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WESTERN

CONSTRUCTION

Volume 28

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FRONT COVER

THE MOUNTAINS of Kenai National Forest, between Anchorage and Seward, are perhaps not typical of Alaska, but they make a splendid backdrop for the asphalt plant operated by Rogers Construction Co. and Babler Bros. on their contract for paving 54 miles of highway. A review of the job appears on page 77 of this all-Alaska issue of *Western Construction*.

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Engineering achievement in Alaska

Alaska has been glamorized long enough. This issue of *Western Construction* is devoted to construction in Alaska, but not to its glamorization. Even so, there are aspects of the building of Alaska today that are worthy of praise.

The impetus for construction in Alaska in recent years has been military. There is no permanence in this impetus; nor do its results accrue as value to the territory, except for the durability of the steel and concrete in the structures themselves. Needs may change, populations may shift, cities and outposts may die. Localized, sited structures then fall into disuse and their structural life is of no consequence.

Public works construction is another matter. This is a field of what may more nearly be considered productive facilities. Power plant output can easily be brought to shifting points of need. Public building and utility systems add to an atmosphere of permanence on a restless frontier; they ease subsequent problems of settlement and encourage the development of an area.

But the most timeless in value of today's construction in Alaska is the territory's highway system. Increasingly far flung, built and rebuilt to good standards, and (now) almost entirely paved, the major highway network will continue to serve the people and industries of Alaska as they move and shift to new areas of enterprise. It is the basis of communications, supplanting the bush pilot and his light plane and eclipsing even the railroad with its longer tradition.

More than anything else in Alaska today, therefore, highways are the proper monument of civil engineering. The development of highways in the United States itself has been relatively slower and consequently less spectacular; in fact, it was the railroad that first linked East and West on a reliable basis and thereafter gained the credit for opening the frontier. But today highway engineering is in the ascendancy and Alaska has provided the newest frontier for highway engineering talents. They have been well used. And, without the insinuated glamor of yesterday's iron horse to detract, they will receive a greater and more just share of the credit.

To the civil engineers who planned Alaska's highways, to the civil engineers who have administered their construction and maintenance, and to the contractors who have taken on the jobs over miles of difficult alignment and through strange and obstinate terrain—to all these are due the praise and thanks of Alaskans now and Alaskans of the future.

Engineering by lottery

Another chapter of an old story has been written by engineers of Phoenix, Arizona, when they agreed to put their names in a hat to determine the order of their selection for doing work for county improvement districts. Apparently, professional qualifications are now so indistinguishable that they can be left to chance selection.

For years civil engineers have fought a delaying action against forces both inside and outside the profession, forces that would reduce their services to the level of selling mere hours-of-effort. The retreat has featured clashes with governmental agencies at all levels, demands not only that engineers in private practice be accorded compensation in keeping with professional ability, but also that they be selected with an element of dignity and a minimum of bargaining.

The distressing fact remains that the preponderance of graduate engineers working for salaries, the current impingement of the idea of collective bargaining, and the pressure of personal economics all tend to depreciate a true feeling of professionalism.

It is no wonder that these facts and attitudes are reflected in the actions of agencies retaining engineers. Without a resurgence of spirit among younger engineers, whose careers lie ahead of them, the retreat could develop into a rout.

Responsibilities are involved

Contracting organizations have taken an active interest in engineering education to the extent of urging colleges of the West to institute courses designed to start graduates on careers of construction. Among the colleges there has been a receptive attitude toward this idea, although it has been necessary to start in a small way and advance slowly.

Having stimulated the idea and secured the cooperation of engineering educators, the responsibility of the contractors is not concluded. Particularly is this true if the students are to secure a well-rounded education. The responsibility includes a continuing contact with college departments to provide opportunities for these students to visit active construction jobs and hear qualified personnel describe the work that is in progress. Further, contractors should make every possible effort to see that summer jobs are available as starting experience in developing administrative personnel.

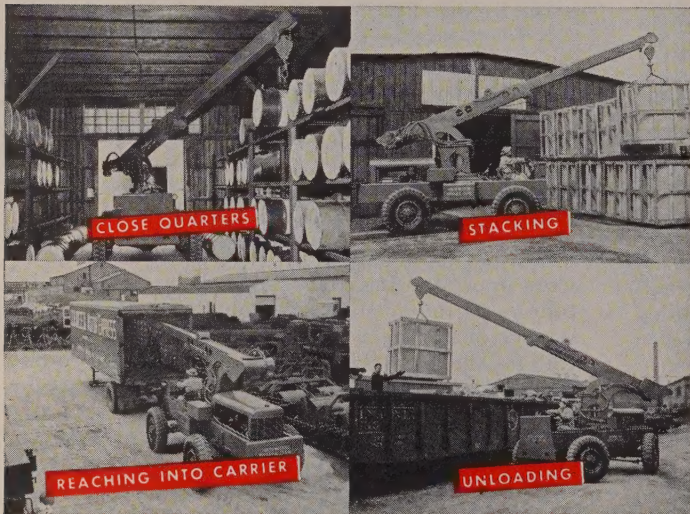
Only as these two opportunities are provided by contractors, either as individuals or as an organization, will the education program advance from its present initial stage into the logical service it could provide for the construction industry as a whole.

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ALASKA: a special report on construction

By R. W. WHITAKER, JR., Executive Editor

1. ALASKA and construction men

A newspaper columnist in Fairbanks this year made note of the succession of tornadoes that had swept the U. S. Musing over what might happen if a similar catastrophe should befall Fairbanks, he concluded to the effect that "we would all be drowned in a flood of Seagram's Seven"! The words are fitting for Fairbanks, and they are applicable elsewhere in the territory too. They highlight a modern tradition of the American boom town; they characterize the boom of Alaska.

In 1953 Alaskan towns are still boom towns. And it is still a construction boom that holds the territory. Among the contractors who are now in their fourth, fifth, or sixth season, some say "the honeymoon is over." But the fact is that the bridegroom, the U. S. Army, and its bride of the postwar unification, the Air Force, still occupy the bridal suite! And they are running up quite a bill.

In the West's \$4,000,000,000 construction year of 1953, military work in Alaska was originally estimated to represent \$240,000,000. The famous federal freeze of February 7 caused moans and groans, both in Alaska and in the home offices of contractors all over the West. (All of that work, it will be remembered, was supposed to go to contract by April of this year.) Thawing out this freeze was a selective process, but the 1953 construction season now has seen the entire originally estimated amount of money awarded in construction contracts. Cancellation of certain jobs was more than offset by additions to other jobs and initiation of still others.

Even so, there has been a loss of glamor on the Alaska construction front. Two things account for it. One has been the above-mentioned stretchout of defense construction, which is no longer a three-ring circus. The other—and this is the one that individuals have used as their yardstick—has been the return to a more normal

