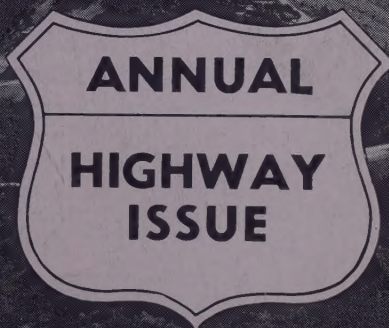
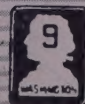
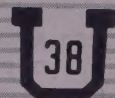
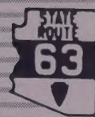


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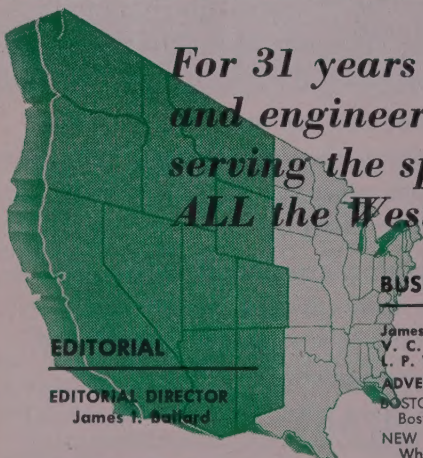
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FRONT COVER

AN AERIAL VIEW of the northern approach to the Golden Gate Bridge sets the scene for this year's June Highway Issue. The first of 16 articles on highway construction starts on page 33.

Photo: California Division of Highways



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Small hole is key to highway program

AROUND a small test hole in a highway fill are gathered the engineer, the contractor, and the equipment manufacturer. For all three that hole represents an important key to the highway building program. These three observers, at least in spirit, have been watching the young soils engineer dig the test hole and measure the volume of this small excavation. At this point the engineer does not know whether the test will show the compacted earth up to his specifications, the contractor does not know whether the test will show that the next lift must be delayed, and the manufacturer is wondering whether the test will show his equipment is proving effective or needs some design modifications.

Ever since soils science developed basic requirements for using earth as a material of construction the time-honored control has been based on the test hole in the fill, be it highway or dam. It produces the information to determine field density and its relation to laboratory standards. The material from the test hole also indicates the moisture content and important facts for checking the grading curve. The tests to be performed on the sample are relatively simple, generally understood and appreciated by the field force. It's not the test, but the time.

TIME is the all important key to the whole matter. Today the same amount of time is consumed between digging the sample and reporting the results back to the engineer in charge, as was required years ago. This essential test which should control all fill operations has not kept pace with accelerating construction speed. In other words, the rate of building compacted fills has far outstripped testing routine. It has become a bottleneck. And every faster and bigger piece of equipment makes the neck smaller.

The control engineer has become more of a job historian. He is recording the results, but frequently it is too late to initiate the control he would like to enforce.

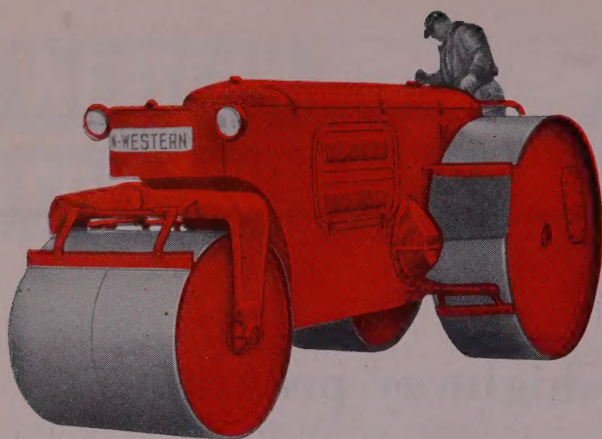
In theory the test is conducted to determine whether the material as compacted and submitted for test meets the specification or whether

it should have further treatment as to moisture or manipulation. Actual control was probably achieved in former years when the rate of placing earth was slower and each layer could be tested and approved before the next was placed. Not so today. Construction speed is too fast for that and the money involved in tying up the contractor's equipment fleet places a heavy responsibility on the control engineer. And so the tested layer may be buried under several succeeding lifts before the results are available, and another chapter in construction history is recorded.

The problem is well understood, and many scientific methods for faster testing are being explored. The ultimate test would provide a direct and instantaneous reading of compaction. The problems confronting the scientists are rather obvious. There are too many variables. Variations in moisture content, in density, and the actual characteristics of the materials compound the unknowns even for today's tools of science.

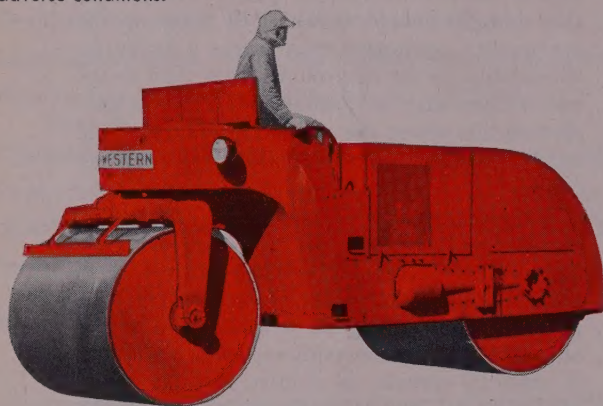
Still, the development of such a test must succeed. It holds the key to further acceleration in highway work, if strict controls are to be enforced. The design engineer is reaching the limit of accepting historic data and calling it "control." The contractor, on the other hand, will maintain pressure for more speed if highway departments want costs kept down. And the manufacturer will feel repercussions that could modify trends in earth-moving equipment. The test hole has become outdated in modern highway building. A better test must be found.

Jim Ballard



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JUNE 1957

Work starts on Interstate Highways

THE WEST is off to a good beginning in the big job of building the Interstate Highway System. A WESTERN CONSTRUCTION survey shows that out of a total of 10,370 mi. to be built in the 11 Western States nearly 900 will be under contract by the end of 1957 at a construction cost of \$350,000,000. Presented here to tell the story for the West is a state-by-state summary and map showing every project.

Arizona

There are about 1,200 mi. on the Interstate System in Arizona. By the end of 1957 it is estimated that about 112 mi. will be under construction, representing a contract cost of about \$20,500,000.

On State Route 79, the Cordes Junction to Flagstaff highway, there will be five projects under way totaling about 42 mi. and costing about \$5,000,000.

On U. S. 66 there are four projects totaling 42 mi. and costing \$6,800,000.

On U. S. 80 there are three projects totaling 15 mi. and costing \$1,500,000.

On State 86 at Benson Steins Pass (Texas Canyon, East) there is a 9.3-mi. \$900,000 project.

On State 84 there are three projects totaling 16½ mi. and costing \$4,300,000.

The first Arizona Highway contract to be started under the Federal Aid Act is in Pima County on the Tucson-Benson highway. Work started on the 7-mi., \$387,600 job on March 26 by contractor San Xavier Rock & Sand Company.

California

The Interstate system in California contains about 2,172 mi. but this length is subject to change pending final approval by the Bureau of Public Roads. The exact locations of all road included in the system have not yet been determined.

A reappraisal of the Interstate System in California is now being made to determine the extent to which existing highways conform to the design requirements set forth in the Federal Aid Highway Act of 1956. When this study is completed it will be known how much of the System already meets the required freeway standards.

Funds made available for actual construction by the Act which was approved on June 29, 1956 were completely obligated by the projects indicated on the full-page map. These projects represent 160 mi. of highway

construction with a total estimated cost of \$158,000,000 including construction engineering.

The approximate location of the Westside freeway taken into the State Highway system by the Legislature in January 1957 is shown by a dotted line on the map. This route may become a part of the Interstate system to supersede U. S. 99 between Sacramento and a point near Grapevine in Kern County.

Colorado

There are over 600 mi. of Interstate Highway in Colorado, of which about 25 mi. is already up to freeway standards. It is tentatively estimated that by the end of December 1957 there will be 108.9 mi. under construction representing a contract cost of \$26,800,000. These figures are only estimates, since the Department operates on a fiscal year and the budget for the second half of 1957 will not be in effect until it is prepared by the Highway Commission and signed by the Governor.

Following is a list of the projects expected to be under construction by the end of the year:

	Miles	Cost
US 85-87, Colorado Springs South	20.5	\$ 5,100,000
US 87, to complete Denver Valley Highway	3.5	6,000,000
US 6, Adams City-Barr Lake, north of Denver	6.4	1,800,000
US 40, Agate-River Bend	20.5	2,200,000
US 85-87, Walsenburg, north and south	8.1	1,000,000
US 85-87, through Trinidad	3.5	900,000
US 87, Denver-Castle Rock	13.4	2,200,000
US 87, Lafayette Jct., north	6.0	1,600,000
US 87, Wyoming line, south	9.0	1,000,000
US 6, Fort Morgan-Brush	16.0	3,000,000
US 85-87, Colorado Springs Freeway	2.0	2,000,000
Total	108.9	\$26,800,000

Idaho

There are about 609 mi. of the Interstate System in Idaho. By the end of the year it is estimated that 63 mi. will be under contract at a cost of at least \$17,000,000.

Two large jobs are already under way, an 8.5-mi., 2-lane, project west of American Falls for a contract amount of \$994,597, and a 7.2-mi., 4-lane contract at the 4th of July Summit for \$2,731,683.

The projects expected to be under contract by the end of the year are:

US 30N—Rockland Jct.-Igo Overhead, 8.9 mi., 4-lane.

US 30N—Raft River-SH 77, 20 mi., 4-lane grading and structures.

US 30—Cleft-Sebree, NW of Mountain Home, 5 mi., 4-lane.

US 10—Rose Lake Jct.-East, 3 mi., 4-lane.

US 10—Coeur d'Alene Belt Hwy., 5 mi., 4-lane.

US 10—Jct. US 95A-Cedar Canyon, 3.8 mi., 4-lane.

US 91—Roberts-Sage Jct., 9.0 mi., 2-lane.

Montana

A total of 1,240 mi. of the System are in Montana, 400 mi. of which is 4-lane divided. About 10.5 mi. were under construction before January 1957 for a contract cost of about \$2,000,000. The Highway Commission hopes to have 52 mi. under contract by the end of the year at a total cost of about \$7,000,000. The approximate locations are shown on the map.

Nevada

There are about 543 mi. of Interstate System in Nevada. About 417 mi. are on U. S. 40 from the Utah State line to the California line and 126 mi. are on U. S. 91 from the Arizona line to the California line.

Now under construction are 5.5 mi. on U. S. 40, some 25 mi. east of Wells.

By the end of the year the Nevada Department of Highways expects to have about 21 mi. under construction at a probable cost of around \$9,000,000. About 10.5 mi. of this are on U. S. 40 in the Truckee River Canyon between Sparks and Fernley and 10.5 mi. are on U. S. 91 from about 20 mi. to 30 mi. northeast of Las Vegas.

New Mexico

New Mexico is off to a fast start with 155 mi. of Interstate System expected to be completed or under construction by the end of the year. These projects represent an expenditure of just under \$40,000,000. There is a total of 1,008 mi. on the Interstate System in New Mexico.

Oregon

There are about 715 mi. of the Interstate System in Oregon consisting of U. S. 30 from Portland to the Idaho border and U. S. 99 from the Washington to the California border in addition to the Urban System in the city of Portland and penetrating spurs at Salem and Eugene. Of this total about 81.5 mi. are already to full freeway standards. These sections are on U. S. 99, 45 mi. from the south urban limits of Portland to Salem, 3 mi. from the southerly end of the Salem by-pass toward Albany, 2.5 mi. in the Roseburg area, and 1 mi. in the Canyonville urban area. On U. S. 30 the sections consist of 11.5 mi. from 39th Avenue in Portland to Sundial and 18.5 mi. from Olds Ferry to North Ontario.

By the end of 1957 Oregon plans to have under contract about 50 mi. on U. S. 99 and 20 mi. on U. S. 30,

representing a cost of over \$30,000,000. The projects contemplated are:

US 99:

1. The extension of U. S. 99 from the southerly urban limits of Portland to the downtown business area.

2. The conversion of the Salem by-pass from two to four lanes.

3. The extension of the Pacific Freeway south from Salem to a junction with the Santiam Highway at Albany.

4. Completion of the section from Myrtle Creek to Canyonville.

5. Completion of the section from a point 9 mi. north of Grants Pass to Grants Pass.

US 30:

6. The completion of U. S. 30 from the downtown area to 39th Avenue in Portland.

7. Completion of 2 mi. to freeway standards easterly from Cascade Locks.

8. The completion to four lanes of the section immediately west of The Dalles.

9. The four-laning of 3 mi. between Hood River and The Dalles.

10. The completion of a four-lane freeway between Meacham and Glover.

11. The construction of a four-lane freeway from Emigrant Hill to Deadman's Pass easterly of Pendleton.

12. Construction of a section between Huntington and Olds Ferry.

Utah

There are about 643 mi. on the Interstate System in Utah but unfortunately estimates for 1957 are not available as we go to press.

Washington

There are 596 mi. of the Interstate System in Washington of which 33.5 mi. are already up to freeway standards. By the end of 1957, about 45 mi. will be under construction representing \$25,000,000 in contract money.

On U. S. 99 the projects are: North of Vancouver—Salmon Creek to Burnt Bridge Creek; Olympia Freeway; Fort Lewis; Tacoma Freeway; Bellingham Freeway; and Conway Junction north towards Mt. Vernon.

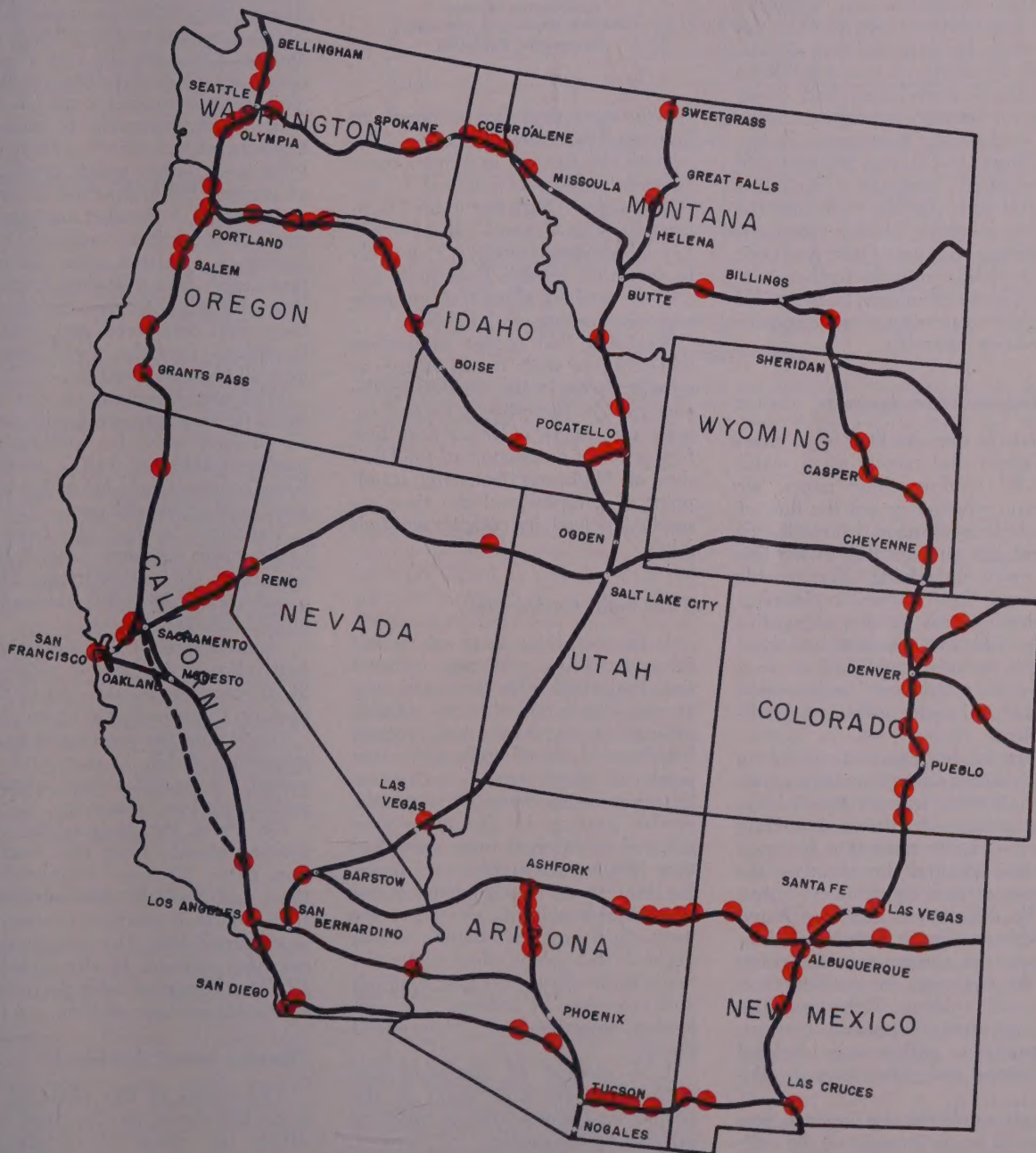
On U. S. 10 the projects scheduled are Snoqualmie Pass; Spokane Valley Freeway; and Burke Junction to Moses Lake.

Wyoming

At present there are 1,007 mi. of the Interstate System in Wyoming of which 17 mi. are now under construction to full freeway standards. The projects already under construction are located between Cheyenne and Wheatland, 10.1 mi.; Midwest and Kaycee, 8 mi.; Glenrock and Douglas, 15.8 mi.; and Cheyenne urban, 1.3 mi.

The locations of the forthcoming projects are not shown on the map since Wyoming Highway Commission policy states that no programs for construction will be made public until the projects have been let for construction.

Western projects for 1957 on the Interstate Highway System



EVERY RED DOT on this map of the 11 Western States represents a construction project on the Interstate System either underway or expected to be by the end of 1957. Exceptions to this are Los Angeles, where the dot represents 9 freeway projects, and San Francisco, where one dot stands for 6 projects. According to Western Construction's survey the overall length of 1957 construction contracts is 879 mi.,

which will cost about \$355,000,000. This length is about 8.5% of the West's total of 10,373 mi. Estimates from Utah were not available when this map was prepared in early May. The dotted line in California is the approximate location of the proposed Westside Freeway which may supersede U.S. 99 between Sacramento and a point near Grapevine in Kern County.

Applying controls to highway work

Management methods are needed as highway construction programs expand. California has prepared a standard progress curve as a guide for field control on contractors' progress.

ACCELERATING highway construction programs are requiring more management controls to be put into effect by state highway departments. Formerly, it was possible to maintain a fairly close and direct check on contract work with available engineering personnel. Today, in California we have a \$350,000,000 construction program (including rights-of-way) for the year, and the efficient handling of this volume is demanding changes in past practices. Responsibilities must be further delegated and decentralized. Such a trend make new controls and management procedures necessary.

Controls measure progress

Controls may be likened to pressure gages and meters on a water line. By reading these gages, we ascertain whether or not the flow of work is progressing satisfactorily, or if there is a partial block in the line that needs remedying. The trouble shooting is then confined to pinpointing these blocks. Studies along this line are far from complete and some controls recently established are now being given a "trial run" to determine the practical application and resultant effect.

In the establishment of controls to construction projects one cannot consider only those features beneficial to the engineers or the constructing agency, but one must also be practical and consider the effect on the contractors and construction industry. To this end, it has been found desirable to arrange formal meetings between the construction fraternity and the engineers for consideration of mutual problems. There have also been informal discussions between the parties to gather more detailed information and expressions of opinions.

Confronted with the program now presented by the passage of the Federal Highway Act of 1956, it was evident that the construction industry was faced with a test of speed in addition to the test of production. As everybody knows, the traveling public, who own our highways and

By **MILTON HARRIS**

Construction Engineer
California Division of Highways
Sacramento, California

streets, want their improvements to be completed with dispatch.

With this thought in mind, a management study was initiated by the Construction Department on "Contract Progress Control." It involved: (1) job progress control, (2) a study to determine feasible time limits and (3) the analysis of contract progress and weather non-working days.

Realizing that proper production scheduling of work would emerge as a major factor in any speed-up of the construction program, a general review was made of the recent performances of contractors of the Division of Highways from the standpoint of progress and the time actually involved in completing their jobs.

Time limits needed study

It was found that there was no uniform procedure and that contract time limits had often been arbitrary. It was also found that no suitable measure of job progress had yet been developed. Lack of uniformity often produced widely varied, and sometimes interesting results. For example, similar projects in like areas constructed at different times often had time limits considerably at variance. To insure more nearly adequate and reasonable time limits, and to provide more rigid progress analysis, it was decided that every effort should be made to develop reasonable methods and procedure of analysis. The following objectives were determined upon:

1. A method of analyzing and setting contract time limits in the preliminary stages, that is, prior to advertising the project.
2. A reasonable guide for determining progress of the contract work.
3. A method of analyzing and interpreting contract progress.
4. A method for determination of "weather non-working days."

Completion of the general review of selected construction projects suggested that a reliable indicator of construction progress could be deduced from the relation between estimate payments and time elapsed. The common denominator seems to be the dollar value of work performed, even though every effort was made to find a common value to be applied to production. Obviously the cost of excavating a yard of earth bears little resemblance to pouring a yard of concrete, yet the composite picture of a highway project reflects a fairly uniform area within which practically all projects fall irrespective of size or composition. A detailed analysis was made of 45 projects considered to be typical of jobs that were diligently prosecuted. The following brief statistics will give the characteristics of those jobs considered and indicate, in general, how they fitted into the over-all highway program.

With the exception of two contracts for structure and grading only, all projects were for grading and paving (PMS or PCC) projects. Some contracts included major structures, and others did not.

Variations in final cost from the preliminary estimates ranged from an increase of \$100,000 (plus 11%) to a decrease of \$21,000 (minus 4%) on \$23,000,000 of work.

Approximately 476 additional days were allowed by change orders on 36 of the projects, and 148 of these days, on 13 projects weren't required.

On 21 jobs the contractors started operations within 15 days after approval, 19 started before approval, and 5 were late in starting.

On 29 of the projects the work finished ahead of the final completion date; 10 were completed on time, and 6 of the jobs were overtime. Of the 6 overtime contracts, 2 were started late. The percentage of overtime contract in the sample is 13. This compares with the present state-wide average of 15%.

"Banana curve" developed

The results of this phase of the study are shown on the chart indicating the range of variation in monthly estimate in relation to the per cent of time elapsed (unduly fast, and the abnormally slow projects were eliminated in preparing the curve). Mathematically speaking the area within the curve represents

80% of the "payments vs. time elapsed" points. Ten per cent of the points above the median and 10% below were disregarded. The chart is, in fact, a statistical record of payment vs. time for the completed projects reduced to actual working days used.

In developing data for the curves, time was accumulated from the actual date the contractor commenced operations, and was adjusted for weather non-working days and any other legitimate delays that interrupted the progress of the work. This was done to determine as nearly as possible the actual time required by the contractor on each project, based on working days as specified in our contracts.

Time must be reasonable

Inasmuch as the contract time limit is a basic ingredient of any contract, the determination of the time limit should be based on a reasonable production rate considered in conjunction with the urgency of the project. This feature of construction practice was considered a very significant one for management to investigate and a suggested approach is as follows:

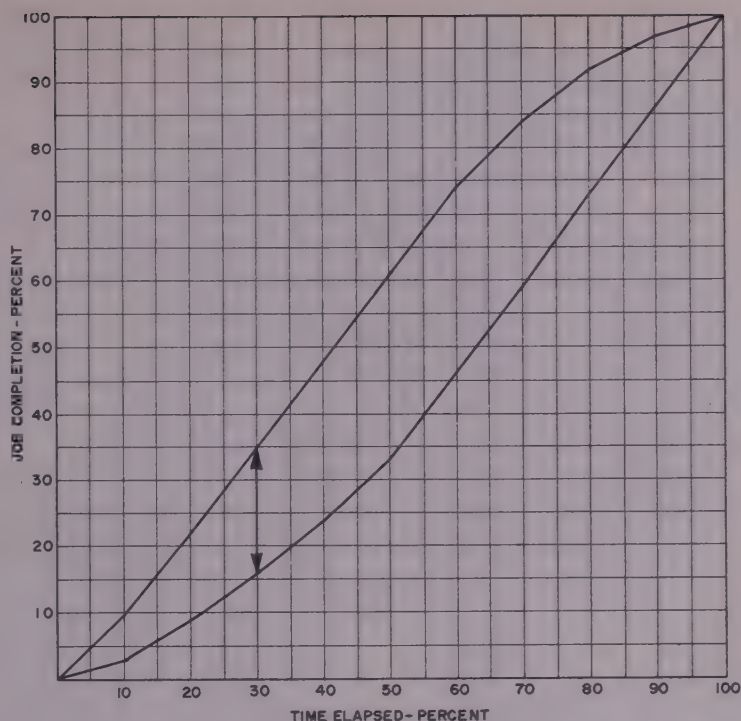
The basis for determining the time limit can be the production chart or schedule of proposed operation. This chart may be constructed by plotting a time bar for each main item, taking into consideration the estimated quantity and the daily production rate which the engineer determined to be reasonable.

In general, only the main controlling items of work will rate an individual bar. Related items may be grouped into a single bar for simplicity. For example, roadway excavation, water, compacting original ground, etc. can be considered to be one item for the bar chart.

Engineer must visualize

In making up such a pre-bid bar diagram, the engineer must mentally place himself in the position of the contractor. He must visualize the equipment to be used, the local conditions, the availability of materials, how to handle public traffic and all the other material aspects of the project consistent with good construction practices.

This diagram should be prepared, using working days as the abscissa, and cost or per cent of contract cost as the ordinate. A separate curve is drawn for each item shown on the bar chart, using straight line pro-



A SATISFACTORY relation between time-worked and job-progress is shown on this "banana curve" developed from actual job studies by the California Division of Highways. To illustrate: If the time elapsed is 30%, the arrow shows that the job progress should fall between limits of 35 and 16% of completion. Below 16% calls for an explanation by the contractor.

duction. Each curve should be started on the appropriate working day and shown as completed in the assumed number of working days. When curves have been drawn for all items, the abscissa is divided into 10% increments and the algebraic summation of all individual curves cutting each such 10% line are readily determined by scaling. The sum of all such values is then plotted on the construction progress curve, giving a resultant mass curve of progress.

If the mass curve does not fall within the limits shown on the construction progress curves, we are reasonably sure that our schedules of production are not realistic.

Curves are time check

It must be pointed out that the control curves themselves will not always determine a time limit. They will only serve as a check. The mass progress curve will indicate whether or not the time limit is consistent with the rates of production that have been assumed for the progress. It will always be necessary to analyze the work to be done and to set production limits consistent with the known factual limitations of the job.

Once this has been done, the use of the curves will serve as check upon the reasonableness of the time specified.

Another management study which has been initiated as a corollary to the time study pertains to contractor's performance. As a result of our preliminary studies, there is now included in the Special Provisions governing our contracts, a stipulation with respect to submission of a progress schedule by the contractor.

This progress schedule is a bar diagram as just described, but made up by the contractor and used by the state as the criterion of his progress. Resident engineers usually take the contractor's bar diagram and construct a mass production curve to see if it conforms to our so-called "banana curve."

In reviewing the contractor's schedule, the engineer usually checks the plan of operations against the "banana curve," as previously discussed, to see that the progress schedule is reasonable. If the contractor's proposed schedule does not plot favorably on the banana curve, the schedule is reviewed with him to determine the operations that are erratic or not properly scheduled.

(Continued on page 42)



Washing dirty gravel

Clay-covered glacial gravel in Montana is scrubbed clean and accepted under rigid Corps of Engineers specs for concrete at Glasgow Air Force Base.

DIRTY, CLAY-COVERED glacial gravel, unsuitable for use in high-class airfield concrete specifications, is being changed swiftly to clean concrete aggregate by a modern semi-portable washing plant at Glasgow Air Force Base, Montana. The contractor — Northwestern Engineering Co. of Rapid City, South Dakota — faced the serious problem of a bad pit, but saved the situation by installing modern washing and sizing equipment now available on the market. Wisdom of the investment has been proved. Rigid Corps of Engineers specifications for high-type concrete aggregates have been met without difficulty, at a production rate of 100 cu. yd. per hour.

Northwestern Engineering's headache originated in the fact that the glacial gravel, although otherwise sound, was extremely dirty. Raw gravel was a well-rounded material with particles of quartzite, granite and other good rock. In its deposition and subsequent rolling by glaciers in bygone ages, the particles were coated with extremely plastic clay. The pit was totally unsuitable as it stood.

Several times in the past, contractors have tried to use this formation for high-type concrete aggregates without success. It was impossible to shake the dirt loose, to blow it off with air, or to remove it with rudimentary washing plants.

Rather than to waste time, money and effort on a job so dependent on a short construction season, Northwestern called for recommendations from Pioneer Engineering Works, Inc., of Minneapolis, Minn. On the basis of a study and recommendations by Pioneer's experts, Northwestern purchased a Pioneer semi-portable 405-W washing plant, which was available as standard equipment. It proved to be the solution to the problem.

Fully integrated unit

The 405-W is a fully integrated, modern rock production plant designed especially for washing dirty material and sizing the finished product at a rate of production consistent with the demands of a modern construction job. Since it was desirable to have at least 100 cu. yd. per hour

The increasing availability of portable and semi-portable aggregate washing equipment is helping to solve today's construction problems. Concrete aggregates, hot-mix mineral filler . . . even the higher types of sub-base rock may require washing for best results. At the recent Los Angeles meeting of the National Sand & Gravel Association, nationally known speakers noted the advent of higher-type washed-aggregate specifications, even on highway work.

Any pit whose particles contain deleterious or decantable materials, or whose PI is high because of colloidal clays, is a logical candidate for heavy duty scrubbing equipment.

Many a Western pit is dirty. This one, in northern Montana, was practically worthless in its natural state for high-type aggregate production. But the contractor wasn't whipped. Here's what was done to meet airfield specifications of the highest type.

EDITOR

of concrete-placing capacity, the 405-W was selected with that production potential in mind. Since the time of its selection the plant has been able to meet this quota consistently, despite the fact that raw



WASHING and screening set-up with Pioneer 405-W washing plant at the right topped by its 6x13-ft. scrubber. The Pioneer screening plant in the left background was used to size base material.



RAW GRAVEL with its tight coat of plastic clay is being moved by Cat and U-dozer into the feeding hopper to be moved up to the scrubber at the top of the washing plant. Note the hand-picked pile of wood and debris indicating the condition of the raw gravel.



RECLAIMING washwater was a feature of the plant operations. Dirty water shown emerging from the Eagle sand dehydrator flows to a stilling basin from which it was reused. The problem of adequate water for washing gravel is a typical Western problem.

pit-run material turned out to be even dirtier than was first expected.

The contractor was lucky in another respect: The plant had been planned with sufficient room for the installation of additional flotation and washing equipment for cleaning even the largest-size aggregates. This, too, was a definite "edge," because it was believed at first that washing of larger particles would be unnecessary. Empirical experience soon demonstrated a need, however, for the removal of chunks of wood and other debris which cluttered sand and even large-size aggregates entering the plant. And the need for this trash removal was in addition to the efforts of a full-time laborer at the feed end, who threw out all debris possible.

Concrete aggregates alone require washing at Glasgow AFB. After exhaustive tests, the use of crushed gravel was permitted for hot-mix aggregates. Granular bases forming the lower portion of sub-base material are being built with the best available, sized material from the pits, rounded out by an excess of washed fine sand from the concrete aggregates washing plant.

Material flow

The raw pit-run material for the washing plant is being dug from a pit deposit in Porcupine Creek, about 4½ mi. from Glasgow AFB. The digging machine is a Bucyrus-Erie 54-B dragline, and its 2½-yd. Hendrix perforated bucket is loading a fleet of International 12-yd. trucks. These trucks dump to a raw pile near the feed end of the plant, where a Caterpillar D8 with U-type dozer supplies the plant feed. There has been some winter stockpiling in the past to develop a dependable supply of raw

material, free of flood danger, through the spring months. This was especially true during the 1956 working season.

Pit-run material enters the plant on a Pioneer 30-in. mechanical feeder, electrically powered. From the feeder, a 24-in. Pioneer conveyor, 160 ft. long, transports and elevates the gravel to a point about 50 ft. above ground level near the top of the plant.

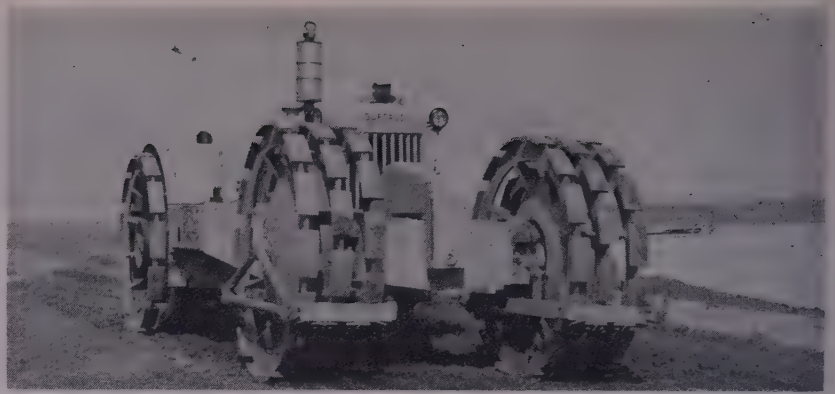
At the top of this conveyor run, the dirty gravel dumps into a Pioneer 6 x 12-ft. scrubber, whose revolving action rapidly dislodges the clay covering the gravel. This scrubber, developed after many years of experience, is trouble-free and thorough in its operation. A dependable supply of about 100,000 gal. of water per hour is pumped through the scrubber by two 6-in. Gorman-Rupp centrifugals, operating from a sump in the creek. To conserve as much water as possible during dry summer months, waste is sent back to settling ponds in flumes, so clear water can be recovered for re-use, and fine material can be settled out.

Material emerging from the scrubber passes to a heavy-duty set of 4 x 20-ft. tandem Pioneer vibrating screens, consisting of 12 and 8-ft. sections. Easily replaceable screen decks on these units separate the rock by sizes, scalping off the undesirable large fraction, and retaining acceptable coarse aggregate and sand.

One of the serious disadvantages of the Porcupine Creek pit is the presence of an excess amount of 40-mesh sand. A great deal of this material must necessarily be wasted from the concrete aggregate manufacturing operation. But the material is not lost entirely. The contractor is adding it to sub-base granular rock, being produced nearby at another Pioneer screening plant. This assures a washed blending product for the upgrading of that important material.

Emerging from the tandem Pioneer screens, the sand fraction is passed into a 16-ft. Eagle scalping tank where the sand submerged in water is further classified. A triple-cell flume beneath this unit also helps to reject between 10 and 15% of the odd-sized sand. The acceptable sand fraction passes into an Eagle sand dehydrator, whose screw-type mechanism turns out a clean and partially dehydrated product. The finished sand is sent by 24-in. Pioneer belt conveyor to a sand stockpile.

The intermediate aggregate (¾-in.) comes off the tandem vibrat-



SUB-BASE material was compacted by a Buffalo-Springfield Kompactor which secured excellent densities close to the concrete slabs. Waste sand was blended with the rock.



TEAM of Galion rollers compacting asphaltic concrete paving on the runway. Inspector is checking with a straight-edge. The 4-in. surface has a 45-in. base depth.

ing screens and passes to an Eagle coarse-material washer equipped with a trash-removing tub end. This mechanism was placed in the line purposely to float off wood and other debris which might have escaped up to this point. The intermediate-sized aggregate passes from this coarse-material washer directly to bin storage, where hauling trucks remove the finished product and transport it to the concrete plant.

The coarse-aggregate fraction (¾-in. through 1½-in.) is routed through another Eagle washer which accomplishes the same purpose, and is then transferred to bin storage. Sand, intermediate and coarse-rock aggregates either are stockpiled at the washing plant or hauled directly to the concrete plant for use. There has also been some re-use of the oversize rock particles, which are trucked to the adjacent crushing plant and reduced into hot-mix aggregates for the asphaltic concrete portion of the air base paving.

Use of the Pioneer 405-W washing plant reached a peak during the late fall months of 1956 when concrete

for the runway ends and the parking apron was being installed by two pavers at rates up to and beyond 100 cu. yd. per hour. According to Project Manager G. W. Keener, the washing plant was a major factor in producing a dependable supply of concrete aggregates meeting the highest specifications. Because of its ability to solve this problem, the critical concrete-paving item was closely integrated with other portions of the big contract, so that work could be pushed ahead on schedule as planned. The early portion of the 1957 working season will see final completion of this job.

Remaining job ties nicely

Remaining portions of the contract tied nicely with production of washed aggregate. By the time aggregate production had reached a peak, earthmoving was largely out of the way, and sub-base construction was well along. Placement of granular sub-base and the thick slabs of portland concrete paving—along with asphaltic concrete—then merged nicely as each operation dovetailed.

Planned accident prevention

— Profit insurance

THERE IS NO POINT in taking an elaborate wind-up to make this pitch. This either will or will not make sense, and we have no intention of appealing to anyone's better nature or attempting to break down a sales resistance. These remarks are pointed in the direction of highway work and the smaller contractor. In trying to do this, we have perhaps sharpened a particular point or two in order to make them felt more keenly, but this does not alter our conviction that, small contract or big contract, the safety problems in all construction are similar, and the same formula should work with them all.

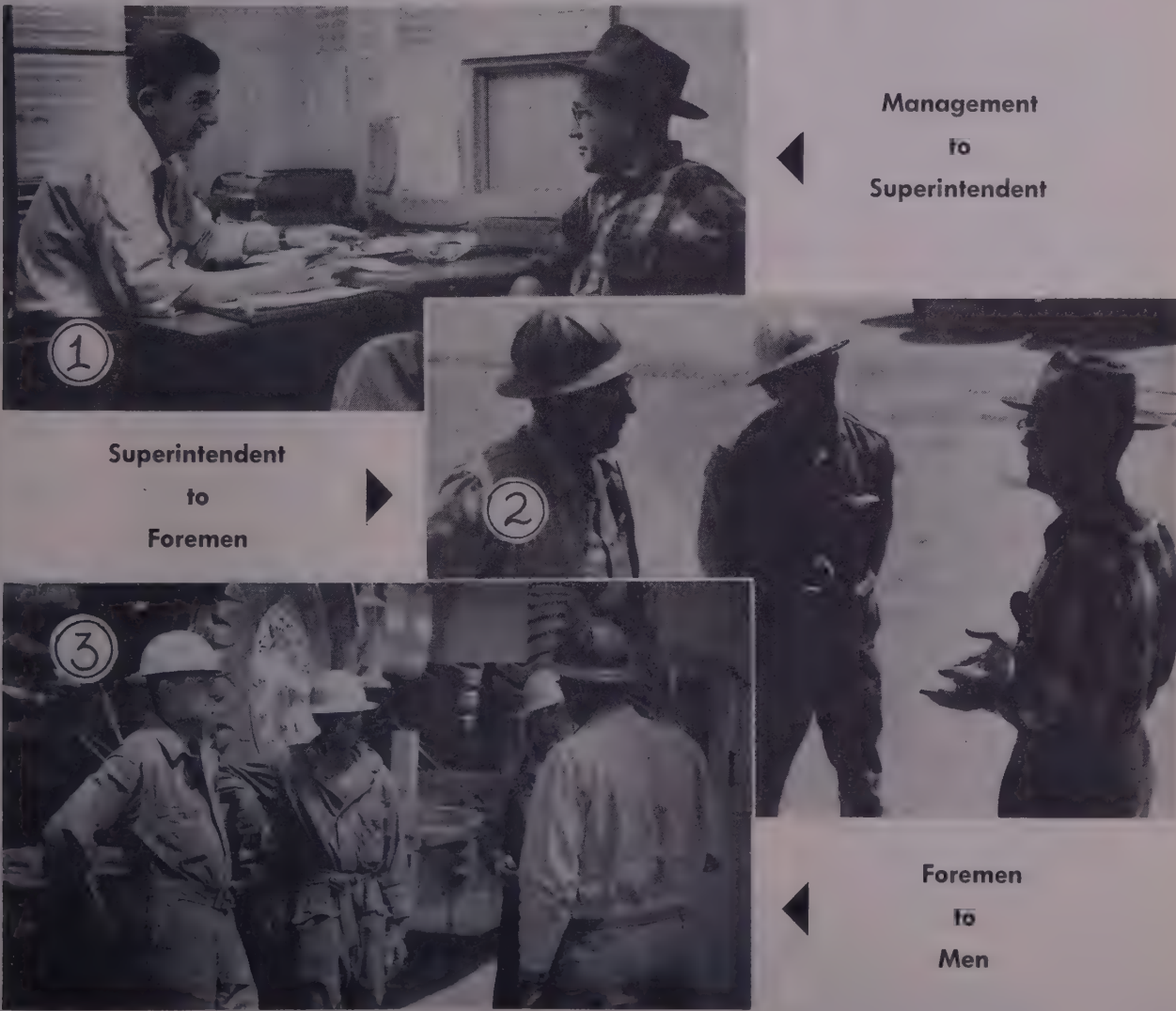
By **ROBERT M. EVENDEN**
Safety Manager
Guy F. Atkinson Company
South San Francisco, Calif.

The typical highway project will be fast moving, relatively small in payroll and in overhead, and not overly supplied with equipment, equipment replacements or maintenance organization. Usually such contracts cannot employ full time safety personnel and will ordinarily secure a limited amount of help from outside agencies with their safety problems.

Such work is highly competitive. Some contracts are won by virtue of an accident (in estimating) and such a project cannot afford another one. The small highway contract is least able to absorb the impact of injury to key personnel. Their top excavation man is probably their only exca-



FLOW CHART—Essential step in accident prevention process



vation man. Equipment damage is equally serious for the same reason. Even with the larger contractor, a spare unit cannot be maintained, for example, for every link in a concrete paving spread which might be damaged through accident and shut the job down.

Often heavy penalties await the highway contractor at the end of his "tough row of stumps," and, if the way has been littered with the debris of a heavy accident frequency and days are missing from his production schedule, the effect will be disastrous. As long as we are painting this picture in dark tones, let's also add the effect upon a small hard-won profit margin of a heavy court judgment as the result of a civil damage suit. The average highway contract has no slack, no cushion to absorb the high costs of accidents. (Has any contract?)

These facts are a foundation upon which effective safety work should and can be built. All the humane aspects of accident prevention are best served if we will recognize that it is sound business to conserve the time, the personnel and equipment, and the money that will sink without a trace in the dry, sandy wastes of a bad accident record.

Always, at this point in telling the story, it occurs to us that in talking to business men we should, by now, have gone far enough. There is actually very little we can tell you about solving the problem that you do not already know or that you have not already put to use on your other problems of management. We think, therefore, that the basic principles of the following approach to accident prevention are not unique and are equally applicable to any management problem.

Six important steps

Step 1. Company management must make a firm and formal decision to consider the problem of accident prevention high among its basic production problems. It must either be given first-line importance or the contractor must resign himself to only partial success.

Step 2. There must be a positive assignment of responsibility for accident prevention given to project management or supervision. In other words, the company general manager must tell the top man on each job exactly what he expects him to accomplish and, as far as necessary, how to do it.

Step 3. A simple yet adequate rec-

ord or control system must be established which will give main office management an easy, accessible and accurate measurement of the progress which project supervision is making in the control of accidents.

Step 4. Project supervision must organize its work to carry out its assigned responsibility. A simple, adequate program should include the following:

A. The assignment, in turn, of the responsibility for accident prevention to every superintendent and foreman on the project in his phase of the job.

B. The provision of time, methods and facilities for foremen to carry out this responsibility. By this, we mean the establishment of such things as "toolbox" meeting between foremen and their workmen, the setting up of safety rules and practices for the job, the investigation and correction of accident causes, posters and bulletin boards, etc.

C. The complete support of every foreman in administering whatever discipline is necessary to enforce safe practice.

D. The establishment of the best equipment maintenance program which circumstances will allow.

E. The establishment of cooperative relationships with all law enforcement agencies having contact with the job in relationship to the safety of the workmen or of the general public. Their services should be encouraged and welcomed, rather than evaded.

F. Where difficult and technical problems of hazard develop, call for assistance. With such things as buried gas mains, electric lines, etc., don't proceed without full knowledge and whatever assistance is necessary.

Step 5. Call upon the safety engineering service of the insurance carrier. We have deliberately placed this step here in the outline because we believe that all the preceding steps should be under way before taking this step. Many organizations who insure for workmen's compensation and other accident losses have fine programs of engineering aid, but they are no substitute for the self-help which we have attempted to outline. A program of accident prevention must have on it the label of the contractor, not that of the insurance company.

Step 6. Develop an earned reputation for a deep and sincere interest in safety. Participate as much as possible in the safety programs of your associations and other agencies. Such a reputation is as valuable as a good credit rating.

That is the pitch. There is little more to be said, and action is the next and most important component. Good construction men collectively know more about the hazards of their work than one professional safety engineer. It is unfortunate that many good construction men have not learned to apply this particular knowledge to their work and consider it something aside from getting the job done. This is perhaps the reason and justification for the entry of the professional safety man into the picture, for in many instances it remains for him to secure the most effective use of everyone's background and experience in accident prevention. The inevitable conclusion remains, however, that given the awareness and the incentive to solve the accident problem, management, whether it is large or small, has all the tools and can best handle the job.

Contract controls

(Continued from page 37)

If, during further progress of the job, the contractor does not maintain his planned schedule, the engineer arranges for a discussion with the contractor of his future progress and requests a revised schedule to bring production up to normal.

Should the progress still remain unsatisfactory, consideration is given to contact the contractor's surety company, so that all parties to the contract will be aware of the unsatisfactory performance to date. In extreme cases, it might be necessary to regulate the contractor's prequalification so as to limit his bidding capacity on future work or in rare instances, the job can be taken away.

For overrun in contract time, the contractor is assessed liquidated damages which are based on the estimated cost of engineering and inspection. Payment of a bonus for early completion of the contract has not been adopted even though provided by law.

From the foregoing explanation it is apparent that construction management has a control tool backed by sufficient facts to guide most any size construction program in an orderly and efficient manner. Our attention is automatically focused on those projects about to run behind schedule and in most instances we find that resident engineer has taken action.

This paper was presented by Milton Harris at the 1957 Annual Street and Highway Conference of the Institute of Transportation and Traffic Engineering at Berkeley, Calif.



TEXAS CITY STREETS Contractor reported highest pouring ever. Credits Flex-Plane. Note amount of concrete in front of screed here.

better! It is more flexible, stronger and faster than ever! Inherent frame design features allow the greatest amount of flexibility—even as much as 12 to 25 feet in one machine! And, there is a complete line of FLEX-PLANES to cover any width range desired. Only FLEX-PLANE self-widening offers independent control of extension frames, which means both sides of the machine can be extended or retracted to-

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NEW STATE PARKWAY Contractor watched machine operate on nearby Route 1 project. Bought immediately.



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261

Granite boulders are a problem on —

Tough highway rock job in Arizona

Drilling and shooting buried boulders is a tough job on Arizona county road project. Rubber-tired scrapers with beefed-up bowls are being used to excavate abrasive granite.

ABOUT AS TOUGH a rock job as you will find anywhere is now under way in Arizona. It's a 5-mi. county road job on the Payson highway about 40 mi. northeast of Phoenix. Contractor Wallace & Wallace is faced with about 200,000 cu. yd. of tough abrasive granite rock to excavate, some of it in solid veins, some of it in the form of huge hard-to-handle

boulders. An interesting feature of the job is the use of rubber-tired scrapers where most contractors would use shovel and trucks.

The project was awarded to Wallace & Wallace in December of 1956 on their low bid of \$585,000. The job is financed by Maricopa County with Federal aid. The State Highway Department is supplying the engineer-

ing. There is about 300,000 cu. yd. of unclassified excavation on the job, most of which is rock.

Blasting boulders is tough

The entire 5.25 mi. of the project is over new alignment. About 2,000 ft. pass through an area of decomposed granite studded with boulders ranging in diameters from several feet to 25 ft. Drilling and shooting the boulders on the surface was managed without too much trouble, but getting at those under the surface was a more difficult matter.

When the drills would strike the rounded surfaces of the boulders they would tend to slide off to one side. Even if the drill encountered a flat surface and entered into a boulder there was no way to tell how big it was and loading the holes for efficient blasting was next to impossible. Sometimes the blast would completely shatter the boulder and sometimes just split it in half. Often the blast would simply stir up the sand. The boulder section took about 1 lb. to 1½ of Apache bag powder per cu. yd. of rock removed.

Wallace & Wallace was fortunate in having one of the best drilling and blasting crews in the state to work on this project. Four drilling rigs are being used, two Ingersoll-Rand wagon drills and two Gardner-Denver Air Tracs. Drilling is done in 20-ft. lifts. The carbide bits require sharpening after passing through about 35 ft. of the abrasive granite. The deepest cut in the boulder section is 50 ft. The deepest cut on the job is 127 ft. through a vein of solid rock.

When the contractor decided to try to load out the rock with rubber-tired scrapers, he purchased two Le Tourneau-Westinghouse Model B scrapers for the job, the first two in the state. The contractor is also using 3 end-dump Euclids and an end-dump Tournapull working with an 80D Northwest shovel, and three 5-yr. old Euclid 8TDT scrapers.



GRANITE BOULDERS dwarf a car on a detour around the job's main cut. Building a highway across topography like this is full of problems, requires skill and plenty of plain hard work.



SOLID ROCK was encountered in some sections. The rock is very hard, very abrasive. Carbide drill bits required sharpening about every 35 ft. The deepest cut on the job is about 127 ft.



CONTRACTOR Wallace and Wallace has what many consider to be the finest drilling and blasting crew in Arizona at work on this job.



They are using two Gardner-Denver and two Ingersoll-Rand drilling rigs. At the right the Northwest 80D gets an oiling during lunch period.

Model B scrapers are rated at 32½ tons capacity, but on this job they have been loaded up to 40 tons occasionally. They are powered by 300-hp. Cummins engines and have Fuller 5F-1220 sliding gear type transmissions with a 2-speed Le Tourneau-Westinghouse transfer case. They are operating on 27:33 General tires. They have a 24-in. clearance, every inch of which was needed in loading out the big rock fragments, some of which were nearly as big as the scraper bowl.

Both of the Le Tourneau-Westinghouse machines on this job are equipped with Electrotarders mounted on top of the yokes. The Electrotarders have greatly reduced the wear on the brakes, clutch, and engine, as well as eliminating the need for dragging the pan to reduce speed on downhill runs. It is switched on and off from the operator's platform and lessens speed at any rpm.

Beefing up the scrapers

In order to better withstand the extremely heavy usage on this job, all the scrapers have been modified by the addition of hardfacing and stiffeners. The entire bottom of the bowls as well as parts of the sides of the bowls are covered with a layer of hardfacing. Across the bottom of the



TWO MODEL B Tournapulls, the first in the state, are working on the project. Both have electric speed reducers, called Electrotarders, mounted on the yokes, reducing brake wear.

bowls 1 x 2-in. steel strips are welded on 8-in. centers. This adds nearly 1,000 lb. to the weight of the scraper, but is essential in very heavy rock work of this type.

What little ripping that was possible was done with a Caterpillar trailer ripper-tooth with a 30-in. shank pulled by a Cat D9 and pushed by a D8.

Compaction is being accomplished with both sheepfoot rollers and pneumatic rollers to the engineer's satisfaction. The final phase of the project will be the laying down of

4 in. of aggregate base course topped by a penetration asphalt applied at the rate of about ½ gal. per sq. yd. The job is expected to finish in June.

The job superintendent for Wallace & Wallace is H. S. Renick. For the Arizona Department of Highways, Roy Miller is resident engineer. Inspectors are Loren Ray and Bob Sherman.

The LeTourneau-Westinghouse Model B scrapers were supplied by Road Machinery Co. of Phoenix, which also carried out the modifications.

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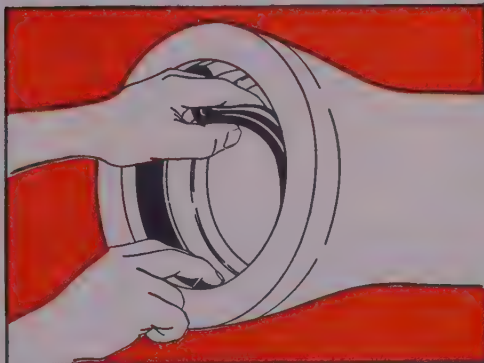
WHOLLY INTEGRATED PRODUCER FROM MINES
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INDUSTRIAL SERVICE

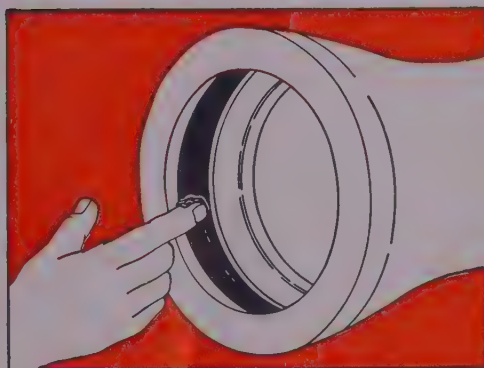
CAST IRON



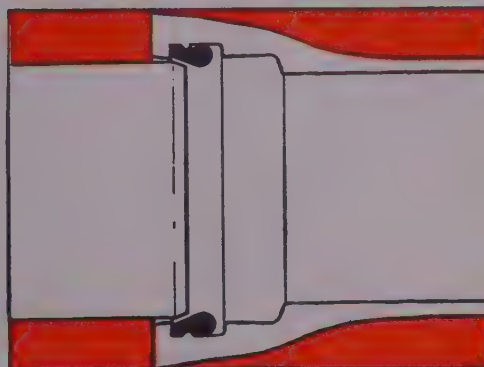
ONLY FOUR SIMPLE ACTIONS



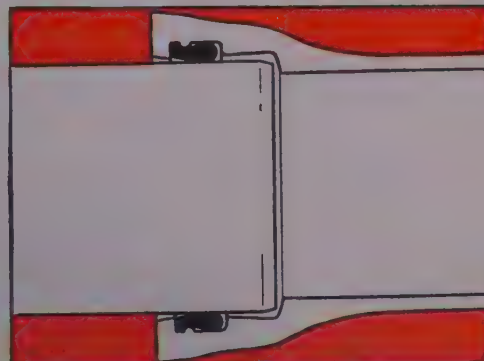
Insert gasket with groove over bead in gasket seat



Wipe a film of special lubricant over inside of gasket



Insert plain end of pipe until it contacts gasket



Force plain end to bottom of socket... the job's done!

Special loader speeds earthmoving

Washington contractor builds his own portable elevating loader which fills a 14-cu. yd. bottom dump in 25 sec. Double-hopper trucks, also built by the contractor, carry 37 cu. yd. of material per trip, help keep job ahead of schedule.

UNIQUE methods of operation are keeping Curtis Construction Co. of Spokane well ahead of schedule on a highway project in central Washington. The project is on State Highway 10 between Rock Island Dam and Vulcan, along the Columbia River. Curtis began the job last September after submitting the low bid of \$477,954.

The first construction problem encountered was an approximate 90-ft. cut with a relatively long haul to a large fill. This cut was opened in the conventional manner using 3 or 4 D8 Caterpillars and dozers. Then Curtis switched to a new method, introducing a portable loader.

The loader is a shop-made unit. Its primary feature is a 20-ft. section of 48-in. endless conveyor belt powered by an RD6 motor. The back portion is framed in with sheet metal and

timber similar to a crushing bunker. And the entire unit is movable, being mounted on an axle and set of dual 11:20 tires.

The loader is benched into a cut, feeds by three D8 Caterpillars and dozers, and loads into four DW 15 wagons. The dozer push is limited to about 250 ft. Then the machine is moved, with moving time about 1½ to 2 hr. Working two 8-hr. shifts, the maximum production day was 9,500 cu. yd. with loading time running about 25 sec. per 14-yd. load into a DW 15. The two large cuts of 228,000 and 125,000 yd. respectively were both moved using this unit.

(The Vulcan to Rock Island project is a State Highway job in Douglas County, Washington. The article presented here was prepared for WESTERN CONSTRUCTION by Pat Thomson, Douglas County Engineer. EDITOR)

Water was a very definite problem, both getting it to the road and getting it on the subgrade. With the Columbia River practically lapping at the toes of the bigger fills, it was nigh impossible to get down the precipitous slopes. Therefore, Curtis placed a 300-gpm. pump on the river bank, running some 1,800 ft. over a 300-ft. lift to a 2,000-gal. surge tank on the hill. To avoid having to carry fuel a 500-gal. fuel tank was placed on the top bank and a ½-in. feed line run to the pump. Under normal pumping conditions, the 2,000-gal. surge tank could be filled in eight minutes.

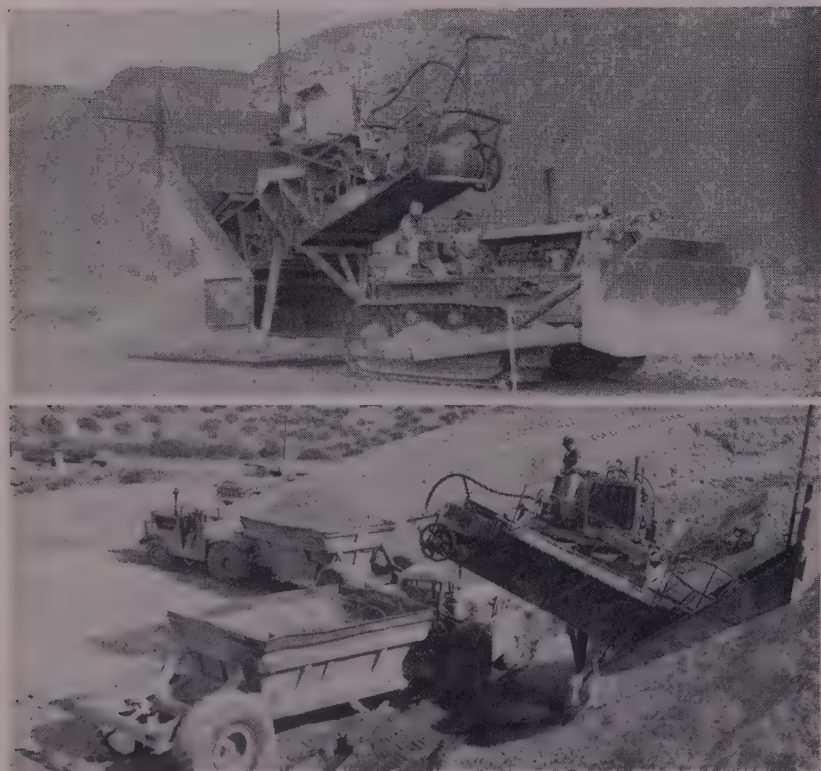
Cut through clay

This first large cut material was a floury, light-gray clay. When water was added to fill surfaces to aid compaction, it seemed to seal the surface immediately. An additional 10,000 gal. would never seem to penetrate beyond that original inch, running off the subgrade in streams. To solve the matter, water was piped to the front end of the loader, sprayed through pressure bars above and below the earth stream as it was loaded. Metered through a 3-in. meter, a water content of 10 gal. per cu. yd. was obtained, giving an excellent compaction without sloppiness.

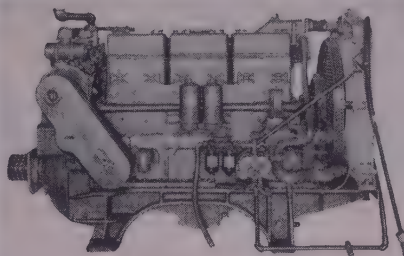
The character of this excavated material made it unfit for profile grade. A selected graded material as determined by the resident engineer, and consisting of a heavy natural gravel, was hauled in for a depth of 2 ft. on a 1,500-ft. stretch. The clay soil was not stable enough to withstand the impact of traffic travel.

From dust to soup

The Douglas Creek drainage is peculiar to the drainages found in this area. In the month of August, it is a stone-dry, dust choked gully slashed across the Palisades coulee floor. In March it often runs bank full with a thick, viscous mixture of silt and water. June cloudbursts often spill down the "gut" in a roar of chasing



TWO VIEWS of loader built in the contractor's shops show it being pulled to a new location by a Caterpillar tractor (upper photo) and in place loading 14-cu. yd. bottom dumps. In two 8-hr. shifts 9500 cu. yd. could be loaded with this special rig.



This Allis-Chalmers 197-hp diesel "matches the needs" for tough excavator service in the Bucyrus-Erie 2½-yd 54-B.

ALLIS-CHALMERS ENGINES MATCH YOUR NEEDS

MATCH YOUR PERFORMANCE STANDARDS — with Allis-Chalmers high-torque, high-usable-horsepower engines that *stay on the job*.

MATCH YOUR POWER REQUIREMENTS — from a wide range of sizes and types, 9 to 516 hp. Specify or install them in *all* your equipment.

MATCH YOUR FUEL SITUATION — There are Allis-Chalmers engines for any fuel you choose — diesel, LP gas, natural gas, or gasoline.

MATCH YOUR SERVICE NEEDS — with close, fast parts and service, wherever you are. Your Allis-Chalmers engine dealer has a full stock of parts, factory-trained servicemen and complete facilities to give you prompt service in his shop or on your job.

See your Allis-Chalmers dealer for full information on engine power and service matched to your needs. Allis-Chalmers, Buda Division, Milwaukee 1, Wisconsin.

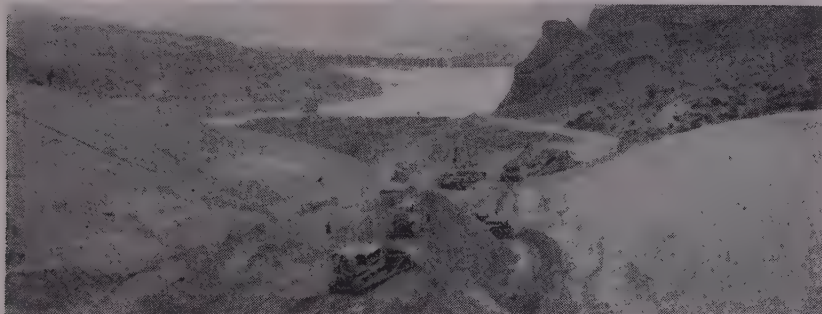
BC-8 A

ALLIS-CHALMERS

Engineering in Action



HERE is the two-hopper belly dump wagon manufactured by the contractor being weighed after leaving the crusher. The big rigs were capable of hauling over 36 tons.



OVERALL VIEW shows job's biggest cut—228,000 cu. yd. The crawlers are dozing material into the special loader which is hidden from view. In the background is the Columbia River.



CONCRETE is dumped from a one-yard bucket into 48-in. cylindrical pier form for overcrossing structure. Forms are made of wooden barrel staves and steel banding.

water. Consequently, a bridge was needed, presenting many difficulties.

The new structure had to be an overcrossing involving the Great Northern Railway. Since this was the mainline between Spokane and Seattle, the contractor was burdened with the maintenance of safe train operations at all times. Direct liability possibilities had to be covered by insurance. These policies included a \$100,000 public liability and property damage for the prime contractor, the same amount and type of policy carried by the prime to cover sub-contractors, and a railroad protective liability insuring the Railway Company against any and all losses as endorsed by them.

The canyon area was not large enough to accommodate channel,

railroad utility, and the conventional type bridge pier. To gain the necessary horizontal clearance the unusual design of a single circular centered pier was utilized. All the contractor's falsework and cribbing plans had to be submitted in advance giving an 8½-ft. horizontal clearance from the center of the track and a 21-ft. vertical clearance from the top of the rail, considering also superelevation and curvature.

The circular piling forms were made on the job, with the National Pipe & Tank Company, Portland, furnishing the staves and bands for a 48-in. pipe. Half a stave had to be added to cover the veneer lining necessary for pouring concrete.

The limited access features separated an orchard, requiring the con-

struction of a large concrete underpass. This had a 12-ft. horizontal clearance, 16-ft. outside, 12-ft. inside vertical clearance, on pad footings, with a 4-ft. gravel backfill inside. The box was 75 ft. long, wing-walled on the right end, clipped for extension on the left end when 4-lane facilities go through.

Ralph Clapp & Sons were sub-contractors for both the bridge and underpass. On the underpass, an old tunnel trick was used. One 25-ft. section of forms was constructed, shimmed up for the pour. The shims were then knocked out, dropping the forms onto 2-in. pipe rollers. And the entire form was rolled into position for the next pour. And in this instance, the trick was successful.

At first reasoning this may be considered a heavy expenditure for orchard access. However, this is the largest orchard in the entire valley region, with more than 500 ac. in active production.

The first structure encountered on the project was an 84-in. multiplate pipe 323 ft. long and lying on a 21% grade. This pipe came with a factory paved invert, the first instance of its kind in the Pacific Northwest. To prevent invert paving damage, the pipe was tied horizontally instead of using timber struts. Steel rod ties were pre-cut of ¾-in. stock 92 in. long and threaded both ends. Compression caps 4 x 4 x 18 in. were set on the outside, the nuts tightened to give 80-in. horizontal measurement, actually a 5% deformation.

Ingenious contractor

Curtis might be called the company of ingenuity, for the ballast was placed by twin belly dumps that are an entirely new feature. These beds were built in the Curits shop by their own mechanics, use an Autocar Diesel prime mover, and carry 36-37 tons. Each hopper functions independently for spreading. Three such rigs working a 3-mi. one way haul for seven hours can place 2,400-2,500 tons of 2-in. material.

The crushing unit is partially powered by a Marine Diesel GMC 1,400 kw figured roughly at 800 hp. This unit more than likely came from a destroyer escort and is used to power a 4.5-ft. cone, the biggest in this region, and one set of 54 x 24-in. rolls.

This project has been an extremely interesting one. And leaves little doubt as to the proficiency and competency of the Western contractor to handle the expanded highway construction.

Falsework is key to O'Byrne Bridge

Building a cast-in-place concrete bridge 125 ft. above water poses some difficult falsework problems. The winning bidder is using a battered design, leaning the supports toward the center from each side of the stream.

WHEN THE RESERVOIR begins to rise behind Tulloch Dam near Sonora, California, many of the descendants of Mark Twain's celebrated jumping frog of Calaveras County will have to find new living quarters. The reservoir is in the heart of Mother Lode country, made famous by writers of the Gold Rush days. Motorists through the area won't be inconvenienced, though. The historic covered O'Byrne Ferry bridge, which may be salvaged by the State Historical Society, is being replaced by a new high level structure a short distance up the Stanislaus River.

Tulloch Dam and reservoir is the lowermost unit of Tri-Dam Project being built for the Oakdale and South San Joaquin irrigation districts. The bridge is being financed by the irrigation districts and Calaveras and Tuolumne counties.

Plenty to think about

Contractors who bid the job late in 1956 had plenty to think about. For one thing the bridge was to be cast-in-place at elevations up to 140 ft. above the ground, with 65 ft. of the highest section over water. For another, all piers and falsework had to be up to elevation 440 (60 ft. above the normal stream elevation) by March 15 so that bridge work could continue even if a high water level resulted from heavy spring runoff.

The bridge is 577 ft. long with a 20-ft. roadway. The main over-water span is 155 ft. The middle three spans of the bridge are to be of box girder design with a 9-ft. depth. The two spans at each end are of cast-in-place T-members.

Three falsework ideas

Several ideas for building the bridge were proposed. One contractor planned to bring the center two piers up to the elevation 440 and then construct a wooden arch from pier to pier to support the formwork for

the bridge deck. Another planned to fill in most of the stream and construct conventional vertical shoring resting on driven piles.

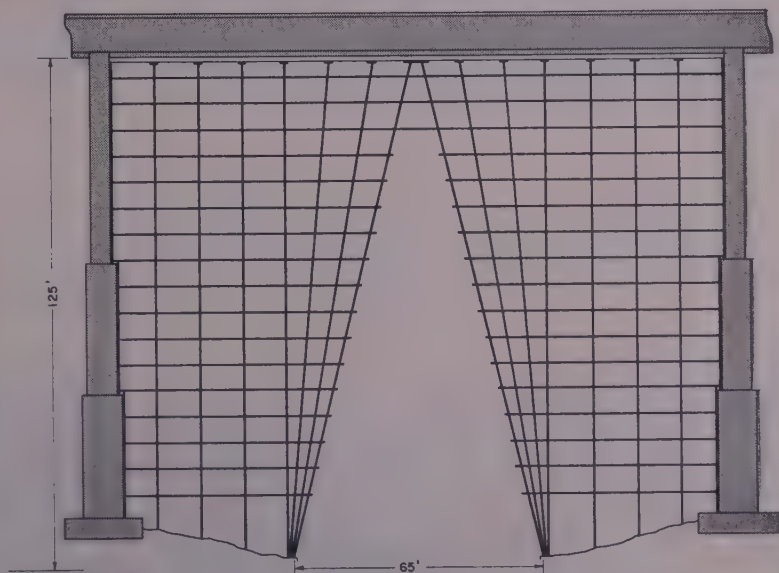
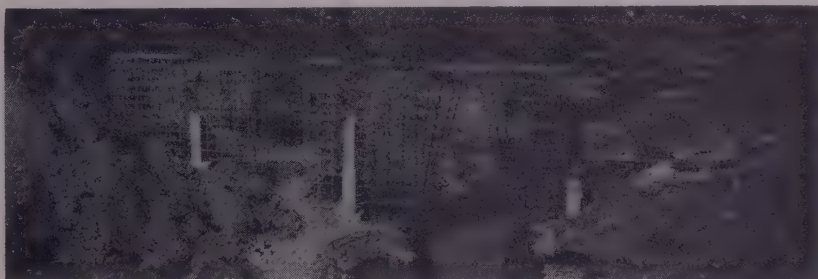
Don Winniford, partner in the Thomas Construction Company of Fresno, California, came up with a battered falsework system. Thomas was low bidder with an offer of \$458,355. The next two low bids were \$517,883. and \$531,126.

Thomas began work January 1957 and expects to finish by September. The first job was building the footings for the piers. Solid rock is for the most part at ground surface. Footings for each of the piers are 5 ft. high

and range in size from 12 x 21 ft. to 19 x 34 ft. The biggest required 257 cu. yd. of concrete. Pier No. 6, which was under construction when WESTERN CONSTRUCTION visited the job, consists of two 4 x 5-ft. columns rising 64 ft. from the foundation. The entire 64 ft. will be poured in one lift.

The forms for the pier are panels 16 ft. high made of $\frac{5}{8}$ -in. plywood with 2 x 4 studs 12 in. on center and 6 x 8 walers on 2-ft. centers. The panels will be used four times in making the 8 piers. On pier No. 6 there are no she-bolts or snap ties running through the concrete. All ad-

(Continued on page 60)



TOP PICTURE shows general arrangement of falsework for entire bridge while drawing shows falsework system for the main over-water span. All vertical members are 6 x 8s, 20 ft. long. Horizontal members and bracing are 2 x 6s. The battered members are additionally braced by tying them back to the piers with wire every 20 ft. of their length.

"65" PAYHAULER[®] hauls

4-ton rocks and 2/3-mile haul involved in Oregon road straightening job!

The wet, sticky clay in these pictures will give you an idea of the working conditions encountered by the "65" Payhauler operated by the Funderburk Construction Co., Sutherlin, Ore., on their 2-mile road job near Elkton. This clay cut machine efficiency on the job as much as an estimated 50%. Truck bodies had to be scraped clean periodically. And a bogged-down 1½-yd shovel had to be replaced by a sure-treading 3-yd International Drott TD-18 Skid-Shovel[®].

In spite of these rough working conditions...and in spite of big 4-ton blocks of rock found in the clay...the International "65" Payhauler still maintained an average of 96 yds per hour on the 2/3-mile haul to the fill.

Veteran earthmover and Payhauler operator, Aaron Johnson, stated, "Here is the poorest loading material I've ever seen. Still I'm getting six 16-yard loads each hour over a cycle distance of 1½ miles."

Don't let unexpected weather and resultant job-bogging clay, mud, or water hold up your off-highway hauling jobs. Consider these all-weather, all-condition Payhauler advantages: proper weight distribution with 71% of total load on "95" drive wheels...74% of total load on "65" drive wheels; ample power from turbo-charged diesel engines with built-in fuel savings up to 10%; maximum power-transfer efficiency of International's long-lasting cerametallic-faced clutch; and load-matched gear ratios for smoother, faster selection of the right gear for every grade...every road condition.

Rock, bigger than 3-yd Skid-Shovel bucket, found in wet clay cut operating efficiency. Payhauler body, fabricated from abrasion-resistant high-tensile steel, together with strongest frame in its class, stands up to tough punishment of rock loading.



INTERNATIONAL[®]
CONSTRUCTION
EQUIPMENT

International Harvester Co., 180 N. Michigan Avenue, Chicago 1, Illinois

A COMPLETE POWER PACKAGE: Crawler and Wheel Tractors...Self-Propelled Scrapers...Crawler and Rubber-Tired Loaders...Off-Highway Haulers...Diesel and Carbureted Engines...Motor Trucks...Farm Tractors and Equipment.



96 yds per hour



of job-bogging sticky clay!

Double-acting hoist cylinder in all stages
with 106,300 pounds of force in first stage
raises body in seconds. Hydraulic snubbing
action prevents undue stress on hoist cyl-
inders and "gentles" body return to frame.

International Drott TD-18 Skid-Shovel re-
placed 1½-yd shovel to load clay, big
boulders into "65" Payhauler. "65" gives
you big, bonus-producing 18-ton capacity,
Model "95" 24 tons.

International trio...TD-18 Skid-Shovel,
TD-24 tractor and Model "65" Payhauler
promote production for Funderburk Con-
struction Co., in spite of wet, sticky clay
and big, stubborn rock.



O'BYRNE FALSEWORK

(Continued from page 57)

justing is done outside of the column with screw ties rented from Superior Concrete Accessories which run through the walers. Final alignment of the forms is done with guy wires and turnbuckles.

The concrete has 4.7 sacks of cement per cu. yd. with 1 qt. of Pozzolith added per sack of cement. Twenty-eight-day tests of better than 4,000 lb. have been common using a 2- to 3-in. slump.

Since the nearest source of ready-mixed concrete was at Sonora, 20 mi. away, the contractor elected to mix the concrete on the job. A Ruby portable batch plant with a capacity of about 30 cu. yd. per hour was set up at the west end of the job. The contractor purchased two transit trucks to transport the concrete, (Ford trucks with 5-yd. Jaeger mixers). The haul will vary from about 100 ft. to 1½ mi.

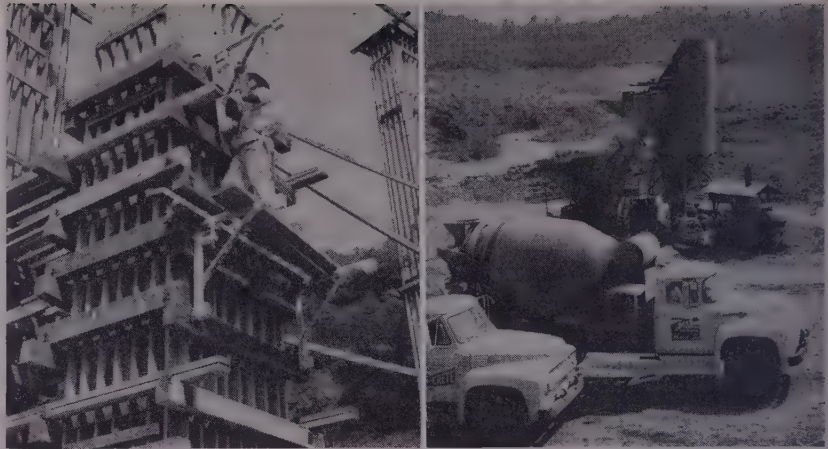
For the columns, the concrete is being poured from a 1-cu. yd. Gar-Bro bucket handled by a Link-Belt 30-ton truck crane. When the deck is poured the contractor plans to use power buggies hauling from both ends of the bridge.

The falsework consists entirely of 6 x 8s and 2 x 6s braced and guyed with 5/16-in. wide (the contractor obtained 8,000 ft. of 5/16 wire from an army surplus store, all of which is being used on this job). All vertical members are 6 x 8s and all horizontal members and diagonal cross bracing are 2 x 6s.

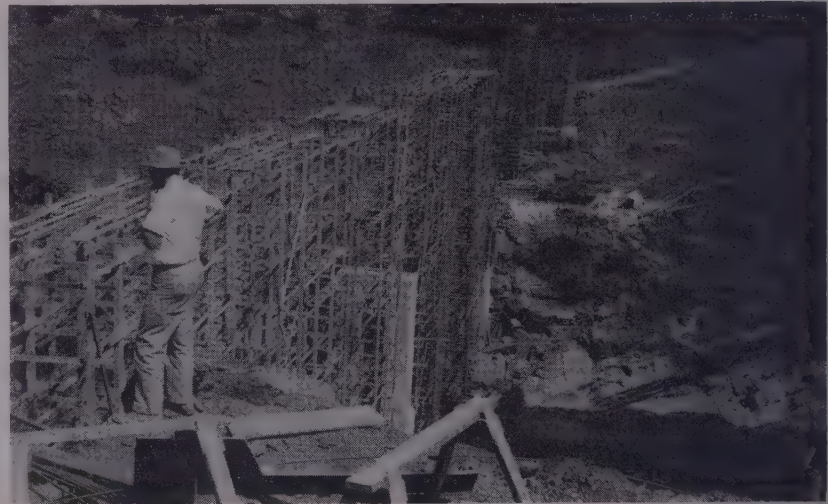
To minimize the amount of nailing necessary above the ground, sections of the falsework were built in a special jig and lifted into place. The sections were 18 ft. 6 in. wide (three 6 x 8s at 9 ft. 3-in. centers), 20 ft. high, with diagonal 2 x 6 bracing and horizontal 2 x 6 ledgers. Five 30-penny nails are driven at every nailing point. The splice of the butted vertical 6 x 8s is made by nailing 2 x 6 scabs 30 in. long on two sides. Four pile butts do all the nailing above the ground and over the water. There is 150,000 bd. ft. of lumber in the falsework.

The entire framework is braced with guy wires attached every 30 ft. both horizontally and vertically and leading out about 100 ft. away from the structure and doweled into the bedrock. Additional support is given to the battered timbers by tying them at every 20 ft. horizontally back to the piers. Turnbuckles keep all guy wires and wire bracings tight.

At the top of the falsework the



ABOVE, LEFT, shows how easily one man can handle W. J. Burke form clamps which were used on column forms. At right, above, are the contractor's two transit trucks (Ford trucks with Jaeger mixers) and Ruby portable batch plant, purchased for this job.



SUPERINTENDENT George Borovich looks over his handiwork. Present plans for stripping the center span falsework call for pulling over the entire framework at once.

6 x 8s are drilled with a 2-in. hole 15 in. deep, into which are set Duff-Norton Simplex jacks. On the jacks are 6 in. x 8 in. x 2-ft. blocks on which rest the 6 x 16-in. caps. On the caps will rest 2 x 8-in. joists at 18-in. centers. The forms will consist of 5/8-in. plywood. A platform 6 ft. below the bottom of the deck will be constructed of 2 x 12s to provide working area.

To set the falsework a temporary trestle had to be built about 60 ft. out from the east bank of the stream. The Link-Belt truck crane, fitted with the 90-ft. boom and a 30-ft. jib worked from the end of the trestle. At times it was necessary to boom out 100 ft. horizontally. A Caterpillar D8 tractor was tied to the front of the truck crane as a counter weight.

The entire bridge must be poured and allowed to cure for 28 days before any deck forms are stripped. Column forms were stripped after 7 days.

The box girders for the deck are 9 ft. deep and 6 ft. wide and will be

constructed by forming the floor and walls first, pouring concrete, removing the forms, and then forming the upper slab, the forms for which will remain in place.

If present plans are carried out the removal of the falsework under the center span will be a spectacular operation. It is planned to remove the joists, stringers and jacks and then pull the entire falsework out from under the bridge by means of a cable attached to the top. It is hoped that the water level will be high enough by that time to minimize the breakage. It is planned to dismantle the falsework for the other spans piece by piece.

George Borovich is superintendent for Thomas Construction Company. Fred Hunsaker is carpenter superintendent. Neville Long is project engineer of both Tulloch Dam and the O'Byrne Ferry bridge, for Tudor-Goodenough Engineers. W. W. Simms is resident engineer for Tudor-Goodenough.



Record timber bridge for dam job

CONSTRUCTION and bridge history is being made as one of the West's longest girder-type bridges nears completion across the Columbia River at Priest Rapids Dam project. This 1,500-ft. wooden structure may well be the longest bridge of its kind. Although designed to last many decades, it will remain in service only from four to five years while the Priest Rapids Dam is under construction. It will not be used by the general public.

This structure demonstrates the versatility of the glulam timbers,

At Priest Rapids project M-C & S builds a 1,500-ft. construction bridge across the Columbia River. Girders are 100-ft. glulams about 12 x 63 in. in section.

man-made from Douglas fir lumber, designed and fabricated by Timber Structures, Inc., at their Portland, Oregon, fabricating plant.

The girders are 100 ft. long, and are $12\frac{3}{4} \times 63\frac{3}{8}$ in. in section. Each

glulam beam is made up of 39 laminations of $1\frac{5}{8}$ -in. fir dimension. Four of these girders are used for each of the 15 spans in the bridge. After lamination and fabrication, the girders were given a pressure treatment of 50-50 creosote to 8 lb. per cu. ft.

The bridge is of the conventional

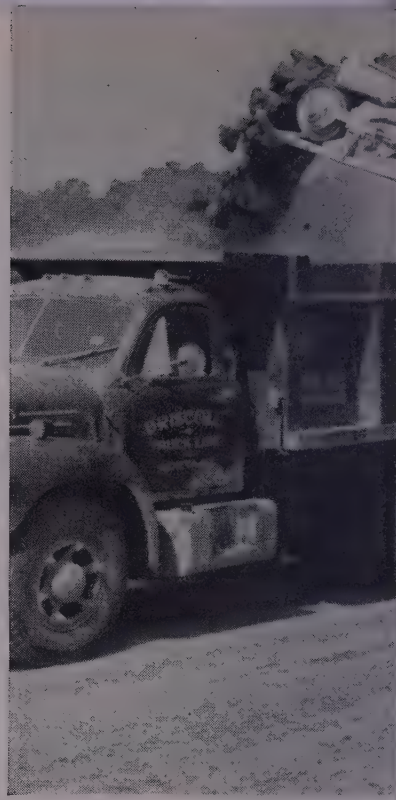
(Continued on page 67)

TRANSFERRING one of the 100-ft. timber girders to a river barge for moving into lifting position. Girders have 39 laminations.



Excavate and load 600,000 yds. with 2 graders

J. D. & P., Inc. equips 2 "660's"
with ELEGRADERS



Johnson, Drake, and Piper, Inc. faced the problem of moving 600,000 yards of dirt $3\frac{1}{2}$ miles over city streets in suburban Buffalo, for a new section of New York Thruway. Contractor found the solution in hauling by truck...digging and loading clay material with two 150 hp Adams* 660 motor graders with outrigger Elegrader attachments.

27 trucks haul to bridge approach

Photos show J. D. & P. loading out dirt to build up a thruway bridge

approach. 27 sideboarded 10-yard dump trucks each hauled 12-yard loads over city streets to the fill. Two dozers, a sheep's foot roller, and a 50-ton pneumatic roller, spread and compacted the dirt. At the borrow, a grader bladed off-highway haul roads and maintained the pit.

Trucks hauled approximately $3\frac{1}{2}$ miles (one way) — including 1200' over rough construction sand at the borrow exit. Haulers' return route included a 500' entrance to borrow, over grader-maintained construction haul road of average quality.

Loads from $\frac{3}{4}$ mile-long borrow

Two "660's" with Elegraders loaded trucks in a flat area, cutting against the outer perimeter of the $\frac{3}{4}$ mile-long borrow. The two loaders worked in tandem. Empty trucks pulled

under the conveyor of whichever unit was available. On this stripping operation, there was very little truck waiting time — in fact, Elegraders could have kept more trucks busy on the lengthy $3\frac{1}{2}$ mile haul.

Strips clay @ 460 yds. per hour

Elegraders and trucks worked two 8-hour shifts daily. An extra man was assigned to ride the front end of each of the Adams graders to aid in truck-spotting, to count loads with timer, and to assure that haulers got a full load, fast. Each Elegrader excavated and loaded at the rate of 460 loose yards of medium density clay per hour. Stop-watch timing showed Elegrader heaped trucks in as little as 40 seconds loading time per truck...plus an average 10 seconds for positioning of haulers under the conveyor.

Adams 660 grader with outrigger Elegrader strips 18" of clay fill along perimeter of $\frac{3}{4}$ mile-long borrow. With 2 Elegraders, Johnson, Drake, and Piper, Inc. excavated and loaded-out 600,000 yards for New York Thruway extension in suburban Buffalo.



girder design, planned to support heavy loads. Roadway width between wheel guards is 24 ft. The bridge was designed for loadings sufficient to support a 100,000-lb. 16 Euclid truck in each of two roadways in each span, and an alternate loading imposed by a diesel locomotive and car at the centerline of the bridge.

This particular design is the result of collaboration between Joe Peraino, chief engineer of Merritt-Chapman & Scott Corp. and the engineering staff of Timber Structures, Inc. Merritt-Chapman & Scott has the general contract for construction of Priest Rapids Dam being built for P.U.D. No. 2, Grant County, Wash. It is one of the ladder of dams being built on the Columbia River and the site is about 60 mi. east of Yakima.

The bridge is needed to give free movement of materials across the swiftly flowing river at this point. It will be dismantled and removed when the dam project has been completed.

Merritt-Chapman & Scott decided on using glulam beams not only because they would handle the heavy construction load, but also because the cost was less than steel. Timber was more quickly obtained, was easier to erect and could be put in place faster. Topping off these advantages was the fact that dismantling is relatively easy and that there is a high salvage value in the glulam beams. All of these factors weighed heavily in favor of wood for this job. Also, the glulam members could be obtained from Timber Structures, Inc., in any size and any quantity without delay.

Construction was simple, and ordinary construction crews were able to do the entire job, without specialists or special erection crews.

Four girders were used for each span, with the center members on 6-ft. centers and the outer members on 7-ft. spacing. Doweled to the supporting girders were 10 x 10-in. fir ties, and this deck was covered with 6-in. fir planking.

Engineers for Timber Structures, Inc., point out that these beams are built up of structural grades of Douglas fir lumber and no upkeep is required after the first preservative treatment has been pressured into the wood.

Piers are welded steel I-beams and tubing which rest upon concrete footings, and a concrete curtain protects the piers on the sides and upstream edge from debris and damage during high water.

The beams were shipped from the



PIERS of welded I-beam design are supported on concrete footings. Concrete curtains protect the steel on the sides and the upstream edge. Fast dismantling and high reclaim value were important factors in selecting the glulam design.



EACH of the fifteen 100-ft. spans consists of four glulam girders to carry the 24-ft. roadway. The structure will provide ready access to both sides of the Columbia River.

Portland plant of Timber Structures, Inc., by rail cars to the job site and then loaded onto barges for transporting to final position. Actual construction work on the unusual struc-

ture was started simultaneously from both banks. Railroad tracks have been constructed so that they are over the two center girders in the structure.

Equipment operators' school opens

The "Western National School of Heavy Equipment Operation, Inc.," at Weiser, Idaho, opened for its first class May 6. Under the direction of Gilbert S. Shaw, president, and with a board of directors that includes prominent contractors and equipment distributors of the Northwest, the school provides four courses: (1) operation of tractors and scrapers, (2) operation of motor graders, (3) operation of cranes, backhoes, draglines and shovels, and (4) maintenance and overhaul of engines and

earth-moving equipment. Tuition is \$400 for Courses 1 and 2; \$500 for Course 4 and \$750 for Course 3.

All courses include instruction in care and preventive maintenance of the equipment. Courses 1 and 2 are four weeks long from start to graduation and include 225 hours of classroom instruction, and field practice. Further information about these courses is available from the Western National School of Heavy Equipment Operation, Inc., P. O. Box 527, Weiser, Idaho.



No special lifting equipment needed. The machine that dug the trench for this job was also used as a hoist in laying the pipe.

Here's the Way to Lower Your Drainage Bids Without Cutting Profits

It's easy to get the jobs *and* the profits when you figure drainage bids with Armco Corrugated Metal Structures. You save time, labor and equipment costs.

For example, with long, 20-foot lengths of Armco Pipe you have fewer pieces to haul and handle, fewer joints to make. A small crew with no special tools can do a fast, efficient job. And inclement weather is no problem.

Armco Drainage Structures are corrugated for high strength with light weight. A rope sling or a small A-frame can be used to handle the largest structure with no danger of cracking or breaking.

It will pay you to investigate Armco Corrugated Metal Structures for your next drainage bid. Wherever you may be, there's always a nearby cooperative Armco representative to assist you—and a nearby fabricating plant to help assure on-schedule delivery.

WRITE FOR HELPFUL DATA

ARMCO DRAINAGE & METAL PRODUCTS, INC.

CALCO AND NORTH PACIFIC DIVISIONS

Berkeley • Los Angeles

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Joints can be made quickly and easily. Here one man tightens the two bolts on a connecting band with a hand wrench.

Armco Drainage Structures



How to test hardfacing in the field

Best way to find the right hardsurfacing material is to make comparative tests in the field. To get reliable results there are four major factors to consider.

By D. B. RANKIN

Rankin Manufacturing Co.
Hardsurfacing Materials
Alhambra, California

SINCE at the present time it is impossible to conduct exact wear resistant tests of hardsurfacing materials in the laboratory, the manufacturer and user alike must determine relative wear resistance by field tests. In order to obtain reliable results you must remember four important points: first, that the best material designed by the manufacturer for the job is being tested; second, that the welder is operating the test at the correct polarity setting and that he is applying the rod at the right heat; third, that an accurate cost record is being kept and finally, that both materials are doing the same quantity of work during the interval of the test.

1. The right rod for the job

There are two ways of finding which of any manufacturer's products best qualify to meet the conditions a prospective user has in mind.

Most producers have published lists showing which of their various surfacing alloys have been found best suited for various applications. One procedure is to take these recommendations at their face value and proceed to test the one listed as most likely to be successful. This is by far the most popular method and the safest in that the designation in itself indicates that the material has been found to perform well and without trouble on applications suggested for it.

Often, however, it is not just as simple as that since frequently two or even more rods from a given line are indicated for certain applications.

Of course the main reason for this lies in the fact that many individual users may be operating the same piece of equipment under such radically diverse conditions that each is best suited with his own type hard rod.

For instance, most sets of crushing rolls remain in service for several weeks or months but in some isolated instances wear is so drastic that they

will not perform efficiently for one whole shift.

In a case like this it has been found that a lower priced material will not be nearly as economical as a more costly one that will eliminate mid-shift shut down.

