



JUNE 1956



WESTERN HIGHWAY PROBLEMS are different!

On this theme a group of 15 articles provide authoritative discussions of how they are being handled by Western engineers and contractors.

Foreword

WASHO is a strange word. It has little meaning outside the highway engineering and construction world of this Western region. But the Western Association of State Highway Officials is 35-year-old proof that highway building in the West is different. If the problem of designing and building highways in the West were not distinctly different from other regions of the country, there would have been no need for WASHO. It has met an important Western need and continues to serve the region well.

Most of the distinct regional characteristics which prompted the formation of that organization are natural and defy man-made solutions. Lofty mountains with rugged terrain mean road building at high elevations through solid rock; deserts and large arid areas mean road building without adequate materials and little or no water; extremes of temperature and extremes of precipitation add to the complications of road building in the West. Added to these God-made differences are ones of human origin including the high percentage of area owned and administered by the Federal Government, and the relatively low density of population in many areas, combined with long distances between population centers. The combination of these problems provides

WESTERN CONSTRUCTION



a region where highway design and construction calls for special solutions. They are being solved by the combined efforts of Western highway engineers and Western contractors.

Many Eastern engineers who are concerned with highway building frequently demonstrate an ignorance of what the West is doing to meet its own problems. A recent statement by a prominent consulting engineer on Park Avenue in New York City whose firm handles airports, highways, and bridges recently referred to the "imminent WASHO tests" and complained that "in the case of the WASHO tests, identical parallel strips of rigid and flexible pavements are not being carried out." This Eastern engineer apparently did not know that the WASHO test road had been concluded months ago and the final report released late in 1955 (**Western Construction** January 1956, p. 82). Further, he was apparently unfamiliar with the fact that it was designed to test a type of highway design and construction which is distinctly suited to the Western region. He might be interested to learn that in the new specifications just adopted by Wyoming, there is no provision for portland cement concrete paving because it is not used in that state. The West will continue to study and solve its own highway problems because they are distinct and different.

Theme of this issue

These same highway problems that have created the need for and growth of WASHO provide the theme for this Ninth Annual Highway Issue of **Western Construction**. A group of articles have been developed to discuss these distinctly Western problems, and to provide helpful information toward their solution. Obviously, each problem could not be covered fully, nor was it possible to treat with some of the specific difficulties that are actually parts of more fundamental problems, but an important group of subjects peculiar to the West are treated in authoritative fashion.

It is fitting to present this information as the West prepares for an accelerating building program. All indications point to Congressional approval for a decade of increased road building activity.

State highway departments of the West are streamlining and modernizing their design and engineering departments in an effort to meet this accelerating load with limited personnel. From more extended use of aerial surveys to the adaptation of modern business machines, the highway departments are producing more plans per engineering hour. One important phase of this endeavor is to separate professional from subprofessional work. In past years too many young professional engineers were required to serve long apprenticeships carrying out duties which were subprofessional in character. This was common practice in all engineering organizations and not particularly common to highway engineering staff work. However, it did tend to cloud the promise of careers in highway engineering and added to the difficulty in recruiting high type talent from engineering colleges. The West needs its top engineering students to enter the highway engi-

neering profession and make this work their lifetime careers. It was to add a stimulus to this idea that **Western Construction** sponsored the "Dr. L. Hewes Award" several years ago.

Today, with highway departments embarking on plans for expansion in size and activity, and with the modern trend to use professional engineers to the utmost of their capabilities, the way is open for graduating engineers to secure careers where growth of the field is combined with opportunities and security.

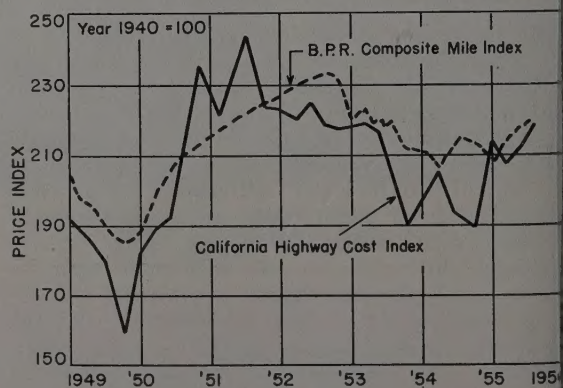
Problems of the contractors

As an indication of the construction activity represented by the expanded federal highway program about 30% of the total of \$101,000,000,000 (national figure for 10 years) will go into earthmoving. It is customary to think of an ever expanding proportion of highway funds used for rights-of-way as cities and land values increase. Sometimes overlooked is the fact that highway design today requires proportionately more excavation as a result of the wider roadways, sweeping curves, and easier grades.

A recent statement by W. V. Buck, a Division Engineer of the Bureau of Public Roads, points out that this modern design, although involving tremendous yardage, has a compensating factor in permitting "a more economical use of larger and more varied pieces of grading and earthmoving equipment." He also reminds highway departments that construction specifications must be kept in step with equipment developments and has specific recommendations. He urges highway engineers and highway departments to consider: (1) modernization of construction specifications to permit the placing of embankment in thicker lifts, thereby taking advantage of the heavy compactors that have been developed; (2) increased uniformity of construction specification among all states since this can result in more advantageous prices; (3) use of a cross-section design which will permit larger pieces of equipment resulting in lower construction costs.

Buck goes on to remind highway engineers that they must work as a team with the contractor and

CALIFORNIA HIGHWAY PRICE INDEX



the equipment designer and manufacturer. In grading work alone, studies indicate that when 12- to 5-yd. scrapers are in use the loss of time runs from to 30% as a result of lack of balance in the various pieces of supporting equipment.

Large size means low cost

Further discussion of this subject by R. P. Jones, Larnischfeger Corporation, calls the attention of engineers to the fact that the size of the project may have a considerable bearing on the size and quantity of equipment the contractor can use economically. This in turn has a bearing on securing minimum cost for the work to be done. He goes on to remind contracting agencies that if the material to be handled in a particular contract dictates a change in equipment, during the course of the job, it results in unnecessary delays during the progress of the work. The type of material and the terrain encountered have an important bearing on the equipment which will obtain the minimum excavation cost, and some materials will permit alternate selections whereas others will dictate only one type.

Getting down more directly to the subject, this expert on power shovels points out that the larger units will handle rock much cheaper than smaller machines. "For instance, the cost for handling poorly blasted rock with a 2½-yd. machine is only about 30% of the cost of handling this same material with a 1-yd. machine. Even larger machines will further reduce cost. Rock must be well blasted to be handled by the smaller machines. This requires additional drilling and blasting which is added cost. Operating personnel represents a large part of the hourly cost of operating power shovels so the greater production of the larger machine reduces the unit cost of handling."

But other factors enter the picture, according to Jones, since the contractor may be influenced in his selection of equipment by transportation restrictions. Highway load limits vary between states but in most cases they tend to restrict the size of power shovels that can be moved over highways without excessive dismantling. Up to the ¾-yd. size, a shovel can usually be transported by rail or highway without

dismantling. Machines of 1-yd. size usually require some dismantling, and to dismantle and reassemble a 2½-yd. shovel for highway transportation requires at least 36 man-hours, as well as adequate lifting equipment.

As a result, the statement continues: "It, therefore, is necessary to review the load limitations imposed on transporting machinery to and from the job, if the contractor is to be permitted to use equipment which will perform the work most economically. Is there some way that greater loads may be permitted to use the highways in order to reduce construction costs of additional highways? Can transporting vehicles be made to haul 50 or even 75 tons and be permitted to use the highways?" A contractor today frequently has an investment in equipment which is equal to the value of work being performed during a season so it is imperative that every means possible be employed to obtain maximum production from this equipment.

Scrapers make longer hauls

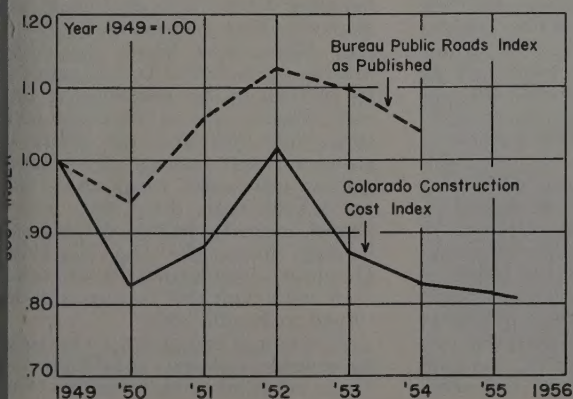
In the field of earthmoving the same principles apply. According to E. E. Howard of the Caterpillar Tractor Co., "Proper equipment selection can be the most important single decision in relation to the success of any construction operation." As jobs become larger, continues Howard, and time becomes a more essential feature, the largest tractors available should be utilized to implement the project.

In past years the track-type tractors pulling a scraper had a range usually figured at about 1,500 ft. of one-way haul distance. Today's efficient rubber-tired hauling units are more concerned with grades and the condition of the haul road than they are with distance. Whether these units are track or tire mounted, according to Howard, in any scraper operation push-loading is a must to secure maximum production and lowest costs. The time taken to load the scraper must be held to a minimum. Of course, as the haul becomes longer, it is more economical to spend time in gaining a larger load.

Carrying the analysis further, Howard reminds contractors and construction engineers that equipment must be matched to the job size to permit maximum work units or production per man-hour. Everyone is aware that skilled labor is difficult to obtain, and the training of operators is expensive. Large machines weighing from 50,000 to 75,000 lb., although difficult to move from job to job, will increase production and speed the completion of the work. Finally, he states: "Knowledge of the job at hand, proper equipment selection, a good preventive maintenance program, and close supervision will result in maximum production, lowered costs, and early completion date."

Starting on the next page are 15 informative articles selected to supply helpful information on these highway problems that face the highway engineers and contractors of the West. And following these, the **Western Construction Road Show for 1956**—31 pages showing 156 pieces of the latest equipment for highway building and maintenance.

COLORADO HIGHWAY COST INDEX





ROCK JOBS are different and take specialized equipment—Tough rock and high elevations are Western problems in highway construction.

WESTERN ROCK EXCAVATION is a specialized business, particularly the high-altitude work. Rock jobs require that last reserve of power to sink drills, to load heavy oversize broken rock against high banks, to pull big rippers through tough formations, and to make speed with heavy loads. The West has other factors which make rock excavation rough. To locate a highway through mountainous terrain so that 60-mph. traffic is possible, engineers specify cuts as a matter of course whose depths stagger the imagination of Eastern people. For modern equipment and explosives have been developed to a point where even rock excavation is cheaper than bridges and tunnels.

The Wyoming Highway Department let a job two years ago which removed a 100-ft. cut in Wind River Canyon. A contractor worked all winter on Beavertail Hill in Montana to create a high-gear grade on U. S. 10. There is a place in Arizona where 212 ft. was sliced off a granite cliff. Cuts in solid rock from 40 to 60 ft. deep are now rather common.

In routine travels over Western jobs, **Western Construction's** editors have noted an ever-increasing trend among highway engineers and contractors to tackle rock excavation willingly. Despite broken, faulted, end-up rock formations in inter-

mountain states, better exploration methods give a contractor more accurate data on what to expect. Highways are also coming to more permanent alignments, so that geological case histories are more apparent in nearby mountainside cuts than they were 20 yr. ago. And the highway departments now use skilled geologists on their headquarters staffs as easily as they use draftsmen, engineers, and economists.

Location through rocky terrain is also undergoing steady change. Aerial mapping now shows the best, most economical location with amazing accuracy. One state figures its rock quantities for contract bids by a combination of photogrammetry and geological interpretation. Another, whose terrain is some of the roughest in America, purchased electronic computing equipment which will do the work of more mathematicians than that highway department could crowd into its headquarters office.

It is this willingness to plan highways on better, more permanent alignment—and rock be damned—which causes this type of job to be more commonplace. What problems there are seem to be transferred to the contractors. They, in turn, then concern themselves with equipment selection, job organization, cut pioneering, drilling, shooting, loading-hauling, and the disposal and proc-

essing of material—about in that order. The maintenance of equipment is a constant with each of these headings.

There is a striking similarity in the way good contractors tackle a hard rock job. What differences there are seem to be differences among human beings as to detail. But we have noticed the following general practice among the better outfits as they relate to the following headings of a rock job:

Equipment selection

When good contractors land a job which they know contains solid rock the old tendency to take a chance on handling it with light equipment no suited for that purpose is disappearing. These men know that dirt moving equipment is far too valuable to be torn up by pounding it into rock. That is why, when they tackle rock, they invariably get plenty of air-compressor capacity, the latest in drilling equipment, tungsten-carbide or oilfield type drill bits, power shovels in the 1½ to 2½-yd. class, and hauling units like the Koehring Dumptor, Tournarocker, or other such equipment that is especially designed to handle rock.

Selection of equipment seems to be governed by two main considerations. If the job is big or if big outfits have

continuing call for rock work in their permanent workloads, they buy enough hard rock equipment so that it can be shifted from job to job to do specialized work. Morrison-nudsen Co., Inc.; Peter Kiewit Sons' Co.; Guy F. Atkinson Co. are such examples. When such organizations adopt certain equipment and retain it from job to job, it is a perfectly safe assumption that such equipment is giving good production at the lowest operating and repair cost which that company has found to date. It is on that basis that equipment is selected.

Equipment still a factor

The only exceptions to this rule are human, and they are fast disappearing under the heat of competition. Last summer a pipeline contractor in Colorado bought a dragshovel from a Denver distributing firm for the simple reason that one of its foremen got up in the middle of the night and drove 80 mi. with a pump and a pumpeller that saved the day. There are still some district managers of big equipment companies who can sell on the basis of personal friendship with construction companies.

The second factor which some outfits must consider is the rock job where quantity is relatively small.

Purchase of new equipment might actually be unwise, because short-life depreciation would be too great and the use of such equipment on lighter dirt work would be expensive. On such a job the contractor can either subcontract the rock excavation to a firm which has the equipment, or rent the necessary equipment and operate it under his supervision. The latter way is usually cheaper and more efficient, since it retains a vital part of the job under the direct coordination of the superintendent.

Job organization

Good organization is the other half of job success, if it is combined with the right equipment. It is universally important; on rock jobs it is especially so. The timing of a rock cut can affect everything on a highway job from the installation of drainage structures through grading, and possibly even the paving if rock excavation progress slows down for any reason.

Knowing what equipment will do is a big part of job organization. Knowing the capabilities of men is another. To remove rock properly and profitably it is necessary to get skilled drillers, powdermen, and equipment operators, and to give them what they reasonably need.

Good outfits do exactly that. And

they staff their supervisory force with men who know the latest improvements in all these phases. The old traditional powderman's excuse "Aw, Tom, this rock is just hard to shoot, that's all," doesn't go these days with superintendents who know how powder should be used and what it will do.

It seems to be universally accepted that it's good business to get the rock cuts out of the way as soon as other conditions permit. That places the broken rock in the bottom of fills where the dumping of thicker lifts is not objectionable. It also permits downhill hauling from the shovel. Rock cuts in a job let in the late fall can often be used through the winter to keep a nucleus of an organization working much more profitably than it could around the shop.

One of the most amusing and dramatic examples of good organization happened recently with one of the West's better project managers. Specifications called for removal of a rock cut before several miles of adjoining highway could be built—it was a concession to traffic so the road could be kept open. This wise project manager possibly tolerated his powderman, let's say, in a tendency to overload holes. When the shot went off it blocked the highway for two weeks, and traffic had to be detoured from a point in the clear of that

3-mi. stretch. It was probably pure coincidence that the yard was full of fast rubber-tire dirt hauling equipment which could and did whip that 3-mi. roadbed to a finish before the rocky mass was removed. Traffic couldn't interfere because traffic was out of the way. Good organizers take advantage of the breaks.

Tractors like the Caterpillar D9 and heavy duty rippers like the Ateco, the Southwest Giant Ripper, or the others have made it easier for superintendents to organize a rock job. Use of these big rippers often permits the removal of material which might otherwise have to be drilled and shot. In any case, however, the point where rippable rock leaves off and solid rock begins is easy to see. For that reason, many outfits go in somewhat cautiously with scrapers until the going gets too hard; then they quickly switch to explosives and the right rock equipment.

Cut pioneering

Mountainous, rugged terrain makes the opening up of cuts a major headache, but skilled operators now take angledozers through impossible-looking terrain. Pioneering a cut in rough country is a job which must not be hurried. The most experienced, cool-headed operator on the



MONTANA has mountains that take equipment designed for severe punishment. Down-time in a remote location is costly.

staff should be picked for this task. It will pay off later if the pioneer road is constructed as something more than a mere trail for the angledozer. If a fairly good road is built at pioneering time it makes a better bench for the Cat operator, creates access for service vehicles, and forms the basis for a haul road later on when shovels and trucks begin their work.

Drilling

The trend in drilling is toward more and more cubic inches of drilled powder capacity per man per hour. In other words, for each \$3 of a driller's time, more hole is being put down now than ever before. Larger hole diameter on highway work, the use of faster cutting bits, higher air capacity in portable compressor equipment, and big drilling equipment which moves about under its own power, are now appearing on rock excavation jobs connected with highways. The use of jib-mounted drills which permit one operator to work more than one drill also has appeared on the scene to reduce drilling costs.

Good drills are cheap

Better contractors who judge their drilling on strict economics seem to have little trouble with their jobs. They do not hesitate to spend \$30 for a tungsten carbide bit because they realize that drillers can do much more per shift in malapai, basalt, dacite, granite, and similar Western rock formations with the more expensive bit. It becomes a wise investment when judged in that light. Too, if union regulations require compressor operators, an air grinder can be installed so that these bits can be

maintained in sharp factory condition by these operators.

Be sure of enough air

Installed air compressor capacity has gone up and up on the better jobs because superintendents realize it's unprofitable business to operate a drill with less than an ample air supply. Drill masts are getting taller so that steel changes are reduced. Drills with masts high enough to handle a 20-ft. piece of steel are beginning to appear on highway work. Wagon drills mounted on self-propelled carriages, operated by compressed air tuggers, now have speeded moves between holes. An Arizona contractor who mounted two heavy wagon drills on a D8 tractor which had outlived its usefulness on heavier work improved drill production by 45% the minute the equipment went to work. Reason? The machines drill more hours per shift and not so much time is lost moving around.

On several drawing boards now are highway-size models of powerful rotary drilling equipment of the type used in mines and quarries. When that equipment is produced, operator performance will improve still further because even the tool changes will then be made by power. Human labor will be reduced. And drill hole diameters will probably go to even bigger sizes than the 3½ to 4¼ in. now frequently used, because bigger shovels will be able to handle bigger sizes of broken rock.

Explosives

The West is "bag powder country," chiefly because it is generally arid. But just about the time a powderman

becomes skilled in the use of bag explosives, a job crops up where ground water is a problem and gelatin type must be used.

Western geology—typical broken up, jumbled masses of rock and cemented conglomerates—have combined to make powder work difficult on Western rock jobs. The weird breaks and fissures in many a cut make the energy of powder dissipate itself in voids, so that secondary breakage is a problem. As a safety measure, powdermen like to shoot the same day they load a shot. This has created a never-ending search for a good explosive which can be loaded rapidly, and which will give the kind of fragmentation highway cuts need. If the rock is to be used as sub-base material after crushing, good fragmentation is doubly important.

New powder is effective

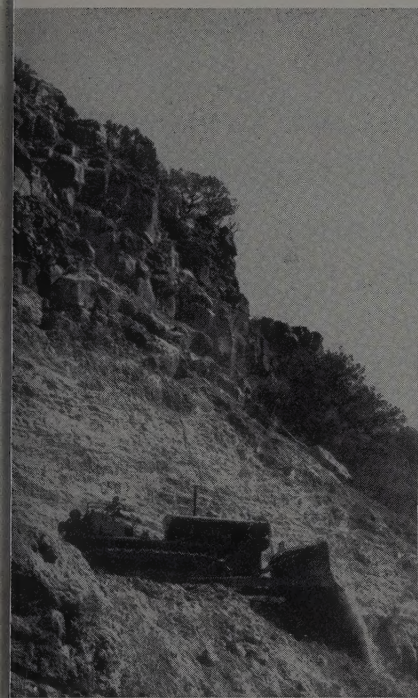
Explosives in 40 and 60% strength see general use. The newest advance in powder is the ammonium-nitrate type known by the trade names Akremite, Carbamite, and the like. This powder utilizes the explosive effect of ammonium-nitrate fertilizers when they receive sufficient shock under closely confined conditions. The powder is extremely safe to handle, is not affected by 2-wire radio transmitting equipment under ordinary conditions, and gives excellent fragmentation. Its really strong point from the view of a contractor is that it costs less than conventional explosives.

Use of delays has made rock shooting almost an exact science. In Oregon, where wet sliding rock planes are easily disturbed, slope lines are cut beautifully with a minimum of

HYDRAULIC JIBS can handle the spacing on this type of drilling. Mobility is the key to this job condition. Two machines per operator are a possibility in the future.

SECONDARY DRILLING is a problem, particularly if transportation conditions do not permit a large shovel to be moved in. One solution is a drill mounted on a Pitman Giraffe.





HARD CAPROCK formation overlying softer material is a common occurrence in the West.



FLAT drilling conditions such as this are uncommon in the West. Superintendent on this job found an economical solution by doing slope holes with a wagon drill, deeper ones with a Joy rotary.

shock or vibration by slope delays. The performance of shovels has been improved by "piling" a shot with delays. This not only concentrates more of the broken rock in one area; it develops considerable secondary fragmentation as the piling takes place. Some powdermen are so skilled with delay shooting that they deliver slopes which almost appear to have been line drilled. When a superintendent finds one of these powdermen he tries to keep him on the payroll.

The science of explosives is changing so fast that every good contractor takes advantage of the skills of traveling field representatives of the major powder companies. No manufacturer's representative can do more good than these men.

Loading and hauling

Assuming that job organization and selection of equipment is right, loading and hauling are rather standard on most Western jobs. Loading

equipment is selected because of its ability to produce well under solid rock conditions, with minimum maintenance cost. Hauling equipment is selected for speed, capacity, maneuverability under close quarters, power, and cost of maintenance. Today's power shovels will load from 40 to 60 cu. yd. of rock an hour per cubic yard of dipper capacity, and the hauling fleet must be able to keep up.

Better outfits use a drive-by system if the cut is properly shaped, or a double spotting arrangement which reduces maximum shovel front-end swing to 90 deg. Use of a man to spot the trucks while he keeps loose stones out of the way of their tires has been proved efficient and economical by almost all the rock-specialization outfits. A dozer to keep the pit floor clean also lets the shovel work at full capacity.

Broken rock makes an excellent fill, so the entire trick is to arrange constantly for places where this material can be incorporated. The best place for broken rock is in the bottom of a fill, because there it can be dumped in relatively thick lifts and the fill still will be sound.

One final thing seems typical of all the good superintendents. When they start a cut they do all the finished slope grading in earth overburden at that time. They follow up by scaling the loose stuff as the cut goes down. When the cut is finished, so is its slope. And the job is ready right then for its final estimate on that item.

ON GOOD JOBS the loading follows closely behind the drilling, as shown, and the shots are fired promptly. The West is "bag powder country" because it is mostly arid.





EFFECT OF ALTITUDE is a Western problem in the efficient use of compressors—Above 5,000 ft. the air density requires more capacity — Information on solving this regional difficult situation is presented.

THE PHYSICAL ASPECTS of certain Western states present construction problems of concern to engineers and contractors alike. One of the most troublesome problems is obtaining maximum operating performance of air compressors and allied equipment at altitudes up to and exceeding 10,000 ft.

From 5,000 ft. up, air becomes rarefied to an extent as to place a decided working strain on both manpower and equipment. At high altitudes, man has trouble breathing and fatigue is reached at a much earlier stage than at lower levels.

Thin air, or lack of air density, also affects the performance of compressors, in that air drawn into a compressor operating at considerable

altitude is compressed to a smaller volume than if the air intake were at a greater density. This smaller volume of air delivered by a compressor affects the air tools serviced by the compressing unit. Tools fail to work effectively, and at extremely high altitudes may fail altogether. This results in mounting construction costs caused by downtime and wasted man-hours.

Costly compressor troubles at high altitudes can be reduced considerably by ascertaining the amount of the smaller volume of air delivered by the compressor, and making allowance for it when calculating the size of the unit to be used for altitude construction.

The accompanying table shows the

effect of altitude on the air capacity of single stage compressors.

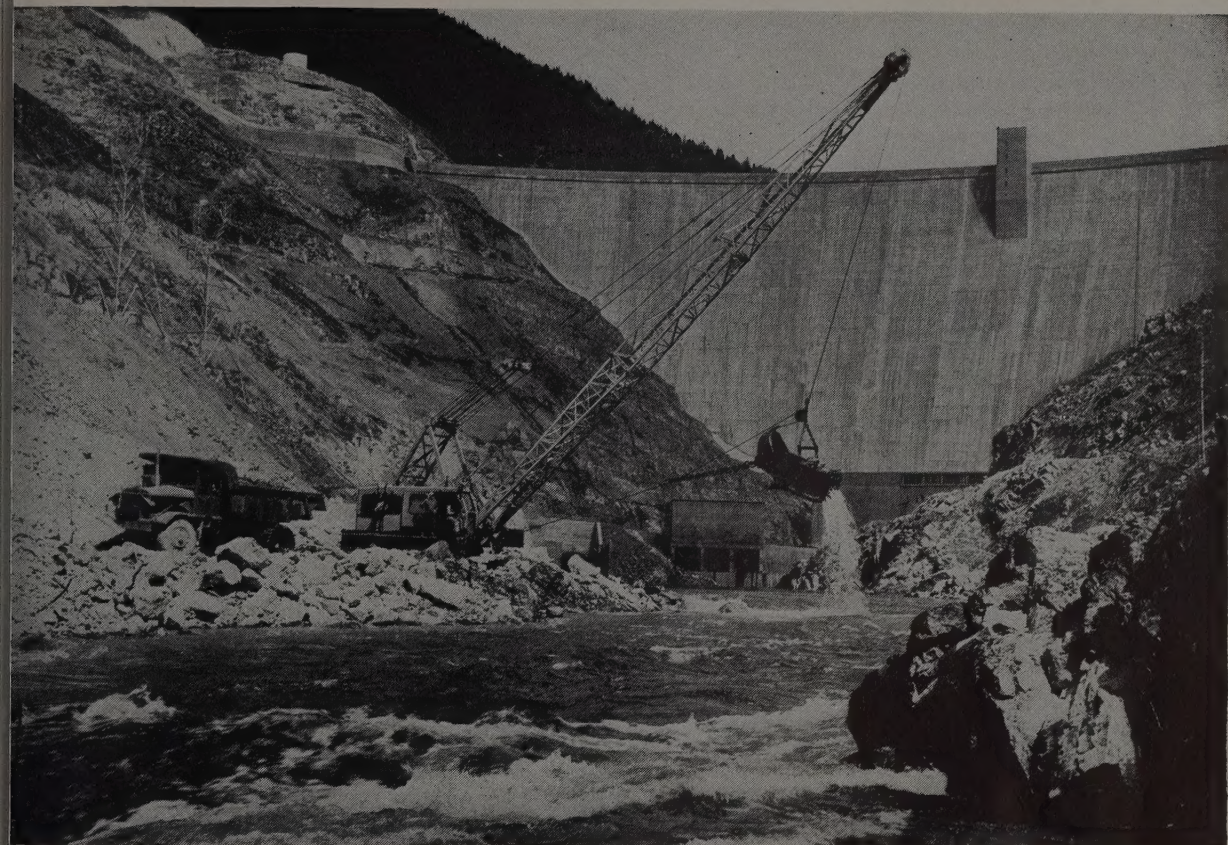
To find the capacity of a compressor when used at a certain altitude, multiply the sea level capacity of the unit by the factor corresponding to the altitude and the discharge pressure. The result will be the actual capacity of the unit at the selected altitude.

A study of the table shows that the compressor capacity drops as the altitude rises. For a 25-psig unit at 1,000 ft., the compressor capacity is 0.996, reducing down to 0.951 at 10,000 ft. and to 0.918 at 15,000 ft. The higher the psig, the greater the capacity reduction at increased altitudes. For example, a 90-psig compressor at 1,000 ft. has a capacity of 0.988,

EFFECT OF ALTITUDE ON CAPACITY OF SINGLE-STAGE COMPRESSORS
Factor for estimating, based on 7 per cent cylinder clearance

Altitude, ft	25 psig		40 psig		60 psig		80 psig		90 psig		100 psig		125 psig	
	Com- pressor ratio	Fac- tor	Com- pressor ratio	Fac- tor	Com- pressor ratio	Fac- tor	Com- pressor ratio	Fac- tor	Com- pressor ratio	Fac- tor	Com- pressor ratio	Fac- tor	Com- pressor ratio	Fac- tor
Sea level	2.70	1.0	3.72	1.0	5.08	1.0	6.44	1.0	7.12	1.0	7.81	1.0	9.51	1.0
1,000	2.76	0.996	3.82	0.993	5.23	0.992	6.64	0.992	7.34	0.988	8.05	0.987	9.81	0.982
2,000	2.84	0.992	3.94	0.987	5.42	0.984	6.88	0.977	7.62	0.972	8.35	0.972	10.20	0.962
3,000	2.91	0.987	4.06	0.981	5.59	0.974	7.12	0.967	7.87	0.959	8.63	0.957	10.55	0.942
4,000	2.99	0.982	4.18	0.974	5.76	0.963	7.36	0.953	8.15	0.944	8.94	0.942	10.92	0.923
5,000	3.07	0.977	4.31	0.967	5.96	0.953	7.62	0.940	8.44	0.931	9.27	0.925	11.32	
6,000	3.14	0.972	4.42	0.961	6.13	0.945	7.84	0.928	8.69	0.917	9.55	0.908	11.69	
7,000	3.23	0.967	4.57	0.953	6.36	0.936	8.14	0.915	9.03	0.902	9.93	0.890	12.17	
8,000	3.32	0.962	4.71	0.945	6.56	0.925	8.42	0.900	9.33	0.886	10.26	0.873	12.58	
9,000	3.41	0.957	4.85	0.938	6.77	0.915	8.70	0.887	9.65	0.868	10.62	0.857	13.02	
10,000	3.50	0.951	5.00	0.931	7.00	0.902	9.00	0.872	10.00	0.853	11.00	0.840	13.50	
11,000	3.61	0.945	5.17	0.923	7.25	0.891	9.34	0.858	10.38	0.837	11.42	.....	14.03	
12,000	3.72	0.938	5.35	0.914	7.53	0.878	9.70	0.839	10.79	0.818	11.88	.....	14.60	
14,000	3.94	0.927	5.71	0.897	8.06	0.852	10.42	0.805	11.60	.....	12.78	.....	15.71	
15,000	4.09	0.918	5.94	0.887	8.42	0.836	10.88	0.784	12.12	.....	13.36	.....	16.43	

NOTE: To find the capacity of a compressor when it is used at an altitude, multiply the sea-level capacity of the unit by the factor corresponding to the altitude and the discharge pressure. The result will be the actual capacity of the unit at the altitude.



Relocating the Flathead River Channel



JOB-ENGINEERED FINANCE PLANS



Job site: Montana's Hungry Horse Dam, third highest in the world. Project: relocating the Flathead River Channel. Contractor: Long Construction Co., Inc., Billings, Montana. The equipment shown is a model 1005 Koehring dragline with a 5 yard bucket.

C.I.T. Corporation financing has figured in Mr. Malcolm G. Long's fleet expansion plans for years. In his words: "Financing construction equipment through C.I.T. Corporation provides prompt and efficient service particu-

larly geared to the requirements of the contractor."

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BECAUSE Western contractors are faced with special problems of operating air compressors at high elevation, Western Construction has secured authoritative information on this subject. This article was prepared for our use by the engineers of the Compressed Air and Gas Institute, through the cooperation of Edmond C. Powers, educational director. Headquarters of the Institute are at 1400 Terminal Tower, Cleveland, Ohio.

Editor.

dropping down to as low as 0.818 at 12,000 ft. Thus, the effect of altitude becomes greater as the size of the compressor increases. Consequently, to obtain maximum operating efficiency of a compressor at high altitudes, it is essential to determine the effect of the altitude on the compressed air capacity of the unit. This should be a primary consideration in selecting equipment for high altitude work and due allowance made.

One of the most diverse group of tools which are put to a wide variety of uses on almost all construction jobs are rock drills and associated drilling equipment. Because of the extensive use of this equipment it is important to determine the air supply required to operate them effectively at high altitudes, if construction problems at altitudes are to be held to a minimum. It is also an effective

method of determining whether or not compressors are supplying adequate air at sufficient pressures to maintain a satisfactory working schedule.

The air consumption of drilling equipment will vary with the construction of the drill, nature of the terrain, type of work done, and the number of drills in operation. Therefore, it is practically impossible to determine the exact amount of air consumption required for respective high altitude construction jobs, but the table shows multipliers generally effective in determining the air consumption of rock drills being employed at altitudes up to 15,000 ft. for the number of tools mentioned in the table.

It is evident that the air consumption is affected by the number of drills used as well as the altitude. However, a study of the table shows the extreme consumption of a few drills operating at high altitude against the same number operating at low altitudes. The table can be used as a guide to indicate the need for corrective measures and trouble eliminating procedures if it is found that the air consumption of a given number of tools is greater than it should be.

To effect a smooth running operation at high altitudes, not only is it important to determine the air consumption of various tools, but also to ascertain the approximate horsepower necessary to supply the required amount of air.

The theoretical horsepower required of single and two stage, single stage, and two stage compressors at high altitudes to compress 100 cu. ft. of air per minute is broken down

into Isothermal and Adiabatic compression as shown on page 70.

Isothermal compression is affected when interchange of heat between the air or gas and surrounding bodies occurs at a rate precisely sufficient to maintain the air or gas at constant temperature during compression.

Adiabatic compression is the ratio of theoretical horsepower to the horsepower imparted to the air or gas actually delivered by the compressor. The power imparted is brake horsepower minus mechanical losses. Brake horsepower is the measured horsepower input of the compressor.

In line with the knowledge and application of such operating factors as compression capacity, air consumption of tools, and required horsepower at various altitudes, other operating and maintenance considerations manifest themselves to a large degree in high altitude construction.

Proper lubrication is extremely important. Normal lubrication procedures oftentimes prove ineffective at high altitudes. The portable compressor is equipped with a lubricating system designed expressly for the operating conditions anticipated. However, at altitudes, the normal function of the machine is disturbed due to rarefied air, with the result that routine lubrication methods frequently have to be changed to coincide with the unnatural atmospheric

(Continued on page 70)

MULTIPLIERS TO DETERMINE AIR CONSUMPTION OF ROCK DRILLS AT ALTITUDES AND FOR VARIOUS NUMBER OF DRILLS* †

Altitude, ft	Number of drills																
	1	2	3	4	5	6	7	8	9	10	12	15	20	30	40	50	70
	Multiplier																
0	1	1.82	2.73	4.41	4.85	5.46	6.06	6.5	7.1	8.1	9.5	11.7	15.8	21.4	25.5	33.2	
1,000	1	1.92	2.83	5.42	4.95	5.66	6.26	7.3	8.3	9.8	12.1	16.3	22.0	26.3	34.2		
2,000	1.1	1.92	2.93	6.44	4.51	5.86	4.7	7.6	8.7	10.2	12.5	16.9	22.9	27.3	35.5		
3,000	1.1	2.03	3.03	7.45	5.53	5.96	6.72	7.8	8.9	10.5	12.9	17.4	23.5	28.1	36.5		
4,000	1.1	2.13	1.3	13.94	7.55	6.16	8.74	8.1	9.2	10.8	13.3	18.0	24.4	29.1	37.8		
5,000	1.2	2.13	2.4	0.48	5.66	6.37	0.76	8.3	9.5	11.1	13.7	18.5	25.0	29.8	38.8		
6,000	1.2	2.23	2.4	1.49	5.86	5.72	7.8	8.5	9.7	11.4	14.0	19.0	25.7	30.6	39.8		
7,000	1.2	2.23	3.4	2.5	0.59	6.67	4.8	8.7	10.0	11.7	14.4	19.4	26.3	31.4	40.8		
8,000	1.3	2.33	4.4	3.5	2.6	1.6	8.7	6.8	9.0	10.2	12.0	14.7	19.9	27.0	32.1	41.8	
9,000	1.3	2.33	3.5	4.4	5.3	6.2	7.0	7.7	8.4	9.2	10.5	12.3	15.1	20.4	27.6	32.9	42.8
10,000	1.3	2.43	3.6	4.5	5.4	6.3	7.1	7.9	8.6	9.4	10.7	12.5	15.4	20.9	28.3	33.7	43.8
12,000	1.4	2.53	3.7	4.7	5.6	6.7	4.8	2.8	9.7	11.1	13.0	16.0	21.6	29.3	34.9	45.5	
15,000	1.4	2.63	3.9	4.9	5.9	6.9	7.7	8.6	9.3	10.2	12.6	13.6	16.7	22.6	30.6	36.5	47.5

* Air consumption at altitudes will vary with construction of drill.

† Air consumption for various number of drills based on fact that all drills will not operate at once. It will vary with rock, type of work, etc.

WILLIAMS DISTRIBUTORS for this Area:

Clyde Equipment Co.

3410 First Avenue S., Seattle, Washington

Construction Equipment Co.

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2145 N.W. Pettygrove St., Portland 8, Oregon
Branch: 1810 7th Ave. W., Eugene, Oregon

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**All-purpose der-
rick, precasting operations,
and vertical sand drains
are features of unusual
mile-long bridge and mile-
long hydraulic fill. The
engineer in charge of de-
sign and construction, and
the 1956 Hewes Award co-
winner, writes the final
story as—**



Idaho bridge nears completion

By A. J. SACHSE

Senior Resident Engineer
Idaho Department of Highways

EXCEPT FOR surfacing the approaches the Sandpoint Bridge and the North Approach fill are complete. The projects provide a 2.3-mi. long crossing of the Pend Oreille River opposite Sandpoint in northern Idaho. Several unusual methods of construction were developed during the course of the work.

For a review of the design and an early construction report see **Western Construction**, June 1954, p. 65 and Dec. 1954, p. 41.

Planning

The planning of these projects began with a study of alternate bridge sites; the establishing of a route for U. S. 95 and 10-Alt. Highways through Sandpoint, which would be fixed by the proposed construction; and foundation investigations and tests to determine the nature of the foundation material to support a fill load.

Studies of bridge sites and alternate routes resulted in the adoption of a route extending from the southerly end of the present bridge to the sandy point opposite the northerly end of the Northern Pacific railroad bridge, and thence along the westerly side of the railroad fill and along the easterly bank of Sand Creek through Sandpoint, a route from which the business section of Sandpoint would be easily accessible; which would have a relatively low right-of-way

cost and which would provide a facility having roadside development and access restricted by terrain and minimum interference with local traffic.

Foundation investigations and tests consisted of explorations to determine the nature of the foundation material and the quantity of sand available for hydraulic borrow of fill material; the driving and loading of test piles, for use in bridge design; and extensive determinations of the shearing strength of the underlying clay, both by means of laboratory tests on undisturbed samples and by use of the Vane borer, which measured shearing strength of clay in place. These investigations revealed: that foundation material was a medium stiff clay overlain by a blanket of sand 8 to 12 ft. in depth along the proposed route; that the clay had a high water content and increased in stiffness with depth below ground surface; that clay was softer and without sand cover at locations away from the sandy point; and that ample sand was available adjacent to the proposed route for fill construction. Data confirmed that economical construction was possible along the proposed route and was used in design of both the bridge and the north approach fill.

The bridge

Design of the bridge was adapted to foundation conditions and special consideration was given to construction methods, problems and costs. A 35-ft. span length was adopted to per-

mit use of pile bents for substructure and to facilitate precasting and handling of spans. Alternate designs requiring: precasting and placing an entire span in one unit; precasting six U-shaped sections for assembly on caps; or precasting stringer stems only and pouring deck in place, were included in plans so that contractors could bid on the design best adapted to their plant and equipment. Concrete filled steel shell piles were called for and composite piles, consisting of 90 ft. of timber pile extended with 38 ft. of concrete filled steel shell were specified, in region where piles terminate in clay, to obtain required bearing in stiff lower region of clay without excessive pile weight and cost. A provision was included in contract which permitted changing the length of bridge if difference in cost per linear foot of bridge and fill was appreciable. Project attracted a relatively large number of bidders and bids were obtained on all three alternate methods of construction. Low bid was obtained on precasting and placing an entire span in one unit as this design required a minimum of over-water forming, placing and curing of concrete and permitted maximum re-use of forms.

Construction commenced near the northerly end of the bridge approximately one-half mile from nearest shore at the sandy point and all materials were moved by water until final span was placed near the south shore.

The bridge is 5,897 ft. long and consists of 154 precast spans 35 ft. long, 25 precast tower spans 17 ft. long,



THE AUTHOR—a specialist in versatility



The executive committee of WASHO elected A. J. Sachse, Senior Resident Engineer, as co-winner of the 1956 Hewes Award (see article on page 78). In nominating him for the honor, E. V. Miller, Idaho State Highway Engineer, had this to say:

"The Sandpoint Bridge was a complex project involving many features new to the Idaho Highway Department and to many of the Western states. The design of

the fill was unusually difficult, involving a great deal of investigation including use of the Vane apparatus for determining foundation shearing strengths. This was the first known use of this equipment in the United States for design purposes. The bridge design was unusual involving three alternate designs of precast type. New construction methods not used before in this state were employed. This was the first job in Idaho to use hydraulic fill and vertical sand drains on the fill section, and precast deck and girder construction on the bridge.

"Although any project of such magnitude involves many engineers and specialists, this project can be primarily attributed to the efforts of one man—Engineer Sachse. Mr. Sachse had charge of all field investigations including the foundation studies. He directed all the preliminary investigations. He personally designed the bridge structure. He directed preparation of the plans in the District Office and prepared the special provisions of the specifications. He was also Resident Engineer in charge of construction. The successful completion of this project is the result of his tireless efforts in all stages of the work."

and one 82-ft. cast-in-place navigation span on steel I-beam stringers. Bridge is divided into 25 units consisting of six 35 ft. spans each which are separated by a 17-tower span to control longitudinal movement. Expansion joints are provided every 227 ft. at the mid-point between towers.

Quantities of the major items used in the construction of the bridge are: 8,490 cu. yd. cement concrete; 1,572,191 lb. reinforcing steel; 50,759 lin. ft. 14-in. steel shell piling; 70,125 lin. ft. untreated timber piling; 297,668 lb. structural steel; and 11,806 lin. ft. of beam type guardrail.

Contractor for the bridge was Peter Kiewit Sons' Co. and LeBoeuf Dougherty Contracting Co., a joint venture. Low bid was \$1,080,868.96 or \$183.29 per lin. ft. of bridge. Bridge width is 28 ft. between curbs and 30 ft. clear between rails.

Test piles

Construction operations began with the driving and loading of test piles. Eight timber piles were driven to 100-ft. penetration below ground surface and loaded with 9-ft. 3-in. diameter specially cast discs weighing 5 tons each. Loads ranging from 45 to 55 tons were balanced on single piles, guyed in three directions, at heights up to 35 ft. above ground. Pile settlement under load was lim-

so tanks could float between or straddle a bent. The derrick was used to place spans, fill shells and caps and could easily pick up entire test load at one time.

Pile driving

As soon as data on test piles were obtained the contractor started driving piles for bridge. All piles in a bent were driven from one setting of the float by swinging the leads from left to right along the moonbeam just above the span. When the pile was driven to about the elevation of the moonbeam, the hammer was raised and a 38-ft. section of steel shell was inserted over partially driven timber pile. The composite pile was then driven to about 4 ft. below deck level.

The pile was spliced by driving shell over the timber pile. In the completed splice top of timber pile rests against stop plate and excess wood covers outside of shell below plate. Difference in cost between timber pile and concrete filled shell was \$3.89 per linear foot or a total of \$272,786 for the 70,125 lin. ft. of timber pile placed and does not include saving in pile requirements due to 6,300 lb. per bent decrease in weight of piles.

Pile bent braced

After all piles in a bent had been driven they were stayed to a heavy timber in transverse direction and bents were spaced to position at top with pipe spacers. Piles were then trimmed and filled with concrete.

In the pile driving operation the pile driver was positioned along centerline with instrument located on survey platforms placed across the 7 ft. towered spans. Distance along centerline was measured from accurate chainage points which were established on every 7th bent from base lines on the old bridge.



EARLY CONSTRUCTION featured the loading of eight test piles by the floating derrick. Loads ranging from 45 to 55 tons were placed on a pile, guyed in three directions. The derrick was mounted on two 8-ft. diameter by 60-ft. long boat salvage tanks.

RUGGED D8S 'DOZE ROCK

*on road to
Donnells Dam*



In rough mountain country above Strawberry, California, Tri-Dam Constructors are preparing for the \$32,000,000 job of building Donnells Dam.

One of the first requirements is an 8-mile, 24-foot contour road leading up to the dam site and permanent camp. And most of the roadway has to be blasted out of steep granite slopes like the one pictured. Handling shot rock on locations like this takes tough equipment. That's why Tri-Dam is using CAT* D8 Tractors with No. 8S Bulldozers. There are 9 of them working on the project.

The D8 has been known as "king of the crawlers" for years. As jobs grew bigger and tougher, the tractor has grown with them. Today's D8 is new from the ground up—bigger, tougher, more powerful than any earlier model. Look at these features:

- *New heavy-duty 4-cycle diesel engine delivering 191 HP at 1200 RPM.*
- *Choice of torque converter or direct drive.*

- *Oil clutch, for smooth performance and long work life.*
- *New 7-roller track frame and long-wearing "water quenched" track shoes.*
- *New, more powerful starting engine with "in-seat" starting.*
- *Better job visibility and greater operator comfort.*

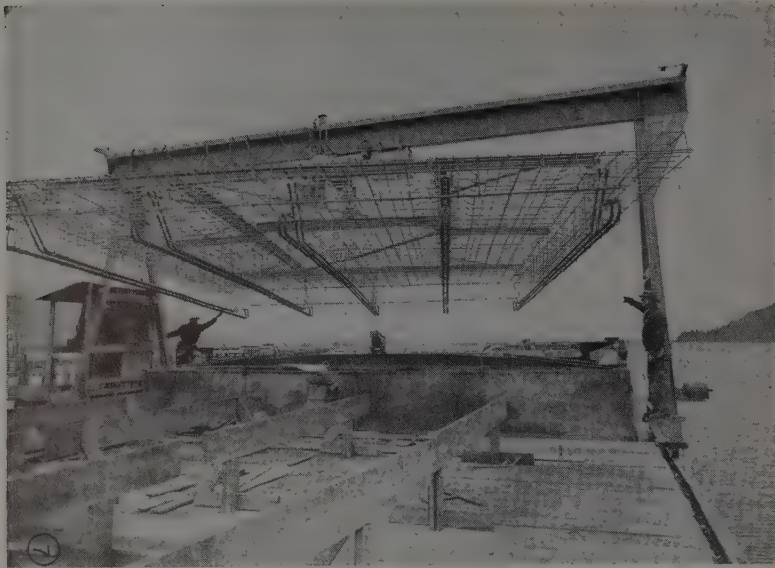
Your Caterpillar Dealer will be glad to show you how this new D8 can increase your production. And you can depend on him for prompt service and original parts. Ask him for a demonstration today.

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



REINFORCING STEEL for the bridge spans was tied together on the wooden racks in the foreground, then lifted into forms in the background. Best production was two spans cast, poured, and removed from each form per week. A minimum strength of concrete of 2,500 psi. was required before spans could be lifted. The work area shown is on specially constructed over-water trestle so that the slabs could be picked up by the floating derrick.

Concrete for shells and caps was handled in 3-cu. yd. buckets and transported from shore in landing barges.

Placing caps

After filling shell with concrete, special steel forms were assembled on shore and transported, placed, and adjusted to position on piles. The forms had plywood bottoms in sections which were dropped between piles after form was in place.

Precasting operations

All precasting was done in 5 metal forms located on a specially-constructed over-water trestle so that spans could be removed with floating derrick. All span reinforcement was tied into mats on a special rack at shore end of dock. Stringer steel was first assembled on a side rack and dropped into place before slab reinforcement was placed. The entire mat was hooked to a lifting frame, transported and lowered into position in forms with a gantry crane. The reinforcing was positioned in forms with adjustable chairs, concrete was poured, finished and cured at a maximum temperature of 130 deg. for approximately 30 hr., plus approximately 10 hr. used in gradually raising and lowering temperature under the plywood cover under steel. Stringers had 1.5 in. of taper in 30 in. and forms were constructed so that all under panel, except supporting beams along under face of stringers, could be loosened and dropped 1.5 in. before lifting. A minimum strength of concrete of 2,500 psi. was required before spans could be lifted. Produc-

tion was governed by weather, effective steam curing, and coordination of operations. Maximum production was attained during the early summer of 1955 when 2 spans were cast, poured, and removed from each form per week. In general, forms were refilled by evening of the same day that span was removed.

Placing spans

After loosening forms spans were attached to a heavy I-beam lifting frame by means of 10 high strength bolts which were screwed into coil ties set 3.5 ft. in from stringer ends during pouring. Lifting derrick was floated to position above frame and block was attached. Span was then lifted free of forms, towed to position between caps and lowered to place. In lifting operation derrick was allowed to float free so as to center over lift point and care had to be exercised so that span would not tilt during lifting so as to avoid binding and damage to corners. Derrick was pulled back from dock on a rear anchor dropped on way in. Anchor was operated from derrick and was also used as a brake in towing derrick to dock. In placing spans the rear anchor was dropped out from and opposite location at which span was to be placed and used as a brake in approaching bridge. After again raising span, the float was carefully towed between pile bents so as to leave maximum clearance between spans and control was transferred from boat to cables anchored to the far pile of each bent. The span was positioned for final lowering between clip angles with these cables and two cable winches connecting lifting

frame to rail bolts of adjacent span. Final aligning of forward end of the span was done by jacking span against anchor bolts in cap.

The north approach fill

The north approach fill extends 5,890 ft. northward from bridge, along the westerly side of the Northern Pacific railroad fill, to the southerly bank of Sand Creek in Sandpoint and includes a temporary wye connection to the present highway at Superior Avenue, which will serve as a permanent connection to the business section of Sandpoint when project is extended through town. Fill is 46 ft. wide at subgrade (38 ft. finished width); ranges in height from 15 ft., across the sandy point opposite end of railroad bridge, to 30 ft. at end of bridge and at Sand Creek; and required some unusual analysis for its design as well as special features for construction and for construction control.

Analysis of fill stability on the foundation material (using the Swedish Circle Method wherein $WX = VR$ times Safety Factor, when W equals weight of superimposed fill and V equals the total shearing strength of the clay along the critical failure arc) indicated little to no factor of safety against a failure of foundation material in shear and that a foundation failure, if experienced, would have to be bridged due to loss of most of the shearing strength of clay during failure and tendency of failure to progress along centerline during continued filling. To obtain an adequate factor of safety against such failure, counter-balancing side berms were provided and designed so as to permit shaping during low pool elevation. Analysis also showed that appreciable subsidence of ground surface due to consolidation of foundation material under fill load would be experienced over a long period of time. To avoid possible accompanying settlement of bridge at its connection with the fill, 141 vertical sand drains were installed and covered with a blanket of open graded sand (to accelerate escape of water from foundation material) and fill load was placed before end section of bridge was constructed so as to obtain maximum loading and consolidation in this area before bridge was placed.

Control. In anticipation of excessive pore pressure (water pressure between soil particles) in foundation, which would reduce shearing strength of the soil and appreciable subsidence of ground surface under fill load: the Department installed and maintained 70 devices for measuring pore pressure at various locations and depths below ground and settlement platforms at 300-ft. intervals along centerline, for measurement of subsidence, as a part of engineering control. Settlement platforms provided data for payment of

additional embankment quantities and showed that settlement during construction was about 50% of the maximum anticipated. Pore pressures approached but never exceeded the 10 psi. allowed so that delays in filling operations, to permit pressures to dissipate, were not required. Data obtained from these devices: (1) conformed to actual loading of the foundation and the slow variations in pool level; (2) showed greater pressure readings in the sand drain area where rate of dissipation of pressure was also faster; and (3) showed considerable slower rate of dissipation of pressures between the railroad and highway fills where pressures must dissipate either vertically or on a long distance horizontally.

Fill construction consisted of three major operations, all of which had to be performed as pool elevation permitted, namely: (1) placing and shaping embankment; (2) placing sand drains and sand blanket; and (3) placing and shaping rip-rap.

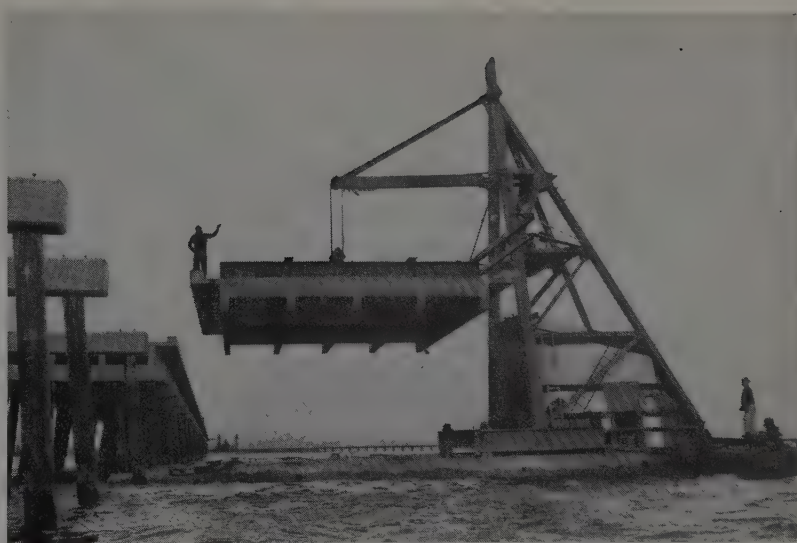
Embankment construction

Construction of the embankment was carried out in three stages: (1) When pool was at storage level, material for the outer berms was deposited below water level between the extremities of the counter-balanced roadway section without confinement, except for that provided by constant pool level. A berm 17 ft. high, above ground (2 ft. above water surface) and 100 ft. wide at water surface was deposited outward from the sandy point in this operation. (2) When pool was at low water stage this material was shaped into the outer berms and the center roadway section was brought to above storage level by filling between dikes dozed up from centerline. (3) When pool was again at storage level the center roadway section was filled to grade in 3- to 6-ft. lifts by successive diking and filling operations. Final shaping of roadway slopes was done by dragline operating from top of fill.

Equipment used for the construction of the embankment consisted of: a 500-hp. electrically powered dredge having a 14-in. pump and suction line; a 12-in. discharge and 5-blade separately-powered cutter head; 1,500 lin. ft. of 12-in. landing pipe mounted on floats; 3,500 lin. ft. of 12-in. levee pipe and 400 lin. ft. of 24-in. overflow pipe with special half round pipe intake structures. Attending equipment consisted of a cable float for electric power cable, anchors and barge for moving same, a 30-ft. power boat, 1-RD6 Cat and dozer and a 1-cu. yd. dragline for shaping and on-shore work.

Sand drains

Sand drains required the drilling of 18-in. diameter holes to 60 ft. below ground surface and filling these holes with open-graded sand. Drains were placed by jetting an 18-in. diameter



WHEN PLACING the slabs the float was towed between pile bents so as to leave maximum clearance between spans. Control was transferred from the boat to cables anchored to the far pile of each bent. Final slab aligning was done by jacking against anchor bolts in cap.

pipe with end gate closed into the foundation; filling pipe with sand and then withdrawing pipe using steam under pressure to assure discharge of sand from pipe during withdrawal. Equipment used for placing drains consisted of (1) 85 lin. ft. of 18-in. jet pipe with 5-cu. yd. hopper, gate closed ends and connections for application of steam under pressure; (2) a 40 x 70-ft. steel float equipped with 115-ft. tower and leads, 5 anchor drums with cable and anchors, steam boiler and hoist (used for pile driving on bridge job); (3) two high pressure jet pumps; (4) a sand barge with ¾-yd. crane for importing and handling sand to hopper and (5) trucks for transporting sand from pit to barge. Drains were located to lines parallel to centerline by instrument and to distance from center of tower 25 by measurement along forward anchor cable.

Shaping embankment

The major problem confronting contractors was the shaping of berms and placing rip-rap below pool level; and the magnitude of this problem was considerably increased when pool was held at 2,060 elevation during winter months and it appeared that a low pool level would not be obtained during the winter or spring of 1954-55 when this work was to be done. Normal pool was finally experienced in April and May 1955. During this brief low water period the outer berms were shaped, rip-rap was hauled from stockpile, dumped over edge of berm and dozed to required section and additional roadway embankment was placed, shaped, and covered with Class C rip-rap so that work could be completed from fill above pool level. Work was completed during summer storage level by hauling rip-rap along and dump-

ing from top face of toe berm and by dumping from finished fill. Slopes were shaped with a dragline.

Rip-rap was quarried at base of mountain northwest of Sandpoint and hauled through Sandpoint to job, a distance of approximately five miles.

Equipment for the shaping and rip-rapping operations consisted of 2 wagon drills, 1 wagon jack, 600-cu. ft. compressor, jack hammers, one 2.5 and one 1½-cu. yd. shovel, one 2½ and one 1-cu. yd. dragline, a fleet of rock trucks, 4 Koehring Dumptors, 3 RD8 Cats with dozers, 2,000-gal. sprinkling truck and one No. 12 Caterpillar blade.

Contractors for North Approach Project were H. G. Palmberg, Astoria, Ore., prime contractor and Strong & McDonald of Tacoma, Wash., sub-contractor for rip-rap. Low bid was \$644,228 or \$103.07 average for linear foot of fill. Cost per lin. ft. near end of bridge was \$144.47 per.

Local materials were used on both projects, except for steel items, and local labor was employed in the projection of local materials (concrete and piling) as well as on the actual construction, except for key personnel.

The work was under the jurisdiction of R. M. Parsons, district engineer. The writer was resident engineer. Vernoy Olson was chief inspector.

The prime contractor on the work was a joint venture of Peter Kiewit Sons' Co. and LeBoeuf Dougherty. J. L. Pierson was superintendent, D. K. Rodgers was project engineer, and George Carlson was office manager. Foremen were Owen Barstow on pile driving and Harold Goodwin and Gordon Wiser on concrete.

Ralph Simpson was superintendent for the Seattle Concrete Pipe Co.



UNUSUAL METHOD of feeding the Barber-Greene paver was developed by the contractor. The mix was deposited in a windrow by bottom-dump trucks and then picked up by Athey loader. This operation moved 14.4 mi. across the desert near Palm Springs, Calif., on a \$2,341,000 contract.



DESERT CONDITIONS are the typically Western highway problem solved by McCammon-Wunderlich.

MOTORISTS TRAVELING through Southern California desert areas often look out over hot sands and rock hills, and marvel at the billions of acres of waste-land.

To the McCammon-Wunderlich Co. of Palo Alto, Calif., however, at least a small segment is anything but waste-land. In fact, they are taking one of these rock-sand hills, flattening it out and using its product of sand and gravel to give these same motorists a divided highway over which to cruise.

Scene of the \$2,341,000 paving operation is near Palm Springs, where McCammon-Wunderlich, under direction of Joe Beydler, project superintendent, is nearing completion of a 14.4-mi. divided strip, each side 34 ft. wide and surfaced with a 4-in. layer of asphalt.

The new highway has a 33-ft. dividing center, with 3-ft. shoulders abutting the center asphalt strips and 8-ft. shoulders on each outer side.

High-capacity production was needed on this job, because of the time element, soil and terrain considerations, and climatic conditions.

Consequently, State Highway officials and Beydler's staff selected a particular 600-ft. high hill—now termed "Old Cropped-Top" by the crews—because of its midway location between both ends of the project and the quality of the mixture of rock and sand it contained.

Rock crushers and a hot-mix plant were "backed-up" to the hill and the operation of obtaining more than 550,000 tons of sand and aggregates for use in the finished highway was begun.

For this job combined aggregates of sand and three separate sizes of rock were needed. Crawler tractors, one with a specially-constructed bulldozer 6 ft. high and 18 ft. long, pushed material into the feed end of the first of three separate portable crushers.

Three crushers speed aggregate

By using three crushers, the material is screened into as many separate sizes of rock, plus sand. Aggregates are carried on conveyors to individual stockpiles, located atop a 200-ft. long feed tunnel, built of 7-ft. diameter corrugated steel culvert.

Under each stockpile the tunnel has feeder gates that are opened automatically by remote control from outside the tunnel for feeding the desired proportionate amounts of each aggregate onto another conveyor, carrying the material as desired to the asphalt plant.

This plant, a 6,000-lb. capacity unit, is one of the biggest yet built by Standard Steel Corp. of Los Angeles. Entirely portable and automatic in operation, the machine can turn out nearly 300 tons of asphalt per hr.

Aggregates are fed, normally, at a

rate of 200 to 240 tons per hr. into the 8-ft. diameter rotary dryer, mounted on its own wheels and axles. Here material is exposed to direct flame heat for moisture removal and heating to 300 deg. F.

Discharged from the dryer, the aggregates are lifted in an enclosed bucket elevator to a 4-ft. wide by 16-ft. long double-deck vibrating screen which separates the previously combined aggregates into four different sizes for storage in individual compartments of a 40-ton capacity storage bin.

By means of air cylinder-operated controls at the operator's platform each size aggregate along with the correct amount of liquid asphalt required for each batch is individually weighed on springless dial scales. The aggregates are dropped into the mixer where revolving paddles quickly and uniformly coat them with the liquid asphalt.

Mixed asphalt is then discharged into waiting trucks below and transported to the paving site.

Top output of 5 tons per min.

When really pressed for production, the McCammon-Wunderlich plant produced about 5 tons per min., or a batch every 35 to 40 seconds, according to Keith Karns, asphalt superintendent for the contracting firm. The plant has consistently turned out anywhere from 200 to 280 tons per hr.

Simplicity of operation of this large unit and the ability to change from one type mix to another rapidly has helped hold the cost down of the overall paving operation.

Two other innovations also reduce the time-cost factors: controls on the operator's platform enabling him to start and stop instantly all conveyors and the rotary dryer; the placing of twin 50-ton overhead hoppers in a position so they can supply trucks with aggregates needed at the roadbed, the hoppers being filled by the same conveyors which feed the dryer when it is in use.

McCammon-Wunderlich is improving an asphalt paving method that is not used generally. Bottom dump truck-trailer transports deliver asphalt to the paving site, where it is laid down on the grade in windrows. Two Athey loaders pick up the material with screw feeders, carry it overhead by belt loader to a chute which drops the asphalt onto two self-propelled laydown machines.

The material is spread evenly between machines at a correctly specified depth, and given an initial compacting without the use of forms.

First, sandy soil was borrowed from alongside the right-of-way to elevate the base of the roadbed and establish the initial grade. In this phase alone it was necessary to move more than 1,000,000 cu. yd. of soil, rolling, spreading and grading it uniformly. Next job was laying the 8-in. cement-treated road base.

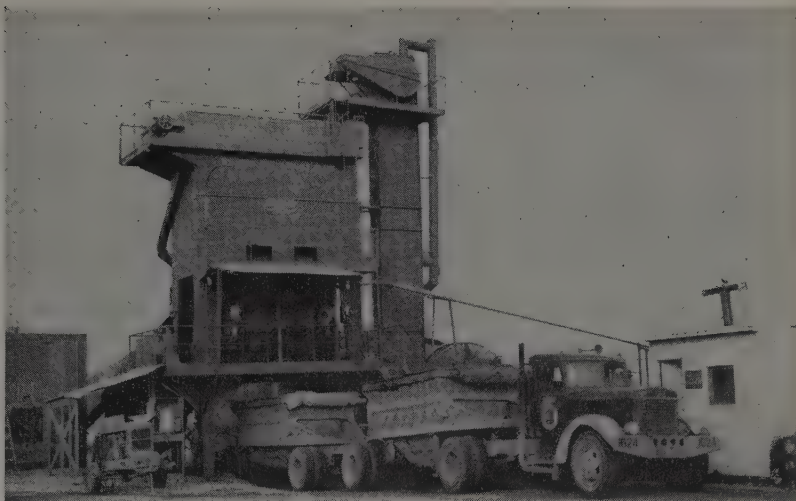
Ten miles of water pipe

No ready water supply was available in the desert for use on the base. The contractors developed their own water supply, bringing in one of three deep wells themselves. However, before the supply could be made adequate, it was necessary to lay more than 50,000 ft. of 6- and 8-in. pipeline, with numerous pump stations.

The company also improvised by constructing special water supply trucks with up to 10,000-gal. capacity. These were kept in almost continuous use in wetting down the unfinished roadbed.

In addition, high winds in this particular desert region could play havoc through erosion to the completed roadbed unless precautionary measures were taken. A 6-in. thick shoulder of 3-in. rock was laid down on both sides, and in the center dividing area of the road to prevent wind damage. More than 150,000 tons of 3-in. rock were needed on this portion alone. As a result, the company set up another rock-crushing unit to provide this need.

High winds whipped up choking, damaging sand storms. To protect weighing scales and the mouth of the tunnel, the company erected snow fences to hold back the sand. It also employed portable air compressors to blow sand dust out of all magnetic switches.



SEMI-AUTOMATIC, but portable, this plant loaded the truck-and-trailer transport fleet. More than 550,000 tons of sand and aggregates for the 14.4 mi. of divided highway.



CRUSHERS in the foreground and screening plants turn out two sizes of aggregate delivered into stockpiles. A 200-ft. reclaiming tunnel had feeders operated by remote control.



WINDROW laid by the bottom-dump transport trucks is ready to be picked up by the Athey loader. Tandem rollers followed the paver. This surfacing rests on an 8-in. cement treated base.



COUNTY as big as Rhode Island with rugged terrain and thin population is typically Western—Engineer must solve variety of problems.

THE COUNTY ENGINEER suffering a variety of topographical, climatic, and physical conditions may have his headaches, but he surely will never be bored. And this engineer will be like a tuning fork, vibrating operationally to the many changes required, or the development needed.

Douglas County, Wash., encompasses a vast territory of 1,786 sq. mi. (State of Rhode Island is 1,058 sq. mi.) in three distinct levels of elevation, each creating its own peculiar problems.

First there is the 600-ft. elevation section along the river, especially between the locations of Rock Island and Rocky Reach damsites. This is the fourth fastest growing region in the State of Washington, twisting in the agonies of suburban growth. Originally, a speculation area for the East Wenatchee Land Co., its acre-



By PAT THOMSON

County Engineer
Douglas County
Waterville, Wash.

age of salable orchard land was of prime importance. Consequently, dedicated rights-of-way were only 30

ft. This was considered sufficient for fruit hauling.

Fruit, aluminum and people

However, some real estate agent discovered these gentle slopes and flat benches presented a magnificent view of the Cascade Mountain range. His plotting of the first subdivision just happened to coincide with the decision of the Aluminum Company of America to build a \$60,000,000 plant. And bang—the housing boom was on in full cry.

Traffic suddenly increased from fifteen or twenty orchard trucks per day to as high as 4,155 AAD traffic count. Narrow cuts that were adequate quickly became critical bottlenecks. Unfortunately, the rapid development overran our first bungling attempts in administration, as is most always the case where blocks of 100 to 300 houses spring up overnight. And with view property becoming premium, the knolls producing the cuts soon developed the finest homes.

Consequently, to widen some of these narrow through cuts demanded the engineering and construction of reinforced concrete retaining walls. These varied from 4 to 9 ft. in height and up to 200 ft. in length at a contract price of \$50 per cu. yd. in place.

And here the character of the land worked against us. For once below the 3-ft. layer of topsoil, gravel and clean sand was encountered. This stood reasonably well as long as damp. So speed of construction was essential to prevent cave-off back to the extent of damaging house foundations.

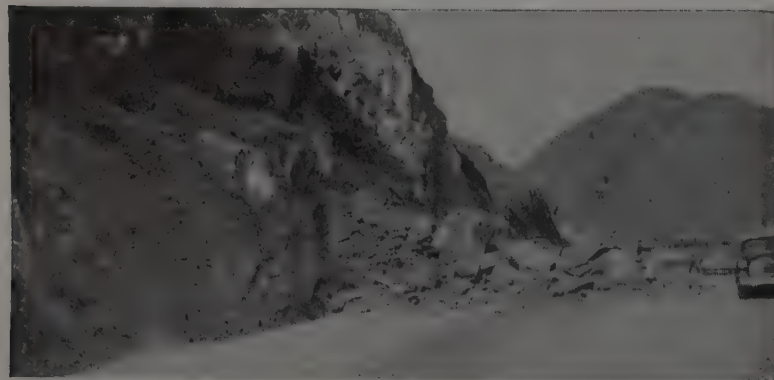
Cheap power makes expensive road

It happens this valley area is in the "development zone" of the Columbia River. Two dams, Rocky Reach and Wells, are programmed. One is to be built by the public utility district of our county, one by the neighboring county district. These are in a preliminary survey state at present. And to say there is rivalry between county districts to produce cheap power and attract "payroll" industry is putting it mildly. Contesting for \$60,000,000 worth of industry is not child's play. But it has truly turned the valley into an engineering "ulcer gulch."

Finally, all authorities reach agreement that the impounding pool level is definitely determined, and highway departments are able to go ahead in relocating facilities. Then, with sur-



FLOOD-CHANNEL maintenance must be worked into the program between winter snow plowing and run-off. Orchards built into deltas of major streams need channeling and dike protection.



CLEAN-UP TIME each spring follows the freeze-and-thaw cycles that dump tons of rock on the county roads. In winter, heavy snows leave up to 50 in. on the level.



GIANT gravity-defying sentinels of high strength alloys, armed with nuclear weapons, may be able to hover near centers of aggression ready at an instant's notice to drop destruction that will make war too deadly to risk.

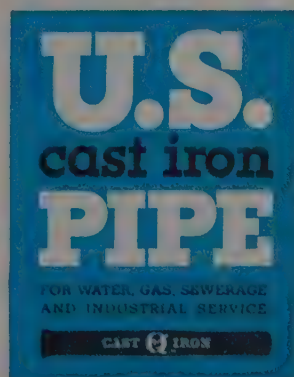
100 years from now...

WE MAY MAKE WAR IMPOSSIBLE!

Scientists, looking ahead, envisage a fabulous future...full of wonderful new products that will bring civilization a whole new era of progress. But, even then, our gas and water will still flow through the same dependable cast iron pipe being laid now.

Here's proof! Today, more than 60 American cities and towns are being efficiently served by the same cast iron water and gas mains laid over 100 years ago. What's more, modernized cast iron pipe...centrifugally cast and quality-controlled...is even stronger, tougher, more serviceable.

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RETAINING WALLS are necessary to widen dedicated streets which were only 30 ft. wide in the original townsites. Orchards were more important than streets to the real estate speculators.



WIND AND PLOWING fill roadside ditches in the wheat growing areas. Farmers are allowed to plow up to the ditch line as a weed control measure, but it means cleaning out the drainage ways.

veys well under way, some hydraulic engineer dreams up an 8-ft. rise in pool level to produce cheaper power. So another 3,000 acres of land just bubbled under—and where can you put the road? You guessed it! Right smack in the vertical rock cliff!

The section of the county still devoted exclusively to fruit poses its own problems. Summer temperatures are hot, often ranging up to 110 deg., but ideal for fruit growing. However, fruit is delicate. Dust is anathema to all fruit, particularly apples. So the demand here is for shoulder-to-shoulder oiling of all roads. Yet, fruit trees transpire heavily in hot weather. Thus, sprinkler systems are installed right to the property line and run 24 hr. a day, covering road and all.

This really puts you between the public and a sense of duty. Should you resort to legal action, as has been necessary, you are immediately hindering the area's growth and development. If you don't, and the roads go to hell under the constant wetting, then you are seven kinds of a so-and-so for wasting taxpayers' money.

On the 2,600-ft. wheat-plateau level, distance is not an idle word. The farm buildings are literally hidden in the vastness of rolling land. And the heavy snows that provide the moisture for the wheat also happen to produce our worst snow control difficulties.

With heavy snowfalls leaving up to 51 in. on the level, wind is our enemy. Sometimes we are still punching the final track through the back roads when a temperature change brings softening conditions. Unable to push the snow back from the shoulders, the subgrade becomes a loblolly that even our own equipment can't traverse. This situation is only alleviated by crews hand-ditching water wherever possible.

Orchards in the flood channels

The snows melt and run downhill. But in the mad rush to capitalize on fruit prices, orchards were built in the deltas of the major drainages. Each spring these lands face complete devastation from a heavy run-

off. So a continuous yearly flood control preventive maintenance is required. This is accomplished by channeling and diking enough each spring to prevent damage, but lack of funds never permit a complete solution to the problem.

Our Pine Canyon is a prime example. Conservative estimates by the State Hydraulics Division tell us that the expenditure of approximately \$100,000 is needed to solve the situation. Ordinarily, before spring run-off time, we operate a D7 Caterpillar tractor and dozer here for four or five days banking the weak spots in the dike and cleaning the main channel. Since this is a gravel soil, the grade high, and the water force great, in a rough run-off, this work of channeling may only last 4 hr. or less under the flash peak. Yet the county engineer must make the decision each spring to conduct this maintenance work or not, knowing it will not solve the problem, but may save property. With present flood control funds it is impossible to do the enormous flood control job correctly.

Weeds or clogged ditches

In the wheatland region, weeds are a definite problem and hazard. On a wide right-of-way, weeds are a costly control item. The easiest and simplest method in our region is to allow the farmers to cultivate the right-of-way up to the back ditch line. Often the plowing is done throwing the furrow out, and the result fills the ditch. This usually means a thorough cleaning of the ditches each fall. So, again, the engineer must choose between the cost of weed control, which in the past for us did not pay at all, and the cost of the annual roadside ditch cleaning.

In any fast, furiously growing county, with an industrial upheaval, there is usually a great deal of sectional jealousy. It may be that conditions in the developing area demand the construction of new facilities. And in the egotism of growing rapidly, the new area may make a constant demand upon the rest of the county. Consequently, any construction of new buildings in the growing

area is a red flag to other county areas. So, the county engineer is sometimes caught in the problem of meeting demands that may be strongly opposed. The engineer's community is the entire county, and his primary responsibility is to the area as a whole, regardless of local feelings.

Tough to get at

Bill Genter, engineer of Whatcom County, has specific problems peculiar to the Western region. The Mount Baker National Forest recreational region occupies 63% of the county area. These acres are entirely tax free, yet present great problems in road maintenance and construction. The prime example is a county forest recreational road only 12 mi. long. Unfortunately, this road is only accessible for maintenance crews and equipment by traveling over 75 mi. of the neighboring county's road. But this short stretch of road will carry a U. S. Forest Service haul of 90,000,000 board feet of Douglas fir, the materials for a \$34,000 bridge, and all of the supplies and material for a \$40,000,000 hydro-electric development.

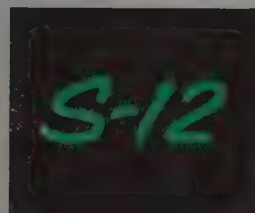
Another unique situation is the 5-sq. mi. recreational area known as Point Roberts. This area has 16 mi. of county road that can only be reached by traveling 21 mi. of Canadian highway. Being immediately adjacent to New Westminster and Great Vancouver, British Columbia, the region is particularly attractive to Canadians recreationally, and is being opened up by Canadian highway facilities. To reach this road, the county must take all maintenance equipment, materials, and supplies through the Canadian customs, be cleared, inspected, and convoyed by Canadian customs personnel. This procedure is definitely slow and costly.

Whatcom County's Lummi Island ferry is an integral part of the county road system. Although it operates at an annual loss of \$20,000, the show must continue. There is no stopping the service and isolating the group

(Continued on page 227)

S-7 and S-12

"EUC" Scrapers



12 yds. struck...
14 yds. at 3:1 slope
... 16 yds. heaped
at 1:1 ... 26.5 x 25
tires ... 218 h.p. ...
9' 6" width of cut ...
NoSpin differential
non-stop 180° turn
in 31 ft.



*Contractor preference
for "Euc" Scrapers
results from
pay-off performance
on the job.*

Big 26.5 x 25 tires, NoSpin differential, Euclid planetary drive axle and 218 h.p. engine give the S-12 plenty of power and traction to pick up heaped loads in a hurry. On this Tennessee highway job, the 28 mph top speed with capacity payloads was a big factor in maintaining high production at low cost.



