile-driving is being done by a floating rig which positions itself by quarter lines attached to the piers. The 23- to 28-ft. pretensioned piles are removed from the barge by a two-point pick-up and 9 are suspended from the rig at one time. A 4-point pick-up will be used on the 131½-ft. piles. The timber piles are up to 104 ft. long and are rafted to the site from San Rafael, 15 mi. away.

By manipulating the cables attached to the pier the rig can position the piles to a 3-in. tolerance. After the heads of the timber piles have been driven down to within several feet of the water surface the concrete piles are swung into position directly above. The steel sleeve on the tip of the concrete pile is then placed on the head of the protruding timber pile. This is a press fit and no further connection is needed. Normally it takes only 10 min. to drive the entire composite pile.

So far little trouble has been met in driving the piles to grade. An average of 16 piles are driven per day and of these only one or two have to be cut off. Pretensioned piles can be cut off at any point without difficulty.

Forming the deck comes next. The pile bents are spaced at 10 ft. and the pile spacing within the bent varies from 5 ft. 9 in. under the railroad tracks to 9 ft. 2 in. under the middle section of the deck. The formwork rests on 6x12-in. girts which in turn rest on 6x12-in. blocks tightened together around each pile with 1-in. bolts. The form panels are made on the job from ¾-in. plywood with 2x8-in. backing.

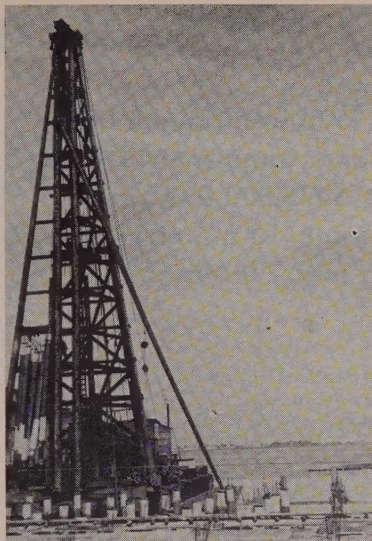
Transit-mixed concrete is placed by two conveyor belts fitted with elephant trunks. One conveyor is 75 ft. long, the other 60 ft. Pouring takes place every Monday close behind the pile-driving operation. About 210 cu. yd. go into a section of deck 200 ft. wide and 30 ft. long.

Form removal

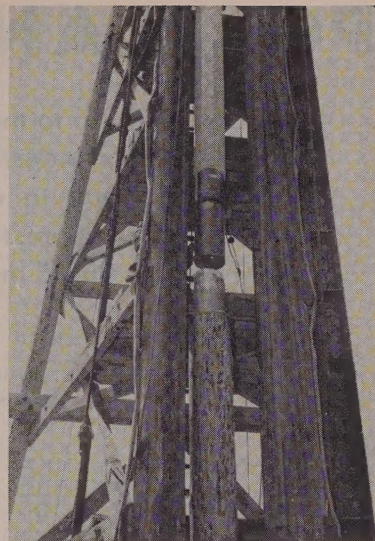
Form removal is a rapid process. At low tide men on rafts float under the deck and loosen the 1-in. bolts which clamp the 6x12-in. blocks to the piles. This allows sections of the forms to drop into the water where they can be floated ahead and lifted into place for the next pour by air tuggers. The plywood sections of the forms have been used 3 times and are expected to last for the whole job.

When the deck is completed a 1½-in. layer of asphalt will be put down. This work has been subcontracted to Charles L. Harney, Inc.

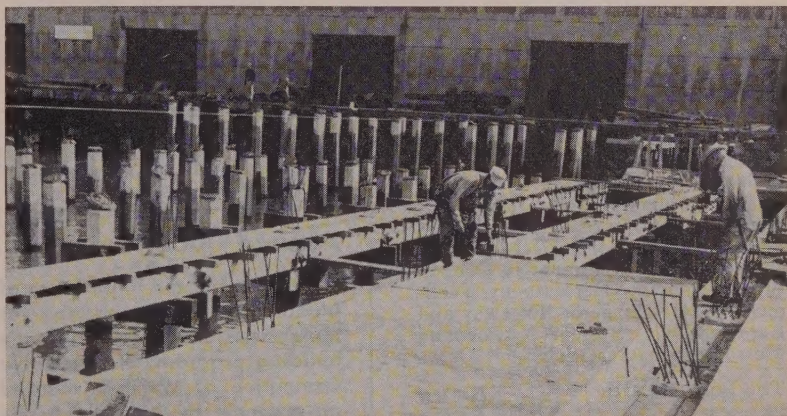
For the Board of State Harbor Commissioners, S. S. Gorman is chief engineer, and Jack Futscher is resident (picture on page 78). For Ben C. Gerwick, Inc., John Ford, Jr., is superintendent. Jack Weiss is in charge of pretensioning at the Petaluma casting yard. Dorence Wain-scott is directing the steel placement in the deck for Herrick Iron Works, steel suppliers.



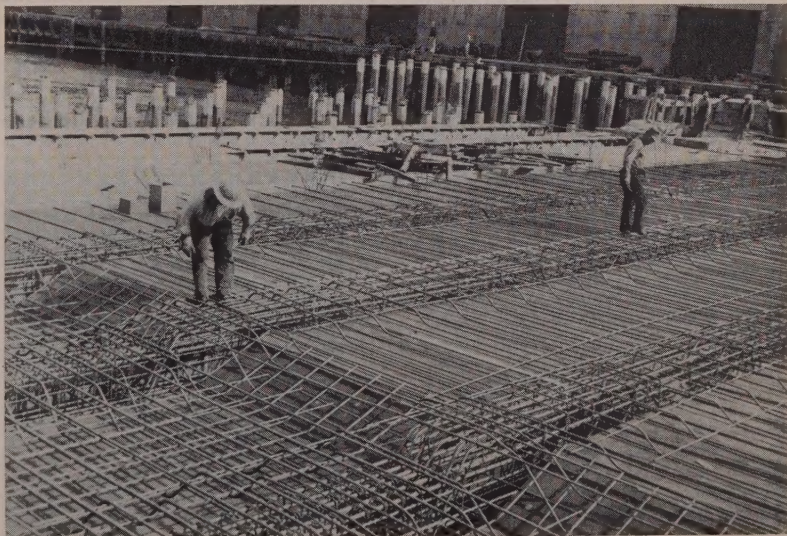
LIFTING UP a timber pile 104 ft. long is easy for this big rig. About 16 piles are driven per day.



PRESS FIT is achieved by dropping the steel sleeve of the concrete pile on the turned-down timber head.



DECK FORMING follows closely with job-made plywood sections which can be used repeatedly. Protruding strand steel from the piles is bent over into the beam before pouring concrete.



REINFORCING STEEL for the deck is put in place as soon as forms are ready. Slab and beams form an integral unit. Heavier reinforcement in the foreground will support a railroad spur.

PORTLAND FREEWAY SYSTEM

A program to meet 1975 traffic needs at the hub of Oregon's industry and commerce involves 96 mi. of freeway to cost \$275,000,000 and includes 75 mi. of depressed route, 13 mi. of viaduct, 3 mi. of tunnel, and 5 mi. of major bridges.

By

J. AL HEAD, Assistant Traffic Engineer
Oregon State Highway Department
(Recipient of the Dr. L. I. Hewes Award for 1955)

REPRESENTING AN ULTIMATE expenditure of \$275,000,000, preliminary plans for a 96-mi. freeway system have resulted from studies of the Portland Metropolitan Area by the Oregon State Highway Department, based on meeting 1975 traffic needs. The types of construction activity to result from this long-range program include 75 mi. of depressed highway, 13 mi. of viaduct, 3 mi. of tunnel section and 5 mi. of major bridges. Translated further, the construction would allocate \$41,000,000 for grading and paving, and \$148,000,000 for structures.

Growth of the area, and resulting traffic problems which made this study necessary, are outlined in this brief review. The subject received comprehensive treatment in Oregon State Highway Department Technical Report No. 55-5, "Freeway and Expressway System, Portland Metropolitan Area, 1955."

The Portland area

Portland is the commercial, industrial, and financial center of Oregon, southwest Washington, and the Columbia River Basin. Population of the city totaled 373,628 in 1950 and is expected to reach 400,000 during 1955. While the economy of the city is well diversified, much of its growth can be traced to its location at the confluence of the Columbia and Willamette rivers. Raw materials and farm products produced throughout the Pacific Northwest are transported to the Portland area by highways, railroads, and waterways for manufacture, processing, and ultimate distribution.

To move the raw materials into Portland for processing, finished goods to their markets, and people into and out of the area, an extensive transportation system has developed. Portland is served by more than fifty steamship lines, five major rail lines and several "short" lines, eight airlines, and seven US numbered routes augmented by six state routes, two of the US routes (US99 and US30) being part of the interstate highway system.

The most important commercial

generator of traffic in the Portland study area is the west-side central business district. On the basis of an origin-destination study of the Portland area made in 1946, it was found that about 16 of every 100 trips made within the area had an origin or a destination within this district. It is expected that the position of the central business district as a generator of traffic will not change appreciably in future years.

Trends and forecasts

A significant population increase was made in the Portland study area

during the 1940's as a result of the large wartime shipbuilding program. The area was able to retain and expand this increase at the end of the war mainly because of the expansion of its basic employment. The following table shows the population trend in the Portland urban area for the years 1900 to 1975. In general, the largest population gains for the years 1940 to 1950 occurred in the suburban areas surrounding the city.

Year	City of Portland	Portland Urban Area
1900	90,426	
1910	207,214	
1920	258,288	
1930	301,815	393,000
1940	305,394	422,000
1950	373,628	600,000
1955	402,900	666,300
1960	424,200	728,800
1965	451,600	801,200
1970	481,300	877,300
1975	505,800	955,400

(Source: Portland City Planning Commission, January 1955.)

If population growth during the 20-year period from 1955 to 1975 follows the trends experienced during the 1940-1950 period, further large scale suburban increases are to be expected, with increases of a smaller

A word about the 1955 winner . . .

Recognizing the importance of planning as the foundation for tomorrow's Western highway building program, the Executive Committee of WASHO selected an engineer in that field to receive the 1955 Dr. L. I. Hewes Award. J. Al Head, the recipient, and author of this article, is the Assistant Traffic Engineer of the Oregon State Highway Department. His study of, and subsequent report on, a freeway and expressway system for the Port-

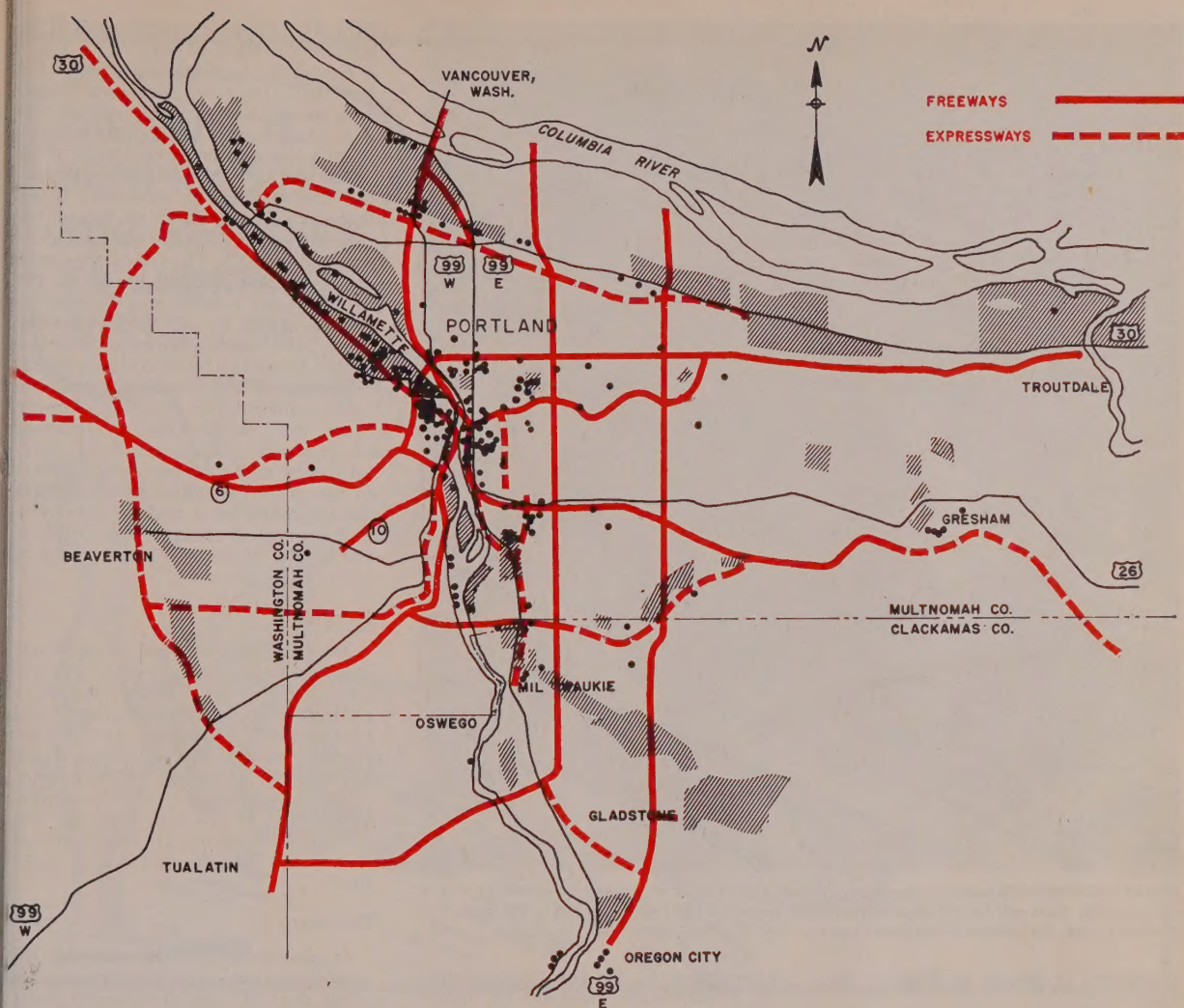
land Metropolitan Area won him the award.

In proposing him as the official nominee from the Oregon Highway Department, R. H. Baldock stated that "The long-range planning of highway development in urban areas is undoubtedly the most complex and difficult task confronting the highway engineer. The work which Mr. Head has done in this field is outstanding, both in the searching analysis of the data and in the clear presentation easily understandable by the general public who are so vitally concerned with such matters. The outstanding service which Mr. Head has rendered to the development of the traffic engineering phase of highway engineering eminently qualifies him for consideration for the Dr. L. I. Hewes Award."

Al Head graduated from Oregon State College in civil engineering in 1939, and joined the Oregon State Highway Department the same year. He has held his present title since 1949.

—Editor





PROPOSED SYSTEM of freeways and expressways for the Portland metropolitan area. Each black dot represents a manufacturing concern employing 50 or more persons, and the cross-hatched areas indicate possible future industrial development. Definitions: Freeway—complete

control of access, no crossings at grade, no left turns, no signals and no parking; Expressway—partial control of access, some intersections at grade but mostly separated, left turns provided for with left-turn refuges, no parking.

magnitude within the city limits. According to the city planning commission population forecast, City of Portland population is expected to reach 505,800 by 1975, a 35% increase over 1950. A 59% increase is anticipated for the Portland urban area from 1950 to 1975.

Any freeway and expressway system to be developed must be designed to give motorists in these expanding areas and in the existing populated areas within the city easy access to the commercial and industrial areas. The proposed freeway and expressway system accomplishes this.

Registered vehicles in the Oregon portion of the Portland metropolitan area—Multnomah, Clackamas and Washington counties—increased 63% during the period from 1940 to 1950. In 1953 the number of registered vehicles reached 286,170 and it is estimated that by 1975 this number may approach 500,000.

A review of vehicular volume on the eight Willamette River bridges within the corporate limits of Portland for the past 10 years indicate a 40% increase. Traffic volumes at 27 "external cordon stations" in the 1946 survey showed a 51% increase in the 10-year period, 1946-1955.

Because of the different growth patterns prevailing in the various Portland areas, it is difficult to derive a single factor which can be used to expand current traffic volumes to the 1975 level. For purposes of the report, however, it has been assumed that a doubling of present day traffic volumes by 1975 on the existing arterial and major street system would occur.

Traffic volumes on the proposed freeway-expressway system itself would expand at a faster rate. For purposes of comparison, it has been assumed that the entire system would be opened to public use at one time. It is estimated that 20 years after

completion, traffic volumes on the system would be 150% above the level of the first year of use.

The traffic projection factor for the increase in traffic volume on the freeway-expressway system, 2.50 for the 20th year over the 1st year, has been used as the traffic projection factor. Because of the possibility of intensive industrial-commercial-residential development in areas with easy access to the freeway-expressway system, a high traffic projection factor of 3.00 could possibly result for the 20-year period of estimate.

The accompanying map shows the system of freeways and expressways designed for the Portland metropolitan area to accommodate not only the desire for movement on the part of existing traffic, but at the same time to care for future neighborhood development and commercial expansion. The map does not illustrate a third level of facility—the major street—which was considered and



BRIDGES CONNECTING proposed freeways on both sides of the Willamette River are the key to the program. Plans call for 64 lanes of trans-river traffic by 1975 as compared to 33 lanes now available. Note the proposed suspension span.

discussed in detail in Report No. 55-5.

The total cost of this adequate system is estimated to be \$371,000,000. This does not include the cost of the secondary street system necessary to serve the new areas developed in the 20-year period, but it does include the cost of the major arterial highway system in the area.

About \$275,000,000 represents the cost of the proposed 96 mi. of freeways; \$53,000,000 represents the cost of the proposed 74 mi. of expressways; and \$43,000,000 represents the cost of the 120 mi. of major streets. This does not include the cost of the secondary state system.

The Willamette River separating east and west side of Portland is one of the major impediments in the normal flow of traffic in this great metropolitan area. It is planned that 64 lanes of trans-river traffic for 544,000 vehicles per day will be available in 1975 as compared to 33 lanes of traffic and 247,000 vehicles per day using the nine river crossings in 1954.

The system of expressways complements the freeway system and integrates additional gridiron and radial routes into the over-all system. The expressway system is further

complemented by the improvement of a minimum number of major streets. These major streets give a sufficient level of traffic service and are in sufficiently close proximity to freeways or expressways to obviate the need for a higher level of design.

Construction features

The 96 mi. of freeways will have: 75 mi. depressed, 13 mi. of viaduct section, 3 mi. in tunnel section and 5 mi. in major bridges.

Of the 24,000 ft. of major bridges, 8,700 are four lane, 11,400 six lane and one is a 3,800-ft. two-level, eight-lane Willamette River crossing. About 18,000 ft. of 4-lane tunnel is planned, with one bore being some 8,500 ft. in length. Within this over-all program, there are some 61 six-lane and 223 four-lane minor structures serving as over-crossings or connecting ramps between the freeway system and surface streets.

The \$275,000,000 total cost of the freeways is accounted for by some \$41,000,000 for grading and paving, \$148,000,000 for structures, and \$86,000,000 for right-of-way. The total program of some \$371,000,000 for freeways, expressways, and major streets calls for the expenditure of \$78,000,000 for grading and paving,

\$171,000,000 for structures, and \$122,000,000 for right-of-way.

Economic benefits to accrue to the Portland area from the freeway system alone would easily justify its cost. Authorities use figures varying from a low of 2 cents to a high of 4.2 cents per vehicle-mile as representing the savings to motorists using freeways. Using the high figure, total savings of \$768,000,000 would be realized by 1975. This compares with a low of \$366,000,000 based on the 2.0 cents per vehicle-mile benefit.

In addition to the direct benefits, there are many indirect benefits. These benefits accrue to the general citizenry of a community and are rather difficult to evaluate. Among these are stabilization or increase of property values, relief of overburdened surfaced arteries, increase in the practical radius of real estate development on a travel-time basis, and increased access from residential neighborhoods to recreational or cultural facilities.

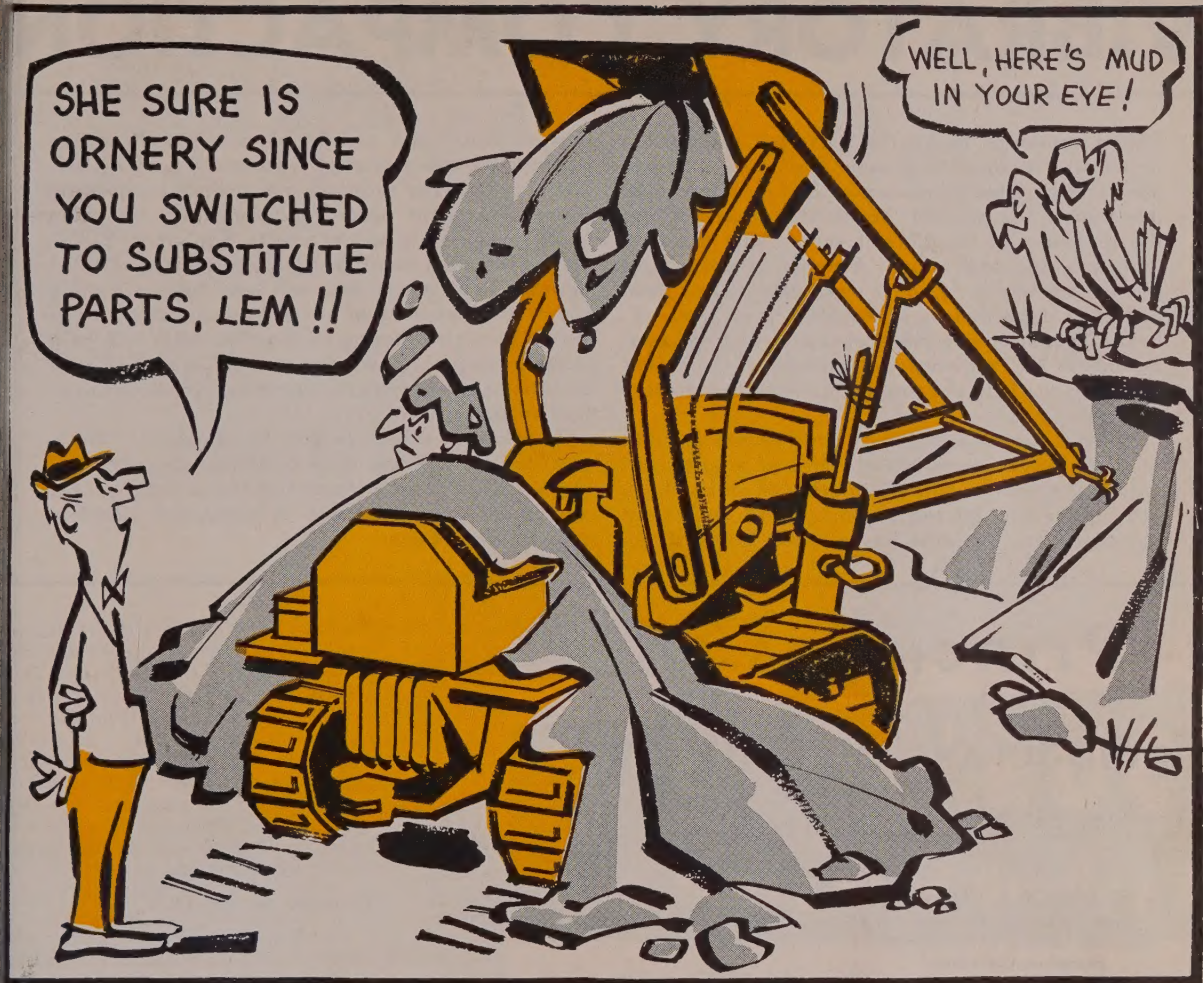
Finance

No attempt was made in the Portland study to show in detail the responsibilities of the state highway commission, the City of Portland and Multnomah, Clackamas and Washington counties for financing. Based upon equity, the state highway commission would very probably assume about 75% of the cost, meeting this part of the cost in part with Federal Aid funds and in part with state funds.

Summary

It should be realized that the report was only a preliminary one. A great deal of time and money must be expended to work out all the details for the major projects tentatively outlined. However, the plan for a freeway and expressway system is the first approach to a solution of the over-all problem. Studies should be continued for the state highway commission and Portland and the counties in the Portland metropolitan area to agree on a basic highway plan for the reason that there appears to be in the immediate offering a substantial federal program for building better highways with which the plan could be coordinated with advantage to all. Some of the most serious bottlenecks in the highway network of the nation are in the great metropolitan areas such as the Portland area, and an early attempt should be made toward agreement upon an over-all plan to effectuate the objective of providing a system of freeways, expressways, and major streets so necessary to service an expanding economy.

R. H. Baldock is state highway engineer of Oregon, and W. C. Williams is deputy state highway engineer. F. B. Crandall is traffic engineer. W. W. Stiffler and G. S. Paxson are assistant state highway engineers.



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VIBRATORY COMPACTION

EARTH continues to be the universal construction material. It is used in greater quantities, on more jobs, and handled by more men and machines than any man-made product. Yet its characteristics and the problems of handling it successfully are only just becoming understood. A major problem is to get it back into a compact state after it has been disturbed. Such density is essential to secure load-bearing capacity with minimum settlement, or water tightness. The required expenditure of time and energy in the field is equally important in construction economics.

Quite recently—compared to the service of earth as a construction material—the idea of supplementing static pressures with a vibratory effect has been actively studied by soil engineers and equipment manufacturers. Progress has resulted in the direc-

tion of theory and practice. Sometimes these two approaches move toward a common goal by different routes. For example, research may work on the principles of ideal conditions and minimum energy required to secure results. Equipment builders, on the other hand, being more familiar with the philosophy of contractors, will work toward getting speed at the expense of power in securing job progress. Although differing in direction both will help close the gap of knowledge and aid in the common objective of advancing the use of earth as a construction material.

To bring the subject to date for readers of "Western Construction" we have combined an authoritative review of basic principles with a summary of the equipment now available to carry out vibratory compaction.—Editor

I—Principles

Compaction of soils by surface vibration

By **FREDERICK J. CONVERSE**

Professor of Soil Mechanics
California Institute of Technology
Pasadena, California

BASIC PRINCIPLES for compacting earth fills by vibration will be discussed in this article in the hope that it will be of value to the contractor in using such equipment, and to the equipment manufacturers in designing it.

The first recorded careful experimental work on vibration compaction of sand was performed at the German Institute for Soil Mechanics in Berlin in the early 1930's.¹ These experiments indicated that the maximum settlement of vibrating equipment on sand occurred at resonance of the vibrator-sand mass. On the basis of these experiments, a 25-ton vibrating device, driven by a 70-hp. motor and mounted on crawler tractors, was developed and used on the German superhighways prior to and during World War II.

At the close of the war, considerable interest in the subject of vibration compaction developed among American manufacturers of construction equipment, and experimental machines were constructed. Lack of a complete understanding of the problem of vibration compaction led to disappointment in the behavior of most of the early vibrators, especially when used on cohesive soils. For this

reason, basic research into the problem was undertaken, both in America and Europe.

Sand is the easiest

Sand is the easiest of all soils to compact by vibration. This is undoubtedly the reason why most successful experimental work has been performed on sand. It is common experience that almost any sort of vibrating equipment or machine will cause settlement of loose sand. However, from the contractor's point of view, the important thing is how deep and how completely and how fast the settlement will take place.

Theoretical and experimental research clearly indicate that best results for compaction of sand are obtained when the vibrator is operating at the resonant frequency of the vibrator-sand mass. This frequency may vary over quite a wide range depending upon the physical characteristics of the sand, such as density and shearing modulus of elasticity, the weight of the oscillator, the dynamic force, and the size and shape of the oscillator base plate. Knowing these factors, it is possible to calculate the approximate frequency for operating the vibrator at resonance.^{2,3}

This is of particular value to the equipment designer, since it provides him with a means for determining the proper range of frequencies for the

vibrator while it is still in the design stage. When the machine is built and is operating in the field, the frequency at which resonance occurs is usually very apparent from the behavior of the machine, since the amplitude of oscillation is much greater at resonance than at other frequencies. The resonant frequency may also be determined by instruments, and this procedure may be desirable when training operators.

Densities are excellent

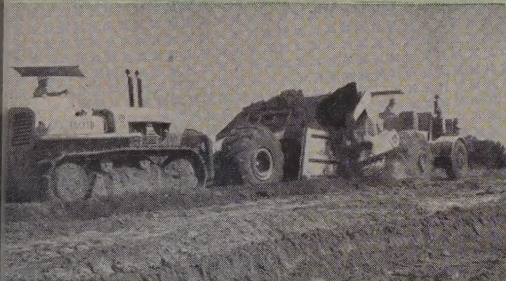
Excellent densities have been obtained at resonant vibration of the oscillator-sand mass, even though the unit soil pressure due to the dead weight of the oscillator was as low as 3 psi.² Maximum density is usually found at a depth below the surface about equal to the width of the vibrator, but excellent compaction occurs to depths at least twice the width of the vibrator. As an example, an experimental vibrator having a 3x5-ft. base plate produced densities of between 90 and 95% of the modified AASHO maximum density in a matter of ten seconds to a depth of 6 ft.

Although any sort of vibration will produce some compaction in sand to shallow depths, operation at resonant frequencies will produce excellent compaction to much greater depths in a shorter time, than when operating at other frequencies.

The most favorable moisture content for compaction of sand by surface vibration is when it is as dry as possible. Experiments with beach sand at 3% moisture have shown excellent results. When the moisture was increased to 8%, slightly less density was obtained. This appears to be due to the cohesive effect of moist sand. When cohesion exists it is necessary to break the cohesive bonds between the soil grains before they can readjust themselves to a



S-18 scraper spreads 21 yds. of clay on the fill. A 300 h.p. engine and Torqmatic Drive this "Euc" plenty of power for fast loading, hauling and grading even in the toughest going.



total of 688 h.p. at work here! Two 194 h.p. engines in the Euclid TC-12 Crawler and 300 h.p. in "Euc" Scraper made short work of getting heaped loads of sand in a hurry.



Dumping their big loads on the fly, Bottom-Dump "Eucs" made fast cycle time from borrow pit to fill and back again. They were loaded by 2½ yd. draglines and a Euclid Loader.

49 "EUCS"

on Heavy Road Grading Job

Contractors who know their earth moving equipment use "Eucs" on the tough, rush jobs. They know from experience that they can rely on Euclids to get more work done at the lowest cost per yard... and keep doing it month after month.

This 6.3 mile road project in Illinois is a typical example. S. J. Groves & Sons Co., J. C. O'Connor & Sons Co. and Potashnick Construction Inc. put 49 "Eucs" to work on a total of 2,238,171 cu. yds. of earth excavation. Grading operations started the middle of July and were completed the end of September. These contractors used 24 Euclid Scrapers, 23 Bottom-Dumps, a "Euc" Loader and a new TC-12 Twin-Power Crawler... 47 out of 68 hauling units on the project were "Eucs"!

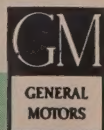
Hauls from borrow pit to fill ran as high as 4500' and averaged about 3000'. Daily production was around 50,000 yds. Fills of 22' to 36' were necessary to raise the road above high water level of the Wabash and Little Wabash Rivers during flood periods. Operating personnel on this job—with the biggest fleet of earth moving equipment ever used on an Illinois road project—say that "Euc" performance played the major part in completing the earth moving in such fast time.

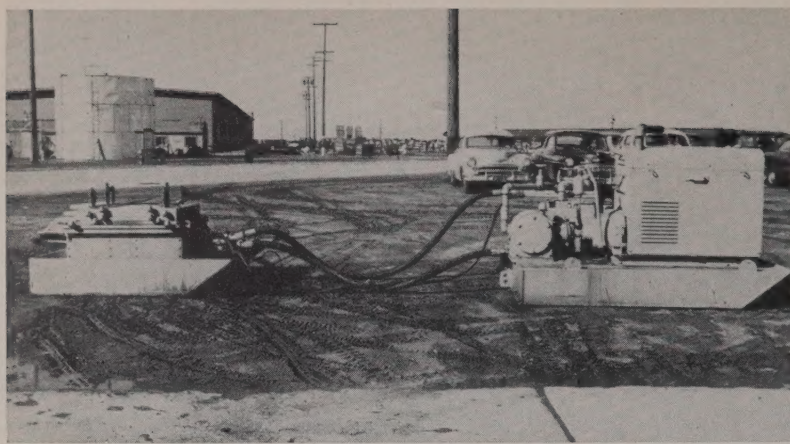
It's performance like this that makes "Eucs" important to the profit picture on hundreds of construction jobs... a good reason why **EUCLIDS are your best investment.**

EUCLID DIVISION GENERAL MOTORS CORPORATION, Cleveland 17, Ohio

Euclid Equipment

FOR MOVING EARTH, ROCK, COAL AND ORE





RESEARCH did not stop in the laboratory as this field test unit indicates. Many of the tests were conducted at the Naval Civil Engineering Research and Evaluation Laboratory at Port Hueneme.

denser condition. When the soil is dry the cohesive bond is lost and readjustment of the grains can easily take place. The intergranular bond is also lost when the sand is completely submerged, but surface vibration cannot be used in this case because of the "quick" condition that develops in the sand.