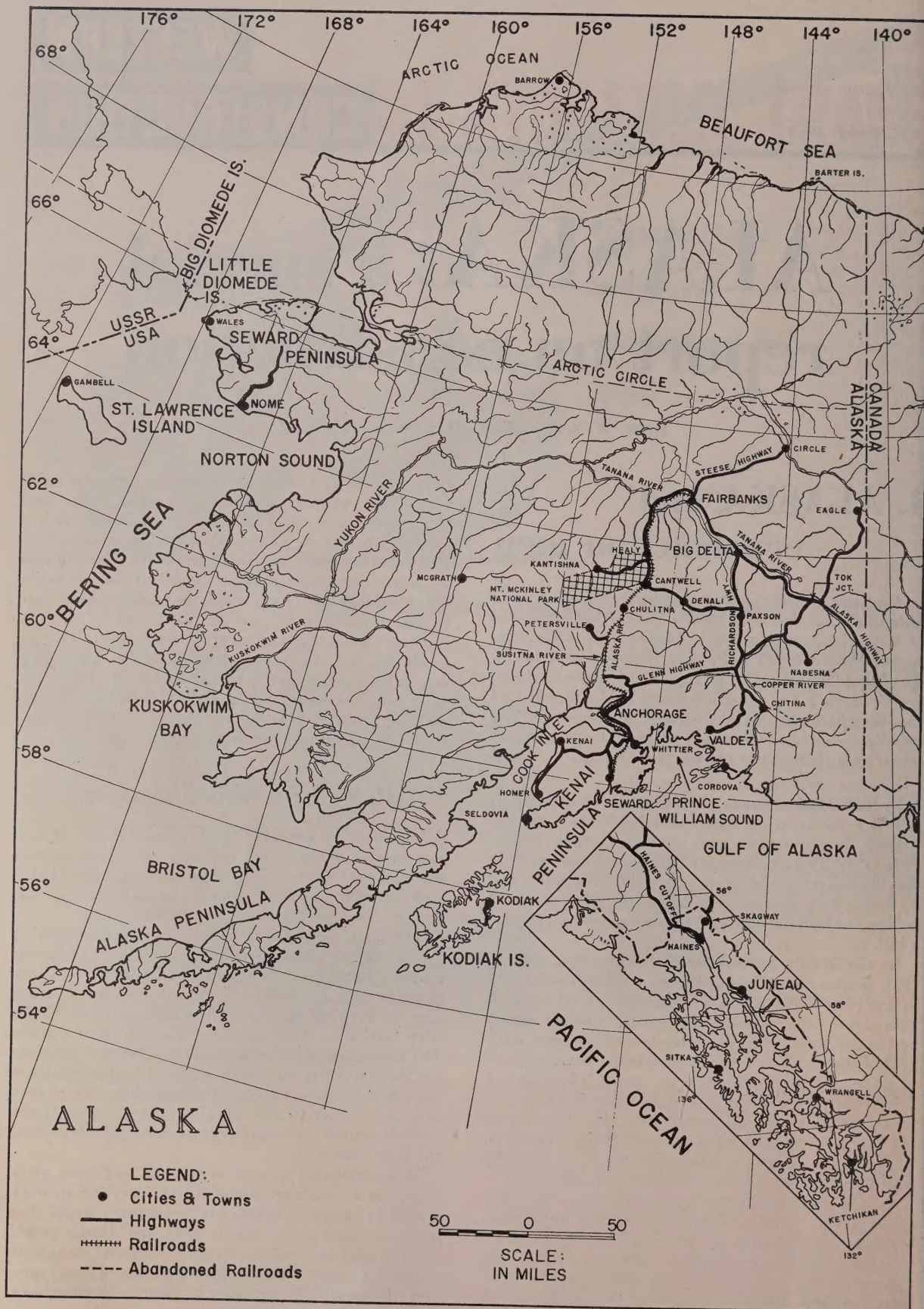
work pace on individual jobs. Gone are the universal 6-day, 54-hr. work weeks, scorned in earlier years when 7-day, 84-hr. jobs could easily be found. This year it is only on jobs like the Eklutna Project where faster schedules are maintained. For that job, the traditions of tunnel work everywhere call for a three-shift pace. But still, for the individual, this is only a 48-hr. week. Elsewhere in the territory, it is only an occasional or highway contract that is working 54 hr., and the 84-hr. business holds on a very few remaining classified military projects in the extreme north and west. (Such a job—work week unspecified—did net \$3,680 to a welder we know for two months and 10 days of work this summer.) In Alaska this year, most work is on a 48-hr. basis.

Strategy and short seasons

A summary of the thinking of individuals and organizations, past and present, may help to explain the contradictory attitudes which can be found in Alaska today—all having to do with the many construction programs and the speed with which they are prosecuted.

The strategic value of Alaska was realized during World War II. The immediate postwar history of international relations gave urgency to development of the territory as a strong point in the U. S. defense perimeter. At no time has military construction in Alaska been carried on with the reckless administrative abandon that allegedly characterized the "crash" program for the Air Force in North Africa. Completion dates for construction were set realistically, but even so they called for fast work. The short working season of Alaska further seemed to compress construction schedules, and the boom was born.

To construction men of every rank and from every state, Alaska was the "frozen North," so Alaskan work gained in glamor. Alaskan work paid fancy wages (not much was said about costs at first), and Alaska gained more in glamor. Alaskan days were long and shifts were planned to match them; there was lots of overtime—and Alaska gained even more in glamor. In some cases,



the long working hours which were thought Stateside to be typical of Alaskan work were not necessarily called for by contract conditions. Rather, they were instituted by contractors themselves as incentives to gain men and to keep them. Isolated jobs out in Alaska's bush were lonely affairs in completely unfamiliar country with largely unfamiliar conditions. There could be no other reward for the individual in their undertaking except the big "stake" that he could put together by working even 10- or 12-hr. days.

At the same time many craft union officials called in vain for shorter shifts. Men were flocking to Alaska as a result of its glamorization, and the union pleas evidenced their attempt to discharge their obligation to their members. After all, shorter shifts—and more of them—would employ more men. And so it went for two or three years.

Now, the administration has stretched out the defense program. And contractors have been quick to see the opportunity for returning to a more economical pace in construction. The result has been a return this year to a nominal maximum work week of six 9-hr. days. This has enabled a contractor to maintain his work force and not have it pirated by another fellow offering more overtime. This course of action was taken despite realization of the attendant difficulty of getting good men. Without lots of overtime in sight, Alaskan work has few advantages. Living costs in Alaska have become the subject of more thoughtful appraisal and, after all, it costs quite a bit to get up there and get back after the work is over.

Men versus machines

Another fact of this year's construction in Alaska adds to the explanation of why Anchorage businessmen are complaining about having a bad year. Construction expenditure is slower and, while very little of it has been cancelled completely, it is true that local business has dipped somewhat. But here is the other fact. The amount of manpower, represented as a percentage of total construction cost, is less today. The greater portion of the work now is heavy construction, and it is the cost of machinery to perform that work—rather than man-hours of the payroll for labor—that accounts for construction dollar volume remaining comparable to earlier years.

Unfortunately, reputation does not follow fact closely enough. Men still stream to Alaska. This year they came even earlier than usual. They did not wait on the bench at the union hall for assignment. They went out to the job sites rustling work. And the fact of the matter was that any good craftsman could find work. The trouble this year, as it has always been during this Alaskan boom, is that the Alaska union halls are full of opportunists from the States. They are—many of them—from other lines of work, ill-qualified for construction. But construction work is no different in its requirements for skill just because it is in Alaska. The selection of available men has been such that contractors occasionally still import men from the States. This is difficult for the local unions to swallow, but it is a fact.

Naturally, the expense of recruiting and importing men is one the contractors would just as soon not have. So long as they can find qualified men to do their work,

they would much prefer that the man gets to the job on his own pocketbook. And so, they have not actively countered the unfounded publicity which has circulated in the States regarding the work opportunities in Alaska, publicity that has been very effective in pulling men in.

Efforts of the unions to correct widespread misunderstanding of Alaska work opportunities have been twofold. The initial, and broadest, effort was to circularize Alaska employment facts to locals in the States through the medium of the international union organizations. Secondly, local officials in Alaska have painstakingly answered every individual inquiry received. But all too few men have looked before leaping. And one local reported the case of a man who turned up in the territory carrying—and virtually flaunting—the union's earlier discouraging reply to his inquiry!

In the overall, the construction population of Alaska is an unstable one. The work is highly seasonal, and its tenure from year to year is uncertain. This is no different from elsewhere and is not therefore, of itself, undesirable. However, the construction industry in Alaska, represented by this population, can be observed from two widely divergent viewpoints.

Much of the foregoing appraisal has been drawn from and directed to construction men. For them as individuals; or companies, or project co-venturers—or even as an entire vocational group—Alaska has been and now is a healthy working climate. The industry there is healthy. If and when it might withdraw to any extent, it would do so in an orderly manner, intact and without fiscal confusion.

But not even so transient an industry as construction can be considered entirely independent from its surroundings. Construction affects the economic face of Alaska even more than the topographic face, and far more than it is, itself, affected. The commercial service enterprises that build civilizations from the dusts of roaring camps have boomed in recent years. Some of them are speculative "camp follower" enterprises—bars and amusement arcades, multitudes of cafes and shoddy trailer camps. These, feeding on a swollen military and construction population, hold almost entirely to the "get it and get out" idea that permanent Alaska residents have sought to counter throughout recent years. Others, the municipal government services that must meet demand and the substantial businesses that have chosen to do so, must survive a construction exodus if Alaska is to advance.