Rugged construction of the S-12 keeps down time to a minimum—it's designed for work on the toughest jobs with big push tractors. Heaped loads of heavy clay—15 yds. and more—were picked up in a short travel distance on this South Carolina railroad grading project.

Euclid Equipment

FOR MOVING EARTH, ROCK, COAL AND ORE





COMPACTION is a special problem in the arid West, with dry materials and high fills—Equipment and methods developed have set national standards.

By **EARL MALOON**

Manager, Construction Machinery Division
Southwest Welding & Mfg. Co.
Alhambra, California

IF YOUR GRADING job is located anywhere in the eleven Western states, and soil compaction is costing too much, you are not alone with the problem. Probably no other area in the United States has such difficult, diversified problems in compaction.

Nowhere is water more scarce than in our arid West. Soil types vary from powder-dry lava fines and clays through every classification including rock. We have frost penetration and some of the coldest winter temperatures in the nation. Highway building through our deserts in summer is duplicated in no other section. Jobs often are located a long distance from population centers and skilled-labor markets. The jumbled-up geology from the Continental Divide west has made the use of mixed soil-and-rock fills the rule rather than the exception. And fills over 100 ft. high are often necessary because of rough terrain.

Conditions like these have caused engineers and contractors much thought. In many respects these difficult Western conditions can be

credited with developing the science of compaction in all parts of the nation as well as the West. For the fills have to be built, and necessity is the mother of invention. Western goods have a way of finding their way to market in trucks, and trucks need stronger highways.

The expanded highway-construction program which now appears likely to be authorized by Congress will intensify rather than diminish the problem. For speed and cost are the demons looking over the shoulder of the laboratory engineer each time he pounds out an optimum density curve. If a construction program of real magnitude is realized, it will not be enough simply to get excellent densities and bearing value. These will have to be developed speedily, and at reasonable cost.

Speed vitally important

The importance of speed—call it high unit production, if you will—can hardly be overstressed in any discussion of compaction. Practically every advancement made during the last 15 yr. in compaction equipment has come about because men searched for some equipment which would compact more cubic yards of material per hour. There is compaction equipment now available which will deliver 95% Modified AASHO

densities on lifts 24 in. thick under average to good conditions. It came about only because older equipment either couldn't move fast enough, didn't have weight or action enough to develop consistently higher densities, or because the compaction costs per cubic yard were too great.

The whole trend in grading equipment is toward bigger loads hauled faster. You see double pushers in the pits now; not singles. Contractors working in the West's typical sandy or granular materials have learned that water on a fill or in a borrow pit is a wonderful investment even if its cost seems high at first. One contractor in Southern California laid sprinkler lines and a circulating irrigation system through his borrow pit, watered it 72 hr. after ripping through past the subsoil with a giant ripper, and allowed the necessary draining period. The result was 40-ton loads every trip where 30-tonners had been the best he could do before. Sandy soil, which the West has in abundance, handle best when its dryness is corrected.

Another contractor in Arizona had an impossible compaction problem when a flour-like silt refused to take water. Rollers couldn't develop required densities unless the fast rubber-tire dirtmoving fleet cut its input by about 60%. The solution here was to get a Trav-L-Plant or

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Cedarapids

Built by
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Owners about Profit...

Someplace near you there's sure to be a Cedarapids plant working. Ask the owner what he thinks about the performance of that plant!

We'll bet you get answers like these—

"We're crushing 100%, averaging 105 tons per hour, with no maintenance costs in 12 months' operation"—a New York Commander owner.

"The only competition I have around here is another Cedarapids plant"—a Wisconsin crushing plant owner.

Call your Cedarapids distributor for the location of the nearest working Cedarapids plant—then ask him to explain the Cedarapids features that will make more money for you.

SUSQUEHANNA QUARRY CO.

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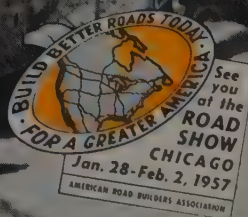
150 TONS PER HOUR

of crushed rock for

Pennsylvania

Turnpike Extension

Set up to produce about 75,000 tons of crushed stone for sub-base on the north end of the Pennsylvania Turnpike Extension, this 3-unit Cedarapids plant is turning out 150 tons per hour for Susquehanna Quarry Co., Millersburg, Pa. Rock from an abandoned strip mine is fed to the 25"x40" primary jaw crusher over a vibrating grizzly which bypasses fines before they reach the crushing chamber to permit greater production of crushed material from the Portable Primary unit. The versatile Cedarapids Commander is used for secondary reduction and delivers finished material directly to the truck loading hopper.



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



the rotary mixing type and put the water in forcibly. The idea made money because the dirt input jumped back where it should be.

Adaptations from dams and airfield

Highway engineers may not admit it, but behind almost any grading and compaction spread on a road job there lurks a dam or an airfield. Either the contractor learned how to move and compact dirt fast on a dam, or some key foreman or superintendent learned what really high compaction is on an airfield. This type of experience has combined to actually outmode some highway compaction specifications. For example, some highway specs still require one roller on a highway fill for each 150 cu. yd. of fill per hour hauled in. There are several California contractors, and some in other states, with fast, powerful equipment that can and do place from 2,000 to 3,000 cu. yd. per hour on the fill. Since some archaic specifications would make it impossible for this fleet to work by placing from 15 to 20 rollers on the fill, contractors do not, as a rule, assign their crack outfits to highway work. Specifications like that do not encourage good densities and a fast grading job. They encourage the retention of compaction equipment that is now outmoded, and they make for a slow, long-drawn-out job.

Lessons to be learned

Contractors on dams and airfields are proving the truth of this statement under compaction conditions as tough or worse than on highway fills. One firm in late 1955 and early 1956 has placed 3,000,000 cu. yd. of granular material in an Arizona embankment for the Corps of Engineers, averaging 96.1% Modified AASHO densities through the first 80% of that project. The material

COMBINATIONS of sheepfoot and pneumatic compaction are usual when fills have big and small area combinations. The big pneumatics can be used in high-production areas.

was hauled in at rates never under 2,000 cu. yd. an hour and often over that.

Instead of using a big fleet of compaction equipment, this contractor placed his moisture in the borrow pit and kept everything off the fill except one DW-21 drawn 50-ton Southwest Pneumatic Compactor, and one double set of heavy-duty sheepfoot rollers pulled by a dozer Cat. The sheepfoot rollers weren't even necessary, but they did some work while the dozer Cat moved around and leveled occasional heaps of dumped earth. Blading equipment for leveling wasn't even used; if a pneumatic compactor has the proper oscillating action it will compact a fairly rough fill to high density. On this big fill only the hauling units and a minimum of compaction equipment worked, but they delivered results which exceeded a very tough specification by over one percentage point. And two passes of this pneumatic roller on 6-in. lifts did the work.

A direct comparison

Available for any engineer's inspection is a compaction comparison which was made on a high fill (Isabella Dam, Calif.) by the Corps of Engineers. On this job the earthwork was split in two contracts. On the first job, 42,000-lb. sheepfoot rollers were used for 12 passes on 12-in. lifts. On the second job, a C-50 pneumatic Compactor was used for 6 passes on 18-in. lifts. Results were virtually identical even though the lifts differed and the number of trips was reduced with pneumatic compaction. About 70% of the tests made exceeded 94% of the Modified AASHO density.

Examples like this indicate that contractors are right in asking for

greater latitude in selection of compaction equipment, in setting their own lift thickness, and in methods of adding moisture. So long as a contractor produces results, he should not be hamstrung by compaction specifications which congest his fills, slow down his hauling units, and make densities much harder to get than he could deliver if he had the freedom to select his own equipment. There might even be fewer dry fills constructed.

Emphasis on speed

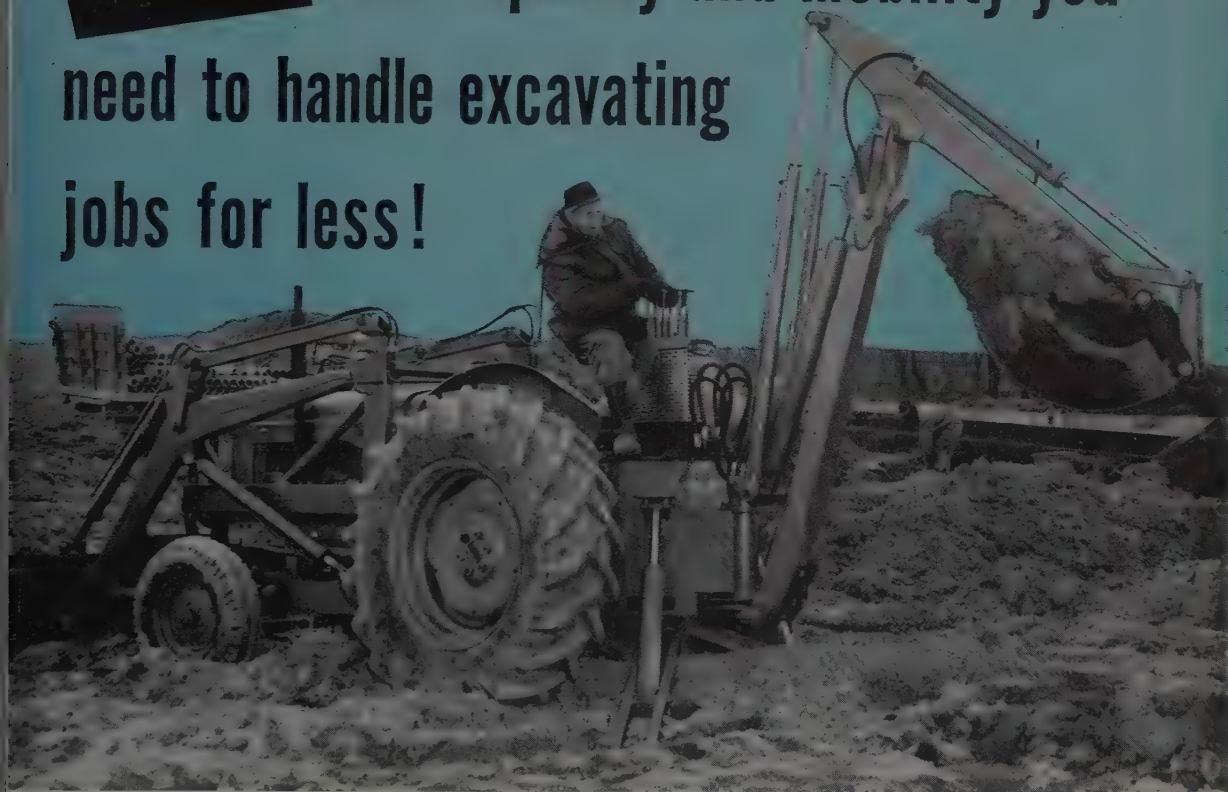
1956-model compaction is a sort of tug-of-war between two opposing forces: contracting and engineering. Engineers cannot lower their compaction requirements, especially on highway work, because of heavier and more frequent pavement loading. Whatever compaction advances are made must be in speed and economics on the contracting side of these opposing forces.

Thus we see a consistent trend toward heavier weights in both sheepfoot and pneumatic rollers. One manufacturer has developed a machine which uses the interrupted pressure principle. According to ARBA Bulletin 109, page 25, vibrating rollers are limited in speed, and the application of vibration to pneumatic tires is subject to some dampening influence. Nevertheless, such rollers have application in certain constructed areas where they do not have to be synchronized with a high-balling dirt-moving fleet of equipment. A roller of this type recently was used to excellent advantage to compact backfill of gravelly sand over a pipeline where street pavements had to be replaced immediately. It did its work faster than flooding, created less mud and slipperiness, and developed a much stronger base to support the pavement than flooding could have done.

Even in the field of hand-held compressed-air compaction equip-

Now!

The capacity and mobility you need to handle excavating jobs for less!



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The right combination of capacity and mobility makes the Fordson Major Diesel today's best power buy for excavating basements, plumbing laterals, footings, and service connections. Here's what we mean:

Equipped with a backhoe, the Fordson Major Diesel will dig as wide as 3 feet, as deep as 12 feet. It swings a full 180 degrees, has plenty of reach to load high-bodied trucks. Fast, positive hydraulic control makes accurate digging easy.

Though big and rugged for work in adverse conditions, the Fordson Major Diesel is exceptionally maneuverable... easy to handle in close quarters and over rough ground. It's also highly mobile, lets you handle several jobs a day in different locations.

You can check the complete specifications of the low-cost Fordson Major Diesel by calling your nearby Ford Tractor and Equipment Dealer. Do it today!



F. M. D. Tractor-Loader gives you $\frac{5}{8}$ yard bucket capacity. A touch of a lever and double-acting cylinders on lift arms and bucket deliver positive down pressure... over two tons of breakaway power... 2000 lbs. load capacity at full lift. Easily attached blade makes it an ideal unit for backfilling, grading and dozing.

For the name of the Ford Tractor and Equipment dealer nearest you who can demonstrate this equipment, write one of the distributors listed below:

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Tractor-Equipment Distributors, Inc.
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Intermountain Ford Tractor Sales Co.
Salt Lake City, Utah

Pacific Tractor and Implement Co.
Richmond, California

Wymont Tractor and Equipment Co.
Billings, Montana

ment there has been a change, dictated by economics. There is a trend toward multiplying the machines on a single frame mounting, so that a great deal more work can be done by one operator. And wise design engineers have learned to clean up the cheesecake from the back sides of bridge abutments and similar structures, so that sheepfoot rollers and pneumatic compactors in the 25-ton class can move in rapidly and handle much heavier lifts of material than labor crews can handle with such hand-held equipment.

Pros-and-cons of rollers

One of the very best indexes of the pros-and-cons of various types of rollers can be found by examining the buying preferences by types of construction firms which rate high in management skill and consistently keep a backlog of work ahead. There is no question whatever that these firms are interested in compaction, because how well and how fast they deliver it is a measure of their reputation as a firm, as well as a measure of their profit on the job.

As a general rule the best outfits now use one of the very heavy pneumatic compactors in the 50-ton class for jobs where high production and density is the main criterion. Where high daily yardage and high density is not so important, or where work areas cannot be made large, heavy-duty sheepfoot rollers still are used to advantage.

Vibratory and interrupted-pressure type machines are found where granular soil types, small work areas, or other such factors arise, but contractors usually try to work out a fill procedure to utilize compaction equipment already on their list if they can, before they buy special-purpose machinery. Grid-type rollers also come under this heading.

Good management important

Good management is still one of the most important secrets to compaction. Dig beneath the surface of any company with a reputation for earthmoving, and certain operational fundamentals appear.

The good outfits consider compaction as a job to be done along with getting the most from their dirt and rock equipment. They do not scream about requirements or question the engineer's design ability. Instead, they ask, "What roller should we select to keep this engineer happy while we get what we should out of our scrapers?" Compaction is thought of by such outfits strictly in terms of a processing part of the production schedule.

Outfits like this study the material carefully to see what its optimum compaction characteristics are. They analyze long-range weather charts to see what probability of rain they

may have. Where water is really scarce they bring well drillers in to develop a nearby water supply . . . then they recover all or part of their cost by selling the well to the landowner on whose property the water supply was developed.

Deepening, rooting and watering

Thinking in terms of loading, they are coming more and more to rooting or deep loosening of borrow areas by giant rippers. Ripping also is an aid to loading where pre-wetting of a borrow pit is done, because it gets the moisture down deeper in a shorter period of sprinkling. Where water is hauled, bigger units in the 4,500-5,500-gal. class now handle more gallons per day per operator.

If the fills are mixed with both soil and rock or boulders, they thicken the lifts and use heavy rollers. The good outfits get their solid rock cuts out of the way as soon as possible so this material can be lost in the bottom of high fills; then they fill in with dirt and mixed material.

They build detours for traffic and keep everything off the fills but dirt hauling machinery and compaction equipment if possible. Production-hungry outfits don't even permit the earthmoving units to run all over a loose fill for compaction purposes, even though a heavily loaded pneumatic tire on a scraper delivers good compactive effort. Instead, these outfits keep the hauling units tracking down a road that will let them get in and get out fast. They buy a roller to do the rolling.

Water at the optimum

The heads-up outfits set up orderly input, processing and compaction methods so that any human equation is minimized. If a material takes 12% moisture and if the contract permits that moisture to be put in, they get it in wherever it will do the most good: either in the pit or on the fill. If this material takes two or three or four roller passes, the dirt input schedule is built around that. When fills top out near the narrow portions, good superintendents manage to have another fill starting nearby so that dirt equipment and perhaps even the roller can work both places and still keep that production UP.

These men frown on slipshod methods, obsolete lightweight sheepfoot rollers, or sacrifices in water where the development of a water supply is possible. They do not tend to temporize or to sneak something out of a schedule which belongs in it as much as we might believe. Given definite specifications to work to, compaction will never be a bottleneck for the good outfits—at least under 1956 conditions—

because they have the know-how and can buy compaction equipment which can keep up with their earthmoving fleets.

High fills present problem

The West's mountainous terrain frequently makes it necessary to construct high fills and consequently deep cuts. There is a place in Arizona where a 212-ft. cut lies directly over a 160-ft. fill; one in Montana is almost as great. And perhaps some of Western Construction's readers know of even greater elevation differentials.

Compaction under such conditions is peculiarly a Western problem. In mountainous terrain a portion of the cuts are usually in rock, and rock dumped in 3-4 ft. lifts in the base of deep fills makes excellent foundation material. Where high fills have to be constructed of mixed material or dirt, however, the problem becomes greater, especially if the material is dry. Water trucks usually cannot haul on the grades where scrapers and rollers work, particularly in the early stages of a fill.

Some of the better outfits get moisture in nonetheless, thanks to quick-coupled pipelines, hoses, or pre-ripping and sprinkling the borrow material. If design engineers decide that the country is sufficiently arid so that compaction can be done far down the dry side, heavy pneumatics seem to do the best compaction job for a stable high fill.

High fills can be built as readily as low fills if the dirt input is balanced inversely in relation to adverse topographical features. Since high fills frequently have heavier lifts than are possible on lower ones, the compaction equipment selected should be able to handle these heavier lifts. It would otherwise be necessary to have spreading and leveling equipment at the very time when the fill surface is at its smallest and should not be congested. And the heavier compactors will, of course, permit boulders and rock to be incorporated in these fills quite readily.

Compaction is no bottleneck

Western highway building in relation to compaction will always present a challenge to men's minds and ingenuity. But the problem connected with compaction is not insurmountable. Compaction need not be a bottleneck, even on the worst jobs where conditions make it a problem even for the best men. If engineering specifications, manufacturer know-how, and experience of good contractors will each stay abreast of each other, there is no reason whatever why compacted fills cannot be built about as fast as dirtmoving equipment can hurry in with the material.



This 110-foot stiffleg derrick pieces together the Bascule span . . . the last of four spans on Seattle's \$6,000,000 First Avenue South Drawbridge. The 25-ton stiffleg and its teammate, a 20-ton mobile crane, are both outfitted with Tiger Brand lines. An interesting thing about this erection job is that the north and south spans were ferried into position atop barges, then lowered onto their shoes on an outgoing tide. Alton V. Phillips Co., contractor for the superstructure has used Tiger Brand Wire Ropes since they went into business . . . "it's been 11 years of complete satisfaction," says Mr. Phillips.

We can prove to you there is a difference in wire ropes!

Tiger Brand users tell us the difference always boils down to *length of service*. Sure, it's sometimes hard to show this difference . . . unless you purposely set up a test condition. Maybe that's why many wire rope users overlook the fact that ropes are not all alike.

We welcome comparative testing. That's how many of our customers have proved they get longer service with Tiger Brand*. Try us. Ask a Tiger Brand Wire Rope Engineer to select the right rope for your job; then watch the Tiger Brand outperform other ropes you have in the same kind of service.

**the right rope for your job . . . because Tiger Brand Wire Ropes are engineered to give the best balance of strength, flexibility, toughness and abrasion resistance.*



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UNITED STATES STEEL



SUN AND HEAT are a Western problem for asphalt technology —An accelerated weathering test is developed and shows good results.

FIFTY YEARS ago the pioneers of the asphalt industry classified and qualified asphalt by use of the following tests: Penetration, Ductility, Flash Point, Softening Point, Loss-on-Heat and Solubility. In this enlightened year of 1956 the sons of the pioneers are still qualifying asphalts with the very same tests, using practically the same equipment, and with only very slight modifications in operational procedure. All this in spite of the fact that the adequacy of these tests to predict the probable curing and hardening properties, and the relative durability of different materials, is very often challenged. We all know how these tests have been cursed and discussed over the years. However, they have all apparently withstood the test of time and still remain the best available tools for specification work. In fact, it is the considered opinion of this writer, after about 30 years of experience with almost every type of test ever advanced for the evaluation of asphalt, that only three simple tests are actually needed in specifying good durable asphalt cements. These three tests are: The Penetration test, the Loss-on-Heat test (either standard or thin-film), and the Ductility test.

The real problem in securing durable asphalt binders is not the development of more quality tests. Instead, the problem is in knowing where to put specification limits and requirements, using the above three basic tests, so that all poor asphalts will be eliminated from consideration without penalizing too many borderline sources which might be only fairly good.

Unlike many other states, New Mexico is situated in an area where some 18 or 20 different sources are on a competitive basis in furnishing the asphalt. Most of these sources produce good durable asphalts, but there are two or three that are putting out material with a consistently poor record of serviceability. A solution to the problem is deciding what specification requirements and limits are necessary, using only basic tests, to insure getting good durable asphaltic binders from as many different sources as possible.

Some recently published developments in accelerated hardening tests

seem to have as a basis the assumption that oxidation is the prime factor in deterioration. We cannot agree with this. In the case of paving grade asphalts, used in plant mixes, the primary cause of hardening is evaporation, or volatility. The factor of oxidation, while always present to some degree, certainly assumes a secondary role in the field operations of mixing and laying an asphalt pavement.

It has been demonstrated that asphalts from a certain source can lose what amounts to half of their life expectancy as binders in the few minutes of mixing in a hot plant, all due primarily to the inherent volatility of these particular materials.

A study of our tests shows that there are great differences in the hardening characteristics of paving asphalts from different sources, all of which have met the same standard specifications. Of particular significance is the comparison of the per cent Loss of Penetration with the loss shown from the standard Loss-on-Heat test. The increase in hardening, or drop in penetration, is in direct proportion to the increase in the loss from heating.

Another significant fact shown is that the loss in penetration, due to field mixing, of the softer 120-150 grade of any given asphalt is much less in most cases than that of the 85-100 grade from the same source. This would indicate that there are

WEATHERING of asphalt pavements has peculiar Western aspects, since the process is aggravated by exposure to bright desert sun and high temperatures. New Mexico has these climatic conditions to an extreme. The resulting problems have been under study for years by Robert G. Clark, Chief Chemist, New Mexico State Highway Department, who presented a paper on "Asphalt Volatility and Weathering Tests" at a technical session of AAPT. Highlights of the paper are presented.

Editor.

many instances where, if it is feasible to use the softer grade of asphalt for hot-mix pavement, there would be a bonus of 10% additional life in the construction over and above the natural advantage the soft asphalt has of having farther to go in its hardening process toward final embrittlement.

The part that ductility plays in the over-all picture of asphalt durability has always been a point of much argument. It is our considered opinion, however, based on the analysis of many pavements, that the ductility of an asphalt, especially after it has been incorporated into the pavement and had its initial hardening due to volatility, is of prime importance in determining the quality of a bituminous structure. We have analyzed sections of "failed" pavements in which we found that, in spite of the fact that the asphalt had not reached the final brittle stage, there was a complete lack of ductility in the thin films of binder. At the same time, we have analyzed sections of "good" pavement in which we found what is usually considered complete final embrittlement of the binder, yet the inherent ductility of the asphalt was apparently keeping the mix alive.

To sum up in our case for considering volatility in asphalts as the predominant factor in deterioration, it is our opinion that if the initial big loss in penetration, or hardening, due to volatilization in field mixing can be lessened, then the over-all life of an asphaltic binder will be correspondingly lengthened. This should follow simply because the slow oxidation process which takes over at the birth of a section of paving has a longer road to travel before it wins out in the final deterioration, or death, of the pavement.

In the case of hot-mix pavement the factor of volatilization takes precedence over oxidation as the initial cause of the age-hardening of asphalts. However, it is pretty well established that oxidation by atmospheric oxygen and moisture is the chief long-range cause of aging and deterioration. Elevated temperature and light exert an accelerating effect on this aging process.

Many special weathering machines and procedures have been constructed and devised in an attempt to arrive at a good quality test for asphalt, or an acceptable method of predicting pavement life. So far none of these has been completely acceptable or practical.

Recently, however, a series of laboratory tests was started which, at this point, shows some promise of indicating a method by which we might be able to estimate the probable life of a new asphalt pavement. The procedure being used is that of curing mat samples in the laboratory, at an elevated temperature, for various lengths of time, then extracting



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They must be easy to move around the yard ...

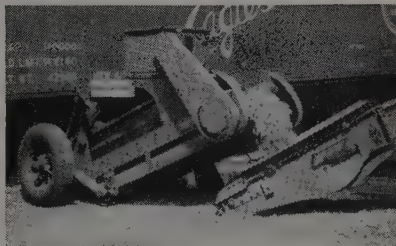
easily towed from job to job. They must withstand constant use and frequent movement.

Shown above is the portable conveyor of advanced design, the Barber-Greene 363. Shaft and gear reducer drive—no chains—no sprockets, full swiveling wheels, Acme take-ups and many other exclusive features.

Shown below are other models in Barber-Greene's complete line of cost-cutting conveyors.



Model 374 cuts cost at high capacity. With capacities up to 425 t.p.h., this heavy-duty machine has antifriction bearings, shaft and gearbox drive, hydraulic boom hoist and other features.



Model 358 cuts cost of car unloading. Feeding a conveyor, this car unloader releases cranes and other expensive equipment for other work. Handles gravel, sand, stone, cinders, etc.



Model 362—low-cost, high-quality portable. Three-roll carriers, swivel wheel truck, and many other features not available on conveyors of this low-price range, are standard on the 362.

Write for literature on any portable in the Barber-Greene line.

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and recovering the asphalt and checking the results of critical tests against those of samples that have remained in place on the project for some corresponding period of time.

Large sample sections of hot-mix pavement were picked up from projects throughout the State and portions cured in large laboratory ovens at 150 deg. F. for periods ranging from one to nine weeks. After each week's curing the asphalt of one portion was recovered by the Abson Method and the hardness and ductility test results obtained.

Of course, a great many tests will have to be made before a satisfactory correlation can be established between these laboratory tests and actual field weathering conditions. In New Mexico we will certainly have to consider the locality of the project in establishing a correlation due to the varying temperatures throughout the State. Asphalt pavements constructed in the southern part of the State would have many more weeks of high temperatures during the year than would those constructed in the high northern part of the State. However, a study of the test results along with other information already yields considerable knowledge of what might be expected of pavements made of asphalts from similar sources. It is indicated, and we have assumed for the time being, that one week of laboratory weathering at 150 deg. F. would be roughly equivalent to one year of natural weathering.

To summarize, we would like to again emphasize that this is a progress report. However, a simple laboratory procedure, together with much accumulated data, has been outlined which, at this point, shows considerable promise of indicating a method whereby we might be able to predict the probable useful life of a new asphalt pavement. Also, we would like to stress the following:

1. The volatility of an asphalt is a predominant factor in its eventual deterioration when used in a hot plant-mix pavement. If the initial hardening of an asphalt, due to volatilization in mixing, can be lessened, then the over-all life of an asphalt pavement will be correspondingly lengthened.

2. The ductility of an asphalt, especially after the asphalt has been incorporated into the pavement in thin films and had its initial hardening due to volatility, is of prime importance in determining the quality of a bituminous structure.

3. It is our sincere belief that good, durable asphalt cements can be specified, and acquired, by the use of only the following three standard tests: Penetration Test, Thin Film Loss-on-Heat Test, and the Ductility Test.



FIGHTING ABRASION— Hard-facing deposited by semi-automatic machine cuts time required by manual methods.

By **HENRY S. WARREN**

Engineer, Stoodly Co.
Whittier, Calif.

IN THE WEST, heavy earth-moving and rock-crushing equipment suffers from excessive abrasion. Maintenance is a never-ending struggle. Development of fabricated alloy build-up and hard-facing wires that can be applied through semi-automatic welding machines is an important factor in reducing this construction problem.

Principal feature of the process is its extremely high deposition rate, three or four times that of the conventional manual method, with consequent reduction in welding time and costs, plus added service life of the hard-faced parts.

One outstanding example of the success of the process is found in the maintenance of portable crusher rolls handling highly abrasive rock. A number of instances have come to light in which excessive roll wear has seriously reduced production. Manual welders have been unable to keep up with metal loss until the semi-automatic was installed, cutting welding time in half and raising aggregate output proportionately.

Wires of varying analyses are now available so that the semi-automatic machine may be used for most of the usual hand build-up and hard-facing applications—bucket teeth, lips, and sides; crushers of all types, crawler parts, rippers, scoop lifts and carry-



HAMMERS from a rock mill are built back up to size with a semi-automatic welder. Build-up is manganese, with a cap of hard-facing alloy to provide resistance to wear. Hammer costs are cut to less than half of replacement.

ing scraper blades, drill tool joints, mill hammers; brick-making machinery, die rings.

The standard semi-automatic machines now in common use may be readily adapted at slight cost to handle alloy fabricated wires. Changes in the simple feed mechanism are generally accomplished in little more than an hour.



SHEEPSFOOT tamp in a carbon mold where its worn unit is rebuilt to size with hardening alloy applied through semi-automatic welder in a third of the time required for manual procedure.

NOW!... out of 40 years' experience in manufacturing Asphalt Plants.

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3000-lb., 4000-lb., 5000-lb.

BATCH CAPACITY PLANT

the Streamlined

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**The Industry's Most Modern
High-Speed • High-Production**

**Fast-Moving
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MADSEN DOES IT AGAIN

Drawing upon experience and knowledge gained over the years, MADSEN now offers the sensational MADSEN HOT ROD Model 391 Asphalt Plant!

It's a versatile plant designed to handle the broad requirements of the contractor who likes to move as well as the contractor who wants to set up permanently. HOT ROD boasts many new features (a few are listed at the left). It has a minimum of removable parts for transport, good bin capacity, and a choice of screen and mixer sizes. It's a plant that's extremely simple to operate and easy to service. The 5000-lb. batch capacity HOT ROD shown above has produced in excess of 200 T.P.H. at a highly consistent rate.

Before you buy any asphalt plant, get all the facts on the all-new MADSEN HOT ROD. Contact your local MADSEN Distributor, ask for Catalog No. 3. MADSEN WORKS, 14120 E. ROSECRAVE AVE., P. O. BOX 38, LA MIRADA, CALIFORNIA.

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- Newly-enclosed gear box reduction unit that gets right into the mixer shafts! ... eliminates exposed mixer timing gears.
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- Simplest, cleanest design in the industry ... with a minimum of removable parts for easy transport and fast set up.
- Exclusive bin design (Patent Pending) eliminates segregation.

- MADSEN Asphalt Pressure Injection System (Patented) with new rotating distribution bar ... injects the asphalt into the mill quickly — cuts it off sharply — to give you improved mixing and reduced mixing time.
- Fast air operation of bin gates, asphalt pressure injection and mixer gate.
- Operator's station on end of plant ... with swivel-head asphalt and aggregate scales and all controls conveniently located for easy, fatigue-lessening plant operation.

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CONCRETE with 1½ to 2-in. slump is deposited ahead of the paver and emerges at the end of the slip-forms as concrete paving without sloughing along the edges of the slab.



SLIP FORMS for concrete paving approved by Colorado— May be used by contractors this season following 1955 test.

SLIP FORM PAVING of concrete highway slabs in the West will possibly get a thorough testing this summer. Colorado has changed its specifications to permit the use of the unusual technique, consistent with its policy of not requiring the contractor to use any given method. The option opens up two current contracts to the use of the machine. One is a \$746,210 grading and paving job 8.3 mi. long near Fort Morgan held by a joint venture of Roberts Construction Co., and Western Paving Construction Co. The other is a \$713,771 project involving 11.9 mi. of pavement south of Denver—a contract awarded to Bushman Construction Co. on March 15, 1956.

Concrete pouring has not started on either of these jobs and it is not known for sure whether the slip method will be used.

Colorado was able to test a slip form concrete paver under normal construction conditions on an important project last summer.

The paving to be done was on part of the Denver-Greeley Freeway, on US 85, approximately 5 mi. to the

south of Greeley. The project on which the slip form paver was used was located between Evans and LaSalle and included the placing of approximately 2,800 ft. of concrete on a stabilized base with no sand cushion. The concrete was placed in two unreinforced slabs, each of which was 24 ft. wide and 8 in. in depth.

The construction was under the direct supervision of Resident Engi-

neer Homer J. Winter. In June, before the paving was started on the Evans-LaSalle project, he and representatives of the contractor, the Gardner Construction Co. of Glenwood Springs, looked over the use of Quad City slip form pavers on two County Federal Aid secondary projects being supervised by the Iowa State Highway Department.

This study indicated considerable merit in this paving method and it was decided to make a trial of whether the machine could be used successfully for placing pavements on primary highways. From the Iowa information, it appeared that bid prices had been lowered from 25 to 30 cents per sq. yd. by writing specifications to permit use of the slip form paver.

One reason for the interest in testing this method was the fact that the added initial cost of concrete paving as opposed to asphalt, has limited Colorado's use of it in the last 15 yr.

The Colorado Department of Highway's decision to make a trial of the slip form paver required minor alterations in the specifications, but it was not necessary to change the standard concrete mix for portland cement.

The use of the machine and its performance were checked by its inventor and manufacturer, Glen Perkins. The machine operates on a subgrade which has been accurately graded to the elevation and typical section desired. It is mounted on crawler tracks thereby eliminating the use of standard forms. These tracks are 22 ft. long, which tends to produce a uniform riding surface free from choppy discrepancies. Ahead of its screed are tampers and tubular vibrators.

The machine is electrically operated from a generator and panel located on top of the paver. The concrete passes the screed and is belted with a 24-in. transverse mechanical rubber belt. Each track is operated individually and this facilitates the means of obtaining uniform lines.

Three sets of travel gears are avail-



FINAL SUBGRADING ahead of the slip-form paver must be accurate. Note the crawler tracks on the grader.

QUALITY in the plant means LONG LIFE on the job

Carefully-measured alloys are added to an eight-ton charge in this electric furnace, where some of Bucyrus-Erie's prime steels are produced. Company foundries use both electric and open hearth furnaces.



There are many years of heavy service ahead for this 38-B 1 1/2-yd. shovel. Owned by the Pioneer Construction Co., Pueblo, Colorado, it is loading granular base material for the State Highway Department on a construction job near Monte Vista, Colorado.

Long life is built right into Bucyrus-Erie excavators and shovels—a direct result of the close attention paid to quality from the day they were designed. Only the finest steels and other materials go into these machines. All castings are produced in Bucyrus-Erie's own foundries, and careful laboratory tests hold them to the highest standards. Modern forging and heat treating methods assure the strength, toughness, and hardness demanded for heavy field duty. Facilities for producing both weldments and castings make it possible to choose whichever is better for each working part.

All down the line at Bucyrus-Erie, quality comes first—in design, in materials, in manufacture, in service. This close attention to quality plus outstanding field-tested machine features make Bucyrus-Erie 3/8- to 4-cu. yd. machines the high-output choice all over the world. For more information on what quality construction means to you, call, write, or stop in to see your local Bucyrus-Erie distributor soon. Bucyrus-Erie Company, South Milwaukee, Wisconsin.

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Westmont Tractor Company....Missoula & Kalispell, Montana
Tractor Equipment Co.....Reno, Nevada
Road Machinery Company.....Phoenix, Arizona

able: one set provides a forward speed of from 2.25 to 4 fpm., the proper range for a full width, 24-ft. pavement 6 in. or more deep when the paver is being supplied by a 34E dual mixer; the other two sets provide speed ranges to 3.5 to 6 and 6 to 11 fpm.

Inexperienced crew

Considerable difficulty was encountered in pouring the westerly two lanes. It should be pointed out here that the entire operation was being carried out by inexperienced personnel. As these first two lanes were laid and finished, problems like control of the slump, proper finishing behind the machine, and difficulties due to starting and stopping of the machine were partially solved. The eastern two lanes were poured with less difficulty and much better results. It is believed that still better results can be obtained in the future by elimination of some of the causes of existing snags, like the use of transit-mix trucks.

Close subgrading was done before grading the trenches for the tracks. The trenches were graded with utmost precision, since they control the finish. Then final subgrading was done by a subgrader with crawler tracks. This type of mechanical subgrader is necessary because the paver does not use side forms. It was here found necessary to make sure that the trenchgrade was not altered before the paver had completed placing the slab.

Because the size of the project did not economically justify bringing in a dual drum paver, transit-mix trucks were used, and they created problems of subgrading, water control, and consistent production of concrete. It required much additional work to keep the subgrade in uniform shape. Control of the water was improved by metering it into trucks from a city water line. However, we found that a standard dual drum mixer operating on the roadway shoulder and correct travel gears are necessary to provide continuous forward movement for a smooth riding surface. Without constant forward speed from the paver, the stopping and starting resulted in a boil, and then a hump, behind the screed.

The hump was remedied by the finishers, but this is unsatisfactory.

The concrete stood up very well behind the forms and no sloughing along the edge of the slab occurred, as the slump was controlled to an average of one and a half to two inches. The slipping of the forms along the side of the slab also resulted in this advantage: The side was as if troweled.

Care had to be taken in depositing the concrete mix on grade so that a surplus would not build up ahead of the paver, causing an overload and slipping of the tracks on the sub-



TRANSIT MIXERS were used to feed the slip-form because the 2,800-ft. length of the test section did not justify a paving mixer. This procedure did not prove completely successful since it required too much starting and stopping of the paver.

grade. For best results, a load approximately up to the top of the 10-in. tracks tends to minimize this difficulty. The paver has a set of rollers spaced every six inches on each track link.

Tamping bars and vibrators should be stopped as soon as the paver is halted, to prevent a boil behind the screed caused by over-vibration and segregation.

Floating was done with 4-ft. wood floats and 10-ft. straight edges and this went easily and quickly when the paver moved continuously. But stopping and starting caused deformity and a considerable amount of extra work to eliminate it.

Best finishing results were acquired by a flat finish which worked only the "mush" and did not disturb the denser material.

The slip forms are attached to the paver and therefore move at the same speed as the machine. They are held rigid by cross frames which tie them together and prevent spreading. Generally, two of these frames are used. Four finishers were on this project, two of whom worked ahead of the first frame with the 4-ft. floats, while the other two did the final finishing and belting ahead of the second frame with the 10-ft. straight edges. A burlap finish, attached to the last frame, was pulled along with the forms.

Due to the lack of forms, a mechanical applicator for the commercial curing agent could not be used. The contractor devised another means: a mechanical hand spray suspended over the pavement by a rope held by a man on each side. On a larger project, it would be advisable to obtain some type of mounted, rub-

ber-tired spraying equipment.

A "travel batcher" which discharged direct into the trucks at a central plant was employed, using bulk cement which was weighed and added to aggregates with our metered water. This batching method was made necessary by our use of transit-mix.

All joints were sawed: Control joints were cut every 60 ft. and intermediates every 20 ft. The controls were cut as soon as it could be done without injury to the concrete. The cutting of the intermediate and longitudinal joints followed the daily completion of the control joints. To date one uncontrolled crack has occurred.

Good results were obtained from the use of a plastic joint filler.

While the paving was going on, a special study was made of results obtained on horizontal and vertical curves. It was found that, in both cases, the machine had been very successful.

The experimental use of the Quad City slip form paver was moderately successful. After proper consideration by the interested divisions of the Colorado Department of Highways it has been decided that use of this type of paver shall be permitted on primary highway projects in the future.

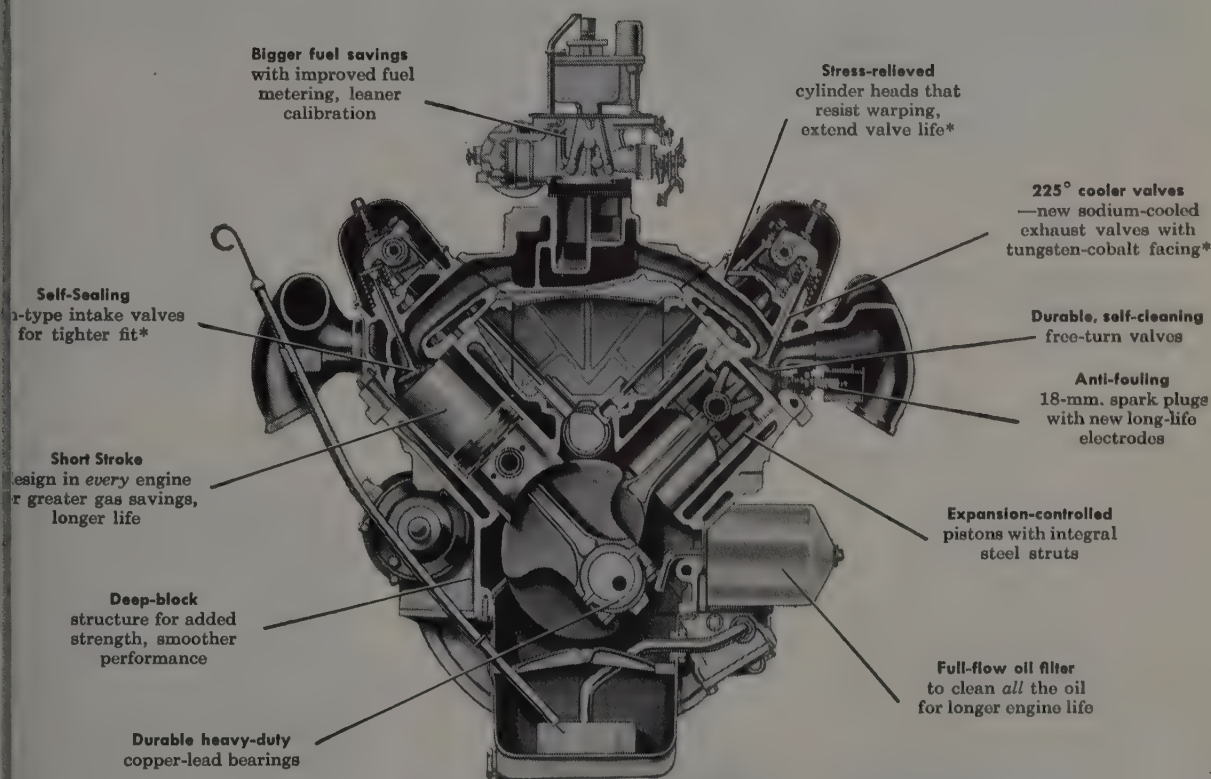
On our experimental project, it produced a reasonably good riding surface and a simplicity of operation which promises to lower the cost per square yard of placing concrete in years to come.

Mark V. Watrous is Colorado Highway Engineer, Charles Shumate is administrative engineer. Greeley District engineer is L. C. Bower.

Tandem in its class-Ford T-800

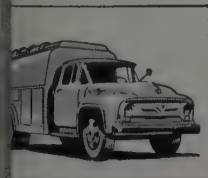
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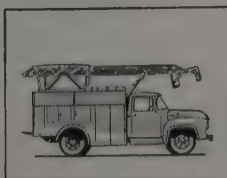


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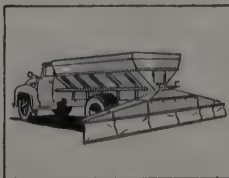
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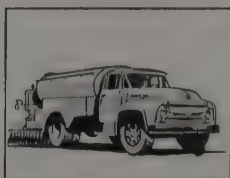
UTILITY TRUCK



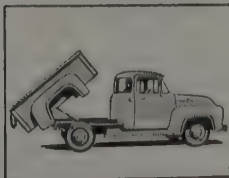
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LIME SPREADER



BITUMINOUS DISTRIBUTOR



LIGHT DUTY DUMP



Heavy-duty equipment under dusty conditions can be protected by extra lube oil filters.

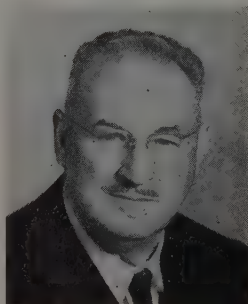


DESERT DUST elimination by the use of filters extends the life of Western highway construction equipment—Cuts down-time, maintenance.

NO ONE KNOWS better than a highway contractor that in any area where heavy and expensive machinery must be used under extreme conditions of desert dust or gritty dirt, one of the most important considerations is the cost of actual operation plus interest on the investment in such machinery. Vital factors in the final cost are engine maintenance and the downtime of equipment due to engine failure.

It must be assumed at the start that the equipment was properly selected for the job, that it was in good working order on arrival and that it was not and will not be unduly abused by faulty operation. If these assumptions are correct, then the contractor's most immediate objective is to prevent engine wear in two ways: (1) by elimination of dirt from the intake air; and (2), by removal of abrasives and metallic particles from fuels and lubricants used in the equipment.

Thirty years of experience in the design, manufacture, and installation of filtering equipment for all kinds of engines (automotive, indus-



By **CHARLES A. WINSLOW**
President
Winslow Engineering Co.
Oakland, California

trial, marine and, most recently, aircraft) have convinced this writer that if all abrasives were successfully removed from the intake air, lubricating oil and hydraulic fluids of industrial equipment, the life span of an engine that was well designed and properly constructed and lubricated

would last until the engine was replaced because of obsolescence rather than wear. By comparison, any standard brand track-laying tractor would probably not last 30 days, operating in extremely dusty conditions if all oil, air, and breather filters were removed.

Much improvement possible

The development of skills in the design of devices to prevent engine wear has been bound and specialized, in large part, by widely accepted customs, convention, and practices. But if these are regarded only in the light of what we can learn through experiment and experience, we can make remarkable improvements. We can change the whole picture of preventing engine wear through the general principle of filtration, and we can adapt newly developed filter applications from other uses to the specific needs of the highway construction industry.

This can be demonstrated readily by applying lessons learned from marine engine installations to the problem of increasing engine life in heavy earthmoving equipment. Here is an easily understood typical example:

A Canadian operator of a fleet of diesel-powered tug boats reports on exhaustive tests of engine wear after five years of complete full-flow filtering of the lubricating oil. Oil and filter elements were changed twice a year, the pistons were removed after the five years of continuous service had elapsed and only .003 wear was found, with all rings loose and in good condition.

These results, described in a voluntary letter, were a welcome tribute to adequate full-flow filtration. But they were more than that. They proved a point.

No dust problem at sea

The major difference between a marine engine and an engine used in highway construction is not so much in engine design as in the lubricant filter installation. Another important thing is that on a ship at sea, practically no dirt enters the engine cylinders with the intake air. Any abrasive material that accumulates in the marine engine's lubricating system is promptly removed by complete full-flow filtration. Therefore, wear by abrasion is prevented.

In other words, these engines will not be replaced due to wear but will eventually fulfill their normal life expectancy through obsolescence alone. And what do we learn from this? This same life expectancy is not impossible with your earthmoving equipment, in the desert or elsewhere if most abrasives are prevented from entering with the intake air and all others are promptly removed from the lubricant and fuel supply to prevent gumming up and grinding away

Can the wear rate on heavy-duty engines be cut?



Yes...and here's how Shell men and techniques do it with an oil



Engineers knew *friction* caused engine wear. But Shell scientists suspected there was a hidden villain—even more destructive.

Years of research proved the hidden villain was *acid action*, result of harmful acids formed during the combustion cycle. Attacking piston rings and cylinder walls, acid action was destroying engines *faster than friction*.

Shell Research men set out to develop an oil which could neutralize these harmful acids. The result—after extensive testing—was SHELL RIMULA OIL, the amazing alkaline oil which stops acid action, extends trouble free engine operation, greatly reduces wear rates in heavy duty engine service.

Shell Rimula Oil is the standard of quality in its field—the only oil of its type to fully meet year-after-year requirements for America's leading diesel engines. It is just one of many fine products developed by Shell's 1500-man research team—a team with 25 years' experience in gasoline and lubrication problems.

A phone call can put this team to work solving your problems. Call your Shell representative today.



SHELL RIMULA OIL

an engine's wearing surfaces.

Any operator of earthmoving equipment would certainly be pleased to find, after five years of continuous operation, that with an oil and element change only twice a year there was just .003 of piston wear and all rings were free and in good condition! He could reasonably expect to put the engine back together and get at least another five years of operation without a major overhaul or costly periods of downtime. By that time, obsolescence instead of wear would be the most likely cause for a replacement.

We have authentic records of heavy-duty, full-flow filter equipped truck engines traveling over 900,000 mi. and measuring .003 of shaft and main bearing wear.

Briefly, another pertinent comparison may be made with the aircraft industry, where air and full-flow oil filters only recently began proving to crop dusters and to major carriers that filters were the means of attaining remarkable savings and extension of engine life beyond any previous expectations. Aircraft engines, like those in marine use, demonstrate that if dirt and grit can be kept out of the intake air, and if internal abrasives can be filtered out of fuels and lubricants, engine life is greatly lengthened and overhaul costs are largely eliminated. This becomes a truth applicable to the equipment that you use in any kind of construction.

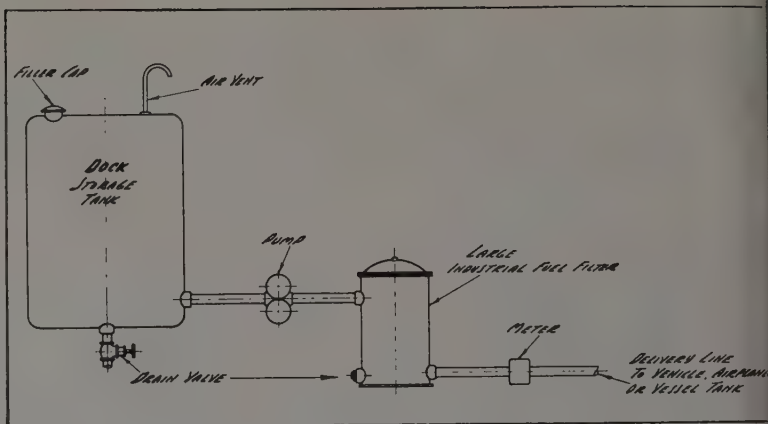
Additional air cleaning

One of the lessons learned from thoroughly tested aircraft installations is already being applied to heavy-duty tractor engines. An air filter originally designed for aircraft usage is installed on the tractor as a primary filter ahead of the conventional filter. Mounted on the outside of the tractor hood, the filter is largely self-cleaned by a combination of vibration and air movement. Similar results, also demonstrated on aircraft, are obtained by mounting filter elements under the tractor hood, where air movement is generated by the fan. Practically no increased resistance is offered to the air intake of the engine, yet the combined air cleaning system provides the engine with air comparable in cleanliness to that taken in by a marine engine.

Goal is ocean air

The goal, of course, is to attain the same long life and low maintenance costs for engines operating under dusty conditions as for the relatively trouble-free marine engines. And there is substantial evidence that this can be accomplished with adequate filtration of fuels, lubricating oils, and hydraulic fluids.

Because the fuels used in engines on construction projects are generally of high quality, they require little filtering other than to prevent the



A large, heavy-duty filter, installed on the outlet of a fuel storage tank, can stop dirt, water, etc. from being transferred from the storage tank to the fuel tank of the engine. The same type precaution applies to lubricating oils stored in bulk.

passage of abrasives between close-fitting surfaces of the injection equipment. However, to make sure that no grit enters any part of an engine's fuel supply system, it is a wise precaution to install a large, heavy-duty filter on the outlet of the fuel storage tank to prevent the transfer of any dirt, water, etc., from the storage tank to the fuel tank on the equipment.

The fuel should also pass through an engine-mounted duplex filter which has ample capacity and in which the two sides of the filter can be used or cleaned simultaneously or separately. This eliminates the risk of an equipment shut-down resulting from foreign substances plugging the small and generally inadequate fuel filter so often installed on the engine as standard equipment. This filter, however, when properly serviced, can serve as a final pass, but it should not be depended upon alone to give safe and uninterrupted service in heavy-duty dusty service.

If lubricating oil is stored in tanks, it should be provided with filtration that will insure that no dirt, abrasives, water, etc., pass from bulk storage to the engine's crankcase.

Full-flow filters built in

The desirability of a full-flow, in-line filter on heavy-duty industrial engines is so universally conceded that a filter of this type is normally built into the engine lubricating system by the manufacturer. Unfortunately, though, consideration of price and space often results in such standard equipment being inadequate and unequal to the task of supplying truly clean filtered oil to the bearings continuously or consistently.

Basically, the problem of protecting engine parts against dirt in the lubricating oils stems from the degree to which the manufacturer or the operator is willing to provide for proper filtration. When there is no filter on a full pressure lubricating system, grit and sand cannot help

but be pumped directly into the engine bearings. A shunt-type filter can accommodate only a small portion of the oil at any one time, so the rest of it gets to the bearings with its cargo of abrasives.

Full-flow may clog

The conventional full-flow, in-line filter does its normal cleansing job excellently at the outset, with a new clean engine, but eventually, under heavy-duty, dusty conditions, surface filter elements generally slick over and cannot pass sufficient oil for normal bearing requirements. Thus, the elements get so clogged that dirt oil is forced through a by-pass, then it follows that the engine is not getting the full-pressure clean oil protection expected or paid for.

Increasingly accepted as the solution to this problem is the use of pressure-controlled elements in full flow filters. These filters provide a low flow-rate section which remove

A controlled pressure full-flow element permits a higher flow-rate and removal of the largest most destructive abrasives at the upper end while micron-sized particles are filtered out by the denser material below.





NEW **CASE** "400" INDUSTRIAL TRACTOR

DIGS DEEP



LIFTS HIGH



BACKFILLS FAST



Pays Dividends at both Ends with Back-hoe and Loader Team

For added usage that keeps your equipment continually busy building profits, investigate this new Case "400" Industrial Tractor Team. Powered by *all-new* engines for gas or diesel fuel, the "400" features *new* Powr-Range transmission with 8 speeds forward, 2 reverse. In any gear, the "400" pushes or pulls stronger as engine speed goes down from rated RPM. And the Case "400" gives you *new* constant running rear power shaft . . . heavy duty single-plate foot clutch . . . *new* hydraulic system for front and rear-mounted equipment. Rugged, forged-steel load-engineered axle handles light or heavy jobs with equal ease. For full *all-new* "400" details, see your Case Industrial Dealer or write J. I. Case Company, Racine, Wisconsin.

Superior Equipment Co. Phoenix, Arizona
 West Coast Engine Equipment Co. Berkeley, Calif.
 Otey's Sierra Machine Shop Bishop, Calif.
 Orange County Tractor Co. Anaheim, Calif.
 Monarch Equipment Co. N. Hollywood, Calif.
 Deakins-Lane Diesel Co. El Cajon, Calif.
 Contractors Machinery Company San Francisco, Calif.
 Electric Tool and Supply Co. Los Angeles and San Bernardino, Calif.

Equipment Sales and Service Stockton, Calif.
 Liberty Truck and Parts Company Denver, Colorado
 Starline Equipment Company Boise, Idaho
 Jenkins and Albright Reno, Nevada
 Montana Powder and Equipment Company Helena and Billings, Montana
 Columbia Equipment Company Portland, Oregon
 (Branches at Seattle and Spokane, Washington)
 Rasmussen Equipment & Supply Salt Lake City, Utah
 Wortham Machinery Company, Cheyenne, Casper, Rock Springs & Sheridan, Wyo.



SUPPLEMENTING the regular filter installation, additional units (left) provide a factor of safety under tough conditions.

the very fine, micronic-sized solid particles, gums, varnishes, asphaltines, etc. Meanwhile, a relatively high flow rate section filters out particles of a larger and obviously harmful size. Regardless of cold starts, oil viscosity or partially clogged elements, the controlled pressure elements insure that the by-pass will not open during normal operation and allow unfiltered oil to carry grit from crankcase to bearings.

Elimination of grit and abrasives from hydraulic fluids also is important when equipment is used under heavy dust or muddy conditions, where pistons and working parts are exposed to grit that gathers on exposed working surfaces. Accumulation of this dust, etc., will build up abrasive and solid particles in the fluid, and these, if circulated by the pump, will wear out the valves and working surfaces as well as the pump. Complete full-flow filtration of the fluid at each cycle is essential to reduced wear and operating costs.

The very nature of many construction projects in the West makes it impossible to operate machinery under ideal or normal conditions. This makes it imperative that we draw on our experience to determine the methods and materials which will best protect and preserve our industrial engines. From such experiences we have learned beyond doubt that it is the worst kind of false economy to base the purchase of filtering equipment on price alone or to buy in sizes too small for the specific jobs the engines must do.

Better that they be too large and cost ten times more than to have valuable machinery become worn or damaged to a point of uselessness instead of lasting until nothing but obsolescence dictates replacement. The cleanliness of intake air, fuels, lubricants, and hydraulic fluids is the true measuring stick of your equipment's profitable performance.

Compressors at high altitudes

(Continued from page 34)

conditions. It is, therefore, recommended that lubricating oil be purchased only from a reputable dealer, that frequent checks of the lubricating system be made, and that oil viscosity be adjusted to satisfy high altitude requirements. It is also recommended that the manufacturer be

furnishing the manufacturer with complete specifications as to altitude, tools used, working conditions, etc. The design of the compressor can then be modified to suit almost any required set of operating conditions within the limitations of the portable design.

THEORETICAL HORSEPOWER REQUIRED AT ALTITUDE TO COMPRESS 100 CU FT OF FREE AIR PER MIN

Altitude, ft	Isothermal compression					Adiabatic compression									
	Single- and two-stage					Single-stage					Two-stage				
	Gauge pressure					Gauge pressure					Gauge pressure				
	60	80	100	125	150	60	80	100			60	80	100	125	150
0	10.4	11.9	13.2	14.4	15.5	13.4	15.9	18.1	11.8	13.7	15.4	17.1	18.7		
1,000	10.2	11.7	12.9	14.1	15.1	13.2	15.6	17.8	11.6	13.5	15.1	16.8	18.3		
2,000	10.0	11.4	12.6	13.8	14.8	13.0	15.4	17.5	11.4	13.2	14.8	16.4	17.9		
3,000	9.8	11.2	12.3	13.5	14.4	12.8	15.2	17.2	11.2	13.0	14.5	16.1	17.5		
4,000	9.6	11.0	12.1	13.2	14.1	12.6	14.9	16.9	11.0	12.7	14.2	15.7	17.1		
5,000	9.4	10.7	11.8	12.8	13.7	12.4	14.7	16.5	10.8	12.5	13.9	15.4	16.7		
6,000	9.2	10.5	11.5	12.5	13.4	12.2	14.4	16.2	10.6	12.2	13.6	15.1	16.4		
7,000	9.0	10.3	11.2	12.2	13.0	12.0	14.2	16.0	10.4	12.0	13.4	14.8	16.0		
8,000	8.9	10.0	11.0	11.9	12.7	11.8	14.0	15.7	10.2	11.8	13.1	14.5	15.6		
9,000	8.7	9.8	10.7	11.6	12.4	11.6	13.7	15.4	10.0	11.6	12.8	14.1	15.3		
10,000	8.5	9.6	10.4	11.4	12.1	11.5	13.5	15.1	9.8	11.3	12.6	13.8	15.0		

contacted regarding lubricating problems and the method of combating these problems prior to moving equipment into high altitude areas.

In view of the abnormal operating conditions at altitudes above 10,000 ft., it is advisable to make routing compressor inspections. Normally, inspecting equipment after every 300 hr. of operation should prove effective in reducing maintenance costs and assuring a smooth operating unit. At altitudes, a general inspection should be made more frequently, and at 15,000 ft. an almost constant check of equipment is advisable.

Pressure drop at high altitudes is more of a problem than at lower levels. Since pressure drop in the air-transmission line between the discharge of the compressor and the tools it operates results in less work from the tools, the user should give careful attention to the selection of the size of hose or piping carrying the air from the compressor to the point of use. Operators should also check lines frequently as a guard against leaks, and a flexible connection, such as a piece of rubber hose, should be installed between the receiver and the connection to the common steel header or pipe line.

Portable compressors may be used for many applications where the standard sizes or ratings do not apply. If a compressor is to be used at extremely high altitudes, considerable trouble can be avoided by

For best operating results, only quality fuel should be used. Fuel should be selected on the basis of quality rather than price. Cleanliness is important, screens and filters should be used and good soft water used in the cooling systems. All housing should be protected and inspected at intervals.

At high altitudes, the over-all performance of a portable unit is expressed on the basis of the number of units of power input (gasoline, fuel oil, or electric power) per unit of air output. Performance may be stated as cubic feet of air actually delivered per gallon of fuel, and high altitudes affect the over-all performance. To obtain maximum performance of compressors at altitudes necessitates maintenance considerations far in excess of that when units are operating at normal levels.

On most high altitude jobs, the rate of progress is dependent upon the reliability of the source of air power. By its very nature, the portable compressor is designed for maximum compactness with minimum weight. It is a highly developed and carefully engineered piece of machinery. This very fact complicates its performance at high altitudes and corrective and protective measures must be taken if normal output is to be attained. Proper attention to operation and maintenance will pay dividends to any user of air compressing equipment at high altitudes.

NEW! a cost-cutting drill
for the push-button age!

the JOY JUNIOR CHALLENGER

BIG-DRILL FOOTAGE... LOWER LABOR COST... LESS TIME BETWEEN HOLES

Our customers asked for a brute of a drill on a mobile, "push-button" carriage. In other words, they wanted more hole at less labor cost, shorter time between holes, and faster set-ups. Here's our answer: the self-propelled *Joy Junior Challenger* . . . the **FIRST COMPLETELY POWER-OPERATED WAGON DRILL** ever produced. It drills anywhere, in any position, in any formation. The operator has nothing much to do but think, and change steels. Here are a few of the reasons why the Junior Challenger will cut costs on your job:

ALL POWER OPERATION—All movements of feed, drill, and carriage are hydraulic or air-powered—no chuck wrench necessary.

DRILLS AT ANY ANGLE—Vertical bench hole, toe holes, horizontal holes, and angle holes both up and down from the horizontal.

RIGID ALIGNMENT—Feed is supported by *two* trunnions, will not vibrate or move out of line.

STABILITY—Treads move independently up or down to conform with terrain, then are locked simply by turning a valve.

NEW HEAVY-DUTY 4½" DRIFTER—Has features found on no competitive machine; drills up to 3½" holes to 40 ft. depth *in any formation*.

SECTIONAL STEEL—1¾" round steel system, sectional type with detachable striking bar, has ⅝" o.d. air tube for outstanding hole-cleaning ability.

Write for complete information to **Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.** In Canada: **Joy Manufacturing Company (Canada) Limited, Galt, Ont.**

SPECIFICATIONS

Easily drills up to 3½" holes to 40 ft. depth in any formation.

Drills horizontal holes to 7½ ft. height.

Write for **FREE Bulletin 87-25**

Consult a Joy Engineer

for AIR COMPRESSORS • ROCK DRILLS • WAGON DRILLS
CORE DRILLS • BLAST HOLE DRILLS
PORTABLE HOISTS • FANS • BLOWERS • TUNNEL,
QUARRY, MINE EQUIPMENT



WSW C 6076-87

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**CONSTRUCTION EQUIPMENT MANUFACTURERS
FOR OVER HALF A CENTURY**



ASPHALT DISTRIBUTOR must be hauled through sand by tractor.



MIXER handles one-third of the asphalt placed in the first pass.

BLOW SAND—A Western material that takes special treatment.

OF ALL Western highway problems, the one which grows progressively worse is the need for carrying heavier traffic loads where available materials are inadequate. Of course, many areas of the West are blessed with an ample supply of sand, gravel, or good quarry rock. But many other localities are less fortunate or have depleted the better sources of supply. As a result, there is a constant trend toward using more unconventional materials, some of which were formerly considered completely unsatisfactory.

Methods have been found to make these materials serve satisfactorily by modifying their original properties. One of these problems and a reasonably satisfactory solution is the use of blow or dune sand stabilized by bituminous materials. This illustration of a method for extending the normal resources of Western road-building materials has come under the direct observation and direction of C. H. McDonald, Highway Engineer, U. S. Bureau of Public Roads, Phoenix, Ariz.

According to McDonald, the first project of this type in Arizona was carried out in 1938 near the Mexican border south of Yuma, and the second project was also near Yuma in 1947. A total of almost 200 mi. of bituminous stabilized blow-sand highway has been built in the state, most of it during the last 7 or 8 yr.

Used on secondary roads, the procedure is usually carried out by road-mix methods, but the same material has been used in plant mixes. One of these jobs was a primary route (U. S. 66) in the northeastern section of Arizona. At the present time there are two contracts involving the use of blow sand. One is a road-mix job on a secondary route and the other is a plant-mix on a primary highway.

Road-mix procedure

Obviously, there is always a shortage of water as an added construction problem where blow sand represents the available material. Compacting and stabilizing with the minimum amount of water is the object of each stage or procedure.

Depending upon the traffic load a 3- to 5-in. top section of the blow-sand base is stabilized with bituminous mate-

rial and sealed as a first stage. A second stage, which may be postponed indefinitely by the use of subsequent seal-coats, usually consists of a 2-in. bituminous mix topping.

Most blow sand will pass from 90 to 100% through a No. 40 sieve. The liquid asphalt specified is R.C. 2 or R. C. 3, depending on atmospheric temperature and weather conditions. The amount used in the mix averages from $4\frac{1}{2}$ to 5% of the dry weight of material.

During the placing of the sand to the required thickness some consolidation is effected on each layer by the use of available water and rolling with light pneumatic tired equipment. The surface is then shaped by motor grader to the full width. It may be necessary to pull the grader with a tractor if the sand is especially dry. The next step is to moisten the sand with water prior to application of the liquid asphalt. This is necessary to prevent excessive absorption of the solvent by the fine sand.

The asphalt distributor must be dragged through the sand by tractor and applies approximately $\frac{1}{3}$ of the required asphalt at the first pass. The distributor should be equipped with a harrow or disc to assist in mixing operations. Mixing is carried out immediately with a Seaman Pulvi-Mixer or similar type of machine. Three passes should be sufficient to add the required asphalt.

Mixing is accompanied by light rolling with pneumatic tired equipment. The purpose of using the roller with the mixers is to secure a gentle consolidation of the untreated sand below the treated material, and gradually increase its shear strength. During this procedure all wheeled equipment is kept off the surface.

After mixing has been completed the pneumatic tired rollers continue, and as the stability of the mix builds up the load on the rollers is increased to build up further the shearing strength of the sand.

When the material has been consolidated to a point where it will bear the weight of a motor grader without rutting, the surface is trimmed with the blade and the cuttings wasted over the shoulder.

Stability of this type of dune-sand mix can be seriously questioned. Ability to stand up under traffic probably results from the resistance of the extremely thin films of high-viscosity binder to the effect of impact loading. Displacement would develop under static loads, particularly when new, but resistance would gain with time. Based on this assumption the mix must be kept lean to achieve thin, strong films of asphalt on the aggregate particles. The asphalt residue in the mix, after curing, must have a high viscosity. Because of this leanness it is essential that the flush and seal coats have a relatively high asphalt content to prevent scuffing by traffic.

When the condition of this base course or the traffic dictates a surface course, it can be placed as a road-mix in a conventional manner using the base as a mixing table. However, this base will also support a laydown machine and a better practice is to place a top course of plant-mix material using a penetration grade asphalt.

**New 6-speed
automatic transmission
lets you slow down
without touching
the brake!**



This is just one of the remarkable advantages you get in **Powermatic** . . . a completely new heavy-duty automatic transmission offered exclusively in new Chevrolet Task-Force trucks.

Now Chevrolet brings you exclusive **Powermatic**—the first automatic transmission designed especially for heavy-duty trucks! Unlike conventional or semi-automatic transmissions, **Powermatic** works for you all the time. Six fully automatic forward speeds and a torque converter virtually eliminate manual gear shifting on hills! A revolutionary "retarder" assures safer downhill hauling, far less brake wear. Furthermore,

Powermatic is designed to aid top-notch economy on the highway . . . and you'll make better time through traffic because all shifts are "power-on" shifts!

For all the facts about the biggest improvement in heavy-duty hauling in many years—exclusive **Powermatic**—see your Chevy dealer soon. . . Chevrolet Division of General Motors, Detroit 2, Michigan.



With exclusive **Powermatic Retarder** most hills can be descended without touching the brakes . . . and most normal slowdowns can be made by the Retarder alone!

New Powermatic transmission* is just one of the many ultra-modern features you'll find in the all-new line of Chevrolet heavy-duty trucks! There's a new 195-hp Loadmaster V8 . . . new Triple-Torque Tandem options with G.V.W.'s up to 32,000 lbs., G.C.W.'s up to 50,000 lbs. . . new 5-speed Synchro-Mesh transmission!** No other big trucks offer so many up-to-the-minute engineering advancements!

*Optional at extra cost in 5000 through 10000 Series models.

**Standard in Series 9-10000 models, optional at extra cost in Series 5000, 6000, 7000, 8000 models.



New Chevrolet Task-Force Trucks

Anything less is an old-fashioned truck!





WYOMING adopts new specifications—Highway department modernizes standards for construction—Contractors consulted.

By I. E. RUSSELL

Chief Materials Engineer
Wyoming Highway Department
Cheyenne, Wyoming

THE WYOMING Highway Department has been operating under specifications adapted in 1948. In the intervening years numerous supplemental specifications and special provisions have been put in use necessitating the insertion of loose-leaf additions in practically every contract document. This inconvenience, together with the fact that the supply of specifications was being rapidly depleted, made mandatory the issuance of a new publication. The new edition is now available and should be of interest to contractors and material suppliers as well as to those who may be considering a revision of their specifications. Major changes in the specifications, likewise, should be of interest to those who have been doing work under the old specifications.

The sections under Division I—General Requirements and Covenants—follow rather closely either the former specification or the recommendations of the American Association of State Highway Officials, but there are some points that should be mentioned.

As regards the authority of the engineer, particularly in the case of controversial issues, it is made clear that the authority to enforce orders to the contractor is vested in the highway commission acting through its duly authorized representative. Such expressions as "satisfactory to the engineer" have been held to the minimum and are used for the purpose of defining procedures to be followed on items that are sometimes controversial and difficult to define in specifications, and are not for the purpose of giving the engineer any extra authority.

Put in line with AASHO

The section covering the contractor's responsibility in regard to public utilities has been expanded and now conforms with AASHO recommendations. A new section, covering cooperation of two or more contractors working on the same project, has been added and this too

conforms to AASHO recommendations. Restrictions may be placed on the load a contractor may haul on any road or structure in the vicinity of his contract.

Sources of materials for subbase, base, and surface courses are designated and thus, in effect, these sources are guaranteed as to both quality and quantity. If, after the contractor establishes crushing equipment in a designated pit, it develops that material becomes unsatisfactory or there is insufficient quantity the State will reimburse the contractor for moving to a new location. Contractor will not be reimbursed for moving from one location to another in the same pit area or for any other move made solely for his benefit.

For several years special provisions have been in use which required the contractor to provide field laboratories when so designated on the plans. This requirement has now been made a part of the new specifications and the minimum requirements for the laboratory building are stated therein. Formerly, this was a bid item but it now is considered subsidiary to other items of the contract.

Damage due to elements

In former specifications the contractor has been held responsible for damage due to action of the elements or any other cause until final acceptance of the work. The new specifications modify this to the extent that the contractor rebuild, repair, restore, and make good all injuries or damages to any portion of the work occasioned by any of the foregoing causes prior to its completion and acceptance and shall bear the expense of such repairs; except that the Commission may, in its discretion, reimburse the contractor for the repair of such injury or damage due to unforeseeable causes beyond the control of and without the fault or negligence of the contractor, including but not restricted to acts of God, of the public enemy, or of governmental authorities. The contractor has been responsible for any damage caused, through his operations, to any public utility. However, the new specifications provide that he will be paid for the repair of such damage in any case where the utility is not

shown on the plans, cannot be readily seen, is not properly monumented or of which the contractor has not been notified.

The specifications have been revised and expanded so as to define more explicitly the requirements necessary for an extension of time to be permitted for completion of the contract. The schedule of liquidated damages for failure to complete the work on time has been revised upward slightly. Provisions for the cancellation of the contract, when necessary due to a national emergency, are now a part of the specifications.

In the section covering earthwork mention should be made of a number of changes that now appear in the specifications. The item of clearing and grubbing is considered subsidiary work but provision is made for payment by extra work order for the removal of unlisted or unmarked obstructions. Excavation quantities to be paid for are based on the stake prism thus eliminating the necessity for remeasurement. Free haul and overhaul have been eliminated, and all haul on excavation is on a cubic yard-mile basis. Further, a motor patrol is required on the grade for leveling purposes at all times in addition to the patrol used for mixing water with the soil. When shown on plans special type of mixing equipment will be required.

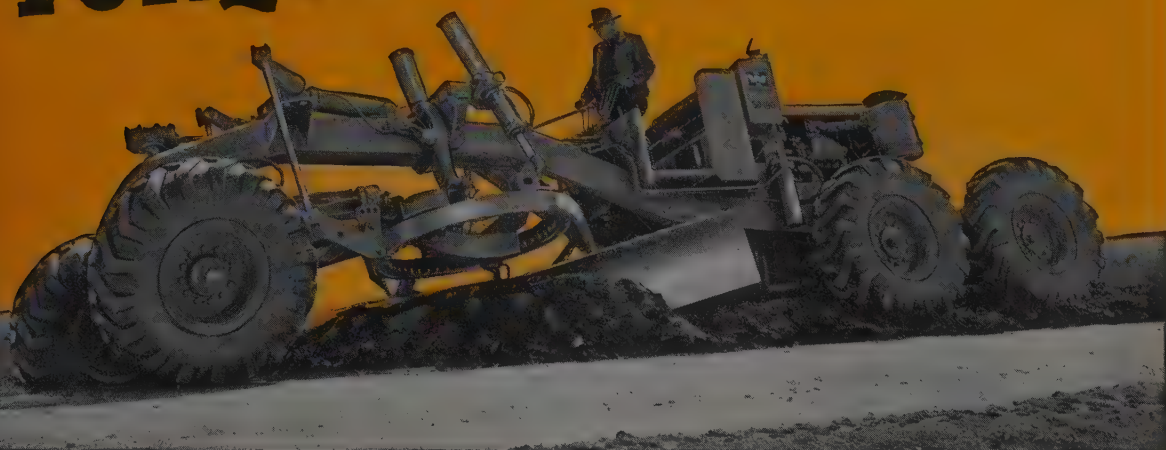
Compaction to 90%

Compaction to 90% of optimum is now specified and the methods to be used are specified as either the usual roller compaction or thin layer method wherein the embankment material is spread in thin lifts, moistened mixed and compacted by routing the hauling equipment over the entire surface with special attention to the outer thirds of the surface.

Provisions are made for payment as "Excavation" for the roughing out excavation necessary for drainage structures and for the removal of pipe culverts having a cover of 2 ft or more. Selected backfill where required around drainage structures will be measured and paid for in accordance with the type of material used; that is "Excavation," "Select Embankment," or "Selected Material Surfacing" as the case may be.

A new section has been added covering "Special Embankment." This material usually is a granular type but may be simply a better class of soil used to top out the grade and reduce the thickness of more expensive foundation materials. Quantity of special embankment may be determined by cubic yard, ton or cubic yard as measured in place on the roadway. Stripping of select embankment sources is paid for in order that the engineer will have some control over material actually taken out for this purpose. In addition to stripping to obtain the select embankment

POWER SHIFT NO CLUTCH TORQUE CONVERTER



HUBER-WARCO 5D-190 (195 H.P.)

POWER!

Tough grading jobs are handled easily and quickly by this 31,450 pound motor grader, powered by a 195 h.p. General Motors diesel engine.

PERFORMANCE!

An Allison Torque Converter protects the unit from shock loads while a full power-shift transmission — **WITHOUT CLUTCH** — permits quick shifts under full load without interrupting power flow from engine to load. A tail shaft governor automatically adjusts engine RPM to meet any load condition, at any speed set by the operator. Power sliding moldboard is standard equipment.

PROFIT!

These power and performance features have been combined to increase the working capacity of the 5D-190 and reduce costly down-time. With this motor grader it is possible to move more material, with fewer passes. This increased working capacity will add more profit to every job.