Cohesive soils

The problem of compacting cohesive soils is considerably different from that of compacting sand. Sand will settle into a dense condition if the grains can be set vibrating. With clay it is necessary to develop shearing stresses which will break the bonds between the particles and force them into tighter contact. The advantages of vibration in this process are not so obvious as they are for the case of sand.

It has been general experience that very heavy rollers are particularly desirable for compacting cohesive materials, hence, a line of supercompactors has been developed in order to supply the required pressures to consolidate such soils. However, there are rules which, if met in the manufacture of a vibratory compactor, will result in a relatively light machine capable of compacting most cohesive soils. These rules follow.

Four important rules

- 1—Operate at resonant frequency of the soil vibrator mass.
- 2—Have the dynamic force approximately equal to the dead weight of the vibrator.
- 3—Have the moisture content equal to or slightly higher than that for maximum density as determined in the laboratory, using the desired compaction specifications. For some cohesive soils this is close to or slightly above the plastic limit.
- 4—Provide sufficient dead weight to give a unit soil pressure on the order of 10 or 12 psi.

Operating at resonant frequency increases the pressure by the amount

of the dynamic magnification. This may be many times the dynamic force and actual soil pressures may therefore be surprisingly high. Calculated values for some field tests have been well above 250 psi. when the dead weight was only 10 psi.⁴ In addition, the ground is subjected to a pulsing wave of compression and tension which undoubtedly has a marked effect on decreasing the bond between the clay particles, thereby reducing the force necessary to cause compaction.

Flat-plate and rollers

In general, vibrators fall into two general classes; the flat plate type, and rollers. Typical of the flat plate vibrators now on the market are the Jackson vibrator, an American manufacture, and the Vibro-plus machine originally developed in Sweden. Of the roller-type, the Cedarapids is manufactured by the Iowa Manufacturing Co., and Buffalo Springfield, while a roller of Swedish manufacture is handled by Vibro-plus Products, Inc., and one of English design is licensed for manufacture by the Essick Manufacturing Co. in America. The eccentric weights of the Vibro-plus machine are operated at three different speeds, thus providing three frequencies of dynamic force, while the English design operates at a single high speed of about 4,500 rpm.

Plate and roller, pro and con

The advantages of a roller containing a vibrating element are its maneuverability and the small size of tractor or other power plant required to move it about. Its one disadvantage, which, in many cases, is not serious is the width of the area of contact in the direction of rolling. This may vary from a few inches to a foot or more, depending upon the size of the roller and the softness of the surface being compacted. The effective depth for compacting dry sand may be two or three times the width of the plate, but for cohesive

soils it may be limited by a depth equal to the width of the plate. Therefore, if the roller contact is 6 in. wide, the thickness of the layer of soil to be compacted is limited to 1 or 1½ ft. for sand, and 6 in. for clay.

The main advantage of flat-plate compactors is the greater depth of compaction than that obtained with rollers, because of the greater width in contact with the surface. Loose sand up to twice the width of the plate can be compacted to good density in exceedingly short intervals of time. A surface plate 3 ft. wide can be effective to a depth of approximately 6 ft. on sand, and to as much as 3 ft. on cohesive soil.

Relative time required

Considering depth of compaction, a plate compactor should be able to consolidate a greater yardage per unit of time than a roller. This advantage is only of significance when a depth of compaction of several feet is desired. There would be little advantage in such equipment on a thin layer of the thickness normally used for sheepfoot rollers or heavy rubber-tired compaction equipment, unless the weight of equipment is a factor.

At the present time, large plate compactors are less maneuverable than rollers. For small jobs the smaller self-propelled type can be used close to abutments and in trenches, but the larger tractor-drawn types are only suitable for compaction of large areas. To date, the largest of the flat-plate compactors are those built for the U. S. Naval Research and Evaluation Laboratory at Port Hueneme, Calif. (see illustration). Three experimental machines have been constructed and are being evaluated.

General conclusions

In order for the vibrator compactor to be an effective tool for the contractor it must be used under circumstances which bring out its peculiar advantages.

On deep, loose sand, either natural or in fills, it is desirable to have a large base plate, low unit dead weight pressure, and operation at resonance of the vibrator-soil mass. Compaction of clean, moderately dry sand to a depth equal to twice the base plate width is possible.

Cohesive soils in fills may be compacted if: (1) the soil is slightly moister than optimum, (2) dead weight soil pressures are on the order of 6 to 12 psi., (3) the dynamic force is close to the dead weight, (4) operation is close to resonance of the vibrator-soil mass. Good compaction of cohesive soil to a depth at least equal to the width of the vibrator base plate has been attained.

A vibrator compactor will not produce maximum compaction under conditions which are not correct for

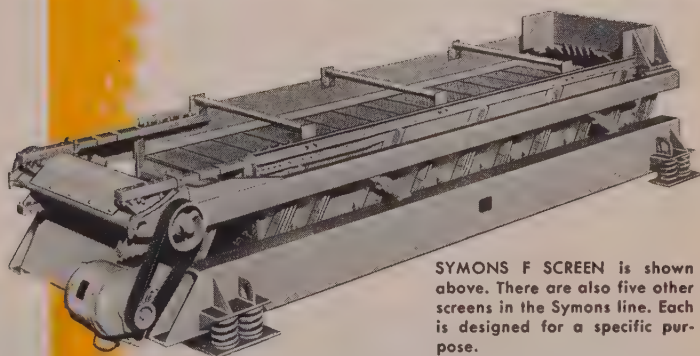


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its use. This is axiomatic for any equipment. A sheepfoot roller does its best work when the soil moisture is at optimum and the thickness of the soil layers is not too great. It is equally important to have the correct moisture content and most favorable thickness of soil layers for a vibrator compactor, although these factors may not be the same as for a sheepfoot roller. Success with a vibrator compactor depends, first upon an adequate design by the manufacturer, and second, by the intelligent use of the equipment by the contractor.

ACKNOWLEDGMENTS

The conclusions outlined above are mainly the result of research at the California Institute of Technology extending over several years and in-

volving the efforts of a number of individuals. The work was originally sponsored by the U. S. Army Engineers, but the major portion of it was done through contracts with the U. S. Naval Research and Evaluation Laboratory at Port Hueneme, Calif. Aside from the regular Institute staff, the men responsible for this work are D. A. Hausman and W. F. Jones, project engineers, and Dr. Adrian Pauw and Dr. Patrick Quinlan, who were responsible for the major portion of the theoretical development. Professor G. W. Housner, of the Institute staff, has been a consultant on the project since its inception, and the author has been Project Director. John Bishop has had general supervision for the Navy during the later years of the project.

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II - EQUIPMENT

Iowa Manufacturing Co.

Two vibrating compactors drive energy deep into soil forcing out air and water and securing a high density rapidly.

CEDARAPIDS vibrating compactors (Model 25 and Model 60) are designed for deep penetration operations. The static load of the Model 25 is 25,000 lb. distributed on four 12.00 x 20 truck tires having a ground contact of 4 ft. lineal width, or a pressure of 521 lb. per lin. in. width contact. When the vibrator is brought up to speed, there is a maximum energy input of 32,000 lb. directed into the tires, which would be an additional 667 lb. dynamic energy from the vibrator unit per lineal inch of tire contact. This added force, generated by the vibrator, is instantaneous or

occurs each time the vibrator weights rotate one complete revolution.

Combining the static load of 521 lb. per lin. width with the dynamic force of 667 lb. there is a total static-dynamic force of 1,188 lb. per lin. in. width of tire to ground contact.

This oscillating action constitutes a reproduction of the proctor mold method whereby an impact or dynamic load is imposed instantaneously onto the soil. As the energy enters the soil it penetrates down into the confined area as it would in a 6 in. diam. by 6 in. long proctor mold cylinder. Therefore, compaction occurs deep in the lift or down in the bottom of the loose fill, and as the energy is imposed upon the soil the density occurs at the bottom and gradually builds up towards the tires until the incoming energy is beyond the bearing ability of the compacted soil. This will break the upper end of the compaction, or the cone, down to

about 4½ in. to 6 in. from the tire. This upper layer will contain the excess air and moisture that has been driven from the compacted, confined area directly below the tire. In other words, the high-density cone will have an optimum moisture possibly two or three points below laboratory optimum.

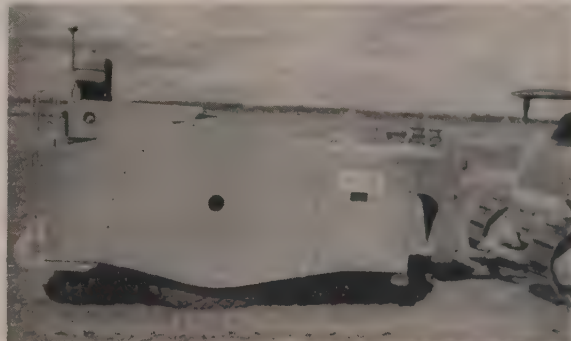
The pressure of the tires (approximately 90 psi.) and the vibrator running at 1,200 rpm. provide forces which will drive energy deep into the lift, pulling out the air first, followed by the moisture, getting the soil particles compacted close together, leaving little or no voids and resulting in a high density. By lowering the tire pressure and lowering the frequency of the vibrator, less energy is put into the soil, arriving at a lower density. Therefore, with the energy input controlled, the machine can be set to obtain any specified density.

The penetration, or the loose lift to be compacted, by the Model 25 compactor, as previously explained, will be a maximum of not more than 16 to 18 in., when meeting a specified density of a standard proctor.

The forward movement of the compactor, which is controlled by the prime mover, such as a track type



MODEL 25 on a California highway job produced 90% density with two coverages on a 4-in. lift after the contractor had been taking sixteen passes of a sheepfoot roller to secure this density on an 8-in. lift. Soil was decomposed granite, moisture averaged 7.2% and forward speed was 2.5 mph.



MODEL 60 on an airport runway with a required density of 95% (modified AASHO) secured 95.5% with one coverage and 97% with three. This was after ordinary compaction methods failed because moisture in the clay-loam remained about 19%, as compared to a 12% optimum by modified proctor.

tractor, will give the compactor a controlled energy input by varying the forward speed from one gear to the next. With the compactor tires set at the proper pressure and the vibrator at the proper frequency, the compactor is pulled so that each vibrating effort input will contact the ground not closer than 1½ in. or farther than 3 in. apart.

The Model 60 compactor is approximately twice as heavy as the Model 25, statically. The vibrator on the Model 60 is identical to that on Model 25. Model 60 is equipped with two single tires instead of the dual tires as furnished on Model 25. Therefore, the energy input (twice the static pressure of Model 25) would be 60,000 lb. per 48 in. lin. width of tire contact area, or a total of 1,250 lb. per lin. in. width. This is slightly more than twice the static pressure per linear inch width on the Model 25. Therefore, the Model 60 gives a considerably deeper penetration than the Model 25, or in many cases a penetration to a specified density at 36 to 45 in. below the surface.

Comparison to static

Static type of equipment such as the sheepfoot or pneumatic-tired

roller has a tendency to compact at the top surface, sealing in air and moisture. Therefore, the passes required are increased in number until the surface is fractured and the moisture and air can be dissipated. The vibrating compactors, on the other hand, eliminate any tendency for the surface to seal, pulling the moisture from the bottom of the lift to the surface and dissipating it into the loose soil directly under the tire so that it will be in a position to be removed by aeration.

Therefore, when working on a soil that is above optimum, the vibrators are capable of pulling and removing the moisture very rapidly; thus again, decreasing the time required to obtain a specified density.

The Cedarapids machines lend themselves very readily to a poor grain size or a wetter soil, due to the fact that they have controlled energy-input and pull the moisture to the surface where it will dissipate. Other types of compactors have a tendency to compact at the surface or the tire contact area, leaving the bottom of the lift loose, with a variable density, which will in time fail.

Output capacities

As to capacities of either the Model

25 or the Model 60, in the field the Model 25 compactor will replace three sheepfoot in yards compacted per hour. It will have the equivalent capacity of a 50-ton static due to the fact that it has the ability to compact a greater lift and requires only six passes or two coverages to obtain the density. For example, with a sheepfoot roller a 6-in. compacted lift may require 10 to 15 passes to obtain the specified density; whereas, a Model 25 compactor can put in place a 12-in. lift that will require only six passes or two coverages. For six passes required for the vibrator compactor, it would take approximately 20 to 30 passes with a sheepfoot to secure a total 12-in. compacted lift. Therefore, the time element with the old method of compaction will prevent the earth from being moved in place rapidly due to shallower lifts, many more passes, and the requirement of three tractors and three drivers with three sheepfoot. These can be replaced by one tractor, one driver, and a Model 25 compactor.

Information was supplied by Everett N. Wood, soils engineer, Iowa Manufacturing Co. A 16-page booklet is available providing more details on these machines, their characteristics, and specifications.

Buffalo – Springfield

Center roller of 3-axle tandem is vibrated by 65-hp. engine at 1,800 to 3,600 rpm. Rubber suspension protects roller frame.

INTRODUCING the advantages of vibration to its well recognized three-axle tandem roller, the Buffalo-Springfield Roller Co. has a machine that was tested by U. S. Army research and on construction projects. The vibrating roll is self-contained having its own power plant and drive independent from the basic machine. A 65-hp. gas engine operating through V-belts can provide vibratory frequencies at either 1,800 or 3,600 cycles per minute. On most macadam highway work the manufacturer states that frequencies between 2,000 and 2,500 are most satisfactory.

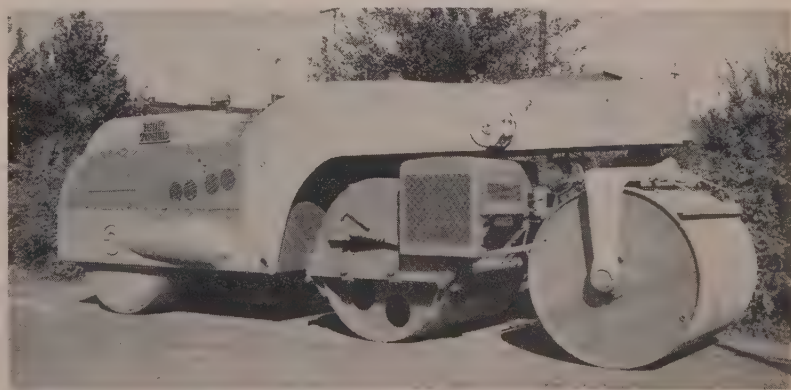
Tested at its own plant, this machine was put through a series of tests under the supervision of Army engineers and its first trial by a contractor was in Virginia where a waterbound macadam base was being placed and topped by a bituminous wearing surface. Use of the vibrating roller made it possible to place the macadam base in 10 to 12-in. depths, rather than 4 to 5-in. depths which were generally accepted as standard

lifts. Further, the vibratory roller provided for filling the voids in these deep lifts which could not be accomplished by other means.

Further, the use of the vibrator on the three-axle roller produced a much smoother surface on this base course. Field tests indicated that normal soils, particularly those of the granular types, satisfactory densities could be secured in depths of 30 in. These evidences of better and faster compaction indicate that contractors will be able to handle many types of soil compaction more economically and faster than with equipment previously available.

The accompanying photograph indicates that the vibrating roller is basically the same as the standard unit with the vibratory effect installed in the center roll. This effect is accomplished by an eccentric shaft in the roll which is driven by V-belt from the separate power plant. The assembly is suspended in rubber bushings to prevent vibrating effects being transmitted to the roller frame. As with the regular unit, the vibrating roll may be locked into various positions either above or below the plane of the other two rolls. It may also be operated in a floating position.

A four-page brochure is available reviewing characteristics and specifications of the basic three-axle tandem roller.



FIELD TEST on a waterbound macadam highway base course put down in 10- to 12-in. depths. In granular soil satisfactory densities were secured in excess of 30-in. depths.

Vibro — Plus

simple principle is effective in producing denser material with saving in construction costs and time.

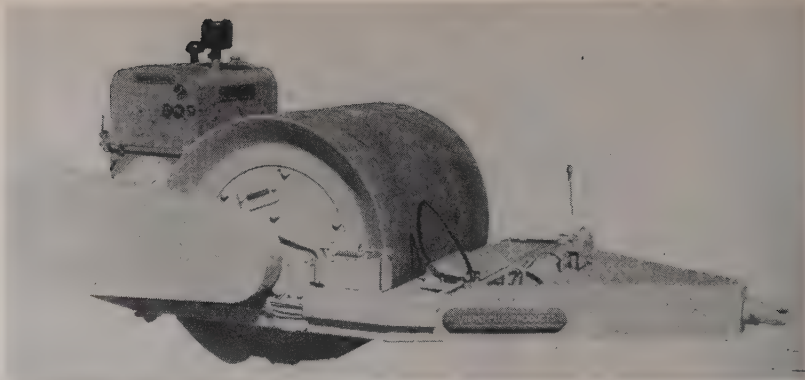
COMPACTION of solid particle mixtures by means of vibration is well recognized by everyone who has used a container with such household items as sugar or salt. Also, the vibrating of concrete mixtures is a well established engineering practice to produce denser product and reduce the volume of voids. The corresponding application of a vibrating force to compact soil, with particular reference to highway bases, is incorporated in a vibrating roller developed by Vibro-Plus Products, Inc. This vibrating compaction reaches greater depths than possible by the use of heavier rollers which do not employ this effect.

This machine (see illustration) weighs 3 tons and consists of: (1) roller 48 in. in diameter and 58 in. width and (2) an independent vibrating exciter driven by a 25-hp. diesel motor which adds a vibrating force to the roller with a frequency of 1,600 rpm. The unit can be pulled by any type tractor.

Among the many experiments made to determine the capacity of the roller a sandy material with a proctor density of 109 lb. and a 12% optimum moisture content was used. The material was composed of 12% coarse sand, 80% fine sand, and 8% silt and clay. The test made made to determine under what operating conditions the required 95% Proctor density could be reached and surpassed. Standard density measurements were made after each pass of the roller, with samples taken at 1-, 2- and 3-ft. depths before and after. The test showed that at a 2-ft. depth optimum compaction was produced with two passes of the roller operating at a frequency of 1,500 rpm., and a propagation velocity of 1 mi. per hour.

It should be pointed out that good compaction has been secured on average more than 2 ft. below the surface, which is difficult if not impossible to secure with purely static rollers of similar weight. On the particular soil tested, when loosely distributed, some tests at 5-ft. depths showed substantial increase in density after 2 static and 4 dynamic passes. This type of combination might lead to new applications for vibratory compaction.

A modification in construction methods which would permit the increase in depth of individual layers during construction ought to be con-



FIELD TEST under state highway department supervision showed 100% standard proctor density obtained at 24-in. depth with two passes. Frequency can be regulated between 1,400-1,600 vibrations per min.

sidered where vibratory compaction is used, because of the substantial saving in construction time and money. This is particularly true in work on large dams, highway fills, and the backfilling of trenches.

In addition to the 3-ton model just described, the company also has a 1-ton unit of 2-wheel standard tandem design in which the front cyl-

inder is vibratory. This is a self-propelled unit powered by a 6-hp. gasoline engine moving at 65 ft. per minute for compaction and 130 ft. per minute for travel.

Both models are illustrated and further information including specifications and characteristics are available in brochure form from the company.

Jay Corporation

PLATE-TYPE vibratory compactors of hand-operated, portable size are available from the Jay Corp., Columbus, Ohio. A small unit (Model J-12) is designed for use in tamping materials around abutments, along walls, and in narrow trenches and has interchangeable tamping shoes of 12-, 18-, and 24-in. widths. The larger machine (Model D-25) has a standard plate width of 25 in. and a special feature by which the exhaust gases from the engine heat a section of this plate when the machine is used for tamping hot asphalt paving patches. The small machine has just been put on the market after several years of intensive research and development. In a recent test, one man using this machine completed approximately 1,400 cu. ft. of earth against a retaining wall in 2½ hr.

The unit is particularly useful in working in narrow ditches or trenches, since it is only 13 in. wide and has a minimum tamping shoe of 12 in. It can be worked conveniently in ditches of 18-in. widths or larger. It can be used not only in backfilling but also for tamping earth under and around installed pipe. With a complete weight of 240 lb. it is extremely portable and contractors can move it around frequently where small backfill jobs are required.

The larger machine, with a vibration of 1,900 rpm. and an impact blow

of more than 1,250 lb. moves forward under its own power at a rate between 22 to 30 ft. per minute.

The smaller model is illustrated and brochures are available. The small model sells for \$788 f.o.b. Columbus, Ohio.





High Speed Sewage Disposal Team

Le Roi Compressors and Cleveland T-286 Mobile Drill Rigs provide flying start for Alabama project

Ordinarily you wouldn't think that air compressors and rock drills had anything to do with sewage disposal plants.

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The Cleveland T-286 Mobile Drill Rigs further cut costs. Basically the T-286 rig consists of a 25-hp

tractor with two Cleveland patented air feeds, 4" drifters, and air-motor booms mounted on a specially-constructed front-end base. The booms swing in a 220 degree arc so that you can get any hole pattern you want. Because the T-286 gives you faster set-ups, better hole spacing, greater footage, faster drilling, greater mobility—because you can drive it anywhere and get better fragmentation — you get lower costs.

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Jackson Vibrators, Inc.

Flexibility in systems of multiple hook-ups is feature of electrically operated compactors.

COMBINATIONS from single hand-operated units with 12-in. width of base to multiple hook-ups of 6 moved by tractor feature the vibratory compactor line of Jackson Vibrators, Inc. Electric power from a separate generating plant drives the motor on each unit, and variations in frequency may be made by setting the governor on the engine generator. Top frequency is 4,500 per minute.

Granular soils in sub-base courses up to 8 in. thick are handled by a single hand-operated machine covering rates of 1,800 to 2,000 sq. ft. per hr. and securing specified densities. Two units can be combined (see illustration) either in tandem or side-by-side to increase this output.

On bituminous mixes, the compactor will handle about the same area per hour securing close to maximum density on 5-in. thicknesses.

When irrigation ditches are lined with soil-cement mixtures, units can be assembled to cover the bottom and side slopes, securing laboratory density at one pass, progressing at a rate of 30 ft. per min. over the 4-in. thick-

ness of material.

Where the size of the job warrants the use of the rubber-tired tractor unit to handle the battery of vibrators, flexibility is at a maximum. For example, one or more of the units may be used to compact shoulder material pulled forward by an offset arrangement. The tractor unit carries the electric generator set making the machine entirely self-contained. Units normally used with this machine may be detached, equipped with handles, and used manually in tight places. A final step in this flexi-

bility is the stripping of the compacting units from the tractor, providing the contractor with a highly mobile power plant of 7.5-kva. capacity supplying 110-volt alternating current.

Some special jobs carried out effectively by the hand-operated vibrators include the compacting of back-fill around pipes, culverts, bridge piers, and walls.

An auto trailer is available mounting the generator set and having space to pick up and carry a twin unit compactor.

Descriptive folders giving operating characteristics and specifications may be obtained from Jackson Vibrators, Inc., Ludington, Mich.

TWO OF THE basic units combined for manual operation in compacting a crushed-rock base course. Electric power plant is on the trailer in the background.



Essick Manufacturing Co.

Announcement of new line built in the West—includes manual, trailer, and self-propelled models.

AFTER extensive field tests and demonstrations, the Essick Manufacturing Company of Los Angeles, Calif., announces full scale production of several models of Essick vibrating rollers. The company states that the introduction of Essick vibrating rollers marks the first practical and proved application of sound engineering principles to the theory of "compaction by vibration." By using high frequency vibrations, these machines produce a consolidation of all types of granular materials and asphaltic paving materials never before possible with dead weight rollers.

The Essick vibrating rollers are produced in three sizes—Model VR 28W hand operated, self propelled vibrating roller; Model VR 32R self propelled, tandem vibrating roller (illustrated); and Model VR 54T trailer type vibrating roller.

Conclusive tests have proved that

Model VR 28W and Model VR 32R are highly effective in compacting layers of granular materials from 10 to 24 in. in thickness. The rollers will give compaction in excess of 95% of the AASHO standards.

Job performances of Model VR 54T, weighing 3,225 lb., prove that this roller produces consolidation of earth fills that exceeds that attained by much larger pneumatic tired compactors. Unlike the bulky prime compactors, the Essick machine produces the required compaction, and yet is small enough to work easily

around narrow confines of bridges and building foundations. This model has also proved superior in the vibration of fine materials for water bound base macadam. In addition it will roll the finished surfaces, eliminating the need of the usual larger dead weight roller.

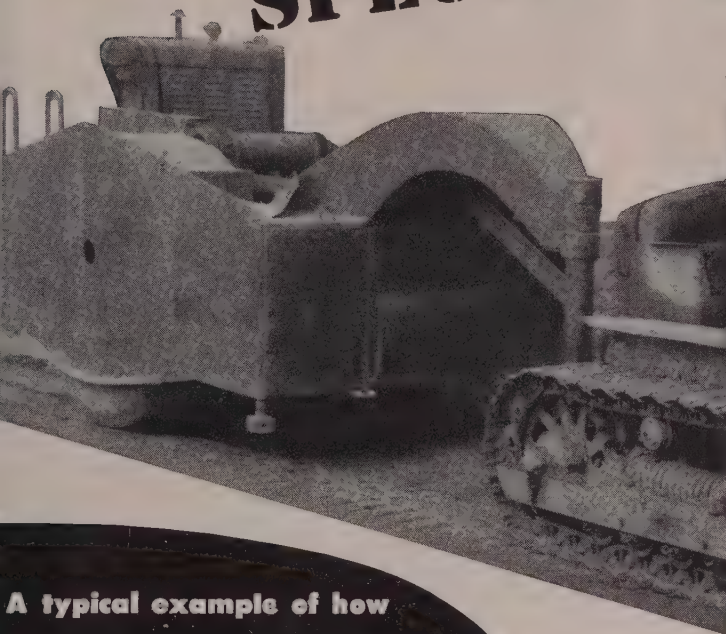
Ability to maneuver easily and operate efficiently, plus the fact they are able to give better compaction than much heavier and more costly equipment, makes their introduction an important addition to the field of construction equipment.

Information and literature on these vibrating rollers can be secured from the Essick Manufacturing Co., Los Angeles.

TESTS proved this model, weighing 1,200 lb., secures greater density than a 10-ton roller and handles 10- to 24-in. lifts of granular material, getting 95% compaction.



Now YOU CAN OBTAIN SPECIFIED DENSITY IN FEWER PASSES WITH THE



Cedarapids Vibratory COMPACTOR

UNEXCELLED FOR
MAXIMUM SOIL COMPACTION

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

A typical example of how
CEDARAPIDS COMPACTORS
save time and money

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

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

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

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

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

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

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

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

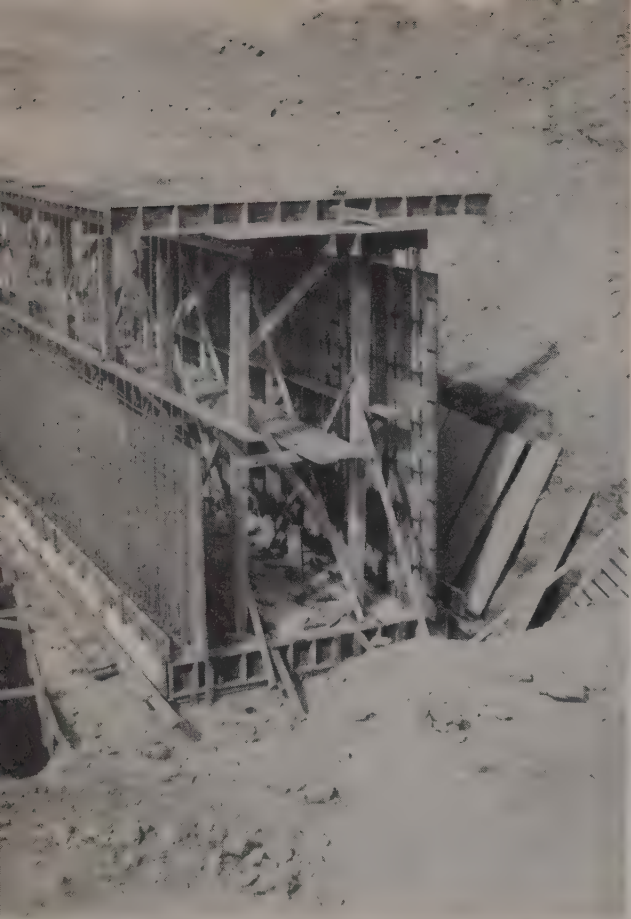
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Gentlemen:
QUICK! Send me full information about the Cedarapids-Vibratory Compactor.

Name _____

Company _____

Address _____



FORMS for the first section are going into place. These same forms will be used 11 times to cover the culvert's 336-ft. length. Seepage water is confined to trench at left.



STRIPPING the panels is fast and the concrete surface is smooth. A 30-ft. long section is stripped and reset in one day for an every-other-day pouring schedule.

An experiment with 1 1-8 in. plywood panels results in — Fast formwork for concrete culvert

THE USE of prefabricated plywood panels is enabling Thomas Construction Co. to cut forming time substantially on its concrete culvert job south of San Francisco. The culvert, first of three to be constructed, will enable tidewater to pass through the new Bayshore Freeway as it cuts across a narrow neck of San Francisco Bay on shallow water mudflats. Thomas is building the 336-ft. reinforced concrete structure on a sub-contract from John Delphia Construction Co., holder of the \$370,000 general contract. Thomas began work on the culvert on September 15, 1955. Completion is set for November 4, 1955.

Excavation involved 11,000 cu. yd. and was handled by prime contractor Delphia with two 20-cu. yd. scrapers pulled by Cat D-8's, and a Northwest 80-D dragline. When proper grade was reached at elevation minus nine feet, seepage water was confined to a narrow channel at one side of the trench to flow to the pumping area.

Specifications called for a 3½-ft. deep untreated base. This consisted of crushed rock, 1½-in. maximum, obtained from a Pacific Coast Aggregates quarry in nearby Brisbane. The untreated base was put in place by the Northwest 80-D with a clamshell and spread by a No. 12 Caterpillar motor grader. An old Austin roller was used for compaction and is pictured on page 128.

The culvert is box-shaped in cross-section, 10 ft. wide and 16 ft. high on the inside, with 14-in. walls. The floor slab is 17 in. thick and the roof slab is 13 in. thick. When the freeway is in service there will be 7 ft. of cover between the roof slab and the finished pavement.

At high tide the water will stand about 4 ft. below the top of the walls. This extra height had to be provided to allow for settlement, which is expected to be several feet over a long period of years. This settlement is due to the fact that the rock fill is placed directly on the mud without preliminary dredging. The

box on the next page gives a summary of the project, a pioneering attempt in this type of construction.

In the interests of speed Thomas elected to try prefabricated plywood panels made by Superior Concrete Accessories for form work on the walls. From all indications the experiment has been successful. After the technique of fastening the panels together was learned work has proceeded rapidly.

The floor slab was poured in advance. Steel for the walls is placed next and is kept about 60 ft. ahead of wall pouring. A 30-ft. long section, including the roof as well as the walls, is poured in one day. On the next day a crew of eight carpenters and eight laborers strip and reset the forms for pouring another 30-ft. section on the third day. Since the first section the crew has found no difficulty in keeping this schedule.

The panels are 2 x 8 ft. and can be handled easily by two men. Each panel has fastened to it 10 metal hook

(Continued on page 51)

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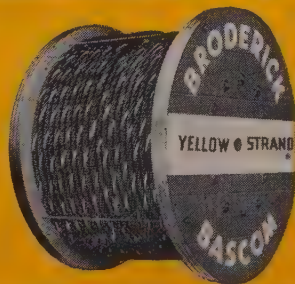
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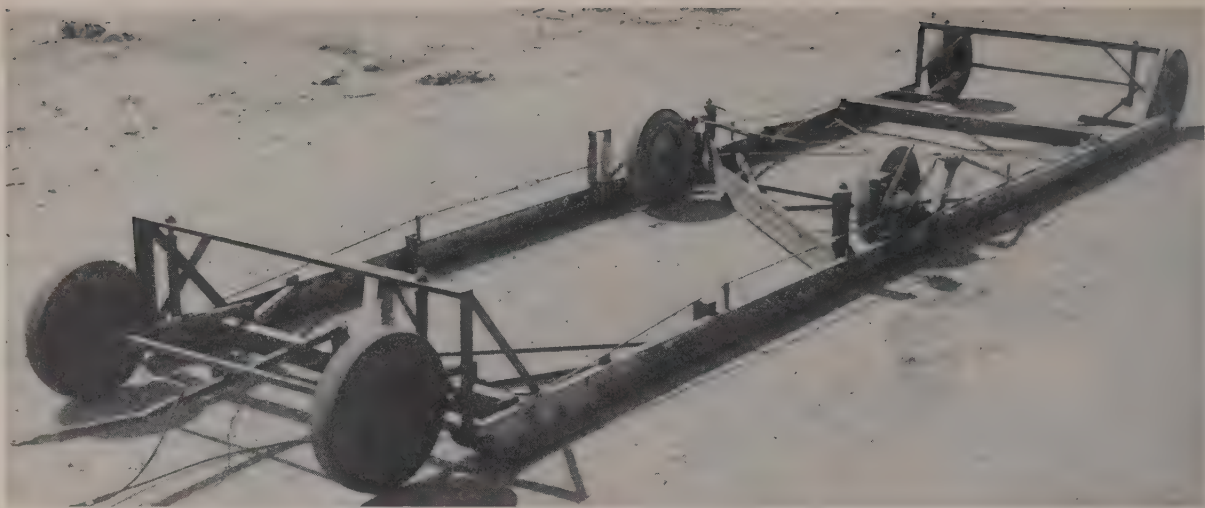
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Arizona highway strike-off float

To smooth out aggregate base course or road-mix surfacing a drag 30 ft. long was built with end wheels to reduce pulling effort and center wheels for turning.