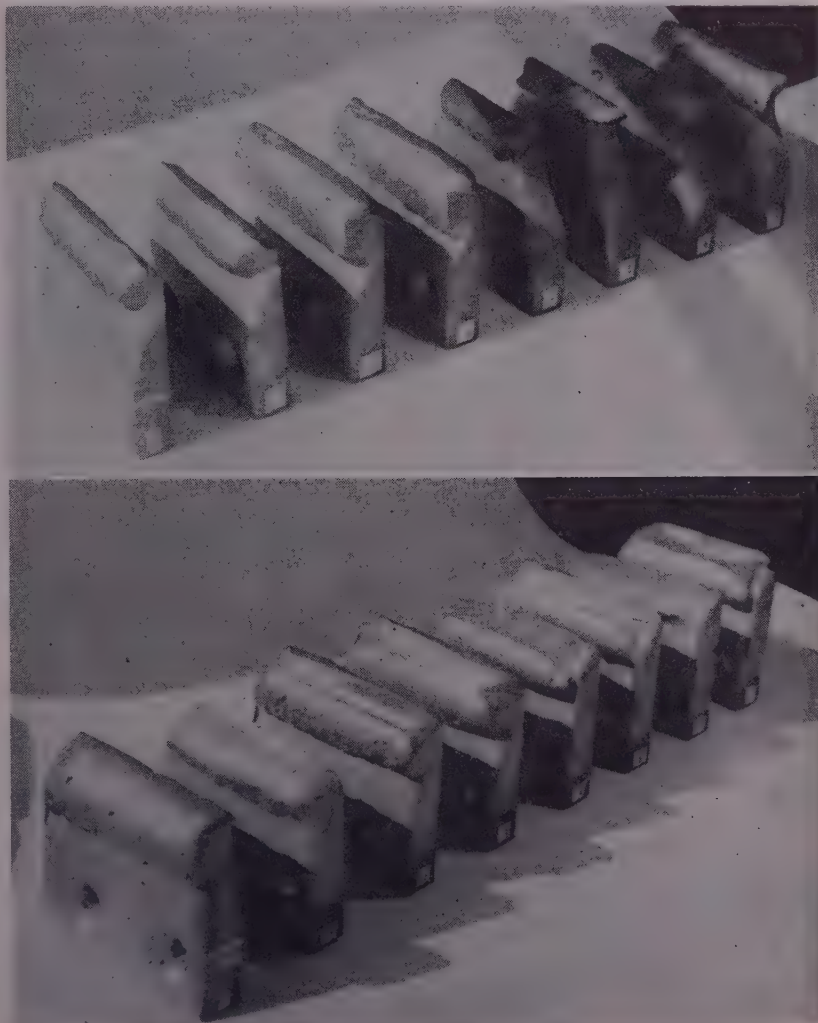
2. The proper heat and polarity

The second important consideration in field testing is correct application, and important is hardly a strong enough adjective since the wearing properties of hardsurfacing deposits have been found to be tre-

mendously affected by different application procedures.

Here again, the manufacturer should be able to indicate in a general way which procedures will give the best results with each of his products, but it still must remain with the user to determine for himself which are the best ones to use.

One variable is the polarity setting of the welding machine. Where a rod will perform correctly on only one of the two possible polarity settings, that of course is the one that must be used. If the electrode runs on either polarity, straight will give faster deposition rate, less dilution from parent metal, and higher build-ups; all of which are generally desirable. On the other hand, most bi-polarity rods operate much more smoothly on reverse polarity and if a relatively



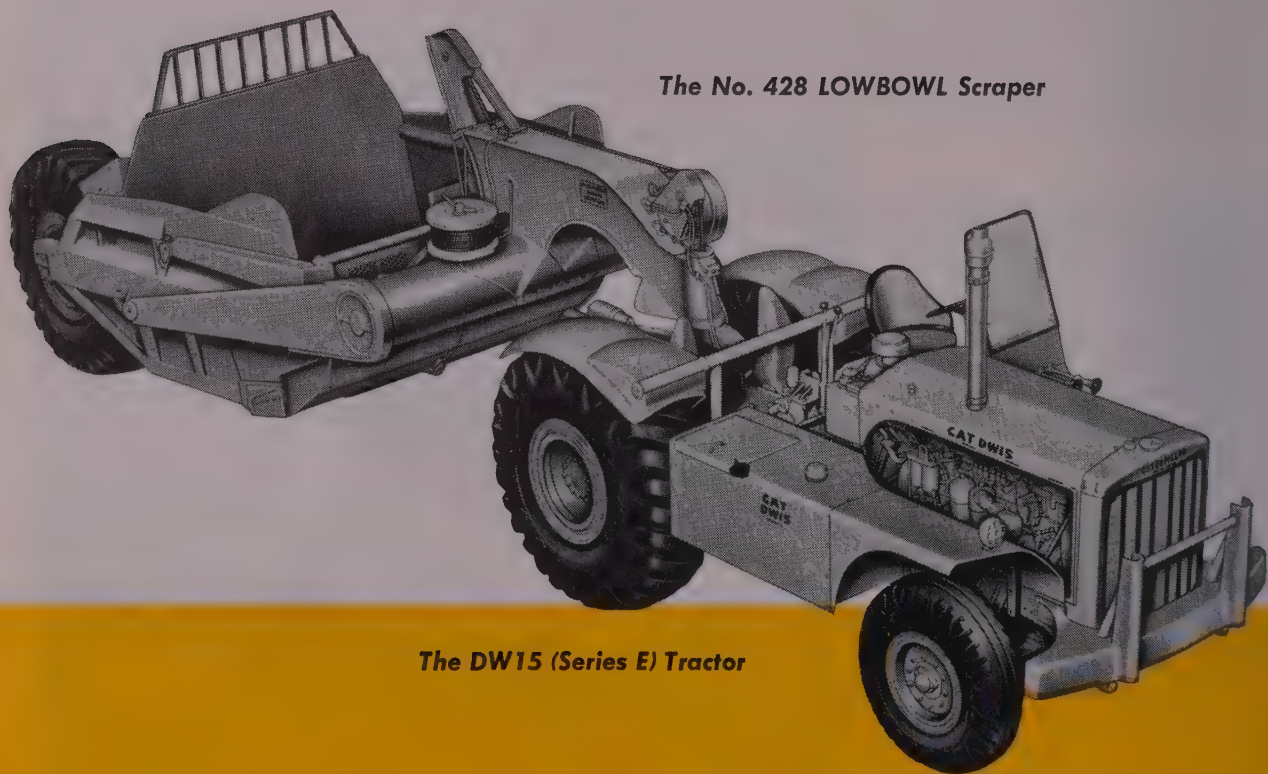
MILL HAMMERS in upper photo were surfaced with same material but in different manners. Procedure used for third and fourth from left was best. In lower photo hammers were surfaced with different electrodes. Hammer at far left obviously held up best.

CATERPILLAR ANNOUNCES

NEW DW15 (SERIES E)

AND NEW No. 428

LOWBOWL SCRAPER



The No. 428 LOWBOWL Scraper

The DW15 (Series E) Tractor

Here's a new Cat team loaded with features that add up to one thing—A HIGHER PRODUCTION RETURN ON YOUR INVESTMENT. See your Caterpillar Dealer for details on this great team's performance.

GET THE STORY IN BRIEF ON THE OPPOSITE PAGE ►

A GREAT TEAM: The performance of the DW15 (Series E) Tractor and No. 428 Scraper can be summed up simply: bigger loads—faster.



FACTS ABOUT THE DW15 (SERIES E) TRACTOR

Around the world, the DW15 has proved that it can move material faster and more profitably than competitive machines in its class. Now there's a new DW15 (Series E) to give you even higher production. This is the story:

ENGINE: A new Caterpillar D326 Engine, designed especially for the DW15 (Series E), develops 200 HP (maximum output capacity).

And Caterpillar research has produced a 23% torque rise in this new engine! This means that high tractor rimpull is maintained through a wide range of travel speeds in each gear, and the need for gear changing is decreased. In fourth gear, for example, over 3,000 pounds of rimpull are delivered at travel speeds from 9 MPH all the way to 18 MPH. A new engine, yes—but with these traditional Caterpillar advantages: uses inexpensive No. 2 furnace oil without fouling; needs no fuel system adjustments; requires no cleaning of fuel injection valves.

TRAVEL SPEED: The DW15 (Series E) offers ten speed selections, from 2.7 to 37.2 MPH. But, more important, it provides four-wheeled sure-footedness—*the ability to use the speed on the job*. Operators ride with more comfort, feel greater stability. They travel faster, and in safety.

MANEUVERABILITY: Four-wheeled stability means faster cycle time because the DW15 (Series E) can make short radius turns at higher speeds. It can turn without stopping inside a 35-foot diameter and in a smaller area through use of a turn-back-turn maneuver.

VERSATILITY: The DW15 (Series E) provides versatility that far surpasses similar sized two-wheeled machines. It can be unhitched from its scraper and

used as an independent unit to tow compactors, water wagons or other units, and it can be teamed with the Athey PR15 Wagon for rock hauling work.

FACTS ABOUT THE No. 428 LOWBOWL SCRAPER

CAPACITY: Struck—13 cu. yd.; heaped—18 cu. yd.

ADVANCED DESIGN: There is more to Caterpillar's exclusive LOWBOWL design than a low bowl profile. Width and length proportions are designed to give maximum loading efficiency. And every component—particularly the apron, ejector, cutting edge—is likewise designed to do its part in achieving capacity loads.

LOADABILITY: The final result of this careful engineering is this: bigger loads—faster. LOWBOWL design gives the new Caterpillar No. 428 Scraper a faster loading rate because incoming material meets less material resistance and less friction from the load already in the bowl. While other scrapers are still in the cut struggling for the last few yards of their load, the new Cat units are on their way to the fill—with big pay loads!

NEW FEATURES: Outstanding new features of the No. 428 include: increased ground clearance—for high-speed travel in rough going; increased apron lift—for faster ejection of any material; large area pushblock—for better pusher contact.

NEW TIRES FOR THE DW15-No. 428

Both the CAT* DW15 (Series E) Tractor and No. 428 Scraper feature 26.5-25 wide-section tubeless tires—the product of extensive co-operative research by Caterpillar Tractor Co. and leading tire manufacturers. Tubeless tires offer load-carrying capacity comparable to conventional tires at a *reduced inflation pressure*. This gives better flotation and traction while decreasing rolling resistance. The wider tire treads take a "grouser like" bite, making more efficient use of engine horsepower. And tubeless tires eliminate 80% of the down time caused by tire failure.

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

CATERPILLAR*

*Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

ONE GOAL: To concentrate our capabilities, resources and experience on the design, manufacture, distribution and service of job-tested heavy equipment.

HARDFACING TESTS

(Continued from page 69)

thin smooth deposit with an assured sound strong bond is desired, reverse polarity is the one to use.

Another variable is the ampere or heat setting of the welding machine.

Higher ampere settings will give substantially faster deposition rates, but they introduce appreciably more heat into the parent metal and result in more dilution of the overlay with this metal. Higher deposition rate is too often the prime concern of many welders. And often, where high amperages are employed, excessive dilution from parent metal will result in a surface whose composition is so different from that conceived by the manufacturer that its wearing characteristics will be almost completely destroyed.

There are a few hard rods that give deposits that are definitely superior when cooled as slowly as is practically possible, and for these, high ampere settings and reverse polarity are generally preferable.

However, in a great majority of cases the parent metal (particularly if it is the widely used manganese steel which is greatly harmed by exposure to high temperatures) is left in a much more desirable condition when not over-heated, and nearly all hard facing overlays benefit in direct proportion to the speed with which they are cooled. Rather astonishing as it may seem, a case is on record where the wearing life of a surface was actually tripled by applying it with 50 amp. less heat.

This brings us back for a moment to the subject of deposition rate and the objection that operating at lower amperes "takes too long to do the job."

In order to show that you greatly improve the performance of hardsurfacing materials by depositing them at reduced amperages, let's consider the following figures.

By actual measurement, a $\frac{3}{16}$ -in. diameter rod, operating at 175 amp., required 62 sec. to be consumed. An identical stick of the same material, pulling 125 amp., took 76 sec. to burn off. This represents a difference of 14 sec. per stick or approximately 100 sec. of 1.6 min. to the pound.

To determine what this means in an actual although somewhat exaggerated case, let us take, for example, a hardsurfacing job done on a set of roll shells where perhaps 100 lb. of the material is being applied. If we were operating at the lower amperage, we would increase the welding time to do this job by 160 min. or two and one-third hours. This increase in ap-

plication time becomes inconsequential if the life of the shell is increased from a month to three months or two months or even a month and a half. Not only is downtime drastically reduced, but so are the actual welding costs themselves.

As another illustration, we might consider a case where a set of four shovel teeth are being hardsurfaced. The quality of rod to do such a job as this is usually about six pounds. At the low amperage, only ten more minutes would be required to face them than at the higher and if they lasted any discernible time longer, this would certainly be the amperage to use.

Surely it should be more than worthwhile to give very serious attention to this matter.

There are a number of other variables, but the only one that we shall mention is the generally highly beneficial results of applying a double pass of rod to a surface. On the obvious face of it this doubles the cost of the operation and in some cases results in a higher build-up than is desired, and in isolated instances might set up undesirable strains in the parent metal. However here again startling results have been obtained by multipassing, and it is not exaggerating too much to say that a double pass surface can last three or even four times as long as a single pass would. We do not contend that this is always the case, but we know of no place where it has not run twice as long as a single pass and so certainly no harm can come from trying it.

3. Keep a close record of costs

The next consideration in field evaluating hard rods is the actual quantity of each applied and what is most important, the overall cost of applying it. Of course it goes without saying that when two materials are being compared in the field, it is desirable that identical quantities of both be applied to their relative surfaces. This does not necessarily mean that identical quantities should be used, because some rods have a much higher recovery rate and it takes less of them to do a given job. The ultimate aim in testing should be to cover each of the surfaces in question to the same thickness.

If an accurate record of quantity of each rod used, price of each rod, and welding cost to apply has been kept, we can calculate the actual cost to do the job with each. Such comparative figures often reveal some rather startling things and due to higher welding losses and slower dep-

osition rate, it is not unusual to find that a relatively cheaper rod will cost as much or even more to cover a given surface than a considerably costlier one.

4. Compare equal amounts of work

The final consideration in field testing of hardsurfacing materials consists in an accurate estimate of the exact work accomplished by each during the test.

The ideal set-up is to have the material being tested operating side by side on exactly the same tonnage or footage of the same material. However, great care must be exercised to see that they are actually both performing the same quantity of work. A very common spot for comparing hardsurfacing materials is on shovel teeth and in many cases where the teeth on a bucket are faced with two or more materials for comparison, no poorer choice of a test spot could be made. The reason for this is that plainly where a shovel is operating against a bank at its side, no two teeth are actually doing the same amount of digging and therefore comparisons of their wear rate are without any real meaning.

Unless one is sure that the bucket will be digging head on during the comparison period, it is better to face the entire set with the same rod and run for a desired time and then repeat this procedure using a new set all faced with the material being compared. Even then it must be assured that both sets did the same amount of digging against the same material before an impartial comparison can be made.

Comparisons on crushing roll shells have also often been made and results incorrectly interpreted. This is apt to be the case where each shell was faced with a separate material. Here, the failure to recognize the fact that the driving roll usually wears faster than the driven roll is a source of common mistake.

Sometimes half the periphery through vertical plane of each shell is faced with materials under observation. Comparison of the relative wear on each half after a given run may lead to erroneous conclusions unless great care is exercised to be certain that the feed is the same on both faces. Even then wrong conclusions can be derived from the fact that the side wearing away the fastest will allow more larger mesh materials being crushed to pass and consequently will not actually be doing as much real crushing as the second faced section surfaced with the more wear resistant material.

A preventive maintenance program

As construction equipment gets larger and more expensive the cost of down-time increases accordingly. Following a schedule of maintenance operations before the machine breaks down is the best way to avoid big repair bills later on. Here is a planned program of preventive maintenance which can be adapted to most types of construction equipment.

DOWN-TIME frequently makes the difference between profit and loss on a construction job where equipment must be worked to the limit. Best way to keep the machines on the job and out of the shop is to spend a few minutes on maintenance at the proper time to head off major breakdowns.

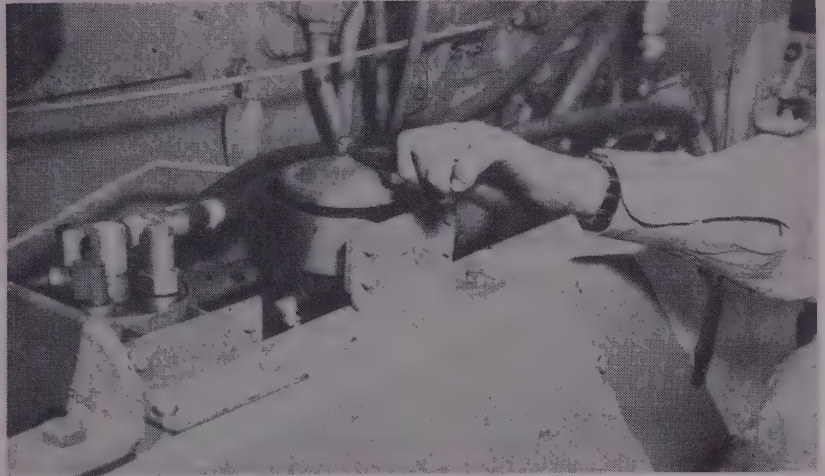
Although most mechanics and operators do the most obvious maintenance jobs—checking the radiator, adding water to the battery—the cheapest way is a planned maintenance program. A check list based upon equipment manufacturer suggestions and individual field operations is the easiest way to have the job done right.

The following maintenance program was prepared by service engineers of Clark Equipment Co. The program is based on studies made on operations of the Michigan 175A tractor shovel but can be adapted for most earthmoving equipment and other construction vehicles.

Daily check

Daily inspection should be made either at the end of each eight-hour shift or at the beginning, whichever is most convenient. In general, it's best to run the daily check at the end of the shift so that in the event extra work is required, it can be done before the machine is needed for another eight hours' duty.

- **Check Engine Oil Level**—Add manufacturer-specified oil to keep the level at the "full" mark. The machine should be parked fairly level and the engine turned off when the check is made.



REPLACING torque converter oil cartridge periodically is good insurance against transmission breakdowns. Clogged filters can cause overheating or power loss and grit in oil can seriously damage precision machined surfaces which are expensive to repair.

- **Clean and Refill the Oil-Bath Air Cleaner**—Tremendous amounts of dust and grit are drawn into the unit during a day's work. Dirt can ruin rings, pistons and connecting rod bearings if the air cleaner is full of sludge. Clogged air cleaners also increase fuel consumption and lower power output.

- **Check Radiator Water or Anti-freeze**—This operation can prevent damage resulting from overheated engines and torque converters. (In the Michigan, the radiator also cools the torque converter.) Use water with a low mineral content and add a corrosion inhibitor.

- **Add Fuel**—Simple as it is, this operation is sometimes forgotten and a machine runs out of gas on the job. Gasoline of 75 octane minimum or No. 2 diesel fuel should be used, and fuel cans and drums should be free of scale and dirt.

- **Check Transmission and Torque Converter Oil Level**—Add manufacturer-specified transmission oil if required. These components share a common oil supply. Oil is added at the upper left side of the torque converter until the level rises to the transmission check plug.

- **Check Hydraulic Oil Supply**—The machine should be level and the bucket should be on the ground during the check. Use only high quality, heavy duty hydraulic fluid.

- **Check Battery Liquid Level**—Only water with low mineral content (preferably distilled water, if available) should be used. Battery terminals should be checked for tight-

ness and any corrosion wiped off. A light coating of grease will help prevent corrosion of terminals.

Daily maintenance should also include a quick visual inspection of the machine to note obvious conditions requiring correction. Operation of lights and other electrical equipment should be checked, too.

Fifty-hour inspection

Maintenance required at 50-hr. intervals requires more time than the brief daily inspection, but is probably the most important operation in prevention of abnormal wear. These components should be inspected:

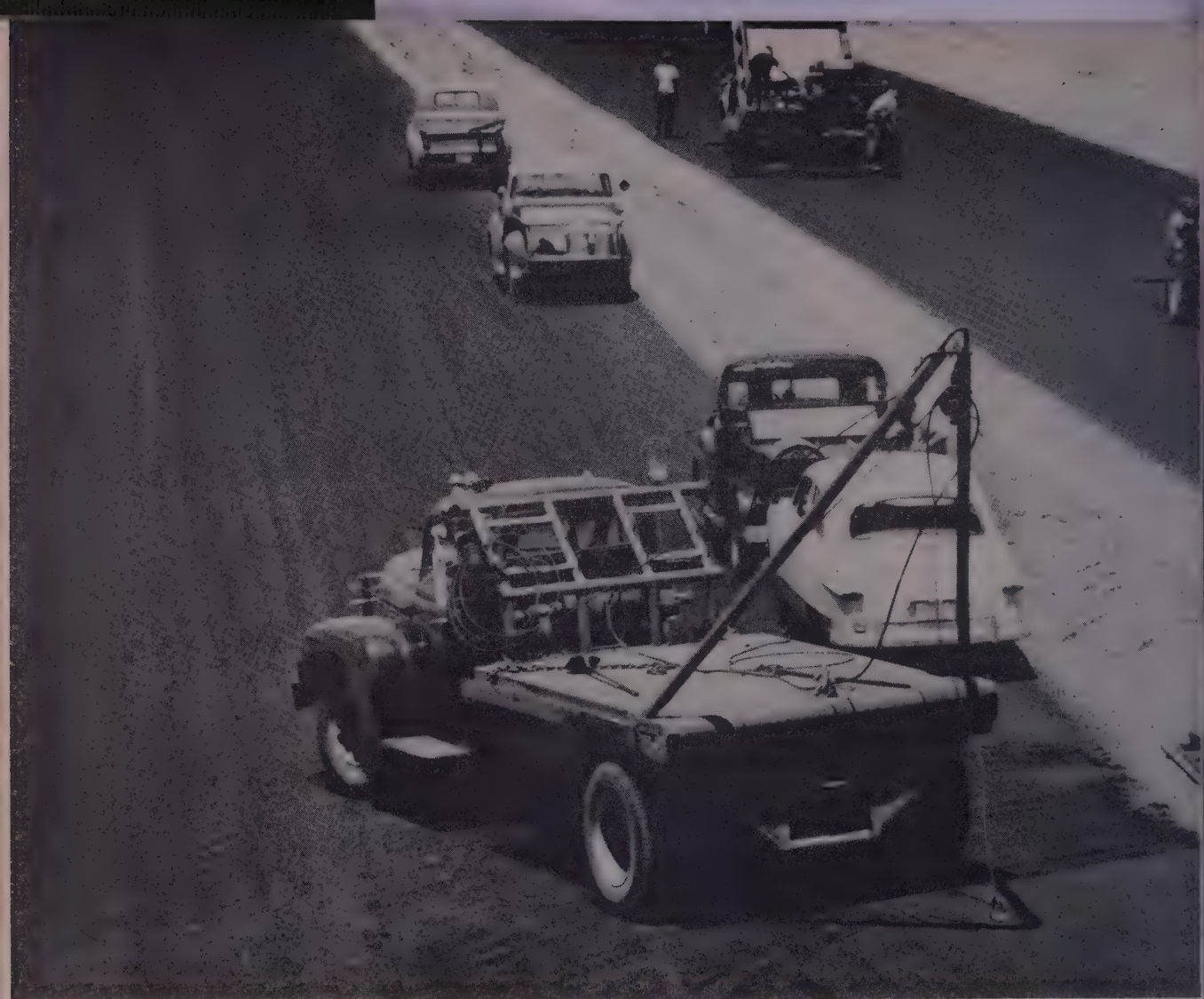
- **Crankcase**—Drain and refill with the proper lubricant specified by the manufacturer. The machine should be level and the oil should be hot. (Hot oil carries out more sludge.) **Never** flush with kerosene; it does not provide sufficient lubrication.

- **Engine Oil Filter**—Remove the sludged filter and replace it with a new filter. Always use new gaskets and run the engine a few minutes after filter installation to make sure there are no oil leaks.

- **Differentials**—Both front and rear differentials should be checked for the proper amounts of lubricant. Add SAE 90 extreme pressure gear lube if required.

- **Planetary Gears**—Rotate the rear wheels until the filler plug is at the top and the check plug slightly below the center of the hub. Remove the plugs with the proper size wrench.

(Continued on page 78)



AMERICA'S "GRAND PLAN OF MODERN ASPHALT ...because highway construction

The Federal Highway program is barely under way. Yet, construction costs already have gone up 4%, according to official figures.

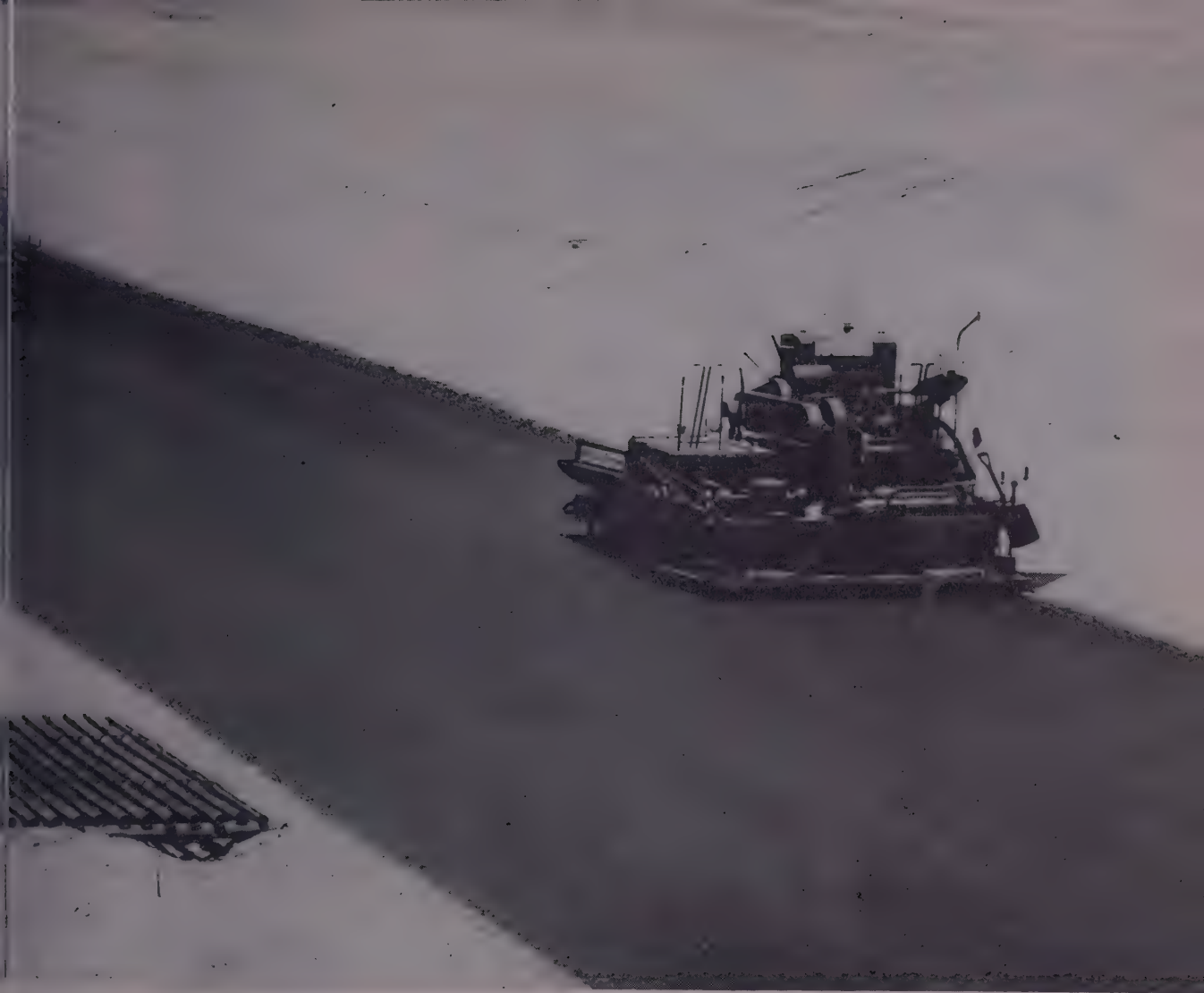
But here's good news! Savings from durable Asphalt construction . . . savings from low, quick and easy maintenance . . . can go a long way toward keeping the costs of *your* much-needed new roads within your ability to pay.

Experts say that 3 billion dollars in original costs alone can be saved on the Interstate System with modern Asphalt pavement. And a substantial part can be realized by *your* state . . . your community.

SMOOTH-RIDING, SAFE HIGHWAYS ARE YOURS, TOO. Yes, at lower cost to the taxpayer, Asphalt pavement provides more, better and wider highway. With smooth riding, tough, resilient, skid-resistant surfaces. Glare absorbent pavement that is easier on the eyes. Large markings that are easier to see day and night.

No wonder that four out of five miles of paved road in the U. S. are surfaced with Asphalt!

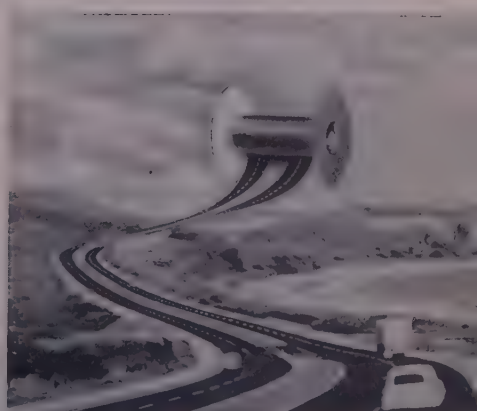
So, specify Asphalt construction now! You won't have to worry about getting Asphalt, either . . . when the tin comes. For, unlike some other construction material, **Asphalt is in plentiful supply.**



Construction Scene on Kansas Turnpike

NEEDS THE ECONOMY PAVEMENT *Costs are rising*

MODERN ASPHALT CONSTRUCTION is a triumph of road-building science. With built-up layers that spread the load . . . hug the earth . . . absorb shock and pounding without cracking. Layers topped off with smooth-riding yet textured skid-resistant modern Asphalt pavement. Economy, comfort and safety are built in *to last* . . . with this modern durable Asphalt construction. Built in to save you tax-dollars.



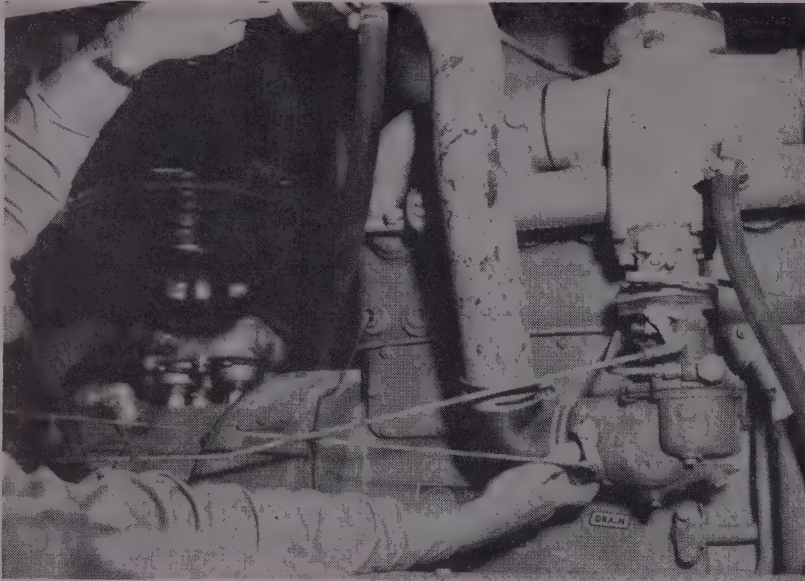
THE ASPHALT INSTITUTE, Asphalt Institute Building, College Park, Maryland

Ribbons of velvet smoothness . . .

MODERN ASPHALT HIGHWAYS

PREVENTIVE MAINTENANCE

(Continued from page 75)



INSPECTION of hose between air cleaner and intake manifold might reveal a hole through which dusty air could enter the engine. Such checks should be made regularly.

- **Master Brake Cylinder**—Add only a heavy duty hydraulic fluid. It's wise to check the air vent and remove any accumulated dirt.

- **Steering Gear Housing**—Check the level and add only SAE 90 straight mineral oil.

- **Generator**—Add a few drops of SAE 10W oil to cups at each end of the armature shaft. This also is a good time to run a visual check of brush and commutator condition.

- **Oil Separator Tank**—This component of the vacuum brake system is located at the rear left of the engine compartment. Check the oil level and add more if needed, following the manufacturer's recommendations.

Other periodic maintenance

Additional maintenance should be carried out at longer intervals. Most convenient intervals usually are 500, 1,000 and 2,000 hr., but requirements will vary with field conditions. A good general rule is that signs of abnormal wear or heavy dirt accumulation mean that the operation should be done more often.

The 500-hr. check should include these operations:

- **Lubricate Propeller Shafts and Universal Joints**—Use a low-pressure hand gun to avoid blowing the seals and apply grease to the fittings sparingly. An old instruction worth repeating is "Clean the grease fitting first." Whatever goes into the fitting

comes out on machined surfaces, and a mechanic who pumps accumulated dirt through the fitting is asking for trouble.

- **Drain and Refill Torque Converter**—The unit should be drained hot, if possible. Transmission sump should be removed and swabbed clean. The sump screen should be cleaned. It is important to use new gaskets in replacing the sump to avoid leakage.

- **Remove and Replace Torque Converter Filter**—Replacing this filter periodically is extremely important in avoiding major repairs: A filter costs a few dollars, but it can avert the need of a transmission overhaul. After the filter is replaced and the torque converter filled with oil, the machine should be run a few minutes at a fast idle and the oil level rechecked. Usually it is necessary to add a small amount of oil.

- **Clean Fuel Filters**—Filters on gasoline models should be cleaned and replaced. Both primary and secondary fuel system filters on diesels should be replaced with new cartridges.

- **Drain Oil Separator Tank**—The tank should be drained and refilled with the proper grade of hydraulic fluid.

Thousand hour check

At 1,000-hr. intervals, front and rear wheel hubs and differentials should be drained and refilled with

SAE 90 extreme pressure gear lube. The Hydrovac mechanism also should be lubricated, removing the plug on the front of the unit and filling to plug level.

The oil separator tank should be removed at 2,000 hr. and it and its lines flushed with gasoline. The boom and bucket hydraulic system should also be drained and refilled at 2,000 hr.—or oftener in extremely dusty operation. This avoids abnormal wear of cylinders, pistons and packing.

Don't postpone simple jobs

Several maintenance operations should be carried out at intervals that are best determined by experience. The same basic principle of all preventive maintenance applies: Fix it as soon as it needs it; nothing is gained by postponing a simple job.

It is surprising how often counterweights have fallen off only because no one ever thought to put a wrench to the bolts. Axle tie-down bolts and engine mounting bolts also are loosened by vibration over a long period of time. Hydraulic lines to bucket and boom cylinders should be checked for abrasion occasionally, especially when work is done in gravel.

Fan belt tension, of course, needs occasional adjustment. The air cleaner screen should be rinsed in solvent when it appears to be quite dirty. The rubber hose between the air filter and manifold should be checked for abrasive damage and leakage.

An important, but simple inspection is that of the bucket stops. After years of use, the stops sometimes will wear down, allowing the piston to advance too far and damage the cylinder head. Whenever work is done on the hydraulic system, the bucket should be on the ground or on a rigid support to prevent injury to mechanics if a hose should give way or someone accidentally touches the controls.

The manufacturer should know

In establishing any preventive maintenance program, remember that owner's manuals contain most of the information you need. Factory men have put much thought into the manuals—and they should be used. If any questions aren't answered in the manual, don't hesitate to write or telephone the equipment distributor. His people know that the best work of design engineers will get a black eye if the maintenance man in the field doesn't give the machine the care it deserves.

Brownlee Dam Facts: Builder, Idaho Power Company. Contractor, Morrison-Knudson Company. Cost, \$63,000,000. This is the first of three dams to be built across the Snake River for power purposes (together with flood control, navigation and recreational benefits). Brownlee will be 1,720-feet in length and 395-feet high... making it one of the highest rock-fill dams in the world.



TIGER BRAND *gets the job done...on time!*

Brownlee Dam has an extremely fast construction schedule: the first generating unit will be on the line in mid-1958. On tight jobs like this, you need to surround yourself with the best men and equipment. Tiger Brand Wire Rope was specified for this

project because Tiger Brand is respected by construction men as "a rope you don't have to worry about."

If you have a worrisome job coming up, specify Tiger Brand Wire Rope. It will get the job done...on time!

First in quality and service

USS TIGER BRAND Wire Rope

United States Steel Corporation—Columbia-Geneva Steel Division
120 Montgomery Street, San Francisco 6.
...with fully staffed service offices in 10 other western cities



UNITED STATES STEEL

Highway construction cost trends

Bid figures are the basis for highway costs. They represent the contractors' best appraisal of all direct and indirect factors. Representative bids for all types of road construction are grouped on the next seven pages, following three general trend curves.

BID PRICES remain the best practical index of highway construction costs. The averaging of several bids for individual items will present a reasonable figure on the cost of such features as excavation or concrete, while a composite average of several major items will show the general cost figure for road construction. It would appear to be that simple, but it isn't.

In fact, cost statistics for highway construction work involve so many variables and require so much explanation and interpretation that "Cost Index" curves maintained by several organizations are only as adequate as their interpretation is precise. This would apply to the actual index figure, because the curves do represent trends and have a value in the changes in their slopes and direction.

To show the general and the specific factors in 1957 highway costs WESTERN CONSTRUCTION is presenting: (1) Cost Index curves maintained by three state highway departments of the West through the first quarter of 1957 and (2) an extensive group of unit bid summaries which were submitted by Western contractors for state highway department work during the past six months.

Words of interpretation

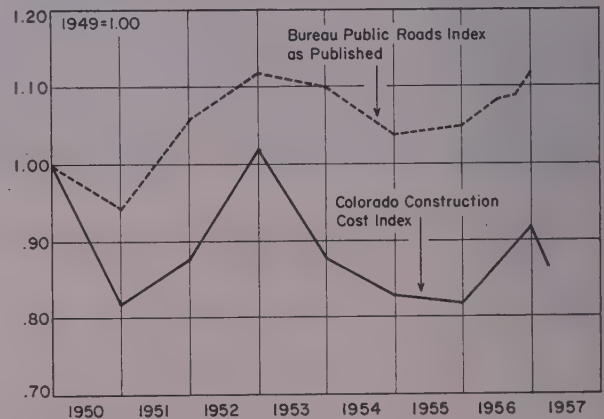
Idaho reports that a large number of bidders, plus favorable conditions, were the principal causes in lowering the average bid prices for items during the first quarter of this year. As one of the intangible factors affecting the curve it happened that the bulk of the unclassified material was unusually free of solid rock with earthmoving conditions ideal for high speed production. This tended to drop the unit price of excavation.

Turning to the California index, again there are unusual factors which tend to move the first quarter index

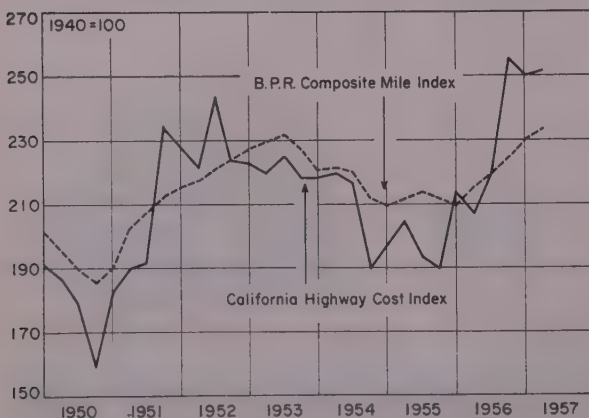
figure out of its normal position. Two very large contracts totaling more than \$12,000,000 were awarded during this period and local conditions placed these bids unusually high. For example, one of these projects is on U.S. Highway 40 near the Nevada state line in an area which is subject to heavy snow for many months, extremely low temperatures, terrain which makes detours almost impossible, canyon walls presenting a threat of slides during many months of each year, and the problem of handling a large volume of traffic through the construction seasons.

Colorado maintains its index on the basis of Composite Mile Costs. For example, unclassified excavation is averaged at 10,360 cu. yd. per mile and the cost of this item per mile was \$2,370 during the first quarter of 1957. This corresponds to a 1956 annual figure of \$3,582. Sub-base material at 2,998 tons per mile shows a cost of \$1,352 for the first quarter of 1957, compared to \$1,091 during 1956. Plant-mix asphalt at 279 tons per mile has a cost figure of \$974 for the first quarter of this year, compared to \$873 for 1956. The corresponding figures for structural concrete (36 yd. per mi.) are \$1,920 for the 1957 first quarter and \$2,128 for 1956. Corrugated metal pipe (109 lin. ft. per mi.) costs are down to \$849 for the 1957 first quarter, compared to a 1956 average figure of \$950. Using the total of all items for the Composite Mile, the total is \$15,965 for the first quarter of 1957, compared to

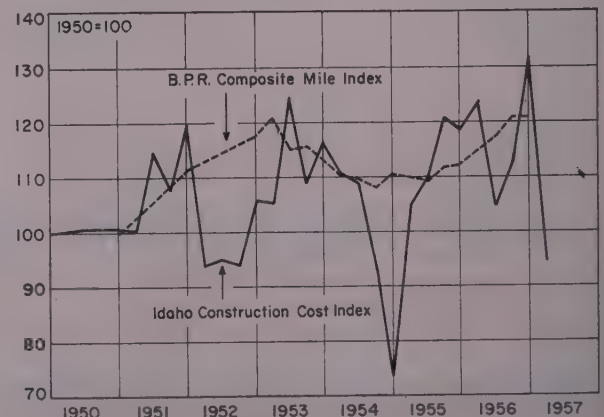
COLORADO HIGHWAY COST INDEX



CALIFORNIA HIGHWAY COST INDEX



IDAHO HIGHWAY COST INDEX





D-457

Production at a profit . . . wherever you use it

DIAMOND 77 PORTABLE CRUSHING and SCREENING PLANT

Here are the cost-cutting, production-boosting advantages that put Diamond way out in front:

- ★ Big, powerful crushing capacity with a 10" x 36" jaw crusher and a 36" x 22" star gear roll crusher.
- ★ Speedy separation of material on a 4' x 12', 2½ deck vibrating screen.
- ★ 30" wide belt conveyors.
- ★ The Diamond "line-flo" rotor-lift principle that guarantees fast, continuous movement of aggregate.

You get all these in a Diamond plus complete portability . . . a hydraulic mechanism to lower the screen deck to travel position . . . and rugged Diamond construction throughout for practically any type of crushing operation. No wonder reports from the field read like these:



"300 to 400 tons per hour of road gravel in 25% to 35% crush" . . . "less down time, more production" . . . "oversize roll crusher and screens do the trick" . . . "smoothest operating plant we have seen".

And remember . . . Diamond gives you a choice of drives. Mechanical drive with one power unit is standard. Optional drive: (1) one power unit to drive crushers with electric motors to drive screens, rotor-lift and conveyor, and (2) same as No. 1 except for motorized head pulleys on all conveyors.

*For complete details, see your
Diamond distributor.*

DIAMOND IRON WORKS
division

GOODMAN MANUFACTURING COMPANY
Halsted Street and 48th Place • Chicago 9, Illinois

Everything For The Aggregate Producer

Jaw Crushers • Roll Crushers • Conveyors • Screens
and Washers • Feeders and Bins • Portable and Sta-
tionary Crushing Plants For Rock and Gravel

\$17,140 as the 1956 average. Using 1956 average as 100%, the cost of the Composite Mile during the first quarter of 1957 is down to 93.1%.

These examples indicate why any highway construction cost index will fluctuate from quarter to quarter and probably the average annual figure would be much more suitable. Nevertheless, the last point on any curve must receive proper recognition since it may represent the beginning of an important trend. To supplement this general picture of Western highway costs, the more specific estimates of contractors in these Western states are presented in the following unit bid summaries.

Typical bid prices

Grading and base course

Wyoming—Teton County—Bureau of Public Roads. A \$631,452 contract was awarded Ethlin E. Peterson for one mi. grading and surfacing in Grand Teton National Park.

(1) Ethlin E. Peterson.....	\$631,452
(2) Chas. M. Smith.....	648,406
Long Construction Co., Inc.....	775,937

	(1)	(2)
Cont. sum		
Miscellaneous force account work.....	\$ 3,000.00	\$3,000.00
13,000 cu. yd. Stripping and storing topsoil.....	.65	.70
55,000 cu. yd. Unclassified excavation.....	.675	1.00
3,000 cu. yd. Unclassified excavation for structure	12.00	15.50
55,000 cu. yd. Unclass. excav. for borrow, Case 1...	.675	1.00
340,000 sta. yd. Overhaul (1,000 ft. free haul).....	.02	.01
45,000 cu. yd. mi. Special overhaul of borrow (1,000 ft. free haul).....	.20	.15
13,000 cu. yd. Replacing topsoil.....	.80	.80
Cont. sum		
Obliteration of old roadways to be paid for as earned.....	2,000.00	2,000.00
1,000 unit Watering of embankment.....	1.50	1.00
600 unit Watering of base course.....	2.00	2.00
Lump sum Prov. and maint. wat. plant or plants	1,000.00	1,000.00
500 hr. Rolling of embankment.....	13.00	9.00
160 hr. Rolling of base course.....	10.00	7.00
19,000 ton Subbase material.....	.95	1.50
18,500 ton Crushed gravel or crushed stone base course, Class 2, grading D-1.....	1.40	2.00
64,000 sq. yd. Processing bituminous base.....	.16	.25
65,000 gal. M.C. cutback asph., grade 0, 1, 2 or 3	.23	.20
7,000 gal. R.C. cutback asph., grade 1 or 2...	.30	.23
1,567 cu. yd. Concrete Class "A" (air-entrained concrete low-alkali cement)	82.00	76.00
331 cu. yd. Conc. Class "S" (low alkali cement)	82.00	52.00
161,100 lb. Reinforcing steel.....	.16	.17
564,700 lb. Struct. steel—furn., fabr. and erect..	.24	.24
1,482 lin. ft. Railing.....	10.00	10.50
300 lin. ft. 18 in. C.G.S.M. culvert pipe.....	7.00	7.00
224 lin. ft. 24 in. C.G.S.M. culvert pipe.....	8.00	9.00
8 ea. 24 in. metal pipe end sections.....	60.0	40.00
1,620 lin. ft. Combination conc. curb and gutter.	4.50	3.00
1,400 lin. ft. 12 in. treated log curb.....	6.00	3.00
650 sq. yd. Concrete sidewalk.....	7.00	7.00
1,300 sq. yd. Bituminous sidewalk.....	3.00	2.00
40 ea. Timber guide posts with reflector strips (treated), Type 1.....	10.00	10.00
80 ea. Barrier posts (treated).....	10.00	5.00
4,800 cu. yd. Furn. and placing loamy topsoil...	3.00	1.00
160 unit Turf shoulders.....	54.00	25.00
Lump sum Removal of Old Snake River Bridge	14,000.00	7,300.00

Colorado—Montezuma County—Bureau of Public Roads. Hinman Bros. Construction Co. was awarded a \$320,803 contract for grading and base surfacing of 3 mi. of Mesa Verde Park entrance road.

(1) Hinman Bros. Construction Co.....	\$320,803
(2) Northwestern Engineering Co.....	346,799
Colorado Construction, Inc.....	349,826
E. J. Rippey & Sons.....	428,026

	(1)	(2)
Contingent sum		
Miscellaneous force account work.....	\$10,000.00	\$10,000.00
20 ac. Clearing and grubbing.....	300.00	400.00
10,000 cu. yd. Stripping and storing topsoil.....	.35	.72
120,000 cu. yd. Unclassified excavation.....	.62	.72
450 cu. yd. Unclass. excavation for structures.....	2.00	4.00
450,000 sta. yd. Overhaul.....	.01	.02
14,000 cu. yd. mi. Overhaul.....	.15	.30
6,900 cu. yd. Replacing topsoil.....	.95	1.00
2,400 units Watering of embankment.....	3.00	3.00
550 units Watering of base course.....	4.00	4.00
Lump sum Prov. and maint. wat. plant or plants	3,915.00	1,200.00
650 hr. Rolling of embankment.....	9.40	12.00
150 hr. Rolling of base course.....	10.00	10.00
33,000 ton Subbase material crushed gravel or crushed stone base.....	2.10	2.10
18,000 ton Course, Class 2, Grading D-1.....	2.55	2.55

60,000 sq. yd. Processing bituminous base.....	.12	.12
61,000 gal. M.C. cutb. asph., Grade 0, 1, 2 or 3	.25	.25
6,000 gal. R.C. cutback asphalt, Grade 1 or 2		
Conc. Class A (air-entrained conc.)	.27	.27
4 cu. yd. Low-alkali cement.....	135.00	125.00
938 lb. Struct. steel—furn., fibr., & erected	.54	.40
55 cu. yd. Cement rubble masonry.....	80.65	110.00
170 lin. ft. 8-in. C.G.S.M. culvert pipe.....	2.95	3.00
1,322 lin. ft. 24-in. C.G.S.M. culvert pipe.....	7.00	8.00
244 lin. ft. 36-in. C.G.S.M. culvert pipe.....	12.75	14.00
92 lin. ft. 60-in. C.G.S.M. culvert pipe.....	30.00	28.00
110 lin. ft. 29 in. x 18 in. arch culvert pipe.....	6.70	8.00
62 lin. ft. 58 in. x 36 in. arch culvert pipe.....	20.00	22.00
7 ea. 24-in. metal pipe end sections.....	48.00	50.00
2 ea. 36-in metal pipe end sections.....	130.00	140.00
4 ea. 29 in. x 18 in. met. pipe arch end sect.	53.75	50.00
2 ea. 58 in. x 36 in. met. pipe arch end sect.	170.00	170.00
90 sq. yd. Grouted rubble gutter.....	13.50	30.00
650 lin. ft. Combination conc. curb and gutter.	3.45	3.75
750 sq. yd. Bituminous sidewalk timber guide posts with reflector.....	2.30	4.50
170 ea. Strips (treated), Type 1.....	6.75	8.00
10 ea. Barrier posts (treated).....	10.65	15.00
140 units Turf shoulders.....	47.00	44.00
50 hr. Road grader.....	14.00	15.00
300 hr. Tractors.....	17.00	15.00
16,000 sq. ft. Remove metal cribbing.....	.60	.33

Wyoming—Lincoln County—Bureau of Public Roads. Eagle Construction Co. received a \$678,449 contract for 4.031 mi. of grading and base surfacing in Targhee National Forest, Wyo.

(1) Eagle Construction Co.....	\$678,449
(2) Pickett & Nelson.....	695,403
Peter Kiewit Sons' Co.....	723,526
Kiely Construction Co.....	728,401

	(1)	(2)
29 ac. Clearing and grubbing.....	\$ 800.00	\$600.00
3,000 cu. yd. Stripping and storing topsoil.....	.50	.25
420,000 cu. yd. Unclassified excavation.....	.81	.84
4,100 cu. yd. Unclassified excavation for structures.....	4.50	6.00
17,000 cu. yd. Unclass. excav. for borrow, Case 1...	.40	.40
1,600,000 sta. yd. Overhaul.....	.02	.02
40,000 cu. yd. Overhaul.....	.25	.40
2,000 cu. yd. Replacing topsoil.....	.60	1.00
Cont. sum Obliteration of old roadways.....	1,400.00	1,400.00
3,300 unit Watering of embankment.....	1.00	1.25
450 unit Watering of base course.....	2.00	2.00
Lump sum Prov. and maint. water plant or plants	4,500.00	1,000.00
1,700 hr. Rolling of embankment.....	6.00	10.00
150 hr. Rolling of base course.....	10.00	9.00
21,000 ton Subbase material.....	1.00	1.35
15,400 ton Crushed gravel or crushed stone base course Class 2, Grading D-1.....	1.50	1.50
81,200 sq. yd. Processing bituminous base.....	.10	.06
85,000 gal. M.C. cutback asph., Grade 0, 1, 2, or 3	.19	.18
10,000 gal. R.C. cutback asphalt, Grade 1 or 2...	.20	.18
425 cu. yd. Conc. Class "A" (air-entrained conc., low-alkali cement).....	79.00	77.50
43,700 lb. Reinforcing steel.....	.17	.15
2,798 lin. ft. 24 in. CGSM culvert pipe.....	6.50	6.50
200 lin. ft. 24 in. perf. CGSM culvert pipe.....	8.00	10.00
390 lin. ft. 36 in. CGSM culvert pipe.....	16.50	12.00
196 lin. ft. 48 in. CGSM culvert pipe.....	21.00	15.00
300 cu. yd. Hand-laid rock embankment.....	25.00	10.00
4,600 sq. ft. Metal cribbing, Design "A".....	7.50	7.50
320 sq. ft. Metal cribbing, Design "B".....	8.00	8.00
380 sq. ft. Metal cribbing, Design "C".....	8.75	8.00
860 sq. ft. Metal cribbing, Design "D".....	10.25	9.40
3,000 lin. ft. 6 in. perf. CGSMP underdrain.....	5.00	4.50
23 ea. Concrete maintenance marker posts.....	12.50	15.00
200 ea. Timber guide posts with reflector strips (treated), Type 2.....	6.00	11.00
1, 50 lin. ft. Deep beam highway guard.....	4.00	4.50

Arizona—Coconino County—Bureau of Public Roads. A low bid of \$112,478 was submitted by Tom Mulcaire for construction of 2.8 mi. of highway in Coconino National Forest.

(1) Tom Mulcaire.....	\$112,478
(2) Fisher Contracting Co.....	120,355
Peter Kiewit Sons' Co.....	129,748
M. R. Maziger.....	142,015

	(1)	(2)
26 ac. Clearing and grubbing.....	\$ 600.00	\$600.00
72,000 cu. yd. Unclassified excavation (other than roadway gutters below subgrade elevation)	.63	.68
300 cu. yd. Unclassified excavation (roadway gutters below subgrade elevation).....	3.00	1.70
340 cu. yd. Unclassified excavation for structures.....	3.50	4.20
2,160 cu. yd. Unclass. excav. for borrow, Case 1...	.70	.80
1,330 cu. yd. mi. Special overhaul of borrow and unclassified excavation (1,500 feet free haul)...	.04	.30
6,200 lin. ft. Furrow ditches.....	.20	.10
Cont. sum Obliteration of old roadways.....	500.00	500.00
520 M gal. Watering of surface course.....	2.60	6.00
Lump sum Prov. & maint. wat. plant or plants...	1,352.00	600.00
19,000 ton Crushed gravel or crushed stone surface course, Class 1, Grading E.....	1.91	2.02
540 cu. yd. Pit stripping.....	1.00	.35
34 lin. ft. 8 in. C.G.S.M. culv. pipe (asph. dipped)	3.75	4.00
362 lin. ft. 18 in. C.G.S.M. culvert pipe.....	4.90	6.00
402 lin. ft. 24 in. C.G.S.M. culvert pipe.....	7.00	9.50
220 lin. ft. Removing, cleaning and stockpiling or relaying salvaged culvert pipe.....	3.50	5.30
1 ea. Embankment spillway inlet assembly (Type A, for 8 in. pipe) (asph. dipped)	42.00	80.00

THE OLIVER SUPER 88



"Saves as much as 50% over other equipment"

On this big \$15,000,000 shopping center project, Jos. L. Muscarelle, Inc., well-known contractor of Maywood, N. J., has an Oliver 88 on a 5-day-a-week schedule. Working right through the winter—and in frozen ground—the 88 handled all trenching for sanitary sewers, water and electric lines and spot excavations as well as all backfilling. Odd jobs include loading trucks with sand at a nearby pit, as seen above.

The 88 is also used to excavate in cramped areas where steel beams have been erected—and where larger machines can't operate. Here, too,

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Averages 550' per day of 5' trench

So far, the 88 has dug over 25,000' of trench ranging from 3' to 11' deep. Average production for 5' trenches—at random lengths, in all directions—totals 550' per day. Cost records show that the Oliver 88 saves

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THE OLIVER CORPORATION

400 West Madison Street, Chicago 6, Illinois

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

Grading and drainage

Arizona, Utah—Colorado River Storage Project—Bureau of Reclamation. A low bid of \$1,156,244 was submitted by Strong Co. for earthwork, culverts and access highway to Glen Canyon Dam.

(1) Strong Construction Co.	\$1,156,244
(2) Morrison-Knudsen Co., Inc.	1,232,189
Rogers Construction Co.	1,300,198
Mountain States Construction Co.	1,363,685
Fisher Contracting Co.	1,406,459
Peter Kiewit Sons' Co.	1,649,006

	(1)	(2)
890,000 cu. yd.	Excavation for roadway	\$ 1.10 \$ 1.13
6,800 lin. ft.	Crown ditches	.65 1.00
3,400 lin. ft.	Crown dikes	.65 .70
20,800 M. gal.	Watering	2.50 4.25
2,220 roller hr.	Rolling embankments	12.00 14.75
1,100 cu. yd.	Excavation for culverts	5.00 4.00
1,530 cu. yd.	Compacted backfill	3.00 4.25
1,070 cu. yd.	Riprap	8.00 4.00
304 lin. ft.	Furnishing and laying 24-in. dia., No. 16-gage, corrugated metal pipe	7.25 9.00
412 lin. ft.	Furnishing and laying 30-in. dia., No. 14-gage, corrugated-metal pipe	10.50 12.00
188 lin. ft.	Furnishing and laying 30-in. dia., No. 12-gage, corrugated-metal pipe	13.00 16.00
384 lin. ft.	Furnishing and laying 36-in. dia., No. 14-gage, corrugated-metal pipe	13.00 15.00
136 lin. ft.	Furnishing and laying 36-in. dia., No. 12-gage, corrugated-metal pipe	16.00 20.00
184 lin. ft.	Furnishing and laying 36-in. dia., No. 10-gage, corrugated-metal pipe	20.00 23.00
306 lin. ft.	Furnishing and laying 42-in. dia., No. 12-gage, corrugated-metal pipe	20.00 21.00
374 lin. ft.	Furnishing and laying 48-in. dia., No. 12-gage, corrugated-metal pipe	25.00 24.00
664 lin. ft.	Furnishing and laying 60-in. dia., No. 10-gage, corrugated-metal pipe	38.00 40.00
122 lin. ft.	Furnishing and laying 66-in. dia., No. 10-gage, corrugated-metal pipe	40.00 45.00
6 end sections	Furn. & install. No. 14-gage, corr-metal, flared-end sect. for 24-in. diameter pipe	65.00 100.00
10 end sections	Furn. & install. No. 14-gage, corr-metal, flared-end sect. for 30-in. diameter pipe	95.00 135.00
12 end sections	Furn. & install. No. 12-gage, corr-metal, flared-end sect. for 36-in. diameter pipe	159.00 190.00
8 end sections	Furn. & install. No. 12-gage, corr-metal, flared-end sect. for 42-in. diameter pipe	235.00 300.00
10 end sections	Furn. & install. No. 12-gage, corr-metal, flared-end sect. for 48-in. diameter pipe	290.00 350.00

Utah—Summit County—Bureau of Public Roads. R. M. Jensen was sole bidder at \$142,443 for construction of 4.333 mi. of U. S. highway in Utah.

(1) R. M. Jensen	\$142,443
(2) Engineer's Estimate	139,483

	(1)	(2)
36 ac.	Clearing and grubbing	\$450.00 \$350.00
66,600 cu. yd.	Unclassified excavation	.74 .75
620 cu. yd.	Unclassified excavation for structures	4.90 3.00
12,900 cu. yd.	Unclassified excavation for borrow, Case 1	.60 .50
69,000 sta. yd.	Overhaul (1,000 ft. free haul)	.03 .02
5,500 cu. yd. mi.	Spec. overhaul of borrow (1,000 ft. free haul)	.25 .20
4,200 lin. ft.	Furrow ditch	.15 .15
70 unit	Roadside cleanup	15.00 20.00
1,120 unit	Watering of embankment	2.00 1.50
420 unit	Watering of surface course	2.00 1.50
Lump sum	Prov. and maint. water plant or plants	500.00 500.00
340 hr.	Rolling of embankment	8.50 10.00
125 hr.	Rolling of surface course	8.50 8.00
16,500 ton	Subbase material	.95 1.10
14,400 ton	Cr. grav. or cr. st. surf. crse., Class 2, gr. B	1.10 1.35
30 cu. yd.	Conc. Class "A" (air-entrained low-alkali Type II cement)	100.00 70.00
450 lb.	Reinforcing steel	.20 .16
1,590 lin. ft.	24 in. C.G.S.M. culvert pipe	6.50 6.00
288 lin. ft.	36 in. C.G.S.M. culvert pipe	12.00 12.00
68 lin. ft.	60 in. C.G.S.M. culvert pipe	28.00 26.00
330 lin. ft.	Rem., clean & stockpile salv. culvert pipe	5.00 2.50
78 ea.	Tmbr. guide posts with warn. refl. (treated)	8.00 9.00

Colorado—Routt and Rio Blanco Counties—Bureau of Public Roads. Schmidt Construction, Inc., received a \$557,705 award for construction of 6.9 mi. of highway in Routt National Forest, Colo.

(1) Schmidt Construction, Inc.	\$557,705
(2) Herren-Strong	571,517
C. L. Hubner Co.	580,237
E. J. Rippey & Sons	584,304

	(1)	(2)
Cont. sum	Miscellaneous force account work	\$3,200.00 \$3,200.00
79 ac.	Clearing and grubbing	500.00 633.00
10,800 cu. yd.	Stripping and storing topsoil	.40 .50
410,000 cu. yd.	Unclassified excavation	.66 .60
2,100 cu. yd.	Unclassified excavation for structures	4.00 3.00
22,000 cu. yd.	Unclassified excava. for borrow, Case 1	.60 .56
500,000 sta. yd.	Overhaul (1,000 ft. free haul)	.02 .02
12,000 cu. yd. mi.	Special overhaul of borrow (1,000 ft. free haul)	.20 .15
6,200 cu. yd.	Replacing topsoil	.70 .50
10,000 lin. ft.	Furrow ditches	.20 .50
Cont. sum	Obilitation of old roadways to be paid for as earned	500.00 500.00

3,870 units	Watering of embankment	.50 2.00
Lump sum	Providing and maintaining water plant or plants	2,500.00 5,000.00
1,950 hr.	Rolling of embankment	8.00 15.00
52,300 ton	Subbase material	1.65 1.84
114 cu. yd.	Concrete Class "A" (air-entrained concrete, low-alkali cement)	80.00 80.00
1,500 lb.	Reinforcing steel	.25 .20
20 lin. ft.	18 in. C.G.S.M. culvert pipe	5.00 5.00
4,542 lin. ft.	24 in. C.G.S.M. culvert pipe	7.00 6.50
90 lin. ft.	36 in. C.G.S.M. culvert pipe	12.00 12.00
242 lin. ft.	48 in. C.G.S.M. culvert pipe	17.00 15.50
96 lin. ft.	60 in. C.G.S.M. culvert pipe	30.00 30.00
244 lin. ft.	29 in. x 18 in. arch culvert pipe	6.00 5.00
52 lin. ft.	43 in. x 27 in. arch culvert pipe	14.00 12.00
80 lin. ft.	144 in. struct. plate pipe (7- and 8-ga.)	105.00 100.00
72 lin. ft.	144 in. struct. plate pipe (10- and 8-ga.)	90.00 90.00
3,000 lin. ft.	6 in. perf. C.G.S.M. pipe underdrain	6.50 6.00
38 ea.	Concrete maintenance marker posts	20.00 25.00
9,200 lin. ft.	Barbed wire fence, Type 2	.25 .35
2 ea.	Gates (12-ft.)	20.00 50.00
540 ea.	Timber guide posts with reflector strips (treated), Type 2	7.00 8.00

Grade and bitu. treatment

New Mexico—Chaves County—State. A \$178,428 contract was awarded Harry Trotz for construction of 10 mi. of highway east of Hagerman.

(1) Harry Trotz	\$178,428
(2) Longenbaugh & Coe, Inc.	179,683
G. I. Martin	181,619
Jack Adams	182,688

	(1)	(2)
Lump sum	Removal of old structures	\$ 500.00 \$1,000.00
Lump sum	Removal of obstructions	500.00 1,000.00
Lump sum	Clearing & grubbing	14,700.00 10,000.00
129,900 cu. yd.	Excavation—unclassified	.21 .24
680 cu. yd.	Excavation for pipe culverts	1.50 1.00
9,115 M. gal.	Watering	.75 .50
210 hr.	Rolling (tamping roller)	7.00 10.00
415 hr.	Rolling (pneumatic tired)	5.00 5.00
160 hr.	Rolling (steel tired)	6.00 7.00
790 hr.	Fifty (50) ton roller operation	10.00 12.00
160 hr.	Mechanical tamping	5.00 4.00
246,614 sta. yd.	Station yard overhaul	.01 .01
41,530 ¼ mi. yd.	Quarter mile yard haul	.05 .05
117,310 ton mi.	Ton mile haul	.04 .07
3.2 mi.	Obliteration old road	300.00 100.00
8,400 lin. ft.	Contour ditches—24 ft. roadway	.10 .05
5 ea.	Cattle guard—24 ft. roadway	2,100.00 2,600.00
4,580 lin. ft.	Galvanized barbed wire fence	.22 .20
1 ea.	Gates—Texas type	10.00 10.00
8 ea.	Bracing	10.00 15.00
108 ea.	Right-of-way markers	8.00 8.00
1 ea.	Stand. Fed. aid proj. markers, Type I	100.00 50.00
36 ea.	Treat. tmbr. warn. posts refl. (6 in. dia.)	8.00 6.00
40,200 ton	Controlled gradation sub-base	.60 .60
25,650 ton	Base course	.89 .77
1,345 bbl.	Bituminous material, Type MC-1	5.50 6.00
1,010 bbl.	Bituminous material, Type 120-150	6.00 6.00
1,760 ton	Cover material	4.00 3.50
34 cu. yd.	Class "B" concrete for cut-off walls	50.00 50.00
59 cu. yd.	Grouted rock retards	20.00 20.00
1,078 lin. ft.	Culvert pipe—24 in. diam.	6.25 6.00
654 lin. ft.	Culvert pipe—36 in. diam.	10.50 11.00
108 lin. ft.	Culvert pipe—42 in. diam.	13.50 14.00
310 lin. ft.	Culvert pipe—48 in. diam.	16.50 16.00

Arizona—Yuma County—State. A low bid of \$213,393 was submitted by Royden Construction Co. for 4.4 mi. of roadwork consisting of grading and draining, select material, aggregate base, bituminous road mix and seal coat.

(1) Royden Construction Co.	\$213,393
(2) Yuma Rock & Sand Co.	221,105
W. R. Skousen	226,265
Dale F. Payne	231,184

	(1)	(2)
66,850 cu. yd.	Roadway excavation	\$.32 \$.32
4,400 cu. yd.	Drainage excavation	.24 .30
8,200 lin. ft.	Grade ditches	.05 .07
1,720 cu. yd.	Structural excavation	1.50 1.70
3,300 cu. yd. mi.	Overhaul	.25 .25
63,600 cu. yd.	Borrow (CIP)	.33 .30
Lump sum	Provide water supply	500.00 500.00
11,700 M. gal.	Apply water	1.20 1.50
1,750 hr.	Rolling	.60 .85
33,800 ton	Select material (CIP)	9.50 7.00
18,200 ton	Aggregate base (CIP)	.75 .90
1,320 ton	Cov. mat. for seal coat (Type "B") (CIP)	5.50 5.00
11,500 ton	Bit. mix. (Class I—rd. mix.) (CIP except cost of liquid asphalt)	.96 1.25
390 ton	Liq. asph. for bit. mix (Grade SC-3) (CIP)	32.50 35.00
155 ton	Emul., asph. for seal coat (Grade B) (CIP)	37.50 42.00
10 ton	Emul. asph. for curing seal (Grade A) (sta. 593 to sta. 612) (CIP)	60.00 68.50
710 cu. yd.	Class "A" concrete (CIP)	46.00 40.00
72,100 lin. ft.	Reinforcing steel (bars) (CIP)	.14 .14
334 lin. ft.	24 in. C.M.P. (CIP except excavation)	7.00 6.25
606 lin. ft.	36 in. C.M.P. (CIP except excavation)	12.00 11.00
74 lin. ft.	42 in. C.M.P. (CIP except excavation)	14.00 13.00
36 lin. ft.	48 in. C.M.P. (CIP except excavation)	16.00 16.00
Lump sum	Rem. of cattle load. ramp (sta. 568±)	200.00 300.00

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all your grading and rolling jobs!



4-D Series — Five standard transmission models in a horsepower range of 75 to 123 h.p. Completely cab-controlled blade positioning.



M-52 Maintainer — with torque converter. With hydraulically controlled attachments, machine can perform nine construction and maintenance jobs.

Why Huber Warco?

Huber-Warco Company and its predecessors, with over 195 years of combined experience, have been pioneers in the design and development of rollers and graders.

Beginning with the introduction of the world's first motor grader in 1921, other firsts include; producing the world's first automotive-type motor roller in 1923, the first hydraulically controlled motor grader in 1926, first to offer a grader with torque converter and power-shift transmission, as well as the world's most powerful motor grader in 1955.

Over 185 domestic and foreign distributors are strategically located to provide Huber-Warco customers with world-wide sales and service.



3-Wheel Roller — Torque converter, tail-shaft governor and two-speed transmission. Standard and variable weight models range from 10 to 14 tons.

HUBER-WARCO COMPANY
MARION, OHIO, U. S. A.



Lump sum	Rem. of conc. foundations (sta. 643±).....	100.00	100.00
48 ea.	Guide posts (std. C-8) (Type B, D or E) (CIP).....	7.00	6.00
31 ea.	Right-of-way markers (std. C-1) (Type B or C) (CIP).....	9.00	10.00
1 ea.	Sur. mon. and cover (std. C-1) (CIP).....	60.00	50.00
150 lin. ft.	Bank prot. (std. C-23) (Type B) (CIP).....	10.00	10.00
10,345 sq. yd.	Process. and placing cement treated base (sta. 593 to sta. 612).....	.12	.33
2,810 sacks	Portland cement for cement treated base (del'd. to job site).....	1.30	1.35
Lump sum	Construct cattle loading ramp.....	1,500.00	850.00

Montana—Custer County—State. A \$754,141 contract was awarded to Summit Construction Co. for 17,057 mi. of grading, gravel surfacing, bituminous surface treatment, widening of bridge and drainage. Unit price are as follows:

(1) Summit Construction Co.....	\$754,141
(2) Harris Construction Co.....	770,792
Husman Bros., Inc.....	808,706
Peter Kiewit Sons' Co.....	864,604

	(1)	(2)
741,025 cu. yd.	Unclassified excav. and borrow.....	\$.24 \$.26
6,431 cu. yd.	Culvert excavation.....	.50 2.00
1,613 cu. yd.	Bravel backfill.....	3.50 2.00
63,706 mi. yd.	Overhaul.....	.20 .20
7,331 ton	Crushed gravel cover material.....	3.00 5.00
185,917 ton	Sel. borrow base course.....	.82 .88
48,654 cu. yd.	Type "A" top course surf.....	1.09 1.10
61,577 cu. yd.	Sand base material.....	.78 .99
102,592 gal.	1st. ap. MC-2 liquid asphalt.....	.17 .18
102,592 gal.	2nd. ap. RS-2 emulsion asphalt.....	1.65 .18
15,947 M gal.	Water surf. course and embankment.....	2.00 .10
1,481 unit	Rolling embankment.....	8.00 8.00
1,271 unit	Rolling surf. course.....	9.00 2.50
1,162 lin. ft.	Corr. metal pipe culv. 18 in. diam.....	4.45 4.30
2,476 lin. ft.	Corr. metal pipe culv. 24 in. diam.....	7.20 7.00
880 lin. ft.	Corr. metal pipe culv. 30 in. diam.....	8.50 8.80
1,042 lin. ft.	Corr. metal pipe culv. 36 in. diam.....	13.90 12.80
78 lin. ft.	Corr. metal pipe culv. 48 in. diam.....	20.85 29.10
98 lin. ft.	St. pl. p. el. cul. 72 in. dia. 10 ga. metal.....	45.15 45.00
300 lin. ft.	St. pl. p. el. cul. 84 in. dia. 10 ga. metal.....	51.25 50.00
252 lin. ft.	St. pl. p. el. cul. 90 in. dia. 10 ga. metal.....	58.75 60.00
128 lin. ft.	St. pl. p. el. cul. 108 in. dia. 8 ga. metal.....	77.50 76.00
70 lin. ft.	St. pl. p. el. cul. 120 in. dia. 8 ga. metal.....	84.75 83.00
162 lin. ft.	Cor. metal p. arch culvert 58 in. span x 36 in. rise.....	19.85 19.90
214 lin. ft.	Cor. metal pipe arch culv. 72 in. span x 44 in. rise.....	36.45 35.00
70 lin. ft.	St. p. p. arch culv. 6 ft.-4 in. span x 4 ft.-9 in. rise 10 ga. metal.....	45.65 47.00
74 lin. ft.	St. p. p. arch culv. 7 ft.-3 in. span x 5 ft.-3 in. rise 10 ga. metal.....	54.15 54.00
74 lin. ft.	St. p. p. arch culv. 8 ft.-7 in. span x 5 ft.-11 in. rise 10 ga. metal.....	60.50 62.00
70 lin. ft.	St. p. p. arch culv. 9 ft.-4 in. span x 6 ft.-3 in. rise 10 ga. metal.....	62.65 65.00
88 lin. ft.	St. p. p. arch culv. 11 ft.-5 in. span x 7 ft.-3 in. rise 10 ga. metal.....	70.70 72.00
78 lin. ft.	St. p. p. arch culv. 11 ft.-10 in. span x 7 ft.-7 in. rise 8 ga. metal.....	85.70 85.00
80 lin. ft.	St. p. p. arch culv. 14 ft.-10 in. span x 9 ft.-1 in. rise 7 ga. metal.....	106.00 104.00
148 lin. ft.	St. p. p. stpkpass. std. 44 10 ga. metal.....	58.00 60.00
100 lin. ft.	Relay pipe culverts.....	4.00 6.00
Lump sum	Misc. to be moved.....	12,000.00 12,000.00
243 ea.	Concrete roadway monuments.....	9.00 5.00
3 ea.	Concrete project markers.....	50.00 25.00
90 ea.	Concrete station markers.....	9.00 8.00
18,785 MBM	Treated timber.....	450.00 400.00
1,402 MBM	Untreated timber.....	350.00 350.00
8 ea.	Ea 20.0 ft. treated timber piles.....	125.00 80.00
4 ea.	Each 25.0 ft. treated timber piles.....	150.00 90.00
Lump sum	Rev. ex. str. and mtn. tr.....	3,000.00 2,000.00

Grading and paving

California—Sacramento County—State. A \$536,124 contract was awarded to McGillivray Construction Co. for 2.2 mi. of grading and paving with plant mixed surfacing on cement treated base.

(1) McGillivray Construction Co.....	\$536,124
(2) Granite Construction Co.....	584,851
A. Teichert & Son, Inc.....	647,750
Brighton Sand & Gravel Co.....	695,637

	(1)	(2)
Lump sum	Removing existing bridge.....	\$2,530.04 \$ 4,400.00
Lump sum	Clearing and grubbing.....	3,072.72 21,600.00
Lump sum	Dev. wat. sup. & furn. wat. equip.....	5,643.85 9,800.00
5,850 M gal.	Applying water.....	.75 2.35
80,000 sq. yd.	Compacting original ground.....	.069 .04
63,500 cu. yd.	Roadway excavation.....	.50 .50
3,000 cu. yd.	Structure excavation.....	2.64 3.25
2,150 cu. yd.	Structure backfill.....	2.94 4.25
900 cu. yd.	Ditch and channel excavation.....	1.30 1.70
2,220,000 sta. yd.	Overhaul.....	.006 .009
18,600 ton	Imported subbase material.....	1.80 1.60
4,750 ton	Untreated base.....	2.23 2.45
76,000 sq. yd.	Mix. spread. & compact C.T.B.....	.465 .09
8,900 bbl.	Portland cement.....	4.67 6.10
33,400 ton	Mineral aggregate (C.T.B.).....	1.67 2.15
100 ton	Asphaltic emul. (cur. el. & fog al.).....	49.47 45.00
12 ton	Liquid asphalt S-2 (prime coat).....	37.91 49.00
770 ton	Paving asphalt (P.M.S.).....	26.64 5.10

15,000 ton	Mineral aggregate (P.M.S.).....	3.63 5.10
16 sq. yd.	Placing P.M.S. downdrains.....	1.24 4.00
230 ton	Sand cover (cur. sl. & pr. ct.).....	4.27 7.25
310 cu. yd.	Class "A" conc. (structures).....	80.20 73.00
36,300 lb.	Bar reinforcing steel.....	.1443 .14
53 ea.	Drop inlet frames and grates.....	86.73 78.00
1 ea.	Special steel grating.....	123.90 90.00
2,150 cu. yd.	Cl. "B" conc. (curbs, gutters and sidewalks).....	33.45 37.00
130 ea.	Curb dowls.....	.62 .50
160 ea.	Roadway monuments.....	8.05 8.90
11 ea.	Survey monuments.....	8.05 20.00
230 cu. yd.	Broken concrete riprap.....	13.85 7.90
47 ea.	Horiz. refl. units & guide posts.....	7.43 8.00
1,000 lin. ft.	New property fence.....	.50 .70
2 ea.	16 ft. port. fence gates.....	61.95 100.00
2,100 lin. ft.	12 in. R.C.P.....	6.02 3.55
775 lin. ft.	18 in. R.C.P.....	7.40 4.95
660 lin. ft.	48 in. R.C.P.....	19.28 17.50
54 lin. ft.	24 in. C.M.P. (14 ga.).....	9.74 9.00
66 lin. ft.	60 in. C.M.P. (10 ga.).....	36.61 36.00
54 lin. ft.	6 in. perf. metal pipe underdrains.....	2.63 2.00
30 lin. ft.	Entrance tapers for 8 in. metal pipe.....	43.37 66.00
91 lin. ft.	8 in. C.M.P. downdrains.....	2.66 3.50
16 lin. ft.	Salv. and relay C.M.P.....	6.20 5.00
20 lin. ft.	42 in. x 1/2 in. welded steel pipe.....	30.56 55.00
4 ea.	4 in. asbestos-cement pipe.....	3.72 1.85
11 ea.	48 in. automatic drainage gates.....	371.70 360.00
1 ea.	Salv. automatic drainage gates.....	49.56 42.00
1 ea.	Reinstall. salv. auto. drain. gate.....	123.90 65.00
113 lin. ft.	6 in. vitrified clay pipe.....	3.47 3.70
116 lin. ft.	8 in. vitrified clay pipe.....	3.84 4.20
2 ea.	Precast manholes.....	229.22 320.00
38 ea.	Adjusting manholes to grade.....	37.17 63.00
27 ea.	Salv. cast iron gutter drains.....	6.20 21.00
10 ea.	Reset. cast iron gutter drains.....	6.20 14.00
175 lin. ft.	Finishing roadway.....	1,491.75 2,750.00
	Raised traffic bars.....	2.66 2.75
	Traffic sig. & hiway. light. sys.....	41,184.36 44,400.00

Washington—Pacific County—State. Erland & Bickie was successful low bidder at \$1,199,762 for construction of 2.857 mi. of highway requiring extensive excavation work.

(1) Erland & Bickie.....	\$1,199,762
(2) Stoen Construction Co.....	1,302,366
Osberg Construction Co.....	1,382,979
Erickson Paving Co.....	1,410,747

	(1)	(2)
39 ac.	Clearing.....	\$ 600.00 \$1,200.00
20 ac.	Grubbing.....	1,000.00 800.00
295,400 cu. yd.	Uncl. excav. incl. haul of 600 ft.....	1.55 1.55
123,200 cu. yd.	Common excav. incl. haul of 60 ft.....	.45 .75
179,000 cu. yd.	Solid rock excav. incl. haul of 60 ft.....	1.70 1.55
170 cu. yd.	Com. trench excav. incl. haul of 600 ft.....	3.00 10.00
68,300 cu. yd.	Uncl. borrow incl. haul of 600 ft.....	1.00 1.15
3,300 cu. yd.	Excav. of unsuitable found. mat. incl. haul of 600 ft.....	1.60 2.00
108,950 unit	Overhaul.....	.50 .50
103,000 cu. yd.	Embankment compaction method B.....	.04 .15
115,000 cu. yd.	Rock embankment compaction.....	.04 .10
1,400 cu. yd.	Structure excavation.....	4.00 5.00
100 hr.	Smooth wheeled power roller.....	9.00 10.00
100 hr.	Pneumatic tired roller.....	8.00 10.00
584 hr.	Mechanical tamper.....	6.00 8.00
85 day	Furn. & operating heavy duty roter.....	72.00 150.00
85 day	Furn. & operat. heavy duty power grader & scarifier.....	56.00 100.00
7,250 lin. ft.	Slope treatment Class "B".....	.20 .20
162 sta.	Finishing roadway.....	20.00 20.00
1,200 M gal.	Water.....	2.50 3.00
290 cu. yd.	Gravel backfill for foundations.....	7.50 6.00
960 cu. yd.	Gravel backfill for drains.....	8.50 6.00
4,740 ton	Furn. & placing cr. stone surf. top course.....	4.00 4.00
10,860 ton	Furnishing & placing ballast.....	3.60 4.00

TYPE 1-1 ASPHALTIC CONCRETE PAVEMENT		
1,540 ton	Class "B".....	15.00 15.00
7 ton	Asphalt cement for tack coat.....	130.00 75.00
11,675 sq. yd.	Preparation of untreated roadway.....	.15 .10
140 cu. yd.	New fine mineral aggregate.....	10.00 10.00
13 ton	Asphalt cement MC-3 prime coat.....	76.00 75.00
20 ton	Furnishing mineral filler.....	30.00 50.00
OTHER ITEMS		
1,660 lin. ft.	Cement concrete curb.....	1.70 2.75
3 cu. yd.	Concrete Class "C".....	100.00 150.00
180 lin. ft.	Concrete or V.C. drain pipe 4 in. diam.....	.80 1.50
550 lin. ft.	Concrete or V.C. drain pipe 8 in. diam.....	1.20 2.00
1,570 lin. ft.	Concrete or V.C. drain pipe 10 in. diam.....	1.50 2.25
600 lin. ft.	Std. reinf. conc. culvert pipe 12 in. dia.....	3.70 3.00
213 lin. ft.	Std. reinf. conc. culvert pipe 24 in. dia.....	8.00 8.00
111 lin. ft.	Std. reinf. conc. culvert pipe 36 in. dia.....	13.00 15.00
90 lin. ft.	Std. reinf. conc. culvert pipe 48 in. dia.....	18.00 25.00
100 lin. ft.	Asbestos-bonded corr. metal pipe 24 in. dia. #14 gauge.....	9.00 15.00
197 lin. ft.	Asbestos-bonded corr. metal pipe 36 in. dia. #12 gauge.....	18.00 30.00
272 lin. ft.	Asbestos-bonded corr. metal pipe 60 in. dia. #10 gauge.....	38.00 54.00
670 lin. ft.	Asbestos-bonded corr. metal pipe 72 in. dia. #10 gauge.....	48.00 66.00
550 lin. ft.	Galv. iron water pipe 1/2 in. diameter.....	1.00 1.50
650 lin. ft.	Galv. iron water pipe 1 1/2 in. diameter.....	1.50 2.50
90 lin. ft.	Galv. iron water pipe 2 in. diameter.....	2.00 2.90
360 lin. ft.	Galv. iron water pipe 3 in. diameter.....	2.00 3.10
80 lin. ft.	Relay. galv. iron water pipe 1/2 in. dia.....	1.00 1.00
800 lin. ft.	Relay. galv. iron water pipe 1 1/2 in. dia.....	1.50 1.50
40 lin. ft.	Relay. galv. iron water pipe 2 in. dia.....	1.50 2.00
2 ea.	Monument cases & covers.....	75.00 100.00
1,200 lin. ft.	Standard beam guard rail.....	3.00 4.00
2 ea.	Double 20 ft. chain link gates.....	325.00 500.00
68 ea.	Reinforced concrete roadway markers.....	11.00 10.00
2,550 sq. yd.	Removing bituminous pavement.....	.60 .50
Lump sum	Removing portions of timber docks (4).....	2,800.00 4,000.00
est.	Flagging.....	1,500.00 1,500.00

Arizona—Pinal County—State. A low bid of \$128,840 was submitted by Tiffany Construction Co. for approximately 3 mi. of roadwork on the Casa Grande-Picacho Highway between Toltec and Eloy, Ariz.

(1) Tiffany Construction Co.	\$128,840	
(2) Tucson Pavers, Inc.	132,651	
Saguaro Contracting Co.	144,526	
Arizona Sand & Rock Co.	144,850	

	(1)	(2)
15,000 cu. yd. Roadway excavation	\$.60	.45
190 cu. yd. Drainage excavation	.60	.40
100 cu. yd. Structural excavation	2.00	2.00
1,300 cu. yd. Overhaul	.40	.30
3,400 cu. yd. Borrow (CIP)	1.00	.70
43,000 cu. yd. Stripping pits	.12	.20
1 lump sum Provide water supply	250.00	250.00
4,000 M gal. Apply water	2.00	1.75
560 hr. Rolling	9.00	8.00
38,600 ton. Sift material (CIP)	.60	.60
12,900 ton. Aggregate base (CIP)	.90	1.25
1,000 ton. Cover material for seal coat (Type B) (CIP)	6.00	6.50
8,600 ton. Bituminous mix (Class II-plant mix) (CIP except cost of liquid asphalt)	2.70	2.75
195 ton. Liquid asphalt for prime coat and tack coat (Gr. MC-2 or MC-3) (CIP)	48.00	50.00
350 ton. Liq. asph. for bit. mix (Gr. SC-6) (CIP)	38.00	37.00
115 ton. Emul. asphalt for seal coat (Gr. B) (CIP)	45.00	45.00
140 lin. ft. 24 in. C.M.P. (CIP except excavation)	7.00	6.00
188 lin. ft. 36 in. C.M.P. (CIP except excavation)	13.00	12.00
22 lin. ft. 30 in. reinf. conc. pipe (CIP except excava.)	15.00	8.00
1 lump sum Miscellaneous removal work	300.00	700.00
26 ea. Guide posts (Std. C-8, Type B) (CIP)	7.00	7.00
17 ea. Right-of-way markers (Std. C-1) Type B or C) (CIP)	10.00	8.00
3,700 lin. ft. Line fence (Std. C-16) (CIP)	.25	.25

New Mexico—Quay County—State. A low bid of \$324,565 was submitted by Leslie Wheeler Construction Co. for grading and surfacing of 5.157 mi. on U.S. 54 in New Mexico.

(1) Leslie Wheeler Construction Co.	\$324,565	
(2) G. I. Martin	331,450	
Allison & Haney and Daniels Construction Co.	334,803	
Longenbaugh & Co., Inc.	343,145	

	(1)	(2)
Lump sum Removal of old structures	\$4,500.00	\$8,500.00
Lump sum Removal of obstructions	6,500.00	5,100.00
41,417 cu. yd. Excavation—unclassified	.23	.22
103 cu. yd. Excavation for structures	2.00	3.00
9,401 cu. yd. Excavation for pipe culverts	2.00	2.00
9,495 M gal. Ordinary borrow	.23	.21
225 hr. Rolling (tamping roller)	5.00	10.00
635 hr. Rolling (pneumatic tired)	3.50	4.50
510 hr. Rolling (steel tired)	4.00	6.00
880 hr. Fifty (50) ton roller operation	13.00	10.00
241 hr. Mechanical tamping	6.00	4.00
268,481 sta. yd. Station yard overhaul	.02	.02
177,466 ¼ mi. yd. Quarter mile yard haul	.04	.05
1,080,955 ton. Ton mile haul	.059	.065
1,000 lin. ft. Contour ditches	.10	.06
26 cu. yd. Dry riprap Class "A"	20.00	12.00
26 cu. yd. Excavation for riprap	3.00	5.00
1 ea. Cattle guard—18 ft. roadway	2,000.00	2,100.00
336 lin. ft. Steel plate guard fence	10.00	6.00
21,125 lin. ft. Galvanized barbed wire fence	.30	.25
11 ea. Gates—standard type	55.00	50.00
37 ea. Bracing	8.00	10.00
5,430 lin. ft. Galvanized woven wire farm fence	.40	.28
54 ea. Right-of-way markers	8.00	8.50
1 ea. Stand. Fed. aid proj. mrkrs., Type I	100.00	50.00
1 ea. Std. Fed. aid proj. mrkrs., Type III	100.00	50.00
57 ea. Treated timber warn. posts, ref. (6 in. diam.)	8.00	7.50
26,625 ton. Selected borrow sub-base	.35	.52
30,305 ton. Controlled gradation sub-base	.65	.60
20,415 ton. Base course	.84	.70
1,185 bbl. Bituminous material, Type MC-1	7.25	6.80
360 bbl. Bituminous material, Type 120-150	7.25	6.80
645 ton. Cover material	5.00	4.25
12,345 ton. Plant mix surface course	3.60	3.90
3,465 bbl. Bit. mat., Type 85-100 (plant mix)	7.00	.630
301 bbl. Bit. mat., Type 85-100 (tack coat)	7.50	6.80
58.73 cu. yd. Class "A" concrete	100.00	100.00
5,523 lb. Reinf. for concrete structures	.20	.16
1,996 lin. ft. Concrete curb and gutter	2.00	2.00
265 lin. ft. Concrete median curb and gutter	2.00	1.90
415 lin. ft. Concrete valley gutter (2.5 ft.)	1.85	2.00
360 lin. ft. Concrete valley gutter (3.5 ft.)	2.00	2.20
36 lin. ft. Std. reinf. conc. pipe—18 in. diam.	9.00	6.50
130 lin. ft. Std. reinf. conc. pipe—24 in. diam.	11.00	8.50
32 lin. ft. Std. reinf. conc. pipe—48 in. diam.	30.00	17.00
1,104 lin. ft. Corr. metal culv. pipe—24 in. diam.	8.50	7.20
412 lin. ft. Corr. metal culv. pipe—30 in. diam.	9.00	9.00
460 lin. ft. Corr. metal culv. pipe—36 in. diam.	11.00	15.00
30 lin. ft. Rem. & rel. culv. pipe—24 in. diam.	7.00	7.00
419 lb. Structural steel	.50	.50

(1) Fred H. Slate Co. and E. C. Hall	\$2,731,683	
(2) Morrison-Knudsen Co.	2,733,369	
Green Construction Co.	3,106,971	
Max J. Kunej Co.	3,254,424	
Peter Kiewit Sons' Co.	3,399,104	

	(1)	(2)
135 ac. Clearing	\$ 500.00	\$ 700.00

52 ac. Grubbing	300.00	250.00
1 ea. Removal of culvert	1,000.00	300.00
2,200 lin. ft. Remove guard rail	1.00	1.00
22 ea. Remove conc. headwalls	35.00	40.00
1,550,000 cu. yd. Unclass. excav.	1.75	.83
110 cu. yd. Excav. for struct. sch. No. 1	10.00	10.00
4,200 cu. yd. Excav. for struct. sch. No. 2	4.00	3.00
130,000 y. u. Haul	.75	.30
30,200 M gal. Watering embankments	1.00	1.00
5,300 M gal. Watering base and surf. courses	2.50	1.50
1,480 hr. Rolling, power roller	8.50	6.00
7,500 hr. Rolling, tamping roller	10.00	6.00
9,080 cu. yd. Rolling, pneu. tire roller	8.50	7.00
6 sta. Mech. tamping	2.50	2.50
61,000 ton. Furrow ditches	50.00	30.00
83,000 ton. Cr. rk. base co. 1 in. max. Type "A"	1.75	1.95
30,000 ton. Cr. rk. base co. ¾ in. max. Type "B"	1.85	2.05
2 mi. Recond. exist. roadbed Class "A"	1.75	1.95
3,100 ton. Cr. rk. in wind. ¾ in. max.	1.85	1.95
87,500 gal. RC-1 asph. rd. mat. for prime	.21	.20
1,500 ton. Blotter mat. Class "C"	3.25	3.00
2 mi. Mix. finish and roll. Class "A"	2,000.00	1,000.00
156 ton. MC-3 asph. rd. mat. for roadmix	47.50	48.00
3,050 ton. 85-100 pene. asph. rd. mat. for pl. mix.	38.00	44.00
26,800 ton. Pl. mix. bit. surf. Class "B"	3.85	3.60
28,500 ton. Pl. mix. bit. surf. Class "D"	3.85	3.60
67,600 gal. RC-5 asph. rd. mat. for seal	.21	.20
3,400 ton. Cov. ct. mat. Class 4	5.00	4.00
339 cu. yd. Conc. Class "A"	75.00	90.00
37,800 lb. Metal reinf.	.15	.17
150 lin. ft. 12 in. pipe culv.	3.00	3.00
4,400 lin. ft. 18 in. pipe culv.	4.00	5.00
2,200 lin. ft. 24 in. pipe culv.	6.00	7.00
500 lin. ft. 24 in. pipe culv. (bit. ct. corr. met. or reinf. conc. ext. str.)	6.00	8.00
240 lin. ft. 24 in. pipe culv. (bit. ct. corr. met. 12 ga.)	7.75	10.00
130 lin. ft. 30 in. pipe culv.	8.00	10.00
280 lin. ft. 30 in. pipe culv. (bit. ct. corr. met. 10 ga.)	12.00	15.00
350 lin. ft. 30 in. pipe culv. (bit. ct. corr. met. 12 ga. or reinf. conc. ext. str.)	9.50	11.00
150 lin. ft. 36 in. pipe culv.	12.50	13.50
210 lin. ft. 48 in. pipe culv. (bit. ct. corr. met. 10 ga. or reinf. conc. ext. str.)	20.00	21.50
74 lin. ft. 60 in. pipe culv.	27.00	28.00
170 lin. ft. 66 in. pipe culv.	31.00	31.00
400 lin. ft. 72 in. pipe culv.	36.00	37.00
441 lin. ft. Salv. 48 in. to 60 in. corr. met. pipe	15.00	6.00
144 lin. ft. 120 in. corr. pl. pipe culv. (10 ga.)	65.00	71.00
184 lin. ft. 126 in. corr. pl. pipe culv. (8 ga.)	75.00	81.00
210 lin. ft. 7 ft.-11 in. x 5 ft.-7 in. corr. pl. pipe arch (10 ga.)	50.00	57.00
420 lin. ft. 8 ft.-2 in. x 5 ft.-9 in. corr. pl. pipe arch (10 ga.)	51.00	58.00
154 lin. ft. 10 ft.-8 in. x 6 ft.-11 in. corr. pl. pipe arch (8 ga.)	66.00	76.00
220 lin. ft. 10 ft.-11 in. x 7 ft.-1 in. corr. pl. pipe arch (8 ga.)	67.50	79.00
21,500 lin. ft. Steel beam type—guard rail	3.25	3.50
950 ea. Wood posts Type 4	3.00	5.00
1,400 lin. ft. Wire fence (Type 1-A)	.40	.35
21,000 lin. ft. Wire fence (Type 1-B)	.45	.35
8 ea. 10 ft. steel gates (Type 2)	150.00	60.00
2 ea. Project markers	25.00	50.00
100 ea. Right-of-way markers	12.00	7.50
44 ea. Drop inlet Type 2	100.00	180.00
35 ea. Drop inlet Type 3	120.00	200.00
1,200 lin. ft. Lined interceptor ditch	2.50	5.00
100 ac. Roadside cleanup	150.00	180.00
110,000 gal. SS-1 emulsified asph. rd. mat.	.22	.25

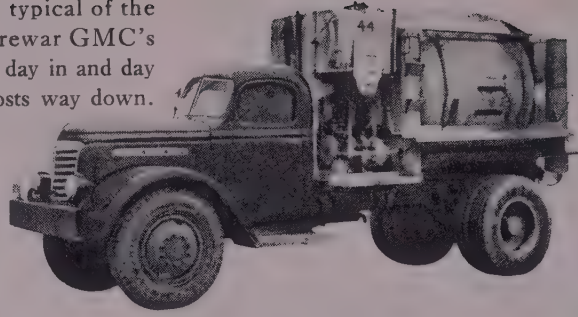
Grading and paving and structures

California—San Mateo County—State. Chas. L. Harney, Inc., was awarded a \$1,583,505 contract for 2 mi. grading and paving and construction of four bridges.