Therefore, beyond the present years of heavy defense spending in Alaska, it is necessary to consider Alaska from the Alaskan viewpoint, to find out whether its economy in the future, deprived of today's boom, can remain healthy. If the territory's natural economic development is not broken by an eventual withdrawal of defense spending, Alaska will continue to provide a market for construction services. And a big one, for the territory's greatest growth will be in the field of resources development. Timber exploitation and mineral production (including refining and the electric power necessary for that) are customarily pretty big operations. Their scale in Alaska will be magnified by the opportunity of doing things in a big way. Construction people, therefore, already have a stake in the future of Alaska. So, let's look at . . .

2. ALASKA and Alaskans

"It's nice to see the Navy pulling out." This was the viewpoint of an oldtimer, a mining man from up near Point Barrow. He was referring to the withdrawal of a Navy group that had for some time conducted petroleum exploration in the area. Their departure meant that local labor would once again become available for economical conduct of coal mining operations.

Now, this man, and others like him throughout Alaska, has no quarrel with population growth so long as it comes about in a normal way. "Normal" does not mean "slow." Alaskans are not entrenched against progress or attempting to run a closed corporation—many of them, in fact, seek statehood, which unavoidably would do away with much that is primitive in Alaska's institutions.

Alaska's recent population growth has not been "normal." Lacking even intention of permanence, it has brought about inflation and has actually harmed some established enterprises. (Mining, most notably, has been marking time since before World War II.)

Alaska's future lies not in numbers of people but in their purpose. On the other hand, it is not required that newcomers consciously develop an esprit. But, no matter how few or how many of them flow into the territory in a given period of time, if they go to stay, then the growth they represent is normal.

Alaska itself is not homogeneous. It is considered by its residents to consist principally of two parts. These are known as Southeastern Alaska and Westward Alaska. Southeastern Alaska encompasses the "panhandle," the long coastal stringer reaching alongside Western Canada to the southern terminus of the territory. Included are cities and outposts such as Juneau, Ketchikan, Skagway, Haines, and Sitka. This portion of Alaska has the most immediate commercial future. The weather is milder, the area is closer to the United States proper, and its resources are most easily accessible. Here are timber stands of sufficient size and quality to be logged. Here, also, are feasible hydroelectric possibilities—ap-

THE LONG, BROAD PANORAMA of Interior Alaska is hardly disrupted by this Lytle-Green-Birch crew laying out footings at Ladd Air Force Base. The \$4,206,300 Corps of Engineers contract covers thirty 8-family quarters.

preciable heads and close to the coast. In addition Southeastern Alaska borders and "confines" a portion of British Columbia which, with the Yukon Territory immediately to the north, is now the subject of an intensive survey of precious and nonprecious mineral possibilities. Southeastern Alaska is the gateway.

Westward Alaska is the rest of the territory. And it is a more westerly projection of the continent than is generally supposed. It lies entirely beyond the meridian of 141 deg. West Longitude; it includes the Aleutian Islands and, farther to the north, Little Diomed Island, Big Diomed Island, only a stone's throw to the north west, is Russian territory.

Alaska is largely a defense economy, although most defense activity is centered in the rail belt area between Anchorage and Fairbanks. Anchorage is the site of Fort Richardson and Elmendorf Air Force Base. Fairbanks is the site of Ladd Air Force Base and Eielson Air Force Base. Defense construction activity in the vicinity of Fairbanks also includes Big Delta about 100 mi. to the southeast.

Anchorage and the railroad had their origins during the first World War when coal fields in the Matanuska Valley were seen as a possible supply for the U. S. Navy. Anchorage was originally a railroad town during construction of the road. Unfortunately, the Navy shifted to oil as a fuel in the early 20's. The Anchorage area languished thereafter for many years, although the railroad was completed up to Fairbanks and was also carried in a southerly direction to connect with a small railroad which had originated in the seaport of Seward.

Anchorage today, with its tides ranging to over 30 ft., is not an active port. Sea traffic discharges at Seward and cargoes are carried northward by rail. An exception has been made with Army supplies, which, until a disastrous fire in June of this year, were unloaded at Whittier, well to the northeast of Seward, and carried on a short branch line to connect with the Alaska Railroad.

The railroad itself, and the activity and settlement that went along with it, have combined to establish Anchorage and Fairbanks as the centers of construction activity in Alaska. Until recent years there has been simply no other consistent means of heavy transport for equipment and supplies. Highways have been little more than adequate almost until now. And they still offer little flexibility of destination. For instance, from



anchorage there are literally only two directions of travel—one is northeast along the Glenn Highway through Palmer, connecting eventually with the Richardson Highway (which goes north toward Fairbanks) and with the Tok Cutoff (which joins the famous Alaska Highway at Tok Junction). Most recently there has been completed a connection south from Anchorage that leads to Seward. Not much choice for the Sunday driver!

The only other major point in Westward Alaska presently served by this interconnected highway system is the port of Valdez on the northeast side of Prince William Sound. This port is, even now, primarily a center for the fishery industry. Construction activity at any distance from the above-mentioned towns is served by air from them or, particularly in the case of defense work west of Anchorage and Fairbanks, by river navigation from points along the Bering Sea.

Resources for the future

Alaskans are truly concerned about the fate of Westward Alaska when the defense construction program is completed. Depending upon the number of personnel stationed at Army and Air Force installations in the territory, there will be a greater or lesser need for commercial services for military personnel. But, beyond this, Alaska depends almost solely on its natural resources.

Agricultural possibilities are limited, although the federal colonization project begun in the Matanuska Valley in the mid-30's has been fairly successful. Oil has been literally a matter for speculation for many years; currently there is a near-record in leases under which companies are exploring the Kenai peninsula, the west shore of Cook Inlet, the Alaska peninsula west of Kodiak, and the Katalla area at the southwest edge of Prince William Sound.

The two biggest resources industries, judging from past performance, are mining and fishing. These industries are traditional, and they are traditionally large. Yet both have prospered, fishing continuing to do so.

Plant investments in the Alaska fishery represent a considerable potential tax base that could be tapped to good advantage in the development of Alaska as a self-supporting governmental entity (whether a state as such or not). Until now, conduct of the fishing industry has necessitated the importation seasonally of large numbers of people, the importation of cans, and the establishment of large canneries in Alaska to handle the annual pack. In recent years, however, developments in the techniques of icing perishable foodstuffs has permitted processing of Alaska catches at points on Puget Sound in the United States itself. Insofar as advantage has been taken of these improved techniques, it has been possible to avoid the necessity for importing empty cans and for expensive maintenance of the faraway canneries. It is to be wondered whether a revision of Alaska's tax structure to produce proper revenue from the fishing industry might not drive the industry out.

Mining is somewhat different. Mining prospered during the years before the second World War. Gold, particularly, was feasible of production because of less stringent income tax provisions of the time, and again because of the property tax structure of Alaska. Mining came to a virtual halt during the war since its machinery, methods and personnel were badly needed else-