By PAUL J. CHADWICK
Project Supervisor
Arizona
Highway Department

PROBLEMS in the finish grading of aggregate base and final laying of road-mix surfacing were responsible for the development of a float which incorporates several novel features. The object of developing a machine for this purpose was to attain a degree of perfection in the finished asphalt highway surfacing that had not been attained on Arizona state highway jobs by other and commonly used methods.

Floats, or drags, for striking off the base or road-mix are in rather common use but experience has indicated that in general they tended to be cumbersome in design, lacking in overall length sufficient to provide smooth riding quality in the finished pavement and had the common fault of tearing up the surfacing and grade where they were turned around.

Design features

With the object of correcting these difficulties, a float was built using runners 30 ft. long of 3x8-in. I-beams and with an 8-ft. blade set at 90 deg.

to these runners. An important feature of the machine was the introduction of two pneumatic tired wheels located exactly at mid point on the frame that could be raised or lowered by hydraulic jacks. The introduction of these wheels permitted the float to be turned around by jacking the wheels down until the entire frame was raised clear of the ground. Turning could then be done without scarring the surface.

The blade was also adjustable for height by means of screw jacks and could be set to strike off the high points of the surfacing and drag the material forward filling in the minor depressions. Length of the runners provided the smooth riding quality desired.

The proper crown was put on the surface by lapping each pass of the float about 1/3 of its width. Working over the entire surface once with this

float provides results on road-mix surfacing superior to the finish usually accomplished with motor graders. Two complete passes of the float over the grade assures a high degree of perfection both as to grade and crown.

First use by contractor

As described, this float was first used on a federal aid highway project between Tucson and Picacho. The contractor was Martin Construction Co. of Tucson. On this job the float was used to finish the aggregate base for a plant-mix bituminous surfacing which was put down by a standard laydown machine. No changes in the thickness adjustment of the laydown machine were necessary.

However, there were certain disadvantages which developed with the use of the float as just described. Carrying all the weight on the steel I-beam runners put an unnecessary load on the small pneumatic tired tractor used for pulling. Also the runners did put occasional shallow ruts in the grade although this was not too serious. With the cutting blade fixed at right angles to the frame, the surplus material tended to pile and did not shift transversely on the roadbed.

An improved model

To remedy these faults and to improve a process which was already producing improvements, certain changes were made in the machine before the next job. Pneumatic tired wheels were installed at the four corners to cut down the friction between the frame and the surface and the load. The two wheels at each end

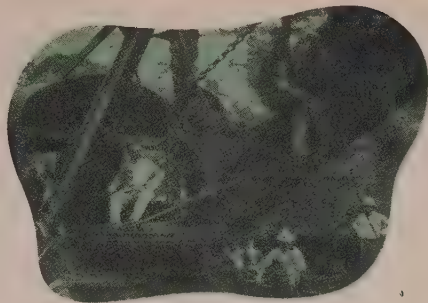
Nominee of the Arizona Highway Department for the 1955 "Dr. L. I. Hewes Award," Paul Chadwick developed this float to meet a highway construction problem. In this article he describes the machine, its evolution and advantages.

—Editor

75

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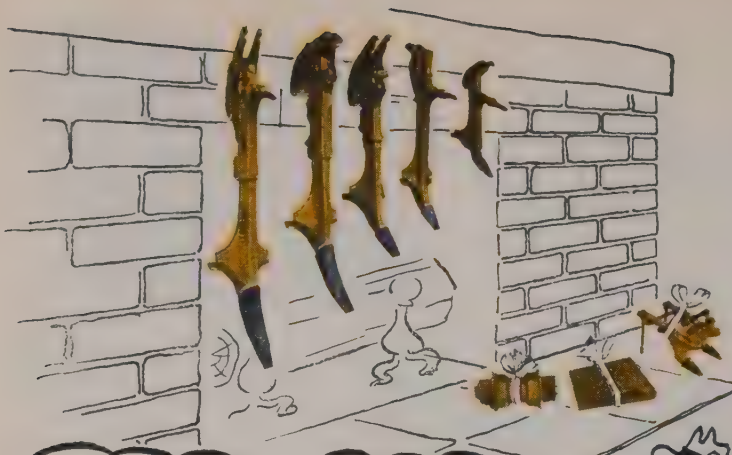
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have a common axle attached by two arms to the frame of the float, but each wheel can be adjusted individually by a screw jack. This permits the frame to be adjusted for any condition of crown. When the center wheels are jacked down for turning, the wheels at the ends raise clear of the surface.

Another modification in design was to change the cutting blade from right angles to an angle of 35 deg. from the right angle. Obviously this permitted material to move along the blade and surplus to be discharged at the side.

With these improvements the machine was used on a road-mix job where the material was very sandy and difficult to lay down by means of motor graders. By using the float from the edges to the center and then back again to the edges, a very smooth grade was secured with a perfect crown.

Records indicate that the machine will float a mile of roadway 40 ft. wide in about 4 hr.

Advantages listed

Based on experience with the float as described and improved, advantages are as follows:

1. The long wheel base of 30 ft. provides longitudinal smoothness for excellent riding characteristics of the finished surface.

2. As compared to the laying down of a road-mix material with motor graders, the float eliminates the reliance on operator's judgment in changing the setting of the blade of the grader.

3. Engineering economy is effected with fewer grade stakes to be set and the machine represents a minimum cost of equipment for this type of work.

4. No special skill is required for operating and the problem of securing highly skilled operators is eliminated.

5. Uniformity of results is assured with the riding qualities for road-mix and penetration surfacing approaching that of higher type pavements.

6. The machine does not involve any factors of costly operation or maintenance.

7. Responsibility of field engineers and contractors is reduced in keeping close watch over the finishing operation.

One of the remaining disadvantages in the machine, as described, is the fact it does not extend out over the edge of the roadway. This and other minor improvements are expected to be built into a future model.

Direction

William E. Willey is State Highway Engineer of Arizona, and H. H. Brown is assistant deputy state engineer.



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The Bayshore fill road is a highway built on mud

The culvert described here cuts across a roadbed that is a new experiment in open water fill. The Bayshore Freeway is being realigned to run three miles across shallow mudflats in San Francisco on the tide, varies from 5 to 15 ft. in depth. Underneath are layers of soft mud from 60 to 80 ft. thick. You would expect a major dredging operation but that is not the case—no dredging is being done at all. The 250-ft. wide rock fill is being "floated" in the mud.

The possibility of such a road was first considered because of the high cost of acquiring right-of-way through the congested areas along the shore. Estimated cost of an 8-lane freeway, 3-mi. long, built across the water by dredging methods was \$7,700,000. An experimental section to test the feasibility of the floating idea was built in 1951 (*Western Construction*, Aug. 1952, p. 81; Aug. 1954,

p. 73). The results were favorable but not conclusive. Many factors remained unknown. But since construction costs without dredging would run about \$2,000,000 less it was decided to take the risk.

So far the roadbed has been pushed southward from Candlestick Point a distance of 2 mi. After trial and error operations at the start the right procedures were found and the behavior of the mud can be predicted. Engineers are certain now that the "gamble" was a success. The road will be open to traffic in 1957.

Differential settlement is expected to produce a gentle rolling effect on the finished pavement, but not to an extent to require abnormal reconstruction or maintenance later. When the project is finished over 5,000,000 cu. yd. of fill will be floating on the mud—an unusual solution to a complex problem.

LIST OF MAJOR FILL CONTRACTS

Contractor	Dates	Amount	Cu. Yd. of Fill	% Complete
Ed. Keeble	1-52 to 9-52	\$ 200,000	400,000	100
Guy F. Atkinson	6-53 to 7-54	800,000	950,000	100
Ed. Keeble &				
Dan Caputo	5-54 to 10-55	625,000*	200,000	100
Guy F. Atkinson	9-54 to 10-55	1,650,000	1,950,000	100
John Delphia Co.	4-55 to 12-55	370,000*	470,000	90
Guy F. Atkinson	Contract not (low bidder) yet awarded	2,000,000*	1,000,000	0

* Includes structures and work other than fill.

Concrete culvert

(Continued from page 46)

straps spaced around the edge. When the panels are in place the hooks of adjacent panels are aligned. A tapered fork on a clamp (the only working part) is inserted into the hooks. Driving the fork home draws the panels tightly together.

Since the plywood is 1½ in. thick very little bracing is needed. Where walers are required the clamp has a ledge provided with a wedge for securing them. On this job bracing consisted of vertical studs spaced every 2 ft. and walers every 8 in. on the inside. Scaffolding for erecting the panels was attached to horizontal stiffeners on the outside and to roof falsework on the inside.

An outstanding feature of the forms is that bracing is required on only one side of the wall. The clamp grips the snap tie securely making spreader blocks unnecessary. One side of the wall is braced and the other side is held in place by the snap ties. The snap ties are of the break-back variety and are furnished in the proper length for the job. The absence of spreaders speeds up form setting and makes finishing the concrete after stripping easier.

Concrete is being carried six miles to the job in four 6-cu. yd. transit mixers. Placing is done with a ¾-yd. Lorain 40A crawler crane with a 1-cu. yd. bucket and a 10-ft. elephant trunk. An unexpected advantage of the plywood panels came to light during the pouring of the first section. The trunk became snagged on the reinforcing steel about 8 ft. from the top of the forms. With standard forms it probably would have been necessary to cut a hole to free the trunk, but with the plywood arrangement it was possible to remove one panel, the work of a few minutes.

Since so little bracing is being used on the walls close watch is kept on the quantity of concrete going into the forms to make sure they are staying the proper distance apart. The forms have more than enough rigidity, however, and so far the concrete has checked out very closely. It will take 850 cu. yd. for the job.

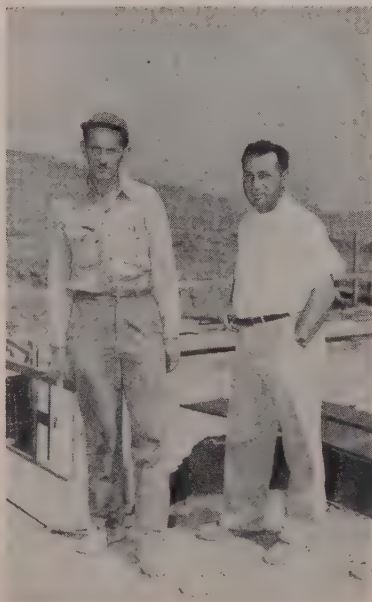
Thomas hopes to use the panels 11 times in covering the 336-ft. distance. Vibration is carried out carefully to avoid damaging the panel surface.

Care must be taken in placing the bottom panels. Any error there is magnified as the wall is built up. The general speed with which the panels are assembled and secured, however, more than makes up for the slight extra care necessary at the bottom.

Resident engineers for the California Division of Highways are Vince Smith and H. A. Hart, assisted by George Perry. For Thomas Construction Co., Al Reimer is superintendent. D. B. Winniford, general superintendent for Thomas, was on the job for the first week of pouring.



FALSEWORK for the roof, shown going into place, will also support scaffolding for erecting inside plywood panels.



SUPERINTENDENT for Thomas is Al Reimer (left). Vince Smith (right) is resident manager for the Division of Highways.



THE PAVER OPERATOR gets this view of the slab pouring operation. The 6-ft. high offset on the left end of the finisher enables the finisher

to run on the outside header despite the vertical dowel steel standing all along the edge of the slab. Initial spreading was done by hand.

Offset on finisher speeds slab pour

A 6-ft. vertical offset on the finisher which straddles vertical reinforcing steel for the walls enables full width of the slab to be poured and finished with one pass of the machine. Re-usable job-made wall forms are 54 ft. long, 11 ft. high.

TEN PERCENT AHEAD of schedule—that's standard for Oberg Bros. Construction Co. on its channel lining job near Temple City, Calif. Concrete goes into the slab and is finished at the rate of 400 cu. yd. per day—excellent production considering the protruding vertical steel for the side walls. The reason? Mostly it's the Clary finisher specially fitted by the contractor on the job with a 6-ft. offset to straddle the vertical steel, and fast formwork and concrete handling on the walls.

Flood control project

The channel is Eaton Wash, south-east of Los Angeles. It's a flood control job under the supervision of the Los Angeles District Corps of Engineers. Oberg Bros. was awarded the \$1,500,000 contract in March 1955. Completion is set for February 1956.

Earthmoving is a major item since 2,200 ft. of the total length of 2.33 mi. to be lined involves channel relocation. The banks have been cut back at a 0.75 to 1 slope, which gives

enough room to handle the wall forms. After the walls are stripped, fill material is placed next to the wall and compaction is carried out by ponding. On some sections, however, a Cat with a $\frac{1}{2}$ sheep'sfoot roller gave satisfactory compaction next to the wall.

Channel excavation to proper grade runs about 5 ft. in average depth. This means a net excess of 200,000 yd. of dirt will have to be disposed of—rare on construction work in this area.

The channel is rectangular in cross-section. The walls will be 11 ft. high for the entire 2.33 mi. but the width varies from 35 ft. to 60 ft. A typical section has a slab invert thickness of 12 in., increasing to 13 in. at the edges, where the walls join the slab.

Drainage for worst conditions

The slab is laid on 6 in. of local sand which acts as a filter material. A French drain of 6-in. perforated asbestos pipe made by Orangeberg

is placed in a V-trench of No. 3 rock. This arrangement should provide more than adequate underdrainage even under the worst conditions of channel flow and ground water.

Steel and wooden headers

Steel headers are placed at the outside of the slab with 3x12-in. wooden headers on the inside at the construction joint. The wooden headers are used because holes can be easily drilled to accommodate the horizontal reinforcing rods which serve as dowels. The steel headers are removed with the assistance of a Gradall, which is also used to dig the V-trench.

The 35-ft. width is poured in two equal passes of the paver. The 45-ft. section is poured in two $17\frac{1}{2}$ -ft. widths, with a 10-ft. center, and the 60-ft. width in two $17\frac{1}{2}$ -ft. passes with a 25-ft. final strip.

Batching concrete

The concrete is batched and dumped into a Rex dual-drum "Hydrocycle" mixer. It has a capacity of 800 yd. per day but the cement situation in this area holds it down to 400. Each batch is 1.4 yd.

Water and air entrainment (4.5% on this job) are introduced according to adjustable settings. All the concrete was mixed on the job.

The concrete is roughly spread by hand ahead of the Clary finisher. A 1-hp. Briggs & Stratton engine drives a vibrating roll that spans $17\frac{1}{2}$ ft. In

addition, 3 Viber vibrators are mounted on the machine, one at each edge and a full depth vibrator at the center. Power is supplied from a generator set that is towed behind the mixer. The paver has 2 idler rolls that do the final finishing. The inverted U-shaped gantry on the edge of the machine is best described by the accompanying photographs. The use of this innovation enabled the paver to move along without the necessity of bending down the vertical dowel steel for the wall.

Membrane curing

Although this is not a unique procedure, it worked so effectively on this job that it bears consideration wherever obstructions interfere with the normal use of a finisher or paver.

Curing posed a problem since laying a water line along the channel would have been far too costly. A membrane process is being used, with the material coming from EDOCO Technical Products, Inc. The air-entrainment agent comes from the same company, part of the Eddington Oil Co.

EQUIPMENT LIST

- 3—Cat DW21
- 1—Northwest truck crane
- 2—P & H truck cranes
- 1—Koehring truck crane
- 1—Gradall
- 2—Smith transit mixers
- 3—Challenge transit mixers
- 1—Rex 34E paver
- 1—Cat 12 grader
- 1—Buffalo-Springfield roller
- 2—Gar-Bro 1-yd. concrete buckets
- 1—Allis-Chalmers HD5 tractor

Wall forms are built on the job in panels 54 ft. long and 11 ft. high. Seven wall sections are poured each day and the forms for seven more sections are set. Since the mixer accompanies the paver on the slab pouring, which takes place 500 ft. ahead of the wall construction, two transit mixers are used to transport the concrete. A P & H crane places the concrete with a 1-cu. yd. Gar-Bro bucket. About four passes along a 50-ft. length bring the concrete up to the 11-ft. height. A section of this size takes 40 min. to pour. The forms (which can be used 20 times or more) are braced with steel shores leading to anchors drilled into the invert slab.

Keeping forms properly spaced is a typical Oberg trick. Small concrete spacer blocks are set into the fresh invert concrete with the out-to-out distance the same as the wall thickness. Later, the forms can be bolted together to squeeze against these blocks.

F. C. Bennett is project engineer for the Corps of Engineers, Bill Sharp is chief inspector. For Oberg, Oscar Kringlen is project manager, Nils Oberg is general superintendent, and Harry Kurlan is engineer. Rutherford & Skoubye holds the sub-contract for reinforcing steel.



CONCRETE WAS HANDLED by this P & H crane with a 1-cu. yd. Gar-Bro bucket. In the right background are two of the 11-ft. high, 54-ft. long panels used to form the walls.



A COMPARTMENTED dump truck is depositing its load into the Rex paver. The paver tows generator trailer with the water truck bringing up the rear.



KEY PERSONNEL on the job include (left to right) Bill Sharp, chief inspector; Oscar Kringlen, project manager; Lee Martin Jr., concrete foreman; Larry Dixon, inspector.

Penstock lining

A tough job for specialists on the 25-ft. diameter steel pipes at Chief Joseph Dam

COATING THE SIXTEEN penstocks at Chief Joseph Dam, mostly on 45-deg. slope, required the application of 180 tons of coal-tar enamel. This special contract has been carried out for the Corps of Engineers, Seattle District, by the Gustafson Coating & Blasting Co. of Coeur d'Alene, Idaho. Each of the 25-ft. diameter penstocks will carry 6,500 cfs. to a 100,000-hp. turbine.

A movable scaffold assembly mounted on rubber tires provided the working platform for the crew. The unit was 32 ft. long and was raised or lowered in the 305-ft. length of penstock as the work advanced. With adjustable side sections the staging could be extended to fill the penstock or be changed to negotiate the curves at top and bottom.

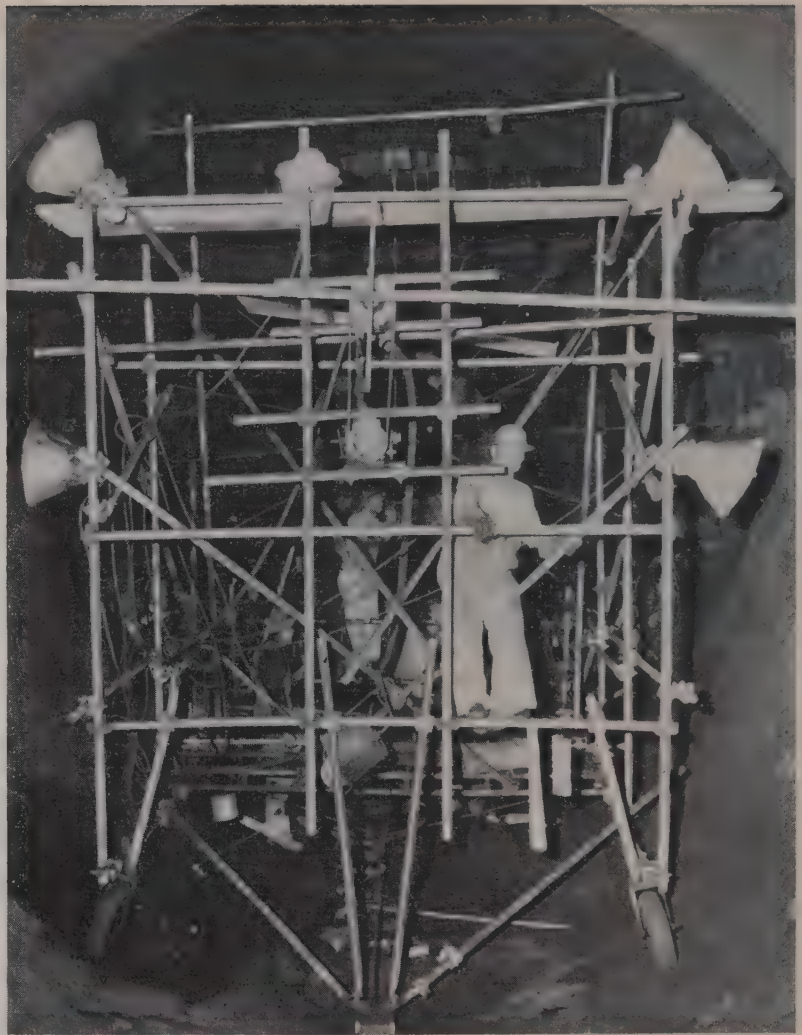
The first step is sandblasting to remove rust and prepare the surface. Immediate application of a primer coat is essential, with no delays tolerated, because weather or dampness will cause the bare steel to oxidize in a very short time. Coal-tar enamel primer is then applied cold.

Heated to 500 deg.

Application of the hot coating follows. The coal-tar enamel is lowered through an opening at the top of the intake structure into the penstock to a set-up for heating the tar to a temperature of 500 deg. F. The heating is done in propane fired, asbestos-lined kettles. Each kettle holds 1,000 lb. of coal tar, and about 2 hr. are required to heat the material.

Applied with dobbers

At the desired temperature the coating is placed in insulated buckets and lowered down the big pipe to the location of the platform. Here the "dobbing" crew applies the coating about 1/16 in. using 6-in. curved dobbers attached to the end of 3 1/2-ft. handles. Each man wears out three or more dobbers each shift.



MOVABLE staging of metal tubing developed by lining contractor moves on rubber-tired wheels in penstock. The platform is 30 ft. long and could be raised or lowered in the 50-deg. slope of the penstocks. About one pound of enamel per square foot is applied.

During the cooking and coating operations, or at any time workmen are down inside the penstock, large electric blower-type fans are placed over the openings at the top of the intake to pull out the smoke and fumes.

After the hot-coating application is completed, the entire surface is spark-tested with an electric detector of 10,000-volt capacity.

A pound per sq. ft.

One pound of enamel is used for each square foot of pipe, and 180 tons were required for the Chief Joseph job. With a crew of eight men Gustafson had working, it required four days to coat each penstock. One day was needed to set up the operations, and one day to dismantle and remove the equipment. Therefore, about one-third of the job's time was required for rigging and moving the equipment. To speed up the operations, sandblasting was done in one

penstock while hot coating was going on in another.

The coal-tar enamel lining will withstand temperatures from -4 deg. to 120 deg. before sagging or cracking.

Three of the penstocks went into service immediately after coating to enable the power units to be tested. These went on the line officially with first commercial power from the project August 20.

When Chief Joseph dam and powerhouse reaches its ultimate planned capacity its 27 power units will turn out 1,728,000 kw.

Planning, designing, contracting, and construction supervision of Chief Joseph Dam have been handled by the Corps of Engineers, U. S. Army, through its Seattle District office. The Corps will continue its service by maintaining and operating the project, which is a major unit in the comprehensive water-resources development plan for the Columbia River Basin.

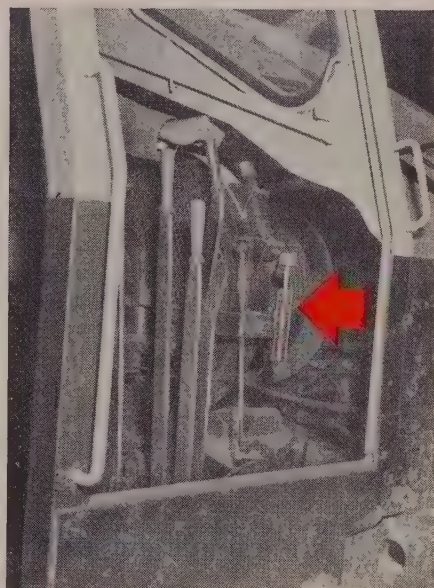
The Engineer's Report

CASE HISTORY

Chevron Starting Fluid
PRODUCT

Larry Hendricks Construction Co.,
FIRM *Mt. Vernon, Wash.*

Special fluid starts shovel in seconds saves manpower, batteries in cold weather



PIPE LINES, ROAD CONSTRUCTION and general contracting jobs keep this $\frac{3}{4}$ yd. Bucyrus-Erie shovel working hard the year 'round. The Larry Hendricks Construction Co. uses 7-cc. gelatin capsules of Chevron Starting Fluid to get the rig's GM-371 powerplant into action fast in cold weather. Owner Hendricks says, "This shovel makes money only when it's working. I can't afford to waste man-hours or wear down batteries getting it started. With Chevron Starting Fluid one man puts it on the job in a few seconds, even in coldest weather. We like the capsules, too. They deliver a safe, controlled charge. Too much fluid makes an engine race, and that ruins bearings

quick." Capsules are discharged through manual applicator installed in cab of excavator. (See arrow, right.) Chevron Starting Fluid atomizes at temperatures as low as -65°F . Fires under pressure or weakest engine spark.

FREE FOLDERS tell more about the Chevron Starting Fluid and Chevron Pressure Primer System. Write or ask for them.

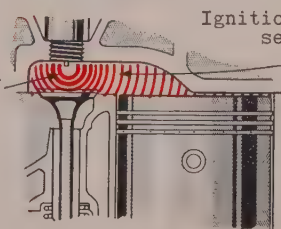
FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your nearest distributor, write or call any of the companies listed below.



TRADEMARK "CHEVRON" AND DESIGN REG. U. S. PAT. OFF.

Why Chevron Starting Fluid starts engines instantly

Highly volatile:
7 times
more than
gasoline

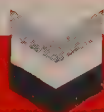


Ignition temperature
several hundred
degrees lower
than diesel
fuel

Contains wear-reducing lubricants

Additives inhibit ice formation

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Summer snow keeps Prepakt cool

Prepakt concrete kept cool by job-made snow is feature of refinery structure, largest of its kind. Design called for largest

reinforcing bars ever used in West. Over 240 tons of pulverized ice were used to cool both aggregate and grout.

SNOW IN August and reinforcing bars 2 $\frac{3}{8}$ in. in diameter are two of the unusual features of a structure being built by Tide Water Associated Oil Co. at Associated, California. It's a fluid coking plant capable of processing 42,000 bbl. of heavy oil per day, the largest of its kind ever built. When the steel reactor, 200 ft. tall and 30 ft. in diameter, and the burner, 76 ft. tall and 44 ft. in diameter, are put in place the overall height of the building will be 256 ft. Bechtel Corp. holds the construction contract, part of Tide Water's refinery expansion program.

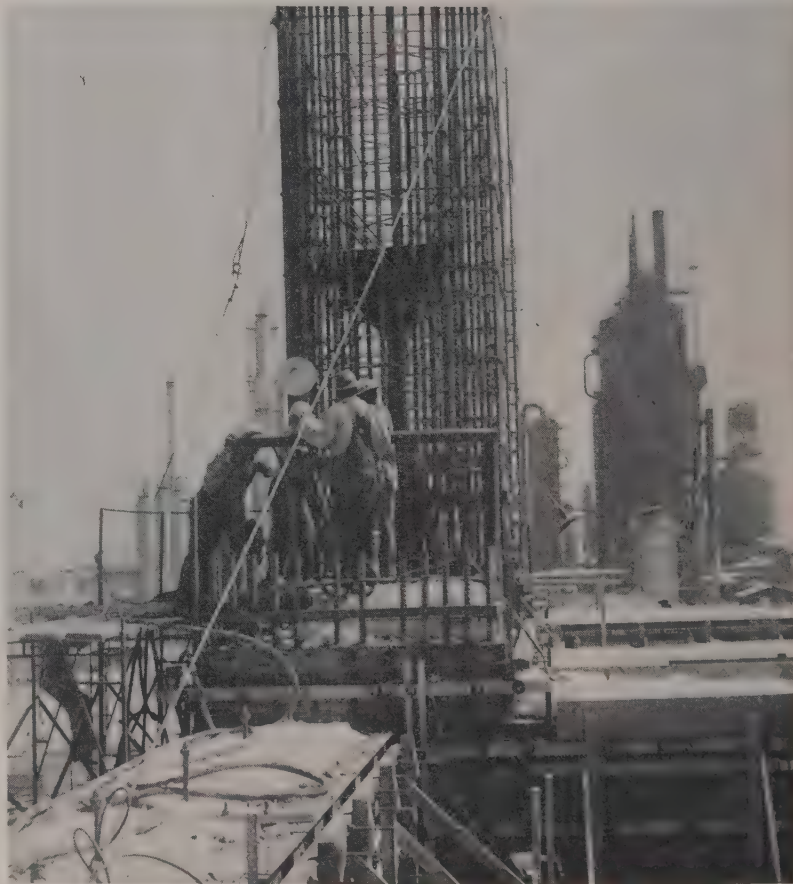
The reinforced concrete structure must support a load of 4,000 tons. It is 106 ft. long by 66 ft. wide and 104 ft. in height. Eight columns, each 8x6 ft. in cross-section, rise 96 ft. to support an 8-ft. thick concrete slab. Quantities include 5,000 cu. yd. of concrete, 800 tons of the largest available reinforcing steel, and 100 tons of smaller reinforcing steel. The foundation consists of a 5 $\frac{1}{2}$ -ft. thick concrete slab 112 ft. long and 66 ft. wide, changing to 11 $\frac{1}{2}$ ft. thick directly under the columns. This slab rests on 384 step tapered Raymond concrete piles which were driven at 4-ft. centers.

Shrinkage minimized

The structure marks the first use of Prepakt concrete high above the ground on new construction. The most usual use of the Prepakt method has been in mass placement including foundations and in many types of rehabilitation work, especially under water. In this case the heavy reinforcing would interfere with the placing of conventional concrete, and the effects of shrinkage and cracking had to be minimized. After consulting with Prof. R. E. Davis of the University of California, Bechtel forces decided to use Prepakt.

Aggregate, an all-important ingredient in this type of construction, was found of suitable quality 40 mi. from the job site and was transported by railroad. The size was graded from $\frac{3}{4}$ in. minimum to 3 in. maximum. It was necessary to wash the aggregate before placing it in the forms.

The Prepakt system has been covered in **Western Construction** in



WORKMEN for Bechtel raise a vertical grout pipe as the grout level rises in the forms. Reinforcing steel for one of the 8 x 6-ft. columns is in place in the background. Melting crushed ice kept temperature of aggregate near 60 deg.

some detail (July 1951, p. 69; February 1955, p. 42). Since the mass of the concrete was large, temperature control was important. About 24 hr. before grouting 2 ft. of crushed ice was placed by clamshell on top of the aggregate in the forms. As the crushed ice, or snow, melted the water trickled down through the aggregate lowering its temperature to about 60 deg.

Water close to the freezing point was prepared for the grout by spraying water on snow in an underground tank. The resultant temperature of the concrete in place was recorded as low as 45 deg. Sack cement

was used and was purchased well in advance so it could be stored for cooling. The other ingredients, fine sand, fly ash, and a fluidizer were not pre-cooled. Cooling conventional concrete to this extent would have required a much more elaborate plant, probably involving internal refrigeration coils. About 240 tons of pulverized ice were used.

As the aggregate and reinforcing steel went into the forms vertical grout pipes were placed on 5-ft. centers. After the steel and aggregate were built up to the desired level and snow had been placed on top of the forms, grout was pumped into the



THE SUN'S HEAT AND GIANT REFLECTORS may convert cosmic energy into power that will propel space ships to distant planets.

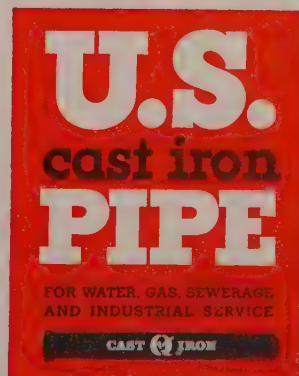
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WE MAY "SIGHT SEE" ON MARS

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A WHOLLY INTEGRATED PRODUCER FROM MINES AND BLAST FURNACES TO FINISHED PIPE.



THE REINFORCING bars are $2\frac{3}{8}$ in. in diameter—800 tons were used. Inside the column grout pipes are being positioned.



SUMMER SNOW was made here by crushing 300-lb. blocks of ice. Part was lifted to forms, part melted for use in grout.



BATCHING grout took place at foot of structure with aid of conveyor and hopper shown here. In the background one of the steel vessels is being fabricated which later will be lifted into place.



ON THE JOB during the first pour were R. C. Richardson of Gilmore Fabricators, Inc., steel suppliers and Bechtel's George Wilcox, superintendent, and Bill Shellhase, senior field engineer.

vertical pipes. As the grout level rose in the forms, the pipes were withdrawn until they stood 8 ft. above the top of the forms. The projecting grout pipes were then cut and supply hoses re-attached. Eight intrusion mortar pumps were required for the grouting.