(1) Chas. L. Harney, Inc.	\$1,583,505	
(2) L. C. Smith Co.	1,608,364	
Guy F. Atkinson Co.	1,750,749	
Piombo Construction Co.	1,805,555	

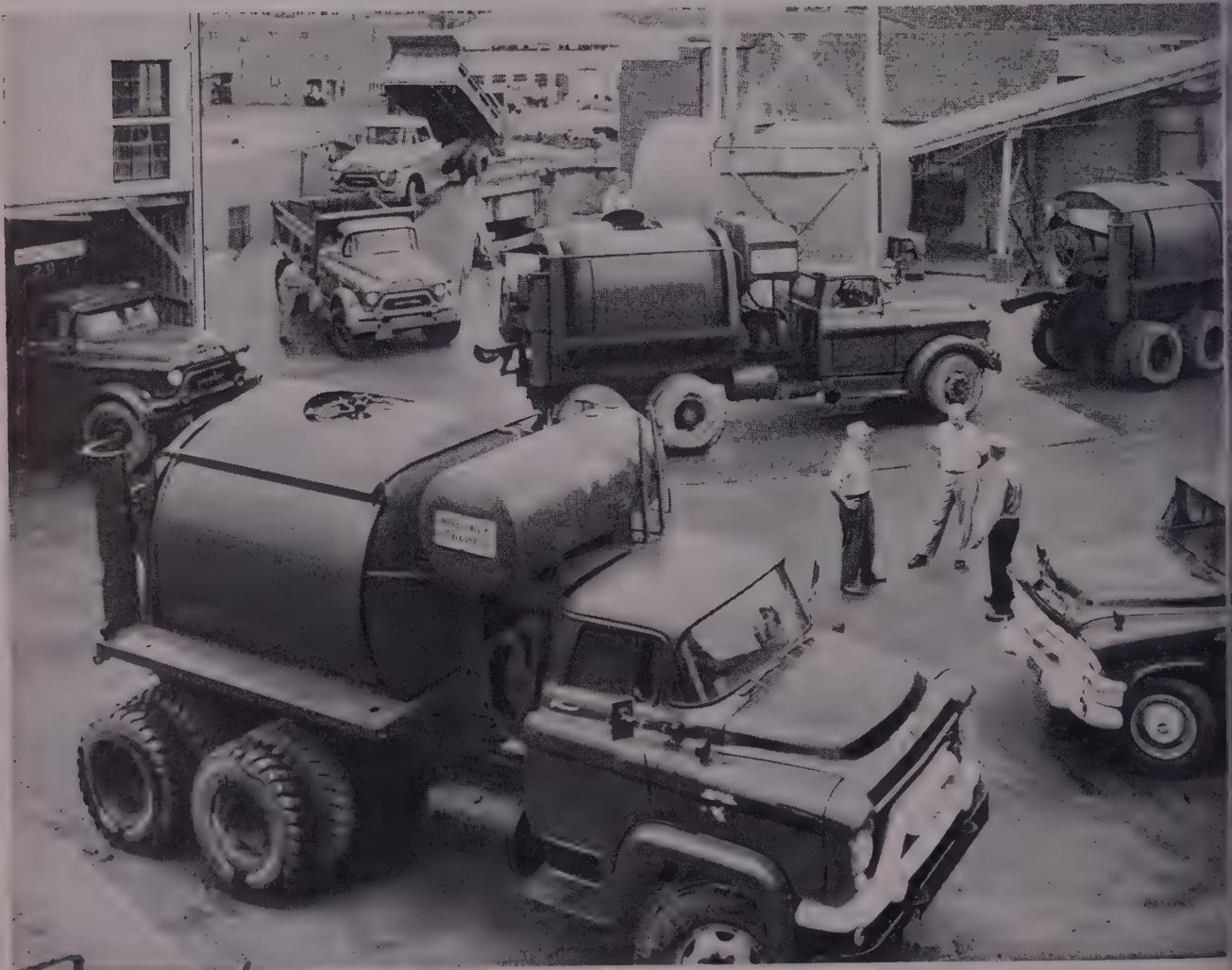
	(1)	(2)
54 ea. Portable timber barricades	\$ 50.00	\$ 25.00
Lump sum Remove pipe railing	1,000.00	500.00
15 ea. Remove & reset. mail boxes	10.00	10.00
26,000 lin. ft. Remove traffic stripes	.12	.10
8 ea. Remove & backfill inlets	50.00	60.00
277 cu. yd. Remove concrete	24.00	12.50
4,800 sq. yd. Remove concrete pavement	1.00	.75
Lump sum Clearing and grubbing	7,800.00	20,000.00
Lump sum Dev. wat. sup. and furn. wat. equip.	53,700.00	43,900.00
9,500 M gal. Applying water	1.00	1.00
125,000 sq. yd. Compacting original ground	.05	.05
125,000 sq. yd. Roadway excavation	.53	.51
790 cu. yd. Roadway excavation (bridge)	2.00	2.00
9,500 cu. yd. Structural excavation	2.50	3.00
6,000 cu. yd. Structural backfill	4.70	4.18
7,100 cu. yd. Ditch and channel excavation	1.15	1.00
136,000 ton. Imported borrow	1.04	1.00
108,000 ton. Imported subbase material	1.04	1.20
9,000 ton. Imported top soil	1.65	1.20
17,500 sq. yd. Preparing roadside areas (roadside development)	.065	.09
44,000 sq. yd. Mix., spread, and compact. cem. tr. subgrade	.24	.25

Here's a transit mix typical of the Maloney group of prewar GMC's — still making money day in and day out, while keeping costs way down.



Inside story on

THE 10-YEAR-SELLING NEW GMC's



THESE FAST-STEPPING, V8-POWERED FW550's are some of the newest additions to Maloney's 94-GMC fleet. Other recent additions include new Turbopower Diesel models equipped for larger loads. These newest trucks are proof on wheels of Maloney's satisfaction with GMC's—used consistently in his fleet for more than 25 years.

OLD TRUCKS BY THE SCORE

***Maloney Concrete's veteran transit mixers help explain
the biggest tandem sales in all GMC history***

MALONEY CONCRETE, of Washington, D. C., has experience with GMC transit mixers that dates back to the '30's.

"GMC built 'em the way we wanted 'em" is their reason. The same reason applied to later purchases that account for Maloney's present 94 GMC units.

And GMC's way of building those trucks is responsible for operation records that have the construction field talking today. For a group of Maloney's older transit mixers—some ten years old, some up to 17—have histories that show downtime—except for normal maintenance—as

a rarity. And all upkeep costs have been amazingly low.

So low, in fact, that construction haulers have been trekking hundreds of miles to study the actual records—and the veteran GMC trucks that made them. What's more, they've been going home and buying GMC tandems—at the fastest clip in all GMC history.

And remember—seven big GMC super-tandems blanket the 40,000-63,000 GVW field. In any one of them, you get the top truck—and top truck-ability—your money can buy. Check that at your GMC dealer's!

99,000 sq. yd.	Mix., spread and compact C.T.B...	30	25
8,500 bbl.	Portland cement	4.50	4.50
150 ton	Asphaltic emulsion (cur. sl., pnt. bdr. and sl. ct.)	38.00	45.00
45 ton	Liquid asphalt, MC-2 (curing sl.)	38.00	48.00
30 ton	Liq. asph. SC-1 (pr. ct. & pen. tr.)	38.00	44.00
890 ton	Paving asphalt (P.M.S.)	6.35	6.00
17,800 ton	Mineral aggregate (P.M.S.)	6.35	6.00
100 sq. yd.	Placing P.M.S. ditch lining	2.00	1.00
280 ton	Screenings (seal coats)	7.50	6.50
10,300 cu. yd.	Class "B" concrete (pavement)	17.00	17.50
10,000 ea.	Pavement tie assemblies	.60	.60
890 cu. yd.	Class "A" concrete (structures)	58.00	40.00
Lump sum	Cl. "A" conc. (bridges) (2,360 cu. yd.)	120,000.00	127,500.00
128 lin. ft.	Concrete railing	8.50	9.00
35 lin. ft.	Rubber waterstop	3.00	3.00
105,000 lb.	Bar reinforcing steel	.13	.12
Cont. sum	Bar reinf. steel (bridges) (388,000 lb.)	40,000.00	43,500.00
2,010 lin. ft.	Furn. treated Douglas fir piling	2.00	1.95
7,500 lin. ft.	Furn. Douglas fir piling	.90	.82
2,565 lin. ft.	Furn. conc. piling (driven type)	3.50	4.00
4,575 lin. ft.	Conc. piles (cast-in-drilled-holes)	6.00	9.00
151 ea.	Driving piles	85.00	100.00
Cont. sum	Struct. steel (Marsh road overcrossing) (260,000 lb.)	43,000.00	48,000.00
Cont. sum	Furn. struct. steel (Henderson underpass) (290,000 lb.)	53,200.00	55,000.00
31,700 lb	Misc. iron and steel	.45	.30
Lump sum	Pumping plant metal work	1,300.00	1,000.00
Lump sum	Clean and paint struct. steel	8,300.00	9,000.00
2,200 cu. yd.	Cl. "B" conc. (curbs, gutters and sidewalks)	37.00	34.00
23 ea.	Survey monuments	28.00	20.00
750 cu. yd.	Broken conc. riprap	11.50	9.00
270 cu. yd.	Class "B" conc. (channel lining)	36.00	33.00
2,390 lin. ft.	Metal plate guard railing	4.00	3.95
820 lin. ft.	Salvag. guard railing	.40	.65
700 lin. ft.	Reconstr. salv. guard railing	1.30	1.15
464 lin. ft.	Steel railing	9.00	8.00
Lumps sum	Pedestrian overcrossing railings	12,000.00	10,000.00
210 ea.	Mkrs., horiz. refl. units & guide posts	7.00	6.50
21,900 lin. ft.	72 in. chain link fence	1.70	1.70
450 lin. ft.	36 in. casing pipe	42.00	50.00
60 lin. ft.	54 in. casing pipe	70.00	75.00
2,000 lin. ft.	12 in. R.C.P. (std. str.)	2.50	3.00
260 lin. ft.	15 in. R.C.P. (std. str.)	2.80	3.50
300 lin. ft.	18 in. R.C.P. (std. str.)	2.40	4.25
3,500 lin. ft.	24 in. R.C.P. (std. str.)	6.00	5.80
80 lin. ft.	24 in. R.C.P. (extra str.)	6.80	7.00
180 lin. ft.	42 in. R.C.P. (std. str.)	16.00	15.75
300 lin. ft.	51 in. R.C.P. (std. str.)	23.00	19.50
16 lin. ft.	51 in. R.C.P. (extra str.)	26.00	25.00
164 lin. ft.	60 in. R.C.P. (std. str.)	28.00	25.00
60 lin. ft.	60 in. jacked R.C.P. (extra str.)	69.00	100.00
360 lin. ft.	12 in. C.M.P. (16 ga.)	3.85	3.10
40 lin. ft.	18 in. C.M.P. (16 ga.)	5.20	5.00
86 lin. ft.	21 in. asb. bonded C.M.P. (16 ga.)	7.50	6.50
7 ea.	12 in. automatic drainage gates	45.00	40.00
3 ea.	24 in. automatic drainage gates	110.00	100.00
2 ea.	Remov. & reinstal. auto. drain. gates	60.00	50.00
900 lin. ft.	8 in. P.M.P. underdrains	8.00	2.25
1,400 cu. yd.	Filter material	7.20	5.00
19 ea.	Adjust. manholes & inlets to grade	44.00	40.00
Lump sum	Finishing roadway	3,400.00	2,500.00
Lump sum	Drainage pumping equipment	10,000.00	8,700.00
Lump sum	Pump house electrical equipment	2,000.00	2,100.00
Lump sum	Sign frames and sign standards	2,000.00	2,000.00
Lump sum	Highway light & illum sign systems	24,000.00	25,000.00

New Mexico—Rio Arriba County—State. A \$515,829 contract was awarded to Brown Contracting Co. for construction of 9.406 mi. of highway and bridge structures.

(1) Brown Contracting Co.	\$515,829
(2) Wayne A. Lowdermilk, Inc.	515,932
O. D. Cowart	569,774

	(1)	(2)
Lump sum	Removal of old structures	\$12,000.00 \$22,500.00
Lump sum	Removal of obstructions	2,500.00 500.00
261,800 cu. yd.	Excavation—unclassified	.43 .35
1,245 cu. yd.	Excavation for structures	2.00 2.00
6,149 cu. yd.	Excavation for pipe culverts	1.50 2.00
10,902 M gal.	Watering	.50 .50
366 hr.	Rolling (tamping roller)	11.00 9.00
743 hr.	Rolling (pneumatic tired)	5.00 4.00
444 hr.	Rolling (steel tired)	7.00 7.50
1,203 hr.	Fifty (50) ton roller operation	7.00 8.50
930 hr.	Mechanical tamping	7.00 5.50
271,300 sta. yd.	Station yard overhaul	.01 .02
139,100 1/4 mi. yd.	Quarter mile yard haul	.05 .04
0.4 mi.	Obliterating old road	500.00 400.00
600 lin. ft.	Contour ditches	.50 .20
42 cu. yd.	Mortar rubble masonry	70.00 60.00
900 lin. ft.	Untreated piles for bank protection	4.00 3.50
615 cu. yd.	Rock for bank protection	10.00 9.00
2,540 lb.	Wire fabric for bank protection	.30 .30
460 cu. yd.	Excavation for bank protection	2.00 2.00
19,950 lin. ft.	Galvanized barbed wire fence	.18 .25
31 ea.	Gates—Texas type	10.00 25.00
2 ea.	Gates—standard type	40.00 50.00
428 ea.	Bracing	8.00 15.00
676 lin. ft.	Galvanized woven wire farm fence	.25 .45
346 ea.	Right-of-way markers	7.00 8.00
1 ea.	Stand. Fed. aid proj. mkr. Type I	60.00 50.00
461 ea.	Treated tmbr. warn. posts, refl. (6 in. diam.)	7.00 5.75
28,000 ton	Controlled gradation sub-base	.75 .88
22,170 ton	Base course	1.08 1.00
1,262 bbl.	Bituminous material, Type MC-1	7.50 7.15
14,080 ton	Plant mix surface course	3.40 3.50
4,765 bbl.	Bit. mat., Type 120-150 (plant mix)	7.00 7.10
316 bbl.	Bit. mat., Type 120-150 (tack con.)	8.00 8.55
285 cu. yd.	Class "A" concrete	55.00 65.00
104,391 lb.	Reinforcement for concrete struct.	.15 .14

45 cu. yd.	Concrete cut-off walls	60.00 55.00
179 cu. yd.	Grouted rock retards	18.00 23.00
3,424 lin. ft.	Corr. metal culv. pipe—24 in. diam.	6.00 6.20
1,094 lin. ft.	Corr. metal culv. pipe—30 in. diam.	7.00 6.85
1,402 lin. ft.	Corr. metal culv. pipe—36 in. diam.	9.00 10.35
288 lin. ft.	Corr. metal culv. pipe—42 in. diam.	12.00 11.90
684 lin. ft.	Corr. metal culv. pipe—48 in. diam.	13.00 14.15
514 lin. ft.	Corr. metal culv. pipe—54 in. diam.	15.00 16.00
1,150 lin. ft.	Corr. metal culv. pipe—60 in. diam.	18.00 20.65
108 lin. ft.	Corr. metal culv. pipe—66 in. diam.	
	Bevel 1 1/2:1	23.00 23.40
206 lin. ft.	Corr. metal culv. pipe—72 in. diam.	
	Bevel 1 1/2:1	24.00 24.90
3 ea.	3-way concrete headgates	300.00 450.00

BRIDGE ITEMS

625 cu. yd.	Excavation for structures (bridges)	10.00 10.00
151.01 cu. yd.	Class "A" conc. bridge superstruct.	84.00 77.75
197.55 cu. yd.	Class "A" conc. bridge substructure	84.00 76.75
12,632 lb.	Structural steel	.35 .35

Washington—King County—State. Erickson Paving Co. was awarded an \$826,545 contract for construction of 3.261 mi. of highway and bridge structures.

(1) Erickson Paving Co.	\$826,545
(2) Northwest Construction Co.	837,728
J. P. Surace Construction Co.	881,063

	(1)	(2)
80 ac.	Clearing	\$160.00 \$200.00
47 ac.	Grubbing	160.00 200.00
964,470 cu. yd.	Common excavation incl. haul of 600 ft.	.225 .22
1,235 cu. yd.	Com. trench excav. incl. haul of 600 ft.	1.00 2.00
3,000 cu. yd.	Strip. borr. & surf. pit incl. haul of 600 ft.	.25 .10
133,600 unit	Overhaul	.40 .35
580 cu. yd.	Excav. of unsuitable founda. matl. incl. haul	.50 1.00
3,965 cu. yd.	Structure excavation	2.00 2.50
824,780 cu. yd.	Embankment compaction method B	.02 .04
80 hr.	Smooth wheeled power roller	6.00 7.00
442 hr.	Pneumatic tired roller	6.00 6.00
552 hr.	Mechanical tamper	6.00 5.00
18,250 lin. ft.	Slope treatment Class "A"	.12 .12
3,270 lin. ft.	Slope treatment Class "B"	.10 .12
257 sta.	Finishing roadway	15.00 18.00
440 M gal.	Water	2.25 2.00
75 cu. yd.	Gravel backfill for foundations	5.00 7.00
370 cu. yd.	Gravel backfill for drains	6.00 7.00
21,830 ton	Selected roadway borrow	.95 .75
7,640 ton	Crushed stone surfacing to course	2.25 2.30

CEMENT TREATED BASE MIXED IN PLACE

74,640 ton	C.T.B. aggregate	1.45 1.45
44,950 cu. yd.	Mixing cement treated base	.18 .18
2,880 bbl.	Portland cement	5.05 5.35
48 ton	Emulsified asphalt SS-1	60.00 60.00

LIGHT BITUMINOUS SURFACE TREATMENT METHOD A

47,280 sq. yd.	Preparation, construction, finishing	.05 .05
115 ton	Asphalt cement MC-3	48.00 48.00
1,010 cu. yd.	Furnishing & placing crushed cover stoner	3.90 3.90

TYPE 1-1 ASPHALTIC CONCRETE PAVEMENT

9,390 ton	Class "B"	6.80 6.80
13 ton	Asphalt cement for tack coat	60.00 60.00
12,590 sq. yd.	Preparation of untreated roadway	.05 .05
140 cu. yd.	New fine mineral aggregate	3.90 3.90
14 ton	Asphalt cement MC-3 prime coat	48.00 48.00
66 ton	Furnishing mineral filler	25.00 20.00

OTHER ITEMS

5,855 lin. ft.	Asphaltic shoulder curb	.50 .50
11,110 lin. ft.	Asphalt lined roadway ditch	1.00 1.00
1,725 lin. ft.	Asphalt lined spillway	2.00 2.00
700 lin. ft.	Cement concrete gutter	2.50 2.50
60 ea.	Precast traffic buttons	3.00 3.00
15 cu. yd.	Concrete Class "C"	90.00 75.00
104 cu. yd.	Concrete Class "E"	30.00 45.00
20,880 lb.	Steel reinforcing bars	.15 .15
270 lin. ft.	Galvanized conduit pipe 1 1/2 in. diameter	1.10 2.00
1,955 lin. ft.	Perf. bit. ctd. corr. metal drain pipe 8 in. dia. #16 ga.	2.30 2.40
659 lin. ft.	Plain conc. culv. pipe 12 in. diameter	1.70 2.00
2,088 lin. ft.	Std. reinf. conc. culv. pipe 18 in. diameter	4.60 4.70
417 lin. ft.	Std. reinf. conc. culv. pipe 24 in. diameter	6.60 8.00
1,183 lin. ft.	Bit. ctd. corr. metal pipe 8 in. dia. #16 ga. Type #2	2.40 2.20
662 lin. ft.	Bit. ctd. corr. metal pipe 12 in. dia. #16 ga. Type #2	3.00 4.00
234 lin. ft.	Bit. ctd. corr. metal pipe 18 in. dia. #16 ga. Type #2	4.20 5.00
285 lin. ft.	Bit. ctd. corr. metal pipe 18 in. dia. #14 ga. Type #2	4.80 5.80
464 lin. ft.	Bit. ctd. corr. metal pipe 24 in. dia. #14 ga. Type #2	6.25 6.50
330 lin. ft.	Bit. ctd. corr. metal pipe 30 in. dia. #10 ga. Type #2	11.85 14.00
804 lin. ft.	Plain conc. or v.c. sewer pipe 4 in. diameter	.60 .80
270 lin. ft.	Galvanized iron water pipe 3/4 in. diameter	.90 1.20
2 ea.	Manholes under 10 ft.	250.00 300.00
19 ea.	Catch basins	110.00 120.00
1 ea.	Concrete inlet	75.00 90.00
318 lin. ft.	Standard beam guard rail	3.50 3.50
76 ea.	Reinforced concrete roadway markers	7.00 7.00
220 ea.	Guide posts	3.00 5.00
1,570 cu. yd.	Loose riprap Class "A"	4.20 3.00
38 cu. yd.	Hand placed riprap	25.00 25.00
10 cu. yd.	Sack riprap	35.00 40.00
est.	Flagging est. \$750.00	

**"THIS IS THE
MACHINE
WE'VE BEEN
LOOKING FOR!"**



**The D9 is not only a great bulldozer but in good material
it loads a DW21-Scraper unit in 25 to 30 seconds
for Copper State Construction Co.**

The CAT* D9 Tractor shown here is building a clover leaf on U. S. 70, some 20 miles east of Globe, Arizona. Copper State Construction Co., of Mesa, Ariz., has the 70,000-yard contract. On hauls of 1200 to 2200 feet each way, three rubber-tired rigs are handling about 4500 cubic yards per day, with cycle times of about 4½ minutes. In tough, unripped material tandem pushers are used, loading a DW21 and Scraper in about 30 seconds. Where material is better, the D9 alone does the loading job in 25 to 30 seconds.

Superintendent Roy Hale says: "This D9 is the machine we've been looking for. We like the torque converter. It gives smooth operation and will lengthen the life of the tractor."

Much of the new D9's high work output is due to its Cat Diesel Engine—the first Turbocharged engine on any track-type tractor. It now develops 320 HP at the flywheel. The D9 is available with torque converter or

exclusive oil clutch, to suit your needs. And it offers in-seat starting, hydraulically boosted controls, smooth, constant power drive for cable controls and excellent operator visibility. It's as easy to handle as many smaller tractors.

See your Caterpillar Dealer and let him *prove* that this "King of the Crawlers" can do more work at lower cost on *your* job.

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

CATERPILLAR*

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**NAME THE DATE...
YOUR DEALER
WILL DEMONSTRATE**

BRIDGES

1,400 cu. yd.	Structure excavation.....	3.00	6.00
Lump sum	Shoring and cribs.....		
1,190 cu. yd.	Concrete Class "A".....	65.00	65.00
202 cu. yd.	Concrete Class "B".....	50.00	45.00
190 cu. yd.	Concrete Class "D".....	40.00	44.00
684 lin. ft.	Reinforced concrete bridge railing.....	8.50	8.50
356 lin. ft.	Aluminum bridge railing.....	16.00	17.00
354,000 lb.	Steel reinforcing bars.....	.14	.12
2,600 lb.	Structural carbon steel.....	.40	.30
320 lb.	Cast steel.....	.50	1.00
8 ea.	Bridge drains.....	75.00	80.00
40 lin. ft.	Downspouts.....	7.00	6.00

California—San Luis Obispo County—State. Madonna Construction Co. received a \$1,116,474 contract for 3.1 mi. of roadwork, the work to consist of grading and paving with portland cement concrete on cement treated subgrade, plant-mixed surfacing on cement treated base and construction of three bridges.

(1) Madonna Construction Co.....	\$1,116,474
(2) Frederickson Bros.....	1,217,830
Granite Construction Co.....	1,235,387
John Delphia and Williams & Burrows Contracting, Inc.....	1,287,892
M. J. B. Construction Co., and Ford & Bishop, Inc.....	1,333,299

	(1)	(2)
Lump sum	Cleaning and grubbing.....	\$80,000.00
Lump sum	Dev. water sup. & furn. water eq.	36,000.00
23,000 M gal.	Apply. water.....	.10
30,000 sq. yd.	Compact. original ground.....	.05
620,000 cu. yd.	Roadway excavation.....	.35
4,700 cu. yd.	Struct. excavation.....	2.50
3,400 cu. yd.	Struct. backfill.....	3.50
2,300 cu. yd.	Ditch & channel excavation.....	.80
11,200,000 sta. yd.	Overhaul.....	.003
34,000 sq. yd.	Prep. excav. slopes (erosion con.)	.10
28 ton	Straw.....	60.00
74,500 sq. yd.	Mix., spread, & compact. cem. ft. subgr.....	.25
26,000 sq. yd.	Mix. spread, & compact. C.T.B.	.25
4,100 bbl.	Portland cement.....	5.00
74 ton	Asph. emul. (cur. sl., pnt. bdr. & sl. ct.).....	50.00
78 ton	Liq. asph. MC-2 (curing seal).....	50.00
62 ton	Liq. asph. SC-2 (prime seal).....	30.00
760 ton	Paving asphalt (P.M.S.).....	20.00
13,300 ton	Min. aggr. (Type "B" P.M.S.).....	4.00
485 ton	Min. aggr. (open graded P.M.S.).....	5.00
1,500 sq. yd.	Pl. P.M.S. dit. & spillway dwndr.	1.00
13,500 lin. ft.	Placing P.M.S. dikes.....	.20
120 ton	Screenings (seal coat).....	6.00
16,590 cu. yd.	Class "B" conc. (pavement).....	17.50
11,234 ea.	Pavement tie assemblies.....	.50
100 cu. yd.	Class "A" conc. (structures).....	70.00
Cont. sum	Class "A" concrete (bridges) (1,450 cu. yd.).....	87,000.00
1,322 lin. ft.	Concrete railing.....	6.00
2,450 sq. yd.	Air-blown mortar.....	5.00
17,000 lb.	Bar reinforcing steel.....	.12
Cont. sum	Bar reinforcing steel (bridges) (312,000 lb.).....	37,440.00
2,450 sq. yd.	Mesh reinforcement.....	.80
2,500 lin. ft.	Furnishing concrete piling.....	3.00
104 ea.	Driving piles.....	100.00
5,200 lb.	Misc. iron and steel.....	.33
765 cu. yd.	Class "B" conc. (curbs & gutters).....	35.00
48 ea.	Right-of-way monuments.....	7.00
8 ea.	Survey monuments.....	15.00
900 lin. ft.	Metal plate guard railing.....	4.00
420 ea.	Culv. mkrks., clear. mkrks., horiz. reflex. units & gate posts.....	6.00
37 mi.	New property fence, Type "A".....	2,000.00
0.9 mi.	New property fence, Type "B".....	3,000.00
1 ea.	14 ft. property fence gate.....	40.00
4,200 lin. ft.	72 in. chain link fence.....	1.80
30 lin. ft.	12 in. reinforced concrete pipe.....	3.00
330 lin. ft.	15 in. reinforced concrete pipe.....	3.00
800 lin. ft.	18 in. reinforced concrete pipe.....	4.00
1,450 lin. ft.	24 in. reinforced concrete pipe.....	6.00
600 lin. ft.	30 in. reinforced concrete pipe.....	8.00
150 lin. ft.	36 in. reinforced concrete pipe.....	10.00
858 lin. ft.	42 in. reinforced concrete pipe.....	13.50
356 lin. ft.	66 in. reinforced concrete pipe.....	25.00
480 lin. ft.	12 in. corr. metal pipe (16 ga.).....	3.00
70 lin. ft.	18 in. corr. metal pipe (16 ga.).....	4.00
12 ea.	Entr. tapers for 8 in. met. pipe.....	30.00
310 lin. ft.	8 in. C.M.P. downdrains.....	2.00
12 ea.	Downdrain slip joints.....	25.00
20 ea.	Downdrain pipe anchors.....	20.00
Lump sum	Finishing roadway.....	1,000.00
140 lin. ft.	Raised traffic bars.....	2.00
Lump sum	Highway lighting systems.....	18,000.00

Roadmix and emulsion

Montana—Madison County—State. A low bid of \$211,197 was submitted by Billings Construction Co. for 4.104 mi. of grading, gravel surfacing and bituminous surface treatment in Montana.

(1) Billings Construction Co.....	\$211,197
(2) Kiely Construction Co.....	220,543
Peter Kiewit Sons' Co.....	220,838
Stanley H. Arkwright, Inc.....	223,228

	(1)	(2)
210,262 cu. yd.	Unclassified excavation & borrow.....	\$.38
1,341 cu. yd.	Culvert excavation.....	3.00

133 cu. yd.	Gravel backfill.....	4.00	3.00
22,428 mi. yd.	Overhaul.....	.24	.25
31,378 ton	Sel. borrow base course (unclassified).....	.79	.90
18,130 ton	Sel. borrow base course (crushed).....	1.12	1.00
7,032 ton	Type "A" top course.....	1.42	1.40
1,700 ton	Cover material.....	6.00	5.00
23,799 gal.	1st application MC-2 liquid asphalt.....	.20	.18
23,799 gal.	2nd application RS-2 emulsion asphalt.....	.21	.17
4,320 M gal.	Watering.....	1.50	1.50
420 unit	Rolling embankment.....	9.00	8.00
400 unit	Rolling surface courses.....	8.00	8.00
380 lin. ft.	Re. conc. pipe culvert, 18 in. dia.....	6.00	5.00
436 lin. ft.	Re. conc. pipe culvert, 24 in. dia.....	9.50	8.00
468 lin. ft.	Re. conc. pipe culvert, 36 in. dia.....	17.00	17.00
76 lin. ft.	Re. conc. pipe cuvert, 48 in. dia.....	30.00	25.00
130 lin. ft.	Corrugated metal syp. pipe culvert, 18 in. dia.....	9.00	7.00
472 lin. ft.	Corrugated metal syp. pipe culvert, 24 in. dia.....	12.00	12.00
532 lin. ft.	Corrugated metal syp. pipe culvert, 30 in. dia.....	17.00	16.00
138 lin. ft.	Strip. p. e. ell. culv., 108 in. dia. 1-gage metal.....	90.00	76.00
100 lin. ft.	Relay pipe culverts.....	3.00	2.00
20 cu. yd.	Type "A" rand m riprap.....	10.00	6.00
200 lin. ft.	Steel guard rail.....	6.00	6.00
2 ea.	Concrete project markers.....	25.00	25.00
80 ea.	Concrete roadway monuments.....	10.00	8.00
50 ton	Stockpiled type "A" top course.....	1.50	1.40

Utah—San Juan County—State. A \$329,395 contract was awarded Germer, Abbott & Waldron for construction of 25.597 mi. of road-mix bituminous surface road.

(1) Germer, Abbott & Waldron.....	\$329,395
(2) J. M. Sumson & Sons.....	342,875
W. W. Clyde & Co.....	346,649

	(1)	(2)
2,200 ton	Bituminous material, Type MC-3.....	\$ 41.00
425 ton	Bituminous mat., Type MC-1 or MC-2.....	41.00
280 ton	Bituminous material, Type RC-4.....	43.00
600 gal.	Bituminous additive.....	2.75
3,200 ton	Cover material, Type A.....	4.25
3,200 ton	Cover material, Type A (in stockpile).....	2.50
25,597 mi.	Scarifying and mixing.....	850.00
92,000 ton	Gravel surface, Type B.....	1.37
1,000 M gal.	Watering.....	4.00
225 hr.	Rolling, pneumatic tire or power roller.....	10.00
42 lin. ft.	15-in. cement pipe.....	3.15
197 lin. ft.	18-in. cement pipe.....	4.00
463 lin. ft.	24-in. cement pipe.....	6.50
162 lin. ft.	30-in. cement pipe.....	7.50
220 lin. ft.	36-in. cement pipe.....	12.00
66 lin. ft.	42-in. cement pipe.....	14.00
71 lin. ft.	48-in. cement pipe.....	19.00
74 lin. ft.	60-in. cement pipe.....	27.00
120 lin. ft.	72-in. cement pipe.....	36.00
190 lin. ft.	Cement pipe arches 22 in. x 13 in.....	4.25
100 ea.	Guide posts.....	7.50
600 cu. yd.	Excavation for structures, unclassified.....	3.25
200 hr.	4 cubic yard dump truck.....	7.50
150 hr.	Motor grader.....	14.00
100 hr.	100 H.P. crawlertractor with angle dozer (or ripper).....	17.00
75 hr.	Crawler tractor with 12 cu. yd. scraper.....	18.00
75 hr.	1 cu. yd. crawler type front end loader.....	12.00
Lump sum	Furnishing water equipment.....	3,000.00
Lump sum	Furnishing construction signs.....	2,000.00

Bridges and structures

California—Los Angeles County—State. Tomei Construction Co. received a \$226,754 contract for construction of a precast, prestressed concrete girder bridge and frontage roads and approaches to be graded and surfaced with plant-mixed surfacing on untreated base.

(1) Tomei Construction Co.....	\$226,754
(2) J. E. Haddock Ltd.....	237,852
George W. Peterson.....	246,611
Charles MacClosky Co.....	247,502

	(1)	(2)
110 cu. yd.	Removing concrete.....	\$ 4.00
Lump sum	Clearing and grubbing.....	6,000.00
Lump sum	Dev. water supply and furn. wat. equip.	4,000.00
2,700 M gal.	Apply. water.....	1.25
7,900 sq. yd.	Compacting original ground.....	.05
4,100 cu. yd.	Roadway excavation.....	.65
825 cu. yd.	Struct. excavation.....	2.50
515 cu. yd.	Struct. backfill.....	2.50
40 cu. yd.	Ditch and channel excavation.....	1.00
27,000 cu. yd.	Imported borrow.....	1.00
1,050 cu. yd.	Imported subbase material.....	2.50
6 ton	Straw (erosion control).....	70.00
200 lb.	Seed (erosion control).....	1.00
5,600 ton	Untreated base.....	2.50
5 ton	Asphaltic emul. (pt. bdr. & fog seal coat).....	45.00
16 ton	Liquid asphalt, SC-2 (prime coat).....	30.00
120 ton	Paving asphalt (P.M.S.).....	6.00
2,250 ton	Mineral aggregate (P.M.S.).....	5.25
2,050 lin. ft.	Placing P.M.S. dikes.....	.70
9 cu. yd.	Class "A" concrete (structures).....	75.00
Cont. sum	Class "A" conc. (bridge) (645 cu. yd.).....	38,700.00
5 ea.	Furn. pre. prest. conc. gird. (Type "A").....	1,500.00
10 ea.	Furn. pre. prest. conc. gird. (Type "B").....	3,000.00
5 ea.	Furn. pre. prest. conc. gird. (Type "C").....	2,500.00
20 ea.	Erect. precast prestressed conc. girders.....	100.00
50 lin. ft.	Rubber waterstops.....	2.50
800 lb.	Bar reinforcing steel.....	.17
Cont. sum	Bar reinforcing steel (bridge) (93,000 lb.).....	13,000.00
14,000 lb.	Miscellaneous iron and steel.....	.35

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mation on Nelson
Shear Connectors.

NAME _____
COMPANY _____
ADDRESS _____
CITY _____ STATE _____



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With Nelson Shear Connector Studs, building designers are making concrete serve double duty. Tying concrete to steel increases load carrying capacity, gives greater rigidity, reduces size of beams.



Bridge at Donaldsonville, Georgia. Designed by Bridge Department, State of Georgia. Nelson Studs installed in the field by Scott Construction Co., Thomasville, Ga.



SHEAR CONNECTOR STUDS AT WORK ON COMPOSITE STRUCTURES

End-welded shear connectors, pioneered by NELSON, are gaining wide acceptance among builders of low-cost composite concrete-and-steel bridges and buildings.

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Technical and application data are available. Write on your letterhead.

NELSON STUD WELDING
DIVISION OF GREGORY INDUSTRIES, INC.
LORAIN, OHIO

230 cu. yd.	Class "B" concrete (curbs and gutters).	32.00	29.00
80 ea.	Curb dowels.	1.00	1.00
350 lin. ft.	Metal plate guard railing.	4.00	4.00
646 lin. ft.	Steel railing.	9.00	8.25
400 lin. ft.	72 in. chain link fence.	2.08	2.00
1,310 lin. ft.	Rem. & reconstruct. 72 in. chain link fen.	1.05	1.00
200 lin. ft.	18 in. R.C.P. (std. str.)	5.00	6.25
230 lin. ft.	24 in. R.C.P. (std. str.)	7.00	8.20
Lump sum	Finishing roadway.	2,000.00	400.00
88 lin. ft.	4 in. asbestos-cement pipe.	3.00	1.50
	Highway lighting & illum. sign system.	16,300.00	14,000.00

California—Tulare County—State. Fredericksen & Kasler submitted a low bid of \$836,656 for grading and surfacing of 2.8 mi. of highway and construction of two bridges and one pumping plant near Visalia.

(1) Fredericksen & Kasler	\$836,656
(2) Gordon H. Ball	938,420
Cox Bros. Construction Co.	964,587

8 ea.	Portable timber barricades.	\$ 50.00	\$ 50.00
Lump sum	Clearing and grubbing.	60,000.00	50,000.00
Lump sum	Dev. wat. sup. & furn. wat. equip.	3,000.00	40,000.00
21,200 M gal.	Apply water.	1.10	1.40
61,500 sq. yd.	Compact. original ground.	.04	.05
155,000 cu. yd.	Roadway excavation.	.33	.44
4,600 cu. yd.	Structural excavation.	2.10	3.00
3,250 cu. yd.	Structural backfill.	3.00	7.00
1,050,000 sta. yd.	Overhaul.	.003	.003
155,000 cu. yd.	Imported borrow.	60.	65.
70,000 cu. yd.	Imported subbase material.	.60	.65
26 ton	Straw.	60.00	55.00
45,000 sq. yd.	Mix., spread and compact. cement treated subgrade.	.22	.25
91,000 sq. yd.	Mix., spread and compact. C.T.B.	.22	.25
4,200 bbl.	Portland cement.	4.70	4.60
71 ton	Asph. emuls. (pnt. bndr. and sl. ct.)	50.00	50.00
37 ton	Liq. asph., MC-2 (cur. sl.)	50.00	45.00
137 ton	Liq. asph., SC-2 (pr. ct.)	34.00	35.00
710 ton	Pav. asph. (P.M.S.)	5.00	25.00
14,400 ton	Min. agr. (P.M.S.)	4.00	4.50
250 sq. yd.	Plac. P.M.S. spillway downdrains.	2.00	1.00
5,900 lin. ft.	Plac. P.M.S. dikes.	.20	.14
66 ton	Screens.	7.00	7.00
10,000 cu. yd.	Class "B" conc. (pavement).	15.00	16.00
6,800 ea.	Pavement tie assemblies.	.55	.55
210 cu. yd.	Cl. "A" conc. (structs.) (1,383 cu. yd.)	60.00	60.00
Lump sum	Class "A" conc. (bridges).	74,000.00	80,000.00
584 lin. ft.	Conc. rail.	6.80	6.20
134 lin. ft.	Rubber waterstops.	2.00	2.50
30,000 lb.	Bar reinf. steel.	.14	.12
Lump sum	Bar reinf. steel (bns.) (230,000 lb.)	30,000.00	28,000.00
1,550 lin. ft.	Furn. conc. piling.	4.00	3.20
52 ea.	Driving piles.	30.00	130.00
Lump sum	Struct. steel (170,000 lb.)	21,000.00	20,000.00
3,970 lb.	Misc. iron and steel.	.28	.35
Lump sum	Clas. and paint struct. steel.	2,500.00	2,400.00
187 cu. yd.	Cl. "B" conc. (curbs and sidewalks).	45.00	48.00
320 ea.	Curb dowels.	1.00	1.50
76 ea.	Right-of-way monuments.	7.00	8.00
14 ea.	Survey monuments.	15.00	11.00
560 lin. ft.	Met. plate guard rail.	3.80	3.65
430 lin. ft.	Steel rail.	8.00	7.50
2.6 mi.	New property fence.	2,000.00	1,500.00
7,741 lin. ft.	72 in. chain link fence.	1.75	1.62
637 lin. ft.	12 in. R.C.P.	3.30	2.50
384 lin. ft.	12 in. R.C.P. (rubber gasketed joints)	3.60	4.50
380 lin. ft.	24 in. R.C.P. (rubber gasketed joints)	9.50	8.50
612 lin. ft.	15 in. non-reinf. conc. drainage pipe.	1.60	2.00
824 lin. ft.	18 in. non-reinf. conc. drainage pipe.	2.50	2.50
1,206 lin. ft.	24 in. C.M.P. (14 ga.)	5.50	6.00
112 lin. ft.	30 in. C.M.P. (14 ga.)	6.50	7.50
1,200 cu. yd.	Filter material.	5.00	4.80
4 ea.	Entrance tapers for 8 in. downdrains	45.00	35.00
192 lin. ft.	8 in. C.M.P. downdrains.	2.20	2.15
	Finish roadway.	4,000.00	4,650.00
109 lin. ft.	Raised traffic bars.	2.20	2.05
Lump sum	Pump, plant met. work.	2,000.00	1,089.00
Lump sum	Drainage pump. equip.	9,000.00	7,192.00
Lump sum	Pump house electrical equip.	4,000.00	3,000.00
Lump sum	Highway light. systems.	9,000.00	10,000.00

Washington—King County—State. A \$396,847 contract was awarded Anderson Bridge Construction Co. for construction of a concrete bridge.

(1) Anderson Bridge Construction Co.	\$396,847
(2) Donald M. Drake Co.	400,212
Kuncy-Johnson Co.	402,141
N. Florito Co.	404,764

1,500 cu. yd.	Common excavation incl. haul.	\$ 1.50	\$ 1.10
400 ton	Selected roadway borrow.	2.50	2.20
110 cu. yd.	Furn. & plac. cr. stone surf. top course.	5.00	5.70
3,720 cu. yd.	Structure excavation.	5.00	4.00
234 hr.	Mechanical tamper.	8.00	7.00
2,255 cu. yd.	Concrete Class "A"	67.00	76.00
1,058 cu. yd.	Concrete Class "B"	67.00	47.00
234 lin. ft.	Reinforced concrete bridge railing.	8.00	13.00
790 lin. ft.	Standard bridge railing Type No. 1.	10.00	8.20
834,000 lb.	Steel reinforcing bars.	.13	.14
Lump sum	Structural carbon steel.	9,000.00	8,200.00
5 ea.	Bridge drains.	75.00	70.00
174 lin. ft.	Downspouts.	8.00	5.50
3,120 lin. ft.	Furnishing concrete piling.	4.50	5.00
72 ea.	Driving concrete piles first 10 ft.	70.00	75.00
1,860 lin. ft.	Driving concrete piles over 10 ft.	.25	.40
2 ea.	Furnishing & driving concrete test piles.	800.00	700.00
est.	Flagging.	500.00	500.00

Washington—Thurston County—State. MacRae Bros. received a \$456,565 contract for construction of a railway undercrossing in Washington.

(1) Mac Rae Bros.	\$465,565
(2) Harry H. Hawkins	478,960
M. P. Butler	479,089

13 ac.	Clearing.	\$ 800.00	\$ 500.00
8 ac.	Grubbing.	300.00	500.00
69,000 cu. yd.	Common excavation incl. haul of 600 ft.	.53	.55
410 cu. yd.	Comp. trench excav. incl. haul of 600 ft.	2.80	2.50
2,800 cu. yd.	Strip bor. & surf. p t incl. haul of 600 ft.	.66	.30
380 unit	Overhaul.	.50	.45
32,000 cu. yd.	Excavation of suitable foundation material incl. haul.	1.00	1.35
59,700 ton	Special gravel borrow.	.88	1.10
1,720 cu. yd.	Structure excavation.	2.80	3.00
50,900 cu. yd.	Embankment compaction method C.	.07	.05
40 hr.	Pneumatic tired roller.	8.00	10.00
48 hr.	Grid roller.	8.00	10.00
48 hr.	Variable load compactor.	13.00	10.00
920 hr.	Mechanical tamper.	6.00	6.00
1,100 lin. ft.	Slope treatment Class "A"	.15	.20
3 sta.	Finishing roadway.	20.00	25.00
70 M gal.	Water.	4.00	2.00
75 cu. yd.	Gravel backfill for foundations.	6.00	5.00
400 cu. yd.	Gravel backfill for drains.	8.00	5.00
2,000 ton	Selected roadway borrow.	1.20	1.10
350 ton	Furn. & placing crushed stone surf. top course.	4.00	5.00
530 ton	Type I-1 asph. conc. pave. Class "B"	11.20	10.00
5 ton	Asphalt cement for tack coat.	71.00	65.00
mi.	Preparation of untreated roadway.	1,200.00	1,000.00
40 cu. yd.	New fine mineral aggregate.	6.00	5.00
3 ton	Asphalt cement MC-3 prime coat.	76.00	65.00
7 ton	Furnishing mineral filler.	30.00	25.00
1,000 lin. ft.	Perf. bit. ctd. corr. metal pipe 21 in. dia. #16 ga. Type #2.	7.00	6.00
26 lin. ft.	Bit. ctd. corr. metal pipe 12 in. dia. #16 ga. Type #2.	6.00	3.50
260 lin. ft.	Bit. ctd. corr. metal pipe 30 in. dia. #12 ga. Type #2.	12.00	10.00
260 lin. ft.	Bit. ctd. corr. metal pipe 48 in. dia. #10 ga. Type #2.	23.00	25.00
594 lin. ft.	Plain concrete culvert pipe 12 in. dia.	3.25	2.50
198 lin. ft.	Std. reinf. conc. culvert pipe 12 in. dia.	4.30	3.25
30 lin. ft.	Galvanized iron water pipe 2 in. dia.	4.00	1.50
820 lin. ft.	Asbestos cement pressure pipe 4 in. dia.	2.25	3.00
20 lin. ft.	Asbestos cement pressure pipe 6 in. dia.	6.00	3.50
373 lin. ft.	Asbestos cement pressure pipe 8 in. dia.	5.50	4.00
20 lin. ft.	Cast iron water pipe 8 in. dia.	7.00	5.00
240 lin. ft.	Relaying cast iron water pipe 8 in. dia.	7.90	2.25
2 ea.	Gate valves 8 in. dia.	235.00	150.00
1 ea.	Gate valve 4 in. dia.	100.00	75.00
8 ea.	Concrete water pipe anchors.	20.00	25.00
1 ea.	Special concrete catch basin #1.	150.00	200.00
3 ea.	Special concrete catch basins #2.	160.00	200.00
360 lin. ft.	Standard beam guard rail.	4.30	4.50
11 ea.	Reinforced concrete roadway markers.	8.00	6.00
90 sq. yd.	One course Port. cem. conc. sidewalk.	5.00	5.00
118 lin. ft.	Resetting standard beam guard rail.	2.00	2.00
1 ea.	Removing & resetting fire hydrant.	250.00	150.00
373 lin. ft.	Remov. asbes. cem. wat. pipe 8 in. dia.	1.30	1.50
240 lin. ft.	Remov. cast iron water pipe 8 in. dia.	1.80	1.50
360 lin. ft.	Remov. standard beam guard rail.	1.00	1.00
est.	Flagging est. \$1,000.00.	1,000.00	1,000.00

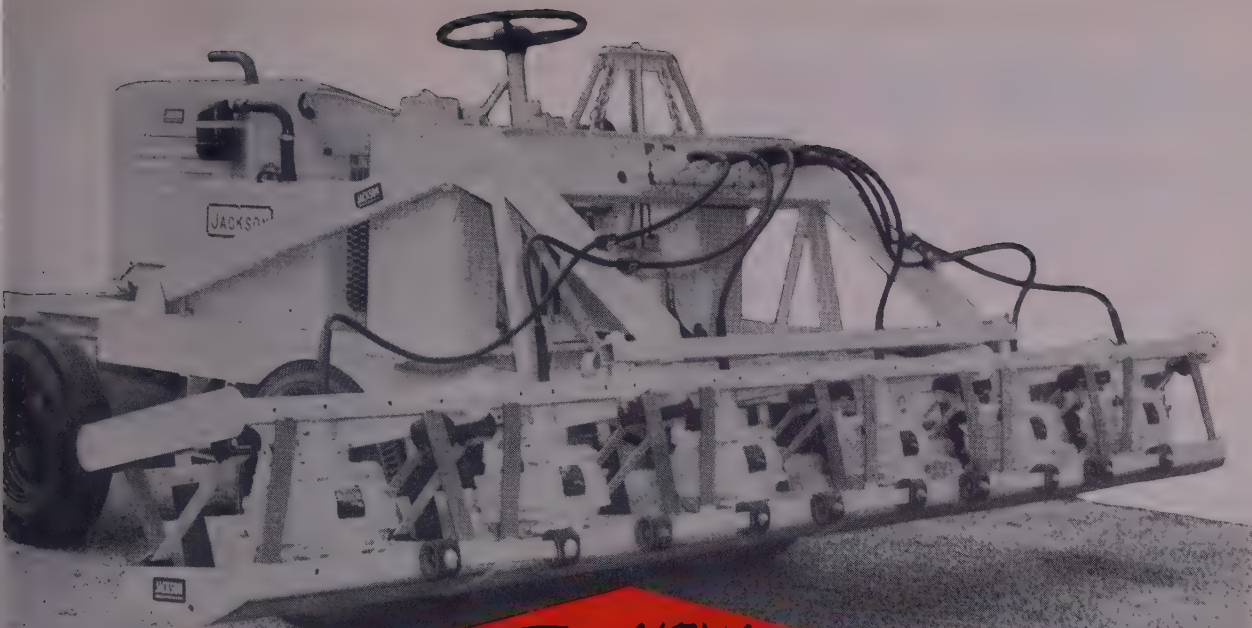
BRIDGE ITEMS

3,070 cu. yd.	Structure excavation.	5.00	5.00
491 cu. yd.	Concrete Class "A"	54.00	52.00
983 cu. yd.	Concrete Class "B"	54.00	52.00
297 lin. ft.	Aluminum bridge railing.	26.00	23.00
177,700 lb.	Steel reinforcing bars.	.134	.13
214,000 lb.	Structural carbon steel.	.22	.225
7,500 lb.	Cast steel.	.39	.48
2 ea.	Bridge drains complete.	56.00	75.00
27 lin. ft.	Downspouts.	6.00	8.00
20,400 lin. ft.	Furn. timber piling (creosote treated).	1.65	1.70
393 ea.	Driving timber piles (creosote treated) first 10 ft.	25.00	30.00
16,200 lin. ft.	Driving timber piles (creosote treated) over 10 ft.	.05	.10
8 ea.	Furn. driving timber test piles.	480.00	700.00
27,400 lb.	Ornamental metal railing.	.50	.50
330 sq. yd.	Marine cement paint.	.80	2.00
180 sq. yd.	Waterproofing.	6.00	3.00
Lump sum	Deck drainage system complete.	3,200.00	3,500.00
Lump sum	Shoofly trestle complete.	14,500.00	17,500.00

Washington—Yakima County—State. Marshall Construction Co. was awarded a \$324,943 contract for construction of the Yakima River Bridge.

(1) Marshall Construction Co.	\$324,943
(2) N. Florito Co.	325,922
Hans M. Skov Construction Co.	339,001

4,500 cu. yd.	Structure excavation.	\$ 4.25	\$ 4.25
2,500 cu. yd.	Loose riprap Class "B"	6.00	7.00
Lump sum	Shoring and cribs.	45,000.00	
1,635 cu. yd.	Concrete Class "A"	70.00	72.00
520 cu. yd.	Concrete Class "B"	40.00	45.00
705 cu. yd.	Concrete Class "H"	30.00	28.00
1,196 lin. ft.	Standard bridge railing Type 1.	8.00	12.00
585,000 lb.	Steel reinforcing bars.	.125	.125
Lump sum	Steel expansion dams.	2,105.00	
8 ea.	Expansion bearings.	480.00	450.00
12 ea.	Bridge drains.	65.00	80.00



The *NEW* JACKSON VIBRATORY COMPACTOR

**HAS MUCH MORE POWER and
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ABILITY TO JOBS OF ALL TYPES!**

Here's the machine that will give you maximum density of all materials normally used in macadam base courses and sub-bases with the greatest economy and convenience.

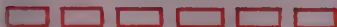
It's a vastly improved version of the Jackson Multiple Compactor which was used with great success on virtually all the nation's important paving projects. It is much more powerful and faster, providing time-saving, full course, single pass compaction. And unmatched as it is for quick and easy adaptability to jobs of all types, it will handle each of them with greatest convenience and least lost motion. Moreover, with this machine you can get into places others can't touch. By all means see your nearby Jackson Distributor (name on request) about this machine or write to us for the complete facts before buying any compactor.

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THE JOB MOST ADVANTAGEOUSLY
IS QUICKLY AND EASILY ACHIEVED.**

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6 UNITS IN TANDEM FOR MAXIMUM ONE
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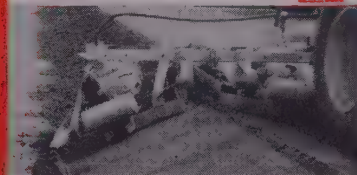
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5 UNITS IN TANDEM AND STAGGERED.
VARIABLE FOR A WIDE RANGE OF WIDTHS.



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TRACTOR. IDEAL FOR ONE
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SHOULDER COMPACTION IS AUTOMATIC.
End unit automatically assumes this position — no adjustment required. Prevents
travelling.



AND FOR SPOTS OTHERS CAN'T REACH.

Any of the compacting units in the Jackson Vibratory Compactor workhead can be fitted with operating handle and used exactly like the nationally renowned Jackson Manually Guided Compactors. Perfect for getting into odd spaces and close to walls, etc. — spots that can't be reached by other equipment. One man with a twin hookup of two of these units will compact up to 1,200 sq. yds. of granular soils in 6" layers per hour.

Aggregates . . .

Locating, grading, testing and producing

A concentrated program on a vital phase of the highway program was a special feature of the eighth annual Road Builders' Clinic sponsored by the State College of Washington, Pullman, Mar. 20-22.

Rather than follow the usual pattern for this type of conference and attempt to cover the broad field of highway engineer-

ing and construction, those in charge of the clinic selected a subject worthy of serious analysis and covered it thoroughly from all angles with papers by recognized authorities.

Selected papers that treat aggregate problems from finding it to preparing the material for final use are presented.

Land formations are key to finding aggregate

By **ARTHUR P. SINCLAIR**

District Soils Engineer
Washington Department of Highways

IN GRAVEL PIT and quarry site explorations, a great deal of time and money can be saved if the investigator recognizes certain land forms and rock structures.

In areas of glacial deposition, there are several land forms that can be investigated. The three most commonly found in northeastern Washington are the gravel outwash, terraces, and alluvial fans. The first of these three, the gravel outwash, is a deposit of gravel in a valley developed by streams emerging from melting glaciers. If the slope of the land away from the glacier is sufficient, the gravel is carried for several miles. The Spokane valley is an example of a gravel outwash. In this case the gravel was deposited deep enough to dam the tributaries which accounts for the lakes near the Washington-Idaho border such as Coeur d'Alene, Hayden, and Liberty Lake. As the water recedes, local variations develop leaving sand deposits, bouldery gravel and silt coated gravel deposits. Therefore, the quality of the material in this land form should not be assumed. Sufficient test pits should be dug to insure the quality and grading of any given area.

One type of the second land form mentioned, the gravel terrace, is formed by a stream cutting into a gravel outwash, but not entirely removing it and in this way forming a terrace at the side of the valley. There may be several terraces developed, depending on the number of

repetitions of this same action. The terrace can be recognized by the flat or level top, and lack of development of surface drainage. Since the gravel outwash was deposited nearly parallel to the valley floor, the best way to expose the layers of the terrace is to cut trenches down the face of the terrace into the undisturbed material. This should expose the major layers.

Vertical test pits from the top of the terrace will reveal local variations. If more than one terrace exists, the grading of the gravel may vary from one terrace to the other. The investigator must consider the grading

of the gravel in the deposit and how it can be best used in the roadway design. It would be expensive and wasteful to produce a highly fractured product from a very sandy pit since the sand would have to be screened out and wasted. A more economical approach would be to try and include the sandy material in the roadway design. Should the terrace be too sandy for the intended use, the investigator should look for a reworked section of the terrace where the gravels are better sorted. This can be found in the form of an alluvial fan, which brings us to the third type of land form.

These are formed by streams dumping material out on a plain and forming a fan-shaped deposit. The

(Continued on page 102)

Grading prepares aggregate to meet designer's needs

By **CARL E. MINOR**

Materials and Research Engineer
Washington Department of Highways

TO HIGHWAY engineers the noun "grading" connotes the distribution by weight of particle sizes within a granular material, usually starting with the largest individual particle and decreasing in regular sizes or steps down to the smallest. There are probably as many grading specifications, each differing in some small degree, for highway construction materials as there are agencies writing specifications. Each specification is intended by its writer to furnish a product tailored to perform a certain specific function in building a high-

way structure. The fact that grading specifications for materials intended for the same general purpose can and do vary widely among different agencies would indicate that grading alone is not a basic factor in determining the suitability of a particular material for any given purpose.

Types of grading specifications

Grading specifications are expressed in three different forms: (1) maximum and minimum percents by weight of material required to pass each of a given series of sieves; (2) maximum and minimum percents by weights required to be retained on

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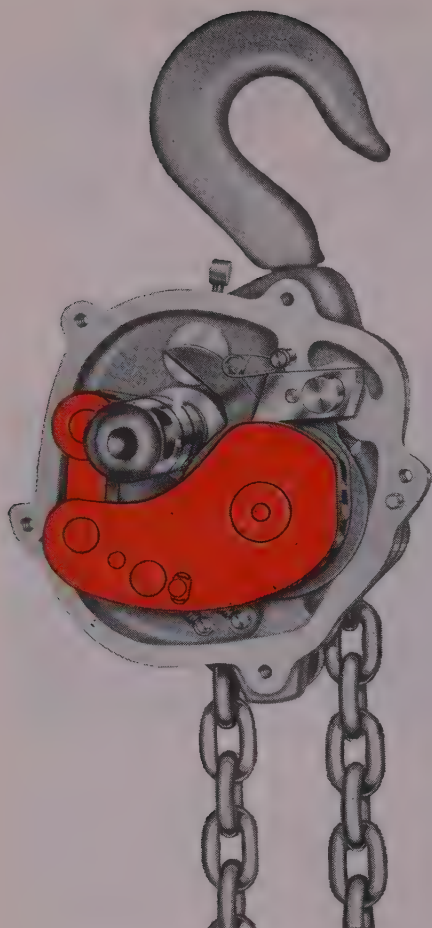
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LOCATING SOURCES

(Continued from page 100)

coarse gravel is deposited at the head of the fan and the sand at the outer fringes to the head of the fan should give a good cross-section of the deposit. Since the contents of an alluvial fan are dependent on the material washed in by the stream, all alluvial fans are not necessarily good prospects for gravel. For instance, an alluvial fan developed from a till deposit may be no better than the original deposit. There have been instances where a gravel pit was worked in the outer fringes of a fan and finally given up because it was too sandy, when the better material was untouched because the land form was not recognized. This briefly covers the three main land forms in the area of glacial deposition in northeastern Washington.

Equipment for investigating gravel deposits varies with conditions. To expose the layers of a terrace, trenches cut with a bulldozer down the face of the terrace will give the best picture. For vertical test pits from the top of a deposit, a backhoe seems to be the best suited. Test pits should be large enough to expose the layers, if any, and the angle of deposition so other test pits can be spotted intelligently. With this information and a knowledge of the type of deposit, the other test pits should complete the picture.

Basalt ledge rock is used extensively for road building materials but problems arise when trying to develop a quarry. For economic reasons the rock should shoot small enough to be fed to a crusher with a minimum of secondary shooting. Therefore, the ideal basalt flow is one with close natural fracture planes, not too tightly knitted, and yet not too weathered so as to produce clay in the seams. The clay would be objectionable when producing oil rock or a free draining surface. If fracture planes have a brownish stain, it usually indicates the rock will come apart easily at these planes.

Since basalts are in flows, we must find a top one with these characteristics so that it can be economically worked. When a suitable flow is found, it must then be determined how thick it is or how deep the quarry can be worked. If surface features do not reveal this depth, the site should be test shot or cored.

By combining our experiences and learning to recognize these geological features, time and money can be saved in establishing sites.

GRADING METHODS

(Continued from page 100)

each of a given series of sieves; and (3) maximum and minimum percents by weight of material required to pass each and to be retained on the next finer of a series of sieves. The percent passing method is the most common of the three.

The passing and retained method of specifying gradation offers a direct means of preventing "skip" or "gap" gradation. It is possible to achieve the same end in the other types, however, by requiring a minimum percentage of material to be retained between successive sieves.

Specifications for concrete aggregates, and often for other types of aggregates as well, generally employ a series of sieves in which any sieve in the series has twice the clear opening of the next smaller size in the series. The U. S. series and the Tyler series of sieves both conform to this relation.

The particle size distribution of an aggregate is determined by a "mechanical analysis" which is usually made by shaking the material through a series of sieves or screens, tested in order with the smallest on the bottom. "Sieves" have square openings and are usually constructed of wire mesh while "screens" have round openings. Almost all agencies now specify square openings for separation of coarse as well as fine aggregates.

Grading charts are the most useful method of showing the grading of individual and combined aggregates. Although arithmetic scales may be used, a plot on semilogarithmic paper is very convenient since, in the regular sieve series with the consecutive sizes of openings related by a constant ratio, logarithmic spacing is equal spacing.

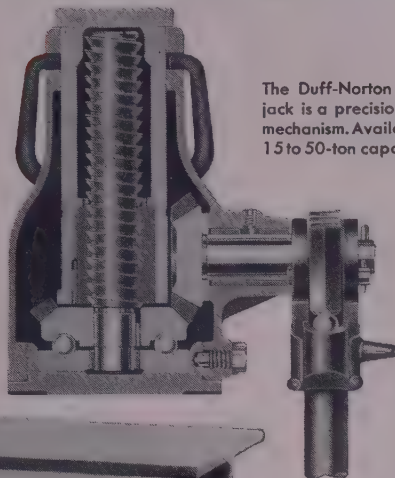
Concrete aggregates

Grading specifications were developed first for the control of concrete aggregates. Talbott, Abrams and Crum were among those who contributed significantly to the early technology of concrete control as affected by control of the aggregate grading.

Grading specifications for most highway materials provide for a product that is uniformly graded from coarse to fine without an excess or deficiency of any size range. Concrete aggregates, however, are often produced with a definite gap or skip in the intermediate sizes because experience has shown that more aggregate can be "crowded" into a given

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volume of concrete in this manner and strength and density are both improved. The Washington Highway Department has for many years used concrete aggregate which has little or no material passing the U. S. No. 4 sieve and retained on the U. S. No. 6. This grading was used on the pontoons in the Lake Washington Bridge at Seattle—much to the consternation of the contractor's engineer—and the absolute watertightness of the concrete in this structure today is excellent evidence of the density that can be obtained with gap-graded aggregate in portland cement concrete.

Desirable concrete aggregate grading

The desirable grading for concrete aggregate depends principally, of course, on the use to which the material will be put. The maximum size of aggregate in reinforced concrete, for example, is governed by the spacing of the reinforcing bars. The largest aggregate particle should not be more than about three-fourths of the minimum clear distance between reinforcing bars. In building construction the maximum size should not be more than one-fourth of the narrowest dimension of the form in which the concrete is placed. Generally speaking, it is good practice to specify the largest size aggregate that can be used consistent with placement conditions because of the economy in cement this affords. Concrete pavements are usually built with three-inch maximum aggregate while mass concrete in dams has utilized aggregate up to 6 in. in maximum size. The volume of mortar needed to fill the voids is inversely proportional to the maximum size of the aggregate and also, to a lesser extent, to the angularity of the coarse aggregate. It is good practice to use the minimum amount of sand consistent with placement, workability, and finishing requirements because the strength of the concrete will be inversely proportional to the amount of sand in the mix. Undersanding to the point of producing a harsh mix should be avoided, of course, as should a combination of sand graded near the coarse limits and gravel graded near the fine limits. Increasing the sand content in this case probably will not overcome any harshness or tendency toward honeycombing.

Concrete sand grading specifications vary considerably depending again on the use which will be made of the finished concrete. The Department of Highways uses a relatively coarse sand for all of its work be-

cause a high degree of surface finish is not necessary or even desirable in pavements or structures. The production of a fine glazed finish is considerably easier with fine sand having up to 25 to 30% passing the U. S. No. 50 and around 5% passing the U. S. No. 200. Our specifications, however, allow a maximum of 20% passing the U. S. No. 50 and 2% passing the U. S. No. 200. This grading gives us a stronger mortar than will the finer sand and still provides sufficient workability for satisfactory surface finish.

Aggregates used as sub-base and base courses are required to meet certain grading specifications. Usually the materials in the lower lifts of the pavement structure are governed by quite broad grading limits so that local deposits can be used without excessive processing costs. It is necessary even in the case of pit-run sand and gravel used for sub-base material, however, for limits to be placed on the dust content of the material as well as on the soils constants of the fines. Many agencies also require that the material meet a minimum sand equivalent value.

Sizes for sub-base course

The Department of Highway uses a large amount of natural sand and gravel as a sub-base course for both flexible and rigid pavements. We require this material to have a minimum of 25% passing the $\frac{1}{4}$ -in. sieve and allow a maximum particle size of 8-in. if the planned depth of the course is sufficient to tolerate that size of aggregate. We also require that the percentage passing the U. S. No. 200 sieve be not more than $\frac{2}{3}$ of that passing the U. S. No. 40. Stability and compacted density of the select borrow material are functions of its grading. Since the grading can vary widely in this relatively inexpensive sub-base material, we determine the depth of better material that will be needed to protect it against failure by testing representative samples in the stabilometer rather than by assuming that it will have a certain minimum "R" value. In working select borrow pits every effort should be made during construction to avoid areas in the pit that vary significantly from the average grading of the material in the deposit. If this is not done, the depth of cover over the select material may be insufficient in areas where excessively sandy material is used.

Base course materials are generally covered by somewhat more stringent grading requirements than the un-

derlying sub-base aggregates. Generally they are controlled on 2 or 3 sieves above the $\frac{1}{4}$ -in. or No. 4 sieve and by the same number of sieves in the sand sizes. If the specification requires a minimum degree of fracture, the base course materials will have to be produced by a crushing and screening operation and their cost will be somewhat higher than for the sub-base materials. By providing material that meets definite grading requirements, the specification writer assures himself of a product having a minimum stability value and he can plan the depth of his overlying surface courses or pavement according to the traffic to which the roadway will be subjected. In the Department of Highways we use 3 general types of base courses, the first is a $2\frac{1}{2}$ -in. minus material with control on the 2-in. and 1-in. sizes and from 30 to 45% through the $\frac{1}{4}$ -in. sieve, the second is a $\frac{1}{4}$ -in. maximum material with control on the $\frac{3}{8}$ -in. sieve and from 30 to 50% through the $\frac{1}{4}$ -in. sieve, and the third is a $\frac{5}{8}$ -in. minus material with from 50 to 65% passing the $\frac{1}{4}$ -in. sieve. Control of the amount passing the U. S. No. 40 and the U. S. No. 200 is exercised on all three of these materials so that we will have some assurance that they will be clean, have reasonably good drainage characteristics, and will not soften unduly when saturated. The practice in use of all sub-base and base materials, of course, is to use progressively finer materials as the pavement structure is built up so that the rocks are keyed together, a firm and unyielding surface is obtained, and the finer material in the topmost layer can be shaped precisely to the required cross-section.

Production and placement of surfacing materials

All surfacing materials are controlled by some type of grading specification. As we discussed previously, the specifications generally become more restrictive for each succeeding course or layer of material. Roadway sections are designed with the assumption that the surfacing materials in place will meet the required specifications. It does little or no good to sample, test, and approve surfacing materials during production if they are not stockpiled in such a manner as to prevent segregation or if they are placed on the roadway without regard to drastic changes in grading because of processing or placing methods. The material must be stockpiled in uniform layers of a depth not more than 4 ft. The build-

ing of conical stockpiles should be absolutely prohibited. The material must be removed from stockpiles in a manner that will not permit segregation and it must be placed in the same manner. We have found from a large number of field tests that many times after placing and processing on the roadway materials have little or no resemblance so far as grading is concerned to the material that was produced originally.

If, for example, the contractor is allowed to place untreated surfacing materials in windrows and then spread the material to the desired depth with a blade, serious segregation is almost certain to occur. We will require in our new specifications that surfacing materials be placed with a spreader box or with bottom dump trucks which spread the material uniformly over the surface of the roadway. I do not entirely favor the use of the bottom dump trucks but the fact that many of our contractors are equipped with them influenced our decision to continue to allow their use. It is desirable that the untreated surfacing materials be processed as little as possible after they are placed on the roadway. The closer that they can be placed to the required depth and cross-section initially, the better the chances are that the material after final compaction in place will meet the grading specifications.

Mineral aggregates

The term mineral aggregate is generally considered to mean aggregate which will be used in bituminous construction. It can vary from aggregates used for surface treatments to those used in hot mix pavements. Since all of these materials are used in the final riding surface, it is usual for them to be covered by rather rigid grading specifications. Aggregates used in surface treatments or road mix construction generally have a maximum size of about $\frac{3}{4}$ in. to $\frac{7}{8}$ in. and the percentage of fine material is controlled within rather narrow limits. The size of the coarse aggregate will vary with different agencies but usually it will have a maximum size of $\frac{1}{2}$ in. to $\frac{3}{4}$ in. The portion passing the U. S. No. 100 sieve for coarse seal coat aggregate is usually controlled within very close limits. If this rock contains any appreciable amount of dust, the larger rocks are very apt to become dislodged under traffic because the dust will prevent the asphalt cement from wetting and adhering to the coarse aggregate. Following the ap-

plication of coarse aggregate, most seal coat work provides for a light application of fine aggregate to cover the coarse aggregate and provide a smooth and uniform riding surface. Here again, it is essential that the fine portion contain a minimum amount of dust so that the coarser sand will be thoroughly wetted by the asphalt cement. Our specifications allow a maximum of 1% passing the U. S. No. 100 for coarse seal rock and not more than 10% for the fine screenings.

Aggregate for hot mix

Aggregates for hot mix pavement must meet rather precise grading limits if a uniform mix is to result. The maximum size of the aggregate is dependent to a certain extent on the depth of the lift which will be placed. While some agencies use aggregate up to a 2-in. maximum size, it is our practice in the State of Washington to limit the coarse aggregate to a $1\frac{1}{4}$ -in. maximum. Aggregate with this maximum size is required to have between 25 and 40% passing the U. S. No. 10 and 2 to 7% passing the U. S. No. 200. This rather coarse gradation is used as a leveling or binder course where a minimum 2-in. lift is placed. For the majority of our work we use a $\frac{5}{8}$ -in. minus material with between 32 and 48% passing a U. S. No. 10 and between 2 and 8% passing the U. S. No. 200. While the contractor is allowed considerable latitude in producing material anywhere within the grading tolerances, we require a minimum of 4% of the total aggregate to be retained between any successive pair of sieves finer than the U. S. No. 10 and further require that the job mix gradings during any day's run do not vary more than 10% on the portion passing the $\frac{1}{4}$ -in. screen nor more than 8% on the material passing the U. S. No. 10 sieve. Most specifications for hot mix paving require the aggregate to be separated into two sizes during the production and stockpiled separately. Here again, it is essential that the separation be made accurately, that the material be stockpiled carefully to prevent segregation, that the two sizes of aggregate are not allowed to intermingle, and that the aggregate is fed into the dryer in a manner to prevent segregation within the separate piles.

Sampling and testing methods

Grading specifications are worthless if the materials are sampled or tested in a careless manner. The engineer depends completely upon

samples of manufactured or processed aggregates to be as nearly representative of the general run of the product as possible. This involves care and good judgment in sampling. No inexperienced person should be assigned to the work of sampling without indoctrination in actual sampling by an experienced person.

As far as coarse aggregates are concerned, samples at the crushing or washing plant should be secured from material as it is fed to the loading bunkers. A sample should be taken in at least three portions spaced at intervals of about five minutes. When it is not possible to sample material feeding to the bin, a sample can be caught from the discharge chute. In this case, it is preferable that the bin is empty and the plant running normally when samples are taken. Sampling large stockpiles of coarse aggregate is very difficult. It is best to start trenches at the sides near the top and work down towards the bottom, making the trenches increasingly deep. Samples can then be taken at regular intervals along the trenches. When sampling stockpiled material, a total of not less than 250 lb. will be required to insure a reasonably representative sample.

Sampling fine aggregate

The same general methods are used in sampling fine aggregates. The use of sampling tubes is recommended as a time-saver, but satisfactory samples can be obtained by digging deep holes and scraping along the sides of the holes. In sampling either fine or coarse material at a stockpile, material from the outer surface of the piles should be avoided because of the tendency for the large grains to run.

Granular materials are checked for grading by separating the particles with screens of the prescribed size. It is highly recommended that the inspector be provided with some type of a mechanical shaking device. It is very difficult to secure a clean separation by ordinary hand screening methods. Likewise, it is desirable that a washing operation be used during the screening process so that all of the dust is removed from the coarse aggregate. If the aggregate is dirty and all of the dust is not removed during the mechanical analysis, the results are extremely misleading. The dust will be present, of course, regardless of whether the screening operation is or is not efficient. The inspector should examine the fine screens carefully at regular intervals.

(Continued on page 110)

Costs of city work seem too high?

LOOK HOW

SANGAMO CONSTRUCTION CO.

CUTS THEM

This well-known 30-year-old Springfield (Illinois) firm, a year ago, had a problem common to most city-area contractors. Moving costs and traffic slow-downs were taking much of the profit out of their municipal work. Small, extra, one-day or weekend jobs, which *could* have built income, often couldn't be handled because, like many contractors, their equipment was either too small or too big. Sangamo, however, found a solution. They bought Michigan Tractor Shovels. Today, their \$3,000,000 annual volume is *largely* in city work and *three* of their busiest, most profitable machines are Michigans.



Does job of bigger machines setting 12 inch sewer pipe

Often, one of the Michigans is assigned to a major job where maneuverability is a vital factor in speeding completion. Above picture shows typical task of this type—laying eight miles of 8, 10, and 12-inch sewer pipe for the city of Decatur (Illinois). Daily—almost hourly—this Model 75A shuttled between *three* crews. Tasks included pushing spoil away from trencher . . . back-filling . . . transporting and laying pipe. At times, it set manholes weighing 1200 to 1500 lbs per ring section. Biggest advantages proved to be speed (a typical half-mile trip took 75 seconds) . . . rugged construction (in a summer of work, no time was lost from the job for repairs) . . . planetary axles (which eliminated all axle breakage despite rugged lifting demands)

Drive, turn non-stop on narrowest city streets

All these units can be on their way to any kind of loader job in minutes. "These rigs go anywhere," says Clyde Turner, one of Sangamo's job superintendents. "They can run three or four blocks, through auto and truck traffic, in a minute or so. Twenty-seven miles takes only an hour. Rubber tires don't tear up asphalt or oil-mat pavement. They can even go up on a sidewalk without breaking it or the curbing. And our Model 75A's (which are 6' 8" wide and 16' 10" long) can turn around non-stop on the narrowest city streets."





Carries 1800 lb water main section

Bigger loads have been no problem for the Michigans, either. Above, the second of Sangamo's 80 hp Model 75A's carries an 1,800 lb, 18 ft section of 20 inch water main. This unit *can* lift 8,000 lbs while standing still . . . can carry 4,000 lbs at 4 mph.



Clears, loads 1,000 yards of rubble in 1½ days

Sangamo's third Michigan Tractor Shovel, a 95 hp, 2 yard Model 125A, also handles assignments where speed is important. Here it's on a historical job in Springfield—clearing the wreckage of Illinois' first governor's mansion to make way for a parking lot. Entire 1,000 cubic yards of rubble and dirt was piled and loaded out in 1½ days. Sangamo Construction bought this machine, their first Michigan Tractor Shovel, after having it demonstrated (to quote Company President, Bill Kewley) "on the toughest tractor shovel work we could find—digging up wet rocky ground to improve drainage around a Springfield sewage treatment plant. Later," Kewley continues, "it proved so handy and so dependable, all our crews wanted one. So, in 5 months, we bought our second Michigan, and 3 months later, our third."



Full buckets are the trademark of all Sangamo's Michigans. Here the Model 125A, bin-storing hot mix material, carries *more* than its rated 2 yard capacity. Unexcelled breakout force, low-level tipback, and low-level-carry result in the delivery of big loads every time, the operator says.

Stockpiling gravel is another job for the busy Model 125A. While at this city-located yard, rig sometimes loads trucks and railroad cars, feeds the crusher, does cleanup. Its standard 2 yard bucket, incidentally, is interchangeable with either 1¾ or 2½ yard buckets.



The model 75A's standard 1¼ yard bucket interchanges with ¾ and 2 yard sizes. Both models can also be equipped with crane hooks, fork lifts, backfiller blades, scarifiers and root rakes. For small jobs you can get a Michigan Model 12B with 6, 10, 16, 20, or 27 cubic *foot* capacity . . . for big jobs you can get a Michigan Model 175A with 1¾, 2¼, 2¾ (standard), 3¼ or 5 cubic *yard* capacity. For help in determining which of these four models, or which of their 35 different buckets and attachments, *best fits your needs*, ask one of our job study engineers to study your layout. Feel free to call or write us any time for this service. It's free, of course and realistic . . . and will put you under no obligation whatsoever.

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MORE ON GRADING

(Continued from page 107)

The U. S. No. 200, for example, may develop a break in the cloth or separate from the rim of the container with consequent erroneous results. Likewise care should be exercised in keeping the screens clean and free of sand particles which may become lodged in the openings.

Performance of aggregates as a function of their grading

I have already made some reference to the strength of concrete mixes as a function of the grading of the aggregates and the proportion of sand and gravel in the mix. The function of grading with respect to strength of concrete is likewise covered in the usual college courses in concrete technology and many references are available in the literature.

I would like to pass on some observations as to the part that grading plays in the performance of untreated surfacing materials. Modern highway construction involves the use of heavy hauling equipment and heavy rolling equipment to compact the surfacing materials. This degree of compaction is very necessary if we are to provide a uniformly dense base upon which to place the subsequent pavement. The heavy traffic that is common today will soon cause non-uniform settlement or consolidation within the underlying surfacing courses if they are not compacted to a high state of density when originally constructed. This extremely high density, however, tends to make even very clean materials quite impermeable as far as drainage is concerned. Material containing as little as 30 to 35% passing the $\frac{1}{4}$ -in. sieve can be compacted to the point that free drainage of water through the coarse is seriously impeded.

The drainage problem

The present trend toward wide travel lanes and wide shoulders, plus very flat grades, creates an increasingly difficult problem with respect to obtaining proper drainage under our pavements. On four-lane divided highways that are crowned at the median, for example, water that enters through the median or inside shoulder must travel as far as 40 feet to drain out under the outside shoulder. The subgrade slope usually does not exceed $\frac{1}{4}$ -inch per foot, which means a drop of 10 inches in 40 ft. Of course crowning each roadway

at its centerline cuts the required drainage distance in half. I am beginning to believe that drainage, particularly at critical places such as the bottom of vertical curves, cannot be assured unless an extremely open graded material containing little or no fines is present to serve as a filter course. This, of course, poses other problems; for example, we know from past experience that open graded material should not be placed directly over a fine-grained subgrade soil because the underlying soil will percolate up into the voids of the granular material and destroy its drainage and stability properties. In order to utilize a material without fines in this case, it is necessary that a 3-inch or 4-inch choker or blanket course of material be laid down to prevent percolation. It is my opinion that some type of pipe drains should be installed to carry off the excess water that would almost surely accumulate under the pavement, at least in areas similar to western Washington.

If the surfacing material contains more than 10% passing the U. S. No. 200 sieve, it may be seriously weakened during thawing periods unless the fines are sandy enough that not more than 3% of the particles are

smaller than 0.02 mm. in mean diameter.

The tendency of some aggregates to break down or degrade under traffic occasionally presents a serious maintenance problem. While this observation is not directly related to grading specifications, it is well to point out that the engineer should be relatively sure that the material he proposed to use will retain substantially its original grading after placement on the roadway and subjection to normal highway traffic. We have found that the Triaxial Institute compactor or the Los Angeles Rattler, without the steel balls, are handy tools to check this property of roadway building aggregates. If it is suspected that the material is soft or that it contains harmful secondary minerals, it is well to check a representative sample in either of these machines and determine the quality of the fines that are developed. If the material breaks down into relatively clean and coarse sand little trouble should develop. If, however, it produces plastic fines, it is almost a certainty that serious maintenance problems will occur in the future if the material is subjected to heavy traffic and will be saturated during at least a part of the year.

Low quality aggregate can cut road building costs

By R. M. SCHWEGLER
Senior Highway Engineer
U. S. Bureau of Public Roads
Portland, Ore.

THERE ARE TWO primary objectives to be attained in building a highway base course: first, to provide an adequate, durable foundation, and second, to accomplish this construction at a low cost.

The first approach to this problem should be made during the initial design of the project. A survey and study of the soils, granular material, and rock in the proposed roadway and adjacent to the roadway should be made. The grading design, plans and quantities should provide for the construction of a stable subgrade.

A stable subgrade can be built during grading operation by selecting and conserving granular materials encountered in the roadway cuts and hauling and placing each select material in the top 6 to 24 in. of subgrade. Low quality granular materials can

be used successfully in such an operation, and they often provide an excellent, stable subgrade or base, even though they don't have a pedigree. We can utilize materials which would not be considered as a source of crushed material, as from a pit or quarry. In many cases the cost of this stabilization is primarily the cost of the extra haul required.

If a stable subgrade is constructed, the surfacing and paving designs become routine and simple. If suitable material is not available in the roadway prism, the possibility of securing such material from borrow pits should be considered. It is often possible to place select gravel borrow or similar material on the roadbed at a reasonable cost.

Some areas of the Northwest are blessed with adequate deposits of high quality aggregates such as glacial gravels, river gravels, talus and various types of sound quarry rock. Other areas, such as the Ore-

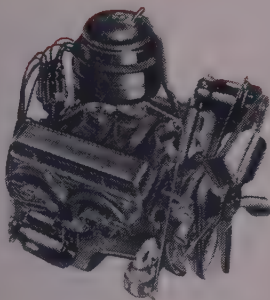


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gon and Washington coast, have a real problem due to the lack of high quality, durable aggregate. No one will advocate the use of low quality material if good high quality material is readily available at reasonable cost.

Combining bad with good

There are many opportunities to use a combination of low cost, low quality materials and high cost, high quality materials to good advantage and at a considerable savings in total cost. A subgrade may require a total surfacing depth ranging from 12 to 24 in. A low quality, low strength material can be used successfully in the lower lifts of the base course where the load concentration and unit stresses are fairly low. The more expensive and often scarce high quality materials can be conserved for use in the top course and pavement aggregates.

Base courses and pavements are expensive enough under the most favorable conditions. If we import our aggregates from great distances, the costs become prohibitive. As a general rule, we must find some way to utilize our local aggregates to secure an economical design for highways.

There are a number of low quality materials which can be used as base or foundation course on a roadway. For example, pit run sand and gravel, pea gravels, talus rock, broken rock from roadway cuts, broken rock choked with sand, blow sand, beach sand, volcanic cinders, disintegrated granite, and blast furnace slag.

Such materials can be used as pit run or quarry run materials, or they may be crushed and graded to size if desired.

Considerable judgment is needed if low quality materials are to be used successfully. Selection is an important factor as most material sources are not uniformly good or uniformly bad.

Quality is, of course, relative. When we have rock with an abrasion loss of 20 or less, we view with alarm materials with abrasion losses of 40 or 50. In other areas, such material might be very welcome due to the absence of better materials.

Certain precautions must be observed in country where severe frost penetration occurs. Open graded materials are not desirable over silty soils subject to frost action. Some soils or inferior materials can be improved by the addition of materials such as portland cement, lime, or asphalt. Each case must be studied and decided upon its own merits.

Value of laboratory tests in selection of aggregate

By F. N. HVEEM

Materials and Research Engineer
California Division of Highways

WHY should laboratory tests be performed on aggregates? Let us assume that the reader is familiar with this material called "aggregates." It might be well however to make sure that we do all agree on the nature of the material and so perhaps we should define the term before we discuss the need for performing laboratory tests. All of you know, of course, that the full name is "mineral aggregates" and it was undoubtedly adopted by someone who felt professional engineers would never get anywhere by using such simple terms as stone or rock. Geologists and petrographers complicated matters when they found out that a piece of stone large or small consists of one or more minerals, hence is correctly called a mixture or aggregation of minerals.

Like their professional brethren in the law or in medicine, engineers confuse people at times with their language and terminology. It is to be feared that they often confuse themselves. For example, the asphalt paving engineer usually recognizes three forms of granular materials identified as coarse aggregate; fine aggregate and filler, and this distinction in terms leads to the inference that there are important differences in properties of the materials.

It is, of course, easy to poke fun at people who use long words, but the professional man, and especially the engineer, has an obligation to be precise and exact in his language, hence engineering specifications properly refer to coarse aggregates, fine aggregates or filler instead of just simply saying gravel, sand or dust. However, in spite of terminology, so-called filler dust is nothing more than minute particles of stone, and when man's vision is expanded by use of the microscope, all of the apparent differences between fine dust, sand and coarse aggregate tend to disappear.

Do these mineral aggregates present any problem or variation in physical properties? First, the most easily recognized is the question of shape, and it is easy to perceive the difference between rounded water

worn pebbles and the angular shapes characteristic of most crushed stone. Most contractors have encountered the specification stipulation that eliminates elongated or flat particles. So far as I know, the reasons why flat or elongated particles are objectionable have never been made too clear. One probable reason is that such pieces of stone will pass through plant screens corresponding to the least dimension with the result that these pieces are much larger than had been intended.

For a great many engineering applications, crushed stone and gravels are used more or less interchangeably, although for some purposes crushed stone is considered superior. This preference is most marked when materials are being considered for granular bases for roads and perhaps the least discrimination exists when materials are being proposed for portland cement concrete. This seems to lead logically to the question of what are the significant differences between crushed stone and gravel.

First, it might seem that the primary difference rests in the question of angularity on the presumption that angular particles are more "stable" than rounded ones. However, an examination will show that in the majority of cases crushed stone particles also have a rougher surface texture than the water-worn gravels. There is a great deal of evidence to indicate that particle surface texture is a far more important variable than is overall particle shape.

A third property of mineral aggregates that may have a marked influence upon the suitability for engineering purposes is the question of porosity or absorption, and a closely related or parallel property is that of density of the stone, usually expressed in terms of specific gravity. These, then, are the principal physical properties of individual stone particles: (1) shape, (2) surface, (3) texture, (4) porosity, and (5) density.

For most engineering purposes, rock particles are assembled in a wide range and variety of sizes. This collection of stone particles is usually classified by means of a sieve analysis and the sequence of sizes is generally referred to as the grading of the

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aggregate. Sieve analyses are not difficult to make and are among the first tests performed by the average young civil engineer. It is also a simple matter to plot the results on a chart in order to study or examine the "grading curve."

It sometimes seems, however, that the very simplicity of the process and familiarity with grading curves leads to the belief that there is nothing particularly involved or mysterious. A simple grading curve, however, can provide a great deal of valuable information to the engineer, and it can also conceal many significant relationships.

The sieve analysis is, of course, one of the first and simplest of the laboratory tests, and engineers have long realized that it is important to determine and control the grading of aggregates.

At this point terminology becomes involved because the operation which the lay engineer would call "determining aggregate grading" might be described by the scientist as the determination of the granulometric composition. Of course, there is usually a difference between the gradation of the aggregate as received and the grading which is considered best for a particular purpose. This leads to the question of what is best and what considerations determine that one gradation may be better than another. Without going into great detail, it may be said that the following factors may be influenced by the grading of the aggregate.

Workability

Workability and the ease with which the mixture can be placed under a given set of circumstances; the **amount of asphalt** in the paving mixture or the **amount of water** in portland cement concrete often need to be varied according to the gradation. The surface texture of bituminous pavements is affected by the amount and type of coarse aggregate and proportions are **usually critical** when the gradation contains an excessive amount of fine particles or dust.