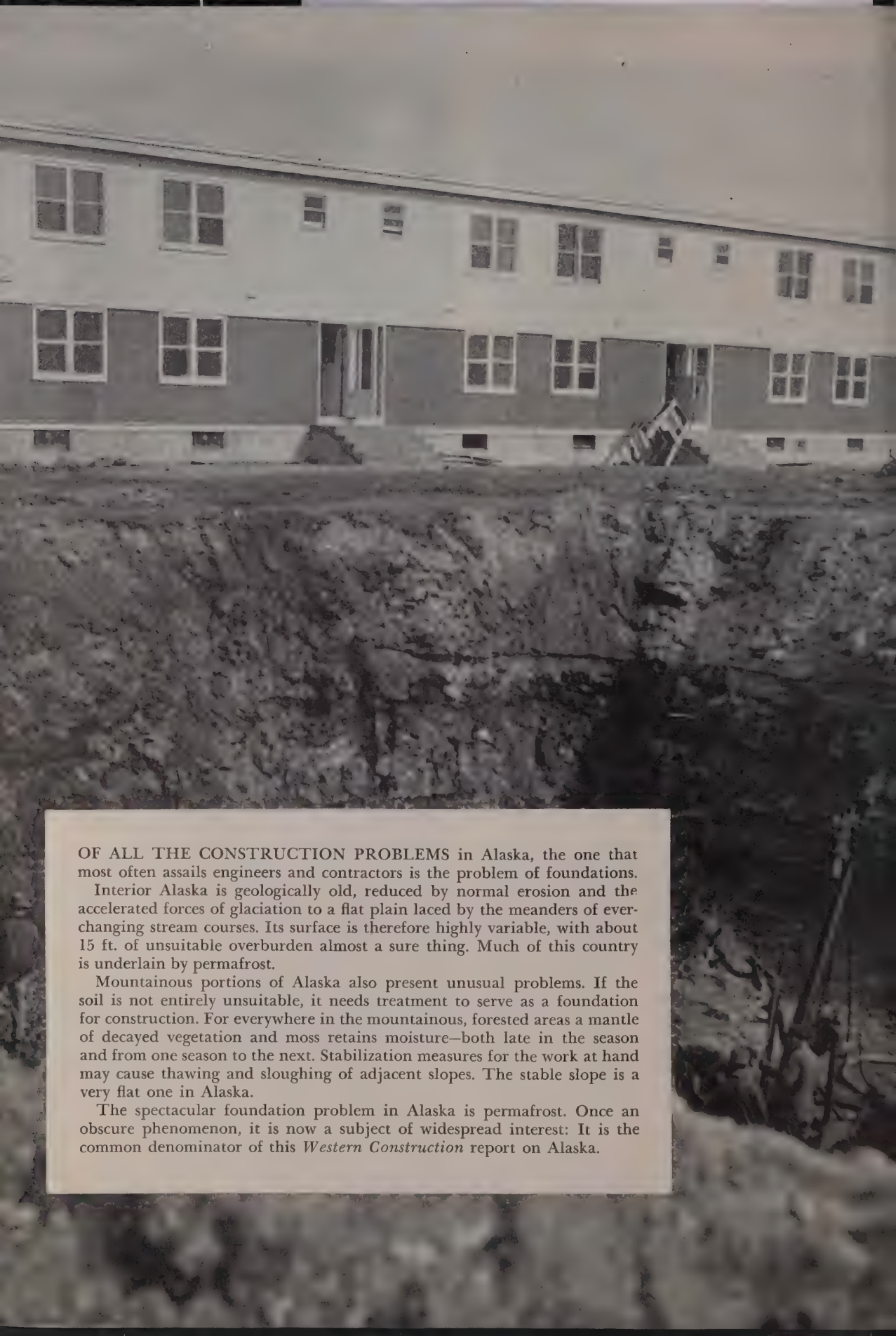
THE DUST of construction activity can never top the mountains of the Kenai Peninsula, where Rogers Construction Co. and Babler Bros. are completing surfacing of the new Anchorage-Seward highway for the Bureau of Public Roads.

where. It could be profitable on almost any given scale today, but the margin would not generally be as much as the mine operators would like. Therefore, since the minerals do not lose value merely by staying in the ground, since labor costs are presently so high, and since income taxes would take so much of the profit, the mining interests have chosen to bide their time.

If all the present deterrents to mining activity were removed tomorrow and Alaska were to receive statehood at the same time, it is difficult to say how much mining would pick up. Undoubtedly, the mining industry, would be prominent among state taxpayers.

In the long run, the mining industry would appear to be a prosperous and dependable one for Alaska, whether as a territory or as a state. The resources of Alaska are not restricted to the traditional precious minerals. As time goes on, the territory will be exploited more and more for industrial ores as they become more essential to U. S. industry. A direct result of mining activity, of course, will be extensive plant and road installations, heavy construction in rough and difficult country. Ultimately, also, it will see the growth of new and larger communities in Alaska and will require all of the civil engineering services performed elsewhere.

Even remaining as a territory, Alaska has the blessing and the support of the federal government. And that government is not unaware of the upheaval which its own defense activity has brought to Alaska. Even now it is acting to stabilize the territory and give permanence to its communities. It is doing this through the construction of public works—and here, again, is opportunity for the heavy construction industry. Under either public or private auspices, construction is the key to Alaska's development and to its future.



OF ALL THE CONSTRUCTION PROBLEMS in Alaska, the one that most often assails engineers and contractors is the problem of foundations.

Interior Alaska is geologically old, reduced by normal erosion and the accelerated forces of glaciation to a flat plain laced by the meanders of ever-changing stream courses. Its surface is therefore highly variable, with about 15 ft. of unsuitable overburden almost a sure thing. Much of this country is underlain by permafrost.

Mountainous portions of Alaska also present unusual problems. If the soil is not entirely unsuitable, it needs treatment to serve as a foundation for construction. For everywhere in the mountainous, forested areas a mantle of decayed vegetation and moss retains moisture—both late in the season and from one season to the next. Stabilization measures for the work at hand may cause thawing and sloughing of adjacent slopes. The stable slope is a very flat one in Alaska.

The spectacular foundation problem in Alaska is permafrost. Once an obscure phenomenon, it is now a subject of widespread interest: It is the common denominator of this *Western Construction* report on Alaska.

CONSTRUCTION IN PERMAFROST

Construction standards have changed while permafrost was aggrading at the sides of the "Pioneer" and thawing at its center—Corps of Engineers and contractor experience in Interior Alaska today is licking the phenomenon — Newly discovered permafrost form brings new questions

PERMAFROST, a word seemingly stolen from a refrigerator advertisement, is a comparatively new term but an old phenomenon. It is that condition where the subsurface remains below freezing temperature throughout the entire year. A great deal of the earth has been frozen since Pleistocene times. Today, it is estimated that one-fifth of the world's land surface is underlain by perennially frozen ground.

Before and during the early part of World War II a good many permanent-type structures were built in Alaska by the government over the rock-hard permafrost with no regard as to what might happen when the ground beneath the structure thawed from the heat of the building.

Roads were constructed in State-side fashion by ripping off the insulating cover of moss and vegetation and attempting to cover the newly formed quagmire with gravel. Airfields began, after a year or so of use, to have a roller-coaster effect and then to fail entirely.

Investigations bring results

What was happening seemingly hit home all at once. Investigation and study programs both in the field and in the laboratory were launched and are continuing today. These programs have not only greatly improved construction over the perennially frozen ground areas, but also have had wide use in the understanding and treatment of some of the problems that have occurred in the States, particularly in construction of highways and runways during the winter and early spring.

Ladd Air Force Base and Eielson Air Force Base in the interior of Alaska (the largest bases within the permafrost zone) are situated in the sporadic zone of permafrost. The soils area to the south is unfrozen while the area to the north is almost entirely frozen. At Fairbanks (where the bases are located) there are areas both of unfrozen ground and of froz-



By STANLEY F. THOMPSON*

en ground. A slight change in surface conditions greatly and often rapidly affects the underlying soil. Removal of a layer of moss will cause the permafrost beneath to thaw and, in reverse, additional surface cover may cause the permafrost to aggrade.

The temperature of permafrost is never more than a very few degrees below freezing and at Ladd or Eielson, the coldest ever noted by the writer was 31 deg. F., or 1 deg. below freezing. So the material may change rapidly from frozen to unfrozen.

Fortunately, in the Ladd-Eielson region, the silt layer is rather shallow—seldom deeper than 20 or 30 ft., but averaging from 10 to 15 ft. This silt cover is underlain by gravel-sand strata down to the Birch Creek Schist bedrock which generally lies 200 to 400 ft. below the surface. The construction problem at Ladd and Eielson is not too great. All that seems necessary is to remove the permafrost in silt, backfill with gravel up to footing elevation, and then construct as usual. This is usually done.

The main difficulty lies in the removal of the permafrost. Three methods are most commonly used. One is the use of a crawler tractor and ripper. This is the most common and

the most successful. The second method is blasting. This method is followed when the material is too tough for the ripper. Then the chunks are removed by any normal means.

Thaw-compaction method

The third method is that of thawing artificially or allowing the material to thaw naturally under exposure to the sun—and then scraping away a foot or so of thawed ground daily. This method, seemingly the cheapest and easiest, is not always so. As the excavation thaws so do the banks, and the hole widens as it gets deeper and it fills with water and muck. The contractor may have to haul away twice as much material as he had originally planned.

Certain buildings where unusual costs are involved, such as power plants or large hospitals, still have thaw-compaction programs. There is a very natural reluctance to change from a proven successful method to a slightly less established method even though the latter may cost but a fraction of the original. So it is with thaw programs. Although it has been rather definitely established that thaw-compaction programs over gravels and sands are unnecessary as well as very expensive (and may even cause a weaker subsurface than the natural condition), the Corps of Engineers required this treatment for certain recent structures such as the 750-man barracks and the power plant at Eielson AFB and the 500-man barracks and the power plant at Ladd.