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payment is made for all stripping replaced over the pit.

Some changes of importance have been made in the sections covering foundation, base, and surface courses: When either binder or filler is required in base or subbase it must be windrowed on the roadway and mixed with the gravel. Blending at the pit is no longer permitted. Stripping of all surfacing pits is now required and this is considered subsidiary to other pay items of the contract. In the interest of more uniformity, the gradation range of all materials has been narrowed.

New sections have been added covering soil cement base course and plant-mixed base course construction. New typical sections call for 1½ in. of plant-mixed base, plus 2½ in. of plant-mixed surface for all interstate and important primary roads. These thicknesses extend the full width of the roadway.

Since no concrete pavement has been constructed for many years, no specification for this type of pavement has been included.

Under the sections covering structures the following changes have been made: Corrugated metal pipe siphons are now bituminous coated and field joints are made with bituminous coated sewer type connecting bands in place of the concrete collar formerly specified. Flared metal end sections are used for inlet and outlet in place of concrete box. Formerly concrete collars were used at all bends but these are now shop welded. Rubber gaskets have replaced mortar joints for concrete pipe siphons.

Timber for bridges may now be treated with either creosote or with pentachlorophenol solution. Piling must still be treated with creosote.

For the various types of rip-rap specified, the required excavation is no longer paid for separately but is considered subsidiary to the item of rip-rap being placed.

Briefly these are the changes in the new specifications which may be of interest to those concerned. In the preparation of these specifications, individuals most directly concerned with the various sections were assigned to make the first draft of these particular sections. This first draft was then given a round table discussion with the construction and maintenance engineers and such alterations made as were deemed necessary. Copies of this draft were then provided to a committee of the Associated General Contractors of Wyoming for their study.

A second round-table review was then arranged with this committee and such changes as they recommended, and with which our department concurred, were incorporated. The final review was made by the Washington Office of Bureau of Public Roads and again such changes were made as were deemed essential.



LONG HAULS—Interstate moves of heavy equipment have problems for specialists.

By **ELMER J. LEE**

Operations Manager

Consolidated Heavy Hauling Service
Portland, Oregon

IN CONSTRUCTION, the quest for heavier, more powerful machinery with greater capacity never ceases. In this competitive field, production is the byword. Manufacturers serving the industry strive to meet the demands of their contractors. As the new model leaves the production line, its successor is on the drawing board.

Both the contractor and manufacturer have a common goal—progress. From the side lines a related industry, the commercial heavy hauler, watches the race with vital interest.

As each new giant makes its appearance, the heavy hauler must be quick to obtain specifications of the machine. He must know the dimensions, how much it weighs, whether it can be reduced in size and weight, what dismantling will be required. And finally, can it be transported over state highways. It is his specialized job to get this heavy equipment to the place where it can do the work it was designed for.

A decade ago, crawler tractors with dozers were easily transported on a single tractor low-bed combination. Today we have huge crawlers of great weight, such as the HD-21, TD-24 and D9-X. In most cases these machines must be dismantled.

Transporting power shovels by truck presents greater problems than crawler tractors. Lack of uniformity in state laws for permitted loads adds to the problem. And yet highway vehicles are essential in transporting this equipment, and the problems must be surmounted.

As an example, let us illustrate a mythical move of a 2½-yd. digger by Consolidated Heavy Hauling Service from Boise, Ida., routed through Oregon to Chehalis, Wash. The customer furnishes the make and model number; our records indicate an approximate weight of 140,000 lb. The machine has standard belts. The counter weight consists of punchings. Using this information, and drawing on our knowledge from past experience, we plan the move to conclusion.

Required for the move are four dual-axle tractors, at least two of which are equipped with winches,

two low and two flat-bed dual-axle semi trailers, detachable A-frame poles, barrels to contain punchings, cribbing, timbers, jacks, hand tools and cable straps. Consolidated draws from its nearest equipment pool to fill these needs. Experienced heavy haulers man the job.

The shovel is dismantled and loaded in approximately 50 man hours. Permits are secured for Idaho travel. About 6,000 lb. of punchings are removed from the house to reduce the gross weight to 90,000 lb. The body is loaded intact; gross weight is 76,000 lb. The boom, dipper sticks, and bucket make up the third load; gross weight, 63,000 lb. The counterweight removed from the house could be added to this load but we have handling gear to contend with, so a fourth flat is needed.

Idaho has a fixed charge for special permits. In this case the house load and the car body require permits, which are secured. Width of the house is 10 ft. 8 in.; of car body, 11 ft. 6 in. As Idaho permits convoy, only two flag cars are required; one ahead, one to the rear.

Two hours travel time brings us to the Oregon line and an 84,000-lb. gross load limit. The house load must be reduced. An additional 6,000 lb. of punchings taken from the bins legalizes the load. Because convoy is not permitted in Oregon, and the width of house and car body exceeds 10 ft. 6 in., two cars are required for each load. Our permits are secured and we travel to Washington.

As we enter Washington, our first stop is the permit office. Because a four-lane highway exists between Vancouver and Chehalis, flag cars will not be required. We obtain permits for loads up to 96,000 lb. gross in Washington. The fee for permits is predicated on a weight-mileage basis here. Permits secured, we travel to our destination at Chehalis.

The next step is assembling. First, the winch tractors are converted to portable A-frames. We then raise the house by jacking and use of A-frames, winch the car body into position and lower the house over the king pin. The jewelry is installed, the front is hung, lines reeved, and the shovel checked for operating condition. That's it; the job is completed, the customer is satisfied, his machine functions properly. He signs the delivery receipt and our job is finished.



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"Better protection of gears and bearings under all operating conditions..."

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G.P.'s Jack Hanafin

McKnight equipment shown working on residential project for Devon Construction Co., builder of several housing tracts in La Mirada.



GENERAL PETROLEUM CORPORATION





OFFICERS ELECTED for the coming year are (l. to r.) Secretary-Treasurer, H. B. Glaisyer, Oregon; Executive Committee Member, T. J. Heimann, New Mexico; Executive Committee Member, J. R. Bromley, Wyoming; President, D. C. Greer, Texas; Vice President, Wm. E. Willey, Arizona;

Executive Committee Member, H. J. Corleissen, Utah; and Executive Committee Member, Houston D. Mills, Nevada. Not shown is W. C. Williams, Oregon, Executive Committee Member. The 1957 Conference will be held in Houston, Texas, June 11-14.



WASHO—Western Association of State Highway Officials hold highly successful conference in Phoenix.

OVER 500 HIGHWAY officials, engineers, and contractors from 12 Western states, Alaska, and Hawaii, met in Phoenix April 10-13 for a highly successful annual conference of the Western Association of State Highway Officials. The record attendance, the excellent facilities of the Westward Ho Hotel, and the warm Arizona weather provided a perfect situation for a constructive interchange of ideas. Great interest was shown in both the general assemblies and the various specific technical sessions.

The opening assembly was held Tuesday morning with J. R. Bromley of the Wyoming Highway Department and President of WASHO presiding. Featured speakers included Arizona's Governor Ernest W. McFarland; Jack Williams, Mayor of Phoenix, and Frank E. Moore, Chairman of the Arizona Highway Commission and general chairman of the conference. Panel group sessions were held each day on administration, commissioners, construction and materials, location and design, maintenance, public relations, traffic, and traffic safety and economics. At the panel sessions several short papers were presented followed by questions from the floor.

The final general assembly on Thursday afternoon was featured by the election of the new officers for

the coming year and the presentation of the "Dr. L. I. Hewes Award." State Highway Engineer of the Texas Highway Department, who served as vice president during the past year. The other officers are: vice president, William E. Willey, Arizona State Highway Engineer; secretary and treasurer, H. B. Glaisyer, Secretary of the Oregon State Highway Commission. Those

elected to the executive committee are: J. R. Bromley, Superintendent and Chief Engineer of the Wyoming Highway Department; H. J. Corleissen, Utah Road Commissioner. The new president is D. C. Greer. T. J. Heimann, Chairman of the New Mexico State Highway Commission; Houston D. Mills, State Highway Engineer of Nevada; and W. C. Williams, Deputy State Highway Engineer of Oregon.

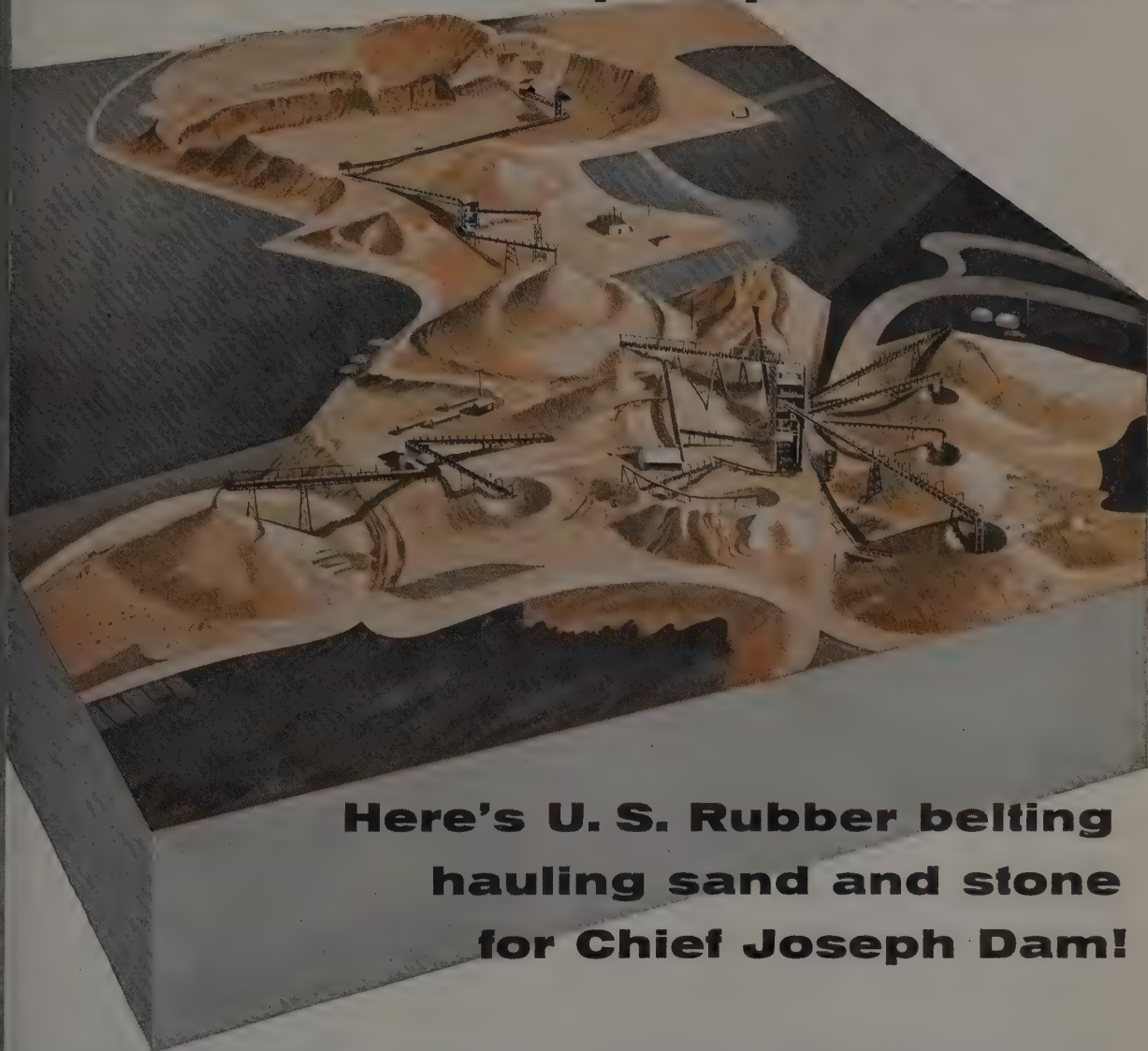
Following the election of officers President Greer announced that the 1957 WASHO Conference will be held in Houston, Tex., June 11-14.

The "Dr. L. I. Hewes Award" is given annually to a highway engineer in the West selected by the Executive Committee from a list of candidates submitted by the constituent organizations in recognition of an outstanding contribution to highway development. Dr. Hewes, the late Western Regional Chief of



THE \$500 Hewes Award was divided by co-winners this year, Robert O'Connell (center), Wyoming traffic engineer, and A. J. Sachse, Idaho resident engineer. E. V. Miller (left), State Highway Engineer of Idaho, accepted for Mr. Sachse. The awards were presented by Robert L. Byrne (right), assistant editor of Western Construction.

Yes, all this adds up to quite a DAM!



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You're looking at one of the biggest aggregate plants ever set up. It supplies aggregate for concrete for the big Chief Joseph Dam in the State of Washington—the dam that will have the world's largest single-unit powerhouse under one roof, the dam that will rank second only to Grand Coulee in operating capacity. Nearly 2 million cubic yards of concrete will be needed to build Chief Joseph.

This aggregate (sand and stone) ranges from fine sand to extraordinarily heavy boulders as large as 20" in diameter. The rock breaks clean, leaving sharp edges which are good for concrete interlock

but bad for ordinary conveyor belting. To handle this most critical portion of the haulage, United States Rubber Company conveyor belts were selected. Although now in their fifth construction season, the belts are still going strong. This is another example of U. S. Rubber's Three-Way Engineering Service: "U. S." Belt engineers work with the designers of the conveyor system and the engineers of the dam—to provide the *right* belt for the jobs.

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Mechanical Goods Division

United States Rubber

the U. S. Bureau of Public Roads, was one of the principal organizers of WASHO. His contributions to highway engineering gave great impetus to Western highway development. The \$500 cash award and the appropriate certificates to the nominees are provided by **Western Construction**.

The Executive Committee had a particularly difficult time electing a winner this year. New Mexico nominated John A. Kennedy, Traffic and Safety Engineer, for engineering research in modern traffic safety and control, especially in the development of striping equipment and investigations in traffic paint. California submitted a team of four who developed to a practical level the use of electronic business machines in traverse and earthwork computations. The team consisted of R. K. Breece, Senior Highway Engineer, Sam Osofsky, Supervising Highway Statistician, John A. Haller, Assistant Research Technician, and Walker L. Ayers, Accounting Tabulating Machine Supervisor.

Texas also submitted a team, William M. Welty, Senior Traffic Engineer, and Paul R. Tutt, Senior Traffic Engineer, who developed a method of analyzing highway accidents through the use of mechanical sort cards.

Wyoming's candidate was Robert C. O'Connell, Traffic Engineer, who has made numerous contributions to traffic control and safety in the State of Wyoming and was instrumental in the preparation of the State's uniform traffic code.

A. J. Sachse, Senior Resident Engineer, was nominated by Idaho. Sachse was recognized for his outstanding engineering versatility in connection with the construction of the mile-long bridge and mile-long hydraulic fill at Sandpoint. He was in charge of the foundation studies, the design of the superstructure, the preparation of the plans, and directed the field construction of the bridge.

O'Connell and Sachse were declared co-winners of the award and received checks for \$250.

The Conference passed 10 resolutions. Included were a recommendation that the Public Works Committees of the House and Senate pass an adequate highway bill this session of the Congress; that conferences between the state highway departments, the AGC, and suppliers of steel and cement be held in order to guarantee time of delivery of materials and firm prices rather than have escalator clauses in the suppliers' contracts; that action be taken by Congress authorizing the Bureau of Public Roads to procure and stockpile necessary bridges for use in probable disaster areas; and that cooperative programs be set up leading to the salvage of geological, archeological, and historical remains that are in danger of being destroyed

as a consequence of highway construction.

Another important feature of the conference was the final report on the WASHO Road Test and a panel discussion on the test by a special review committee of WASHO, with E. V. Miller, State Highway Engineer of Idaho, as moderator. Panel

members were R. H. Kenyon, Washington Department of Highways, F. M. Hveem, California Department of Highways, R. E. Livingston, Colorado Department of Highways, Raymond Archibald, Bureau of Public Roads, Roy E. Jorgenson, National Highway Users' Conference, Washington, D. C.

The following three articles were presented by the authors at the 1956 WASHO conference—Editor.



COMPACTION—A look at specification trends and a survey of vibratory equipment.

By **A. W. JOHNSON**

Engineer of Soils and Foundations
Highway Research Board

THE ACCOMPLISHMENT of a study of trends in compaction requirements on the comprehensive scale is beyond the scope of this report. The intent here is (1) to summarize past and current specification requirements and determine trends in changes which have occurred, (2) indicate the possibilities of present commercially produced vibration compaction equipment and, (3) discuss briefly the changing needs in compaction resulting from the increasing number of heavy wheel loads and increasing tire pressures.

Fortunately, for determining trends in specification requirements, past surveys of compaction practices have been made by a committee of the Highway Research Board. The first survey was in 1942. That survey was too limited in scope to be used here. However, surveys were made in 1946 and 1951 which make for useful comparison in determining trends. The 1946 survey was a letter canvass. The 1951 survey was by letter canvass and by personal contact. The 1951 survey covered embankments, subgrades, and granular base courses. The survey for the present report was made by a review of specifications and also covers embankments, subgrades, and granular base courses. The specifications reviewed include current standard specifications, new drafts of standards, supplemental specifications, and special provisions. The files of the Bureau of Public Roads covering these specifications were made available to the writer for this purpose.

The reliability of the trends determined from a review depends on the accuracy in determining the intent of a specification, and properly classifying the findings. For these

reasons, it may be well to bring out that there are wide differences in terminology used in standard specifications. For example, about a third of the forty-eight state highway specifications include the item "subbase." Others use a wide variety of names as insulation course, blanket course, subgrade topping, selected soil subgrade, select material, etc. Hence there is no positive means for the reviewer to determine if they constitute the item "subbase" as defined in American Association of State Highway Officials specifications. Therefore, the item subbase is not included.

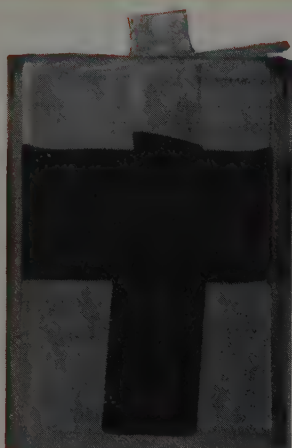
Subgrade is, in most specifications, listed as a separate item. However, some specifications list requirements for compacting subgrades under excavation or embankment, or under the type of base course the subgrade is to support. Where separate requirements are given for each base type, the writer has attempted to select the method used in the construction indicated for heavy duty roads.

Base course or borrow?

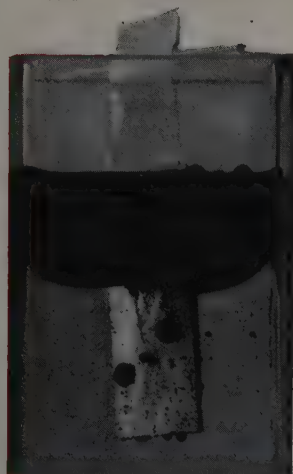
Even the term base course is not used in all states. One state carries only macadam under the item "base course," yet the writer has seen gravel base courses in construction there. The specification item under which gravel base courses would be found in that state is "Borrow." Other problems involved are (1) selection of the proper type of compaction when more than one type is listed, and (2) the extent of use of a supplemental specification or special provision. In each instance where more than one type was listed, that one was selected which specified density limits. In reviewing hundreds of supplemental specifications and special provisions, they were selected only when they had been used on several projects.

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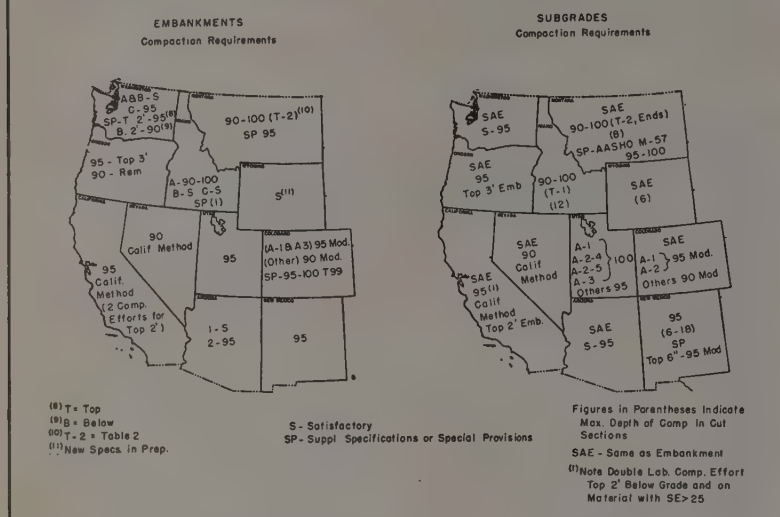
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AAEC-3

Compaction specifications for embankments and subgrades



These items are mentioned here to indicate that there were in some instances problems of properly interpreting intent.

Embankments

Control of Density. Present embankment compaction requirements are indicated for each state on the map. Idaho has three types of compaction—Type A, Type B and Type C. Type A specifies density limits ranging from 90 to 100% of AASHTO Method T-99 maximum density depending on soil type. Types B and C specify compaction to the satisfaction of the engineer. Seven states each specify a range of density limits.

Control of Lift Thickness. All the Western states specify 8-in. lifts except Washington, which calls for 6 in.

Payment for Compaction. Compaction is paid for directly or its cost is included in the contract unit price bid per cu. yd. of excavation or some other contract item. When paid for directly it is measured in Roller Hours, Roller Units, or Roller Days. When not paid for directly it is usually said to be incidental to the cost of the construction.

Payment for Water. Water is paid for directly per 1,000 gal. or the cost is incidental to the contract unit price bid for other items. Some states have an additional bid item covering the furnishing of water equipment and in some instances also furnishing a water supply. The geographical distribution of the different pay items for furnishing and applying water is indicated in the table.

Subgrades

Specifications governing compaction of subgrades were first compiled in 1951. The compaction require-

ments currently in use are shown in the Figure. Because of the wide diversity in methods of specifying subgrade compaction in use now as well as in 1951, it is difficult to make a precise comparison by a statistical grouping of limits. Generally, there has been an increase in the density requirements in several of the states which use that method of control.

Granular bases

A reading of the standard specifications and supplemental specifications of the various states shows a wide variety of types of granular base courses. They include soil type, soil aggregate, stabilized, stabilized aggregate, caliche, clam shell, reef shell, sand and shell, limerock, limerock and sand, sand gravel, chert gravel, clay gravel, sand clay, crushed gravel, crushed stone, crusher run stone, and others. In a study of this item it has been the intent to cover those items whose compaction may normally be measured in terms of density. Therefore, macadam types have been included only in those instances where they are the only type of "granular" base course listed in the standard specifications. Where macadam base course is listed, in no instance is density specified as a means of controlling compaction.

Compaction Requirements. The wide diversity of methods in use to specify compaction of granular bases is shown in the map in the table.

Payment for Compaction. Compaction is paid for directly in units of Roller Hours, Roller Days, Roller Units, or is included in the contract unit price bid for other items.

Payment for Water. Water is paid for directly, or is incidental to the cost of some other item or items. In some instances the contract includes a pay item for furnishing water

equipment. In some instances it was difficult to determine the "general practice" as in some instances in a given state it was paid for directly and in others was an incidental cost. In those cases it is shown here as a pay item. It should be noted that the use of water as a pay item in the construction of granular bases is not limited to the Western states but is also used in other areas except in New England.

Summary of trends

Lift Thickness in Embankments. The Western region shows a trend toward the use of the 8-in. lift thickness.

Compaction of Embankments. There is a trend of departure from the earliest of methods, namely specifying "thoroughly compacted," "maximum feasible compaction," or "compacted to the satisfaction of the engineer." A slight trend is indicated toward higher density requirements in all of the regions.

Compaction of Granular Bases. This summary indicates a trend toward increasing compaction requirements in all of the four Regions of the American Association of State Highway Officials. Some of the states now require densities which are near the maximum which can be obtained with a "nominal" number of coverages of presently used equipment.

Light-weight vibrators

There are on the market three types of commercially produced vibratory equipment. One of these is the heavy pneumatic tire vibratory roller. A second is a vibrating "shoe" or base plate type, which may be obtained in units of a single shoe or in a gang of several vibratory units operating side by side. The third type is a towed type of vibrating steel drum. In addition, there are experimental vibratory compactors, for example, those studied by Professor Bernhard at Rutgers University, by Professor Converse at California Institute of Technology (this refers to the Navy Experimental Compactor described in *Western Construction*, Dec. 1955, p. 36) and those tested at the Waterways Experiment Station. There are an estimated 1,500 of the Commercial units distributed in the United States and Canada. They have been used widely on a demonstration or experimental basis and on many projects on a production basis. Many of the more recent specifications include provision for use of vibratory compactors.

It was not possible in the limited time for preparation of this paper to make a complete canvass of all areas where they have been used. The writer and others of the Highway Research Board staff have had time to discuss their use with engineers in many states. However, to date, only a limited amount of data is available

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June 1956—WESTERN CONSTRUCTION

SUMMARY OF COMPACTION SPECIFICATIONS

	EMBANKMENTS		GRANULAR BASE COURSE		
	Pay item for compaction	Pay item for water (per 1,000 gal.)	Density requirements	Pay item for compaction	Pay item for water (per 1,000 gal.)
ARIZONA.....	roller hours	furnish equipment	satisfactory	roller hours	furnish equipment
CALIFORNIA.....	incidental	furnish equipment	Calif. method 95, double comp. effort	incidental	furnish equipment
COLORADO.....	roller hours	.....	satisfactory	roller hours	.....
IDAHO.....	roller days	.....	satisfactory	roller days	.....
MONTANA.....	incidental	.....	satisfactory	roller hours	.....
NEVADA.....	roller hours	furnish equipment	satisfactory	roller hours	.....
NEW MEXICO.....	roller hours	furnish equipment supplemental specs	95, special provisions top 6 in.—95 mod.	roller hours	.....
OREGON.....	incidental	.....	satisfactory	incidental	.....
UTAH.....	roller hours	furnish equipment	satisfactory	roller hours	furnish equipment
WASHINGTON.....	roller days	.....	satisfactory	incidental	.....
WYOMING.....	roller hours	furnish equipment special provisions	satisfactory	roller hours	furnish equipment special provisions

to indicate the compaction abilities of vibratory compactors of relatively light weight. Where data are available they are not often accompanied by comparable data for conventional pneumatic and steel wheel rollers. However, the data available show that while in a few instances higher densities were obtained by heavy rollers, they also show instances where vibratory rollers and vibratory compactors produce densities equal to or higher than those produced by rollers and do so in some instances on greater compacted lift thicknesses and under a lesser number of passes or coverages.

It was believed by the writer that inclusion of trade names would serve no useful purpose, accordingly code numbers have been assigned. The letters VB indicate vibrating base plate or vibrating "shoe" type compactors; the letters VR indicate vibratory rollers; and the letters VX refer to one commercial make with which the writer is not familiar.

Data indicate that with few exceptions recent models of both the vibratory tampers and vibratory rollers have produced densities about equal to and in some instances higher than densities produced by conventional pneumatic tire and steel rollers used in highway construction. Also, in some instances, those densities were produced on thicker lifts and with lesser passes with the vibratory compactors.

Discussions with engineers have brought out that the vibratory equipment was most effective on granular

soils having generally less than about 15% passing the number 200 sieve and being non-plastic or having low plasticity indices.

Experimental developments

The California Institute of Technology designed and built a vibrating base plate type compactor having base dimensions of three to five feet and a dead load of 6 psi. (total wt. 13,200 lb.). The vibrator was towed by a track type tractor at speeds ranging from 0.6 to 7.25 ft. per sec. A limited testing program was conducted on beach sand to observe behavior of the unit under field conditions. Field densities of 93 to 96% of Mod. AASHO maximum density were obtained between depths of 2 to 5 ft.

The Corps of Engineers at the Waterways Experiment Station has made field studies of three models of an impact compactor. Two of the models were of the wheel type and the third a sled type compactor. Model A consisted of a light eccentric system and axle assembly equipped with steel disks. Two assemblies were tested. One assembly was equipped with disks 30 in. in diameter and 3 in. wide, with a 3-in. clear space between disks. Over-all width was 4 ft. The other assembly used disks one inch wide with 3 in. clear space between disks. The unit developed a maximum centrifugal force of about 12,000 lb. at 1,000 rpm.

Model B was similar to A except a larger eccentric system was used.

Model C used the same eccentric system as Model B but was equipped with stationary sled-type feet having a flat bottom surface approximately 6 x 3 in. with a clear space of 3 in. between feet. This model was considered by the developers to show the most promise. Their current test model was two rows of fixed skid-type feet so arranged as to give complete coverage to a strip 8 ft. wide in one pass.

Tests were made at 6 coverages with Model C. Two coverages used a high centrifugal force (35,600 lb.). The force was then reduced (7,300 lb.) for the remaining coverages. A minimum dry density of 113.6 pcf. (97% of Modified AASHO maximum density) was developed for a 4-in. thick compacted lift on a fine grained lean clay (P.I.—15) soil. The maximum densities developed by 6 coverages for 4.5-in. compacted lift are greater than densities developed in previous studies on the same soil for 6-in. compacted lifts with 12 passes of a 250-psi sheepfoot roller or with 8 coverages of a 50-ton rubber tired roller with tire pressures of 90 psi.

Conditions determining changes

It is of little value to determine trends unless a like effort is made to determine the causes which have brought about changes which are sufficiently well defined to be labeled trends. A number of possible factors can be examined as sources of changes. Personal preference of the administrative officer responsible for

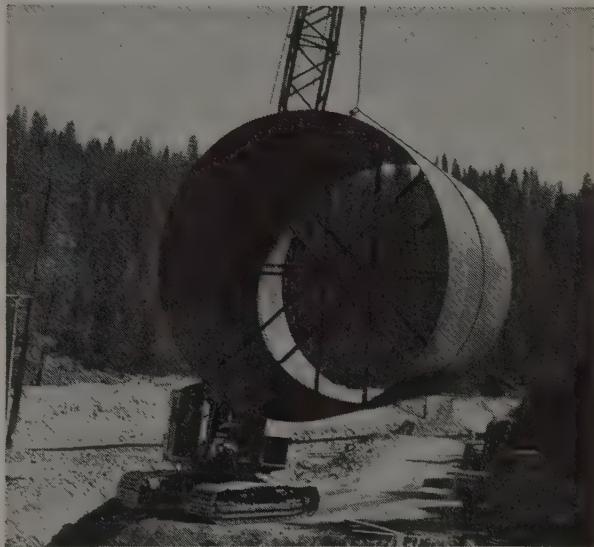
The Engineer's Field Report

CASE HISTORY

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The 163 h.p. Scoopmobile (above left) loads aggregates at batch plant. The Northwest crane (right) with a Murphy diesel engine, lifts and positions 40-ton, 15'4" OD tunnel liner sections. Other RR&W equipment using

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specifications may bring about changes. That personal preference may be based on the feasibility of administering inspection of different methods of specifications with available personnel. The writer has encountered one instance where the lack of qualified personnel was said to be a factor in determining type of specifications.

New equipment has much influence on specifications. The use of increasingly heavier construction hauling equipment has in itself increased compaction and this has increased requirements to support such equipment. New compaction equipment in the form of larger sheepfoot rollers, segmented rollers, heavier pneumatic rollers with higher tire pressures and the more recently vibratory equipment facilitate compaction and thus influence specification changes.

Another factor which is responsible for present trends in compaction is a better understanding of the influence of compaction on the physical properties of soil by a greater number of engineers. This better understand-

ing of the relationship between compaction and properties of strength and resistance to climatic effects has resulted in specifying those compaction requirements which impart to the various types of soil those properties which are in greatest need in the part of the structure in which they are used.

Finally and perhaps the most significant reason for the trend toward increased density requirements in subgrades and base courses is the need for greater densification to prevent compaction by traffic using the completed roadway. Any student of stress distribution in soil under a loaded area is keenly aware of the facts that the unit stress caused by a wheel load is greatest near the surface and decreases with depth; and that the greater the unit stress the greater the compaction under load. Thus today's increasing numbers of heavy wheel loads and increasing tire pressures call for greater densification in new construction if future compaction under traffic is to be prevented.

the road conditions. In fact, the radio system was often used to relay emergency messages to both public agencies and private individuals regarding the storm damage. At the district level, the radio was the means whereby the district or headquarters offices could be informed from the field on conditions.

As the storm abated and flood waters receded, the magnitude of the damage became apparent and immediate steps were taken to restore highways to traffic use as well as review the extent of damage and estimate the cost of repairs. In the review of damage, it was even necessary in some instances to make the initial inspection from an airplane. Damage insofar as highways were concerned was the most severe of the Redwood Highway where it follows the Eel River, and on the highways following the courses of the Trinity, Klamath, Feather, Kings, Merced, and Kaweah rivers and to a lesser extent on highways following the course of minor streams. The extent of damage varied from large washouts involving the loss of one-half mile of road to the minor washouts occasioned by blocked culverts. Damage also included slides, slipouts, damaged culverts, lost bridges, and the accumulation of an almost unbelievable amount of drift and debris. At one location, six fairly large houses rested partially upon the traveled way after flood waters receded. The estimated cost of restoring State highways alone was \$11,600,000 which was later increased to \$14,500,000 by a second severe storm early in January.

The most extensive damage to highways occurred in the northern western portion of the state, Highway District I, where the unstable terrain is subject to heavy rainfall in any year, and so much damage can be expected yearly. However, this year's damage far exceeded any previous record. For 1 mi. along the Eel River, damage was so extensive that it appeared the highway could not be opened for normal traffic for several months. This part of the state is unique in that there is no other through highway serving the area and its only railroad is subject to more severe damage conditions than the highways and to longer closures at all times. Manufacture of lumber products, the big industry and during periods of railroad closure the entire industry must rely on truck transport. Likewise, all passenger traffic must rely on auto transportation with all consumer goods deliveries relying on the same means. With the entire economy dependent upon motor transportation, a no uncertainty demand was made on the Government for the immediate opening of the highway. With the County road damage even greater than the State high-



FLOODS—Bringing up to date the flood story that appeared in the March issue of Western Construction is this general survey of damage and rebuilding in California.

By G. F. Hellesoe

Maintenance Engineer

California Division of Highways

THE WINTER of 1955-56 will go down in California history as the year of the big floods, with precipitation and stream discharges even greater than the near legendary floods of 1861-62. Seventy-six lives were lost through drowning, and it is conservatively estimated that the cost of public and private property damage will approximate \$255,000,000. Several years' time must elapse before all evidence of that disastrous Christmas week will be entirely eradicated.

Following several days of average rainfall, an intense tropical storm on December 20 enveloped the central and northern portions of the state, precipitating rainfall in almost fantastic amounts throughout the area. As for example, 19 in. of rain fell in two days at a Coast Range station, 13 in. in two days in the Siskiyou, and 17 in. in two days in the lower Sierra. Large rivers rose to as much as 50% above any previous record

of discharge with some smaller streams approaching 100%. These excessive discharges seriously damaged streambeds and abutting property and flooded the lowlands, and highways located on one or the other were blocked to the extent that for almost three days highway traffic in the northern two-thirds of the state, except for purely local movements, was at a standstill. Every interstate route north of the Tehachapis was closed by damaged roadways, and flooded areas in the lowlands were too numerous and extensive to enumerate.

Everything out but radio

During the height of the storm, all efforts were made by highway crews to minimize the damage, protect traffic through barricading of hazards and provide detours where possible. Although often all public communications were broken, constant contact was made with the highway districts through the short wave radio system and public advice was made available at all times on

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MANY COMMUNITIES were completely inundated during the Christmas floods. Shown is a road-side motel in Weott along the Eel River in District 1. This part of the state is unique in that the terrain is very unstable and there is only one major highway. The only railroad is subject to more severe damage than the highway. This year the locality was entirely isolated and damage exceeded all previous records. See *Western Construction*, March 1956, p. 25.

ways, it would be hard to visualize any locality more isolated or faced with a greater peril. As a pattern, it might be well to describe the steps taken in opening the highways in this area.

The first step in road restoration was to provide a pioneer or emergency road to all the areas, sufficient to accommodate emergency vehicles and also gain access to the most severely damaged locations, and appraise the extent of damage to immediately formulate plans for full-scale roadway restoration at the earliest possible moment. The pioneer road work was immediately undertaken by State forces and equipment, supplemented by extra personnel hired on the spot and by privately-owned equipment that was found available within the damaged areas.

It was interesting to note that the intense and widespread development of the logging and lumber industry since World War II throughout the area was of considerable benefit during the emergency, with the utilization by the industry of similar equipment such as tractor-dozers, graders, dump trucks, etc., as used in highway construction and maintenance. The wide dispersal of such equipment locally proved to be an important factor in the road opening work. The equipment, ranging from chain saws to the larger tractors, dozers, and loaders, along with their operators, was hired on a daily basis and greatly accelerated the first opening. The pioneering started and progressed in both directions from many locations between points of closure and wherever equipment was available, together with Division of Highways personnel to instigate the work and provide supervision. Field forces were authorized to procure additional personnel and equipment as necessary, and as available. By December 27, the highway had been opened sufficiently so as to permit transport of heavier and more proper equipment into the most troublesome

areas to supplement that already in use. Such equipment as four $1\frac{1}{2}$ -cu. yd. shovels, together with other incidental equipment, was brought in to work on the several most troublesome areas of damage and to widen and strengthen the pioneer facilities in order to permit passage of all traffic.

Restoration

The restoration work progressed by general cleanup and repair of damage such as clearing slides and debris, filling washouts, clearing drainage facilities, etc., restoring the road in general to traffic use. Major slides, settlements, slipouts, and washouts in places constituted major problems, and in many locations it was obvious that retreat into side hills would have to be resorted to in order to establish a stable roadway with sufficient width to accommodate normal traffic. At this stage, cost-plus contracts were made with contracting firms supplied with proper and adequate road-building equipment and experience. Tractors with steel tracks and other equipment of the logging and lumbering industry, as used in pioneering the road restoration and proper for the use intended, were not suitable for detailed and specialized highway work. The contracts were largely made with local contracting firms who, despite the cost-plus incentive, with their special equipment and trained personnel did an outstanding job in repairing damage and restoring the highways.

Steady rains

The restoration activities were hampered by almost continuous rains ranging from intermittent to heavy lengthy downpours. River bars, as a source of material for backfill of slipouts, washouts, settlements, and as a surfacing material, were inundated by recurring high water in streams, hampering and delaying

many phases of the work. Slide settlements, and slipouts already supersaturated were kept continually active by further rains, closing the road for intervals and necessitating additional work.

Despite the difficulties, the Redwood Highway was open to public traffic throughout its length on January 5 and emergency restoration was fairly well completed by the end of January. Similar work was carried on in a like manner at the same time on other damaged highways within the District.

Vital statistics

A few vital statistics might be in order to indicate the magnitude of the road opening and restoration work which was carried on within this District. During the December 19 to January 31 period, 416 pieces of privately-owned equipment were engaged by means of Service Agreements to participate in the work throughout the District. In addition to this, there were the State-owned equipment and contracting equipment working on restoration projects covered by emergency cost-plus contracts. Construction equipment of all descriptions was represented in this array, ranging from the smallest one-man chain saw to large power shovels. Emergency help was hired throughout the district by the field offices to supplement the regular State maintenance forces and these totaled 177 men in the Laborer and Equipment Operator classifications. In addition there were operators of the larger units of rented equipment and the contractors' personnel. In all, 33 emergency contracts were awarded to prosecute the restoration work with an authorized expenditure of \$1,200,000. To this must be added \$1,275,000, the cost of the work done by rented equipment and State forces, making a total of \$2,500,000 expended for emergency restoration. Of this amount, approximately \$2,000,000 was expended by January 31.

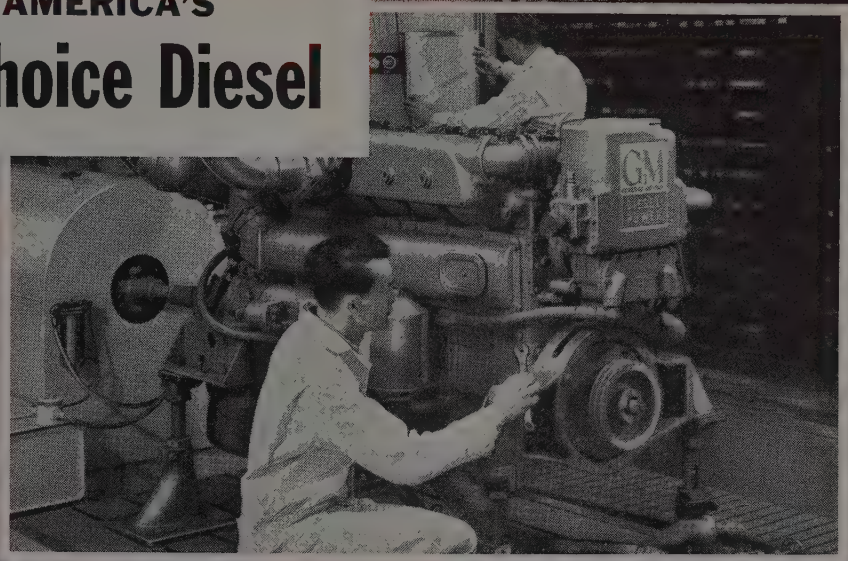
As an ironic note, late in January the father of all slides swept a half-mile of secondary highway into the Klamath River. The slide extended 630 ft. above the old highway and needless to say, an attempt will be made to maintain a road through the slide rather than to remove the enormous yardage.

Similar work in a like manner was carried on during this same period in many other locations within the state, although damage, while severe, was not as extensive in any district as that described above. While in the initial stage many roads were blocked, there were no other sections of the state completely isolated and road openings provided restoration of traffic to proper channels and return to economic normalcy. Here again, rented equipment was used to augment State forces. Free use was

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made of emergency contracts where in one contractor would be awarded all of the equipment needed on a particular job with operations supervised by State personnel. Good progress was made in immediate restoration and by the end of January, even though there were ensuing storms, all roads of any importance were virtually restored for normal traffic use.

Damage surprisingly small

While the cost of final replacement and repair of damaged bridges will approximate \$2,000,000 with five bridges completely destroyed and 23 damaged in various degrees, it is hard to understand why the over-all damage was not much greater. Why bridges with 6 ft. of high velocity water over the decks withstood the pounding of logs and other litter is something that even the designers cannot explain. Most of the damaged bridges were old with many constructed by the County before the route was taken into the Highway System. Immediate restoration work ranged from placing a Bailey truss at a lost span to driving 450 ft. of trestle through fast water to replace a steel span which was finally found 4,000 ft. downstream from its original position. This trestle, incidentally, was open to traffic for ten days when another exceptionally high water took out 12 bents and driving started all over again. At a location on U. S. 40, a 160-ft. trestle was driven over a failed and saturated embankment area in order to restore the route for immediate use. At another location, it was necessary to construct a 60-ft. timber bridge over water and at several locations new pile trestle approaches were needed.

Revetments, particularly of sacked concrete riprap, grouted riprap, masonry walls, and concrete cribs, came through in exceptionally good shape. In one location, 1,500 ft. of sacked concrete riprap and another 1,200 ft. of grouted cobbles, both walls 60 ft. in height, were overtopped 20 ft. by flood waters and although most of the roadway above the slope paving was lost, neither wall was damaged in any way. In many places, all types withstood heavy pounding from log debris without damage. Such failures as did occur were invariably caused by undermining scour.

By the middle of February, damaged roads and bridges had, with few exceptions, been repaired or replaced to the extent that traffic enjoyed uninterrupted use of a normal traveled way. Approximately \$5,500,000 was spent on this phase of restoration. Some \$9,000,000 worth of work still remains to be done, mainly in replacement of bridges, building of revetments, and protection against similar stream damage, and permanent replacement of dam-



CONTRACTOR Arthur B. Siri loads rock with a Northwest shovel from a slide on Highway 101 south of Garberville during the second flood, which struck in mid-January. Over 31,000 pieces of privately owned equipment were put to work on restoration of the highway system.

aged pavements. This latter work will be contracted later in the season in the usual manner with Standard Survey Plans and Specifications.

In reviewing the winter experience, the importance of several phases was so strongly demonstrated as to be of special interest:

(1) The Absolute Dependence of the Local Economy on Open Highways.

The country's social and economic activity, especially in the West, comes to an absolute standstill today if all motor transport is brought to a stop. Not even a start can be made on relief to devastated areas until roads have been opened. People actually become frantic and clamor for superhuman action. On the other hand, it was our experience in California that the people are very appreciative if kept informed and if adequate relief measures are properly executed; and the Department received many letters of commendation in thanks and praise for the expediency with which the highways were restored to normal use.

(2) The Use of Local Contractors and Forces in Accelerating the Progress of Restoration.

Under the Governor's declared emergency, it was possible for the Department to negotiate directly with the selected contractors and enter into agreement on a stipulated amount, which might be on a unit basis or a force account including time of men and equipment plus profit. While they did work for profit, the contractors for the most part displayed a willingness as an industry to assume some of the responsibilities to restore the highways to normal use and deployed their forces just as though the job had been secured for a stipulated amount by competitive bidding. The relief given the Maintenance forces by the use of these specialized forces was invaluable and restored the highways to use much sooner than would otherwise have been the case.

(3) The Use of Short Wave Radio.

It is impossible to overevaluate the importance of the short wave radio system during the emergency or the part it played in the rapid restoration of the highways. During the storms and accruing damage, instead of sitting and wondering, the superintendents, advised by their foremen, knew exactly what was happening and directed such action as could be taken to minimize damage. They passed the information on to their headquarters where authorization could be given for immediate start of repairs. During the restoration period, it was invaluable to supervision in deploying the large concentration of forces in a proper and efficient manner. During all of the emergency, the public was at all times kept advised as to the extent of damage and closures, progress of restoration and time of opening of highways. This proved of particular benefit in combating wild rumors which were prevalent and clamor for unwarranted action. It was also of importance to highway users in keeping posted as to the routes available for travel, with knowledge as to anticipated changes.

(4) The Value of a Well-Organized Resident Maintenance Force.

As never before, at least in California, was shown the value of a resident maintenance force in protection of the highway plant and of human life during an emergency and in many instances actual alleviation of human misery by rapid and efficient restoration. Only from an organization thoroughly familiar with all phases of the highway, both plant and traffic, and with the need for immediate repair could knowledge be secured permitting assessment of damage, additional force requirements and available sources, and where and how best deployed. Even under the extremely difficult conditions that prevailed, action followed by such an organization surely alleviated human misery and greatly reduced the economic loss accrued by California's Christmas Flood of 1955.

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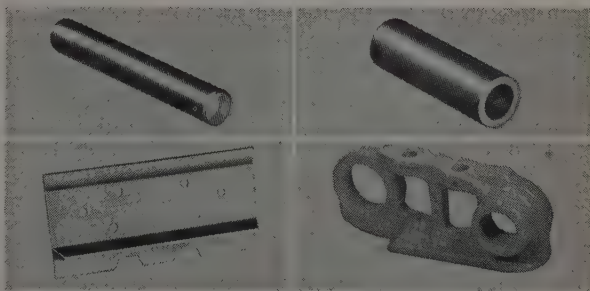
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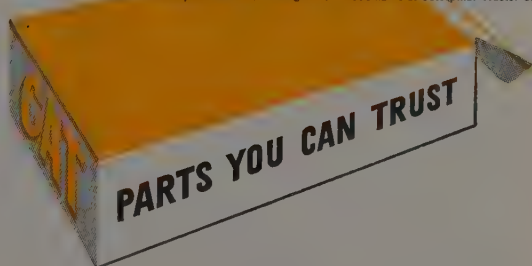
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MAINTENANCE—Why Texas uses seal coats on a large scale and how they design and apply them on 3,600 mi. of highway.

By J. A. WALLER

Engineer, Maintenance Operations
Texas Highway Department

SEAL COAT application and design has been the subject of extensive study in recent years. There have been a number of excellent papers presented in meetings of organizations such as WASHO which have contributed greatly to progress particularly in the design phase of seal coat application.

In Texas we class seal coats as a primary tool of periodic maintenance. It serves as a low cost treatment which arrests deterioration of the pavement and has firmly convinced us of its merit. A specific and adequately financed program is set up each year to take care of work of this type. A majority of the work is performed by contract with the same degree of design and construction supervision given other highway improvement projects.

We feel that there are several factors which cause seal coats to be adaptable on a large scale in Texas. Due largely to our lack of serious problems from frost action, over 35,000 mi. of the approximately 50,000 mi. we maintain have a penetration type surface less than one inch in thickness. It is primarily on these light surfaces that our seal coats are applied. While we sometimes place seals on highways carrying heavy traffic, it has been the general practice to use some type of asphaltic concrete on major highways, particularly where traffic is exceptionally heavy. Last year we sealed some 3,600 mi. of highways using about 12,000,000 gal. of asphalt and over 400,000 cu. yd. of aggregate.

Functions of a seal coat

Before considering developments in design, it might be well to enumerate the features which we consider essential or desirable functions of a seal coat.

1. A non-skid wearing course must be provided. It is our opinion that any seal coat which does not have a sufficiently aggregate textured surface to provide this quality is a failure.

2. It should seal the old surface. In some cases the old pavement may

have cracks caused by dry weather, normal movement of flexible base, or minor frost action which must be filled to avoid deterioration and loss. In others, the seal coat may serve to eliminate raveling of an excessively open pavement.

3. It may be desirable for a seal coat to increase the thickness of pavement. As mentioned earlier, a majority of our highways have thin surfaces and this is particularly true of our lower traffic farm-to-market roads where the original surface may consist of a prime and a one-course surface treatment.

4. The finished surface should have a light uniform colored aggregate texture appearance.

- a. In many instances a seal coat greatly improves the general appearance of a highway by covering spot repairs and other blemishes in the pavement.

- b. Although a light color is not essential, it is normally desirable, for improved night visibility.

- c. We have been using seal coats recently, in some instances, for delineation. Where we have a dark-colored pavement, a light-colored aggregate is used in shoulder sealing to provide a sharp contrast at the pavement edge. A sealed strip contrasting in color with the pavement and supplemented by paint stripes is also being applied in some instances as a divider on multi-lane highways where there is not a raised median.

DESIGN

Some discussion of past practices in Texas will provide a background for our developments in design over the last several years. In the past it was a standard practice throughout the State to use small aggregates graded from $\frac{3}{8}$ in. downward and a relatively hard oil asphalt. At the time of application a considerable excess of aggregate was applied, and it was often necessary to continue applying aggregate throughout the remainder of the summer and sometimes again the following year. This design provided a smooth, fine-textured surface and there is no doubt but what it did a good job of sealing the old pavement. We now

feel that many satisfactory jobs of that time were only possible with the light weight and volume of the traffic using them.

A few years ago, however, various factors made us aware of the unsatisfactory condition of our sealed pavement. In more and more instances we found that they were slippery when wet. Bleeding roads with necessary additional stone began to cause many complaints about windshield breakage and the increased volume and weight of traffic on these light seals was removing any semblance of a light or uniform color. It was often found that the cost of curing approached the cost of initial application. Much of the material added was being whipped off and wasted. All of the factors pointed conclusively to the need to re-examine our thinking on this phase of highway work.

Current designs better

We feel that current designs are much more practical and give more assurance of obtaining desired results. The deficiencies just mentioned are largely overcome, we are able to better tailor this type of work to meet specific needs, and greater reliance is placed on scientific methods for determination of the various features in design. It might be generally stated that in our present design we are using a larger aggregate more uniform in size, with high voidage based on the theory of single stone mat thickness with a bituminous binder filling the lower portion of the voids.

As a general rule, the aggregate to be used will govern the other features of design. In selecting the aggregate, first consideration is given to the thickness of mat which is desired. This will depend, of course, upon condition of the pavement, traffic, and other specific features which contributed to the need for sealing. The mat thickness will be no greater than the average dimension of the larger stone particles. We agree with the theory which has been advanced in a number of recent papers on this subject that the ideal aggregate will be composed of stones of equal size. As a practical consideration, we realize that some spread from maximum to minimum must be allowed and this course is taken in our aggregate specifications. The trend has generally been toward a grade which has a $\frac{3}{4}$ -in. top size and eliminates the minus $\frac{1}{4}$ -in. material. By elimination of these minus $\frac{1}{4}$ -in. materials, we also eliminate much of the aggregate dust problem in addition to improving the grade and increasing the voids.

There are several types of aggregate used on seal coat work in Texas. They include washed gravel, crushed gravel, crushed limestone, and crushed natural limestone rock asphalt. While each of these materials

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EXACTLY THE RIGHT DESIGN FOR TOP PAYLOAD IN YOUR STATE!

has characteristics which influence its suitability for seal coats, all of them are being used and are providing satisfactory surfaces. All aggregate except limestone rock asphalt must have a resistance to abrasion not to exceed 35% when subjected to the Los Angeles Abrasion Test.

While discussing aggregate types it might be noted that we have used a limited amount of precoated material. Where crushed limestone is used, the coating has consisted of from 1 to 2% of a very high penetration asphalt, or you might say, a very high viscosity asphalt, which is applied to the heated aggregate in a bituminous mixer. Where limestone rock asphalt is used, the material is lightly fluxed bringing out some of the natural asphalt. Where these materials have been used, there was no problem in their application by standard equipment. Their affinity for asphalt and elimination of dust are qualities which favor their use. The disadvantages we have considered are the limitations in stockpile period, and possible elimination of competition in some instances by some of the smaller producers on aggregate purchases. While our experience to date has been limited, use of this material is increasing and we feel that there is a place for precoated aggregate seal coat work.

After the grade and type of material is selected, the rate of application can be determined. This determination may be based in part on formulas, laboratory tests, and experience in use of any particular aggregate. The object is to determine the quantity of aggregate required to provide a mat of single stone thickness. We feel that this is a most critical element of the design, as application of an excess of aggregate causes stacking and improper embedment with loss of the larger size stones, and results in degradation of the aggregate with reduced percentage of voids.

Type of asphalt

The other major element in design is the determination of type and application rate of asphalt. It has been our general practice for a number of years to use oil asphalts on the majority of our seal coat work. In the selection of the grade of oil asphalt, we do not consider the hardness of the asphalt as a major factor in the stability of the mat. Whereas we formerly used lower penetration asphalt, we are still using some asphalt with a penetration of 120 to 150, but on the majority of our projects an asphalt of 150 to 200 penetration is used. In some instances asphalt of 210 to 250 penetration constitutes the bituminous binder. With the single stone principle, the asphaltic binder has the function of sealing the old pavement, providing a tack coat for the aggregate and holding the aggregate in

position while filling the lower portion of their voids. Where traffic is light or where sealing the old pavement is the principal purpose of the seal coat, many of our engineers favor the higher penetration asphalt, with slightly lower penetrations generally used on the heavier traffic roads and on those where appearance and nonskid properties are most needed.

Rates of application

The selection of application rates on the other hand is considered an item of primary importance. Our general thinking is geared to selecting the rate of application which will provide sufficient bituminous binder to seal the old pavement and fill a proper portion of the voids. Factors influencing this determination are the average mat thickness of the aggregate and the voids in the aggregate, with adjustments included to compensate for condition of the existing pavement, traffic and other factors which may vary from job to job. Here again we feel that much of the guess work has been eliminated by combining theoretical computation and laboratory tests with experience. Where the aggregate is predominantly round or cubical, considerable weight can be given to the quantities derived from computation of mat thickness from screen analysis, and voidage may be determined by standard tests. Where aggregate contains a high percentage of flat or elongated particles, mat thickness can be more accurately determined from a test panel. With the rate of application necessary to properly fill the voids determined by computation and tests, a major portion of the asphalt rate has been established, reducing our dependence on experience and judgment to minor adjustments for the several factors which vary from job to job.

METHODS

In supervising the application of seal coats we feel that close control of asphalt and aggregate application, ample rolling, and adequate provisions for traffic should be provided.

In the application of asphalt it is, of course, essential that this material be placed uniformly at the proper rate without streaking or other irregularities. The temperature of the asphalt should be varied as necessary to provide the proper viscosity for application by the distributor. It might be noted here that there is a wide range in the temperature to which different asphalts used in this state must be raised to obtain the viscosity best suited for application. This quality is generally constant for each of the different asphalt sources and can be determined from a simple temperature viscosity curve which our Materials and Test Division has provided. A major problem in secur-

ing uniform application has been at the beginning and ending of each application. We require that a sufficient width of kraft paper be placed at the joint and that the distributor be in motion when the application is begun. Beginning and ending on paper insures a neat and uniform transverse joint.

As mentioned earlier in discussing designs, I pointed out that the aggregate rate is computed for a single stone thickness mat with no excess for stacking. With this design it is imperative that the aggregate distribution be as uniform as possible. The initial position of the aggregate when it reaches the pavement, should be in large extent the place it is to stay; therefore, it is essential that great care be exercised in proper distribution of the aggregate from the mechanical spreaders, and any excess aggregate be removed by hand. We find that experienced men on the standard mechanical spreaders are capable of providing satisfactory distribution of aggregate.

While the thinking of our engineers still varies somewhat on the amount and type of rolling, this operation has been expanded in general practice throughout the State to provide adequate rolling to firmly seat

the aggregate without relying on action of traffic. In reviewing recent contract jobs, I find that we are specifying about ten hours of rolling per mile of pavement. Rolling is generally performed by five to six ton flat wheel and pneumatic rollers. Immediately after the aggregate has been applied we generally give an initial coverage with a flat wheel to set the aggregate. This is normally followed by pneumatic rollers operating at speed just below that at which suction from their tires tends to pick up unbonded aggregate, and is continued until it appears that all aggregate is firmly seated. In using the flat wheel roller we find that close attention should always be given to assure that the aggregate is not being crushed and degraded to any appreciable extent.

We consider conditions on the road which influence the handling of traffic at the time the plans for each job are prepared. If shoulders are too narrow to carry traffic it is often provided in the specification that the seal will be applied to one-half the pavement at a time, and extra flagmen may be required where traffic in both directions must alternate in one lane. Fortunately, the majority of our highways have shoulders which can

be used by traffic moving through the job. In these instances we set up an item for sprinkling to keep dust down, and before projects are started our maintenance forces place the shoulder in the best possible condition.

Final operation

The final operation is removal of any aggregate which is not bonded. When you consider that for many years it was our normal practice to keep surplus aggregate on the pavement for weeks following application of seal coats, removal of all "curing materials" is indeed a drastic change. You might say this is a test of the design. On the morning following application, or the morning after rolling is completed, and while the pavement is still cool, any loose stones are removed with a rotary broom. With some care exercised to see that the broom elevation is high enough to avoid pulling out bonded material from the still tender mat, we have found it to be a simple and effective operation. While the primary objective is to reduce the flying stone hazard, we believe loose stones under the traffic also tend to dislodge bonded aggregate and by filling voids, raise the elevation of the bituminous binder, resulting in bleeding.

On runways and taxiways—

Concrete or asphalt?

On page 77 of the April issue of *Western Construction* we presented remarks given by Maj. Gen. Lee B. Washbourne, Assistant Chief of Staff, Installations, U. S. Air Force, which described the decision by the Air Force to curtail the use of asphalt in the construction of runways. In reply to that decision, we present here a statement by Arvin S. Wellborn, Chief Engineer of The Asphalt Institute.—Editor.

THE DECISION of the Air Force to curtail construction of asphalt pavements on military airfields was based on alleged pavement failure at seven heavy bomber bases, two of these in California, two in Arizona, two in Oklahoma, and one in Florida.

With the permission of the Department of Defense, the bases have been inspected by engineers of The Asphalt Institute. Preliminary appraisal of the inspection reports indicates that, in every instance, pavement distress was caused by the displacement of supporting foundation materials. The reports show:

- a. Air Force criticism of asphalt pavement has been unduly harsh.
- b. Serious pavement distress was found at only two of the seven bases in question.
- c. Pavement maintenance at these military airfields continues to be haphazard or seriously neglected.
- d. There is a definite need for heavier airfield pavement design and

improved construction methods to accommodate America's heavy bombers.

The reports, covering inspections made at all seven bases, included these preliminary findings.

None of the four bases in California and Arizona showed a condition of pavement distress serious enough to impede normal operations.

At one of the two bases in Oklahoma the reports showed evidence of serious rutting which could be traced directly to displacement of foundation materials beneath the pavement. At the other Oklahoma base, heavier aircraft have not been operated extensively on the pavement and, of course, there is no evidence of distress.

The seventh base, in Florida, has developed dips in the pavement at approximate 100-ft. intervals along the centerline of the runway, causing the aircraft to "porpoise" at high speed. Again, the fault is clearly in the foundation.

In every instance, the Institute inspections confirmed the findings of a special committee of the Highway Research Board which, at the request of the Department of Defense made an extensive study last year of pavement conditions at 27 major military airfields. On that occasion the committee reported a serious lack of proper airfield maintenance at virtually all installations. The reports of the engineers of The Asphalt Institute find this still existing.

The reports pointed up one disquieting feature that suggests a revision of airfield pavement design may be in order. Present design criteria are based on the assumption that aircraft movements will be distributed over the entire width of taxiways and runways. However heavy bomber traffic, instead of being so distributed, is channelized along the centerline. A rising volume of traffic and steadily increasing wheel loads, coupled with this channelization, has established a pattern of pavement stress which calls for heavier pavement design to carry this narrow concentration of loading.

The reports indicate there is definite need, not only for heavier design, but also for better construction methods for all heavy bomber airfield paving, with particular attention to the need for better foundations and proper drainage.

With necessary attention to these requirements, there is no doubt that asphalt will meet all airfield needs and at much less cost.

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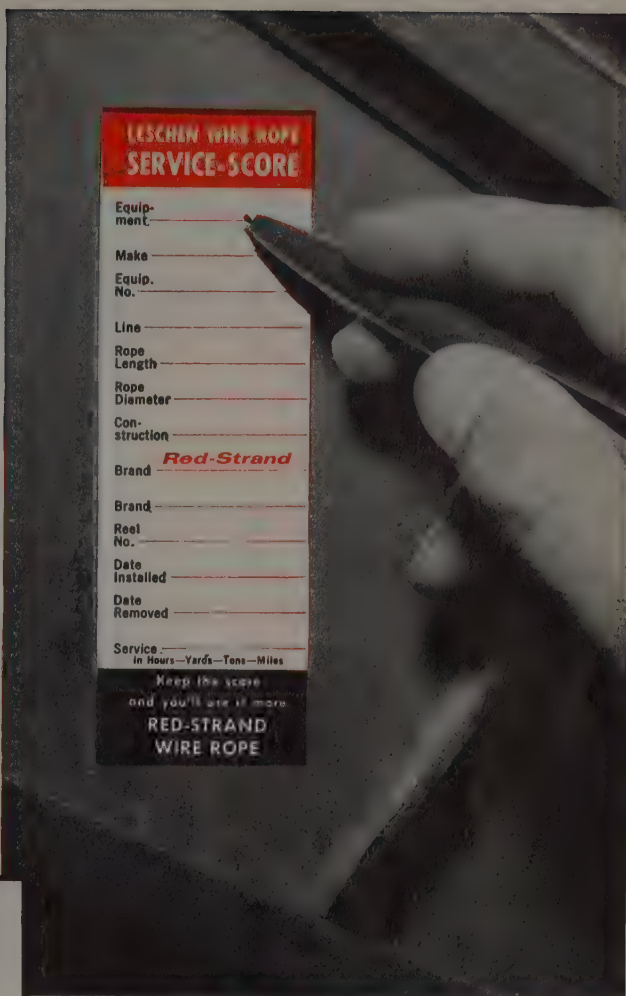
Service-Score stickers provide easily-available, helpful reordering data—equipment identification, wire rope diameter, length, construction,

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St. Louis 12, Missouri





IN IDAHO this 536-ft. timber bridge over the Bear River (main span 161-ft. steel truss) contains 203,700 bd. ft. of pressure creosoted fir.



TIMBER — A Western material with many uses in highway structures —Treated, it has permanence, and advantages where routes will change.

By AMERICAN WOOD PRESERVERS INSTITUTE

BRIDGES and other drainage structures represent large amounts of public road funds, particularly in areas cut by many streams or washes. Demands of economy include not only the first cost, but also maintenance and the cost of strengthening and widening when revision or modification is necessary to avoid obsolescence.

Structural timber offers certain mechanical advantages not inherent in other materials. It has outstanding ability to absorb impact or shock and ability to carry safely short-time overloads, beyond those for which the structure was designed. For loads of short duration, timber is twice as strong as is indicated by working stresses which are for permanent loads. Before ultimate failure, it gives ample warning. Moreover, properly designed, treated timber structures are easy to erect with simple equipment that is readily available in all localities.

Modern pressure preservative treatment has converted wood into a permanent structural material that often outlives the structure in which it is used. Thousands of long service records have established its usefulness as a permanent material for exposed highway structures.

Most bridges are short

The major portion of bridging on any highway system consists of short span structures, or those which can be made up economically of shore spans. A survey made some years ago by the highway department of a Western state showed that of 100,673

lin. ft. of bridge structures on 10 typical primary highways, 51% of the total length consisted of individual span lengths of less than 30 ft.

Short spans, or a series of ordinary trestle span lengths, are easily erected with timber and can be widened or strengthened without difficulty. They are durable when properly designed and built with pressure treated timber. Hundreds of such trestles were built during the past 30 yr. by county, state, and federal highway departments, and over a much longer period by the railroads. Many railway ballasted deck creosoted timber trestles, in heavy service for 35 to 45 yr., are still in excellent condition and good for many more years of service.

The grade separation on First Avenue, Seattle, Wash., is a typical combination structure in which treated timber substructure and stringers were used for all sections where short spans were suitable. Steel girders were used for the longer spans, providing for railroad tracks. This structure carries First Avenue over the tracks of the Union Pacific, Northern Pacific, and lines entering the city from the south. It is 2,800 ft. long with 85 spans. It has a 64-ft. roadway with a 5-ft. sidewalk on each side.

Use in Colorado and Idaho

The state highway department of Colorado has used a large volume of treated wood in construction and maintenance projects for many years, and specifies it for a variety of purposes. Many pile trestle or framed bent bridges, designed for standard H-15 loading, have been erected. Usual span lengths are 19 or 23 ft.,

and the roadway width between curbs is 25 or 29 ft. Flooring plank has been superseded by laminated floors of 2x4's or 3x6's on edge with wearing surfaces of asphalt plank, or mastic, mixed in the field. It is now the practice, when such bridges are built close to a town, to make them of sufficient width to provide for a sidewalk in addition to the vehicular roadway.

In Idaho, where altitudes range from 750 ft. to 12,000 ft. above sea level, the state highway system must necessarily be planned with special care to meet the wide variety of conditions encountered. Flumes and canals in many areas of the state frequently intercept highway crossings. Types of structures included in the highway system range from small irrigation flumes and canal crossings to long span bridges across major rivers. Many of these structures are built of pressure creosoted piles and timbers. In many cases, creosoted foundation piles are driven for the support of concrete pedestals and piers, where the soil conditions necessitate the use of piles, and where the pile cut-off is above permanent ground water-table.

For spans up to 16 ft. across canals, longitudinal laminated decks are sometimes used on round drive piles, or on framed bents where there is a shallow clearance between water level and road grade. Such decks usually are 2x4-in. planks set on edge. The deck planks are spiked together with 40d nails at about 2-ft. centers.

An example of the latter construction is found in the new 536-ft. bridge across the Bear River at Grace, Idaho. Because of the profile of the channel and the interference offered by two penstocks 12 ft. and 14 ft. in diameter, which it was necessary to span, the bridge includes

ON A GRADE separation in Utah this design called for a 6-in. laminated floor pressure treated with creosote. Stringers were treated with Wolman salts.



smooth, rugged service

IN FOUR SHORT YEARS total traffic volume on the asphalt-paved New Jersey Turnpike has exceeded the total carried during the 15-year life of the Pennsylvania Turnpike, the grand-daddy of present-day toll roads.

Yet in spite of carrying more traffic than any other turnpike in the world, maintenance costs are low and the asphalt pavement is in excellent condition.

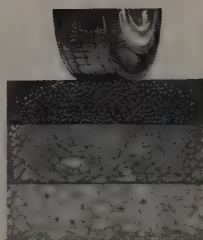
To highway engineers the New Jersey Turnpike's record of tremendous traffic and outstanding safety is a remarkable demonstration of the dependability of modern asphalt pavements for rugged, heavy-duty service.

Modern asphalt pavement saved \$50,000 a mile on the New Jersey Turnpike. For one thing, material costs were less because, as is usually the case with asphalt construction, economical use was made of local soils and aggregates. This is one of the many benefits of asphalt's versatility. Also, asphalt construction is faster. Thus the road begins to earn revenue sooner.

Modern, heavy-duty asphalt construction is demonstrating that it offers economy, durability and ease and speed of construction. That's why more engineers are recommending asphalt pavements—engineered for smooth, rugged service.

Engineered for rugged wear

TYPICAL SECTION showing modern 4½" asphaltic concrete pavement on New Jersey Turnpike. Pavement structure designed from the ground up for axle loads of 36,000 lbs. Bids on asphalt design were \$5,000,000 less than bids for 10" rigid pavement to carry the same loading.



- 4½" Asphaltic Concrete
- 7½" Asphalt Penetration Macadam
- 6½" Compacted Stone or Gravel Subbase

THE ASPHALT INSTITUTE

Asphalt Institute Building, College Park, Maryland



ALT

R MODERN HEAVY-DUTY HIGHWAYS

RIBBONS OF VELVET SMOOTHNESS



variety of panel lengths.

Wyoming has been a constant builder of creosoted timber bridges since 1924. This state has developed excellent standards for treated timber spans from 11 to 25 ft. with 25- and 35-ft. clear roadway widths. Excellent detail on these structures has resulted in almost negligible maintenance costs over the years.

Also in Montana

In Montana, creosoted timber and piling are widely used because they have been found well adapted for use in areas with alkali soils.

Trestles built with pressure creosoted lumber and piling were estimated by Montana highway officials to have a useful life of more than 30 yr. In many cases, the changes in highway locations necessitate replacement of a bridge long before it is necessary to replace it because of decay.

On the other hand, untreated timber trestles in Montana have an average life of only 10 to 12 yr. The additional cost of creosoted timber is negligible when considering the increased life.

The two types of timber trestle adopted by Montana have been designed to standards that are moderate in cost and easy to build. Furthermore, they are easy to modify when changes are made in the highway grade or width of roadway.

Most commonly used is the treated timber trestle with laminated deck. This type not only makes use of sturdy, simple principles, but permits use of an oil surface laid continuous with the surface of the adjacent roadway. Such construction produces a smooth-riding surface that can be maintained by regular road crews.

Composite deck design

Two types of composite timber-concrete decks have met with considerable favor for heavy traffic

TREATED TIMBER posts are standard for installing guard rails on Western mountain highways. Location is Oregon, near Detroit Dam.



CRIBWORK of pressure creosoted timber is effective in holding slides without preventing drainage. This example is on the McKenzie Pass Highway, Oregon Route 28.

highways. One type was developed by the Oregon Highway Commission, and a number of bridges of this design were built on Oregon and Washington highways. In this design, the tops of the pressure treated stringers are integrally connected to the concrete deck slab, thus forming a T-beam with a timber stem and concrete flange, which is the roadway slab itself. The shear connection consists of daps in the top of conventional size stringers, or a combination of daps and spikes.

The second type utilizes small timber and was developed by the Service Bureau of the American Wood Preservers' Association (now the American Wood Preservers Institute) at about the same time. It consists of a solid laminated timber slab of 2-in. treated planks on edge, covered with a concrete mat. The wood base and concrete mat are rigidly locked together, so that the assembly acts as a unit with an effective depth, equivalent to the over-all thickness of the two materials. The concrete mat not only provides an excellent wearing surface but also distributes wheel loads over wide areas.

Because of the shear connection the deck becomes an effective part of the supporting slab, instead of a dead load burden, as is commonly the case where concrete is placed on stringers. The laminated timber base is formed by alternating two heights of plank to form grooves in which shear developers—small trapezoidal steel plates 3/32 in. thick—are seated. This deck has been used extensively for highway bridges in practically all parts of the country and for a very large number of wharf decks, from Newfoundland to the Caribbean.

A variation of the Service Bureau design was developed by the West Coast Lumbermen's Association and used for several Western highway bridges. This modified design uses gains in the tops of the laminations for the shear connection. Grooves along the projecting sides of the

high laminations bind the timber and the concrete together to prevent any tendency to vertical separation of the two materials.

Two bridges with composite decks of the Oregon design were constructed on Eighth Street in Los Angeles, Wash., some years ago, to span Valley and Tumwater creeks. Both bridges are more than 750 ft. long and 100 ft. high at the low point of the valley. The supporting piers are creosoted timber towers with Teco split ring connectors at the joints of the tower members.

Foundation piles

Pressure creosoted timber piles have been widely used for more than 50 yr. in foundations for bridge buildings, and other structures in all parts of the country. They have been used longer than any other type of so-called permanent piles for foundations, where the tops of the piles, although cut off below the ground level, extend well above the permanent water-table. When such piles are entirely embedded in the earth, they are effectively shielded from air currents.

Centuries would elapse before the preservative would be so depleted that it would no longer protect the wood against rot, insects, or other deteriorating agencies. Creosoted piles are particularly resistant to alkali and acid soils, and in many cases have been chosen for foundations where resistance to these soils was desirable.

The high capacity developed by creosoted timber piles driven in good soils was demonstrated in tests made for the foundations of the Salsipuedes Bridge by the California Division of Highways several years ago. This dual lane bridge, comprising 21 spans, is about 1,300 ft. long, and each lane has a clear roadway width of 26 ft. Permanent settlements on the driven creosoted timber piles averaged less than 5/64 in. under a 60-ton test load, and approximately 5/16 in. under an 80-ton load.

(Continued on page 208)



NEW

18-yd. FULLPAK Scraper cuts dirtmoving costs

any way you look at it, the all-new Fullpak C Tournapull-Scraper is a money-maker for you! Designed for lowest-cost dirtmoving, it incorporates massive high-production features that

add up to bigger profits the year around in your operations. Here's why:

Lower, Wider Bowl

You get faster, easier loading with this new 18-yd. "Fullpak" bowl design. Dirt slides in almost horizontally from a wide 9½' cut...rolls back to fill corners...then up and over to pack around apron. Low, smooth bottom and sides speed loading and unloading.

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Wide, correctly-curved deflector plate starts live boil...keeps load rolling up and forward without spilling. Heaps high for bigger pay load.

Exclusive Fullpak Scraper design gives faster loading, better boiling. Diagram shows how lower push-block carries pusher thrust direct to blade for fast cut. Big 43" x 16" block is well behind wheels, and at correct height for fast, easy contact by all pushers.



Low Push-Block

Big (43"x16"), low (36" center) push-block is the right height for all tractors...gives them an easy, solid target for fast contact. Located well behind wheels, push-block delivers direct downward thrust of pusher to self-sharpening blades. This assures a clean blade-bite in toughest materials.

Ample Power, Speed

Fullpak's big 208 hp diesel prime-mover is geared for heavy loading conditions. It gives you solid power and traction in loading...has fast 30 mph hauling speed. Electric controls, 90° turn maneuverability, low-pressure high-flotation tires—these and other valuable features combine to make Fullpak a money-making dirtmover for you!

Get all the facts now, at your LeTourneau-Westinghouse Distributor.

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LUBRICATION —A problem anywhere in the heavy construction field, and especially tough under Western conditions — A comprehensive review of the subject, with detailed information and suggestions for field servicing.

PART ONE OF TWO

PROGRESS and expansion in the heavy construction field during recent years have been so rapid as to be almost beyond comprehension. Developments in new equipment and techniques have combined to convert the impossibilities of yesterday into the routine realities of today. Hills can be leveled, solid rock sliced, the course of rivers can be altered. Truly, the whole contour of the earth now can be reshaped by man with unbelievable speed and rapidity to fit his needs of the moment—whether they be super-highways, dams, tunnels, sewers, bridges, factory sites, or new residential areas.

Statistics, dry though they may be, frequently are quite revealing. Those which have been compiled on heavy construction operations reflect well the rate at which activity in this field has expanded since the close of World War II. For example, in highway construction alone, the amounts spent since 1946 on both new projects and maintenance have increased at an average rate of \$300,000,000 and \$100,000,000 per year respectively. Or, expressed another way, the total expenditure in 1954 for highway construction, including both new operations and maintenance, was 46% greater than that in 1950 and 11% over that for 1953. Actually, in 1954 approximately \$7,600,000,000 was spent on heavy construction operations, and conservative forecasts predict that by 1959 this figure will be doubled.