Performance of a sieve analysis, however, and an intelligent study of the results requires information on another property, namely, the specific gravity. If all particles of stone and sand were of equal density or had the same specific gravity, the matter would not be as important. However, it often happens that the sand particles have a specific gravity different from the coarse stone.

As sieve analyses are determined

by weighing the amounts of each size it is necessary to know the specific gravity of each fraction in order to compare aggregate gradations. It is obvious, however, that the relative volumes of the fine and coarse fractions can vary considerably.

It is proper to emphasize one of the fundamental relationships that must be considered in all engineering work dealing with the laboratory analysis and the field proportioning or batching of mineral aggregates. This is the fact that virtually all of the important relationships depend upon relative volumes and not upon weight. In some instances the bulk volume or weight per cubic foot of the granular material is significant, but for most work the important relationships in proportioning rest upon the absolute volumes of the various particle size groups.

Weight, and not volume

It may be asked, then, if this is true why are all specifications based upon weight percentages and why are plants controlled by means of scale weights rather than by volume. It has been amply demonstrated that proportioning by volume is nearly always unreliable or erratic because many factors influence the degree to which granular materials will bulk. It has been found by long experience that the most reliable method, either for laboratory or for construction control, is to weigh all materials at the time of proportioning.

But when establishing the weights to be used, an engineer must make allowances for any differences in the volume-weight relationships. This means that whenever a given combination includes materials that are measurably different in specific gravity, then two different sets of figures must be calculated for the aggregate grading, one based on relative volumes which conforms to the theoretical or specified grading, the other corrected for variations in specific gravity to give the actual weights of each fraction which must be combined. The need for this correction is very often overlooked, especially in bituminous work.

Some other properties

We may now consider other properties of the aggregate; for example, the question of absorption or porosity. Aggregates that are absorbent obviously have holes or pores, and consequently are nearly always below the average in density or specific gravity. However, absorption can

present variables and complexities as there can be a considerable range in the size as well as the volume of the pores. For example, an aggregate particle may have a considerable volume of pore space but the capillaries may be so minute that only a liquid of very low viscosity can penetrate deeply.

There have been various methods used to evaluate porosity, the oldest and most common is by means of soaking in water which is reasonably satisfactory for concrete aggregates. However, it can be shown that the amount of water absorbed does not necessarily indicate or parallel the amount of organic liquid such as road oil, for example, that could be taken up, and as asphalts are organic liquids derived from petroleum it becomes desirable to evaluate the absorption by some similar liquid.

Porosity test—CKE

Many years ago we developed the test known as the Centrifuge Kerosene Equivalent or CKE method for evaluating the total surface including the pores in the coarse aggregate. This method, too, is not entirely free from discrepancies because kerosene may penetrate deeply into stone having very fine pores but the penetration of asphaltic materials will naturally vary with the viscosity of the asphalt. Therefore, while the CKE method may give a fairly reliable indication of the amount and rate of absorption of the more liquid asphalts, it often happens that the heavier paving grades will not be absorbed at the same rate.

However, if the pores are relatively large, then the CKE evaluation will be satisfactory for all grades of asphalt. It may therefore be seen that even such a simple property as porosity must be broken down into three distinctions: (1) volume of the pores, (2) size of the pores, and (3) whether or not there is any differential or preferential absorption between water and organic liquids.

We now come to the question of surface texture. There are direct tests for the first three mentioned, but significant differences in surface texture are not so easily measured. While either markedly rough or obviously smooth, polished particles can be detected by inspection or by feel, there are many intermediate stages not easily evaluated. The real reason for this difficulty is the fact that surface irregularity is not always the major consideration.

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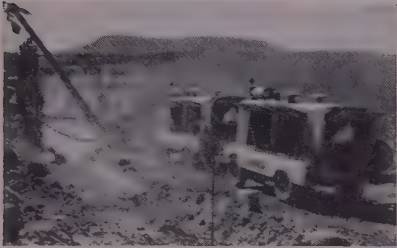
Murchison Skyscraper, Denver—Pile driver is air-powered from this G-D Rotary 600.



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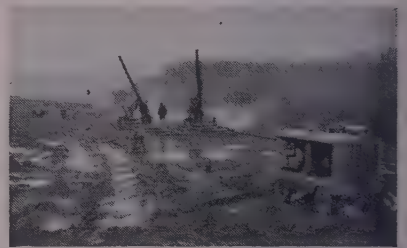
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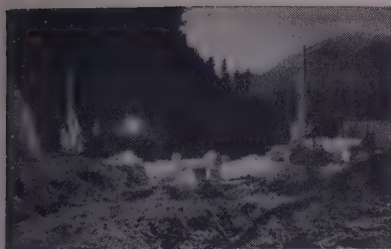
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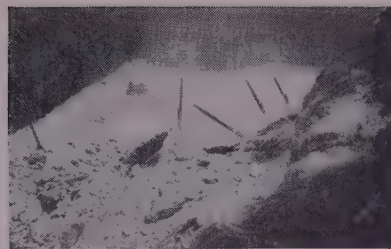
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LABORATORY TESTS

(Continued from page 115)

The real significance lies in the question of resistance to sliding. It can be shown that some surfaces that appear rough or irregular do not offer any unusual resistance to sliding between particles. Other stones that may appear rounded and water worn can display a very significant resistance. This means then that the only means for correctly evaluating the effect of surface texture so far as stability is concerned is to perform tests that will reflect the frictional resistance. Such a test is the stabilometer. While it is said to measure stability, actually it measures with reasonable accuracy only one of the factors that contributes to the overall stability of paving mixtures; namely, the inter-particle friction. Furthermore, in an asphaltic mixture it evaluates what may be called the residual friction or the algebraic sum of plus-friction and minus-lubrication allowing for the influence of compaction and the lubricating effect of any asphalt or other material present.

Thus far we have not discussed the effects of particle shape; that is, whether angular particles are more stable than rounded or spherical ones. A limited number of tests have been performed attempting to settle this point. For example, in our own laboratory samples of rounded, smooth quartz gravel were crushed and tested in the stabilometer both before and after crushing. Little difference in stability value was found and it may be observed that the broken fractured surfaces of quartz particles are virtually as smooth as are the water worn surfaces.

By way of contrast, tests on a sample of crushed ledge rock indicated no greater stability than the quartz gravel although the particles were extremely angular, having many square, sharp corners. The flat surfaces however were obviously smooth and glassy in texture. In a third case rounded stream gravel of basaltic rock was found to develop very high stability even though all particles were nearly spherical in shape. However, a careful examination showed that these rounded particles offered a great deal of resistance to sliding when pressed tightly together by hand.

All of the discussion thus far has neglected one of the properties of stone which has long been considered of primary importance. I refer to the matter of hardness. Virtually all specifications today carry require-

ments limiting the loss in such testing devices as the Los Angeles Rattler. These rattler tests are hardness tests and are, of course, aimed at eliminating the softer and weaker stone types and there is no doubt that some such evaluation is necessary. It is true, however, that the emphasis on hardness has been shifted in recent years and there is also room for doubt whether existing methods evaluate this property properly.

So much for purely physical properties or relationships. Grading, porosity, particle surface texture and shape, specific gravity and hardness—these may be classed as among the rather general requirements as all these properties are important regardless of the particular type of construction.

In this same field we encounter differences in the ability of mineral aggregates to retain a coating of asphalt in the presence of water. Here again this performance cannot be predicted from a simple chemical

analysis as we are dealing with differences in adhesion tension between the asphalt and the surface of the particles. Such laboratory tests as stripping tests, swell tests and water asphalt preferential tests are among those devised to evaluate aggregates to determine their ability to hold asphalt against the action of water.

It should be apparent from this discussion that there is no single test to determine whether a mineral aggregate is a "good" aggregate or a "poor" aggregate. Therefore, the question of whether or not a material is good or poor depends entirely upon the use to which it will be put and, as is the case with all engineering materials, it is necessary for the engineer to know what properties of materials are necessary for the particular purpose. The only way to find out whether or not the aggregates have the desired properties is by means of laboratory tests. It usually requires a separate test for each property.

A look at the delays in aggregate production

By GILBERT GRAY

Engineer & Superintendent
Murphy Brothers
Spokane, Washington

ACCORDING to a report published by the Highway Research Board, construction equipment is engaged in actual productive work about 58% of the total working time, excluding weather delays. The remaining 42% of time is lost in various kinds of delays (interruptions to the routine cycle of operations) nearly half of which are minor delays of less than 15 min. each in duration. This information is based on several years of study by the Production Cost Unit of the Bureau of Public Roads on highway construction jobs by contractors, county and state forces throughout the United States. For purposes of that report, information on five key classes of equipment was presented. The classes were: 1, Asphalt Plants; 2, Dual Drum Concrete Pavers; 3, Power Shovels; 4, Scrapers with Crawler Tractors, and 5, Scrapers with Rubber-tired Tractors. Of course the percentage of delay time varied between the five groups with a low of 31% for crawler tractor pulled scrapers and a high of 48% for asphalt plants with the average 42%.

Rock crushers are not included in

the Highway Research Report although they certainly are one of the key units of highway construction. I participated in many of these studies, including studies on rock crushers, but there were not enough rock crusher studies to be able to present conclusive averages. Nevertheless crusher delays and a study of their causes are just as important to the ultimate cost of highway work. Therefore I would like to give some indication of what has happened on certain typical highway projects, recognizing that they are only single cases and cannot be construed to be averages. But I believe they will point on what can and is happening on some jobs.

To simplify comparison with some plants with which you are familiar, I will use as example two different projects on which similar crushing plants were used. The aggregate produced for both cases was similar to the grading required by the Washington State Highway Department for 1 1/4-in. maximum base course and 5/8-in. maximum top course. Both were 3-crusher unit portable plants with an apron type feeder. Both plants had a primary jaw crusher (although size varied slightly) and a 4-ft. cone crusher. One plant had a 54 x 24-in. roll crusher as the final unit, the other a 3-ft. cone crusher. The quarry in both cases consisted of solid rock, one

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basalt, the other granite, which required drilling and blasting.

Material was pushed into the feeder by a crawler tractor with a U-dozer part of the time. When the haul became too long to be economical with a dozer the blasted material was loaded into hauling units by a shovel and hauled to the feeder. The crushed material was hauled directly away from the crusher and either stockpiled or put on the roadway. First let's look at the major delays.

Two case studies

Plant No. 1 was studied for 145 hr. It was found that 10 hr. were lost by lack of rock at the crusher, 6 hr. were lost by rock jammed in the crusher, and 45 hr. were lost due to repairs and maintenance to the crusher.

Plant No. 2 was studied for 1,054 hr. Lack of rock at the quarry cost 24 hr., repairs to the crusher resulted in delays totaling 191 hr., moving in and out took 68 hr., and rocks jammed in the crusher meant a loss of 13 hr.

This is what actually occurred on two different projects. Let us see if we can learn something from analyzing the results of the records. One very apparent item is that age of hauling units was not an appreciable delay factor for either plant. Even though they had only a small storage bin, it was not difficult to balance a hauling unit fleet so as not to hinder the crushing operation. Generally, if they were hauling to the road and the fleet could not keep up with the crusher, the superintendent would have one or two trucks stockpile the material, which may or may not be the most economical, depending on the cost of reloading it out of the stockpile.

No rock at the crusher

Also it is equally apparent that it is not so easy to eliminate delays caused by supplying rock to the crusher (7% in one case and 2% in the other). There is generally only one prime unit in the quarry, a tractor dozer or a power shovel, and if it fails the crushing operation is halted. Delays caused by the drilling or blasting operations can usually be eliminated by having that work done well in advance of actual crushing. It may be significant that in the case of Plant No. 1, the rock was poorly blasted with much of the rock too large for the feeder or the jaw crusher to handle. The effect of this is more apparent later in our discussion of minor delays.

Another item that obviously affects

the overall crushing cost is the item of moving in, up and then tearing down the crushing set-up again. (In Plant No. 1, the study did not include moving time.)

The largest cause of delays, as it is in any construction operation, was due to repair and maintenance of equipment. Delays for repairs to the crushing equipment amount to 31% of total available working time in one case and 18% in the other. Of course, records were kept as to the actual cause of each of these delays so further study might help to eliminate future recurrences. This is the item that requires constant vigilance to keep cost to the minimum. Acquisition of new equipment is excellent insurance of dependable performance, but can be extremely costly as I will show you later. And new equipment, by itself, will not insure top job performance.

Problem of repair

The problem of keeping equipment in satisfactory repair is a critical one. Mistreatment of expensive equipment by careless or inexperienced operators has to be kept to a minimum. There is a general scarcity, too, of dependable mechanics for servicing and repairing equipment. These are circumstances which cause highway contractors to place a premium on long-term ruggedness, durability and "built-in maintenance" features of heavy equipment rather than its first cost or apparent performance characteristics. These statements relative to equipment are just as true for all equipment as for crushing equipment.

As important as reducing major delays are to an economical crushing operation, there is a minor delay factor which is frequently overlooked. These are short periods, sometimes measurable only with a stop watch, in which there is no production. Costs are at their maximum during this period. They are often so minute that the superintendent or contractor is not aware of them except in production figures. Sometimes low production figures are blamed on the material being crushed when they are due to delays which can be reduced. The results of some stop-watch time studies made on one of these plants during 82 hr. of net available working time (major delays excluded) showed that there were 1,097 minor delay occurrences for a total delay time of 30 hr. which amounted to 37% of the net available working time.

In analyzing minor delays it was found that there were 452 delays due

to lack of rock at the crusher totaling 11 hr. in lost time. There were 427 delays to remove or loosen drill steel or oversize rock in the crusher jaws or apron feeder which cost 13 hr. Maintenance took 2 hr. Other delays, such as rock jammed in cone, starting late and quitting early, and operator inefficiencies, totaled 4 hr. in lost time.

The average length of time per delay was 98 sec.

Better blasting helps

As you can see, the major cause of these delays was in removing or loosening rocks in the feeder or jaw crusher. A large part of the delay could have been prevented by better drilling and blasting in the quarry. If this delay alone could have been eliminated entirely, production would have increased from the 118 tons per hr. recorded to 148 tons per hr. Recognizing that delays affect the crushing plant production and by applying production rates without delay time, a direct ratio could be developed to determine the dollar and cents cost of various delays in the actual crushing process. But crushing studies indicate that for the base course and top course material included in this report, the crushing costs represent only 50% of the total cost of putting the material in place on the finished roadway. Therefore just as important is the effect the key unit (the crusher) has on the related equipment used in the operation.

Three basic rules

It is recognized that many delays are unavoidable—or possibly more expensive to avoid, but there are three basic steps which can be taken by plant owners to help reduce delays

1. Keep accurate production and delay time records. Include causes for delays. Major delays can be kept by supervisors or timekeepers on a daily basis. If there are any indications of necessity, stop watch time studies can be made for short periods of time.

2. Analyze these records systematically and regularly. If more detail is needed to clarify the information, ask supervisors for it. Frequently the inquiries will keep supervisors more alert and efficient.

3. Correct any indicated inefficiencies in the plant operation. Replace or repair defective equipment. If possible, replace inefficient personnel.



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Automatic blade control speeds grader operations

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John Becza, job superintendent,

said, "With the Caterpillar Number 12 and blade control, you do not have to take all day setting stakes. You get your grade directions, set the dials and away you go!"

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Automatic Blade Control is a new electronically-operated device which permits the operator of a motor

grader to set automatically the blade at the exact slope required and to keep it there regardless of the position of the grader or the unevenness of the terrain. When conditions are such that the blade can carry sufficient material, the operator can complete a given grade in a single pass.

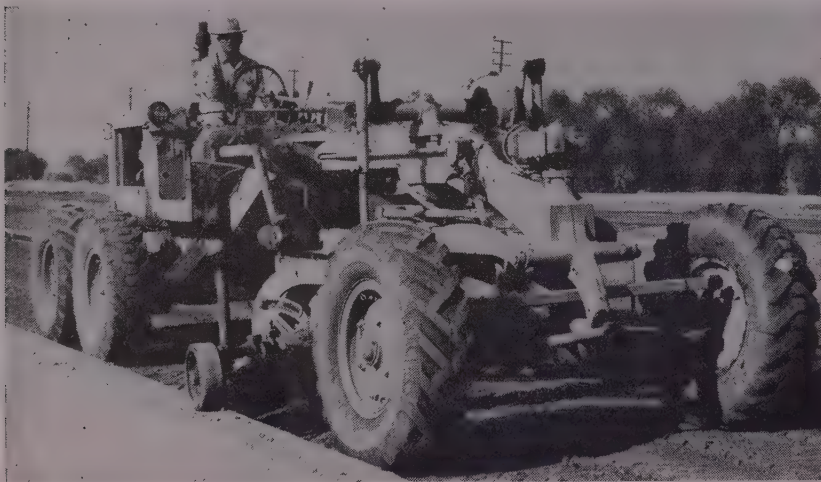
Faster travel speeds have also been accomplished. The operator simply sets the desired slope on the dial, then turns his entire attention to stake lines. He does not have to watch the heel of the blade, he has only to control the depth of cut. He may raise or lower the blade as required but the slope across the cut or fill will remain as selected regardless of the terrain or surface conditions.

The dial is calibrated in both percent of slope and slope ratio, from 0 to 20%, and accurate to $\frac{1}{4}\%$ slope. Additional range up to $1\frac{1}{2}\%$ slope ratio is available. Power source is the standard 6-volt Caterpillar generator and battery system. This is the first time that automatic electronics has been applied to earth-moving equipment. The Automatic Blade Control unit is manufactured by Preco, Incorporated, of Los Angeles.

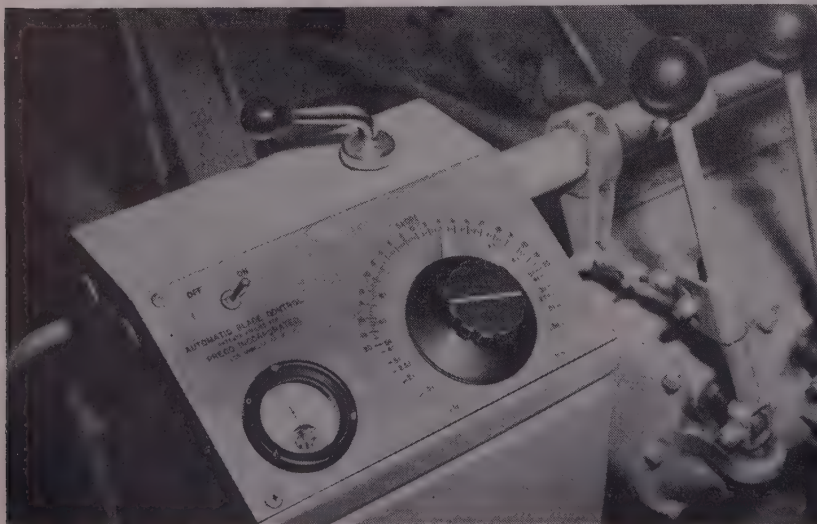
In Los Angeles, this equipment was also used to finish grade for concrete pavement on super-elevated sections of the 8-lane San Diego Freeway. J. A. Thompson & Son, Inc., Inglewood, Calif., was the contractor for this work. The grader operator used a rubber tired wheel attached to one end of the moldboard. By placing the wheel on an adjacent concrete strip, depth of the cut was easily maintained. Accurate transverse slope was held by placing the opposite end of the moldboard under automatic control and setting the Preco dial at the specified percent of slope. Transitions and super-elevated curves varying from $1\frac{1}{2}$ to 5% were easily constructed to required accuracy by turning the dial as the grading work advanced.

The operator made only one pass in each direction to obtain precise, acceptable finish grade in each 12-ft. lane. In addition, use of the Preco Automatic Blade Control in combination with the rubber-tired wheel made it possible to travel at higher speeds.

Because of the accuracy (grade checked within $\frac{1}{8}$ in. in 10 ft. at all points), substantial savings in concrete yardage were made. The contractor said, "This combination of Caterpillar and Preco Blade Control upgraded our work and saved us many hours of stake setting and actual grading time."



WITH the Preco automatic blade control set, and the rubber-tired wheel riding on the slab, this grader of J. A. Thompson & Son, Inc. maintained a uniform depth of cut. The operator merely put the opposite end of the blade under automatic control and set the Preco dial.



THE CONTROL DIAL is calibrated in both percent of slope, and slope ratio, from 0 to 20%. Power source is the standard 6-volt Caterpillar generator and battery system.

GIANTS AT WORK



O. E. Van Winkle



Jack Hanafin

Carving out a section of the big Golden State Freeway in Los Angeles is a job for giants. That's exactly what the Vinnell Constructors are using. Starting with four D-9 Cats at 36 tons each, the equipment scales down to small trucks. Everything must operate under the worst dust and terrain conditions.

Jack Hanafin, General Petroleum's Contractor Representative, has worked from the start with General Superintendent Glen MacAfee and Master Mechanic O. E. Van Winkle to see that these giants and the other equipment is kept running on a tight schedule. Much of the credit, according to the Vinnell personnel on the job, goes to G.P.'s field service and engineering.

The next time you need prompt action or just information about a lubrication or fuel problem, call in your G. P. Contractor Representative. He is trained to help you keep your equipment rolling.

GENERAL PETROLEUM CORPORATION



ALASKA Newsletter

By CLIFFORD S. CERNICK, Anchorage

NEW WAGE SPIRAL—After weeks of verbal sparring, representatives of contractors and major labor unions have at last reached an agreement on wages—so the 1957 construction season is off to a somewhat belated start. In general, terms of settlement included a 5% wage hike for 1957 with another 4½% slated for 1958. Seven Alaska construction unions will share in this more-generous slice of payroll pie—lathers, plasterers and cement masons, laborers, bricklayers, teamsters, ironworkers and operating engineers. Increased travel allowances also are included in the new contract.

CONTRACTORS' DILEMMA—For union treasuries and for the pocketbooks of union men, the recently-signed contracts insure greater prosperity in 1957 and 1958. For contractors doing business in the North there's very little to cheer about. Manpower costs, though stabilized at a high level for two years, will tend to shave the profit-margin on project bids. There seems to be no decrease, either, in cost of materials, transportation and equipment. The best contractors can do in the face of such Alpine cost structures is look at the whole matter philosophically, realizing that each contractor who bids on a given project must face the same dilemma in estimating costs.

BONANZA PAYCHECKS—Under the new wage scales, certain categories of construction workers will receive paychecks that even some captains of industry would envy. For example, the wage rate for shovel runner in 1958 will be \$4.80 an hour. If we figure on the basis of a 40-hr. week, plus the average weekly overtime of 8 hours, our mythical shovel runner walks home with a paycheck of \$249.60 a week. One small contractor told me: "With wages like those, a lot of small contractors are going to be forced to become construction stiff."

EMPLOYMENT SITUATION—At the risk of seeming repetitious, I'd like to stress again a somewhat familiar theme which often appears in this column: If you're looking for work, Alaska isn't the place. Employment officials have informed me that the job rush to Alaska this year has been the heaviest in history. In the first three months of 1957 alone, a total of 5,209 job seekers poured into Alaska over the Alaska Highway. About one-third of these went to Fairbanks and the remainder to Anchorage. John Isadore, manager of the Territorial Employment Service in An-

chorage said a total of 5,947 calls have been made at his office by persons seeking jobs for the period from March 31 to April 13. For the same period last year, there were 2,243 visits. They told me the Alaska unemployment situation—aggravated by this heavy influx of workers—can be termed as "very serious."

SWAMPED BY LETTERS—Apparently an increasing number of stateside residents are hoping for employment in Alaska. A veritable flood of letters from job-seekers is swamping employment offices in Alaska. In the two-week period from March 31 to April 13 of this year, a total of 463 job-seeking letters were received at the office of the Territorial Employment Service here—309 more than were received for the same period last year. College students have been writing from every college in the country, employment officials said.

HARD - LUCK STORIES—Employment officials have passed on to me a number of pathetic "hard-luck stories" they received from jobless men from the states. "I was misled . . . They told me I could go to work immediately," one despondent youth of 22 told John Isadore, manager of the Territorial Employment Service here. "When my buddy and I got to Anchorage, we had \$6 between us. We couldn't even pay for a room," another declared. Earl Hubbard, manager of Mars Employment Service told me: "One youngster of 22 came in here and said he had only two bucks in his pocket. 'You've just got to help me find a job,' he told me." Isadore said a camp of homeless, jobless men has formed at a river 10 miles from Anchorage. "Some of them are sleeping in their cars parked in vacant lots," Isadore said. "It's putting a hardship on community agencies such as the Salvation Army." For the past few weeks, even the Salvation Army in Anchorage has been forced to turn men away. There simply isn't room for the droves of would-be construction workers who are pouring into Anchorage and other Alaskan cities. Union officials in Alaska are especially anxious to call a halt in the annual Alaskan job rush, now at its peak. More than 3,000 union members are awaiting jobs in Anchorage alone. Most unions give Alaskans preference in filling jobs—so if you're a newcomer from the states, your chances of going to work as soon as you reach Anchorage are nil.

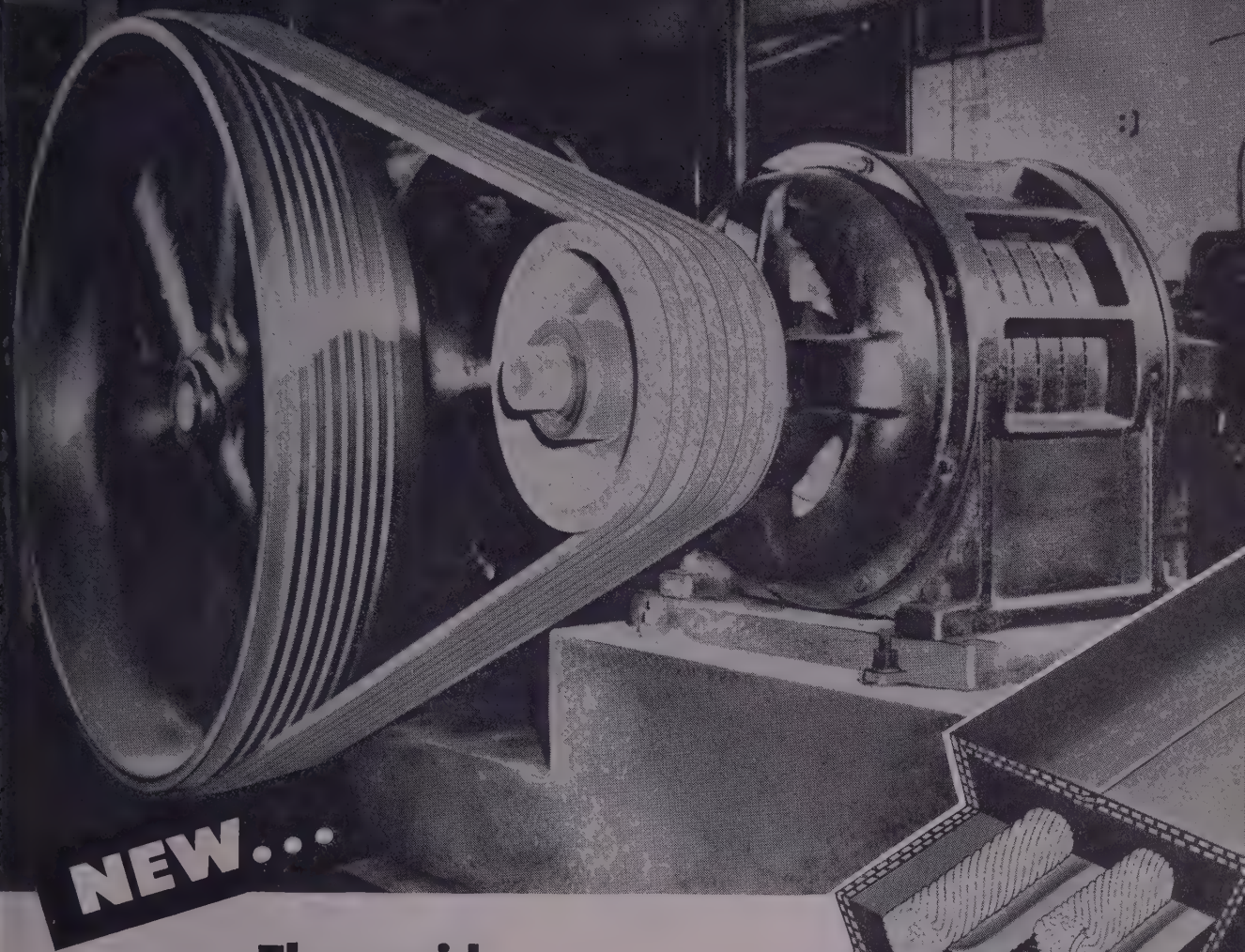
EMPLOYMENT WARNING—At the risk of laboring the point on the Alaska

employment situation, I'd like to quote an official statement issued recently in the bi-weekly report of the Alaska Territorial Employment Service: "This agency is exerting every effort to publicize the current employment picture to persons stateside, pointing out current labor market conditions and advising job-seekers not to come to Alaska unless they have a job commitment or are armed with sufficient funds to carry them through while they are 'looking around,' and in addition a return ticket in the event they are unsuccessful in landing the type of employment for which they may be qualified. An uncontrolled immigration of workers to Alaska which would increase the ranks of resident unemployed would create hardships on individuals and communities alike."

PUBLIC RELATIONS—The method used by one contractor in Anchorage when carrying out construction which would temporarily inconvenience motorists could well be used by other contractors on similar projects. The firm, now engaged in placing phone lines under ground in the downtown Anchorage area, took out large advertisements in Anchorage newspapers concerning the nature of and necessity for the work. I'd like to quote excerpts from this ad for the benefit of those contractors who might like to use it as a pattern.

MACRI AD—The following is an advertisement placed in Anchorage newspapers by Macri Construction Co. prior to beginning work on a downtown contract: "The city of Anchorage has contracted with us for the placement of underground electrical and telephone facilities and work will begin in the very near future. The installation of these underground facilities will result in the permanent removal of the unsightly forest of power poles located in our alleys. Every effort will be made to complete this work in the shortest possible time so that you may have access to the rear of your home or business. We sincerely appreciated the cooperation rendered us last season while excavating for the water main replacement in these alleys and your cooperation and patience are again solicited. We again request that you make every effort to keep your children away from the machinery and work facilities. Thanks again for your understanding—Macri Construction Co."

CONSTRUCTION NEWS NUGGETS—Many job-seekers coming to Anchorage are loggers although there is no logging in the Anchorage area . . . A new safety regulation of the Alaska District Corps of Engineers provides that field, maintenance and operations employees wear hard hats at all times while on duty in construction or operating areas . . . A Navy "help wanted" call put out in Seattle to obtain workers for repair of earthquake damage in the Aleutians brought a protest from Alaska employment officials who said Alaskans were available to do the job.



Thermoid
Powerflex Hi-Capacity V-Belts
40% stronger
than standard belts!

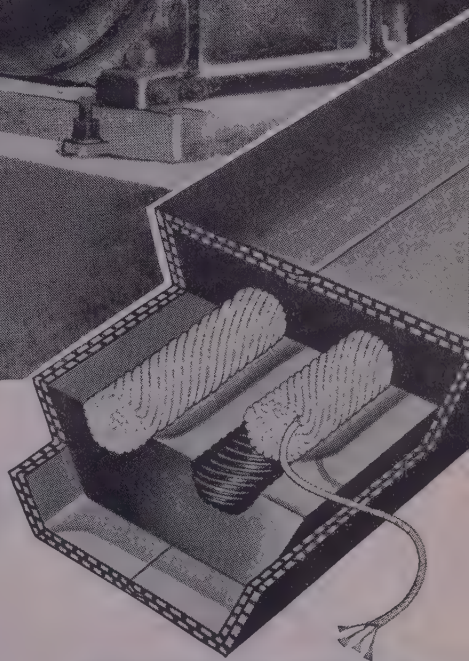
Where more driving power is called for, switch to Powerflex Hi-Capacity V-Belts. These new *premium* belts can step up the drive capacity of "under-belted" drives by as much as 40%.

If your present belts are being stretched beyond their take-up allowance... or if you're going to replace worn or damaged pulleys... change to Powerflex Hi-Capacity V-Belts. They permit you to use fewer belts and narrower sheaves... reduce drive costs.

Powerflex Hi-Capacity V-Belts are available in all standard sizes, and feature a special oil-resistant cover which prolongs belt life. Static conducting covers can be supplied. Order from your Thermoid Distributor, or write direct for complete information.



THERMOID COMPANY • Trenton, N. J.



There's a Thermoid Conveyor Belt



... and Thermoid Hose for every job.

OWEN

Engineering scores again

Never before have so many important and improved features been combined in a bucket as in the new OWEN "SCL" wide-type materials handling clamshell bucket . . . redesigned from bowl to head.

OUTSTANDING IS THE 75% TO 100% INCREASE IN CABLE LIFE.

Here's how it's done. The closing line now leads straight through the center plane of the head of the bucket to first lower sheave, thus eliminating bending of the closing line around upper guide sheaves as in conventional block and tackle and lever arm buckets.

Reinforced arms and crosshead afford greater durability without adding weight to bucket. Available in sizes ranging from 3/4 to 3 cubic yards inclusive.

Write today for additional information.

The OWEN BUCKET Co.

BREAKWATER AVENUE, CLEVELAND 2, OHIO

BRANCHES: New York • Philadelphia • Chicago
Berkeley, Calif. • Fort Lauderdale, Fla.

Structural Design Chart—XI

By **THOMAS HARAN**
Civil Engineer

THE DATA appearing in the chart on the opposite page are an illustrated condensation of the author's interpretation of the "ACI Building Code" requirements pertaining to the structural analysis and design of footings. The chart's title restricts its scope to isolated footings, as there are no specific recommendations in ACI 318-51 for other types of footings. Even so, structural engineers use much of this information as a general approach to the design of any type of footing.

The chart is headed by a section entitled "Minimum Dimensions" which pertains to reinforced concrete except where "P/C" is inserted to indicate a dimension is applicable to only plain concrete footings.

Dowel Requirements are given with minimum lengths of embedment indicated.

Allowable Bearing @ PL presents a graph which limits the concrete bearing stress for various ratios of (area of plate)/(area of reaction).

Column Faces are shown as they are to be assumed in the shapes of squares from the actual cross-hatched shapes—the area of the square being equal to the actual area.

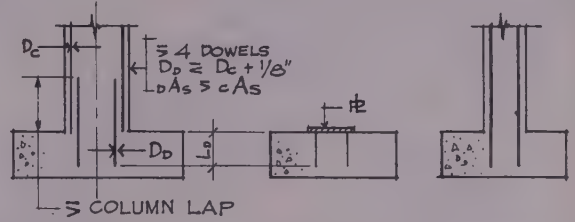
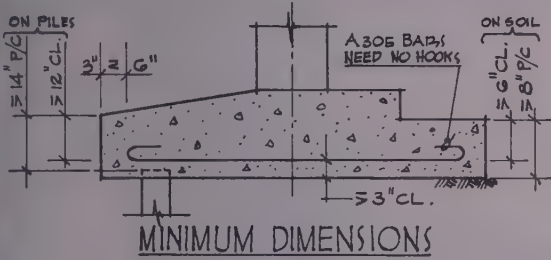
Bar Spacing has a footing shown in plan with the area of all transverse bars indicated as yA_s and the area of transverse bars that are distributed across the middle strip as $zA_s = 2yA_s / (1 + W/B)$.

Plain concrete design stresses are shown at the bottom of the chart at the critical sections indicated. The maximum tensile stress, " f_t ", is designated and the combination of tensile and shear stresses is limited to a maximum of $.03f_c$.

CORRECTION

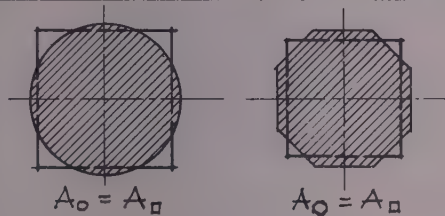
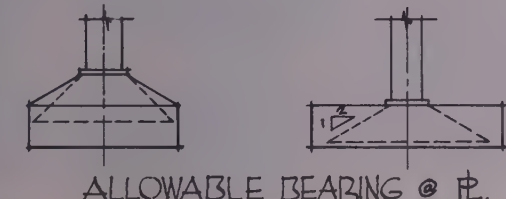
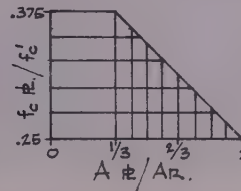
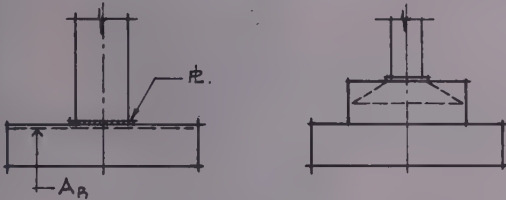
The first sentence of the second paragraph of the column accompanying Chart X in May should have read: "It gives under " $A_s/1$," needed" the cross-sectional areas of steel that are required to satisfy the minimum steel ratios of .0025 bt = .03t for bars and .0018 bt = .0216t for welded wire fabric."

A.C.I. ISOLATED FOOTINGS

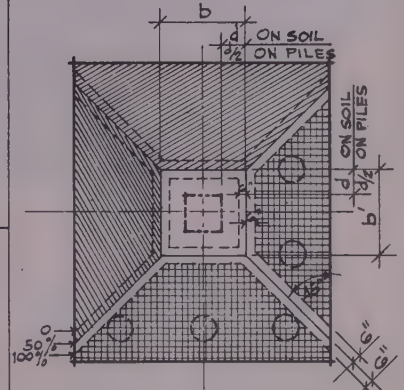


f'_c	MINIMUM L_d/D_d			
	SPIRAL COLUMN		TIED COLUMN	
	$f_s = 16 \text{ Ksi}$			
2.0 Ksi	20	25	12.8	16
2.5	16	20	12 ⁴ / ₅	16
3.0	13 ¹ / ₃	16 ² / ₃	10 ² / ₃	13 ¹ / ₃
3.5	11 ³ / ₇	14 ² / ₇	9 ¹ / ₇	11 ³ / ₇

DOWEL REQUIREMENTS

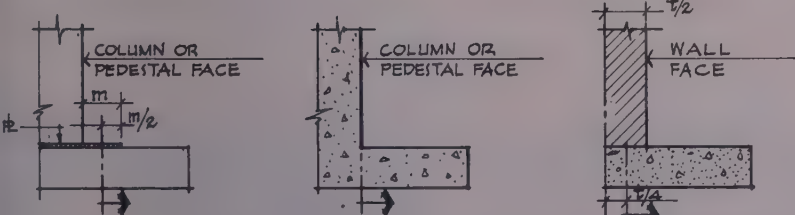


COLUMN FACES
ARE FACES OF
THE SQUARES



- SOIL BEARING AREA FOR V ACROSS b OR b' .
- AREA WHEREIN PILES WITH CENTERS WITHIN THIS AREA CONTRIBUTE 100% OF THEIR LOADS TO V ACROSS b OR b' . (FOR PILES WITH CENTERS OUTSIDE THIS AREA INTERPOLATE % OF LOAD APPLICABLE TO V. LIMITS OF INTERPOLATION FOR V ACROSS b ARE SHOWN ABOVE AND ARE TO BE REVERSED FOR V ACROSS b' .)

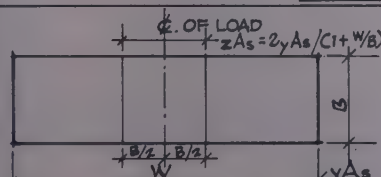
MAXIMUM V



SECTION CUTS INDICATE WHERE PLANE IS TO CUT ENTIRE FTG. FOR COMPUTATION OF M_{MAX} & U_{MAX} IN 2-WAY FOOTINGS:

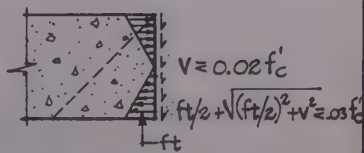
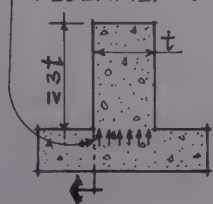
$$M_s = 0.85 M \quad U = 0.85 V / (\sum_o j d)$$

M and U



BAR SPACING

BEARING IN CONCENTRICALLY LOADED PEDESTALS $\leq 0.25 f'_c$.



P/C FOOTINGS & PEDESTALS

T. HARAN

top performer...with straight or arched boom



Whether your preference is for a straight or arched boom, you can put Insley's proven design characteristics and dependability to work for you. An Insley is easy to service, simple to maintain, and always ready for the tough jobs, day after day. Insley is fully convertible for hoe, shovel, dragline, clamshell and crane work, and is available with gasoline or diesel power.

See your Insley distributor for more details or write direct to Insley.

INSLEY MANUFACTURING CORPORATION • INDIANAPOLIS, INDIANA



REPORTS from the COURTS

By HOWARD S. BURNSIDE, Low and Burnside
Attorneys at Law, San Francisco—Menlo Park

Is salesman's knowledge a trade secret?

Every owner of a business who sells to a specialized trade must direct his sales efforts at specific users of his product. He acquires either directly or through his salesmen over a period of time the identities of firms which become his customers or remain potential customers. This list of users becomes a valuable business asset, whether it be a list of construction firms that specialize in certain classes of construction or a list of customers for a laundry route. Sooner or later a salesman or other employee departs or is lured away by a competitor. Can this asset be protected as a trade secret and the competitor enjoined from using the knowledge of one's former employee? The case at hand concerns the selling of tool steel, alloy steel and other steel products.¹

The appellate court referred to an earlier opinion and said there are two groups of such cases—"one, the so-called 'route cases', in which injunctive relief was held proper, and another group in which it was denied."

The features which cast a given case into the group of "route" cases may be summarized roughly as follows:

The former employee has confidential information not readily accessible to others, he solicits his former employer's customers in a competing business, such customers comprise a preferred list, knowledge of which is confidential, and customers are apt to buy from just one concern; and there is an established business relationship between the customer and the former employer which would normally continue.²

The second group of cases comprises those where the customers are commonly known to the trade, there is an open competitive market, sales are based on price or quality, and each sale is a distinct transaction.²

The appellate court affirmed the denial of injunctive relief in the present case saying that the business information was apparently readily accessible to others. It was merely a matter of spending time to get a list of tool steel users.

"It is obvious that purchasers of tool steel and alloy steel are generally known in the trade or could be readily ascertained . . . The allegation that the list of plaintiff's customers was secret and confidential is a mere conclusion . . . The facts alleged negative secrecy and the information is confidential . . . If the

customer list is not secret and confidential it is not the property of the employer."

1. American Alloy Steel Corp. v. Ross 149 Adv. C. A. 244.

2. Calif. Intellig. Bureau v. Cunningham 83 C. A. 2d 197.

Engineer violates contractor's license law

"Plaintiff, a licensed mechanical engineer, and defendant entered into a written contract calling for plaintiff's construction of a grain elevator on a "cost plus ten per cent" basis. The elevator was built on property owned by defendant in the town of San Lucas. It was located on Main Street amidst business buildings and homes on town lots and adjacent to the Southern Pacific main line tracks. Nearby there were also commercially operated grain sheds and storage bins owned by another individual. The site for defendant's grain elevator was approximately 3½ miles from defendant's farm and its only access therefrom was by public road.

"The trial court found that the grain elevator was 'not constructed on a farm, either actually or constructively'; that it 'was designed with the intent that it would be usable for the storage of the grain of others on a rental basis' . . . The court concluded that the statutory farming exemption was of no avail to plaintiff and, in the admitted absence of the required contractor's license, plaintiff could not recover.

"At the trial the court and both parties treated the holding in . . . a companion case on the first appeal, as stating the governing principle: 'that the construction must be located on a farm and must be incidental to the farmer's own farming operations in order to be 'incidental to farming,' within the meaning of the exemption.' Consistent with this interpretation of the statutory language, the trial court's judgment, based upon its determination that the construction in question did not qualify under the farming exemption, must be affirmed.

"To . . . permit the farming exemption to apply to construction work which is not performed on a farm, would seem to run counter to the purposes of the contractor's licensing law enacted for the safety and protection of the public respecting structural improvements to real property wherein special skill,

training and ability are required. In exempting construction 'incidental to farming' from the state licensing requirements, the Legislature manifestly did not intend to include every structure bearing a possible relation to the farming industry and without regard for its location in relation to the farm. It therefore seems clear that the exemption should not be extended to office buildings, warehouses, grain elevators or similar structures constructed at sites far removed from the farm, and perhaps in the center of cities or towns, even though such facilities might be constructed for the sole use of a single farmer in connection with his own extensive farming operations. Rather, it is only where the particular structure is 'located on a farm' and 'designed to function as an incidental part' of the farmer's own farming operations . . . that such structure thereby reasonably becomes 'dissociated from the objects and purposes of the licensing law' . . . and the farming exemption applies."¹

The contract price of construction was \$21,238. During construction defendant paid \$8,979 and refused to pay any part of the balance. Two judges of the Supreme Court of California dissented.

It is worth the attention of civil and professional engineers to note carefully that the court in making this decision was cognizant of Section 7051, Business and Professions Code, which provides that the chapter on contractor's licensing "does not apply to a licensed architect or a registered civil or professional engineer acting solely in his professional capacity . . ." Thus, a professional engineer does not have the right to undertake construction work unless licensed as a contractor, although he may be the person who designed the structure for safety in the first place. It is hard to understand how such strict interpretation of statutes further public safety and welfare. There seems to be a steady trend toward creation and rigid enforcement of little areas of monopoly in our economic life. This is done in the name of public health and welfare and placed under the supervision of a state administrative agency.

The ultimate result for engineers and technical professional people might be reduction to a state supervised class of persons in a society where every man wears a vocational label and dares not cross into another's occupational domain.

1. Fraenkel v. Trescony 48 Adv. Cal 376.

Notes

"A patent owner has three rights. They are the right to make, use, or vend. If he releases all those rights so that he retains nothing, the release may be an assignment, but if he does not release all those rights, it is only a license."

69 C. J. S., Patents, 223; Farmland Irrig. Co. v. Dopplmaier 299 P. 2d 1033

27 cu. yds.



MORE FOR YOUR MONEY

Low-and-wide Fullpak Scraper produces more at lowest-net-cost-per-yard

This easy-loading LeTourneau-Westinghouse 27-yard Fullpak Scraper is the result of building more than 13,000 self-propelled scraper units over a period of more than 19 years. Its basic low-and-wide design has been thoroughly field-tested on hundreds of 18-yd. Model C Tournapulls on jobs all over the world. Using the same pusher in the same materials, the new 27-yd. B Fullpak gets heaped loads in approximately same time as most medium-size scrapers.

Direct-line thrust from pusher to cutting edge... cuts loading time

Large-size push-plate is positioned low, with angle of thrust in direct line with cutting edge of scraper bowl. There is no "humping action" of pusher or scraper. Direct-line thrust steadies scraper, keeps pusher on the ground, makes use of all push-power available. Scraper floor has a rise of only 1° when blade is on ground. Materials move in easily, with smallest possible resistance. This all adds up to easy loading... faster loading... bigger production.



ROAD EQUIPMENT ON DISPLAY

By Western Construction

Only a relatively few Western contractors and other equipment users attended the ARBA Road Show last January. As a result, Western Construction presents an extended review of the latest machines and accessories available for road building in these Western States.

Knowledge of equipment the manufacturers have developed is a preliminary to selecting and purchasing the machine best suited to the job to be done. The following 34 pages picture and describe almost 175 of the latest machines and tools for road building and maintenance.

Diesels power new IH crawler tractors

Largest of International Harvester's line of new diesel-powered crawler tractors is this 200-hp. TD-24 torque converter model. It is shown here with a front-cable operated bulldozer and front-mounted cable control unit. For full information, write to **International Harvester Co.**, Consumer Relations Dept., 180 N. Michigan Avenue., Chicago 1, Ill.



Three sand grades at once with Eagle plant

This Eagle Washing-Classifying-Dehydrating section is performing near Santa Cruz, Calif. This straight sand operation is unique, since the plant is near the bottom of a 160-ft. high sand bank. Material is excavated by hydraulic monitor near top of sand bank, then chuted down a 10% grade to a primary screening plant where the oversized material is screened off. The sand is then pumped to a secondary screen in the Eagle section. It is then fed to a 28-ft. Eagle Water-Scalping-Classifying tank with eight power-operated bleeder valves and triple collecting blending-flume. Three gradations of fine material are produced simultaneously and delivered separately to three Eagle fine material single screw units; one 36-in. diameter by 25 ft. and two 24-in. diameter by 25 ft. for further washing, classifying and dehydrating. **Eagle Iron Works**, 175 East Holcomb St., Des Moines, Iowa.



Knee-action crawler drill tows its own air power

A completely mechanized and self-propelled crawler drill has been introduced by **Ingersoll-Rand**, 11 Broadway, New York 4, N. Y. Called the Crawl-IR, it is a knee-action crawler mounting which will tow its own compressor and travel over the roughest terrain. Drill positioning is completely mechanized through five hydraulic cylinders. Four other cylinders permit hydraulic positioning of the feed tower.



Road Equipment . . .



Tire-mounted tractor converts to heavy duty compactor

Here is a prime mover with multiple use for compacting, dozing, towing, sheepsfoot and self-loading scraper. **Wagner Tractor, Inc.** has designed four-wheel drive and four-wheel steering tire-mounted tractors which can readily be converted to heavy duty 50,000- or 65,000-lb. compactors. Two models, IND-14 (shown here) and IND-18, accommodate the compaction wheels and are driven by planetary gears powered by 150- and 210-hp. Cummins diesel engines respectively. Model IND-18 also features dual controls and a reversible operator seat. The unit, with compaction wheels and optional dozer blades, can doze truck dumps and compact at same time with all wheels powered. **Wagner Tractor, Inc.**, 8027 N.E. Killingsworth St., Portland 10, Ore.



Front engine power take-off featured on truck mixer

New 5- to 7-cu. yd. "Mixomatic" truck mixers featuring front engine power take-off with automatic transmission are announced by **Willard Concrete Machinery Co.**, 11700 Wright Rd., Lynwood, Calif. An automatic transmission provides four discharge speeds allowing a greater flexibility of concrete flow; and two levers, throttle and transmission, simplify the controls. Two-speed gear box and take-up drive chain are easily accessible for maintenance.

New pile hammer uses less force for high energy

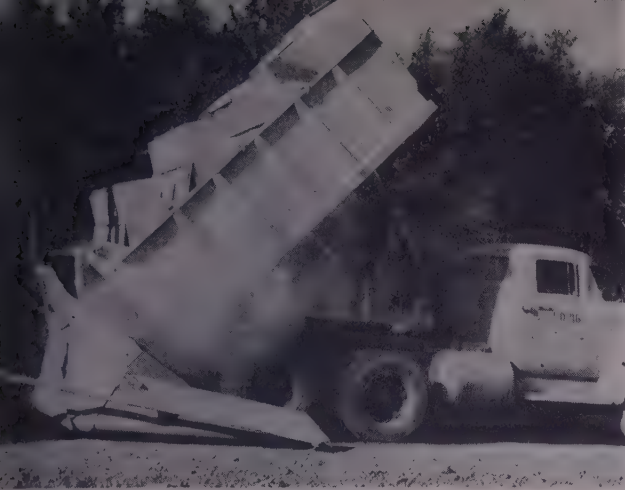
A new compound steam-air pile hammer reputed to use about one-half motive power of existing types is announced by **McKiernan-Terry Corp.**, Dover, N. J. The new hammer, McKiernan-Terry C-5, has an extremely low total weight to ram weight ratio so that less steam or air is required. It delivers 110 blows per min. with a striking energy of 16,000 ft. lb.



Pettibone Mulliken offers loader with 180-deg. swing

An extra long reach coupled with exclusive 180-deg. boom swing enables the new all-purpose Pettibone Speed Swing loader to load into trucks from either side or from the rear without gee-hawing for position. The Pettibone Speed Swing power train features either diesel or gasoline engines, Torqmatic Power Shift transmission, Allison torque converter drive and planetary drive axles. Hydraulic steering and controls are standard equipment. Two or four-wheel steering and four-wheel drive provide ample traction over any surface. Full information and literature available from **Pettibone Mulliken Corp.**, 4700 W. Division St., Chicago 51, Ill.





Dumping by remote control

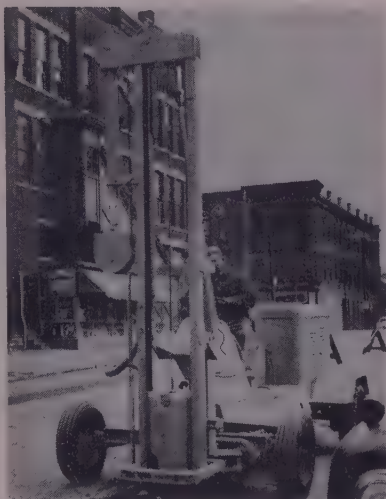
A new high-speed batching hoist which raises and dumps in less than six seconds is manufactured by **Hercules Steel Products Co.**, Galion, Ohio. A new feature, recently added, is a hydraulic tripping device for release of the individual batches. The partitions are securely locked in position by a rectangular cam located in the center of the body floor and operated by hydraulic rams controlled individually from the cab of the truck. This new type control eliminates the need of a man for manual release of the individual batches and speeds up the dumping cycle since the body need not be lowered for manual release of the batches. The hydraulic tripping device is adaptable to practically every front mounted type telescopic hoist and is available to contractors for installation on their present equipment.

In-place materials reducer handles 350 cu. yd. per hr.

The Bros Preparator (in-place materials reducer) is a 182-hp. machine designed to reduce native or oversize rock materials, up to 30 in. diameter, to 2 in. minus aggregate size right on the roadbed. It reduces up to 350 cu. yd. per hr. It also pulverizes scarified blacktop



which can then be re-used with new materials added. The Preparator can be pulled by any tractor of 30 hp. or more. It is driven by a diesel power unit. **Bros Incorporated**, 1057 Tenth Ave. S.E., Minneapolis 14, Minn.



Increased hammer power

Larger engine and heavier hammer on the new Model SPHH-1000 Ottawa Hydra-Hammer effect greater production on all pavement breaking, cutting, and backfill tamping jobs. Features include the traverse tower arrangement, hydraulically controlled lay-down, engine cover, flange type tools and combined power brake and clutch control. **Ottawa Steel Div.**, L. A. Young Spring & Wire Corp., Ottawa, Kan.

Torque converter drive multiplies engine force

An important feature of this new Galion, three-axle tandem roller is the Roll-O-Matic torque converter drive which, unlike a fluid coupling transmission, requires no gear shift transmission, and automatically multiplies the engine driving force by means of oil in motion instead of by transmission gears. Driving



force is applied as the work demands, and desired roller speed is maintained regardless of grade or working conditions. **Galion Iron Works & Mfg. Co.**, Galion, Ohio.



New screed for bridge decks

Stow Manufacturing Co. has developed a new vibrating screed for striking off concrete pavement on bridge decks. Heart of the new screed is a 2½-in. diameter vibrator head driven by a 2½-hp. gasoline engine at 5,000 vibrations per min. Vibration is transmitted from the vibrator head evenly throughout the length of steel shod wooden beam directly to the concrete. As the vibrating screed is pulled along by just two men, it leaves a smooth true-to-grade surface behind. **Stow Manufacturing Co.**, 371 Shear St., Binghamton, N. Y.

Road Equipment . . .

Electric vibrators produce smooth, high-density mat

A new principle of paving by use of an electrically-vibrated screed which "irons" the bituminous material into a smooth, uniform, high-density mat is incorporated in the new Cedarapids Bituminous Paver made by **Iowa Manufacturing Co.**, 916 16th St. N.E., Cedar Rapids, Iowa. This new method permits bituminous paving at higher speeds than before, since the vibrating action of the screed greatly reduces the possibility of tearing the mat or causing voids. The screed is of one-piece construction and is vibrated at 3,600 impulses per min. by four electric vibrators, each of which is controlled by a rheostat to regulate the intensity of vibration. It is made of special $\frac{1}{2}$ -in. steel plate which resists abrasive wear and distortion, and is equipped with two screw adjustments with vernier type gages for controlling mat thickness. Fifteen working speeds range up to 102 ft. per min., and the three travel speeds vary from 1.15 to 2.19 mph.



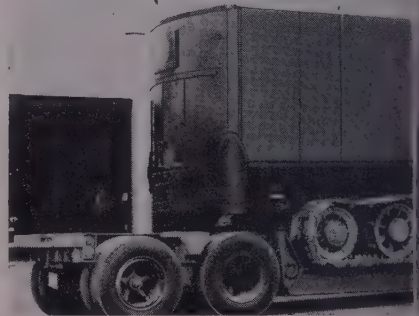
New concept in bulldozer design

Recently introduced by **Caterpillar Tractor Co.** is the Gyro Dozer, a new earth-moving tool which combines the functions of ripping and moving material in one bulldozing operation, and eliminates the need for a separate ripping operation. The new bulldozer provides greater dozing efficiency by restricting the length of cutting edge entering the ground, breaking up and conditioning hard material more readily, and supplying a more efficient wedging angle to utilize the full power of the tractor. Four penetrating teeth mounted on the cutting edge of the bulldozer blade teeth extend forward 20 in. in front of the cutting edge and are used in ripping up stubborn material in order to more rapidly obtain full loading of the blade. The blade is capable of being tipped both forward and backward, and of being tilted 20 deg. to either side. Tilting action is provided by two hydraulic cylinders mounted on the blade in place of the tilt braces. Full positioning of the blade is accomplished during operation by two levers located at the right of the operator. Full information available from Caterpillar Tractor Co., Peoria, Ill.



Less weight, more power

A single diesel power plant replaces several electric motors, generators, control boards, etc., on this Model 4500 $5\frac{1}{2}$ -cu. yd. shovel developed by **Manitowoc Engineering Corp.**, Manitowoc, Wis. With dead weight eliminated, the machine is more mobile, economical and easier to handle.

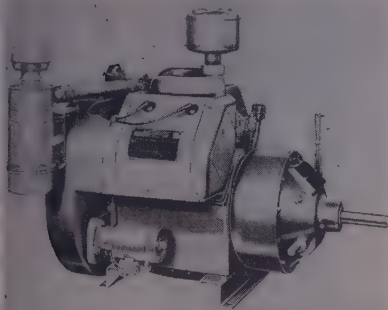


Removable gooseneck cuts unloading time in half

A removable gooseneck provides a quick and convenient front-end system for unloading heavy equipment on this 35-ton carryall manufactured by **Fruehauf Trailer Co.**, 1444 South Alameda, Los Angeles, Calif. No winch or hydraulic system is required to couple and uncouple the gooseneck. Carryall is uncoupled and dropped, pins and block attaching gooseneck to platform are removed and pulled away. Winchless units are available with capacities up to 50 tons. The new winchless removable gooseneck Fruehauf Carryall cuts unloading time to less than 15 min., and it is possible to unload in narrow or hilly areas; big cranes move quickly off or on from the front.

New heavy-duty engine

This new heavy-duty VR4D Wisconsin V-type four-cylinder air cooled engine is rated at 56 hp. at 2,200 rpm. Among its features are Stellite exhaust valves and valve seat inserts in combination with positive-type valve rotators for greatly extended valve life and low cost maintenance. **Wisconsin Motor Corp.**, 1910 South 53rd St., Milwaukee 46, Wis.



Barber-Greene announces wheel-type ditcher

Barber-Greene Co. of Aurora, Ill., announces their entry into the wheel-type ditcher field with their Model 774 machine, a crawler mounted unit, featuring a 5 ft. 6-in. digging depth and widths adjustable in 1-in. increments from 18 to 30 in. Among the innovations offered on the new model are: widespread use of hydraulic power transmission, a unique flexible connection between chassis and digging wheel; an electric, magnetically actuated overload release clutch and a reversible, hydraulically driven spoil conveyor.

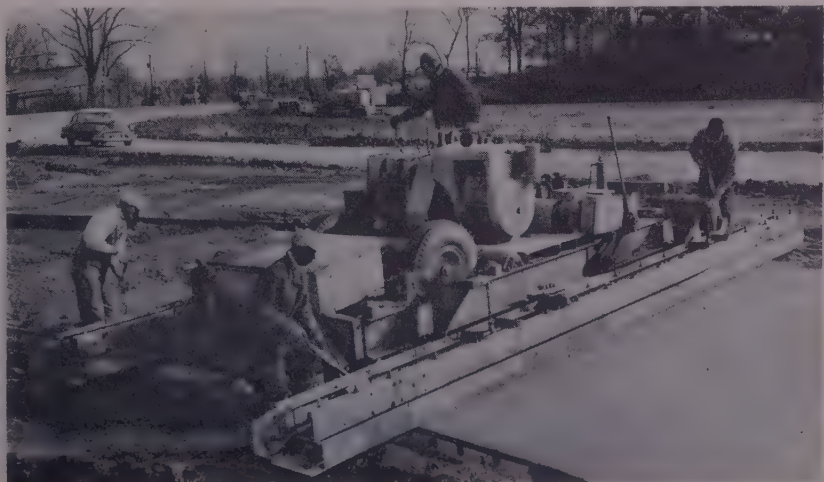


Six vibrating shoes compact to specification

The penetrating vibration of six heavy vibrating shoes on this Lima Roadpacker compacts macadam bases and gravel sub-bases to specified densities. Single courses up to 12 in. thick reduce material handling by one half or more, eliminate backtracking of spreading equipment. Contour shaping of the surface need be done only once. Vibration "runs in" screenings to full depth of macadam bases with only three spreads. Much of the labor formerly required to spread, broom and roll is eliminated. The Roadpacker also performs the above operations on widening jobs; no need to buy single-purpose machines. **Baldwin-Lima-Hamilton Corp.**, Construction Equipment Div., Lima, Ohio.

Telescopic frame on screed adjusts required form width

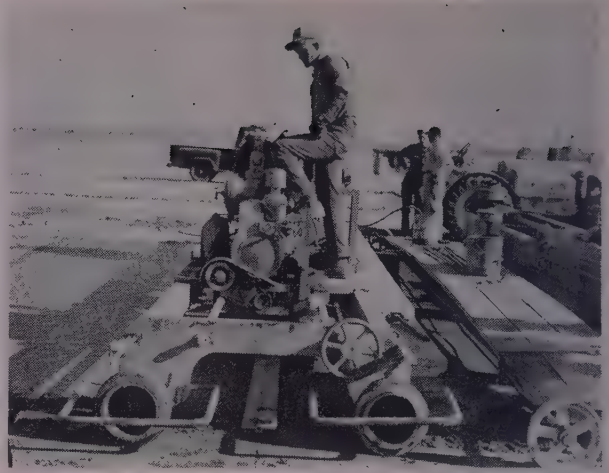
This Rex Finisher is capable of producing smooth-finished concrete slab surface 10 to 32 ft. wide in one pass. It is instantly power-widened through telescopic frame construction, automatically extending or narrowing to the required form width. A simple, single-lever operation does the job. Big front and rear screeds provide maximum compaction and finish of the mix. Twenty-four different working combinations are possible. With six forward, six reverse and four independent screed speeds, there is complete range flexibility for handling all types of concrete. **General Road Machines, Inc., Div. of Chain Belt Co.**, 4701 W. Greenfield Ave., Milwaukee 1, Wis.



Road Equipment . . .

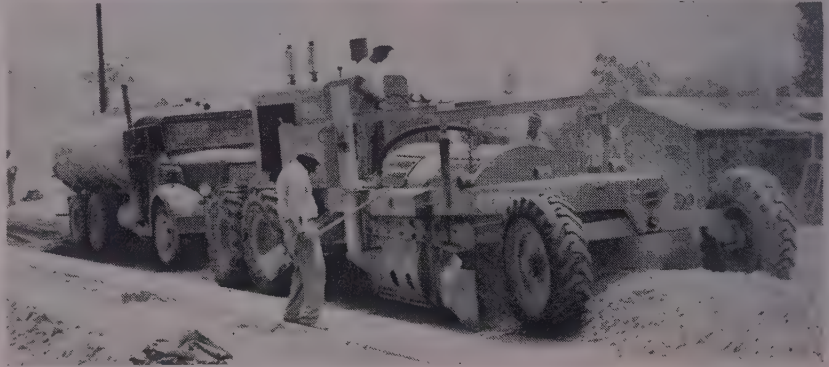
Concrete sawing at five cents a foot

On road building, Seaman-Andwall Corp.'s new Model V-J-25 Vibro-Joint Cutter brings the cost of sawing contraction joints down as low as five cents per lin. ft., cheaper than hand joints. Completely self-contained, it follows the longitudinal finishing machine, hydraulically displacing aggregate to leave a weakened plane in fresh concrete which can be easily sawed later with only fibre abrasive blades. Direct costs per lin. ft. of Vibro-sawed joints compared to conventionally sawed joints indicate a saving of about 30 to 70%. Available in two sizes: 18 to 25-ft. paving lane widths, and for 10 to 13-ft. paving lane widths. **Seaman-Andwall Corp.**, 13050 West Bluemont Rd., Milwaukee 3, Wis.



World's largest self-propelled mixer

Model 54-S Pettibone Wood Road-mixer with 54-in. pugmill produces up to 350 tons per hr. of asphalt mix, up to 550 tons per hr. of soil cement. It discharges windrows up to 10 cu. ft. A diesel engine supplies power for both traveling and mixing. One-man operation, simplicity of design and fewer moving parts bring operation costs down. The rig picks aggregate cleanly off subgrade, thoroughly mixes it with binder in a 54-in. pugmill while oil is hot and produces a uniformly mixed windrow ready for spreading. **Pettibone Wood Manufacturing Co.**, P. O. Box 620, North Hollywood, Calif.



Portable belt conveyor

This portable Hi-Speed troughed belt conveyor comes standardized and job-fitted to the contractor's needs for medium and heavy-duty requirements. All moving parts are mounted on sealed anti-friction bearings. Belt widths: 16 to 30 in. Lengths: 18 to 46 ft. Powered by gasoline or electric motor. Unit is described in Bulletin A-296. **Baughman Manufacturing Co.**, Jerseyville, Ill.



Truck-crane features four-axle carrier

A four-axle carrier is featured on Link-Belt Speeder Corp.'s model HC-98 truck-crane. This is one of the company's six new truck-crane models with 10 to 35-ton capacities. Other features include optional extra turntable hook rollers, a large diameter ring gear positioned to provide improved balance and a more favorable center of gravity. The machine, with a high-alloy steel boom, is available with any of three new high-capacity jibs. These jibs are of a completely new design and are available in 20, 30 and 40-ft. lengths with maximum capacities of 6, 5, and 4 tons respectively. Overall benefits from the above and other Link-Belt Speeder features result in a truck-crane that's capable of lifting greater weights when using longer booms at extended radii. **Link-Belt Speeder Corp.**, 1201 Sixth St. S.W., Cedar Rapids, Iowa.



Payloader tractor-shovels feature four-wheel drive ▶

Payloader models HU, HH and HO, manufactured by **The Frank G. Hough Co.**, Libertyville, Ill., have 1 1/3-, 1 3/4- and 2 1/4-cu. yd. capacities respectively. Featured on the models are four-wheel drive, fully power-shifted transmission and torque converter drive. A new system of bucket motion tips the bucket back 40 deg. at ground level in a powerful breakout action. A shock-absorber system cushions the loaded bucket while carrying, smooths out the ride and permits faster movement with less spillage.

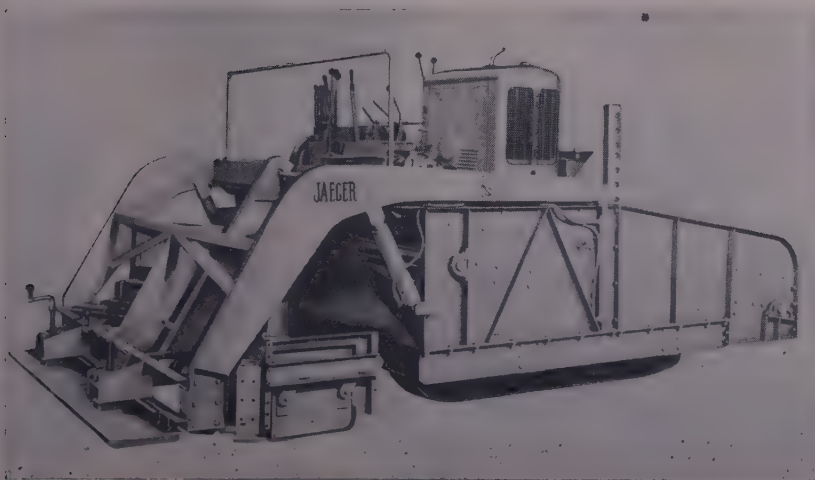


Tractor turns in own length

A unique counter-rotating Terra-matic transmission provides independent power control of each track, both as to speed and direction, on this new big-capacity tractor shovel. The tractor can turn 360 deg. within its own track length, with one track driving forward, the other in reverse. Two new models were introduced recently by **J. I. Case Co.**, Racine, Wis. TerraTrac Model 800 shown here has a heaped capacity of 1 1/2 cu. yd. and 9 ft. 1-in. dump clearance at maximum discharge angle. Model 1000 has a 2-cu. yd. bucket and 9 ft. 6-in. dump clearance. Standard features on these 80- and 100-hp. Case-TerraTracs include torque converter drive, torsion-bar track suspension and centralized lubrication.

Can't break a spring, because it has no springs . . .

This 30-ton off-road hauler, introduced by **LeTourneau-Westinghouse Co.** of Peoria, Ill., has no springs, no grease fittings, no conventional axles. Four big pistons act like giant shock absorbers. The "Hydair" suspension system makes conventional axles unnecessary. Chassis grease fittings have been replaced by special bearings lubed and sealed at the factory which need regreasing only if disassembled. The LW-30 has twice the underclearance of conventional trucks because the entire steering system is protected within or above the frame line.



Paver-type spreader

This paver-type aggregate spreader lays all base and surface aggregates and plant-mixed stabilized soils. Model SPS-6, recently introduced by **Jaeger Machine Co.**, Columbus 16, Ohio, lays up to 16-in. thickness in 19 ft. 6-in. to 32-ft. base or surface courses in two passes. The hopper is equipped with two independent dual material conveyors and independent hydraulic gates. It has oscillating screeds, adjustable for crown, with accurate leveling insured by combination of 7 ft. 6-in. equalizing crawlers and leveling pans. The spreader is designed in two basic units, a tractor-hopper conveyor unit and a screed assembly.



Twin-engine power

Model TS-24, a new overhung type Twin-Power scraper with 24-cu. yd. struck capacity, has been announced by Euclid Div., General Motors Corp., Cleveland 17, Ohio. Incorporating Twin-Power, the use of two engines driving separate axles through separate transmissions, the TS-24 is a one-man earth-moving spread. Unit is powered by a 300-hp. diesel in the tractor and a 218-hp. engine located behind the scraper.

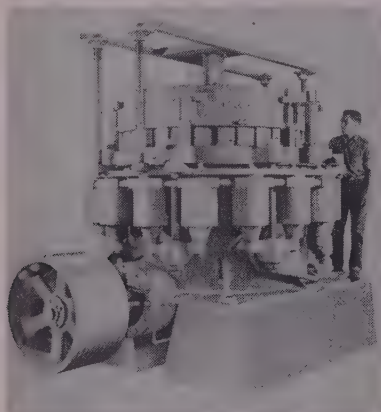
Makes sand from feed

In sand deficient areas, this 54-in. Gyradisc crusher has proved economical in producing large quantities of manufactured specification sand from a pea gravel feed. Nordberg Manufacturing Co., 3073 South Chase Ave., Milwaukee 7, Wis.



Machine digs a mile of clean side ditch per day

Designed to eliminate high costs in highway widening, the Gar Wood-Buckeye Hi-Way Widener digs a flat-bottomed, clean ditch of uniform width and depth. Once over, and the subgrade is ready to receive material. No fine grading is required. The Gar Wood-Buckeye Hi-Way Widener will dig up to a mile of clean side ditch per day. The machine can also be used for curbs, gutters and storm water carry-offs. Gar Wood Industries, Wayne, Mich.



Excavator-crane does seven jobs

The Hysterway, a 1/2-yd. excavator-crane for mounting on new or used Caterpillar D8, D7 or D6 track-type tractors, is quickly convertible for seven different types of service: dragline, crane, clamshell, pile driver, shovel, backhoe and bulldozer. Heavy-duty tractor power is derived directly from the heavy-duty diesel engine of the tractor on which it is mounted. The Hyster Company, P. O. Box 4318, Portland 8, Ore.

All-steel barricades

Especially effective on the open highway is this all-steel barricade unit designed by Traffic Equipment Corp., 2064 Bannock St., Denver 23, Colo. Stands are designed so that they may be used with either 6- or 12-in. panels. Overall height is 5 ft., extensions and sign holders can raise flags and signs to over 7 ft. New catalog now available.





Portable A-W plant producing base material for large state highway job near Los Banos, California.

AUSTIN-WESTERN Crushing Plant produces rock at low cost for Richards-Underdown Co., Fresno, Cal.

High output and low cost—that's the story on the Austin-Western 101-S Crushing Plant working for one of the biggest producers in the San Joaquin Valley. Despite its large capacity, it can be moved easily and fast from job to job.

In the operation shown above, feed material is scalped ahead of the crushing plant to remove fines and produce minus 1 $\frac{1}{4}$ inch material. Feed over the scalper goes to the primary crusher, which has a 1036 jaw. It then passes into the big 30 x 20 inch roll crusher, which turns out a $\frac{3}{4}$ inch plant-mix material. The plant has three conveyors, which deliver sand and road-base material in sizes of 1 inch and minus $\frac{3}{4}$ inch.

The plant is powered by a 62.5 kva generator, driven by a diesel engine. The individual motors operate the conveyors and the scalping screen through short-coupled V-belts—there are no idlers, clutches, etc., to cause mechanical loss. The crushing plant itself is direct-diesel-driven by a propeller shaft. A single convenient push button station controls the entire closed-circuit system.

Edward R. Bacon Company San Francisco, California
Columbia Equipment Company
Portland, Oregon; Seattle, Spokane, Washington
N. C. Ribble Company Albuquerque, New Mexico
C. D. Roeder Equipment Company Reno, Nevada
Shriver Machinery Company Phoenix, Arizona
Smith Booth Usher Company Los Angeles, California

There's a high-speed, profit-making Austin-Western Plant exactly right for your needs. Call on your nearest distributor for full information. Or write Construction Equipment Division, Baldwin-Lima-Hamilton Corp., Lima, Ohio.

COMPARE—AND YOU'LL WANT AN AUSTIN-WESTERN CRUSHING PLANT

1. *Welded steel plate frame for high strength without weight of cast steel frame.*
2. *Machined steel toggle plate for absolute protection, instead of cast iron.*
3. *Inclined positive-throw-type vibrating screen.*
4. *All moving screen parts operate in rubber bushings that need no lubrication.*
5. *Dual rear wheels for added stability; fully enclosed brakes on rear tandem.*
6. *Oversize self-aligning spherical bearings in crusher.*
7. *Heat treated chrome vanadium steel shaft in crusher.*

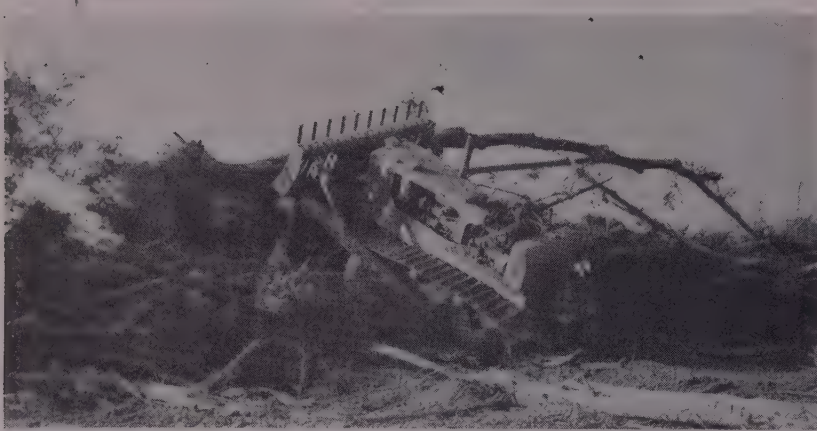
Western Machinery Company Salt Lake City 15, Utah
Western Machinery Company San Francisco 7, California
Keremi Tractor and Equipment Company, Cheyenne, Casper, Wyoming
Hall-Perry Machinery Company
Billings, Butte, Great Falls, Missoula, Montana
Engineering Sales Service, Inc. Boise, Idaho
Macdonald Equipment Company Denver 16, Colorado

AUSTIN-WESTERN
CRUSHING, SCREENING AND WASHING EQUIPMENT



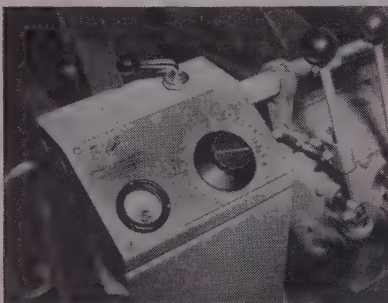
BALDWIN-LIMA-HAMILTON
Construction Equipment Division—LIMA WORKS

Road Equipment . . .



Giant rake matches Cat D9 in strength and power

Might makes right, in this case. It's Fleco Corporation's 9,390-lb. rake built to match the power and strength of the Caterpillar D9 tractor. This massive rake stands 6 ft. 4 in. high and 14 ft. 6½ in. wide and is designed to push out trees, brush, stumps, and rake material into dirt-free piles. The unit uses the same C-frame or push arms as an angle or straight dozer and is easily interchangeable with the dozer. Multiple spacing of the teeth permits the number of teeth to be varied from 5 to 10 with equal spacing to match clearing conditions and types of material. **Fleco Corporation**, Jacksonville, Fla.

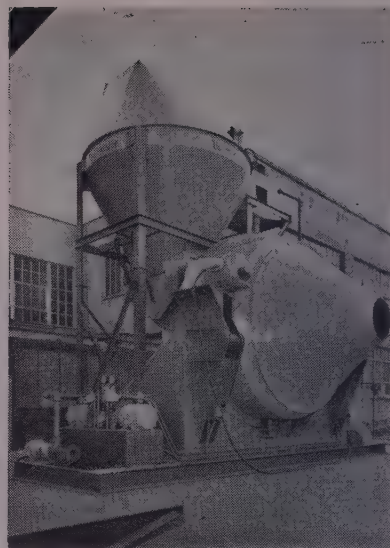


Control guides grader blade

Closeup of the Preco Automatic Blade Control for Cat No. 12 motor graders shows the dial which is conveniently located to the other controls. Calibrated in both percent of slope and slope ratio, it keeps the grader blade at any desired slope, regardless of the position of the grader or the unevenness of the terrain. **Preco Incorporated**, 6300 E. Slauson Ave., Los Angeles 22, Calif.

Major design changes on Badger ½-yd. Hopto unit

Badger Machine Co.'s redesigned ½-yd. Hopto Digger, Model 360 57-90, has a new split hydraulic system powered by a M363 Continental engine. A triple tandem pump delivers 90 gal. of oil per min. to a split valve bank which provides a more efficient, faster and cooler operating hydraulic system. Digging depth has been increased to 20 ft., the ground reach to 30 ft. and the backhoe loading height to 16 ft. Two 6-in. ID cylinders on the boom lift have increased both the down pressure and the lifting capacity. **Badger Machine Co.**, Winona, Minn.



Set it, forget it

An electrical control panel guides all operations on this 7½-cu. yd. Tilt-up concrete mixer manufactured by **L. Burmeister Co.**, 4535 West Mitchell St., Milwaukee, Wis. Presettings make it impossible to make an incorrect mix or to double batch. Two 15-hp. electric motors operate two hydraulic rams for the tilting mixer. The mixer drum is revolved by two 40-hp. gearmotors. The unit is skid mounted for easy moving. The entire unit less holding hopper can be skidded onto a low-bed trailer and hauled to a new location. Weight of the unit is 35,000 lb.



New digger in production

Highway Trailer Co. of Edgerton, Wis., has started production on an earth boring machine with new adjustable clutch, brake assembly and integral winch. To increase the ease of operation, hydraulic controls are available on the digger as optional equipment. The HCAMS earth boring machine is a versatile skid mounted unit that digs holes from 9 to 36 in. in diameter in any soil condition.

ESSICK

VIBRATING ROLLERS

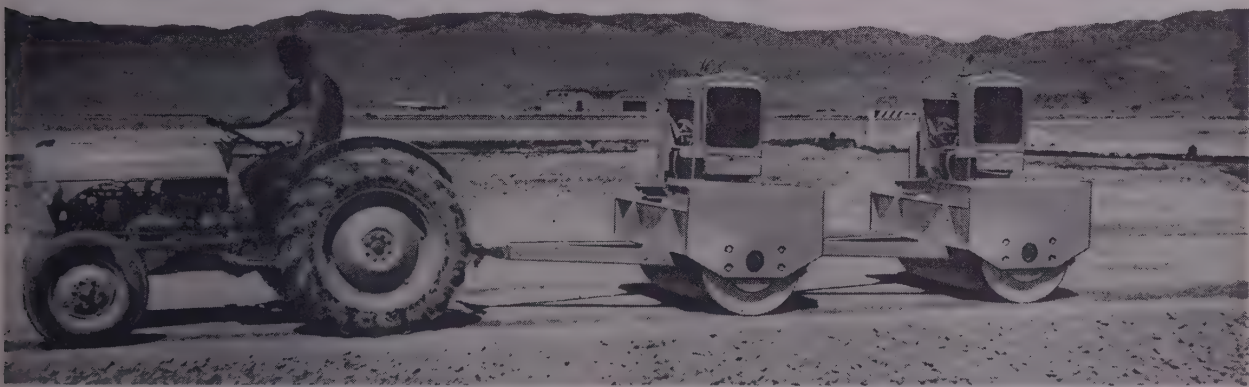
CUT COMPACTION COST!



ON THE SANTA ANA FREEWAY WITH GRIFFITH COMPANY

Two out of every three compacting hours are saved with Essick's VR-54T Vibrating Roller. The VR-54T operates in narrow confines and compacts to specifications in $\frac{1}{3}$ the normal equipment hours. Around Freeway bridge ap-

proaches where high densities are a must — and unusually difficult and expensive — the VR-54T enabled one contractor to cut compaction costs from \$4 to less than \$1 per yard.



MORRISON-KNUDSEN ON THE BOISE AIRPORT

A new "multiple hookup" use of Essick Vibrating Rollers, two hooked in tandem or three hooked in triplex, handles with ease lifts of fill material up to 30 inches. The tandem hookup equals the output of three single rollers

while the triplex unit covers 13'-2" on every trip and does the work of 5 single rollers. Versatility, easy handling, unequalled performance and low maintenance cost makes Essick VR-54T the most valuable compactor available.

WESTERN DISTRIBUTORS FOR ESSICK MANUFACTURING COMPANY

WESTERN TRACTOR & EQUIPMENT COMPANY...Seattle 8, Washington
BALZER MACHINERY COMPANY.....Portland 14, Oregon
SULLIVAN & CROWE.....Redding, California
RICKER MACHINERY COMPANY.....Oakland 7, California
CONTRACTORS EQUIP. & SUPPLY COMPANY.....Fresno, California
W. K. EQUIPMENT COMPANY.....San Bernardino, California
SOUTHERN EQUIP. & SUPPLY COMPANY.....San Diego, California

EQUIPMENT SALES COMPANY.....Phoenix, Arizona
INLAND SERVICE & SUPPLY COMPANY.....Las Vegas, Nevada
GENERAL EQUIPMENT COMPANY.....Reno, Nevada
STARLINE EQUIPMENT COMPANY.....Boise, Idaho
LUND MACHINERY COMPANY.....Salt Lake City, Utah
KING & EAST MACHINERY COMPANY.....Denver, Colorado
MONTANA POWDER & EQUIPMENT COMPANY.....Helena, Montana



Fast, uniform spreading

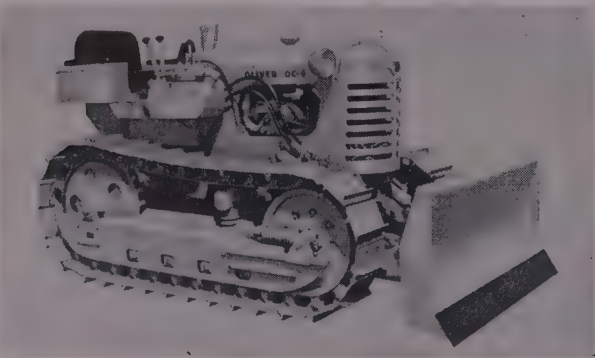
It took only 11½-hr. operating time for an Arizona contractor to apply 205 tons of liquid asphalt on a road surface and cover it with 1,747 tons of cover-coat material, using the Flaherty Spread-Master power spreader. This self-propelled spreader is designed for chip and sand-sealing, applying armour coat or surface treatment materials, and for spreading fines on water-bound macadam. There is sufficient aggregate storage capacity in the unit to make the spreading of materials a continuous operation as it is not necessary to stop to hook and unhook the trucks which are delivering the aggregate. Two 20-in. conveyors deliver material from the receiving hopper to the spread hopper in front. Full information available from Flaherty Mfg. Inc., P. O. Box 1042, Pocatello, Idaho.



Wagon offers controlled dump or spread

Two Movalls on a 1,000-ft. haul kept a 3-yd. shovel busy on this highway job near Roseburg, Ore. The C & D Movall features a positive ejection system which enables it to haul and dump any material from clay to shot rock and dump it standing still or "on the fly." The operator has complete control of

the discharge rate. Movalls can spread material in even lifts or any desired depth, feed hoppers of controlled rate, dump in a pile or over the edge of a fill. An extra heavy-duty rock body stands up under toughest service, loading big rock under 2½ to 6-yd. shovels without damage. Designed for use with Caterpillar DW20 or DW21 tractors, it has a capacity of 31 tons, 25 cu. yd. heaped. C & D Div., Yuba Manufacturing Co., Benicia, Calif.



Close quarter work

Work in close quarters is easy for this compact new crawler tractor, Model OC-4, manufactured by the Oliver Corporation, 400 W. Madison St., Chicago 6, Ill. A four-cylinder gasoline engine delivers 22 db. hp. and a new four-speed transmission provides a range of from 1.56 mph. in first gear to 5.26 mph. in fourth.

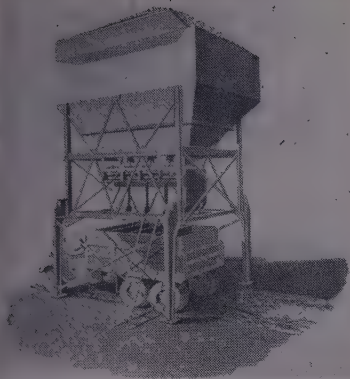


Four-wheel drive trucks

The powerful Mine Truck Series with capacities from 10 to 50 tons represents the largest four-wheel drive models in a complete line of 4 x 4 and 6 x 6 trucks manufactured by Oshkosh Motor Truck, Inc., 2300 Oregon St., Oshkosh, Wis. The trucks are equipped either as dump trucks like the 28-ton model W-2801 shown here or as truck tractors.

Fast automatic weighing in road batching plant

The new Butler TX4 Automatic Road Batching System can be purchased originally to handle high speed batching to serve one or two 34E dual drum pavers, then be expanded later to handle three or four pavers working at full speed. The basic plant, for one paver, consists of one 72-cu. yd. aggregate bin (shown here) and one 60-cu. yd. (404-bbl.) elevated cement bin, each equipped with four completely automatic weighing batchers. The complete plant will batch four loads of sand, cement and two sizes of stone every third of a minute. **Butler Bin Co., Waukesha, Wis.**



High capacity and mobility

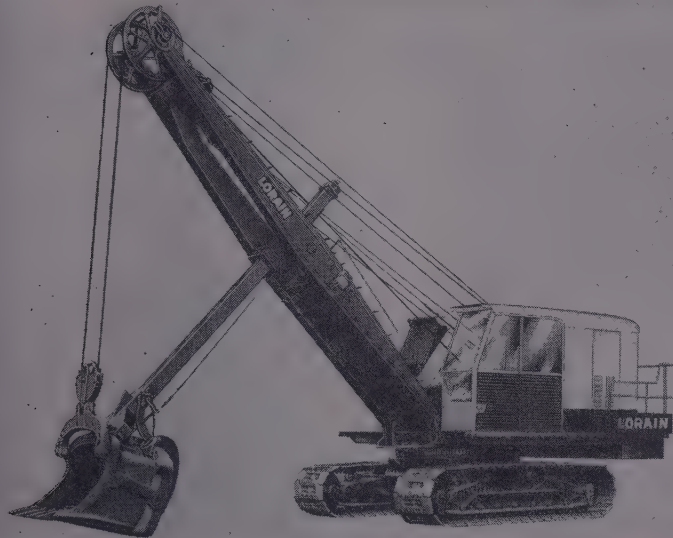
A Terrapac Vibratory Roller is seen here being hauled up an embankment on a California canal job. Vibrating action pounds the soil particles deeply and in all directions; maximum density can frequently be achieved in only two passes of the roller. A 25-hp. diesel is furnished as standard equipment so that a Terrapac can operate equally well on angles and slopes. **Vibro-Plus Products, Inc., Stanhope, N. J.**



Big producer on the highway

Fleets of these big capacity 26-yd. "Cobra Quads," powered by 300-hp. Turbo Diesel engines, are currently at work on federal and state highway projects in California. **Wooldridge Manufacturing Div., Continental Copper & Steel Industries, Inc., Sunnyvale, Calif.**

inside walk-around space. Lorain's two-lever "Joy-Stick" metered-air controls reduce operator fatigue, improve control, response and speed. "Shear-Ball" mounting eliminates all types of turntable rollers, center pin and nut and requires no adjustment. Air control of crawler steering, locking pawls and travel jaw clutch is standard. Swing, retract and crowd clutches are of same size and design with interchangeable parts. The unit is fully convertible to crane, dragline or hoe. **Thew Shovel Co., Lorain, Ohio.**

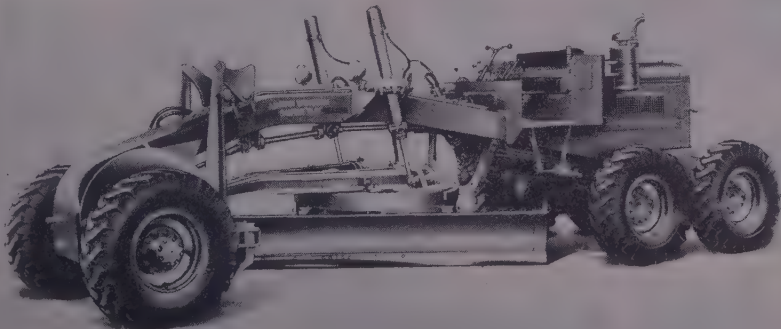


Lorain's "new look" of '57

The "new look" of the Lorain line for 1957 is shown with this photo of the Lorain L85A, a 2½-yd. shovel, incorporating an entirely new, modern two-color cab with many features for more comfort, convenience, safety and operating ease. The new cab has increased glass area for improved visibility in all directions, and includes a sliding overhead sunshade and window adjustable to many combinations; it is wider for more

Controlled traction is feature of large grader

Shown is the Austin-Western Super 99 Power Grader with six-wheel drive and six-wheel steer and the optional torque converter. Largest and most powerful of the firm's four graders, the Super 99 features precision sideshift, high-lift blade, extreme blade reach, completely reversible blade and hydraulic controls. Controlled traction is attained through the all-wheel steer and the "push-pull power" of all-wheel drive. **Austin-Western Works, Construction Equipment Div., Baldwin-Lima-Hamilton Corp., 601 Farnsworth Ave., Aurora, Ill.**



NOBLE TRIPLE BATCHER produces one operator in 1 stop



Bin center section can be truck-hauled without removing weigh hoppers, operator controls or any other components. All electrical switches are mounted in this unit and connections are made by simple twist-lock couplings.