Second pour is fast

The first pour, 27 ft., was made on July 29. Grout for 840 cu. yd. of Pre-pact concrete was pumped into the forms in a 24-hr. period. On this pour prefabricated panels were used for form work. However, these panels provided too many butt joints to hold the thin grout and several leaks resulted. But the time lost in stopping the leaks was regained on the second pour when 850 yd. were placed in 13 hr. on August 25. For this pour and the final pour of 38 ft. job-made $\frac{3}{8}$ -in. plywood forms were used which could resist full hydrostatic pressure. Vertical studs consisted of 2 x 4s on 6-in. centers, with 4x6-in. walers on 18-in. centers. This bracing was not as heavy near the top of the forms. The final pour took place on September 4 when 1,450 yd. were put in place in 19 hr.

Joints sealed with putty

All form joints were sealed with putty making the entire framework nearly water-tight. Openings were left in the forms to allow water from the melting snow to escape as the grout rose. The reinforcing steel, supplied by Gilmore Fabricators, Inc., was joined together by the thermit process and required 1,600 butt welds. It was necessary to hold to 1/32-in. tolerance in cutting vertical steel, and a 1/8-in. tolerance on horizontal steel.

Limited area on the construction site made it necessary to do most of the carpentry and stockpiling $\frac{1}{2}$ mi. away. Large sections of forms were prefabricated in the carpenter shop and lifted into place by a guy derrick 320 ft. high. The guy derrick will later handle 17-ton pieces of the steel superstructure.

The project is scheduled for completion April 1956.

Directing the job

Key personnel on this job for Tide Water include Oscar Larson, refinery manager; B. C. Shaul, refinery superintendent of maintenance and construction; P. H. Woods, refinery chief engineer, and J. A. Thomas, refinery assistant chief engineer.

For Bechtel, T. W. Moran is project manager, R. S. Allen is general construction superintendent, and G. H. Wilcox is superintendent of the coker area.

For Pre-pact, J. H. Bowman is Western States regional manager, W. K. Ingram is San Francisco district manager, C. O. Smith is project superintendent, and Louis Gerdine is regional engineer.

ARIZONA

UNIVAC, Remington Rand's electronic brain, is being installed in the Accounting Department of the Arizona Highway Department. The machine will be used to assist in engineering calculations, highway locations involving survey notes, and will be a supplement to the engineering staff because of critical shortage of professionally trained engineers. The machine has been used by the Louisiana State Highway Department and Arizona is the second state to use its service.

RECENT MAJOR CONTRACT AWARDS

and low bids in Arizona include a low bid of \$401,000 submitted by **Isbell Construction Co.** of Phoenix for 1 mi. of grading and surfacing in Yavapai County. **Ashton Building Co.** of Tucson submitted a low bid of \$394,000 for grading and construction of access bridges in Pima County. **Wallace & Wallace Contractors** submitted a low bid of \$297,000 for 12.7 mi. of grading and surfacing in Gila County. **Pioneer Constructors** of Tucson submitted a low bid of \$275,900 for grading and surfacing in culverts in Pima County. **Western Constructors, Inc.**, received a \$219,000 award for 1 mi. of grading, draining and surfacing in Pinal County. **Kitchell-Phillips Constructors, Inc.**, of Phoenix submitted a low bid of \$196,000 for a steel and concrete overpass on the Ashford-Flagstaff Highway. **Dale F. Payne** submitted a low bid of \$187,500 for grading and surfacing in Maricopa County.

CALIFORNIA

A \$392,000 **BRIDGE** and road project in Shasta County, the first to be constructed under supervision of the new County Department of Public Works created September 1st, is nearing completion between Igo and Girvan. The 247-ft. long structure of reinforced concrete and steel is surpassed only by the 805-ft. Sacramento River Bridge which county forces also engineered.

THE SACRAMENTO-YOLO PORT DISTRICT has completed its part of the job leading to start

of construction on the Sacramento Deep Water Channel. The District provides the rights-of-way for the channel and the Army Engineers will do the work. Dredging is expected to start shortly after the first of the year. Congress voted \$500,000 to resume work on the \$34,000,000 project. A larger appropriation is expected next July 1st.

CONSTRUCTION CREWS will be working in San Timoteo Canyon south of Redlands this month installing the first pipeline the section has ever had for the transportation of refined petroleum products. The Southern Pacific Pipe Lines, Inc., has a contract with Coyne Construction Corp. for laying the 197-mi. section of the line from Yuma to Colton. This is part of the 846-mi. line that will run from the Los Angeles refining district to El Paso, Texas.

EXTENSION OF HIGHWAY 40 as a four-lane route in the Sierra Nevada foothills and near the California-Nevada line is included in California's \$348,000,000 highway budget for 1956-57. The Department has budgeted \$11,000,000 for an additional 21 mi. of four-lane expressway to be built during the same budget period. The new construction, when completed, will mean that 133 of the 213 miles of Highway 40 between

San Francisco and the Nevada State line will be multi-laned.

A **NEW \$670,000** concrete and steel bridge will soon replace a steel truss bridge in use on Highway 118 which crosses the Santa Clara River, in Ventura County. The new bridge will be similar to one that spans the river at nearby Montalvo. The old bridge is the longest and narrowest in the county and has been the site of a number of serious accidents.

RECENT MAJOR CONTRACT AWARDS

and low bids in California included a low bid of \$4,000,000 submitted by **Vinnell Co., Inc.**, for 2.4 mi. of grading and paving, six bridges, and three pedestrian undercrossings in Los Angeles County. **Gordon H. Ball** of Danville submitted a low bid of \$3,000,000 for 2.6 mi. of grading and surfacing in bridges in Contra Costa County. **Guy F. Atkinson Co.** of Long Beach submitted a low bid of \$2,800,000 for 2.6 mi. of grading and surfacing and six bridges in San Diego County. **Madonna Construction Co.** of San Luis Obispo submitted a low bid of \$1,663,000 for 11.3 mi. of grading and surfacing and a concrete undercrossing in Santa Barbara County. **V. R. Dennis Construction Co.** of San Diego submitted a low bid of \$410,000 for grading and paving and a concrete and steel bridge in San Diego



MARINE CORPS BUILDS A MOUNTAIN ROAD

These two International TD-24 crawler tractors owned by E. Paul Ford Co. of San Diego, Calif., have just dozed their way to the top of a mountain at Camp Pendleton, Calif., where they are helping to build a field training road for the Marine Corps. The new road will be 3.2 mi. long with a 10 to 13% grade. The job started in Nov. 1954 and will be completed this month. Over 65% of the 320,000 yd. of material to be moved was rock.

County. **Somers & Stacy** of Klamath Falls, Ore., submitted a low bid of \$337,900 for construction of another section of the forest development in Siskiyou County. **Harms Bros.** of Sacramento submitted a low bid of \$300,800 for grading and surfacing 3.5 mi. in Lassen County. **Granite Construction Co.** of Watsonville, submitted a \$296,397 bid for 1.6 mi. of grading and surfacing in San Mateo County. **Granite Construction Co.** of Watsonville submitted a low bid of \$236,500 for grading and surfacing 2.5 mi. and a concrete bridge in Santa Clara County. **Lowe & Watson** of San Bernardino submitted a low bid of \$202,000 for grading and surfacing in Los Angeles County.

THE 37TH ANNUAL convention of the Northern California Chapter of Associated General Contractors will be held December 2 and 3 at the Sheraton-Palace Hotel in San Francisco.

The sessions on Friday will be addressed by business leaders and directors of large construction programs. In the evening the associate members will entertain. The annual banquet, one of the outstanding social events of the construction industry in the West, will be held on Saturday evening.

COLORADO

THE NEW OVERPASS leading Boulder-bound traffic from Denver's Valley Highway to the Boulder-Denver toll road, which crosses over a section of the new highway link connecting the Valley Highway and U. S. Highway 87 leading north to Cheyenne, has been completed. The overpass is part of the \$769,000 project which was begun in October 1954 by Northwest Engineering Co.

THE STATE HIGHWAY DEPARTMENT has hired Robert H. Carpenter, geology professor of the Colorado School of Mines, to help in final reports and evaluations of two proposed sites for a highway toll tunnel under the Continental Divide. Test drilling, which involved holes sunk to 400- and 800-ft. levels on both sides of the divide, has been completed.

IDAHO

CONSTRUCTION WAS EXPECTED to begin shortly on two dams on the controversial Hells Canyon Gorge of the Snake River. Construction has been authorized by the Federal Power Commission over the objection of groups which advocated a Federal High Dam at Hells Canyon, the site of which would be flooded by the three low level dams proposed by the Idaho Power Co. Equipment has already been ordered for the Brownlee and Oxbow projects on which work will begin simultaneously. First power is expected to be on the line early in 1958.

A CONTRACT HAS BEEN SIGNED between the U. S. Atomic Energy Commission and Henry J. Kaiser Co. for construction of an Engineering Test Reactor. The structure will be built at the National Reactor Testing Station to provide further experimental space in nuclear power development programs. Work on the project has begun and will be done on a cost-plus-a-fixed-fee basis. Completion of the Reactor is scheduled for spring of 1957. Overall cost is estimated to be \$15,000,000.

RECENT MAJOR CONTRACT AWARDS and low bids in Idaho include a \$303,000 award to **Peter Kie-**

wit Sons' & LeBoeuf Dougherty Co. of Sandpoint, for constructing a roadway and bridge in Bonner County. **Nielson & Smith Construction Co.** of Twin Falls, submitted a low bid for a steel bridge across the Malad River. **Nielson & Smith Construction Co.** of Twin Falls, received a \$128,000 award for construction of a bridge and roadway in Twin Falls County. **Grant Construction Co.** of Coeur d'Alene received a \$102,000 award for 1.8 mi. of grading and surfacing in Benewah County.

MONTANA

CONSTRUCTION of the Yellow-tail Dam 45 mi. southwest of Hardin, in the Missouri River Basin Project is expected to be put out for bids in November or December, according to a tentative schedule of the U. S. Bureau of Reclamation. The first contract, on which work should begin this winter, involves the construction of 4.4 mi. of bituminous-surfaced access roads. The dam, for which \$4,000,000 is initially available, will be a 1,600,000-cu. yd. concrete arch structure 520 ft. high and about 1,350 ft. long at the crest, damming the Big Horn River in the Crow Indian Reservation.

FINAL COST of Hungry Horse Dam and powerhouse, the Bureau of Reclamations' first major post World War II project, is being computed. When construction of the dam began in May 1948 the estimated cost of the nation's fourth largest, third highest concrete dam with its powerhouse was \$108,800,000. The dam and powerhouse were completed October 1952. It now appears that the total cost will be close to \$102,000,000. The dam backs up a 34-mi. long lake holding 3,400,000 acre-feet of water.

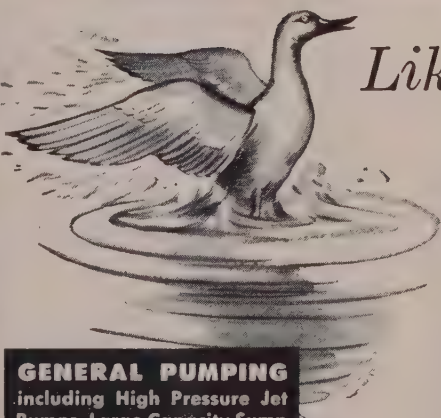
RECENT MAJOR CONTRACT AWARDS and low bids in Montana include a \$624,000 award to **Union Construction Co., Inc.**, of Missoula for grading, draining, and surfacing in Ravalli County. **O'Neil Construction Co.** of Havre, received a \$367,000 award for grading and surfacing in Toole County. **W. P. Roscoe Co.** of Billings, received a \$294,000 award for a steel and concrete bridge in Stillwater County. **Earl L. McNutt Co.** of Eugene, Ore., submitted a \$270,000 award for grading and surfacing in Teton County. **Richardson Construction Co., Inc.**, of Miles City, received a \$257,000 award for grading and surfacing in Sheridan County. **Max J. Kuney Co., Inc.**, of Spokane, Wash., received a \$231,000 award for grading and surfacing in Meagher County. **Stanley H. Arkwright, Inc.**, of Billings received a \$224,000 award for grading, graveling, and surfacing in Golden Valley



AGC OFFICIALS VISIT LOCAL CHAPTERS

Three top officials of the Associated General Contractors of America, on a nationwide tour to visit local chapters, were guests of the Northern and Central California chapters at a dinner meeting held at the Sheraton-Palace Hotel in San Francisco on Thursday, Oct. 20. Pictured here, from left to right, are: **J. D. Marshall**, executive director, of Washington, D. C.; **Frank J. Rooney**, vice president and nominee for the presidency in 1956, of Miami, Fla.; **George C. Koss**, president, of Des Moines, Iowa; **M. J. Heller**, Central California Chapter president, of Sacramento; and **E. L. Clements**, Northern California Chapter president, of Centerville.

This photo of the excavated trench shows the nearly vertical walls, made possible by the STANG Wellpoint System. At the right of the picture is a portion of the 8-inch diameter header including a series of STANG Wellpoints and the intake lines.



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In the Pacific Northwest where rainfall is heavy and drainage slow, STANG Wellpoint Systems have proved the profitable and efficient answer to the unwatering of many construction projects.

At Puyallup, Washington, a particularly tough assignment was completed by STANG. Unwatering this sewer trench at Puyallup proved to be no easy job... quicksand and mud presented a real problem. STANG engineered and installed a Wellpoint System, enabling the contractor to lay 200 feet of 48-inch pipe per day in a completely dry, 6½-foot by 9-foot trench without danger of uplift, "boils" or sloughing.

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The carcass is made of horizontally braided steel wires, providing exceptional strength, durability and resistance to kinking, without impairing flexibility. The long-lasting Synplastic tube is impervious to the action of oil from the drill. The cover is a tough, wear-resistant yellow rubber compound. A black spiral stripe gives the hose a distinctive appearance for easy identification. Sizes 1/2" to 2", inclusive.

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County. G. E. Marshall of Roundup received a \$180,000 award for grading, surfacing, and structures in McCone County. James Crick & Sons of Spokane, Wash., received a \$165,000 award for grading, surfacing, and drainage structures in Lewis & Clark County. O'Brien Construction Co. of Great Falls received a \$110,000 award for grading, draining, and surfacing in Lewis & Clark County.

NEVADA

CONSTRUCTION of approximately 11 mi. of highway on the California side of the Pole Line Road route from Hawthorne to Leevining, Calif., has been completed and is open to traffic. Nevada's 33 mi. of highway on Pole Line Road was completed several years ago. The road provides a shorter route to Yosemite National Park via Tioga Pass.

RECENT MAJOR CONTRACT AWARDS and low bids in Nevada include a \$346,000 award to Morrison-Knudsen Co., Inc., of Salt Lake City, Utah, for 6.5 mi. of highway construction in Lincoln County. Silver State Construction Co. of Fallon received a \$309,000 award for highway construction in Nye County.

NEW MEXICO

BIDS HAVE BEEN APPROVED on all except two of the 32 lots of the \$1,500,000 construction and equipment "Phase 4" of the new penitentiary. The Board of Penitentiary Commissioners awarded the majority of the contracts to Robert E. McKee Co., Santa Fe, the only contractor to bid on each one of the 32 lots.

TOTAL VALUATION of construction in Albuquerque so far this year has exceeded that for the entire year of 1954 and appears headed for a record. The all time high was recorded in 1953 at a figure of \$37,300,000.

RECENT MAJOR CONTRACT AWARDS and low bids in New Mexico include a \$659,000 award to Brown Contracting Co. of Albuquerque for 4.6 mi. of grading and surfacing in Santa Fe County. Longenbaugh & Coe, Inc., of Albuquerque received a \$409,000 award for 6.2 mi. of grading and surfacing in Colfax County. J. W. Jones Construction Co. of Albuquerque received a \$310,000 award for 10 mi. of grading and surfacing in Rio Arriba County. G. I. Martin of Albuquerque received a \$268,000 award for 4.9 mi. of grading and surfacing in Catron County. Boswell Construction Co. of Albuquerque submitted a low bid of \$141,000



Takes shortest route to job . . . via highway or cross country . . . cuts hours from job-to-job moves.



Drives through city without interference to traffic, turns sharp corners, maneuvers easily in tight quarters.

Safe in traffic with big brakes, finger-tip control. Tires do no damage to blacktop, curbs, sidewalks.



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by driving job-to-job under own power

A major advantage of rubber-tired Tournatractor is the 19 mph on-the-job and between-job mobility it gives you. With this machine, you drive anywhere under your own power. Big low-pressure tires do no damage to pavement, curbs, sidewalks or railroad tracks. You don't need planking to cross blacktop. You save the time, bother, and expense of locating a trailer, moving in extra men and extra transport equipment, loading and unloading, etc., etc.

When it's time to move from one job to the next, your operator starts as soon as the last yard is in place, drives down the highway, right through regular traffic, at speeds up to 19 mph. 50 miles is only 3 hours away . . . and you go right to work when you get there.

Then, if there's a call for tractor services at the other end of your job, Tournatractor hurries there, traveling up to 1,670 feet per minute. Often it can go, complete the work, and be back at its starting point, before a crawler gets to the site.

Figure out for yourself
what this means in dollars:

- 1 Greater speed on the job that completes each assignment faster.
- 2 Roadability that cuts moving costs and reduces the non-pay hours of moving time.
- 3 Fast one-man moves that make it easy to keep Tournatractor profitably busy at all times, that let you fill in with small jobs between big ones with no stand-by losses.
- 4 Long range drive-yourself mobility and versatility that lets you move with the seasons, find year-round earnings when you need them.

Write or call us for more information on this versatile, high-speed tractor-on-rubber. Ask for a demonstration on your job. See for yourself what Tournatractor can do to speed your dozing, towing and pushing jobs.



Crosses tracks without damaging ties, tripping signals, tearing rails loose, or injuring tires.

Can haul own fuel wagon, other supplies. Self-sustaining on job, eliminates need for service trucks.



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for earthwork and structures on the Middle Rio Grande Project.

OREGON

THE MANSON Construction & Engineering Co. of Seattle recently was awarded the \$1,900,000 contract to build four river piers for the new Morrison Street Bridge in Portland. Work will be restricted to low-water months, probably from November through May. Two low water periods will be required before the job can be completed in the spring of 1957.

DAMS AT THE BRUCES EDDY and Penny Cliff sites on the Clearwater River likely will be recommended to make up for loss of floodwater storage at John Day Dam on the Columbia, according to a report from the North Pacific Division of the Army Engineers. The John Day Dam had been projected as a high dam of 292 ft. capable of storing 2,000,000 acre-feet of water for flood control. When opposition developed, a revised height of 262 ft. was adopted which would store 500,000 acre-feet. The Board of Review for Rivers and Harbors refused to approve the lower dam saying it was necessary first to find some substitute storage locations. The John Day Dam proposal, with substitute storage sites, will be reviewed at a January meeting.

RECENT MAJOR CONTRACT AWARDS and low bids in Oregon include a \$1,120,000 low bid submitted by **Rogers Construction Co.** of Portland for grading and paving in

Malheur County. **Rogers Construction Co.** of Portland submitted a \$900,000 low bid for grading in Umatilla and Union counties. **Porter W. Yett** of Portland submitted a low bid of \$304,700 for grading and paving in Multnomah County. **Hamilton & Thoms**, of Eugene, submitted a low bid of \$295,000 for construction of a bridge in Yamhill County. **R. A. Heintz Construction Co.** of Portland submitted a low bid of \$275,000 for grading in Douglas County. **T. W. Thomas** of Portland submitted a low bid of \$201,000 for grading and paving and construction of a bridge in Malheur County. **Gibbons & Reed Co.** of Cascade Locks, submitted a low bid of \$174,000 for a viaduct extension on the Banfield Expressway in Multnomah County.

UTAH

TEST-DRILLING at the proposed site of the multimillion-dollar flood control dam in Upper Parleys Canyon is under way. A U. S. Corps of Engineers crew is boring into the mountainside to determine feasibility of the proposed damsite at Little Dell Fork of Parleys Creek just below the city-owned farm. Need of a second dam above Mountain Dell Reservoir was pointed up dramatically by the destructive spring floods of 1952, which inundated a large section of the city's westside. Estimated cost of the proposed earth-filled dam is \$5,000,000. If it is authorized by Congress the city's share of construction costs would be half the total. In addition to flood control, the dam would store spring runoff.



TACOMA RESERVOIR WILL HOLD 50,000,000 GAL.

Construction on the Tacoma city water division's newest reservoir in the McKinley Hill area is progressing rapidly. The reservoir will hold 50,000,000 gal. and is designed to provide better fire protection and a greater water supply for the downtown and industrial areas. **Ostruske-Murphy Co.** holds the \$638,995 contract. Work is expected to be completed in less than six months.

RECENT MAJOR CONTRACT AWARDS and low bids in Utah include a low bid of \$766,000 submitted by **Jack B. Parson Construction Co.** of Smithfield for 2.1 mi. of grading and surfacing in Salt Lake City and County. **Turner Construction Co.** of Heber City, Ida., submitted a low bid of \$231,000 for construction of a sewer treatment plant for the City of Toole. **Gibbons & Reed Co.** of Salt Lake City submitted a low bid of \$149,000 for 7 concrete structures on U. S. Highway 91 in Salt Lake County, Utah.

WASHINGTON

TURBINES AND GENERATORS at Pleasant Valley and Mountain Sheep dams planned for construction on the Snake River above Lewiston will be the world's largest, according to the Washington Water Power Co. New records in dam building and power plant operation are expected to be set when Pacific Northwest Power Co. undertakes the two-dam hydroelectric project which will cost an estimated \$210,000,000. Construction schedules call for starts at both sites in March with first power available in 1959.

Permanent cranes to be used for handling the big power units will be capable of lifting 700 tons. Output of the project will be two-thirds that of Grande Coulee.

APPLICATION to the Federal Power Commission for a license to build an 85,000-kw. hydroelectric plant on the Upper Baker River at an estimated cost of more than \$27,000,000 has been announced by Puget Sound Power and Light Co. The proposed dam would be 300 ft. high and would be located 8 mi. above the company's present Baker River project near Concrete and would impound about 238,000 acre-feet of water in a reservoir 9 mi. long.

RECENT MAJOR CONTRACT AWARDS and low bids in Washington include a \$1,159,000 low bid submitted by the **General Construction Co.** of Seattle for constructing a water supply dam for the City of Bremerton. **Rumsey & Co.** of Seattle received a \$728,000 award for construction of a viaduct in King County. **Neukirch Bros.** of Seattle received a \$633,000 award for construction of a channel bridge in Skagit County. **Murphy Bros., Inc.**, of Spokane received a \$487,000 award for 5.1 mi. of grading and surfacing in Okanogan County. **Mac Roa Bros.** of Seattle received a \$426,000 award for construction of a bridge in Thurston County. **Anderson Bridge Construction Co.** of Tacoma received a \$348,000 award for an overcrossing in King County.



Morrison-Knudsen, Blythe Brothers, and electric Tournapulls

... the trio which is licking one of the toughest jobs in airport-building history

Excellent production with their fleet of electric Tournapulls is being reported by Morrison-Knudsen Company, Inc. of Boise, Idaho, and Blythe Brothers Company of Charlotte, North Carolina, joint-venturers in dirtmoving work for the new Air Reserve Training Center at Alvin Allender Field, Belle Chasse (New Orleans), Louisiana.

Moving Mississippi River-bed sand from stockpile to swamp fill, each of the combine's 4 high-speed "C"s completes a typical 12,000 ft. cycle every 9 minutes 25 seconds. Of this, load time averages 55 seconds; spread, 20 seconds. Load size, with 48 hp pusher aid, averages 13 pay yards . . . the 5900' haul over well-maintained sandy roads averages 15.7 mph . . . the 5900' return, 17.2 mph. These figures, the result of accurate time-studies made by field engineers, add up to 6 loads (78 pay yards) per Tournapull per 55-minute hour. Contractors' load count on this length haul show a similar per-machine

average of 5 to 6 loads per hour for the entire construction period.

Rigs pull through soft footing

Morrison-Knudsen and Blythe Bros. officials cite "high speed" and "ability to keep traveling through soft fills" as two major advantages of their electric-control Tournapulls. The reason for Tournapulls' ability to work in soft underfoot conditions is simple. Of all scrapers, only Tournapulls have an automatic power-transfer differential and power steer. The differential prevents a drive wheel, which loses traction, from spinning and digging in. The power steer works through geared kingpin independent of footing, lets you pivot prime-mover from side to side to move drive wheels out of ruts.

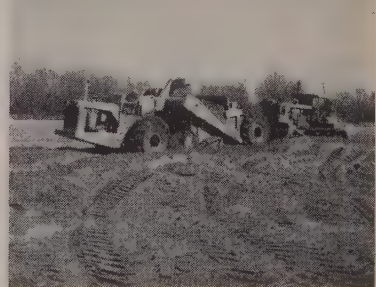
If you have a tough job on hand or coming up this season, let us show you how an electric-control Tournapull can help lick it. We'll be glad to demonstrate on your job. There's a size to fit your needs . . . the 7-yard "D" . . . the 16-yd. "C" . . . and the NEW 23-YD. BIG "B".*

*Capacities heaped without sideboards. Factory-built sideboards available to increase capacity for use in light materials.

A mammoth cypress swamp of the Mississippi Delta is the scene of this sand-muck-water air-base job — one of the most difficult contracts in either Morrison-Knudsen or Blythe's long history. "Nothing can work here," many experts said. "The footing is too poor — 7 ft. of bog on top of 100 to 200 ft. of unstable material."



But Morrison-Knudsen and Blythe have rapidly proved the experts wrong. First they put a big dragline on mats, and with it stripped and side-cast all muck and vegetation. Depth of stripping varied from 1 to 7 ft. over the entire 200' x 8,000' runway, 2000' runover strip, taxiway and apron areas. At another location, over a million yards of Mississippi River-bottom sand were dredged and pumped into a giant stockpile. This job, now completed, provided material for sub-base plus an 8' surcharge. The surcharge, which will help speed settling of the sub-base, will weigh 50 to 100% more than the future load of pavement. It will be left on a section of sub-base 30 to 45 days, then moved forward to the next section. Six moves are planned, each move to involve handling about 75,000 yards. Photos and time study on this page were made when Tournapulls were hauling sub-base. Later, the 4 "C"s will handle and re-handle the surcharge.



Government soil experts say the sand here, dredged from river-bottom, is either marine in origin (from the ancient past when the Delta was part of the Gulf of Mexico) or glacial (washed down the Mississippi). In either case, it's probably the same hard-loading, abrasive type of sand that wrecks crawlers in your state.

Tournapull—Trademark Reg. U.S. Pat. Off. P-805-A-B



LeTourneau-WESTINGHOUSE Company

Peoria, Illinois

A Subsidiary of Westinghouse Air Brake Company

WYOMING

THE STATE HIGHWAY DEPARTMENT has invited bids for aerial photographs in connection with the proposed tunnel on U. S. Highway 14-20 near Buffalo Bill Dam west of Cody. The tunnel will eliminate the danger of rock slides which occasionally block the road, and also will eliminate the steep grade from the Hayden Bridge to the dam. The Highway Department operates a free towing service during the tourist sea-

son because the grade is so steep. Bids on the first project involve the furnishing of aerial photographs, enlargements, and topographic maps of the area.

RECENT MAJOR CONTRACT AWARDS and low bids in Wyoming include a \$433,000 award to **Platte Valley Construction Co.** of Grand Island, Nebraska, for 10.8 mi. of grading and paving of 5 culverts in Sheridan County. **Asbell Bros. Construction Co.** of Riverton received a \$380,000 award for 4.7 mi. of grading, draining, and surfacing in Fre-

mont County. **Lichty Construction Co.** of Casper received a \$186,000 award for 3.1 mi. of grading and surfacing and 1 culvert in Platte County. **Platte Valley Construction Co.** of Grand Island, Nebraska, received a \$163,000 award for 9.2 mi. of grading and draining in Goshen County. **Rissler & McMurrey Co.**, of Casper received a \$130,000 award for 1.9 mi. of grading and paving and 2 culverts in Natrona County.

ALASKA

THE 17TH NAVAL DISTRICT Public Works office has announced that bid openings will be scheduled in March and April of 1956 on a series of projects at Kodiak and Adak. The jobs will include expansion of aviation facilities including housing units. Plans for the work are being prepared by Alaska Affiliates, a joint architectural and engineering group consisting of Clark, Buhr and Nexsen, Norfolk, Va.; Naramore, Bain, Brady & Johanson, and Bouillon & Griffith, Seattle; and Alenar Associated, Anchorage and Seattle. The Navy also plans construction of 80 housing units at Kodiak, with necessary utilities, sidewalks, streets, and landscaping.

APPROXIMATELY \$13,000,000 was spent on the Alaska Railroad during the past season, according to Irvin P. Cook, chief engineer. Of this about \$9,000,000 was for new construction and about \$4,000,000 for line maintenance. Next year's plans call for about the same expenditure.

THE ALASKA DISTRICT, Corps of Engineers, plans to begin production of half-size drawings for most of its projects. The District will discontinue its requirements of cash deposits for plans and specifications in most instances, and no half-size drawings may be returned to the District unless so specified in the advance notices. In a letter to bidders Col. Carl Y. Farrell, district engineer, said: "Research and inquiries have disclosed the fact that generally, once the half-size drawings are adopted, they are favorably accepted by contractors and in many instances preferred. Actual savings realized have been found to be considerable."

RECENT MAJOR CONTRACT AWARDS and low bids in Alaska include a low bid of \$395,000 submitted by **S. S. Mullen, Inc.**, of Seattle, Wash., for construction of one section of the Glacier Highway near Juneau. **Keil & Peterman** of Ketchikan submitted a low bid of \$306,000 for 2.6 mi. of grading and surfacing near Juneau. **Reed & Martin** of Fairbanks submitted a low bid of \$318,000 for the construction of 3 bridges on the McKinley Park Highway.

MORE THAN 80% OF ALL PAVED ROADS ARE NOW SURFACED with ASPHALT



CUMMER BATCH-TYPE ASPHALT PLANTS... CONSISTENTLY PRODUCE RECORD TONNAGES WITH LESS DOWN-TIME

You can't beat the actual experience of "old hands" who have been operating Cummer Asphalt Plants for years when it comes to telling the real story behind Cummer equipment.

Such an "old hand" is Mr. Henry W. Jenkins, Vice-President of the Savannah Asphalt Company of Georgia. Mr. Jenkins says, "Our Cummer Portable Asphalt Plant—shown in the picture above—is rated at 60 to 70 tons per hour capacity. It's been delivering that in the three years we've owned it, and we're still surprised at how little we've had to shut down for repairs and replacements. The way we figure it, ruggedness and efficiency are built right into these Cummer Plants."

Cummer Asphalt Plants are batch-type complete with all motors and starter switches and all moving parts are individually motor driven.

Write now for your copy of the fully-illustrated Cummer catalog giving complete specifications on all plants and accessories.

Write now for names of our Western Representatives



THE F. D. CUMMER & SON CO.
1827 EAST 18th ST. • CLEVELAND 14, OHIO

30 mph "C" hauls shovel rock



Babler Brothers, Eugene, Oregon, used "C's" with rear-dump bodies on this 160,000-yd. 7-mile relocation of U.S. 99 near Anlauf. All-steel body easily withstood shocks of loading big-chunk rock. Short 14'4" turn radius speeded positioning at both shovel and dump.

with 22-ton rear-dump

Here's just *one* profitable use for versatile, 208 hp C Tournapull prime-mover. Coupled to 22-ton rear-dump trailing unit, this 30 mph prime-mover becomes a big-production hauler. Operator takes it through its cycle at top speed, with complete safety, because it has 3763 sq. in. braking surface—*more on one wheel than most haulers have on all four*. Holding action of powerful 4-wheel, disc-type air brakes, plus *front-wheel drive*, let it back safely to edge of bank, dump load clear to save dozer clean-up. Simple electric hoist (no troublesome hydraulics) tips body to vertical position. Smooth, clean, streamlined bowl clears loads instantly. Big 10'4" x 10'10" top opening speeds loading from shovel, dragline, or loader...reduces spillage. When you have no shovel work, money-saving interchangeability with scraper *doubles* Tournapull's earning capacity.

..then converts for scraper dirt

with 16-yd. scraper

For less than 25% of the cost of the original unit, the rear-dump body interchanges with a LeTourneau-Westinghouse electric-control scraper. All you need is the scraper body—wheels, tires, brakes, and controls can be switched. This, of course, substantially reduces the cost of unit interchangeability. Big 21.00 x 25 tires, all-around, assure ample flotation in mud. Constant-pull, power-transfer differential also reduces weather delays...gives positive traction on soft banks and slick grades. Thus, scraper and rear-dump keep your "C" prime-mover earning all year 'round. Other auxiliary hauled units—including a 16-yard Bottom-Dump, 20-ton Flat-Bed and 20-ton Crane—further save time and reduce equipment investment per job. This money-saving Tournapull package is available also in *larger* and *smaller* sizes. Write today for facts on performance, price, and delivery!



R. A. Farish, San Francisco, coupled his 2 "C" prime-movers to scrapers for subdivision grading in Belmont, California. Units moved 286 pay yards of clay and common earth hourly over 1125' cycles. Changeover takes only a few hours.