At the 750-man barracks, the process used by Chris Berg, Inc., was to

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How to identify and evaluate permafrost

WHAT HAPPENED when engineers in Alaska found that, in dealing with permafrost, they had a bear by the tail? As is very natural, the pendulum of thought swung from indifference to permafrost to very elaborate and expensive treatment of the phenomenon. Permafrost became a subject of science and complex theories were worked out for the treatment of it. The schools of thought ran in two directions. One theory stated flatly that whenever and wherever permafrost was encountered, there was but one choice: "Remove it." The other theory rested on the basis of "use it"; that is, by both natural and artificial means keep it frozen and build right over it.

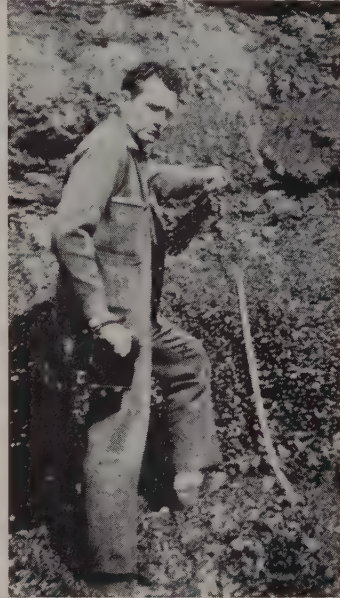
This was excellent theorizing except for one very basic fact which, in the turmoil and haste, everyone seemed to forget. Permafrost consists of many kinds of materials, in many types of conditions, and each situation is entirely different. A few of these divergent conditions of permafrost are as follows: its depth from the surface downward may under natural conditions only be a foot (or less) or it may extend to the known depths of 1,300 ft. in the Point Barrow region of Alaska, or 2,000 ft. in the Nordvick region of Siberia.

Physical properties

It may consist of tightly packed gravels or "rock," or it may be in the form of pure ice lenses. (Lenses up to 140 ft. thick have been found and many great lenses and wedges of ice are visible along the Arctic coast where the cutting action of the sea keeps them exposed. The whaling ships used to get their ice from some of these lenses near Elephant Point.) It may be that the permafrost is composed of silt with a high moisture content, and usually shot through with tiny microscopic or megascopic veins of ice. At Ladd Air Force Base, in the excavation of frozen ground preparatory to the building of eight-family quarters (a Pomeroy construction job), a test was made of permafrost in silt of the sides of the excavations. The moisture was present in frozen particles and veinlets not readily visible to the naked eye. On being thawed and dried out, the specimens shrank an average of 90%. This meant that 10 ft. of ground, upon being thawed and dried would shrink to 1 ft. Naturally, a heated building founded on such material would in a very short time become completely useless.

It is this condition, permafrost in silt, that causes almost all of the construction problems usually blamed on the more general term, permafrost.

Careful laboratory work, coupled with field tests and observations, has shown that there is normally no settlement or shrinkage in the thawing of permafrost in rock, gravel or sand; but that in silts or clays the shrinkage is under most field conditions excessive.



THE AUTHOR (pictured here) and his associates last year encountered a new twist to permafrost, strata like this of ice-in-gravel. For close-ups, see next page.

Why is this true? A simple laboratory test will show the condition. If three cardboard ice cream containers are each filled, one with gravel, one with sand, and one with silt, and then kept below freezing temperature (but with free water at intervals available to them), it will be found that the gravel and sand samples remain frozen with no noticeable change in volume. (There is in actuality a slight measurable swelling in each.) But the carton containing the silt sample will swell, break open and continue to grow as long as it has water.

The water in the silt or clay is drawn in through capillary action to where an ice crystal starts to form. This crystal or lens grows and continues to grow for as long as water is supplied.

Seemingly then, the catch is that in the laboratory there is a suffi-

ciency of free water, while in the field there would not be free water obtainable at below-freezing surface temperatures. Such is not the case, for throughout the summer months there is a more than ample supply of surface water; and, even in the coldest winter months, there is water available in the fine capillaries. Water in these capillaries does not freeze at the usual temperature but remains fluid well below 0 deg. F. In silts in nature as in the laboratory, the material tends to take in more water, form more ice, and therefore expands.

Present construction methods

As these facts became known to engineers in Alaska the present methods of construction over permafrost came into being. The first step is a careful preliminary exploration of the proposed construction site to see whether or not it is economically feasible to treat the frozen soil and how best to handle it. This is usually done by churn drilling, with a careful laboratory testing of the drive samples coupled with the soils engineer's analysis of the samples and the driller's remarks. A second method, becoming increasingly popular, is the use of a mechanical auger. Using carbide bits, this is a much faster method of testing, but has the disadvantage of giving no undisturbed samples. It is best used for determining the presence, location, and depths of permafrost without too much information as to the character of the materials.

A third preliminary exploration method, by far the most satisfactory, although the most expensive as well as the slowest, is that of test pits. This method allows the soils engineer to observe the material strata in place and to take careful tests as seems necessary.

The main disadvantage or drawback of all of these methods, but particularly of the test pit, is that soil conditions may change very considerably in only a few feet, and what is true under one portion of the proposed building may not be true at all under the rest of the building. Engineers and contractors alike have a strong tendency to put too much faith in the results of the one test pit or a few drill or auger holes. These pits and holes are, at best, only indicative of what is present under the surface in that general locality. They are accurate only at the exact location of the pit or hole and, even then, their accuracy and usefulness depend on ability to interpret.

thaw the ground down 30 ft. by steam points and then compact by blasting. For the Eielson power plant (construction by Morrison-Knudsen) the thawing was done by steam points and the compaction by pile driving. Both methods seemed quite successful.

At the Ladd 500-man barracks (an Anderson-Montin-Benson job), the steam-pile program was originally scheduled but during the course of construction (and against the field soils engineer's advice), the compaction program was deleted. So far the building has not settled noticeably.

On the Ladd power plant and its addition two different methods were used. The plant area was treated by the steam-blasting method. (And although a failure occurred, subsequent investigation showed it to have been caused by improper placing of backfill rather than by failure of the underlying ground.) The addition (under construction at the present time by Lytle-Green-Birch) used a combination of cold and hot water for thawing, and compaction was obtained by the repeated dropping of a heavy weight over the surface.

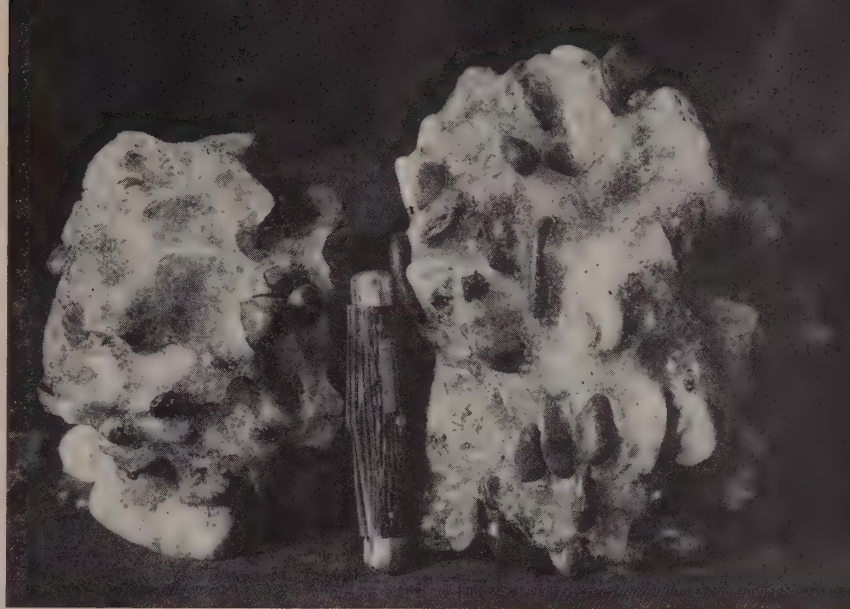
All of these methods are very expensive and, if proper investigation is conducted beforehand, probably useless.

Ice in gravel

During the writer's next to last year (1952) as Chief Soils Engineer a different phenomenon of permafrost was encountered. Although for a good many years believed to exist, this condition was thought so rare that it was never even mentioned in permafrost construction manuals or books and very rarely in scientific writings on permafrost. In fact, most investigators were quite positive that it did not exist at all. It is the condition of gravel in ice; that is, gravel particles separated by ice layers to an extent that appreciable settlement will occur upon thawing.