To describe, even sketchily, the recent developments in the equipment which make the current heavy construction operations possible—the tractor and its attachments, the shovel, the dragline, the scraper, the crusher, the grader, the excavator, and the loader, to mention some—would require volumes. However, if one could select a single word which would reflect the trends in equipment design that have prevailed during the past few years, it might very well be **Increase**—increase in engine horsepower, in speed, in unit load and capacity, in mobility and flexibility, in size and ruggedness, in ease of operation, and in features which make for more comfort and less strain on the operator. Full advantage is being

By R. K. GOULD

and

E. J. BOWHAY

Research and Technical Dept.

The Texas Co.

New York, N. Y.

taken of all the improvements that have been realized in the power units whether they be gasoline, diesel, or in some cases, LPG engines. Fully automatic or semi-automatic transmissions have been adopted by many equipment manufacturers. Refinements continue to be made in the design of the hydraulically, electrically, or mechanically operated attachments which permit easier and more efficient operation. Thus, on the whole, new equipment tends to be larger and more powerful which increases the unit work capacity; but at the same time it is faster, more mobile and much easier to handle, all of which increases overall operating efficiency.

Ratio of equipment costs

Now to revert to some additional pertinent facts and figures comparing equipment costs with total heavy construction expenditures. The accumulated evidence shows that the ratio of equipment value to construction value has been increasing steadily over the years. In 1929 the U. S. Bureau of the Census reported this ratio as 19.9%. A Bureau of Public Roads survey indicated that in 1935 for \$100,000,000 spent on highway construction, the value of the major equipment involved was \$47,800,000, an "equipment ratio" of 47.8%. In 1949 a similar survey revealed the ratio to be 67%. In the field of highway maintenance, as separate from new construction, this equipment ratio is even higher. In 1954 the BPR reported that for maintenance operations, a dollar's worth of major equipment was required to perform a dollar's worth of annual maintenance, for a ratio of 100%. These figures emphasize very convincingly the tremendous investment involved in the purchase and ownership of heavy construction equipment.

Idle equipment represents an investment but it doesn't perform any work. It must be operating to be pro-

ductive, and some very interesting statistics have been developed on the costs of keeping it in service. Of each dollar spent on heavy construction operations, 21.3 cents is equipment expense (items such as direct operating costs, repairs, and depreciation). Of each dollar of equipment expense, 18.2 cents is for fuel but only 3.3 cents is spent on lubricants, including oils and greases. In other words, 21.3% of the total heavy construction costs is for equipment expense, but only about 0.7% is spent on lubricants.

Proper lubrication is a "must" if the equipment is to operate satisfactorily and efficiently. This is particularly true for today's modern machines with their increased speeds and loads and closer tolerances and clearances. The penalty for lubrication failures can be extremely heavy. When one compares the relatively insignificant cost of the lubricant to the replacement cost of the part to be lubricated and add to that the downtime required to make the necessary repairs, it is certainly "penny wise and pound foolish" to make any compromise with lubricant quality—the risk is too great.

Thus the first step toward proper lubrication is to choose the right product—one which has built into it all of the properties and characteristics required to do the job. However, this is not sufficient in itself. The best lubricants in the world are of no real value until they are applied

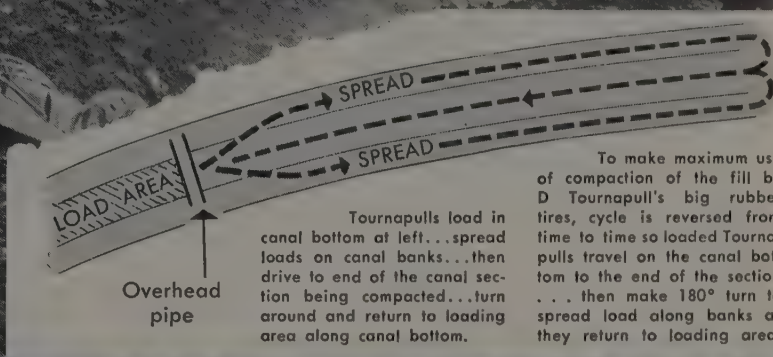
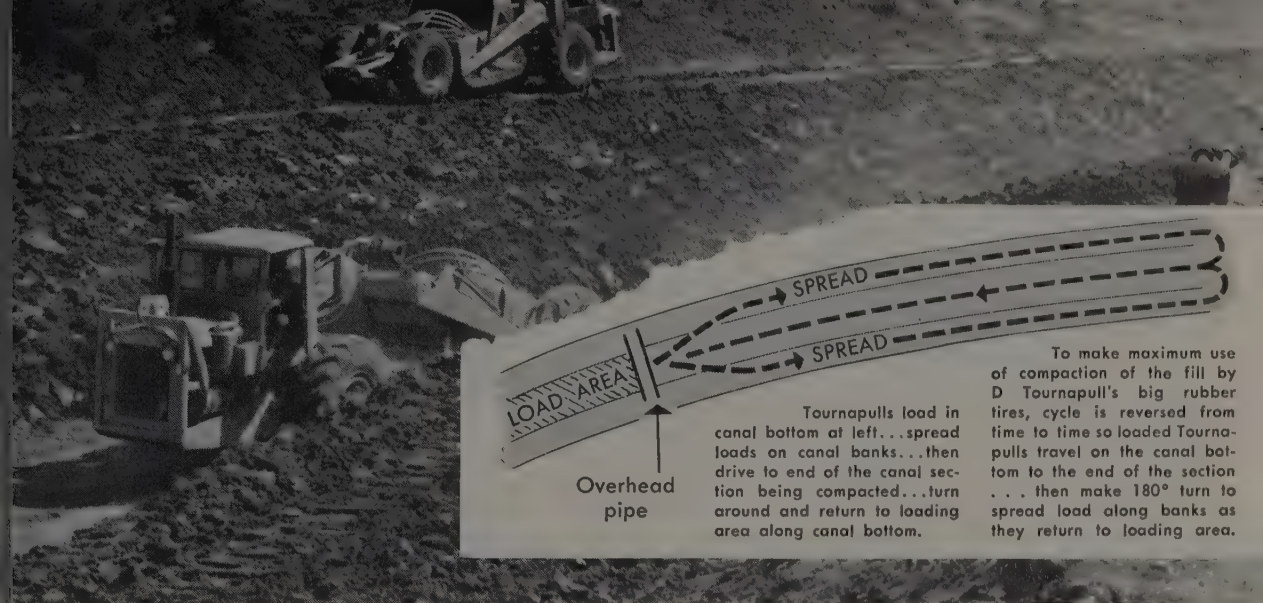
Statistics quoted obtained from Gillette Publishing Company.

and applied properly—at the right time and in the right quantity. This involves establishing a definite lubrication schedule and adhering to it strictly.

Through the combination of proper lubrication and a good preventive maintenance schedule, the costs of keeping equipment in service can be reduced and at the same time the equipment life will be extended. It is hoped that the discussion to follow on lubrication and maintenance will be of some benefit to the operators of construction equipment.

Simplified lubrication plan

In order to meet the demands of industry in general, the petroleum companies have made available hundreds of different types and grades of



low Gregerson & Jensen plugged leaks in 1½-mile Utah canal

**high-speed earthmovers
help patch leaks
with 150,000 cubic yards
of clay in 3 months**

end seepage loss of 200 cubic feet water per second in an important diversion canal, Gregerson & Jensen, Gunnison, Utah, sent in 2 rubber-tired D Tournapulls and 2 C Tournapulls. This U. S. Bureau of Reclamation 1½-mile canal carries water from Weber River to Deer Creek Dam. It normally carries 1000 cubic feet of water per second.

How canal is sealed

Canal was divided into sections and lined. The first section was dug out to increase its bottom width from 24' to 35'. Clean clay, free from rocks, vegetation, etc., was dug from another section of the canal and spread on the banks of the first section.

After spreading, the "D's" traveled up banks to the end of the section,

and then returned along canal bottom to the loading area. Continual travel by the "D's" with their big 18.00 x 25 rubber tires helped to compact build-up of banks and bottom, to make canal water-tight. This procedure was repeated for each section until the entire 1½-mile canal was sealed. Entire project took only 3 months.

Time-studies on the 150,000-cu. yd. job showed that each D Tournapull averaged 4.52 minutes on a 1600' cycle. "D's" were push-loaded to average 4.8 yards of clay per load. On this cycle each machine averaged a total of 52.8 yards per 50-min. hour.

D Tournapulls' ability to turn around non-stop in an area only 26' wide allowed machines to complete cycles fast. Owner says, "I like the maneuverability of the 'D's' best on a job like this. They get around good."

Ask for demonstration

You, too, can solve your dirtmoving problems and make more money with the versatile D Tournapull. The rubber-tired "D" offers you speed, maneuverability, low-cost maintenance and fast job-to-job travel. Gregerson and Jensen

drove their "D's" 100 miles, from Brigham City to Kamas, in 5 hours.

Write for complete information. We will be glad to demonstrate the 7-yard "D", 18-yard "C" Fullpak, or 25-yard "B" on your own earthmoving job.



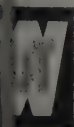
D Tournapull maneuvers under overhead pipe-structure while being push-loaded in 1 minute.

Fullpak—Trademark, Tournapull—Trademark Reg. U.S. Pat. Off. DP-907-D-b

LeTourneau-WESTINGHOUSE Company

Peoria, Illinois

A Subsidiary of Westinghouse Air Brake Company





MODERN UNIT for loading trucks is this crawler tractor-shovel of Allis Chalmers Mfg. Co.

lubricants represented by thousands of different brand names. From these, the construction machinery manufacturers prepare lubrication charts recommending the various grades or types of lubricants which they feel are best suited for their equipment. However, there has been little progress throughout industry toward standardizing lubrication recommendations. For example, one manufacturer will specify certain grades of lubricants for use on his equipment, while another manufacturer of the same type of equipment with similar basic lubrication requirements may recommend an entirely different set of products. Thus, individually the lubrication charts provided by the equipment manufacturers are usually excellent with respect to lubricant recommendations, but collectively they provide some problems and complications in the field. They are very useful on jobs where there is not a large variety of equipment or where the equipment may be all of one manufacturer. However on jobs where the number and variety of equipment are great, more products would be required than could be handled conveniently if each manufacturer's lubricant recommendations were followed to the letter. For example, a survey of equipment on a small road job revealed that to meet each specific lubricant recommendation would require five grades of motor oil, four grades of gear oil, three grades of gear and cable lubricant, six greases, a track roll lubricant, a cylinder oil, and a hydraulic oil, for a grand total of 21 different products.

Field conditions poor

Lubrication of construction equipment on the job is usually not performed under ideal conditions even at best. Time is always of the essence and frequently the weather conditions leave much to be desired. In such circumstances the contractor will be most reluctant to stock all of the different products required and to insist that his oilers abide by each manufacturer's lubricant recommendation. The personnel responsible for lubricating the equipment know from

necessity that the number of lubricants used on the job must be reduced to a minimum. Lacking any other alternative, the contractors themselves or their lubrication engineers must decide upon a consolidated group of lubricants to be used where many have been recommended. Actually this is placing responsibility where it does not belong. What is needed is a carefully designed, simplified lubrication plan worked out in advance so that it will not be necessary to improvise simplification methods in the field.

After considerable study of the lubrication requirements of construction equipment, such a simplified plan has been devised. Actual experience on construction work, which has been confirmed by the military,

indicates that six basic types of lubricants can satisfy the requirements of nearly all construction machinery. These are shown in the Chart along with the parts to be lubricated and interval between applications. The required characteristics of the six lubricants are discussed in the section that follow.

For gasoline engines as well as diesel engines powering construction machinery, it is necessary to use an engine crankcase oil which provides oxidation stability, corrosion resistance, detergent-dispersant characteristics, extreme pressure and anti-wear properties, rust protection, and foam prevention. These are the principal characteristics of engine oils generally known as the heavy-duty type.

Heavy-duty type engine oil

Industry has come to recognize several different grades or classifications of these heavy-duty type engine oils. Basically an acceptable heavy-duty oil is generally recognized as an oil which complies with the requirements of Military Specification MIL-o-2104A. Increased detergent-dispersant properties may be found in those oils which have come to be known as "Supplement I" type oils. Actually there is no established specification covering this type of oil, although the engine test requirements to indicate an oil of this quality level are generally recognized by industry.



LOADING by crawler-mounted dragline of Koehring Co. calls for operating skill and timing.

Why the **Big "B"** Rear-Dump



can cut your hauling costs

Speeds to 34 mph

The new 35-ton capacity B Tournapull Rear-Dump has 10 forward speeds, from 2 mph to 34 mph ... 2 reverse speeds, 2 and 4 mph. Rapid shift and quick acceleration of 293 hp diesel engine lets you move faster and easier into higher gear ranges.

Improved gradability

Proper distribution of weight forward

ward onto drive wheels allows "B" to go up steep grades.

Fast loading

Large "target" area makes loading fast and simple. Bowl is 17'8" long, 10'2" wide, has maximum depth of 7'6". Rear of body provides wide, low entry which gives excavator faster loadings.

Fingertip control of dumping

The touch of a switch, activates hoist motor to lift body. As body lifts quickly, it swings behind rear wheels to dump clean. Completely streamlined bowl sheds material readily. There is positive control both up and down.

Rugged Construction

Body is heavy steel plate, rigidly reinforced. Three layer bottom consists of heavy bottom plate, thick steel billets and heat treat-

ed steel strips to resist wear. Main case of prime-mover is built extra strong ... will not distort to put strain on power-train.

No hydraulics, springs or hinged steering connections

Problems of conventional rear-dumps are eliminated by simple design of "B" Rear-Dump. Troublesome hydraulics, long driveshafts, springs, spring hangers and hinged steering connections are eliminated. Improved hauler means higher mechanical efficiency and lower maintenance costs on all hauling jobs.

Ask for complete information on how this unit can be interchanged with a Scraper or Crane, at about 25% of original total price.

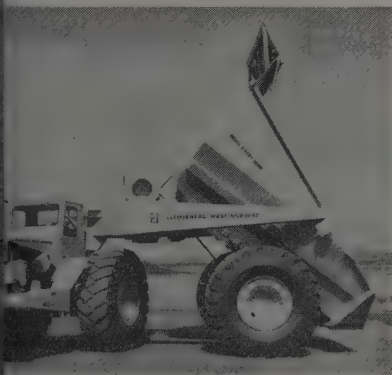
*Now available
with optional tailgate.*

Tournapull—Trademark Reg. U.S. Pat. Off. BR-889-G-b

LeTourneau-WESTINGHOUSE Company

Peoria, Illinois

A Subsidiary of Westinghouse Air Brake Company





A BIG SHOVEL in the pit—10-yd. Marion—means low cost loading per truck load.

Beyond this quality level are the "Series II" oils or "Super-Duty" type oils. These products were developed originally to satisfy the requirements of Caterpillar as "Superior Lubricants (Series II)." More recently Caterpillar has announced a still further advancement in their engine oil requirements designated "Superior Lubricants (Series III)." Oils meeting "Series III" represent about the highest degree of detergency-dispersancy to be found in commercially available lubricating oils for internal combustion engines.

Many of the different types of gears, such as the ordinary spur or spiral-bevel where rolling contact oc-

curs between the gear teeth, can be lubricated satisfactorily with a straight mineral oil. However, where there is a sliding contact between the gear teeth faces, as in hypoid or worm gears, the lubricants should be fortified to prevent scoring under heavy loads. These extreme pressure lubricants will also take care of slight misalignments or machining imperfections and frequently are used for breaking in plain gears.

Proper oil for gears

Since a variety of gears is used in construction equipment, a gear oil containing extreme pressure properties is recommended to insure suffi-

cient load carrying capacity for a types encountered. A good EP gear oil will absorb shock loads in the heaviest drives and still retain its load carrying properties and will be resistant to oxidation or thickening corrosion and foaming.

A highly refined straight mineral oil of the proper viscosity has been and can be used satisfactorily for lubricating air compressors, electric motors, generators, bearings, and hydraulic mechanisms.

However, for hydraulic systems in particular there is usually a tremendous advantage in using a premium grade hydraulic oil. These oils have been so compounded as to resist foaming, oxidation, and sludge formation, and at the same time to protect the system against rust and corrosion. Just one or two flakes of rust passing through precision made pumps or valves may so mar the surface as to affect seriously the efficiency of these parts. Likewise, sludge, as might be formed from oxidation of the oil, can cause sluggish operation of the mechanisms, will increase wear and will eventually reduce clearances, plug lines and valves, and cause the system to become inoperative. Consequently for smooth, trouble-free operation of the hydraulic system, a premium grade oil should be employed, and in line with consolidation of lubricants, use the same product for air compressors, electric motors, generators, and oil lubricated bearings, realizing the benefits of this type oil on this equipment also.

Greases for track rollers

Greases and semi-fluid lubricants are now available which not only form a tough, durable, long lasting film and cling to the parts to be lubricated, but which also are very water resistant. Such products are especially suited for track rollers and other bearings which are exposed to mud and water. Track rollers in particular require a lubricant which will be sufficiently fluid to flow through bearing passages and still be non-fluid enough to minimize leakage from worn bearings.

Wheel bearings and hand packed ball and roller bearings, such as the clutch release and pilot bearings, require a heavier grease which will provide a tough, adhesive film to cushion against shock and make parts last longer. A good grease for such application will provide ideal film lubrication inside a bearing but at the same time will maintain its original consistency at the outer edges, sealing itself in and keeping out grit and water.

Open gears require a lubricant which will cushion load shocks, decrease noise, and reduce wear. It must not channel or throw-off, but should cling to tooth surfaces and follow through from gear to gear

(Continued on page 112)

SIMPLIFIED LUBRICATION PLAN FOR LARGE CONSTRUCTION PROJECTS

PART REQUIRING LUBRICATION	INTERVAL, HOURS	90-32°F.	32-10°F.
Gasoline, LPG, and Diesel Engines (including misc. oiling parts, such as Air Cleaners, Generators, etc.)	100	Heavy Duty Engine Oil SAE-30	SAE 20-20W
Gear Boxes	1000		
Bearing (severe service)	10		
Chain Drives	100		
Flexible Couplings	1000		
Universal Joints	1000	E. P. Gear Lubricant SAE-140	SAE-90
Other oil lubricated parts in heavy duty services	10		
Hydraulic Mechanisms			
Air Compressors		Premium Grade Hydraulic Oil	
Electric Motors	1000	SAE-30	SAE-10
Generators and Bearings			
Grease Fittings			
Plain Bearings	10	General Multipurpose Grease	
Track Rollers		No. 1 or 0	No. 00
Hand Packed Bearings	100		
Wheel Bearings	1000		
Roller Bearings	100	Wheel Bearing Grease No. 2	
Ball Bearings	100		
Exposed Gears			
Cables	As Required	Cable Lubricant	
Wire Ropes			

"We've delivered 3 million tons of 'fill' to keep a sinking island afloat!"

Here's Asbury Transportation's story on their giant Terminal Island, California, job—and the part played by their 46 GMC trucks.

Terminal Island — Long Beach, California, harbor and site of rich-producing oil wells — has been sinking into the sea at the rate of two and a half feet a year.

Naturally, there's hot competition for the huge job of supplying "fill" to keep this island gold mine "afloat." Asbury Transportation willingly shaded their bid very close to land the contract for supplying three million tons in the past three years. After all, there's an estimated 12 million tons still needed over the next decade.

Forty-four new GMC tandems and 2 four-wheelers were assigned to the job. "We had to be sure of completely dependable equipment to take on one like this," owner Al Eyraud declares.

"Even a few delays and a large part of the profits go out the window."

Actually, the GMC's have done better than expected. Maintenance costs over the three years of hard service have been remarkably low. Rear-end troubles—common in this kind of on-and-off-the-road work—have been nonexistent.

And gas mileage—despite "green" drivers and much hauling through Los Angeles traffic—has been a remarkable 4 miles per gallon.

Yet there's nothing remarkable about Asbury's experience with GMC's. You'll find them—gasoline or Diesel—saving time and cutting costs on many of America's biggest construction jobs. *And many of them have the smallest price tags of any truck in their weight class.*

Come see for yourself—at your GMC dealer's!

GMC TRUCK & COACH—A General Motors Division



LOADED, WEIGHED AND OUT OF THE PIT IN 3 MINUTES, these GMC's get their crackling pace from GMC's 225-h.p. "503" engine. That's from GMC's great new Blue Chip line of gasoline and Diesel power plants. They team with Safety Power Steering* to ease even the toughest off-the-road work.



WORKING A JOB THAT CALLS FOR 3 MILLION TONS of "fill" in three years, Asbury Transportation's 46 GMC's have chalked up remarkably low operating cost records. And that's typical of GMC owners' experiences — on jobs large and small — the country over!

**Optional at extra cost*



Lubrication . . .

(Continued from page 108)

even at high pressures, temperatures, and peripheral speeds.

For cables and wire ropes, the product must penetrate into and preserve the core, preventing collapse. It should seal each wire in a tough, viscous film to reduce internal friction and wear, keep out moisture, prevent corrosion, and extend the rope life.

Lubricants have been developed which have been endowed with the properties necessary to satisfy both of the foregoing requirements. Consequently, if properly selected, a single lubricant may be used for both open gears and wire ropes.

These, then, are the basic properties and characteristics of six types of lubricants which will satisfy most of the main lubrication requirements of heavy construction equipment. This simplified plan is flexible and can be modified and adjusted to meet any given situation. It should be regarded as a guide in assisting operators of construction equipment to reduce their inventory of different kinds of lubricants to a minimum with the assurance that their machines will be lubricated satisfactorily.

Recommendations have exceptions

Although the recommendations outlined cover the vast majority of equipment, there may always be certain exceptions or conditions which will necessitate special lubricant recommendations. For example special products may be required for such

OVER 900 hp. of dirt-moving power is represented by this twin-powered Euclid of General Motors, being push-loaded by a twin-powered tractor of the same make.

applications as water pumps (shaft seal type), fifth wheels, electric motors and generators (anti-friction), rock drills, steam cylinders, waste packed car journals, brake drum bearings on power shovels (severe service), concrete forms, and rust proofing of equipment in storage.

Also it is not advisable to make a general blanket recommendation for torque converters and hydraulic couplings. Since there are wide variations in lubricant requirements for these components, product recommendations should be made on an individual basis.

Generally speaking, construction equipment manufacturers look very favorably on a simplified lubrication plan as evidenced by the following comments.

Manufacturers say—

A diesel engine manufacturer: "Many contractors and users of large quantities of lubricants should profit by such a program."

A manufacturer of generator sets: "We appreciate the advantage of standardizing on a minimum number of lubricants."

A manufacturer of road maintenance equipment: "We believe that a simplified and standardized lubrication program has been needed for a long time."

An excavator manufacturer: "We believe that the types and grades of lubricants can be materially reduced so that a contractor will not be required to carry so many different kinds of lubricants to properly serv-

ice a piece of construction machinery."

A manufacturer of loaders: "We certainly approve such a plan. We believe the fewer lubricants specified the more likely that the correct one will be used."

A manufacturer of paving equipment: "It is not only a nuisance to the contractor but could be detrimental if a contractor is compelled to handle too many different types of greases and oils."

Fuels

For the gasoline engines powering the various types of equipment with which we are concerned in this article, the regular grades or household brand gasolines should be entirely satisfactory. Octane ratings of these gasolines are now sufficiently high throughout the country so as to satisfy the octane requirement of even the latest types of equipment for construction service.

Volatility or distillation characteristics of modern gasolines are carefully controlled for quick starting, rapid warm-up, protection against vapor lock, and uniform performance with respect to power and economy. This controlled volatility is maintained not only to satisfy ever changing climatic conditions in a given area but also for any section of our vast country.

The majority of the manufacturers of diesel engines used in construction machinery either specify a No. 2 grade of fuel or have established specifications which are usually broad enough to be met by a reputable supplier of diesel fuels of this grade.

As a possible aid in selecting the proper grade of diesel fuel a table has been prepared showing the diesel fuel specifications of the majority of the diesel engine manufacturers whose engines are used in construction equipment. For comparison, the requirements of the ASTM Grade No. 1-D, and 2-D of Diesel Fuel are also shown.

NEXT MONTH the second and final section of this article will be published.



ELEVATING loader—Sierra of Harnischfeger—pulled by crawler tractor is a modern outfit.

Could it be **SIMPLER?**

The New **STANDARD**
Model R-B ASPHALT PLANTS
Now offer the
Simplex **FINGER-TIP
BATCHING CONTROL**

The most accurate, flexible and simple means of control—insuring uniformity of every batch.

so simple to operate... with Standard's new *Simplex* control system—you merely push the buttons—the *Simplex* control system does the work.

Instantaneous cut-off permits positive mix control without necessity of complicated automatic batching devices.

- No gadgets to get out of order.
- No complicated working parts.
- Easy access to all moving parts.
- Less operational fatigue.

*Proven Performance
...over half a Century!*

...built to do a better job!

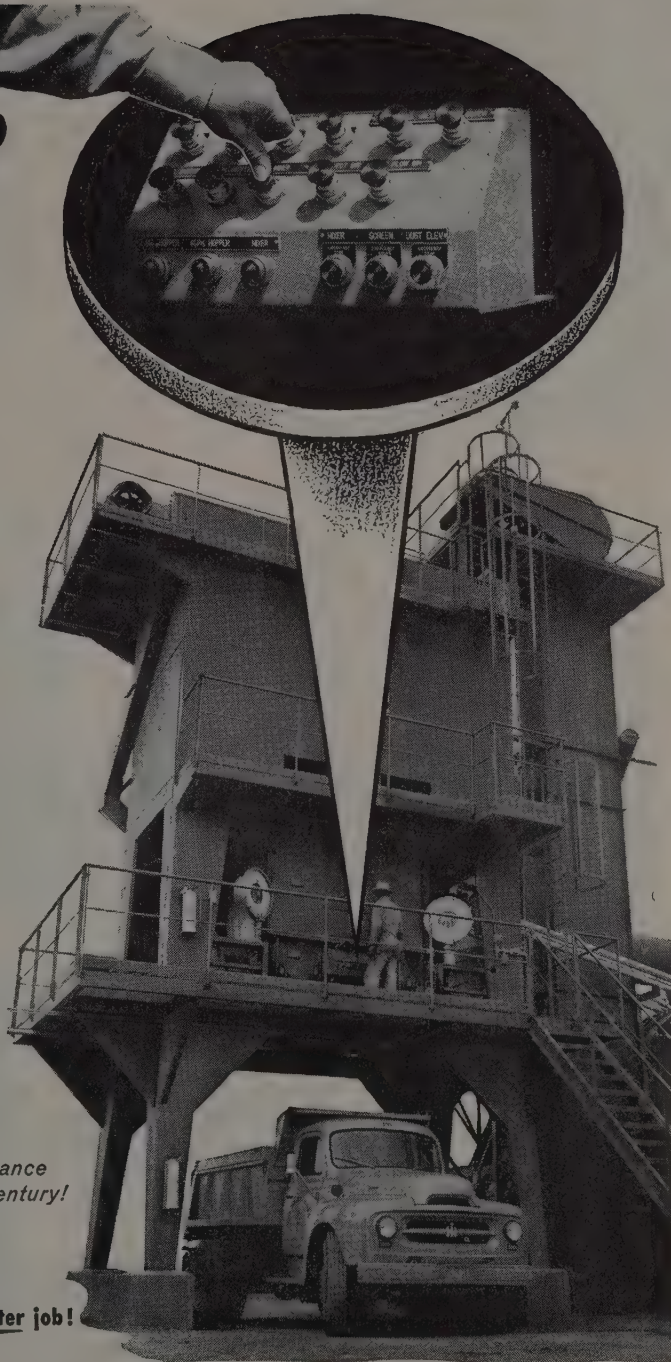
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ROAD SHOW in print

By Western Construction

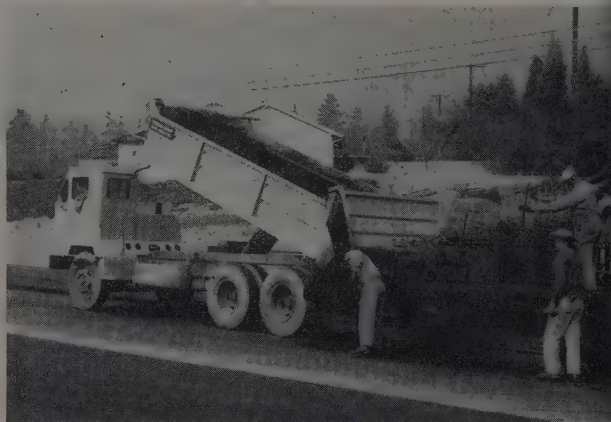
Highway construction efficiency and costs depend on: (1) knowing the equipment that is available, (2) selecting it for the job to be done and (3) using it at top performance.

The first of these three needs is met in this ROAD SHOW in print compiled and

presented by "Western Construction" for the highway contractors and engineers of the West. In the following 30 pages more than 150 items describe and picture the latest types and models of equipment, machinery and accessories for all phases of road building and maintenance.

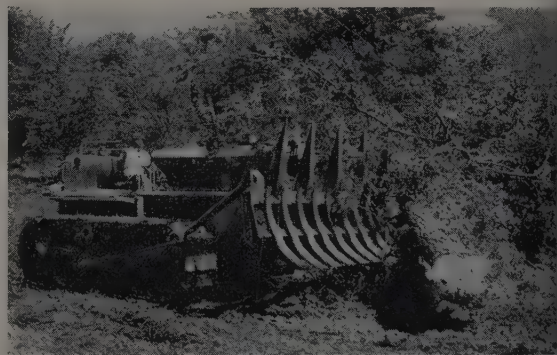
Pioneer paver handles 14-ton trucks on upgrade

Tested on 4.6 mi. of Foothill Freeway, near La Crescenta, Calif., a new bituminous paver, the Pioneer VIBROMatic, pushed 14-ton truckloads of hot mix up a 600-ft. section of 2.75% slope in 4th gear without lugging down. The machine paved at 53 ft. per min., leaving behind a mat of excellent texture 2 in. thick. The paver incorporates an oscillating toothed strike-off bar and precompactor screed which delivers new accuracy in metering material for any thickness of mat. Oscillating movement tends to fill all voids across the lane. Following the screed is a 2,000 cycle-per-min. heated vibrating compactor which irons out the mat and compacts it to uniform density. Only one 12-ton steel wheel roller was needed behind the paver to finish compaction on the mat. **Pioneer Engineering Works, Inc.**, 1515 Central Ave., Minneapolis 13, Minn.



Fleco rake speeds land clearing

Shown here clearing right-of-way for a highway construction job is a Fleco Rock Rake with top guards. The rake is available for all track type tractors from the D4 class through D9 class and is recommended where service requirements are extra tough—for clearing large boulders, for spreading rock riprap, for heavy clearing and piling. It allows full tractor power to be concentrated on the object being removed and not on the surrounding soil. For brush clearing, it allows soil to sift between the teeth and gives a clean pile for fast burning. The unit can also be used to rake and pile old road beds, such as concrete or blacktop. **Fleco Corp.**, 1375 W. Church St., P. O. Box 2370, Jacksonville 3, Fla.



World's heaviest motor grader

The Galion Model T-700 Grade-O-Matic motor grader weighs in at 40,125 lb. with scarifier, is claimed to be the biggest, heaviest grader on the market. The machine is powered by a Cummins 190-hp. diesel engine and is weight-balanced to give maximum push-power to 2,150-lb. V-type scarifier blade. Power-shift transmission allows three speeds both forward and reverse, from 0. to 20 mph. in either direction. Torque converter with torque converter governor multiplies engine torque up to 340% automatically as needed and adjusts engine speed to meet all conditions. Other features include four wheel brakes, hydraulic shiftable moldboard with overlay end bit, an muffler. **Galion Iron Works & Manufacturing Co.**, Galion, Ohio.





Plows snow right or left on winding roads

The new Wausau 3-way snow plow, consisting of two high speed blade plows joined to form a V-shaped moldboard which can be hydraulically shifted to throw snow to right or left, answers plowing needs on mountainous, winding roads. The machine, developed primarily for airport use by the Armed Forces, will plow snow under high speed in the wind direction without dead-heading. Powered by 4 x 4 trucks, it will throw four to six inches of snow up to 65 ft. Hydraulically controlled deflector plates on top of the moldboard shape the plow to type and depth of snow. The model is available in two truck sizes: 28,000 to 36,000 gross vehicle weight to cut an 8-ft. 6-in. to 9-ft. path in the blade position, and the 40,000-gvw. model, which cuts to approximately 10 ft. **Wausau Iron Works, Wausau, Wis.**

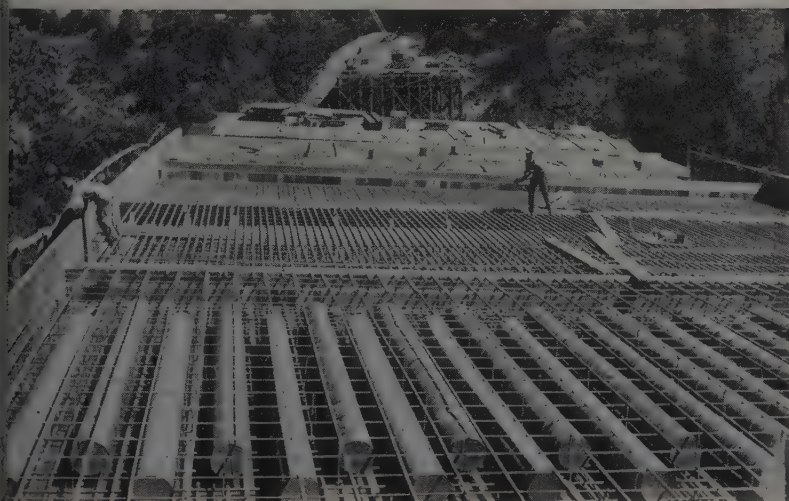
Powerloader moves big yardages fast

A Case Model 30 Powerloader, right, feeds hot-mix plant on Corps of Engineers' job in Phoenix, Ariz. The loader's bucket design provides easy filling, quick dump and fast return to digging position. Lift arms, lift rams, front bumper, bucket and double acting hydraulic rams are carried on the frame. Weight is distributed to rear of the unit to assure easy steering and improved traction. **J. I. Case Co., Racine, Wis.**



Jackson compactor adapts to highway widening

Photograph shows a Jackson Multiple Compactor with individual compactors towed in tandem at the side of the tractor in highway widening operation. The compactor is adaptable to widening projects of any width. Individual units may be staggered and towed at the side, as shown, or any number of units may be used in customary position in the workhead. Quickly interchangeable compactor bases from 12 to 26 in. wide are available to make machine fit every job requirement and provide specified densities. **Jackson Vibrators, Inc., Ludington, Mich.**



Sonovoids lighten bridge deck

This photograph shows installation of Sonovoid fibre tubes in the Dog Creek Bridge located in Sacramento River Canyon near Redding, Calif. Bridge is an arch spandrel structure with open spandrel length of 300 ft. and over-all length of 642 ft. 7 in. Sonovoids measuring 12 in. O. D. were used to equalize the load on the arch in north side spandrels where bridge deck is on a constant upgrade and spandrels are longer. Tubes measuring 16 in. O. D. were used in the first 55-ft. approach span at the north end to lighten the load through displacement of concrete at the neutral axis. Also available are Sonotubes for columns. **Sonoco Products Co., Hartsville, S. C.**



Movall wagon has 16-yd. heaped capacity

A new multi-purpose Movall wagon for use with Caterpillar DW15 tractors now in the field or with new prime mover units offers heaped capacity of 16 cu. yd. (12 cu. yd. struck) and a carrying capacity of 22 tons. It's the RD15, a "scraper in reverse" wagon which features positive cable-controlled (out the rear) ejection which enables it to handle any material that can be top-loaded, including dirt, mud, ore, aggregate, and surfacing materials, and permits a load to be dumped over the edge of a fill with all brakes locked, without raising the body and with drive wheels well away from the edge. The unit has target loading area of 10 x 16 ft., turning width of 27 ft., dumping time of 11 sec. Low center of gravity permits dumping at any travel speed. The new model Movall uses standard Caterpillar No. 27 cable controls. C & D Manufacturing Co., Perkins (Suburb of Sacramento), Calif.

Formgrader has power steering, hydraulic controls

The Cleveland Formgrader, a machine that cuts form trenches quickly and accurately, is now equipped with power steering and a hydraulically operated cutter lift bar. One man and a Formgrader, in six hours, can cut 6,840 ft. of form trench. Here's how it's done: Stakes are set up with a guide line at the required height, the operator simply sees that the line gage on the left side of the machine is kept on line with the guide line, and the machine does the rest. Because the line gage on the



machine is always kept level through means of a pendulum-controlled shaft, the form trench is cut to proper depth regardless of unevenness of the ground. Cleveland Formgrader Co., Mills Road, Avon, Ohio.



Bantam T-35; A multi-purpose unit for scattered jobs

To handle scattered and varied jobs on turnpike bridge construction, Rhoades Construction Co. of Newton, Kan., purchased a Schield Bantam T-35 mounted on the "300" crane carrier. The contractor is building 17 bridges on the Kansas Turnpike, several of which are under construction simultaneously. The machine has proved adaptable to quick job-to-job moves, handling 11,000-lb. structural steel beams as a crane, pouring concrete with the 1/2-yd. bucket, backfilling around bridges with the clam and setting forms and unloading steel at the bridge site. Schield Bantam Co., Waverly, Iowa.

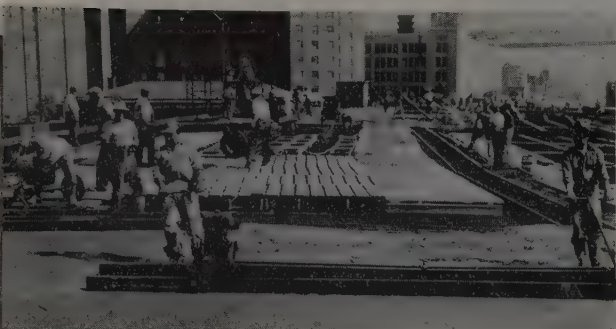
Barber-Greene expands Batchomatic line

Now available in the Batchomatic line of automatic, bituminous batch plants are 2,000- and 6,000-lb. models to supplement the 4,000-lb. plant introduced last year. The units feature simultaneous weighing of all sizes of aggregate; instant change from fully automatic to manual operation; and instant, positive inspection of aggregate. Barber-Greene Co., 400 N. Highland Ave., Aurora, Ill.



Whiteman screeding machine is lightweight

The delivery and pouring of concrete for a highway 30 ft. above heavy traffic is a tough assignment; yet on this job it was done smoothly and efficiently with Whiteman power buggies and portable screeding machines. Photograph shows two Whiteman Model 52-15 screeding machines spreading and finishing concrete for a concrete deck. This adjustable model has capacity of 3- to 14-ft. slab widths. It works the slab to perfect level and puddles and vibrates concrete throughout the entire depth and area, thoroughly compacting the slab and bringing fines and moisture to the surface. Whiteman Manufacturing Co., 3249 Casitas Ave., Los Angeles 39, Calif.



Cat D9 hard to beat for heavy ripping, tough pushing jobs

The Cat D9 has found a place in heavy construction, often replacing two D8 tractors on push-loading, and can rip rock which formerly would require blasting. It is shown here equipped with a No. 9S bulldozer working on a new section of U. S. 70, east of Globe, Arizona. It's styled like the five small Cat models, but it offers a drawbar pull of 60,000 lb. With conventional drive it has six speeds forward and six in reverse and can move up to 6.8 mph. With torque converter it has 5:1 multiplication with three speeds forward and two in reverse with speeds up to 7.8 mph. Weight of the tractor alone is 52,000 lb. Maintenance considerations are hydraulic track adjustments—steering clutch and brake assemblies removable without disturbing the bevel gear—easy removal of the flywheel clutch assembly or torque converter units without disturbing the engine or transmission. Inexpensive No. 2 fuel oil (burner oil) can be used rather than diesel fuel. **Caterpillar Tractor Co., Peoria, Ill.**



Take the bumps out of concrete paving

The "Berg" Model H-8 Hiway Surfacar, a one-operator machine designed to remove surface variations from concrete paving, is seen here in use on a large turnpike project. Air-cooled gasoline engine drives hardened steel cutters. **Concrete Surfacing Machinery Co., 4665-69 Spring Grove Ave., Cincinnati 32, Ohio.**



Lorain shovel-crane with special mounting

A revolutionary new method of attaching shovel-crane turntables to crawler or rubber-tire mountings, the Shear Ball mounting, is now available for Lorain cranes. It's claimed the mounting eliminates all need for top or hook type turntable rollers, for center pins and nuts, for exposed roller paths and for center gudgeons, and hence all need for maintenance and adjustment of these items. The innovation results in more effortless swing with less power needed for swing operation. It acts like a huge ball bearing. A continuous circle of hardened steel balls sealed in precision-ground race provides at once attachment of turntable to carrier and rolling surface for the turntable. Normal lubrication is the only attention required. **Thew Shovel Co., Lorain, Ohio.**



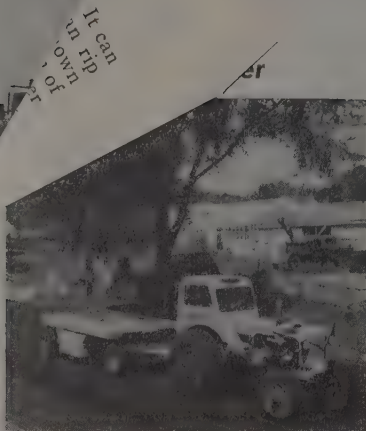
New 36-hp. Clipper saw cuts dry

Shown working on Kansas Turnpike job near Bonner Springs, Kan., is the new 36-hp. Model C-360 Clipper concrete saw. Tobin Construction Co. of Kansas City, Kan., contractor for this section of job, used two of the saws with Clipper's Green-Con abrasive blades in dry cutting operation. **Clipper Manufacturing Co., 2800 Warwick, Kansas City 8, Mo.**

Vibrator compacts low slump concrete

A paving vibrator that will produce maximum compaction down to sub-grade for low slump concrete is now available for highway and airport paving. Individual vibrators are mounted on a tubular frame and are adjustable for depth and spacing. With vibrators mounted only at the ends of the spreader bar, the machine can be used for consolidating concrete close to side forms. Complete unit may be attached to a concrete spreader or hauled on a special trailer. Equipment is pictured in use by Morrison-Knudsen Co., Inc., and R. A. Westbrook, Los Angeles, in building runways at Edwards Air Force Base. **Gar-Bro Manufacturing Co., 2415 E. Washington Blvd., Los Angeles 21, Calif.**





Minneapolis-Moline builds the model UTI wheeler, a prime mover for drawbar and mounted attachments, for same performance as the versatile MM UTIL but without shuttle gear transmission. This is an initial cost saving to users who do not require high reverse speed. If selection of high reverse speeds is required later, parts are available to convert the unit to a model UTIL. Shown is a UTI equipped with all weather cab and 18.00-26 tires pulling a pneumatic tired compactor. Cab does not hinder loader installation or operation, provides operator comfort for heavy drawbar work in extreme weather conditions. Minneapolis-Moline Co., Minneapolis 1, Minn.

Most powerful pile hammer

Shown during recent operational tests is the S-20, claimed to be the most powerful pile hammer in the world. Three ft. square and 15 ft. high, the S-20 weighs 20 tons and is equipped with a 10-ton ram. It delivers 60 blows per min. with a force of 60,000 ft.-lb. It's a single-acting hammer, driven by steam fed through a 3-in. hose from a 150-hp. boiler at pressure of 150 lb. per sq. in. The hammer was designed for use by Brown & Root, marine contractors, for installation of oil drilling platforms in the Texas tidelands. McKiernan-Terry Corp., Dover, N. J.

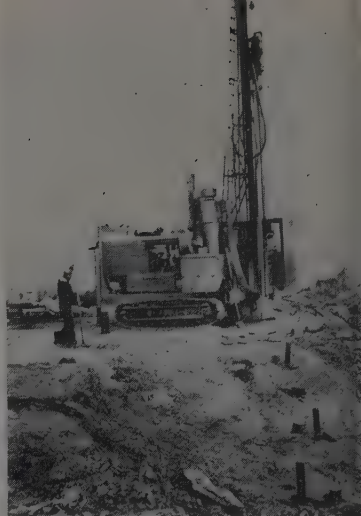


Heavy-duty GMC trucks are versatile, durable

An improved and expanded line of rugged heavy-duty GMC trucks designed to give peak performance in both highway hauling and off-the-road operations is on the market for 1956. The versatile GMCs include an expanded line of tandem-axle models, a wide range of four-wheel vehicles with more powerful gasoline and diesel engines and many engineering advances for durability and performance. The heavy-duty line ranges from 4-wheel gasoline models with 22,000-lb. gross vehicle weight to tandem-axle trucks with 90,000-lb. gross combination weight. Six- and 8-cylinder gasoline engines ranging from 160 to 225 hp., and diesels from 150 to 230 hp. are offered in various models. On tandem-axes, inter-axle differential includes a lockout feature which disconnects it for off-road operations, connects it for highway use. GMC Truck & Coach Division, General Motors Corp., 660 S. South Boulevard, East Pontiac 11, Mich.

Spray Master saves time

The Littleford Spray Master bituminous distributor features a full circulating, mechanically operated spray bar which can be heated to spraying temperature in the morning a full 15 min. quicker than any other similar unit. The two-section bar, an exclusive Littleford design, provides full width instantaneous starting and shut-off of all nozzles and is raised hydraulically. Any of the valves may be blanked off by removing quick-pull pins. Littleford Bros., Inc., 443 E. Pearl St., Cincinnati 2, Ohio.

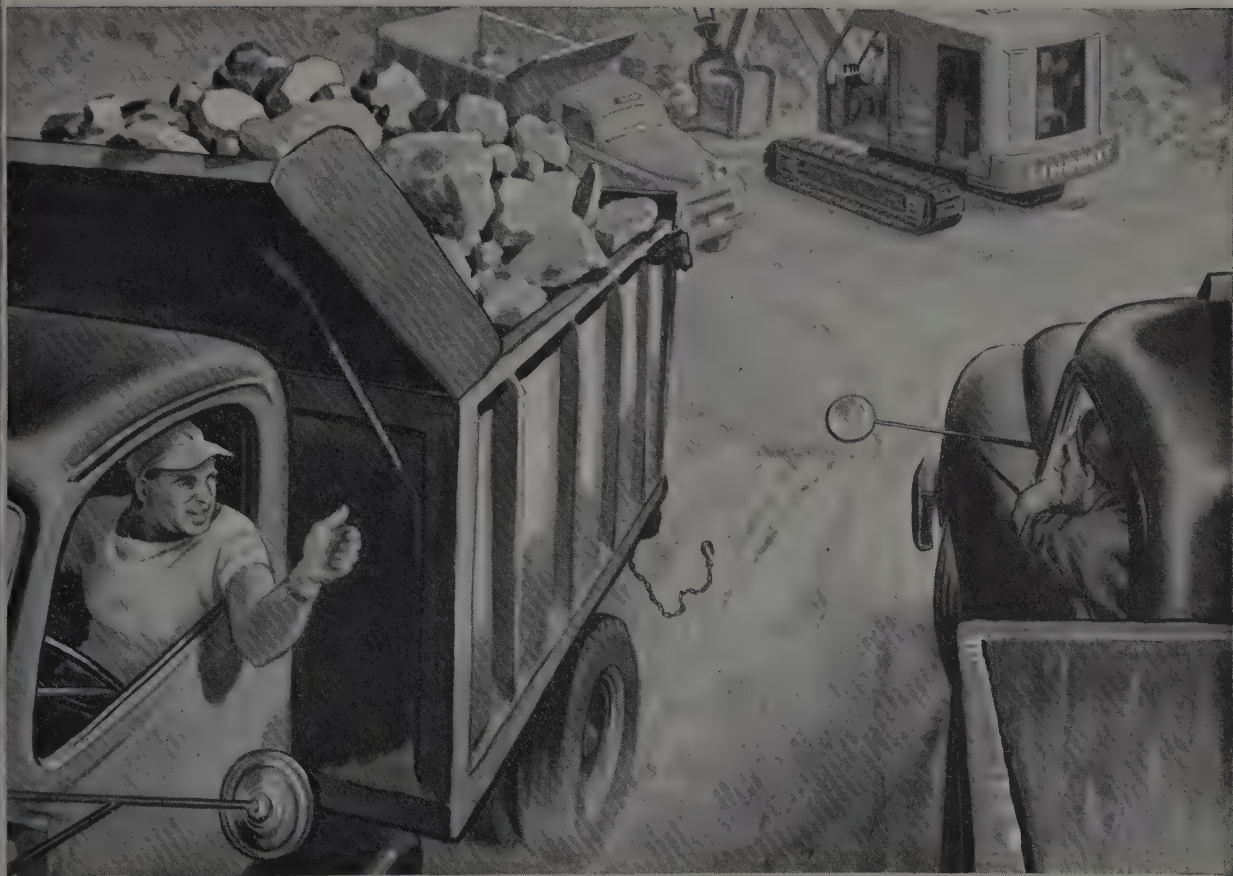


Drillmaster combines three rock drilling methods

Because the Drillmaster embodies, in one completely integrated unit, three separate and distinct methods of drilling, it is one of the most versatile pieces of drilling equipment on the market today. It utilizes a new "down the hole" drill for deep blast holes up to 6-in. diam. It is also available with a heavy-duty hammer drill for 4¼-in. holes, or it can be used with a rotary drill for hole sizes up to 6¾ in. Independent rotation is supplied by a powerful rotary motor used in all three methods of operation. Shown is a Drillmaster with down-the-hole drill and 6-in. Carset bits, operating on a recent turnpike job. The unit operated around the clock, sinking blast holes in a big sedimentary rock cut and kept two 3-cu. yd. shovels and a 3½-cu. yd. shovel busy handling the rock it produced. Holes 55 ft. deep were drilled on 14-ft. centers with 19-ft. burden. Production was over 5,900 gross cu. yd. per 24 hr. Ingersoll-Rand, 11 Broadway, New York 4, N. Y.



It's time to compare...with **LINK-BELT SPEEDER**



"First time a shovel has kept us rolling like this!"

Shovel-Crane owners:

New Link-Belt Speeder performance is so outstanding, it has completely revised existing production standards . . .

With competition getting rougher, can you afford to think in terms of outdated production standards? If you aren't using a Link-Belt Speeder or haven't seen one in action recently—it's hard to realize just how much more production . . . more usable net horsepower these new shovels, cranes and hoes offer.

Speed-o-Matic power hydraulic controls—a Link-Belt Speeder exclusive—make every move fast, sure, easy. With them, you can boost output—often as much as 25% or more!

From track treads to boom tip

. . . every detail of a Link-Belt Speeder reflects advanced engineering, skilled craftsmanship, pre-

cision construction and quality materials.

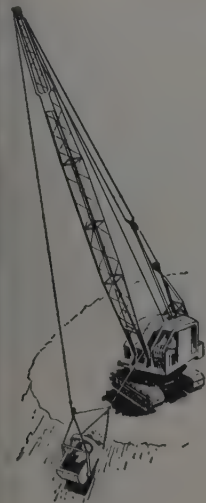
And look at this list of standard and optional features— independent swing and travel . . . independent rapid boomhoist . . . torque converter . . . third drum . . . reversing clutches for both hoist drums . . . and power hydraulic-actuated swing brake, to mention only a few.

It's good business to *compare now!* See why more and more Link-Belt Speeder owners have completely revised their thinking on how fast a job will go. Your distributor will be pleased to arrange for you to see a new Link-Belt Speeder in action, give you the facts. Call him now! Link-Belt Speeder Corporation, Cedar Rapids, Iowa.

14, 103

LINK-BELT SPEEDER

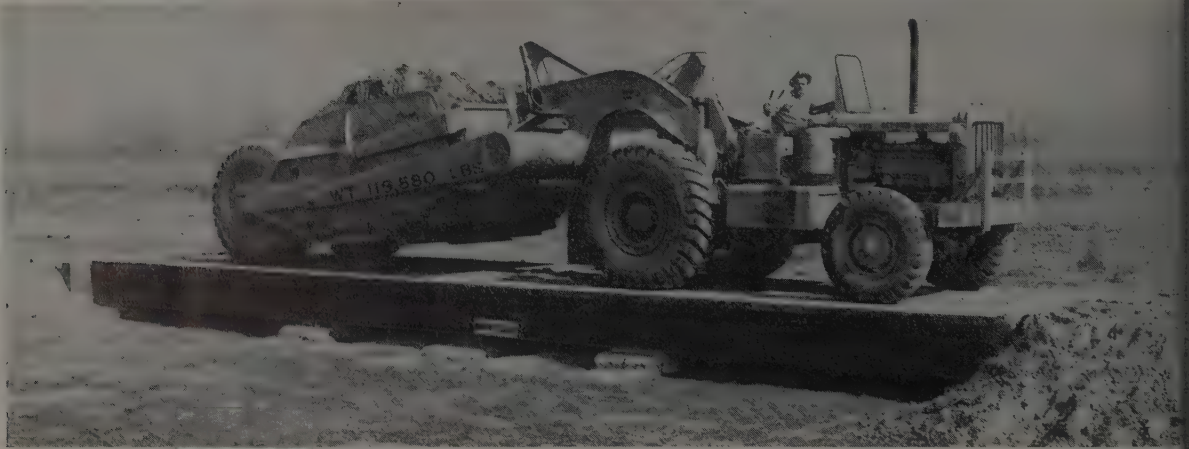
Builders of a complete line of shovel-cranes . . . with exclusive Speed-o-Matic power hydraulic controls





Hensley Ripper fits largest dozers and features wearing qualities

The Model 2000-H ripper, a special heavy-duty ripper designed to fit D-9 tractors and others of comparable size and horsepower, is a unit of outstanding wearing quality. It features a specially designed wear collar, which provides added protection to the leading edge of the ripper shank, and is fully adjustable and interchangeable on D-8, D-9, HD-19, HD-20, TD-24, and other tractor with blade heights varying from 39 to 61 in. The ripper incorporates replaceable, reversible, self-sharpening wear boots; positive locking and holding yoke; simple cotter pin rough adjustment arrangement plus ball and socket fine adjustment; and a throat opening that cannot chip the cutting edge or break off hardfacing. Hensley Equipment Co., Inc., 800 Peralta Ave., San Leandro Calif.



Murphy portable scale gives accurate equipment weight

For on-the-job equipment weighing, Murphy portable motor truck scales are made to meet every requirement. The scales, for use with timber decks, eliminate expensive pits and foundations, can be loaded and moved in a matter of minutes. Three available designs include

the single unit, built in a standard 8-ft. wide frame to permit transporting on the highways within legal limits, with capacity sizes from 20 to 50 tons. Tandem-connected units are composed of two standard scales connected to provide greater platform size and capacity for weighing larger equipment. When not connected, each unit is a separate self-contained scale. L. R. Murphy Scale Co. 1610 N. C St., Sacramento, Calif.



LineMaster is versatile

Latest development in M-B line markers is the LineMaster, a low-cost self-propelled unit that features either single or double, solid or intermittent lines. The machine incorporates automotive steering, 18-gal. paint capacity and extreme maneuverability. M-B Corporation, New Holstein, Wis.



Sentry barricades easily assembled

For marking highway construction areas, a new line of low cost Sentry All Steel Barricades is now available in a complete range of styles and sizes. Sign brackets, light brackets, extensions, and flags are available. Traffic Equipment Corp., 2461 S. Dahlia Lane, Denver 22, Colo

DRIP ACT AT ONLY 1200 RPM:
 to join new and old bridge
 structures on the \$8,527,000
 Spring-Sandusky Interchange, at
 Columbus, Ohio, required dem-
 olition of the existing deck. Seven
 tools (3 medium sinkers, 3
 heavy duty breakers and a heavy
 ripping hammer) were sup-
 plied by a Jaeger "600" Rotary
 which never ran faster than
 1200 rpm. Visintine & Com-
 any, contractors.



SLING AT ONLY 900 RPM, on this road job, the Jaeger "600" Rotary
 operating these four Thor "75" rock drills at 100 lbs. pressure.
 Under all ordinary conditions the same compressor will hold full
 pressure in two heavy duty wagon drills while operating well below
 its full load speed of 1650 rpm. "It's a windjamming sonofagun" says
 John Newman, Orco Construction president, Kirkwood, Mo.

Why air costs you less with a Jaeger Roto®

Full load speed of other "600" rotary compressors is as high as
 800 rpm. Full load speed of the Jaeger Rotary is 1650 rpm,
 using the same economical GM 6-71 diesel engine. This differ-
 ence means that, for the lengthened life of your compressor, you
 will produce air with less fuel, with fewer feet of engine piston
 travel and up to 150 fewer compressor revolutions per minute.
 Further improvement in efficiency results from Jaeger's closer
 regulation of engine and compressor to air demands. Speed
 modulation over the entire range is smooth and stepless, and so
 instantaneous as to prevent any over-run and racing of engine.
 Jaeger "125" and "365" Roto Air Plus units offer comparably
 superior performance. For complete details, see your Jaeger
 distributor or send for Catalog JCR-5.

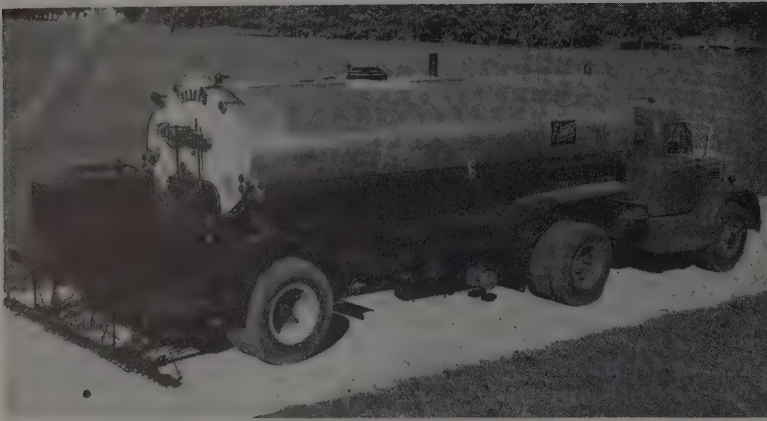
Sold and Serviced by:

EDWARD R. BACON CO.....	San Francisco 10
NELSON EQUIPMENT CO.....	Portland 14
WESTERN MACHINERY CO.....	Salt Lake City, Denver 4, Spokane 2 and Idaho Falls
THRIVER MACHINERY CO.....	Phoenix
D. COGGINS & CO.....	Albuquerque



SMOOTH AS STEAM, AT A FUEL-SAVING 1200 RPM: A Jaeger
 "600" Rotary and Union #1 hammer here team up to
 drive 75' pilings of 14" - 16" diameter at Port of Seattle
 unloading dock. Never running faster than a fuel-saving,
 compressor-saving 1200 rpm, the compressor maintained
 a hammer speed of 120 blows per minute. Average
 penetration was 1/2". At 1/4" penetration, driving was
 stopped. Larsen Construction Co., contractors.

JAMES CASHMAN CO.....	Las Vegas, Nevada
SMITH BOOTH USHER CO.....	Los Angeles 54
A. H. COX & CO.....	Seattle 4 and Tacoma
THE SAWTOOTH CO.....	Boise and Twin Falls, Idaho
TRACTOR & EQUIPMENT CO.....	Sidney, Miles City, Glasgow
CENTRAL MACHINERY CO.....	Great Falls and Havre
WORTHAM MACHINERY CO.....	Cheyenne, Wyo.



FX-500 "Blacktopper": Lightweight, large-capacity distributor

Shown is the Model FX-500, latest "Blacktopper" bituminous distributor. The big machine's actual capacity of 2,640 gal. with axle weights under 18,000 lb. is made possible by use

of aluminum and steel stainless steel for the jacketing, high tensile steel in the trailer frame and 2-in. fiber glass reinforced with asbestos block insulation. Aluminum roughread forms platforms, catwalk and fenders. Empty weight of the distributor with full equipment is 11,400 lb. **E. D. Etnyre & Co., Oregon, Ill.**



8-ton Tilt Bed trailer balances weight automatically

This Model TT80A 8-ton Selma Tilt Bed tractor trailer features overall length of 26 ft. 10 in. with 8 x 22-ft. bed 37 in. high. Four wheel dual trunion axles assure automatic balancing of load weight on all four wheels. Each axle is independent of

the other to prevent rocking when trailer is pulled on rough ground. Shipping weight of unit is about 4,350 lb. Low-priced airplane tires are recommended when trailer's major use is in the field. Manufacturer stocks Tilt Bed trailers in capacity ranges from 2 to 8 ton, will build up to 12 ton on special order. **Selma Trailer & Manufacturing Co., P. O. Box 237, Selma, Calif.**



Seco screen in Oregon

A 5 x 14-ft. Seco vibrating screen is an integral part of this modern rock crushing plant, shown producing fill for the Oregon State Highway Department project 8 mi. south of Salem on Highway 99. The screen has been producing 250 tph. of 2½-in. minus stone to meet state highway specifications. Roy L. Houck & Sons of Salem, owner of the plant, reports the screen is smooth running, transmits little vibration to supporting structure. **Screen Equipment Co., Inc., Buffalo 25, N. Y.**



Koehring 405 crane lifts 20 tons

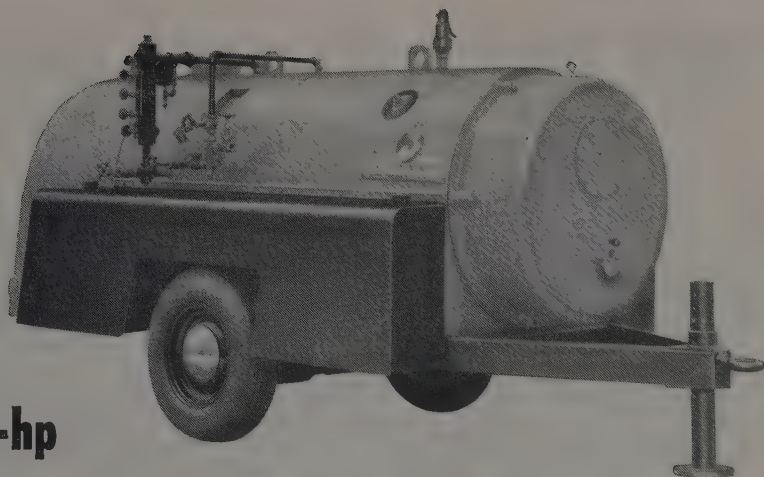
Shown handling concrete bucket on a bridge widening job is the Koehring Model 405 crane, introduced into the construction market within the past year. The model can be fitted with 1-cu. yd. shovel and hoe dipper and is rated at 20-ton lift capacity as a crane. The unit can be lightened for road travel because crawlers and counterweights are easily removed. **Koehring Co., 3026 W. Concord Ave., Milwaukee 16, Wis.**



Cut blading on base courses with Rola paver

Rola paving boxes are capable of handling all sizes of aggregates including asphaltic mixes and cement treated bases, with no shoe or wheel marks to rake out. Models are available from 6 ft. to 9 ft. in width. A models can be equipped with cut-off plates to reduce the width to any size down to one foot. On base work up to 50% of blade time can be eliminated by rolling material immediately behind the paver box. Shown is the Rola being used by Clements Construction Co. in Centralia, Calif., on a 1,300-ton job. The work took only two days, with a variety of trucks supplying the box. Chains provide fast attachment to any type of truck. **Creative Metals Corp., 1290 Power St., Emeryville 8, Calif.**

New!



Cleaver-Brooks 50-hp

PS-50 PORTABLE STEAMER

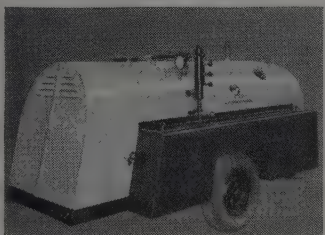
twice the steam and work capacity!

Job-test this husky heater NOW!

If you've ever owned or operated a Cleaver-Brooks 2- or 3-car heater — you *know* Cleaver-Brooks' work capacity! *That's why this new rig — with twice the capacity, offers more value than ever before.*

Surveys among contractors, municipalities, state and county highway departments prove the need for the new PS-50. They show this extra capacity is essential to economically handle scores of extra jobs constantly added to yearly work schedules.

The PS-50 PORTABLE STEAMER is the huskiest ever offered in its price range. It has the same high-quality design advantages of America's most modern boilers: quick steaming from a cold start . . . delivers 1725 lbs. of dry steam per hour . . . has proved economy of famous four-pass, forced-draft construction. Fully equipped — ready to GO!



TOWS ANYWHERE WHEELS CAN ROLL — Fender tanks carry 45 gals. water, 45 gals. fuel-oil, 8 gals. gasoline. Completely insulated, weatherproof. Attractively painted black and orange. Size: 13'-0" long, 5'-3½" wide, 6'-0" high overall.



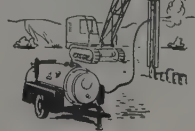
FRONT END OPENS WIDE — More room for components. Greater ventilation means cooler running engine . . . more operating convenience. Removal of 6 bolts opens rear head for fast cleaning. ASME code constructed.



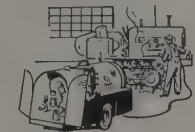
HEATING — tank-cars, bituminous materials, asphalt, oil, aggregate, jacketed lines, water for masonry, heavy fuel oil.



THAWING — culverts, water mains, pipe lines, gravel, shot holes in frozen ground.



STEAM SUPPLY — for pile driving, soil sterilization, aggregate dryers, steam atomizing burners.



CLEANING — construction equipment, buildings and structures, de-vaporizing fuel tanks, and the like.

JOB-TEST THE PS-50 PORTABLE STEAMER NOW . . . write or phone for illustrated catalog.

A product of Cleaver-Brooks Company, Dept. R, 326 E. Keefe Ave., Milwaukee 12, Wisconsin



VENTY-FIVE YEARS OF LEADERSHIP BY THE ORIGINATORS OF THE SELF-CONTAINED BOILER



Shawnee Carry Scraper

For county road maintenance work and drainage ditches, this maneuverable Shawnee Carry Scraper proves highly adaptable. The semi-mounted unit, designed for attachment to the International 300 Utility and to Farm 300 and 400 tractors, features $\frac{3}{8}$ -cu. yd. bucket fully controlled by the IH Hydra-Touch system. Two-way hydraulic power controls the bowl. Fast-hitch frame is rigidly braced to withstand lateral strain and to allow scraper to trail freely. Shawnee Manufacturing Co., Inc., 1947 N. Topeka, Topeka, Kan.



Finisher sets a record

Shown is a Jaeger Type H finishing machine as it places 1,966 lin. ft. of 24-ft. concrete pavement (5,242 sq. yd.) of 10-in. thickness in 10 hr. 45 min. The job is on U. S. Route 75, near Hutchins, Tex., and the machine set a Texas record. The paver produced 960 batches. Jaeger Machine Co., 550 Spring St., West, Columbus, Ohio.



Boom telescopes hydraulically

A boom that will telescope hydraulically from 17 to 27 ft. with full-capacity load is one of the improvements in the new Model 60 Pitman Hydra-Lift. It installs on any truck two tons or larger. Pitman Manufacturing Co., 300 W. 79th Terrace, Kansas City, Mo.

Eimco tosses boulders

Here's the powerful Eimco 105 tractor-excavator at work cutting trail for a highway. The 18-ton, 45,000-lb. drawbar pull unit serves as well as dozer or overshot loader. Operator's position in covered cab up front allows maximum visibility and control. The unit is engineered for gear shifting under full power in motion, instant reversals, elimination of master clutch. Eimco Corp., 634 S. 4th West St., Salt Lake City 10, Utah.



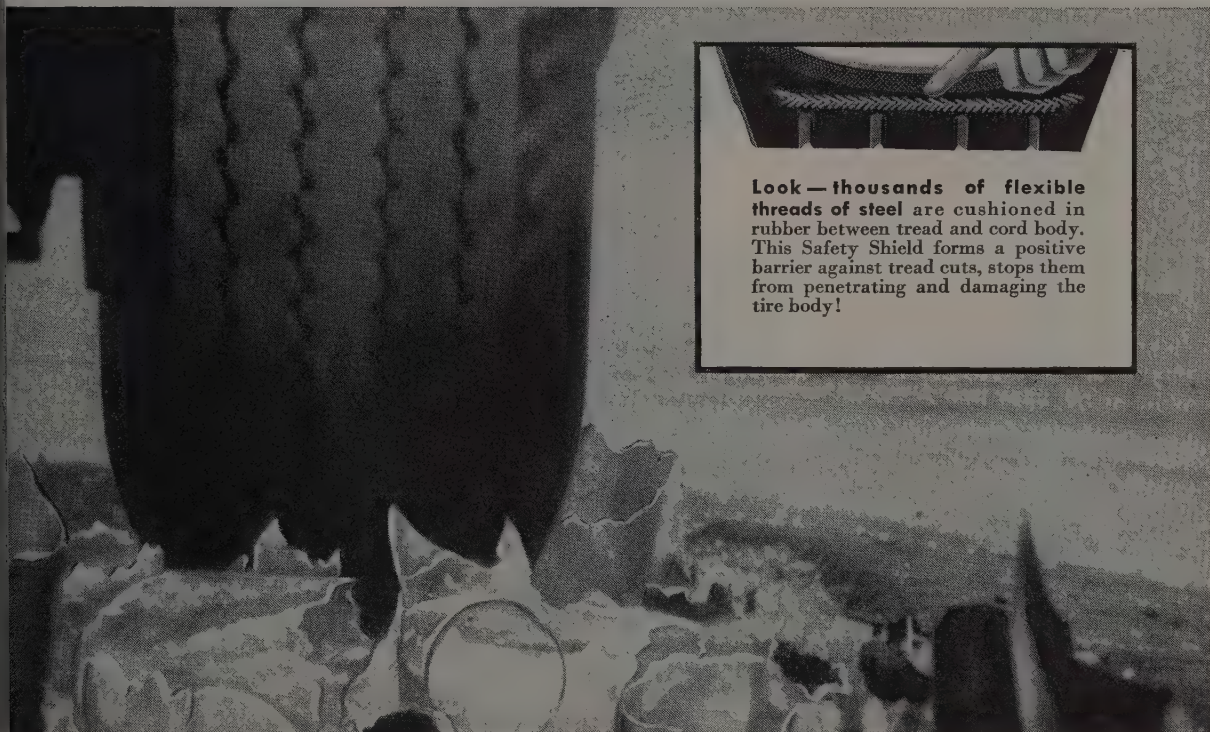
Digs the hole and sets the pole

For fast, easy positioning and efficient digging at any angle, the newly developed Highway "Swing-Base" earth-boring machine allows the operator to rotate the base 180 deg. Machine will dig 9- to 36-in. holes at any point within this arc. Highway Trailer Co., Edgerton, Wis.

Tread Cuts Are Stopped

by new
exclusive

SAFETY **STEEL** SHIELD



Look—thousands of flexible threads of steel are cushioned in rubber between tread and cord body. This Safety Shield forms a positive barrier against tread cuts, stops them from penetrating and damaging the tire body!

U.S. ROYAL Truck Tires

You are looking at an entirely new kind of highway truck tire. It combines the strength of *steel* with full flexibility, light weight and soft ride—without increased inflation.

Because this new U.S. Royal is *invulnerable* to cuts and ruptures in the vital tread area, it gives you the longest, most trouble-free service in truck tire history. Because steel cord shields its carcass, it remains undamaged for more safe recapping, mak-

ing it the most economical of truck tires.

You'll find new U.S. Royals like this cost *surprisingly little*. Ask your U.S. Royal Dealer now. And remember—you can specify them on the new equipment you buy!

AND COMING SOON!

An all-new, all-wheel, all-job
ON-AND-OFF-THE-ROAD TIRE—
new U.S. Royal Super Fleetmaster
with SAFETY STEEL SHIELD



United States Rubber

ROCKEFELLER CENTER, NEW YORK 20, N. Y.

IN CANADA: DOMINION RUBBER CO., LTD.

Highway compaction at top speed

On a highway job this Hyster Grid roller and the Caterpillar DW 15 tractor compacted 835,000 cu. yd. of common fill at a rate which exceeded 1,000 cu. yd. per hour compacted. The contractor was C. F. Lytle Co., well known in the West. The material was glacial clay A-7-6 and 100% density was required on the top 18 in. of the fill with 95% on the next 18 in. and 90% down to foundation. Information from **Hyster Co.**, P. O. Box 4318, Portland 8, Ore.



Fast, thorough land clearing

Every contractor knows that land-clearing for a project can be a tough, time-consuming job. Here's a piece of equipment that will go into the most rugged terrain and do a fast, clean job. In photograph, a Rockland Model RF-2, mounted on the Baker pushframe assembly of Allis-Chalmers HD-9B tractor, clears small rock, large boulders, and tree stumps. Teeth can be added to the rake to fulfill contracts for clearing small debris. Spacing may also be changed to permit removal of teeth, and for



brush piling, brush rack is available. **Rockland Allied Equipment Co.**, 3778 W. Colonial Dr., Orlando, Fla.

Model D Tournapull: An odds-and-ends specialist

Every sizeable grading contract has its share of scattered small-yardage excavation jobs that can delay work and final completion. Such operations as building access roads, drainage, finish work, clean-up, and other little jobs which become costly when it is necessary to divert big production dirtmovers to handle them are a natural for the Model D Tournapull. This 28-mph., 7½-yd. scraper gets odd jobs done fast, and runs from assignment to assignment over virtually any terrain. It will self-load up to 5 yd. in good dirt, and equipped with an accessory blade can double as a light dozer. Teamed in pairs, Ds equipped with blades or push plates can push-load each other. In the photo, two Ds are helping put the finishing touches on a new super-highway by hauling in topsoil and spreading it. **LeTourneau-Westinghouse Co.**, Peoria, Ill.



35-ton crane carries maximum load at 15-ft. radius

Model 43-MR is Marion's new 35-ton truck crane which will carry its maximum rated load, with outriggers, at a radius of 15 ft. The unit features dual front axles, power removable counterweight for easy preparation of the machine for highway travel, and 180-in. wheelbase—10 inches shorter than many other truck cranes—for maneuverability. The large capacity machine will handle normal loads at much greater radii in operation than smaller units and since it does not have to be moved often, work output is substantially greater. **Marion Power Shovel Co.**, Marion, Ohio.



Town Wagon for passengers or loads

Designed for use of engineering parties or contractors, a new vehicle has been produced by Dodge. Built on ½-ton truck chassis, it is offered in 8- or 6-passenger models and has a maximum payload capacity of 1,600 lb., representing 90 cu. ft. of load space when carrying six passengers. Information from **Dodge News Bureau**, 2751 East Jefferson, Detroit 10, Mich.



1105...YES, ELEVEN-O-FIVE

is the new-strength wire in Roebling's



AS SIZES and constructions go, Royal Blue is like the ropes you have used until now...but the likeness ends there.

Royal Blue is made of Roebling's new 1105 wire, the strongest, toughest wire developed up to now for use in any wire rope.

Royal Blue Wire Rope is as enduring as the wire from which it is made.

Write us for full facts on Royal Blue Wire Rope, or contact your Roebling distributor.

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Bank sloping to grade with Gradall

On a freeway project near San Francisco the L. C. Smith Co. is working its Gradall to slope the bank for creek diversion. As an all-purpose machine the contractor also used the Gradall for a large amount of structure excavation as well as on sewer and drainage facilities which formed part of the project. This M-2460 Gradall is mounted on the heavy duty carrier and is one of four models available. Information from Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.



Bucyrus-Erie; a standard highway shovel

The Bucyrus-Erie 38-B shovel with its 1½-yd. dipper is recognized as almost standard equipment for highway excavation work. The machine shown is working on an access road through the wilderness of Olympic National Park in Washington. Owned by Hugh Govan of Port Angeles, it is shown cutting through weathered granite with a soil overburden. Bucyrus-Erie Co., South Milwaukee, Wis.



Willard has a way with concrete

Aggregates are loaded and weighed out of stockpiles with the self-loading and weighing Weigh Batch Loader. The blended aggregate and cement then is loaded into the truck mixer together with metered water and the batch is on its way to the job. Information from Willard Concrete Machinery Sales Co., Lynwood, Calif.