3 pen recorder, optional equipment, produces record of each material as required by Corps of Engineers specifications. Adaptable to 1 or 2 stop set-up.

✓ **Weighs 3 materials for a single batch one time!** (sand, coarse aggregates, cement)

✓ **Batches accurately to rigid specifications**

✓ **Supplies 2 or 3 dual drum pavers!**

Lowest erection costs. Noble comes completely equipped ready for batching. Factory assembled sections, all within legal width for highway transport, are quickly erected on timbers or concrete.

NOBLE CONCRETE BATCHING PLANTS

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International Sales Agent: Frazar International Corp., San Francisco

over 300 yards per hour with
stop set-up



FROM COAST TO COAST

—Supplying 3 pavers on California air base construction. Produced 3500 cubic yards in 10 day period. 36" coarse aggregate conveyor, sand conveyor. Cement silo has facilities for direct loading of cement spreader trucks.

Now—On New England paving job.



For short stretch paving, come back work, tunnels, bridges, use...



Conair Aircraft taxiways



Bureau of Reclamation siphon, Othello, Wash.

NOBLE-MOBILE Batching Plant on Wheels



Ohio highway paving

Batches at the job site where hauls are shorter and profits longer. 100% complete plant. 65 to 125 yards per hour. Scooploader, crane or conveyor loaded. Supplies transit mix, dry batch or premix.

DEALERS: BIRMINGHAM, ALA., Equipment Service Co., Inc. • LOS ANGELES, CALIF., Smith-Booth-Usher Co. • DENVER, COLO., Western Machinery Co. • MIAMI, FLA., Neff
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Co. • DALLAS, TEX., North Texas Equipment & Supply Co. • EL PASO, TEX., Border Machinery Co. • HOUSTON, TEX., Boeck Engineering Co., Inc. • SAN ANTONIO,
Contractors Machinery Co. • WACO, TEX., Richards Equipment Co. • SALT LAKE CITY, UTAH, Arnold Machinery Co., Inc. • SEATTLE, WASH., Star Machinery Co. • SPOKANE,
Intermountain Equipment Co. • CASPER, WYO., Studer Tractor & Equipment Co., Inc. • CALGARY, ALB., Precision Machinery & Foundry Co., Ltd. • VANCOUVER, B. C.,
Equipment Co., Ltd. • WINNIPEG, MAN., Huggard Equipment Co., Ltd. • TORONTO, ONT., Ontario Equipment & Supply, Ltd. • MONTREAL, QUE., Laurentide Equip-



Hydraulic boom extends 33 ft.

Trimming a highway shoulder is the "Quick-Way" Model 125A with hydraulic "Chore-Master" attachment. The hydraulically operated boom extends to a radius of 33 ft. or retracts to a radius of 21 ft. The bucket swivels 100 deg. from side to side on the end of the boom and digs with a wrist action of 90 deg. The attachment is interchangeable with other standard "Quick-Way" crane-shovel attachments. The machine is full revolving and swings through a complete circle even with the hydraulic boom. "Quick-Way" Truck Shovel Co., P. O. Box 1800, Denver, Colo.



Motor grader offers high hp.

The world's first motor grader to offer 195 hp., the Huber-Warco 5D-190, features a torque converter, full power shift transmission and complete cab-controlled blade movement without manual adjustments. Huber-Warco Co., Marion, Ohio.



On the go, on the job

Greater mobility is the feature of Models 303 or 404 M-H-F Work Bulls equipped with the 185 backhoe and the 11-cu. ft. 102 loader. Units can easily dig laterals, handle other digging assignments and then do their own cleanup work. Massey-Harris-Ferguson, Inc., Racine, Wis.

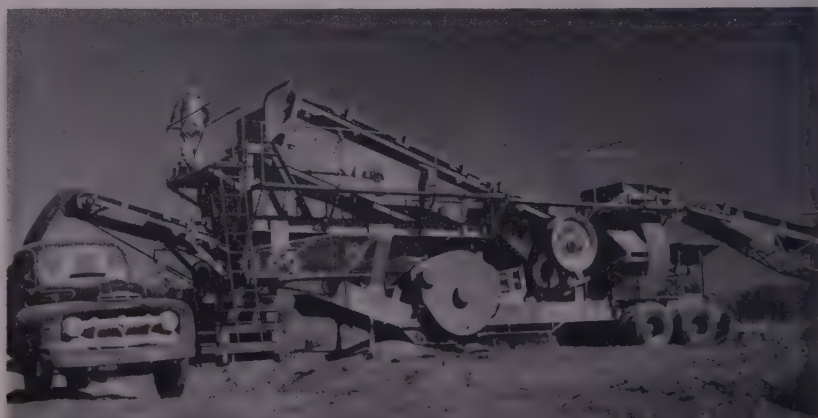
Portable aggregate plant

Capacity, based on 25% oversize passing 1-in. screen, is 160-225 cu. yd. per hr. on this rugged Diamond Type 77 plant. It operates on the "line-flo" rotor lift principle assuring a continuous flow of material. The plant runs on pneumatic tired dual wheels and is equipped with a truck or semi-trailer hitch attached to its frame. Diamond Iron Works, 4834 S. Halsted St., Chicago 9, Ill.



Streamlined asphalt plant

Built in capacities of 3,000, 4,000 and 5,000 lb. per batch, this portable type asphalt plant is manufactured by Madsen Works, Construction Equipment Div., Baldwin-Lima-Hamilton Corp., P. O. Box 38, La Mirada, Calif. Emphasis is on a clean and simple design, portability and fast production. Featured is the fully-enclosed double reduction gear box that goes right to the mixer shafts eliminating the exposed mixer timing gears and the pressure injection pump motor.





Using dozer blade, this machine clears way to job site, performs many rough-grading, leveling and back-filling chores without added equipment.

*High-production excavating and trenching
with the HYSTER*

D4 HYDRAULIC BACKHOE

combination backhoe and bulldozer

COMPARE THESE PERFORMANCE BENEFITS

then see a working demonstration

Designed specifically for Caterpillar-built D4 Tractors.

Develops approximately 4 tons digging force at the teeth and *balanced* by tractor weight to use it all.

Simultaneous swing and hoist at full hydraulic pressures from separate pumps.

Large hydraulic capacity for continuous, all-day operation without overheating.

Track-type tractor mobility retained by exclusive patented equalizer arrangement.

Hyster's hoe, mounted on a Caterpillar D4 Tractor, will go anywhere to get at the tough jobs. It gives you all the advantages of a combination excavator-bulldozer with full track-type tractor mobility. Handles all kinds of utility trenching and digging jobs at low cost. Everything about this rugged machine is engineered for performance far beyond the capacity of other hydraulic backhoes.

Call your Caterpillar-Hyster® Dealer
for demonstration.

HYSTER COMPANY

**D4 BACKHOE MAKES MORE
JOBS "ONE MACHINE" JOBS**



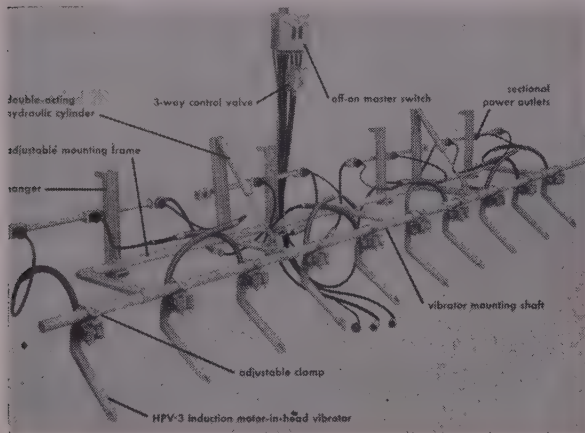
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Road Equipment . . .

Full-slab paving vibrator

Designed to provide uniform internal vibration throughout the slab, the new Hi-Lectric attachment of the **Maginnis Power Tool Co.**, Mansfield, Ohio, improves concrete quality and increases production on highway paving and airport jobs. The vibrators operate submerged below the surface and this feature provides a complete mixture of mortar and aggregate from base to surface. The result of this internal vibration leaves the



concrete surface smoother which is said to reduce finishing time. The lightweight attachment consists of motor-in-head vibrators at about 30-in. centers mounted on a tubular frame which can be attached directly to a spreader or finisher. No auxiliary carriage is required. The unit is suitable for paving widths up to 25 ft. and concrete depths from 4 to 19 in. Vibrating frequency from 5,000 to 10,000 per min. is obtainable by regulating the generator speed.

Rock bolts for highway cuts

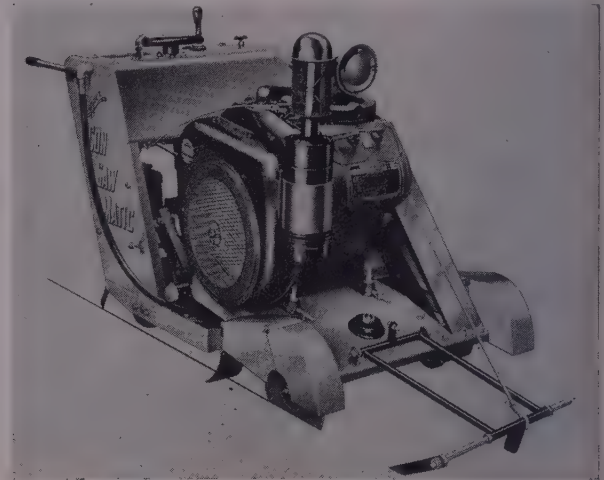
Where highway cuts in these Western states extend through rock formations the resulting problem of controlling possible slides and reducing the excavation yardage can frequently be solved by the use of modern rock bolts. These anchor bolts



of **Bethlehem Pacific Coast Steel Corp.**, San Francisco, Calif., are installed in drilled holes and when tightened lock together the stratified rock, stabilizing the slope. The lower end of the bolt is spread by a steel wedge in the slotted end which enables the tension to be supplied to the layers of rock.

Concrete saw with many features

The Model C-360 concrete saw of the **Clipper Manufacturing Co.** represents the most modern design of this type of machine. With a 36-hp. motor, it develops speeds up to 26 ft. per min. and has all controls conveniently dash mounted for



the operator. Clipper Diamond Blades are offered in a wide range of specifications for handling both cured and green concrete and asphalt containing all types of aggregate. These saws have been used extensively on airfield installations in addition to their common use on highway work. Uniform speed and positive traction is guaranteed by exclusive abrasive coated drive wheels which are in contact with the rear wheels to provide smooth and positive forward motion. Clipper Manufacturing Co., 2800 Warwick St., Kansas City 8, Mo.

Roadranger transmission is semi-automatic

Lighter in weight and shorter in length a new 10-speed semi-automatic transmission has been developed by **Fuller Manufacturing Co.**, Kalamazoo, Mich. This Roadranger transmission is 2½ in. shorter and 60 lb. lighter than the previous



model R-95 which it supercedes. The new R-96 consists of two sections, a 5-speed transmission with closely spaced ratios and a 2-speed auxiliary with wider space ratios. This combination provides 10 forward speeds and 2 reverse speeds shifted by only one lever. The range shifts are pre-selected automatic and synchronized. The auxiliary section is automatically shifted by air after pre-selection of the operating range required. Higher road speeds are possible through use of the new transmission because the engine operates at its peak power range resulting in greater fuel economy. Less drive fatigue results from the fewer shifts.

A black and white photograph of a construction worker on a steel beam. The worker is shirtless, wearing dark shorts, and is positioned on a horizontal steel beam, leaning forward and working on a vertical beam. The background shows a complex network of steel beams forming a structural framework.

**BUT SUPPOSE THE STEEL HADN'T BEEN
DELIVERED ON TIME?**

Somehow, schedules seem easier to make than to meet. And if delays do occur, costs can skyrocket. That's why so many western builders have learned to specify structural shapes from Kaiser Steel. Because, with Kaiser, an order placed is a promise kept—for delivery right on the nose. Kaiser Steel's fully integrated facilities are unique in the West, permitting careful control of quality all the way from mine to market. Combine this with our nearby location and full line of structural shapes (the most complete produced on the Coast) and you've built a mighty strong case for building with shapes from Kaiser Steel.

Kaiser Steel

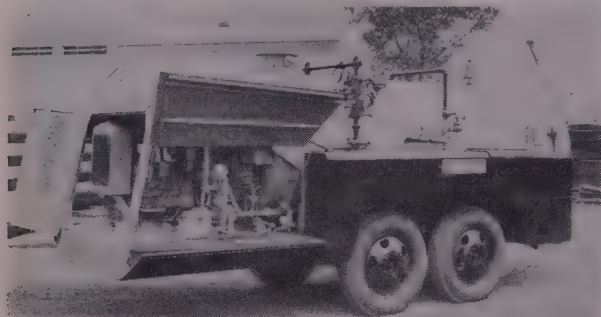
built to serve the growing West

For specifications WRITE: KAISER STEEL CORPORATION

Los Angeles • Oakland • Seattle • Portland • Phoenix • Denver • Tulsa • New York

Portable unit for quick steam

Designed specially for highway contractors and all types of construction work **Cleaver-Brooks Co.**, Milwaukee 12, Wis., has developed a portable 125-hp. trailer mounted steamer. Among the many uses for this unit are the driving and extracting of all types of piles, the heating of asphalt or road oils, the



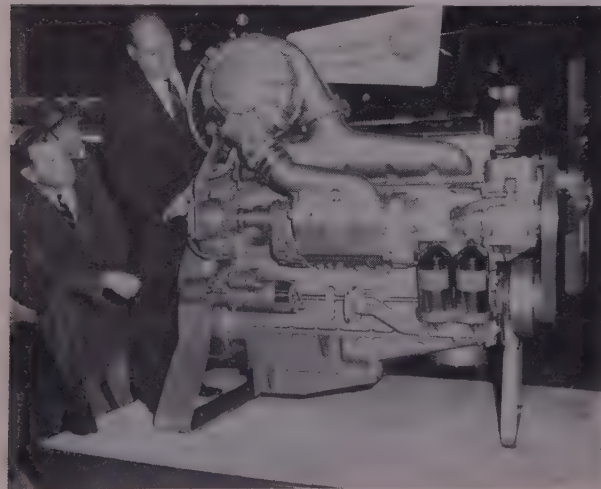
temporary heating of buildings, and steam cleaning of construction equipment. The Model PSM-125 delivered 4,300 lb. of steam per hour from a cold start in 30 min. and will maintain this production continuously. The oil fired burner handles commercial No. 2 oil and one simple control regulates the fire for all steam demands. The unit can be towed by truck or tractor.

Braided wire rope slings for construction

New to many contractors are the braided wire rope slings in both round and flat type now available from **Macwhyte Company**, Kenosha, Wis. Macwhyte wire rope products represent a complete line for all types of construction equipment including special cable assemblies for towing, handling and controls. Of interest to contractors is the scraper rope specially designed and supplied on a reel to fit on carrying type scrapers and bulldozers.

Detroit Diesel engine for earthmoving equipment

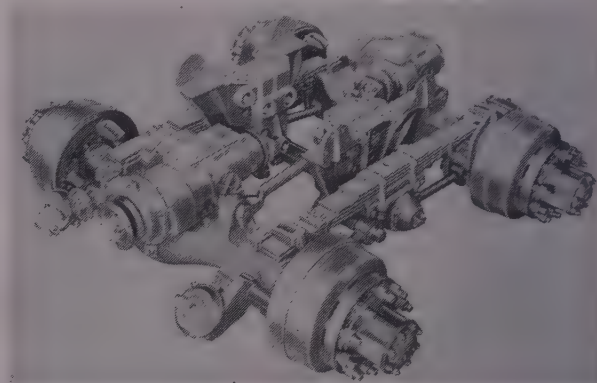
Developed for off-the-highway earthmoving and other construction equipment, **Detroit Diesel Division of General Motors** has a 375-hp. engine that is comparatively small in size and light in weight with a high-power output. The engine is a 6-cylinder, 2-cycle model in which a 25% gain in horsepower has been attained through turbocharging. This increase in power from 300 to 375 hp. has been attained with no appreciable increase in bulk, weight or fuel consumption. The exhaust-driven turbine increases the fresh air supply to the engine and results in improved combustion, greater efficiency and



better high altitude performance. In connection with construction work **Detroit Diesel** reminds contractors that the additional horsepower permits the operator of a scraper unit to carry out more work at a lower cost per yard.

Truck drive axles with stamina

Based on 35 years of research and manufacturing experience on tandem drive rear axle units, the new **TDA Model SFD-4600** rear axles of **Rockwell Spring and Axle Co.**, contain many new features. The final drive is by hypoid-spur with greater tooth contact. The straight-line final drive eliminates



any angularity in the propeller shaft and power lockout is controlled from the cab. Torsion flow axle shafts are guaranteed for 100,000 mi. or three years. Rubber torque rod bushings eliminate all metal to metal contact and require no lubrication. The units provide ample strength for design loads with no excessive weight. **Rockwell Spring and Axle Co.**, Coraopolis, Pa.

Panel forms speed retaining wall work

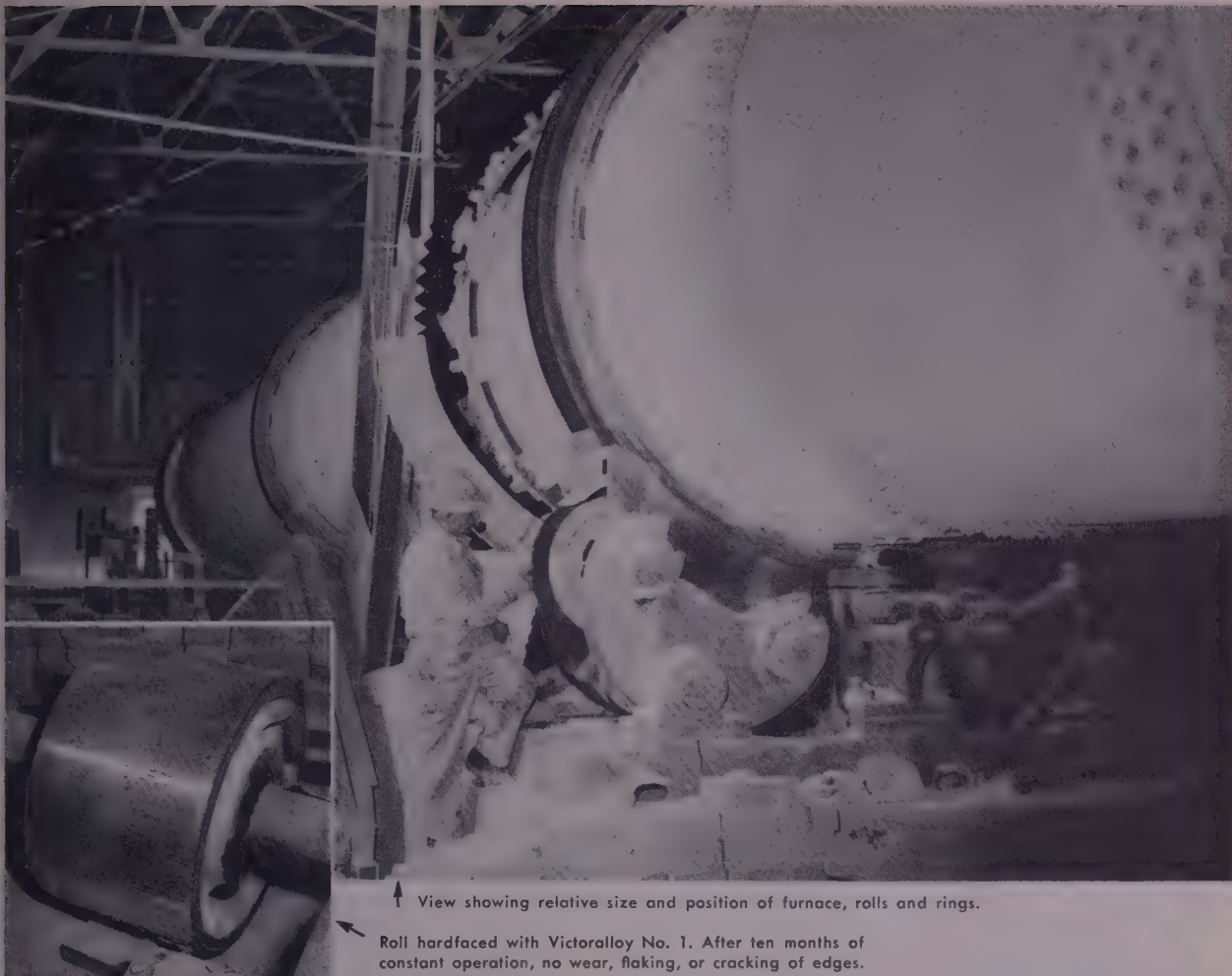
Panel forms made up into gang sections and handled by truck crane permit the pouring of 140 lin. ft. of retaining wall



per day. These Symons forms provided by **Symons Clamp & Manufacturing Co.**, 4249 W. Diversey Avenue, Chicago, Ill., were used in 4 x 6 and 3 x 6-ft. sizes and the 5,400 sq. ft. supplied for the job permitted the concreting of 70 ft. of wall in one pour.

Single unit with two kinds of power

The **Murphy Diesel Mech-Elec** combines a **Murphy Diesel** engine and a 75-kw. alternating current generator, and derives its name from the fact that both mechanical and electrical power, each independently controlled, can be taken from the same unit. **Murphy Diesel Co.**, 5317 West Burnham Street, Milwaukee 14, Wis., provides this engineered power unit mounted on a structural steel base and states that the machine



A case of wear and tear... and how Victor alloy solved it

PROBLEM:

The 300-ton furnace of Diamond Springs Lime Company, Diamond Springs, Calif., rolls on 16 centered 30/40 carbon steel rolls. The furnace's heavy weight and terrific heat caused the rolls to flake and crack at the edges. This in turn caused the furnace roller-rings to begin disintegrating. How to stop the wear and tear before an expensive shutdown and complete replacement of rolls and roller-rings became necessary?

SOLUTION:

Herbert Green, superintendent, and John Desson, general foreman, hardfaced the rolls with Victor alloy No. 1 Coated-Electric. Checking after ten months of operation, they found the case solved: no flaking of rolls, no cracking at the edges, and no disintegration of furnace roller-rings.

You, too, can solve cases of wear and tear on operating parts with Victor hardfacing alloys. Complete line of 26 different alloy rods assure you a right rod for every hardfacing need. Full range of sizes for both acetylene and electric AC and DC applications, either hand or automatic. Order from your Victor dealer TODAY.

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Victor Hardfacing Manual shows you right rod to use and how to apply it. Write us now for your copy.

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ALLOY ROD AND METAL DIVISION

13808 E. Imperial Highway, Norwalk, Calif. • Wakita, Oklahoma

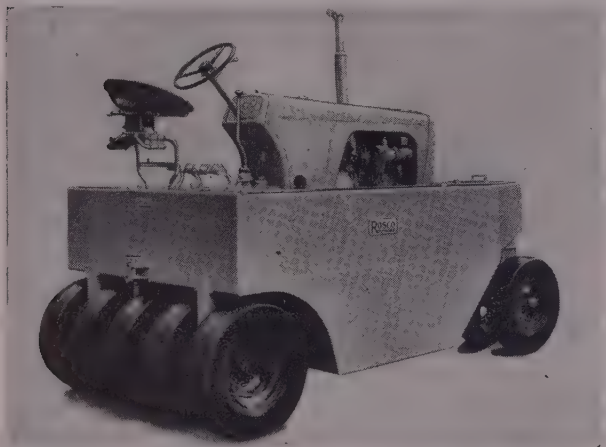
Road Equipment . . .



will deliver electric power all of the time that the engine is running at full speed whether or not the power takeoff clutch is engaged. The full engine power can be delivered through the mechanical clutch for starting up heavy machines. It will also provide electric power independently so that the motors on a crushing plant and the screens and conveyors can be operated after the crushers are stopped. The unit will distribute power automatically in step with the load demand. It will also deliver full engine power without taking any power from its electric production. Makes an ideal unit for providing lights for night operation and also for powering small electric tools.

New self-propelled pneumatic roller

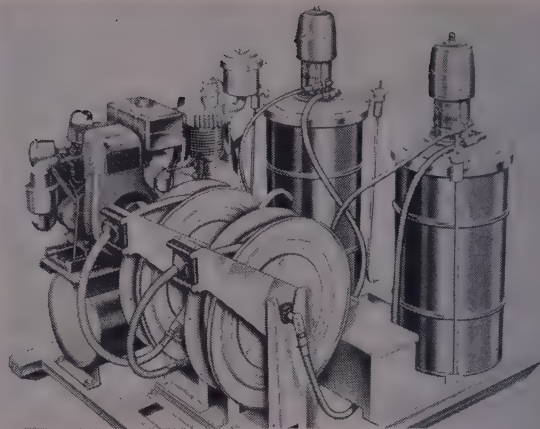
With field tests completed, **Rosco Manufacturing Co.**, Minneapolis 6, Minn., has announced its Model SR-9-O which is a self-propelled 9-wheel pneumatic road roller. This is in addition to the company's line of machinery for asphalt road



construction. Steering and handling are made easy with hydraulic power. The unit is driven by a 4-cylinder, heavy-duty gas engine. At the front of the roller are four oscillating wheels and the five rear wheels drive and provide maximum flotation. The wide smooth tread tires provide a 69-in. rolling path with overlap. The roller is of 9-ton size and the short wheel base provides a 13-ft. turning radius. Bulletin 560-B is available from the manufacturer.

Field lubricator for handling on pickup trucks

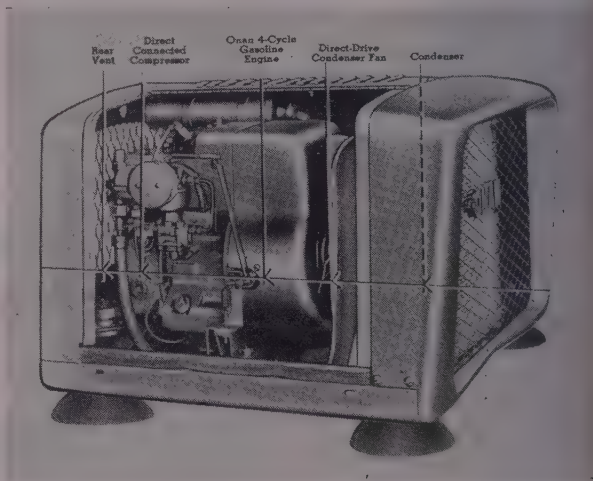
A new model of portable field lubricator has been announced by **Gray Company, Inc.**, Sibley Street, N.E., Minneapolis 13, Minn. The low-cost unit is designed to be carried in pickup trucks or small trailers and is particularly suited for fast lube jobs on equipment located at remote job sites. It is compact and lightweight. The unit is complete with two dispensing hose



reels, high pressure and low pressure Fire-Ball pumps, 7.5 cfm. air compressor and tool box. This complete unit is mounted on a steel frame with hardwood skids for fast loading. Other Grayco Lubers are available for all types of contractors needs.

Air conditioning for truck cabs

Called a Kab-Kooler, an air conditioning unit for truck cabs has been developed by **D. W. Onan & Sons, Inc.**, Minneapolis, Minn. It is a 1-1/3-ton air conditioning package designed for the comfort of the truck cab occupants. Weighing 225 lb. this mechanical refrigerating unit mounts directly on the cab roof. It is ample capacity for air conditioning large



truck cabs on the hottest days. All components, excepting the fuel tank and starting batteries, are conveniently arranged as a single unit inside the housing. Although designed for highway trucking, the Onan Kab-Kooler can be installed easily on other vehicles in the construction field such as cranes, shovels and off-the-road trucks.

Steel forms for concrete members

Steel forms designed specifically for the fabrication of prestressed concrete members are available from the **Florida Division of Food Machinery & Chemical Corp.**, Lakeland, Fla. These forms are also well suited for any poured-in-place and production line casting. The manufacturer provides consulting service on design and engineering features in connection with forms on specialized projects. Basic forms are designed to produce either I-beams or square beams. Side forms and inserts are fabricated in 10-ft. lengths for most efficient casting operations. Form-Crete bulletin 200 describes these forms in detail.



Your choice is complete

**New standards provide a size of truck mixer
for every condition and need**

On May 1, 1957, the above ratings were established as standard for truck mixers and agitators.

With these 10 sizes (3½ to 9 cubic yards as mixers, 4½ to 12 cubic yards as agitators) it is possible for every user to realize the maximum payload potential of today's trucks consistent with his own requirements and the conditions and weight laws under which he operates.

Note that truck mixer ratings have been simplified by eliminating the former

system of both "rated" and "guaranteed" capacities. Only a "maximum" capacity is now given. This maximum capacity corresponds to former "guaranteed" capacity without change in the drum volume requirements which have been used, proven and officially accepted for nearly four years (since September, 1953).

Replacement Plates, Printed Standards

Owners of truck mixers carrying Bureau rating plates of 3-3½ and larger sizes

may now replace them with new plates obtainable, without cost, from the Bureau.

Copies of the new standards, which also include more exacting requirements for mixing time, water measuring tanks and pumps, are offered to architects and engineers who help to maintain these high standards by writing them into their concrete specifications. Please address your request to the TRUCK MIXER MANUFACTURERS BUREAU, Munsey Building, Washington 4, D. C.

Member Companies

BLAW-KNOX CONSTRUCTION EQUIPMENT DIV.
Matoon, Ill.

CHAIN BELT COMPANY
Milwaukee, Wis.

CHALLENGE MANUFACTURING CO.
Los Angeles, Calif.

CONCRETE TRANSPORT MIXER CO.
St. Louis, Mo.

CONSTRUCTION MACHINERY CO.
Waterloo, Iowa

THE JAEGER MACHINE COMPANY
Columbus, Ohio

THE T. L. SMITH COMPANY
Milwaukee, Wis.

WESTINGHOUSE TRANSIT MIXER DIV.
Indianapolis, Ind.

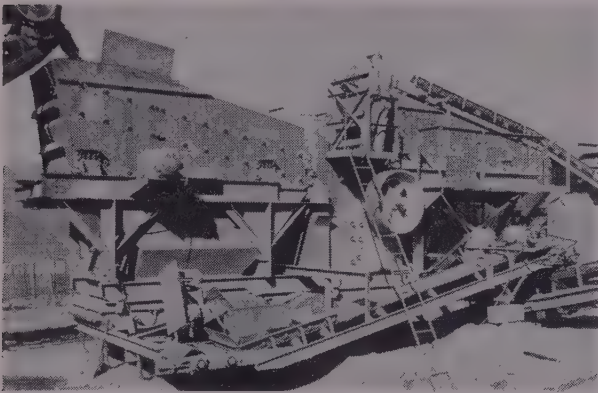
WHITEMAN MANUFACTURING CO.
Pacoma, Calif.

WILLARD CONCRETE MACHINERY CO., LTD.
Lynwood, Calif.

WORTHINGTON CORPORATION
Plainfield, N. J.

Largest portable screening plant

With capacities up to 300 tons per hr., **Universal Engineering Corp.**, Cedar Rapids, Iowa, now has available for road builders and contractors its Universal 293QS Senior Twin Dual Gravel King. This is reported to be the largest single unit portable, three-stage crushing and two-stage screening



and loading plant now available. It is completely re-designed and includes larger units throughout. A central control panel permits one operator to run the plant. By supplementing the scalping screen and swivel feed conveyor for an apron feeder the plant can be converted to quarry operation. Capacities and product are equal to those of a stationary plant but the 293QS is fully portable. A Universal Wobbler Feeder is one of the plant features.

Back-Hoe digs on the side

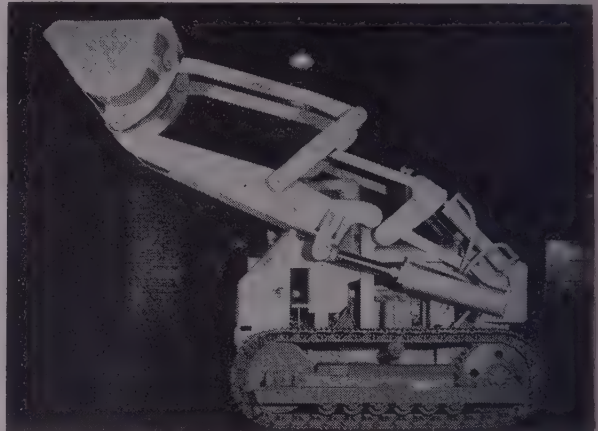
To overcome a difficulty common with tractor mounted back-hoes, the Davis 210 Back-Hoe, a product of **Mid-Western Industries**, Wichita, Kan., is a machine which is designed to



dig outside the wheel position. This feature makes it particularly suited to digging next to existing structures or along the toe of fills. Back-hoe can be removed in 5 min. making the power unit available for other work promptly. The boom has a swing of 200 deg. permitting right angle operation at either side of the machine. Mounting points on the frame are three (center and both sides) to permit flush digging on either side or straddling the trench line. Digging depth is 13 ft. and transport height is slightly more than 9 ft.

Front-end loader designed for roughest applications

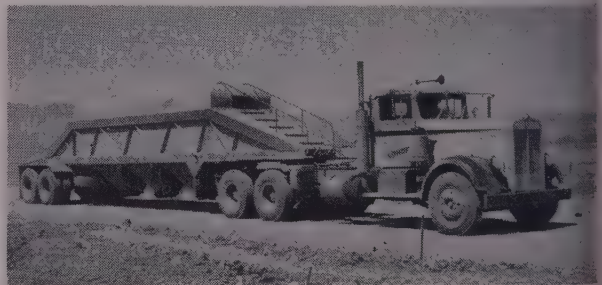
Designed to serve industry's requirement for a heavy-duty front-end loader, **Eimco Corporation** of Salt Lake City, Utah has developed its Model 105. This machine was not designed to compete with the available lighter front-end loaders but to present a machine capable of handling rough applications including rock. It can also be fitted with attachments to convert



it into lifting and handling logs and other uses common to heavy fork lift trucks. The 105 model will operate in a 9½-ft. headroom, making it suitable for tunnel work and it has a lifting height which will put the pivot point of the bucket up 14 ft. For fine grading the model can provide a strong downward pressure on the bucket. The machine can lift to full height a load of 15,000 lb. and has a top break-out force of 40,000 lb. Shipping weight is 44,000 lb.

New truck adapted for hauling bulk cement

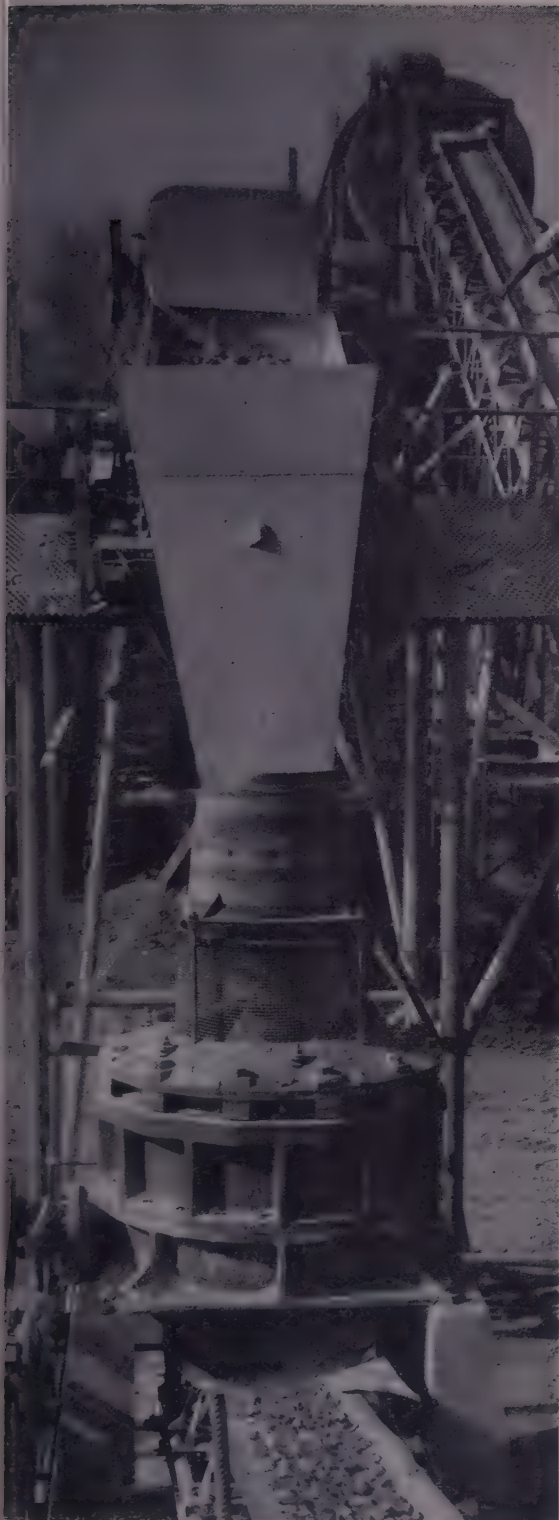
Featuring a drop-frame, front-end design this Model 925 of **Kenworth Motor Truck Co.**, Seattle, Wash., is well suited for hauling bulk cement. In this new design the frame rails are



carried through to the front end and directly under the radiator. Kenworth has shortened front spring brackets bringing them up closer to the rail which increases strength and ruggedness of the unit. This new front-end structure results in increasing access to the engine. Visibility has been improved by shortening the hood and by providing an off-set rear window. The 925 is a three-axle chassis with dual rear axle drive.

More portability for vibrating roller

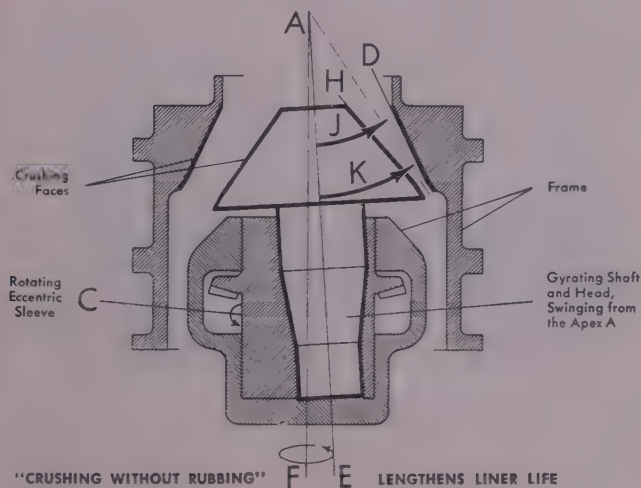
Latest feature of the self-propelled vibrating roller of **Essick Manufacturing Co.**, 1950 Santa Fe Ave., Los Angeles 21, Calif., is the carrying hooks which permit the roller to be easily moved by truck. The fast loading and unloading feature for the roller adds to its use in road construction and maintenance.



Reduction to uniformly fine product more economical with

KUE-KEN® GYRATORY CRUSHER

Kue-Ken is designed for low head room and choke feed so that this economical method of reduction can be adapted to most any flow sheet. It is the only gyratory crusher that operates on the "crushing without rubbing" principle that eliminates the main cause of liner wear. Kue-Ken liners give prolonged, trouble-free service under continuing, hard-materials crushing. This exclusive design also speeds crushing, increases capacity and economizes on power. Though exceedingly strong, Kue-Ken is sufficiently compact and light that it may be used in either a permanent or portable installation.



Kue-Ken crushes without the upward abrasive action that quickly wears out liners on ordinary crushers. See how crushing faces above pass through crushing zone on arcs J and K to crush rock *squarely*. Only Kue-Ken operates on this principle.

WRITE FOR CATALOG

DEALERS:

SEATTLE, WASH.	Washington Machinery Co.
SALT LAKE CITY, UTAH	Lund Machinery Co.
SAN ANTONIO, TEX.	Closner Equipment Co.
PORTLAND, ORE.	Contractors Equipment Co.
LOS ANGELES, CALIF.	Garlinghouse, Fremont Co.
PHOENIX, ARIZ.	Stapley's
DENVER, COLO.	Union Supply Co.
CASPER, WYO.	Moss Equipment & Supply Co.
VANCOUVER, B. C.	Universal Equipment Co.

KUE-KEN® CRUSHERS

'CRUSHING WITHOUT RUBBING'

STRAUB MFG. CO., INC., 8381 Baldwin, Oakland 21, Calif.

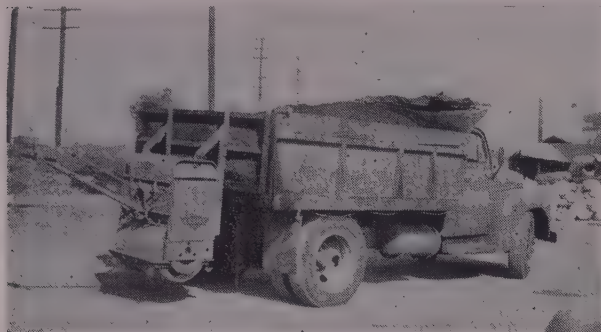
Two Crushers Gyratory Crushers Overhead Eccentric Crushers Revolving Screens
Classifiers Feeders Rib Cone Ball Mills Concentrating Tables Vibrating Screens

Pennsylvania Crusher Division, Exclusive Licensed Eastern Manufacturer and Distributor, 323 S. Matlack St., West Chester, Penn.
Armstrong Whitworth (Metal Industries) Ltd., Authorized Licensed Manufacturer and Distributor, Close Works, Gateshead-upon-Tyne 8, England

June 1957—WESTERN CONSTRUCTION

Road Equipment . . .

The 865-lb. Essick VR-28W is designed to do the work of four men with power operated hand tamping equipment and is claimed to turn out work equal to a 5-ton deadweight roller on asphalt. Tests show the vibrating roller gives excellent re-



sults on all types of asphaltic materials and the compaction of base courses. Essick also has a Model VR-546 vibrating roller which can be towed by tractor either in tandem or with a special hookup which permits three of the rollers to cover a 13-ft. strip.

Rocket truck mixer

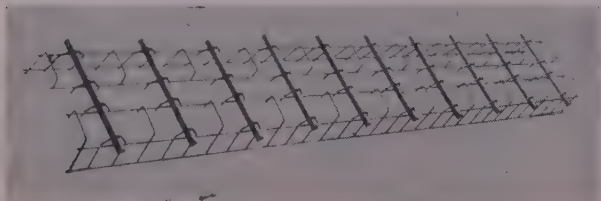
This 5½-6-yd. Rocket of Concrete Transport Mixer Co., 4985 Fyler Avenue, St. Louis 9, Mo., includes as standard equipment the following accessories; a two-way hydraulic



chute lift, revolution counter, 4-ft. aluminum extension chute and the opportunity to have the unit painted to the customer's color specifications and mounted on the customer's truck at the factory. The unit shown is mounted on a Champion Crane Carrier, made in Tulsa, Okla.

Dowel basket for concrete paving

A new heavy duty type of dowel basket assembly is available from Universal Form Clamp Co., 1238 North Kostner Ave., Chicago, Ill. This unit has the approval of many state highway



departments and has been used on several Eastern toll roads. Completely assembled and welded units are furnished together with all other transverse and longitudinal joint requirements such as stake pins, base plates, construction or expansion materials, hook bolt assemblies or tie bars.

All-new model of Sherman Power Digger

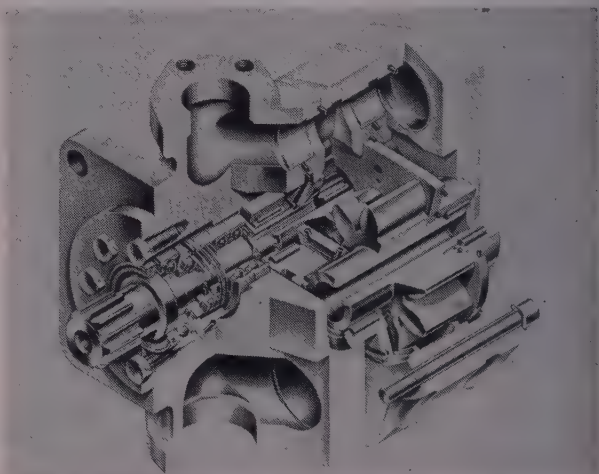
With a digging depth of 12 ft. and a reach of 18 ft. from axle at grade, the new Model "F" Sherman Power Digger designed for mounting on Ford tractors is being announced this



month by Sherman Products, Inc., Royal Oak, Mich. Other characteristics include an uninterrupted swing of 188 deg., a loading height of 9 ft. 2 in. and a high interchange of replaceable parts in all key positions. A 6-plunger control valve is designed to permit the handling of more than one control for a faster digging cycle. Operating pressure is 2,000 psi and the break-away power is 9,000 lb.

Fluid power for big equipment

To provide oil power on many types of large earth-moving equipment this Hydreco pump of hydraulic gear type is designed to provide 150 fluid hp. and operating pressures up to 1,500 psi. These units are usually installed on original equip-



ment and have been field tested for operating under adverse conditions common to construction work. The pumps are the product of the Kalamazoo Division of The New York Air Brake Co., Kalamazoo, Mich. In the West the company is represented by the Rucker Company of Oakland, Calif.

Fast and positive lubrication

Construction equipment, subject to rough use under tough conditions, deserves the type of lubricating service provided by the units available from Lincoln Engineering Co., St. Louis 20, Missouri. This is particularly true because many units of contractors equipment must be given their preventive maintenance in remote locations without central shop facilities. Lincoln's Lubrovans and Lubmobiles provide this type of com-



3/4-YARD HOE digs 20 feet deep

You have come to expect *extra work capacity* in Koehring machines — and you get just that in the new 305, heavy-duty leader in the 3/4-yard class. On hoe applications, it digs up to 40 inches wide over side-cutters — and 20 feet below grade. Cutting angle is adjustable to suit all digging conditions. Dipper pulls up close to boom, avoids spillage. Equalizer at dipper assures an even pull on both cables. Long reach puts spoil bank well beyond edge of cut — gives over 12½-foot clearance height (at beginning of dump) to load trucks. And that's not all —



Look at these other work capacities you get with Koehring 305: It converts to 3/4-yard shovel, handles 3/4 to 1-yard clamshell or dragline buckets on a wide work radius — has 15-ton lift capacity on crawlers — and 25-ton capacity on truck mounting. Better call your Koehring distributor about it *today*.

OPERATING EASE, SAFETY:

Self-adjusting, 23-inch main-drum power clutch reduces lever-pull 90%.

Main operating levers on antifriction, self-aligning bearings.

Automatic crawler traction-brakes.

Torque-converter optional.

SIMPLE, HEAVY-DUTY DESIGN:

Only 2 main-shafts in upper machinery, fewer parts, less maintenance.

Splined shafts, antifriction bearings.

Extra-long, extra-wide crawlers available to suit work conditions.

Welded, high-strength steels.

Butt-connected crane boom — safe, solid. Inserts easily changed. Only 2 bolts per corner.

305 WORK CAPACITIES:

15-ton crawler crane
(80-ft. main boom plus 20-ft. jib raised with low A-frame.)

25-ton truck crane
(100-ft. main boom plus 30-ft. jib raised with low A-frame.)

3/4 to 1-yard clamshell, dragline.

3/4-yard dipper as shovel, hoe.



K696R

AMERICAN MACHINE CO., Spokane, Washington
PACIFIC HOIST & DERRICK CO., Seattle, Washington
COLUMBIA EQUIPMENT CO., Portland, Oregon
HARRON, RICKARD & McCONE CO. of Southern California
Los Angeles, California
STANDARD MACHINERY CO., San Francisco, California
KIMBALL EQUIPMENT CO., Salt Lake City, Utah

ACTION EQUIPMENT CO., Stockton, California
NEIL B. MCGINNIS CO., Phoenix, Arizona
THE HARRY CORNELIUS CO., Albuquerque, New Mexico
SAN JOAQUIN TRACTOR CO., Bakersfield, California
ENGINEERING SALES SERVICE, INC., Boise, Idaho
WESTERN CONSTRUCTION EQUIP. CO., Billings, Montana
WESTERN CONSTRUCTION EQUIP. CO., Great Falls, Montana

plete portable power lubrication for on-the-job maintenance. Models vary from the LV-3 weighing approximately 785 lb.



with three air motors operating 400-lb. drum pumps (high pressure motor oil and gear lubrication) to Model LV-6 weighing 1,490 lb. with six drum pumps and seven reels and hose attachments.

Giant wire rope sling

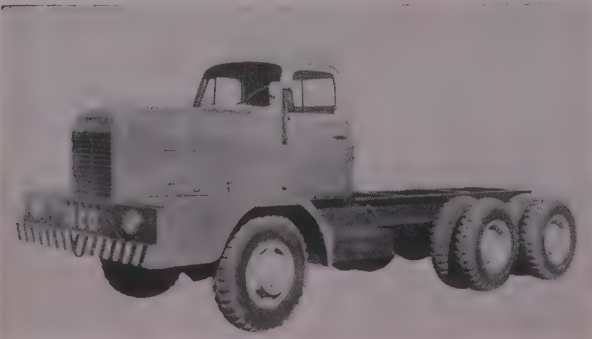
A new giant in wire rope slings, 3 in. in diameter, has been introduced by the Wire Rope Division, **American Chain & Cable Co., Inc.**, Wilkes-Barre, Pa. The new sling, with its fully mechanical Dualoc. Ending, is said to be the world's



largest. There are 19 diameters in ACCO's line with the largest and smallest ($\frac{1}{4}$ in.) shown in the photograph. The sling is proof tested to 288,000 lb., double the safe working load. American Chain & Cable Co., Inc., 929 Connecticut Ave., Bridgeport 2, Conn.

Try a Roughneck for off-highway use

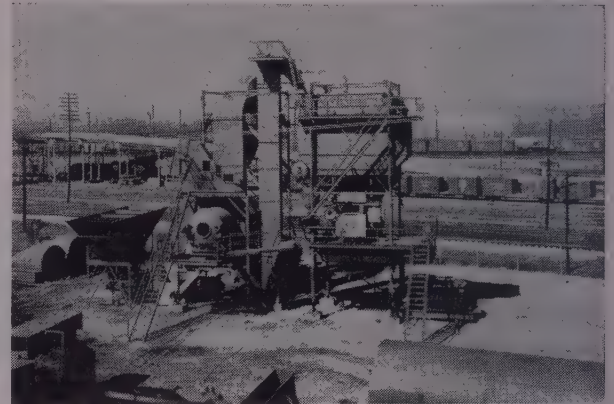
The Model LCM-6566 Roughneck was designed primarily for off-highway use. The unit is equipped with a Cummins JT6B1 diesel 175-hp. engine, a Clark 326VO transmission, a



Clark 375-DA-2 auxiliary transmission, a Clark 15,000-lb. front driving axle, a 50,000-lb. capacity Clark tandem, and air actuated brakes—front and rear. This vehicle can be adapted to many other applications. **Crane Carrier Corp.**, Tulsa, Okla.

Simplicity offers its largest plant

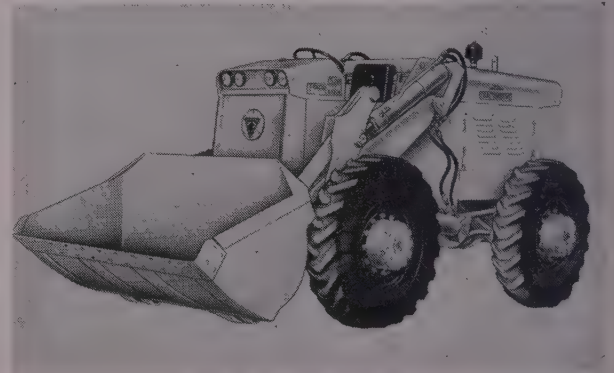
Now available is the Model S-200, the largest asphalt plant ever built by **Simplicity System Co.**, Riverside Drive, Chattanooga 6, Tenn. The plant has a 10 x 20-ft. double shell dryer assembly, 2½-deck Nordberg-Symons vibrating screen, an 85-



ton aggregate storage bin, and an 8,000-lb. capacity steam-jacketed pugmill mixer with automatic controls. The automatic unit can be set to produce up to 6 consecutive uniform batches by merely pushing one button. The unit can also be switched to manual operation if desired.

4-wheel drive, 2-cu. yd. front-end loader

The TL-20D Tracto-Loader is a new 22,100-lb. 4-wheel drive, 2-cu. yd. front-end loader. An outstanding feature of the machine is the one lever power-shift and direction control.



Only one lever is used to select any of the 3 speeds in either direction. Top travel speed is 23 mph. Power is provided by an a-c. diesel engine developing 100 hp. at 2,000 rpm. It has a 24-v. electrical system with an electric starter and ether dispenser for starting in cold weather. **Tractomotive Corp.**, Deerfield, Ill.

High-speed loader by Oliver

Many operating improvements have been introduced in the new 1½-yd. tractor-loader built by **Oliver Corp.** A lower silhouette mounting gives much better visibility and the lower center of gravity gives an improved stability. The frame of the OC-126 is rigidly mounted for extra loader strength. Full-length steel guards protect the 5 lower track wheels and track



Buffalo-Springfield 3-Wheel Roller on a widening and bituminous resurfacing job.

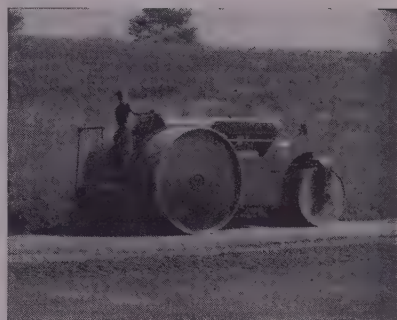
To compact largest variety of material, use Buffalo-Springfield's 3-Wheel Roller

Buffalo-Springfield Heavy-Duty 3-Wheel Rollers are long-time favorites for handling the wide variety of materials found in fills, subgrades and bituminous pavements. Variable weights in 10-14 and 12-15 ton sizes, power roll brakes, tapered roller bearings on *all* rolls . . . assure widest range of use, unequaled safety, maximum maneuverability, smoothest performance and longest operating life.

The Buffalo-Springfield 3-Wheeler's time-proven 4-speed transmission is an unmatched assembly

built for outstanding performance and durability under severe load conditions. Torque converter drive with 2-range transmission is also available as optional equipment.

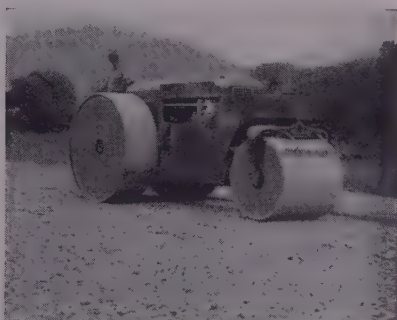
When *one* roller must do *many* jobs, the Buffalo-Springfield 3-Wheel Roller is your best buy. Ask your nearest Buffalo-Springfield distributor today for all the reasons *why* Buffalo-Springfield 3-Wheel Rollers are top choice for multi-purpose compaction regardless of the type of material to be compacted.



This 3-Wheel Buffalo-Springfield Roller is compacting earth fill for new pavement.



Buffalo-Springfield 3-Wheel Rollers speed compaction on fill consisting primarily of slate refuse from a coal mine.

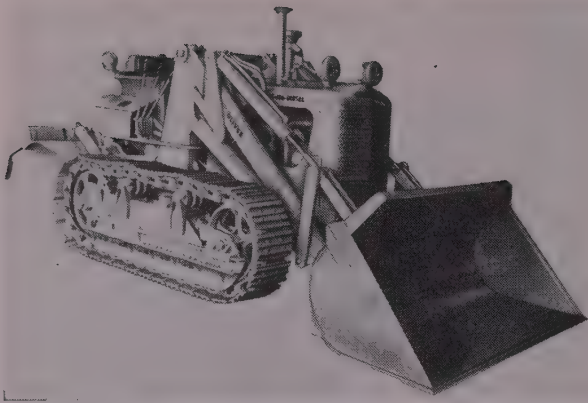


Here a Buffalo-Springfield 3-Wheel Roller compacts crushed stone base for new highway.

Write today for a copy of the new 3-Wheel Roller Bulletin, S-72-156.



BUFFALO-SPRINGFIELD ROLLER CO.
DIVISION OF KOEHRING COMPANY • SPRINGFIELD, OHIO



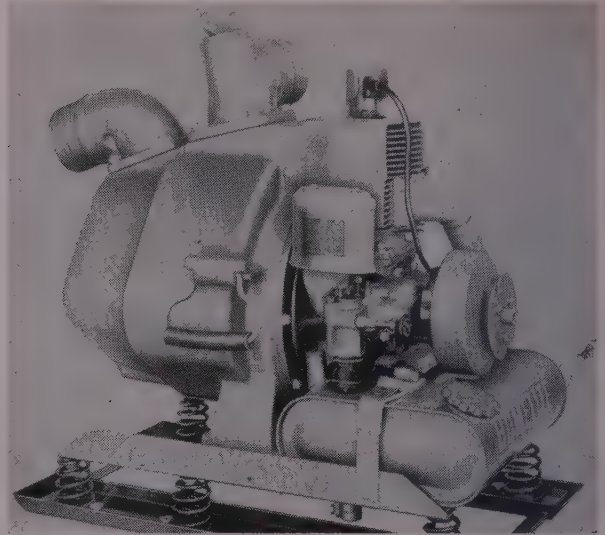
assembly by keeping out stones and gravel. The machine has 2-track power at all times, even on turns. It is powered by a 52-hp. diesel or gasoline engine. Complete literature is available from the **Oliver Corp.**, 400 W. Madison St., Chicago, Ill. Ask for Bulletin I-1047.

Plastic film for curing paving

The curing of portland cement concrete paving can now be done under a protective polyethylene film. Such a film .004 in. in thickness is manufactured by the **Visking Company, Plastics Division**, Terre Haute, Ind., and marketed under the name of Visqueen. Visking is a division of Union Carbide and Carbon Corp. Light in weight (20 lb. per 1,000 sq. ft.) this plastic film can be placed over a concrete paving slab by two men. Film is not affected by mold or mildew and it can be re-used many times. Being non-absorbent, it does not increase in weight even after exposure to heavy rain. Cost of this type of film is about \$.02 per sq. ft.

Lightweight high capacity pressure pump

Designed specifically for use of contractors and utilities, this new centrifugal pressure pump announced by **Homelite**, Port Chester, N. Y., has a capacity range of 55 gpm. at 70 lb. to 205 gpm. at open discharge. Model 24S3-1P weighs only 107



lb., making it extremely portable for construction work. It is self priming and will develop pressure in 15 sec. at 5-ft. suction lift and 45 sec. at 15-ft. suction lift. It has a guaranteed suction lift of 28 ft., a total head of 185 ft. including friction and is equipped with 3-in. suction and discharge fittings. The pump is mounted directly on the crankshaft of a Homelite, 2-cycle gasoline engine.



THE
ORIGINAL
DOZER-RIPPER



E. A. ROGERS COMPANY
149 East Main Street, Grass Valley, California
Phone 1202

root, rip, doze

in hard pan, concrete,
rock, shale and road
asphalt materials.

Pays off in grubbing jobs, too!

Light weight, easy to mount or dismount.
Can be used in single or multiple units.

Selected dealerships available!

Please send more information about the original
Dozer-Ripper.

Name.....

Address.....

City.....Zone.....

State.....

FELKER *di-lock*

**A better diamond
blade giving
GREATER CUTTING SPEED,
MORE FOOTAGE
on highway control
joint cutting!**

The Felker DI-LOCK, a totally new development in the concrete cutting industry, gives *premium blade performance at low cost!* It hangs on to its diamonds under terrific abrasion and shock, cuts faster, lasts longer, keeps on cutting foot-after-foot after other blades give up!

DI-LOCKS are versatile cutters, too...perform well under varying conditions and in a wide range of aggregates.

If you want *more speed* and *more footage* from your diamond blades, ask for Felker DI-LOCKS, *the answer to modern control joint cutting in today's highway program!* Available from your Felker distributor or write direct.

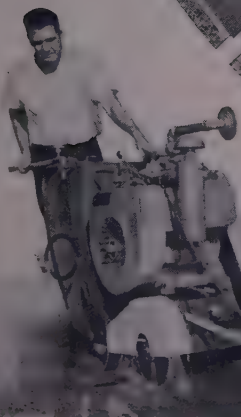
*First in
Diamond
Cut-Off
Blades!*



See the new Felker
Concrete Cutters
with highest rated h.p.
actually delivered
to the spindle!

Model 257—25 h.p.
Model 367—36 h.p.

Other models available

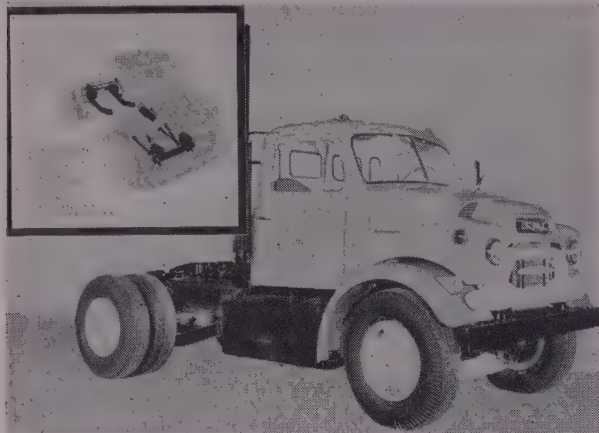


FELKER MANUFACTURING CO.

Torrance, California

Truck rides on air suspension

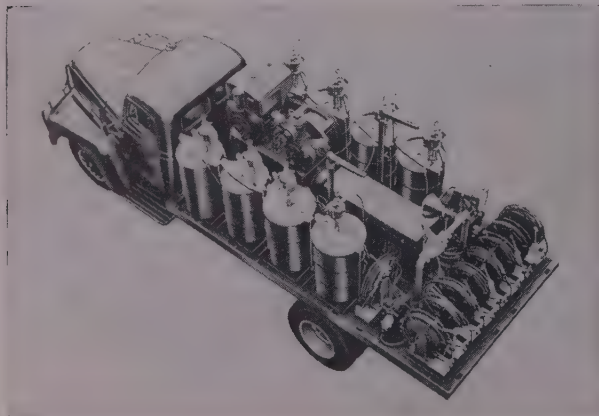
Considered one of the most important advances in truck design since pneumatic tires, the new units of **GMC Truck & Coach Division** ride on air suspension. The trucks also feature lightweight aluminum cabs and the powerful turbo-charged diesel engines. The unique GMC air suspension system consists of rubberized cushions of air that absorb road shocks and vibrations before they reach the frame. The design eliminates spring



repair, lubrication and replacement, providing a smoother ride for both driver and cargo. In addition the new system maintains a constant vehicle floor height for easier loading and unloading. Basically this new series of ten models uses air filled rubberized bellows to replace the conventional leaf springs. The design also results in saving space and weight for larger loads. General arrangement of the system is indicated in the shadow drawing.

Portable service station for construction

Designed to meet specific construction job requirements, the portable lubricating equipment of **Alemite (Division of Stewart Warner Corp.)** Chicago 14, Ill., can be adjusted for the needs of any contractor or construction job. The air compressor would probably be established directly behind the cab of the lubricating truck. Next, the barrels of lubricant and the



necessary pumps to handle the greases and oils are arranged in convenient order. Lastly, a bank of hose reels is added at the rear of the truck to deliver the various types of lubricants efficiently and with minimum amount of time. This arrangement provides high pressure power lubrication and completes the portable service station for construction contractors. Meters to measure the lubricants can be provided as optional equipment.

Improved aggregate spreader

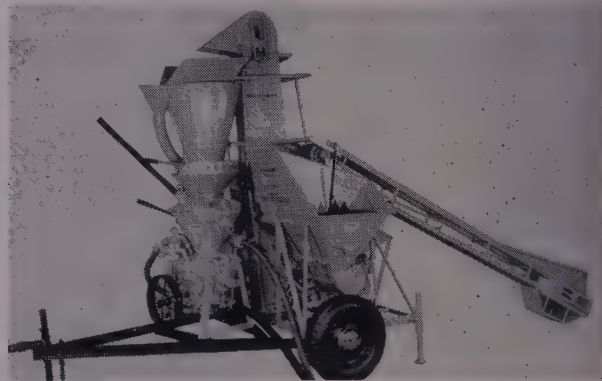
Rugged but easy moving, the "Handy" aggregate spreader is designed for economical spreading of sand, slag, stone, gravel, cinders, or calcium chloride, up to 1 in. in diameter. A flexible keyboard of tempered-steel fingers permits obstacles



in material to drop through without clogging thus eliminating streaks or spots. Spread is positively controlled by micrometer adjustment from powder to 3-in. depth. Specifications available on request. **Good Roads Machinery Corp.**, Minerva, Ohio.

Completely portable gunning rig

A new gunning rig combines 3 basic pieces of equipment, the concrete gun, the elevator for automatic proportioning and dry mixing, and the sand loader. This last element is an im-

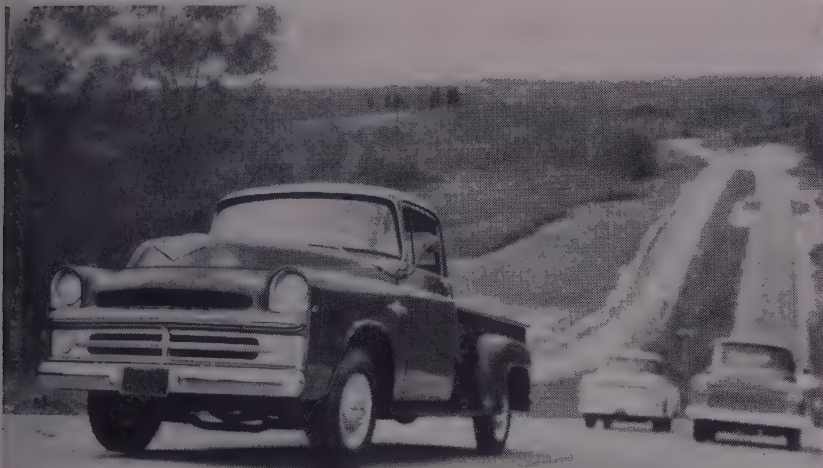


portant labor saver and operates from a power take-off. The rig has a greater capacity, 2 to 8 cu. yd. per hr., than any previously obtainable. It is designed for jobs where it is necessary to move the equipment from one site to another with a minimum of downtime. Full information can be obtained from the manufacturer, **Air Placement Equipment Co.**, 1009 West 24th St., Kansas City, Mo.

Gravel plant has 4-deck screen

A new series of portable duplex gravel plants is being manufactured by **Pioneer Engineering, Div. of Poor & Co., Inc.**, Minneapolis, Minn. The new line consists of four plants built around 2 basic models, the essential difference between them being in roll crusher size. Through its flexible screening and spouting arrangement, plus availability of a full deck of scalping area ahead of the primary crusher and availability of a full deck of sand screening area, the new 4-deck, 4 x 12-ft. screen allows high total production of one, two, three, or four sizes of closely graded product. The owner of the plant shown in Yuma, Arizona, reported the following figures to the manu-

In actual road tests . . .



Dodge won top honors in test after test between comparable models of all three low-priced trucks. Special high-speed camera records actual finish of hill-climb test. From a standing start, test crews raced all three trucks up a 32% grade. Dodge was *first* by five lengths.

and on your job . . .



Dodge gives you more V-8 power, in every weight class, than either of the other two low-priced trucks. From 204-hp. pick-ups to 232-hp. tandems, the extra power you get in a Dodge means an on-the-job performance bonus for you. It means greater economy, too, because it cuts down engine strain, reduces wear and repairs.

Dodge Power Giants outpower, outperform the "other two" low-priced trucks by wide margin!

Want power? Dodge outpowers its low-priced competitors by as much as 27 percent.

Want economical performance? The advanced design of the Dodge short-stroke V-8 produces the most efficient fuel usage in the industry. You get more miles per gallon . . . full power on regular gas.

Want extra payload capacity and handling ease? Dodge has 'em beat on both counts.

How about it? Don't you think you should find out for yourself? Just give your Dodge dealer a ring. He'll bring a truck right to your door and he'll show you certified test results that demonstrate Dodge is a winner in actual tests and on your job.

DODGE

Power Giants

MOST POWER OF THE LOW-PRICED 3



manufacturer: working with material containing 35 to 40% oversize to crush, 350 tph. of 1½ to ¾-in. aggregate base course, 60 to 75 tph. sand removal, and 9 tph. of ¾-in. to No. 10 mesh, for a total production including sand of 434 tph., this despite the fact that the screens and crushers were not working at top capacity.

New rock drill on crawlers

The new MM-2 Drillcat is a self-propelled rock drill on crawlers announced recently by **Thor Power Tool Co.**, Aurora, Ill. It is being introduced especially for the present highway building program to provide fast and economical drilling with one-man operation. The air operated crawlers permit the rig



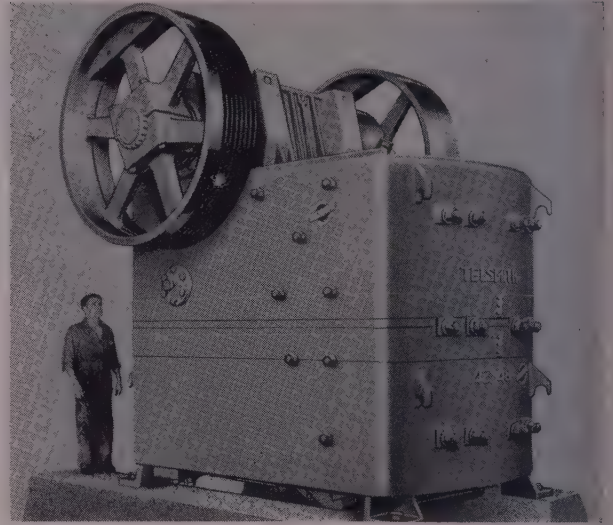
to move over rough terrain eliminating much labor in such moves. The machine consists of Thor's 105M Drifter Rock Drill and the BW-2 Wagon Drill Mast mounted on crawlers and equipped with twin, reversible 7½-hp. air motors. The rig also has a hydraulic boom to raise and lower the mast. The Drillcat performs in vertical, horizontal or angle drilling and the crawlers' extra heavy weight of 3,000 lb. adds stability.

Dual air control for concrete bucket

To secure greater flexibility in the operation and discharge of concrete buckets, **Gar-Bro Manufacturing Co.**, Los Angeles, Calif., has added a 250-psi. air receiver within the bucket to provide the self-contained energy for gate operation. This development has proved most successful and reliable in handling low-slump concrete containing large size aggregate. The compressed air at 250 psi. is charged to the bucket at the concrete loading point and the air receiver has sufficient capacity to operate the gate six to eight times before refilling. The system uses only 100-psi. operating air pressure and can be handled by pull chain or remote control since no air supply is required at the point of discharge. The dual feature refers to the fact that discharge can be regulated either from the high pressure air supply within the bucket or from a low pressure air supply line at the point of discharge. These buckets are available in all sizes from 2 to 12 cu. yd.

Jaw crusher has 42 x 48-in. opening

The **Smith Engineering Works**, Milwaukee, Wis., is offering a jaw crusher with a 42 x 48-in. opening which will take bigger rock and thus reduce quarry labor and expense. The



crusher has a 2-piece double wall, box section welded steel frame and a massive cast steel swinging jaw with extra large cylindrical roller bearings. It is designed to be fed by a large shovel. Bulletin No. 280A describes the new Telsmith crusher.

Things worth knowing about the Little Giant

Low center of gravity, large safety factor, no hook rollers, good stability and easy swinging are just a few things worth knowing about the Little Giant crane manufactured by the **Little Giant Crane & Shovel, Inc.**, E. 16th & Howard Drive,



Des Moines 13, Iowa. This single engine self-propelled crane is equipped with hydraulic steering, hydraulic power braking and spring loaded parking brakes. The entire unit including counterweight and attachments, have been engineered to meet existing highway load limits.

Brand new line of crawler tractors

The first of a completely new line of crawler tractors to be designed and built by Minneapolis-Moline in its own plants has been announced. Tentative name for the new tractors is the Golden Crawler line. The tractors, expected to be available within a few months is in the 57 engine brake horsepower class and will be designed for use with either diesel or gasoline engines. Transmission is a 5-speed sliding gear type. A torque

ALL MUSCLE

Here's the conveyor-screen plant built to take all the punishment you can throw at a portable plant. The MAN-SIZE Kolman 101 is all muscle—it's ruggedly constructed to handle heavy loads at constant rates, but without excess weight. It's a brute for production—the 36" belt, 50-foot unit shown loads out and screens over 800 tons of wet, sticky gravel per hour!



KOLMAN

COMPLETELY PORTABLE
CONVEYOR-SCREEN PLANT
CONVEYOR • SCREEN • TRAP • FEEDER

The Kolman Model 101 Conveyor is available in 18 to 48-inch belt widths in lengths up to 70 feet. It is capable of carrying a single, double or triple-deck Kolman vibrating screen without additional support, and can be equipped with a dozer trap, casting hopper, feeder-trap, or feeder-hopper. Adaptable to any type of feeding—dozer, dragline, front-end loader and others. Best of all, the Kolman 101 costs less than comparable heavy-duty conveyors.

SEE YOUR NEAREST DEALER OR WRITE FOR LITERATURE

ARIZONA

PHOENIX—Equipment Sales Co., 720 S. 19th Ave.

CALIFORNIA

LOS ANGELES—Brown-Bevis Industrial Equip. Co.,
6550 E. Washington
OAKLAND—Spears-Wells Machinery Co.

COLORADO

DENVER—Faris-Moritz Equipment Co.

IDAHO

BOISE—The Sawtooth Company, 1115 Grove St.

MONTANA

BUTTE, BILLINGS, GREAT FALLS and MISSOULA—
Hall-Perry Machinery Co.

NEW MEXICO

ALBUQUERQUE and FARMINGTON—J. D. Coggins
Company

NEVADA

ELKO—A-D Machinery Co., 251 W. Commercial St.

OREGON

PORTLAND—Contractors Equipment Corporation

UTAH

SALT LAKE—Rasmussen Equipment & Supply Co.

WASHINGTON

SEATTLE—Air-Mac, Inc., 3838 4th Ave. South

WYOMING

CHEYENNE, CASPER, ROCK SPRINGS and SHERIDAN—
Worham Machinery Co.

ALASKA

FAIRBANKS, ANCHORAGE—The Carrington Co.

Western Representative

S. A. MADRID

1729 32nd Ave., San Francisco 22

KOLMAN Manufacturing Co.

5670 W. 12th St.

Sioux Falls, S.D.

Send literature on following:

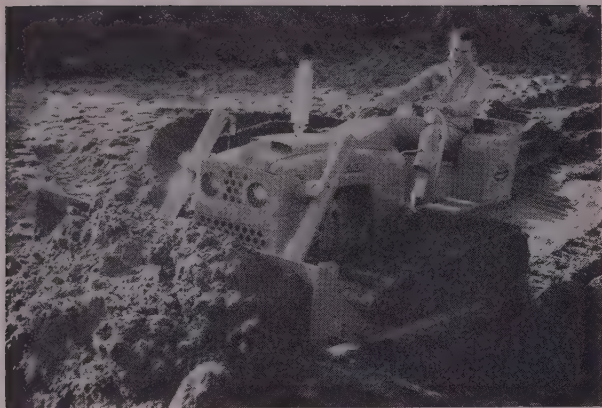
- ☐ 101 Heavy Conveyor
- ☐ 202 Junior Conveyor
- ☐ Vibrating Screens
- ☐ Traps ☐ Feeders

Please quote.....size or.....capacity

Name.....

Address.....

City.....



converter works in conjunction with a reverse shuttle gear. The crawler will be powered by MM's recently announced 206-cu. in. valve-in-head engine. Complete description of the tractor and its attachments will be supplied on request to the manufacturer. Minneapolis-Moline Co., Box 1050, Minneapolis 1, Minn.

Unit trencher has $\frac{3}{8}$ -cu. yd. capacity

The Unit Crane & Shovel Corp., Milwaukee 19, is now manufacturing the Model 510C which is convertible to all attachments. The lower traction gears operating in a bath of oil are completely enclosed, insuring protection against dirt or dust. The Unit Challenger features a 1-piece cast gearcase in which all gears and shafts are completely enclosed and lubricated by a constant flow of oil. The independent worm type boom hoist permits power lowering as well as power raising at high speeds. As a trencher the capacity is $\frac{3}{8}$ cu. yd.,



the digging depth is 14 ft. 5 in. and the dumping height is 19 ft. Boom length is 15 ft. Descriptive literature and specifications are available.

Distributor has new tank and spray bar system

Here is the new Seaman-Gunnison bituminous distributor, incorporating a new system of tank and spray bar circulation. Material can be constantly circulated in the tank for uniform temperature rise, preventing local over-heating and thus protecting material quality. Tank circulation also is maintained while recirculating material through the spray bar. Material feeds to both lines of the spray bar assuring uniform pressure at nozzles with bar length up to 24 ft. or longer. Nozzles are opened or closed by air action from the truck cab or front-end control platform. Seaman-Gunnison Corp., 2763 S. 27th St., Milwaukee 15, Wis.

1,000 Man-hours Saved on Highway Job with GRIPHOIST

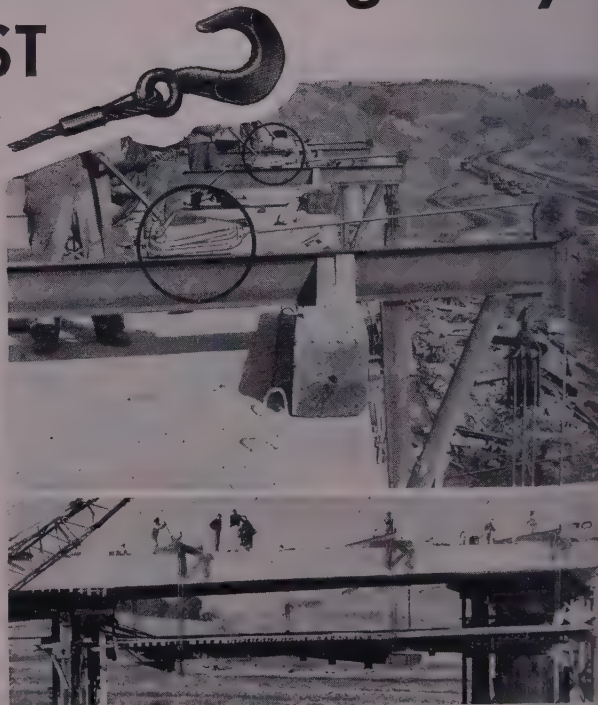


When you bid — figure on GRIPHOIST

You too can save. On 12-span bridge job, 8-man gang, using conventional methods, dismantled one set of forms in 14½ hours. Then Super placed three needle beams under forms and installed 6 GRIPHOISTS with cables attached to beams. Six men lowered 45-ton forms in 2½ hours . . . saved 1,000 man-hours.

For scores of other Griphoist uses . . . see your local dealer.

East of Mississippi
Princeton Griphoist 32 GEORGE ST.
 BOSTON 19, MASS.
 West of Mississippi
Griphoist, Inc. 424 BRYANT ST.
 SAN FRANCISCO 7, CALIF.



EASY TO DROP 45-TON BRIDGE FORM

Upper—close-up of 3 manually-operated GRIPHOISTS used as lowering device. Lower—start of smooth, simple GRIPHOIST operation that cuts stripping time.



John Deere crawler-loader with scarifier

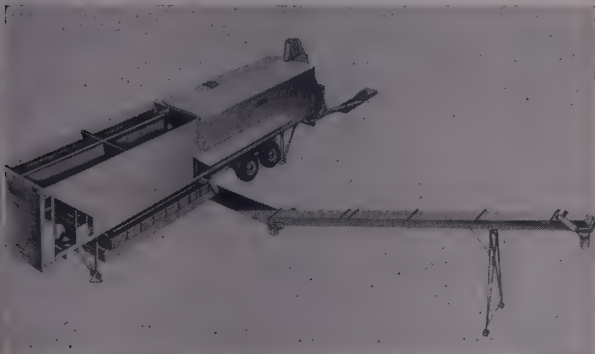
Pictured is one of the latest offerings of John Deere & Co., Moline, Ill. It's a Model 420 crawler fitted with a loader and scarifier. Engine hp. is 29.72 and the tractor is equipped with



12-in. flat street shoes, 5-speed transmission, and direction reverser. The bucket is 60 in. wide and has a capacity of $\frac{5}{8}$ cu. yd. struck and $\frac{7}{8}$ cu. yd. heaped. Breakaway lift at ground level is 4,500 lb. and the lifting capacity at full height is 2,700 lb.

Batch plant is completely portable

The newest product being made at the C. S. Johnson Co., Champaign, Ill., (a Koehring Co. subsidiary) is the Porto-Batcher, a portable batch plant that disassembles into 3 completely roadable trailer units. Production for the batcher



varies from 60 to 100 batches per hr., depending on batch quantities and truck size. An interlocked batch control with repeater is fully automatic. Aggregate capacity is 39 cu. yd. in 4 compartments—46 cu. yd. with 12-in. side boards. Two types of discharge conveyors are available, 1 for batch trucks and another for transit-mix trucks. For further information write for Bulletin KJ502.

Semi-trailer carries 30 cu. yd.

Shown in the photograph is a semi-trailer unit with a 19-ft. long body and 51-in. sides and ends. The body is tapered, being 80 in. in the front and 86 in. in the rear. It is con-

TUSKY HOIST

THE FINEST IN HYDRAULIC AND STRUCTURAL ENGINEERING.
Manufactured by Tubular Structures Corp. of America, Los Angeles, California.

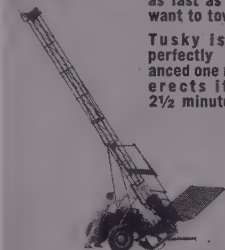
finally! A modern Hoist that meets today's competitive demands for Contractors' requirements with today's higher cost labor.

On a large job or a small job

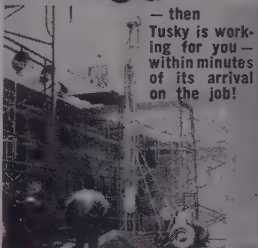


Tusky is towed to the job — as fast as you want to tow it.

Tusky is so perfectly balanced one man erects it in 2½ minutes.



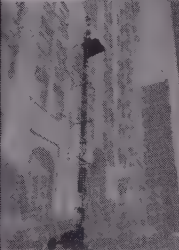
— then Tusky is working for you — within minutes of its arrival on the job!



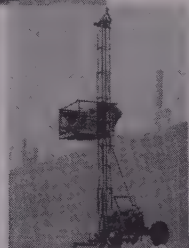
AT 100 FEET



AT 60 FEET



AT 20 FEET



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Spokane, Washington

Laurence Myers & Co.
61 Bluxome St.
San Francisco, Calif.

Waco Scaffold & Equipment Co.
2092 South El Dorado Stockton, Calif.

Universal Equipment Co.
1549 Eastlake Ave.
Seattle 2, Washington

Waco Scaffold & Equipment Co.
2405 E. Jackson
Phoenix, Arizona

Please send me a Tusky Hoist brochure

Name _____

Company _____ Position _____

Street _____

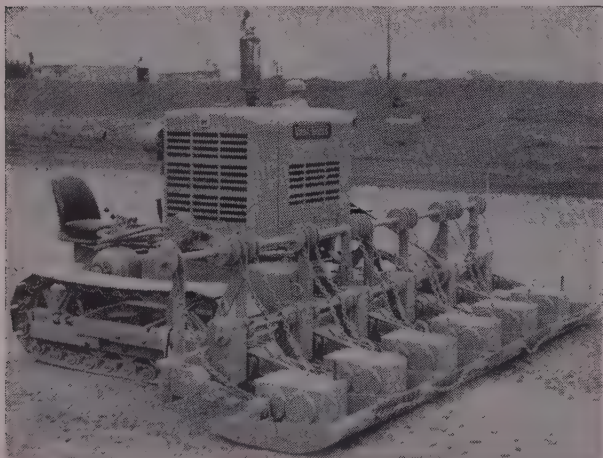
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structed of 8-gage, high-resistant steel, and has a reinforced upper body roll plus a cap angle. It is constructed with ¼-in. wareplate to withstand the impact of shovel loading. It has a 1½-in. hardwood cushion between the two steel floors. This particular unit is equipped with a barndoor type tailgate. The unit is powered with a Galion Model 88367 Telescopic underbody hoist. Capacity is up to 30 cu. yd. Manufactured by The Galion Allsteel Body Co., Galion, Ohio.

Vibro-Tamper has six vibrating shoes

The 1957 Vibro-Tamper compacts aggregate or granular base and sub-base materials laid in a single course of 15 in. of aggregate and crushed stone and 12 in. of granular spread material and 1 or 2 passes, while obtaining densities of over 95% modified Proctor. The tamper consists of six 450-lb.



independently driven shoes each of which exerts a force of 9,000 psi. Compaction costs run as low as \$.015 per cu. yd. By removing end shoes the width is reduced from 12 ft. 6 in. to 8 ft. 6 in. permitting operation between forms such as is used in the laying of stabilized material. This machine with improvements has been manufactured since 1945 by the International Vibration Co., 16702 Waterloo Rd., Cleveland 10, Ohio.

Simultaneously backfilling and tamping

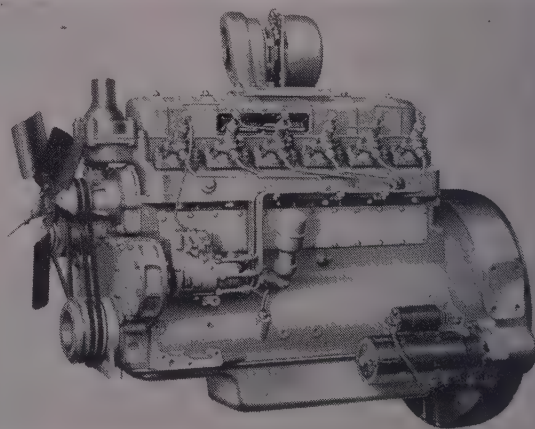
The Cleveland 80W is a versatile machine which served as a sidecrane, a backfiller, and a tamper. The machine is operated by 1 man even when backfilling and tamping simultaneously. The side boom has a 10-ft. 7-in. reach which can be telescoped to 17 ft. The backfill scraper board is 4 ft. wide



and 2½ ft. high. The tamper unit can be installed or removed in 5 min. It has an independent self-starting 5.8-hp. engine. Automatically tamps and adjusts to depth variations. Full literature is available. The Cleveland Trencher Co., 20100 St. Clair Ave., Cleveland 17, Ohio.

Turbocharger on Waukesha diesel engine

An exhaust turbocharger system affords a large increase in horsepower with a minimum of parasite load on the latest Waukesha model 197-DLCS. Waukesha Motor Co. Waukesha, Wis., rates this diesel, even without an intercooler, at a maximum of 131 hp. at 2,800 rpm. It is a compact powerful, heavy

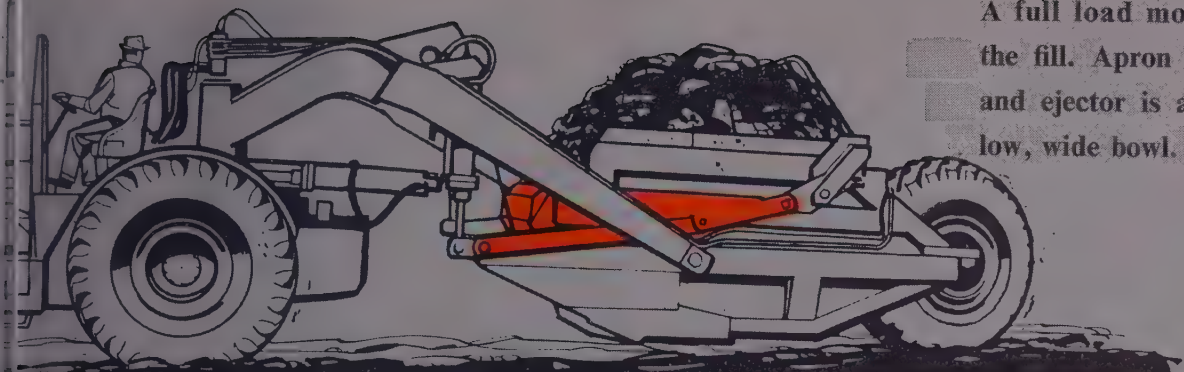


duty 6-cylinder, 4-cycle diesel of 203-cu. in. displacement. The exhaust turbocharger represents a relatively light and compact installation which eliminates mufflers on many applications due to the smoothing out of the exhaust impulses by the turbo-charger turbine.

Northwest introduces 35-ton truck crane

The Northwest Engineering Co., 135 South La Salle Street, Chicago, Ill., announces a new truck crane of 35-ton capacity known as the 41TC. Among the many unusual design features is the pivoted gantry which can be lowered or raised by power. Changing of the gantry position requires only the changing of two pins. The counter weight is removable and is easily lowered and removed from the cab to reduce gross load. The unit includes an independent high speed boom hoist providing safe and accurate raising and lowering of the boom under power. The carrier has been built to Northwest design and has a heavy main frame of 18-in. channels and a box section with heavy cross bracing. Either gasoline or diesel engines are available and Westinghouse air brake equipment and power steering are standard.

A full load moves on to the fill. Apron is closed, and ejector is at rear of low, wide bowl.

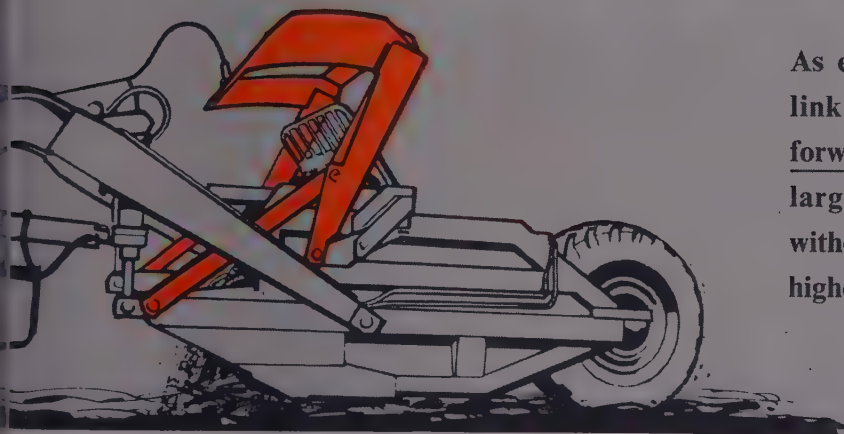


How Allis-Chalmers' patented 3-point scraper linkage



Spreading starts. As the apron raises, the ejector moves forward with positive force, accurate control.

assures fast, clean, controlled spreading of any material



As ejector moves toward cutting edge, linkage simultaneously moves apron forward and upward, providing opening large enough to let any load fall free without jamming. Result: faster cycles, higher production, more profit!

Only your nearby Allis-Chalmers dealer can offer you this important advantage. See it demonstrated now . . . on either motor or pull-type scrapers.