Tournapull—Trademark Reg. U.S. Pat. Off. RP-819-G-bw



LeTourneau-WESTINGHOUSE Company

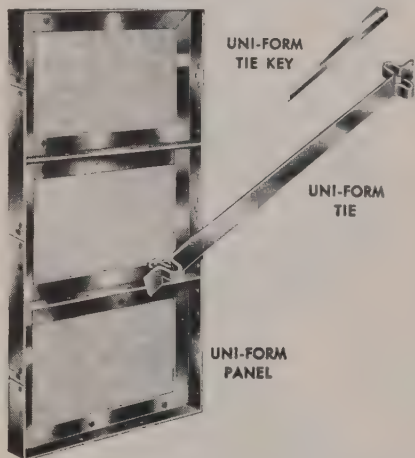
Peoria, Illinois

A Subsidiary of Westinghouse Air Brake Company

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3 BASIC ELEMENTS mean
Faster, Easier, More Accurate Forming



Simple mechanical assembly of UNI-FORM Concrete Forms provides faster forming...easier stripping and lowest all around costs. Ready to use when they reach the job, UNI-FORMS guarantee time, material and labor savings on any forming job. Let us prove UNI-FORM advantages... send us a set of prints for free recommendation and proposal on your next job. There's no obligation.

FORM CIRCULAR WALLS AT LOWEST COST

- No alignment or bracing on outside.
- Free working area.
- Minimum excavation required.
- Maximum job safety.



UNI-FORMING Circular walls costs less per square ft. of contact area... provides unhampered steel setting... greater control of concrete placement. Write for details on UNI-FORMING circular walls.

PREFABRICATED CIRCULAR WALL FILLER

Used on outside form only... assures true form curvature with standard UNI-FORM Panels.



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SEE YOUR LOCAL DISTRIBUTOR



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FIVE-TON COLUMNS

Bethlehem Pacific steelworkers have started to erect some of the heaviest steel columns ever to be used in an office building in Washington. The columns, some of which weigh as much as five tons each, are going into the Pacific Telephone & Telegraph Company's new six-story building at Third and Seneca in Seattle. The five-ton sections are up to 34 ft. long and have flanges 2 1/4 in. thick. The average weight per piece erected will be about one ton. Contractor Henrik Valle is scheduled to finish in mid-1956.

THE BUILDERS of dams, bridges, and other engineered construction projects in the West, who recently formed the organization known as the "Beavers," will gather at the Statler Hotel in Los Angeles on Friday, Jan. 27, 1956, for their first annual awards dinner. According to William A. Johnson, president, over 900 guests are expected to attend the presentation of awards to members of the construction industry for special achievements in their field. Robert V. Edwards, president of American Pipe and Construction Co., is general chairman of the Awards Day Committee. The board of directors for the Beavers (*Western Construction*—July 1955, p. 74) is now complete with the election of B. H. Mercer, Guy C. Kiddoo, Edward H. Honnen, and John M. Server, Jr.

'56 Ford valve advancements for extra-long truck engine life!

Sodium-cooled valves that operate up to 225° cooler among the many new durability features

Every 1956 Ford Heavy Duty Y-8 engine brings you a combination of long-life features available in no other trucks.

The long life of these new engines (offered in all Series 600 and larger trucks) begins right with the basic engine structure—the block.

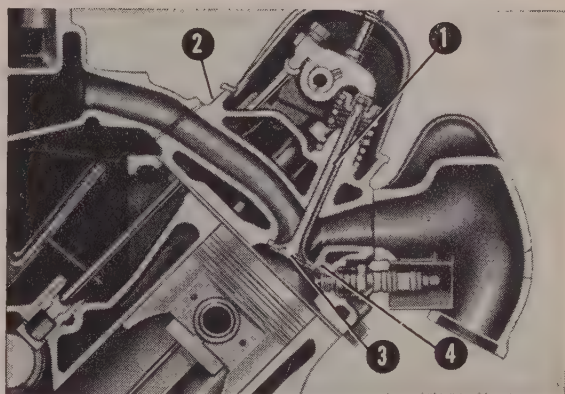
Compared with ordinary V-8's, Ford's Y-8 engines have a deeper, more rigid block. This extra depth holds main bearings in more precise alignment and gives the crankshaft better support.

Stress-relieved cylinder heads are specially heat treated to resist warping. As a result, the heads remain "true" and valves retain their precise fit. Also, there's less chance of compression leaks around the heads. Gaskets stay on the job much longer—reducing truck down-time.

Sodium-cooled exhaust valves play a major part in slashing upkeep costs. Instead of having solid stems as ordinary valves do, the stems are hollow and partially filled with powdered sodium. Under heat, the sodium turns into a liquid. This liquid carries heat away from the valve heads far faster than solid stems do. Valves run up to 225° cooler, last far longer.

But even the best valve won't do its job right unless it closes against an equally durable seat. That's why Ford sodium-cooled exhaust valves have superhard alloy seat inserts.

New Ford Big Job—the '56 T-800 with new carrying and earning power. Choice of two Heavy Duty engines: new 190-h.p. Y-8 . . . or new 200-h.p. Special Y-8 with exclusive hood air scoop, 4-barrel carburetion and dual exhausts. New tubeless tires, tachometer and *Power Steering* are standard. Big new 42,000-lb. GVW—new 65,000-lb. GCW.

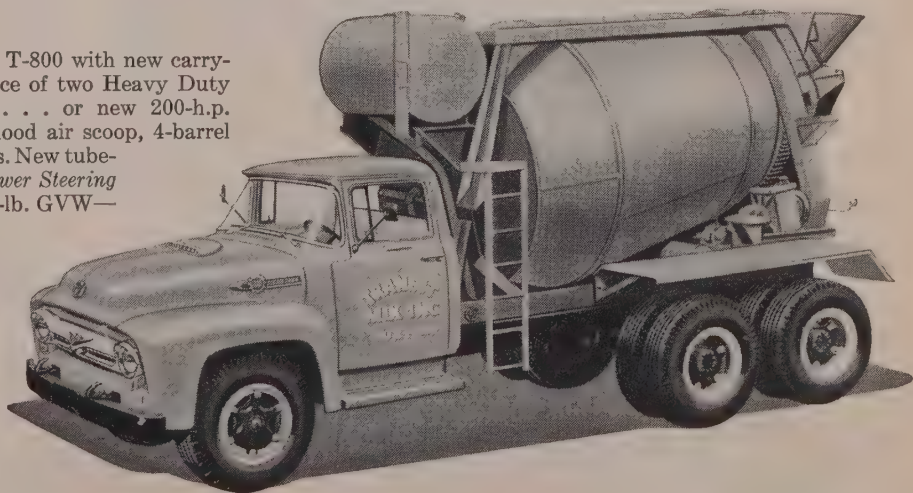


1—Sodium-cooled exhaust valve 2—Stress-relieved cylinder head 3—Tungsten-cobalt alloy valve facing 4—Tungsten-cobalt alloy seat insert.

Solid tungsten-cobalt alloy seat inserts. These special inserts are highly resistant to heat and wear. And, for still greater mileage before valve regrinding, exhaust valve heads also are faced with tungsten-cobalt alloy.

Other Ford Heavy Duty features include self-sealing, dish-shaped intake valves that seat tightly under extreme heat conditions . . . full-flow oil filter to clean *all* the oil and cut engine wear . . . and special long-life copper-lead bearings.

These and still other Ford features help keep engine efficiency at its peak for many more miles. They extend engine life and cut maintenance costs. All told, it's a combination you can get *only* from your Ford Dealer. Be sure and see him before you buy your next truck.



Here and There

RESULTS of a 570-day large-scale highway research project sponsored by the Western Association of State Highway Officials to determine the effect of various axle loadings on different thicknesses of asphalt pavements have been made public. The Highway Research Board, Washington, D. C., conducted a test for the WASHO group on a specially constructed section of highway in southern Idaho. Total thickness of sub-base, base and asphalt pavement was 6, 10, 14, 18, and 22 in. Pavement thicknesses of 2 in. and 4 in. were compared under equal traffic loads. The test road was constructed in 1952 and tests were completed in May 1954. The section has now become a section of U. S. Highway 191 in Idaho. Two of the most important findings of the test, as concerns the use that may be made in the design of new highways, were those dealing with the benefits of thicker paving and the added advantage of paved shoulders. On certain sections of the road where the 6-ft. shoulders were paved with the same thickness as the roadway, less failures were noted than in the areas with gravel shoulders.

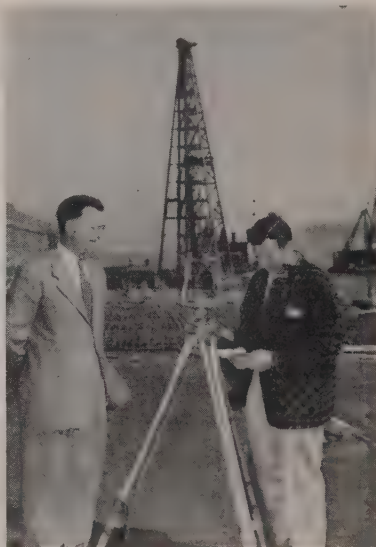
THE BOARD OF DIRECTORS of the Gardner-Denver Co. has announced the establishment of an engineering scholarship fund that is part of the Gardner-Denver foundation. Scholarship grants are given to schools which are leaders in their specific fields. The student selection for scholarship grants was made by the schools on the basis of their requirements jointly agreed to by the Gardner-Denver Co. and the schools involved. So far, 11 scholarships have been awarded in 9 different colleges.

WELDERS HAVE SEAMED UP the last joint in the San Juan Basin section of the 1,500-mi. pipeline under construction to deliver gas from Colorado and New Mexico to the Pacific Northwest. Construction crews finished the job of laying 600 ft. of heavy pipe across the Animas River, 8 mi. south of Durango. Seven tractors brought the section of pipe down the bank and across the stream.

THE UNITED STATES formally protested the Canadian scheme to divert the natural flow of the Columbia and Kootenay rivers in British Columbia, charging it "would result in very great injury to the United States." The United States rejected a proposal for a joint study of the Canadian plan. The statement was made at Ottawa, Canada, in a meeting of the International Joint Commission over mutual problems concerning use of rivers crossing the border between the two countries.

ENGINEERS on the move

T. A. Smith and **O. T. Kuehster**, resident engineer and project engineer respectively, are key men for the Bureau of Public Roads, working on a new project known as 1-A, B, C East Side Highway, Grand Teton National Park, Wyoming, contract for which was recently won by Strong Company. Estimated to cost \$1,500,000, project involves 21 mi. of grading and base course surfacing and 2 major bridges, and is essentially a by-pass to prevent commercial traffic on US 187 from winding through the park. Project is under supervision of the Wyoming District Office of BPR, a part of Division 9 at Denver, of which **K. S. Chamberlain** is division engineer.



S. S. GORMAN, chief engineer for the State Board of Harbor Commissioners, confers with **Jack Futscher**, resident engineer, at the scene of pile-driving operations between Piers 15 and 17 in San Francisco. The project, which involves the driving of 2,000 pretensioned concrete piles, is pictured on this month's cover, described on pp. 29-31.

Harry S. Riddell, after nearly 50 years of engineering work, principally in irrigation, retired Oct. 1. His work for irrigation districts has been in the states of Washington, California, and Arizona. At the time of his retirement he was employed as project manager of the Yuma County Water Users' Association, Yuma, Ariz.

O. H. Folsom, who for the last three years has been with Peter Kiewit Sons' Co. as Director of the Project Services Department at the atomic plant project at Portsmouth, Ohio, has accepted a position with the International Cooperation Administration as River Valley Development advisor to be stationed at New Delhi, India. This is a return to Government service for Folsom after four years of private work which started as project manager for construction at Travis AFB, Calif., for joint venture of MacDonald-Young & Nelson, Inc., and Morrison-Knudsen Co., Inc., and the last three years with Kiewit. His previous Government work was with the USBR, first at Parker Dam, Calif.-Ariz., then Central Valley Project, with a short stay in Washington, D. C., following four years of service with the Corps of Engineers during World War II. All told, Folsom has 15 years of Federal service to his credit.

* * *

Willard D. Beattie, formerly associated with Hill & Ingman, consulting engineers of Seattle, Wash., has been appointed manager and chief engineer for the Southwest Suburban Sewer District, Seattle, Wash., to replace **Hamilton K. Johnson** who has been recalled to active duty in the Air Force.

* * *

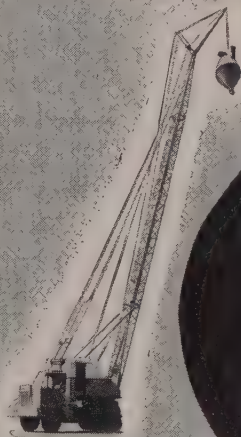
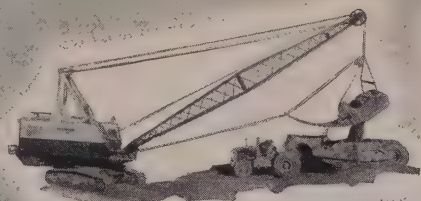
Fred O. Jones has opened a private practice in engineering geology at 39 West Twenty-sixth Ave., Spokane, Wash. Jones' wide background of experience includes a period during 1940-1947 with the Bureau of Reclamation at Coulee Dam as project geologist. Most recently he has been consultant on the Cooper Lake Project in Alaska. In this work he has been connected with North Pacific Consultants of Portland, Ore., who have been handling the engineering work for the Central Alaska Power Assn.

* * *

Glenn A. Duba has joined the Tecon Corporation of Dallas, Tex., as engineer doing estimating. He was formerly project engineer on a dam project recently completed by Texas Construction Co.

* * *

Chosen as project engineers responsible for getting tough construction done at remote Alaska sites where the Corps of Engineers is supervising construction of a net of U. S. Air Force installations are the



MARION

Announces

The Appointment of
A New Distributor to Cover
The State of Colorado

**WESTERN
MACHINERY COMPANY**

2400 West Seventh Avenue

Denver 4, Colorado



**HEADQUARTERS
FOR THE FOLLOWING
MACHINES**

	Shovel (Cu. yds.)	Crane (tons)	Hoe (Cu. yds.)
MARION 32-M	$\frac{3}{4}$	17½*	$\frac{3}{4}$
MARION 43-M	1	27*	1-1½
MARION 362	1½	37	1½-2
MARION 372	—	43	—
MARION 83-M	2	60	2-2¼
MARION 87-M	—	75	—
MARION 93-M	2½	80	—
MARION 101-M	3	84	—
MARION 111-M	4	169	—

*Rated at 10' in accordance with general practice.

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COMPANY**

MARION, OHIO, U.S.A.

POWER SHOVELS FROM ½ TO 4 CUBIC YARDS • DRAG-
LINES • CLAMSHHELLS • LOG LOADERS • PILE DRIVERS
CRANES, CRAWLER AND RUBBER MOUNTED • BACKHOES

following picked group of engineers: Galena, **Noren V. Anderson**; Bethel, **Harold D. DeWitt**; Chiniak, **Donald MacKinnon**; Fort Yukon, **Frederick W. Burns**; Homer, **Harry E. Jones**; King Salmon (Naknek), **George W. Avery**; Kotzebue, **Harry Knudson**; Middleton Island, **Bernard Sturgulowski, Jr.**; Unalakleet, **Joseph F. MacIsaac**.

THE THIRD and last volume of the Textbook of Structural Shop Drafting issued by the **American Institute of Steel Construction** is ready for distribution. Covering complicated details of trusses and girders, both riveted and welded, the book is suitable for use in advanced training on structural shop drafting, as a supplementary reference for courses in structural design, and in design office practice. It is for sale at \$3.00 per copy and orders are being accepted at the Institute offices, 101 Park Ave., New York 17, N. Y.

Charles B. "Chuck" Ellis recently transferred from Mather Field, Calif., to Corps of Engineers' Sierra Ordinance Depot where construction of ammunition maintenance facilities are in progress. He relieved **Ray Sorensen**, the former resident engineer.

Oral I. Conyers, until recently resident engineer for Tudor Engineering Co. on the \$5,000,000 Umatilla Bridge across the Columbia River at Umatilla, Ore., is now at the head-

quarters of the engineering firm in San Francisco, engaged in estimating and design work.

Ridgway M. Gillis recently retired as deputy state highway engineer after 26 years of service with the California Division of Highways. Most of his career with the State has been in positions of broad responsibility. In 1947 he was made assist-



R. M. Gillis

ant highway engineer in charge of operations. In 1950 he was promoted to deputy state highway engineer. Gillis is a life member of the American Society of Civil Engineers, and a past president of the Sacramento Section.

A. I. "Irv" Rivett, safety engineer for the California Division of Highways, recently retired. Often referred to as "Mr. Safety" by his fellow workers in the Division, Rivett has spent the last 17 years of his career in accident prevention work. The present employee safety program now in operation throughout the 11 highway districts in California was developed largely by Rivett. His place will be taken by **B. A. Switzer**, assistant traffic engineer.

DEATHS

Charles P. Cramer, 71, president of Cramer Machinery Co. of Portland, Ore., died recently following several weeks illness. He was a member of Associated Equipment Distributors and an associate of Associated General Contractors.

John R. Banning, 56, for 12 years Intermountain district engineer at Denver, Colo., for The Asphalt Institute, died suddenly near Fairplay, Md., while on a field trip. Before joining the Institute in 1944, Banning served the city and county of Denver as highway commissioner for nine years, and prior to that was project engineer with the Bureau of Public Roads in the Rocky Mountain area.

THE CONSTRUCTION fraternity of the Pacific Northwest suffered a severe loss with the untimely death of four officials of the Associated General Contractors in an airplane crash in Colorado on Nov. 1. Killed in the tragic accident were **Frank M. Brennan, Jr.**, vice president of Mountain Pacific Chapter, Seattle; **Elton B. "Bill" Hickok**, manager-secretary of Seattle Chapter; **James W. Purvis**, president, and **Clarence W. Todd**, manager of Tacoma Chapter. All outstanding and highly esteemed members of AGC, they were returning home from the Western Chapters' Conference in Denver.

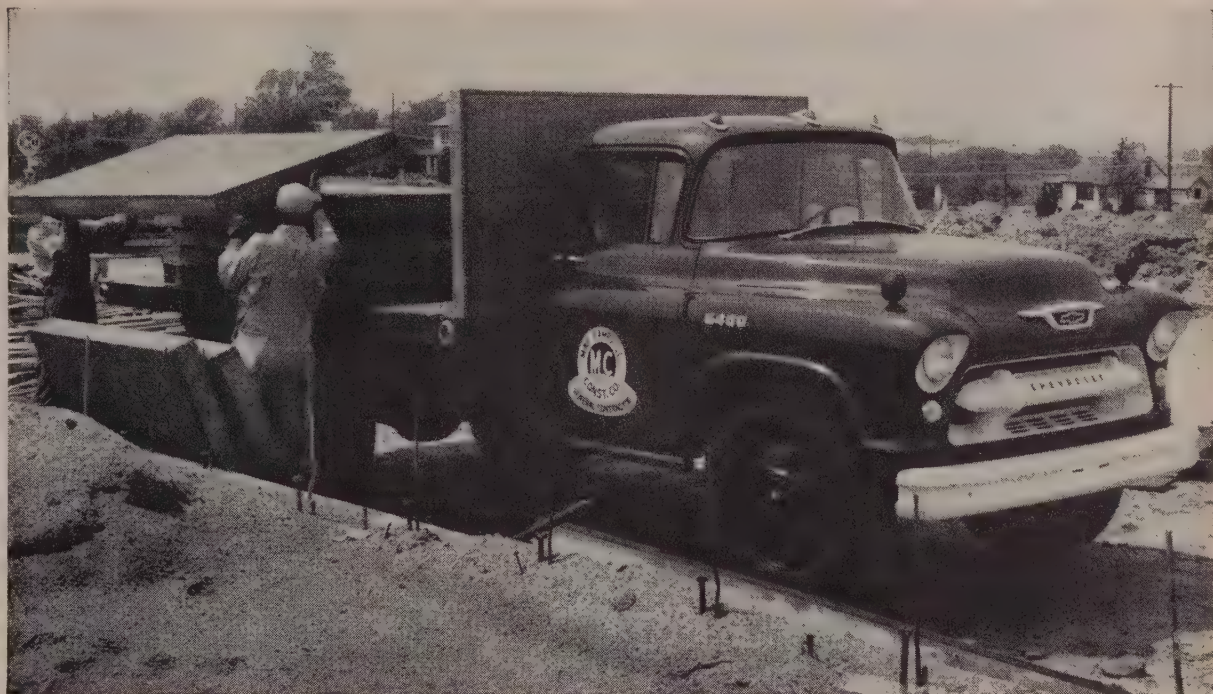
Blair Burnson, 43, executive of the East Bay Municipal Utility District, Oakland, Calif., died recently after a brief illness. He joined EBMUD as a civil engineer twenty years ago upon graduation from the University of California.



COMMANDER JOHN A. CLARK, (left) CEC, USNR, Reserve CB Program Officer, 12th Naval District, presents orders assigning **Lt. Comdr. W. C. Names** as Commanding Officer of Naval Reserve Construction Battalion Division 12-3, Alameda, Calif., relieving **Commander A. P. Koetitz** (right), who has accepted a civil engineering position with Holmes & Narver in connection with the AEC on Eniwetok Island. Commander Koetitz has had extensive experience in amphibious work with the Seabees including the training of personnel. Commander Names recently finished an assignment with the California Department of Highways supervising construction of the overpass freeway system on the Oakland side of the San Francisco Bay Bridge.

CALENDAR

- Jan. 27—Beavers, 1st annual meeting, Statler Hotel, Los Angeles, Calif.
- Jan. 28 - Feb. 2 — American Road Builders' Association, Road show and convention, Chicago, Ill.
- Feb. 9-10, 1956—Society of American Military Engineers, annual technical meeting, Palmer House, Chicago, Ill.
- Feb. 13-15—Association of Asphalt Paving Technologists, annual meeting, Hotel Cleveland, Cleveland, Ohio.
- Feb. 13-16—Associated General Contractors, annual national convention, New York City.



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NEW CHEVROLET



Task-Force TRUCKS

ALASKA Newsletter

By CLIFFORD S. CERNICK, Anchorage

BRIDGE OF ICE—Alaska construction circles are watching with keen interest plans of Alaska Freight Lines to bridge the mighty Yukon with a span of ice in the dead of winter. The unique ice bridge will go across the river near Eagle, the jumping-off point toward the Arctic for freighting operations to Distant Early Warning radar outposts. Timbers will be used to firm up the structure and pumps will be used to obtain water for laying a mile-long slab of ice-roadway across the river.

SNOW-TIME—Alaska is again in the grip of snow. Heavy snow already has fallen in the area surrounding Alaska's largest city, Anchorage. Snow, to varying depths, is fairly general throughout all of interior Alaska. The coming of snow, known in construction jargon as "termination dust," signals the decrease in tempo of construction activity in the north. Much activity has moved indoors. But a lot of jobs have been halted completely and unemployment in the territory is beginning to climb. Construction in Alaska in winter is confronted not only with ice, snow, and bitter cold but with the increasing hours of darkness. It won't be long until it's dark virtually around the clock.

NEW CONSTRUCTION FRONTIER—Stateside construction firms can well heed the advice "go north"—since the U. S. Census Bureau has announced that Alaska is leading all states and territories in the rate of population increase. The Bureau's figures covered the period 1950 to 1954, during which time Alaska showed an amazing 62% population rise. Such a phenomenal rate of population growth is always good news to builders. It points to the need for more homes, more commercial structures, more schools, more utilities, and more municipal construction. Growth in roads and airports must keep pace. Because of these facts, construction executives stateside could do much worse than give a lot of attention to possibilities for Alaska projects.

WINTER WEATHER has brought a halt not only to major construction activity but also to a large number of mining and oil drilling projects. Placer mining in the territory, because of freezing conditions, is at a standstill. Typical of suspension of oil drilling activity is the report from George Tucker of the Anchorage Gas and Oil Development, Inc. Tucker said work on a promising well

site in the Anchorage area has been suspended; the outfit has a 10,000-foot drill rig and recently discovered oil-bearing sands at a depth of about 2,000 feet.

TAX REMINDER—Alaska firms—including construction—got the word recently from the Bureau of Internal Revenue about failure to pay withholding taxes. Verle Collar, director of the Anchorage office, said many firms are not turning over their withholding tax receipts and are using such funds for operating capital. Two firms were seized by the Revenue Bureau in October and all assets sold.

GALENA GRAB-BAG—A sizable construction project will have been awarded to a contractor by the time you read this—with the work to be done at the Interior Alaska village of Galena. The government opened bids Nov. 18 on the Galena air force project, which includes a base rocket building, airfield and taxiway lighting, and bulk fuel facilities. The big job—estimated at more than a million dollars—is to be completed by November of 1956.

KODIAK CONSTRUCTION—A multi-million dollar construction program at the Kodiak naval base has been announced by the 17th Naval District. Bids for the work will be opened in March or April of 1956. Construction will include petroleum, oil, and lubrication facilities, a steel hangar, control tower, reinforced concrete operations buildings, barracks, mess hall and galley, bachelor officers' quarters, heating and power plant, and aircraft parking areas.

HARBOR PROGRAM—Col. Carl Y. Farrell, Alaska District Engineer, appeared recently before the senate committee on interstate and foreign commerce and appealed for favorable consideration of the small boat harbor and navigational channel and flood control program in Alaska.

Col. Farrell pointed out that in many Alaska communities, only means of access is by small boat or amphibious aircraft. In most of these communities, commercial fisheries are the sole reason for their existence, and the small privately-owned fishing boat is essential to continuance of the fishery. Small boat harbor program would aid these villages by providing convenient anchorages.

ALASKA PUBLIC WORKS was center of discussion at recent Anchorage city council meeting. Anchorage councilmen expressed

opinion that APW was not providing a fair share of assistance to Alaska's largest community. City Manager George Shannon said he believed requests for APW help were stymied in Washington.

NEW CONSTRUCTION MEMOS

—From time to time this column will keep readers advised on contemplated Alaska projects. This may prove valuable to those wishing to participate in bidding. In Anchorage, the Chugach Electric Association plans a new \$75,000 electrical substation. Plans and specs are now being drawn up. In Seward, a new post office building has been authorized. At College, near Fairbanks, a \$2,250,000 library is scheduled for construction. Architectural firm of Manley and Mayer is drawing preliminary plans. University also is planning a \$1,000,000 gymnasium.

FUTURE APPROPRIATIONS

—Alaska agencies in general usually feel short-changed by Uncle Sam when appropriation time comes around. A symptom of this feeling was the resolution passed in Palmer during a meeting of the League of Alaskan Cities. The group called for an annual appropriation of \$25,000,000 to the Alaska Road Commission until Alaska is included in the federal aid highway program. It also urged an annual appropriation of \$10,000,000 for Alaska Public Works during the remainder of that program.

HOSPITAL CONSTRUCTION

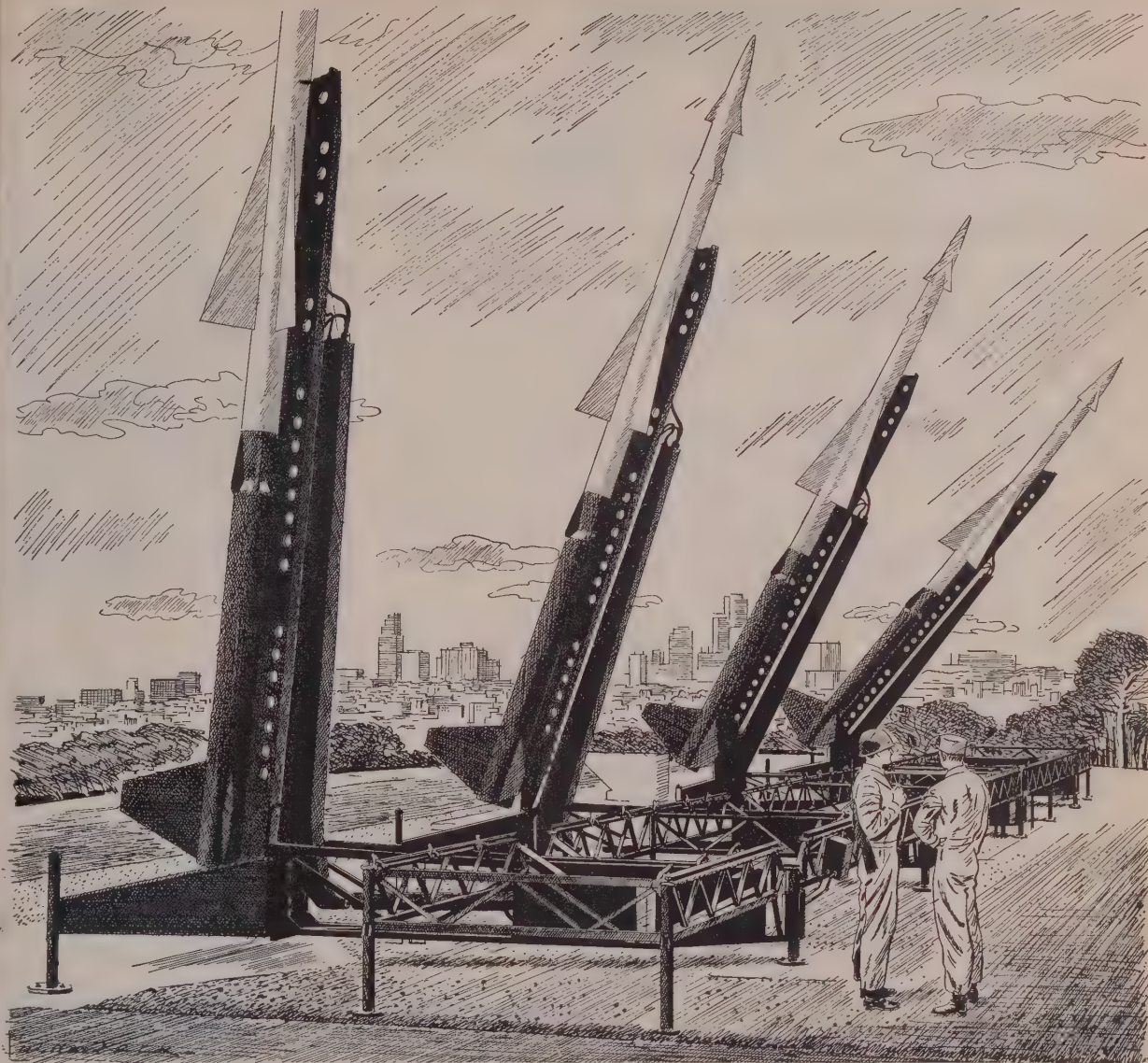
—Providence Hospital in Anchorage is planning a 75-bed addition. Plans are now being prepared in the office of John Malone, architect, in Seattle.

HUGE AIRPORT PROGRAM

—A \$1,200,000 airport development program has been scheduled for 1956 by the Alaska Aeronautics and Communications Commission. Airfield improvements will be undertaken at Petersburg, Haines, Kiana, Point Hope, Mekoryuk, Chitina, Homer, Iniskin Bay, and Bethel. Investigations are under way for a development at Kodiak and Sand Point. Engineering studies and surveys will be made at Arctic Village, Crooked Creek, Sleightmut, Stony River, Eek, and Kokrines. The Civil Aeronautics Administration has made available \$1,350,000 for airport development in Alaska each year for the next four years, provided the funds can be matched by \$450,000 in funds from the territory. The territory has only \$300,000 to match with federal funds.

CONSTRUCTION NEWS CAPSULES

—Early snowfall has curtailed work on some Distant Early Warning Line projects in Alaska. . . . Construction of another large pulp mill in southeastern Alaska is being contemplated.



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NIKE takes off in a *whoosh* of rocket fire to track down its prey at supersonic speeds. When the hunter and hunted meet... it's a one-way trip for both! NIKE'S outer skin and other critical parts must be made of steel... for only steel can take extremes in stress and heat.

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UNITED STATES STEEL

SUPERVISING the jobs

Ken Wheelwright is superintending the pipe-laying job being done by Wheelwright Construction Co. on the Weber Basin Project near Ogden, Utah. (*Western Construction*, Nov. 1955, p. 28-29). Personnel for the Bureau of Reclamation include **Clinton D. Woods**, project manager; **L. R. Dunkley**, construction engineer, and **Jack Carter** resident engineer on the job.

Allen Katz, project manager and engineer, and **Thor O. Thorsen**, superintendent, are in charge of a 12-month, \$1,191,920 contract of Crown Construction Co. for erection of the Earl Warren High School, Downey, Calif.

E. L. Williamson is superintending a \$600,819 job for R. A. Farish Co. on the Solano Project, Calif. Assisting are **C. R. Williamson**, job foreman, and **Frank Kerkenes**, maintenance foreman. Construction got under way Sept. 15 and consists of earthwork, structures, and surfacing, relocation of S. H. 102, from 15 mi. east of Rutherford to Route 6, Monticello reservoir. Completion is set for June 1956.

R. J. Sundling, **James Eagen**, and **C. W. Sederholm** are important supervisors of McLaughlin, Inc.,

which on Aug. 10 started work on a contract award for grading and surfacing 12 mi. of the Geraldine-Fort Benton road in Chouteau County, Mont. This \$388,674 project is scheduled for completion in July next year.