Isolated remnants of this material were first observed in the rim area of the thawed ground beneath a 500-man barracks at Ladd AFB. The observed quantity was too small for any conclusions to be reached. During the same season, test pits for a proposed 750-man barracks at Ladd showed a 2-ft. lens of this material. Although tests, measurements, and pictures of the material were taken, a great many high-level engineers refused to believe the results. In the late fall of 1952, the writer observed this material being excavated from a sewer lift station excavation and was able to get excellent photographs and perform reliable tests which convinced all but the most skeptical individuals.

A few other samples in smaller layers began to be found in utilidor excavations and it came to the attention of the Ladd-Eielson soils department that there was no way of finding this



YOU JUST DON'T HAVE capillary action in natural materials of this size. Yet, the gravel particles are fully separated by clear ice. The origin of this permafrost form is undetermined. But most important is its treatment by construction men. Ice in gravel is hard to locate and means additional excavation expense if structure above is not to fail.

material except actual visual means, as neither auger nor drills would show the existence of the ice. Dr. Hakon Wadell, who was and is conducting a series of soils investigations at Ladd AFB, pointed out that the material is always associated with loose openwork gravel.

This fact enabled the soils engineer at Eielson, Richard Dority, to find, by the use of intuition and hard work, a 10-ft. lens of this material only a foot beneath the footings of the remote transmitter station being constructed by Reed & Martin at Eielson. The contractor was ready to pour the footings (the underlying material was a coarse openwork gravel), the auger and drill hole results had shown this coarse gravel to continue in depth, and no unusual conditions had been noted.

Observing the openwork structure of the gravel, Dority borrowed a jack hammer from the contractor and found his surmise to be correct: the gravel immediately below was included in an ice mass. Construction was halted and the material was excavated thus saving the cost of an entire building which would have settled beyond use immediately.

All permafrost problems are not quite as simple as those at Ladd and Eielson bases. In many places it is necessary to build over the frozen silt. Wrapped piles, natural refrigeration, artificial refrigeration, and floating slabs have been tried with varying success. The plan of most of these methods is to keep the permafrost in a solid condition and thereby utilize its basic strength. The artificial refrigerant method appears to be the most successful method and is not as expensive as would appear. The system needs to be in operation only

very occasionally to keep the ground in its frozen condition.

The wrapped pile method, widely used by the Russians in Siberia, consists of piles placed in augered or drilled holes and then wrapped with roofing paper or grease. Thus, the heave and settlement slide the wrapping and do not affect the piles or the structure built on the piles. The floating slab method is the least successful and perhaps is the most often tried. The pressures are too extreme for the construction of the average slab and at best the slab tilts excessively.

Summary

In summation, then, the basic facts of permafrost are these:

(1) It is a widespread phenomenon and exists in all types of soils. However, permafrost in silt is normally the condition in which construction problems occur. It has been found at Ladd and Eielson most satisfactory to remove this silt and replace it with gravel backfill, such removal being accomplished by ripping, thawing, and/or blasting. In certain conditions, the time-tested, more elaborate, method of thawing and compacting the frozen gravels is used.

(2) In areas where the silt layer is too deep to remove economically, certain methods have been devised for constructing on the undisturbed material. The most successful method is artificial refrigeration, while the least successful and most often used is the rigid floating slab.

(3) The recent discovery of ice in gravel and the finding of considerable masses of this condition are leading to one more change in the ever fluid design and construction over permafrost areas.



MILITARY WORK is the mainstay of construction in Alaska today. Repetition of this fact has dulled the sense of outsiders to its truth. Only a survey of contract operations can fully convey the magnitude of the work. Alaska military construction would be big anywhere; by comparison to the normal economy of Alaska, it is overpowering.

For the needs of the nation, and to the benefit of Western contractors, defense work in Alaska continues to progress on a high-volume basis. Particularly since bid competition is increasing, this does not mean that Alaska work is a gravy train. The tradition of post-war years has been realistic bidding, and this will continue.

Execution of Alaska work has involved universal application of uncommon techniques of scheduling materials, of planning construction sequence, of architectural treatment, and even of original concept. The utilidor pictured here is an example. Others are reviewed in the following nine pages devoted to military construction in Alaska.

Valle-Sommers makes a good job from a bad

Rigid siting requirements on this Elmendorf job meant lots of water when the hillside thawed — Late spring freeze brought heaving and delays — Good advance planning on concrete pours has helped put job back on schedule



TROUBLE on a Valle-Sommers job at Elmendorf Air Force Base this spring was tersely described in the Corps of Engineers' construction progress report for the month of May: "Contract behind schedule due to a shutdown caused by frost conditions under footings. Construction will be resumed when frost condition is corrected."

When the job was visited in the latter part of June, all was well. First floor slab had been poured, walls were in various stages of forming and concreting, and even a part of the second

floor pour was under way. The days by then were warm and long, and the weather itself had, in large part, corrected the frost condition.

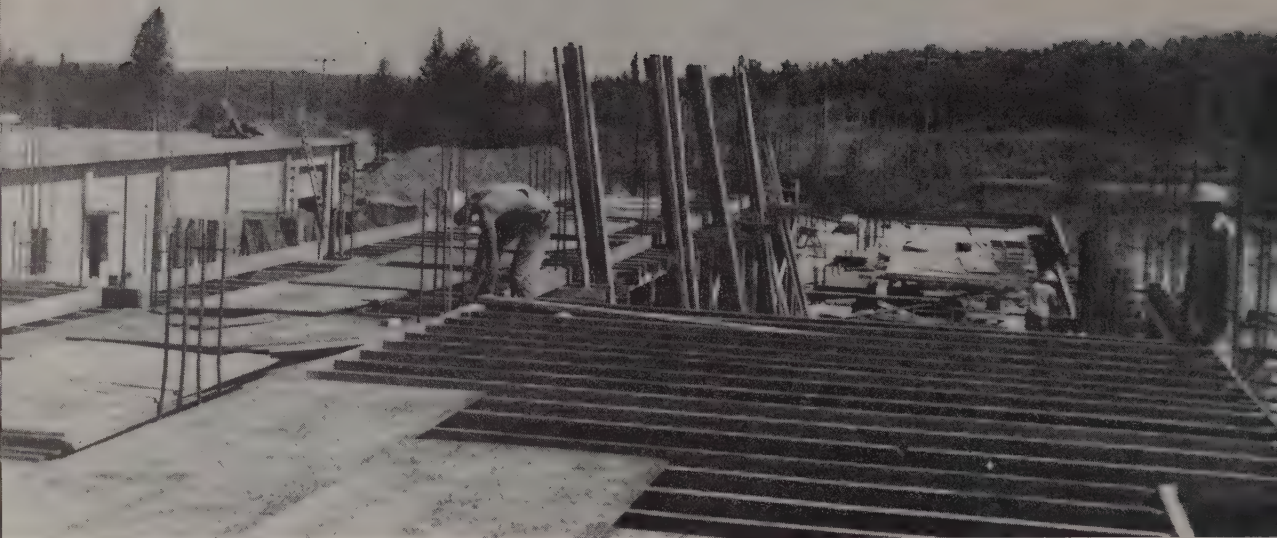
Valle-Sommers' job is a \$2,127,000 contract for building a "converted 500-man barracks." The designation roughly describes the building and it

GETTING "OUT OF THE WOODS" is the first thing on almost any Alaska job near the coast. Building sites on the military bases near Anchorage all have to be cleared of heavy birch growth like that shown here. In foreground is partially poured first floor slab of messing wing adjacent to barracks proper.

hints at something more. The something more is military business, and it was that which brought about the irksome frost condition. For undisclosed operational reasons, the structure is situated on the shoulder of a wooded hillside—no other spot would do. This was no trouble when the job was begun in August of 1952, but beginning of the 1953 thaw changed things.

Excavation for footings had been done, the footings were in, and a lot of slab area had been fine graded and poured also. A tentative rise in the





mean daily temperature brought melting of frost trapped in the thick soil mantle uphill from the work. Water began to percolate, and to flow, through the Valle-Sommers work. It had nicely saturated the structural backfill when a cold snap hit. Footings cracked and the slab opened up in a few places: as much as 3 in. of heave was recorded. Further work was halted.