ALLIS-CHALMERS

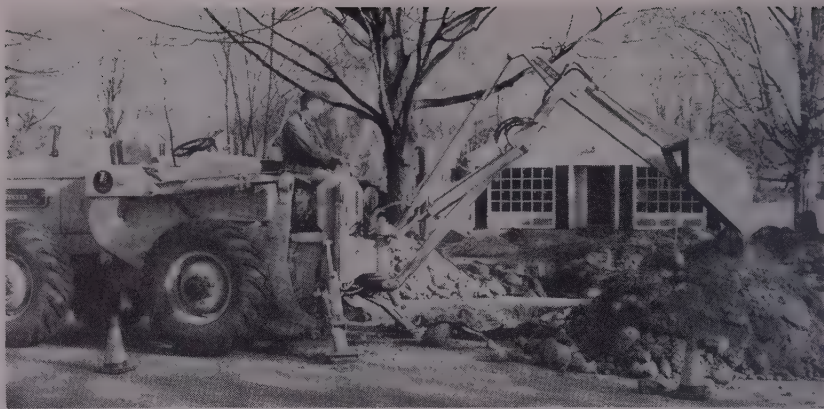
Engineering in Action

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| <p>ARIZONA
Neil B. McGinnis Equipment Company—Phoenix</p> <p>NORTHERN CALIFORNIA
Industrial Tractor Sales—North Sacramento
Shasta Truck & Equipment Sales—Redding
Alkins Tractor Co.—Eureka and Willits
West Coast Engine & Equipment Company—Berkeley</p> <p>SOUTHERN CALIFORNIA
Construction Machinery Company—San Diego
San Joaquin Tractor Co.—Bakersfield
Shaw Sales & Service Co.—Los Angeles and San Diego</p> | <p>IDAHO
Southern Idaho Equipment Co.—
Idaho Falls and Twin Falls
Southern Idaho Equipment Co. of Boise, Inc.—Boise</p> <p>MONTANA
Mountain Tractor Company—Missoula and Kalispell
Richland Machinery Company—Sidney
Seltz Machinery Company, Inc.—
Billings and Great Falls</p> <p>NEVADA
A D Machinery Company, Inc.—Elko and Las Vegas
Reno Equipment Sales Co.—Reno</p> |
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| <p>OREGON
Haupt Tractor Company—
Medford and Klamath Falls
Wood Tractor Company—Portland
Timber Tractor Company—Springfield</p> <p>UTAH
Cate Equipment Company—Salt Lake City</p> <p>WASHINGTON
Pacific Hoist & Derrick Company—Seattle
American Machine Company—Spokane</p> <p>WYOMING
Studer Tractor & Equipment Company—Casper</p> |
|---|

Backhoe for payloader mounting

Designed for mounting on payloaders (HU-HH) and International Models TD6 and TD9 the backhoe of **Wain-Roy Corporation**, Hubbardston, Mass., has several special design features. The unit designed for mounting on payloaders Models HU-HH has a swing of 190 deg., a digging radius of 15 ft. 4 in. and a maximum lifting load of 3,000 lb. It has a loading height of 9 ft. 2 in. and a reach of 19 ft. 7 in. from the axle. Digging reach is 15 ft. 4 in. and the reach below grade is 13 ft. All units have twin boom cylinders, fast acting stabilizers that are hydraulically operated and simplified



controls consisting of four finger-tip operated levers grouped within easy

reach of the operator and controlling all functions.

Portable dryer and feeder bin

Newest addition to its complete line of black top equipment is the portable Trail-O-Dryer and Dual Feeder Bin of **Littleford Bros., Inc.**, Cincinnati, Ohio. This unit is intended to meet the need of contractors and maintenance crews for a small, low cost aggregate dryer. It will feed hot pre-mixed dry material to a Littleford, Model 700 Trail-O-Patcher. This latter unit mixes the aggregate and asphalt for discharge directly into trucks without rehandling. The Trail-O-Dryer can also be used for drying aggregate for other uses. It has a capacity of 15 tons per hr. based on removing 5% free moisture and discharge temperature of 310



deg. Its capacity will be 25 tons per hr. if working from stockpiles or when moisture content is unusually low. The dual feeder bin has a capacity of 5 tons

and is divided into two equal compartments. Two adjustable gates permit variable proportioning of the two different aggregates.

Center mounted rotary mower

Shown on an Oliver 77 is the 8-ft. center mounted mower complete with safety chain, manufactured by **Danuser Machine Works Inc.**, 2525 South Sheridan Rd., P. O. Box 5095, Tulsa, Okla. The operator has full vision looking straight ahead or down and complete maneuverability because the mower be-



comes a part of the tractor. By locating the mower between the front and rear wheels the center of gravity is lowered improving stability. The mower is quickly raised and lowered by

means of an hydraulic system. Cutting heights are about 2 to 12 in.

Newest Hydrocrane can lift 20,000 lb.

The all-hydraulic H-5 Hydrocrane is available as a $\frac{1}{2}$ -cu. yd. excavator and as a 10-ton lifting crane. It is designed for



mounting on a new or used conventional motor truck, eliminating any need for a costly crane carrier. One outstanding feature of the H-5 is its capability, depending on truck selection, to conform with state highway restrictions regulating

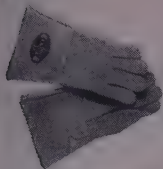


AIRCO HELMETS:

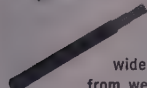
A complete line of welding helmets and face shields including the new hard hat equipped with "helmet blocks" for attachment of welding helmet.



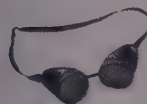
AIRCO HOLDERS: Available in 25 models, jaw and screw types, ranging from 200 ampere holders to the heavy duty model for handling 700 amperes.



AIRCO GLOVES: The same quality that makes other Airco accessories the best value you can buy extends to welders' gloves and leather sleeves.



AIRCO CABLE AND CONNECTIONS: Unrivalled dependability, long life and flexibility. Sizes from 4 to 4/0, for wide range of amperages at varying distances from welding machine. Make sure of good connections with Airco ground clamps, cable splicers, Quik-Trik cable connectors and cable lugs.



AIRCO GOGGLES: For gas welding or cutting. Precision made, they afford excellent ventilation with maximum eye protection.



AIRCO CYLINDER TRUCKS: Make your welding and cutting outfit easily portable with an Airco two-wheel hand truck. Strong, rigid, welded steel frame; broad steel platform. Five models offer wheel sizes and styles for every type of surface.



AIRCO SAFETY HATS AND CAPS:

Lightweight, molded of fiber glass and polyester resins to give maximum protection. Available in seven standard colors. See the new hard hats equipped with "helmet blocks" for the attachment of welding goggles or coverspecs.



AIRCO TWIN-HOSE: Two lines of hose molded into a single, light flexible unit. Close, tight braid permits thicker rubber cover for greater wear resistance.

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*it's Airco quality for
superior results*



YOU NAME IT — Airco has it . . . oxygen, acetylene, torches, tips, regulators . . . sparklighters, soapstones, tip cleaners, circle cutting attachments, carrying cases, chipping hampers, brushes . . . all at low prices. Call your Authorized Airco Dealer or nearest Airco office for your arc or gas requirements.



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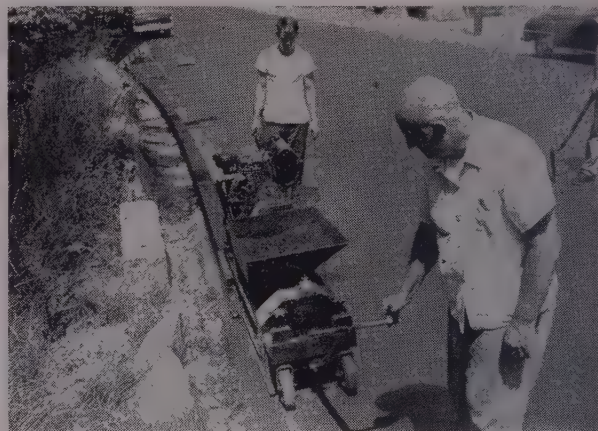
TECHKOTE COMPANY
INCORPORATED

600 Lairport Street, El Segundo, California

width, height, and axle load limits. The H-5 has a 20,000-lb. maximum lift, can be equipped with a standard 2-piece boom (telescoping hydraulically from 24 ft. to 36 ft.) or with an optional high-lift, 3-piece boom (extendible hydraulically from 38 ft. to 50 ft. long). The machine is self-powered and is equipped with a 75-hp. Ford engine mounted on the upper deck. For further information write **Bucyrus-Erie Co.**, South Milwaukee, Wis.

Automatic curb paver

A self-propelled curb paver is now available which automatically cleans and preheats the surface ahead of the machine. The paver lays curb to the desired shape, straight or



curved, compact curb to over 90%, travels at speeds from 4 to 8 ft. per min. and lays curb at the edge of pavement or next to buildings. The machine irons the curb smooth with a heat-jacketed mold and cuts the curb clean at pavement, no trimming is necessary. It weighs 750 lb. empty and about 1,350 lb. loaded. Manufactured by **E. D. Etnyre & Co.**, Oregon, Ill.

Scoopmobile: 4-wheel drive, 4-wheel steering

Features which are exclusive in the new Scoopmobiles are 4-wheel steering, 2-axle oscillation, interchangeable axles, and lateral bucket spotting. Standard equipment includes torque



converter, power-shift transmission, 4-wheel drive, 4-wheel steering, 4-wheel air brakes, and full reverse transmission. Models LD8A and LD8AD have capacities of 3 cu. yd. or 12,500 lb. Specifications and descriptive literature are available. **Mixermobile Manufacturers, Inc.**, 8027 N.E. Killingsworth St., Portland 20, Ore.

for road bed preparation it's...

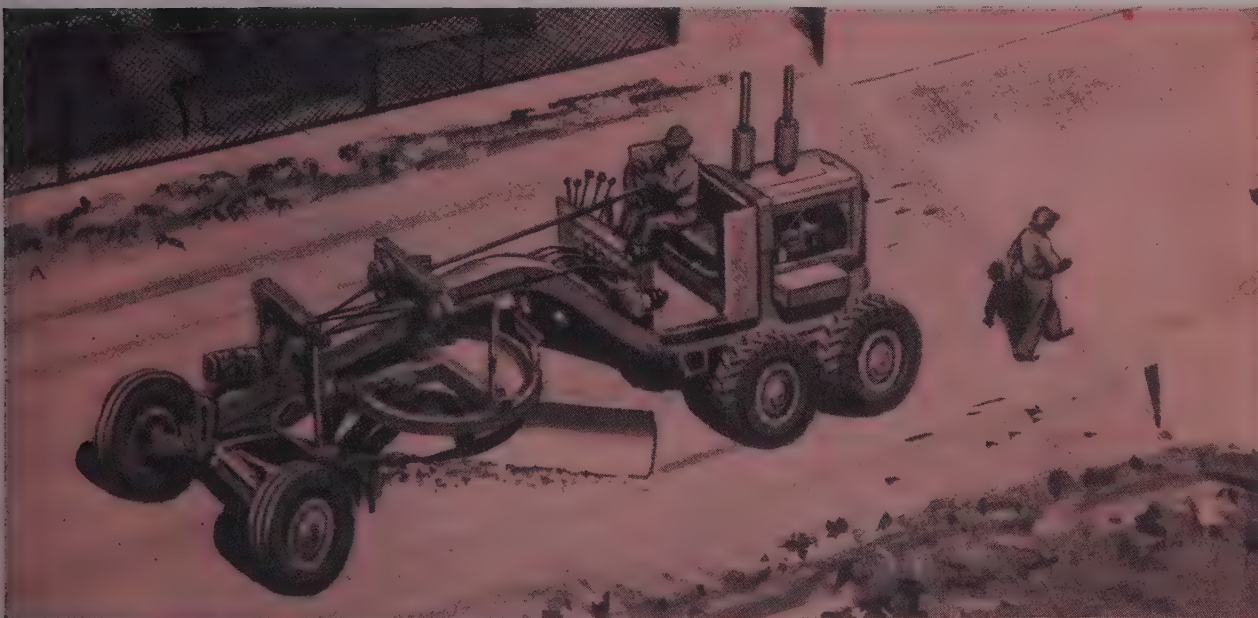


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... for scrapers, graders, dozers, and allied equipment.

CF&I Cutting Edges have an unmatched reputation with the Nation's roadbuilders. And for good reasons, too! Every CF&I Cutting Edge is carefully made from special analysis steel that's chosen for its resistance to abrasion and fatigue, then scientifically hot rolled, punched and inspected to make sure it's perfect.

For all earth-moving jobs—especially the tough ones—you'll find it profitable to choose CF&I Cutting Edges. What's more, they are available in a wide variety of lengths, widths, thicknesses, and hole spacings... flat or curved, with beveled or square ends, and in different finishes.



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Optional Ford equipment for road building

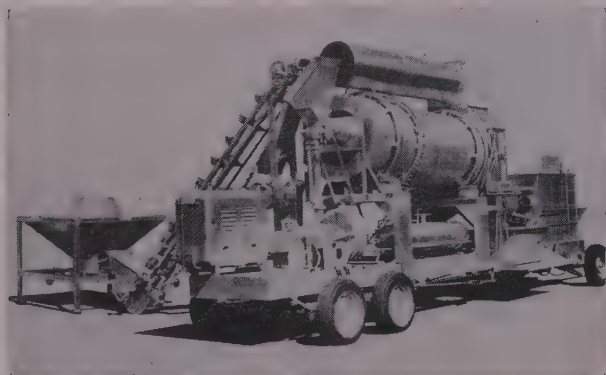
Ford is offering a wide variety of optional equipment suited to truckers in road construction work. Trucks can be ordered with tube tires, off-the-road tires of tread designed to give traction in all types of terrain, or special nylon type tires. Front



power take-off units are available for Ford trucks hauling concrete mixers. One weight-saving option which can be ordered is an aluminum walking beam and rubber suspension unit which replaces steel leaf springs and steel walking beams. The aluminum and rubber unit weighs some 500 lb. less than the standard equipment. Pictured is one of Ford's new line of Tilt Cab trucks. Ford Division, **Ford Motor Company**, Plymouth and Middlebelt Roads, P. O. Box 638, Dearborn, Michigan.

Asphalt Plant is big producer

A small asphalt plant which is finding wide use is the Model L-10 manufactured by **The White Manufacturing Company**, Elkhart, Indiana. Available as either a portable or stationary

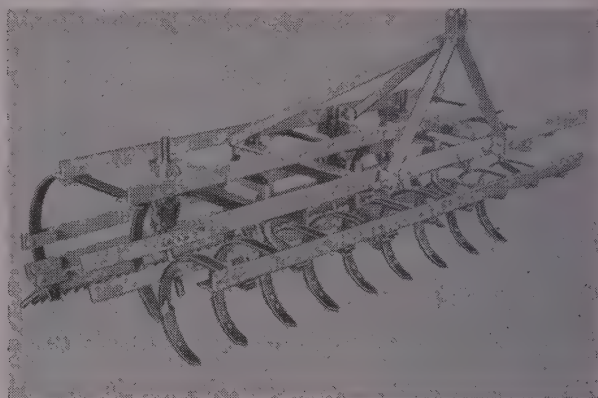


unit, it has a 1,000 lb. capacity batch mixer, is rated at 20 tph. hot mix. It has a dryer drum measuring 46 in. in diameter by 10 ft. long. A 2-compartment divided feeder is supplied which can be built up to carry a large quantity of aggregate. All equipment on the plant is driven from a single power unit either a 50-hp. engine or a 30-hp. electric motor.

Consider this roadside seed bedder

Dotmar Industries, Inc., 502 Hanselman Building, Kalamazoo, Mich., has introduced a roadside and parkway seed bedder for attachment to any tractor with rear end lift. In one pass the

unit scarifies, grades, harrows, cultivates, levels, and rakes. Scarifier blades, cultivator blades and rake are adjustable for



height. Scarifier and cultivator blades are adjustable horizontally. Wearing parts are of high carbon alloy steel. Literature is available from the manufacturer.

Kaiser Aluminum highway railings

Kaiser Aluminum bridge railings are competitive with other railing materials on first cost. From this point on economy of aluminum railings increases as the necessity for maintenance



is eliminated. Aluminum railings are so light that very often heavy lifting equipment is not needed during erection. The railing shown has a 4-in. diameter top rail and a 3-in. diameter bottom rail. A booklet describing and giving complete specifications for the entire Kaiser line of bridge railings is available. **Kaiser Aluminum & Chemical Corp.**, Kaiser Building, 1924 Broadway, Oakland 12, Calif.

Pneumatic vibrating feeder for aggregate

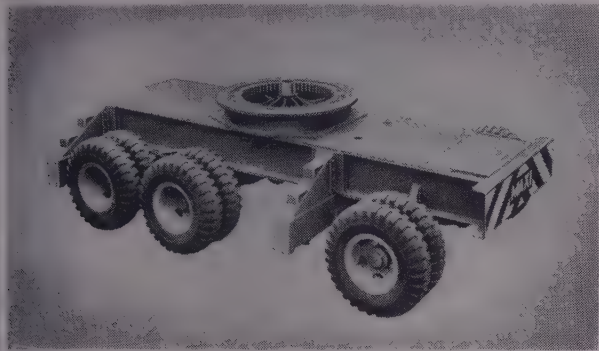
With its vibrating force generated by a pneumatic drive mechanism the **Cleveland Vibrator Co.**, Cleveland, Ohio, has introduced a new feeder capable of handling sand, gravel and cement. The usual electric drive is eliminated and the Cleve-



land Vibrator has only one moving part with no cams, bearings, belts or gears. Its construction is designed to seal out dirt. Its unusual method of operation permits the feeding of some materials at an uphill slant as great as 20 deg. Rates of feed are easily adjusted and the frequency of vibration can be changed by varying the air pressure over a range of 30 to 90 psi.

Maxi Carrier for 50-ton cranes

The Maxi Corporation, Los Angeles 54, California, has available 5 models of 3-axle carriers for cranes with capacities up to 50 tons, and a 2-axle carrier for cranes with capacities up



to 15 tons. The carriers are self-propelled, have 360-deg. operation, and are operated by one man. Mechanical features include hydraulic steering, 2-speed transmission with enclosed differential, air brakes, and extendable outriggers.

Compactor weighs 100,000 lb.

The Model 50T4 Pneumatic Compactor is equipped with 4 wheels with tire size 18:00 x 25 and operates at speeds of from 1 to 5 mph. Each wheel is individually assembled to a ballast compartment exerting a maximum load per tire of

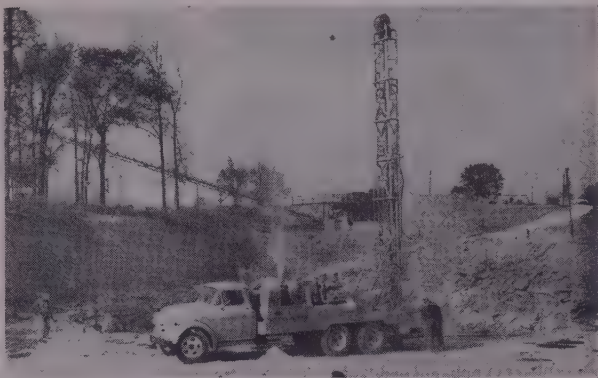


25,000 lb. All compartments are hinged about a 12-in. diameter pivot axle permitting maximum oscillation of 24 in. Total weight of the Model 50T4 with water and sand ballast is 100,000 lb. or 1,250 lb. of ground pressure per in. of rolling width. Turning radius is 10 ft. Tires are easily changed by elevating the entire compactor at the draw bar and a rear push pad is provided for momentary assistance if required in heavy loose soils. Chester Products Co., North 5th and Ford Boulevards, Hamilton, Ohio.

Davey offers rotary air drilling machine

The Model M-8A rotary air drilling machine has a 1,000-ft. rating. Normal performance with a 6-in. drill bit is 150 to 500 ft. in fair to good sedimentary rock formations with air, and 1,000 ft. plus with mud. Power is from the truck engine through a Davey PTO. Hoisting and pickup drum line

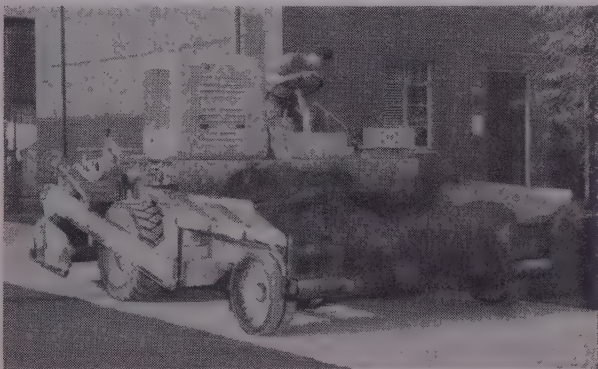
capacity is $\frac{5}{8}$ in. wire rope 370 ft. long. The rated working capacity of the drill mast is 20,000 lb. with ample factor of safety. The mast is raised and lowered by two 4-in. diameter



double acting hydraulic cylinders. Height from bottom of crown block to top of rotary table is 28 ft., which allows pulling 15-ft. lengths of drill pipe. Full literature is available. Rotary Drill Division, Subsidiary of Davey Compressors Company, Box 29, Kent, Ohio.

Highly maneuverable rubber-tired paver

Now available is the Model PF-45 rubber-tired paver designed for the small and medium sized jobs. It has a capacity



of 4 tons, is powered by a Continental F-162 gas engine, and has 6 working speeds with the highest about 8 mph. Control of the screed, which has a vertical tamping action of 1,000 rpm. at 1,300 engine rpm. is hydraulic. Blaw-Knox Co., 300 Sixth Avenue, Pittsburgh, Pennsylvania.

Self-propelled, belt-conveyor loader

The Athey 125 HiLoader is a self-propelled, belt-conveyor loader which puts loading on a continuous, assembly-line basis.



The 125 has a capacity of up to 10 cu. yd. per min. in loading stockpiled or windrowed construction materials such as sand, gravel, stone or cinders, and handles up to 25 cu. yd. per min. of snow. The machine moves from one job to another at 20 mph. At the operator's touch, the conveyor swivels to the right, left or rear. **Athey Products Corp.**, 5631 West 65th St., Chicago 38, Ill.

Diesel-powered Hanson Excavator

A ½-cu. yd. crawler-mounted Diesel-powered excavator is being offered by the **Hanson Clutch & Machinery Co.**, Tiffin,



Ohio. The machine has such features as air-controlled steering through a differential on the lower propel assembly; internal expansion mechanical torque booster controlled clutches with a one-point adjustment and relined without dismantling shaft; ball and roller bearings at all vital points; and independent power boom hoist assembly of the self-locking worm and worm gear type, friction clutch controlled.

Newest Dart Truck carries 70,000 lb.

The latest offering from Dart Truck Co., so new it was not shown at the Chicago Road Show, is the Model 35SL end-dump truck. It has a capacity struck of 24 cu. yd. and



27.5 cu. yd. heaped. It is powered by a 12-cylinder Cummins 400-hp. diesel engine, and has a twin disc hydraulic torque converter. The wheelbase is 16 ft. 8 in. The loading height is 10 ft. 10 in., the turning radius (outside track) is 36 ft. 4 in., and the dumping angle is 65 deg. Weight empty is 56,000 lb. **Dart Truck Company**, Oak at 27th Street, Kansas City, Mo.

New asphalt plant by Standard Steel

Pictured here is the TM Mobile Mixer 2,000-lb. capacity portable batch plant as it was set up across from the Conrad Hilton Hotel at the 1957 Road Show. Standard Steel asphalt



plants are manufactured in sizes ranging from 2,000 lb. to 6,000 lb. batch capacities. All sizes are available with either electric motor drives or a combination of diesel engine and electric motor drives. The Standard plant can be tailored to fit your requirements because of the large number of sizes of Standard-sized component units such as mixing sections, bins, dryers, dust collectors and other accessories. Complete literature is available on request. **Standard Steel Corp.**, Manufacturers & Engineers, 5001 Boyle Ave., Los Angeles 58, Calif.

1957 Westinghouse Transit Mixers

The 1957 line of Westinghouse Transit Mixers is headed up by the 6½-cu. yd. model shown in the photo. The units have a fully enclosed gear mechanism which is not subject to



abrasive wear and breakage and needs no constant lubrication as is the case with open-chain and gear-drives. Another outstanding feature is a large ball-and-socket front-of-drum mounting to which the drum driving mechanism is geared. This connection absorbs all the misalignment caused by the truck and mixer frames weaving when passing over uneven ground. There are no drive chains to become too tight or too loose and no driving gears to get out of alignment. Catalogs are available from the manufacturer: **Westinghouse Transit Mixer Division**, Le Tourneau-Westinghouse Company, Indianapolis, Indiana.

Radically new type off-highway carrier

A radically new type of vehicle for transporting freight over rough country without the benefit of highways or rail-



3 GRADERS With GRADE-O-MATIC Torque Converter Drive

Model T-700, 190 h.p.
40,125 lbs.

Model T-600, 140 h.p.
30,420 lbs.

Model T-500, 125 h.p.
25,765 lbs.

MODEL 118 GRADER
115 OR 125 h.p., 24,910 lbs.



MODEL 104 GRADER, 100 h.p., 23,635 lbs.
MODEL 450 GRADER, 75 h.p., 22,415 lbs.



MODEL 303 GRADER
60 h.p., 16,165 lbs.



MODEL 503 GRADER
50 h.p., 9,360 lbs.



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Whether it is routine maintenance work or important new construction, you can put GALION Graders and Rollers on the job with the assurance that —

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With ROLL-O-MATIC Torque Converter Drive
Variable Wt., 5-8, 8-10½, 8-12, or 10-14 Ton



THREE-WHEEL ROLL-O-MATIC ROLLERS
8 Sizes with Spoke-Type Rolls,
8 Sizes with Ballastable Rolls.
Weights: 7 to 16 Ton.



PORTABLE ROLLER
Variable Weight
7100-9765 lbs.



SMALL TANDEM ROLLERS
3-5 Ton Variable Weight
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TRENCH ROLLER
Variable Weight
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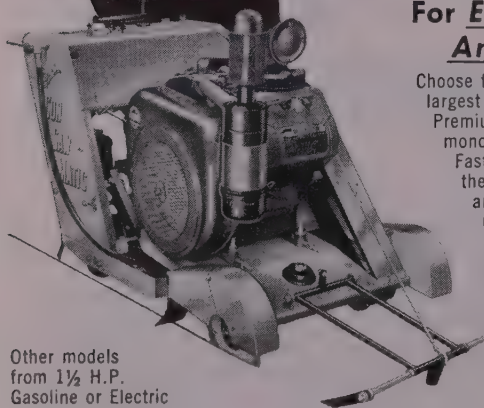
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2804 S. Warwick • Victor 2-3113 • KANSAS CITY 8, MO.
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roads has been introduced. Major feature of the new 35-ton transporter is the DC electric motor geared directly to each of the 6 wheels, making each individual wheel an independent



drive unit. Braking is accomplished by the regenerative action of the electric motors. The low-pressure tubeless tires measure more than 6 ft. and have treads 2½ ft. wide. **R. G. Le Tourneau, Inc.**, Longview, Tex.

New dual drum paver is fast

Now available is the 34E dual drum paver which incorporates many major design modifications. The engine speed of this paver has been increased from 1,400 rpm. to nearly 1,800 rpm. This increased horsepower will enable operators



to have additional power for pulling out of heavy subgrades. The foot operated mechanical brake has been replaced by a hydraulically operated steering brake. Other features include a new four-strand chain drive to replace the old triple-strand drive, thus increasing the drive from the speed reduction unit to the countershaft, and a 700-gal. auxiliary water tank that has been redesigned to eliminate buckling due to water surge and the possibility of welds cracking. The photo shows how the machine can turn around within its own length. **Worthington Corp.**, Harrison, New Jersey.

Paver lays hot or cold mixes

The Model AS Paver lays an accurate spread over irregular base courses. Screed arms are centered between the center lines of the front and rear wheel axles, permitting full independent floating action of screed which fills in low spots of irregular base course. Ballast boxes at the front of paver maintain proper balance and can be filled with sand, rock or gravel. An automatic self-coupling draw bar spreader hitch quickly couples spreader to truck. The operator can pave a convex or concave surface up to 1½ in. Bottled propane gas is used for heating the screed. **Highway Equipment Company, Inc.**, 616 D Avenue, Northwest, Cedar Rapids, Iowa.



REACHING FOR PROFITS

38'-6" Digging Reach, 25'-9" Digging Depth Among Profit Features of 43-M

This job on the outskirts of Trenton, N. J., proved again that a Marion 43-M is a contractor's best tool if he's reaching for profits.

The job involved residential sewers for a suburban housing development. The trenches opened easily with a 43-M on the job. And the big Marion quickly swung the tile into position as it moved along.

The 43-M is a big one-yard machine. It has full Marion air control that steps up an operator's daily output without strain on him or on the machine. It converts quickly on the job. Its self-cleaning crawlers let it work and travel almost everywhere. These and many other features, such as 22 anti-friction bearings, help make it the machine you need and want when you reach for extra profits.

Get complete details about the 43-M from your nearest Marion Distributor today.

Whatever your job requirement, there is a Marion machine of the right size and type for greatest efficiency. Your MARION distributor is the man to see. He can save you money!

LA PUENTE, CALIFORNIA
Kyle Equipment Company,
Division of Willis B. Kyle, Inc.
125 North Vineland
P. O. Box 2128
Phone—EDgewood 6-4581

EUGENE, OREGON
Western Equipment Co.
1360 W. First Avenue
P. O. Box 3205
Phone: 4-4265

PORTLAND, OREGON
Western Equipment Co.
2244 N.W. Sawyer Street
Phone: Capitol 8-4128

SAN FRANCISCO 3, CALIFORNIA
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New addition to Jeep line

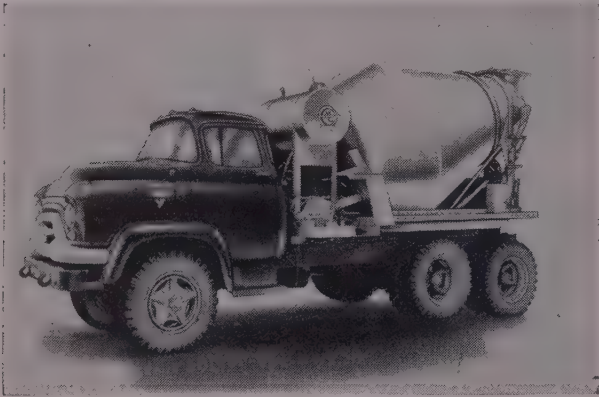
The latest addition to the Jeep line is the FC-150, which features an up-front driver position which provides the driver



with 200% greater visibility than in conventional vehicles and allows maximum use of the vehicle's 81-in. wheel base for payloads. The FC-150 is powered by the F-head Hurricane engine and is equipped with 4-wheel drive power. A variety of attachments is available. Willys Motors, Inc., Toledo 1, Ohio.

Model 550 Transcrete truck mixer

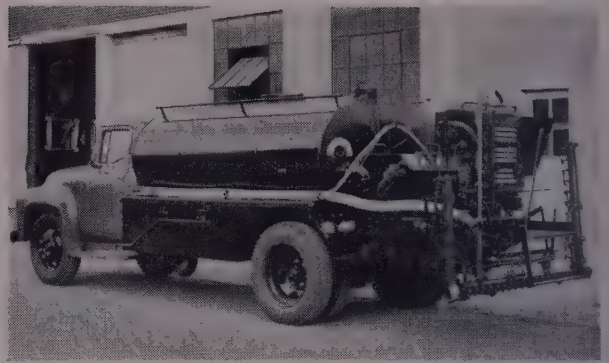
The newest addition to the Construction Machinery Co. line is the Model 550 Transcrete truck mixer. The 550 has a drum volume of 243 cu. ft., carries a mixer rating of 5½ cu.



yd., and as an agitator is rated to carry 6 to 6½ cu. yd. of concrete. It is available with optional Ford or Chrysler separate engine power, and is also offered in the CMC Truck Engine drive. The 550 has all of the familiar Transcrete features, including floating drive, swing-out hopper and a favorable center of gravity for load distribution and stability. All regular accessories are available. Complete information will be sent by writing to the manufacturer at the Arts and Crafts Bldg., Waterloo, Iowa.

Self-draining pump is feature of distributor

Outstanding feature of the new South Bend bituminous distributor is a powerful rotary, self-draining pump. The pump draws back all bituminous material from the spray bars to the supply tank when a job is completed. This helps to eliminate lost time due to clogged lines. A 10 to 1 gear reduction supplies plenty of power to the pump. Other features include a full-circulating type spray bar with individually



operated valves at each nozzle, aluminum alloy spray bar extensions, and joints that allow the spray bar to swing away from road obstacles. Municipal Supply Co., 2508 S. Main St., South Bend 23, Ind.

New asphalt plant in 15-20 tph. range

The accompanying photograph is one of the first action shots of the new Wylie Roadmaster asphalt plant. The contractor has excavated a pit under the machine in which to



back the dump trucks for loading. The machine is completely self-contained and mobile and it is not necessary to dismantle any part when moving. A dump truck can be used as a towing unit and the plant is ready for operation a few minutes after arriving on the job. Details and specifications will be sent on request. Wylie Mfg. Co., Inc., P. O. Box 7086, Oklahoma City, Okla.

Eagle truck-mounted loader

Shown is a new loader which can handle most loose materials at a rate of 3 to 5 cu. yd. per min. The Model 400 is



particularly good for windrow loading or loading from stockpiles. Travels from job to job at truck speeds, and requires only one man to operate. According to manufacturer's specifications the discharge chute swings in an arc of 170 deg., is conveyORIZED, and can be raised or lowered hydraulically. Eagle Crusher Co., Galion, Ohio.

CARBIDE INSERT? or MULTI-USE?



"We get maximum production at lowest bit cost with TIMKEN® carbide insert bits"

... Reports The Bridge Construction Corporation

IMPROVING U. S. Highway 1 near Woolwich, Maine, required the removal of 152,000 cubic yards of granite. In drilling blast holes to depths of 20 feet, the Bridge Construction Corporation, of Augusta, got maximum production at lowest bit cost per foot-of-hole with Timken® carbide insert bits.

Timken carbide insert bits permitted increased drilling speed and fewer bit changes. They made it possible to drill out full increments of drill steel.

They're your best bet, too, for drilling in tough, abrasive ground. But carbide insert bits may not be best for every job.

When drilling in ordinary ground

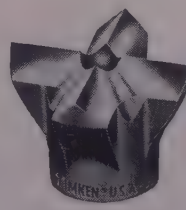
you'll find more economy when you use Timken *multi-use* bits. With correct and controlled reconditioning, they give you the lowest cost per foot-of-hole when you can drill out full increments of drill steel.

Timken carbide insert and multi-use bits save time because they're interchangeable in the same thread series. They permit you to switch bits when the ground changes without changing drill steels. Both types of Timken bits have a special shoulder union that protects threads from drilling impact.

And Timken carbide and multi-use bits are made from Timken fine alloy steel. We're the only American remov-

able bit manufacturer that makes its own steel. It enables us to control quality every step of the way.

For the right bit for your particular job, call or write the Timken Rock Bit Engineering Service, The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO".



Timken Threaded multi-use rock bit



Timken threaded carbide insert rock bit

TIMKEN

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

your best bet for the best bit for every job

Largest earth moving combination

With a line of five heavy diesel wheeled tractors combined with the Wooldridge matching scrapers up to a 41-cu. yd. heaped capacity size, **M-R-S Manufacturing Co.**, Flora, Miss., offers the world's largest 4-wheel cable scrapers. The tractors are powered from 210 to 500 hp. in the five model line. The largest (M-R-S 250) is a 500-hp. tractor with a matching Wooldridge scraper combined to provide the largest rubber-tired earth-moving combination now available. Model M-R-S 200, with its 335-hp. tractor handles scrapers up to 39-cu. yd. heaped capacity and like all

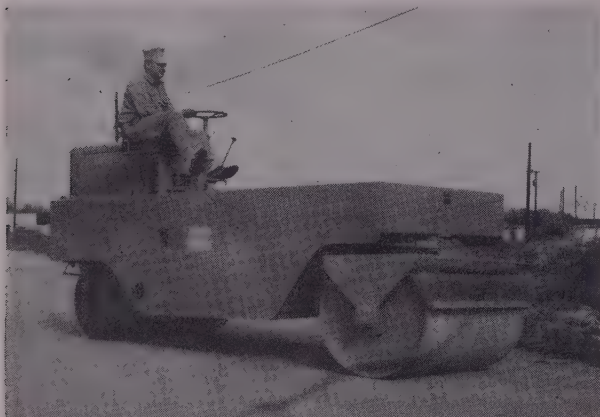


of the other units in the tractor line is equipped with the M-R-S hydraulic weight transfer system. A complete line

of matching Wooldridge high capacity scrapers is available with the M-R-S tractors.

Combination steel-pneumatic roller

The SPR-4 is a combination of 4 pneumatic tires that drive the roller and a smooth roll under the front of the body which is interchangeable with 5 pneumatic tired wheels. This combination of smooth roll and pneumatic tired rolls has an



excellent ability to compact sub-base and asphaltic top materials. The machine has full hydraulic steering. The interchange between the smooth roll on the pneumatic tires requires about 30 min. **Browning Mfg. Co.**, 111 Humble Ave., P. O. Box 2707, San Antonio, Texas.

Le Roi-Cleveland Wagon Drill

On this new wagon drill the carriage is 8 ft. long and the width is 5 ft. 10 in. The length of the feed shell is 13 ft. with a travel of 10 ft. Weight with the D14DR drifter is 600 lb. The control valves may be mounted on either side of the shell or



remotely, for easier operating convenience. The adjustable swivel wheels are quickly and easily locked in any position for line and face drilling. **Le Roi, Division of Westinghouse Air Brake Co.**, Milwaukee 1, Wis.

Rippers to speed highway work

Rock rippers are becoming a standard tool of highway contractors and the Ateco ripper on a TD-24 International Harvester tractor provides a team of high effectiveness. The ripper teeth are operated by double-acting hydraulic power and are swiveled to turn 15 deg. in each direction. They have curved and tapered shanks of alloy steel heat-treated four times for longer life and are adjustable to depth and pitch. In the West Ateco products are made by **American Tractor Equipment Corp.**, 9131 San Leandro Boulevard, Oakland 3, Calif.

Power shovel has many features

Newest machine in the Marion line is the ¾-yd. 35-M. As a shovel it weighs 48,000 lb. and is designed for excavating with a hoe, clamshell, dragline or front end crane. Among



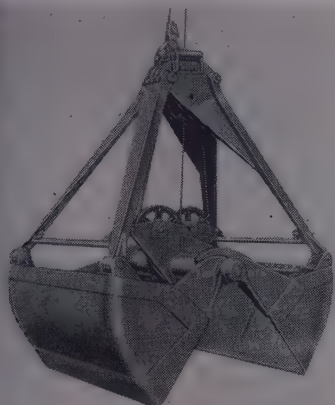
the features are complete built-in air controls, fast field conversion, simplified upper frame machinery, independent shaft assemblies, anti-friction bearings, oil bath lubrication, large swing and travel clutches, and self-cleaning crawlers. Maximum boom and jib length when used as a crane is 115 ft. **Marion Power Shovel Co.**, Marion, Ohio.

New 2-cu. yd. tractor shovel

Now available is the Model 200 Nelson 2-cu. yd. plus tractor shovel with full reversing transmission, 4 wheel drive,

Material handling bucket has lower closing sheaves

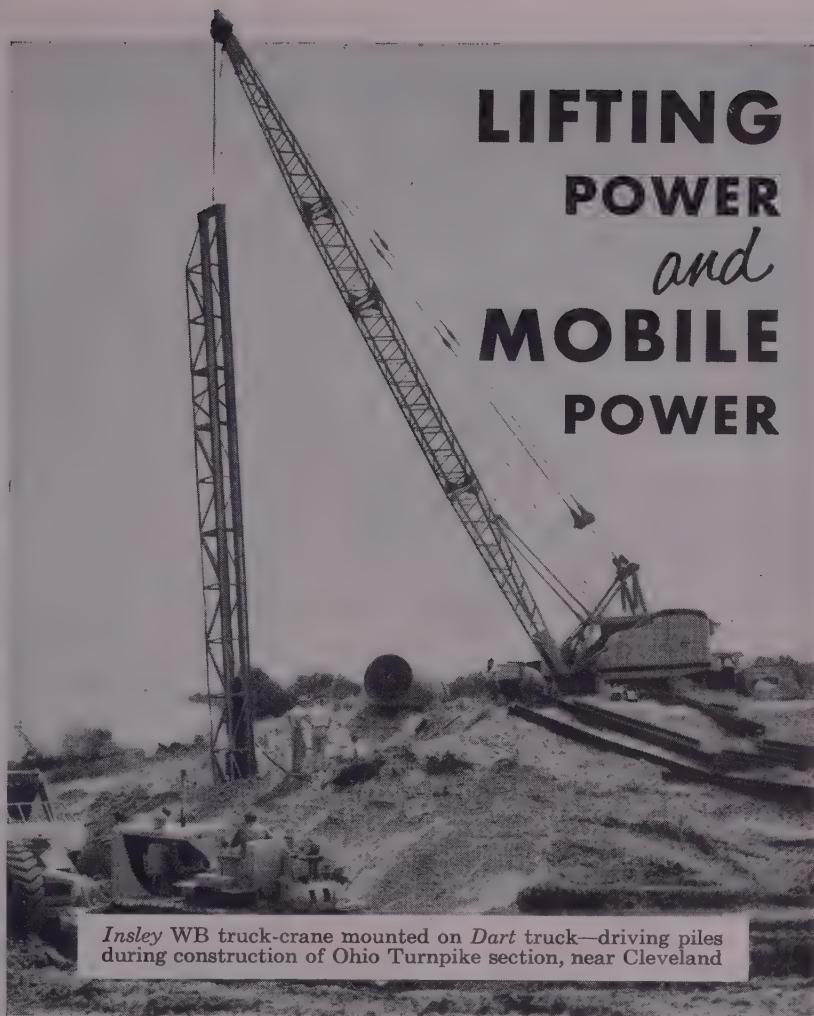
Among the improved features on this Owen SCL wide material handling bucket are the lower closing sheaves arranged so closing line leads straight through center plane of bucket to first lower sheave. This eliminates the bend-



ing of the closing line cable around guide sheaves as in conventional block and tackle and lever arm buckets. The diameter of closing sheaves and guide sheaves has been increased and all closing sheaves are grooved for size of wire rope specified. In many cases these improvements have increased wire rope life by 75 to 100%. **Owen Bucket Co.**, 5001 Breakwater Ave., Cleveland 2, Ohio.

AC-DC welders

Two new welders have been added to Lincoln Electric Co.'s line of Idealarc combination AC and DC welders. The new machines are 180-amp. and 250-amp. capacity Idealarc welders which operate equally well as an AC transformer type welder or a DC rectifier type welder. A switch on the front panel changes the welder from AC operation to DC positive or DC negative. The "two-in-one" feature enables operation of all types of manual electrodes, including stainless and alloy rods. **Lincoln Electric Co.**, 22801 St. Clair Ave., Cleveland 17, Ohio.

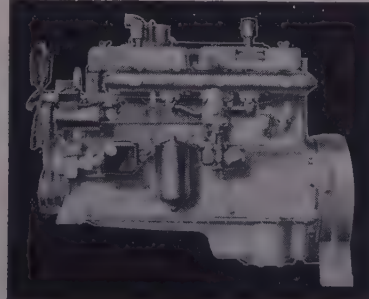


Insley WB truck-crane mounted on Dart truck—driving piles during construction of Ohio Turnpike section, near Cleveland

BOTH Crane and Truck have **WAUKESHA** **ENGINES**

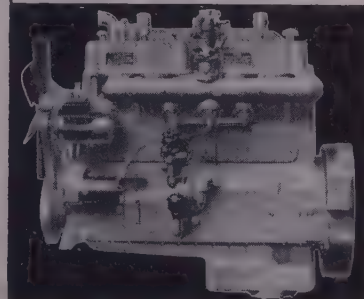
POWERING CRANE (Boom)

Waukesha 140-GK Gasoline—6-cyl., 4½ x 5½-in., 525 cu. in., 160 hp @ 2250 rpm. Send for descriptive bulletin 1548.



POWERING TRUCK (Carrier)

Waukesha 145-GK Gasoline—6-cyl., 5¼ x 6-in., 779 cu. in., 216 hp @ 2000 rpm. Send for descriptive bulletin 1551.

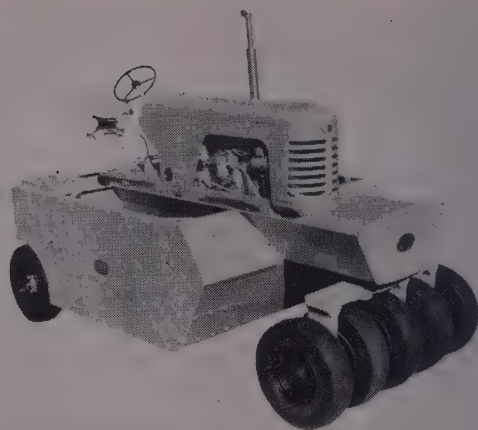


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WAUKESHA MOTOR COMPANY, WAUKESHA, WISCONSIN
NEW YORK TULSA LOS ANGELES



planetary axle, and underslung arms for full visibility. The outside width is 7 ft. 4½ in. and the maximum dumping height is 9 ft. 6 in. The machine has an Allison Torqmatic with a 3.5 to 1 stall ratio. GM diesel operation is optional. Nelson Iron Works, Inc., 850 Blamfield Ave., Clifton, N. J.



L. 501

and reverse from 3 to 22 mph. The 65-hp. engine is available for both gasoline and diesel fuels. Tempo Mfg. Co., 1146 W. Laurel St., P. O. Box 2340, San Antonio, Texas.

Lippman crusher has cost-reducing features

Now available from Lippman Engineering Works, Inc., 4603 W. Mitchell St., Milwaukee 14, Wis., is the Mohawk portable primary crushing plant. The plant has a Grizzly-King crusher which uses an eccentric motion to force the feed and rapidly empty the chamber. The long jaws are curved to reduce slippage and provide greater crushing area. A simple adjustment with screws and shims controls the discharge opening. The Mohawk is made in four sizes ranging from 40,000 lb. to 90,000 lb. in total weight. Full specifications are available on request, as well as information on custom-built arrangements.

Roller has power-operated reversing clutches

The Model SP-11S self propelled pneumatic tired roller offers power-operated reversing clutches combined with a torque converter to provide fast forward-reverse operation. The roller has 11 wheels mounting 7.50 x 15 6-ply tires, a rolling width of 88 in. and a gross ballasted weight of 22,600 lb. A 6-speed transmission provides operating speeds forward

now available!

GARRISON

POWER STEERING

for White Trucks

Models 3016 through 3028 and
Models WC22 through WC28



Available in kit form for field installation through White factory Branches, Distributors, and Dealers.

Provides effortless steering—With Garrison Power Steering a hydraulic booster cylinder does 80% of the work of steering. Under adverse road conditions only light pressure on the steering wheel gives driver complete control.

Increases maneuverability—Better steering control enables driver to quickly maneuver in and out of tight places. More work is accomplished each day with far less driver fatigue.

Eliminates jarring road shocks—The power cylinder also serves as a shock absorber, preventing road shocks from reaching the steering mechanism, reducing wear on your equipment.

Available for other makes and models! Garrison Power Steering is available for many makes and models of trucks as factory-approved original equipment or in kit form for easy installation in the field. Ask your dealer or write direct for full details.

Garrison kits have everything needed for installation...can be accomplished in a few hours in even the most limited service shop.



4609 E. Sheila Street, Los Angeles 22, California

Illinois paving contractor uses the Heltzel E-3 with extra large ground cement storage to provide high speed batching for modern paving operation. Note piers for addition of third 1000 BBL. recirculator.



Ohio paving contractor selected this E-3 with recirculator after comparing with several other makes. He reports the plant is most versatile, fast and exceedingly accurate.

● The Heltzel E-3 Bulk Cement Plant has long been recognized as the industry's finest engineered plant. Now, because of an increased demand, Heltzel has set up a new production facility that has resulted in economies that enable us to offer this outstanding plant at standard equipment prices.

There is absolutely no quality reduction! You get the all butt-welded bin with rounded corners (fabricated by an automatic welding process) that assures smooth flow and guarantees water tightness. You have your choice of Heltzel's patented tubular valves—with or without rotary vane feed. The rugged wide flange, flare-leg supports that mean extra rigidity and truck room! All connections are out in the open, easily accessible for fast, easy erection or dismantling.

Select your capacity—from 250 BBls to 670 BBls—portable recirculators up to 1000 BBls each. Choose your batcher—manual, semi- or fully automatic from 16 to 60 cubic feet including the outstanding Heltzel Twin Batcher designed for high production paving operations. Plants available with "unitized construction"—factory assembled in units for even faster erection and dismantling.

Whatever your needs you will want to get all the facts on this exceptional offer before you buy. Contact your Heltzel representative—or write direct.



THE HELTZEL STEEL FORM AND IRON CO., 417 THOMAS RD., WARREN, OHIO

Road Equipment . . .



Matched Michigan tractor and scraper

New additions to the earthmoving line built by the Construction Machinery Div. of Clark Equipment Co., Benton Harbor, Mich., are the Model 380 Michigan tractor scraper and the Model 310 Michigan tractor dozer. The machines are matched for size and have interchangeable power trains and engines. The scraper carries more than 27 cu. yd. of material at speeds up to 32 mi. per hr. The scraper is available in 3 models, 10-cu. yd. capacity, 18-cu. yd. capacity and 27-cu. yd. capacity

Airco cutting attachment

A new light duty oxyacetylene cutting attachment, the Airco Style 1490, is now available from Air Reduction Pacific Co. Inc., 220 Bush St., San Francisco, Calif. This unit attaches to the Airco Style 400 lightweight welding torch. The new attachment weighs 13 ounces, measures 9½ in. in length. Cutting range is up to one inch thick steel. A firm gas-tight seal is assured with tapered gas sealing rings and hand tightening makes a firm joint.

New Warn hub

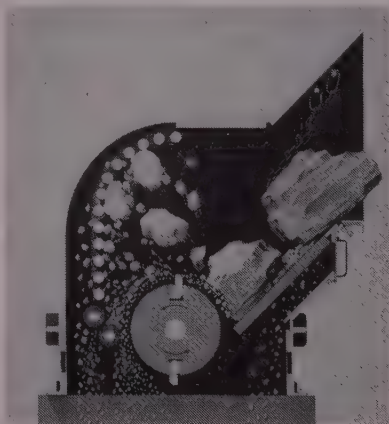
"Free" position on the new Warn "Lock-O-Matic" hub transforms the four-wheel drive into a vehicle that handles like a passenger car most of the



time, but automatically engages in four-wheel drive as load or road conditions require. The automatic change takes place in any gear forward or reverse. The front wheels turn freely, and the front drive train stands still whenever power is not applied at the front end, with the result that tires and gears last longer, less gas is consumed, and the vehicle has snappier performance on the highway. Warn Manufacturing Co., P. O. Box 6064 Riverton Station, Seattle, 88, Wash.

Jeffrey rock busters

Jeffrey Primary rock busters apply with high efficiency the principle of impact crushing. They can reduce any hard friable material from a maximum feed of 36 in. down to 1½-in. stage. Material is fed through a curtain of chains onto a grizzly which removes a large portion of the fines already in the feed. The large pieces are reduced by impact with the stationary hammers as shown in the picture. Built in two sizes: Type 303 with



30-in. square feed opening and Type 404 with 40-in. square feed opening. Capacities range from 75 to 350 tons per hr. depending upon size of product desired. The Jeffrey Manufacturing Co., East First Ave. and North Fourth St., Columbus 16, Ohio.

Garrison power steering

Various pieces of literature are available describing Garrison hydraulic power steering kits for installation on various makes of trucks, truck crane, motor graders and tractors. The hydraulic booster units can be attached to conventional steering linkage. Garrison Manufacturing Co., 4609 East Sheila St., Los Angeles 22, Calif.

Allis-Chalmers tractor shovels

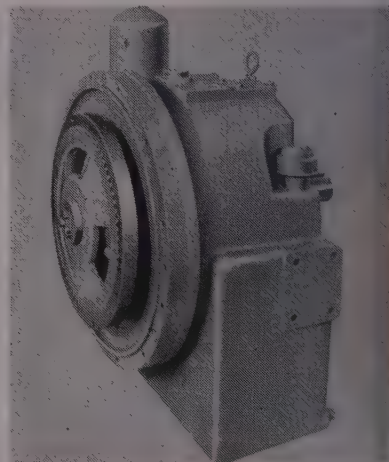
Operating, performance and maintenance advantages provided by Allis-Chalmers HD-16G and HD-21G tractor shovels are told through pictures and story in a new eight-page, two-color catalog (MS-1102) now available from the Allis-Chalmers Manufacturing Co., Construction Machinery Div., P. O. Box 512, Milwaukee 1, Wis. Also included are engineering, design and construction features of the two models.

Victor equipment

Two comprehensive booklets are available describing products manufactured by Victor Equipment Co., 840-54 Folsom St., San Francisco 7, Calif. Catalog 20 covers the Victor line of flame cutting and welding equipment; Victor hard-facing products are covered in the Victor Hard-Surfacing Manual.

Twin-Disc torque converters

Production of a new line of single-stage torque converter has been announced by Twin Disc Clutch Co.'s Hydraulic Division, Rockford, Ill. Currently available in the 1500 Series, they are the first of a new line of single-stage units designed for engines producing



from 30 hp. at 1,500 rpm. and 198 hp. at 2,400 rpm. Specific torque ratings are 165, 200, 240, 285 and 330 lb. ft., depending upon the impeller blading selected by the user. The new Twin Disc unit features "unloading" of the engine through an exclusive blade design wherein the turbine develops a counter-head which stops fluid circulation at high speed ratios. This not only simplifies construction by eliminating free-wheeled stators but also eliminates possible field failures from the use of such devices.

Bulb-beam draingate

A new type of riveted draingate, employing alternate bulb beams for main bearing members to give greater clear span with less weight, is being made by Irving Subway Grating Co., Inc., Long Island City 1, N. Y. The new design is

ANNOUNCEMENT! The new, improved **No. 933 (Series E) TRAXCAVATOR***



is ready
with longer life, lower maintenance!

Looks a lot like the popular No. 933 you already know—but there's greater stability, performance and durability built into this new Series E!

Now the rugged CAT* No. 933 Traxcavator includes a new heavy-duty undercarriage with:

- New Rugged Track Roller Frame
- New Solid Sprockets
- New Heavier Idlers
- New Tough Track Rollers

The easy operation, the great capacity and the dependable power—these features remain as outstanding as before.

For complete details on this *tough* new Traxcavator, call your Caterpillar Dealer. He'll be glad to give you full information on the complete line of Cat-built Traxcavators. He's the man to remember, too, for expert service and for replacement parts you can trust.

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

The complete line of Cat-built Traxcavators

	No. 977	No. 955	New No. 933 (Series E)
Flywheel HP at sea level	100	70	50
Bucket capacity, cu. yd.	2¼	1½	1
Bucket tip-back at ground level	40°	40°	40°
Bucket tip-back at maximum lift	46½°	47½°	48°
Dumping height (center of hinge pin to ground)	141½"	128"	119½"

CATERPILLAR*

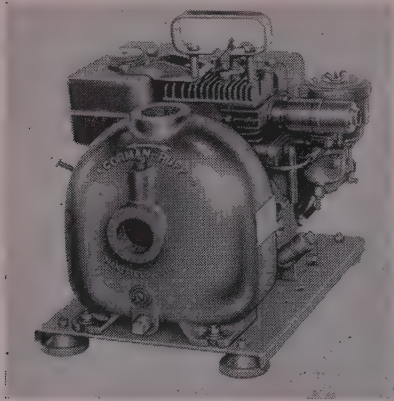
*Caterpillar, Cat and Traxcavator are Registered Trademarks of Caterpillar Tractor Co.

**ONE GOAL: To concentrate
our capabilities, resources and
experience on the design,
manufacture, distribution and service
of job-tested heavy equipment.**

also used in longer and wider panels as a bridge flooring. When used for this purpose it is referred to as "Sil-Deck," since in some applications the bulb-beam bearing bars serve as their own sills. As a decking, the product is also fabricated with 5-in. plate sections instead of bulb beams, in which case it is known as RP-6.

Pump eliminates check valve

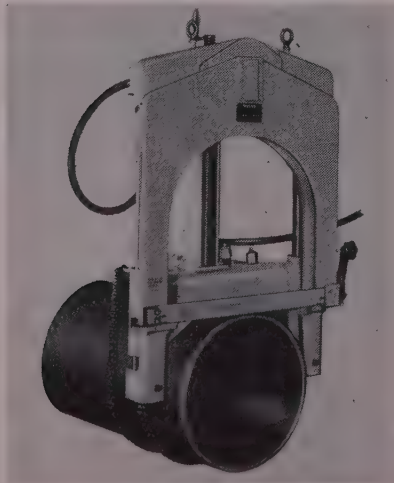
A completely new line of contractors' pumps, the Series 80-Centrifugal Pumps that prime, were introduced recently by Gorman-Rupp Co. of Mansfield, Ohio. The new design eliminates the check



valve and features straight-in suction with the pumped liquid entering directly at the eye of the impeller. Available with base or wheel mounts, the new contractors' pumps are driven either by engine or motor.

Portable power pipe cutter

The "Big Guillotine" is a new large capacity guillotine type power pipe saw for on-the-job cutting of 10 to 16-in. cast iron and steel pipe. Weighing only 312 lb. and operating in a space 32 in. wide, the new Guillotine saw makes tough cuts easy. A 16-in. standard wall cast iron pipe is cut in 16 min.; a 16½-in. wall double extra heavy steel pipe is cut in 20 min. The E. H. Wachs Co., 1525 North Dayton St., Chicago 22, Ill.



All types, sizes of rippers

These rippers, manufactured by E. A. Rogers Co., are designed to rip rock, frost, hardpan, asphalt and other tough materials. There is a type and size for every tractor and blade and they may be used singly or in multiples. E. A. Rogers Co., 149 East Main, Grass Valley, Calif.

Heavy-duty engine

This Hall-Scott "Spartan" Model 590 BV-1 engine is used for off-highway equipment. A 6-cylinder engine, it uses L.P.G. as fuel, has an overhead cam-



shaft, 5-in. bore, 5-in. stroke and 590-cu. in. displacement. It delivers 255 hp. at 2,800 rpm. Hall-Scott, Inc., Power Div., 2850 Seventh St., Berkeley 10, Calif.

Controlled tension on tagline

The Westfall Center Pull Automatic Tagline can be installed in 30 min. for use in every type of clamshell and concrete bucket work. Model 300 maintains sufficient tension to steady clamshell buckets from ⅜ to ¾ cu. yd. in size at all times and under any and all working conditions. For heavier units, 1 to 2½-yd. capacity, the Westfall Model 600 is recommended for maintaining proper tension: 200 to 350-lb. pull from neutral position. Compact construction, simple installation and trouble-free operation are some of its features. Westfall Automatic Tagline, 345 East Second St., Los Angeles 12, Calif.

(Continued on page 200)

HEADQUARTERS FOR THE NEW LORAIN

ANDREWS
EQUIPMENT SERVICE
Spokane, Wash.

ATLAS EQUIPMENT
COMPANY
Salt Lake City, Utah

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

COAST EQUIPMENT CO.
San Francisco 3, California

A. H. COX & COMPANY
Seattle 4 and Tacoma, Wash.

GENERAL EQUIPMENT CO.
Reno, Nevada

INTERSTATE
TRACTOR & EQUIPMENT CO.
Portland and Eugene, Ore.

McCOY COMPANY
Denver 17, Durango, Grand Junction,
Pueblo and Sterling, Colo.

MOUNTAIN TRACTOR CO.
Missoula and Kalispell, Mont.

NASH-DAVIS MACHINERY CO.
Billings and Bozeman, Mont., Greybull, Wyo.

NEW MEXICO EQUIP. CO.
Albuquerque, New Mexico

LEE REDMAN EQUIP. CO.
Phoenix, Arizona

SANTA FE
EQUIPMENT CO., INC.
Los Angeles and San Bernardino, Calif.

SOUTHERN IDAHO
EQUIPMENT CO.
Idaho Falls, Boise and Twin Falls, Idaho

TRACTOR & EQUIPMENT CO.
Sidney, Miles City and Glasgow, Mont.

WORTHAM MACHINERY
COMPANY
Cheyenne, Casper, Sheridan and Rock Springs, W.

YUKON EQUIPMENT
INCORPORATED (for Alaska)
Seattle, Wash., Fairbanks and Anchorage, Alaska

SHOVELS • CRANES
CLAMSHELLS • DRAGLINES
HOES
SALES • PARTS • SERVICE



Blaw-Knox MultiFoote Paver with Hydraulic Controls gives you more complete mixing in a shorter Mixing Cycle

You will be sure of higher production for hour-after-hour and day-after-day when you have a Blaw-Knox MultiFoote working in your spread of paving equipment. Faster skip operation gets the batch into the mixer with no loss of time. Hydraulic controls of batch transfer and discharge give immediate response in the automatic cycle. Cone-shaped drums assure you of thorough mixing in a shorter time or more complete mixing in a specified time than is possible in the cylindrical-shaped drum of ordinary mixers. Hydraulic controls for raising and lowering the A-Frame enable the paver to get under over-

passes, bridges or other low overhead clearances and at the same time give you the advantages of single-cable skip control with its high speed, simple reeving and low maintenance cost.

These MultiFoote advantages combined with spreading or spotting action of the hydraulic operated bucket and simplicity of Paver design with its get-at-ability and freedom from excessive number of parts assure better day-after-day performance with lower maintenance costs. MultiFoote Pavers are available as single or double drum models in the 34E size.

All "Complete Package" Paving Equipment Job-Proved

Blaw-Knox "Complete Package" Paving equipment has become the first choice of contractors throughout the country. Contractors with a spread of Blaw-Knox equipment know that they can depend on its many tested and proved design features plus

one distributor source for parts and service to keep their jobs on schedule. If you are planning to bid on concrete paving, plan to use the only line of equipment with experience—see your nearest Blaw-Knox Distributor today.

For more information on any of these units send for the following bulletins by number — MultiFoote, No. 2616; Road Forms, No. 2370; Finisher, No. 2517; Subgrader, No. 2227-R; Batch Plants, No. 2488; Spreader, No. 2485.



BLAW-KNOX COMPANY

Construction Equipment Division

45 Charleston Ave., Mattoon, Illinois

Central lubrication on roller bearing

SKF Industries, Inc., manufacturers of ball and roller bearings, announces manufacture of an improved spherical roller bearing, Type C, which provides 25 to 50% increased capacity. All sizes of this bearing from 140 mm. (outside diameter) and larger, now have a new positive method of lubrication. This is accomplished by means of a circumferential groove in the center of the outside diameter of the outer ring with equally spaced holes drilled in the groove. This allows the lubricant (either oil or grease) to move around the groove and through the holes in the outer ring directly into

the center of the bearing where it does the most good. Further information available from **SKF Industries, Inc.**, Front St. and Erie Ave., Philadelphia 32, Pa.

Light at night

Codit, a reflective liquid which can be brushed or sprayed on any objects in or near a roadway that constitute hazards to traffic, is described in an eight-page bulletin published by **Minnesota Mining & Manufacturing Co.**, 900 Fauquier Ave., Saint Paul 6, Minn. This material can be applied to barricades, equipment and road building materials to delineate them at night.



Construction torch has square burner

A new self-righting construction torch with an exclusive square type burner is offered by **Anthes Force Oiler Co.**, Fort Madison, Iowa. This unique burner with umbrella style hood stays lit under most adverse weather conditions, has a burning time of 24 to 48 hr. Simple cam-type coupling allows easy removal of burner for filling, yet locks securely in place.

Portable blast cleaner works quickly, cheaply

A portable blast cleaner, designed to clean steel, concrete and any other material of rust, mill scale, old cement and



paint corrosion, is manufactured by **Safetee Products Co.**, 173 14th St., San Francisco 3, Calif. This rig is especially recommended for use in blasting off traffic lines and parking stripes, in filtration plants, sewage treatment plants and in cleaning equipment and automotive parts.

Construction lubricants

Lubriplate lubricants for the construction industry are described in an eight-page circular issued by the Lubriplate Division of **Fiske Brothers Refining Co.**, Toledo 5, Ohio. Included is a complete list of Lubriplate dealers throughout the country.

**CLEMENT
HYDRAULIC
TANDEMS**

Built to take it...ANYWHERE

Hauling more payload faster at lower cost is routine work for Clement hydraulic tandem trailers. They're built simply and ruggedly to dump capacity loads of bulk material smoothly and without strain on operator or equipment. Utilizing extra lifting power of hydraulics with performance-proved *caterpillar-dump-action* developed by Clement, the big 15-yard tandems provide flexibility on the job, too. Wet weather, sandy locations or rough terrain won't stop them, and they'll jackknife to a 90° angle, batch, spot or spread dump... anywhere.

See what Clement Bonus-Loader dump trailers will do for you. Call, write or wire **TODAY**, or...

SEE OUR DISTRIBUTOR



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PLANT: P. O. Box 746, Minden, Louisiana

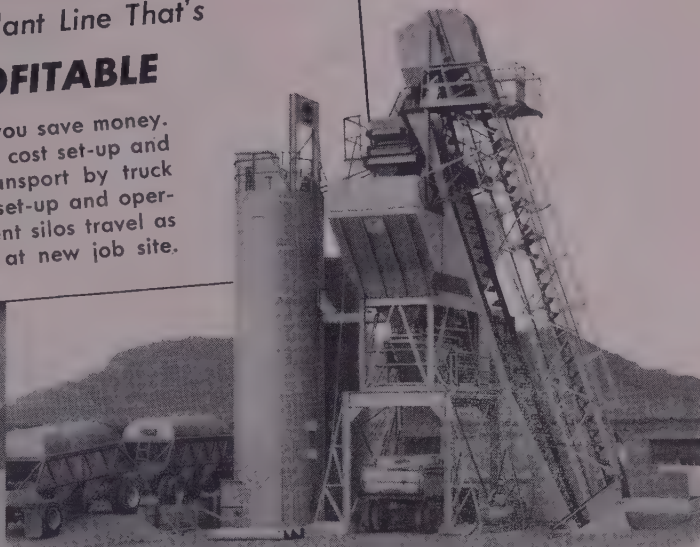
Schetky Equipment Company
1810 Southeast 10th Avenue
Portland, Oregon

Edwards Equipment
1765 Bayshore Boulevard
Redwood City, California

A **CONVEYCO** BATCH PLANT FOR EVERY NEED

The One Complete Batch Plant Line That's
FAST, PORTABLE, PROFITABLE

Keep your plant close to the paver and you save money. Conveyco Portables are designed for low cost set-up and take-down. Complete sectional units transport by truck with all controls in place for immediate set-up and operation. Patented Conveyco 500 bbl. cement silos travel as semi-trailer units — tilt up into position at new job site.



- Conveyco Portable Plants are equipped with manual operation, semi-automatic or automatic weighing and recording systems.
- Rescreens for mounting on top of batch bins are available for Conveyco plants equipped with automatic batching.
- Conveyco also offers stationary batch plants in capacities of 200, 300 and 500 tons.
- Conveyco automatic weighing and recording systems are available for conversion of all makes of concrete and asphalt plants.

Write for literature and location of the Conveyco Batch Plant nearest you.



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Engineers and Manufacturers

3260 E. Slauton Avenue • Los Angeles 58, California

Portable truck scales eliminate pits, foundations

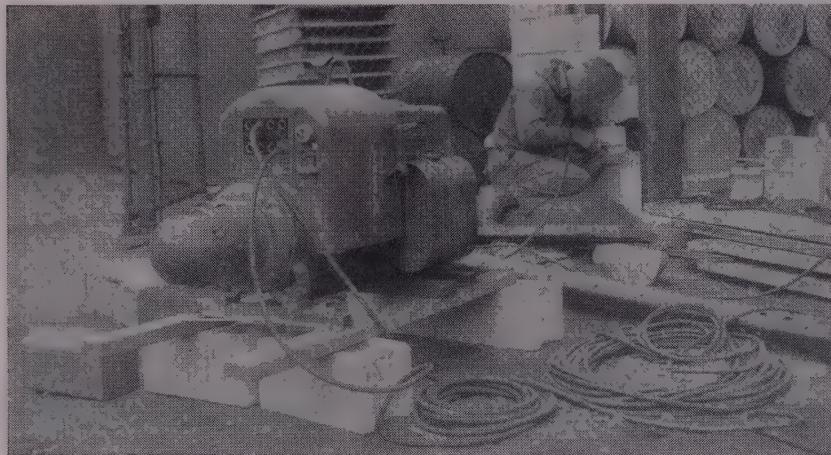
A heavy-duty motor truck scale that is self-contained and portable is being manufactured by **L. R. Murphy Scale Co., Inc.**, 1610 North "C" St., Sacramento, Calif. These scales can be loaded and moved in a matter of minutes and, in addition, eliminate expensive pits and foundations necessary with most other types of truck scales.

First transistorized flasher

The world's first electronic highway flasher to use transistors is now in production by **R. E. Dietz Co.**, P. O. Box 1214, Leavenworth Ave., Syracuse 1, N. Y. Termed the Visi-Flash, the transistorized flasher is available in four models: 360-deg. barricade, two-faced barricade, 360-deg. traffic cone and two-faced traffic cone type. Among its outstanding features are long trouble-free life, ability to stand up under all weather and use conditions, bright signal and low cost.

Wire fabrics in highways

Two illustrated folders describe the use and advantages of welded wire fabric in asphalt and concrete highways. The brochures, "Fabric-in-Asphalt" and "Steel Welded Wire Fabric" are issued by the **Wire Reinforcement Institute**, National Press Bldg., Washington 4, D. C. Case histories and job photographs are included.



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WHERE YOU WANT IT
WHEN YOU WANT IT!**



WELDANPOWER Portable Power Plant

Supplies...

- 230 volts for heaters, heavy-duty power equipment
- 115 volts for lights and power tools
- Welding current for repairs, equipment modifications and construction
- ... all at the same time

As a Power Plant Weldanpower furnishes 4 KVA, 115/230 volts, AC, 60 cycle power.

As a Welder Weldanpower supplies 200 amps AC current.

Weldanpower is light, compact and economical to operate.

Contractors! Write for Bulletin SB-1339

THE LINCOLN ELECTRIC COMPANY

Dept. 4315, Cleveland 17, Ohio

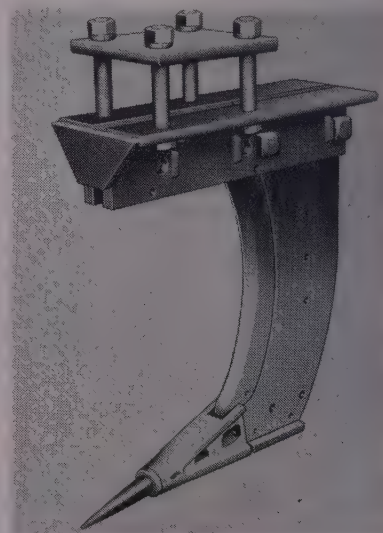
The World's Largest Manufacturer of Arc Welding Equipment

Hercules introduces interchangeable engines

Interchangeability has been stressed throughout the new line of Hercules gasoline and diesel engines. Not only are the new gasoline engines interchangeable in regard to mounting dimensions with the new diesel engines of the same number of cylinders, but the planned program is further carried out in many common parts and components. This extends over the entire 12 new models. The new engines are designated G.O. Series (gasoline overhead valve) and D.C. Series (direct injection diesel), **Hercules Motor Corp.**, Canton, Ohio.

New ripper

The Towner Subsoiler is a tool used for breaking through hard subsoil. It is designed for standard $4\frac{1}{2} \times 7\frac{1}{2}$ -in. tool bars on many Caterpillar tractors and similar machines. Twenty-four or 32 in. penetration shanks are available with optional box point or the new Towner Sabre Point which can be replaced for about one-third the cost of a box point. The points and wear shin are reversible and replaceable. **Towner Manufacturing Co.**, Santa Ana, Calif.



New Jay Tamper

Jay Company announces its model 12 Tamper mechanism designed to deliver twenty-two hundred 1,800-lb. impacts per min. to the material under the tamping shoe. This action sets up a continuous series of vibrations plus impact blows and properly keyseats as well as tamps its material to uniform proctor densities. Tests show that the model Jay 12 Tamper applies more pressure per sq. in. than a 10-ton roller but weighs only 240 lb. The "Jay" can be easily carried in a light truck or station wagon from one job to another. It is operated and serviced by one man and runs a full eight hours on 2 gal. of gasoline. **Jay Company**, 168 Hosack St., Columbus, Ohio.

GYRO-FLO + CRAWL-IR



... a highway construction team
that gives you completely
mechanized drilling power
at its **RUGGED BEST!**



THE new Ingersoll-Rand CRAWL-IR is the most completely mechanized, self-propelled crawler drill ever developed. Boom swing, boom lift, tower tilt, tower swing and tower lift are all hydraulically controlled at the touch of a throttle, permitting faster, easier and safer setups for drilling in any position. And because it tows its own air compressor, even up grades and over rough terrain, you don't have to take other equipment off the job for this purpose.

Teamed up with a Gyro-Flo 600-cfm, it gives you a drilling combination that has no equal for economy and dependability of operation. The famous Gyro-Flo rotary action, thoroughly proved by more than six years of on-the-job service, is your best assurance of low-cost, virtually maintenance-free air power. Ask your IR Distributor or representative for complete information on this pace-setting drilling team.



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COMBINATION

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11 Broadway, New York 4, N. Y.

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THE BEST AIR EQUIPMENT FOR BETTER HIGHWAYS

World conference next month on prestressed concrete construction

International meeting to be held in San Francisco starting July 29.

A "SKY'S THE LIMIT" note will be sounded at San Francisco's University of California-sponsored World Conference on Prestressed Concrete, July 29 through August 2, when two structural engineers presently planning construction of buildings as high as six stories by the prestressed concrete lift slab operation outline their methods.

Representing the lift slab construction-pioneering Architectural Division of the California Department of Public Works, Charles Peterson and A. H. Brownfield will detail their department's solutions to fabrication and erection problems encountered on numerous prestressed lift jobs.

Attracted by the unprecedented opportunity for insight into American "know-how" in the field of prestressed concrete mass production as afforded by such conference speakers as structural engineers Peterson and Brownfield and the previously-announced Wayne F. Pal-

mer, designer of the world's longest highway bridge, more than 150 engineers representative of some 41 foreign nations will be among the 900 delegates expected to attend the conference.

According to University of California's Professor T. Y. Lin, chairman of the conference general arrangements committee, speakers from a dozen nations will spearhead the conference's primary purpose of pooling scientific, engineering and manufacturing knowledge and experience.

Additionally, the conference will feature some 50 papers on materials and techniques, precast prestressed bridges and buildings, prestressed wharves, piles pavements, thin shells and slabs, research, design and construction in various countries.

Devoting an entire day to visiting construction jobs and prestressing plants in the San Francisco Bay area, the conference will also present industrial exhibits featuring machinery, equipment, tools, prestressing wires, anchorages, and related materials by American and foreign suppliers. Similar conferences were pre-

viously held in London and Amsterdam.

This year's San Francisco conference will be held concurrently with the third annual meeting of the Prestressed Concrete Institute. Other technical societies cooperating will be the American Association of State Highway Officials, American Concrete Institute, American Institute of Architects, American Society of Civil Engineers, Associated General Contractors of America, Association of American Railroads, International for Prestressing, National Science Foundation, Portland Cement Association, and Structural Engineers Association of California.

Assisting general arrangements committee chairman Lin are Professors J. W. Kelly, C. Scordelis, Kenneth L. Downes, Jr., all of the University of California; Ben C. Gerwick, Jr., and Robert Singer of Ben C. Gerwick, Inc., San Francisco; Harold A. Price and Jack Streblow of Basalt Rock Co., Inc., of Napa, Calif.

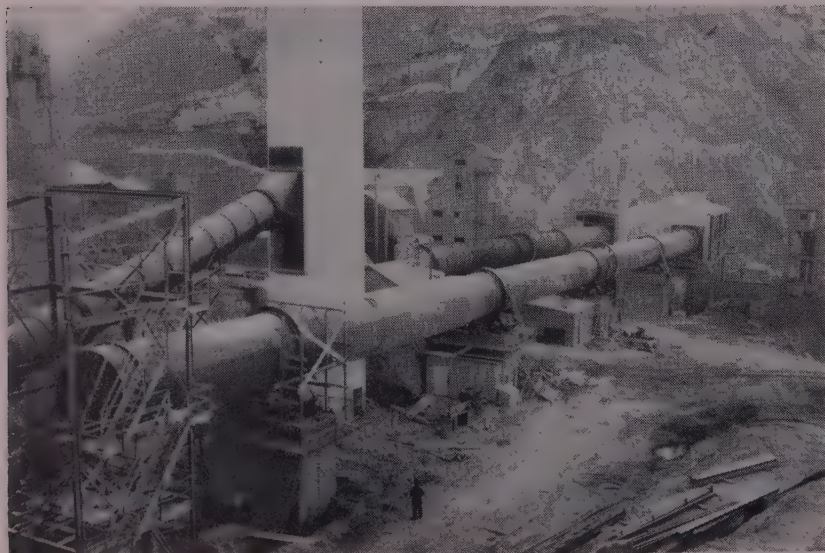
Glen Canyon awarded and diversion planned

AWARD OF CONTRACT to the Merritt-Chapman & Scott Corp. for construction of Glen Canyon Dam has been authorized on a bid of \$107,955,522. It is the largest single contract of record for construction of a dam, and allows approximately seven years for construction. Actual award of contract for the structure will be made by Assistant Commissioner and Chief Engineer L. N. McClellan at the Reclamation engineering center at Denver.

Simultaneously, Secretary Aandahl advised agencies from the Lower Colorado River Basin States of Arizona, California and Nevada that gates will be installed in the left diversion tunnel which will be able to pass annually the entire flow of the river even in a high runoff year. The agencies had expressed concern that the closure plan as outlined in the specifications might be detrimental to downstream interests.

"In order that it may be entirely clear to downstream interests that a closure procedure which would prejudge actual flow conditions prior to and during the closure process has not been adopted," Secretary Aandahl said. "The Bureau of Reclamation proposes to modify the gate installations in the left tunnel plug, increasing the capacity to accommodate flow conditions greater than those normally to be expected . . .

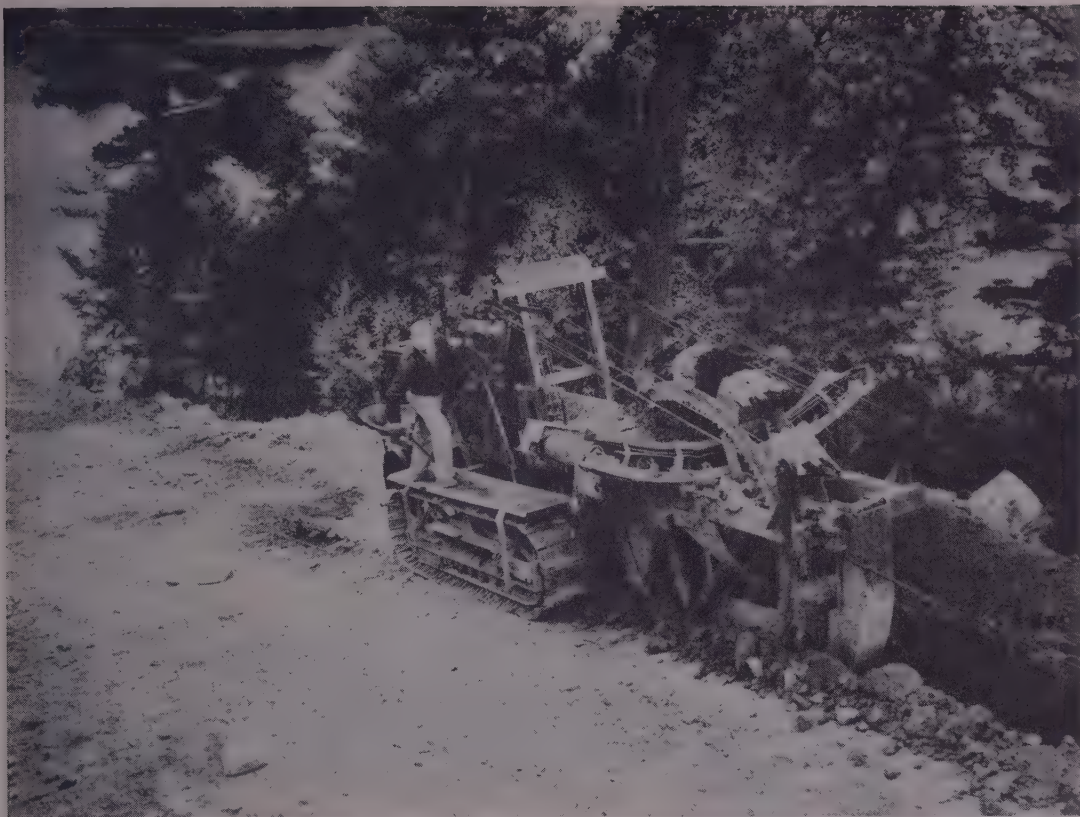
"The Bureau will provide for installa-



CEMENT PRODUCTION INCREASED IN OREGON

At a cost of more than \$3,000,000 the Oregon Portland Cement Co. is bringing its plant at Lime, Ore., up to an annual production of 1,000,000 bbl. This plant serves eastern Oregon and western Idaho.

The expansion program includes a new 350-ft. kiln with complete clinker cooling system, new stack, raw grind mill and slurry basins. Quarry facilities have been improved to meet the added volume of rock needed in the plant.



Cleveland 140 digs through rocky New Hampshire hills



"...exceeds wildest expectations"

"We got trench with our Cleverlands where we thought it would be impossible," says H. J. Burns of Hallen Construction Co., Island Park, N. Y., about a recently completed pipeline job for the Granite State Transmission Co., between Exeter and Somersworth in the rugged New Hampshire hills. The Hallen spread cut through numerous swamps and terrain strewn with boulders and choked with frequent outcroppings of rock.

"Our Cleveland 140 cut 24 miles of our 30-mile section—dug everything except the deepest swamps and solid ledge rock. It dug through shale and even handled boulders up to 6 and 8 cubic feet. Even in the toughest going the 140 never fell below 1,700 feet of trench per day and averaged 2,200 feet per day for the whole job."

Good



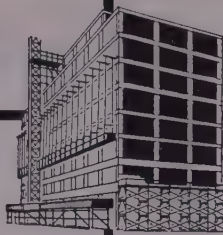
Everywhere

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SIDEWALK BRIDGES HOIST TOWERS

FOR GREATER SAFETY...EFFICIENCY...ECONOMY



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Ray Wayne.....1869 Hedges St., Fresno, Calif.
Capitol Scaffolding & Equipment Co.....North Sacramento, Calif.
Borchers Brothers.....342 North Second St., San Jose, Calif.
The United Materials.....814 West 14th Ave., Denver, Colo.
Crissey Fowler Lumber Co.....117 Vermijo St., Colorado Springs, Colo.

tion by the contractor of larger gates so that during the whole of the construction period the tunnel gates and the other outlet facilities available will be capable in any year of passing all of the runoff even though years of great runoff like 1907, 1909 or 1917 were to be experienced.

"Those three years have produced the maximum runoff at Lees Ferry during the past 60 yr. The Bureau will also maintain full control over and direction of the closure process. Thereafter, the outlet facilities, including turbines, will be capable of passing the total inflow in any year."

The Glen Canyon Dam project was described in a comprehensive article in *Western Construction*, Feb. 1957.

Diversion completed at Coyote Dam project

ON APRIL 22 the east fork of the Russian River was diverted into a conduit 12½ ft. in diameter and 967 ft. long beneath the partially completed Coyote Dam, 3 mi. north of Ukiah, Calif.

This diversion of the river was carried out according to a schedule that will see the \$8,000,000 dam complete in 1958, according to Col. John A. Graf, San Francisco District Army Engineer. The Guy F. Atkinson Company of South San Francisco began work last summer.

The completed dam will be 163 ft. high and 3,500 ft. long. In addition to the earth and rock fill, Colonel Graf said that 1,400 tons of steel and 53,200 tons of concrete is being used in the structure. The project is now 30% complete.

Designed to control floods similar to that of 1956, the dam will also furnish

70,000 ac. ft. of water for use in Sonoma and Mendocino counties. This water will come from the reservoir 5 mi. long and 1 mi. wide, which will be created in Coyote Valley behind the dam. Flood control storage amounts to 48,000 ac. ft. with 4,500 reserved for siltation, making a total of 122,500 ac. ft. in the lake.

The total cost of the Army Engineers' project will reach about \$18,000,000 as channel improvements, highway relocation, and reservoir land acquisition contribute to the total amount.

Thomas H. MacDonald dies; headed BPR

THOMAS H. MacDONALD, 76, first commissioner of the Bureau of Public Roads, died April 7 at the campus of Texas A&M, College Station, Texas. Since his retirement from the BPR he had held the title of distinguished research engineer at the college.

Throughout the highway transportation field, MacDonald was affectionately known as "Chief." He had served for 34 years as commissioner before retiring in 1953. No official had headed a major Federal agency for as long a period of time as had Commissioner MacDonald on his retirement in 1953. Not an ostentatious man, his career in highway transportation was not a showy one, but in every sense it was a highly effective one.

Tunnel progresses for blasting Ripple Rock

RIPPLE ROCK, menace to navigation since the days of wind-jammers, on the inside passage up the British Columbia

coast, is being conquered. For years this rock defeated efforts of engineers salvage and construction companies to eliminate this threat to navigation.

By spring next year it is hoped that 750 tons of high explosive will blow up the twin peaks of Ripple Rock which have sent untold number of ships to the bottom and cost the lives of many men. The explosion will remove from 40 to 50 ft. from the peaks of the underwater mountain and leave a relatively clear channel for shipping through the 2,500-ft. narrow neck of Seymour Narrows, 100 mi. north of Vancouver on the main north-south B. C. coastal artery.

After previous attempts had failed and exhaustive investigations by National Research Council it was decided to tunnel under the rock and attack it from below.

Work started late in 1955 by two Vancouver firms given a \$2,639,000 contract to do the job. Works department officials said that since that time a 572-ft. shaft has been sunk on the island and a tunnel has been run 1,926 ft. out under Seymour Narrows to a point right below Ripple Rock. Here the tunnel divides.

Already 31 ft. of the north tunnel has been drilled up toward the north underwater peak and 418 ft. has been drilled so far to get under the south peak. The peaks of the rock are about 400 ft. apart.

Every precaution will be taken before the big blast is set off. Residents for miles around will be given special instructions of measures they should take. The blast will be timed so as to do the least harm to the valuable fish stocks. Seismic recording apparatus will record the extent and magnitude of the earth tremor that will spell the end of "Old Rip."

Johnston Stainless Welding Rods

Practical, Down-to-Earth Welding Rods
Alloys as they are supposed to be

Corrosion Resistant—
Clean metal

Strong—
Low in cracking

A. P. JOHNSTON CO., INC
1845 E. 57th St., Los Angeles 58

Hawaii Report

By SYD LOVE
Honolulu, Hawaii

PALI TUNNELS OPENED—The \$3,000,000 Pali tunnel project was opened May 11 following ribbon-cutting ceremonies by Governor King. J. M. Tanaka, of Honolulu, was the builder. The project includes bores 1,000 and 500 ft. long and eight bridges. It is for traffic one-way to Honolulu on Leeward Oahu from Kailua on Windward Oahu. The old Pali road over the 2,200-ft. summit is now used for traffic one-way to Kailua from Honolulu. The Territorial job was started one year and nine months ago. The Territory will advertise for bids in June for a similar parallel project. Bids will be opened in July. It is expected to cost about the same and consist of bores of similar length. Five bidders were qualified for the job just finished. Tanaka is expected to make a strong bid for the second project.

WATER PROJECT—The Territory's Hawaii Water Authority will advertise for bids in June for a five-mile tunnel project on Molokai. L. H. Herschler, manager and chief engineer for the authority, says the tunnel is expected to cost between \$3,500,000 and \$4,000,000 and take four years to build. It will be through rock and will be lined only in small portions. The tunnel will take irrigation water to 13,260 acres of pineapple land and 400 acres of land proposed for diversified crops. The pineapple yield is small because of a lack of water. Construction of an access road and on stream realignment is 60% completed. Fong Construction Company of Maui is the builder.

NEW BUILDING—The Hawaiian Land Company says it will build a 14-story business and professional building for the 53-ac. Ala Moana shopping center between Honolulu and Waikiki on Oahu. Target date for completion is April 1959. Hawaiian Dredging and Construction Company will build it. The building will have a double-deck parking lot and revolving restaurant on top. The building will have 100,000 sq. ft. of office space. It will be of fireproof reinforced concrete construction. The exterior will be styled mainly in metal and glass, with the interior motif to be created with terrazzo tile, marble and hardwood. Two other buildings on Oahu are 14 stories high. They are the Hawaiian Village Hotel and Tripler Army Hospital. No building is taller. The Land Company says the revolving roof-top restaurant will be the first of its kind in the world. Only the outer 15-ft. rim—where patrons will sit—will revolve. Speed at the edge will be approximately three feet per minute.

NO SHORT WEEK—Island union leaders say Hawaii is not ready for the

four-day week that the United Automobile Workers Union wants on the Mainland. A. S. Reile, A.F.L.-C.I.O. organizer, says it would create an artificial manpower shortage. "All we want is a 40-hr. week and eight-hour day," he says.

STRIKE—About 110 lathers and plasterers are striking for higher wages, halting work on major construction projects. They want a 15-cent increase to \$2.75 an hour.

CHURCH COLLEGE WORK—Joseph E. Wilson, construction superintendent, says the technology building at The Church College of Hawaii (Mormons) at Laie on Oahu is completed. September 1958 is the expected completion date for all 18 permanent buildings in the \$3,000,000 project. Doing the work are a unique force of 87 volunteer missionaries, who get only basic expenses—no salaries. Thirty-four are from the Mainland.

GETS BONUS—Hawaiian Dredging got an \$8,400 bonus for completing the first stage of the \$800,000 Foremost Dairy Building in Honolulu 42 days ahead of schedule. C. W. Watson is general superintendent. R. C. T. Baker is project engineer.

BIDS—C. K. Buckert is low bidder at \$79,986 for Hilo breakwater repair for the U. S. Corps of Army Engineers. Other recent low bids include: Guided missile facility (presumably for the Navv on the island of Hawaii), \$892,000, E. E. Black, Honolulu; Waialae shopping center Oahu, \$1,234,340, E. E. Black; first unit of Pearl City elementary school, Oahu, \$378,236, Nakakura Construction Co., Honolulu; B.O.Q. and mess, Barber's Point Naval Air Station, Oahu, \$1,220,000 Hawaiian Dredging; aircraft parking area, Kaneohe Marine Corps Air Station, Oahu, \$345,700, A. C. Chock-Guili Construction, Honolulu.

Large contracts let in the West

ARIZONA

Merritt-Chapman & Scott Corp. of New York City, New York, submitted a low bid of \$107,955,522 for construction of the Glen Canyon Dam and Powerplant, Glen Canyon Unit, Middle River Div. of the Colorado River Storage Project. T. M. K. Construction Co. of Phoe-

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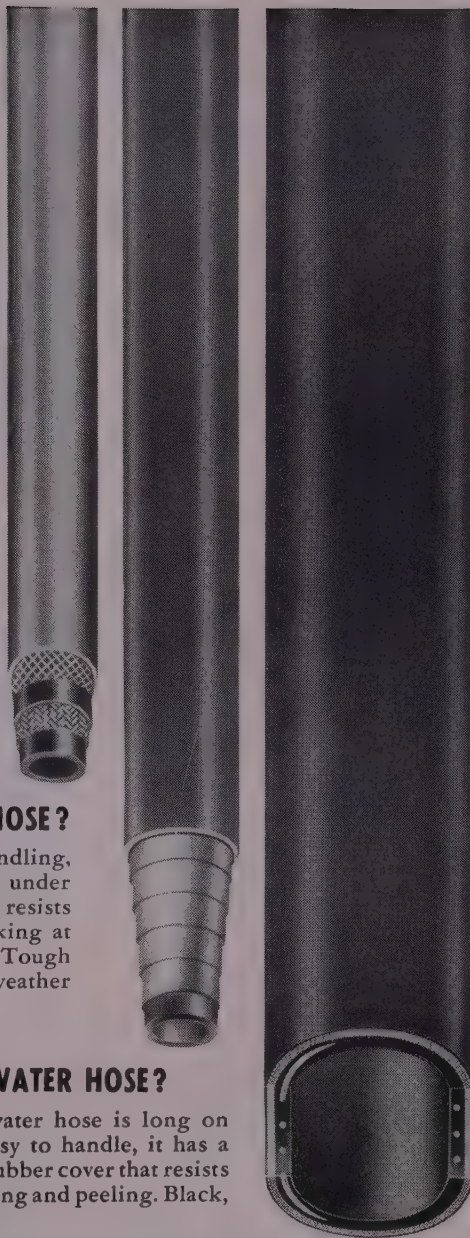


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nix submitted a low bid of \$577,884 for 4.2 mi. of grading and surfacing north of Christmas in Gila County. A low bid of \$234,988 was submitted by **Tiffany Construction Co.**, Phoenix, for 4.1 mi. of grading and surfacing west of Gila Bend in Maricopa County. **Royden Construction Co.**, Phoenix, submitted a low bid of \$179,103 for widening concrete girder bridge, grading and surfacing approaches, in the town of Wickenburg, Maricopa County. **Phoenix-Tempe Stone Co.**, Phoenix, submitted a low bid of \$259,371 for grading, draining and construction of two 5-span concrete slab bridges on the Wickenburg-Kingman highway in Mohave County. A low bid of \$479,351 was submitted by **Copper State Construction Co.**, Mesa, for 6½ mi. of grading and surfacing the Globe-Lordsburg Highway in Graham County. **Tanner Bros. Construction Co.** of Phoenix submitted a low bid of \$169,947 for grading and surfacing the Phoenix-Globe Highway in the town of Miami, Gila County.