Hugh Cameron is superintending a \$450,575 construction of tactical troop facilities at Eielson AFB, Alaska, for Reed & Martin, Inc. **Jack Hansell** is timekeeper and expeditor. Foremen assisting on this job, now in the completion stage, are: **H. C. Olson**, carpenter; **James Green**, steel, and **Joe Okada**, labor.

Bernhard Tullinen, project superintendent, **Fredrick Pearson**, project engineer, **Joel C. Johnson**, general foreman, and **Joe Yawney**, office manager, comprise E. M. Peterson Construction Co.'s top men on the \$388,888 construction of a main PX building at Fort Richardson, Alaska. Scheduled for completion Aug. 30, 1956, project was over 56% complete in mid-September, 22% ahead of schedule.

Tommie Martin, job superintendent, assisted by **Richard Redding** and **J. R. Rountree, Jr.**, foremen, and **F. P. Eby**, gravel superintendent, is in charge of grading and surfacing 5.5 mi. of Harlowton-Ryegate high-

way in Golden Valley County, Mont., a \$251,841 award which recently went to Stanley H. Arkwright, Inc., on a low bid of \$251,841.

Fred Jackson is doing the general superintending of a \$750,000 contract being executed by Davis & Butler for a new water plant treatment plant at Ogden Canyon for the City of Ogden, Utah. Work started September 1954 and is expected to end next January.



Lester Jackson Wheelock

Economy steel forms are being used, with **Melvin Lester** as foreman on this work and **C. E. Kinney**, millwright. The firm of Templeton & Linke are consulting engineers and designers. Resident engineer is **Hugh Wheelock**.

R. J. "Dick" Laird, project manager for Utah Construction Co., is now located at Hawthorne, Nev., where he is in charge of repair of flood damage and rehabilitation of reservoirs at the Naval Ammunition Depot. General superintendent is **George Jones**, assisted by **Art Winfrey**, **Frank Barnard**, and **Greg Granados**, shift superintendents. **Dick McCleary** is engineer.

Harold K. Wilson, superintendent for Northwestern Engineering Co., is supervising a \$102,853 construction of two steel bridges on the Glasgow-Nashua road and Nashua-Wolf Point road in Valley County, Mont., a job which started Sept. 1 and will probably run to June, 1956.

Willis Smith, project superintendent, **Eugene C. Pierce**, field office manager, **D. N. "Bud" South**, general foreman, and **Darwin Ritchhart**, grade foreman, comprise Fisher Contracting Co.'s key men on a \$183,833 contract for grading and surfacing 7 mi. of the Phoenix-Yuma highway southwest of Buckeye over US 80, Arizona. Job started in mid-October and will probably end about March 1 next year.

Willard C. Swenson is general field superintendent for Carl N. Swenson Co., Inc., which is working on a 1.2-

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STANDARD

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mi. grading and surfacing job with concrete bridge near Greenbrae, Marin County, Calif. Superintendent Hood is supervising the \$856,850 job, which got under way in mid-October and will take 260 working days.

* * *

W. E. Robertson, general superintendent for Robert E. McKee, General Contractor, Inc., is in charge of construction of the State prison at Santa Fe, N. Mex., a \$5,000,000 contract. Carl B. Hartley is office



Robertson

Hartley

engineer and V. M. Cobos is field engineer. L. L. Robertson is general carpenter foreman, assisted by R. E. Watson, and E. Sailsbury, foremen. D. R. Hust is labor foreman, and Art Montana is chainman. Under way since May 1954, completion date is set for March next year.

* * *

H. A. Sturney is general superintendent for Johnson, Drake & Piper on construction of California Medical facilities at Vacaville, Calif. Pete Phillips is assistant superintendent. Bill Comer is engineer and cost accountant. Office manager is John Westphal. Foremen are: Gordon Lindsey, general carpenter, assisted by Leon D. Mooney, Kenny Nation,

FLANKED by two of his key men at the yard of J. H. Ryan & Son, Inc., Albuquerque, N. Mex., is J. H. Ryan, (center) president of the contracting firm. On his left is George D. Young, Jr., general superintendent; on his right B. L. McVicker, pile-driver foreman. Others working out of this yard are Ruben Gomez, crane operator; Jim Scott, shovel operator, and Chris Olvera, lead man.



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The first section, of 27' diameter, and 20" wall thickness, heavily reinforced, required a 4½ hours' pour of 26 cu. yds. of concrete. The final top section, of 16' diameter and 6" wall thickness, needed only 5¾ cu. yds. of material and was poured in 20 minutes.

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Concrete shell stacks up to 732' high have been constructed by the method here being used for Picway Generating Plant of the Columbus & Southern Ohio Electric Co. One-yard concrete bucket, operating inside the stack and controlled from the rising platform, places material for each 7'6" stage. Rust Engineering, Pittsburgh, Pa., designers.



CHIEF PERSONNEL in charge of construction on Webb & Knapp's \$35,000,000 Court House Square development in Denver, Colo., are, l. to r.: **G. E. Lapham**, assistant general superintendent; **F. G. Chaisson**, general superintendent; **J. J. Wetzel**, business manager; **J. E. Smith**, assistant project manager; **A. J. Magee**, resident engineer, and **T. J. Smith**, project manager. The names of other key men appeared last month.

and **Sherman Boylan**; **Bill Peach**, general labor, and **Hal Boyle**; **Clarence Bond**, cement finisher. Representing the California State Division of Architecture is **Nick Gatoura**. A \$3,000,000 undertaking, completion date is set for early 1957.

* * *

C. V. Forrest is acting as project manager, and **W. G. Hatfield** as general superintendent on another Robert E. McKee job in New Mexico. This is the \$2,439,252 concrete and



Bell

Shultz Hatfield Patterson



tile dormitory building at the University of New Mexico at Albuquerque which has been under construction since March and will probably be finished about the middle of next year. **Joseph Shultz** is office engineer, and **E. J. Hutchins** is field engineer. **L. W. Lawton** is brick superintendent, and the following are foremen: **L. B. McDonald** and **Bob Johnston**, carpenter; **Angelo Vuscolo**, labor. Among the subcontractors are: **W. M. Walters**, steel erectors; **J. S. Brown**—**E. F. Olds**, plumbing and heating—**Jack Scroggins**, job superintendent, and **T. O. Pearson**, fitter foreman; **Yearout Electric Co., Inc.**, Stage 1; **Reynolds Electric & Engineering Co.**, Stage 2; **Southwest Steel Products**, reinforcing steel—**L. V. Bell**, superintendent. **Meem-Zehner-Holien & Associates** are the architects represented on the project by **W. S. Patterson**, inspector.

* * *

Parker Johnson, engineer, and **W. W. Hamilton**, foreman, are two key men working for **T. C. Holmes**, contractor on grading and surfacing a stretch of about 9.4 mi. of the Phoenix-Payson highway northeast of Mesa, Ariz.

* * *

Clarence Webb, superintendent, assisted by **Harry R. Merrick**, foreman, is supervising **Duffy Reed Construction Co.'s** \$241,113 contract for 12.3 mi. of work on U. S. 93 in Lincoln and Blaine counties, Idaho.

* * *

C. A. Smith is superintendent, and **O. L. Roscoe** is engineer for **J. B. Boespflug Construction Co.'s** \$1,750,000 award to construct a 2-story, steel reinforced concrete dairy plant

and a garage of piling foundation in Seattle, Wash. To cost \$1,750,000, the project got started July 11 and will be finished about Oct. 1, 1956.

* * *

Arthur W. Rogers is supervising a grading and surfacing job for **Tanner Bros. Contracting Co.**, which won the award on a \$278,756 bid. Work consists of about 8 mi. of the Ash Fork-Prescott highway south of Ash Fork, Ariz. **Owen W. Neville** is plant foreman. Work started Sept. 12 and will end about February of next year.

* * *

B. E. Owen, project superintendent, and **Bruce D. Woodward**, project engineer, key men for **Ramstad Construction Co.**, are in charge of construction of 3 1/3 mi. of access road near Haines, Alaska, a \$577,588 job which started in July and is expected to run into 1956.

* * *

H. E. Buddemeyer, project manager, and **George Keller**, general superintendent, with **T. V. Christlieb**, project engineer, head the construction force working on the \$50,000,000 housing development (5,000 homes) at Thornton, Colo., contract for which is being carried out by **F. & S. Construction Co., Inc.**, for **Hoffman Homes**, owner. **C. D. Spurlock** is in charge of purchasing and warehouse; **Joe Tinianow** is accountant, and **S. F. Dakolios** is paymaster. Assistant superintendents are **Mel Slaysman**, **Ed Webber** and **Mei Plambeck**. Foremen working on this large development which has been in progress since the fall of '53 with completion set for 1957, are: **Dewey**



Peters Lance

Slaysman Webber Keller Plambeck



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J. Tyrrel, Vic Saucerman, Eloy Santistevan, Donald Peek, and John Murdock, carpenter; Judd Laur, mechanic; C. B. Lance, mason, Ed Degan and W. E. Corbin, equipment; F. W. Rethmeier, mill; Al Davis, concrete; Ronald Sims, labor, Melvin Peters, mason. Chainmen are Arnold Gasson and Darnell Douglas, with C. R. Dow, party chief.

* * *

Bernard Fredrickson, superintendent, Magor Bailey, general foreman, and Jim Gahan, office manager, comprise the top personnel handling the recent \$185,555 award to Fredrickson & Watson Construction Co. Contract covers 3.5 mi. of grading and surfacing in Goleta, Calif.

* * *

J. D. "Pete" Balden is superintending a recent award to Summit Construction Co., a \$442,401 job of grading, draining, surfacing, and miscellaneous work on 7.1 mi. of the Manville-Lusk road in Niobrara County, Wyo.

* * *

Galen Gregg is superintending the job of erecting a warehouse in Denver, Colo., a recent award to Harry G. Worsham Construction Co. from The May Company. Job foremen on this structure which is expected to be finished by the end of the year are Russell Means, carpenter; Lee Ingram, cement; John O'Brien, steel; L. Burns, labor.

Job accidents take their toll

THESE were the accidents that resulted in death or serious injury on the West's construction jobs during the last reported month.

Charles McLemore, of Safford, Ariz., was killed when a tractor he was driving went off a 200-ft. embankment south of Miami, Ariz.

William Kinder of Burns, Ore., was killed when a dragline digging machine toppled into the water at The Dalles Dam project. He was pinned in the cab of the equipment under the surface of the water. Another workman was able to scramble to safety as the bank on which the dragline had been working gave way, spilling the machine into the deep pool.

Iner Hansen, 45, was killed when his tractor overturned, pinning him underneath. He was a substitute operator on a road building operation 25 mi. northeast of Colville, Wash.

Frank J. Stopka, 55, of Glenns Ferry, Ida., was killed when a steel section of the old Broadway bridge over the Boise River collapsed as he worked beneath it. He was working on one end of some bracing when an

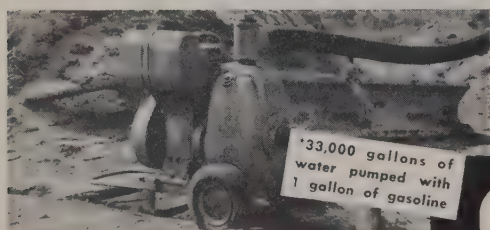
entire section of the steel frame crashed. Structure was being demolished to make way for a new bridge.

Carl A. Rodeck, 21, Lewiston, Ida., a pipefitter, was killed when a ditch in which he was working suddenly caved in, burying him under hundreds of pounds of dirt. Fellow workers freed Rodeck's head, but were unable to get him out in time.

R. C. Underwood, 19, was dead on arrival at a hospital from injuries suffered in a fall at The Dalles Dam. He was working on top of the non-overflow dam between the spillway section and the powerhouse and apparently was changing the position of a safety belt when he slipped and fell. Underwood was employed by the joint contracting organization of Montag, Halvorson, Cascade, and Austin.

David Pimental, 37, San Jose, Calif., a construction worker employed by P & E Construction Co., was killed when the walls of a sewer ditch in which he was working in southern Alameda County caved in.

Manuel Crnelas, 41, was trapped by a cave-in while working in a sewer trench in Denver, Colo. His shovel was pinned across his chest, cutting off his breathing, and all efforts to revive him failed.



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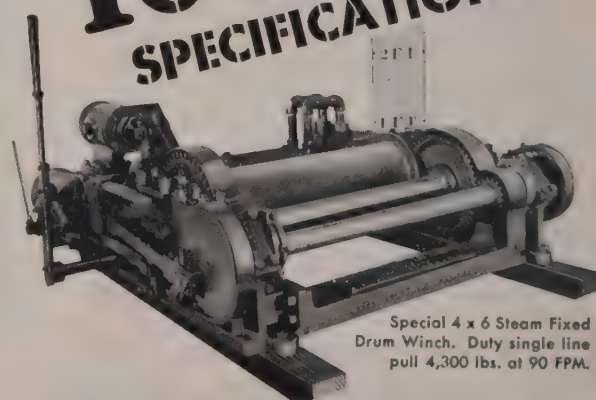
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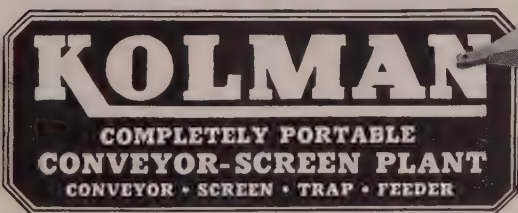
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Above, 50'x36" KOLMAN Portable Conveyor-Screen Plant equipped with built-in feeder and wing walls. Owned by Peter Kiewit Sons' Co.



Cutaway view of Portable Feeder-Trap Combination

Reciprocating Plate Feeders Built into KOLMAN Portable Loading Traps

Now you can handle rough, rocky, abrasive material without fear of belt damage—you can be sure of a constant, regulated flow of material—you can enjoy all of the advantages of a feeder on a completely portable plant!

With the "built-in" feeder, both loading trap and plate feeder are an integral part of the portable conveyor and are easily moved with it. The trap provides a complete cover for all working parts and is large enough to permit a man to enter on either side to service and adjust the

feeder. The feeder is controlled by adjusting the length of stroke and angle of operation.

This new Portable Feeder-Trap-Combination is now available on all Model 101 Heavy Duty KOLMAN Portable Conveyors. Loss of time in setting up, taking down, and moving a separate feeder and hopper is eliminated entirely.

Steel Wing Walls Also Portable

The Portable Trap can also be equipped with steel wing walls extending forward and up beyond the regular loading trap walls. This additional enclosure prevents loose gravel, earth or



The complete plant ready for towing includes Feeder-Trap combination, Wing Walls and Vibrating Screens "folded under" conveyor.

other material from working into the conveyor tail section and eliminates the need for building awkward walls of timbers and planks. The Wing Walls are permanently mounted and portable with the rest of the plant.

The Feeder-Trap Combination makes it possible to use the KOLMAN Portable Conveyor-Screen Plant with virtually any type of feeding device, including bulldozer, shovel, dragline or front end loader. Available with either single, double or triple-deck vibrating screen, it is a versatile plant for high production screening, too!

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TRICKS of the TRADES

The "K System," for concrete floors

A TWO-OUNCE cast iron clip used with Junior Beams, lightweight steel structurals made by Jones & Laughlin Steel Corporation, has resulted in a new building technique that saves time, materials, and trouble in the installation of concrete floors.

This new technique, known as the "K System," has saved an estimated \$90,000 in the construction costs of a



12-story apartment building in New York City. Immediate plans call for eight more apartment houses to be built with the same method.

The system solves a problem that has long plagued builders—how to install and remove forms for concrete flooring.



The "K System," developed by Edward S. Klausner, a New York engineer, involves the hooking of small

cast iron clips—about three inches long—over the top flanges of the J&L Junior Beams. Plywood rests on the clips and serves as a ready-made form for the concrete.

After the concrete is poured and hardened, workmen go along the underside of the flooring and knock off the exposed section of the cast iron clip. Part of the clip remains permanently in the floor. The plywood form drops down and can be re-used as many as 20 times.

Not only does the system save time and materials, but it also gives the structure additional rigidity because the clip allows the concrete to come below the top flange of the Junior Beams.

Forecast: COLDER

THE FOLLOWING list of suggestions for cold weather equipment operation and maintenance was recently issued by LeTourneau-Westinghouse.

Drain and thoroughly flush the cooling system. Check the radiator, hose, gaskets, and connections for possible leaks and—very important—see that thermostats are operating properly. Be sure connections are tight. Repair or replace if necessary.

Fill cooling system with anti-freeze, always using the permanent type of anti-freeze and ethylene-glycol base. (Alcohol or alcohol base anti-freeze should not be used because the evaporation point is too low for high operating temperatures of 165° - 180°.) Test the solution at the end of each day to make sure it is strong enough for protection against prevailing temperatures. A few gallons of anti-freeze are much cheaper than a broken engine block or radiator.

When putting anti-freeze in engine, make sure to bring engine up to operating temperature to make sure that the anti-freeze mixes completely.

Drain oil from engine crankcase, transmission and final drive, and from gear boxes and rectifier pot. On motor graders, drain the hydraulic system. Refill with winter-weight oils and greases, as recommended in your equipment manuals.

On motor graders and related equipment, consult instruction books and decals on hydraulic fluid tanks for cold weather instructions.

Summer fuel may be a little heavy for use in winter operation, so be

sure the pour point is low enough to permit it to flow freely through fuel lines and filters at low temperatures. Consult your manuals for proper grade. Be sure to keep fuel clean at all times and in winter be doubly sure to keep water, ice, and snow out of fuel and tank. Strain dirty fuel.

Fill fuel tank at end of each day to prevent fuel tank condensation. A pint of denatured alcohol to each fifty gallons of fuel will keep down condensation and prevent fuel line and filter freeze-up.

Cable dump batch gate

A. C. McMILLIAN, aggregate hauling contractor, was a man with his back to the wall—until he had a brainstorm last fall.

His idea was to place a batch-gate across the center of a 12-yd. capacity single-axle Hobbs-Schonrock cable dump trailer, so that he could haul two 6-yd. loads in one trip and dump them alongside road beds at exact distances from one another, according to state highway specifications.

How well McMillian's idea worked out can best be illustrated by the fact that he is now operating 24 of the trucks full-time—every one is equipped with a batch-gate attachment.

Worked out and installed by Hobbs Manufacturing Co., the batch-gates enable the cable dump trailers to "do everything a conventional dump truck can do, and much more



efficiently," according to McMillian, who formerly operated a fleet of the smaller trucks. "Since the war," McMillian states, "competition between dump-truck operators has become so keen that only the very big outfits are able to survive. Bigger equipment is the only answer, but up to now it has had the disadvantage of not being able to mesh its operation with rigid specifications set up with dump trucks in mind."

That's the beauty of McMillian's compartmented cable-dumps, as he sees it. They are able to work with dump trucks on projects which formerly were out of their operational scope, or which would have had to be specially set up for cable dump operation.



High-quality, low-cost

WELDED STEEL PIPE

for more efficient water supply lines

When planning your next permanent water supply project, be sure to consider the quality and money-saving features of American's welded steel pipe. Many cities throughout the Northwest have found it to be the answer to their problems.

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felt wrapping where required) protects against corrosion. The pipe is fabricated with one longitudinal tension seam only on *all* diameters. Longitudinal and girth seams are automatically welded.

This outstanding pipe can be advantageous to you in initial economy and trouble-free performance. We'd like to plan with you on your next project... our services include both manufacture and installation where desired. Call us for estimates and further information.



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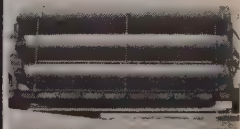
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NEW EQUIPMENT

For your convenience in obtaining more information quickly, the manufacturer's address is provided with each review.

World's largest earthmover announced

Now available is the world's largest rubber-tired scraper unit, the M-R-S 200. The hauling unit is designed to meet production problems and schedules encountered on multi-million yard grading jobs. Power for the units is supplied by a 500-hp. M-R-S 200 tractor which is capable of supplying necessary energy to assist a push tractor in



securing a payload at speeds up to 33.9 mph. The power plant of the 33,000-lb. prime mover is a V-12 diesel engine capable of delivering a full 500 hp. in altitudes up to 5,000 ft. The scraper, called the Wooldridge OS-300B, is equipped with broadbase tires for high flotation over spongy and loose surfaces. The weight is distributed over four axles instead of two or three thus reducing the ground bearing pressure. The machine has a struck capacity almost twice as large as the largest competitive model. The manufacturers are **M-R-S Manufacturing Co.** of Flora, Miss., and **Wooldridge Manufacturing Division**, Continental Copper and Steel Industries, Inc., Sunnyvale, Calif.

280-hp. bottom dump wagon

A hydraulically operated bottom dump motor wagon, the TW-360, has been added to the Allis-Chalmers Manufacturing Company's line of earthmoving and construction machinery. The 47,000-lb. unit is powered by an



Allis-Chalmers 280-hp. diesel engine providing, at 2,100 rpm., forward speeds ranging from 3 mph. in first, to 20 mph. in 4th gear. Reverse speed is 3.1 mph. The wagon, with a 22-ft. wheel base, has a 22-cu. yd. heaped and a 17-cu. yd. struck capacity, or 26 tons. Other features are: 2-speed hydraulic steering, 24-volt electric system, 4-wheel air brakes, and one-lever control to operate doors which retract along the sides of the body for greater ground clearance. **Allis-Chalmers Manufacturing Co.**, Tractor Group, Milwaukee, Wisconsin.

Ford announces 200 truck models for 1956

Complete literature is available on Ford Motor Company's 200 1956 truck models. A T-750 truck together with established T-700 and T-800 give Ford an expanded line of trucks in the tandem axle class for 1956. The new model has a gross vehicle weight of 36,000 lb. The standard engine is a 332-cu. in. Y-8 rated as 190 hp. An optional 332-cu. in. Y-8 engine is rated at 200 hp. with four barrel carburetion, dual exhausts, and a fresh air intake. Gross vehicle weights of the T-700 and T-800 are 28,000 and



42,000 lb. respectively. Standard on all the new models are a wrap-around windshield, a hooded roof outline over the windshield, and a re-styled, one-piece grille. An optional wrap-around rear window is available for greater rearward visibility. Safety belts are offered as optional equipment on all the trucks. **Ford Division**, Box 638, Dearborn, Michigan.

LeTourneau freighter for cross-country travel

Full 32-wheel drive, plus the ability to maneuver around such obstacles as the automobiles in the picture, make the LeTourneau freighter ideal for transporting heavy cargoes under practically all off-road conditions. Each wheel—on the lead car and trailers alike—has an





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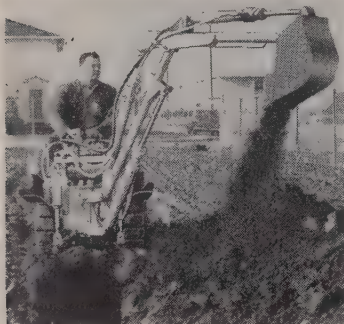
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New hydraulically operated backhoe converts Agricat into efficient digging tool . . . cuts costly hand labor! Equipped with 9" or 12" bucket, AGRIOHE reaches 10 feet, digs 6 feet, loads to 8-ft. heights.

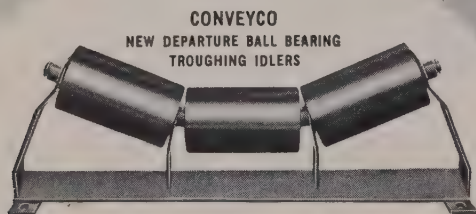
Agricat is available with short or long track . . . may also be equipped with High Lift Bucket or Dozer attachments.

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3260 E. Slauson Ave., Los Angeles 58, Calif.

individual electric power motor geared directly to it. Should any wheel lose traction and start spinning, power from it is automatically shifted to other wheels which are taking hold. Three of the transporters have been completed. The tires range up to 10 ft. high and 4 ft. wide offering more than 50 times the ground contact area of an automobile tire.

A unique steering arrangement assures that the last car of the freighter will follow the identical tracks of the first car, regardless of how many cars may be in between. The effect is that of a train being guided by permanent tracks. A two-color booklet showing photographs and concepts of some of the equipment in action is available from the manufacturer, **R. G. LeTourneau, Inc.**, 2399 South McArthur, Longview, Texas

Allis-Chalmers introduces motor grader

Allis-Chalmers has introduced a new motor grader powered by the ADS-516 six-cylinder, 4-cycle diesel engine with a rated 120 maximum brake hp. at 1,600 rpm. The grader weighs 23,800 lb., of which two-thirds is on the tandem drive rear wheels, and 6,425 lb. on the front



wheels. Blade pressure is 10,950 lb. Some of the features of the machine include combination mechanical and hydraulic power steering; a foot pedal that permits engine speeds to be increased or decreased without change of hand throttle setting; and 24-volt electric starting system. **Allis-Chalmers Mfg. Co.**, Tractor Group, Milwaukee, Wis.

Portable batching and mixing plant

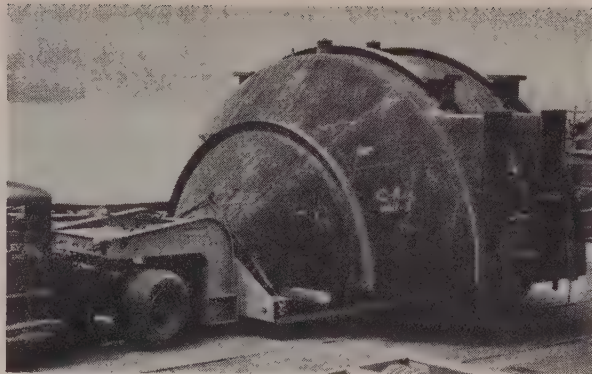
Koehring Co., 2200 Country Club Blvd., Stockton 4, Calif., has announced its new portable batching and mixing plant. The unit is 35 ft. long and 8 ft. wide. Starters



and switches for all motors are located at a central control panel. The bulk cement silo is lined with Oregon pine, bolted to the steel frame with countersunk bolts and is ventilated and weather-proof. Features of the unit include a motorized screw-type cement feeder conveyor, motorized head pulley drive, plug-ins for auxiliary equipment, and electronic cut-off controls for the scales. Overall weight is 24,000 lb.



HOPPER DUMP TRAILERS—Ideal for transport of pulverized materials. Available in semis and combinations.



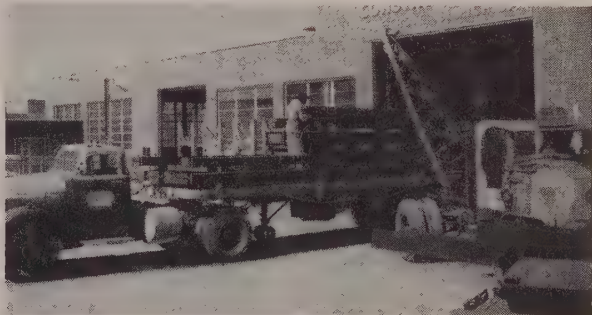
CARRYALLS—Level and drop decks, both available as semi or full Trailers with capacities from 10 to 75 tons.

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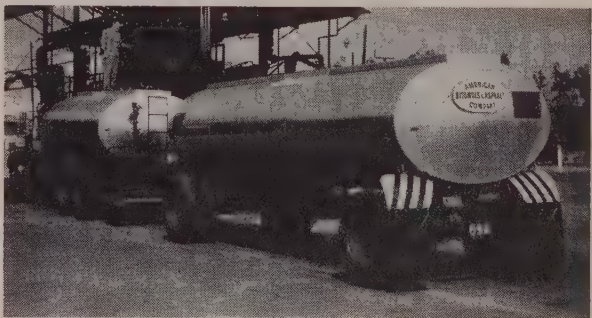
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Insulated Hot Commodity Tank
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(for movement of self propelled units)



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(for movement of heavy duty power equipment)



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The 500,000 square-foot Equal Facilities Warehouse recently constructed at Palmdale, California, is subjected to high winds and severe dust conditions. Since the warehouse is used to store valuable aircraft and electronic equipment, the building had to be air- and dust-tight.

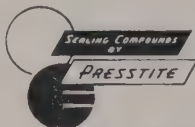
To effectively seal the steel frame and corrugated aluminum structure all horizontal and vertical lap joints on the roof and sides were sealed with Presstite 579.6 Sealing Tape—263,075 feet of it! This tape is applied from rolls by hand; has excellent adhesive qualities and stays in place as applied. The corrugated aluminum sheeting was then riveted tightly against it. The tape remains permanently tacky; will not flow at temperatures up to 300°F., or become brittle at -65°F.

Perhaps this application suggests a use for this non-corrosive sealer on your next job. Write for complete data.



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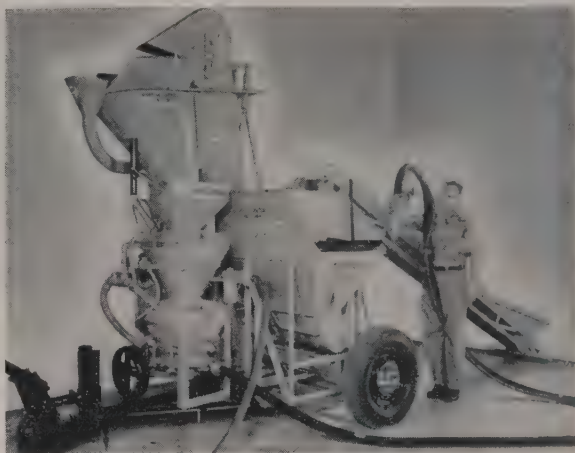
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SELF-VULCANIZING
RUBBER REPAIR MATERIALS

Portable concrete gunning rig

Now available is a completely new portable concrete gunning rig. The machine is made up of three basic pieces of equipment used in concrete gunning operations, the



concrete gun, the automatic proportioning, dry mixing and elevating machine, and a labor-saving item—a sand loader. The sand loader operates from a power take-off from the drive mechanism of the elevator. The entire unit may be hitched to either the air compressor or, if the compressor is mounted on a truck, to the trailer hitch of the truck. Additional information on the complete rig or on any of the components may be secured by writing to Air Placement Equipment Co., 1009 West 24th St., Kansas City, Mo.

Lennox Heat Wagon is small and portable

A portable heat source, the Lennox Heat Wagon, is light enough to be carried upstairs by two men and can be rolled through standard 30-in. doorways. The heating unit is the same one used in oil furnaces, so the heater can be serviced by any heating dealer. The 19 gal. self-contained oil supply is enough for top output for 12 hr. of continuous operation. Combustion products are exhausted through a pipe at the top directly into the air—a pipe can be added to direct the exhaust through a window if operating indoors. The unit plugs into any standard 110-volt outlet and can be operated with a thermostat if desired. Capacity is over 200,000 BTU per hr. Lennox Furnace Co., 1701 East Euclid Ave., Des Moines 13, Iowa.

Lincoln announces iron powder electrode

An all-position, iron powder type electrode called Improved Fleetwood 47 has been announced by Lincoln Electric Co., Cleveland 17, Ohio. It is claimed to surpass the performance of conventional electrodes and to give previously unobtainable iron powder results in out-of-position welds, as well as downhand. Powdered iron is included in the coating to produce higher deposition rates which result in 10 to 30% higher welding speeds than those obtained with conventional E-6013 electrodes. The electrodes can be used on either AC or DC welding current and conform to AWS class E-6013 and have been approved by the American Bureau of Shipping. Available in sizes from 1/8 in. to 5/16 in. diameter.

NOW Model RD15 Movall, with Positive Ejection, Controlled Spread, for Cat DW15



This rugged wagon hauls 16 heaped yards (12 struck or 22 tons). It works off standard Caterpillar controls, has "dozer-type" ejector that gets rid of loads with a positive, 140,000-lb. push.

Like larger Movall, the Model RD 15 can dump at controlled rate into grizzlies or hoppers.

NEW C & D MOVALL MODEL RD15 for hauling rock, dirt, mud or any other top loaded material is designed especially for Caterpillar DW15 Tractors, both new and old; under favorable working conditions it also can be used with Cat DW10 Tractors. Like the larger, job-proved 25-yard Movall, the Model RD15 operates off standard Caterpillar controls, works interchangeably with scrapers, is simple and easy to operate. There's nothing new to learn.

"DOZER-TYPE" EJECTOR PUSHES LOADS OUT QUICKLY—with a powerful, positive force of 140,000 pounds. This cleans the haul unit completely whether you're hauling dirt, rock, mud, gumbo, or frozen ore. There's no build-up or double hauling of sticky material, or time wasted cleaning. The "scraper-in-reverse" design, available only on C & D Movalls, also allows

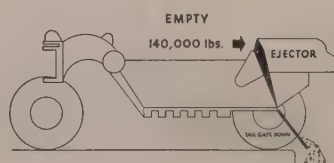
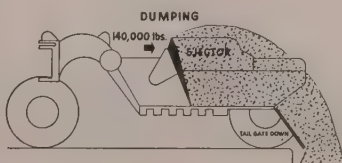
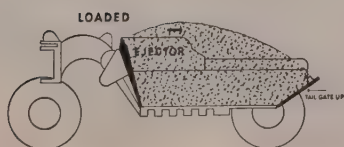
you to place the load anywhere and in any manner you want: over the edge of fill; spread in even lifts of any desired depth; or dumped into hoppers at a controlled rate.