Finally corrective measures and the ultimate progression to summer temperatures saw the frost thawed, the work restored to grade, and the percolating moisture drained harmlessly off downhill from the work. Next year will be no trouble. The building will

GOOD COORDINATION of crews results in having form lumber stacked in advance of carpenters as they work along second floor. Basic building plan is evident here, with central hallway formed farther along than rest of floor. Boiler building and garage in left background.

be closed in by then, some utilities will be hooked up, and inside trades will continue work throughout the winter with artificial heat. This heat, during construction and during the subsequent life of the building, will hold frost permanently out of the building subgrade.

Building design is typical

The basic design of this building follows that used for similar construction on Air Force bases in Alaska. It is a 4-story affair 480 ft. long and 45 ft. wide, the interior plan being substantially a through central hall flanked by barrack accommodations and administrative offices for the military unit occupying the barracks. Modifications undertaken for the "conversion" mostly involve reassignment of purposes for various spaces and the juggling of some partitions.

Like many other barracks, this one has an attached wing for messing facilities. This 93 x 99-ft. structure, joined to the middle of the barracks by a narrow crumble-joint connection, is also modified somewhat. Contrasted to the barracks, the mess wing

STEEL and other building materials are no problem for Valle-Sommers on this job. The contractor takes advantage of the slack winter season, when incoming cargo space is plentiful, to stockpile. Of course, this job is convenient to transportation and accessible even in winter, so storage of supplies is no added expense to the contractor.

risers only 3 stories. Additional facilities in connection with the project, which is off on one corner of the base away from the central utilities network, include a garage and boiler house, and a standby power plant.

The barracks is a reinforced concrete frame design with concrete block filler walls. Exterior walls are 9½-in. thick and interior partitions typically, 7½-in. Flat slab floors are mostly 6-in. thick, except over hallways, where they are 11½-in. Spans from exterior walls to the hallway are about 19 ft., and the hall is 8 ft. across. The mess wing differs somewhat, due to its configuration; it has a dropped panel design.

Both barracks and wing have been designed for about 100-psf. of floor load. In the main barracks, this is distributed among components as follows: live load, 40 lb.; partitions, 35 lb.; and the slab, 10 lb. The mess wing is figured for live loads of 50 lb.; finish work, 10 lb.; partition, 30 lb.; and slab, 10 lb.

Good progress in June

In June the job showed the results of good control and good scheduling despite the frost that had shut it down during April and May. And it was proceeding in a workmanlike way when visited, with concrete being delivered in a steady sequence for an undelayed pouring job on the second floor.

John Bragg, the area engineer for the Corps (resident engineer on this job and others, possibly, as well), was watching the pour with a critical eye. His main concern was proper vibration and good concrete. Leo Smith, inspector, took over some of the observation while Bragg talked, volun-



teering (with tongue in cheek) that he had solved the problem of rock pockets in a simple, rudimentary way. Actually, his solution was more of a definition, a definition of proper inspection: "You've got to watch the vibrators. Assuming everything is okay in the forms—steel set right—and that the concrete hits the specifications, you've got to get those vibrators into all of it. They should move in 2-ft. jumps—not get picked up and tossed into the next buggy load 6 ft. away.

"Watch it all the time, do more than be a sidewalk superintendent, and you've got rock pockets licked!" He went back to watching.

For the job superintendent, concrete quality is one thing, but quantity is another—perhaps more important. George Ongman remarked that the system of supplying concrete on the Elmendorf jobs is sometimes inconvenient. For instance, the Army's central mix plant has a capacity of about 120 yd. per hr. But, when Ongman is ready to pour, he wants 45 yd. per hr., nearly half the capacity. He must share this capacity with perhaps ten other jobs on the base. This means that he must schedule pours a week in advance.

Easing the situation is the fact that slab pours, such as were occupying the Valle-Sommers crew in June, have priority in getting concrete. Finishing requirements make the work more critical. And, there is always the possibility of rain during the Alaska summer.

Work problems aren't unusual

By and large, though, the problems of getting work done in Alaska, for the Army or anyone else, are not much different from elsewhere. Take the matter of material supply. This one is often thought "on the Outside" to be a constant headache in Alaska. And it might appear so at times. Two jobs near Anchorage were going at a slow pace in mid-June (and making a lot of consequently unemployed labor unhappy) because they were short of steel. Rumor had it that the contractors, hearing in February of the government freeze, had not ordered steel for 1953 until the fate of their jobs had been decided—preferring to stand the cost of delays against being stuck with fabricated structural and re-steel that they could not use.

George Ongman couldn't account for the rumor, but he waved his hand at the extensive steel stockpile lying ready on the Valle-Sommers work. They hadn't worried about prospects for their contract. They had followed their customary practice of shipping materials to the job during the winter, when shipping space was easily available. For this job at least, close to civilization, it is easy to get all manner of supplies to the site, even in coldest weather. And that is certainly



PROGRESS on slab pours is watched closely for Valle-Sommers by C. F. Ricker (left), job engineer, and for the Corps of Engineers by John Bragg, area engineer.



THE STATE OF THINGS is evident from the expression of George Ongman, superintendent for Valle-Sommers on this \$2,127,000 job.

Fairbanks recommended for flood control project

THE CORPS OF ENGINEERS has issued a report recommending a \$7,667,000 (estimated cost) flood control project for protection of the Fairbanks area, including Ladd Air Force Base, in Alaska's Chena and Tanana river valleys. Additional costs of \$50,000 have been estimated to cover extraordinary maintenance and operation. Local interests must furnish lands, easements and rights-of-way, and contribute \$30,000 annually towards operation and maintenance costs. They must also make a cash contribution of 3.3% of the total construction costs, estimated at \$274,000 at 1951 price levels, and agree to hold and save the United States free from claims for damages due to construction, maintenance and operation of the project. This report, which was issued by Brig. Gen. E. C. Itschner, division engineer for the North Pacific Division, Corps of Engineers, is a revision of the basic Tanana River Basin report released in January.

Survey to begin for Alaska to B. C. road

THE ALASKA Road Commission has allocated a sum of \$250,000 for surveying a proposed connection between southeastern Alaska and British Columbia. According to a report by William Niemi, chief engineer for the ARC, surveys of routes connecting Juneau, Wrangell and Ketchikan will begin this winter.

preferable to getting caught in the traffic jam at Seward during the summer time. (There are plenty of ships coming in, and plenty of railroad cars going out, but terminal handling facilities themselves are a bottleneck.)

Under district engineer Col. L. H. Foote, Lorn E. Anderson is chief of projects, south. Lt. Col. Robert E. Hisle is resident engineer at Elmendorf AFB, with three assistants headed by Major E. L. Rountree. John Bragg is area engineer on the Valle-Sommers work, and Leo Smith is inspector.

For Valle-Sommers, George Ongman is superintendent, C. F. Ricker is job engineer, and Gary Hanson is foreman.



UTILIDORS are a construction item peculiar to Alaska. And the one at left, carrying steam, steam condensate, water and sewage, becomes a fancy plumbing trick where a fire hydrant is required. This is a Lytle-Green-Birch job, superintended by Don Feltus. H. O. Bullock is general foreman for the sub, Urban Heating & Plumbing.

GANTRY for utilidor piping installations (right) was dreamed up last year by Oscar Buchanan, utilities superintendent for Kiewit and Fred J. Early on their \$2,513,200 contract for BOQ's and utilities at Eielson. These utilidors are 5 ft. wide, 6 ft. deep, connect to BOQ's by 3 x 4-ft. laterals. Using 20-ft. form panels, contractor poured 300 ft. of utilidor in one operation. Joints are 60 ft. apart. Arley Decker is concrete foreman on this work, and Perry Robiataille is carpenter foreman. Bob Leach is foreman for the sub, Lents Plumbing Co.



A SWITCH from grading and paving is this storm sewer installation on the \$2,921,850 apron paving contract held by Max J. Kuney at Eielson AFB. Shown below are a Dumpcrete discharging directly into the forms, and a Northwest with a lay-down bucket taking over where the reach is too great. Sometimes, as pictured at left, there is trouble. A little too much vibration packed the concrete under on corrugated barrel—it broke its ties and floated out. Fast work was necessary to rip out steel, break out the form, remove wet concrete and tie the pipe down again.