CALIFORNIA

Johnson, Drake & Piper, Inc., of Oakland received a \$4,935,599 contract for construction of a full 8-lane freeway and construction of 3 bridges on the East-shore Freeway in the city of Oakland, Alameda County. A \$1,233,296 contract was received by **Griffith Co.**, Los Angeles, for grading and paving a 4-lane divided highway with frontage roads for a length of 4.8 mi. in Visalia, Tulare County. **Fredericksen & Kasler** of Sacramento submitted a low bid of \$2,718,100 for 3.9 mi. of grading and surfacing and construction of 9 bridges and 3 pumping plants north of Madera in Madera County. **Mercer Fraser Co., Inc.**, and **Mercer Fraser Gas Co., Inc.**, of Eureka received two bids for highway work in Humboldt and Mendocino counties. A \$1,803,911 contract for 4.2 mi. of grading and surfacing north of Willits in Mendocino County and \$469,862 for construction of three concrete bridges in Humboldt County. A low bid of \$947,105 was submitted by **L. C. Smith Co.**, San Mateo, for grading, paving, widening one bridge and construction of one bridge in Santa Clara County. **Osborn Co.**, Pasadena, submitted a low bid of \$635,215 for 1.1 mi. of grading and surfacing and construction of a concrete slab bridge in city and county of Los Angeles. **Stewart Nuss, Inc.**, of Fresno submitted a low bid of \$538,356 for 8 mi. of grading and surfacing on Rt. 10, Kings County. A \$389,896 contract was received by **Stecker & Scott** of Sun Valley for grading and surfacing 5.5 mi. and seal coating portions on Rocky Ridge Road east of Roseville, in Placer County. A \$288,223 contract was received by **Volpa Bros.**, Fresno, for grading and surfacing 2.7 mi. of Sign Rt. 41, in Fresno County. **Sully-Miller Contracting Co.** of Orange received a \$223,868 contract for 3.8 mi. of widening to 4-lanes Sign Rt. 22 in

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Engineering Data . . .

Concerning Sully-Miller's
6000-lb. Madsen Asphalt
Plant shown.



- PLANT MODEL . . . Madsen Model 481 — 6000-lb. batch capacity.
- SCREEN . . . 48" x 16' Symons 2½ deck.
- DRYER . . . 96" x 30'.
- BURNER . . . 12" combination gas and oil.
- DUST COLLECTOR . . . 12' dia. cyclone and 65 tube multicone.
- WET SETTLING EQUIPMENT . . . Madsen Triple Wet Tube Dust Washer—one 6' x 12' and two 6½' x 12' tubes.
- TYPE OF FEED . . . Tunnel to cold stone elevator.
- PLANT SET UP INCLUDES . . . dust elevator, dust bin and dust entering screw.

Sully-Miller Contracting Co. is one of the largest suppliers of asphalt and asphalt paving in Orange County and southern Los Angeles County. Like other leading producers of asphalt, the prime concern of this contractor is to get big-volume, money-making production day-in and day-out from his asphalt plants. That's why he's mighty glad to have the MADSEN Model 481 6000-lb. plant, shown above, on the job. It's one of several MADSEN Asphalt Plants owned by this successful operator.

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Orange County. **Lee P. Immel**, San Pablo, received a \$212,269 contract for 24.4 mi. of surfacing at various locations in Alameda and Contra Costa counties. **R. H. Douglas** of Fortuna received a \$196,921 contract for construction of a bridge across Mad River east of Humboldt County Line, Trinity County. **Paul E. Woof**, Fresno, received a \$185,987 contract for construction of retaining walls and restoration of roadway on Sign Rt. 1, south of Monterey, Monterey County. **Connolly-Pacific Co.** and **T. E. Connolly, Inc.**, of Long Beach received a \$3,877,711 contract for construction of Subsidence Remedial Measures, Increment No. 1, to be located at Naval Shipyard, Long Beach. **J. E. Haddock, Ltd.**, of Pasadena submitted a low bid of \$3,742,457 for grading, surfacing and construction of 4 bridges in Camarillo, Ventura County.

COLORADO

A low bid of \$1,200,202 was submitted by **C. L. Hubner Co.** of Denver for grading, surfacing and structures, Pueblo easterly, Mineral Park to Belle Plain Underpass on State Highway No. 18 in Pueblo County. **Colorado Constructors, Inc.**, of Denver submitted two low bids for road work in Denver and Montrose counties: \$514,387 for construction of bridges and approaches located in city and county of Denver and \$141,661 for

grading and surfacing in city and county of Montrose. **Gardner Construction Co.** of Glenwood Springs submitted a low bid of \$192,529 for construction of twin bridge over Sand Creek in El Paso County. **Siegrist Construction Co.**, Denver, submitted a low bid of \$129,789 for grading and structures between Limon to Ordway in Limon County. **M. C. Jacobs Construction Co.** of Denver submitted a low bid of \$209,238 for grading, structures, and surfacing north of Fowler on State Highway No. 167 in Crowley and Otero counties. A low bid of \$996,304 was submitted by **Smith & Lucas** of Colorado Springs for grading and structures between El Paso County Line and Pueblo in Pueblo County. A low bid of \$1,382,466 was submitted by **Schmidt Construction Co., Inc.**, of Arvada for grading and structures on State Highway No. 1 in El Paso County. **E. J. Rippey & Sons**, New Castle, submitted a low bid of \$133,548 for grading, structures and gravel surfacing 3 mi. of the State Highway No. 317 in Moffat County. A low bid of \$180,003 was submitted by **Domenic Leone Construction Co., Inc.**, of Trinidad for grading, structures and surfacing southwest of Hawley in Otero County.

IDAHO

Pickett & Nelson of Idaho Falls received a \$493,547 contract for grading,

surfacing and bridge construction on 5.2 mi. of State Highway No. 49 in Bonneville and Jefferson counties. **Fife Construction Co.** of Brigham City, Utah, received two contracts for roadwork in Lemhi and Franklin counties: \$84,551 contract for 6.4 mi. of grading and surfacing the May-Patterson road in Lemhi County and \$55,208 for drainage structures and surfacing 2.8 mi. of the Bear River Bridge-Fairview road in Franklin County. **Cherf Bros. & Sandkay, Inc.**, of Ephrata, Wash., submitted a low bid of \$581,569 for earthwork and structures, Main Canal East, Michaud Flats Project. **Fluor Corp., Ltd.**, Los Angeles, Calif., received a letter contract of approximately \$1,900,000 for construction of storage tanks and related facilities to handle radioactive wastes at the Atomic Energy Commission's National Reactor Testing Station.

MONTANA

Harris Construction Co. of Aberdeen, South Dakota, received two contracts for road work in Richland, Dawson and Fallon counties. A \$630,079 contract for 10.6 mi. of grading and gravel surfacing the Circle-Sidney Highway in Richland and Dawson counties and \$432,527 for 10.6 mi. of grading and surfacing the Baker-Wibaux Highway in Fallon County. **Hilde Construction Co., Inc.**, of Great Falls received a \$137,908 contract for 4.1 mi. of grading and gravel surfacing the Ovando-Rogers Pass in Lewis and Clark County. **S. Birch, Inc.**, and **S. Birch & Sons Construction Co.** of Great Falls received a \$154,044 contract for 5.2 mi. of grading and surfacing the Raynesford-South Highway in Cascade and Judith Basin counties. A \$109,075 contract was received by **Naranche & Konda** of Havre for 8.8 mi. of grading and gravel surfacing the Galata-North Highway in Toole County. **J. F. England's Sons, Inc.**, Rapid City, South Dakota, received a \$157,405 award for 7.2 mi. of grading, gravel surfacing and draining the Cleveland-Chinook Highway in Blaine County. **Cherf Bros. & Sandkay, Inc.**, of Ephrata, Wash., received a \$357,606 contract for Helena Valley Dam, Helena-Great Falls Div. of the Missouri River Basin Project. **Miles & Williams** of Kennewick, Wash., submitted a low bid of \$205,032 for earthwork and structures, Helena Valley Unit, Montana, Helena-Great Falls Div. of the Missouri River Basin Project. **The O'Neil Construction Co.** of Havre received a \$216,285 contract for 6 mi. of grading, surfacing and draining on the Big Sandy-Rudyard Highway in Hill County. **Naranche & Konda** of Butte received a \$235,151 contract for 7.5 mi. of grading, surfacing and structures on the Jackson-Dillon Highway in Beaverhead County. A \$164,957 contract was received by **Richardson Construction Co., Inc.**, Miles City, for 15 mi. of grading and surfacing the Poplar-Flaxville Road in Roosevelt County. **Pew Construction Co.** of Missoula received a \$683,472 contract for



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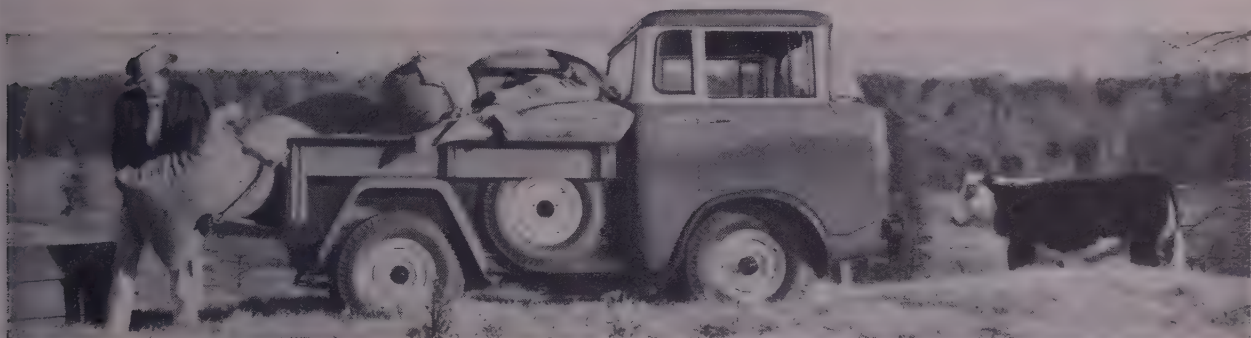
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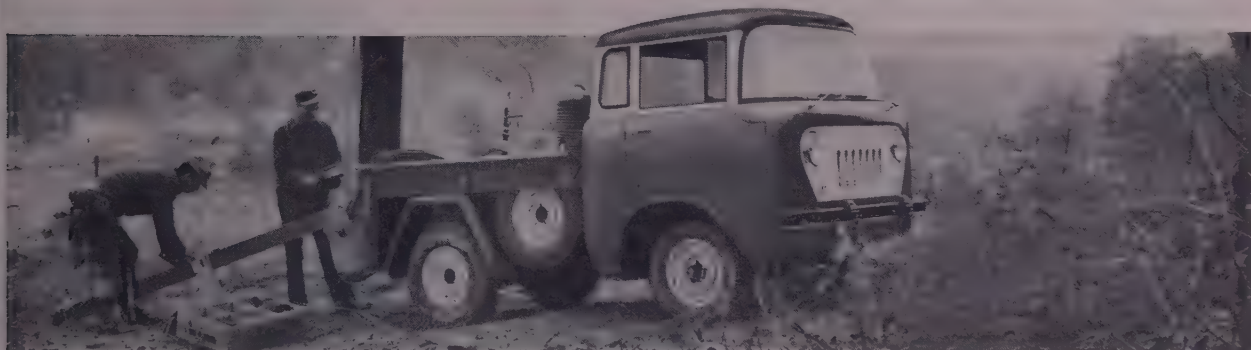
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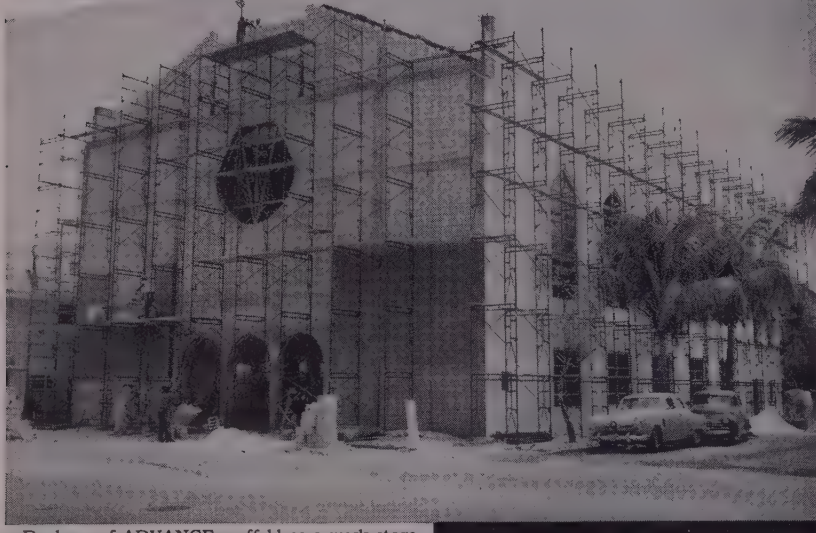
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construction of combination bridge and overpass in Missoula County. **Roth Construction Co.**, Rapid City, South Dakota, received a \$375,922 contract for 16.3 mi. of grading and draining the Grass Range-Malta Highway in Phillips County. A \$173,983 contract was received by **E. C. Powell** of Great Falls for 13.7 mi. of oiling, surfacing and new steel guard rail on the Vaughn-Conrad Road in Teton County. **Duffy Reed Construction Co.** of Twin Falls, Idaho, received a \$416,191 contract for 7.4 mi. of grading and surfacing the Pablo-Kalispell Highway in Lake County. A \$114,893 contract was awarded to **Zook Brothers Construction Co.**, Big Fork, for 5.8 mi. of grading and surfacing the Chester-Northwest Highway in Liberty County.

NEVADA

Morrison-Knudsen Co. of Salt Lake City, Utah, received a \$589,948 contract for 10.9 mi. of grading and surfacing near Hickison Summit in Lander County. A \$595,404 contract was received by **Wells Cargo, Inc.**, of Las Vegas for 2.5 mi. of highway construction south of Las Vegas in Clark County.

NEW MEXICO

Miller, Smith & O'Hara, Inc., and **Harry Trotz Construction Co.**, Albuquerque, received two contracts for roadwork in Sandoval, Bernalillo and Taos counties. A \$1,774,085 contract for 11.9 mi. of grading, surfacing and structures on the Albuquerque and Algodones road in Sandoval and Bernalillo counties and \$571,266 for 10.5 mi. of grading and surfacing the Colorado-New Mexico State Line—South in Taos County. **C. R. Davis Construction Co.**, Albuquerque, received a \$255,176 contract for 8.3 mi. of grading and surfacing the Tajique-Chilili Road in Torrance County. **J. H. Ryan & Son, Inc.**, of Albuquerque received two contracts for roadwork in De Baca and Taos counties: \$117,885 for construction of Fort Sumner Underpass in De Baca County and \$98,126 for construction of Taos Junction Bridge and approaches in Taos County.

OREGON

George Chicha Co., Spokane, Wash., submitted a low bid of \$404,200 for repair of the North Jetty at the mouth of the Siuslaw River near Florence. **Mack Slate, Jr.**, of Albany submitted a low bid of \$85,332 for clearing area at Cougar Reservoir on the East Fork, south of Blue River in Lane County. **Rogers Construction Co.**, Portland, received a contract of \$718,514 for grading and oiling The Dalles-California Highway in Jefferson County. **Roy L. Houck & Sons**, Salem, received \$605,067 contract for grading over-crossing section of Pacific Highway

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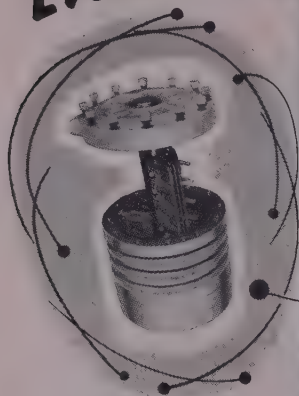
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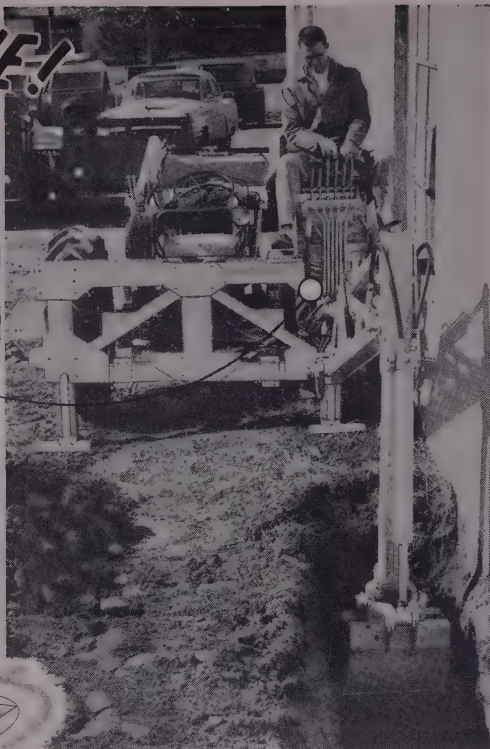
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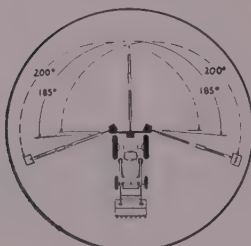
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—East, south of Salem, Marion and Linn counties. A \$223,055 contract was received by **The Central Heating Co., Ore. Ltd.**, of Eugene for grading and paving the Gold Beach-Hunter Creek Section of the Oregon Coast Highway south from Gold Beach in Curry County. **Earl L. McNutt Co.** of Eugene received a \$250,723 contract for 2.7 mi. of grading the Columbia River Highway east from Mosier in Wasco County. A \$286,592 contract was received by **Tom Lillebo Construction Co.**, Reedsport, for bridge structures on the Pacific Highway, north of Grants Pass, Josephine County. **Babler Bros., Inc.**, of Portland received a \$167,625 contract for grading and oiling 6.2 mi. of the Lytle-Boulevard Highway in Malheur County. **Johnston & Bryant** of Newberg received a \$174,977 contract for bridge construction, Southern Pacific Railroad on the Pacific Highway in Linn County. **George E. Berry**, Beaverton, received a \$104,618 contract for bridge construction, 3rd and 4th crossings of the Wilson River in Tillamook County. A \$120,800 contract was received by **Orlando C. Bernard**, Portland, for Glover Overcrossing of Union Pacific Railroad, Old Oregon Trail in Union County. **Cherf Bros. & Sandkay** of Ephrata, Wash., submitted a low bid of \$181,000 for earthwork, structures and siphon, Antelope Creek Siphon and wasteway, Medford Canal, Rogue River Basin Project. **Ausland Construction Co.**, Grants Pass, submitted a low bid of \$113,461 for main canal structures, Medford and Rogue River Valley Irrigation District.

UTAH

Nelson Brothers Construction Co. of Salt Lake City submitted a low bid of \$223,295 for warehouse building, Flaming Gorge Community, Flaming Gorge Unit, Colorado River Storage Project. **Whiting and Haymond**, Contractors of Springville submitted a low bid of \$152,513 for 4.1 mi. of grading and surfacing north of Heber in Wasatch County. A \$190,878 contract was received by **F. R. Knowlton & Son** of Layton for 3 concrete structures in Kane County.

WASHINGTON

Scarsell Bros., Seattle, received a \$413,953 contract for 1.7 mi. of grading and surfacing Lacey Road to Martin Way in Thurston County. A \$213,269 contract was received by **Grant Construction Co.** of Coeur d'Alene, Idaho, for 28.7 mi. of grading and surfacing Block 18, Feeder Roads in Franklin and Adams counties. **Associated Sand & Gravel Co.** of Everett received a \$157,999 award for construction of Haskell Slough and Skykomish River bridge and approaches in Snohomish County. **Max J. Kuney Co., Inc.**, of Spokane received a \$457,823 contract for 5.5 mi. of grading and surfacing Pines Road to Greenacres in Spokane County. **C. B. Croy** of Bellingham submitted a low bid of \$143,

TREMENDOUS RIPPING TEAM



GREENVILLE RIPPER and INTERNATIONAL TD14, TD18 or TD24

The tremendous power of the IH TD14, TD18 or TD24, plus the 10,000-pound Greenville tractor-mounted rock ripper shatter rock and packed earth for easy scraper loading. On many jobs explosives, shovels and trucks are eliminated.

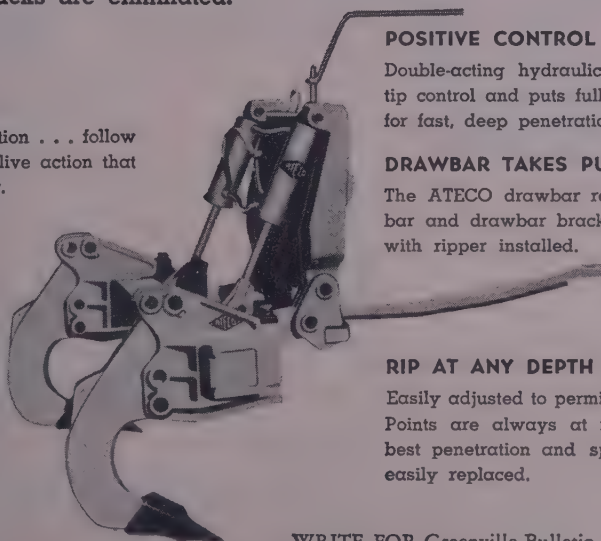
Put this power-packed team to work for you. Your IH dealer can give you the facts. Let him show you how you can save as much as 25% on any earth or rock moving job.

LIVE SWIVEL ACTION

Shanks swivel 15° in either direction . . . follow tractor like a trailer. Points have live action that shatters rock like a jack hammer.

RUGGED POWERFUL SHANKS

Scientific contour gives extra strength at strain points and pulls points down deep . . . rocks roll out and clear of headframe. Made of tough, heat-treated, manganese-moly steel. Mount one, two or three shanks as needed.



POSITIVE CONTROL

Double-acting hydraulic system provides fingertip control and puts full tractor weight on points for fast, deep penetration.

DRAWBAR TAKES PULL

The ATECO drawbar replaces the tractor drawbar and drawbar brackets. Clevis is accessible with ripper installed.

RIP AT ANY DEPTH

Easily adjusted to permit settings as deep as 24". Points are always at most desirable angle for best penetration and splitting action. Points are easily replaced.

WRITE FOR Greenville Bulletin IH-156. It gives complete data on the Greenville-Ateco ripper.

GREENVILLE

STEEL CAR COMPANY

ATECO DIVISION
Greenville, Pennsylvania





Gorman-Rupp Pumps keep this hot job moving!

The Horvitz Company, under a \$2½ million contract, is building a ten-span bridge over the historic Ohio Canal and Cuyahoga River near Cleveland. The job, which includes two other bridges and river relocation, opens up a direct connection between heavily traveled Routes 8 and 21.

Constant seepage from the canal is always a threat for Mike Sekela, supervisor for Horvitz. Here he has spotted a Gorman-Rupp 40M Pump, Model 34A-VG4D, to dewater the cofferdam 20' down for pilings. Mike says, "We prefer Gorman-Rupp because of their proven dependability."

THE GORMAN-RUPP COMPANY

305 Bowman Street • Mansfield, Ohio

See listing below for your Gorman-Rupp Distributor

Andrews Equipment Service of
Washington, Inc.
Spokane

Bay Cities Equipment, Inc.
Oakland, San Jose

Delta Tractor Co.
Stockton

Elliott Equipment Co.
Wenatchee

Flaherty Equipment Company
Pocatello

Harron, Rickard and McCone of Southern
California
Los Angeles

Industrial Tractor Sales
North Sacramento

Logger's and Mill Supply Co.
Arcata, Calif.

Pacific Hoist and Derrick Company
Seattle

Shasira Truck & Equipment Sales
Redding

Studer Tractor and Equipment Co.
Casper

791 for construction of overcrossing in Whatcom County. A \$172,506 contract was received by **Ray Weist** of Yakima for 9.4 mi. of grading and surfacing the Riggs and Decker roads in Yakima County. **Acme Construction Co.** of Redmond received a \$113,493 contract for 2.5 mi. of grading and surfacing from Owl Creek to Toutle River in Cowlitz County. **Strong & McDonald, Inc.**, Tacoma, received a \$134,686 contract for 2.6 mi. of grading and surfacing in the vicinity of Yale in Cowlitz County. The **Harrison Brothers Co.** of Tacoma received a \$712,107 contract for 4.1 mi. of grading and surfacing Keehelus Dam to Midway in Kittitas County. **Max J. Kuney Co., Inc.**, Spokane, received a \$1,060,150 contract for 2.1 mi. of grading and surfacing from Sunset Lodge to Keehelus Dam in Kittitas County. **N. Fiorito Co.** of Seattle was awarded two contracts for roadwork in Snohomish and King counties. A \$472,556 contract for 7.6 mi. of grading and surfacing Getchell Road to Arlington, Snohomish County, and \$215,286 for construction of a bridge in King County. **F. R. Hewett Co.** of Spokane received two contracts for roadwork in Grant and Spokane counties: \$289,324 for 5.1 mi. of grading and surfacing from Dean to Chattaroy in Spokane County and \$809,965 for grading and surfacing Moses Lake Bridge east in Grant County. **Peter Kiewit Sons' Co.**, Vancouver, received a \$526,952 contract for 1.7 mi. of grading and surfacing, Anacortes vicinity in Skagit County. **Glenn Dusky** of Moses Lake received a \$182,111 contract for 4.2 mi. of grading and surfacing Ensley Change in Almoda Road, Whitman County.

WYOMING

Peter Kiewit Sons' Co., Sheridan, submitted a low bid of \$165,998 for schedule 1 and 2, earthwork, structures and surfacing access road and county relocation, Glendo Dam and Reservoir.

ALASKA

A contract for \$11,842,238 was awarded to **Peter Kiewit Sons' Co.** of Seattle, Wash., for construction of Nike guided missile installations in the Eielson Air Force Base area near Fairbanks. **Patti-MacDonald** and **M-B Construction Co.**, St. Louis, Mo. (joint venture), received a \$9,495,744 contract for construction of Nike sites in the Fort Richardson area near Anchorage. **Denali-McCray** of Juneau received a \$403,929 contract for completion of the Gold Creek flood control channel in Juneau. **Manson-Osberg Co.** of Seattle, Wash., submitted low bids on civil works projects at Craig Harbor, Elfin Cove and Pelican Harbor: \$313,595 for Craig Harbor, \$147,020 for Elfin Cove and \$331,920 for Pelican Harbor. Work is in southeastern Alaska and includes dredging and breakwater construction.

Double your secondary crushing capacity with a CEDARAPIDS PORTABLE PRIMARY



**...and get all these
other advantages!**

- Work pits with high percentages of oversize
- Handle previously rejected boulders or big rock
- Meet 100% crushing specifications
- Open up pits considered unworkable or exhausted
- Convert your gravel plant to a rock plant

IT'S A PROVED FACT!

With a Cedarapids Portable Primary of the size and type to fit your conditions to handle the heavy crushing load ahead of your secondary equipment, you can double your plant capacity!

It adds a third stage of reduction to your operation, permitting your secondary crushers to handle twice as much material. It reduces the circulating load. More material will be taken off by the screen in your secondary plant before it reaches the crusher.

Equipped with a vibrating grizzly or scalping screen, your Portable Primary by-passes fines, sand, chips or dirt to prevent choking of the crushers.

You can turn *all* pit-run material, even big boulders, into specification 100% crushed aggregate. You'll have the capacity and flexibility to handle a wider variety of jobs . . . open up deposits considered unworkable because of excessive oversize or fines, re-open pits thought to be exhausted, operate in pits or quarries closer to the job to save hauling costs.

**THERE'S A SIZE AND TYPE
OF CEDARAPIDS PORTABLE
PRIMARY FOR EVERY
PRIMARY REDUCTION JOB**

Single Jaw Crusher

15" x 24"	25" x 40"
22" x 36"	30" x 40"

Twin Jaw Crusher

18" x 36"

with low-cost Vibrating Grizzly

Increases output of primary crusher up to 25% by by-passing fines before they reach the crusher. Three sizes available with single or double deck.

with Scalping Screen

48" x 6' horizontal vibrating screen between feeder and crusher increases production in pits with low percent of crushing, or where specifications require 100% crushed particles.

Portable Double Impeller

Impact Breakers

30" x 42"	36" x 45"
-----------	-----------

With a reduction ratio of 20 or 30 to 1, this unit assures high capacity of desirable cubical shaped aggregate, which needs little or no further reduction.

IOWA MANUFACTURING COMPANY

Cedar Rapids, Iowa, U. S. A.

Hy POWER SUPPLIES "CANNONS" TOO . . . !

Why specify a hydraulic cylinder that is outsized — too large or too small for your job. To borrow a cliché, "Why buy a cannon when you only need a rifle?"

HyPOWER makes the big ones, of course — up to 6 inches. We make the small one's, too. In fact HyPOWER allows you a selection from 14 types and more than 350 diameters and strokes! Need we say that selection like this saves you big money? And remember, these are rugged cylinders made for *today's* highway construction machinery and agricultural equipment. Heavier cylinder walls and shafts . . . simple but accurate stroke controls . . . all-welded construction without staybolts.

Summing it up; whether you want a "rifle" or a "cannon" for your cylinder application, check HyPOWER first. A note from you will see a HyPOWER catalog on its way to you by return mail. Manufactured by TURLOCK IRON AND MACHINE WORKS, TURLOCK, CALIF.



Hy POWER

HYDRAULIC CYLINDERS

FACTORY REPRESENTATIVES
GRETH & GRETH

P. O. BOX 47 - STOCKTON, CALIFORNIA

ENGINEERS on the move



SUPERIOR SAFETY PERFORMANCE: Fort Richardson and King Salmon field project offices have been awarded special certificates of merit for safety by the Alaska District Corps of Engineers. During 1956 the two offices supervised a total of 542,147 man-hours with no reportable lost-time accidents. *Colonel P. V. Kieffer, Jr. (right)*, Alaska District Engineer, presented the awards to *George Avery (left)*, resident engineer at King Salmon, and to *Captain Virgil S. Adkins, Jr.*, resident engineer at Fort Richardson during 1956.

Six Bureau of Reclamation engineers who have contributed a total of 212 years of experience and service to water development in the United States were given the highest honor the Department of the Interior can bestow: its Distinguished Service Award.

Gold medals and official citations of award were presented by Under Secretary of the Interior **Hatfield Chilson** in Washington, D. C., to **Grant Bloodgood**, Bureau of Reclamation Associate Chief Engineer, and **Arthur B. Reeves**, retired Chief of the Division of Irrigation Operations, Denver; **Clyde H. Spencer**, Regional Director, **Robert S. Calland**, retired Assistant Regional Director, and **Russell Vinsonhaler**, Construction Engineer, Region 2, Sacramento, Calif.; and **Ernest O. Larson**, Regional Director of Region 4, Salt Lake City, Utah.

The aggregate service record of these men includes participation in the planning, design and construction of the world's highest and largest dams, reservoirs, hydroelectric power plants and canal systems, as well as leadership and responsibility in the administration of the Federal reclamation program in the West.

* * *

Hal W. Hunt was recently named executive editor of "Civil Engineering," official publication of the American Society of Civil Engineers. Long active in

the ASCE Construction Division, Hunt has served as program committee chairman and secretary. While in Portland, Ore., from 1951 to 1953, he was resident engineer for **Frederic R. Harris, Inc.**, on pier construction at Swan Island.

* * *

Olaf W. Olsen was recently appointed assistant general sales manager of Pacific Coast Engineering Co., Alameda, Calif. At one time prior to joining PACECO Olsen served as an engineer with the U. S. Corps of Engineers.

* * *

Robert D. Austin, engineering chief of the Bureau of Reclamation's Gila Project, near Yuma, Ariz., has been advanced to chief of the engineering and hydrology branch, Project Development Division, Region 3, Boulder City, Nev. With the Bureau since 1937 when he worked on construction of the All American Canal, Austin has since held important engineering posts on Imperial Dam, the All American desilting works, and Coachella Branch of the All American.

* * *

William G. Weber, head of the large gates and valves section of the USBR Mechanical Branch at Denver, Colo., has retired after completing 30 years' continuous service. He designed many of the Bureau's largest and highest pressure gates and valves, including the bulkhead and cylinder gates for Hoover Dam. Ma-



One of Watkins' 26 Macks receiving a load of crushed gravel from a crusher fed by a 1¾-yard shovel.

on the Spaulding Turnpike . . . big-yardage fills at low hauling costs

Grading a three-mile section of New Hampshire's Spaulding Turnpike, R. G. Watkins & Sons, Inc. of Amesbury, Massachusetts, put down 1,580,000 cubic yards of common borrow and 100,000 cubic yards of gravel. This pike, with two 24-foot lanes separated by a 2-foot median, is a 22-mile addition to the Seacoast Turnpike near the White Mountain area. High fills along the Cocheco River and at intersecting roads required big yardage borrow.

Fourteen of the 17 dumpers used by Watkins & Sons on this high-volume hauling were Macks.

Here's the kind of job where Mack efficiency and dependability really pay off in minimum hauling costs. The ability to maintain tight schedules, to keep going month after month with only routine servicing and maintenance, and to operate with ease over difficult terrain and in all kinds of weather puts Macks in a class by themselves for real profit-making performance. Reason enough why Watkins & Sons has 26 Macks in its fleet of 32 dumpers.

Why not let your Mack representative bring you up to date on

the most complete line of heavy-duty trucks in the industry? Dumpers, mixers, tractors, flat-bed trucks—there's a Mack that will do your toughest jobs more economically, more efficiently, and more profitably. Mack Trucks, Inc., Los Angeles, Denver, San Francisco, Seattle, Portland, Salt Lake City, Albuquerque.

MACK
first name for
TRUCKS



This man knows concrete and power trowels

S. PATTI CONSTRUCTION CO.
GENERAL CONTRACTORS
1340 ADMIRAL BOULEVARD
KANSAS CITY 6, MISSOURI

January 14, 1957

Gentlemen:

After trying and testing the troweling machines manufactured by six leading companies, we selected the Master Powermatic for our use. We found this machine to be superior due to its ability to finish floors better in a more workable manner. Holidays (cat faces) have been virtually eliminated due to the low center of gravity. The stationary guard ring, dead man control and ease of handling, makes this machine the safest we have used. The simplicity of operation does not require any former knowhow or special instruction. Maintenance has been almost unbelievable, we finished over 60,000 sq. FT. of hard trowel concrete with no sign of wear to the blades.

S. PATTI CONSTRUCTION CO.

By *George M. Klossner*
George M. Klossner
Supt. all cement constr.

Here's the letter Mr. George Klossner, Supt. of cement construction, S. Patti Construction Co., Kansas City, Mo., sent his Master distributor.

Those are strong words of praise from a man in Mr. Klossner's position, but he is sold on the Master "Powermatic" because:

Low center of gravity. The Master "Powermatic" has the *lowest center of gravity of any power trowel on the market.* It's only 14" from the slab to the top of the Briggs & Stratton engine... and is the most stable, easiest to handle trowel you've ever operated... it hugs the slab from start to finish; doesn't try to run away, tilt or buck. Even new operators do a professional job the first time with a "Powermatic."

Power blade adjustment. This saves many a stoop and sore back. You just pull or push a knob on the handle and *engine power* automatically adjusts the angle of the blades to float or finish. You get the exact finish wanted. Master's "dead man" control automatically idles the engine when the operator lets go... eliminates wildly swinging handles and other hazards.

Free data sheet. Write for free data sheet or visit your Master distributor today and find out about the "Powermatic" yourself. No obligation, naturally.

MASTER

MASTER VIBRATOR COMPANY
1752 Stanley Avenue • Dayton 1, Ohio

DISTRIBUTORS

ANDREWS EQUIPMENT COMPANY.....Spokane, Washington
ANDREWS MACHINERY OF WASHINGTON, INC......Seattle, Washington
POWER EQUIPMENT COMPANY.....Denver, Colorado
SHRIVER MACHINERY COMPANY.....Phoenix, Arizona
SIERRA INDUSTRIAL CO., INC......Reno, Nevada
WEST COAST MASTER, INC......Los Angeles, California
THE SAWTOOTH COMPANY.....Boise, Idaho

for designs completed under his supervision were gates and valves for Flatiron powerplant in Colorado, Palisades in Idaho, and Hungry Horse in Montana.

* * *

C. T. Douglass has joined the Grant County Public Utilities in Washington



C. T. Douglass

working as concrete engineer at Priest Rapids Dam. He was recently in the employ of the Bureau and left to join the County organization.

* * *

Lyall A. Pardee, who has been in the Los Angeles Bureau of Engineering for 33 years, has received a permanent appointment to the post of city engineer. He has been acting city engineer for more than a year.

* * *

Paul V. Hennessy, member of the American Society of Civil Engineers, and active in Association affairs in Los Angeles, has joined the Pipe Products Division of Gladding, McBean & Co. He will make his headquarters in the company's San Francisco office.

* * *

Two personnel changes are announced by Dames & Moore, soil mechanics engineers in Los Angeles. **Charles L. Nichols**, formerly chief engineer, has been made



Charles L. Nichols

an associate. **Malcolm D. Horton**, who has been serving as a staff engineer in the Los Angeles area, has been promoted to chief engineer.

* * *

Appointment of **Kenneth I. Crosier** to the newly created supervisory position of safety engineer in Kaiser Engineers is announced. He has his headquarters in the firm's Oakland, Calif., main office.

* * *

Earle V. Miller, associate in the firm of Johannessen and Girand and Miller, consulting engineers of Phoenix, Ariz., has accepted an appointment to the AASHO-ASCE Highway Division Joint Committee as representative of the American Society of Civil Engineers. Miller, former Idaho State Highway Engineer, and previously a deputy assistant state highway engineer in Ari-

Here's why



ROCK RIPPERS

lick jobs others can't touch!

TOUGHEST, BEST-DESIGNED SHANKS!

Contoured for extra strength at strain points; made of manganese-moly steel, heat treated four times. Special forged alloy straight shanks for sandstone also available.

DRAWBAR MOUNTING SAVES YOUR TRACTOR!

Rugged ATECO drawbar takes the pull, protects you against costly transmission case damage.

HEAVIEST-DUTY CONSTRUCTION ON THE MARKET!

Tool beam, for example, is box-girder welded of 1 1/2" steel plate with sides in compression. Solid steel—not the weld—takes the strain.



OUTPERFORMS

'EM ALL! Replaceable rock points have splitting wedges; underground "quiver" of curved shanks works like a jackhammer to shatter rock and shale fast, with less power. Rock is rolled up and out in the clear, back of tool beam.

Make your tractor a 3-way profit maker with an ATECO ripper plus your dozer—ready to rip, bulldoze or push-load instantly without tool changing! No other ripper on the market matches ATECO's reliability and performance—why settle for less? Promptly available for all popular heavy duty crawler tractors—see your dealer or write for literature. Please address Dep't. W-1

American

39

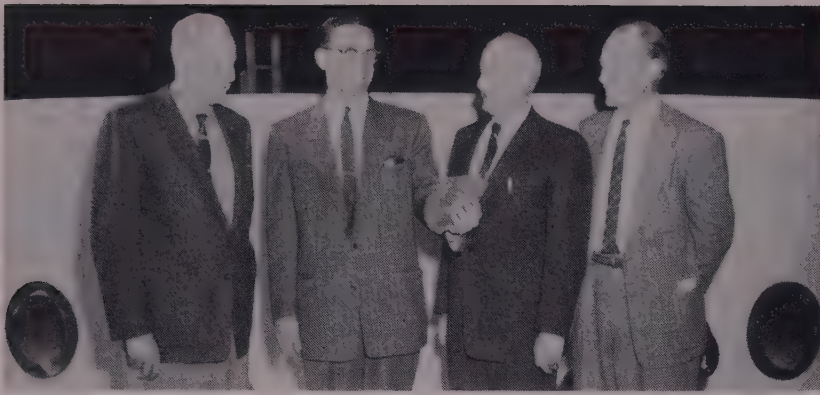


TRACTOR EQUIPMENT

Corporation

Designers and Manufacturers
Since 1920

9131 SAN LEANDRO BOULEVARD • OAKLAND 3, CALIFORNIA



KAISER ENGINEERS became the first construction contractor in the state of Idaho to win Idaho's million man-hour safety award. The firm is currently constructing the engineering test reactor at the National Reactor Testing Station for AEC. Shown admiring the award are, left to right, **M. L. Fulton**, Kaiser Engineers' general construction superintendent; **W. F. Bort**, manager of industrial construction; **W. L. Robison**, labor commissioner for Idaho, and **Allan C. Johnson**, manager of AEC's Idaho Operations Office.

zona, has been active in both the American Association of State Highway Officials and in the ASCE.

Two other Westerners appointed to serve with Miller are Co-chairman **Harmer E. Davis**, professor of civil engineering and director of the Institute of Transportation and Traffic at the University of California, also representing ASCE; and **W. A. Bugge**, Director, Washington State Department of Highways, and **G. T. McCoy**, California State Highway Engineer, both representatives of AASHO.

George Schoch, The Dalles Dam relocations resident engineer, has been transferred from the Portland to the Walla Walla District, Corps of Engineers. He had been at The Dalles Dam since mid-1953 and before that was relocations resident at McNary Dam. He now assumes similar duties at the Ice Harbor Dam project on the Snake River near Pasco, Wash. Practically all relocation work is completed at The Dalles. Relocations there have cost in the neighborhood of \$35,000,000. Replacing Schoch at The Dalles post is **G. S. Chapman**.

Robert P. Leatham, hydraulic engineer on the Bureau of Reclamation's Region 3, Boulder City, Nev., river control staff for the past six years, has accepted a transfer to the Corps of Engineers District Office in Sacramento, Calif. In his new position with the Corps, he will be assistant to the chief of the reservoir regulation section and chief of regulation manuals unit.

* * *

Charles A. McMahon, one of the most widely known construction men of the West where he has served the industry as general manager, project manager, and project superintendent, has joined the Ryan Construction Co. of Los Angeles as vice president. A member of the American Society of Civil Engineers and other professional organizations, as well as a licensed building and engineering contractor, McMahon has supervised \$175,000,000 worth of construction. Included are such projects as the Broadway-Valle Department Store and Panorama Shopping Center, Anheuser-Busch Brewery, Pershing Square Underground Garage, all in the Los Angeles area; the Rocky Mountain Arsenal, Denver, Colo., Basic Magnesium Plant at Henderson, Nev., and others.

* * *

Recently elected to head The Associated Engineers of Spokane, Wash., is **Harold A. Halstead**. Vice presidents representing the several engineering groups in the association were also chosen, with **Byron Barber** named as third vice presi-

"My Henry Digs Faster -- Handles More Materials"

—Says Max Reinhardt, contractor of Pontiac, Ill.

Digging ditches for water and sewer lines is Max Reinhardt's business. His equipment must dig, backfill, handle pipe and load various types of material . . . must do all these jobs speedily and economically.

After thorough testing, his ultimate choice is HENRY.

He states: "My Henry Backhoe and front end loader digs faster and handles more material than any similar outfit I have operated."

Get full details on the Henry Hydraulic Backhoe Super C-10H and the Henry Industrial Shovel from your nearby dealer. Or write to us for free literature.

"You can do it BETTER with a HENRY!"



MANUFACTURING COMPANY, INC.

1700 N. Clay St.

Topeka, Kansas

PARTS AND SERVICE FROM COAST TO COAST



Mr. Reinhardt's HENRY BACKHOE digs a ditch for a sewer line in a Pontiac residential district. Though soil is laced with tree roots, digging goes ahead smoothly.



Henry Industrial Tractor Shovel makes quick work of loading excess dirt into dump truck. Shovel easily loads over 8½ feet.



HERE'S BIG-GRADER PERFORMANCE ... *economy size*

The Allis-Chalmers Model D is a full-fledged motor grader . . . and a "natural" for road construction and maintenance jobs where fine grading performance and low cost are both important!

It has the basic design and performance features found in machines costing up to three times as much, but there is one important difference: The Model D is compact and maneuverable enough to work in crowded areas where many other graders cannot operate.

To add still further to its usefulness, the Model D may be equipped with a rear-mounted, $\frac{5}{8}$ cu-yd loader, scarifier, shoulder maintainer, leaning front wheels, power circle turn, shiftable moldboard. Optional cab offers year-round operator comfort.

Let your Allis-Chalmers dealer show you how the Model D can measure up to your standards of grader performance . . . at low cost.

ALLIS-CHALMERS

Engineering in Action

ARIZONA

Neil B. McGinnis Equipment Company—Phoenix

NORTHERN CALIFORNIA

Industrial Tractor Sales—North Sacramento
Shasta Truck & Equipment Sales—Redding
Atkins Tractor Co.—Eureka & Willits
West Coast Engine & Equipment Company—Berkeley

SOUTHERN CALIFORNIA

Construction Machinery Company—San Diego
San Joaquin Tractor Co.—Bakersfield
Show Sales & Service Co.—Los Angeles and San Diego

IDAHO

Southern Idaho Equipment Co.—Idaho Falls and Twin Falls
Southern Idaho Equipment Co. of Boise, Inc.—Boise

MONTANA

Mountain Tractor Company—Missoula and Kalispell
Richland Machinery Company—Sidney
Seitz Machinery Company, Inc.—
Billings and Great Falls

NEVADA

A D Machinery Company, Inc.—Elko and Las Vegas
Reno Equipment Sales Co.—Reno

OREGON

Haupt Tractor Company—Medford and Klamath Falls
Wood Tractor Company—Portland
Timber Tractor Company—Springfield

UTAH

Cate Equipment Company—Salt Lake City

WASHINGTON

Pacific Hoist & Derrick Company—Seattle
American Machine Company—Spokane

WYOMING

Studer Tractor & Equipment Company—Casper

dent, representing the American Society of Civil Engineers. **Wilbur L. King** acts as secretary of Associated Engineers.

* * *

F. A. Doupnik announces his entrance into the practice of general contracting at 4290 Piedmont Ave., Oakland, Calif. He was formerly vice president of A. S. Holmes & Son, Oakland, and prior to his affiliation with Holmes he was general superintendent for James H. McFarland. While with McFarland, Doupnik was in charge of construction of the first precast concrete structure in Oakland.

* * *

Wm. E. Willey in announcing a reorganization of the engineering divisions at the Arizona Highway Department stated

that **H. H. Brown** will be office engineer; **E. W. McIntire**, plant engineer; **A. J. Medford**, advance planning engineer. The State Engineer said that "a study committee has been analyzing all engineering functions, toward the end of increasing production brought about by the expanded Federal-Aid Highway Program."

* * *

Oliver E. Warren recently moved from Idaho Falls, Idaho, to Sacramento, Calif., where he is employed by A. Teichert & Son as field engineer on construction.

* * *

Col. Edwin M. Eads, Air Force Installations Representative, South Pacific

Region, has been awarded the Newman Medal for 1956. The medal is awarded

Col. Edwin M. Eads



annually by The Society of American Military Engineers to an Air Force military or civilian engineer in recognition of the most outstanding achievement during the year in design, construction, administration, research and development connected with military engineering.

* * *

Fred Quinnell, Jr., has been appointed Montana Highway Engineer to succeed **Scott P. Hart**, according to an announcement by **Harry L. Burns**, chairman of the Montana State Highway Commission. Quinnell was assistant state highway engineer in the technical division and has served with the department in various capacities since 1927.

* * *

The U. S. Bureau of Public Roads district engineer for the State of Washington area is **Roe P. Rodgers**, who earlier this year was appointed to succeed **Fred J. Dixon**, who will be regional engineer for the U. S. Bureau of Public Roads at Ankara, Turkey, under the foreign aid program.

* * *

The Arizona Chapter of the Associated Contractors of America has announced appointment of **Glenn E. King** as its executive secretary. King, former secretary of the State Highway Commission, succeeds **Joseph P. Condrey** who retired recently.

CALENDAR

June 11-14—Western Association of State Highway Officials, meeting, Shamrock-Hilton Hotel, Houston, Tex.

June 17-21—American Society for Testing Materials, annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

June 21-23—Concrete Products Association, annual summer meeting, Harrison Hot Springs Hotel, British Columbia, Canada.

June 24-25—Wire Reinforcement Institute, annual summer meeting, The Greenbrier, White Sulphur Springs, W. Va.

June 24-29—Concrete Reinforcing Steel Institute, meeting, The Greenbrier, White Sulphur Springs, W. Va.

July 29-Aug. 2—World Conference on Prestressed Concrete, San Francisco, Calif.

Jan. 16, 1958—Beavers Award Dinner, Biltmore Bowl, Los Angeles, Calif.



©Morrison-Knudsen Co., Inc.

BATTLE WITH STUBBORN ROCK AT THE DALLES DAM RESERVOIR . . . A JOB FOR BRUNNER & LAY ROK-BITS



Brunner & Lay carbide Rok-Bits drill round, easy-to-load holes—provide better chip clearance—with bit working in rock, not its own cuttings—and offers deep seated, generous carbides that stay put to give you big daily yardages at lowest cost.



Brunner & Lay Rok-Bits and drill steel used on the wagon drills kept ample rock ahead of the shovels. For details on this and other important low-cost Rok-Bit blast hole drilling jobs, call our nearest office. Ask for NEW catalog #756.

Brunner & Lay Products

Brunner & Lay, Inc., 9300 King St., Franklin Park, Ill. • Brunner & Lay Rock Bit of Philadelphia, Inc., 2514 East Cumberland St., Philadelphia 25, Pa. • Brunner & Lay of Los Angeles, Inc., 2425 East 37th St., Los Angeles 58, Calif. • Brunner & Lay, Inc., 150 Leslie St., Dallas, Texas • Brunner & Lay Rock Bit of Asheville, Inc., Sweeten Creek Rd., Asheville, N. C. • Brunner & Lay of Portland, Inc., 660 N. Tillamook St., Portland 12, Ore. • Birmingham Rock Bit Co., Inc., 5-18th St., S.W., Birmingham, Ala. • Brunner & Lay, Inc., 2 Santa Fe Drive, Denver, Colo. • Brunner & Lay, Ltd., 6301 Cote de Liesse, Dorval Sta., P. Q. Canada

TROJAN....



STANDS OUT ON THE TOUGH JOBS!



... TROJAN owners never hesitate to tackle the tough jobs! On difficult landclearing, digging in rocky, dry soils or working with extra heavy materials they know that the power, stamina and balanced design of their machines will always permit an honest day's work ... So many "extras" are standard with TROJAN and so many useful operating features are built into every machine that we'll gladly demonstrate against any comparable model—any place and any time ... Make a date with your TROJAN distributor!



EVER WORK IN MOIST SAND? ... Look how this TROJAN heaps the bucket yet remains perfectly stable without any tendency to tip at any point in the lifting cycle ... Big tires give full traction and flotation to work at high speeds.

Check This List of Important TROJAN Features

Reverse Curve Safety Arms
Straight Line Horizontal Thrust
Independent Bucket Action
Low Load Carrying Position
Allison Torqmatic Transmission

Detroit Timken Full-Floating Axles
GM Diesel Engine Available
Self-Centering Finger Tip Controls
Box Welded Frames
No Stopping to Shift

Foot Clutch Eliminated
Shift Easily at Full Throttle
Fastest Time Cycle
Standard 90" Bucket Spans Wheels
Bucket Position Indicator



TROJAN

TRACTOR SHOVELS

YALE & TOWNE

2 & 4 Wheel Drive Front-End Loaders

AD NO. 44-83

CONTRACTORS MACHINERY DIV., THE YALE & TOWNE MANUFACTURING COMPANY, BATAVIA, NEW YORK; SAN LEANDRO, CALIFORNIA

Earthmovers do double-duty

**...relocate 5½ tortuous miles
of U.S. 2, near
"Continental Divide"**

**Tournapull® scraper
change river channel
--convert to Rear-Dumps
outmaneuver trucks 5 load
to 4, hauling blast-rock**

Completion of a million yards of tough earthmoving by Tony Marrazzo Construction Co., Boise, Idaho, has ended a motorists' nightmare east of Nyack, Montana, along "the most dangerous 5 miles in the entire cross-country length of U. S. 2." Road hazard was so bad, that even before surfacing, traffic started using new route to bypass hairpin turn in the old mountainside road.

Construction of a river-level road along Middle Fork, Flathead River — boundary of Glacier National Park — involved moving 1,000,000 cu. yds. of dirt and rock. To handle 75% of the yardage, Marrazzo used three 16-yd., 210 hp, self-propelled C Tournapull-Scrapers — plus 2 interchangeable, 22-ton rear-dump trail-units. Machines were equipped with Electrotarders — an auxiliary braking system which eliminates brake wear and provides added safety on long, steep grades.

Scraper trail-units used first

C Tournapull-scrapers dug out new channels to straighten 3 curves in the mountain river. To do this, they waded out thru water with full loads, working in the river bed without difficulty. Scraper units also handled other dirtmoving assignments along the job...built grade along the river...and cut off a sharp curve to relocate 1600' of G.N.R.R. track.

Convert 'Pulls to Rear-Dumps Haul blast-rock to "Devil's Elbow"

In one 3000' section of road, contractor had to drill, blast, and excavate 195,000 cu. yds. of rock. For hauling, contractor converted "C's" to Rear-Dumps by a simple change of trail-units. The two 22-ton 'Pulls and 2 similar-sized conventional competitive dump trucks hauled and dumped rock in a deep valley...built a fill for the roadway, 125' high, over an 8½' x 41' culvert. The new highway cut

C Tournapull Rear-Dump rolls onto narrow fill and pivots around for quick back-up to dump edge. For only about 25% extra outlay, Tony Marrazzo Construction Co., Boise, Idaho, bought interchangeable dump trail-units for their "C" scrapers. Scrapers loaded, hauled and spread dirt; Rear-Dumps hauled and loaded rock, near Nyack, Montana.

straight-across the deep ravine, and eliminates the always-dangerous curve called "Devil's Elbow".

'C's' save 2 minutes per cycle

A stop-watch time-study showed that Tournapull Rear-Dumps' extra speed and 90° turn-ability saved time in restricted loading zones... over narrow, shelf-like haul-roads... and at tight dump areas. Chart right shows typical time study (in minutes) for one phase of the job.

"Muck-movin' sons o' guns"

Marrazzo superintendent says, "These Tournapulls are muck-movin' sons o' guns... they'll get under a tighter spot than (competitive unit). I like their maneuverability in narrow cuts. They work in and get loaded quick... and this is some of the roughest going there is!"

Rear-Dump operator reports, "'C's' are good maneuvering rigs... so far ahead that our dump-truck type haulers aren't even in it. The Electro-tarder pulls you right down — no matter how fast you're going — without touching the regular brake pedal. It's a real brake-saver."

Contact us for complete details on how Tournapull Rear-Dumps and scrapers — or combination of both — can cut your earthmoving costs.

	Competitive Dump-trucks	Tournapull Rear-Dumps	"C's" saved
LOAD, 5-2½ yd. dipperfuls	1.97	1.91	0.06
MANEUVER, at shovel	0.84	0.52	0.32
HAUL, 1470' down and up grades to 18% ..	3.04	2.36	0.68
MANEUVER, at fill	1.22	0.46	0.76
DUMP	0.28	0.21	0.07
RETURN, 1470'	2.62	2.51	0.11
TOTAL CYCLE, average	9.97	7.97	2.00



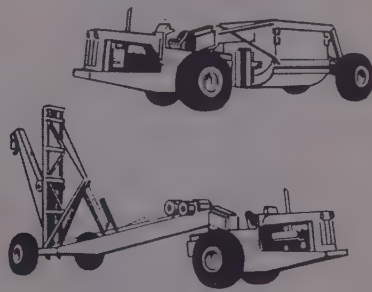
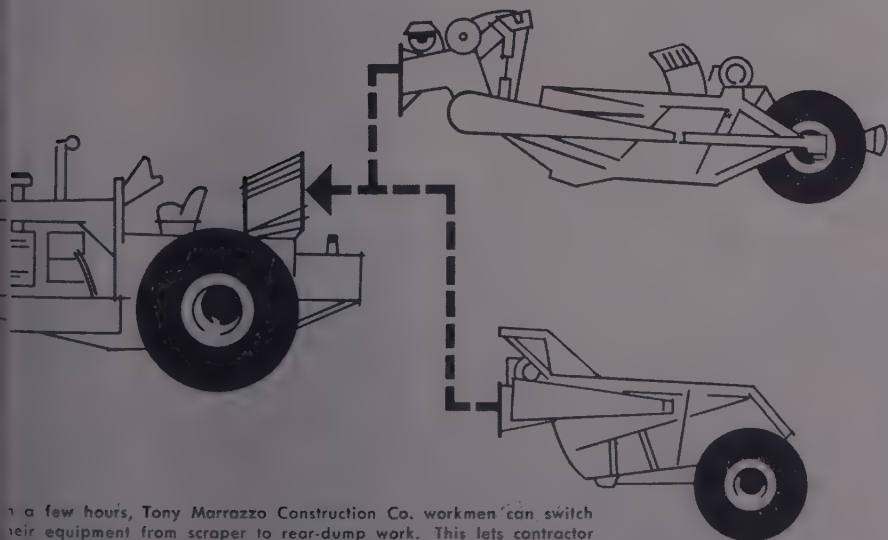
On this narrow ledge, 2 of Marrazzo's C Rear-Dumps and 2 competitive dump trucks were each loaded with five 2½-yd. buckets of blast-rock. Restrictive terrain temporarily made it necessary for loaded haulers to back up to 40' wide turn-around before starting haul.



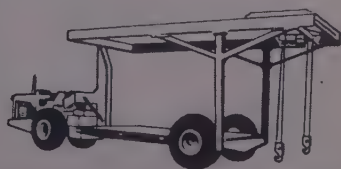
Hauling thru cuts previously carved-out, loaded Tournapulls attained speeds to nearly 30 mph, averaged 7.08 mph from start to stop on 1470' trip to the fill. Haul road presented a continuous succession of grades varying from 18% favorable to 10% unfavorable on the haul.

CPCR-1206-H

Simple conversion from scraper to rear-dump



Both scraper and rear-dump units use same wheels, tires, brakes, and electric controls. No special tools or equipment are needed to make the change-over. Same prime-mover can power other interchangeable tools: bottom-dumps, lift-and-carry crane, and flat-bed.



In a few hours, Tony Marrazzo Construction Co. workmen can switch their equipment from scraper to rear-dump work. This lets contractor take advantage of more and bigger job-opportunities. He keeps his prime-movers working and earning all thru an extended season.



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A Subsidiary of Westinghouse Air Brake Company

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Write for prices and specifications on America's safest, easy-to-handle vibrators with 115 volt AC-DC motor in head. Also new HI-CYCLE model ...and flexible shaft models, electric or gasoline engine.

WHITE MANUFACTURING CO.
Elkhart 15, Indiana
Some Dealer's Territories Available—
Write Today

SUPERVISING the jobs



GEORGE BOROVICH checks one of the jacks which will be used to support forms at the top of falsework on the O'Bryne Bridge. Borovich is superintendent for Thomas Construction Co. See article on page 57.

D. D. Davis, project superintendent, and **C. D. Mahoney**, project engineer, are top men on construction of expended core facility at the NRT Station, Idaho. This \$3,392,000 contract is being executed by the contracting firm of Paul Hardeman, Inc., and covers 400x200-ft. structural steel frame, concrete foundations, masonry walls and equipment. Scheduled for completion April 15, 1958, the project started April 1.

Guy Scott, general superintendent for Peter Kiewit Sons' Co., is in charge of \$688,986 worth of work consisting of 6.1 mi of clearing, grading, and miscellaneous concrete structures on Pacific Highway north of Grants Pass, Ore. Other key men on the job, which will be finished in September, are **S. Ward**, structures superintendent, **Fred Nieman**, grade foreman, and **Jack Lyons**, master mechanic. Office manager is **Bill Allen**.

T. D. Hart is superintending a \$144,577 job of grading and surfacing, with construction of concrete girder bridge across the Arroyo Simi in Ventura County, Calif., for **W. F. Maxwell Co.** Other key men are **Rupe Gault**, carpenter foreman, **Vic Franks**, steel superintendent, and **Murl Abernathy**, concrete foreman.

Glen Carlson, superintendent for Northwestern Engineering Co., is in charge of construction of runway extension at Natrona County Airport, Casper, Wyo. This is a \$243,423 job.

Earl C. Gregg is general superintendent on a 16-mo. job which started in April consisting of a 1-story, part basement, reinforced concrete hospital at Kellogg, Idaho. Matelich Corporation is doing the work at a cost of \$1,010,000.

* * *

General superintendent **Hugh Cameron**, with the aid of **Jack Hansell**, assistant superintendent, **H. C. Olson**, carpenter superintendent, and **Hank Ricard**, grading superintendent, is in charge of construction of ammunition storage facilities at Ladd AFB in Alaska. The contractor, **Reed & Martin, Inc.**, started working here in April and expects to finish September 1958.

* * *

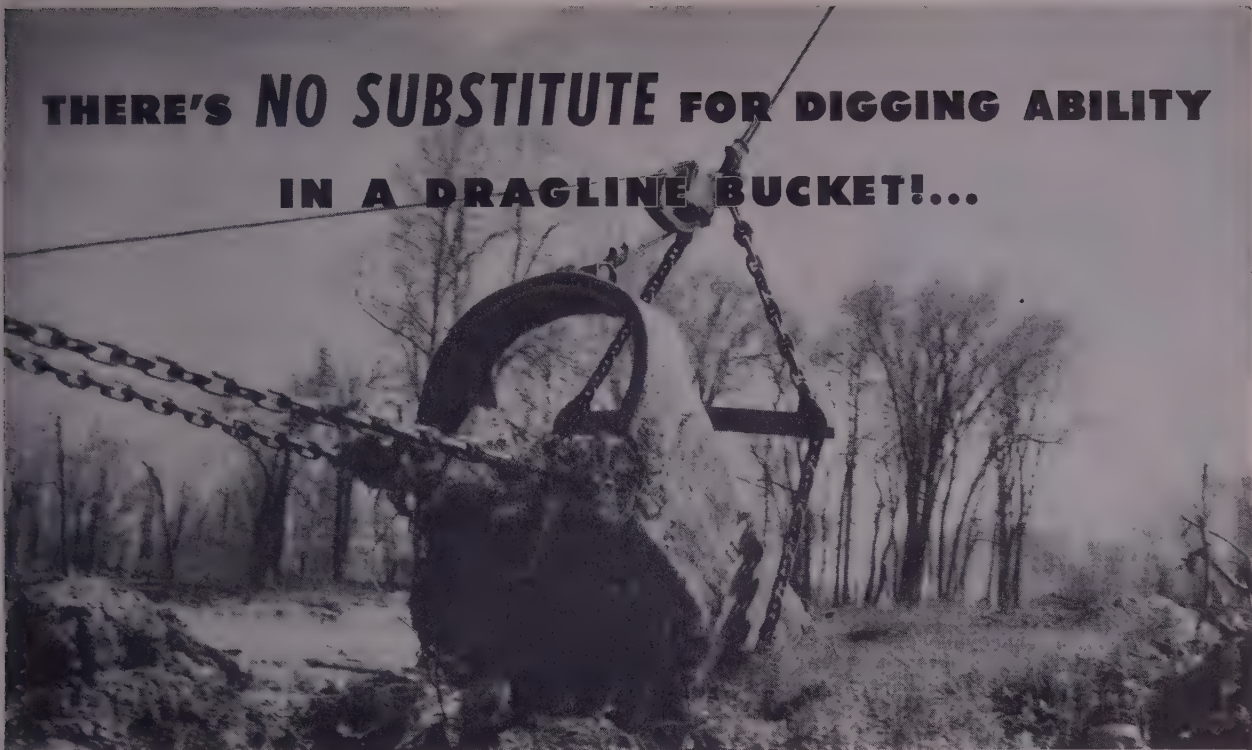
Cal Schlegel is job superintendent for Valley Paving & Construction Co. on grading and surfacing about 30 mi. of highway at various locations in Santa Barbara and San Luis Obispo counties, Calif. Master mechanic on this \$117,434 contract is **Lucio Reis**. Resident engineer is **Gordon A. Durnbaugh**. July 1 the project will be complete.

M. J. Ruddy, Jr., project manager, **Fred Sattler**, chief engineer, **Warren L. Shields**, project superintendent, and **Paul D. Snyder**, office manager, comprise the top men for **M. J. Ruddy & Son's** job of grading and paving on the Tuolumne-Sonora road in Tuolumne County, Calif., just now finishing. Ruddy was awarded the contract on a low bid of \$164,619.

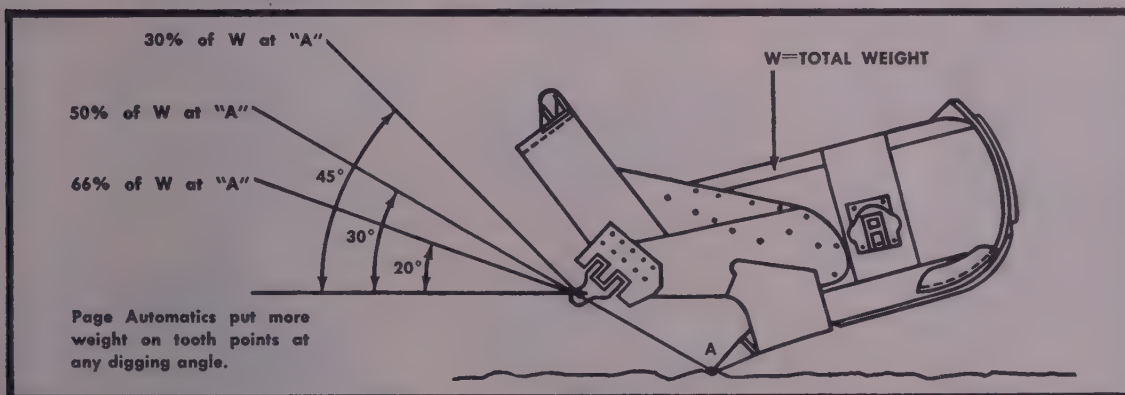


RESIDENT ENGINEER on the Arizona highway job described this month on pages 46 and 49 is **Roy Miller** (right.) **Loren Ray** (left) is inspector. Contractor **Wallace and Wallace** holds the \$585,000 contract, now finishing.

THERE'S **NO SUBSTITUTE** FOR DIGGING ABILITY IN A **DRAGLINE BUCKET!...**



And it's DISTRIBUTION of **WEIGHT** That Makes A Bucket Dig



Regardless of all other arguments, the only practical way to judge and buy a dragline bucket is on its *digging ability*. If a bucket won't dig, or digs with difficulty, it is a poor investment in production.

Balance—the distribution of weight—is an important factor in a bucket's digging efficiency. The more weight concentrated on its tooth points ("A" in drawing) at the first pull on the loadline, the better the bucket will dig. Because Page Automatics are designed and built so that a greater percentage of their total weight is concentrated on the tooth points *at any loadline angle*, they are recognized as the best digging bucket on the market.

We can prove that a Page Automatic will out-dig and outperform ordinary old style buckets and increase yardage up to 25% *on your own machine*. Ask for details on a demonstration today. Write for *Bucket Catalog GPB554*.

PAGE ENGINEERING COMPANY
CLEARING P.O. — CHICAGO 38, ILLINOIS

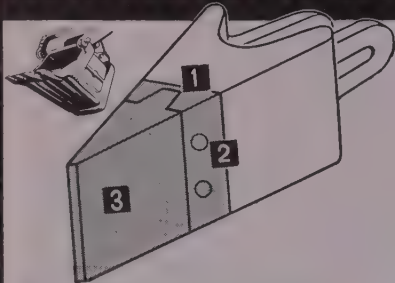
Page
Automatic Dragline
Buckets
Walking Draglines

If it's a PAGE... It DIGS

NEW!

Bulldog Replaceable Digger Teeth

**CUT INVENTORY
AND REPLACEMENT
TOOTH COSTS UP TO 65%**



**Revolutionary Design
Has Just 3 Parts**

1. **Universal Weld-On Adapter** uses old tooth as a base. Saves the cost of conventional adapter or new tooth. Same adapter fits on several different types of equipment. Easily welded on worn teeth.



2. **Positive Lock Pins** that give a tight fit to the replaceable tooth and are easily removed for replacement.



3. **Easy Change Replaceable Tooth***, changed with a hammer and punch. Has reversible bevel point. Made of highest quality alloy steel — heat treated to outwear all other teeth. Field tested in tarmac mines under toughest abrasive conditions, Bulldog Teeth have consistently shown cost savings up to 65%.



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A. L. Ellis, superintendent for Foley Brothers, Inc., is in charge of a \$2,289,052 recent award for construction of Anchor Dam and access road, Owl Creek Unit, Big Horn Basin Division of the Missouri River Basin Project in Wyoming. Concrete superintendent is R. C. Peterson. Other key men on construction of this concrete dam are E. H. Thomas, project engineer, and Jno. Dougherty, office manager. Work got under way in April, with July 1959 set as the finishing date.

* * *

I. Ross Dana, Jr., project engineer, and Cecil C. Cooley, superintendent, head the personnel on 28.3 mi. of grading and surfacing west of Hinkley railroad crossing in San Bernardino County, Calif. Dana Company, Inc., received the award at \$155,697 and will soon have the job finished.

* * *

Whitey Iman and H. E. Gabert, paving and plant superintendents respectively, are G. W. Ellis Construction Co.'s chief supervisors on a job near Chico, Calif., involving 17.5 mi. of grading and plant-mix paving. With June 15 the finishing date, this \$139,755 contract has been going since mid-May.

* * *

Curt Vander Linden is supervising for Guido O. Ferini a recent award at \$186,902 for resurfacing 31.5 mi. of state highways at various locations in Mon-

terey and San Benito counties, Calif. This job started in April and Ferini reports he expects to have it finished by the middle of July.

* * *

K. N. Baird, grading superintendent, and D. A. Wagner, in charge of surfacing, are head men on a recent \$788,888 award to Woodward Construction Co. for grading, draining, base course and plant-mix surfacing 16.9 mi of the Rock Springs-Hiawatha road in Sweetwater County, Wyo. Foreman here is L. Vosika. Under way since May, the work will probably be finished in September.

* * *

Jack Edwards is superintending a \$141,661 award to Colorado Constructors, Inc., for grading and surfacing in the city and county of Montrose, Colo. Foremen on the job, now about finished, are Sammy Samuelson, grading, and Robert Droel, surfacing.

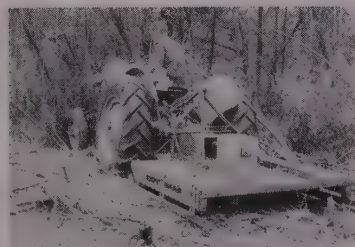
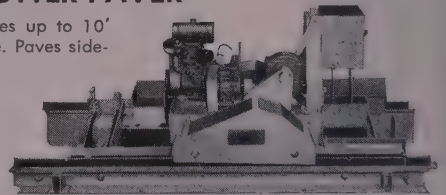
* * *

Guy Haney, superintendent for S. Birch, Inc., and S. Birch & Sons Construction Co., is in charge of 5.2 mi. of grading and graveling on the Raynesford-South highway in Cascade and Judith Basin counties, Mont. Other important men on this job are Herb Kennedy and Ed Kiinen, foremen; George Ellington, pipe foreman, Austin Tayer, mechanic; and Jack Harwood, service man. Work on the \$154,044 contract was started in April and will probably be completed in June.

These 3 Remarkable Machines DO A COMPLETE JOB in one operation!

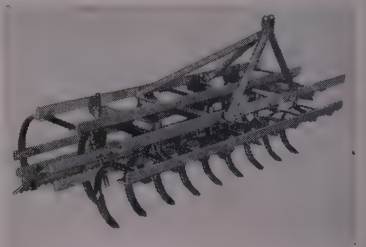
DOTMAR CURB and GUTTER PAVER

Dotmar Curb and Gutter Paver—paves up to 10' of finished curb and gutter per minute. Paves sidewalk too, or integral curb, gutter and sidewalk. Mechanical tamper in front hopper—vibrator on rear hopper. Forward and reverse transmission. Pays for itself in first mile of paving. Hit of the Road Show. Get the facts!



DOTMAR BRUSH & WEED CUTTER

Gear box unconditionally guaranteed. Cuts and chips weeds and brush up to 2" dia. in one operation. Also wheel mounted model.



DOTMAR ROADSIDE SEED BEDDER

Prepares parkway and roadside soil for seeding. Scarifies, grades, harrows, cultivates, levels and rakes in one operation, at one pass.

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KALAMAZOO, MICHIGAN

The answer to lower roadbuilding costs...

The right machine at the right stage

BROS SELF-PROPELLED ROLLER

Sealcoat, surface and subbase compaction work accomplished in fastest time possible with the BROS SP-54 roller. Infinite speed range from 0 to 18 MPH, both forward and reverse; torque converter drive; full oscillation of ALL wheel pairs; positive chain drives to both rear wheel pairs; engine, gasoline (or diesel) produces 50 usable horsepower at 2000 RPM; smooth automotive-type hydraulic steering.



BROS ROTO-MIXER

In-place mixing and blending of surface, subbase and subgrade materials to 12" depth with heavy duty BROS Roto-Mixer. Solid steel rotor shaft; positive equally loaded chain drives to both ends of shaft; simplified split-sleeve type tool plates. Hood and rotor each power hydraulically controlled.



BROS PREPARATOR

In-place reduction of subbase aggregates from over-size pit or bank-run materials. Reduces up to 400 cu. yds. per hour to acceptable gradation percentages. Also prepares scarified asphalt materials to proper sizes for re-use.



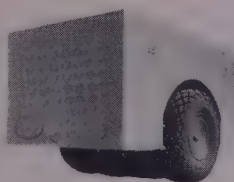
BROS TOW-TYPE ROLLERS

For surface and subbase and shallow lift subgrade compaction. 9 and 13 ton capacities; 3/4" overlapping wide face tires for full coverage; full oscillation of all wheels. Wobble-wheel* action adds side-to-side weaving motion to knead out voids and material bridging.



BROS ROLL-O-PACTOR

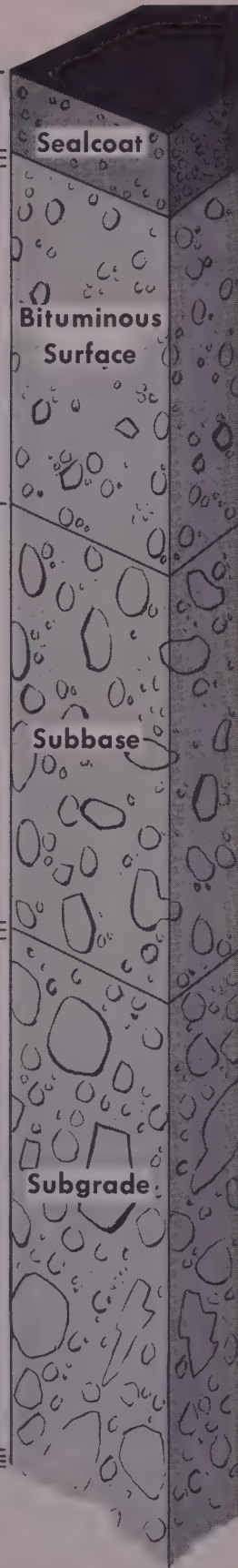
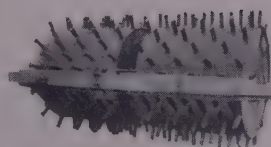
35, 50 to 100-ton. Heavyweight champion for compacting subgrade, earthfills, airfields and dams in lifts up to 24". 19° wheel oscillation. Tire pressures up to 150 psi. Heavy duty wheel assembly and bearings.



BROS TAMPING ROLLERS

For subgrade and embankment constructions of non-granular soils. Capacities range from 133 to 725 psi foot pressures. Sheepsfoot and Diamondfoot. Large tamping face and relief shank design provide maximum compaction pressure with the least drag when rolling at all depths. Get full information and specifications on any of these machines from your nearest BROS Distributor or write us.

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BROS Incorporated

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Arizona Equipment Sales, Inc., Phoenix, Arizona; Western Equipment Company, Boise, Idaho; Falls, Idaho; Pioneer Equipment Company, Reno, Nevada; The Harry Cornelius Company, Albuquerque, New Mexico; Crook Company, Los Angeles, California; McCoy Manufacturing Company, Denver, Colorado; Loggers & Contractors Machinery Co. Portland, Oregon; Keremi Tractor & Equipment Company, Casper, Cheyenne, Wyoming; Coast Equipment Company, San Francisco, California; Western Constr. Equip. Co., Billings, Great Falls, Montana; Totem Equipment Co., Seattle, Washington

TRICKS of the TRADES



Griphoist makes piling alignment easy

LOOK CLOSELY and you will see four Griphoists in this picture, one at the left, two in the center, and one at the right. Seven of the small machines are being used by foundation contractor Ben C. Gerwick on the \$10,000,000 Crown Zellerbach building which will rise 20 stories above the intersection of Post and Market Streets in San Francisco.

Superintendent H. E. Larsen has been using the manually operated hoisting and pulling machines since they were first introduced several years ago. He has found a wide variety of uses for them and on this job is using them to expedite

placement and alignment of the hard-to-handle sheet piling. The method is saving a lot of time for the pile driver.

After the sheet piling have been driven around the perimeter of the site the basement will be excavated and contractor Haas and Haynie will start pouring the concrete foundation mat.

Fairly new in the construction field, the 42-lb. Griphoist serves as a portable pulling machine that is rated on a single line pull at 3,300 lb. It operates with a ½-in. wire of unlimited length that passes through two pairs of steel jaws gripping alternately.



Simple method for curing concrete walls

THE USUAL METHOD to cure a concrete wall after the forms have been removed is to cover the wall with paper or burlap and then keep it wet—a tedious and expensive process. The Construc-

tion Department of San Diego Gas & Electric has devised a new method which seems to avoid most of the difficulties.

A small trough is bolted to the wall at the top which carries a canvas hose or

sack—the type used by gardeners for deep watering lawns. The trough is simply a board which is clamped onto the wall by a Universal form tie. The lower edge of the board is fitted with soft rubber so that the water is distributed uniformly throughout the entire length of the trough.

It takes only a few minutes for a carpenter to install this trough and after the canvas hose is put in place and the water is turned on no more attention is required.

M. Hjalmarsen is General Superintendent of Plant Construction for San Diego Gas & Electric Co.

Huckbolt is fast fastener

COMPLETE ERECTION of the Kaiser Geodesic Dome in Hawaii in a record 23 on-the-job working hours (*Western Construction*, March, p. 104) was aided by the use of the Huckbolt fastener, a rivet-type lockbolt patented and manufactured by Huck Manufacturing Company of Detroit.

The fastener was originally developed for use in aircraft primary and secondary structure. The type used in the Kaiser Dome is a lower cost commercial grade which is particularly well suited to building construction. It fills the hole, pulls adjoining metal surfaces together, is very rapidly installed and has approximately one-half the weight of a bolt and nut of similar material. It consists of a pin and collar, both made to close dimensional tolerances. As the pin is pulled by the fastening tool, the collar is swaged into locking grooves. Tensile preload is built into the fastener, and when tension is just right, the pin automatically breaks flush with the collar at the breakneck groove provided in the fastening design.

The Goedsic Dome, which forms the exterior for a new auditorium at Kaiser's Hawaiian Village resort in Waikiki, is 48 feet high and 152 feet in diameter. It is made up of 575 diamond-shaped cambered panels of varying lengths (9 to 11 ft.) which are joined to form a rigid, high-strength spherical shell. Auditorium floor space is approximately 18,000 sq. ft.; seating capacity on the main floor is 1,800.

Don't mix your greases

USE MIXED GREASES without an in-service test and you'll risk equipment failure, warns a report of Army research into the compatibility of binary lubricating greases. The report has just been released for industry use through the Office of Technical Services, U. S. Department of Commerce.

The safest plan, advises the report, is not lubricate with mixtures of different types of greases. They are too complex for valid tests of their compatibility. But if they must be used, a compatibility test should be run involving the greases, the equipment to be serviced, and actual conditions of operation.

NEW LITERATURE

For your convenience in obtaining free copies of literature described, the company address is provided with each review.

Kwik-Mix catalog

A four-page catalog describing the popular priced Model 3½-S Dandie Junior concrete mixer has been released by the Kwik-Mix Co. of Port Washington, Wis., a division of the Koehring Co. Called the "Dandie Junior," the new tilting side discharge concrete mixer is of rugged, lightweight construction and has a capacity rating of 3½ cu. ft. of mixed material plus 10% overload. The illustrated catalog highlights structural and operational features of the Dandie Junior that contribute to ease in handling and operation for long life and low maintenance.

Data on prestressed concrete tanks

Prestressed concrete tanks for processing plants, pulp and paper mills, cement plants, water storage and supply facilities and water treatment are described in a new four-page bulletin published by Preload Co., Inc., 211 East 37th St., New York 16, N. Y. This bulletin covers both design and construction data. Also included are condensed data on the use of prestressed concrete for con-

tainment vessels, silos and shell foundations. Ask for Bulletin T-15.

The A-B-C's of soil cement

An attractive manual entitled, "The A-B-C's of Soil-Cement Stabilization," has just been released by Pettibone Wood Mfg. Co., a subsidiary of Pettibone Mulliken Corp. The booklet tells the story of soil-cement base stabilization as processed by the Wood method, using Pettibone equipment. Among the subjects covered are: What is soil-cement, Where it's used, How it's processed, and Operation procedures. Helpful charts and photographs of typical jobs illustrate the text. For a copy of this informative booklet, write to Pettibone Wood Mfg. Co., Box 620, 6902 Tujunga Ave., North Hollywood, Calif.

New dragline bucket catalog

A new catalog illustrating and describing the new lightweight, lower cost

Page "A" Series automatic dragline bucket is available from the Page Engineering Co., Clearing Post Office, Chicago 38, Ill. One section of the catalog is devoted to a detailed explanation of the Automatic's exclusive digging action. Other sections illustrate the features of this new "A" series and the types of work each of the three bucket classes are designed and engineered to meet. Write for catalog A57.

Clipper 1957 catalog

A new 10-page booklet describing all Clipper Products including the new 2-hp. Supermatic masonry saw with Hi-Lo Control Wheel and Sta-Level Cutting Head is available from Clipper Manufacturing Co., Suite 245, 2800 Warwick, Kansas City 8, Mo. Clipper products covered include the Select-A-Notch Masonry saw, Clipper concrete saws, diamond, break-resistant and abrasive blades, joint sealers, both hot pour and cold applied. Details of Clipper's mixed specification savings plan on all types of blades are also included.

FLASH-R-LITE

BATTERY OPERATED
ELECTRIC WARNING
LITES

NEW APPROVED DUAL
HEAD
GREATER VISIBILITY

FLASH-R-LITE

is the modern barricade warning system. Visibility and no-fire-hazard means more safety to the public and protection for men and equipment. The rental plan saves money. Order barricades as needed; return them when not needed.



FLASH-R-LITE insures
safe control of traffic
in hazardous areas

New Model R-2 (Dual Head)



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Also for
general
blast
cleaning
in shop



CYCLONE TRAFFIC LINE REMOVER

- One man operation.
- Erases about a foot per minute.
- Pushes as easily as a shopping cart.
- Sand not thrown so as to obscure vision of traffic.
- No large annoying sand deposits left.
- Proven in use.

Dealers Wanted

Cyclone Sandblast Eqipt.

42 Clara St., Dept. W, San Francisco 7, Calif.

IH power unit-engine rating chart

International Harvester has just announced a rating chart for its line of 17 engines and power units. This chart offers brake horsepower on engines without fan or accessories, and on power units with fan and accessories. The horsepower ratings are corrected to standard conditions at sea level and 60 deg. F. Ratings are given on all fuels which can be used in the carbureted units. A separate page lists the extensive number of typical applications possible for the IH units. For your copy, address: CR-522-G, International Harvester Co., Construction Equipment Div., 180 N. Michigan Ave., Chicago 1, Ill.

New R-M conveyor belt catalog

A new catalog covering conveyor and elevator belts has been issued by Raybestos-Manhattan, Inc., Manhattan Rubber Div., Passaic, N. J. It covers new style designations of general service heavy-duty types of conveyor belts made with special strength members, gives tension ratings for vulcanized and metal splices, minimum recommended pulley diameters and minimum belt width for good troughing. Also included is a complete line of hot material belts for temperatures from 150 deg. to 350 deg. F. Ask for catalog 25 CB.

Detroit Diesel publishes catalog

The Detroit Diesel Engine Division of General Motors has issued a 19-page catalog outlining its complete line of

power units for all types of industrial applications. Specifications are given on 31 engine models ranging from 44 to 761-brake horsepower including the Division's new six-cylinder Turbopower engine. A copy may be obtained from Detroit Diesel Engine Div., General Motors Corp., Detroit 28, Mich.

Rexarc electrode manual

"Rexarc Engineered Toughness" is the title of a new 20-page manual on Rexarc Hard-facing and Manganese electrodes made available by The Sight Feed Generator Co., West Alexandria, Ohio. A comprehensive procedure section illustrates many typical buildup and hard-facing applications for better wear resistance. Recommended application procedures are shown, together with the type and quantity of material required, and the range of machine settings for each. In addition, a Directory of Uses, by industries, features an alphabetical list of worn parts that can be rebuilt, and names the proper electrode for the purpose.

Cleveland worm gear drives

A new 16-page, illustrated brochure, "Finger Tip Facts on Cleveland Worm Gear Drives," provides useful summary information on the complete standard line of speed reducers, worm gear sets and special units manufactured by The Cleveland Worm & Gear Co., 3249 East 80th St., Cleveland 4, Ohio. Ask for Bulletin No. 145.



BUILDER'S RISK INSURANCE

...ironclad safeguard for builders and owners

National Surety's facilities now include the issuance of this essential protection during the entire period of construction. Coverage is available nationwide through a network of top independent insurance agents and brokers.



NATIONAL SURETY CORPORATION

BUILDER'S RISK INSURANCE
(Fire and Extended Coverage)



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Blaw-Knox paver described

A new bulletin on Blaw-Knox Co.'s Black Top Paver, Model PF-45 is now available. Introduced at the ARBA Road Show, the PF-45 is advertised as the "big paver at a small paver price." Like the PF-90, the smaller PF-45 is rubber tired, reducing maintenance, increasing travel speed and maneuverability. The bulletin lists 23 operating features as well as the mechanical specifications. Write for bulletin 2539, **Blaw-Knox Co.**, Construction Equipment Div., Advertising Dept., Mattoon, Ill.

Literature on new Euclid models

Three new Euclid scrapers and a new over-hung engine bottom-dump are described in literature just issued by **Euclid Division of General Motors Corp.** Models SS-18 and SS-24 are four-wheel tractor type scrapers with truck capacities of 18 and 24 yd. and 300-hp. engines with Torqmatic Drives. The Model S-12 Bottom-Dump is an overhung engine tractor with semi-trailer of 13-cu. yd. truck capacity which is interchangeable with a 12-yd. scraper bowl. The Model TS-24 is an over-hung engine type twin power scraper with a capacity of 24 yd. truck and 32 yd. heaped at S.A.E. 1:1 slope. It is powered by two engines—300 hp. with Torqmatic Drive for the tractor and 218 hp. with Torqmatic Drive for the scraper axle. Literature on these units is now available from Euclid dealers or direct from Euclid Division at Cleveland 17, Ohio.

Spring maintenance for unpaved roads

Engineers faced with the problem of maintaining many miles of unpaved roads will be interested in a new leaflet "Calcium Chloride Roads-Spring Maintenance." The four-page text is well illustrated and includes data on adding materials, on shaping, crowning a road, applying calcium chloride, and maintenance tips. A chart lists recommended amounts of calcium chloride for various road widths, and total tons per mile. Copies are available on request to the **Calcium Chloride Institute**, 909 Ring Bldg., Washington 6, D. C.

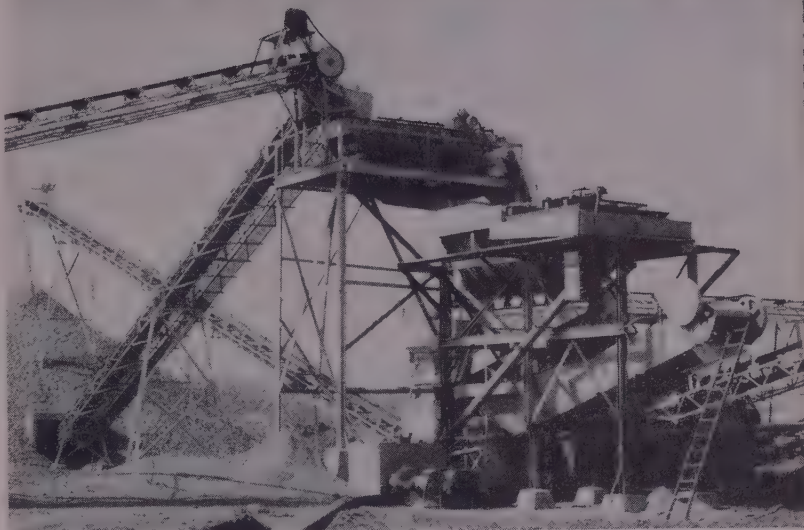
Bethlehem steel for highways

"Steel for Highways," a new Bethlehem publication describing the complete line of highway steels it manufactures for every roadbuilding operation, has recently been released by **Bethlehem Pacific Coast Steel Corp.** Fully illustrated, the booklet describes various Bethlehem products listed under right-of-way, highway bridges, bridge foundations, paving and highway guards and posts. Copies of the booklet can be obtained from any Bethlehem Pacific sales office in Seattle, Spokane, Portland, San Francisco, Los Angeles or Phoenix.

Hi-Way Widener catalog

A new four-page catalog covering the Gar Wood-Buckeye Hi-Way Widener is now available from **Gar Wood Industries, Inc.**, Customer Service Dept., Wayne, Mich. The Hi-Way Widener, a

PRODUCT VERSATILITY WITH EAGLE Washing-Classifying-Dehydrating Equipment



AT GENERAL
MATERIALS DIVISION
OF NEW YORK
COAL COMPANY
Springfield, O.

The diversified activities of New York Coal Co. include the modern aggregate plant of their General Materials Division near Springfield, Ohio. This compact, versatile plant can produce a variety material gradations to exact specification.

A Complete Washing-Classifying-Dehydrating Section consisting of a 16 ft. Water Scalping-Classifying Tank with Power-Operated Bleeder Valves and 3-Cell Collecting-Blending Flume and a 36" dia. x 22' Single Screw Washer-Classifier-Dehydrator handles fine material processing.

At a secondary station coarse material is processed by a 36" dia. x 18' Eagle Coarse Material Washer-Dewaterer.