Self-propelled and track-mounted for high production

The Chicago Pneumatic G-800 Tracdril mounts a 4-in. drifter and can tow its own air supply around the drilling area. This reduces manpower and accessory towing equipment for compressors. Moving from hole to hole, the compressor is uncoupled and the drill works within the limits of the hose lengths. Resulting savings and greater efficiency increase the footage drilled at a lower cost. The tramming motors are not used while the drill is in operation and a 365-cfm. Chicago Pneumatic compressor provides full operating efficiency. A special design allows the tracks to operate independently. Further information from Chicago Pneumatic Tool Co., 6 East 44th St., New York 17, N. Y.



Rip and root while you doze

On a highway resurfacing job in Washington these two Esco Dozer Rooters, mounted in tandem on a Caterpillar D-7 tractor, are tearing up old pavement. Esco makes a complete Dozer Rooter line to fit all make and models of tractors with blade heights from 26 to 50 in. This heavy duty ripping device consists of a two shank housing mounted on the dozer blade by special clamp with adaptors to fit different makes. Adjustment provide for four ripping depths below the cutting edge and the units may be attached singly or in pairs. A major advantage is the ability to root and doze at the same operation. They may be mounted or dismantled without special equipment. Additional information from Electric Steel Foundry Co., 2141 N. W. 25th Avenue, Portland 10, Ore.

**New DODGE heavy-duty "station wagon"
doubles as truck-of-all-work!**



**Goes places a standard station wagon
can't... carries up to 50% more payload!**

Take a good look at the new Dodge *Town Wagon*—the ideal low-cost vehicle for your business! It's a double-duty carrier of passengers, cargo, or *both*. And with Forward Look styling it's as handsome as it is versatile!

The *Town Wagon* is built on a rugged $\frac{1}{2}$ -ton Dodge *truck* chassis, giving you extra ground clearance for off-the-road driving. It's powered by either the famous Dodge L-head Six or the new Power-Dome V-8.

With seats in place, one model carries six passengers, the other eight. In the six-passenger model you've got about 90 cubic feet of load space in the rear compartment. The same amount of space is available in the eight-passenger model with the rear seat removed. You can also take all extra-passenger seats out of either model, leaving clear, unobstructed room for a big, truck-size payload of 1575 pounds.

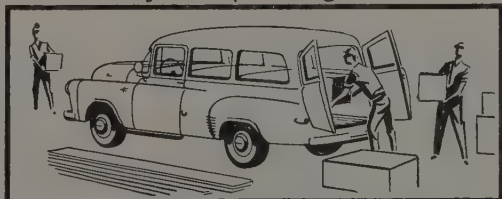
You can see . . . and drive . . . the *Town Wagon* at your Dodge dealer's now.

DODGE TOWN WAGON

WITH THE FORWARD LOOK



Carry 6-8 passengers . . .



or big, 1575-lb. payloads . . .



or passengers plus cargo

MAIL TODAY!

Advertising Department J—Dodge Division
Chrysler Corporation
P.O. Box 1259—Detroit 31, Mich.

Please send me more information and complete specifications for the new Dodge Town Wagon.

Name

Street address

City Zone State



48S Roadmixer produces thorough mix in one pass

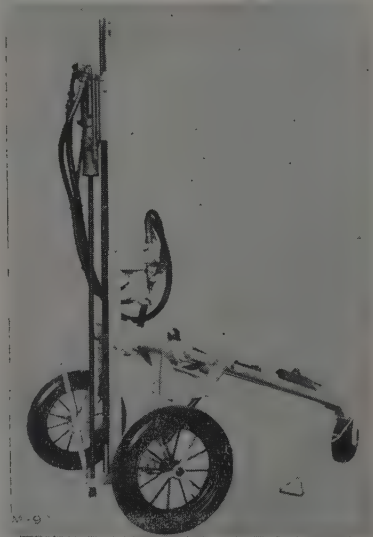
Here a new Model 48S Pettibone Wood Roadmixer works in soil cement operation for Guy F. Atkinson Co. at Santa Barbara, Calif. The machine has a capacity of up to 250 tph. in asphalt and up to 450 tph. in soil cement base. The one-man operated machine is powered by a diesel engine for both traveling and

mixing. It produces a thorough mix in one pass, picking up aggregate cleanly off sub-grade, thoroughly mixing it with binder in pugmill and leaving behind a uniformly mixed windrow ready for spreading. Tandem drive assures positive traction, even in low bearing soils. Unit is pneumatic tire mounted for maneuverability over all types of surfaces. Pettibone Wood Mfg. Co., P. O. Box, 620, North Hollywood, Calif.



Le Roi 125 Tractair: A tractor air-compressor

This highway undersealing drilling was completed 45% faster than previous drillings with power provided by a LeRoi Tractair. The Tractair is a combination 42-hp. tractor and 125-cfm. compressor designed to operate a dozen or more attachments, as well as to power the usual air tools used in highway and street construction or repair. With five traveling speeds, the rubber-tired unit brings air power to places in rough or smooth terrain with equal ease and with a valuable saving in both time and labor. Le Roi Division, Westinghouse Air Brake Co., Milwaukee 1, Wis.



Two new Thor drills

Two new Thor air-driven wagon drills feature fully automatic controls grouped on a motor which can be repositioned along the mast. They are the SW-1, a general purpose model, pictured, and the BW-2, a heavy-

duty unit. The SW-1 produces exceptionally high drilling speed and offers marked hole cleaning capacity. Saddle and cone permit mast adjustment for drilling holes through a full 360 deg. in all directions. Chain-drive mast can be completely reversed for longer wear. The BW-2, built around Thor's 105 drifter, features new mast with improved chain tension adjustments and advanced shock absorbers to harness power output. Thor Power Tool Co., Aurora, Ill.

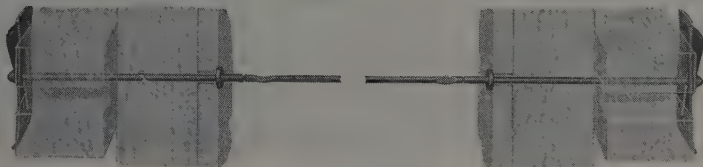


Homelite pump clears excavation for overpass

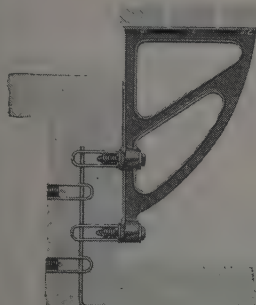
Pictured above in action on a new section of U. S. Highway 40 in California is a Homelite diaphragm pump, Model 20DP3, introduced on the market early this spring. On this job, Raymond Concrete Pile Co. is assisting in building an overpass over the Santa Fe right-of-way at junction of U. S. 40 and California State Highway 4. The pump is removing water and sludge from excavations where contractor will drive casings for concrete pilings. Job calls for removal of large volumes of water and handling of seepage in thick mud. By adjusting manual throttle control, operator can match engine speed with job requirement, be it pumping water at 5,000 gph. or small seepage flow. Pump weighs only 120 lb., can be carried to another location on the job without help of special planking or tow truck. Homelite, 75 Riverdale Ave., Port Chester, N. Y.

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SNAP TIES



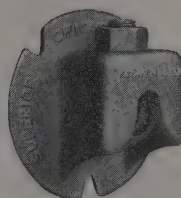
RISER FRAMES



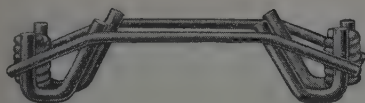
PANEL LOCK BOLTS



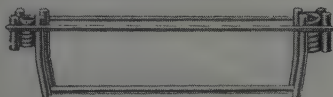
ROD CLAMPS



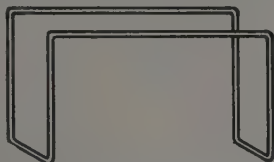
**ADJUSTABLE
SCREED CHAIRS**



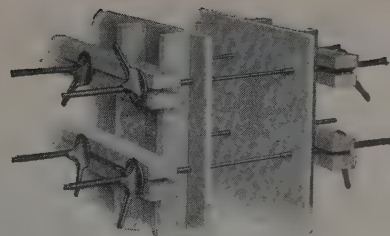
STANDARD HANGER FRAMES



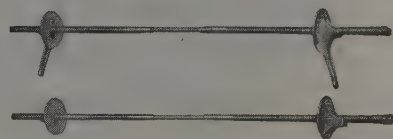
SPECIAL HANGER FRAMES



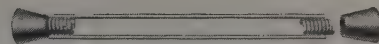
WIRE BEAM SADDLES



TILT LOCK CLAMPS



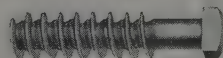
STANDARD COIL TIES



CONE-FAST COIL TIES



COIL LOOPS



SCREW ANCHORS AND BOLTS



**"PICK-UP" INSERTS
FOR TILT-UP SLABS**

Shown here are some of the many types of Form Ties, Anchors, and other concrete accessories which SUPERIOR'S years of engineering and field experience plus manufacturing dependability have developed and produced.

Every item in the SUPERIOR line is specifically designed to provide the most dependable and efficient forming method for ordinary foundations, engineering structures, watertight walls and architectural concrete.

When you plan form work, SUPERIOR'S experienced engineers are available to prepare suggested layouts of form work as well as complete estimates and quotations.

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Pacific Coast Plant: 2100 Williams St., San Leandro, Calif.





Oshkosh concrete carrier drives on four wheels

Features of this Oshkosh 50-50 carrier are appreciated by the National Ready Mixed Concrete Co. of Lancaster, Calif., owned by Nick Rini. Designed for heavy going it carries its full load distributed equally at 18,000 lb. on each of the two axles. The 4-wheel drive traction permits the carrier to be spotted exactly where it is wanted under adverse conditions, aided by power steering. Capacity is 5 cu. yd. of concrete as a maximum depending on the model of mixer selected. **Oshkosh Motor Truck, Inc.**, 2300 Oregon St., Oshkosh, Wis.



Outrigger (roughly 6,000 lb.) and counterweight (up to 18,500 lb.) are easily removed by the crane itself without assistance of other machines, making the 2800 one of the few large machines which will strip down for travel within weight regulations. Rig is mounted on Hendrickson carrier and is available with tandem front axles and with hinge type boom so short trips can be made with boom in place. **Manitowoc Engineering Corp.** Manitowoc, Wis.

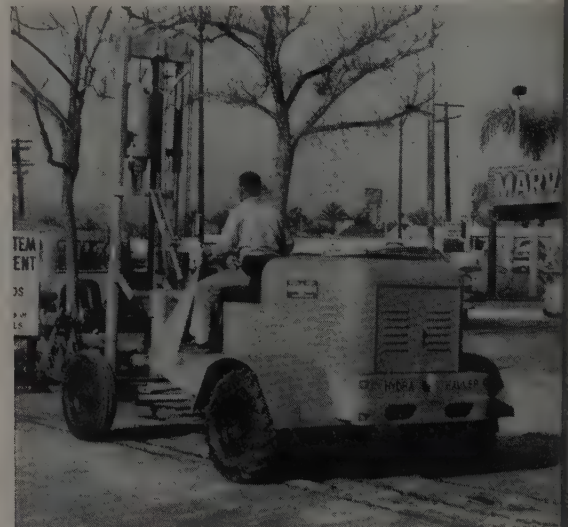


Cuts brush for clearing or maintenance

Whether it's cutting brush on a right-of-way for a new highway in a national park, as shown, or for maintenance work on existing routes, this new McCulloch brush cutter has a wide variety of uses in all types of highway work. It handles dense undergrowth with ease and can be used on small trees. It is strictly a one-man machine and is powered by an engine with a special tank for long operation between refills. **McCulloch Motors Corp.**, 6101 W. Century Blvd., Los Angeles 45, Calif.

Manitowoc 2800 mobile crane strips for travel within weight limits

The recently introduced Manitowoc Model 2800 mobile crane, with rated capacity of 40 tons at 12 ft., is pictured unloading and placing 9-ton segments of concrete pipe on a project on Sierra Madre Blvd., San Marino, Calif. This work was done at a 32-ft. radius using 40 ft. of boom, with and without blocking under the outriggers. Outrigger arrangement deviates from conventional designs in that it does not place stress against the frame mem-



Hydra-Hammer cuts and pulverizes asphalt, compacts backfill

The Ottawa Hydra-Hammer is shown cutting asphalt for a water line job in Beverly Hills, Calif. After asphalt is removed, the contractor uses the machine to pulverize the concrete base for easy removal and to compact backfill to support new pavement after the pipe has been laid. This economical unit is especially suited to road and utilities construction work due to its ability to cover a 4-ft. path. Operator can hit a straight blow at any point in the 4-ft. area, taking advantage of the full free fall of the hammer. Hammer can be stopped at any point in its movement either up or down. Other features include hydraulic transmission and shock accumulator, adjustable seat and brake pedal. **Ottawa Steel Division**, L. A. Young Spring & Wire Corp., Ottawa, Kan.

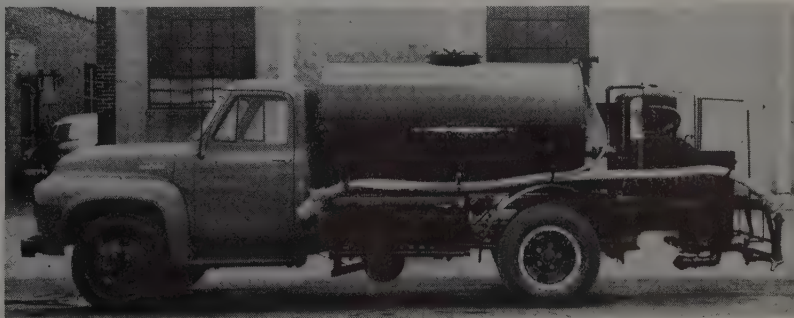
Page has new line of walking draglines

With capacities from 5 to 15 cu. yd. a new line of Page draglines incorporates many design features meeting demands for improved operating conditions and lower operating costs. The line is powered by an unusual V-type horizontal diesel engine designed and built specifically for dragline operation. Booms are supported at three equally spaced points along their length to produce a more rigid and stronger design. Lubricating oil is fed from one central pump, eliminating much of the hand oiling usually required, and an electric pre-heater provides only warm oil, a feature particularly valuable in cold weather operations. **Page Engineering Co.,** Clearing Post Office, Chicago 38, Ill.



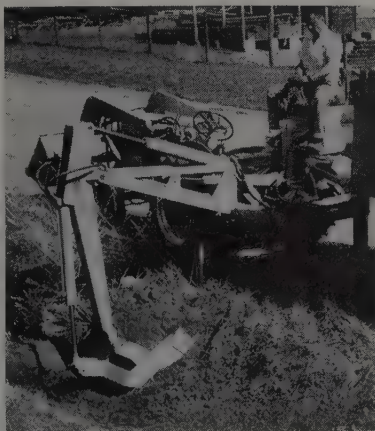
South Bend bituminous distributor

Shown is a South Bend bituminous distributor, designed to give the operator full control at all times. Materials are held at an even temperature; distribution starts and stops are instantaneous; triple spray pattern insures full coverage with sharp edges. **Municipal Supply Co.,** South Bend 23, Ind.



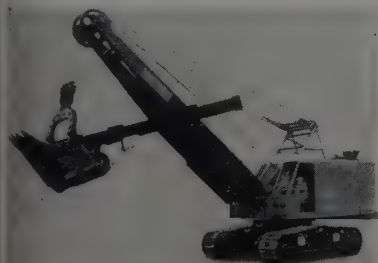
Largest model of Link-Belt line

The new 3-yd. K-608 shovel-crane is the newest and largest model to be added to the line of Link-Belt Speeder. The unit is designed for crane fittings with a lifting capacity of 75 tons at 12-ft. radius. Other accessories provide for its operation as dragline, clamshell, and piledriver. The unit has hydraulic controls for fingertip-operation and has an output up to 25% greater than machines with manual controls. Hydraulic pressure is produced by a pump driven by the main engine and is metered to the clutches by valves opened and closed with short control levers by the operator. Ground clearance of the machine is 18 in. for the 7-roller frame, and 24 in. for the 9-roller frame made possible with the complete enclosing of the traction shaft assembly. Information from **Link-Belt Speeder Corp.,** Prudential Plaza, Chicago 1, Ill.



Handy for highway maintenance

Attached either to the rear or side of a tractor this new Davis Backhoe was recently introduced by Mid-Western Industries, Inc., of Wichita, Kan. It is particularly suited to state and county highway maintenance work, but also is an all around tool for contractors. A special feature is the fact that the operator's seat revolves with the boom so that he is always facing the direction of his work, whether digging or dumping. **Mid Western Industries, Inc.,** Wichita, Kan.



Gorman-Rupp pumps for cofferdams

For unwatering cofferdams at bridge sites, the Gorman-Rupp Contractors' Pump (below) solves a tough problem. These two 6-in. pumps are working on a job where the construction crews encountered particular problems in handling glacier boulders in streambed as they were carrying excavation down for bridge piers. **Gorman-Rupp Co.,** 305 Bowman St., Mansfield, Ohio.





Burch unit widens roads, fills trenches

The rubber tire-mounted Burch road widener is designed for coupling to a dump truck to transfer road building materials in controlled quantities from truck to roadside. Unit features a hopper wide enough to receive materials from the full width of a standard dump truck. Belt conveyor within the hopper transfers material to fill location. Adjustable shields and strikeoff blade govern width of fill. The machine is equipped with power hydraulic drive, for short-distance moving under its own power, and power steering. Short wheel base allows 180-deg. turn in 40-ft roadway. **Burch Corp.**, Crestline, Ohio.



Compact Parsons Trenchliner digs 8 ft. deep

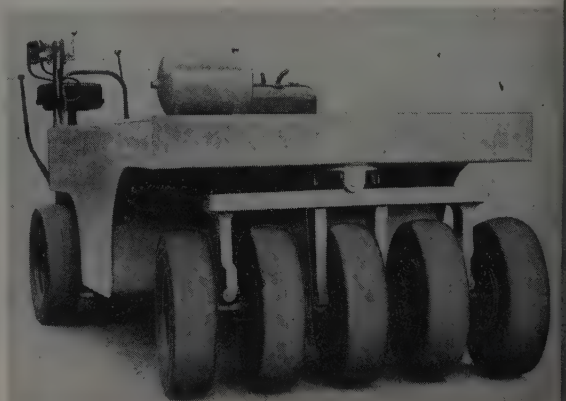
The Parson utility 155 Trenchliner digs 8 ft. deep, 16 to 26 in. wide. The unit itself stands only 7 ft. 4 in. high, 5 ft. 4 in. wide, and will work efficiently in congested areas. Adjustable telescopic boom can be fitted with multiple cutting widths. Tractor type crawlers provide a low ground bearing pressure to enable the 155 to work in softest ground conditions and wide range of speeds facilitates maximum production in all soil conditions. **The Parsons Co.**, Newton, Iowa.

Onan generating plants produce power on big Western project

Mounted on a two-wheel trailer, this 5-kw. Onan Model 5DRP diesel electric plant provides power for flood-lighting night operations during construction of the Cherry Valley Dam project in Yosemite National Park.



Contractor Guy F. Atkinson Co. used nine Onan plants both 3- and 5-kw. capacity, for mobile servicing equipment. Plants powered air compressors for grease wagons and the whole unit moved around to service heavy equipment right on the job and reduce downtime to a minimum. Other Onan diesel models available in sizes from 15,000 to 55,000 watts. Gasoline engine-driven plants are available in sizes from 400 to 50,000 watts. **D. W. Onan & Sons Inc.**, Minneapolis 14, Minn.



Grace Model M roller features changeable tires

The new Grace Model M self-propelled roller has eleven 7.50-15 tires, each easily changeable without removing other tires, aligned to overhang the body and permit rolling a trench or up to a curb. A 48-hp. 6-cylinder engine provides four speeds in both directions at speeds from 2½ to 14 mph. The six rear tires are driving tires, all of which oscillate. Hydraulic brakes are featured on 10 of the 11 wheels, with mechanical parking brake on the rear wheels. Unobstructed body capacity permits gross loading up to 10 or 12 tons. **W. E. Grace Manufacturing Co.**, 6000 S. Lamar St., Dallas 15, Tex.

Champions in their field ...



MARION 93-M • 2½ Yard Shovel • 80 Ton Crane

From the starting gun to the finish line—
from the windup until the javelin falls—
champions are a symphony of strength,
balance and endurance. The same qualities
make the Marion 93-M a stand out among
2½ yard machines—a true champion in its
field. Let the 93-M give you range, power,
strength, speed and dependable long life
of true championship calibre.

Marion Means Business

MARION POWER SHOVEL COMPANY, MARION, OHIO



Portable plant produces aggregate for highway job

A Diamond 77 portable rotor lift crushing and screening plant is shown on location at a state highway job southeast of Salt Lake City. To meet state specifications on this job, the plant produced a limestone aggregate of 2-in. minus for a base course and ¾-in. minus for a finish course. The 77 is claimed to outproduce every machine in its class, regularly turning out 300 to 400 tph. of road gravel in 25 to 35% crush. High productivity is attributed to shorter material flow and oversize units without increase in weight of machine. A hydraulically operated mechanism lowers screen deck to travel position in a fraction of the time required for manual knockdown and facilitates moving of the unit with a minimum of downtime. **Diamond Iron Works Division, Goodman Manufacturing Co.,** Halsted St. and 48th Place, Chicago 9, Ill.



Rotadrill drills 6¼-in. hole, almost any depth

The new truck-mounted Rotadrill, rotary drilling rig with full hydraulic operation, can be operated by one man, requires no rotary table or kelly. The big unit is applicable for water wells, blast holes, exploratory work and core drilling. It will drill up to 6¼-in. hole to depth of 800 ft. with 4½-in. O.D. flushtool joint drill pipe, and 1,500 ft. with 2⅞-in. O.D. pipe. Air compressor delivers 20,000 lb. down pressure on the bit. **Schramm, Inc.,** West Chester, Pa.



Jobmaster features mobility, speed, low-cost upkeep

Smallest unit in the Lima line, the streamlined Type 2 Jobmaster, a ½-cu. yd. power shovel and 13- to 15-ton capacity crane, is available with crawler or rubber mountings, and is readily convertible to shovel, crane, dragline or pull shovel application. On truck or wagon mount crane has lift capacity of 15 tons at 10-ft. radius; a crawler crane it lifts 13 tons at 10-ft. radius. The air-controlled unit is designed for mobility, high output, speed and low-cost maintenance. Among its features are independent boom hoist with engine controlled boom lowering, tractor-type steering, independent combination chain and cable crown and retract, and internal-external tooth jaw clutch for quick engagement and minimum backlash in gear train. As a shovel, the Jobmaster is equipped with 16-ft. 6-in. boom and 13-ft. 3-in. dipper handle. Crane booms from 30 to 80 ft. and 10-ft. jib are available. **Baldwin-Lima-Hamilton Corp.,** Construction Equipment Division, Lima, Ohio.

Bay City Model 60: An excavator with 21-ton crane

Shown loading shot rock for gravel crushing plant is the recently introduced Bay City Model 60, a 1-yd. convertible excavator. Shovel has 21-ft. box-type welded boom, 16-ft. straddle type dipper sticks and a one-piece continuous crowd chain. Like other Bay City equipment, model features tandem drums with power clutches. Standard power is GM 4-71 diesel engine, 113 net hp. As a crane, the unit has rated capacity of 21 tons on a 40-ft. boom at 10-ft. radius. **Bay City Shovels, Inc.,** 2611 Centre Ave., Bay City, Mich.

Roller with ¾-in. side clearance

A new 2 to 2½-ton roller is now being marketed for patch work applications and for building blacktop highways, parking lots, and similar jobs. This small, compact roller, Model 92AA, offers side clearance of ¾ in. enabling it to operate up against the side of a building or other obstruction. **C. H. & E. Manufacturing Co.,** 3849 N. Palmer St., Milwaukee 12, Wis.





Two of the fleet of 28 Euclid 46TD 22-Ton Dump Trucks equipped with Fuller 10-F-1220 Transmissions, and operated by Nello L. Teer Company, Durham, North Carolina.

Fuller 10-Speed Transmissions handle Teer's tough hauling assignments

The Nello L. Teer Company of Durham, North Carolina, handles tough hauling assignments with Euclid 22-Ton Dump Trucks equipped with Fuller 10-F-1220 Transmissions.

On the boulevard construction job shown above, approximately 3,000,000 yards of dirt and rock were removed to add 80 feet to the present highway along Ohio River bluffs so steep that in many places a triple-bench system was necessary.

Says George Walker, Teer's Master Mechanic: "The heavy-duty Fuller Transmissions paid off in much faster work cycles. We get more work time and less downtime through the right gear ratios provided by Fuller to meet load and grade with shorter, easier shifts."

More equipment owners and users specify Fuller than any other transmission. From the 110 models, semi-automatic and full-manual control,

for trucks from 100 to 400 hp, engines from 330 to 1440 cubic inches, select THE Fuller Transmission designed to do your job better and at less cost . . . ready to help you move more for less. Check with your local truck dealer for the *right* Fuller Transmission for your job.



FULLER MANUFACTURING COMPANY
TRANSMISSION DIVISION • KALAMAZOO, MICH.

Unit Drop Forge Div., Milwaukee 7, Wis. • Shuler Axle Co., Louisville, Ky. (Subsidiary) • Sales & Service, All Products, West. Dist. Branch, Oakland 6, Cal. and Southwest Dist. Office, Tulsa 3, Okla.



Mack trucks for concrete mixers

A Mack truck designed specifically for transporting concrete mixers, known as Model B-42S, is a 6 wheeler with 4-wheel drive designed for top performance with large load capacity. Power plant is a Mack built 401-cu. in. Magnadyne engine. The chassis frame is of rugged construction designed to meet the necessary strains of off-highway operation. Main rails of the frame are of special heat-treated alloy steel. The Mack bogie suspension with dual reduction carriers and power divider between the two axles results in tractive-ability and long service. Information from Mack Trucks, Inc., 350 Fifth Ave., New York, N.Y.



Marlow dewatering pumps for contractors

With capacities ranging from 4 M to 125 M in centrifugal and diaphragm-type pumps, Marlow has a line for contractors powered by Waukesha, Chrysler, and Continental gasoline engines and with Continental and General Motors diesel engines. The pump illustrated is Model 8F3 which handles 125 M while operating at less than top speed. All Marlow pumps are primed by the exclusive "Diffuser" method which is credited with priming faster and resisting clogging to a greater extent than pumps of more conventional design. The manufacturer is Marlow Pumps Div., Bell & Gossett Co., Midland Park, N. J.

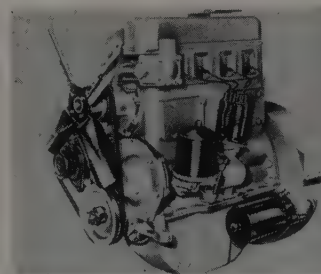
Paving form is both light and rugged

Recognizing the need for a paving form which was light enough to be easily handled and yet with ample strength to give years of rugged service, Metaforms is the answer. The particular design feature of this heavy duty load form is the box construction which carries the load of the paving machine on two legs and distributes this load over the entire base. The outside leg is set at an angle to resist horizontal thrust and since it extends the full length of the form, it eliminates the collection of dirt and concrete. A simple positive end connection assures easy and accurate alignment. Information from Metal Forms Corp., 3334 No. Booth Street, Milwaukee, Wis.



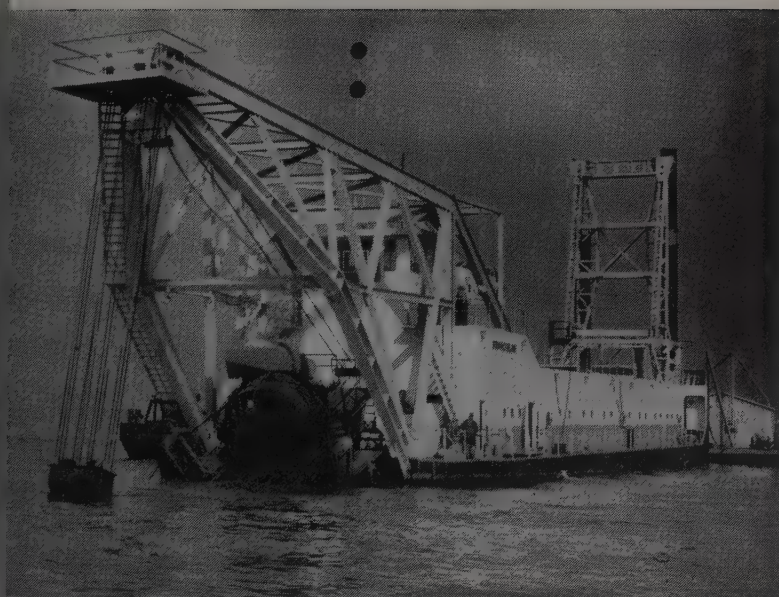
CMC has swing-out hopper providing full flow discharge

On a sidewalk job this CMC Model 400 Transcrete illustrates the exclusive CMC swing-out hopper. It swings in for charging and swings out for discharge so that concrete is discharged through a big unobstructed opening in a full and easily controlled stream. The units pour ordinary 4- to 6-in. slump concrete at the rate of 1 yd. in 10 to 12 sec., and 1- to 2-in. slump concrete at the rate of 1 yd. every 25 to 30 sec. Model 700 hauls up to 8-plus yard loads and is guaranteed to mix any 7-yd. batch. Information from Construction Machinery Co., Waterloo, Iowa.



Engines that are interchangeable

In addition to mounting dimensions which are the same for gasoline or diesel engines, Hercules Motors has carried the idea further into common parts and components. This interchangeability extends over the entire twelve new models. Cylinder blocks are not only interchangeable between gasoline and diesel engines of like size, but are designed to be turned end for end which permits shifting of manifolds and accessories. Information from Hercules Motor Corp., Canton, Ohio.



Dredge Franciscan is 207' long, digs 50' deep, with ladder at 45°, pivots in 350' arc on one of two 80' spuds, has seagoing stern. Present power comes from shore, but design provides for installation of on-board power plant.

The cutter head on the Franciscan has a 1,500 hp. motor.

DESIGNED AND BUILT BY YUBA Hydraulic dredge for 11 million yard sand fill

Dredge Franciscan (Yuba No. 170), built for The Utah Construction Co., is the largest, most powerful suction dredge on the West Coast. It has 9 ft. diameter cutter head powered by 1,500 hp. motor, pump has 36" intake and 30" discharge with 8,000 hp. motor. Its immediate job: Filling 390 acres of Alameda (Calif.) tideflats with 11,000,000 cu. yds. of sand for future homesites. Following this job, Dredge Franciscan will fill 24,000,000 yards on adjacent tidelands at Bay Farm Island.

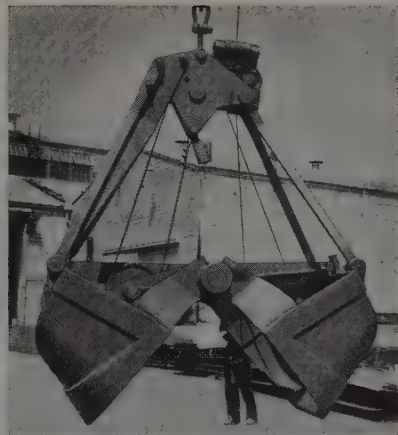
1,500-horsepowered cutter on the dredge successfully tears apart "Alameda sandstone," a very tight formation heretofore handled inefficiently by other hydraulic dredges. Its big pump thrusts sand and silt nearly two miles at a rate that will easily complete the 11,000,000-yard fill in the scheduled year. The entire dredge is operated by one man from a central control room.

If you have hydraulic fill, channels or harbors to excavate, or levee construction, consult Yuba. To your problem, Yuba applies 50 years of building bucket ladder and hydraulic dredges, plus more than 30 years of experience by George Pelton, Yuba consultant on hydraulic dredges. Wire, write or call us NOW—no obligation, of course.

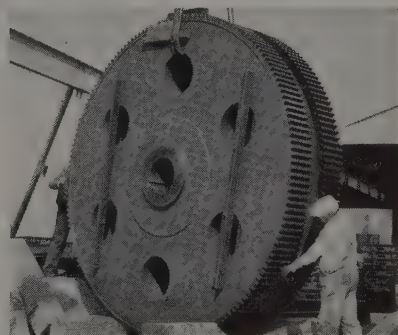
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YUBA MANUFACTURING CO.

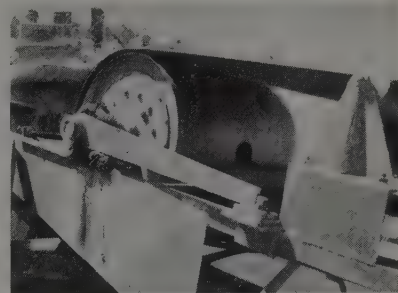
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STOCKTON YUBABILT CLAMSHELL BUCKETS, power-arm type, for tough, continuous digging of rock, hardpan, coral and other hard, abrasive materials. 1/2 to 6 cu. yds.



YUBABILT BULL GEARS with 12" face and outside diameter of 146", for main drive gears on bucket line of bucket ladder dredge. Welded construction saved cost of new patterns.



YUBA-SCHROCK MOTORIZED HEAD PULLEY has motor mounted internally, eliminates all external gears, sprockets, chains, saves space, operates safely under wet, dusty, gritty conditions. 1/2 to 125 hp.

For special equipment, designed and built to your order, consult YUBA.



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YUBA MANUFACTURING CO.

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Bulk cement in aluminum Autocar model

In Montana Clark L. Coberly, a contracting cement hauler operating out of Billings, uses his Autocar model DC10264L with a Fruehauf bulk cement trailer to move 125 bar-

rels at a trip. Operating on 20 tires, the lightweight aluminum carrier removes dead weight and puts it into pay load. Information from the White Motor Co., Cleveland 1, Ohio.

A crusher for cubes with minimum of slivers

This Kue-Ken gyratory crusher working in a California gravel plant (below) is producing $\frac{3}{8}$ to $\frac{3}{4}$ -in. material and has a rated capacity ranging from 15 to 50 tons per hr. depending on the setting. This model is designed to be an intermediate machine between the 18-in. and 36-in. sizes. Minimum setting with a fine bowl is $\frac{1}{4}$ in. It has a shipping weight of 9,500 lb. and requires about 40 hp. for average crushing conditions. It is designed particularly for choke feeding which produces a cubicle product with a minimum amount of undesirable slivers in the finished aggregate. More information on this new model of Kue-Ken gyratory from Straub Manufacturing Co., Inc., 8383 Baldwin St., Oakland 21, Calif.



New back-rippers for Caterpillars

New and over-sized back-rippers have been introduced by Preco Incorporated and are now available for Caterpillar No. 9S straight blade bulldozers. These rippers consist of four housings with pivoted shanks capped with lock-on teeth. The two outer rippers will loosen the ground to a depth of about 18 in. as the tractor backs up and the inner shanks will take a 12-in. depth. When the tractor moves forward, these rippers skid along the top of the ground. The back-ripper loosens up hard ground and rocks as the tractor backs up and conditions the earth for taking a full load on its next pass. Information from Preco Inc., 6300 E. Slau-son Ave., Los Angeles 22, Calif.



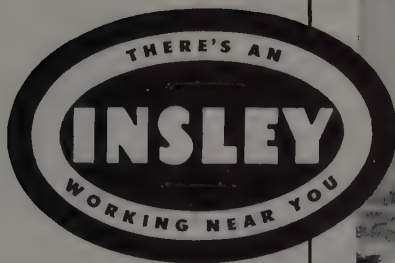
Hanson 654 crawler excavator is rugged top performer

With all operating mechanism well back of center, the new $\frac{3}{4}$ -cu. yd. Hanson Model 654 crawler excavator affords excellent load handling ability in relation to over-all weight. It's rated as a 12-ton capacity crane, designed with low center of gravity and independent power-controlled boom hoist advantageous for steel erection or any type of crane work where fast booming in either direction or pinpoint spotting is required. All clutch linings can be replaced without dismantling any shaft assemblies. Excavators also available in $\frac{3}{8}$ and $\frac{1}{2}$ -cu. yd. capacities, either crawler or truck mounted. Hanson Clutch & Machinery Co., Tiffin, Ohio.



Heavy-duty mower teams with John Deere "420"

When grass and weeds must be cut on the roadside, here's a matched team to do a fast, low-cost job. It's the John Deere No. 47 mower and 420 utility tractor. Center-mounted position of the mower permits the operator to pull up onto the highway and watch the mower and passing traffic at the same time. Low design of the tractor provides balance and stability, allowing the combination to work into ditches and on grades where other units could not operate safely. Deere & Company, 3300 River Dr., Moline, Ill.

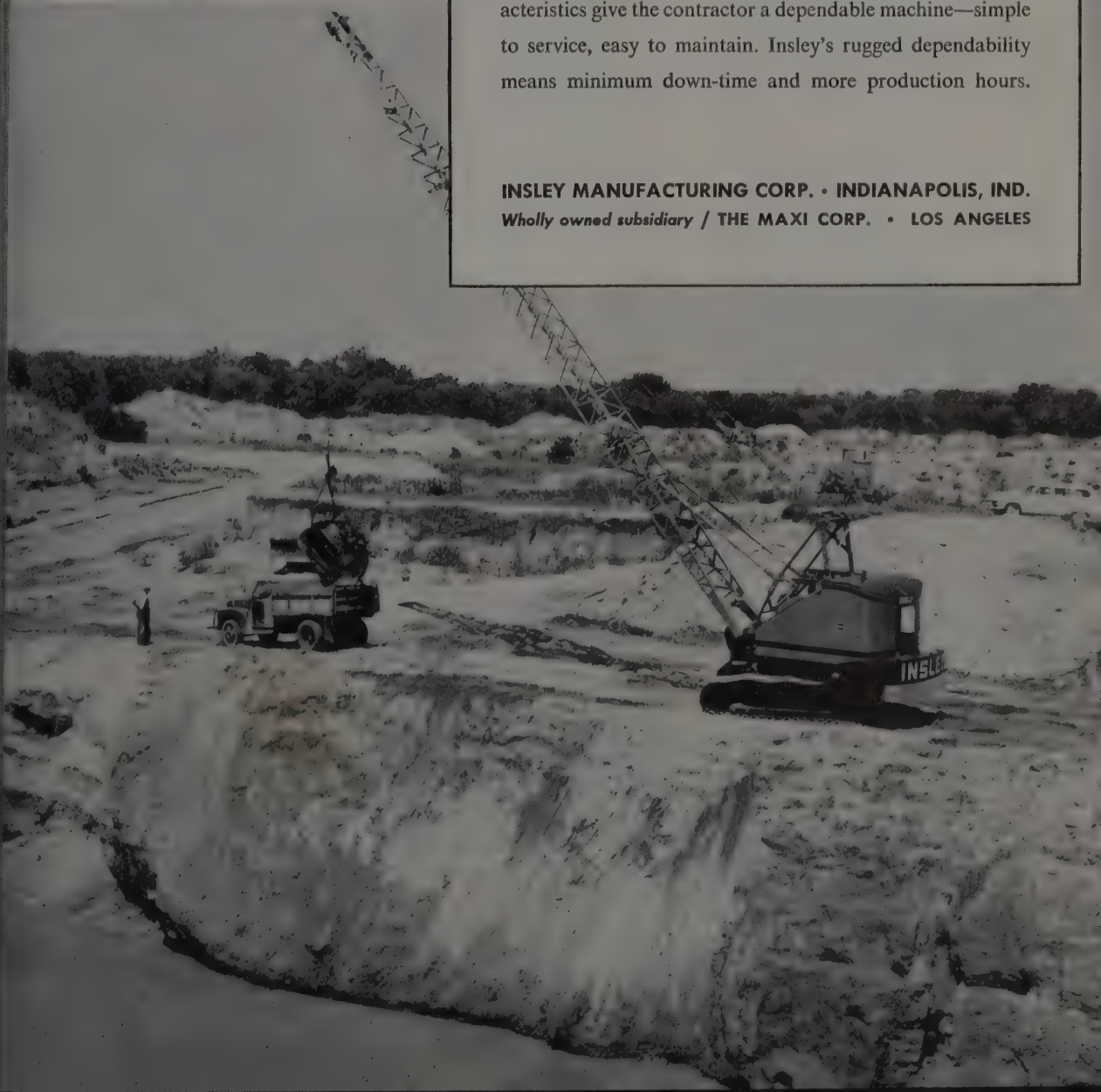


INSLEY TYPE WB DRAGLINE

Recognized as standard equipment by highway contractors for excavating and trenching—Insley's proven design characteristics give the contractor a dependable machine—simple to service, easy to maintain. Insley's rugged dependability means minimum down-time and more production hours.

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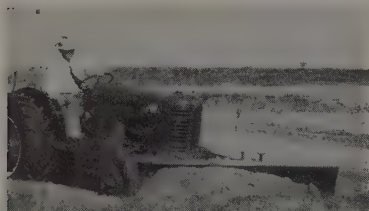


Kenworth 521 hikes pay load

Cement Distributors, Inc., Seattle, operated about 1,500,000 mi. last year, in Washington and Oregon, keeping trucks on the move often 24 hr. a day hauling bulk and sacked cement, heavy machinery and building materials from coast points inland and back-hauling grain. The firm recently added five new Kenworth 521s to its

fleet. When operated with doubles, as pictured, the trucks carry 52,500-lb. pay load, and gross combined weight is 76,000 lb. Dry chassis weight is only 10,780 lb. Aluminum is used extensively in the vehicle's construction to save weight. **Kenworth Motor Truck Corp.**, 8801 E. Marginal Way, Seattle 8, Wash.

Dozers for small tractors



A hydraulically operated dozer designed to be mounted on most wheel-type tractors of 45-hp. size or smaller provides a handy tool for contractors

for backfilling trenches, excavations, as well as moving earth on small jobs. It is a tool that has many uses in connection with county road work and highway maintenance. The blade is adjusted by two hydraulic cylinders which provide both up and down pressure. It is raised vertically and maintains its cutting angle in every direction. Thrust is transferred directly to the center of the tractor.

The blade can be mounted in conjunction with a backhoe or scraper to provide a complete utility tool. **Hydraulic Tool & Equipment Co., Inc.**, 10825 Sessler St., South Gate, Calif.

New features on Felker Cutter

Ahead of the trend toward more power on concrete cutters, the Felker heavy duty Model 364 is now equipped with a 36-hp. Wisconsin gasoline engine. Other new features include a change of pulleys now carrying 4 V-belts replacing the 3 formerly used. In addition there is a new method of suspending the motor which permits the belts to the spindle and the belts to the power drive to be tightened at the same time. This provides insurance against slipping or coasting on steep grades. Another feature on all Felker models is a collar containing a cavity in which water is directed to be ejected by centrifugal force down each side of the blade. The collar directs the water supply beneath the air pressure blanket which surrounds the revolving blade thus creating an effective



washing action penetrating deep into the slot and rinsing out sludge and cooling the blade more efficiently. This design feature results in a longer life for a diamond blade. **Felker Manufacturing Co.**, Torrance, Calif.



Can't use explosives? Roc-Jac does the job

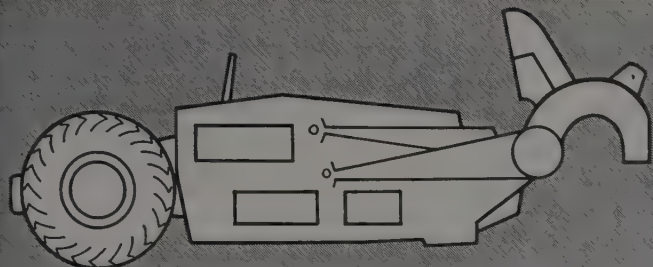
The Duncan hydraulic Roc-Jac does a quick, economical job of rock and concrete breaking where the use of explosives is prohibited or impractical. The device is available in two sizes—Type 10, with 150-ton thrust capacity, and Type 9, with 75-ton thrust capacity. Photo shows two Type 10 Roc-Jacs breaking out a retaining wall where use of explosives was prohibited. **K. O. Duncan Co.**, 10713 W. Pico Blvd., Los Angeles 64, Calif.



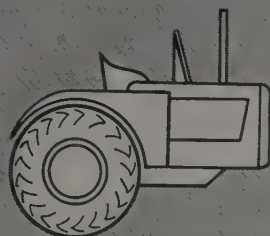
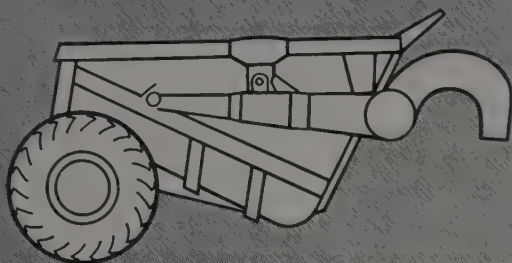
Air Trac drills in solid volcanic rock

A Gardner-Denver Air Trac drill is shown operating on a rock cut for relocation of roads in Oregon necessitated by building of The Dalles Dam across the Columbia River. Over 1,300,000 yd. of solid volcanic rock had to be removed. Air Trac has proved its ability to travel practically anywhere with its full traction rubber shoes. With self-stabilizing tee-bar and chain feed, drilling mast remains constant over rough terrain. **Gardner-Denver Co.**, Quincy, Ill.

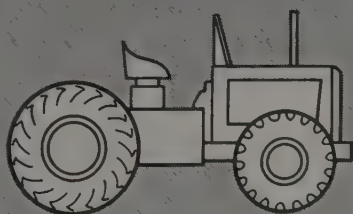
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+
50% TRAILER WORK**



**= 100% TRACTOR*
EFFICIENCY**



*2-wheel or 4-wheel tractors.

ATHEY PR21 Rear Dump Trailers interchange with Scrapers for complete job adaptability.

100% efficiency with your present 2 or 4 wheel tractors means big savings for you! With the Athey PR21 and a Scraper you have full coverage on any mixed material hauling job. Use the Scraper for dirt and overburden — the PR21 for rock and mixed material. Self-loading or shovel loading — you have the equipment to do the job. You save approximately $\frac{1}{3}$ of your initial capital investment and get 100% tractor efficiency.

Conversion is easy and fast — no additional parts or attachments are needed.

Additional savings can be realized by ordering the PR21 less tires and wheels and interchanging the Scraper tires and wheels.

The PR21 gives many advantages you can't get in comparable sized trucks — maneuverability with a $33\frac{1}{2}$ ft. turning diameter, quick loading with a big target body and a low loading height, safety with a low slung design that keeps the load close to the road, fast 18 second dumping with simple, sure hydraulic controls, independent braking of tractor driver and trailer wheels, retracting wheelbase for working close to the fill or hopper. All these profit-packed advantages are yours with the PR21. Why tie up your working capital in limited duty trucks?

Scraper for dirt, Rear Dump Trailer for mixed materials — a complete team for any hauling job. Add the PR21 to your present tractor-scraper units for full efficiency of your tractors and a complete team for any job.

COMPARE THE INVESTMENT:

TRACTOR	SCRAPER	PR21	YOU SAVE THIS CAPITAL
---------	---------	------	-----------------------

TRACTOR	SCRAPER	TRUCK
---------	---------	-------

The diagram above shows the proportional investments required for a tractor-scraper-trailer team and a tractor-scraper plus truck. You save approximately $\frac{1}{3}$ by adding the PR21 as against a comparable sized truck. And when you work the PR21, you work your tractor, too. 100% efficiency with the least possible investment.

Athey

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5631 West 65th Street, Chicago 38, Illinois



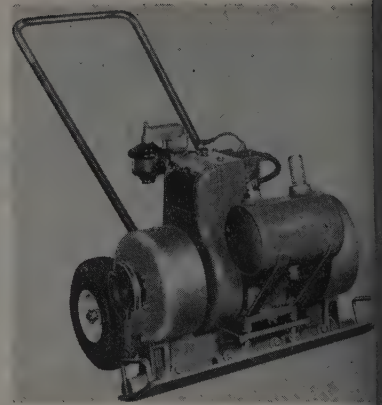
Elevating grader attaches to Galion

Designed specifically for the Galion grader, the B & L elevating attachment creates a one-man all-purpose machine for casting, loading, terracing, ditching, widening, and stripping. This elevating attachment is available with a 42-in. conveyor belt for Galion 118, 114, and 116 and a 24-in. conveyor for Model 503. These attachments are designed for fast installation in the field or may be installed directly at the factory. Among the features are fingertip hydraulic controls, permanently lubricated troughing rolls, adjustable plow disc, and extendable length carrier. Capacities range up to 1,800 yd. per hr. in casting. Information from **Construction Machinery Division, Barnard & Leas Manufacturing Co., Inc.**, Cedar Rapids, Iowa.



Standard plant with mechanical handling of materials

Operated by Industrial Asphalt at San Bernardino, Calif., and supplying road building material for jobs throughout the county, this Standard Model RB 6000 installation is turning out from 250 to 275 tons of hot mix per hour. The outstanding feature of the plant is a mechanical handling of all materials from the time they leave the dump trucks at the raw materials bins. As pictured, the plant includes the new Standard No. 830 dryer with dual dust collector and the semi-automatic batching system which provides a quick and simple control of all batching operations. The same producing organization is now erecting a similar plant at a new location at Little Rock, Calif. Information from **Standard Steel Corp.**, 5001 S. Boyle Ave., Los Angeles 58, Calif.



Barco announces the new Vibra-Tamp

A new portable gasoline powered vibrating compactor has been announced by Barco. Called the Barco Vibra-Tamp, this compactor combines positive impact from high speed counterweights, with intensive vibrating effect to produce maximum compaction of granular materials and bituminous surfacing. Among its many uses are the tamping and finishing of bituminous paving in restricted areas, the compacting of sand or earthfill and tamping inside of building areas. Operated by one man, the machine moves forward by its own power up to speeds of 50 ft. per min. on level surface and will handle 750 sq. yd. of surface per hour with lifts up to 12 in. The tamping shoe is 27 in. Power is provided by a 3-hp. air-cooled gasoline engine and the exhaust is passed through the tamping shoe. Information from **Barco Manufacturing Co.**, 500 N. Hough St., Barrington, Ill.



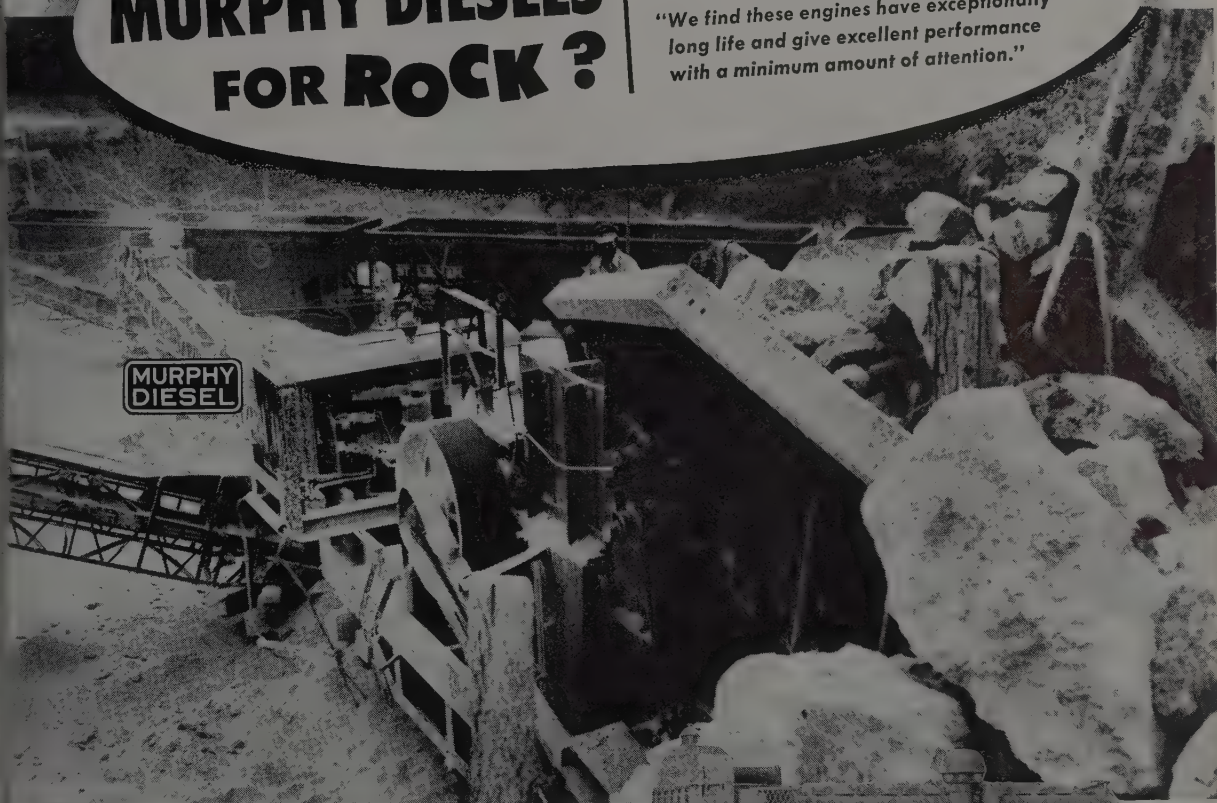
Small digger for tight places

The combination of a Model F Agricat equipped with a hydraulically operated backhoe attachment provides a unit which is particularly useful in digging small trenches in tight places. The unit has a 10-ft. reach and can dig to 6-ft. depth loading to a 7-ft. height. Information from **Jost Manufacturing Co.**, 742 Bancroft Way, Berkeley 10, Calif.

HOW ABOUT MURPHY DIESELS FOR ROCK ?

"Excellent," says
HAROLD S. BULLARD, Equip. Supt.
Amis Construction Co.

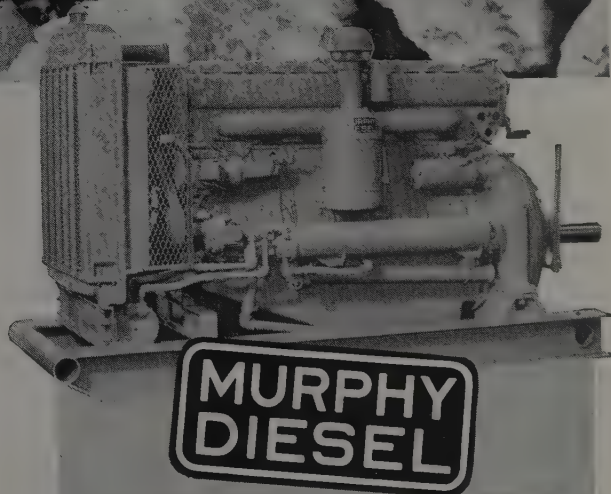
"We find these engines have exceptionally
long life and give excellent performance
with a minimum amount of attention."



● When we are asked about Murphy Diesels for tough rock service, we prefer to let an owner answer for us. Harold S. Bullard, Equipment Superintendent, Amis Construction Co., Oklahoma City, is well qualified to answer, too.

Amis Construction Co. bought their first Murphy Diesel years ago as original equipment on a shovel. Mr. Bullard says of this engine, *"We were very well pleased with the economy of operation and rugged dependability of this original Murphy engine and since that time have purchased other Murphys for heavy duty work in our vast operations. We now have them in use as power for rock crushers, generators, shovels and cranes."*

Here is one user's opinion. And the repeat orders remove any doubt as to his sincerity. But don't stop here. Ask other Murphy Diesel owners for their opinions, they are our best salesmen. Then ask your Murphy Diesel Dealer to show you how Murphy Diesel Power will fit into your operation.



Heavy duty power
for construction

Murphy Diesel Engines and Power Units are available in sizes from 96 to 264 H.P. Engine speeds are 1200 and 1400 rpm. "Packaged" generating units are available with capacities ranging from 64 to 165 K.W.

MURPHY DIESEL COMPANY

**5325 W. Burnham St.
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335



Vibrating rollers cut construction labor costs

Consistently averaging 98% of required compaction this Essick vibrating roller has proved unusually effective for Walter Radkovich, Los Angeles contractor. Savings have included not only labor costs but ability to move in close quarters and attain difficult compaction quickly. This Model VR54T, weighing 3,135 lb., produces consolidation of earth fills that exceed results obtained by many times heavier pneumatic tired compactors. Smaller models of 28-in. and 32-in. sizes are available. Information from **Essick Manufacturing Co.**, 1950 Santa Fe Ave., Los Angeles 21, Calif.



Soil stabilizing at one pass

For stabilizing road bed materials and particularly for producing soil cement the P & H "Single-Pass" stabilizer has a processing method which leaves the materials thoroughly pulverized, mixed, and spread. Stabilizing of base courses requires the meeting of several basic requirements and the P & H machine has been designed to: (1) provide positive depth control so all materials will be accurately proportioned, (2) does its own digging, (3) blends all material uniformly, (4) mixes materials thoroughly while maintaining a true subgrade, (5) applies liquids accurately and (6) spreads materials evenly for immediate compaction. Information from **Harnischfeger Corp.**, Milwaukee, Wis.



Trailer for black top pavers

With a self-contained power system, a new front-loading low-bed trailer has just been announced by LaCrosse Trailer Corp. This unit has been designed especially to provide fast transportation for black top pavers and rollers. Equipped with a simple cable lift arrangement, Model LXP-14 can readily be operated behind any standard truck, with or

without a truck hoist. The hydraulic pump located under the trailer bed actuates the cable which lowers the trailer platform. Energy for the electric motor comes from the battery of the towing truck. Models are of 8- and 14-ton capacity. Information from **LaCrosse Trailer Corp.**, LaCrosse, Wis.



Signs for contractors

Highway contractors have frequent need for temporary signs to direct or detour traffic during the construction period. Often the contractor needs these signs on a day's notice and Hawkins is prepared to deliver in about four days to most of the Western states. A typical sign is shown made of heavy alloy aluminum or zinc-coated steel and Scotchlite. Information from **Hawkins-Hawkins Co., Inc.**, 1255 Eastshore Highway, Berkeley 10, Calif.



Power steering for easy operation

Power steering by Garrison helps in the operation of truck cranes. This power steering is offered as standard equipment on most models of Lorain trucks and is optional on others. The Garrison product is standard equipment on these models. Information from **Garrison Manufacturing Co., Inc.**, 1500 S. Santa Fe Ave., Los Angeles 21, Calif.

THOMPSON RETREADS take rugged abuse among granite boulders on U.S. 299 realignment



2.42 miles of new road at Trinity River, California. 525,000 cubic yards of excavation. Contractor: John Delphia Co. and Humboldt Constructors. Superintendent: Earl Bernard.

The 9 big rubber-tired scrapers operating on the 4½ month dirt moving job over granite boulders and 25% grade were equipped with heavy duty Thompson Retreads. Bidding on this job was very close and the savings made by using Thompson Retreads were especially important. These retreads give new tire performance both in wear and efficiency at a fraction of replacement cost. They are non-directional for use on all wheels—traction or free-rolling—and provide maximum grip with self-cleaning design. Available in sizes 1800-24 through 27.00-33. In off-the-road retreading, Thompson alone provides the standard of quality required by the world's leading airlines.



Contact Thompson for prompt efficient service

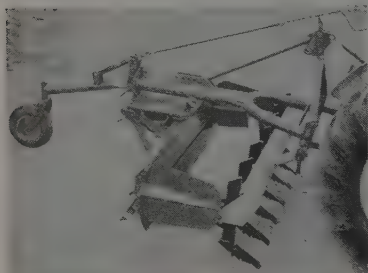
THOMPSON *Aircraft Tire* CORPORATION

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Be-Ge for speed

Working on a highway job in Oregon this 12-yd. WSS Speedhaul shown being pulled by a Wagn tractor, made in Portland. The Speedhaul is designed particularly for use with industrial wheel tractors. Sizes range from 9 yd. heaped 14 yd. heaped. Information from Be-Ge Manufacturing Co., Gilroy, Cal.



Arps utility blade has time-saving accessories

Two new accessories are available for the Arps tractor-mounted utility blade. A scarifier attachment designed to rip hard soils, sod, and blacktop prior to leveling and other dirt moving applications has seven teeth which may be set in three different depth positions. The ripper may be attached or detached in a moment. A new backfill flap which automatically moves downward into a backfill position when the blade is pushed backward allows the operator to backfill up against a wall without reversing the moldboard. Arps Corporation, New Holstein, Wis.



Cables for dumping save weight for Fruehauf

A new principle of dump trailer design is shown in this new Fruehauf Schonrock volume-dump trailer. It consists of using cables to accuate the dump body providing a simple device that eliminates the usual heavy hydraulic hoist mechanism. Moving parts have been reduced to only five in number. The saving in weight which results is translated into more payload. It becomes possible to extend the body and obtain maximum length from cab to rear axle. The new trailer is designed particularly for handling sand, gravel, dirt, and building materials on construction jobs. Simplicity provides for lower cost and high operating efficiency. Information from Fruehauf Trailer Co., 1444 S. Alameda, Los Angeles, Calif.

Four concrete cuts at the same time

On an air base paving job this Model 2400 Jointmaster sawing machine is making four cuts at the same time. As shown, the concrete in the foreground has been cut and the operator is waiting for the newly poured concrete to harden sufficiently for further sawing. The unit operates off the side forms, or may be adjusted to run on the concrete. The machine is equipped with improved hydraulic drive for easier handling. Design considers ease of transporting on highways. Information from Concrete Sawing Equipment, Inc., 331 N. Santa Anita Ave., Arcadia, Calif.



Waukesha power for construction equipment

The Waukesha Model 135-DKI turbo-supercharged diesel is a well-known power plant for contractor equipment. This 6-cylinder, 426-cu. in. compact plant develops a maximum of 185 hp. at 2,800 rpm. and has a large reserve for temporary overload or emergencies. The installation illustrated is in a Michigan turbo-diesel which is rated at 165 hp. 2,200 rpm. continuous duty. Information from Waukesha Motor Co., Waukesha, Wis.





ELEVATED TANKS



PRESSURE VESSELS



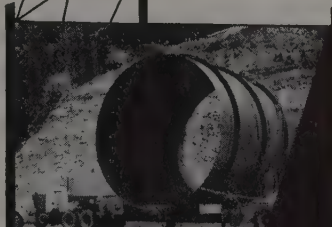
WELDED STEEL PIPE



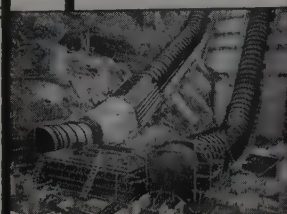
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TUNNEL LINERS



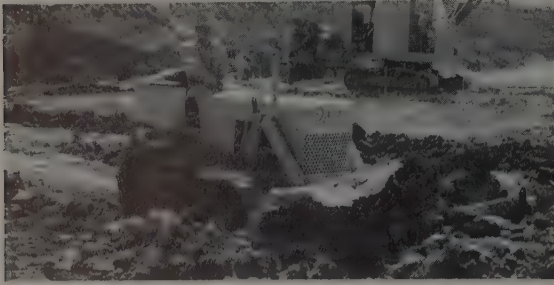
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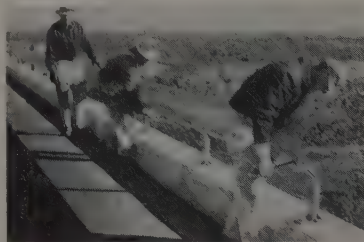


TerraTrac features high speed and power

Featuring a high power to weight ratio and high speed up to 7.68 mph. in reverse, the new TerraTrac Model 600 offers special features for highway contractors. The 62-hp. crawler tractor has a torque converter drive and automatic shifting hydraulic transmission and is powered by either gasoline or diesel engine. It develops a 15,860-lb. drawbar pull with adequate weight and traction. An exclusive feature permits full power turns at fingertip controls and smooth pivot turns with hydraulic foot brakes. Equipment includes a 1-yd. loader, a 72-in. bulldozer blade, a rear-mounted 5-tooth scarifier, and a 16,000-lb. winch controlled from the driver's seat. Information from **American Tractor Corp., Churubusco, Ind.**

Fast installation of steel guard rail

A bracket mounted directly on the concrete footing permits fast installation of Rheem-Beam highway guard rail. This HG-26N mounting bracket uses heat-treated chrome Vanadium steel spring leaves for strength and resiliency. The bracket mounts directly on two anchor bolts, installed in the concrete footing. All posts are eliminated with reduction in maintenance costs. The installation pictured is on California Highway 63 north of Visalia. The bracket is designed for



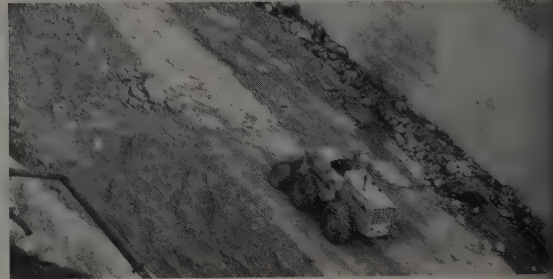
absorbing energy from impact shocks. Information from **Rheem Automotive Co., Box 2475, Terminal Annex, Los Angeles 54, Calif.**

Stripping forms from a bosun's chair

This could be a bridge pier but happens to be a test cell for aircraft engines built with specially prepared heat-resistant concrete. It is located at the overhaul base of TWA and is one of the first of its type in this country. The stripping of the panels is being carried out by a workman in a bosun's chair suspended from a crane boom. Symons forms were used for the 55,000 sq. ft. of concrete surfacing. Information from **Symons Clamp & Manufacturing Co., 4240 West Diversey Ave., Chicago 39, Ill.**

Model HO "Payloador": Double-duty workhorse on Western dam project

This new Model HO "Payloador" is proving its worth to the contractor on the San Antonio Dam project near Monrovia, Calif. Part of its job, as pictured, is to clear the spillway—and to work on a 40% grade in the process. In addition, the unit keeps a 75-ton per hr. batching plant supplied with sand and gravel, which it carries from stockpiles. The 4¼-cu. yd. capacity, 4-wheel drive tractor-shovel is equipped with complete power-shift transmission and torque converter drive and is powered with either gasoline or diesel engines. Bucket motion system tips the bucket back 40 deg. at ground level to secure heaped loads quickly and easily, even in shallow cuts and low piles. **Frank G. Hough Co., Libertyville, Ill.**



Safe, fast equipment loading

You can be sure of getting equipment on the job fast and with minimum labor with a Martin Folding Gooseneck trailer. When lowered, the platform forms a low incline on which even very low traction or to heavy equipment can be driven easily with no blocking or cribbing. Photograph shows lowered platform holding backhoe. Winch cable from tractor is then attached and gooseneck is winched up on the fifth wheel.



Travel locks are set and air and electric connections are attached, and unit is ready to roll. One man can do the job in five minutes. **Martin Machine Co., Kewanee, Ill.**





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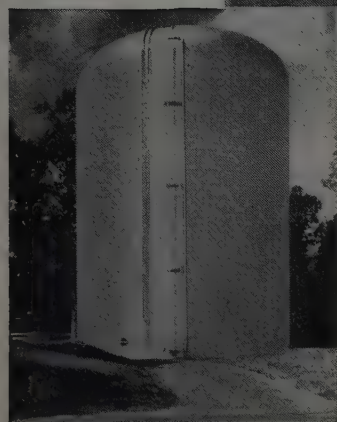


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MADRID, SPAIN.....	Diego DeLeon, 60		





"Hot Rod" asphalt plants announced by Madsen

Designed specifically for the medium and larger contractor and municipalities, a new portable batch type asphalt plant has just been announced by Madsen. Model 391 is built in 3,000, 4,000 and 5,000-lb. capacities per batch. Design has emphasized a plant that is extremely clean and simple, free of excess baggage and with a minimum of removable parts that require dismantling for transport. Among the many new engineering features is a fully enclosed, double reduction gear box eliminating the exposed mixer timing gears and the pressure injection pump motor. This device is the most practical method of handling the reduction from engine or motor to the speed of the mixer shaft. Fast production is possible on today's tight specifications. Information from **Madsen Works**, Construction Equipment Division, Baldwin-Lima-Hamilton Corp., P. O. Box 38, La Mirada, Calif.



Patchmobile for all types of maintenance

Purchased by the City of Walla Walla, Wash., this Model PM-215 Patchmobile of the Wylie Manufacturing Co. is a complete all-in-one unit. The elements include a rotary dryer, 165-gal. asphalt tank, engine driven-fuel and asphalt pumps, asphalt measuring system, pugmill, and tool heating compartment. Because of its compactness and completeness, this unit is a favorite of cities and counties for maintenance work. It reduces the number of equipment units on the street or road and thereby cuts traffic hazards. Normally, the heating system operates on propane, but the machine can also be equipped for low pressure oil burners or high pressure kerosene burners. Information from **Wylie Manufacturing Co., Inc.**, P. O. Box 7086, Oklahoma City 12, Okla.



Six models—one for every job

There is a model of Michigan tractor shovel for any type of highway job from loading aggregate to routine maintenance work. Model 125-A is shown loading out of a windrow on a paving project in San Diego. Capacity ranges are from 15 cu. ft. up to $2\frac{1}{4}$ cu. yd. Each one of these models feature: Short turning radius, four forward and four reverse speeds, power operated gear selection, hydraulic steering booster, and easy servicing. Information from **Clark Equipment Co.**, Construction Machinery Division, Benton Harbor, Mich.



Transport concrete to point of pour

Here's a unit that will make a hit with inspection agencies. It's a 3-yd. Rocket truck mixer, which, because of its small size and lightweight, can be brought in very close to the pour, requiring a minimum of chuting. **Concrete Transport Mixer Co.**, 4985 Flyer Ave., St. Louis 9, Mo.



Loads and screens at the same time

Largest addition to its line of portable conveyors and vibrating screens has just been announced by Kolman. Model 101 features a 42-in. belt 50 ft. long, mounted on dual tires and with accessories makes a complete portable conveyor-screen plant. It is shown loading a 20-ton truck in less than a minute while scalping out a heavy proportion of oversized rock. The single deck vibrating screen has been designed in proportion to the plant output. Information from **Kolman Manufacturing Co.**, Sioux Falls, S. Dak.

MAKE NEW PROFITS WITH A



COMPLETELY PORTABLE

BATCH PLANT

Made to be Moved...

Anywhere a truck can take it
with no over-width permit needed

Modern contractors and concrete producers know the importance of bringing the source of concrete close to the job. Conveyco has used its 35 years' experience in batch plant engineering to design a portable plant with every detail planned to produce components in easy-to-transport sizes . . . in a ready-to-run condition. It takes just one work day to erect a plant—and dismantling is equally as fast with a minimum of labor. All components travel by truck or trailer *without an over-width permit*. The Recirculating Silo with integral bucket elevator and operating mechanisms travels on its own pneumatic wheels as a semi-trailer. You only find this matchless portability and operating efficiency in Conveyco Batch Plants.

Built for Capacity as well as Portability, Conveyco "portables" feature either belt feed, bucket elevator, or crane-operated clam shell loading of aggregates.

**There's a Conveyco Batch Plant
for Every Batching Need**

Conveyco has for more than three decades specialized in the design and manufacture of portable and stationary concrete batch plants in capacities from 75 tons to 500 tons. It is this vast experience that has provided the equipment by which contractors produce concrete more efficiently — and more profitably.



No Over-width Highway Permit Needed for this Plant

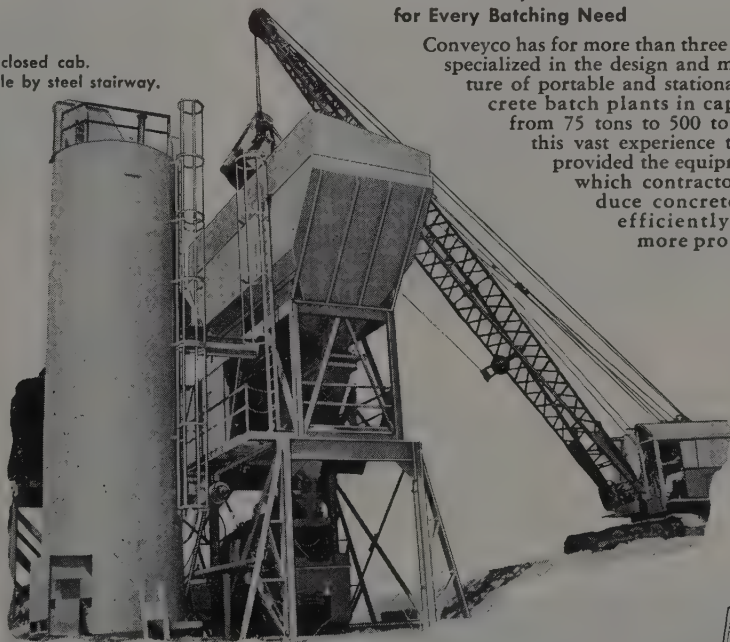
The 1½ and 2½ yard completely Portable Conveyco Batch Plants with capacity of 95 tons (135 tons with surcharge section), are designed specifically to move with the job—anywhere a truck can take them—and set up or take down in one work day. All components when loaded on 42" truck beds or semi's will measure no more than 8' x 9'6", giving adequate height clearance and within width requirements of most states. Plant is fully automatic or can operate manually. Recirculating Bulk Cement Silo, 10' wide, is equipped with dead axle and pneumatic tires to travel as a semi-trailer. Aggregate Loading Bucket Elevator travels assembled on trailer ready to set in place. Rescreen Unit is mounted on bin. Does not require a separate structure.



Fully enclosed cab.
Accessible by steel stairway.

The Conveyco 2½ yard Portable Batch Plant

(requires a 9' over-width permit) gives you needed capacity with a 4 compartment aggregate bin 9'0" 10'6" x 28'0" (115 tons or 165 tons with surcharge section). The operator's section is transported without changing any parts from their operating positions; all controls are connected. Plant can be operated fully automatic or manually. A single switchboard control panel with flexible wire leads can be connected to electric motors in one hour. Belt conveyor bucket elevator or crane-operated clam-shell can be used for aggregate loading. Recirculating Silo is 10' in diameter and travels on its own pneumatic wheels as a semi-trailer. Rescreen Unit can be added without additional structure.



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Please send free Catalogs describing Conveyco batch plants and auxiliary equipment.

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Road Show

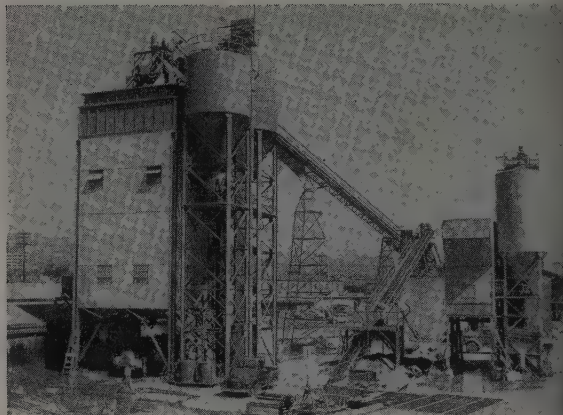
Batching plant for big production

Whether on a construction job or at a central mixing plant, the Noble 500-ton unit is designed for big production. Controls are centralized for one-man operation and accuracy is well within the strict limits of the Bureau of Reclamation or state highway departments. As a special feature a single elevator can be used to fill both batching and storage cement silos cutting down the investment and the operating cost. Picture shows a CA 500 plant owned by Rhodes-Jamieson in Oakland and used for ready-mix output. The CA 154 batching plant at the right background has been moved to another location. Information from Noble Co., 1860 7th Street, Oakland 20, Calif.



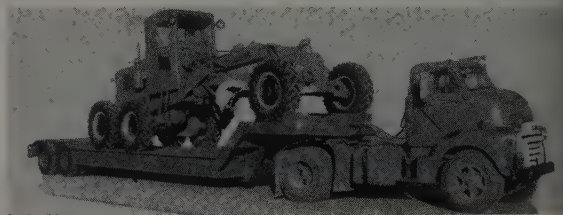
Vibratory strike-off screed

Master Vibrator makes a 36-ft. vibratory screed particularly adapted to finishing a deck slab on a freeway job. It was used for 10,000 lin. ft. of concrete deck slab in two lanes, each 36 ft. wide and 7 in. thick. Note the retractable wheels riding on the rails. These permit the screed to be raised easily and rolled back for another pass. The vibrating element is shown attached to the screed at mid-point. Information from Master Vibrator Co., Dayton, Ohio.



Simplicity screen operates trouble-free at 400 tph.