HANDLES ANY MATERIAL YOU CAN TOP LOAD with a shovel, drag line, or belt. You have a large loading target of 10' x 16' and short turning width of 27'. You get capacity loads every trip—tailgate minimizes spillage while loading, and during haul. Heaping loads are ejected over a fill in only 11 seconds.

ASK YOUR CATERPILLAR-C & D DISTRIBUTOR FOR A DEMONSTRATION on your job. Find out what a C & D Movall can do for you. Call him NOW or write direct to C & D Manufacturing Co., Perkins (near Sacramento), California. Phone Hillcrest 5-8592.

HOW IT WORKS—Movall uses standard cable scraper power control. To dump, operator releases back-haul drum to drop tailgate, engages ejector drum. Eight-part ejector line gives 140,000 lb. push to boost load out fast and clean. Operator has complete control of discharge, controls spread depth by varying travel speed. After dumping, backhaul line closes tailgate and rolls ejector to loading position.

7



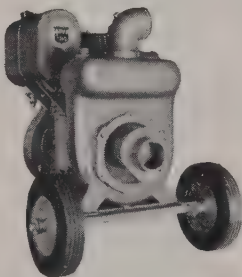
HOW MANY G.P.H. does your job require?

4000?
up to 250,000?

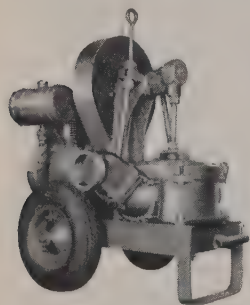
**You'll find the right pump
in CARVER'S Complete Line**



CARVER manufactures the complete line of contractor's self-priming pumps from 4000 G.P.H. to 250,000 G.P.H. — pumps of proven performance on large and small jobs throughout the world!



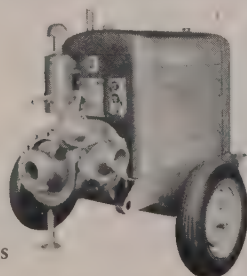
Sturdy Carver Diaphragm Pumps, 6000 G.P.H., assure outstanding performance



where jobs are really tough.



CARVER also manufactures a full line of high pressure Jetting Pumps.



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Ask for Bulletin No. 111



CARVER PUMP CO.
1416 Hershey Avenue
Muscatine, Iowa

*The quality name
in pumps*

Submersible booster pump

General Electric & Layne & Bowler Pump Co., 2943 Vail Ave., Los Angeles 22, Calif., have combined to produce a submersible booster pump. Most of the pumps are factory assembled units so that the equipment is ready for use upon installation without venting, filling, adjustment, or alignment. Standard models are available from 5 to 150 hp. with a discharge head of 50 to 500 ft. and 100 to 4,000-gpm. capacity. A bulletin is available.

Form oil sprayer

An air-operated pump that quickly empties form oil from 55-gal. drums is available from **Gray Co., Inc.**, 1033 Sibley St., N.E., Minneapolis 13, Minn. Operating on air pressures from 35 to 200 psi. the pump will empty a full size drum faster than the oil can be poured from the bung. The adjustable nozzle may be varied for heavy or fine spray to suit the operation. For further information write for the free descriptive booklet No. 300-012.

Frameless dump trailer

A new frameless dump trailer has been announced by **Anthony Co.**, Streator, Ill. When dumping a load, the entire front end of the trailer is lifted by a single hydraulic telescopic cylinder mounted on the tractor fifth wheel coupling. In raising or lowering, the trailer body pivots around the rear wheels, and during this cycle, tubular stabilizer arms pinned to the hoist-fifth wheel and the trailer body, give added support for a variety of loads and working conditions. The advantage of this new dump trailer design is that additional legal payloads up to 2,000 lb. can now be hauled. This weight saving is possible because of the elimination of the conventional trailer frame. Literature is available.

Hydraulic truck loader

A hydraulic truck loader that operates as a complete unit with one man and one machine is the new LoDal. With a 3,000-lb. capacity, it

loads up to 2 yd. per minute in heavy material, and fits most trucks from 1½- to 4-ton capacity, with special models for trucks over 4 tons. The truck loads itself and in addition, the forward tilting bucket provides for loading other trucks. Manufactured by **Lodal, Inc.**, Norway, Mich.

Link-Belt truck-cranes

Five new truck-crane models, ranging from 12½- to 35-ton lifting capacity, are now being offered by **Link-Belt Speeder Corp.**, Cedar Rapids, Iowa. All of the models have



power hydraulic operated clutches. They are fully convertible to standard front end attachments, and are available with torque converter power units. All are mounted on full-floating walking beam rear axle supports that allow travel over uneven terrain. Also available are screw-type outrigger jacks and pontoons, and removable rear outriggers. Optional equipment includes a reversing clutch for either or both main drums.

Twin roll crushers enlarged

A new size of twin roll crusher which will increase production 33⅓% over its smaller counterpart without a corresponding hike in cost is now being made by **Pioneer Engineering Works, Inc.**, 1515 Central Ave., Minneapolis 13, Minn. Changing the roll setting to vary the size of the crushed product will also be a

PREFERRED by CONTRACTORS

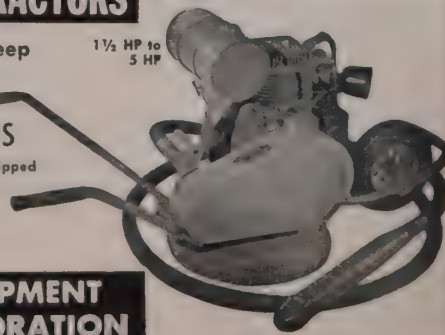
Less initial cost—Lower upkeep

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GV-1, GV-2 & GV-3 Models Now Equipped with Automatic Centrifugal Clutch as Standard Equipment. Interchangeable Flexible Shafts.

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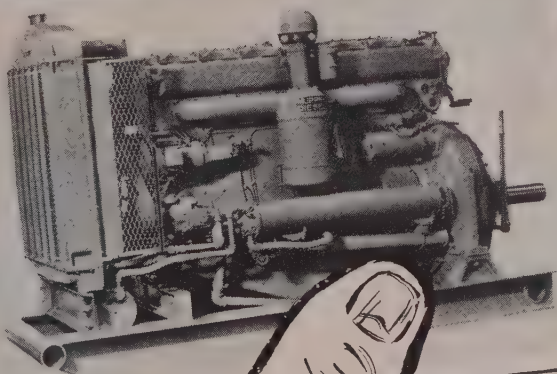


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The best crushing plant in the world can't be any more efficient than its power plant. And that's why more and more aggregate producers are turning to Murphy Diesel Power. Heavy duty Murphy Diesels offer an exclusive combination of design features that make it possible for you to get more aggregate per dollar of power costs. With Murphy Diesel in the picture you get greater fuel economy, longer life and dependability unmatched by any other engine of comparable size. It all adds up to a prettier profit picture for you.

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Balzer Machinery Company, 2136 S. E. Eighth Avenue, Portland 14, Oregon
Engineering Sales Service, Inc., P. O. Box 831, Boise, Idaho
Industrial Engine Service, 5315 Valley Boulevard, Los Angeles, California
Lively Equipment Co., 2601 Fourth St., N. W., Albuquerque, New Mexico
Oswald Machine Works, 2936 Hyde Street, San Francisco 9, California
Glenn Rose Engine Service, 502 South Real Road, Bakersfield, California
General Machinery Company, E. Station 8, Spokane 31, Washington
Hall-Perry Mach. Co., 812 East Iron St., Butte, Montana
Western Tractor & Equipment Company, 745 Lucile Street, Seattle 8, Washington

MURPHY DIESEL

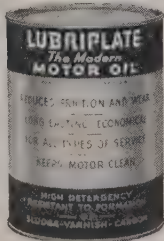


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REDUCE MAINTENANCE COSTS.**



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simpler job through a modification of design which incorporates a hydraulic jack and shim adjustment mechanism. The new crusher has rolls 30 in. in diameter, and 24 in. in width, and will have a production rate a third again as much as the next smaller size. Capacity of the new size runs up to 254 tons of 2¼-in. aggregate per hour, based on material weighing 2,700 lb. per cu. yd. Overall dimensions of the unit are 8 ft. 6 in. long by 6 ft. 10 in. wide, power requirements are in the 85-105-hp. range. Detailed information is contained in Bulletin S.B. 435.

New engine by Wisconsin

Wisconsin Motor Corp., Milwaukee, Wis., has introduced a new engine, the Model BKN. It is rated from 3.2 to 6.8 hp. and has a speed



range of 1,600 to 3,600 rpm. Its 2⅞-in. bore by 2¾-in. stroke provides a displacement of 17.8 cu. in. It can be equipped with various gear reductions, clutch assembly, electric starter and generator or starter only, and can be equipped to operate on kerosene, butane, propane, or natural gas although regularly supplied for operation on gasoline.

Hydraulic starter for diesels

A hydraulic starting system for diesel engines has been developed by General Motors. The unit is available for installation on new GM Detroit diesel engines at the factory or on others already in operation. The efficiency of the new system is not affected by temperature, humidity, or altitude. In zero temperatures, for instance, the unit attains cranking speed almost instantly. A brochure

describing the Hydrostarter is available by writing: Detroit Diesel Engine Division, General Motors Corp., Detroit 28, Mich.

Blacktop surface sealer

A pitch emulsion that is insoluble in oils and gasoline and which can be quickly applied has been developed by Maintenance Engineering Co., 16 W. Johnson St., Philadelphia 44, Pa. The product prevents softening and disintegration of bituminous concrete due to attack by oils, greases, gasoline, and weather. It is available from stock in three colors, charcoal, green, and red. It can be applied to a wet surface as it comes from the container, and it dries in a few hours.

Oil clutch for Cat D4

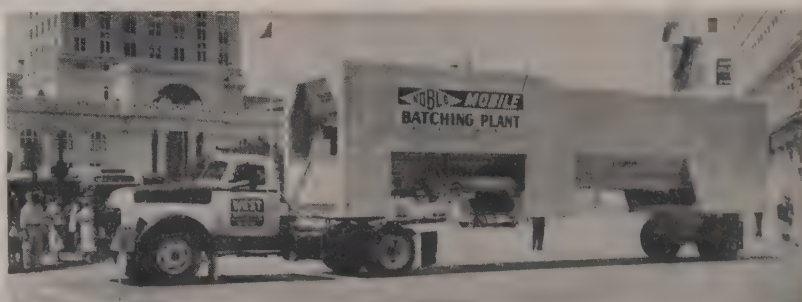
An oil clutch is now available as an attachment for D4 tractors. The clutch is similar in design to the oil clutches in the D6, D7, D8, and D9 tractors. The oil clutch, found exclusively on Caterpillar machines is especially desirable on bulldozing work and other jobs where frequent engagement, disengagement, and slipping of the flywheel clutch are necessary. Caterpillar Tractor Co., Peoria, Ill.

Carbide-tipped masonry drills

Longer shanks to permit deep-hole and through-drilling in concrete construction are a feature of the 24 new carbide-tipped masonry drills added to the line manufactured by Carboly Department of General Electric Co., Detroit 32, Mich. Besides including the new spiral construction developed by Carboly, the new drills have butt-welded shanks of 12 and 18 in. with diameters of ¾ to 1½ in.

Secondary spring for Pioneer screens

An optional secondary spring suspension designed to eliminate transfer of vibration, and to increase freedom of screen motion has been developed for its larger screens by



CURIOUS onlookers witnessed the first batching plant on wheels as it was driven recently through downtown Oakland, Calif. Known as Noble-Mobile, this complete, ready-to-operate plant drives the highways within legal limits directly to the job site where shorter hauls result in greater capacity. Noble-Mobile saves erection costs and requires no footings, crane, or electrical wiring. Utilizes bulk cement. Aggregates charged with scooploader, conveyor, or clamshell. Sixty yd. per hr. or more output to truck mixers. Manufactured by Noble Company, 1860 Seventh Street, Oakland 20, Calif.

AIR POWER *speeds trenching jobs*

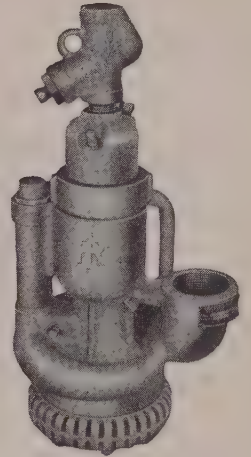


faster work.....

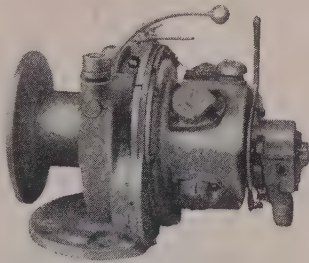
lower costs



DIGGERS—One man operating an Ingersoll-Rand Digger loosens more material than six or eight men using ordinary hand methods. Six sizes are available, ranging in weight from 19½ to 37⅝ pounds.



SUMP PUMPS—An Ingersoll-Rand Sump Pump should be kept on hand for all trenching jobs. In cases where water problems arise the immediate application of a Sump Pump means the difference between profit and loss. Two sizes are available, the Size 250 and the Size 35.



UTILITY HOISTS—Ingersoll-Rand's Utility Air Hoists are used effectively for backfilling, pipe and material handling. These Hoists can be mounted in any position—pole and column mountings are also available. There are twenty sizes having single line capacities up to 3500 pounds. Capacities may be increased many times with sheave blocks.—A little air goes a long way with these popular Hoists.



BACKFILL TAMPERS—Ingersoll-Rand's Backfill Tampers are one of the contractor's greatest time saving tools because the Tamper, not the man, does the work. They provide a solid fill with no subsequent ground settlement and they are easy on the operator.



Ingersoll-Rand's latest rotary, portable Air Compressor—Four models—105, 210, 315 and 600 cfm at 100 pounds full rated air pressure.



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Pioneer Engineering Works, Inc., Minneapolis 13, Minn. Another advantage of the new mounting is that the rear of the mounting framework has been designed to facilitate installation of conveyor supports. Further information is available.

Emergency lighting equipment

A new emergency lighting unit with a hermetically sealed battery gives many years of service with no maintenance whatever. It turns on automatically when power fails and rapidly restores full battery energy once power is resumed. It requires no addition of liquid at any time, and can be recharged over 1,000 times without essential loss of power. It can be stored indefinitely either charged or discharged. The unit weighs 13.5 lb. The lighting units are unconditionally guaranteed for 10 yr. For full information write for Bulletin A46 and A71. **Dynaseal Lighting Corp.,** 5 Hadley St., Cambridge 40, Mass.

Onan electric plant

The Model 2LK electric generating plant has been announced by **D. W. Onan & Sons, Inc.,** Minneapolis 14, Minn. Their Model 2LK produces 2,000 watts, 60-cycle, A.C. at 1,800 rpm. or 1,500 watts in 50-cycle, in all standard frequencies and phases. Overall weight is 235 lb. It is powered by a single-cylinder, air-cooled, 4-cycle gasoline engine. Radio shield-

ing on high tension wire and spark plug is standard equipment for all models. Optional accessories include: carrying frames, 2-wheel dollies, automatic controls, emergency line transfer controls, and gas-gasoline carburetors.

Front-Wheel-Drive Hough loader

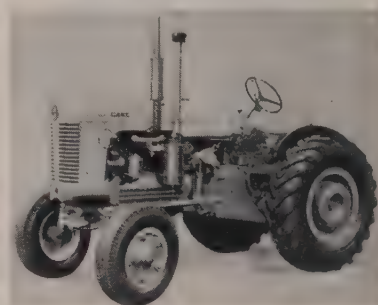
A new and larger two-wheel-drive "Payloader" tractor-shovel, Model "HAH," has been announced by



The Frank G. Hough Co., Libertyville, Ill. The new machine has a struck capacity of $\frac{3}{4}$ cu. yd. and a heaped capacity of 1 cu. yd. Bucket breakout action permits 40 deg. of tip-back at ground level. The breakout force is 4,500 lb., lifting capacity is 4,000 lb., and a carrying capacity of 3,000 lb. at 4 mph. The high lift is 7 ft. 9 in.

Case tractor with diesel or gas

Now on the market is the Case 400 series, industrial tractors, available with a choice of engines. The transmission has 8 speeds forward and 2



in reverse. Depending upon tire size, the tractor has a speed range from 1 $\frac{1}{2}$ to 18 mph. Power is available to operate allied equipment of all types. Hydraulic power steering is available on all the 400 series tractors. **J. I. Case Co.,** Racine, Wis.

Tenoning tool for asbestos-cement pipe

Available in two sizes, 4 in. to 8 in., and 10 in. to 20 in., a new asbestos-cement pipe tenoning tool saves time by eliminating the need for figuring and specifying short lengths. The ACT-Model B machines asbestos-cement pipe, cuts ends for many types of couplings, flange assemblies, and end facings. By changing the cam plate, the tool can be adapted for cutting any type profile. One man can operate it on the job. Descriptive literature is available from the manu-

36-42 HAMMERMILL

Unexcelled for limestone reduction—produces output from 3" to dust. Easy access to wear parts—known for economical operation! From a pioneer manufacturer of hammermills and jaw crushers. Get additional details, engineering help through:

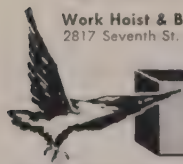
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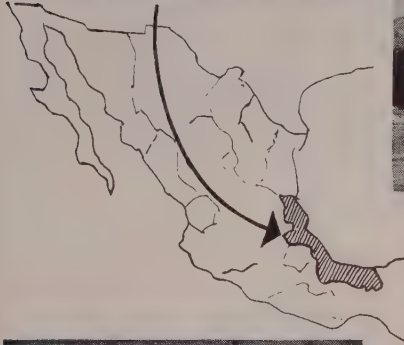


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They're Loading Sulphur for the Free World!

with an S-A CONVEYING SYSTEM...



Sulphur is weighed "on-the-run" as it rides slope conveyor to loading tower.



Ship loading boom conveyor in raised position to clear ship superstructure.

Deep in the jungle of the state of Veracruz, Mexico, liquid sulphur flows from pipes probing 600 to 1000 feet into the ground. This is the first sulphur plant using the Frasch process outside the United States.

First put into production in March 1954, the Mexican Gulf Sulphur Company's operation is the result of teamwork of United States and Mexican technicians. Engineered for a production of 200,000 tons per year, the plant has a planned potential of 500,000 tons annually.

After a barge trip to storage and shipping facilities, the sulphur is solidified in vats. Then, blasted loose, it is de-

livered to a Stephens-Adamson Conveyor System. A traveling hopper with crusher "working over" to belt conveyors, reduces lumps to 6-inch size. Both belts feed to a slope conveyor, running to a loading tower at dockside. Belts have a normal capacity of 400 TPH each.

From the unloading tower, sulphur moves out on a boom conveyor for ship loading, or is directed to a chute for loading railroad cars.

Another good example of S-A engineering to meet a specific need for economical handling. What is *your* problem? We'd like to help you solve it. Just write for full details.



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First Ave. South, Seattle 4, Wash.

Rok-Bit for threaded drill rods

A carbide-insert Rok-Bit is available for use on J-7.50 threaded drill rods. It is available in 4- and 4½-in. gauge sizes and is made to fit directly on the steel without the need for an adaptor. The bit has 5 air holes in all to facilitate chip removal, so that the bit is not working in its own cuttings. Chicago Brunner & Lay Rock Bit Corp., 9250 King St., Franklin Park, Ill.

Diesel crawler tractor

A 12,400-lb. crawler tractor powered by an Allis-Chalmers HD-344 diesel engine is now on the market. The engine develops 57 net flywheel



hp., 55 hp. at the belt, and 45 hp. at the drawbar. Their crawler is equipped with a hydraulically controlled bulldozer. Allis-Chalmers Mfg. Co., Construction Machinery Division, Milwaukee, Wis.

International industrial tractor

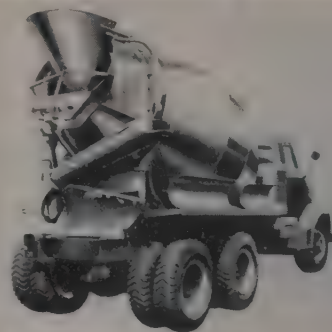
A rubber-tired 42-hp. wheel tractor, the International 300, has been announced by International Harvester Co., 180 North Michigan Ave., Chicago 1, Ill. Powered by an IH C-169 gasoline engine, the tractor



weighs 3,820 lb., 1,000 lb. more than tractors of comparable size and class. The added weight provides greater traction, stronger power train and axles. Model 300 is available either in a standard 5-speed transmission or in a torque amplifier drive. Specifications include: wheelbase, 75 in.; overall length, 118 in.; width, 59½ in.; turning radius, 9 ft. 8 in. Over 23 attachments are available for the tractor.

Transcrete truck mixers

The first of the 1956 Transcrete truck mixers, the Model 700, has been announced by Construction Machinery Co., Waterloo, Iowa. One of the features is a shorter over-all length



which makes for larger legal payload loads. This is possible because of a 75-in. diameter drum and a 16-degree slope. The mixer will haul up to 8 yd. loads, and is guaranteed to mix any 7-yd. batch of any slump concrete. For further information, write the manufacturers for Bulletin TM 700.

Redesigned straddle carrier

Now available is Series 71, a model of straddle carrier with a rated capacity of 10,000 lb., the only carrier available designed for that rating. Operator visibility and comfort have been increased by moving the driver's seat to the center of the machine instead of over the rear axle, and lengthening the wheelbase to 90 in. 14 in. longer than the previous model. A torque converter is optional equipment. Road speed is 20 mph. Clark Equipment Co., Ross Carrier Division, Benton Harbor, Mich.

Lightweight vibrator

Now on the market is a lightweight gasoline concrete vibrator, model BGW. It has a 2-hp., 4-cycle air-cooled gasoline engine and runs at speeds from 6,000 to 9,300 vibrations per min. The vibrator head weighs



lb. 7 oz. A rubber tip for use where plywood forms are used can be substituted for the steel tip on the head if desired. A 2-in. head is available. Wet rubbing or dry grinding of concrete can be done with this machine.

Speaking of **power**



Look at this **SPEEDALL TRACTOR SHOVEL** at the

GENERAL MOTORS

powerama

**THREE MODELS WITH SPEEDMATIC
POWER SHIFT TRANSMISSION**

BIG DIESEL ENGINE is just the start of the Speedall power train story. From engine to wheels—the Speedall well ahead of any other tractor shovel. The Speedall Torque Converter was designed and constructed for its one and only job—to make this tractor shovel the smoothest and fastest of them all. It's 30% more rugged than any other in the field.

SPEEDMATIC POWER SHIFT TRANSMISSION offers a new concept in no-shift ease of operation. It does more than just eliminate the clutch pedal—it provides smoothness, speed and dependability never before possible. It puts the profit back into those "marginal" jobs.

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MOORE EQUIPMENT CO.

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Three Models — 1¼, 1¾, 2½ YARDS STRUCK CAPACITY
Engine GM Diesel*
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300% Torque Multiplication
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Axles 17 to 1 Planetary Drive

FINALLY—There's the 17 to 1 Planetary Drive Axle. These are the axles whose design started where others left off. It eliminates the difficulties encountered in earlier planetary axles—it puts a stop to axle failures.

DON'T BELIEVE US—ask your local Speedall distributor for a convenient demonstration. You name the time and place—let him worry about the details.

*Also available with gasoline engine.

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CALAVAR CORPORATION

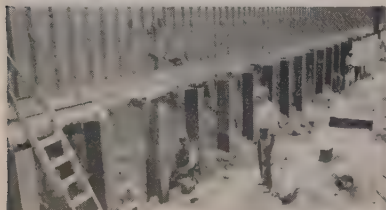
2700 S. Broadway, Los Angeles, California

BIG HEAD START ON DEADLINE WITH FOSTER RENTAL STEEL-SHEET PILING



Checking Foundations with 120-Ton Load on H-Bearing Frames Anchored to Foster Piling Hotel - Department Store - Parking Facility THE DENVER COLORADO PROJECT

Contractors Webb & Knapp got a *Head Start* on this gigantic project by calling Foster for rental steel-sheet Piling, to complete four sumps (that were holding up the major excavation of this 400-foot square foundation). Foster delivered *on time*, the exact sections and exact lengths of steel-sheet Piling needed to get a head start on work schedules.



Foster 12"x 53 lb. H-Bearing Piles driven an average depth of 50 feet, around perimeter of the gigantic 400 foot excavation.

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by removing the vibrator head and using an anglehead. For more information, write Stow Mfg. Co., 56 Shear St., Binghamton, N. Y.

Traffic-Line spreader

Savings in the amount of paint consumed in laying down traffic and safety lines are possible with an all-

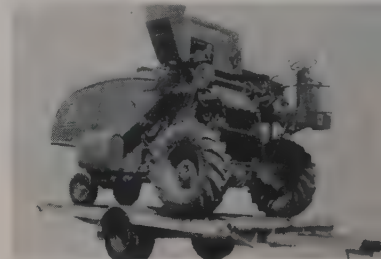


metal sled-type spreader manufactured by Industrial Equipment Co., 477 Ashford Ave., New York. The

savings come about as a result of increased applicator surface and a corresponding decrease in flow orifice. Maintenance requirement for the spreader consists of a can of kerosene or ordinary paint thinner for immersion when not in use. The machine's simple maintenance stems from the fact that it is gravity fed and has no power unit.

Tilting trailer

Now available is a new trailer which shifts the axle forward reducing the tilt angle to about half for safe, easy loading. The shift is accomplished quickly and easily, loaded



or empty, by pushing the bed back or pulling it forward over the wheels. In its lowered position the bed is supported on all four corners. By uncoupling the hitch, it can be used as a ramp for loading or unloading the truck. Further information can be obtained from the manufacturer, Buhl Machine Works, Buhl, Idaho.

Soil Testing



The unit is light in weight, compact, very portable, easy and economical to operate and maintain.

WASHINGTON Dens-o-meter

The KEY to accurate field tests for moisture-density of embankment and foundation soils.

Developed after two years research and experiment by Department of Highways, State of Washington. Opens up entirely new possibilities for earthwork engineers and contractors. Engineers can now make accurate moisture-density and compaction tests.

- in all large or small holes
- in all types soils and granular base materials
- in about 3 minutes after hole is dug

Now for the first time, holes of any size from 0.000 cu. ft. to 0.500 cu. ft. can be measured with the same equipment. Holes up to 22 inches in depth can be measured—singly or in successive lifts.

Get full information from

Exclusive Sales Agents

CHARLES R. WATTS & CO.

4121 SIXTH AVENUE NORTHWEST
SEATTLE 7, WASHINGTON

It's usable horsepower that counts!



Internationals give you power without strain at safe, economical rpm to save you the BIG money!

Rated horsepower figures don't tell the whole story of truck performance.

Wise truck buyers want to know *more* than rated horsepower. They want to know how much load they can haul without tearing the engine's heart out—what actual *usable* power they are going to get to pull capacity loads at normal, legal speeds.

Usable horsepower—that's the point to keep in mind when buying trucks.

INTERNATIONAL engines deliver high usable horsepower at economical, wear-reducing speeds. Because they are built for use in *trucks*, with no compromise with passenger car design.

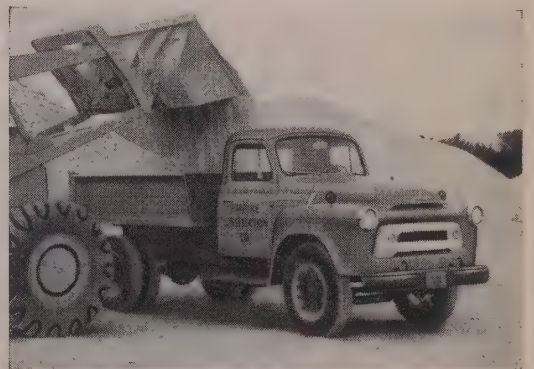
You get the usable power you need, plus longest truck life, every driver comfort and convenience. See your INTERNATIONAL Dealer or Branch for trucks exactly right for your job—all-truck built to save you the BIG money.

INTERNATIONAL HARVESTER COMPANY • CHICAGO

**INTERNATIONAL
TRUCKS**



Many passenger car type truck engines have to rev up to high speeds to pull their loads. They strain at the job—cost big money in wear and repair. INTERNATIONAL all-truck engines turn at relatively low rpm—deliver high usable horsepower at normal road speeds, for peak performance, long life, BIG money savings.



In the world's most complete truck line, there are trucks for every job. More than 200 basic models from 4,200 to 90,000 lbs. GVW—conventional and COE, 4-wheel, 6-wheel, four-wheel-drive—in thousands of variations for exact job specialization.

All-Truck Built to save you the BIG money!

Motor Trucks • Crawler Tractors • Industrial Power
® McCormick® Farm Equipment and Farmall® Tractors

News of DISTRIBUTORS

New No. Calif. distributorship

A new distributor for the multi-purpose Gradall has been appointed by the Gradall Division of The Warner & Swasey Co. of Cleveland. Western Traction Co., San Francisco, headed by John Jorgensen, has been given the exclusive territory that includes the northern part of California, including Fresno, Sacramento, and San Francisco.

I-H district managers

M. T. Sprague has been named Oakland, Calif., district manager by the motor truck division of International Harvester Co., to succeed Roy A. Legge, retired. Formerly Portland district manager, Sprague also served in various sales capacities previously at Denver and Los Angeles. G. S. Stewart, assistant to Sprague at Portland, has been named manager there. Promoted to Portland assistant district manager is R. M. Beauchamp, who managed the International branch operation at Seattle.

Superior adds to sales staff

Superior Concrete Accessories, Inc., San Leandro, Calif., announces the addition of Norman G. Turner to



Norman G.
Turner

its sales staff. Turner brings to his position a background of several years association with the construction industry in the Chicago area and since moving to California in 1950 has continued in the selling of concrete form accessories and form panels.

Distributor named for No. Calif.

Clark's Welding Works, Perkins (Sacramento suburb), Calif., was recently appointed Northern California distributor for Yuba Manufacturing Co., and Tulsa Winch Division, Vickers, Inc. Clark's territory includes all of Northern California, except the San Francisco Bay area counties, for Yuba-Schrock motorized pulleys, Yuba sprockets, and the winch lines of Tulsa. J. C. "Curt" Clark heads the company bearing his name.

G. W. Schriver heads Cramer

All of the capital stock of Cramer Machinery Co., Portland, Ore., has been sold, according to recent announcement. The company was formerly headed by C. P. Cramer, now deceased. The company will continue in its present headquarters with sales and servicing of the lines of construction equipment which it has handled for the past 23 years. George W. Schriver, one of the purchasing group, who has served the company as sales manager, has been elected president and will act as chief executive of the company.

New sales mgr. for Boise firm

J. C. Jensen has succeeded J. H. Patterson as sales manager of Western Equipment Co., Boise, Idaho. Jensen joins Western Equipment after five years with Industrial Equipment Co. of Billings as office

NATIONAL SURETY CONTRACT BONDS...



... and our fast and efficient service have long been favorably known to both contractors and owners.

And this service is available through our country-wide network of agents.



**NATIONAL SURETY
CORPORATION**

4 ALBANY ST., NEW YORK

A MEMBER OF THE FIREMAN'S FUND INSURANCE GROUP

To the man who's thinking about buying a new truck:

maybe you're missing something...

➤ And what you're missing is more than "maybe," it's for *sure*—if you haven't yet visited your Dodge truck dealer.

➤ Do you want to miss a *rock-bottom price*? Perhaps you haven't realized that Dodge trucks actually cost *less* than you'd pay for corresponding models of most other makes.

➤ Do you want to miss *power* so high it leads the field? Consider this: with engines of 169 to 175 horsepower, Dodge overpowers *every other leading make of truck* in the low- and medium-tonnage fields.

➤ Surely you don't want to miss the many advantages of

"*Job-Rated*." Because all units from engine to rear axle are engineered and matched for a specific job, the Dodge truck you buy is exactly *right* for your business.

➤ You don't want to miss Dodge safety—which includes the biggest wrap-around windshield of any truck on the road, the shortest turning radius. Or Dodge superior cab comfort... Forward Look Styling.

➤ In short, you get a whale of a lot more truck for a good deal less money than you think! Stop in and see your Dodge truck dealer right away—don't miss *anything*!

DODGE Job-Rated **TRUCKS**

WITH THE FORWARD LOOK ➤

Mall

POW'R TROW'L

Finishes Concrete

FAST, EASILY, ECONOMICALLY



4 POWER HEADS

- 4 cycle gas engine
- 2 cycle gas engine
- electric motor
- pneumatic motor

Before you Buy Check all these New Features

- New safety throttle control. If handle slips from hand, ring automatically stops and engine idles.
- New lifting eye-hook for raising or lowering machine from one floor to another.
- New clamp ring permits changing of power heads in seconds.
- New automatic recoil starter—fast and easy—no lost rope, no waste of time.
- New direct gear transmission delivers 97% of power to the blades.
- New quick-kick ring—a mere kick adjusts pitch of all three blades at once.
- New extra strong $\frac{3}{8}$ " diameter solid ring in 26", 36", and 45" sizes . . . all easily interchangeable.
- New reversible shoes and blades. Both edges can be used—gives double wear.
- Powers floating disc for dry tamping floors and grinding-grouting head.