Here is a profitable combination of Eagle Equipment that gives this producer—and their customers—just the material they want. You, too, will find that you can't beat Eagle Equipment for economy, low maintenance cost, service and most important—profit! You'll stay ahead with Eagle Aggregate Processing Equipment.

EAGLE IRON WORKS, 203 Holcomb Ave., Des Moines, Iowa

Sold and Serviced by



Brown-Bevis Industrial Equip. Co., Los Angeles, Calif.; Coast Equipment Co., San Francisco, Calif.; Balzer Machinery Co., Portland, Oregon; Intermountain Equip. Co., Boise, Pocatello, Ida.; Spokane, Wash.; Keremi Tractor & Equip. Co., Cheyenne, Casper, Wyo.; Lang Construction Equip. Co., Salt Lake City, Utah; H. W. Moore Equip. Co., Denver, Colo.; Jack Sahlberg Equip. Co., Seattle, Wash.; Shriver Machinery Co., Phoenix, Ariz.; Sierra Machinery Co., Reno, Nev.; N. C. Ribble Co., Albuquerque, N. Mex.; Western Construction Equip. Co., Billings, Great Falls, Mont.



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LIGHTWEIGHT PILING

Foster Lightweight Piling is the best, low-cost steel sheeting for light load excavations. Offers greater strength, pound for pound than any other lightweight piling. No special rigs required—easy to drive and recover—new interlock cannot jam, locks rigidly. Rent or Buy from Foster's nation-wide warehouses—Write for catalogs.

STEEL-SHEET PILING • PIPE PILES
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Gar Wood development, excavates and finish grades a highway widening trench in one pass. Requiring only one man to operate, the Gar Wood-Buckeye Hi-Way Widener digs a clean, flat-bottomed trench ready for concrete or bituminous material. Pouring can be done without forms or with outside forms only.

Semi-trailers for light trucks

The Junior Semi-Trailer for light trucks is described and illustrated in a four-page specifications folder issued by Locomotion Engineering, Inc., Sunnyvale, Calif. The trailer has a capacity of 6,000-lb. loads for ½-ton trucks, 9,000-lb. loads for ¾-ton trucks.

Saw shop manual

Contractors who have their own saw shops will be interested in an informative 30-page manual put out by Max Manufacturing Co., 138 Stockton Ave., San Jose 26, Calif. The Acme Saw Shop Manual contains complete instructions on the use and care of Acme saw sharpening equipment as well as practical suggestions as to how to operate a saw shop, ideas for shop layouts and a glossary of saw shop terms. A limited number of copies is available.

Blaw-Knox construction equipment

The complete lines of Blaw-Knox equipment for concrete and bituminous paving, ready-mix plants and general construction are illustrated in a new

24-page general bulletin. In addition to the general descriptions of some 14 basic items of equipment, the bulletin also lists numbers for other bulletins devoted to describing specific equipment, which are available upon request. Write for Bulletin No. 2530 to Blaw Knox Co., Construction Equipment Div., Advertising Dept., Mattoon, Ill.

Littleford paver-spreader

Publication of a new bulletin describing the Littleford True-Lay Paver-Spreader is announced by Littleford Bros., Inc. The True-Lay Paver-Spreader is a combination unit which lays a mat from 4 to 10 ft. wide and up to 6 in. deep. Diagrams and photographs illustrate the brochure. Write for Bulletin HH-33 to Littleford Bros., Inc., 453 East Pearl St., Cincinnati 2, Ohio.

Lighting catalog

Information on the uses, maintenance and history of portable and hazard warning lighting equipment is listed in a new catalog announced by R. E. Dietz Co. The catalog shows the full line of kerosene lanterns and highway torches, Visi-Flash transistorized highway warning flashers, and Comet Electric Lanterns. Catalog sheets and stuffers of individual lines are also available. Copies may be obtained by writing for Catalog 57 to Portable and Hazard Lighting Div., R. E. Dietz Co., 225 Wilkinson St., Syracuse, N. Y.

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There's a CONCUT

Concrete Sawing Machine
for every concrete
sawing job:

- ▶ MODEL RL-85 Lightweight CONCUT
- ▶ MODEL S-200 Standard CONCUT
- ▶ MODEL SP-300 Self-Propelled CONCUT
- ▶ MODEL 1200 and 2400 JOINTMASTER SAWING MACHINE
- ▶ CONCUT Precision BUMP CUTTER

SPECIALISTS
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CONCRETE SAWING

CONCRETE SAWING

Let us handle your concrete or asphalt sawing jobs. NO JOB TOO SMALL — NO JOB TOO LARGE. Our experienced concrete sawing experts are ready to assist you on any concrete sawing job. Multiple-blade joint sawing and bump cutting our specialty. WRITE OR PHONE FOR COMPLETE INFORMATION.

WE USE THE FAMOUS LINE OF

CONCUT

SAWING EQUIPMENT AND SAWING BLADES



the NEW CONCUT Precision BUMP CUTTER

This revolutionary machine eliminates bumps and rough places in concrete or asphalt surfaces, removes old paint markings from streets, highways and airfields, and removes accumulations of old rubber from airfield runways.

The approximate cost for contract bump cutting services varies between .05 and .10 per square foot of concrete.

CONCRETE SAWING EQUIPMENT, INC.

1845 BELCROFT AVENUE • EL MONTE, CALIFORNIA

Phone: Gilbert 3-1741

Bulletins on new Euclid rear-dumps

Euclid Division of General Motors has just published descriptive literature on four new rear-dump models that are now in production. These bulletins contain specifications on the following units: Model S-7 which is an overhung engine type tractor with semi-trailer of 12-ton payload capacity; Model S-18 is also a semi-trailer with rated payload of 35 tons and heaped capacity of 32 yd.; Model R-18 is a conventional type hauler of 18-ton capacity; Model R-40 is a tandem-axle machine powered by two engines (total of 470 or 500 hp.) with separate Torqmatic Drives for each axle—capacity is 40 tons. This literature is available from Euclid dealers or direct from Euclid Division at Cleveland 17, Ohio.

Paving plant layouts shown for airports and highways

Plan view drawings and photos of operating concrete paving plants for highways and airports are an important part of a new 36-page catalog available from the C. S. Johnson Co., a subsidiary of the Koehring Company, Milwaukee 16, Wis. A one stop central mix and one, two and three stop batch truck plant operations are illustrated. Also included in the catalog (No. KJ 449) are a table and formula showing how to obtain maximum paver production through proper utilization of equipment. Concise explanations for operation of automatic batch control and recording systems, as well as bin and cement silo selection guides are other informative features. Copies may be obtained by writing direct to the C. S. Johnson Co., Champaign, Ill.

Intermediate scalping plants described in Iowa bulletin

Portable intermediate scalping plants that provide intermediate crushing and scalp off unwanted fines and dirt are completely illustrated and described in a new eight-page bulletin issued by Iowa Manufacturing Co., Cedar Rapids, Iowa. These plants are designed to fit between portable primary crushing plants and portable secondary crushing and screening plants to increase both crushing and screening capacity and to remove fines to provide a high percentage of crushed material. Also described are the five models that are available with three different crushers including the twin jaw crusher, the roll crusher and the Symons Cone Crusher. Ask for Bulletin 4.

Unionarc welding for steel fabrication

Literature is available on Unionarc welding, a new process for manual welding of carbon steel developed by Linde Air Products Co., a Division of Union Carbide and Carbon Corp., 420 Lexington Ave., New York, N. Y. Unionarc welding is a semi-automatic metal arc welding process, using a continuously-fed bare wire, powdered magnetic flux, and carbon dioxide gas. Welds with this visible-arc process can be made manually in flat, horizontal, vertical or overhead

positions. Welding speeds are reputed to be 50 to 100% greater and total welding costs between 20 and 50% less than those obtained with covered electrodes.

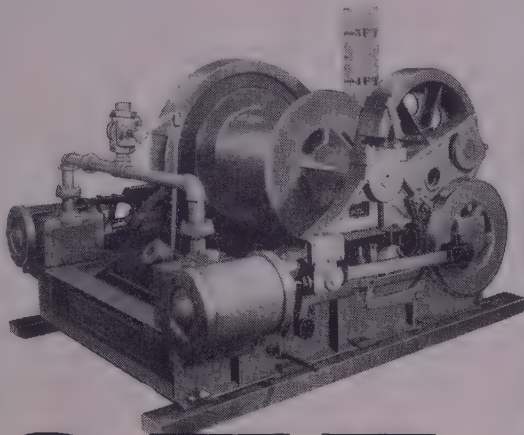
Two new concrete products

Stow Manufacturing Co. has just put out a bulletin, No. 5616, which gives specifications and on-the-job photos of two new products they have developed for the concrete field. The first is a "twin beam" vibrating screed that is used to strike off and smooth prestressed slabs or sidewalks. The other is a "power midget" concrete vibrator with only a 1¼-in. vibrating head. For bulletin 5616

write Stow Manufacturing Co., 56 Shear St., Binghamton, N. Y.

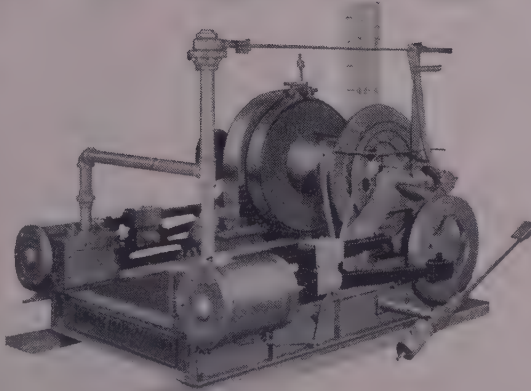
Morse-Starrett wire rope cutter

A four-page catalog folder presents concise information on the Morse-Starrett Wire Rope Cutter. Parts and specifications lists are provided alongside photographs of the units. The hammer-type Morse-Starrett Wire Rope Cutter comes in three models: light tool kit, heavy duty and extra heavy duty. Information is also given on the Morse-Starrett cable band, and wire rope band. Copies available from Morse-Starrett Products Co., 1204 49th Ave., Oakland 1, Calif.



Single Drum
Double Drum
Specials

STEAM HOISTS



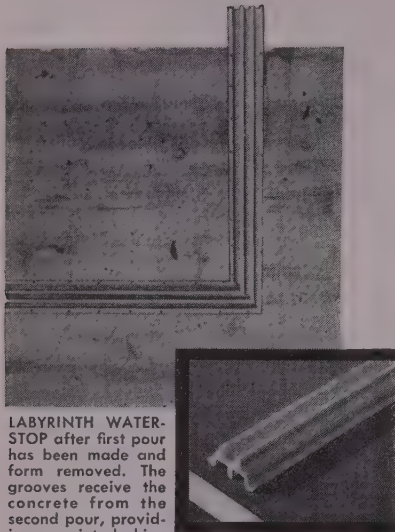
*A specialty of
Superior-Lidgerwood-
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who can supply
any type or size
of Steam Hoist
you may require.
Make your next
Steam Hoist
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Pacific Coast Representative: GEORGE E. SWETT & COMPANY
100 Howard Street, San Francisco 5, California

Waterstop in place in seconds!



LABYRINTH WATER-STOP after first pour has been made and form removed. The grooves receive the concrete from the second pour, providing an interlocking joint.

Just a few seconds were needed to nail this **LABYRINTH WATERSTOP** to the form...just a few seconds and water seepage worries were over before they could ever have a chance to start. **LABYRINTH WATERSTOP** forms a waterproof bond between two pours. The corrugated ribs bond firmly with the concrete.

LABYRINTH WATERSTOPS are made of flexible polyvinyl plastic... that has superior weathering qualities, is not affected by temperature changes and chemical activity.

LABYRINTH WATERSTOPS are easy to work with, can be cut to any desired length. "L" and "T" joints can be welded with just a hot knife. Find out now how your costs can be cut...and end your seepage problems.

Distributed by
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THOMAS CONCRETE ACCESSORY CO.
1219 S. Herbert St.
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2344 N.W. 21st St.
Portland 9, Ore.

News of DISTRIBUTORS

Sales staff additions

New additions to the sales staff of Howard-Cooper Corp. in Portland are Jim Smith and Theron Gordon. Both men have been transferred to the main headquarters in Portland from branch

offices, Smith from Eureka, Calif., and Gordon from Albany, Ore.

All lines of heavy construction machinery distributed by Howard-Cooper, including the big IH TD-24s and the new 16- and 24-ton IH Payhaulers, will be sold by the new men in their respective territories. Smith will cover Clackamas and Marion counties and the smaller contractors in the Portland area. Gordon's area will include all of Yamhill, Wasco, Sherman and Hood River counties in Oregon, and Yakima, Skamania and Klickitat counties in Washington.

Lund has new Salt Lake address

Following a period of many years at 49 North 2nd West St., Salt Lake City, Utah, Lund Machinery Co. has moved to 2350 South West Temple St., where the distributor occupies a new building, plus a large storage lot. The new facilities better equip Lund to take care of their many customers in the area.

New industrial sales manager

S. R. Hendricks has been added to the staff of McCarty-Sherman Distributing Corp. as manager of industrial sales for the Denver company. Coming from another equipment firm, Hendricks brings the benefit of a wide experience to the McCarty-Sherman dealer organization.

Important changes at Sanford

Following the untimely death of H. D. Sanford, head of Sanford Tractor & Equipment Co., Reno, Nev., who was killed in an airplane accident last January, Blaine R. Oakey has succeeded to the presidency of the company. Office manager is Russell E. Adams; parts and service manager, R. V. Robertshaw. On discontinuing the Caterpillar and allied lines, the Sanford firm recently became distributor for International Harvester.

New branch established in So. Calif.

Industrial Vibrator & Machinery Co. of San Francisco reports the establishment of a branch to cover the Southern California area. James K. McIntosh, formerly with the De-Laval-Pacific Co., has been made district manager for the territory, with headquarters in Santa Ana. Industrial Vibrator is exclusive representative in California for Southwestern Engineering Co., Los Angeles; The Cleveland Vibrator Co., Cleveland, Ohio; Taylor, Stiles & Co., Riegelsville, N. J.; and Consolidated Baling Machine Co. of Brooklyn, N. Y.

Studer Tractor adds salesman

Ray Studer, president of Studer Tractor & Equipment Co., Casper, Wyo., announces the addition of David R. "Dick" Sedar to his sales staff. Sedar will in-

profit from the
efficiency and
economy of a

**LENKER
AUTOMATIC
LEVEL ROD**



Every

Rod Reading

An Elevation—

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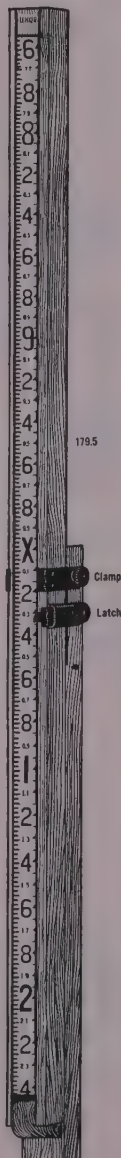
**SURVEYORS
SERVICE CO.**

2021 South Grand Ave.,
Los Angeles 7, Calif.

Manufactured by

LENKER MFG. CO.

Sunbury, Pennsylvania





SERVING

THE WORLD'S LARGEST

CONTRACTORS WITH

CEMENTS FOR EVERY CONSTRUCTION PURPOSE

Cement users in the West are faced with many problems in concrete construction not generally found in other parts of the nation. Weather conditions range from semi-tropical heat to sub-zero cold. Great areas of desert land are separated by only a few miles, from regions of torrential rain. These extremes in temperature and humidity can cause wide variations in setting time and ultimate strength of concrete.

Concrete research by such agencies as the Bureau of Reclamation and the California Highway Department indicated that no one type of cement would produce durable concrete under conditions which are encountered in the West. As a result of these surveys, PERMANENTE manufactures fifteen different types of standard and special purpose cements—cements specially designed to meet every construction problem that may confront Western builders.



On the job - On time

PERMANENTE, SANTA CLARA, YOSEMITE AND KAISER BRANDS OF PORTLAND CEMENT AND PERMANENTE LIME PRODUCTS

PERMANENTE
CEMENT COMPANY

OAKLAND • PORTLAND • SEATTLE
ANCHORAGE • FAIRBANKS • HONOLULU

initially promote the sale of asphalt and oiling equipment throughout the state.

Intermountain Ford Tractor news

James A. Young, president and general manager of Intermountain Ford Tractor Sales Co., Salt Lake City, Utah, announces the appointment of Glen Davidson, formerly district supervisor for the eastern Idaho area, as the new Ford tractor and industrial dealer for the Vernal, Utah, trade area. Robert S. Lane, Jr. has been named to Davidson's former post and will make his headquarters in Idaho Falls, Idaho.

Robert S. Lane, general sales manager, with John Geisser, service man-

ager, and John Frowein, sales promotion manager, recently completed a tour of the Intermountain Ford tractor dealerships, conducting sales meetings on the new loader and other Ford equipment, and inaugurating a sales campaign, with emphasis on industrial applications of the Ford tractor.

Philpott sells So. Calif. branch

George M. Philpott Co., Inc. announces the sale of the company's assets in Southern California to Kyle Equipment Co., headed by Willis B. Kyle. George M. Philpott Co., Inc. continues with Gardner-Denver, Euclid, Marlow and Marion accounts for the

Northern California service territory north of Kern County. George M. Philpott Co., Ore., Ltd. also distributes Gardner-Denver and Marlow in Oregon and western Canadian territories. J. G. Woodford has been elected vice-president of George M. Philpott Co., Inc. following the retirement of R. G. Fletcher April 1. R. Sim has been made sales manager and Paul Hayden has been made manager of the Sacramento branch.

Announcement is also made that Philpott's branch at Fresno, Calif. has been appointed a distributor of "Fort Worth" mechanical power-transmission and materials-handling equipment manufactured by Fort Worth Steel & Machinery Co., Fort Worth, Tex. Vernon Artz and Leonard Martin are sales representatives at Fresno.

Sierra Machinery extends territory

The addition of Clark County in Nevada to the territory of Sierra Machinery Co., Inc., Euclid dealer in Reno, is announced by the Euclid Division, General Motors Corp.

ESCO distributes Witte Engines

Equipment Service Co. of Long Beach, Calif., has been appointed as distributor of Witte Diesel Engines for Southern California and southern Nevada by Witte Engine Works of Kansas City, Mo. Equipment Service Co., headed by V. M. Cortes, has been operating in Long Beach for the last seven years.

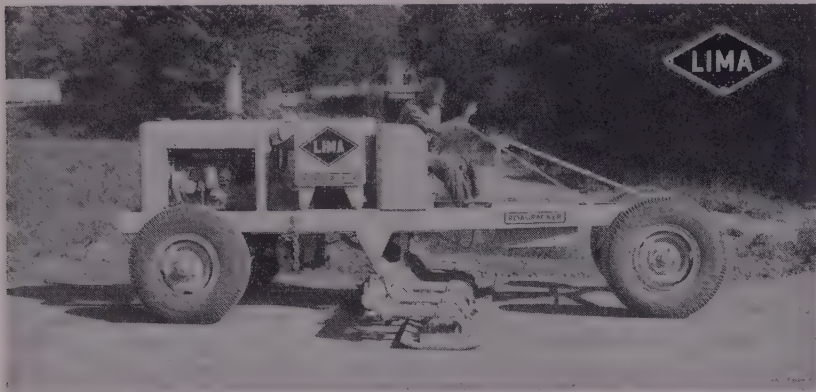
Two new dealers appointed by Clark

Graid Equipment Co., Reno, Nev. has been appointed by the Construction Machinery Division of Clark Equipment Co. as dealer in the entire state of Nevada and in nine California counties. The Portland firm of Cramer Machinery Co. has been appointed to sell and service the Michigan line in the whole of Oregon with the exception of Wallowa, Union, Baker and Malheur counties, and in the Washington counties of Wahkiakum, Cowlitz, Clark, Skamania, Klickitat and part of Pacific.

Westerners named to AED committees

Nine Western distributors have been named to national committee posts of Associated Equipment Distributors: J. D. Burgess of Sierra Machinery Co., Inc., Reno, Nev., to the Used Equipment Committee; W. F. Watts of Pioneer Equipment Co. of Nevada, Reno, to the By-Laws Committee; G. B. Brose of The Brose Company, Oakland, Calif., to the Traffic and Transportation Committee; I. R. Kraemer of Buran Equipment Co., Oakland, to the Equipment Financing Committee.

Also, in Los Angeles: A. L. Chappell of the Crook Company, to the Membership Committee; A. F. Garlinghouse of Garlinghouse, Fremont & Co., reappointed chairman of the Education Committee; and Beal Shaw of Shaw Sales & Service Co., to the Insurance Trust Committee. In San Francisco: Albert P. Hahn of Edward R. Bacon Co., to the General Advertising Committee, and H. J. Mayer of Western Machinery



Cut your high-density compaction costs with the LIMA ROADPACKER

Macadam Bases—Coarse aggregate for bases up to 12 in. thick can be spread in a single layer, then uniformly compacted to final density by the Roadpacker over a 13 ft., 1 in. width. This single course construction, possible only with vibrators, reduces spreading time by half. Also it eliminates the need for backtracking all the equipment for the second pass; and contour shaping is done once—instead of twice. In waterbound work, the Roadpacker's tamping and vibrating action runs in screenings solid from top to bottom. Only three spreads of screenings are required, and much of the hand labor of spreading, brooming and rolling is eliminated.

Gravel Subbases and Soil Cement Bases—Specified density is obtained in one to three passes, depending on material and depth. Because the Roadpacker compacts equally well traveling forward or in reverse, there's no deadheading when two or more passes are needed. Vertical packing action prevents troublesome shoving on difficult materials and does not drift the spread down on super-elevations.



Widener Attachment—Vibrating shoes compact material in widening trench while Roadpacker runs on existing pavement. Easily adjusted for various width trenches.

ROADPACKER FEATURES

- **Low maintenance**—Rugged vibrator shoes are pressure lubricated and actuated hydraulically through a completely sealed system. There are no exposed moving parts, no oil levels to check, no breather holes through which oil can escape.
- **Fast and maneuverable**—Highway speeds up to 28 mph, reverse speeds up to 7

mph. Steers easily. For work in tight places, can be operated with only four shoes. Shoes can be folded up easily and need not be removed from machine.

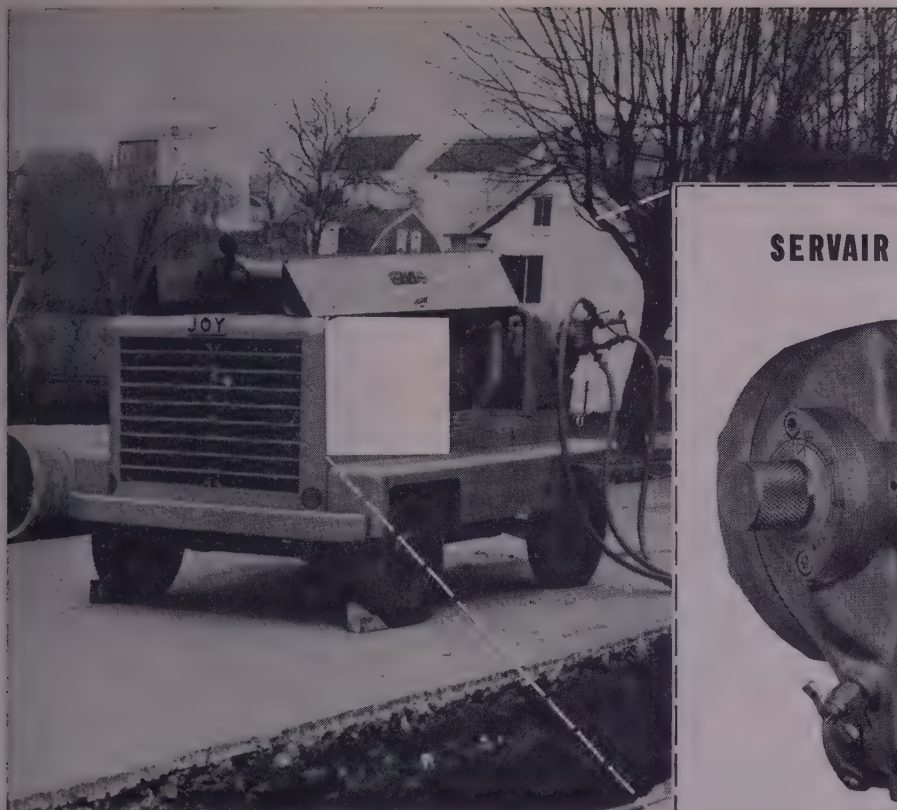
- **Easy to operate**—Operator is above dust, away from engine heat and exhaust for maximum comfort and efficiency. He has excellent visibility... controls are readily accessible.

Reno Equipment Sales Company, 1510 W. 4th Street, Reno, Nevada; Feenaughty Machinery Company, 112 S. E. Belmont Street, Portland 14, Oregon; Feenaughty Machinery Company, 600 Front Street, Boise, Idaho; Farls-Maritz Equipment Company, 1354 Wazee Street, Denver, Colorado; Evans Engine & Equipment Company, 4300 11th Avenue, N. W., Seattle 7, Washington; Bay Cities Equipment, Inc., 2792 Cypress Street, Oakland 7, California; Bay Cities Equipment, Inc., 1178 West San Carlos Street, San Jose, California; N. C. Ribble Company, 1304 North Fourth Street, Albuquerque, New Mexico; Smith Booth Usher Company, 2001 Santa Fe Avenue, Los Angeles 54, California; Shriver Machinery Company, 1756 Grand Avenue, Phoenix, Arizona; Heiner Equipment Company, 501 West Seventh, South, Salt Lake City, Utah; Hall-Perry Machinery Company, 302 Central Avenue, Billings, Montana; Hall-Perry Machinery Company, 312 East Iron Street, Butte, Montana; Hall-Perry Machinery Company, 1116 15th Street, North, Great Falls, Montana; Hall-Perry Machinery Company, 127 East Main Street, Missoula, Montana; Modern Machinery Company, Inc., East 4412 Trent Avenue, Spokane 10, Washington; Evans Engine & Equipment Co., Inc., Post Road—Box 894, Anchorage, Alaska.

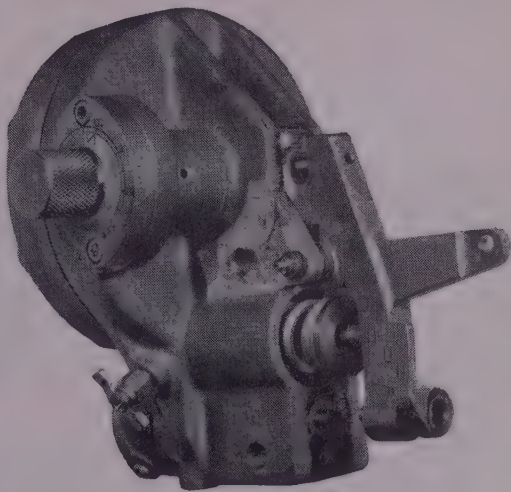
LIMA ROADPACKER



BALDWIN-LIMA-HAMILTON
Construction Equipment Division—LIMA WORKS



SERVAIR DEMAND CONTROL



ONLY JOY AIRVANE PORTABLE COMPRESSORS HAVE THIS NEW FOOL-PROOF LOAD CONTROL

The new Servair Demand Control takes the mystery out of pressure setting . . . makes it as simple as turning up the furnace thermostat at home. You just set the dial for the pressure you need and the Joy Airvane Rotary will deliver it.

The Servair is a true "demand" load control because it matches compressor output to demand . . . from 0% to 100% capacity. The control maintains steady air pressure regardless of the number and size of tools cutting in and out during operation, yet runs the engine only fast enough to meet the demand for air. This gives you top fuel economy and a minimum of wear and tear on the engine and compressor.

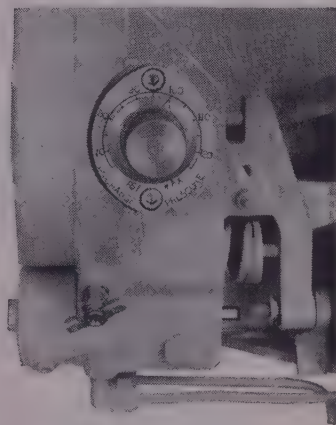
Joy Airvane Rotaries have many other features that make them trouble-free:

THERMAL BY-PASS—an exclusive oil circulating system that provides immediate lubrication and temperature control under all weather conditions.

DIRECT DRIVE—efficient spline coupling eliminates clutch (and clutch maintenance).

READY ACCESSIBILITY—to controls and items normally requiring regular maintenance.

You should get the whole story on Joy Airvane Portables before you consider any new compressor. Write **Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.** In Canada: **Joy Manufacturing Company (Canada) Limited, Galt, Ontario.**



"JUST SET THE DIAL FOR THE PRESSURE YOU NEED"

JOY . . . EQUIPMENT FOR CONSTRUCTION . . . FOR ALL INDUSTRY

WRITE FOR
FREE BULLETIN
181-25



Portable Air
Compressors



Wagon
Drills



Rock
Bits



Hand-Held
Rock Drills

Co., to the Manufacturer Relations Committee.

Bituminous Paving Forum is success

A very successful Bituminous Paving Forum was held in Phoenix in April sponsored by Road Machinery Co. of Phoenix and Barber-Greene Co. The two-day forum was held in the Westward Ho Hotel, and was addressed primarily to engineers and inspectors. Marshall C. Ham, Western Area Manager for Barber-Greene, gave the lectures, covering paving the first day and asphalt production the second day.

The State Highway Department was well represented in the 100 that attended along with the Bureau of Rec-

lamation, the Bureau of Public Roads, nearby cities and counties, and the Bureau of Indian Affairs. Everyone was agreed that it was time very well spent.

Road Machinery Co. has also sponsored schools for operators on the subjects of bituminous paving and rubber-tired equipment. This is the first one directed toward engineers and its success indicates that there will be more in the future.

Harold Bone is president of Road Machinery Co.

Euclid names Kyle So. Calif. dealer

J. W. Bloomquist, domestic sales manager of Euclid Division, General Motors Corp., Cleveland, Ohio, an-

nounces the appointment of Kyle Equipment Co. as authorized dealer for the complete line of Euclid earthmoving equipment in Southern California. Kyle, who recently purchased the assets of George M. Philpott Co. in Southern California, is maintaining headquarters at 125 N. Vineland in Puente.

Dealers named for asphalt plant line

New dealer appointment announced by Standard Steel Corp. of Los Angeles at its recent dealer and distributor sales conference at Palm Springs included Wheeler-Kershaw Co., Salt Lake City, Utah; James H. Hope, Sacramento, Calif.; Starline Equipment Co., Boise, Idaho; and Craig Taylor Equipment & Supply Co., Anchorage, Alaska.

Colorado Builders handling Parsons line

Colorado Builders Supply Co., Denver, Colo., has been awarded an exclusive distributorship by The Parsons Co. for Colorado and Wyoming. A Koehring Co. division located in Newton, Iowa, Parsons produces full crawler-mounted ladder and wheel-type trenching machines and a utility size Trenchmobile. Also recently placed into production were the "Big Incher" and "Middle Incher" ditching machines used in cross-country pipe-laying operations.

Distributors gather at Anthony meet

Anthony Company distributors from all over the United States recently assembled at the Anthony factory at Streator, Ill., for a general sales conference, where several new products, accessories and improvements were demonstrated. The occasion also marked the fortieth anniversary of the company, which manufactures hydraulic and telescopic hoists and dump bodies, dump trailers, lift gates, as well as a truck-mounted crane for Truck-Crane, Inc., an Anthony subsidiary.

Admixtures, Inc., named Marathon rep

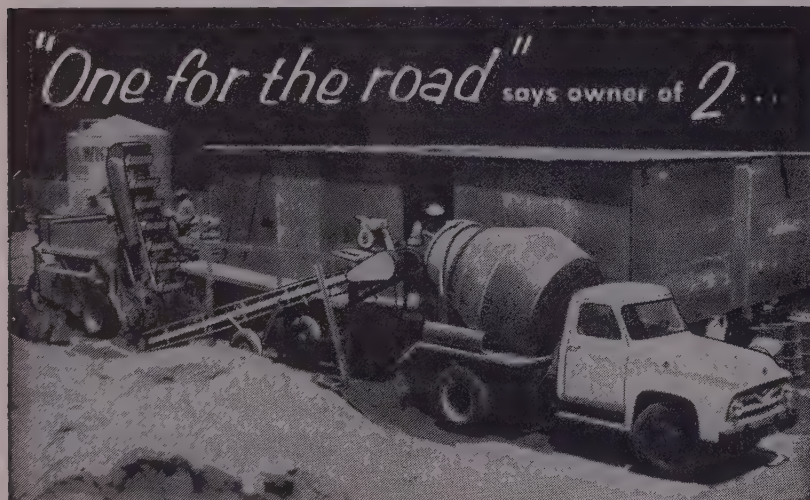
Marathon Corporation, Rothschild, Wis., announces appointment of Admixtures, Inc., Pasadena, Calif., as exclusive distributor for Maracon cement-dispersing agent in the 11 Western states, Alaska and Hawaii. Although Marathon's lignosulfonates have been used by portland cement manufacturers for more than twenty years, the appointment of Admixtures, Inc., represents the corporation's first venture into the concrete products fields.

W. A. Stiles heads field salesmen

Appointment of Winthrop A. Stiles as manager, field salesmen, is announced by J. H. How, general manager, Edward R. Bacon Co., San Francisco, Calif. Stiles' background of accomplishment in heavy industrial sales, management, and engineering will materially add to the overall effectiveness of the Erbeo sales program, according to How.

Redman gets Chicago Pneumatic

The Chicago Pneumatic Tool Co. account was recently taken on by Lee Redman Equipment Co., Phoenix, Ariz.



WILLARD READY-MIX PLANTS

WITH A COMBINED CAPACITY of 400 cu. yds., these two all Willard plants give Earl Ladd Ready-Mix Concrete Co., the ability to handle any city job and to move hundreds of miles out of town for the high profit jobs that no one else can touch.

PLANT 1. 150 C. Y. CAP. "Have tux and will travel"

Consists of Willard Weigh Batch Loader, Mixer Loading Conveyor and three 3 cu. yd. Willard Truck Mixers. Uses sack cement. No other equipment is required; one operator does the job.

PLANT 2. 250 C. Y. CAP. "Stay at home set up"

Consists of electric operated Willard Weigh Batch Loader, Cement Silo, Mixer Loading Conveyor and 3 to 5½ cu. yd. Willard Truck Mixers.

Whether you need a stationary plant or want to contract for public works jobs it will pay you to investigate the "Willard Way." Write for literature.

Manufactured in Los Angeles,
California and Galion, Ohio

**WILLARD CONCRETE
MACHINERY CO.**

11700 Wright Rd., Lynwood, Calif.
Member T.M.M.B.



READY-MIX

"the Willard Way"

MANUFACTURERS

New Western division manager

Ralph E. "Pat" Kramer, executive vice president of Hammond Iron Works, Warren, Pa., announces appointment of Fred J. Myers as general manager of the Western division, with headquarters at the Provo, Utah, offices.

Ryerson appoints manager at S. F.

Joseph T. Ryerson & Son, Inc., Chicago, Ill., has appointed Robert H. Wasz as general manager of its San Francisco steel service plant. He succeeds Wayne D. Dukette, who was recently appointed general manager at Los Angeles. Wasz has been in the Ryerson organization since 1942.

New Thew sales assignments

M. B. Garber, vice president-director of sales for The Thew Shovel Co., Lorain, Ohio, announces that George E. Gunther, formerly assistant sales manager, has been appointed sales manager of shovel and crane products. Other new Thew sales assignments include Wilson H. Madden, sales manager of special products, and Quincy J. Winsor, sales technical manager.

J. A. Hanratty dies

J. A. Hanratty, one of the five original founders of Pioneer Engineering Works,

FREE



Form Erection Drawings for owners of EFCO FORMS

In addition to free form erection drawings, here are other benefits enjoyed by owners of EFCO Steel Forms for concrete construction:

- Lifetime steel faces should never need to be replaced.
- Easy to handle and assemble.
- Saves time, material, money.
- Low original cost.

Other forms from Economy are available on a rental basis.

Write nearest office for catalog.

Economy Forms Corp.

H.P. Station, Box 128 DES MOINES, IOWA

NEAR-BY DISTRICT OFFICES:

Denver, Colo. 2883 Walnut

Los Angeles, Calif. 5718 Long Beach Ave.

Oakland, Calif. 190 MacArthur Blvd.

Other Offices Coast to Coast

Navy gets double savings with... Bitumuls Slurry Sealing of Runways at Jet Training Station



IN addition to accommodating propeller-driven aircraft, the Alameda (California) Naval Air Station is an important West Coast jet aircraft training center. The runways, surfaced with asphaltic concrete some four years ago, recently showed signs of weathering: some ravelling, minor hair-cracks on the surface, and some loose material. (This loose material threatened to become a major source of expense after jets started operating here. Small stones, sand, etc. can cause considerable damage, when scooped into jet engines.)

Dual Problem—The Navy was looking for answers to two problems: First, a method of extending the life of the pavement surface. Second, a means of cutting down the repair bills on jet engines. *They found a single answer to both these problems in Bitumuls Slurry Seal!*

Bitumuls Slurry Seal, composed of fine, sharp aggregate, Bitumuls and water, was mixed in transit-mix trucks to a free-flowing, slurry consistency, and applied by the squeegee action of a spreader-box. 350,000 sq. yards of runway and taxi-way were sealed in this manner. George Reed, a contractor from Modesto, California, was successful bidder on the job.

To offset the high abrasive action of the aircraft tires on landings, a dilute Bitumuls tack coat was placed ahead of the Slurry Seal to insure maximum adhesion.

Fast Application—The Bitumuls Slurry Sealing reduced interference with air traffic to a minimum. Planes at the Station were able to taxi over the fresh seal coat four hours after application. Jet aircraft landed on this new seal coat 24 hours after application!

"Meanwhile, Back at the Hangar..." In addition, an extra "bonus" economy will be realized because Bitumuls Slurry Seal has eliminated loose material from the runway. *The cost of*



BITUMULS SLURRY is chuted into spreader-box as mix-truck travels at speeds up to 5 MPH.

mechanical repairs occasioned by the induction of foreign material through the jet engines is expected to be sharply reduced!

A Proved Procedure—Bitumuls® Slurry Seal has been proved on many installations—on highways, streets, and airport runways. Call our nearest office for full information. It will be given gladly; and, of course, no obligation.



American Bitumuls & Asphalt Company

200 Bush Street, San Francisco 20, Calif.

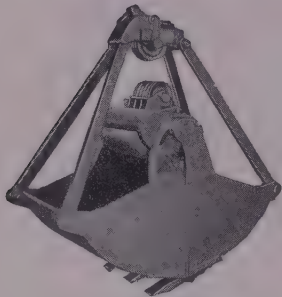
Baltimore 3, Md.
Mobile, Ala.
Inglewood, Calif.

St. Louis 17, Mo.
San Juan 23, P.A.
Oakland 1, Calif.

Perth Amboy, N. J.
Cincinnati 38, Ohio
Tucson, Ariz.
Portland 7, Ore.

**You can't beat these
buckets for work power!**

McCAFFREY All-welded **BUCKETS**



CLAMSHELL Extra sturdy, more yardage, more profit! Digging and re-handling types. **EXTRA LIGHT-WEIGHT BUCKET** designed for speedy stockpiling also available.



DRAGLINE Well balanced for deep bites, easy control, and clean dumping.



macGrab—combination magnet grapple handles any type of scrap, and rock. Cuts costs! Use with or without magnet.

MADE IN THE WEST

Quick delivery . . .

Freight savings . . .

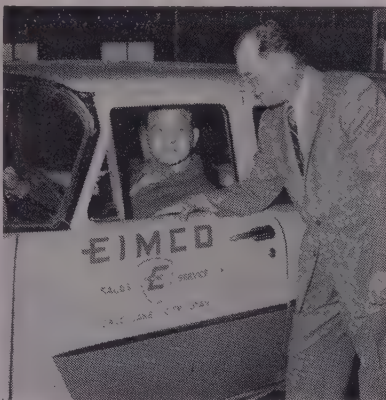
24 hour parts service.

M. P. McCAFFREY, INC.

2121 E. 25th Street - Los Angeles

Phone: LU 8-7181

Inc. (now Pioneer Engineering, Division of Poor & Company), Minneapolis, Minn., died recently at the age of 69. Retired from active work with Pioneer since 1953, Hanratty had continued as a consultant until recently.



KENNETH D. "KEN" LLOYD, left, recently appointed as Intermountain Region field service engineer for the Model 105 tractor division, Eimco Corporation, Salt Lake City, Utah. With him is **R. W. Young**, service manager.

Universal announces subsidiary

Universal Form Clamp Co. of Chicago, Ill., announces the opening of the Universal Form Clamp Co. of Canada, Ltd. The subsidiary company will be located at 226 Norseman St., Toronto, Ontario, with **J. D. Livingston** serving as manager.

White's Pacific regional meeting

Branch, distributor, and dealer personnel of the Pacific Coast Region of The White Motor Co. recently met in San Francisco for their 1957 regional meeting. Addressing the group of more than 175 persons, **Wilson D. Patterson**, White's vice-president in charge of the Region, introduced the executive group from Cleveland, who spoke on various phases of the company's merchandising plans. Presentations were made by **Robert F. Black**, chairman of the board; **J. N. Bauman**, president; **P. E. Tobin**, vice president in charge of sales; **Karl A. Roesch**, vice president in charge of the Autocar Division, and **W. L. Pepin**, director of service.

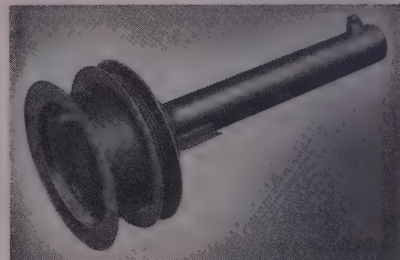
Management-sales personnel shifts

C. W. Turner, president of American Bitumuls & Asphalt Co., San Francisco, Calif., announces several shifts in management and sales personnel. **W. K. Smith** has been appointed to the position of district manager in St. Louis, Mo., succeeding **J. S. Felter**, who resigned. Replacing Smith as assistant district manager at Mobile, Ala., is **R. P. King**. Succeeding King in the Eastern division office is **R. L. Hoover**.

Calaveras expands services

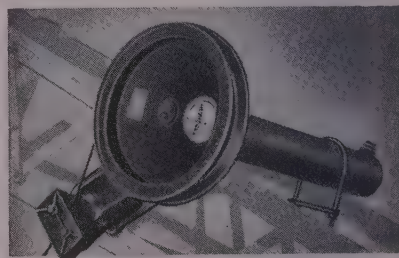
In a move to expand further its services to dealers and contractors, Calaveras Cement Co., San Francisco, has appointed **William G. Jeffrey** as sales manager and has set up two regional

2 ways to make crane operations pay more



1 **RUD-o-MATIC** Combination Magnet Reel-Tagline

Rud-o-Matic Combination Magnet Reel-Tagline saves expensive electric cable wear on overhead and boom crane jobs. Tension on the steel tagline cable keeps the strain from the expensive electric magnet cable. Now standard equipment with major crane manufacturers, the Rud-o-Matic Combination Magnet Reel-Tagline is made in five models to fit your present equipment. Insure complete tagline control on your crane with Rud-o-Matic!



2 **RUD-o-MATIC** Tagline

Crane operations are more profitable when you install Rud-o-Matic Taglines. Heavy duty torsion coil spring keeps tension on tagline cable at all times for bucket control. Buckets are held steady at any angle of the boom. Available in 11 models for various bucket sizes and pull out requirements. Taglines delivered fully equipped with fairlead and cable attached—ready to install. Get more pay loads per day with your crane with Rud-o-Matic Tagline Control!

For full information on Rud-o-Matic Taglines, call or write—

McCAFFREY-RUDDOCK
Tagline
CORPORATION

2131 East 25th Street • Los Angeles 58, California

divisions under the direction of experienced field men, according to Mel J. London, vice president in charge of marketing. With the company since 1949, Jeffery has been manager of dealer sales since 1954. The new regional division managers will be James Casey, former supervisor of contractor salesmen, and Jack Gordon, former contractor sales representative in Oakland.

New GMC engineers appointed

Appointment of Charles R. Lewis as an assistant chief engineer and Hans M. Gadebusch as a special projects engineer for GMC Truck & Coach Division, Pontiac, Mich., is announced by C. V. Crockett, chief engineer. Lewis has been with General Motors since 1934 and Gadebusch joined the company in 1925.

Barber-Greene executive appointments

Barber-Greene Co., Aurora, Ill., manufacturer of asphalt mixing and paving equipment, belt conveyors, ditchers, loaders, and other road building and materials handling equipment, announces the promotion of W. E. "Ned" Putz to the post of administrative assistant to E. H. Holt, vice president and director of sales. Putz was advertising manager and is succeeded by Charles E. Parkin.

Burton gets new Koehring post

Raymond E. Burton, assistant sales manager for Koehring Division, Milwaukee, Wis., has been appointed to the new post of assistant director of marketing for Koehring Company. His new duties will cover both market research and analysis, according to E. B. Hill, director of marketing.

Caterpillar names department heads

Eight department heads have been named to administer the Engine Division of Caterpillar Tractor Co.: Randall Roman, chief engineer; L. F. Redenius, manufacturing manager; W. N. Foster, market services manager; J. H. Gill, sales manager; W. E. Irwin, service manager; R. D. Norris, purchasing agent; K. J. Zerwekh, chief accountant, and E. H. Spaulding, employee relations manager.

Euclid tractor plant started

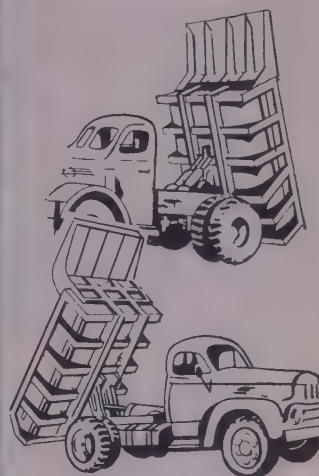
Especially designed for manufacture of crawler tractors for heavy construction and industrial use, Euclid Division of General Motors Corp., Cleveland, Ohio, is building a new 650,000-sq. ft. manufacturing plant which is expected to be in operation by July 1958. Three models of Euclid earthmovers, the TC-12 tractor, 218-hp. C-6 crawler, and the new Twin-Power TS-24 scraper were to be used in the actual ground-breaking for the excavation and filling.

West Coast plant produces new lines

The new West Coast materials handling plant now being completed at San Leandro, Calif., by The Yale & Towne Manufacturing Co., will produce a completely new line of Yale equipment, including heavy-duty gasoline fork-lift



TODAY'S BIGGEST VALUES IN ORE AND ROCK MOVERS



Marion rock bodies can be mounted with twin jack telescopic hoists (photo at left and top illustration) and with double arm underbody hoists (bottom illustration).

MARION ROCK BODIES and HOISTS . . . they're made to stand abuse

Designed for the severest type of service, Marions are built to take it under a shovel on all types of rugged off-highway operations.

Heavy steel armor plate combined with thick oak planking and on-the-job designing is assurance of "day-in day-out," long-life use from all Marion rock bodies. Together with heavy-duty Marion hoists, these rugged bodies will move big payloads fast with minimum downtime and maintenance costs. The result is substantial savings over a period of many years, making Marion rock bodies and hoists today's biggest values for handling rock and ore.

MARION

BODIES AND HOISTS

MARION METAL PRODUCTS CO.
MARION, OHIO, U.S.A.

SEE YOUR MARION DISTRIBUTOR AND SAVE!

M & F Equipment Co.
824 Arno St., N.E.
Albuquerque, New Mexico

Bogard GMC Company
2626 South Fourth Avenue
Tucson, Arizona

J. H. Holan Corp.
302 East Pima St.
Phoenix, Ariz.

Truck Body Company
2865 East 26th Street
Los Angeles 23, California

Ruckstell California Sales Co.
2985 Ford Street
Oakland 1, California

Ruckstell California Sales Co.
452 West Yolo
Fresno, California

Woeber Auto Body & Mfg. Co.
4950 Jackson St.
Denver 16, Colorado

Pacific Body Builders, Inc.
1812 N.E. Grand
Portland 12, Oregon

Alloy Manufacturing
Route No. 4 (West on U. S. 10)
Spokane, Washington

Washington Truck Equipment, Inc.
3626 Airport Way
Seattle 4, Washington

Erwin H. Johnson, Inc.
Box 1831, 1101 3rd St., N.W.
Great Falls, Montana

trucks with load capacity up to 20,000 lb., according to Vice President Elmer F. Twyman. Manager of the San Leandro plant is John T. McCarley, formerly of the Philadelphia plant.

Major expansion by Link-Belt Speeder

The second major expansion in two years which can increase by 40% its production of power cranes and shovels at its Cedar Rapids, Iowa, plant, is announced. David W. Lehti, president of Link-Belt Speeder Corporation, said the expansion will give the firm the capacity to take full advantage of the sales potential in the nation's long-range highway building program for its crawler and rubber-tired shovel-cranes.

J. C. Virden new board chairman

The retirement of Howard J. McGinn as chairman of the board of Eaton Manufacturing Co., Cleveland, Ohio, was recently announced, thus terminating 45 yr. of active association in various executive capacities with the automotive parts industry. John C. Virden, Eaton's president since January was elected chairman to succeed McGinn and will occupy the dual position of president and chairman.

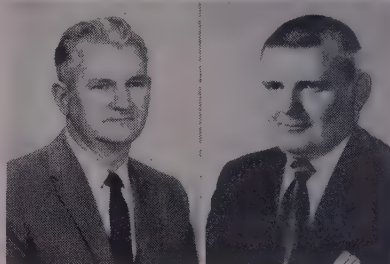
John Rowold leaves Mack Trucks

John C. Rowold, general manager—Western division, announces his retirement from direct connection with Mack Trucks, Inc., as of April 1, to join one

of Mack's largest distributors located at Winston-Salem, N. C. Rowold has been affiliated with Mack Trucks for a period of 40 yr. When J. A. Stoner retired in 1945 as vice president and division manager, Rowold replaced him at Los Angeles. For the past twelve years he has been in charge of Mack's operations in the Western states, with six factory branches and 54 distributors.

New Northwest factory representative

Appointment of John Scott as factory representative in the Pacific Northwest is announced by J. D. Anderson, general sales manager of The Jaeger Machine



Anderson

Scott

Co. Scott has been an employee of Jaeger at Columbus, Ohio, since 1951. He will now work with distributors of Jaeger construction machinery in Washington, Oregon, Idaho, Montana, and Wyoming, as well as western Canada and Alaska.

Two added to sales staff

Specialized Trailers & Machinery, Inc., North Hollywood, Calif., producer of heavy duty custom mobile equipment to order, combined with complete design service for developing specialized equipment to purchaser's specifications, has appointed E. V. "Dave" Davis, sales manager, and Frank Pender as sales representative. Davis has been identified with the truck and trailer business since 1921. His most recent connection was with a GMC dealership, calling on the trade in Los Angeles County. Pender has a background in the industry that includes tractor selling plus a knowledge of the entire mobile equipment business.

Thermoid building new plant

Thermoid Company, one of the nation's leading manufacturers of rubber and asbestos products for automotive and industrial uses, has started construction on its new West Coast distribution center in South San Francisco, Calif. This new San Mateo County operation will be the tenth in a nationwide network of distribution centers of the 75-year-old firm located at Trenton, N. J. A plant at Nephi, Utah, serves the Western United States. Thermoid's San Francisco sales and warehousing organization, headed by O. J. Sand, will move from its present location at 544 Second St., on completion of the new plant.

Thor expansion creates new post

Establishment of an industrial division manager as a separate position in Thor Power Tool Co.'s expansion program

3,000,000

gallons of poured asphalt



...and no repairs to this distributor's

WISCONSIN

Air-Cooled ENGINE

Quite a service record for this model VG4D 36 hp. Wisconsin Engine! It powers a distributor built by Standard Steel Works, Inc., North Kansas City, Missouri. A total of 3,000,000 gallons of asphalt have been poured by the distributor without making a single engine repair. The Wisconsin Engine drives a 375 GPM asphalt pump through a two-speed transmission and operates a high capacity blower, servicing

two low pressure instant atomizing burners.

Don't be misguided. Here is positive proof that a Wisconsin Air-Cooled Engine is right for this kind of duty. On most models, a Wisconsin Engine substantially reduces cost and you have no cooling problems even in temperatures up to 140°F.

Write for complete details . . . bulletins S-143 and S-212.

WISCONSIN MOTOR CORPORATION

MILWAUKEE 46, WISCONSIN, U. S. A.

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



and appointment of William J. Laughlin, Los Angeles branch manager to fill the new office, is announced by Neil C. Hurley, Jr., president. Laughlin, Los Angeles manager since January 1953, is being transferred immediately to the company's new executive offices in Chicago and his place at Los Angeles is being filled by Clarence H. Gabriel, who was Denver manager. Mark A. Sorenson, Philadelphia manager, succeeds Gabriel at Denver.

Rocky Mountain sales representative

Edwin Extract was recently appointed by Chain Belt Co., Rex Construction Machinery Division, as district sales representative of the Rocky Mountain territory, one of three newly formed districts. Located in Denver, Extract will be responsible to Robert Krikorian, sales manager of the division in Milwaukee.

New cement plant at Albuquerque

A new cement plant near Albuquerque, N. Mex., is planned. Ideal Cement Co., Denver, Colo., has decided to build a 1,000,000-bbl. annual capacity plant, with provision made for doubling capacity if desired. Cost of this first stage construction is estimated at between \$10,000,000 and \$12,000,000, with completion scheduled for early 1958.

Allis-Chalmers promotes salesman

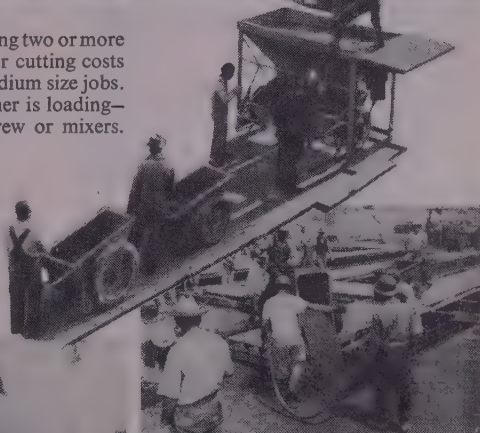
Donald F. Bryant is appointed assistant construction machinery sales man-

Use Production Line Methods FOR HANDLING CONCRETE



SETTING A FASTER PACE by using two or more concrete buckets is a method for cutting costs used by many contractors on medium size jobs. While one is discharging the other is loading—there is no delay of placing crew or mixers.

FLOOR HOPPERS keep concrete carts moving by serving as storage for concrete. Fill them direct from truck mixer or by bucket if in elevated position.



POWER-CARTS, because they carry more, travel faster and are non-fatiguing, can place 4 to 5 times as much concrete per hour as a push cart even at hauling distances of 1000 feet.

PORTABLE HOPPERS move from job to job easily and save hours of time all the way down the line from mixer to placing crew to finishers because it eliminates waiting time and delay.

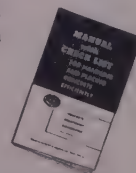
New power operated **CRANE HOOKS** are electrically controlled from the crane cab. They are ideal for picking up and releasing each individual bucket when several buckets are used.

GAR-BRO MANUFACTURING CO. • Los Angeles, California • Peoria, Illinois
General Offices: 2415 East Washington Boulevard, Los Angeles 21, California

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Ask your dealer for
the Gar-Bro Manual...

the world's most complete line of CONCRETE HANDLING EQUIPMENT



EASY TO REPLACE ON THE JOB

Tamprite Tips

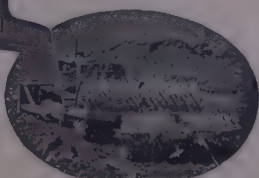


NO WELDING!

DRIVE OFF WORN TIPS
DRIVE ON NEW TIPS

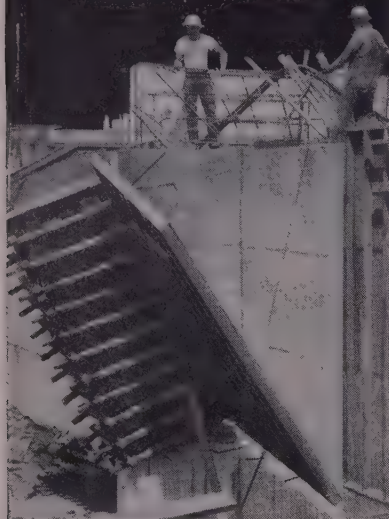
PREVENT COSTLY DELAYS by equipping your sheeps foot rollers with Tamprite Tips and Shanks. Simple to replace on the job. Available for immediate delivery. Write for information.

PATENT NO.
2131041



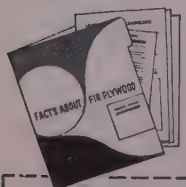
LOS ANGELES
STEEL CASTING CO.
6100 So. Boyle Avenue, Los Angeles 58, California

**CUT
COSTS
up to
20%**



FIR PLYWOOD concrete forms shave weeks off work schedules . . . cut form construction, erection and stripping time by as much as 20%. Can be used over and over. Every feature makes it ideal for faster construction. Fir Plywood is large, light, rigid, easy to work. Ideal for cost-cutting panelized form sections. Fir Plywood forms reduce finishing costs, too . . . form smooth, fin-free concrete surfaces.

specify 
Fir Plywood
CONCRETE FORMS



FREE: New portfolio to help you design and use fir plywood forms. Contains complete specification, construction and design data. (Offer good USA Only)

DOUGLAS FIR PLYWOOD ASSOCIATION
Dept. 150, Tacoma 2, Wash.
Please send new Fir Plywood Concrete Form Portfolio

Name _____
Firm _____
Address _____
City _____ Zone _____ State _____

ager at the Los Angeles, Calif., branch of the Tractor Group, Allis-Chalmers Manufacturing Co., Milwaukee, Wis. Until now he was construction machinery salesman at the branch.

Friedrich named LeT-WESCO rep
Appointment of A. E. "Dolf" Friedrich as district representative for LeTourneau-Westinghouse Co. in the states of Oregon, Idaho, and

**A. E.
Friedrich**



Nevada is announced from company headquarters in Peoria, Ill. The territory which Friedrich will serve is one which has been newly created in the firm's sales organization as a result of increased business in the area. Friedrich's headquarters are in Portland.

Briggs named GM Diesel service mgr.
Appointment of D. H. Briggs as service manager of GM's Detroit Diesel Engine Division is announced by Robert E.

Hunter, general sales manager. Briggs joined General Motors in 1935 and was one of the original Detroit Diesel employees when the Division was organized in 1937.

Executive appointments by Wisconsin

H. A. Todd, president of Wisconsin Motor Corp., Milwaukee, announces appointment of two new vice presidents: F. Burrows Esty, chief engineer, and Ray J. Fellows, sales manager.

Symons Clamp Western branch

Principal personnel at the San Leandro Branch of Symons Clamp & Manufacturing Co. include J. Frank Pearson, division manager;

**J. F.
Pearson**



Robert P. Tross, chief engineer; Harry Barber and Ed Boston, both sales engineers for Northern California; and Bob Ashesen, sales engineer for Southern California.

(Advertisement)



Symons Forms Speed Concrete-Pouring on Radiation Laboratory at Berkeley

Symons Forms, steel scaffold brackets and other accessories were used by Leo S. Holm, contractor, to meet rigid time schedule on two additions to the Radiation Laboratory at the University of California. Joe Benetti, superintendent on the job, was particularly impressed with the quick and easy manner which Symons Forms can be stripped and moved from pour to pour.

Symons "Champ" Form was used for the major part of this job. The "Champ" is an inexpensive wood-ply form and is provided with handles for easy handling . . . It costs approximately 20 per cent less than Symons Standard Form. Only three basic pieces of hardware are used with Symons Forms . . . form tie, connecting bolt and wedge. This simple hardware makes possible substantial saving in labor.

Symons Forms being adaptable to any type general construction and for any height wall, can help you save considerable on your forming costs. Our Representatives and Engineers can help you with any forming problem. Symons Forms can be rented with purchase option. Symons Clamp & Mfg. Co., 634 Williams St., San Leandro, California. Phone: LOckhaven 9-9159.

The Strange Case of Oliver Dancer

(He thought he had cancer.)

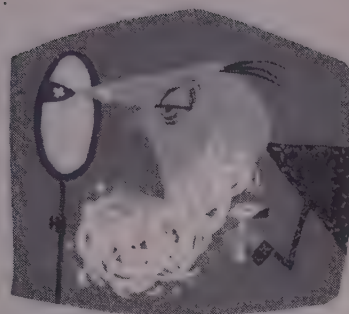
OR

You can't be your own doctor

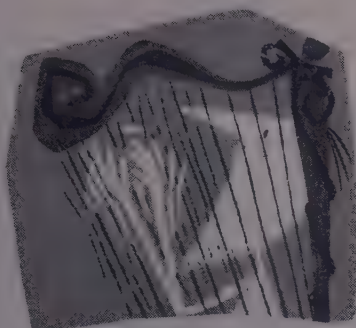
1. This is the story of an ordinary man . . . worked from 9:00 to 5:00 . . . raised hamsters in his spare time . . . steered clear of doctors.



2. Oliver did twenty push-ups every morning . . . took long bracing walks in the fresh air . . . made sparing use of condiments and stimulants.



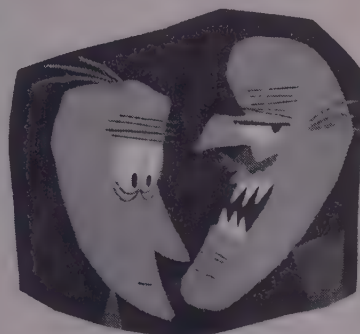
3. Then one day while he was shaving, he noticed a small lump. An icy hand reached out and clutched at his heart . . . This was it—CANCER!



4. Overnight Oliver became a changed man. He gave his hamsters to a neighbor, bought a small harp and a booklet entitled "Harp-playing for Beginners."



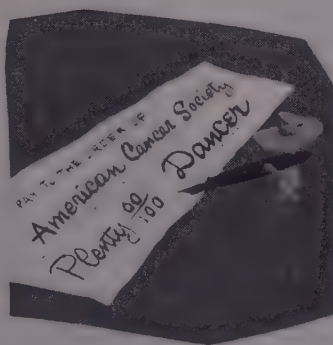
5. Instead of taking long bracing walks, he tottered into his lawyer's office, cut two nephews out of his will and hastily added a couple of codicils.



6. His lawyer, a man of real intuition, knew that where there's a will there's a way, and firmly bullied Dancer into seeing a doctor.



7. A complete checkup showed he was in perfect health, except for a minor tone deafness that would preclude much skill with the harp.



8. Dancer was so overjoyed he promptly went home and made out a very large check to the American Cancer Society, and that's what you should do, too.

AMERICAN CANCER SOCIETY

Gentlemen:

I WANT TO HELP CONQUER CANCER

☐ Please send me free information about Cancer.

☐ Enclosed is my contribution of \$..... to the Cancer Crusade.

NAME.....

ADDRESS.....

CITY..... STATE.....

9. (MAIL TO: CANCER, c/o your town's Postmaster.) Help others and help yourself. Fight Cancer with a checkup and a Check.

DISPLAYED recently at the Loggers Show in Sacramento, Calif., is this new hydraulic outrigger designed and built by Insley Manufacturing Corp. Outriggers can be set or retracted independently of each other or both operated at the same time, and can be operated to set position or to retract position in 32 seconds. Pointing out the floater design is Lee R. Smith (left), Western representative for Insley Manufacturing Corp., Indianapolis, Ind. ➡



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PROCESS**

MEMBRANE CURING COMPOUNDS

- 1 **HUNT PROCESS CLEAR**—For natural concrete color.
- 2 **HUNT PROCESS "TILT-UP"**—For curing and bond breaking in TU or precast construction. Paintable.
- 3 **HUNT PROCESS BLACK**—Cures, waterproofs. Blended asphalts with pigments in petroleum solvent.
- 4 **HUNT PROCESS PIGMENTED**—White or gray. Pigments in curing compound produce heat reflecting film.

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"Spray it and forget it"

HUNT PROCESS CO., INC.

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Joy opens in Seattle

On April 1, Joy Manufacturing Co. opened a new Seattle office at 221 Western Ave., with W. G. Didrichsen representing the Mining and Construction Division, and C. C. Ballard representing the Industrial Division.

Tusky Hoist names national sales mgr.

Tusky Hoist, a division of Tubular Structures Corp. of America, Los Angeles, Calif., has appointed Charles D. Clark as its national sales manager. In



**Charles D.
Clark**

this capacity, Clark will coordinate the sales activities of Tusky Hoist's national network of distributors, and will assist the broadening requirements of Tusky distributors throughout the United States and Hawaii.

American Chain names DeCredico

Paul D. Steele, district manager of American Chain & Cable Co., Inc., Denver, Colo., announces the appointment of Seal DeCredico as field representative of American Chain & Cable Co., Inc.,



**Seal
DeCredico**

Wire Rope Division, to travel and service the states of Colorado, Wyoming, and the Deadwood region of South Dakota. DeCredico spent many years with the Leschen Wire Rope Co., and has a large circle of friends in the above territory.

UNIT PRICES

Selected abstracts for Western projects

DAM—Glen Canyon Dam, Colorado River Storage Project

Arizona—Coconino County—Bureau of Reclamation. Merritt-Chapman & Scott Corp. of New York was low bidder at \$107,955,522 for construction of Glen Canyon Dam including the powerplant, appurtenant works, access and service roads. The following is a selected abstract of unit bids.

Engineer's estimate.....\$135,608,170

(1) Merritt-Chapman & Scott Corp..... 107,955,522

(2) Glen Canyon Contractors..... 118,336,476

A joint venture consisting of:
Guy F. Atkinson Co.
American Pipe and Construction Co.
Arundel Corp.
L. E. Dixon Co.
Chas. L. Hatney, Inc.
Ostrander Construction Co.
Hunkin Conkey Construction Co.
Isbell Construction Co.
J. A. Jones Construction Co.
W. A. Kettlewell, Inc.

Morrison-Knudsen Co..... 120,178,853

Henry J. Kaiser Co.
Peter Kiewit Sons Co.
Brown & Root, Inc.
Perini Corp.
Perini Limited
The Shea Co.
Ralph E. Mills Co.
F & S Contracting Co.

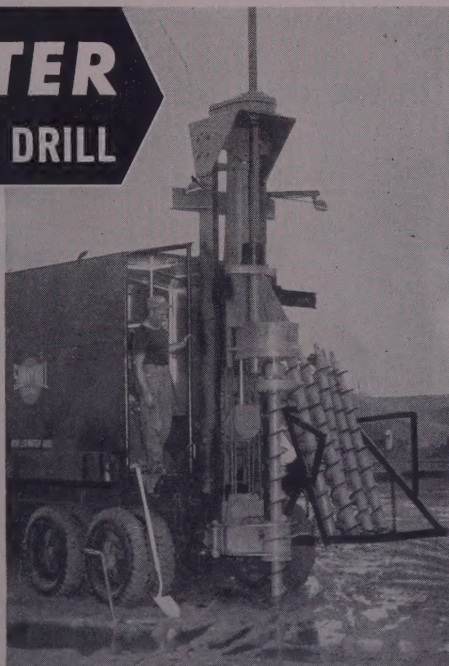
DAM, POWERPLANT AND APPURTENANT WORKS

	(1)	(2)
Lump sum		
5,000 cu. yd.	10.00	17.80
Diver. and care of river dur. const. & unwt. founda.	\$3,674,145.00	\$5,700,000.00
Removal of rock slabs from canyon walls.....		

500,00 cu. yd.	Excav., com., in open cut for dam, pwrplnt & appurt. works, 1st 500,000 cu. yd.	3.30	3.90
485,000 cu. yd.	Excav., com., in open cut for dam, pwrplnt & appurt. wks., over 500,000 cu. yd.	.60	1.90
800,000 cu. yd.	Excav., rock, in open cut for dam, pwrplnt. & appurt. works, 1st 800,000 cu. yd.	5.00	6.96
850,000 cu. yd.	Excav., rock, in open cut for dam, pwrplnt. & appurt. wks., over 800,000 cu. yd.	1.50	4.00
130,000 cu. yd.	Excav., all classes, in open cut for diversion tunnels.	3.00	3.90
950,000 cu. yd.	Excav., all classes, in open cut for spillways..... (Deleted by Supplemental Notice No. 12)	4.00	1.22
	Excav., all classes, for transf. circuits clearance		
16,700 cu. yd.	Excav., com., in open cut for switchyard.....	5.00	1.20
24,200 cu. yd.	Excav., rock, in open cut for switchyard.....	5.00	2.50
158,000 lin. ft.	Drill. line hls. for rock excava.	1.00	1.25
182,000 cu. yd.	Excav., all classes, in diversion tunnels.....	20.00	15.00
132,000 cu. yd.	Excav., all classes, in spillway tunnels.....	20.00	16.00
4,500 cu. yd.	Excav., all classes, in foundation tunnels.....	30.00	48.00
3,200 cu. yd.	Excav., all classes, in control tunnel.....	35.00	49.00
780,000 lb.	Furn. and plac. perm. structural-steel tunnel support.	.30	.26
13,000 lin. ft.	Furn. and instal. tun. roof support bolts.....	6.00	2.95
3,000 sq. yd.	Furn. and instal. chain-link fabric for tun. roof supp.	9.00	2.70
343,000 cu. yd.	Backfill.....	1.00	1.10
17,600 cu. yd.	Const. embank. for stchyard	2.00	.38
850 cu. yd.	Rock fill adjacent to pwrplnt	15.00	9.00
11,000 cu. yd.	Riprap.....	2.50	3.90
18,000 cu. yd.	Compacted backfill.....	2.00	1.75
250 lin. ft.	Core drill. NX holes in stage bet. depths of 0 ft. & 50 ft.	6.00	8.90

40% FASTER THAN ANY OTHER DRILL

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Clyde Equipment Company.....1631 N.W. Thurman St.,
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Montana Powder & Equipment Co...123 E. Lawrence St.,
Helena, Montana
Hall-Perry Machinery Co.....802-812 East Iron St.,
Butte, Montana

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Intermountain Equipment Co...Broadway at Myrtle St.,
Boise, Idaho
Intermountain Equipment Co.....P. O. Box 151,
Pocatello, Idaho

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Union Supply Co..5460 Colorado Blvd., Denver 16, Colo.

NEW MEXICO

Contracting Equipment & Supply Co...Broadway, N. E.
(707), Albuquerque, N. M.

ARIZONA

Western Machinery Co..820 N. 17th Ave., Phoenix, Ariz.

UTAH

Western Machinery Co.....2300 S. Main St.,
Salt Lake City 15, Utah

NEVADA

Sierra Machinery Co. Inc...307 Morrill Ave., Reno, Nev.

ALASKA

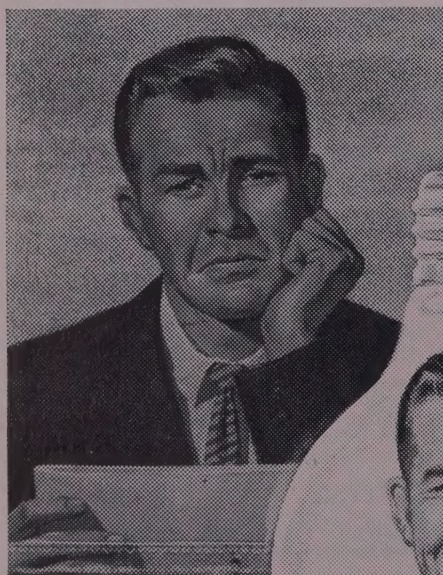
The Carrington Co...91 Columbus St., Seattle 4, Wash.



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THE SALEM TOOL CO.

791 South Ellsworth Ave., Salem, Ohio

250 lin. ft.	Core drill. NX holes in stage between depths of 50 ft. and 100 feet.....	6.00	8.90	44,000 lin. ft.	Drill. holes for anchor bars and grouting bars in place	2.50	1.90
500 lin. ft.	Core drill. NX holes in stage between depths of 100 ft. and 200 ft.	7.00	8.90	120,000 bbl.	Furn. and handling cement.	6.60	7.00
200 lin. ft.	Core drill. 5½ in. dia. holes not more than 50 ft. deep	9.00	18.50	4,400 sq. yd.	Special finish. of conc. surf.	20.00	38.50
48,000 lin. ft.	Drill. grout holes in stage bet. depths of 9 ft. & 30 ft.	4.00	2.50	19,900,000 lb.	Detailing, furn. and placing reinforcement bars.....	.15	.19
15,000 lin. ft.	Drill. grout holes in stage bet. depths of 30 ft. & 60 ft.	3.50	2.60	9,000,000 lb.	Furn. and placing reinf. bars	.15	.19
12,000 lin. ft.	Drill. grout holes in stage bet. depths of 60 ft. & 110 ft.	3.50	2.90	2,400,000 cu. yd.	Conc. in dam, first 2,400,000 cubic yards.....	11.00	15.38
7,000 lin. ft.	Drill. grout holes in stage bet. depths of 110 ft. & 160 ft.	3.50	3.25	2,370,000 cu. yd.	Conc. in dam, over 2,400,000 cubic yards.....	9.50	5.75
2,000 lin. ft.	Drill. grout holes in stage bet. depths of 160 ft. & 210 ft.	4.00	3.60	1,600 cu. yd.	Con. in sidewlks & parapets	120.00	88.50
1,500 lin. ft.	Drill. grout holes in stage bet. depths of 210 ft. & 260 ft.	4.00	4.00	1,000 cu. yd.	Con. in elevator towers and vista canopies.....	150.00	160.00
1,000 lin. ft.	Drill. grout holes in stage bet. depths of 260 ft. & 310 ft.	4.00	5.00	170 cu. yd.	Conc. in gate hoist and stem stor. platf. and gate erect. platform.....	70.00	88.00
500 lin. ft.	Drill. grout holes in stage bet. depths of 310 ft. & 360 ft.	4.00	5.20	17,000 cu. yd.	Con. in trashracks and gate-hoist structure.....	130.00	138.00
318,000 lb.	Furn. & plac. met. pipe & fit. for found grtg & drain	.60	.58	500 cu. yd.	Second-stage conc. in ring-followed gate chambers...	20.00	44.00
1,800 hook-ups	Hook-ups to founda. & tunnel grout holes.....	20.00	26.00	1,900 cu. yd.	Concrete in blockouts.....	100.00	140.00
44,000 sacks	Pres. grtg. founda. & tunnels	3.00	3.00	4,200 cu. yd.	Conc. in floors of spillway chan. downstream from downstream tunn. portals	25.00	29.00
755,000 lb.	Furn. & instal. met. tubing & fit. for grtg. cont. jnts.	.75	.60	470 cu. yd.	Con. in spillway hoist bridges	90.00	192.00
700 hook-ups	Hook-ups to contract. joint grouting systems.....	30.00	55.00	7,000 cu. yd.	Con. in cests of a spillway intake structures.....	35.00	33.35
45,500 sacks	Pres. grtg. contrac. joints & cooling systems.....	3.00	2.40	16,000 cu. yd.	Con. in walls and piers of spillway intake structures	30.00	33.35
8,000 lin. ft.	Drill. drain. holes in stage bet. depths of 0 ft. & 25 ft.	5.00	4.00	17,000 cu. yd.	Con. in lining of right diversion tunnel.....	36.00	57.00
7,200 lin. ft.	Drill. drain. holes in stage bet. depths of 25 ft. & 50 ft.	5.00	4.00	44,000 cu. yd.	Con. in lining of left diversion tunnel.....	37.00	51.00
6,000 lin. ft.	Drill. drain. holes in stage bet. depths of 50 ft. & 75 ft.	5.00	4.50	15,500 cu. yd.	Con. in lining of spillway tunnels upstream of Sta. 26+11.72.....	40.00	75.00
5,000 lin. ft.	Drill. drain. holes in stage bet. depths of 75 ft. & 100 ft.	4.00	4.50	17,500 cu. yd.	Con. in lining of tight spillway tunnel downstream of Sta. 26+11.72.....	40.00	48.50
2,000 lin. ft.	Drill. drain. holes in stage bet. depths of 100 ft. & 150 ft.	4.00	5.85	33,000 cu. yd.	Con. in lining of left spillway tunnel downstream of Sta. 26+11.72.....	40.00	47.00
1,000 lin. ft.	Drill. drain. holes in stage bet. depths of 150 ft. & 200 ft.	4.25	7.00	200 cu. yd.	Concrete in tunnel plugs and backfill concrete.....	30.00	25.00
500 lin. ft.	Drill. drain. holes in stage bet. depths of 200 ft. & 250 ft.	4.25	8.00	10,000 cu. yd.	Conc. in gutt. & drop inlets	50.00	160.00
18,000 lin. ft.	Drill. drain. holes in spillway tun. to a depth not to exceed 25 ft.	6.00	8.00	800 cu. yd.	Concrete in p-nstock supports and vaults.....	35.00	55.00
750 lin. ft.	Constr. 8 in. dia. sewer-pipe drains with open joints.....	4.00	5.50	24,000 cu. yd.	Con. in floors of founda. tun. Mass conc. beneath mach. shop.....	16.00	48.00
500 lin. ft.	Furn. & lay. sewer pipe with calked joints.....	5.00	7.00	180 cu. yd.	Conc. in river outlets valve structure superstructure.....	10.00	14.00
1,000 lin. ft.	Construct. split sewer-pipe drains with cem. joints...	10.00	4.75	9,200 cu. yd.	Conc. in gravity-type walls	90.00	110.00
20 cu. yd.	Porous concrete.....	150.00	125.00	7,600 cu. yd.	Conc. in line drill-type walls	17.00	24.00
				19,000 cu. yd.	Mass conc. around river outlet pipes & in valve structure substructure.....	25.00	32.00



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60,000 cu. yd.	Mass conc. for powerplant struc., except mach. shop	12.00	12.00
35,000 cu. yd.	First-stage conc. in power-plant structure.....	14.00	48.00
45,400 cu. yd.	First-stage conc. in power-plant intermediate struct.	50.00	60.00
550 cu. yd.	Conc. in powerplant structure cover slabs.....	55.00	70.00
5,400 cu. yd.	First-stage conc. in power-plant superstructure.....	120.00	196.00
52,600 sq. ft.	Cast-in-place or precast-conc. powerplant superstructure walls.....	6.00	10.00
220 lin. ft.	Drill. 10 in. dia. core specimens in concrete.....	60.00	45.00
4,650,000 lin. ft.	Furn. and plac. 1 in. outside dia. metal pipe or tubing and fittings for concrete cooling systems.....	.27	.24
180,900 lin. ft.	Furn. and placing 1½ in. stand. pipe and fittings for concrete cooling systems.	.60	1.00
600 lin. ft.	Constr. Type A cont. joints	10.00	3.00
750 sq. ft.	Furn. and placing ½ in. bituminous joint filler.....	2.00	2.25
750 sq. ft.	Furn. and placing ½ in. sponge rubber joint filler	4.00	4.50
4,400 sq. ft.	Furn. and placing 2 in. spge. rubber joint filler.....	5.00	7.50
52,000 sq. ft.	Furn. and placing 1 in. cork-board joint filler.....	1.00	2.25
1,600 sq. ft.	Furn. and placing ½ in. corkboard joint filler....	.80	3.25
510 lin. ft.	Furn. and installing rubber jnt. strips with metl straps	8.00	4.50
1,000 lin. ft.	Furn. and installing rubber jnt. strips without metal straps.....	5.00	4.00
250 lin. ft.	Furn. and placing Type D rubber water-stops.....	4.00	4.50
3,100 lin. ft.	Furn. and placing Type E rubber water-stops.....	5.00	6.75
8,000 lin. ft.	Furn. and placing Type F rubber water-stops.....	5.00	4.00
124,000 lin. ft.	Furn. and placing met. seals in dam.....	3.00	2.20
12,000 lin. ft.	Furn. and placing met. seals, Type N2, in powerplant.	3.30	6.00
54,500 lin. ft.	Furn. and placing met. grout groove covers.....	3.00	1.00
1,900 lin. ft.	Constructing asphalt seals.	7.00	20.00
6,500 sq. yd.	Furn. and applying concrete floor hardener.....	1.50	.70
24,000 sq. ft.	Furn. and placing membrane waterproofing.....	1.00	1.00
1,400 sq. yd.	Furn. and applying 2-coat asph.-emul. dampproofing	2.00	1.70
65,000 sq. ft.	Furn. and installing precast-concrete roof slabs.....	1.50	2.00
62,000 sq. ft.	Furn. and plac. roof insula.	.80	.75
67,000 sq. ft.	Furn. and plac. 4-ply, asph.-saturated built-up roofing	.60	1.20
1,200 cu. yd.	Sand fills for pwrplnt roofs	7.00	7.50
135 mbm.	Furn. and installing protective timb. cov. for power-plant roofs.....	400.00	440.00
10,700 sq. ft.	Furn. and placing asphalt board and fabric roofing.	1.00	1.20
4,250,000 lb.	Furn. and erecting steel for powerplant superstructure	.20	.34
600 sq. ft.	Furn. and install. aluminum rolling door.....	10.00	13.50
7,250 sq. ft.	Furn. and install. aluminum windows.....	7.00	9.00
75 sq. ft.	Furn. and installing fixed stormproof louvers.....	6.00	35.00
300 sq. ft.	Furn. and install. operable stormproof louvers.....	9.00	37.50
400 sq. ft.	Furn. and install. automatic louvers.....	12.00	40.00
184,500 lb.	Furn. and installing cast-iron soil pipe and fittings	.60	.52
3,900 lb.	Furn. and installing cast-iron bell traps.....	.60	1.10
160,000 lb.	Furn. and installing cast-iron bell-and-spigot and flanged pipe, wall pipes, and fittings.....	.35	.70
3,000 lb.	Furn. and install. wrought-iron pipe and fittings 2 in. and smaller in nom. dia.....	1.00	.90
80,500 lb.	Furn. and install. wrought-iron pipe and fitt. 2½ in. and larger in nom. dia.....	.75	1.20
50 lb.	Furn. and installing valves 2 in. and smaller in nom. dia.....	20.00	4.00
20,000 lb.	Furn. and installing valves 2½ in. and larger in nom. dia., ex. draft-tube drain valve.....	1.50	1.20
8 valves	Furn. and install draft-tube drain valves.....	3,000.00	850.00
705,500 lb.	Install. metal pipe, fittings, and valves.....	.50	.48
16 g.atings	Furn. and install. gratings for draft-tube pieces.....	600.00	750.00
Lump sum	Installing 4 oil storage tanks	20,000.00	3,900.00
141,000 lb.	Install. nonembedded metal-work.....	.25	.45
72,470 lb.	Install. emb'dded mtlwork	.30	.45
61,000 lb.	Installing anchor bolts.....	.50	.75
232,000 lb.	Installing stairways.....	.30	.48
1,880,000 lb.	Install. trashracks and slot closures.....	.14	.06
12,800 lb.	Installing pipe handrail....	.75	.40
197,000 lb.	Installing track for 190-ton gantry crane.....	.20	.07

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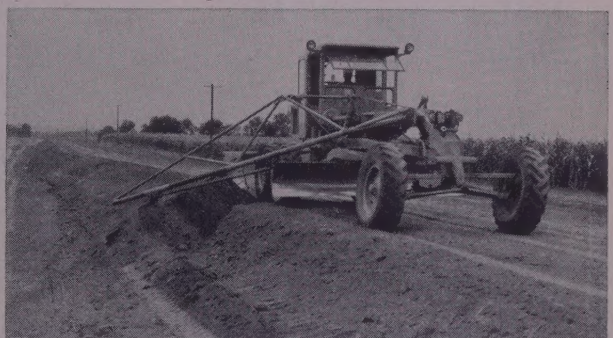
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GRADE-MORE
SLOPE GRADER

quickly cuts and finishes slopes and shoulder lines!



Saves close bids . . . and your "Profit-Margin" by cutting FINISHING TIME and COST!

The most sensibly-priced attachment in construction work . . . GRADE-MORE saves investment money! Then it saves on the more-costly equipment it replaces. It cuts and finishes grades, slopes and shoulder lines, to the finest specs . . . leaves ditches clean . . . while handling material ONCE! And the time saved means MONEY to you!

GRADE-MORE'S 16-foot, one-piece moldboard cuts slopes from minus 1 to 1, to horizontal . . . reaches 12 feet down slope. Folds in close for fast, easy road-transport! Initial installation requires only 3 man-hours . . . no extra cost!

13 models fit individual Adams, Allis-Chalmers, Caterpillar, Galion

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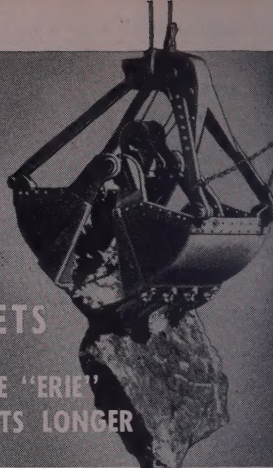
70 lin. ft.	Furn. and erect. chain-link fences.....	8.00	7.50
330,000 lb.	Furn. and install. miscell. metalwork in powerplant and machine shop.....	.74	.65
Lump sum	Installing cranes.....	45,000.00	250,000.00
Lump sum	Testing cranes.....	20,000.00	15,000.00
21,000,000 lb.	Installing penstock outlet pipes, and bellmouths...	.14	.15
Lump sum	Install. bulkhead gate frames and anchor bolts.....	21,741.00	10,000.00
Lump sum	Installing fixed-wheel gate frames and anchor bolts...	30,500.00	120,000.00
Lump sum	Install. bulkhd. gate in outlet works.....	69,600.00	3,600.00
Lump sum	Install. 8 fixed-wheel gates in penstock intakes.....	263,200.00	200,000.00
Lump sum	Install. high-pressure gates and metal transitions....	9,600.00	35,000.00
Lump sum	Install. control equip. and piping for high-pies, gates...	39,400.00	7,000.00
Lump sum	Furn. and installing 2 slide gates, lifts, and anch. blts.	560.00	6,500.00
Lump sum	Furn. and install. 2 flap gates	244,200.00	2,000.00
Lump sum	Install. fixed-wheel penstock gate hoists.....	225,000.00	98,500.00
Lump sum	Installing radial-gate hoists.	100,000.00	40,000.00
Lump sum	Install. radial gates and embedded metalwork.....	245,000.00	220,500.00
Lump sum	Install. four 96 in. hollow-jet valv., adapters, and cont.	89,800.00	48,000.00
Lump sum	Installing four 96 in. ring-follower gates, complete with hoists.....	95,000.00	100,000.00
Lump sum	Install. ring-follower gate and fixed-wheel gate hoist controls.....	45,000.00	50,000.00
Lump sum	Install. draft-tube bulkhead gates.....	65,000.00	24,000.00
1,005,000 lb.	Install. seats and guides for stop-logs and draft-tube bulkhead gates.....	.20	.17

ACCESS HIGHWAY

20,500 cu. yd.	Excavation for roadway....	1.25	35,875.00
1,500 M. gal.	Watering.....	5.00	6,300.00
160 roller hr.	Rolling embankments.....	25.00	4,000.00
7,500 mi. cu. yd.	Overhaul of exca. for rdway.	.40	4,125.00
Lump sum	Special comp. of roadway embank. at bridge abut....		1,400.00
10 cu. yd.	Excavation for roadway....	100.00	106.00
60 cu. yd.	Compacted backfill for roadway structures.....	8.00	510.00
17 cu. yd.	Concrete in bridge sidewalks	125.00	1,700.00
2,800 lb.	Install. met. bridge railing.	1.50	1,680.00
106 lin. ft.	Furn. and lay. 24 in. dia. No. 16-ga. corr.-metal pipe..	10.00	1,272.00
1,065 ton	Crushed-rock base.....	8.00	3,727.50
113 ton	Cover coat material.....	20.00	565.00
4 ton	Liquid asphalt MC-2.....	350.00	440.00
4 ton	Liquid asphalt MC-4.....	400.00	110.00
875 lin. ft.	Furn. and erect. beam-type guardrail.....	4.00	5.50

SERVICE ROADS

208,000 cu. yd.	Excavation for roadway....	3.00	1.50
13,200 cu. yd.	Excav., open cut, for roadway tunnel approaches....	4.00	2.20
3,100 cu. yd.	Excav. in partial roadway tunnel section.....	5.00	5.00
151,000 cu. yd.	Excav. in roadway tunnel and adits.....	20.00	18.50
30,300 cu. yd.	Excav. for roadway in talus	7.00	2.00
320 M. gal.	Watering.....	6.00	6.00
34 roller hr.	Rolling embankments.....	15.00	25.00
800 cu. yd.	Excav. for roadway structure	7.00	7.50
330 cu. yd.	Compact. backfill for roadway structures.....	3.00	9.00
340,000 lb.	Furn. and plac. perm. struct. steel supp. for roadway tunnel and adits.....	.40	.26
30 mbm.	Furn. and plac. perm. timbr. lagg. and struts for roadway tunnel.....	500.00	300.00
6,400 lin. ft.	Furn. and install. roadway tunn. roof support bolts.	7.00	2.95
2,200 sq. yd.	Furn. and install. chain-link fabric for roadway tunnel roof support.....	6.00	2.70
135 lin. ft.	Furn. and lay. 12 in. dia. No. 16-ga. corr.-metal pipe..	7.00	7.00
32 lin. ft.	Furn. and lay. 15 in. dia. No. 16-ga. corr.-metal pipe..	8.00	8.00
800 lin. ft.	Furn. and lay. 18 in. dia. No. 16-ga. corr.-metal pipe..	10.00	9.00
390 lin. ft.	Furn. and lay. 24 in. dia. No. 16-ga. corr.-metal pipe..	13.00	10.00
470 lin. ft.	Furn. and lay. 30 in. dia. No. 12-ga. corr.-metal pipe..	15.00	16.00
40 lin. ft.	Furn. and lay. 48 in. dia. No. 12-ga. corr.-metal pipe..	28.00	25.00
110 cu. yd.	Conc. in serv. bridge abutts.	100.00	65.00
310 cu. yd.	Conc. in serv. bridge decks.	90.00	120.00
400 cu. yd.	Conc. in rdway. tun. portals	75.00	126.00
100 cu. yd.	Concrete in drop inlets and manholes for roadway...	200.00	320.00
200 lin. ft.	Drill. holes for anchor bars and grout. bars in place.	5.00	3.00
550,000 lb.	Erecting struct. steel for service bridges.....	.11	.05
1,500 lb.	Furn. and install. miscell. mtlwrk. for serv. bridges	1.00	1.10
2,170 lin. ft.	Furn. and erect. beam-type guardrail.....	4.00	5.50
15,200 ton	Crushed-rock base.....	5.00	3.50
2,100 ton	Cover-coat material.....	8.00	5.00
80 ton	Liquid asphalt MC-2.....	300.00	90.00
70 ton	Liquid asphalt MC-4.....	140.00	90.00



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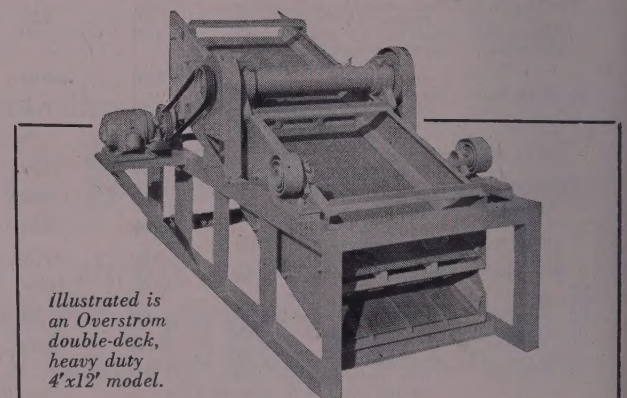
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