Photo shows a two-deck Simplicity gyrating screen selecting 2-in. highway base from tough, abrasive volcanic material for Baldwin Construction Co., Inc., Marysville, Calif. This 5 x 12-ft. Model D embodies the balanced assembly of all Simplicity screens to assure trouble-free operation even when handling capacity loads up to 400 tph. Gyrating and Simpli-Flo screens have found wide application in asphalt plants as well as for aggregate screening. Available in sizes up to 6 x 16-ft. three-deck. Simplicity Engineering Co., Durand, Mich.



Built for transporting earthmoving equipment

Highway contractors must make frequent moves with shovels, draglines, and dozers and to meet their needs Transport Trailers has designed a multi-purpose low bed trailer for fast rear loading and unloading. This Transport unit is particularly adaptable for motor graders and similar equipment. Model TPS has special gooseneck ramps and extended beavertail rear end. Design features include welded frame construction, tandem axle assemblies, cambered for maximum tire life, heavy duty brakes. Capacities range from 15 to 35 tons. Information from Transport Trailers, Inc., Cedar Rapids, Iowa.

Retreading giant tires

To meet the needs of the construction industry in maintaining its larger and larger tires, Thompson has available a mold to put on retreads for tires up to 8 ft. in diameter and 3 ft. in width. A new design of the Thompson special purpose retread results in greater traction and longer wear. Information from Thompson Aircraft Tire Corp., 18th and Minnesota Streets, San Francisco 7, Calif.

TRACTOMOTIVE

TL-12 TRACTO-LOADER *demonstrates*

all-around ability

on expressway job



TIP-BACK BUCKET RETAINS FULL LOAD while crossing pavement to load truck on Congress Street expressway job in Chicago. Says Jim Flanagan, foreman for contractor, **M. J. Boyle & Co.:** "The TL-12 comes in handy because it can cross paved lanes, even when forms are still in. This is one place where the 4-wheel drive really pays off."



"A VERY CONVENIENT TOOL," said Mr. Flanagan, "we use the TL-12 for everything." One of its jobs is dumping material on fill over railing (at right in picture), then leveling the material on fill. Other jobs include loading crushed rock, backfilling, fine-grading between forms, pulling fine-grading equipment and pneumatic rollers, carrying fuel drums, transporting and loading sewer pipe.

ALY LOADS THE HIGH TRUCK BODIES Has 10-foot dumping clearance. Can clear trucks with boards 9 feet, 8 inches high by retracting bucket. Has long reach, too, because tires do not extend out of cowl. Loader can get close to truck, place material in center — no time wasted bulldozing or distribute load.



KEEP YOUR JOB IN HIGH GEAR

with the fast-working TL-12 Tracto-Loader . . . a rugged, 4-wheel drive excavator-loader that combines a tip-back bucket and power steering with hydraulic torque converter drive and clutch-type transmission. 1 1/8 cubic yard bucket — choice of diesel or gasoline engine. Various interchangeable attachments.

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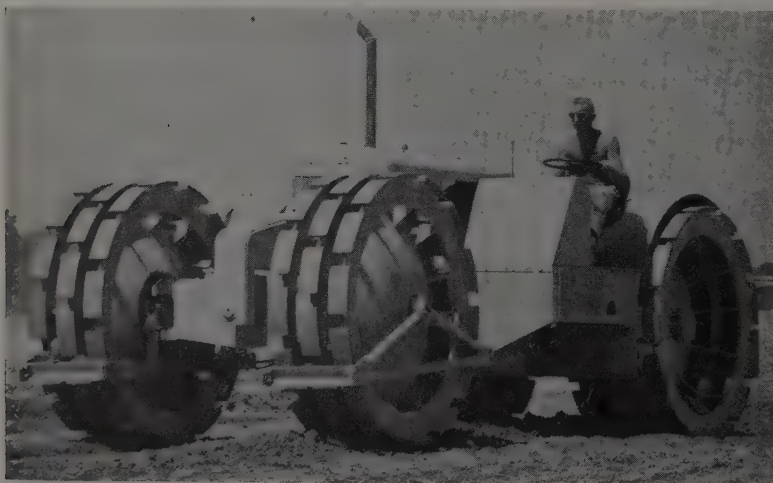
WASHINGTON
A. H. Cox & Company—Seattle
American Machine Company—Spokane
Mid-State Equipment Company—Wenatchee

WYOMING
Studer Tractor & Equipment Company—Casper



Taking on an 18-yd. load

In the relocation of U. S. Highway 30, Rogers Construction Co. of Ontario, Ore., is moving 440,000 yd. of material. This Euclid S-18 is shown loading 18 yd. struck capacity of waste fines from a portable rock crushing plant. The overhung engine scraper features a 300-hp. engine, torqmatic drive, no-spin differential, and planetary drive axle. Design features ease of operation and maintenance. The unit makes a non-stop 180-deg. turn in only 36 ft. Information from Euclid Division, General Motors Corp., Cleveland 17, Ohio.



Compactor looks and is unusual

Contractors state that Buffalo-Springfield K-45 Kompactor saves them 50% over regular compaction costs. It is fast and efficient with its four large roller wheels faced with staggered rows of heavy steel pads. These pads enter the loose material with a minimum of displacement either forward or sideways, and then leave without disturbing the compacted area. It is this principle that keeps loose material from flowing ahead of the roller. The principle of interrupted pressure secures more uniform density from lower elevations to the top surface with a minimum number of passes. The unit is self-contained, has a top speed of 5 mph. and a weight of 32,000 lb. Information from Buffalo-Springfield Roller Co., Springfield, Ohio.



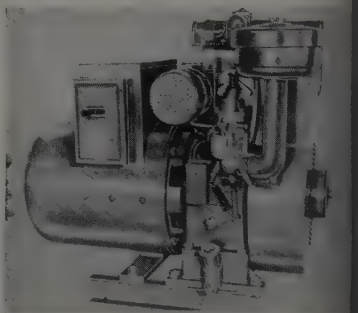
New self-propelled roller

New Model SPR-9 BMCO is a much improved 1956 model of self-propelled pneumatic tired roller. Power plant may be selected from either of Chrysler or Continental engines and operate through a torque converter. Information from Brown Manufacturing Co., 111 Humboldt Ave., San Antonio, Tex.



Symons centers motor

By centering the motor on a 48 in. x 14 ft. and 48 in. x 16 ft. screens Symons Brothers has provided better balance, shorter belt centers, and overall neater appearance. Information from Symons Brothers Co., North Hollywood, Calif.



Higher speed; small size

Illustrating the trend in portable electric generating sets, this Model 71-B has an engine speed of 3,600 rpm. which permits a smaller size and lighter weight unit. Information from Universal Motor Co., Oshkosh, Wis.

new DW21 makes 15 round trips per hour on 1200-foot round-trip haul in Montana



on Tenth Avenue, South, in Great Falls, S. Birch & Sons Construction Co. is rebuilding four miles of bypass connecting U. S. Highways 87, 89 and 91. The \$54,000 contract calls for widening the route from two lanes to four lanes, divided. Completion of the one-year project is scheduled for August, 1956.

A CAT* DW21 Tractor (Series C) with a No. 470 LOWBOWL Scraper is shown here loading material from the old road surface. It makes 15 round trips per hour over a haul distance of 200 yards each way. The rig has done 90% of the earthmoving on this job, according to C. F. Graves, foreman. He says: "It's the best piece of rubber-tired equipment I ever saw. It does a good job of ripping up the old oil surface, and in dirt it can do a pretty good job of grading itself."

Guy Haney, the superintendent, adds: "Our new DW21 is a honey. It has fine power and traction and the No. 470 definitely loads much easier than any other scraper we ever used."

Wherever these new units are in action, that's the kind of reports that come in. The DW21 (Series C), with its 300 HP (maximum output) Turbocharged engine, is perfectly matched with the No. 470 LOW-BOWL Scraper. The lower, wider bowl design loads more earth faster and with less effort. That means consistently better cycle times and bigger production.

If you haven't seen the DW21-No. 470 unit at work, ask your Caterpillar Dealer for a demonstration right on your job. Hold a stop watch on it and prove for yourself that it will outwork any comparable wheeled rig.

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

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



Completely new portable gunning rig

More automatic and versatile than any other similar unit, a new rig has just been made available by Air Placement Equipment Co. which combines new features increasing capacity and flexibility. Three basic pieces of equipment are combined: the Nucretor concrete gun, the Mix Elevator for automatic proportioning and dry mixing, and the sand loader. This last element is an important 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 and is provided with the new Airplaco nozzle. The rig is designed particularly for jobs where it is necessary to move the equipment from one site to another with a minimum of downtime. Information from Air Placement Equipment Co., 1009 West 24th Street, Kansas City, Mo.



Ripper can go to 60 in.

This Southwest RXH-3 giant ripper has a weight of 25,000 lb. and is designed for use with today's largest crawler tractors. It has standard shanks which provide three depths of digging—36, 42, and 48-in. Using a single special center shank a maximum penetration of 5 ft. can be accomplished. Shanks are of alloy heat-treated steel with replaceable hard-faced points. Information from Southwest Welding and Manufacturing Co., 3201 W. Mission Road, Alhambra, Calif.



Asphalt spraybar with minimum adjustment

This Rosco unit will maintain a nozzle discharge through any length of spraybar from 1 up to 24 ft. without changing pressure and without any application adjustment. A single lever handles the metering master valve and has within it an adjustable by-pass requiring only one setting at the specific pounds pressure required for the job. The valve automatically compensates for volume variation of material pumped and maintains pressure over the entire length of spraybar. As a result of this control, asphalt can be applied without need of pump metering and the discharge need not be measured in relation to pump revolutions. Information from Rosco Manufacturing Co., 3118 Snelling Ave., Minneapolis 6, Minn.

Cleaver-Brooks multi-duty steamer

For years contractors and highway departments have asked for a bigger capacity machine that would be suitable for extra duty such as pile driving, steam cleaning, and thawing. Cleaver-Brooks has now developed the PS-50 to meet this demand, providing a capacity twice that of previous car heaters. Designed with a top efficiency boiler, this unit produces 1,725 lb. of dry steam per hour. The four-pass design draws maximum heat from the flames and also provides for quick starting. The unit is trailer mounted and readily towed. It is insulated with 2-in. thickness of Fiberglas and designed for fast and simple maintenance. Information from Cleaver-Brooks Co., 326 E. Keefe Ave., Milwaukee 12, Wis.



Scarifier attachment for Pulvi-Mixer

A new accessory for use with Seaman Trav-L-Plants and Pulvi-Mixers has just been made available. This accessory is an inexpensive underbody scarifier attachment with 6 heavy-duty teeth and header board or curb shoe, for light scarification in combination with the in-place mixer. It bolts onto the frame between the front and rear wheels of the mixer and is hydraulically controlled from the operator's station. The Trav-L-Plant (not shown) is designed for in-place mixing of all types of road material for bituminous, soil cement or chloride roads, blending and placing the mixed products. In addition to mixing the plant also applies accurately all of the binding materials and is equipped with pump spray bar and other accessories. Information from Seaman-Andwall Corp., North 25th Street, Milwaukee 1, Wis.

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Yellow Strand keeps scraper producing at top efficiency.



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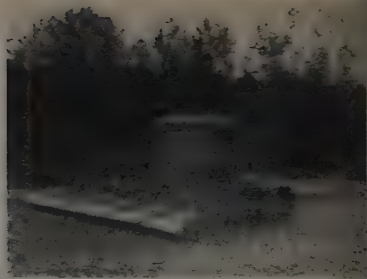


American Logging Tool Corporation is a
subsidiary of Broderick & Bascom Rope Co.



Allis-Chalmers grader has all features

With all the standard features and many optional items the Allis-Chalmers 45 Motor Grader meets all requirements for Western highway use. Shipping weight is 23,800 lb. and speeds are up to 20.6 mph. forward and 7.0 mi. in reverse. Steering is a combination of mechanical and hydraulic and the mold-board is 12 ft. long and 22 in. in width. The power plant is Allis-Chalmers with maximum brake horsepower of 120. Information from Allis-Chalmers, Construction Machinery Division, Milwaukee, Wis.



Vibro-tamper is wide or narrow

With a width that can be adjusted from 8½ to 13 ft. and a travel speed of 14 ft. per min., the Vibro-tamper is credited with compacting material in two passes which would require several by other means. Sub-bases for highways can be placed in a single course without slip planes. Compaction to 95 Proctor can be produced. Each shoe has a contact area of 240 sq. in. Vertical vibration rate is 2,200 per min. Information from International Vibration Co., 16701 Waterloo Road, Cleveland 12, Ohio.



Simple, compact, trouble free is the G60

With a nominal rated capacity of a 3-ton batch this Cedarapids Model G60 can handle batches up to 7,500 lb. depending on the aggregate, its dryness and the specifications. The plant was designed and engineered to meet the increasing demand for faster operations, lower production costs, and bigger tonnage. With its special features it will enable contractors to secure the larger contracts. As compared to a 4,000-lb. plant the Model G60 increases output up to 50% with no increase in labor and completes the job in less working time. Simple self erecting equipment means the G60 can be assembled in a few hours without cranes. Information from Iowa Manufacturing Co., Cedar Rapids, Iowa.



A popular model on highway work

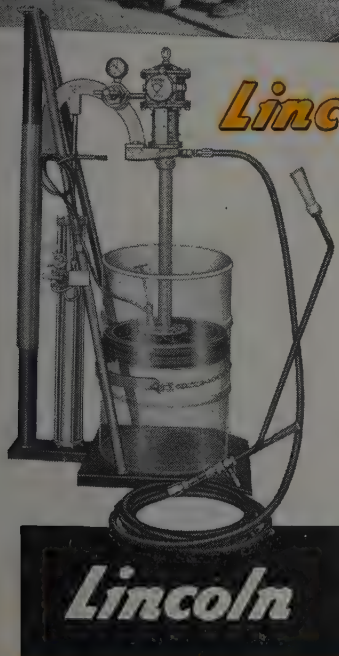
P & H Model 955-A of 2½-yd. capacity is a popular machine on highway construction operations. Featuring the Magnetorque Swing, which uses electro-magnetic forces without friction, it swings 15 to 25% faster. The model is particularly suited for handling rock with all-welded construction to withstand shock loading, direct acting hydraulic control and a rapid reversing chain crowd. Another feature is its easy conversion from shovel to dragline, clamshell, or crane. Low center of gravity and extra long and wide crawlers make it possible for Model 955-A to handle longer booms and larger buckets. Information from Harnischfeger Corp., Milwaukee, Wis.

Form ties for concrete culverts

On a highway project near Brighton, Colo., the Latimer Construction Co. used the Gates system in forming a series of concrete culvert. These form ties are adaptable to various phases of concrete construction work. They include the Gates horizontal rod system of forming 8-ft. panels and the Gates rod-type ties. Information from Gates & Sons, Inc., 80 S. Galapago, Denver 23, Colo.



cut costs **75%** with the *Lincoln* method of highway joint sealing!



Lincoln POWER-OPERATED

pumping systems deliver amazing economy with cold application of ready-mixed sealing compounds. Tests by highway engineers prove that this method of joint sealing is actually 75% more efficient than hot mix methods.

Lincoln Power-Operated Dispensing Systems save time and labor. Ready mixed sealing compounds are applied cold—from original 55-gallon drums. No transferring, proportioning, weighing.

Reduce operating costs because waste is eliminated, every ounce of material is used—and you need no extra kettles or agitating devices. Burns and other accidents are eliminated.

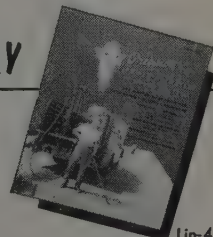
Satisfaction guaranteed because joints are sealed solidly, top to bottom with uniform application of material under pressure.

What's more, your Lincoln Power-Operated Pumping System works in any weather... assures sealing of maximum joint footage at lowest cost per man-hour, per day.

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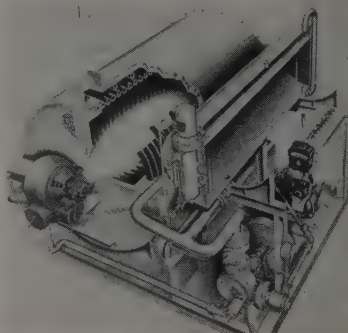


Allis-Chalmers model of 15-yd. scraper

Powered by an Allis-Chalmers diesel of 280 hp. this motor scraper (TS-360) has a truck capacity of 15 yd. It heaps at 20 yd. and the payload is 25 tons. Forward speeds are up to 20 mph. with 3 mph. in reverse. Width of cut is 9 ft. 8 in. for depths up to 10 in. and the depth of spread is a maximum of 20 in. Shipping weight is approximately 49,000 lb. Information from Allis-Chalmers, Tractor Division, Milwaukee, Wis.

Choose your drill from 3 to 24 in.

This McCarthy vertical auger drill Model 106-24 is shown putting down 150-ft. holes of 8-in. and 10-in. size on a highway construction project. Interchangeable size permits choosing the most suitable auger for each drilling depth. Size ranges from 3 to 24 in. in diameter and the machine is particularly suited for drilling holes for explosives, exploration or heavy-duty contract work. An auxiliary speed-reducing unit permits cutting down the rotary speed and increasing the torque for the larger diameter augers. Information from the Salem Tool Co., Salem, Ohio.



Oil heater has weatherproofed controls

A unique feature of the Bros oil heater is the fact that the entire electrical system is weatherproofed and all controls are centralized on a weatherproof electric control box. This Hi-Heat heater is applicable where the desired temperatures are up to 500 deg. F. and operation at low pressures is desirable. With heating pressures below 15 psi. operational economies are large. The internal construction as indicated provides positive control flow of the oil volume through the heating chambers. This constant flow and control of the high temperature oil guarantees uniform heat transfer and maximum efficiency. Information from Wm. Bros Boiler & Manufacturing Co., 1057 10th Avenue S.E., Minneapolis 14, Minn.



Backhoe designed for Fordson-Major tractors

Sherman Products, Inc., has introduced a hydraulic backhoe specially designed and built for attachment to Fordson-Major tractors. Known as the Sherman Major, the unit has been made available after two years of development. With a swing of 180 deg. it will dig to a depth of 12½ ft. and can clear a height of 8 ft. 8 in. for truck loading. An important feature of the rugged machine is the twin crowd cylinders for extra balanced power in digging. Linkage on the bucket provides a powerful stroke with up to 5,000-lb. effective pressure through the 9 ft. of bucket travel. Production of the unit was under way in March and President Romain predicts that "this latest Sherman digger will become a new standard of the industry." Information from Sherman Products, Inc., Royal Oak, Mich.



Trucks for handling rock

This truck body of 22-cu. yd. capacity on a Fruehauf trailer is a Perfection TRB-22 handling rock on a heavy construction job. The unit is one of a fleet of 12. Each is equipped with a single telescopic hoist for end dumping. Information from The Perfection Steel Body Co., Galion, Ohio.

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Marmon-Herrington all-wheel-drive supports heavy duty performance

Marmon-Herrington all-wheel-drive Fords, like the one pictured, can perform heavy tasks off the highway and still operate at express speed over the highway. Contractors are finding Fords equipped with all-wheel-drive answer a great variety of taxing demands from snow removal, year-round hauling of sand and gravel, and road construction to use with underbody blades and other equipment. Up to 200 hp. and 29,000 gross vehicle weight is available in these sure-footed vehicles. **Marmon-Herrington Co., Inc.**, 1511 W. Washington St., Indianapolis 17, Ind.

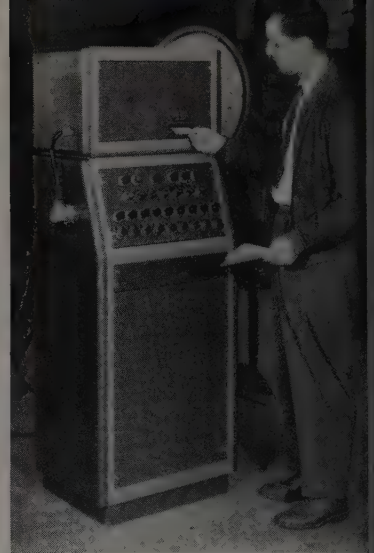
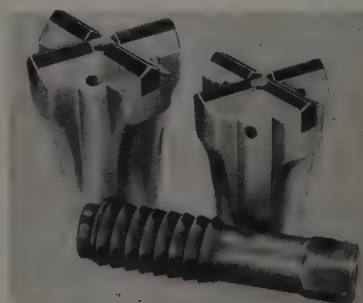
Frameless design permits greater legal payloads

Additional legal payloads can be hauled in the Anthony Teleramic frameless dump trailer, literally a "dump body on wheels," which eliminates the conventional trailer frame and uses only one front-mounted head lift telescopic cylinder. When a load is dumped, the entire front end of the trailer is lifted by the cylinder mounted on the tractor fifth wheel coupling. In raising or lowering, the trailer body pivots around the rear wheels. During this cycle, tubular stabilizer arms, pinned both to the hoist-fifth wheel and the trailer body, give added support for a variety of loads and working conditions. **Anthony Co.**, Streator, Ill.



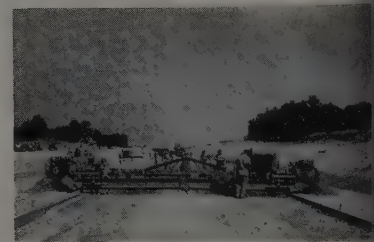
Rok-Bits without adaptor

Bits that fit directly on G-D extension rods without requiring extensive adaptors have been announced by **Brunner & Lay, Inc.**, in a 600-series. The bits are provided with carbide inserts and sizes from 2½ to 3½ in. In the X-design, each bit has 5 air holes, one in the center, two on the cutting face and two side holes to improve chip removal. Information from either the Portland or San Francisco office of **Brunner & Lay, Inc.**



Concrete mix control by IBM cards

An electronic batching system for concrete mixes that will work in conjunction with IBM punch cards has been perfected by the Heltzel Steel Form and Iron Co., after more than 2 yr. of development. Called the Helco-matic Batchmaster, it combines for the first time the speed and accuracy of electronics with acceptable weighing units. Housed in a compact stand, the unit takes IBM punch cards and will instantly and automatically select and weigh out the amount of materials indicated by the card. Combinations of weights are unlimited. The insertion of a different card changes the batching. Push button controls are provided for manual batching. Maintenance has been considered in grouping the related components in a drawer which can be easily removed. Information from **The Heltzel Steel Form and Iron Co.**, Warren, Ohio.



A Finegrader takes the curves

Designed to take highway curves with continuous operation and to grade to exact specifications, a new **Gar Wood-Buckeye** power Finegrader has been announced. With its special feature known as **Grade-A-Curve**, it cuts to specifications all the way eliminating extra costs for a thick slab and protecting against penalties from a thin slab. Information from **Gar Wood Industries, Inc.**, Wayne, Mich.

Low Cost Loading

**WITH NO SACRIFICE OF
STRENGTH OR CAPACITY**



KOLMAN

**MODEL 202
CONVEYOR**

40' x 24" belt Model 202 conveyor
with 6' x 36" screen

ged Box-Type Construction mits Amazing Low Price

Here's the answer to low cost materials handling. Prices of the KOLMAN Model 202 conveyor so low you'll be amazed—yet design and operating features the very finest.

The Model 202 meets the demand for a conveyor in the low cost field stout enough to carry a single or double-deck vibrating screen and loading trap in a completely portable conveyor-plant.

'Box-Type' Construction

The rugged "box-type" construction the Model 202 conveyor gives it unusual strength and rigidity. The sides fabricated of 3/16" steel plate welded into a channel 16" deep with 2". The steel belt cover reaches completely across the top, completing the box and completely encasing the return

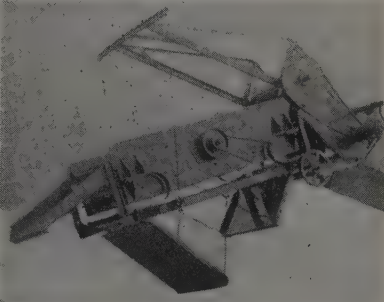
belt to prevent materials from working in to cause belt damage.

The under-slung power unit provides easy access for servicing and operation from the ground. This is an ideal feature for the operator who has to stop and start his plant frequently during the day. The V-belt drive assembly assures positive and efficient transmission of power and the motor mount design provides for quick and easy adjustments to maintain proper belt tension through a turn-buckle arrangement.

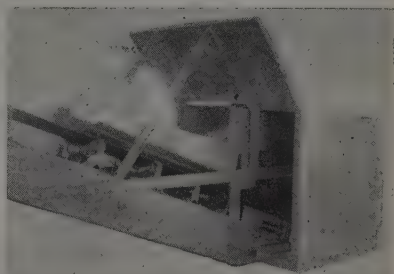
Folding Feature

The 202 is available with the Head Pulley Clutch feature which allows the belt to be stopped and started while the vibrating screen remains in operation. All plants with screens attached also have the folding feature, which permits the screens to be folded back under the conveyor when towing without removing any of the mounting or drive assemblies.

The KOLMAN Model 202 is rugged enough to carry a loading trap and large vibrating screen without additional support. It will take the kind of punishment that is dished out to a portable outfit—and will cost you far less money to own and operate. Available in 18" or 24" belt widths, in lengths up to 50'.



Rugged construction of Model 202 permits use of double-deck KOLMAN screens to make several sizes of material at once.



Portable feeder-trap combination available as integral part of conveyor. Gives positive constant flow of material.

SEE YOUR NEAREST DEALER

CALIFORNIA

AKERSFIELD—Inland Equipment Co.,
Highway 99 and Olive Drive
L MONTE—Warnock-Bancroft Equip. Co.,
9635 Rush Street
RESNO—Allied Equipment Co.,
1824 Santa Clara
MARYSVILLE—Valley Truck & Tractor Co.,
100 "D" Street
OAKLAND—Spears-Wells Machinery Co.,
1832 West Ninth Street
ACRAMENTO—Sacramento Valley Tractor Co.,
Broadway and Nineteenth Street

IDAHO

COISE—The Sawtooth Company,
1115 Grove Street

NEVADA

LYKO—A-D Machinery Co.,
251 W. Commercial Street

OREGON

PORTLAND—Western Equipment Co.,
2244 N.W. Savier Street
EUGENE—Western Equipment Co.,
1360 W. First Avenue

UTAH

SALT LAKE—Rasmussen Equip. & Supply,
1960 S. Second West

WASHINGTON

SEATTLE—Andrews Machinery of Wash.,
3640 E. Marginal Way
SPOKANE—Andrews Equipment Service,
126 S. Walnut

Western Representative

S. A. MADRID
1739 32nd Ave., San Francisco 22

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KOLMAN Manufacturing Co.

5670 W. 12th St.
Sioux Falls, S. D.

Please send literature on

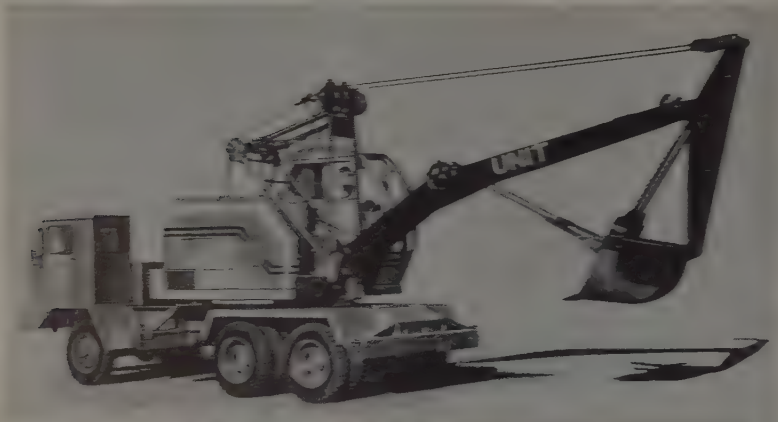
- ☐ 101 Heavy Duty Conveyors
☐ 202 Conveyors
☐ Vibrating Screens
☐ Feeders ☐ Traps

Quote.....size or.....cap.

Name

Address

City



Unit Crane announces new 3/8 yd. model

New in design and construction Unit Challenger Model 510 includes features of hydraulic clutch control, full floating support frame, self-aligning truck wheels, front-end wheel drive, and full range motion from the cab. The unit is powered by Ford heavy duty industrial engine with torque converter. In common with other models of the line, this new unit has a one-piece cast gear case and straight-in-line engine mounting. Information from the Unit Crane & Shovel Corp., 1401 W. Vermont St., Milwaukee 18, Wis.



Loadmaster Lo-Boy trailer

With a weight rating of 13,500 lb., this trailer has a 65-ton capacity. The construction is full bottom. Design permits use not only as a trailer to handle heavy equipment but also as a flat for loading all other types of construction materials. Length from king pin to center of bogies is 20 ft. Information from Miller & Smith Manufacturing Co., Inc., 500 Princeton Ave., N.W., Albuquerque, N. Mex.

Spreads up to 1,000 tons per hour

Spreading at depths up to 10 in. and with widths from 10 to 30 ft., the Jersey Spreader has established records of up to 1,000 tons of material per hr. over extended periods of time. Adjustments are quick and simple. Overall width is 11 ft. and an overall height of 48 in. Total weight, without engine, is 4,200 lb. The power-hydraulic tractor D-8, HDA-20 or TB-24, can be used for normal work and attached to the Jersey Spreader in less than 30 min. The spreader can be used with either cable or hydraulic tractor equipment and is attached in the same manner as a loader. The hopper holds any type of aggregate permitting a versatile use. Information from Tractor Spreader Co., Washouck Heights, N. J.



Fast positioning of fast ditcher

Backhoe Model 1000, a wheel-type fast ditcher designed for cross-country work as well as any job, wheel drive is operated by a system from the operator's seat raising and lowering is achieved by digging wheel or transfer system. The hydraulic drive for the ditcher conveyor is also controlled from operator's seat and is protected from damage by towed frames. Maximum digging depth is 5 1/2 ft., with spreading width from 10 to 12 in. Information from Gar Wood Industries, Inc., Wayne, Mich.



High mobility and versatility

This new 'Quick-way Model 125A shovel, a 6,000-lb.-ton machine is shown on road construction in Colorado. Because of their ability to get around from job to job, these units are particularly suited to many phases of road and highway maintenance and construction operations. Information from Quick-way Track Shovel Co., 1401 E. 40th Ave., Denver, Colo.



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next

And this
for the pas
profession
prove the
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FIRS

See 1956—WESTERN

**INTERNATIONAL sells
more 6-wheel trucks than the
next two makes combined!**



And this kind of sales leadership has been going on every year for the past 21 years! One big reason: Actual cost records of the professional fleet operators—the men who *know* truck costs—prove these trucks cost less to own. Let your INTERNATIONAL Branch or Dealer show you in black and white, today. INTERNATIONAL HARVESTER COMPANY, Chicago.



FIRST with men who know truck costs!



Small asphalt plant with big output

Using a side slope installation this White Model L-8 portable asphalt plant is producing hot mix for driveway and parking lot paving. Use of the slope enables the plant to be set up without piers or other form of elevation. Production of the L-8 plant is about 15 tons per hr. It is complete with asphalt heating tank, dryer, power, and an 850-lb. mixer. If steady production is desired, a distributor is frequently used to provide an additional supply of asphalt as shown. The manufacturer announces a new Model L-10 similar but with larger capacity. This new model will have a 1,000-lb. batch mixer and an aggregate dryer 4 ft. in diameter and 10 ft. long. Capacity will be 20 tons per hr. and the new model will be the lowest priced plant of its capacity on the market. Information from **White Manufacturing Co., Elkhart, Ind.**



Large jaw crusher on mobile plant

This is one of Lippmann's portable crushing plants mounting a 30 x 42-in. Grizzly-King jaw crusher. The 15-ft. x 42-in. apron feeder, also mounted on the plant, takes the shovel load directly and feeds it to the crusher. The plant is shown delivering 250 tons per hr. of 4-in. stone. The three conveyors in the background are 24-in. portables of 70-ft. length. Information from **Lippmann Engineering Works, 4603 West Mitchell St., Milwaukee 14, Wis.**



Reos haul concrete for Hall in Denver

This line-up of Reo transit mixers belongs to the Hall Sand & Gravel Co., Denver, Colo. The first truck is a Reo A-630 equipped with a 6-yd. Challenge mixer. The other units are F-226M and F-506M trucks also equipped with 6-yd. mixers. These Reo tandems are designed to move big loads fast and combine power with easy maneuverability both on and off highways. A wide selection of Timken or Eaton heavy-duty tandem axles are available. Wide base rims provide maximum stability and tire life. The power plant is the Reo Gold Comet engine. Reo claims the only complete line of truck engines with an unprecedented 100,000 mi. or one year warranty. Information from **Reo Motors, Inc., Lansing 20, Michigan.**

High density compaction

The Roadpacker (Model C) uses the vibratory method for securing faster uniform compaction of highway base courses, gravel sub-bases, and soil-cement bases. The normal unit includes six 420-lb. shoes providing the vibrating and tamping action. These shoes are 26½ x 25½ in.



and the sole plate is designed for either forward or backward operation. Vibration is directed vertically into the ground. The shoes are pressure lubricated and are driven hydraulically through a completely sealed system. Information from **Roadequip Manufacturing Co., 30210 Lakeland Blvd., Wickliffe, Ohio.**



Mower attaches to motor grader

The "Hydro-Clipper" attaches by only 4 bolts to an Allis-Chalmers Model D motor grader and the mower is operated entirely by the hydraulic pump on the grader. When lifted to transport position the total width of the machine is only 95 in., while the height of the cutter bar, when raised, is approximately 7 ft. This is the same Hydro-Clipper mower that has been used successfully with wheel tractors. All controls can be operated from the cab and the operator can change from grading to mowing by a single control lever. The cutter bar operates from an angle of 45 deg. below the horizontal to a full 90-deg. vertical position. Information from **Triumph Machinery Co., Hackettstown, N. J.**

(Road Show continued on page 231)

WHIP WEIGHT PROBLEMS and HAUL

BIGGEST LEGAL PAYLOADS

ANTHONY
HYDRAULIC

Teleramic

FRAMELESS Dump Trailer Units

A completely new way to get more profit producing Payload—a frameless dump trailer that is literally “a dump body on wheels!” Elimination of the conventional extra trailer frame and other unnecessary dead weight mechanisms, makes possible up to 2000 lbs. extra legal payload by using a single Anthony telescopic hoist of new Teleramic head-lift design. Hoist location over tractor driving wheels gives excellent traction for spreading. Sloping tailgate lets you stockpile high and clean. Write or call today for the “Complete Frameless Story.”

THE MOST COMPLETE LINE OF TELESCOPIC HOISTS



ANTHONY COMPANY, Dept. 5653, Streator, Illinois

Please send me additional information on Anthony Teleramic Hoists used for the following body classifications.

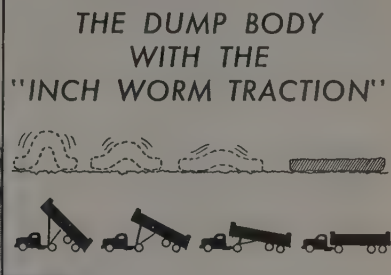
- ☐ Contractor Bodies
☐ Asphalt Bodies

- ☐ Rock Bodies
☐ FRAMELESS DUMP TRAILERS

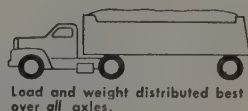
I have the following make and model of truck.

Name _____
Firm _____ Address _____
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ANTHONY COMPANY • STREATOR, ILLINOIS



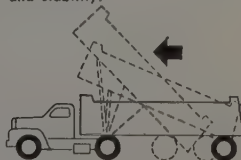
“Inch Worm Traction”
lets you get out of
soft spots by hy-
draulic power.



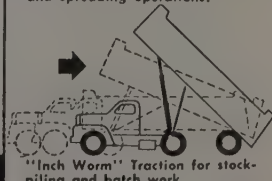
Load and weight distributed best
over all axles.



Maximum power, leverage safety
and stability.



“Inch Worm” Traction for fill
and spreading operations.



“Inch Worm” Traction for stock-
piling and batch work.

ARIZONA

Big construction jobs for the West

RECENT MAJOR CONTRACT AWARDS and low bids in Arizona include a low bid of \$208,757 submitted by **San Xavier Rock & Sand Co.** of Tucson for grading and surfacing in Pima County. **Tucson Pavers, Tucson**, submitted a low bid of \$64,899 for 1.8 mi. of grading and surfacing near Tucson. **Martin Construction Co.** of Tucson submitted a low bid of \$340,196 for grading and surfacing in Pima County. **Gilbert & Dolan Enterprises, Inc.**, of Phoenix, was awarded a \$375,000 contract for construction of the Safari Hotel in Scottsdale. A low bid of \$184,319 was submitted by **B. L. Gustafson Construction Co.** of Phoenix for 1.6 mi. of grading and surfacing in Pinal County. A low bid of \$196,295 was submitted by **Western Constructors, Inc.**, Phoenix, for grading and surfacing the San Manuel-Tiger Highway in Pinal County. **Peter Kiewit Sons' Co.**, Phoenix, submitted a low bid of \$749,174 for schedule A, Grand Canyon Project in Coconino County. **Fisher Contracting Co.** of Phoenix submitted a low bid of \$314,412, for approximately 2.7 mi. of grading and surfacing in Pinal County. **Cyr & Evans Contracting Co.** of Tempe submitted a low bid of \$181,665 for 11 mi. of grading and surfacing in Cochise County. **Tiffany Construction Co.**, Phoenix, submitted a low bid of \$311,004 for grading and surfacing in Yuma County.

CALIFORNIA

WORK WAS EXPECTED to begin in May on the \$8,000,000 Harbor project in Redondo Beach. The contract is held by **T. E. Connolly Company** and **Connolly-Pacific Company** of Long Beach. The contract covers rehabilitation and extension of the present breakwater and construction of a south breakwater on a bid of \$4,900,000. The basin to be formed will provide anchorage for 1,000 small vessels and eliminate erosion conditions along the city's north beach.

THE STATE has leased to Utah

Highways

THE HOUSE OF REPRESENTATIVES has passed and sent to the Senate the Fallon Bill, authorizing a \$51,000,000,000, 13-year national road-building program. It was the largest peacetime public works project ever approved by the House; in fact, it authorized the biggest national capital investment in history. Now it's up to the U. S. Senate where its Committee on Public Works and Finance are expected to get immediately to work. Under the bill as passed by the House and sent to the Senate, Federal aid to be matched 50-50 by the States for the primary and secondary systems (and urban extensions) will be increased \$25,000,000 each year, beginning this July, on a progressively accelerated basis. While actually the \$25,000,000 per year increases are only authorized through fiscal 1959, Congressional intent is expressed that this per annum increase will be continued through 1969. This is calculated to bring Federal funds for these systems up to \$1,000,000,000 per year by 1969. Matched with equal State funds, this envisions a minimum \$2,000,000,000 per year program.

Construction Company of San Francisco 383 ac. of tideland north of Martinez. The state granted a 60-yr. lease at a total rental of \$747,000. The Utah Company intends to fill in the submerged land at a cost of about \$2,000,000 and to make improvements for warehouses, docks, and manufacturing plants.

FULL-SCALE CONSTRUCTION on Monticello Dam should be resumed in May. Work has been delayed due to damage caused by floods. Construction of the cofferdam downstream from the main dam which was washed out last December is under way and former employees have been notified of the construction schedule by letter and offered employment again when full scale operation begins.

THE TOTAL VALUE of new buildings authorized in Long Beach in March was \$17,400,000, the second highest monthly figure in history.

Colorado River

PRESIDENT EISENHOWER has signed into law the Colorado River Storage Project. The development, the largest Bureau of Reclamation project in point of dollars ever to be approved by Congress in a single piece of legislation. It authorizes comprehensive development of the water resources of the Upper Colorado River basin. Several decades will be required to bring the development to completion. The Act authorizes appropriation of not more than \$760,000,000 for construction. The President has requested \$8,000,000 for fiscal year 1957 to permit start of construction on the Glen Canyon and Flaming Gorge units, and advance planning on the remainder of the project. The first problem in the construction of the Glen Canyon Dam is the provision of access roads and the camp and headquarters for the construction workers. The dam site is on the Colorado River in the isolated area just south of the Utah-Arizona line. Glen Canyon will be concrete dam comparable to but only slightly smaller than Hoover Dam which is situated 300 mi. downstream.

The figure was swelled by a record-breaking \$13,800,000 construction permit issued to Douglas Aircraft Company for an assembly plant. General contractor is C. L. Beck Construction & Realty Co. Superintendents will be T. G. Lennon and C. T. Walker.

INVITATIONS for bids for the main construction of Coyote Dam are expected to be issued soon by the Corps of Engineers in San Francisco. The work will consist of construction of an earthfill dam about 163 ft. high and 3,500 ft. long with outlet works and spillway. The spillway excavation will be about 1,200,000 cu. yd. and the embankment, all classes including stone riprap, will be about 6,000,000 cu. yd. A \$319,000 contract was signed on April 18 for the manufacture and delivery of three gates that will control the flow of the river through the outlet works. The contract went to Guy F. Atkinson Company doing business as Willamette

TRAFFIC INTERRUPTIONS

ON 80-FOOT FREEWAY CONSTRUCTION

Mixing of Cement Treated Sub-base Key to Successful "Foothill Freeway" Job

Transforming a 30-foot wide California street into a major 80-foot freeway without obstructing traffic or utility lines, within cost and time limitations is an accomplishment recently completed in Los Angeles County. One of the most serious construction problems, the tricky

cement-treatment for the 6-inch sub-base course, was handled profitably with the help of a Seaman-Andwall TRAV-L-PLANT and a portable Seaman-Andwall HERCULES Cement Spreader.

Construction was handled in 600-foot sections, which were ripped out, widened, graded and then treated with 2½ percent by weight of portland cement, applied and metered in precise quantity by the Hercules Spreader. The Seaman-Andwall TRAV-L-PLANT followed immediately with an initial dry-mixing pass, mixing and blending to the full 6-

inch depth. Then the TRAV-L-PLANT made a second pass, pumping water from a tank truck, through integrally mounted pump, meter and spray bar, mixing the water into the full depth to leave a uniform, damp strip of cement-treated base, ready for final compaction.

Despite the job difficulties, the TRAV-L-PLANT chalked up some excellent records — an average of 68,500 square feet of cement-treated base per day at unusually low cost — kept up with cement deliveries, moved in and out fast to keep out of the traffic.



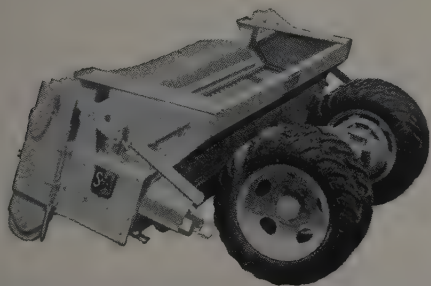
Seaman-Andwall Hercules Spreader applies cement, carefully metered to precise 2½ percent by weight to leveled and graded sub-base material.



Initial dry-mixing with a TRAV-L-PLANT provides uniform and intimate blend of cement and materials to full 6-inch mixing depth.

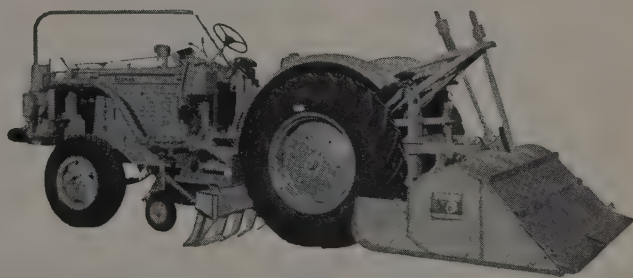


TRAV-L-PLANT working with tank truck, pumps, meters and sprays water as it mixes, for completed cement-treated sub-base, ready for final compaction.



Seaman-Andwall HERCULES Cement Spreader

Heavy-duty, box-type, designed for fast, accurate spreading of bulk cement in any amount required up to 10 feet in width. Ideal pneumatic tires for traction and mobility. Auto-Type differential for efficient transfer of power. Fast, smooth-operation. Easy to install and adjust.



Seaman-Andwall TRAV-L-PLANT

Completely self-propelled, fast, versatile, does a thorough and more uniform job of in-place mixing. Pump, spray bar, tachometer assemblies and volumetric meter apply water or bitumen simultaneously with mixing operation. 7-foot mixing width. Available with special Underbody Scarifier for light scarification.

Complete Sta-bilt Equipment Includes:

- Self-Propelled PULVI-MIXERS
- 2-3 Ton Portable Steel Wheel Rollers
- 7-20 Ton Pneumatic Compactors
- Century Material Spreaders
- Portable Rock-Busters



STABILIZING THE WORLD

SEAMAN-ANDWALL

CORPORATION

285 North 25th Street • Milwaukee, Wisconsin

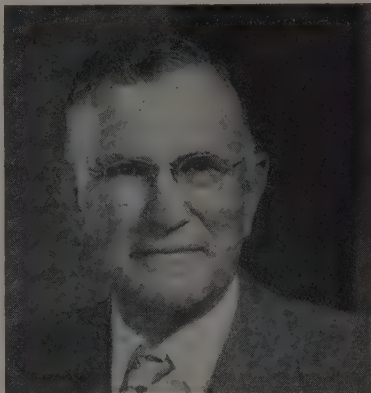
Iron & Steel Company in Portland, Ore. The dam is located on the Russian River 4 mi. north of Ukiah and is expected to cost around \$18,000,000.

AWARD of a contract for construction of an underground powerhouse on the Feather River to Bechtel Corporation of San Francisco has been announced by Pacific Gas & Electric Company. The plant is part of the Poe Project which will develop 106,000 kw. at a cost of about \$35,000,000. The powerhouse will be located on the river southeast of Jarbo Gap and about 24 mi. by road from Oroville. The plant will be below ground, constructed in the deep excavation through a gravel bar to bedrock. The ground will be filled in again around the structure to provide yard space. Water will be carried to the turbines through 6½ mi. of 19-ft.-diameter tunnel and an underground penstock. The tunnel is now under construction by the Utah Construction Co. and Bates & Rogers Construction Corp. The diversion dam and tunnel intake are located about a mile upstream from the railroad community of Pulga. The Bechtel Corporation holds the contract for dam construction. PG&E also will begin driving tunnel soon for two more plants, the Butt Valley and Caribou No. 2 powerhouses, further upstream on the Feather River. This project will develop a total of 145,000 kw. at a cost of about \$33,000,000.

RECENT MAJOR CONTRACT AWARDS and low bids in California include a low bid of \$2,285,809 submitted by **Fredericksen & Kasler** of Sacramento for 7 mi. of grading, paving, and construction of seven bridges and three pumping plants in Madera County. **Peter Kiewit Sons' Co.** of San Francisco submitted a low bid of \$2,711,100 for 3.5 mi. of grading, surfacing, and construction of two bridges in Marin County. A low bid of \$134,385 was submitted by **Thomas Construction Co.** of Fresno for construction of detours and removal of four existing bridges in Kern County. **Madonna Construc-**

W. A. Johnson dies

William Arthur Johnson, 71, one of the deans of the construction industry and a leader in California's business life for more than 50 yr. died of a heart attack May 10 at his home in Balboa, Calif. Johnson was chairman of the board of American Pipe & Construction Co. and Amercoat Corp., Pipe Linings, Inc., and Johnson Western Constructors. Be-



sides being prominently identified with numerous other business firms and organizations in Southern California, he was president of Pacific Constructors, Inc., builder of Shasta Dam, and was first president (1955) of the Beavers, a new organization of the West's leading construction men. He was a joint venturer with many leading contractors in the building of dams and other large construction projects. Shasta, Chief Joseph, and Mount Morris are a few of the many in which he played an important part.

tion Co., San Luis Obispo, submitted a low bid of \$1,777,164 for grading, paving, and construction of three concrete bridges in San Luis Obispo County. A low bid of \$1,885,484 was submitted by **Griffith Co.** of Los Angeles for 2.2 mi. of grading, paving, and construction of six bridges and a pumping plant in Riverside County. **Secret & Fish**, Whittier, received a \$1,238,287 contract for construction

Ben Hagglund dies

Bernard L. "Ben" Hagglund, 60 Southwest sales manager of Caterpillar Tractor Co. and a resident of San Leandro, Calif., died May 12 after a brief illness. He had been associated with Caterpillar since 1930 when he joined the company as supervisor in agricultural sales, became a special representative in 1933, district representative in 1934, and a



assistant sales manager for the Western Division in 1940. He was named sales manager in 1944. During his yr. with Caterpillar, he played a large part in setting up and continuing the development of the company's dealer program in California and in the entire Western Division of the company.

of the Temple City High School Temple City. **M. H. Golden Construction Co.** of San Diego awarded a \$1,242,000 contract for construction of enlisted men's barracks, Naval Amphibious Base, Canada. **William Simpson Construction Co.** of Los Angeles will construct a \$3,000,000 office building at El Segundo for North American Aviation Inc.

SCAFFOLDING

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SHORING

SIDEWALK BRIDGES HOIST TOWERS

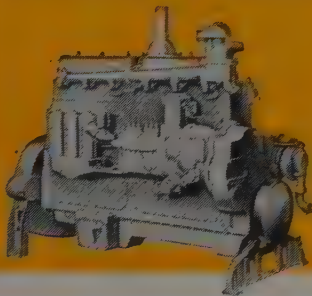
Builders Supply & Equipment Co. 417 Kentucky St., Bakersfield, Cal
Squires-Belt Material Co. 12th and L Sts., San Diego 12, Cal
Capitol Scaffolding & Equipment Co. North Sacramento, Cal
Borchers Brothers. 342 North Second St., San Jose, Cal
The United Materials. 814 West 14th Ave., Denver, Col
Superior Equipment Co. 2221 South 19th Ave., Phoenix, Ar

ROOF OF PERFORMANCE!

After 8 years' experience
with a D13000, "nothing
but another Caterpillar
engine" was considered
for the Wenonah
Sand & Gravel Co. for its
second dredge

The CAT* D13000 Engine drives a 6" pump in a
hydraulic sand dredge, operated by the Wenonah Sand
& Gravel Co., Wenonah, N. J. There's a 70-foot lift
through 600 feet of pipe to the wash tower. The engine,
purchased several years ago, is the company's second
D13000. According to Earl T. Kroll, Chief Mechanic,
this is why: "Having used a duplicate of this engine in
our dredge since 1946 with unquestioned economy
and reliability, when we wanted to put another dredge
in service, there was nothing but another Caterpillar
engine for us, a choice we haven't regretted."

This is just one of thousands of cases where the
performance of one Caterpillar Diesel has sold another.
There's a reason. These rugged units, available up to
210 HP (maximum), pay off in dollars and cents *on*
the job. Simple to operate, they need a minimum of
attention and maintenance. And they're sturdily built
for a long life of low-cost use in *every* type of construc-
tion equipment. What's more, your Caterpillar Dealer
stands back of them with prompt, capable service when-
ever and wherever it's needed!



**NOW IN THE CAT
POWER LINE-UP:
THE NEW D342,
AN EVEN MORE
EFFICIENT UNIT!**

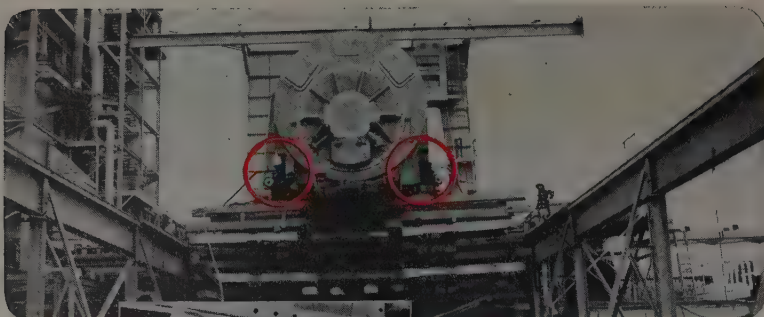
Replacing the D13000, the more powerful, more
compact 6-cylinder D342 delivers 210 HP (maximum).
And with Caterpillar 4-cycle design, the fuel system re-
quires no adjustment and there are no air boxes or
cylinder ports to clean. Your maintenance is reduced
to a few minutes a month for oil and filter changes.
For complete information about this and other modern
heavy-duty engines, see your Caterpillar Dealer.

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

CATERPILLAR*

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

**MODERN HEAVY-DUTY
DIESEL POWER**



Duff-Norton air jacks

Raise Big Loads—and Profits

By ingenious use of Duff-Norton air jacks, a Dallas contractor finds that he lowers costs, speeds work, gets greater dependability and safety with these portable tools on difficult installations of big equipment.

Using two 100-ton capacity Duff-Norton jacks, the mechanical contractor, E. E. Farrow Company, raised a 240,000 lb. turbo-generator 22 ft. at the plant of the Western Farmers Electric Co-operative. Three men completed the job in 2½ days with a jacking-blocking procedure which resulted in a savings of \$400.

Duff-Norton air motor jacks were also used to raise a 210-ton, 100,000-kw generator 13 ft. at the Dallas Power & Light Company, Parkdale Station. These same jacks helped cut costs of similar jobs at Haskell, Lone Star, Corpus Christi and Riesel, Texas.

Duff-Norton air motor jacks have a lift of 14 to 30 inches and are mounted on rubber-tired, roller bearing wheels for easy positioning by one man. They operate on 80 to 100 lb. air pressure.

The six Duff-Norton models range in capacity from 20 to 100 tons—weigh from 238 to 530 pounds. Asturdy base prevents tipping or settling. Safe operation is assured by an automatic shut-off which stops motor when safe limit is reached. Keyway in ram prevents the head from turning and shifting load. Lowering and lifting speed is controlled by air motor. Jacks will not creep or drop the load.

For data on these cost reducing jacks and name of nearest distributor write Duff-Norton Co., P.O. Box 1889, Pittsburgh 30, Pa. Ask for bulletin AD-11-A.

DUFF-NORTON

Giving Industry A
Lift Since 1883

Jacks

DUFF-NORTON COMPANY

Branch office & warehouse: 1016 Howard St., San Francisco, Calif.

COLORADO

RECENT MAJOR CONTRACT AWARDS and low bids in Colorado include a low bid of \$240,445 submitted by **Harrison & Atchison Co.** Denver for structures, grading, and paving in Montrose County. **Schmidt Construction, Inc.**, of Arvada was awarded a \$387,000 contract for 2 miles of grading and surfacing in Roosevelt National Forest, Boulder County. **Domenic Leone Construction Co. Inc.**, Trinidad, submitted a low bid of \$487,344 for grading, surfacing, and structures on State Highway No. 1 in Prowers and Bent Counties. A low bid of \$125,801 was submitted by **Broderick & Gibbons, Inc.**, of Pueblo for grading, surfacing, and structures in the city of Pueblo on State Highway No. 96, Pueblo County. **Per Kiewit Sons' Co.** of Denver submitted a low bid of \$233,939 for grading, surfacing, and structures in Englewood, Arapahoe County. A low bid of \$693,645 was submitted by **Crocker Construction Co.** of Denver for furnishing and installing canal covering, Vasques-St. Louis collection conduits, Denver Municipal Water Works, Denver. A low bid of \$379,827 was submitted by **Herro Strong Co.**, Platteville, for grading, surfacing, and structures between Lupton and Platteville in Weld County.

IDAHO

THE AIR FORCE plans to build a runway, probably the nation's longest, for testing an atomic-power plane at the National Reactor Testing Station near Idaho Falls. The House has passed and sent to the Senate an \$11,400,000 authorization to begin the project. The sum is included in a \$2,000,000,000 military construction authorization.

RECENT MAJOR CONTRACT AWARDS and low bids in Idaho include a low bid of \$157,845 submitted by **Utility Construction Co.**, Ontario, Ore., for rehabilitation of Ontario-Nyssa Pumping Plant, Owyhee Project, Idaho-Oregon. **W. R. Cahoon Construction Co.**, Pocatello, was awarded a \$504,359 contract for construction of high school in Bonanza, Blaine County. **Western Construction Co.** of Pocatello was awarded a \$86,439 contract for grading, surfacing, and construction of one bridge on 3.7 mi. of the Carey Northwest road in Blaine County. **Quinn Brothers & Robbins** of Boise was awarded a \$124,970 contract for 1.2 mi. of grading and surfacing in the vicinity of

aw Creek in Gem County. **Inter-
e Electric Co.** of Salt Lake City
mitted a low bid of \$681,567 on a
tract for construction of a new
station and additions to an exist-
substation at the National Reac-
Testing Station. **Carl E. Nelson
Construction Co.**, Logan, submitted
w bid of \$166,093 for construction
roadway, surfacing, extending
dge, and stockpile in Rexburg.
Ingsgaard Construction Co. of
gan Utah, submitted a low bid
\$103,718 for construction of road-
y, drainage structures, and miscel-
eous work in Caribou City.

MONTANA

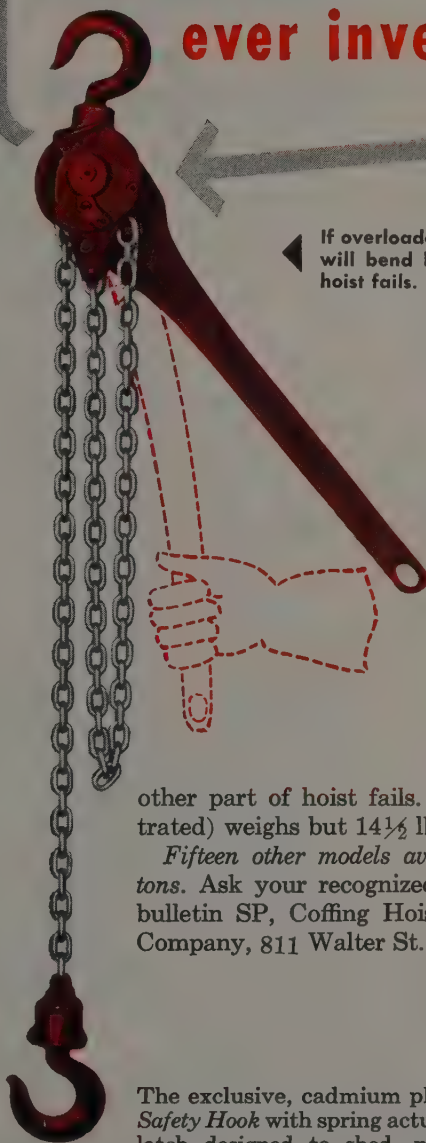
CENT MAJOR CONTRACT

VARDS and low bids in Montana
ude a \$274,558 contract award to
ly Construction Co. of Butte for
mi. of grading, oiling, and surfac-
in Park and Sweet Grass Coun-
Miller & Strong, Inc., of Eugene,
e., was awarded a \$347,047 con-
ct for 3.6 mi. of grading, draining,
surfacing in Sanders County. A
9,759 contract was awarded to
P. Roscoe Co., Billings, for con-
uction of a bridge and overpass in
sebud County. **Peter Kiewit Sons'**
Billings, was awarded a \$365,421
tract for 7.3 mi. of grading and
facing in Fergus County. A \$222,-
contract was awarded to **Mc-
ughlin, Inc.**, of Great Falls for 7.9
of grading and surfacing in Pon-
a County. **Virgil Smith**, Miles
y, was awarded a \$135,549 contract
9.8 mi. of grading and surfacing in
rfield County. **Albert LaLonde Co.**
Sidney was awarded a \$337,420
tract for 10.6 mi. of grading and
facing in Roosevelt County. **Schye
Sullivan** of White Sulphur Springs
was awarded a \$173,884 contract for
mi. of grading and surfacing in Pon-
rie County. **Norgaard & Hilling**
Williston, N. Dak., submitted a
y bid of \$350,451 for 9.3 mi. of
ding and surfacing west of Wolf
int-North Dakota line in Roose-
t County. **Holm Construction Co.**,
ndive, was awarded a \$75,540 con-
ct for grading, surfacing, and con-
uction of bridges in Roosevelt
nty. **William W. Strever** of Bill-
s, Mont., was awarded a \$164,743
tract for 6 mi. of grading and sur-
ing in Treasure County.

NEW MEXICO

OWDERMILK BROTHERS
an \$897,600 highway contract
construction of a highway

Here's the safest ratchet lever hoist ever invented!



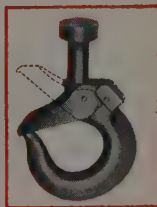
◀ If overloaded, "safety valve handle"
will bend before any other part of
hoist fails.

It's the original Coffing
Safety Pull, a ratchet
lever hoist with dual
pawls and ratchet that
keep load from slipping.
Safety stops prevent
spinning out of control
and if overloaded,
"safety valve handle"

will bend before any
other part of hoist fails. The $\frac{3}{4}$ -ton model (illus-
trated) weighs but 14 $\frac{1}{2}$ lbs.

*Fifteen other models available handling up to 15
tons. Ask your recognized distributor or write for
bulletin SP, Coffing Hoist Division, Duff-Norton
Company, 811 Walter St., Danville, Ill.*

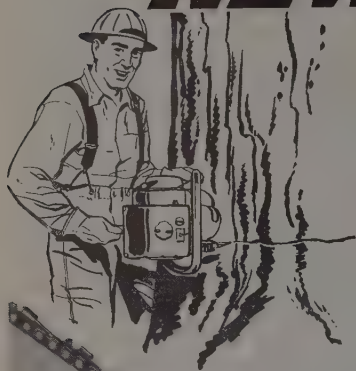
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Safety Hook* with spring actuated locking
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 $\frac{3}{4}$ -ton, 1 $\frac{1}{2}$ -ton and 3-ton models at
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29 pounds

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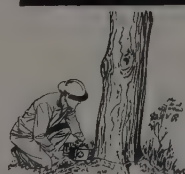
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MODEL EZ — Lightest, most powerful direct drive chain saw ever developed. Only 14 pounds, full 5 horsepower. Brings down trees up to 6 feet in diameter.

ugh Riverside. The contract includes a four-lane highway with two parallel bridges 200 ft. long. The bridges were designed under the supervision of W. E. Strohm, Bridge Engineer, the road work under the supervision of Herbert F. Hall, Road Design Engineer. It is expected that George J. Lalla will be the resident engineer on the project.

RECENT MAJOR CONTRACT AWARDS

and low bids in New Mexico include a low bid of \$732,801 submitted by **D. D. Skousen & Son** of Albuquerque for channelization of Rio Grande, south boundary of land and wildlife refuge to San Antonio, Middle Rio Grande Project. **Wynn Contracting Co.**, Albuquerque, was awarded a \$684,223 contract for 6.1 mi. of grading and paving in Dona Ana County. A \$365 contract was awarded to **Ryan & Son, Inc.**, of Albuquerque for construction of a bridge, paving, and surfacing 1.5 mi. south of Eddy County. **Armstrong**, Roswell, was awarded \$50,525 contract for 9.1 mi. of paving and surfacing in Curry County. A \$127,068 contract was awarded to **Logenbaugh & Coe, Inc.**, Albuquerque for 5 mi. of grading and surfacing in Catron County. **Ryan & Son, Inc.**, of Albuquerque, was awarded a \$106,971 contract for Paraview Bridge and approaches in Rio Arriba County.

OREGON

THE PORTLAND General Electric Co. expects work to begin soon on the \$25,000,000 Pelton Dam project on the Dechutes River. Guy F. Atkinson Company of South San Francisco has been awarded a \$6,500,000 contract for the construction of the project. Atkinson was the lowest of three bidders by about \$1,200,000. It is also expected that agreement will be reached soon on fish facilities.

THE MULTNOMAH County Commissioners at Portland have taken under consideration bids received for the approaches of the Morrison St. Bridge, and have invited bids for the superstructure of the bridge across the Willamette River. Kuckenberg Construction Company of Portland was the low bidder at \$4,789,000 for the total project. The project calls for constructing two east approaches to two bridges, the Morrison span, now under construction, and the existing Hawthorne Bridge. Bids on the construction of the west side approaches to the Morrison Bridge are to be asked later. Estimated cost is about \$1,200,000.

RECENT MAJOR CONTRACT AWARDS

and low bids in Oregon include a low bid of \$6,534,349 submitted by **Guy F. Atkinson Co.** of



BUILT UP PLATE GIRDERS FOR EXTRA HEADROOM

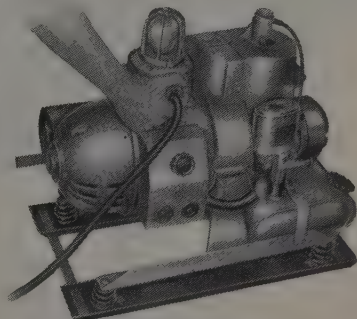
Wide girders, built up from steel plate to 190 ft. in length to provide maximum headroom while using minimum steel, are being fabricated by Grano Steel Co. at a new plant of the Rose-Derry Co., Los Angeles. The 6-ton transverse girders provide the extra headroom between supporting columns by using stress patterns in each beam which eliminate much of the depth required with rolled beams. The Harold Roach Construction Co. is the general contractor erecting the girders fabricated from Kaiser Steel plate.

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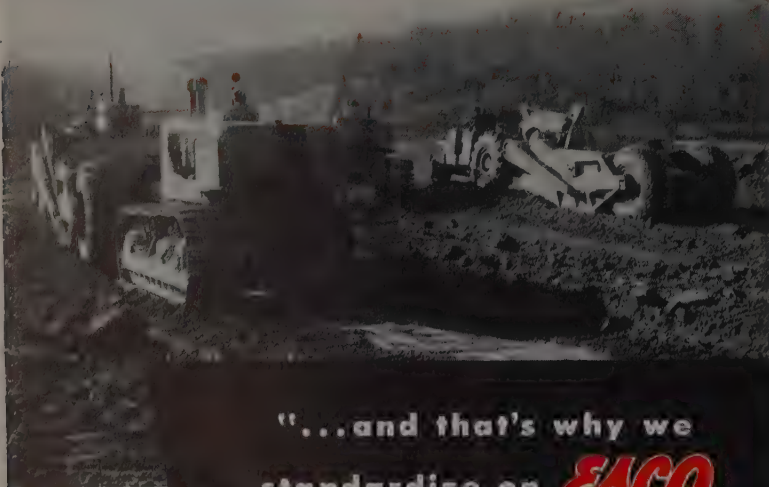
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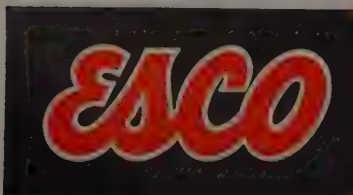
said C. B. Hewitt, President, Hewitt Contracting Company
Columbus, Georgia



"...and that's why we
standardize on **ESCO**
Alloy 12M Scraper Blades"

"Rolled steel blades were giving us a rough time," said Clyde Hewitt, President, Hewitt Contracting Co. "They were wearing out fast and costing us plenty in breakage downtime. When we switched to ESCO Cast 12 M Blades, on one job, blade life more than doubled and blade breakage stopped entirely. Can you blame us for standardizing on ESCO Blades?" ESCO Blades last longer because they are cast of ESCO 12M—a special alloy steel metallurgically-engineered by ESCO to resist the impact and abrasion of scraper operation. See your ESCO Dealer or write for cost-reducing details.

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ESCO International—New York Office at 420 Lexington Ave., New York City, or Portland Manufacturing Plant	In Canada Vancouver, B.C. and Toronto, Ontario

Portland for construction of a concrete arch dam, power house and spillway, reregulating dam, fish ladder, Pelton Dam Project in Jefferson County. Warren Northwest, Inc., of Portland, submitted a low bid of \$401,671 for grading and paving in Washington County. A low bid of \$207,605 was submitted by Hamilton & Thoms, Eugene, for construction of a bridge in Yamhill County. Tom Lillebo of Reedsport submitted a low bid of \$149,059 for reconstructing existing bridge in Lincoln County. Darkenwald Construction Co., Inc., Sacramento, Calif., submitted a low bid of \$897,668 for electrical work on the Haystack Dam, Deschutes Project, North Unit. W. H. Shields Construction Co. of Salem was awarded a \$1,202,552 contract for construction of a high school in Lebanon. A \$139,948 contract was awarded to F. H. Jarnagin, Port Angeles, for clearing right-of-way and construction of access roads for the final 17-mi. section of the Bonneville Power Administration's Chief Joseph-Covington transmission line. Ross B. Hammond Co. of Portland submitted a low bid of \$1,110,597 for Unit 1, Biological and Agricultural Science Building, and a low bid of \$1,455,798 for construction of two men's dormitories and cafeteria, Oregon State College, Corvallis.

UTAH

RECENT MAJOR CONTRACT AWARDS and low bids in Utah include a \$221,313 contract award to L. A. Young Construction Co. for Richfield for 16.1 mi. of grading and surfacing in Box Elder County. A low bid of \$116,605 was submitted by Dudley, Jensen & Johnson of Moab for grading and surfacing 20 mi. of the Indian Creek Mine Access Road in San Juan County. Max Boesiger of Mountain Home received a \$459,321 contract award for construction of Squadron Operations Buildings at the Mountain Home Air Force Base. James Reed, Lark, was awarded a \$653,759 contract for construction of two bridges in Washington County. W. W. Clyde of Springville was awarded an \$894,575 contract for earthwork, concrete pipe lines, and structures, Davis Aqueduct, Weber Basin Project.

WASHINGTON

LATE IN 1956 the Skamania County Public Utility District expects to begin construction on a \$4,000,000 hydroelectric project on the Little White Salmon River. The project

include an earthfill dam 2,000 ft. long and 125 ft. high. Permits have been filed for and no opposition is expected by the PUD.

THE \$5,600,000 suit of Pend Oreille County Public Utility District No. 1 has begun in the Spokane county courthouse. The action over the construction of the Box Canyon Dam on the Pend Oreille River is being defended by Pacific-General-Shea, original contractors on the project, and several bonding companies, who in turn ask \$2,600,000 on a cross-complaint. The PUD contends the contractors failed to live up to terms of the \$8,000,000 contract, while the contractors claim there was no justification for termination of the contract. The project was finished by Morrison-Knudsen Co., Inc.

THREE CONTRACTS totaling \$1,000,000 for construction of gas supply lines in the Seattle-Everett-Toma area have been awarded by Washington Natural Gas Company. Each of the contracts is for labor only and was awarded on a unit cost basis. The work should be completed in August and September. The successful bidders on the three projects were: Thorn & Marble Company, Inc., a joint venture of Valley Construction Company and the Morrison-Knudsen Co., and the last contract to Hood Construction Company.

STEEL for the Ice Harbor first step dam will be unloaded from railroad cars and transported by barge up the Snake River to the dam site. The steel is being transported by barge from the Geneva Steel Company's two plants at Chicago and in Pennsylvania. The complete shipment will total 80 carloads.

RECENT MAJOR CONTRACT AWARDS and low bids in Washington include a \$1,150,000 award to L. E. Sellen Construction Co. of Seattle for construction of a 3-story reinforced concrete office addition for the Pacific Telephone Co. in Seattle. Pieler Construction Co. of Port Angeles received a \$236,786 award for 0.9 mi. of grading and surfacing in Walla Walla County. Bocek Bros. of Aberdeen was awarded a \$166,550 contract for 1.2 mi. of grading and paving in Grays Harbor County. McFee & Heathe, Inc., and F. R. Hallett Co. of Spokane was awarded a \$1,019 contract for 5.1 mi. of grading and surfacing, Custer Street to 2nd Road in Spokane County. Per Kiewit Sons' Co. of Vancouver was awarded a \$533,731 contract for 1.5 mi. of grading and surfacing, Dry Creek to Steptoe in Whitman County. A contract for \$499,893 was awarded to Osberg Construction Co. of Seattle for 1 mi. of grading and

Photo courtesy of Harnischfeger Corp.

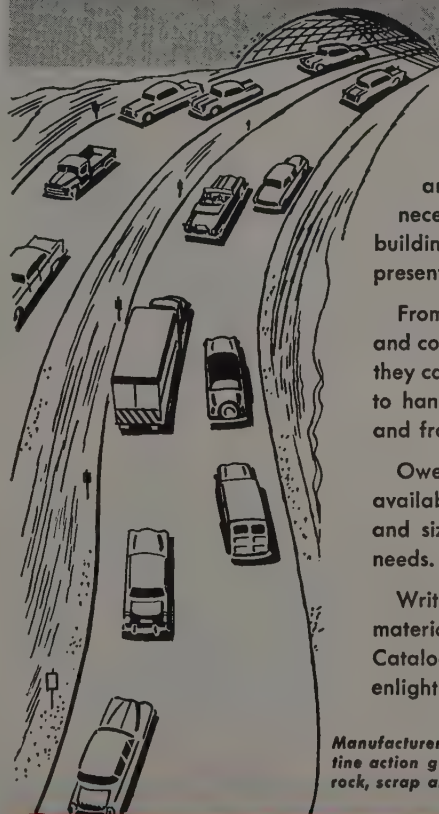
from
SANDPILES
to

SUPERHIGHWAYS

with

OWEN BUCKETS

"ON



THE JOB"

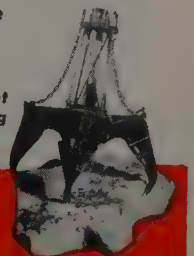
It will take a "heap" of sand and gravel to make the concrete necessary for the tremendous road building programs forthcoming and presently under way.

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Waukesha Sales & Service, Inc., Hobbs

OREGON

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UTAH

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WASHINGTON

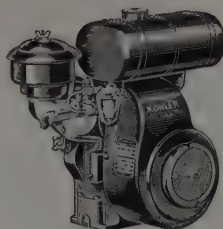
Northwest Motor Parts & Mfg. Co., Seattle
Northern Commercial Co., Seattle
Equipment Sales & Service, Spokane

WYOMING

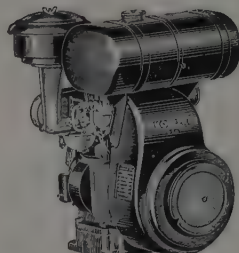
Casper Supply Co., Casper
Van's Supply, Cody

ALASKA

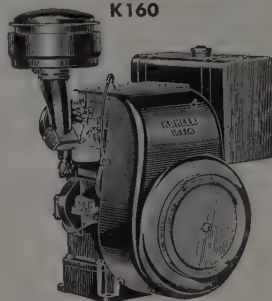
Northern Commercial Co., Anchorage, Fairbanks,
Juneau, Ketchikan, Nome



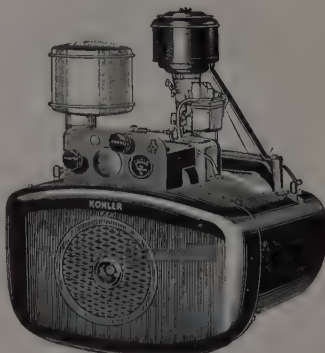
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surfacing the South Bay Bridge approaches in Grays Harbor County. C. E. Oneal and Riverside Sand & Gravel Co. of Ellensburg was awarded a \$232,488 contract for 6 mi. of grading and surfacing in Yakima County.

WYOMING

RECENT MAJOR CONTRACT AWARDS and low bids in Wyoming include a \$645,027 award to Inland Construction Co. of Omaha, Neb. for 1.7 mi. of grading, surfacing, and construction of one bridge in Park County. Knisley-Moore Co. of Douglas was awarded a \$367,889 contract for grading, draining, and miscellaneous work on 9.5 mi. of the Medicine Bow-North road in Carbon County. Gilpatrick Construction Co., Riverton, was awarded a \$74,419 contract for grading and surfacing 5 mi. of the Big Piney-West road in Sublette County. Northwestern Engineering Co. of Denver, Colo., was awarded \$629,046 contract for grading, surfacing, and one arch culvert on 10.8 mi. of the Upton-Sundance road, Crook County. Harrison & Atchison Co. of Denver, Colo., was awarded \$55,919 contract for grading and construction of one bridge over Inyo Kara Creek on the Upton-Sundance road in Crook County. Riedel-Lowe Co., Cheyenne, was awarded \$1,282,719 contract on schedule 1 for construction of Airmen's dormitory and dining hall, Warren Air Force Base.

ALASKA

RECENT MAJOR CONTRACT AWARDS and low bids in Alaska include a \$3,477,306 contract awarded S. S. Mullen, Inc., of Seattle, Wash. for construction of barracks, mess hall buildings, radio power and heating plant at the Naval Station, Kodiak. Williams Equipment Co., Fairbanks submitted a low bid of \$1,219,000 for grading, drainage, and construction of bridges on the Denali Highway between MacLaren and Susitna rivers. Doughty Construction Co., Spenard, was awarded \$645,286 contract on schedule A, site grade preparation, asphalt concrete paving, storm and sanitary sewers in Anchorage. Denali Engineering Co. of Anchorage submitted a bid of \$1,794,593 for construction of Juneau High School Building. Patti-MacDonald, Anchorage, was awarded a \$606,733 contract for construction of a heat and power plant improvements, Fort Richardson.

ke passing a camel through a needle's eye!