SEE FOR YOURSELF—Phone or write the MALL office nearest you for a free demonstration. Do it today!

MALL TOOL CO. PORTABLE POWER TOOLS
Gasoline • Electric • Air
7706 S. Chicago Ave., Chicago 19, Illinois
Send me a colorful descriptive folder on the new MALL POW'R TROW'L.

Name _____

Company _____

Address _____

CU-178

manager and sales representative; and four years with Treasure State Equipment Co. of Missoula, and Kalispell, as sales representative and sales manager.

M & F named Marion distributor

Appointment of M & F Equipment Co., Albuquerque, New Mex., as a distributor of Marion Power Shovel Co.'s line in the northern two-thirds of New Mexico was recently announced. Since 1946 M & F has been serving the construction and truck equipment markets, and has a broad background of experience in the servicing of power shovel equipment. The company also manufactures and repairs all types of trailers and truck bodies. C. L. McClaskey, president, has been in the construction equipment business for more than 20 years. Joe Ferguson, vice president, has had 15 years' experience in servicing contractors' equipment.

Atwater joins Rhodes & Jamieson

Rhodes & Jamieson, Ltd., Oakland, Calif., recently appointed Dan Atwater, formerly with U. S. Gypsum, as sales engineer specializing on their Serviced products line of construction materials. He is prepared to supply technical assistance on such products as Kork-Pak and asphalt expansion joint premoulded filler, as well as cork, and rubber expansion joint fillers for reservoir, water, and

sewerage treatment plant construction; also the complete Serviced line of concrete specialty items.

J. T. Mains appointed asst. gen. mgr.

Continuing its program of expanding both service facilities and personnel, the H. W. Moore Equipment Co., Denver, Colo., has created a new



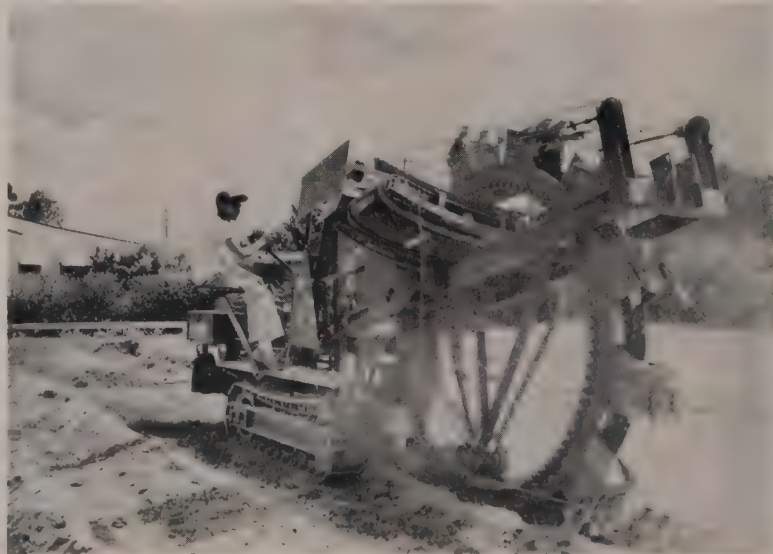
J. T. Mains

position of assistant general sales manager. John T. Mains has been selected to take over this new job. A member of the Moore organization since October 1954, Mains has had more than 20 years' experience with construction machinery, in sales, parts, service, and management.

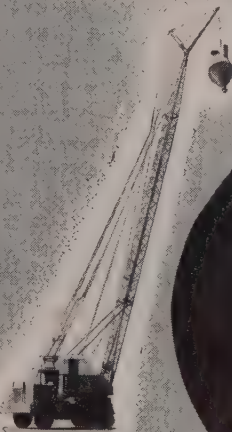
Additional line for S.F. firm

West Coast Industrial Sales Co. of San Francisco recently added to its lines the "Kor-It" concrete core drilling machine.

Advertisement



H. M. McGLOTHLIN & SON completed more than 80 trenching jobs in less than two months early this year with their Model 92 Cleveland trencher. Digging in the coral rock in and around Homestead, Florida, their Cleveland is in almost constant use cutting trenches for the city's pipe and sewer lines and house footings for building contractors. McGlothlin says his Cleveland works twice as fast as another type trencher he formerly used, is more maneuverable and requires less maintenance. Your local distributor will show you how Cleverlands *dig more trench . . . in more places . . . at less cost.* **THE CLEVELAND TRENCHER CO., 20100 St. Clair Ave., Cleveland 17, Ohio**



MARION

Announces



HEADQUARTERS FOR THE FOLLOWING MACHINES

	Shovel (Cu. yds.)	Crane (tons)	Hoe (Cu. yds.)
MARION 32-M	$\frac{3}{4}$	17½*	$\frac{3}{4}$
MARION 43-M	1	27*	1-1½
MARION 362	1½	37	1½-2
MARION 372	—	43	—
MARION 83-M	2	60	2-2¼
MARION 87-M	—	75	—
MARION 93-M	2½	80	—
MARION 101-M	3	84	—
MARION 111-M	4	169	—

*Rated at 10' in accordance with general practice.

MARION POWER SHOVEL COMPANY

MARION, OHIO, U.S.A.

POWER SHOVELS FROM ½ TO 4 CUBIC YARDS • DRAG-
LINES • CLAMSHELLS • LOG LOADERS • PILE DRIVERS
CRANES, CRAWLER AND RUBBER MOUNTED • BACKHOES

The Appointment of

A New Distributor to Cover

The Northern two-thirds of New Mexico

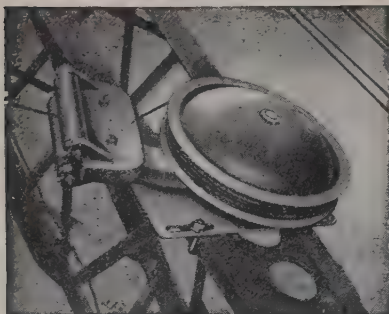
M & F Equipment Company

824 Arno Street, N. E.

Albuquerque, New Mexico

Phone: 3-3793

GREATER BUCKET CONTROL WITH
UNIFORM TENSION
at any pay-out



**WESTFALL CENTER-PULL
AUTOMATIC TAGLINE
AND MAGNET CONTROL REELS**

- FAIRLEAD ROLLERS** — Save needless line wear.
- MOVING PARTS** — Ball-bearing mounted.
- AMPLE PAY-OUT** — Big reserve for all jobs.
- SMALL, COMPACT** — No bulky projections.
- BETTER SIGHT** — Does not obstruct operator's vision.
- QUICK INSTALLATION** — 4 "J" bolts — No drilling.
- 5 SIZES** for any tagline requirement.

WRITE FOR FREE FOLDER!

WESTFALL AUTOMATIC TAGLINE

345 E. Second St. Los Angeles 12, Calif.
Phone MUtual 4694

MANUFACTURERS

Mittelstadt named chief engineer

C. F. Mittelstadt has been appointed chief engineer of The Heltzel Steel Form & Iron Co. and its subsidiary, The Flexible Road Joint Machine Co. Heltzel manufactures paving forms, batching plants, and handling systems for the concrete and rock products industries. Flexible is the builder of Flex-Plane concrete finishing machines, spray curing machines, automatic joint and dowel installing machines.

Hyster engineer retires

H. Noel Dimick has retired after 16 years as engineer in charge of straddle truck design and production at the home offices of the Hyster Company, Portland, Ore.

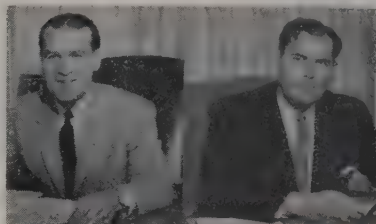
Ned Putz made ad-manager

Barber-Greene Co., Aurora, Ill., manufacturer of material handling and road construction machinery, announces the appointment of W. E. "Ned" Putz as advertising manager. He has been a member of Barber-Greene's publicity department since November 1950, and now succeeds Wayne D. Adamson, Jr. who resigned to accept a similar post elsewhere.

J. H. Baxter merger

Merger of its associated companies into the parent company and election of new officers is announced by J. H. Baxter & Co., one of the West's largest producers of pressure treated forest products. Effective Jan. 1, 1956, the merger embraces Baxco Corporation, J. H. Baxter & Co. of Oregon, J. H. Baxter Timber Co., Puget Timber Co., and Puget Timber Co. of Oregon. The consolidation streamlines the entire "Baxco" operation, with all sales and business offices centralized in the newly occupied headquarters at 120 Montgomery St., San Francisco.

President of the merged companies



Chadbourne

A. X. Baxter

is C. A. Chadbourne, the former executive vice president. He succeeds A. M. Baxter, son of the founder, who will continue as a vice president. Taking over the post of executive vice president is Alfred X. Baxter Gardner P. Pond continues as a vice-president and district manager in Southern California. Secretary-treasurer of the consolidated companies is R. B. Mossman, and W. W. Jackson is general sales manager. Other key executives are R. K. McCulloch, assistant general sales manager and district manager, Northern California; Willard O. Spies, manager, production and timber department; William C. Cairns, Portland district manager; Roy F. Gillespie, Eugene district manager; Hugh McClure, Seattle district manager.

Dick Nelson joins McKiernan-Terry

McKiernan-Terry Corp., manufacturer of pile hammers and other construction equipment, announces the appointment of R. H. "Dick" Nelson as assistant sales and service manager of the company's pile hammer division. Nelson comes from Garling house Bros., Los Angeles, Calif. where he was a sales engineer. In his new position, his headquarters will be at McKiernan-Terry's home office in Dover, N. J.

Two named to sales posts

Appointment of two to sales positions at LeTourneau-Westinghouse Co., Peoria, Ill., is announced. Jack McCann, who has been serving as manager of the Washington, D. C. office, is now directing activities of the Government sales department including the Washington office. Jack Errion, former advertising promotion supervisor, has been named sales promotion manager. As such, he

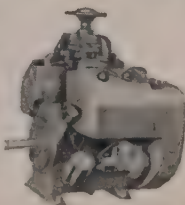
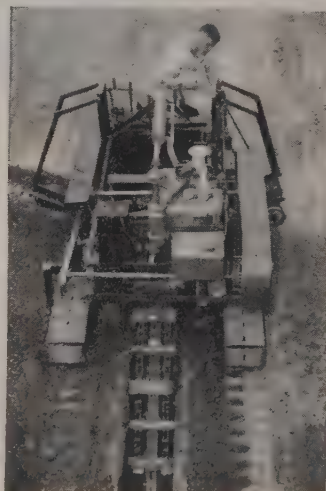
WISCONSIN-POWERED
New **VERMEER**
One-Man Track Type
POW-R-DITCHER

Cuts Trenching and Ditching Costs...

According to the manufacturer, Vermeer Mfg. Co., Pella, Iowa, this machine is "the lowest cost 'Big Ditcher' on the market" ... especially designed for wide foundation footings, gas, water and sewage lines.

It is self-propelled and operated by a Wisconsin V-type model VF4 Heavy-duty Air-Cooled 4-Cylinder Engine which provides all the power needed for all operations.

Heavy-duty engine design and construction, easy starting in any weather and dependable AIR-COOLING at all temperatures from sub-zero to 140° F. are features that assure efficient Power Performance, Long Engine Life and Low-Cost Maintenance ... factors of prime importance in relation to the service functions of the original equipment. Reasons why you can't do better than to specify "Wisconsin Power" for your equipment.



This 3 1/4" x 3 1/4" engine has a power range of 15 to 25 hp., at 1400 to 2400 rpm. Wisconsin Air-Cooled Engines are available in a complete power range from 3 to 36 hp.



WISCONSIN MOTOR CORPORATION

World's Largest Builders of Heavy-Duty Air-Cooled Engines

MILWAUKEE 46, WISCONSIN

The American Road Builders' Association

*invites you to Miami Beach
to attend its*

54th ANNUAL CONVENTION



EXHIBIT OF HIGHWAY MATERIALS and SUPPLIES

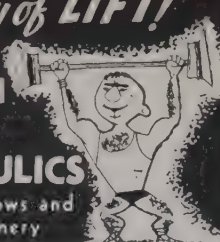
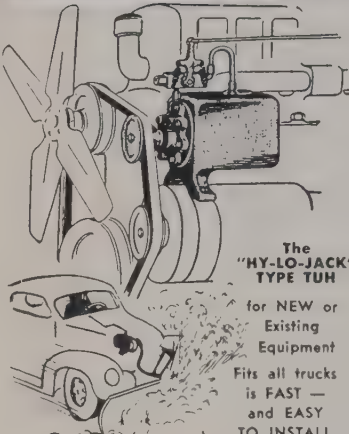
**Both Meetings and Exhibits will be held in the
Miami Beach Auditorium**

JANUARY 11-14, 1956

The Nation's leading legislators, engineers, and road builders will address this Meeting—the most important in ARBA's history. Write to ARBA in Washington for information on hotel reservations and Exhibit arrangements.

American Road Builders' Association • World Center Building • Washington 6, D. C.

Plenty of LIFT!
with
**MONARCH
POWER
HYDRAULICS**
for Snow Plows and
Road Machinery

The
"HY-LO-JACK"
TYPE TUH
for NEW or
Existing
Equipment
Fits all trucks
is FAST —
and EASY
TO INSTALL

1000 lbs. Pressure - 1 Gallon per minute
volume. Fan Belt driven. Electric models
(6 or 12 volt) also available.

MONARCH
ROAD MACHINERY CO.
1311 MICHIGAN ST. N. E.
GRAND RAPIDS 3, MICH.

keeps LeTourneau-Westinghouse distributors and sales forces informed on equipment applications and product development.

McCausland joins LeTourneau

R. G. LeTourneau, Inc. of Longview, Texas, recently appointed John E. McCausland to the sales management staff. McCausland previously was with the Adams Division of LeTourneau-Westinghouse as district manager in charge of sales in New York and the New England States.

Albert E. Cummings dies

Albert E. Cummings, director of research and a director of Raymond Concrete Pile Co., New York, international foundation and heavy construction firm, died recently.

C. H. Carrick promotion

Charles H. Carrick has been named product manager for the Remington stud driver in the sales department of Nelson Stud Welding, a division of Gregory Industries, Inc., Lorain, Ohio. He has been associated with the organization since 1949 when he joined them as a field engineer.

Timken promotes three

E. H. Hughes, manager of the sales order department of The Timken Roller Bearing Co., Canton, Ohio, has been named to the newly-created post of assistant to the sales director. The appointment of J. L. Brown and Don M. Brown to the posts of assist-

ant manager of the sales order department and manager of the allocations department respectively was also announced by P. J. Reeves, sales director.



TO FACILITATE more rapid delivery. Gates & Sons, Inc., Denver, Colo., manufacturer of concrete form ties and the Gates forming system, has installed this 96-ft. transmitter-tower. It covers a 15-mi. radius, linking the company's fleet of delivery trucks to the central office by means of a two-way radio system, and is intended to speed service to customers throughout the Denver metropolitan area.

Pete Turner expands operations

Farm Aid Equipment Co., Inc. Spokane, Wash., headed by Pete Turner, recently expanded its operations to cover the entire Western half of the United States with the granting of a distributor's franchise for California, Nevada, and Arizona. The line of back-hoes, rear blades, front end loaders, etc., for more than 30 tractor makes is manufactured by Shawnee Manufacturing Co., Topeka, Kans.

The main office of the Farm Aid Equipment Co. is at 2932 Trent Ave. Spokane. Branches are located at 1st Avenue North & 15th, Billings, Mont.; 745 Wall Ave., Ogden, Utah; and 17028 South Figueroa, Gardena, Calif. Each of the branches carries a full stock of equipment as well as a large supply of the necessary replacement parts to amply supply their dealers throughout the territory.

New S. F. warehouse for Macwhyrte Macwhyrte Company, wire rope manufacturer, has moved its San Francisco quarters to a new address, 188 King St. A complete new building with facilities for handling, cutting and shipping wire rope has been built.

"The Head Pulley with Motor Inside." Safe, compact, simple—no chains, no belts, no sprockets, no exposed motors.



Built by Yuba for sale in Arizona, California, Idaho, Montana, Nevada, New Mexico, Oregon, Texas, Utah, Washington.

Built and sold in other states by Iowa Mfg. Co., Cedar Rapids, Iowa.

IF YOU USE BELT CONVEYORS OR BUCKET ELEVATORS SAVE SPACE, CUT DOWNTIME with YUBA-SCHROCK HEAD PULLEY

All moving parts fit compactly inside pulley shell, protected against weather and dirt, thus practically eliminating pulley troubles. This pulley with motor inside requires no more

room than an idler pulley; can be installed quickly. Diameters 10½" to 56". ⅓ to 125 hp. for voltages to 2300. Job proved. Write TODAY for folder and name of nearest distributor.



YUBA MANUFACTURING CO.

82

Pulley and Sprocket Dept.

PHONE 628

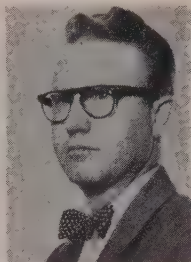
BENICIA, CALIFORNIA

Rankin Company occupies new home

A new plant of Rankin Manufacturing Co. located at 616 Marengo Ave., Alhambra, Calif., houses the offices and manufacturing headquarters for "Ranite" hardsurfacing materials for national and international markets. D. B. and W. D. Rankin, owners, have been manufacturing Rankin welding materials since 1938.

Heads dealer-distributor sales

Donald E. Stoops was recently appointed manager of distributor sales



Donald E. Stoops

for Clark Equipment Co.'s transmission division. He will be in charge of dealer and distributor sales activities for the division and will continue to supervise the advertising and merchandising program.

Sales appointments

Three new sales division appointments were recently announced by Insley Manufacturing Corp., Indianapolis, Ind. Fred B. Ray, formerly vice president in charge of sales and a 34-year veteran with the firm, was made vice president in charge of sales research and development. R. J. Boatman, factory sales representative, was named sales manager. At the same time C. W. Hoke's appointment as advertising manager was announced.

Hyster factory manager

New factory manager at the Hyster Company plant at Peoria, Ill., is Arvel A. "Al" Mann. Since joining the industrial truck and tractor equipment manufacturer in 1953, he has held the positions of factory engineer and chief inspector.

New plant manager

James C. Mabe, Jr., has been appointed manager of plant operations for Chicago Pneumatic Tool Co., and will headquarter at the head office in New York City.

U.S. Spring & Bumper has new name

U. S. Spring & Bumper Co., one of the nation's leading auto parts suppliers, has taken a new name: Rheem Automotive Co., a division of Rheem Manufacturing Co. The change was made to clarify the relationship of the two companies.

Perlite Div. promotions

Kirk E. Hazelton was recently promoted from operations manager to assistant general manager of the Perlite Division of Great Lakes Carbon

Corp., with headquarters at Florence, Colo. William R. Howell, who was regional sales manager at Chicago, was made general sales manager of the division.

New manufacturing plant

Whiteman Manufacturing Co., maker of concrete power buggies, finishing machines, vibrators, screeding machines, and truck mixers, announces a new plant at Pacoima, Calif., to be completed in January.

New plant

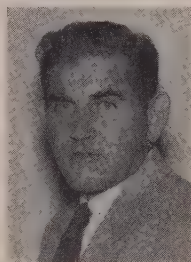
Fuller Manufacturing Co., Transmission Division, Kalamazoo, Mich., announces a \$1,000,000 plant addition to its present building.

I-H marks 32nd year

International Harvester Co. marks the 32nd year of motor truck manufacture at its Fort Wayne, Ind., works with production of the 650,000 International from this heavy-duty truck plant.

S. R. Horn made general manager

Stanford R. Horn, sales manager of the Pacific Coast Division of A. C. Horn Co. since 1947, has been named general manager by Ralph Persons, president of Sun Chemical Corporation, the parent company. The A. C.



Stanford R. Horn

Horn Division, manufacturer of building construction and maintenance materials since 1897, operates manufacturing plants at both Los Angeles and San Francisco, with offices in principal Western cities.

Johns-Manville

The Industrial Products Division of Johns-Manville was recently split into three new operating divisions: Pipe Division, Packings and Friction Materials Division, and Industrial Insulations Division. General manager of the pipe division will be Robert F. Orth, with Francis J. Wakem heading industrial packings and materials, and Don L. Hinmon, industrial insulations.

ESCO establishes new division

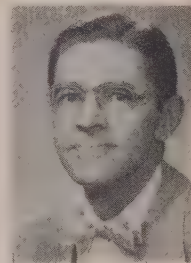
Establishment of ESCO International, a new division created to handle its large volume of export business, is announced to Electric Steel Foundry Co., Portland, Ore. Main office of the new division is in New York City, with branch offices located in Portland, Ore., and San Francisco, Calif.

New Service engineer added

C. C. "Scotty" Dunlop was recently appointed service engineer at the Iowa Manufacturing Co. factory in Cedar Rapids, Iowa. He will assist Boyd Titsworth, service manager, on all matters pertaining to service for Cedarapids crushing and screening plants, bituminous mixing plants, and other Cedarapids products.

Marion Shovel names D. B. Reed

Appointment of Dudley B. Reed, Jr., as director of advertising and



D. B. Reed

public relations for Marion Power Shovel Co., Marion, Ohio, has been announced. Harold E. Bonecutter continues as advertising manager for the company. Most recently associated with an advertising agency, Reed was formerly with Bucyrus-Erie, first in advertising and later as manager of public relations for the same firm.

New Western district mgr.

Monarch Rubber Co., Hartville, Ohio, announces that Donald L. Roach has been appointed Western States district manager for the company's complete line of industrial tires. In this capacity, Roach will be responsible for expanding sales and service to original equipment manufacturers, distributors, and government installations throughout the Western states. His headquarters are at Hayward, Calif.

Fuller Mfg. appointment

Fuller Manufacturing Co., Transmission Division, Kalamazoo, Mich., announces the appointment of Robert W. Firlik to the position of sales research analyst.

I-H new sales facility

International Harvester Co. recently opened a regional motor truck sales office at 610 Brannan St., San Francisco, Calif., out of which to administer its motor truck business throughout the eleven Western States, Alaska, and Hawaii.

Clausen heads new PCA dept.

Carl F. Clausen has been appointed director of the newly created manufacturing process department of the Portland Cement Association, Chicago. Before joining PCA in 1947, Clausen was associated with the Pacific Portland Cement Co. in San Francisco, Calif.

UNIT PRICES

Selected abstracts for Western projects

HIGHWAY—Surfacing, grading, and drainage in Toole County, Montana

Montana—Toole County—State. O'Neill Construction Co. submitted a low bid of \$396,263 for grading, surfacing, and drainage work on 8 mi. of the Shelby-Chester highway. Unit prices were as follows:

(1) O'Neill Construction Co.	\$396,263
(2) McLaughlin Inc.	405,293

	(1)	(2)
292,773 cu. yd. Unclass. excav. and borrow	\$.20	\$.20
1,518 cu. yd. Culvert excavation	2.75	2.00
181 cu. yd. Gravel backfill	4.00	3.00
17,323 mi.-yd. Overhaul	.23	.20
5,272 ton Crushed gravel cover material	6.75	6.00
26,296 ton Type "A" top course surface	1.85	2.10
18,522 ton Sel. borrow base course	1.55	1.60
52,722 gal. 1st. appl. MC-2 liquid asphalt	.17	.15
52,722 gal. 2nd. appl. MC-2 liquid asphalt	.17	.15
585 unit Rolling equipment	8.00	8.00
850 unit Rolling surface courses	8.00	8.00
7,395 M. gal. Watering	2.00	2.00
246 lin. ft. Reinforced concrete pipe culvert 15 in. dia.	2.87	3.50
246 lin. ft. Reinforced concrete pipe culvert 24 in. dia.	5.86	7.00
246 lin. ft. Reinforced concrete pipe culvert 30 in. dia.	7.94	10.00
88 lin. ft. Reinforced concrete pipe culvert 36 in. dia.	10.26	12.50
28 lin. ft. Reinforced concrete pipe culvert 48 in. dia.	17.09	21.50
92 lin. ft. Reinforced concrete pipe culvert 60 in. dia.	24.45	31.00
90 lin. ft. Reinforced concrete pipe culvert 72 in. dia.	33.51	43.00
154 lin. ft. St. sec. reinforced concrete underpass	30.42	41.00
338 lin. ft. Relay pipe culverts	2.00	2.00
1 ea. Concrete project marker	25.00	25.00
52 ea. Concrete R/W monuments	5.00	5.00
42 ea. Concrete station markers	7.00	9.00

HIGHWAY — Base course surfacing and a plant mix surface course for 6.6 mi. in Wyoming

Wyoming—Johnson County—State. Big Horn Construction Co. of Sheridan received a \$234,797 award for base course surfacing, plant mix surface course, and miscellaneous work on 6.6 mi of the Sheridan-Buffalo road and the Buffalo-Kaycee road. Unit prices were as follows:

(1) Big Horn Construction Co.	\$234,797
(2) Richardson Construction Co., Inc.	239,145
Northwestern Engineering Co.	239,874
Inland Construction Co.	240,238
Knisely Moore Co.	247,014
Taggart Construction Co.	247,310
Blanchard Construction Co.	256,744
S. Birch & Sons.	260,384

	(1)	(2)
46,450 ton Crushed gravel base course (1 in. max.)	\$.84	\$.90
1,720 ton Shoulder gravel	2.00	2.50

17,850 ton Plant mixed surface course	3.68	3.95
2,035 ton Crushed gravel surf.-dbl. sh. treatment	3.00	3.60
1,300 ton Crushed sand-gravel	3.50	4.00
120,755 t. mi. Haul of surfacing material	.15	.13
420 hr. Pneumatic tired roller operation	6.00	7.00
220 hr. Smooth steel roller operation	8.00	9.00
1,060 M. gal. Watering	2.50	2.50
335 ton Asphaltic material MC-prime	33.00	30.00
1,095 ton Asphaltic material AC (120-150) pent.	23.00	25.00
140 ton Asphaltic material RC-seal	37.00	31.00
175 ton Asphaltic material MC dbl. sh. treatment	33.00	34.00
11,392 L.F. Straight curb	1.50	1.50
2,435 sq. yd. Median paving	4.50	3.50
200 sq. yd. Concrete double cutter	6.00	5.00
785 ton Selected material surfacing—Type 1	2.00	1.00
63 hr. Mechanical tamping	8.00	6.00
3,810 cu. yd. Topsoil	1.00	1.00
2.64 acre Seeding	400.00	50.00
3,424 lin. ft. Portable snow fence	2.00	1.30
145 ea. Reflectorized guide posts (Type C)	5.00	5.00

HIGHWAY — Surfacing and structures for relocated highways U.S. Nos. 26 and 89 in Idaho

Idaho and Wyoming—Bureau of Reclamation. Holmes Construction Co. of Hayburn, Idaho, submitted a low bid of \$442,392 for surfacing and structures for completion of relocated Idaho and Wyoming state highways 26 and 89 and construction of Indian Creek detour road, Palisades Reservoir. Unit prices were as follows:

(1) Holmes Construction Co.	\$442,392
(2) Strong Co.	448,442
Gibbons & Reed Co.	452,582
Morrison-Knudsen Co., Inc.	481,275
Pickett & Nelson	482,031
Peter Kiewit Son's Co.	486,492
Carl Nelson Construction Co.	516,192
Inland Construction Co.	626,719
Knisely-Moore Co.	690,521

	(1)	(2)
15,100 cu. yd. Excavation for roadway	\$.40	\$.40
2,000 mi.-cu. yd. Overhaul of excavation for roadway	.40	.25
1,650 M gal. Watering	2.50	1.50
830 hr. Rolling, pneumatic tired roller	6.00	10.00
179 hr. Rolling, smooth tired roller	6.00	10.00
16.3 mi. Class "A" reconditioning	300.00	235.00
3.66 mi. Class "B" reconditioning	500.00	335.00
37 cu. yd. Excavation for structures	5.00	4.00
33 cu. yd. Compacted backfill	5.00	5.00
32 lin. ft. Furnishing and laying 18 in. diameter corrugated-metal pipe	4.00	4.50
4 protectors Placing corrugated-metal embank. prot.	50.00	25.00
162 lin. ft. Furnishing and laying 8 in. diameter No. 16 ga. corr.-metal embankment		
Pipe	3.00	2.50
27,395 lin. ft. Furn. and erect. beam-type guardrail	2.50	2.60
175 posts Guideposts	12.00	12.50
1,100 lin. ft. Raising existing guardrail	1.00	1.20
3 catch basins Rock catch basins	100.00	25.00
2,900 lin. ft. Bituminous curb	1.50	.20
99,000 ton Crushed gravel base material	1.10	1.00
32,000 ton Plant-mix bituminous surfacing type B	3.20	3.60
2,040 ton Liquid asphalt, 120-150 penetration	34.50	34.50
63 ton Liquid asphalt, MC-2	38.00	41.00
887 ton Liquid asphalt, MC-1, MC-4, and MC-5	30.00	39.50
6,200 ton Cover coat material	4.00	4.00
200 ton Blotter material	2.00	1.00

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Rates are \$8.50 a column inch. Copy should be sent in by the 15th of preceding month if proofs are required by the 20th if no proofs are required.

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WANTED: One, used 1 1/2 or 2 yard Crane with dragline boom and bucket in working order. Any standard make will be satisfactory. Must be priced right. G. E. Oaks, Redding, California.

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BACKFILL, uncompacted

4 Out of 7 in the West

When the American Society of Civil Engineers recently selected the "Seven Modern Civil Engineering Wonders of the United States," 4 of them proved to be in this Western region. They are Hoover Dam, Grand Coulee Dam, the Colorado

River Aqueduct and the San Francisco Bay Bridge. They represent substantial and noteworthy achievements of engineers and contractors who served and are still serving this Western region. The growth which necessitated these super-projects continues to demand still larger projects.

Twenty-five years ago in *Western Construction*

"Preparations are being made in San Francisco for one of the most elaborate and interesting national conventions of the Associated General Contractors when the Northern California Chapter plays host to 1,500 visitors, January 25 to 30, 1931."

* * *

"Bids for the 10-mi. railroad and 7-mi. highway between Boulder City and Hoover Dam will be opened in Las Vegas by the Bureau of Reclamation on January 12 and 7, respectively. Bids on the 727-ft. Hoover Dam will be opened in the Denver office of the Bureau of Reclamation, probably late in February."

* * *

"Charles D. Vail has been appointed state highway engineer of Colorado, succeeding the late L. D. Blauvelt."

* * *

"John C. Page, formerly superintendent of the Grand Valley Project, has been transferred by the Bureau of Recla-

mation to Las Vegas, Nevada, to act as office engineer on the Boulder Canyon project."

* * *

"Henry E. Blood, chairman of the Utah State Highway Commission, has been elected president of the American Association of State Highway Officials. S. C. Durkee, state highway engineer of Nevada was elected a vice-president."

* * *

"The State of Montana and the Hargrave Construction Co. of Spokane, Wash., have been experimenting with a bituminous road mixer on a 60-mi. road oil mix project between Dillon and Butte. This mixer was a product of the Iowa Mfg. Co."

* * *

"The American Road Builders Association will hold its 28th Annual Convention and Road Show at St. Louis, Mo., the week of January 12, 1931, with an estimated attendance of 30,000."

Engineers Find Answer

An editorial in the Idaho Daily Statesman of Boise, commenting on the recent final report of the WASHO Test Road has the following to say on this exhaustive engineering study:

"We have given the matter considerable thought and it is just possible that we were born in the wrong era. For some reason we find much that is irritating, if not downright disgusting.

"Take, for instance, the report of a committee of Western highway engineers which has just completed a 'exhaustive, 570-day test' on an experimental highway near Malad, Idaho."

"What they discovered is little short of amazing.

"According to the report, 'those test sections with four-inch surfacing proved far superior to that of equivalent sections with two-inch surfacing.' Five of the sections with two inch surfacing failed completely.

"Who would have thought such a miracle would be discovered."

NEXT MONTH

AGAIN, the January issue will include the **Western Construction Handbook** listing equipment manufacturers and their Western distributors. This is the Seventh Annual Edition of this comprehensive directory and buyers guide to outlets for construction machinery. It will sell for \$5.00 in a separate spiral-binding. The complete book will be bound into the January issue and will go to regular subscribers at no extra cost.

Major sections of this 160-page directory are: (1) A list of construction equipment manufacturers, arranged alphabetically, along with their products, branch offices, key Western personnel, and their distributors in the 11 Western states and Alaska. (2) Distributors in the West and Alaska listed by states and cities, with their addresses, personnel, phone numbers, branch offices, and lines sold and serviced. (3) An alphabetical listing of construction equipment, and products, with the manufacturers for each. (4) An extensive trade names identification section. (5) Indexes for the manufacturer and distributor section to speed reference to these listings.

From no other source is this material available covering the Western region.

...The Editor



SO VIBRATORY COMPACTION IS NEW?

If you think vibratory compaction requires modern and late-model equipment you are wrong. This Austin roller which is estimated to have seen a half century of service, according to the oldest living operators, is being used successfully to compact base—because it vibrates so much. As it moves clanking and fuming over the fill its ancient tremors and palsied parts provide vibrations effective—according to the contractor—in consolidating the material. Possibly not in strict accord with modern theory (see page 36) but shakingly successful.