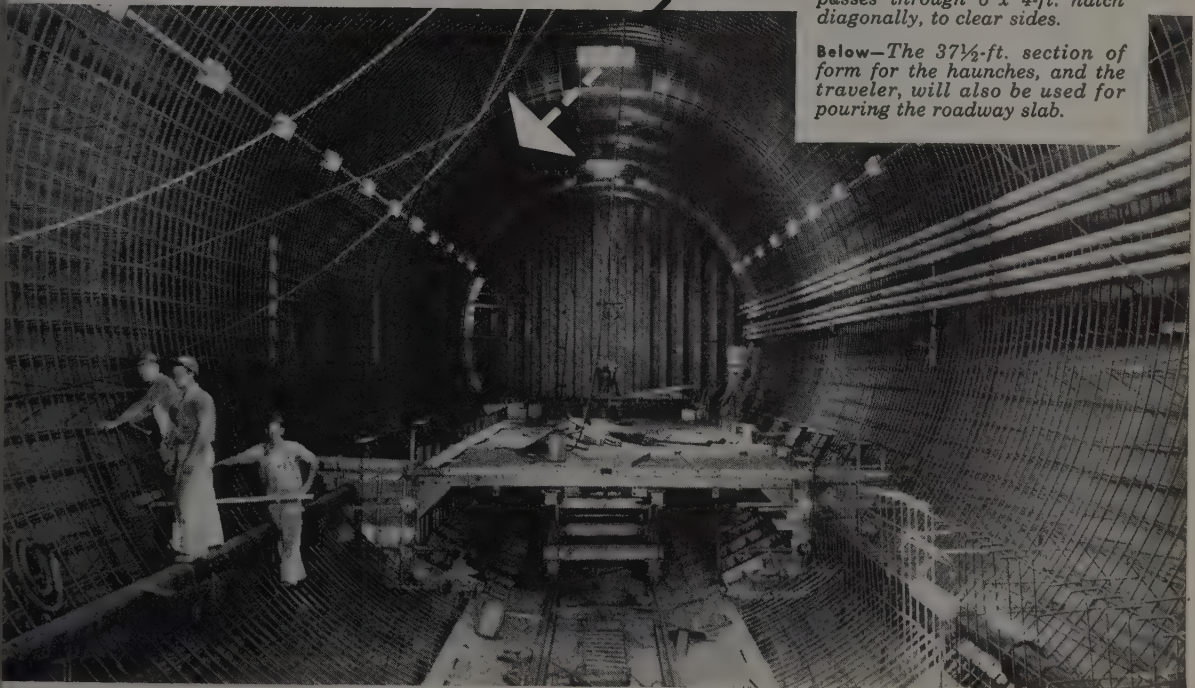
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pass through a 6-ft. by 4-ft. hole!



Above—Blaw-Knox sidewall form passes through 6 x 4-ft. hatch diagonally, to clear sides.

Below—The 37½-ft. section of form for the haunches, and the traveler, will also be used for pouring the roadway slab.



● It sounds impossible, but Blaw-Knox engineers did it! For the Hampton Roads Tunnel, a job involving 5 pour lifts on the river surface, then sinking 23 tube sections into a prepared trench, a unique Blaw-Knox form design permits passing two complete 150-ft. sets of forms through a 6 x 4-ft. hatch opening.

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These time and money-saving steps are expected to knock several months off scheduled time.

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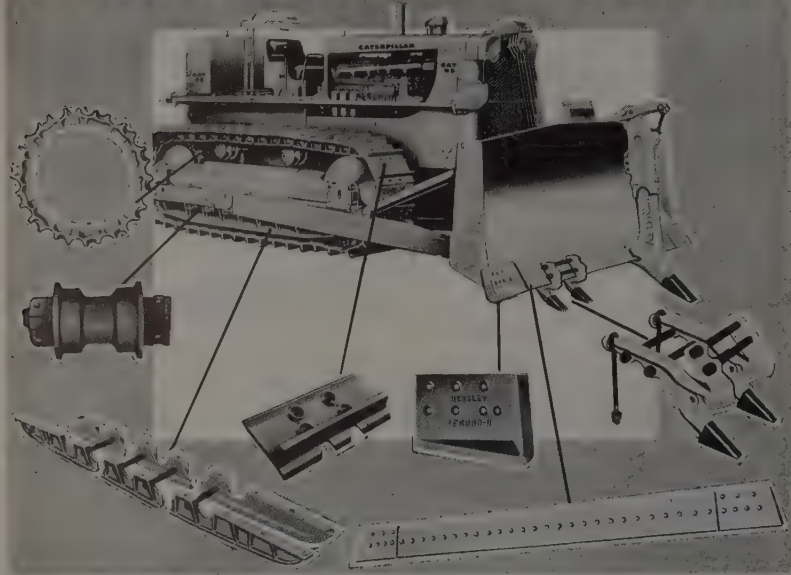
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Holz Co., Ukiah
Hust Bros., Marysville
Leary Equipment Co., Redding
McGarrahan Supply Co., Eureka
Oreville Auto Parts, Oroville
Stevenson's Equipment Co., Santa Rosa
Stockton Iron Works, Stockton
Western Equipment & Supply Co.,
Sacramento
Westside Tractor & Equipment, Willows

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S & M Supply Co., Grand Junction
Joe Smith Machinery, Denver

IDAHO:

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Lively Equipment Co., El Paso

UTAH:

Holland Equipment Co., Salt Lake City

WASHINGTON:

Pacific Hoist & Derrick Co., Puyallup and
Seattle
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WISCONSIN:

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(Continued from page 102)

Treated timber cribs

Cribs of pressure treated timber provide economical retaining walls that are particularly useful for head-of-banks at bridge ends, and for holding back unstable sliding materials. A timber crib is also very easy to erect. It practically eliminates foundation troubles, since the fill material settles sufficiently to stop any tendency of the structure to settle into soft ground. When built to the usual dimensions, they have a very high factor of safety against either overturning or sliding.

An excellent example of a treated timber crib, used to retain a fill slope on a steep mountain side, was built about 1945 by Montana Highway Department on U. S. Highway 10, west of Missoula. The highway at this point lies between Clarks Fork of the Columbia River and the Milwaukee Railroad. The railroad is on a steep mountain side about 80 ft. above and 130 ft. distant from the highway. By retaining the fill with a crib, sufficient clearance was provided along the river bank for the highway. This crib is 140 ft. long, and 21 ft. high through the center portion; base widths are 14 ft. through the highest part and the top width uniformly 8 ft.

Culverts

Requirements for minor drainage openings in roads are met frequently by pressure treated wood culverts. When properly designed and treated against decay, such structures are capable of long and satisfactory service.

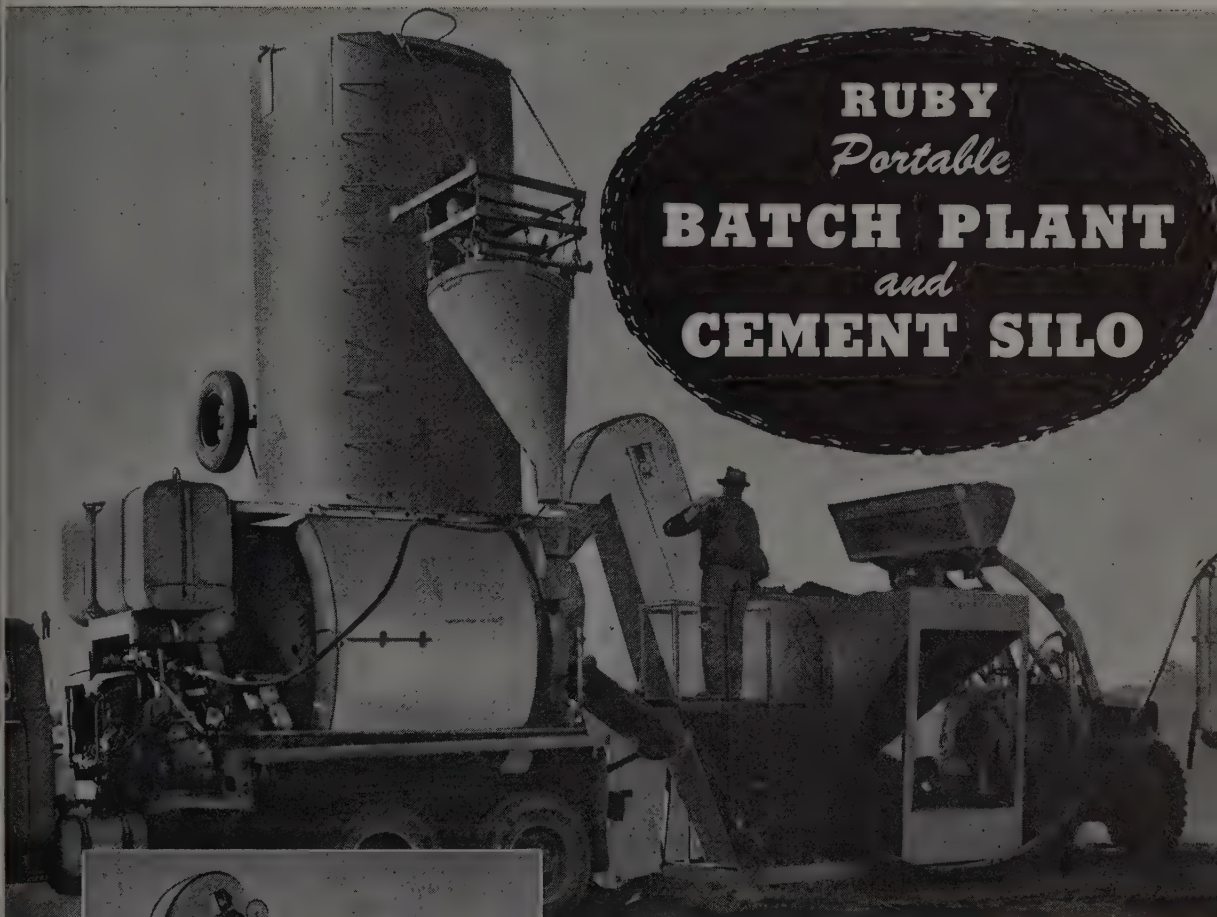
If they are of sectional or demountable construction, they can be moved easily to another location, or shifted to meet altered flow lines. Many such culverts have been in continuous use in railroad track for 40 to 50 yr., and are still in good condition. During the last 20 yr. numbers of them have been built by highway departments. A prefabricated design of laminated material is provided by some of the treating companies, and this type has met with considerable favor, as these culverts can be readily assembled.

Guard rail and miscellaneous

Pressure treated timber is generally used for these items by most Western highway departments. When pressure treated with either creosote or pentachlorophenol, both guard rails and guide posts have a dark brown color, which contrast well with the white rail and provide excellent visibility.

Practically all of the Western departments have reduced maintenance labor costs appreciably by eliminating the necessity for painting guard rail posts.

The Ruby "Team" that saves batching Dollars



RUBY Portable BATCH PLANT and CEMENT SILO



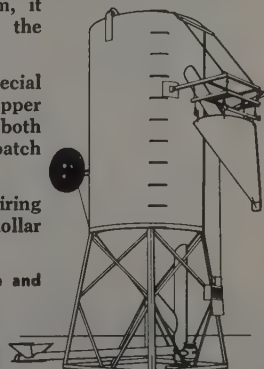
When you find complete portability of both Batch Plant and Silo . . . "one-man" economy of operation . . . and quick, efficient production, all combined in one LOW COST team, it's NEWS! . . . REAL NEWS for the transit mix operator, AND his pocketbook!

The Ruby Portable Batch Plant, in either 3 or 5 yard capacity, is designed for completely portable highway transport and quick, easy installation. Used with the Ruby Portable Cement Silo (170 barrel capacity), as a one-man operated . . . one location . . . batch-on-the-job team, it means lower operation costs from the first day!

The Ruby Portable Cement Silo, also designed for easy highway transport without special permits, is engineered for "team" operation with the Ruby Batch Plant. The Silo scale hopper accurately measures the bulk cement needed for controlled batching. One man operates both units from the Batch Plant platform. Lost time and added labor costs of separate silo and batch plant locations are eliminated.

The Ruby Portable Cement Silo makes bulk cement use a "profit-maker" on jobs requiring even small amounts of transit mix concrete. Complete portability of both units means dollar savings on every yard of concrete handled.

Write to Clark's Welding Works, Dept. 5, Perkins, California, for complete information or the name and address of the dealer nearest you.



Sketch of Ruby Cement Silo showing loading hopper

CLARK'S WELDING WORKS

PERKINS, CALIFORNIA (NORTHEAST OF SACRAMENTO)

ALASKA Newsletter

By CLIFFORD S. CERNICK, Anchorage

JOB RUSH STARTS—The annual job rush to the Territory from all over the States is under way. A survey I made of local employment agencies, unions, and contractors convinces me that the "lure of Alaska" is stronger this year than ever before and literally hundreds of workers are arriving in the Territory each week bent on staking their claim to a bonanza of construction cash. Advent of this stampede north on the part of stateside construction men has brought the usual warnings from employment and union officials. If the experience of previous years is any guide, such warnings won't keep many from making the long journey to this so-called "land of gold." In the hope that some of the construction workers reading this may be spared disappointment and needless expenditure, I'll devote this month's column to an up-to-the-minute analysis of job conditions in Alaska. And to save you the \$1 fee that is asked for in certain classified ads, I'll tell you exactly where to write for answers on specific questions concerning Alaskan employment.

ROSTER OF UNEMPLOYED—

To give you a breakdown on the number of unemployed in Anchorage alone, I called John F. Isadore, manager of the Employment Security Commission office here. With about 2,000 persons in Anchorage now seeking jobs, this is the breakdown: 238 carpenters, 157 truck drivers, 345 laborers, 100 heavy duty operators, 99 steamfitters and plumbers, 54 heavy duty mechanics, 28 welders, 33 electricians, 154 clerical personnel and 60 sales clerks. About 200 are unemployed under the heading of "miscellaneous." Analysis of these figures shows that the job opportunities for laborers, carpenters, truck drivers, and heavy duty operators are very poor in Alaska at this time.

OVER-ALL OUTLOOK—To be perfectly honest with you, the overall job outlook in Alaska has never been better. Before you pack your duffle bag and kiss the wife goodbye, take heed of these important facts: 1. Although employment in Alaska is expected to break all records, there is still a very substantial pool

of unemployment in the Territory waiting for jobs. If the rule used by unions and employment agencies applies this year as it did in previous years, Alaskans will get first crack at available openings. 2. The housing squeeze at both Anchorage and Fairbanks is extremely critical. Persons expecting to find living quarters for their families—and sometimes for themselves—may find themselves sadly disappointed. Naturally, the situation is different out at the remote jobsites, where housing is generally furnished by the contractor. 3. Need for construction workers in Alaska this year varies according to your skill. If you're a laborer or a truck driver, you'll find it fairly difficult to get on a payroll. As a general rule, the more highly-skilled you are the less difficult your job quest will be.

LABOR SHORTAGE—Another facet of Alaska's paradoxical employment situation is the acute shortage of certain categories of workers and professional people—a shortage that is growing more severe, according to word from employment officials. I asked Isadore to tell me what the categories in short supply were, since I felt this would be of interest to readers of this column. He reports that principal shortages involve personnel in the highly technical and skilled classifications, especially in

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POWER-CARTS



CONCRETE-CARTS



WHEELBARROWS



Selection Chart

Equipment	Load Capacity	Maximum Travel Distance	Speed	Capacity* Per Hour
POWER-CARTS	9 to 12 cu. ft.	1000 ft.	15 mpr.	15 to 20 cu. yds.
CONCRETE-CARTS	6 to 8 cu. ft.	200 ft.	walking	3 to 5 cu. yds.
WHEELBARROWS	3 to 5 cu. ft.	200 ft.	walking	1 to 1½ cu. yds.

*according to hauling distance

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SELECTION OF EQUIPMENT is most important in planning any concrete job—it can make the difference between profit and loss. That's why Gar-Bro offers check lists to guide you in considering all job factors. Remember, Gar-Bro builds the only complete line of concrete handling equipment. And only Gar-Bro dealers can give you unbiased advice in the selection of the best equipment.

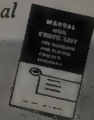
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to 20 cu yd

to 5 cu yd

to 14 cu yd

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June 1956

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How oscillating wheels can save you untold street maintenance costs...



See the flow of compaction effort that the BROS Self-Propelled roller with torque converter drive provides for street seal coating, resurfacing and shallow lift compaction...

Here's how it is helping cities throughout the country make great savings in street maintenance costs:

- With full oscillation of all wheel pairs to provide uniform compaction, the BROS SP-54 helps "key" and "lock" aggregate materials tightly in the base course to prevent various pavement failures.
- Wheel oscillation of this roller also kneads the asphalt into a tight, solid surface, eliminating hairline cracks that would otherwise turn into

surface breaks. Very important, too, rubber tire rolling correctly imbeds the wearing course chips *without* crushing them.

• Besides such proven advantages, the BROS SP-54 offers these time-saving performance features: a torque converter drive provides smooth, easy handling and eliminates "tipping" of chips when starting; it also lessens drive line strain.

• Full-reversing type transmission with shuttle gear permits rolling in either direction without shifting; turn arounds are thus eliminated.

• Infinite speed range from 0 to 18 mph; positive chain drive to both rear wheel pairs; 50 HP engine and smooth, hydraulic steering provide fast, proper compaction results that you can't get from any other roller. See a BROS Distributor or write us for full information and/or a demonstration. WM. BROS BOILER & MFG. Co., ROAD MACHINERY DIVISION; 1057 TENTH AVE. S. E., MINNEAPOLIS 14.

Find out, too, about the complete BROS TEAM. With the SP-54, the BROS Preparator and Roto-Mixer make the perfect combination for low cost street construction. The Preparator (in-place materials reducer) reduces native over-size materials and old blacktop to proper roadbed sizes. The Roto-Mixer stabilizes and blends the base and wearing course materials to improve load bearing values.



Self-Propelled Roller

Roto-Mixer

Preparator

BROS

engineering fields. There is currently a shortage of qualified draftsmen, instrumentmen, party chiefs, office engineers, mechanical engineers, and civil engineers. Well-qualified clerical personnel with construction experience, particularly male clerks, continues to be in very short supply. Clerks are needed for office duties at remote construction sites.

A LABOR SHORTAGE?—Despite the lack of applicants for a few skilled and semi-skilled jobs, there is definitely not a labor shortage in Alaska at the present time, according to employment and union officials. Isadore said: "Although employment

will continue to expand until we reach our high point in July and August, I would strongly urge that everything possible be done to discourage a job rush to the territory." Both Isadore and union officials confirmed that a steadily-increasing stream of workers is arriving in the Territory seeking work. One union official told me: "They come in here with 'bright hopes and shining faces' and no money." He said the job rush "happens every year but it's worse this year." Another declared. "Not since 1952 have I seen so many new men come in here from all parts of the States. Apparently it's the DEW line (Distant Early Warning)

line of radar sites publicity that is bringing them here. Most of these men are going to be hurt because there aren't jobs for them."

OTHER UNIONS—Here are the results of a check I made of several unions with regard to their current employment status: **LABORERS**—A union official said: "We have enough men out of work to man every conceivable job in the near or distant future. This includes all work from Cordova to McGrath and on the Aleutian Chain and of course includes the Anchorage area. **IRON WORKERS**—There are about 50 men unemployed in this category, an official said, but he expects most of them to be employed by the first of June. **PAINTERS**—There are now 30 painters unemployed in the Anchorage area.

ADVICE TO JOB-SEEKERS—Employment, union, and several contracting firm officials asked me to pass this advice on to stateside construction men through the pages of **Western Construction**. Under no circumstances should you pack up and rush off to Alaska unless you have a job commitment. Contractors doing business in Alaska generally have stateside offices which direct hiring of workers. These officials will keep you informed as to job opportunities. If you are a union man, check through your local or inquire by mail of an Alaskan local as to the opportunities in your particular craft. If you want general job information, write to the Employment Security Commission headquarters at Third and C in Anchorage.

TOTAL LABOR FORCE—A total labor force of 22,946 persons exists in the Anchorage area alone at the present time. When outlying areas are added to the figures, the total labor force in the Third Judicial Division should amount to more than 30,000, employment officials say. During the last 60 days, there has been about a 15% increase in total employment in the Anchorage area alone.

THE WAY I SEE IT—As the peak of employment and construction in Alaska approaches, the year 1956 looks as though it will be a year of tremendous accomplishment. A banner year in terms of total employment and total amount of construction accomplished. A year in which more dollars than ever before will pour into the coffers of Alaska contractors and their employees. I also looks—from my analysis of figures issued by the District Engineer—like the peak year before the predicted downswing. The drop in construction volume and construction employment will be gradual, the experts say, but it will be perceptible. So, construction-wise, one might say that 1956 will definitely be "a year to remember."

Sooner or Later



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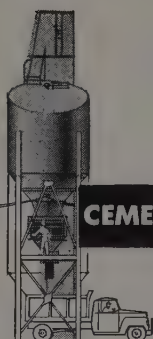
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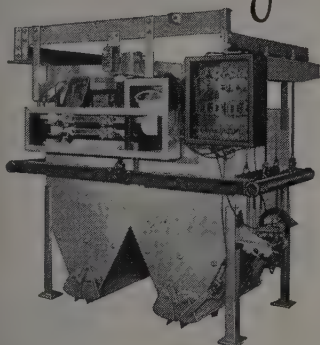
CEMENT



2 SIZES OF STONE

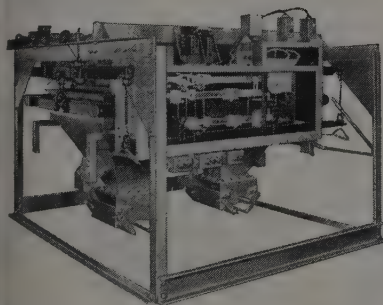


Automatically, Simultaneously...



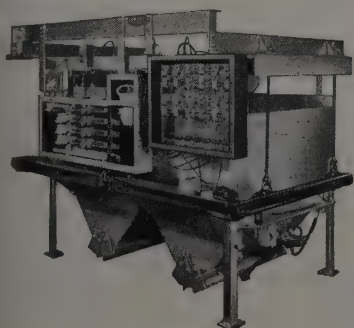
SAND

Two batches are discharged simultaneously. Electrical controls permit operation either by man at cement batcher, by the truck driver or, if required, by operator stationed on the sand batching plant.



CEMENT

Here one man may operate all 3 units or the cement batcher alone. Hoppers are quickly and accurately charged by ingenious combination of rotary gate (for speed) and vane feeder (for final accuracy).



STONE

Two batches, each comprised of 2 sizes of stone are discharged into the truck in the same instant. Cross feeds from each battery of hoppers to batchers provide correct proportion of each size of stone in each batch.

with the new

BUTLER 0-1-0

Road Builders Plant

Electrically operated controls are centralized at the cement batcher so that one man operates any one, two or all three plants simultaneously — and at the touch of a finger. That's performance that easily keeps pace with two 34E pavers.

Relays on each plant are pre-set for the specified batch proportions and continue those cycles unless at some point the engineer requires a change. New proportioning is then quickly and easily established.

So versatile,* however, is the BUTLER 0-1-0 that, if the contractor prefers, the truck driver himself can actuate either the sand or stone batchers without leaving the truck cab.

Important for quick set-up time are the special electrical connectors between the batchers. Interconnection is as simple as plugging in your toaster.

In the 0-1-0 BUTLER has provided new and more profitable horizons for the contractor in automatic operation at higher production levels. And for the supervising engineer the 0-1-0 attains perfect and constant fool-proof accuracy.

Please write for the complete story about the 0-1-0.

*Should local regulations require, each batcher may be controlled by its own operator.

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ENGINEERS on the move

Victor I. Corbell and Bert M. Pringle were recently reelected president and vice president respectively of the Salt River Project, Phoenix, Ariz., for a two-year term. Prior to assuming the presidency two years ago, Corbell was vice president. As a young boy he attended the dedication of Roosevelt Dam in 1911 and



Corbell



Pringle

last year presented the final payment on the loan for the dam and canal system to the Secretary of the In-

terior. Pringle is a former highway engineer in Wyoming and at one period in his career was partner in the Vinson-Pringle Construction Co. for 16 yr.

* * *

Maurice C. "Mutt" Wren, who was assistant field engineer for the USBR on the Lower Marias Unit, Tiber Dam, Mont., is now located at Thermopolis, Wyo., where he is serving as chief, Field Engineering Division, on the Owl Creek Unit, Missouri River Basin Project. Included in the work are pumping plants, canal, and dam construction.

* * *

Fred E. Cornwell, design engineer at the Bureau of Reclamation's engineering center in Denver, Colo., has been named to join a small group of experts going to Australia as advisers on the multipurpose Snowy Mountains construction program. Cornwell will give guidance to engineers in matters related to dam, tun-



WILLIAM F. CASSIDY, Division Engineer of the South Pacific Division of the U. S. Corps of Engineers, who recently became a brigadier general. General Cassidy is responsible for all river and harbor and flood control work as well as all military construction for the Army and Air Force in the area generally comprising Arizona, California, Nevada, Utah, and the Hawaiian Islands. His work involves an expenditure of more than \$180,000,000 annually.

nel and hydroelectric plant design. Going with him is Frank E. Goehring, construction engineer, whose duties will involve guidance to personnel engaged in all aspects of



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A most unusual area-to-height ratio, utilizing high-value property to its fullest extent. This apartment is secured on bell caisson footings extending four feet into bed rock ...and is constructed with BASALITE Lightweight Aggregate Concrete from basement to roof ... including a twelve story smoke tower.

Design advantages of BASALITE Lightweight Concrete in the structure:

1. Architectural concrete.
2. Reduced dead weight by 30%.
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On your next job...specify BASALITE Expanded Shale Aggregate for stronger, lighter, concrete construction.

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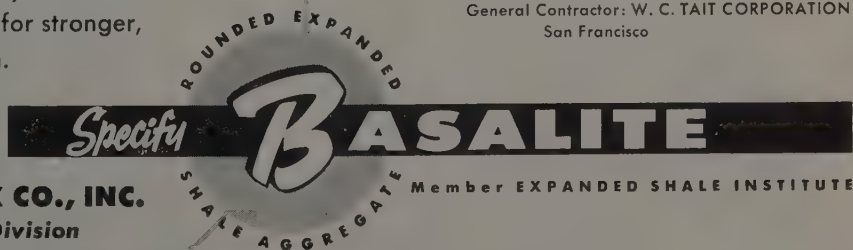


COMMUNITY APARTMENTS, Nob Hill, 1190 Sacramento Street, San Francisco. Note expansive glass areas and cantilever principle for window treatment.

Architect: ANGUS McSWEENEY, A. I. A.
San Francisco

Structural Engineer: C. JEFFERSON SLY
San Francisco

General Contractor: W. C. TAIT CORPORATION
San Francisco



heavy construction projects. The two men are replacing two engineers who have completed their Australian assignments.

* * *

Assignments of construction engineers for the Trinity River, Ventura, and Santa Maria reclamation projects in California were recently made by W. A. Dexheimer, Commissioner of the Bureau of Reclamation. Louis B. Ackerman, construction engineer in charge of Palisades Dam, Idaho, becomes construction engineer for Trinity River Project in Northern California. G. Raymond Rolin, presently construction engineer on the American River development, goes to

the Ventura Project, north of Los Angeles, also as construction engineer. John R. Lawrence, field engineer in the distribution system project office of the Central Valley Project at Lindsay, now takes over as construction engineer on the Santa Maria Project, northwest of Santa Barbara.

* * *

Bert G. Jepsen is now with the Civil Aeronautics Administration as air operations specialist in connection with air traffic control at the Sacramento (Calif.) municipal airport. From 1949 to 1952 Jepsen was with the U. S. Air Force as air traffic controller. Just prior to his newest

connection, he was with the State of California, District 4, "working with a great group of men," he reports, on the Petaluma by-pass out of Santa Rosa.

* * *

M. J. Kinsey was recently appointed resident manager for construction of the new Kaiser Aluminum & Chemical Corp. alumina plant at Gramercy, La., according to announcement by Henry J. Kaiser Construction Co. Kinsey assumes his new position after serving as project manager for L. E. Dixon Co. In this capacity he supervised construction



M. J. Kinsey

of a new cement plant for the California Portland Cement Co. at Mojave, Calif. In 1952-53 he was project manager for Brown & Root, Ltd., and supervised a \$76,000,000 cellulose acetate plant in Canada. His engineering background includes a hospital in Salt Lake City, a manganese extraction plant in Boulder City, Nev., engineering design for shipyards in the San Francisco Bay area, as well as various foreign projects.

* * *

James W. Huston, director of Alaska Public Works for the Office of Territories, Department of Interior at Juneau, Alaska, recently resigned to accept a position as engineer with a San Francisco construction company.



ALEX ROBERTSON CO., Paramount Calif., for over 30 yr. a Western engineering contractor, has taken on a new look. The company's new red and black insignia will soon mark its presence on public utility jobs and pipeline installations all over the West.

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- Planes up to 1" deep, 78" wide.

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One Man
Operates



YOUR SUCCESS

STORY...

IN CONCRETE FORMING, your success depends on **MEN, MINUTES** and **MONEY**. Using the ultra-modern Symons System you will:

Conserve Manpower—put your **MEN** to work with ready to use, lighter weight panels when you need them.

Save Time—Up to half the **MINUTES** are saved in panel handling, erecting, stripping and finishing.

Increase Profits—Make more **MONEY** faster and easier, plus...a better job.

SPEEDIER FORMING BECAUSE...



The connecting bolt, wedge and panel tie provide a simple—unique method of faster assembly—no special tools—**ONLY A HAMMER**.

Put a panel in—take a panel out—at any stage of forming—without the usual complications.

Symons more than fifty years of successful—on the job experience—is your assurance of the finest in concrete forming equipment.

It's easy to decide once you've compared—Why not find out now how the Symons System can save you—Men, Minutes and Money.

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SUPERVISING the jobs

Ralph L. Hawkins is project manager for Guy F. Atkinson Co., holder of contract for grading and structures on Highway 101 bypass at Sierra Point, South San Francisco, a State of California project. Assistant superintendents are E. M. "Mickey" Daley (days), and W. Lee Reid (swing). Job office manager is Jack Sanders. E. D. Hunt is time-keeper. The following are foremen: pit, Walter Hendrick (day), Alex Morgan (swing); fill, Les Pettit (days), Bill Harnit (swing); equipment, Ernest Grossot and Dave Haney (days), Glen Ragsdale (swing); master mechanic, Gordon Melton; truck, Jake Coffey; mechanic, Ed Phillips; tire, Billy Lough and Jerry Miller; shovel, "Dutch" Hendricks; shop, C. H. Nickolisen. Electrical superintendent is Gene Reed, and Bob McKinzie is storekeeper. Serving as lugman is Mel Dunham; heavy duty mechanic, Ervin Wakeman; electric operator, Warren McQueary. Work here has been going on since last November and will probably draw to a close in September. * * *

Dick Rundle is project engineer for Peter Kiewit Sons' Co. which has the contract for a music building, stadium and swimming pool at Pasadena City College, Pasadena, Calif. Until recently Rundle was on PKSCo.'s Dublin Canyon and Richmond-San Rafael Bridge job. This latter project will be completed in a few months. With Rundle on the \$1,000,000 Pasadena contract are Bob Berry, job office manager, and Lew Adams, superintendent. This is a 10-month contract.

Ray Russell, project manager, and Mike Barcus, general superintendent, head the list of personnel on a smelter construction project nearing completion by Bechtel Corporation for Hanna Nickel Smelting Co. at Riddle, Ore. Construction has been under way since 1953. Foremen are: Dave Pitts, carpenter; Bud Hawkins, ironworker; Les Billings, electrician; Bill Bell, operators; Claude Clark, pipefitter; John Wilhite, millwright; Ward Baines, sheet-metal; Calvin Robison, labor, and Harry Edwards, boilermaker.

Ralph Wigle, general superintendent for M. J. Ruddy & Son, has been supervising construction on three recent awards to Ruddy from the California Division of Highways. One a section of the Madera-Firebaugh highway recently completed at a cost of about \$138,000, on which Roy Morse acted as superintendent. An-



Ralph
Wigle

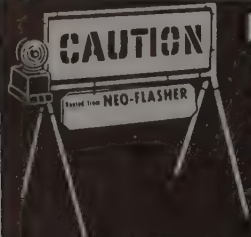
other is a section near Modesto, a \$170,000 job which started in February 1955, on which Dick Spriggs is job superintendent. This work will be finished about August. On the third, an \$87,000 contract on the LaGrange-Keystone highway, Nat Walker was superintendent.

Down-time By Domagalski



"Same forecast as yesterday, Joe—occasional showers."

Western Construction



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A quarter century of rock handling...



A SOFT TOUCH FOR THIS

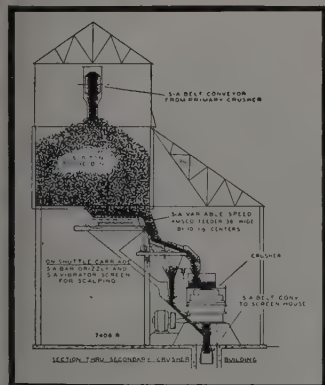
S-A Conveyor System

Any quarryman will admit that conveying big, tough rock tonnages at high speed and low cost, really takes some doing.

The Elmhurst-Chicago Stone Co., Elmhurst, Illinois has been doing it since 1930 with a conveyor system engineered and built by STEPHENS-ADAMSON MFG. CO.

The system, installed more than twenty-five years ago, is today still pouring out 450-500 tons of crushed limestone per hour. Altogether, more than 8½ million tons have passed over and thru its bins, feeders, crushers, screens, and belt conveyors.

Actually, STEPHENS-ADAMSON has been designing and building conveying systems for over 50 years. This tremendous wealth of experience is why S-A engineers can go immediately to the heart of any bulk material handling problem to solve it swiftly and economically.

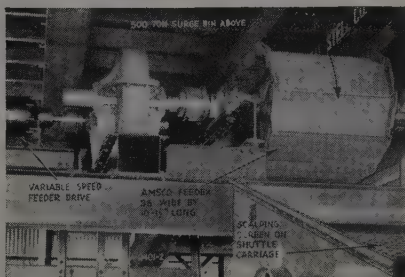


Secondary crusher building contains 500 ton capacity surge bin, enough for 2 hr. operation in case of quarry shutdown. A stacker conveyor builds up primary crush for use in case primary crusher is closed down.

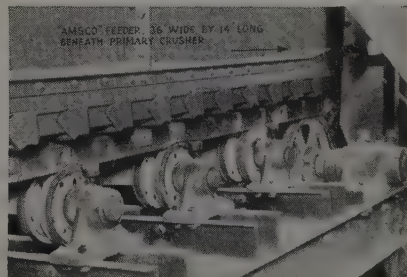
VISIT OUR BOOTH, #316—M.H.I. Exposition, June 5-8, Cleveland, Ohio.

S-A MANUFACTURES:

- Conveyors (apron, flight, portable, screw, bucket, REDLER, zipper, vibrating, etc.)
- Bin dischargers • Car & Ship loaders—unloaders • Car pullers—chains and sprockets • Elevators—screens and grizzlies • Winches—hoists—transmission equipment • Speed reducers—bin gates—feeders
- SEALMASTER bearings.



Manganese Steel feeder receives quarry stone in the primary crusher house. It feeds to the crusher which in turn delivers to an S-A conveyor belt. Stone is then carried to a 500 ton surge bin in secondary crusher building as shown in drawing at upper left.



Manganese Steel feeder in secondary crusher building receives primary crush from 500 ton surge bin and delivers to crusher thru a bar grizzly or vibrating scalper. S-A belt conveyor then carries to 3rd and final processing station.



STEPHENS-ADAMSON MFG. CO.

88 Ridgeway Ave., Aurora, Ill.—Los Angeles, Calif.—Belleville, Ontario

ENGINEERING DIVISION

Designers and manufacturers of all types of bulk materials conveying systems.

STANDARD PRODUCTS DIVISION

A complete line of conveyor accessories—centrifugal loaders—car pullers—bin level controls, etc.

SEALMASTER DIVISION

A full line of industrial ball bearing units available in both standard and special housings.

Everything

FOR MORE PROFITABLE PAVING



JACKSON PAVING TUBE
(INTERNAL TYPE)



Jackson Multiple Vibratory Compactor

MACADAM BASE COURSES, SUB-BASES, SOIL-CEMENT PAVING, FILLS

The JACKSON MULTIPLE COMPACTOR has now thoroughly demonstrated that it is by far the most advantageous equipment for achieving or exceeding specified densities in rock, slag, sand, gravel . . . all granular soils used in waterbound and penetration macadam construction, and in filling the voids in rock and slag courses with fines. The Jackson does it in about half the time required with other types of equipment. It is equally efficient for consolidating large granular soil fills such as bridge approaches and kindred projects.

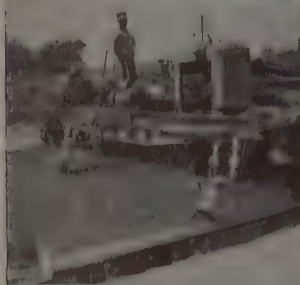
JACKSON INTERNAL TYPE PAVING TUBE

Supplied with extraordinarily powerful motors, no concrete highway or airport paving job is too tough for this improved machine. Tubes vibrate deep in concrete, quickly plasticizing harsh dry mixes in slabs to 24" thick and as wide as 25'. It saves time, saves cement; provides greater density and compressive strength. Cuts spreading costs where no spreader is used. The tube is made up of one unit as shown for each 5'-0" (maximum) of slab width. Usually attached to front of finisher and controlled by finisher operator. Power is supplied by a Jackson Power Plant mounted on the parent equipment. Use of a JACKSON Side Form Vibrator on standard finisher assures thorough consolidation and plasticity of concrete at side and center forms — with no "missed" spots. Labor savings effected quickly repay cost of equipment.

MUNICIPAL PAVING — BRIDGE DECKS, ETC.

For jobs of this type a JACKSON Vibratory Screed and Portable Power Plant is the most convenient, productive and inexpensive outfit you'll find anywhere. Strikes off to any crown, undercuts at curb and sideform, works right up to and around all obstructions. Two men easily handle it on all slabs up to 30 feet wide, and it may be rolled back for second passes on 4 rollers.

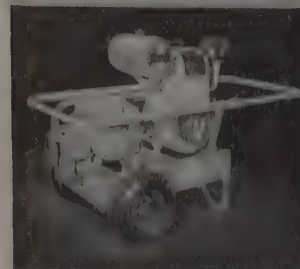
PORTABLE POWER: Thoroughly reliable, time-proved plants in capacities of 1.5 to 7.5 KVA . . . equipped with permanent magnet generators requiring no maintenance or adjustment. They provide both single and 3-phase 120V., 60 Cy., AC and may be used for lights as well as operating all JACKSON equipment.



JACKSON SIDE FORM
VIBRATOR



JACKSON VIBRATORY
SCREED



JACKSON POWER PLANT

FOR SALE OR RENT
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JACKSON VIBRATORS, INC.

LUDINGTON

MICHIGAN

Dan Handy is supervising the job for Lowdermilk Bros. Construction Co., which has a \$376,631 contract for 2.9 mi. of grading and surfacing State Highway 4, in Mesa County, Colo. Structures superintendent is R. G. McGillivray; grade foreman, Tom Dean, and timekeeper, Lloyd C. Smith. A 180-day job, work has been under way since January.

* * *

K. O. Taylor, construction manager, and H. H. Warner, superintendent, are Bechtel Corporation's top men on construction of a power plant at Buhne Point, Eureka, Calif., for Pacific Gas and Electric Co. Other key men are Lanthrop Milman, job engineer, and J. F. Moore, office manager. General foremen: Abe Kiewer, carpenter; W. H. Murray, electrician; Lou Penrod, pipefitter; T. A. Spencer, millwright, and G. J. Fitzsimmons, warehouse. Foremen: R. McDowell and W. G. Rehorn, electrician; Paul B. Overby, painter; Denzil L. Hancey, O. D. Turner, and M. M. Long, pipefitter; R. W. Miller, ironworker. Contract is expected to be finished Oct. 1.

* * *

Charles W. "Bill" Young is general superintendent for Stolte, Inc., on Corning Canal, an 8-mi. earth-lined canal with concrete siphons, near Corning, Calif. About 400,000



Charles W. Young

cu. yd. of excavation, 2,500-cu. yd. concrete structures are involved. Other key men are John Hoskins, office manager; J. J. Salvador, excavation superintendent; Jim Foose, concrete superintendent, and M. E. "Whitey" Orr, master mechanic.

* * *

I. D. Robbins, project manager, Sam Shelton, general foreman, Evan Hendricks, office manager, as well as John Henzley and Bill Conners, engineers, head the supervisory force working for Morrison-Knudsen Co., Inc., on the runway and taxiway extensions, airfield lighting and drainage at Mountain Home, Idaho. This \$1,340,275 airfield project has been under construction since mid-February and is expected to be finished about mid-October.

* * *

George Smith is general superintendent and engineer in charge of a \$528,500 contract for clearing the

Compaction at its Best!



Southwest Model C-75 with DW-21 "Cat" on Dam Project in the West.



Southwest Model C-25 with D-6 "Cat" in Structural Backfill on Southern California Freeway Construction.



Southwest Model C-50 with "C" Tournapull on Large Housing Project.



Southwest Model C-15 with D-4 "Cat" on Highway Job.

Structure Backfilling

Frequently neglected places are the restricted backfill areas around structures, such as abutments and similar spots. The smaller sizes, Models C-15 and C-25 of Southwest Heavy Duty Compaction Rollers, can work in close quarters and produce low-cost compaction.

On a recent State of California freeway contract a Southwest Model C-25, working on 10-inch sand lifts close to the concrete structure, developed 98.5 average modified AASHO densities in only four passes. The contractor was able to increase the yardage placed per shift by several hundred percent over slower hand and vibratory methods of compaction.

Kneading action of the backfill material by the Roller tires and the ponderous weight of the Roller produce maximum compaction results.

Speed and Mobility

In earthmoving, the trend is to faster travel and unloading, particularly on large projects requiring the placing of big yardages per hour.

Equipment must of course be operated with a high degree of coordination—Southwest Heavy Duty Rollers teamed up with present day wheel type tractors can follow closely behind the earthmovers and maintain job efficiency.

For movement from job to job, where conditions permit, the Southwest Roller with its large tires, and ballast removed, can be quickly and readily moved over highways.

Large Yardages

The present-day projects with big quantities of earthfill to place and compact must have large hourly production.

Southwest Heavy Duty Rollers handle thicker lifts than Sheepfoot Rollers, and with fewer passes.

Lifts 12" to 18" are not uncommon with resulting yardage several times greater than obtainable with Sheepfoot Tampers or other slow-moving compaction equipment.

Fill conditions—soft spots, stones and boulders—are easily overcome without

interference to operations. The patented independent vertical oscillating weight boxes and constant, uniform wheel load pressures assure uniform compaction at all times.

The result is time savings and lower costs with larger yardages.

Lower Maintenance Costs

The Pneumatic-Tired Roller will give lower maintenance costs per yard of production than other types of compaction equipment.

The few moving parts and long-life tires on Southwest Rollers keep maintenance costs at a minimum. Other items of equipment, particularly Sheepfoot Tampers with feet to be replaced, have greater unit costs due to numerous wearing parts.

Interchangeable With All Tractors

Southwest Heavy Duty Compaction Rollers can be teamed up with all crawler type tractors and practically all wheel type, off-the-highway tractors.

For crawler tractors with standard drawbar, our standard goose-neck type draft beam is supplied.

For the wheel type tractor the properly engineered draft beam is available for this combination.

Versatile Application

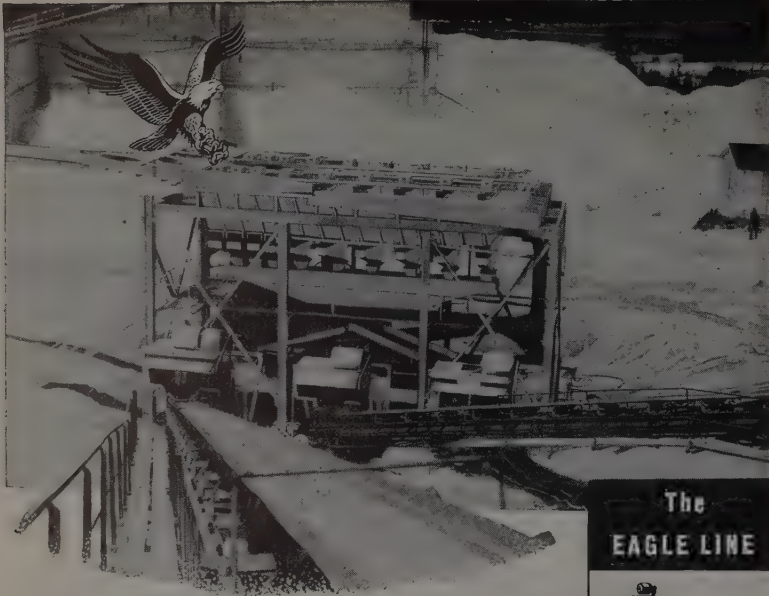
The range in sizes (15- to 100-ton) in Southwest Rollers will cover most all earthfill compaction jobs, from housing projects, highways and airfields up to the largest of earthfill dams.

Another feature, particularly valuable on levees and steep embankments, is the ability to operate without tipping over, as compared with the ordinary type Pneumatic-Tired Roller, should the outside wheel run off the edge of the fill.

Write for Complete Information

SOUTHWEST WELDING & MANUFACTURING CO.

Construction Machinery Division
ALHAMBRA, CALIFORNIA



The simple, effective, economical way to wash and classify concrete aggregate!

THE combination of equipment shown above is an Eagle Complete Washing-Classifying-Dehydrating Section. These Sections are designed to meet capacity and product requirements of any producer.

They are a "package unit"; can be set down and integrated with any plant.

There is NO equipment or combination of equipment that comes even close, as far as ease of operation, economy and overall results are concerned. Eagle pioneered material washing and classifying and has the broadest experience in the field.

Material, in this case, is flumed to the Eagle Water Scalping-Classifying Tank. The power-operated valves assure removal of excess water, and classification within the tank by utilizing natural settling rate of particle sizes. Gated splitters below each valve, enable throwing desired percentage of each valve's bleed to multiple-cell Collecting-Blending Flume below splitters. The multi-cell Flume below the tank routes the desired gradations to three Eagle Screw Washer-Classifiers-Dehydrators. They wash and further dewater the material, producing concrete sand, mason sand and plaster sand. Or, two screw units can produce concrete sand while one produces mason sand—any combination you want—utmost flexibility. The cost? Mere pennies per ton of material to meet specifications!

Send for YOUR Copy of new 44-Page Catalog 55.

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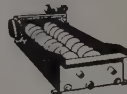
EAGLE IRON WORKS, 203 HOLCOMB Ave., Des Moines, Iowa

Brown-Bovis Industrial Equip. Co., Los Angeles, Calif.; Coast Equipment Co., San Francisco, Calif.; P. L. Crooks & Co., Portland, Oregon; Intermountain Equip. Co., Boise, Pacatello, Ida.; Spokane, Wash.; Kerami Tractor & Equip. Co., Cheyenne, Casper, Wyo.; The Long Co., Salt Lake City, Utah; H. W. Moore Equip. Co., Denver, Colo.; Jack Sohberg 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, Missoula, Great Falls, Bozeman, Mont.

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FINE MATERIAL WASHERS



COARSE MATERIAL WASHERS



LOG WASHERS



WATER SCALPING—CLASSIFYING TANKS.



"SWINTEK" DREDGE LADDERS



COMPLETE DREDGES



BREAKER BALLS & PILE HAMMERS.

Feather River overflow areas, Sutter bypass to Yuba River, Sutter and Yolo counties, California, for Pinole Land Co., Inc. Charles Jarvis is assistant superintendent. This work started in May and will probably extend to January 1957.

* * *

Clyde Rossow as superintendent heads the list of personnel on \$169,562 award to Armstrong & Armstrong covering grading, base course, drainage structures, and three concrete bridges with H-beam piling, located at Roswell, N. Mex. Paul Taylor and T. C. Carr are foremen. Under way since March, the job is scheduled for completion in August.

* * *

A. L. Roark is division superintendent for Morrison-Knudsen Co., Inc., and in charge of a \$219,549 contract in Garfield County, Utah, for 2.5 mi. of grading, surfacing, and a bridge construction in Garfield County. Dean Rule is superintending this job which will be finished in about a month.

* * *

Dave Warnick, superintendent, Howard Woods, project engineer, and W. G. Kirkham, office manager, are top men on the \$2,152,663 construction for Schedule B, apron parking, at Hill AFB, Utah. Gibbons-Reed Co., contractor, started work here in February and expects to have the project finished about November.

* * *

Herman K. Siron, superintendent, is in charge of a \$192,606 Navy contract under way since April in San Diego County, Calif., by Edward R. Siple Co. O. E. Spencer, engineer, and Donald T. Sweetser, purchasing agent, are other important men on this contract which covers construction of highspeed apron fueling facilities at the Naval Air Station at Miramar. April was the starting date and work will probably extend till September.

* * *

James Gordon, project manager for M-B Construction Co., is directing construction of runway and taxiway extensions at Elmendorf AFB, Alaska. Other key men on this recent \$9,045,575 award to M-B are Joe Sipes, grading superintendent, N. V. Raney, utilities superintendent, and Harold Leader, job office manager. Started in May, the work will probably continue through mid-1957.

* * *

Charlie Joy, superintendent, aided by John Blaire, grade foreman, T. C. McNeely, plant foreman, and J. E. Dowell, expeditor, is supervising W. J. Henson's \$615,627 contract covering base material and plant-mix paving on the Globe-Safford and Globe-Lordsburg highway project in Arizona. Under way since since March, work is scheduled for completion in September.

* * *

Ralph J. Jones is job superintend-

NOBLE Triple Batcher Concrete Paving Plant



This Center Section view shows the air ram operated double clamshell batch gates, the cement feed screw, adapter and batch gate over the cement weigh hopper in the center with an aggregate weigh hopper on each side.



If you desire further information concerning this revolutionary new plant, please let us hear from you.

You, the contractor, are of course interested in new equipment which will reduce your cost of producing and placing concrete. Some of the advantages of the new Noble Triple Batcher Plant are:

1. TRIPLE SPEED—allows the use of one single batch plant on many paving jobs which formerly required dual plants or two-stop plants. Proven capacity of over 250 cu. yds. per hour in 1½ yd. paving batches. **COMFORTABLY SERVES 2-34E DUAL DRUM PAVERS.**

2. TRIPLE ACCURACY—cement, fine aggregates and coarse aggregates are each weighed on a separate scale, *simultaneously*. Accuracy surpasses the most exacting specifications of State and other Government Agencies. All materials weighed automatically. Recording optional.

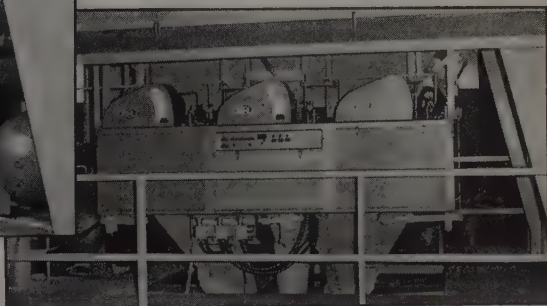
3. TRIPLE CONVENIENCE—this plant breaks down into units which can be transported by truck without a highway permit, making loads not over 8' wide. The plant is designed for fast, easy erection and can be supported either on timbers or on concrete footings. All wiring is done at the factory so you need only make a few quick lock couplings when the various units are assembled. Weigh hoppers, scales, gates and controls are shipped intact and completely assembled in the all welded center section.

4. Cement silo has facilities for direct loading of bulk cement spreader trucks (for cement treated subgrade).

Center Section view, showing the triple-automatic scale beam cabinet with operator's controls mounted in the center directly under the cement scale indicator.



70



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June 1956 — WESTERN CONSTRUCTION

225



Cleveland® "95" digs 10 miles for airfield lighting system at Portsmouth, N. H. Air Force Base

Morrison-Knudsen Company, Inc. and Landers & Griffin, Inc. employed a Cleveland Model 95 "Baby Digger" to good advantage in the construction of the airfield lighting system for the Strategic Air Command's 4,500-acre, \$60,000,000 Jet Base at Portsmouth, N. H. The Cleveland dug approximately 52,000 feet of trench 17 inches wide by 27 inches deep for the installation of cable and duct.

The "Baby Digger" was also profitably used on the same project for the excavation of some 3,600 feet of underdrain pipe trench, approximately 2 feet wide by 5 feet deep. As the photograph above shows, much of this trenching was done in rocky, stony soil, definitely not what could be termed "easy going."

The dependable Cleveland steadily delivered good daily trench footage—as it had been counted upon to do—in spite of the rugged digging and adverse conditions encountered. Just another example of Cleveland's ability to *dig more trench . . . in more places . . . at less cost.*

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ent under A. L. Roark, division superintendent for Morrison-Knudsen Co., Inc., on a recent \$1,064,978 award for construction of a 4-lane highway near Wells in Elko County, Nev. Dean Straw, Jack Good, Grant Peacock and Fred Huff are foremen on this job which started in May and will probably end this November.

* * *

Hubert Roth, grading superintendent for Summit Construction Co., heads a \$196,802 job of grading, drainage, and selected material surfacing on 5.1 mi. of road near Moorcroft, Crook County, Wyo. Work which has been going on since April is expected to end in July.

* * *

"Hap" Johnston, general manager, is in charge of a \$132,693 contract awarded L. J. B. Construction Co. and H. J. Wimmer covering rebuilding of road, gravel, and surface with road-mix bituminous surfacing and construction of a bridge in Emery County, Utah. Acting as grade superintendent is H. J. Wimmer. Bud H. Henrie is plant foreman. Under way since mid-March, contractor expects to be finished by the end of July.

* * *

Frank Muren, project manager, Carl Whitore, bridge superintendent, and F. H. McBee, office manager, head Frederickson & Kasler's recent \$2,285,809 award for construction of 4-lane freeway by-passing the town of Chowchilla, Calif. Work started in May; will probably be finished about August 1957.

* * *

Vern Mulherron, job superintendent for Mardian Construction Co., recently finished a \$416,605 highway and railroad bridge job located at Grand Ave. and Black Canyon highway between Phoenix and Prescott, Ariz.

* * *

Owen Haskell, project manager, and Glen Thomas, general superintendent, with William Bates, assistant superintendent, are handling Haas & Haynie Corp.'s contract for erection of an office building at Antioch, Calif., for Crown-Zellerbach Corp. Under way since mid-April and scheduled for completion Oct. 1, this structure is costing approximately \$300,000.

* * *

Cliff Earsley as superintendent, and Earl Shannon as his assistant, head the construction crew working for Henry Thygesen & Co. on a \$560,319, 7-mi. grading, surfacing, and structures job on US 70, from Alamogordo to Holloman AFB, N. Mex. Work which started last December is fast coming to a close.

* * *

William Baldwin, foreman, is key man for Wilder Construction Co. on a 2.5-mi. grading and paving contract in Skagit County, Wash. Going since March, the \$395,058 contract is scheduled for October completion.

County engineer . . .

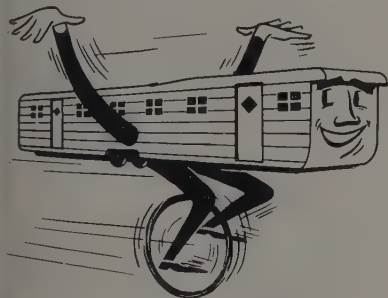
(Continued from page 46)

of people needing contact with the mainland. And this represents a problem of coastal counties that is hard to beat.

Western counties expect the county engineer to be a mediator between personnel and governing board. More often than not, his conscience dictates support to the personnel. And for the benefit of everyone concerned, including himself, most county engineers hope for some type of merit system. These are often difficult decisions, but the county engineers feel such systems make careers possible.

Western engineers must recognize that Western counties are advancing in engineering responsibilities more rapidly than any other region of the nation. They should realize that good highway work must become normal procedure. The county engineer must be tolerant of the criticisms and comments from his public. Highway administration is extremely important, but is only one function of his service.

The principal job of the Western county engineer is the proper administration of his highway department under his governing board's broad policy. His ability to organize must be equal to his engineering knowledge to secure well rounded department growth.



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greatest economy—whatever
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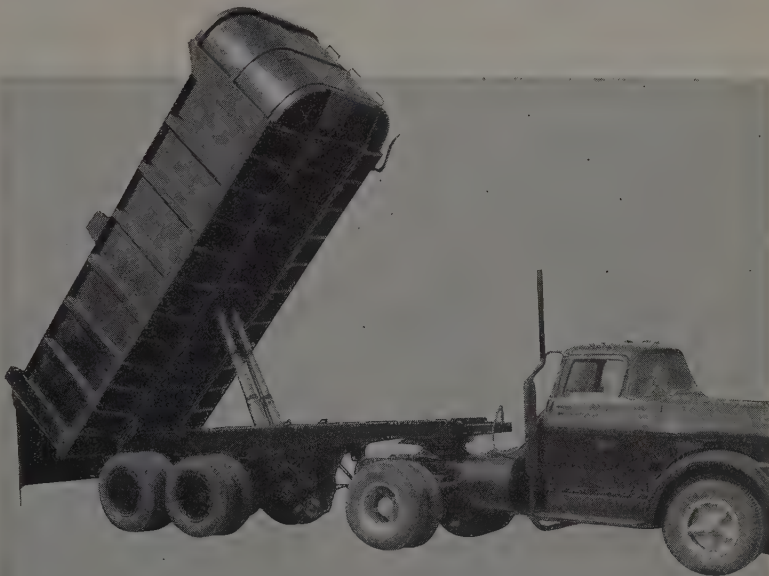
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- Design allows proper load distribution.
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Box 1831, 1101 3rd St., N.W.
Great Falls, Montana

NEW LITERATURE

"Typical Lumber Designs" for 1956

Now available to architects and engineers is the new 1956 edition of "Typical Lumber Designs," a 12-page publication containing more than 450 typical lumber designs employing the Teco system of engineered timber construction. The booklet is issued by Timber Engineering Co., 1319

Eighteenth St. N.W., Washington, D. C. research affiliate of the National Lumber Manufacturers Assn. The designs are applicable to almost any type of wood roof truss with spans from 20 to 120 ft. The publication includes suggested plans for wood bridges, trestles, grandstands, and a variety of towers, in addition to

designs for commercial, institutional, industrial, and residential buildings.

Corrosion proof construction materials

Atlas Bulletin CC#3 is a new 16-page bulletin giving basic data on the complete line of corrosion proof construction materials manufactured and installed by Atlas Mineral Products Co., Mertztown, Pa. Included in the release are chemical and physical data, estimating data and descriptions of corrosion proof cements, tank linings, protective coatings, rigid plastic fabrications, and rigid plastic pipe, plus a chart showing their resistance to various chemicals.

Plastic coated wire rope

New specifications and information regarding proper use of plastic coated wire rope have been released by Macwhyte Co., Kenosha, Wis. Circular No. 5610 shows ropes with from 480 to 7,000-lb. strength and weighing from 13 to 153 lb. per 1,000 ft. Minimum safety factors, sheave and drum diameters and tread pressure formulas are included.

Kilowatt-producing machines

International Fermont Machinery Co., Inc., Ramapo, N. Y., has published an 8-page manual entitled "Engineered Kilowatts," which contains data on kilowatt-producing machines. The electric plants powered by internal combustion engines, range in capacity from 5 kw. through 250 kw. and are designed for automatic or push-button starting. The manual, Fermont Bulletin No. 955, includes information concerning selection factors (for emergency standby electric plant) based on case histories, typical specifications installation, and automatic starting controls.

Load-N-Gate tail-gates

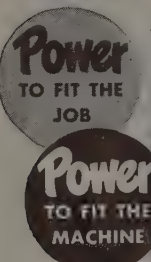
Models H-20 and H-30 Load-N-Gate power-lift hydraulic tail-gates are described in a two-page catalog offered by Hercules Steel Products Co., Galion, Ohio. The two-color catalog, No. 152, covers both 2,000- and 3,000-lb. capacity power take-off driven models. Construction, operation, and controls are described and illustrated. Condensed specifications shown.

Stran-Steel catalog

Metal curtain wall panels and 10- and 12-in. joists are new products featured in the Stran-Steel architectural products catalog for 1956. The steel panels are offered in several styles and weights, either insulated or non-insulated, and are easily applied with metal clips fastened by a hand-operated clinching tool. Metal thicknesses have been standardized at 18, 20 or 24 gage. The new joists are available for low-cost applications and can be used for spans up to 30 ft.

The 24-page catalog lists the entire line of Stran-Steel architectural

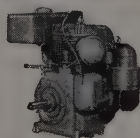
POWER to MIX Concrete and DELIVER it... BOTH UNITS ARE WISCONSIN-POWERED



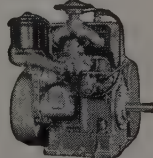
Working here are two fine units powered by Wisconsin Heavy-Duty Air-Cooled Engines . . . the versatile "Scoot-Crete" made by Getman Brothers, Manufacturing Div., South Haven, Mich., and the Kwik-Mix Dandy, built by Kwik-Mix Co., Koehring subsidiary, Port Washington, Wis. Both of these units have the inbuilt stamina and Lugging Power that are Wisconsin Engine characteristics . . . insured by such features as:

Heavy-duty engineered design and construction in all details; self-cleaning, file-hard tapered roller bearings at BOTH ends of the crankshaft; an easily accessible rotary type, high tension OUTSIDE Magneto, equipped with Impulse Coupling for quick starts in any weather, at low cranking speeds; pump circulated splash lubrication on smaller models and geared oil pump delivering individual oil stream to each rod on multi-cylinder models, plus efficient AIR-COOLING at temperatures from sub-zero to 140° F.

All this adds up to efficient Power Performance, Long Engine Life and Low-Cost Maintenance . . . reasons why you can't do better than to specify "Wisconsin Power" for your equipment.



Single-cylinder
3 to 9 hp. models.



2-cylinder
7 to 15 hp. models.



V-type 4-cylinder
15 to 36 hp. models.



WISCONSIN MOTOR CORPORATION

World's Largest Builders of Heavy-Duty Air-Cooled Engines
MILWAUKEE 46, WISCONSIN

Ingersoll-Rand Drillmaster

A 32-page bulletin on the Ingersoll-Rand Drillmaster 6½-in. blast hole drill is now available to quarry operators, road contractors, and construction men. The bulletin covers three types of mountings—crawler, truck, and tractor—and explains the "down the hole" drill. Two pages are devoted to helpful rock job estimating data. Manufacturer asks that all requests for copies be made on company letterhead and mailed direct to Ingersoll-Rand Co., Attention: J. K. Uhler, Phillipsburg, N. J.

products, including the continuing line of 6-, 8- and 9-in. joists, 1¼- to 3¾-in. studs, 2¼- to 3¼-in. punched channels, 1¼- to 6¼-in. unpunched channels, cold-formed columns and beams, and galvanized ribbed decking. Copies available from Stran-Steel Corp., Ecorse, Detroit 29, Mich.

Dresser Style 91 service saddle

Dresser Manufacturing Division of Dresser Industries, Bradford, Pa., has issued a new catalog containing complete description and specifications on the Style 91 service saddle. The service saddle, for tapping asbestos-cement, cast iron, and steel pipe, is available in sizes 2- through 12-in. inside diameter. Features include flat straps to increase bearing surface on the pipe and rolled threads, which maximize strength since no metal is cut away. Saddles available heavily galvanized or with special plastic tip.

IH skid-shovels

Two new folders, "Versatility Unlimited" and "Four-Machine Utility," which detail operating features and advantages of the new International Drott Four-in-One skid-shovel are now available. The folders describe mechanical features and performance of the new machine, for use with International TD-6, TD-9, and TD-14 crawler tractors. Ask for forms CR-405-F and CR-406-F. International Harvester Co., Consumer Relations Dept., 180 N. Michigan Ave., Chicago, Ill.

Shafer Bearing catalog

A 72-page catalog on Shafer roller bearings has just been published by Chain Belt Co., Milwaukee 1, Wis. The catalog contains specification and data pages on all models of Shafer units, with shaft sizes ranging from ¾ to 7 in. It includes completely revised, engineering data, load rating tables and exploded view for parts identification, and highlights such features of the line as the self-aligning principle of concave rollers running between convex raceway, Micro-lock adjustment, and Shafer "7" Seal.



Reasons Why UNI-FORM PANELS ARE THE MOST WIDELY USED PREFABRICATED FORM IN THE INDUSTRY...

VERSATILITY

Uni-Form Panels will form straight, irregular, curved, battered walls . . . slabs, beams, columns, piers—everything from small house foundations to massive concrete structures.

COMPLETE — READY TO USE

The Uni-Form Panel System is complete, ready to use when it reaches the job. Eliminates field fabrication. Result: FASTER JOB STARTS.

FAST ERECTION

Simple assembly of easy to handle panels increases productivity of labor. Form more contact area per man hour with Uni-Form Panels.

AUTOMATIC ACCURACY

Assembly of Panels with Uni-Form Ties furnished for any wall thickness insures automatically accurate forming. Tie positively locks and spreads panels. No measuring . . . no guesswork.

LUMBER SAVINGS

You use less lumber in Uni-Forming. Steel-framed panels erect into a tight, rigid form requiring minimum alignment and bracing on 1 side only—regardless of height. Saves labor too.

FASTER STRIPPING

Less alignment and bracing lumber . . . fewer parts to remove means faster stripping, lower costs.

LONG LIFE

Rugged steel frame designed for fast pouring, cradles and protects plywood edges . . . permits maximum re-use of plywood (actually 50 times or more) before replacement is necessary. Minimum panel maintenance required . . . lower material costs.

EXPERT ENGINEERING SERVICE

Universal's engineering staff and field engineers provide competent, specialized assistance, backed by over 40 years of experience in concrete forming.

3 SIMPLE STEPS FOR ASSEMBLY



1. Insert Tie loop in Panel tie hole.



2. Tie Key locks Uni-Form Tie to Panel.



3. Tie loop receives adjacent Panel. Insertion of Tie Key completes tying, locking and spreading operation.



3 BASIC ELEMENTS UNI-FORM PANEL

... Heavy duty — steel-framed, plywood faced.

UNI-FORM TIE

... High strength, easy break-back.

UNI-FORM TIE KEY

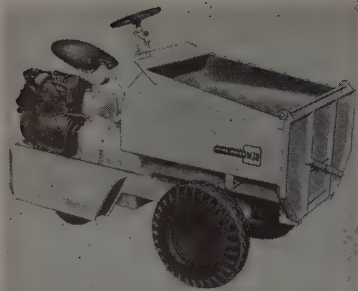
... Wedge shaped for fast, easy insertion and removal. Reusable.

UNIVERSAL FORM CLAMP CO.

1238 N. Kostner Avenue • Chicago 51, Illinois

DISTRIBUTED BY:

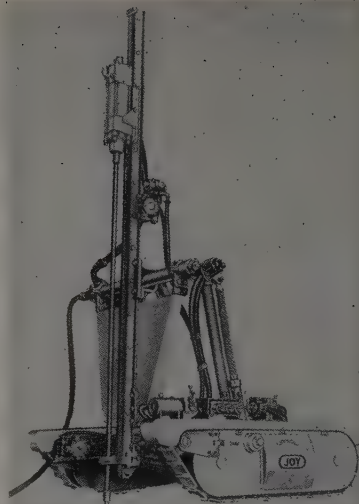
UNIVERSAL FORM CLAMP CO.
5855 S. Western Ave., Los Angeles, Calif.
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1549 Eastlake Ave., Seattle 2, Washington
UNIVERSAL FORM CLAMP CO.
2051-59 Williams St., San Leandro, Calif.



Joy announces new Challenger drill

A completely power operated wagon drill has been announced to the construction industry by Joy Manufacturing Co., called Junior Challenger. It is a self-propelled track-mounted drill that handles a heavy 4½-in. drifter and drills up to 3½-in. diameter holes to depths of 40 ft. in any formation. Trimming power is provided by two air motors (one for each tread) which are direct connected eliminating drive chains. Each tread moves independently to follow the terrain and can be locked by turning a valve to provide stability

spillage of liquid loads or the shifting of stacked materials. Information from The Prime-Mover Co., Muscatine, Iowa.



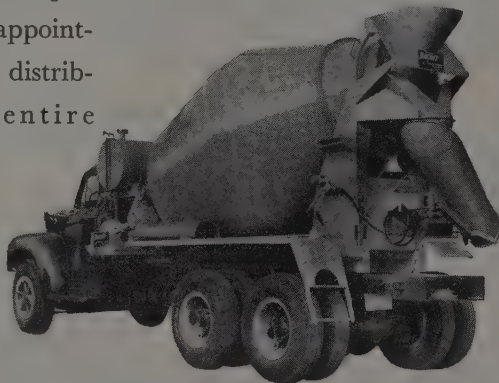
while drilling. The machine drills at any angle. Information from Joy Manufacturing Co., Oliver Bldg., Pittsburgh 22, Pa.

Concrete Transport Mixer Co.

is now appointing

QUALIFIED DISTRIBUTORS in the Western States for **ROCKET** revolving drum truck mixers!

Ever-increasing national acceptance and vastly expanded sales of the rugged, dependable ROCKET truck mixers has made possible the appointment of *qualified* distributors for the entire ROCKET line in the Western States area.



as a **ROCKET** distributor, you'll be backed by:

- ① Concentrated National advertising program
- ② Intensive regional direct mail advertising program
- ③ Representation at major concrete conventions
- ④ Fast delivery, assistance in arranging financing
- ⑤ Substantial net profit margin for **you**
- ⑥ A mixer that is considered by **owners** and **operators** as the **best mixer that money can buy.**

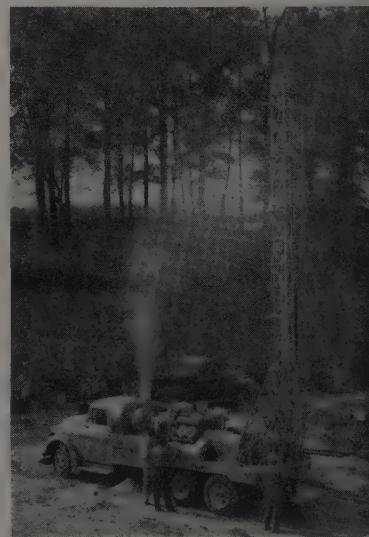
Write immediately for complete information

Concrete Transport Mixer Co.

4985 Fyler Avenue • St. Louis 9, Missouri

Davey rotary air drill

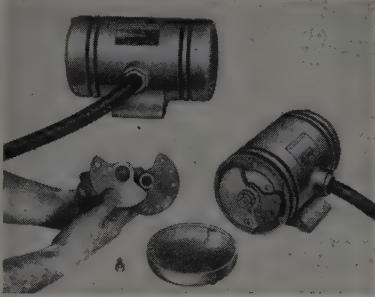
Powered directly from the truck engine, or from a separate power unit mounted on the drill frame, this Davey drill is rated to put a 6-in. bit through from 150 to 600 ft. of good sedimentary rock with air. The separate power unit (diesel or gasoline) is equipped with clutch, 5-speed transmission, starter and fuel tank. The hoisting and pick-up drum line has a capacity of 370 ft. of 5/8-in. wire rope. Cable pull on the drums is in



excess of 10,000 lb. with two lines. The tubular drill mast is 28 ft. which allows for pulling a 15-ft. length of pipe. A complete line of accessories is available. Information from Davey Compressor Co., Kent, Ohio.

Vibrators for bins and forms

Adjustable settings are a new feature of the Cleveland line to vary the amount of impact to the job. Within a matter of minutes the user can adjust vibrations; in the smallest unit the 6 settings range from 140 to 550



lb. of impact. Each end of the vibrator is equipped with two interleaving eccentric weights which may be opened or closed to adjust the degree of eccentricity. The vibrators are in general use for bins, chutes, and concrete forms. Information from the Cleveland Vibrator Co., 2828 Clinton Ave., Cleveland 13, Ohio.

End of the . . .
Western Construction
Road Show

POUR CONCRETE at LOWER COST BUY EFCO STEEL FORMS

Lifetime steel faces
never need replacing

Easy to handle and assemble

Save time, material, money

Low original cost

Other forms available
on a rental basis

Write for catalog to
ECONOMY FORMS CORP.
HOME OFFICE • DES MOINES, IOWA

DISTRICT SALES OFFICES: St. Louis, Mo. • Kansas City, Mo.
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Meluchen, N. J. • Rochester, N. Y. • Springfield, Mass.
Washington, D. C. • Decatur, Ga. • Dallas, Texas • Los
Angeles, Calif. • Oakland, Calif. • Denver, Colo.

NOW

AIRPLACO Concrete Gunning Equipment

Available in Complete Range of Sizes...

... to Make Your Concrete Gunning
EASIER... MORE EFFICIENT... MORE PROFITABLE!

Whatever your concrete gunning requirements, now there is an AIRPLACO concrete gun sized just right to meet your specific needs, from 1/2 to 7 cu. yds. per hour.

BONDACTOR MODEL 750 — Capacity of 1/2 to 3/4 cu. yd. per hour. Operates with 75 or 125 CFM compressor.

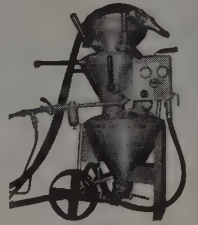
BONDACTOR MODEL 1250S — Capacity of 3/4 to 1 1/2 cu. yd. per hour. Operates with 105 or 125 CFM compressor.

BONDACTOR MODEL 1250L — Capacity up to 3 cu. yds. per hour. Operates with 210 CFM compressor.

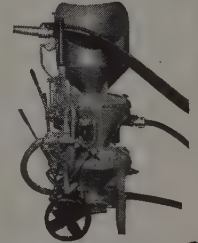
NUCRETOR MODEL 1500S — Capacity up to 3 1/2 cu. yds. per hour with 250 CFM compressor and 1 1/4" placement hose, or up to 5 cu. yds. with 315 CFM compressor and 1 1/2" hose.

NUCRETOR MODEL 1500L — Capacity up to 7 cu. yds. with 365 CFM compressor and 1 5/8" placement hose.

Capacities will vary with materials being gunned and with operating conditions.

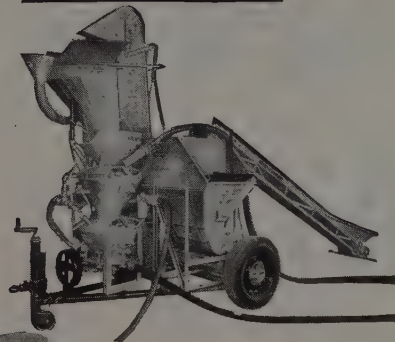


BONDACTOR MODEL 1250



NUCRETOR MODEL 1500

NEW



AIRPLACO Portable Rig Gives You Everything You Need for Any Concrete Job

Here is real portability, efficiency and economy. The AIRPLACO rig consists of the AIRPLACO Bondactor or Nucletror (Nucletror shown in photo) . . . the automatic proportioning, mixing and elevating MIX ELVATOR . . . and the new AIRPLACO Sand Loader. This completely mobile unit moves easily and quickly from one job site to the other and out-performs all other methods for profitable concrete construction, maintenance or restoration.

See These Distributors for

Free Catalog



EDWARD R. BACON CO.
San Francisco, Fresno
Oakland, Sacramento

**OREGON RENTAL &
EQUIP. SALES CO.**
Portland

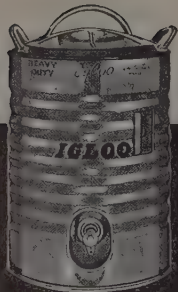
SMITH BOOTH USHER CO.
Los Angeles

WESTERN MACHINERY CO.
Phoenix

A. H. COX & CO.
Seattle, Tacoma

WESTERN MACHINERY CO.
Denver, Grand Junction

WESTERN MACHINERY CO.
Salt Lake City, Idaho Falls



*You
won't worry about
drinking water if you use*

IGLOO WATER COOLERS

Make an IGLOO water cooler standard equipment with your working crews. Clear, cool water means better workers, more work.

IGLOO out-cools and out-lasts the old-time water barrel because it's corrugated for extra life, all-steel made for extra strength, galvanized to be rust-proof, leakproof with double locked seams and sanitary to the Nth degree. There's an IGLOO for every need—2 to 15 gallon sizes.



P. O. DRAWER 9365 • HOUSTON 11, TEXAS

News of DISTRIBUTORS

John Gillette joins S. F. firm

Charles G. Robinson, president of Robinson Equipment Co., San Francisco, announces the association of John M. Gillette as sales engineer. Gillette has been identified with the construction equipment business for many years, having been manager of the Fresno branch of Industrial Equipment Co. He will specialize in the distribution of the products of Bay City Shovels, Inc., including cranes, shovels, and draglines, as well as Arrow hydraulic hammers, Schramm compressors, and other lines.

Hatten adds lines; opens store

Hatten Machinery Co. recently added to its accounts three new lines: Marion Power Shovel Co., Delta Power Tools, and Le Roi Division of Westinghouse Air Brake. A division of the company, known as "Power Tools," has been opened at 1325 Fourth Ave. in Seattle. This retail store, with over 13,000 sq. ft. dealing exclusively in power tools, brings the

machinery directly to the customer where he can use it or even be schooled in its use. The new division is under the supervision of Bob Markle and Rodger Evans.

Construction man joins distributor

W. W. Shepherd, general manager, recently announced the following appointment and promotions in the service department of Shepherd Machinery Co., dealer in the Los Angeles area: Appointed to the position



**James H.
Miller**

of general service manager is James H. Miller. Miller was formerly with

You SET THE SPECIFICATIONS



Special 4 x 6 Steam Fixed
Drum Winch. Duty single line
pull 4,300 lbs. at 90 FPM.

Superior-Lidgerwood-Mundy has the facilities and experience to meet them . . . either from an all-inclusive line of standard hoisting equipment or with equipment engineered to your specific requirements.

WRITE FOR BULLETINS AND CATALOGS

SUPERIOR-LIDGERWOOD-MUNDY CORPORATION

Main Office and Works: SUPERIOR, WISCONSIN, U.S.A.

New York Office, 7 Day Street, New York 7, N. Y.

50 miles of Presstite Sealing Tape used to seal warehouse against desert wind and dust . . .

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

To effectively seal the steel frame and corrugated aluminum structure all horizontal and vertical lap joints on the roof and sides were sealed with Presstite 579.6 Sealing Tape—263,076 feet of it! This tape is applied from rolls by hand; has excellent adhesive qualities and stays in place as applied. The corrugated aluminum sheeting was then riveted tightly against it. The tape remains permanently tacky; will not flow at temperatures up to 300°F., or become brittle at -65°F.

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



THE
**HUBBARD
COMPANY**

4809 East 49th Street, Los Angeles 58, California. L.O.G. 8-3136
SAN DIEGO: Glencourt 4-1659 SAN FRANCISCO: Underhill 3-0288



Morrison-Knudsen Co., Inc., in the capacity of master mechanic on several large construction projects and recently was general superintendent on a large dam job. Harry A. Faris, former welding shop foreman, who has been with Shepherd for the past seven years, has been made Los Angeles service manager. He is being succeeded in his former post by George Wanamaker who has been with the Shepherd organization since 1951.

Jetco California dealers

Jetco Sales & Engineering Co. of Alhambra, Calif., distributor of Vermeer Pow-R-Ditchers, announces the appointment of the following California dealers: Pringle Tractor Co., Salinas; M.F.D. Inc., San Jose, San Leandro, and Healdsburg; Tractor Specialties Co., Cotati, and Dome Tractor Co., Sacramento. Jetco Sales & Engineering Co. is a division of Jetco, Inc., manufacturer of Jetco Jiffy teeth.

New accounts and men

George M. Philpott Co., Portland, Ore., recently took on the Mall Tool line, as well as the products of Arrow Tools, Inc. Sales engineers working under Jack F. Bell, Philpott's manager, are Norbert T. Gleason, Charles Hoskins, Victor A. Meyers, Jr., Roy K. Farris, Richard L. Henderson, Richard A. Bouchard. Walter F. Predmore is in bearing sales.

Marion Power Shovel appointment

Dean Calland, Western sales manager for Marion Power Shovel Co., recently made the announcement that George M. Philpott Co., Inc. is now distributor for its complete line of diesel and gasoline powered excavators from 1/2- to 4-cu. yd. capacity and truck cranes to 35-ton capacity for the entire state of California, Clark County in Nevada, and Yuma County, Ariz. The Philpott company maintains sales offices and service facilities in San Francisco, Oakland, Sacramento, Fresno, and Monrovia, Calif.

Gar Wood dealer appointments

Industrial Tractor Sales Co. of North Sacramento, Calif.; Reno Equipment Sales Co., Reno, Nev.; and Western Machinery Co., Salt Lake City, Utah, have been appointed dealers for the construction equipment line manufactured by Gar Wood Industries, Inc., Wayne, Mich. Included in the line are fine-graders, material spreaders, highway wideners, and Gar Wood-Buckeye ditchers.

Boise firm has new prexy

H. W. Hurd, vice president and sales manager of Engineering Sales Service, Inc., Boise, Ida., recently assumed the presidency of the company. Other newly elected officers are: Eugene W. Shellworth, vice president; Robert Remaklus, secre-



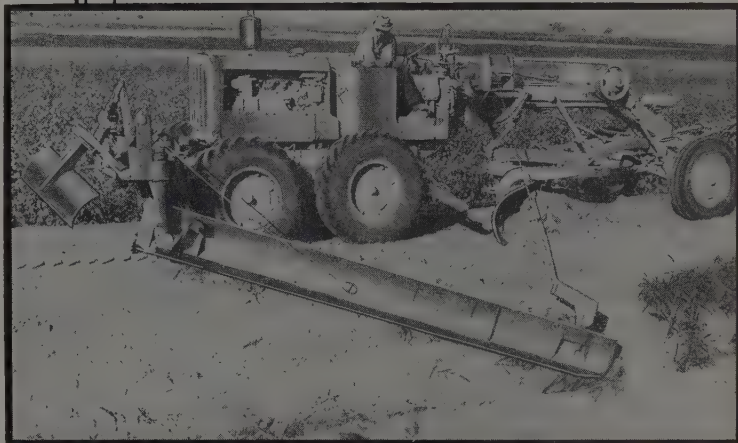
TO CUT COSTS!

Investigate

THE NEW

BRISCOE

GRADER-SLOPER



Here's the Latest—Low Cost Sloping Method for Roads, Highways and Canals

This new versatile attachment to the Grader cuts costs on sloping and grading operations. Easily moving in either 2nd or 3rd gear, the BRISCOE Grader-Sloper cleans slopes quickly and effectively, bringing up spoils from as low as six feet. The Grader-Sloper leaves a clean uniform slope, pulling all dirt and spoils up onto the roadway, while supplying loose material for finishing the top.

Grader-Sloper users note these exclusive features: either blade may be operated independently of the other, or the two blades may be utilized together, using all 38 feet of blade, cutting and sloping . . . all in one operation. (Your motor grader serves double duty, no need to detach the sloper to use the grader.)

For effective, low cost sloping operations, write or wire Briscoe Mfgs. for complete information. Satisfaction assured.



BRISCOE Manufacturers

OF CALIFORNIA

4129 N. Del Norte Ave. Kerman 2, Calif. Phone 9381



A McKiernan-Terry S10 Single-Acting Pile Hammer starts underwater to drive 195-foot 14-inch H-beam 70 feet below water for Richmond-San Rafael bridge foundation on the West Coast. McKiernan-Terry Corporation, 24A Mercer St., Dover, New Jersey.

tary, and R. W. Hermann, assistant secretary-treasurer. R. H. Mozer heads the shop, and H. J. McLean is parts manager. In the selling end are E. N. Brooks, Ralph Smith, Z. W. Scott, and Glenn Eldredge.

Sales additions; new lines

Ralph C. Hopkins and Don Chumby are now representing Calavar Corporation, Los Angeles, as salesmen, while Alfred R. Cartier is new sales correspondent. Calavar recently added to its lines the Wagner tractor and logger and the Browning pneumatic-tired roller.

Ditchers and tampers in Northwest

Vermeer ditchers, a product of Vermeer Manufacturing Co., and Jay tampers manufactured by Jay Corporation, are two lines newly acquired by Star Machinery Co. of Seattle, Wash.

New accounts for Northwest firm

Andrews Machinery Co. of Washington recently took on the distribution for the territory it serves of the complete line of General Road Machines, Inc., Niles, Ohio, manufacturer of curb and gutter, sidewalk and highway forms, planers, finishing machines, and other equipment used in highway construction. Master Vibrator Co. is another account recently acquired by Andrews who will now sell this manufacturer's complete

WE'LL BET YOU'LL LIKE THIS PAVER... **BECAUSE**

.....It costs but \$1,195* yet performs like it cost \$8,000!

SPREAD DEPTH • Leveling 3" to 12" • Finishing 1/2" to 3"

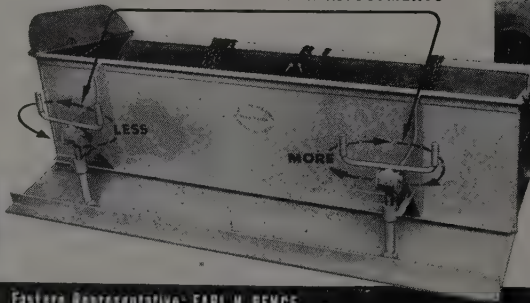
CONNECTS QUICKLY...FLOAT-TOWS EASILY

Pats. Applied For

INSTANT DEPTH & PITCH ADJUSTMENTS

- UNEQUALLED FOR CONTINUOUSLY VARYING DEPTH CONTROL
- LEAVES NO MARKS THAT REQUIRE RAKE OUT
- ACCURATE DEPTH & BREADTH OF SPREAD
- CAN RUN 1000' PER HOUR, 5-FOOT PLUS 5" SHOULDER
- SIDE GATES PROVIDE UP TO 6-INCH WIND-ROW
- NO SPILLAGE OF MATERIAL

**ROLA
PAVER**



*F.O.B. Factory plus sales taxes for the 9-FT. STANDARD MODEL

ASK FOR BULLETIN SHOWING SIZES

Eastern Representative: EARL H. FENCE

488 Oak Lane, Baltimore, Maryland

CM-21

Another



Product

SOLD BY

Jack FINGLAND Equipment Co.

1290 POWELL STREET • EMERYVILLE 8, CALIFORNIA • PHONE: OLYMPIC 3-8300

line of vibrators, screed beams, generators, Turn-A-Trowels, etc. Andrews has also established itself as a stocking distributor for American Chain & Cable Co.'s wire rope, and has also put into operation its own steel shop, under the supervision of Claude Thomas, well known blacksmith in Pacific Northwest, and has facilities for the manufacture and service of drill steel, bits, paving breaker gads and spades.

Totem gets H & L account

Totem Equipment Co., headed by R. E. Vadnais, with offices at both Seattle and Spokane, Wash., has been named distributor in those territories for H and L Tooth Co., Montabello, Calif. This pioneer manufacturer makes teeth for shovels, draglines, tractor shovels, and other types of heavy construction equipment.

Birt Slater resigns as sales mgr.

Birt Slater, sales manager and vice president of Cate Equipment Co., Salt Lake City, Utah, resigned as of April 1. Bob Evans and G. E. Roberts were appointed as managers of the Construction and Mining divisions, respectively.

Modern Machinery's operations

A switch in sales engineers has taken place at Modern Machinery Co. of Spokane, Wash. Jerry Dale has moved from Tacoma to Spokane.

EASY TO REPLACE ON THE JOB

Tamprite Tips



NO WELDING!

**DRIVE OFF WORN TIPS
DRIVE ON NEW TIPS**

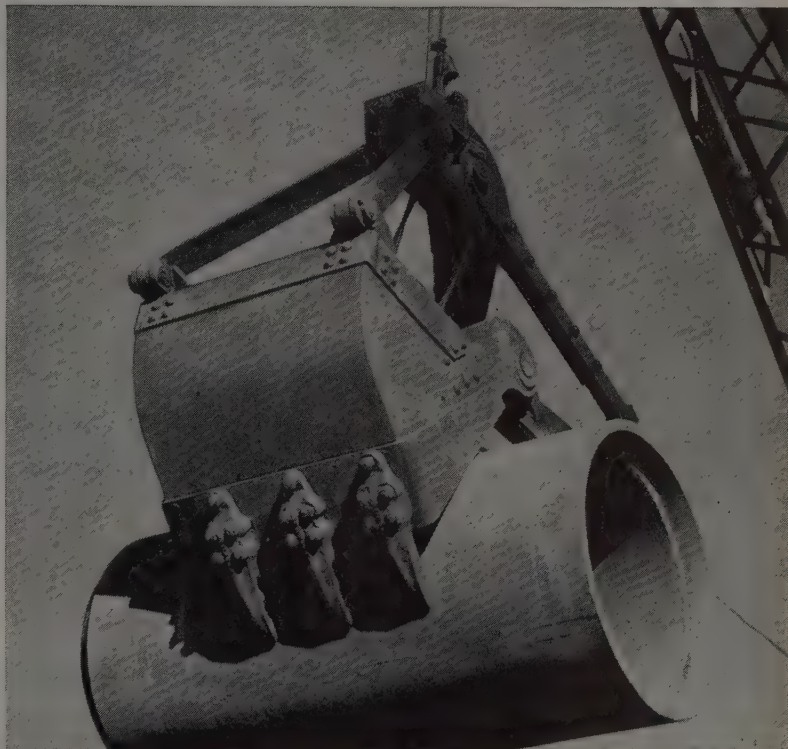
PREVENT COSTLY DELAYS by equipping your sheeps foot rollers with Tamprite Tips and Shanks. Simple to replace on the job. Available for immediate delivery. Write for information.

PATENT NO.
2131941

**LOS ANGELES
STEEL CASTING CO.**
4100 W. Boyle Avenue, Los Angeles 38, California

"OUR ERIE STRAYER BUCKET IS THE MOST VERSATILE TOOL WE OWN"

• States Edward J. Petrillo, President, Edward J. Petrillo, Inc.



On the job photo shows an ERIE bucket's no-slip grip on concrete pipe being moved at Edward J. Petrillo, Inc. on the New York Thruway.

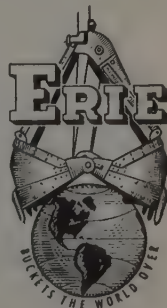
The change-over from clamshell bucket to grappling hook costs time and money—to say nothing of the extra man needed to work the hook. That's where an ERIE bucket's versatility pays extra dividends.

Like Mr. Petrillo, many satisfied owners use their ERIE not just to dig and load sand and gravel, but to move boulders, sewer pipe, steel girders, concrete slabs, logs, and old lumber.

An ERIE Strayer bucket is nimble, too. Its great power is perfectly balanced and easily controlled. Operators appreciate this feature—especially when digging in corners, along edges or loading hoppers in tight quarters.

These better buckets provide these "wanted" features:

1. Top closing power from block and tackle, plus lever arm construction, plus precision balancing.
2. Manganese steel teeth and high carbon steel lips that bite up full payloads of even toughest clay and gumbo.
3. Rigid, one-piece, welded head that shrugs off bumps and jars. No shimmy. No wobble.
4. Two-line, continuous reeving. Adds up to 50% to cable life. Less down-time for reeving.
5. Low head room for fast work in tight quarters; low center of gravity for easy positioning.



For catalogs, write Dept. WC66

ERIE STRAYER CO.

3766 GEIST ROAD • ERIE, PENNSYLVANIA

GEARED to SERVE



the **WHOLE DERN**
WEST!

WITH the **BEST IN—**
New, Used and Rebuilt

Contractors Equipment

Hoists • Pumps • Light Plants • Gas
and Diesel Engines • Electric Motors
and Control Equipment • Compressors
• Gear Reducers • DC Variable Speed
Drives • Couplings • Transmission
Equipment • Wire Rope and Cable, etc.

New and New Surplus

Industrial Piping

Valves • Flanges • Welding Fittings •
Pipe • Tubing • etc.
"COMPLETE Industrial Piping"

INQUIRIES INVITED...
QUOTATIONS GLADLY!

ZIDELL

Machinery & Supply Co.



3121 S. W. Moody Street
PORTLAND 1, OREGON
Capitol 8-8691



COOK BROS. Equipment Co. held its second Biennial Equipment Cavalcade recently at its main office, 3334 San Fernando Rd., Los Angeles, Calif. The purpose of the show was two-fold: to introduce a new line of front mount semi-trailer dumps, front mount dump bodies, new hoists; and to display equipment manufactured and distributed by this company to the construction industry. *Kemp Yorke*, Southwest regional manager, said the show represented over a half million dollars of equipment value and of its type was the most complete show of trucks and truck equipment used on construction. Over 1,800 viewed the display.

and Ken Ballinrud from Mount Vernon to Lewiston, Idaho. The company is increasing shop and parts facilities at Spokane and closing out its Seattle operation. New lines recently acquired by this distributor are International Harvester's industrial line, Frank G. Hough Co., and Galion Iron Works & Mfg. Co.

Third branch opened

Central Equipment Co., Inc., Berkeley, Calif., has located a third branch at 148 Jackson St., Hayward, where Bob Logan is manager. An-

other branch is in Sacramento. The Jay tamper was recently added to Central's equipment accounts.

Tapecoat appoints West Coast rep

As a service to West Coast users of its protective coating, The Tapecoat Company, Evanston, Ill., announces the appointment of Tay Holbrook, Inc., 165 Eighth St., San Francisco, as distributor in Northern California, and Palmer Supply Co., 222 Westlake Ave., No., Seattle, Wash., to handle sales and service in the Northwest. The Holbrook organ-

**BLAST HOLES
UP TO...**

30' DEEP



PHOTO COURTESY CATERPILLAR TRACTOR CO.



Carbide Rok-Bits—cross, "X" or chisel types—gauge sizes: 1 1/4" thru 6".

Alloy or carbon drill steel.

Most of the drill steel supplied by Brunner & Lay of Portland on this job.

DRILLED WITH CARBIDE ROK-BITS

Widening a 5.7 mi section of U. S. 95 near Riggins, Idaho called for the removal of nearly 430,000 cu yd of rock. Sub-contractor to Goetz & Brennan for blasting: Harding Blasting Co., Portland, cut costs by using carbide Rok-Bits®. That's because Rok-Bits gave increased drilling speed with few bit changes in ground varying from very hard to soft basalt. For quick help with your drilling problems, call our nearest plant. Write for Bulletin B-1.

Brunner & Lay Products

Brunner & Lay, Inc.
9300 King St.
Franklin Park, Ill.

Brunner & Lay Rock Bit of Philadelphia, Inc.
2514 E. 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 Road, Asheville, N.C.

Brunner & Lay of Portland, Inc.
660 N. Tillamook St., Portland 12, Ore.

ation maintains offices in Oakland, Berkeley, Sacramento, Stockton, Fresno, San Jose, Santa Rosa, Bakersfield, Eureka, Salinas, and San Carlos in addition to San Francisco.

McCoy adds a man; a line

Ted Shestak was recently appointed sales promotion manager for McCoy Company, Denver, Caterpillar dealer for Colorado. For the past two and



Ted Shestak

half years Shestak was in the employ of an electrical supply wholesaler and distributor in Denver. The McCoy Company has taken on the dealership for the Blaw-Knox Equipment Division, Pittsburgh, manufacturer of road paving equipment.

Mark Anthony joins H. S. Watson

H. S. Watson Company, Emeryville, Calif., announces the appointment of Mark Anthony as assistant sales manager. R. S. Pershing is sales manager. Anthony comes from the Anthony Company, Streator, Ill., with a broad background of truck equipment merchandising. His experience is most timely and helpful in the firm's expansion into new motor truck equipment lines for construction, as well as industrial and farm use.

Machinery Center handles TerraTrac

Machinery Center, Inc., Salt Lake City, has been named factory distributor for TerraTrac crawler tractors and equipment in Utah, southwestern Wyoming, and northeastern Nevada, according to announcement of American Tractor Corp., Churubusco (Fort Wayne), Ind. To accommodate TerraTrac, in addition to its other equipment lines, Machinery Center has moved into a new building at 1201 So. Sixth St., West, Salt Lake City. The company has been organized into three major departments. Edd L. Barnett will direct instruction machinery sales.

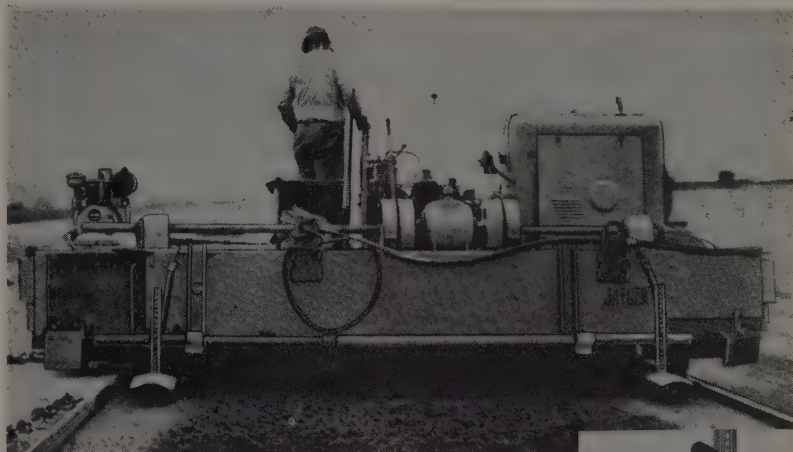
Buffalo-Springfield distributorship

Road Machinery Co., Phoenix, has been appointed Arizona distributor for the complete line of road roller and compaction equipment manufactured by Buffalo-Springfield Roller Co., Springfield, Ohio. The distributing company is managed and directed by Harold R. Bone, president, and its sales staff is comprised of eight machinery men who have spent their entire working careers with Arizona machinery houses. In

Cut Paving Costs

with

Maginniss Side Form Vibrators



Maginniss Vibrating Attachment at work on the Ohio Turnpike. Note vibrated concrete near side forms.

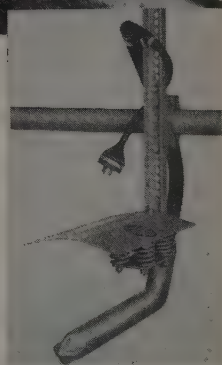
Fifteen Maginniss side form vibrator attachments are now in use by paving contractors on the Ohio Turnpike.

Mounted on Blaw-Knox and Jaeger spreaders and finishers as well as Heltzel telescoping finishers, these vibrators are reducing paving costs—increasing production efficiency every day!

The Maginniss side form vibrator attachment, easily mounted on machines from 12 to 24 feet wide, consists of 2 Hi-lectric, 180 cycle motor-in-head vibrators spring mounted on a shaft and hanger. Position of the vibrator heads, which ride completely submerged in the concrete for maximum vibrating efficiency, is controlled by a hand lever. There are no cumbersome flexible shafts or external drive units.

Powered by a 120 volt, 180 cycle gasoline engine-driven generator mounted on the spreader or finisher, the vibrators produce up to 10,500 VPM—can be mounted as much as fifteen inches in from the side forms and still vibrate concrete effectively at the forms, leaving it free from honeycomb.

The Maginniss side form vibrator attachment eliminates the need for hand labor—cuts costs—produces better paving. Ask your Maginniss distributor for all the facts. You'll find him listed in the Yellow Pages.



Model HPV-3 Hi-lectric paving vibrator—heart of Maginniss side form vibrating attachment.



Actual photo showing honeycomb left in slab before Maginniss attachment was installed.

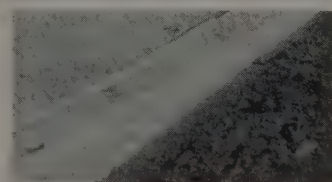


Photo of slab on same job showing dense, sound concrete consistently produced by Maginniss Side Form Vibrators.



AA-1708

MAGINNISS

POWER TOOL COMPANY

154 DISTL AVENUE • MANSFIELD, OHIO

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

addition to distributorship of Buffalo-Springfield for the entire state of Arizona, Road Machinery Co. is Arizona dealer for Barber-Greene, Adams motor graders, Wayne sweepers, Joy air compressors, Standard Steel Works, Gorman-Rupp, Sauer Bros., and Brown Manufacturing Co.

Peterson Tractor modernization

To increase repair and equipment fabrication facilities, Peterson Tractor & Equipment Co., Northern California dealer for Caterpillar and John Deere tractors, has just added a 120 x 120-ft. area to its present shop at San Leandro, Calif. This addition gives the firm an over-all shop area of nearly 1½ acres of floor space.

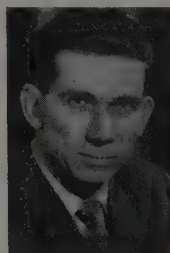
Montana distributor for Trip-L-Grip

James A. Madden, construction materials supplier of Billings, Mont., (Box 1522) has been appointed distributor of Teco Trip-L-Grip framing anchors throughout Montana, according to Alden K. Smith, sales manager of Timber Engineering Co. The new distributorship was set up to meet increasing interest in the structural and economical advantages offered by Teco anchors which are designed to provide stronger nailed joints in wood framing.

New firm called Cummins Idaho, Inc.

Raymond L. Schwartz of Twin Falls, Idaho, has purchased certain assets of Cummins Diesel Sales Corp., Boise, Idaho, and has organized a new company known as Cummins Idaho, Inc. Temporarily the new Cummins distributorship will

Raymond L. Schwartz



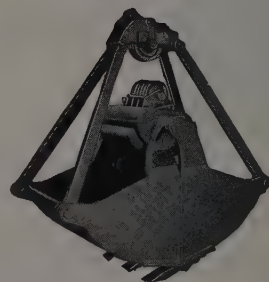
operate at 1204 Front St., Boise. Cummins Idaho, Inc., will sell and service Cummins diesels in 18 central and western Idaho counties as well as Malheur County in Oregon. Schwartz has until recently been the Diamond T dealer at Twin Falls.

Western distributors to AED posts

A. F. Garlinghouse of Garlinghouse, Fremont & Co., Los Angeles, and R. L. Arnold, Arnold Machinery Co., Inc., Salt Lake City, have been named to three committee posts of Associated Equipment Distributors. Both men will serve on the newly formed Education Committee and also on the Advisory Board, made up of selected past presidents. Also, Garlinghouse was appointed to the

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.



DRAGLINE Well balanced for deep bites, easy control, and clean dumping.



LIGHTWEIGHT BUCKET for speedy stockpiling only—larger capacity gives extra payloads.

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

By-Laws Committee, and Arnold to the Nominating Committee. AED is now in its 37th year as a national organization of construction machinery and equipment distributors and manufacturers.

Nevada dealer for prefab buildings

Wonder Building Division of General Auto Parts Co., Las Vegas, Nev., was recently named to handle distribution of prefabricated trussless steel buildings manufactured by Wonder Building Corp. of America, Chicago.

A new Schield BANTAM dealer

Standard Machinery Co., San Francisco, Calif., has been appointed as exclusive distributor of west-central California for the Schield BANTAM Co. of Waverly, Iowa. Standard will sell and service this complete line of crane carrier-mounted, crawler-mounted and self-propelled 5-, 6-, and 7-ton power crane and excavators, including the BANTAM line of specially engineered crane carriers.

Lordberg repair facilities

To serve the users of Symons Cone crushers in Northern California and Western Nevada, West Winds, Inc., San Francisco, has been selected by Lordberg Manufacturing Co., Milwaukee, as an authorized maintenance and repair depot in Southern California, eastern Nevada, Utah, Arizona, and New Mexico.

MANUFACTURERS

Hyster engineer promoted

Hugh Richmond, Hyster Company, has been promoted to the sales engineering department of Hyster's Eastern Industrial Truck Division at Danville, Ill. He has been with the engineering department of the home offices in Portland, Ore. for the past four and a half years.

Blue Brute training course

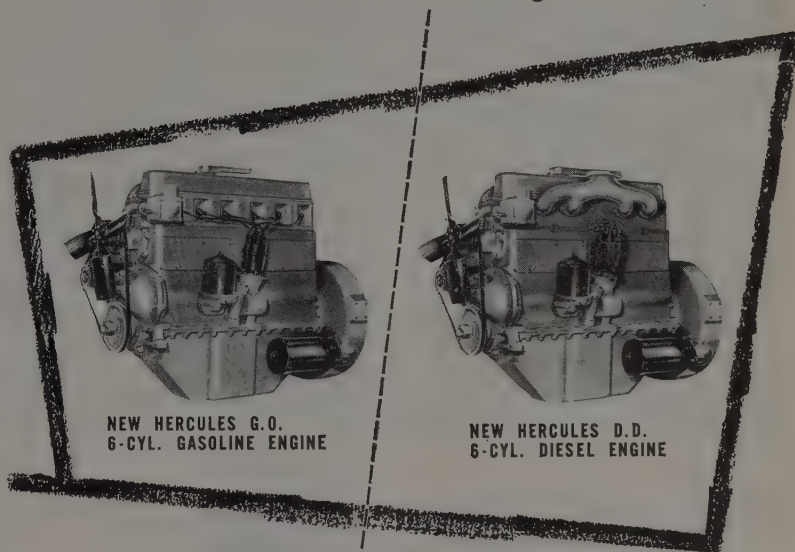
Holyoke Division of Worthington Corporation, Harrison, N. J., recently announced a new field sales training program covering Blue Brute portable compressors and contractors' tools. Company sales representatives will bring the new mobile training course to Worthington distributors by prearranged visits to even of the country's leading industrial centers.

James F. Bork joins Cook Bros.

J. E. Hall, executive vice president, Cook Bros. Equipment Co., Los Angeles, Calif., announces the appointment of James F. Bork as works manager. Bork's 14 years with Bucyrus-Erie Co., plus added experience with other manufacturing and engi-

WHEN YOU BUY AN ENGINE

... what's the first thing to look for?



Of course, some people look at the "outside" of an engine and see only a nice shiny paint-job. But that's not too important. Other buyers look at what's "inside" an engine. That can be very important. However, we think a buyer should also look at what's "back of" an engine. That's why we at Hercules Motors Corporation guard the enviable reputation we have earned in more than 41 years of engine building experience.

Hercules' reputation isn't merely a way of doing business or just the top quality of our product. We feel that our reputation means more than good business ethics and a quality product. Our reputation also means supplying new and better engines to meet the various needs of our customers.

As an example, our new line of INTERCHANGEABLE engines gives the customer the choice of gasoline or diesel power without changing engine mountings in the end product. These new G.O. (Gasoline Overhead valve) and D.D. (Direct injection Diesel) engines, not only have the same mounting dimensions in engines of the same number of cylinders, but many component parts are also interchangeable over the entire range of these new models.

Years of engine building "know how" stand "back of" every Hercules Engine. In addition, our wide selection of more than 90 models of engines and power units, available for operation on gasoline, diesel fuel, natural gas, L.P.G. and kerosene, provides a dependable source of power for all requirements between 3 and 500 H.P.

For help in solving your power problems, contact our factory. Our sales-engineers will be glad to assist you. No obligation, of course.

HERCULES MOTORS CORPORATION

CANTON 2, OHIO

Build Better Roads Faster at Lower Cost

DUO

PACTION

by

SEAMAN-GUNNISON

DUO-PACTION builds better roads through more uniform, more firmly consolidated roadbed aggregates without change of grade or surface level. You build faster because you can get greater coverage, with fewer passes, in less time than with conventional methods.



DUO-PACTOR steel and rubber rolls, operating alternately or together, produce aggregate base of higher density and greater stability than with either pneumatic or steel alone.



Pneumatics down, steel up for conventional rubber rolling. Large diameter front drive rolls are non-tracking with rear rolls . . . no increase in depth of grooves.



Pneumatics up, steel roll down, flattens out the ridges without disturbing aggregate base. No need for another roller.



Torsion spring deflection of gang roll provides higher loading on ridges, leveling out compacted surface.

Swing-Bar DISTRIBUTOR

Positive rate of bitumen application . . . no lean spots at starting line; no dripping after shut-off provided by quick-opening and closing exclusive Air-Snap spray bar.



SEAMAN-GUNNISON CORPORATION
Baraboo, Wisconsin

Send full information on:

☐ Duo-Pactor ☐ Distributor

Name

Address

neering firms, makes him well qualified for his new position with the Cook organization.

Scoopmobile representative

Wayne Hardy was recently appointed district representative for Mixermobile Manufacturers for 14 Mid-western states. He will make his headquarters in the Portland, Ore., office. Hardy has been with the firm, manufacturer of the Scoopmobile front end loader, for seven years.

New Western sales rep for Bros

Dudley Hall has been appointed district sales representative for the West Coast, A. O. Williamson, manager, Road Machinery Division, Wm. Bros Boiler & Mfg. Co., Minneapolis,



Dudley Hall

recently announced. Formerly assistant manager of the division, Hall will cover California, Oregon, Washington, Idaho, Nevada and the Canadian provinces of Vancouver and Alberta. Hall's headquarters are in Sacramento, Calif.

Promotion at Iowa Mfg. Co.

Kenneth V. Turner, Dallas, Tex., district sales representative for Iowa Manufacturing Co. of Cedar Rapids,



Kenneth V. Turner

Iowa, has been promoted to assistant sales manager for the Cedar Rapids line of aggregate producing and bituminous mixing equipment. His new headquarters will be at Cedar Rapids.

New A-C distribution policy

A new distribution policy for material handling equipment, products of its Buda Division, is announced by Allis-Chalmers Mfg., Co., Milwaukee. Now for the first time dealers handling this equipment will work through twelve factory branches and a Chicago district office. The branches will supervise

FOSTER LIGHTWEIGHT PILING



New, Lower Cost Protection for Light Excavation!

This is the most economical sheeting available for smaller excavation jobs. Foster Light Weight Piling offers the greatest strength, pound for pound, of any light weight piling made, handled by hand, drives with an airhammer, requires no special rig or tools. Rigid box-type corrugation gives easier driving and recovery, lets you work faster. Special interlock design won't jam, permits the simple locking of sheets together without sliding one into the other the entire length. The new, higher section modulus permits using a lighter gauge, with less bracing—assures lower costs on any job. Immediate Deliveries in any length, in any quantity from Foster warehouse stocks—Rental or Sale. Investigate these special advantages . . . get our quotation for your next job.

STEEL-SHEET PILING • PIPE-FOR-PILING
H-BEARING PILE • RAILS
TRACK EQUIPMENT • PIPE & FABRICATION

L.B. FOSTER co.

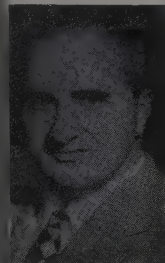
3460 Wilshire Boulevard
LOS ANGELES 5, CALIF.

PITTSBURGH 30 • NEW YORK 7
ATLANTA 8 • HOUSTON 2 • CHICAGO 4

ales and service and will carry a stock of parts, as well as new machines and accessories. This new policy means a closer contact for dealers and customers with the company in the field. Three Western ranches are among those designated: Los Angeles and Oakland, Calif., and Portland, Ore.

New advertising-promotion mgr.

Harnishfeger Corporation, Milwaukee, Wis., announces the appointment of Charles F. Parthum as



Charles F. Parthum

advertising and sales promotion manager. Parthum was formerly with the Buchen Company of Chicago, and before that with MacManus, John & Adams of Detroit and New York.

Pabco opens new plant

Pabco Products Inc. of San Francisco opened a new gypsum plant in Newark, Calif., recently. At the opening ceremony, W. L. Keady, president of Pabco, said the plant is another step in the company's service plan designed to meet the special needs of the 11 Western states.

New Worthington district manager

Charles D. Cummins has been appointed district manager of Worthington Corporation's office in Seattle, Wash., according to announcement



Cummins

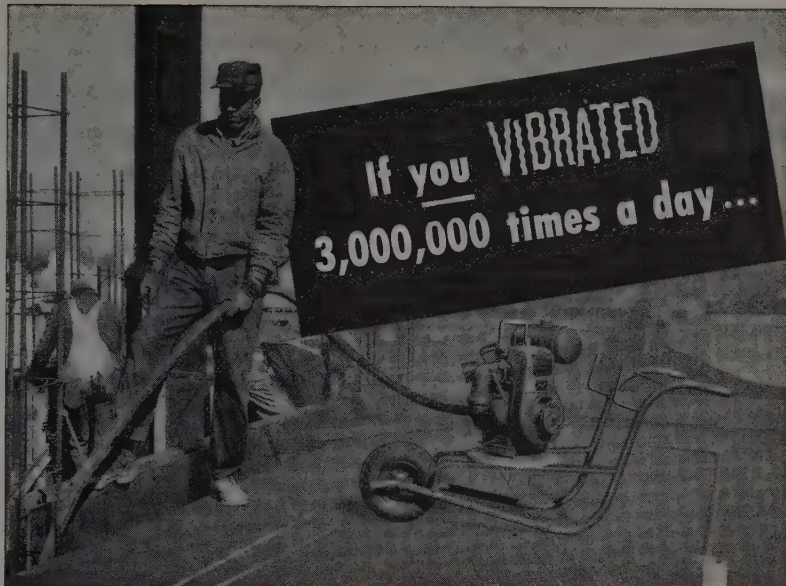
William A. Meiter, general sales manager. Since 1949 Cummins has been assistant district manager. He now succeeds E. D. Schively who has accepted a special assignment in Worthington's new Canadian operation.



Schively

Worthington's new research lab

A new, fully equipped welding research laboratory was unveiled recently at Worthington Corporation's Harrison, N. J., Division. Designed to provide Worthington with in-



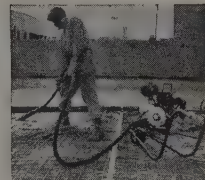
... you'd have to be rugged. Masters are.

Few pieces of equipment have to take this kind of a beating. 9,500 to 12,000 vibrations per minute against abrasive bits of stone, in wet cement. Imagine yourself inside one. Rough!

That's why it pays to buy *only the best* in vibrators... and why the *service* you get is just as important as the vibrator itself.

No flexible shaft vibrator is made with more care or better materials, than the Master... and our nearest distributor is ready with the service you want. He handles a complete line of gasoline and electric powered vibrators for any vibrating job. Try him. See for yourself.

For full information, specifications and prices on any Master product, see your Master distributor. There's no obligation... he's glad to help you.



Portable Gasoline



Lightweight Electric

MASTER VIBRATOR COMPANY

1752 Stanley Avenue, Dayton 1, Ohio

MASTER

DISTRIBUTORS

ANDREWS EQUIPMENT COMPANY.....Spokane, Washington

C. P. CONCRETE EQUIPMENT COMPANY.....Inglewood, California
Oakland, California

NEW MEXICO EQUIPMENT COMPANY.....Albuquerque, New Mexico

OREGON RENTAL & EQUIPMENT SALES CO......Portland, Oregon

POWER EQUIPMENT COMPANY.....Denver, Colorado

SHRIVER MACHINERY COMPANY.....Phoenix, Arizona

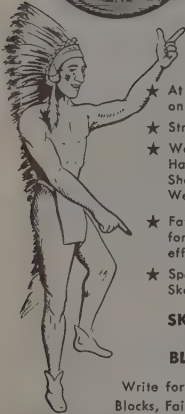
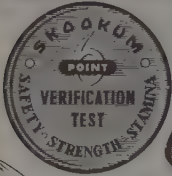
SIERRA MACHINERY COMPANY.....Reno, Nevada

WORTHAM MACHINERY COMPANY.....Casper, Cheyenne, Newcastle,
Riverton, Rock Springs, and Sheridan, Wyoming

SKOOKUM

TIMKEN BEARINGS

BLOCKS



- ★ At least a 5-to-1 Safety Factor on every Skookum Block!
- ★ Stress-Proof Steel in Axle-Pins.
- ★ Work-Hardening, True Hadfield Manganese Steel Sheaves to Eliminate Line-Wear.
- ★ Famous Timken Roller Bearings for longest life at top working efficiency and safety!
- ★ Specially designed for Skookum Blocks.

SKOOKUM will build ANYTHING in a BLOCK or FORGING!

Write for your catalog of Skookum Blocks, Fairleads and Forgings TODAY!

The SKOOKUM-CO., Inc.

3424 N. CRAWFORD, PORTLAND, OREGON • 547 TERMINAL AVE., VANCOUVER, B. C. U.S.A. CANADA

WESTFALL

COMBINATION AIR HOSE AND TAGLINE REEL

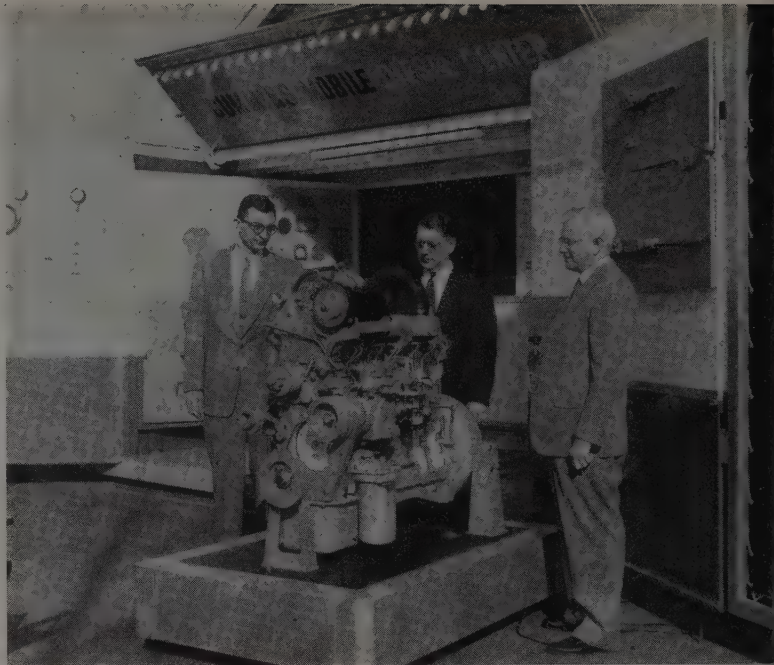


CONTROLS CONCRETE BUCKET

This combination Air Hose Reel is designed to control bucket by cable while it pays in and out air hose. Cable takes all the hard pull—eliminating any strain on air hose. Spring has uniform tension. Parts are interchangeable with Westfall standard equipment. Installed in 15 or 20 min. making it a great time and labor saver. Tagline can be used separately when not in use with cement bucket.

WESTFALL AUTOMATIC TAGLINE

345 E. Second St., Los Angeles 12, Calif. MUtal 4694



THREE EXECUTIVES of Cummins Engine Co., Inc., Columbus, Ind., inspect one of the cutaway units carried in the new Cummins Mobile Diesel Center. From l. to r.: **H. E. Bollwinkel**, executive service manager; **E. Don Tull**, executive vice president, and **R. E. Huthsteiner**, president. The purpose of the mobile demonstration unit is to bring the latest service information on Cummins Diesels directly to service men throughout the country.

creased service in the application of advanced welding techniques for the design and manufacture of its eleven major projects, the new laboratory is one of the most complete research facilities of its kind.

ESCO personnel changes

Electric Steel Foundry Co., Portland, Ore., announces that Frank C. Cook has been transferred from the sales district at Eugene, Ore., to Salt Lake City, where he will act as district representative for the San Francisco sales area. Cook replaces Garland Allen who returns to the Portland sales district after three years service in the Intermountain territory. Patrick Feyerisen replaces Cook at Eugene. Another personnel

change involves the addition of Lewis McMurran to the ESCO Seattle sales district.

New advertising manager

Littleford Bros., Inc., Cincinnati, Ohio, announces the appointment of William Bramlage as advertising and sales promotion manager for the black top road building equipment and metal fabricating divisions.

Leschen appoints Courtright

Deane Courtright has been appointed district sales representative for Leschen Wire Rope Division H. K. Porter Co., Inc. His territory includes the state of Washington, northern and western Idaho, and Montana.

PREFERRED by CONTRACTORS

Less initial cost—Lower upkeep

MARVEL CONCRETE VIBRATORS

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

Write for full information

1 1/2 HP to 5 HP



MARVEL EQUIPMENT CORPORATION
215-217 EAGLE ST. • B'KLYN 22, N. Y.

UNIT PRICES

elected abstracts for Western projects

IGHWAY—5.753 mi. of roadwork in New Mexico

New Mexico—Chaves County—State. Armstrong & Armstrong submitted a low bid of \$169,652 for 5.753 mi. of roadwork at junction, state route 83-Dunken.

Armstrong & Armstrong.....	\$169,652
Floyd Haake.....	187,352
Skousen Construction Co.....	199,272
G. I. Martin.....	199,693

	(1)	(2)
Lump Sum	\$ 100.39	\$ 100.00
675 lin. ft. Removal of old structures.....	.16	.20
060 cu. yd. Excavation—unclassified.....	.42	.65
283 cu. yd. Excavation for pipe culverts.....	2.50	3.00
680 M gal. Watering.....	1.00	.50
465 hr. Rolling (tamping roller).....	6.00	5.00
530 hr. Rolling (pneumatic tired).....	4.00	4.00
80 hr. Rolling (steel tired).....	6.00	7.00
181 hr. Mechanical tamping.....	4.00	6.00
216 sta. yd. Station yard overhaul.....	.02	.03
398 ¼ mi. yd. Quarter mile yard haul.....	.05	.09
1.64 mi. Grading.....	2,000.00	1,600.00
000 lin. ft. Contour ditches.....	.10	.12
3 ea. Cattle guard—24 ft. roadway.....	1,800.00	2,500.00
705 lin. ft. Galvanized barbed wire fence.....	.20	.25
2 ea. Gates—standard type.....	35.00	25.00
36 ea. Bracing.....	12.00	8.00
521 lin. ft. Galv. woven wire farm fence.....	.30	.27
70 ea. Right-of-way markers.....	8.00	6.00
2 ea. Stand. Fed. aid proj. mark, type I.....	50.00	50.00
275 ton. Base course.....	1.00	1.00
72 cu. yd. Class "B" conc. for cut-off walls.....	31.50	40.00
155 cu. yd. Grouted rock rebar.....	18.00	20.00
416 lin. ft. Culvert pipe—24 in. diameter.....	5.25	5.50
90 lin. ft. Culvert pipe—30 in. diameter.....	6.25	7.00
130 lin. ft. Culvert pipe—36 in. diameter.....	9.35	11.00
132 lin. ft. Culvert pipe—48 in. diameter.....	13.50	15.00
60 lin. ft. Culvert pipe—60 in. diameter.....	22.00	23.00
198 lin. ft. Culvert pipe—84 in. diameter.....	37.50	35.00

1	ea.	Remov. & rebuilding cattle guard.	(1)	(2)
		\$	200.00	500.00
		SUB-TOTAL	104,770.22	120,698.22
		BRIDGE ITEMS		
34	cu. yd.	Excava. for structures (bridges)...	\$ 5.00	8.00
207	cu. yd.	Wire enclosed riprap.....	6.00	7.00
3,949	lb.	Wire fabric.....	.24	.30
55	cu. yd.	Excavation for riprap.....	2.00	3.00
165	lin. ft.	Steel stakes for riprap.....	1.75	3.00
106.01	cu. yd.	Class "A" conc-bridge substruct.....	75.00	80.00
194.54	cu. yd.	Concrete for precast bridge units.....	90.00	85.00
72,752	lb.	Reinforcement for conc. struct.....	.14	.15
33,946	lb.	Structural steel.....	.28	.31
1,352	lin. ft.	Structural steel piles in place.....	8.25	8.00
727.5	lin. ft.	Drilling holes for bearing piles.....	8.00	8.00
		SUB-TOTAL	\$64,882.02	\$66,654.46

HIGHWAY—Grading and drainage structures in Montana

Montana—Silver Bow County—State. Fred H. Slate Co., Oregon, Ltd., Portland, submitted a low bid of \$825,791 for grading of 4.383 mi. and drainage structures on Butte west highway and brewery by-pass.

(1) Fred H. Slate Co., Oregon, Ltd. (Portland).....	\$825,791
(2) F & S Contracting Co.....	880,654
James Crick & Sons (Spokane, Wash.).....	947,858
Kiely Construction Co.....	971,494

	(1)	(2)
1,353,086 cu. yd. Unclassified excavation & borrow.....	\$.44	\$.505
191,069 mi. yd. Overhaul.....	.30	.10
2,558 cu. yd. Culvert excavation.....	3.00	2.00
20,290 M gal. Watering.....	2.75	2.00
2,705 unit. Rolling embankment.....	6.00	8.00
300 lin. ft. Rein. con. P. culvert—15 in. diameter.....	3.00	4.00
32 lin. ft. Rein. con. P. culvert—18 in. diameter.....	4.50	5.00

BIG NEWS in maintenance: COLD-APPLIED BITUMULS® Slurry Seal

THE "HOTTEST" ITEM of current interest among maintenance men is Bitumuls Slurry Sealing for pitted, cracked, "alligatored," spalled pavements. It is applied cold; goes down fast; and its results are reported to be running in a very low range.

Bitumuls Slurry Seal consists of a mixture of Bitumuls SS-1 or SS-2, water, and fine aggregate (3/16" minus crusher dust, sand, and a blend of these two materials).

It is applied by squeegee or drag box, equipped with squeegee and strike-off edge. Developed by forces of Los Angeles County in cooperation with Bitumuls Engineers, field tests indicate that it is readily adaptable to all areas. Our Engineer nearest you will provide full details.



ABOVE: Spreader-box application of Bitumuls Slurry is fast and easy. BELOW: Aggregate and Bitumuls are fed into transit mix truck, then water is added as required.



American Bitumuls & Asphalt Company
200 BUSH STREET, SAN FRANCISCO

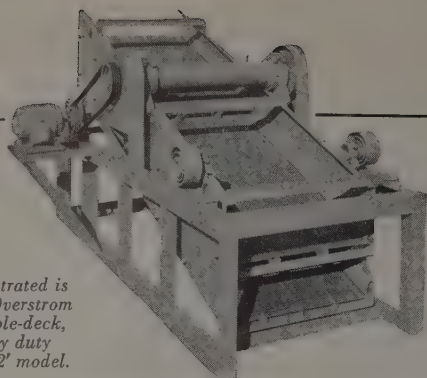
Tucson, Arizona

Inglewood, California

Oakland 1, California

Portland 7, Oregon

Seattle, Washington



Illustrated is an Overstrom double-deck, heavy duty 4'x12' model.

Overstrom Vibrating Screens

HIGH OPERATING EFFICIENCY — LOW COST PER TON OF MATERIAL SCREENED

Overstrom Screens assure fast, accurate sizing and processing of either wet or dry material. Rigid accuracy in construction and simplicity of operation results in high efficiency and low cost per ton of material screened.

Illustrated above is an Overstrom double-deck, heavy duty 4'x12' model—one of the many single, double and triple deck units available for screening crushed rock, sand and gravel, limestone, cement, gypsum, borax, mining ores, salt, coke, etc.

Overstrom Screens can also be designed and engineered to meet your individual requirements. For detailed information, write:

Overstrom & Sons

2213 West Mission Road • Alhambra, California

890 lin. ft.	Rein. con. P. culvert—24 in. diameter....	5.50	7.00
162 lin. ft.	Rein. con. P. culvert—30 in. diameter....	7.00	9.00
304 lin. ft.	Rein. con. P. culvert—36 in. diameter....	8.50	13.00
78 lin. ft.	Rein. con. P. culvert—48 in. diameter....	12.00	12.00
694 lin. ft.	Rein. con. P. culvert—24 in. dia., E. str....	6.25	7.50
346 lin. ft.	Rein. con. P. culvert—36 in. dia., E. str....	10.00	13.00
388 lin. ft.	Rein. con. P. culvert—48 in. dia., E. str....	15.00	23.00
206 lin. ft.	Rein. con. P. culvert—72 in. dia., E. str....	30.00	45.00
388 lin. ft.	Str. Pl. P. culvert 108 in. dia., 1 GA. M....	90.00	100.00
204 lin. ft.	Str. Pl. P. culvert 108 in. dia., 8 gal....	90.00	95.00
114 lin. ft.	Relay pipe culverts.....	10.00	2.00
830 cu. yd.	Gravel backfill.....	5.00	5.00
2 ea.	Concrete catch basins.....	150.00	250.00
2,441 lin. ft.	Remove concrete curbs.....	.20	.30
1,761 sq. yd.	Remove concrete sidewalks.....	.20	.75
2,200 sq. yd.	Remove concrete pavement.....	.50	.75
7 ea.	Manholes to adj. to grade.....	100.00	75.00
10 cu. yd.	Type "B" random riprap.....	5.00	5.00
8 ea.	Concrete project markers.....	10.00	30.00
42 ea.	Concrete station markers.....	10.00	6.00
120 ea.	Concrete R/W monuments.....	8.00	4.50

HIGHWAY—Grading, surfacing in Colorado.

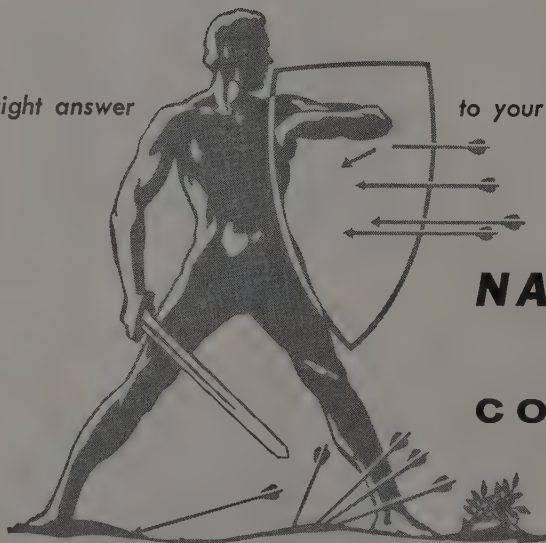
Colorado—Montrose County—State. Harrison & Atchison Co. submitted a low bid of \$240,445 for highway grading, structures, and surfacing on 15.211 mi. in the Uravan-Bedrock area.

(1)	Harrison & Atchison Co.....	\$240,445
(2)	Average of five lowest bids.....	260,975
	Schmidt Const., Inc.....	250,143
	Inland Const. Co. (Cheyenne, Wyo.).....	257,854
	N. W. Eng. Co.....	274,962
	Colorado Constrs., Inc.....	281,474

		(1)	Average 5 low bids	(2)
1,000 cu. yd.	Stripping.....	\$.29	\$.	
80 M gal.	Wetting.....	4.40	6.	
202,600 ton mi.	Ton mile overhaul.....	.20	.	
21,000 ton	Sub-base material, Class "3".....	.504	.	
18,700 ton	Gravel surf., Class "B".....	2.802	2.	
762 lin. ft.	18" C.M. culvert pipe.....	5.50	5.	
1,422 lin. ft.	24" C.M. culvert pipe.....	7.30	6.	
556 lin. ft.	30" C.M. culvert pipe.....	8.65	7.	
160 lin. ft.	36" C.M. culvert pipe.....	12.60	11.	
322 lin. ft.	48" C.M. culvert pipe.....	17.20	15.	
60 lin. ft.	60" C.M. culvert pipe.....	28.40	25.	
1 ea.	Barb wire gate.....	50.00	33.	
1 ea.	cattle guard—26' rd.....	2,000.00	2,020.	
430 hr.	Blading.....	12.00	10.	
2,700 hr.	Dozing.....	16.60	16.	
58,170 lin. ft.	Drilling, blasting.....	1.47	1.	

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to your bonding problems



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Branch Offices in Principal Cities Throughout America

DAM—Priest Rapids in Washington.

Washington—Grant County—Grant County Public Utility Dist. No. 2. Merritt, Chapman & Scott of New York City submitted a low bid of \$91,880,625 for construction of Priest Rapids dam, powerplant, and appurtenances on the Columbia River 14 mi. downstream from Beverly.

(1) Merritt, Chapman & Scott.....	\$ 91,880,625
(2) Henry J. Kaiser Co., and Assoc.....	93,160,204
American Pipe & Constr.....	97,494,814
Grant County Constr.....	103,996,562
J. T. M. Construction.....	108,889,162

Summary of schedules of prices:	(1)	(2)
Construction.....	\$56,673,775	\$57,677,852
Vanapum site sub surface explore.....	378,850	495,228
Turbines.....	12,000,000	11,200,508
Governors.....	825,000	789,780
Generators.....	12,540,000	11,324,000
Transformers.....	1,830,000	1,549,571
Cranes.....	1,116,000	1,155,715
Rates and Trashracks.....	5,112,000	6,489,912
Witchgear and bus structures.....	805,000	883,133
Cost of performance bond.....	600,000	638,000
	\$91,880,625	\$92,203,699

5% of the limit of increase of proposed price adjustment (to be used only if proposal includes price adjustment).....	None	956,505
TOTAL.....	\$91,880,625	\$93,160,204

Selected unit bid prices follow:	(1)	(2)
Lump Sum Access. road.....	\$450,000	\$207,900
Lump Sum Office facilities.....	50,000	45,400
Lump Sum Laboratories, field inspection offices and rock core shed.....	60,000	53,500
Lump Sum Special river equipment		
12 ea. River hole set-up.....	600.00	8,000 750.00 9,380
22 ea. Land hole set-up.....	200.00	225.00
1,000 lin. ft. River hole drilling.....	20.00	19.10
3,000 lin. ft. Land hole drilling.....	12.00	16.11
2,000 lin. ft. Observation well pipe.....	2.00	2.55
Special sample hole		
200 lin. ft. Drilling.....	25.00	30.70
180 lin. ft. 4" casing.....	6.00	4.10
Sampling and testing		
200 cr. hr. Drill holes.....	17.00	22.50
250 ea. Core boxes.....	10.00	11.08
200 cu. yd. Test pit excavation.....	100.00	9.35
25 ea. Test pit samples.....	25.00	13.40
2,500 hp. hi. Test pumping.....	.60	.35
Lump Sum Diver. and care of water left embankment.....	8,048,744	7,500,000
350,000 cu. yd. Excava. right embank.....	2.00	.64
352,000 cu. yd. Excavation.....	1.50	.64
320,000 cu. yd. Spillway excavation.....	3.50	3.28
767,000 cu. yd. Powerhouse excavation.....	4.00	3.16
150,000 cu. yd. Tailrace excavation.....	3.00	2.76
150,000 sq. ft. Line drill. & broaching.....	1.25	2.77
15,000 sq yd Rock found, prep., setting up over grout, check or drain holes.....	3.00	4.93
2,500 ea To be drilled.....	4.00	7.00
71,000 lin. ft. Drilling AX holes.....	3.00	2.50
7,000 lin. ft. Drilling BX holes.....	4.50	4.00
26,000 lin. ft. Drilling NX holes.....	6.00	6.00
5,000 lin. ft. Core recovery.....	1.00	1.50
2,000 ea Conn. to drill. grt. holes.....	3.00	9.20
20,000 lin. ft. Drilling anchor bar holes, processing, mixing and placing foundation.....	1.50	\$ 8.0
75,000 cu. yd. Grout.....	3.00	2.45
500 cu. yd. Sand in grout.....	50.00	38.00
40,000 cu. yd. Impervious fill, right embankment.....	.75	1.13
10,000 cu. yd. Imperv. fill, left embank. alt. 1.....	2.20	2.49
10,000 cu. yd. Imperv. fill, left embank. alt. 2.....	1.20	1.90
05,000 cu. yd. Impervious blanket.....	1.20	1.56
00,000 cu. yd. Pervious fill, right embankment.....	.50	.78
50,000 cu. yd. Pervious fill, left embankment.....	.50	.64
80,000 cu. yd. Transition fill, right embankment.....	1.30	1.13
25,000 cu. yd. Transition fill, left embankment, alt. 1.....	2.50	2.15
5,000 (pass per 10,000 sq. yd.) Additional compaction.....	1.00	5.68
25,000 cu. yd. Filter.....	1.50	1.06
78,000 cu. yd. Riprap.....	1.50	1.61
41,000 cu. yd. Gravel blanket.....	1.50	.86
4,800 cu. yd. Base course.....	3.00	1.09
1,650 cu. yd. Surface course.....	5.00	18.30
300 ton Bituminous cement.....	15.00	38.65
62,000 cu. yd. Spillway concrete.....	11.50	9.68
70,000 cu. yd. Powerhouse concrete.....	13.50	13.98
19,000 cu. yd. Concrete in gravity dam, left abutment retaining wall and similar walls.....	12.60	11.46
38,000 cu. yd. Fish passing facilities, concrete.....	15.00	16.20
500 cu. yd. Miscellaneous concrete.....	40.00	32.30
37,000 bbl. Portland cement.....	5.50	5.135
43,000 ton Pozzolans.....	15.00	17.55
0,000 sq. ft. Forms, straight.....	1.60	2.10
7,000 sq. ft. Forms, curved.....	3.00	4.29
00,000 lb. Steel reinforcement and anchor bars.....	.12	.124

TECHKOTE

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CONCRETE CURING COMPOUNDS

Clear — Pigmented — Black

TILT-UP COMPOUNDS

Wax Base — Non-Wax Base

LIFT SLAB COMPOUNDS

(YOUTZ-SLUICK METHOD)

Wax Base — Non-Wax Base

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Hand and Power Operated

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(COLD APPLIED IN 3 TYPES)

Ready Mixed Rubber Base Mastic, Rubber Base Emulsion and 2 Component Mastic

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 San Diego, California, Squires-Belt Material Co.
 Portland, Oregon, W. J. Burke & Co., Inc.
 Seattle, Washington, W. J. Burke & Co., Inc.
 Billings, Montana, Midland Materials Co.
 Casper, Wyoming, Casper Concrete Co.
 Denver, Colorado, K. C. Construction Supply Co.
 Albuquerque, New Mexico, W. J. Burke & Co., Inc.
 Salt Lake City, Utah, Intermountain Concrete Specialties
 Phoenix, Arizona, Superior Building Materials
 San Antonio, Texas, Rufus A. Walker & Co.
 Honolulu, T. H., R. L. Castendyk Company
 Vancouver, B. C., Canada, Burrard Construction Supplies, Ltd.

TO BE SURE . . .



USE THE FINEST!

TECHKOTE

INCORPORATED

COMPANY

600 Lairport Street, El Segundo, California

HIGHWAY—Construction in Washington.

Washington—Chelan County—State. C. E. Oneal submitted a low bid of \$542,066 for grading, paving, and construction of drainage structures on Dryden to Cashmere route.

(1) C. E. Oneal.....	\$542,066
(2) Goodfellow Bros., Inc.....	584,821
Osberg Const. Co.....	619,172
Natt McDougall Co. (Portland, Ore.).....	675,022
N. Fiorito Co., Inc.....	679,323

	(1)	(2)
83 ac. Clearing.....	\$60.00	\$50.00
37 ac. Grubbing.....	50.00	50.00
394,950 cu. yd. Unclass. excavation including haul of 600'.....	.64	.79
46,370 cu. yd. Com. excavation including haul of 600'.....	.25	.60
251,390 cu. yd. Channel excavation including haul of 600'.....	.34	.30
170 cu. yd. Com. trench excava. including haul of 600'.....	2.00	10.00
50,520 cu. yd. Solid rock borrow for embankment protect.....	1.35	.75
166,120 unit Overhaul.....	.35	.39
1,000 cu. yd. Stripping borrow & surf. pits including haul.....	.25	.30
1,115 cu. yd. Structural excavation.....	2.00	2.00
1 unit Furnish. smooth-wheeled power roller.....	50.00	100.00
1 unit Furnish. pneumatic-tired roller.....	50.00	100.00
1 unit Furnish. grid roller.....	100.00	400.00
5 day Operating smooth-wheeled power roller.....	60.00	40.00



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ALL METAL FULLY SCOTCHLITED BARRICADE

FOR NO MORE THAN THE COST OF OPERATING ONE KEROSENE TORCH

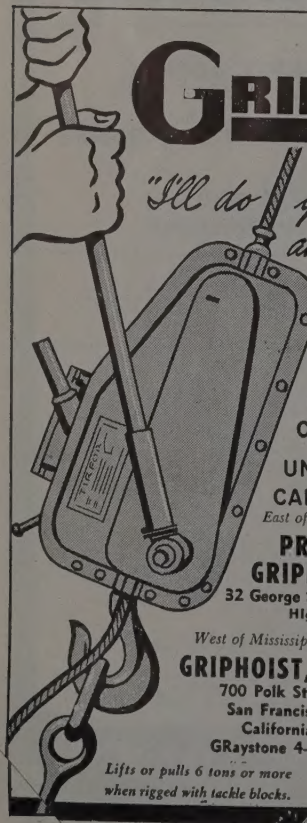
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- NO BARRICADES TO BUILD • NO CAPITAL INVESTMENT
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TIRFOR

"I'll do your pulling and lifting"

WEIGHS 42 LBS.

PORTABLE

MANUALLY OPERATED CABLE HOIST

UNLIMITED CABLE TRAVEL

East of Mississippi River

PRINCETON GRIPHOIST INC.

32 George St., Boston 19, Mass.

Highland 5-9493

West of Mississippi River

GRIPHOIST, INC.

700 Polk Street

San Francisco 9, California

GRaystone 4-7435

Lifts or pulls 6 tons or more when rigged with tackle blocks.

3300 LBS.

5 day Operating pneumatic-tired roller.....	60.00	90.00
53 day Operating grid roller.....	65.00	100.00
54 day Mechanical tamper.....	30.00	30.00
3,830 lin. ft. Slope treatment Class "A".....	.12	.20
3,780 lin. ft. Slope treatment Class "B".....	.15	.25
200 sta. Finish. roadway.....	10.00	15.00
5,490 M gal. Water.....	1.00	.50
460 ton Sand filler.....	.90	1.00
1,970 ton Crushed stone surf. top course.....	1.55	1.20
5,710 ton Special ballast.....	1.45	1.20
1 mi. L.T. BIT. SURF. TREAT.—METH. A.....	300.00	250.00
36 ton Asphalt cement MC-3.....	50.00	40.00
480 ton Crushed cover stone in stockpile.....	1.40	1.40
310 ton Placing crushed cover stone from stockpile.....	1.75	1.50

OTHER ITEMS

2 sq. yd. Cement concrete spillway.....	\$ 50.00	\$ 20.00
75 cu. yd. Concrete Class "A".....	70.00	70.00
53 cu. yd. Concrete Class "B".....	70.00	70.00
6 cu. yd. Concrete Class "C".....	65.00	65.00
17,400 lb. Steel reinforcing bars.....	.15	.15
292 lin. ft. Plain conc. or V.C. sewer pipe 4" diam.....	1.30	1.00
153 lin. ft. Plain conc. or V.C. sewer pipe 8" diam.....	1.50	2.00
99 lin. ft. Plain conc. or V.C. sewer pipe 10" diam.....	1.70	2.50
198 lin. ft. Plain conc. culvert pipe 12" diam.....	2.00	3.00
717 lin. ft. Std. reinf. conc. culvert pipe 18" diam.....	3.60	4.00
420 lin. ft. Std. reinf. conc. culvert pipe 24" diam.....	5.80	7.00
207 lin. ft. Std. reinf. conc. culvert pipe 36" diam.....	10.00	12.00
175 lin. ft. Galvanized iron pipe ¾" diameter.....	1.00	1.50
276 lin. ft. Bit. coated welded stl. pipe #14 ga. 4" dia.....	1.65	3.00
178 lin. ft. Bit. coated welded stl. pipe #12 ga. 6" dia.....	2.50	4.00
232 lin. ft. Rel. bit. ctd. weld. stl. pipe #14 ga. 4" dia.....	2.00	3.00
66 lin. ft. Plain corr. met. culv. pipe #14 ga. 24" dia.....	5.70	6.00
62 lin. ft. Plain corr. met. culv. pipe #12 ga. 36" dia.....	10.50	12.00
1 only Automatic tide gate 24" diameter.....	200.00	140.00
1 only Automatic tide gate 36" diameter.....	300.00	300.00
1 only Drain assembly.....	200.00	50.00
2 only Drop manholes.....	500.00	250.00
390 lin. ft. Std. beam guard rail.....	3.10	3.50
Flagging.....	1,000.00	1,000.00

HIGHWAY—Highway and bridge construction in Wyoming.

Wyoming—Park County—State. Inland Construction Co. of Omaha Neb., submitted a low bid of \$645,027 for grading, draining, base course surfacing, oil treatment (road mix method) and sand-gravel seal coat, and for construction of one bridge consisting of four continuous steel plate girder spans over Shoshone River and miscellaneous work on 1.723 mi of Powell-Cody road. Inland's bid was lowest of 13 submitted.

(1) Inland Const. Co.....	\$645,027
(2) Knisley-Moore Co.....	645,570
Tasgart Const. Co.....	661,658
S. Birch Inc., and Birch & Son Const. Co. (Great Falls, Mont.).....	662,780

	(1)	(2)
515,000 cu. yd. Excavation.....	\$.40	\$.
145,000 cu. yd. mi. Cubic yard mile haul.....	.20	
8,200 ton Selected mat. surfacing (Type 1).....	.75	
6,100 ton Crushed gravel base course (1" max.).....	1.20	
3,200 ton Crushed gravel surfacing (Type "B").....	1.60	1.00
220 ton Crushed sand-gravel.....	3.40	3.00
15,900 ton mi. Haul of surfacing material.....	.17	
610 cu. yd. Binder.....	.75	
360 cu. yd. mi. Haul of binder.....	.30	
828 lin. ft. 18" C.M.P.....	4.70	5.00
68 lin. ft. 4'-0"x6'-0" precast conc. cattlepass.....	43.00	50.00
75 lin. ft. 42" bituminous coated siphon C.M.P.....	30.00	35.00
300 lin. ft. 6" metal drain pipe.....	2.00	3.00
500 cu. yd. Excavation for pipe culverts.....	2.60	2.00
810 hr. Mechanical tamping.....	6.00	6.00
1,725.3 cu. yd. Class "B" concrete.....	49.00	60.00
211,320 lb. Reinforcing steel.....	.145	
719,150 lb. Structural steel.....	.234	
2,100 lin. ft. 20" O.D. welded pipe.....	9.60	9.00
490 cu. yd. Dry excavation for bridges.....	6.25	5.00
1,090 cu. yd. Wet excavation for bridges.....	6.25	9.00
450 cu. yd. Class 1 riprap.....	14.00	15.00
275 cu. yd. Structure excavation.....	4.50	1.00
100 cu. yd. Special backfill.....	3.00	
1,820 hr. Sheep's foot roller operation.....	8.00	7.00
25 hr. Equipment roller operation.....	14.00	14.00
150 hr. Pneumatic tired roller operation.....	7.00	6.00
15 hr. Smooth steel roller operation.....	9.00	8.00
2,300 M gal. Watering.....	2.00	1.00
60 ton Asphaltic material MC-prime.....	33.00	30.00
30 ton Asphaltic material RC-seal.....	40.00	30.00
180 ton Asphaltic material MC-3.....	32.00	30.00
31,000 sq. yd. Processing.....	.08	
6,100 lin. ft. Type "A" right-of-way fence.....	.29	
1,470 lin. ft. Standard right-of-way fence.....	.19	
5,900 lin. ft. Remov. and reset. right-of-way fence.....	.13	
65 ea. Fence posts.....	2.00	1.00
360 rod Barbed wire.....	.33	
300 ea. Stays.....	.13	
40 ea. End panels.....	16.00	13.00
35 ea. Brace panels.....	18.00	12.00
70 cu. yd. Grouted riprap.....	26.00	20.00
2,100 lin. ft. Shaping and tamping curb.....	.64	
550 lin. ft. Shaping and tamping spillway.....	2.00	1.00
2,700 lin. ft. Metal plate guard fence (Type "B").....	2.80	5.00
30 ea. Right-of-way markers.....	13.00	10.00
2 ea. Reinforced concrete project markers.....	26.00	25.00
.5 mi. Road obliteration.....	500.00	2,000.00
Lump Sum Prov. and maint. smooth steel roller.....	250.00	100.00

Rights-of-way won't wait

Legal hurdles can be serious delays in highway building. They tend to loom even higher in the coming decade of accelerating road building in the West. The State of Washington faces a problem which will require public education in correcting a situation that could have a serious braking effect on the quickening operations of the highway department.

At the present the state constitution does not permit laws to be enacted that would allow access to private land, under right of eminent domain proceedings, until court action has been concluded. This situation in Washington, and in some other Western states, must be corrected. Both Oregon and California have such necessary legal authority, permitting immediate possession of property by the highway department upon putting up the deposit specified by the court. This procedure does not in any way result in the loss of legal rights to the property owner through the usual process of establishing a fair and equitable price for the land, but its use by the highway department is materially speeded.

Passing of a constitutional amendment will be necessary in Washington at the general election this November to enable the passage of laws permitting such prompt acquisition. Without this public action the state highway department will have a handicap just when it needs an aid in the accelerating program. With the backing of the highway commission and the active support of the local chapters of The Associated General Contractors the required amount of public education to secure passage of the amendment deserves the active support of all elements of the entire construction industry.

Engineers say "What"
Contractors say "How"

There is much of construction philosophy in that comparison. Engineers for generations have been concerned with the final results to be achieved. Contractors are directly concerned with problems of securing these specified results at a minimum of dollars and time. Reduced to its simplest analysis, this means that engineers tend to be conservative, whereas the attitude of the contractor must be always seeking a new means or method. This situation is particularly true of engineers in large public agencies—as distinct from those in private practice—and it is to the former groups these thoughts apply.

Those engineers working for agencies that spend public funds have a feeling of security when their designs are referred to as "good engineering practices" by their contemporaries. If their designs smack slightly of a conservative flavor there is usually no criticism. "Why be accused of being daring in trying to save public funds?" There is more job security in putting out plans that conform to ideas which have been time-tested. The tendency is definitely in the direction of status quo. "Building Codes" and "Standard Specifications" stand as monuments to this philosophy.

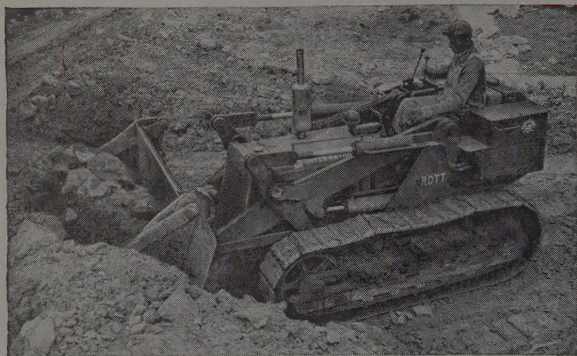
It is not good for those in the lower echelons to be looked upon as being a bit radical in their designing. And, lives and huge sums of money are often involved, which are logical reasons that conservative practice should dictate. Competition is not a pressing factor.

On the other hand the contractor is fighting for his very existence in trying to find a method or a machine to do the required job for just a few dollars less than his competitor. If there is a new type of machine, or a product that has even the bare chance of being a time or money saver, it is worth a try.

If engineers assumed a little more of this attitude it would be healthier for the entire construction industry. There are two specific areas that warrant a change. First, a more open mind for the suggestions and ideas of those who represent manufacturers of machines and products. Call them salesmen—at the same time they are usually qualified experts of firms spending large sums on technicians and research to find ways for getting construction done better or faster. Second, rather than extend specifications to include the field methods to be used, the engineer should state the results to be obtained, as rigorously as necessary, and then leave the "How" open to the ingenuity of the contractors and manufacturers. These changes in attitude and procedure would make for construction progress.

Western Construction was founded in January 1926 as Western Construction News. Western Highways Builder, founded in 1919, was consolidated with Western Construction News in April 1932 and subsequently became Western Construction. All rights to the above titles are reserved.

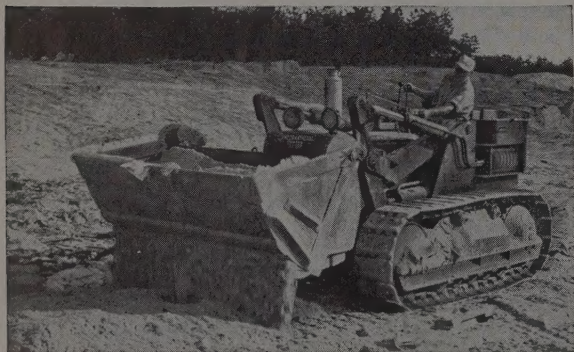
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