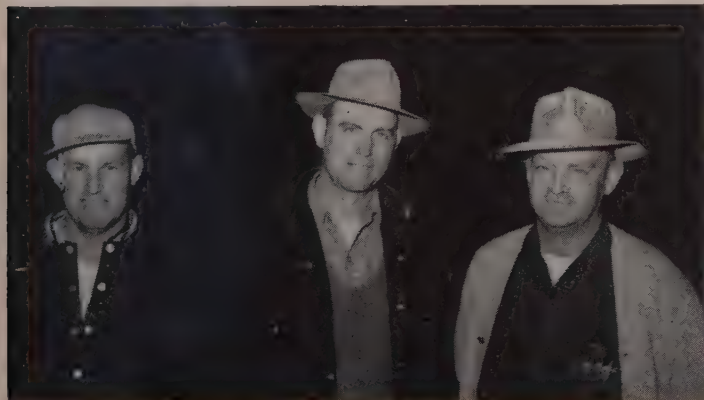


A.K. EMBREE, superintendent for Brezina Construction Co., indicates 4-in. fibre ducts installed on their job to house electrical services. The ducts are a fine idea, but must be secured so as not to float out on a slab pour. Contract is a \$758,350 administration building at Fort Rich. Progress is past 40%, with about 40 men on the job. Chris Lee is project manager. For the Army, O. W. Urbom is project engineer and John Holland is inspector.



THE PIT WILL STAY, but this is the last year for the rock processing equipment shown. Owned by the Army, it is operated by Ashback-Craig on their contract to furnish concrete on jobs at Elmendorf AFB and Fort Rich. In the past, Army has bought cement and contracted for operation of its own pits and equipment at Anchorage and also at Ladd and Eielson, near Fairbanks. Pit operators at latter bases (Lease-Leighland and M-B) already furnish their own cement and equipment. Inside two years the Army plans to be entirely out of the rock and concrete business. Concrete production at this pit by Ashback-Craig totaled nearly 110,000 cu. yd. between April 7 and end of July this year.

FINISHING TOUCHES on this 300 x 300-ft. hangar (right) are a job in themselves, as indicated by the maze of scaffolding erected by H. H. McDougall, plaster subcontractor to Peter Kiewit Sons' Co. on this \$4,100,000 job at Eielson AFB. Work began in July 1951 and finished up this summer. Kiewit personnel shown below are (from left) Paul Nichols, carpenter foreman; Glenn Price, labor foreman; and Charles Updegraff, superintendent. Other key men, not shown, include Harold Norbeck, ironwork superintendent, and Harry Bowers, steel foreman.





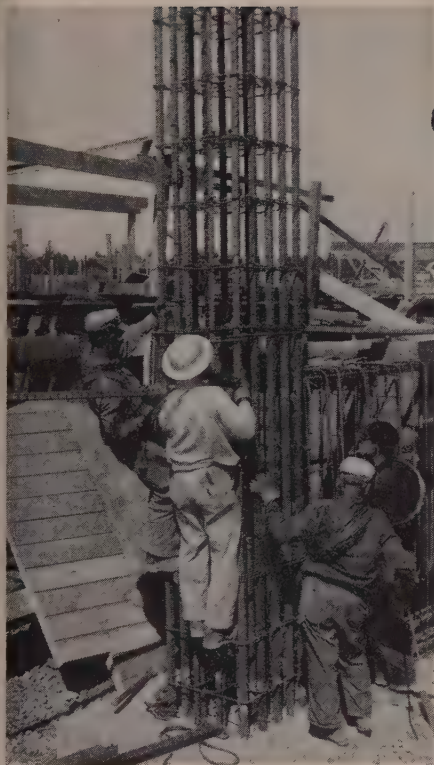
IT MAY BE a building job, but it starts out with earthmoving. This is the Lytle-Green-Birch \$4,206,300 job for thirty 8-family quarters at Ladd AFB. Foundation backfill is brought in 2.4 mi. from a pit where this Lima and a P&H load a fleet of 10 belly-dump Eucs. Site preparation (below) is a dirty job for Cats and cans. This isn't permafrost, but it's almost as nasty to handle for its entire 12-ft. depth, where silt leaves off and grave begins. Annual frost goes only 4 ft. into this stuff, which is removed by 2 shifts of ripping followed by one of scraping. Backfill is not complete, as these family quarters have full basements under their 24 x 175-ft. plan.

FIVE BASKETBALL games at once. That's what will be possible beneath the steel-spanned ceiling of the field house gym being built at Eielson AFB on a \$1,976,900 contract held by Anderson-Montin-Benson. Suppliers and subs on the steel include Robberson Steel Co. and Sparling Steel Co., the latter doing erection. Remainder of field house is a reinforced concrete structure. For A-M-B, Al Montin is project manager and Bob Davis is superintendent. Larry Beaty is general foreman, Jim Huntley, office manager.



A PAIR of Caterpillar D8's (above) take the backfill down the ramp after it is windrowed in the background by the Eucs. The men who work out these details for Lytle-Green-Birch are shown below (from left): Ira Hamrick, general carpenter superintendent; Harry Jones, project engineer for the Army; Ed Triem, general superintendent; and "Rosie" O'Grady, excavation superintendent.





\$8,443,400 is the price tag on this job—the hospital at Elmendorf AFB. It's a Boespflug Construction Co. project, begun in March of this year and expected to run until June of 1955. Work to date has been almost all on footings and foundation walls, with some heavy column steel going up as at left. Building was designed by Skidmore, Owings & Merrill, is really three wings separated by crumble joints. Specs on some of the early work are rough, requiring very large continuous concrete pours—several of 100 yd., and a few as big as 200 yd. This has meant setting and supporting large masses of steel, to unusual heights. For instance, steel shown at right is column reinforcement used in "A" wing of the hospital. Contractor people said in June that concrete would have to be poured here with a syringe! This mass includes 10 1½-in. square bars tied up in a double spiral of ½-in.



"B" WING spreads out over a lot of ground, will have the maximum height too—10 stories plus a so-called penthouse. "A" wing, a long portion of the hospital adjacent to this scene, will rise 7 stories. Remainder of structure, "C" wing, is just 2 floors. The latter wing has already gone up—forms were in place in June for second floor pours. All in all, this job is an intricate one, both in scheduling and in construction.

J. A. FELLERHOFF (right), superintendent on the Elmendorf hospital for Boespflug Construction Co., has kept progress pretty much to the schedule rate. Watching over the job with him are Robert Farley (below, left), project engineer for the Army, and M. M. Perry, inspector. Other principal personnel of the contractor include O. F. Edsall, project manager; Clare Broxholm, ironwork superintendent; J. J. Tennison, concrete superintendent; Jack M. Boyd, general carpenter foreman; and Seth Downing, master mechanic.





Compaction a big item on this 250,000-sq. yd. contract — Apron paving job by Max Kuney

A 75-ton single-axle compactor is also on the job—Dense-graded asphalt will come next, covering up over 400,000 yd. of borrow material in a design base section 49 in. thick

AT EIELSON Air Force Base, out of Fairbanks, the Corps of Engineers has one of those paving jobs that contractors in recent months have gotten mad at. Not Max J. Kuney, though. This Washington contractor is doing the \$2,900,000 job and says he would bid another one.

The work involves some 250,000 sq. yd. of aircraft parking apron—still

more pavement on an installation that already is one of the biggest the Air Force has. But the work doesn't begin anywhere near the ground surface. The total specified thickness of the various subbase, base, binder and surface courses comes to 53 in. And in spots it has been necessary to carry stripping operations down another 5 ft. or so. Adding this dimension to the

area of the job (maximum length 5,170 ft., width 425 ft.), one comes up with a sizable earthmoving operation—in two directions.

The stripping part had pretty well been done when the job was visited this summer. Work had gotten under way in July of 1952 and official progress of over 25% had been logged. Excavation had been done by dragline, loading out belly-dump Eucs, and by Euclid scrapers, pushed when necessary by D8's.

Backfill operations

Backfill was put in from end-dump and belly-dump Euclids, and by the scrapers again. All these units were loaded at a nearby pit by a 120-B dragline. The extra subbase material required below specified subbase depth had to be pretty fair pit run, and it had to be compacted to 95% of modified AASHTO density—same as for select pit-run in the design section. This careful attention to stripping and to subbase composition and treatment is another example of taking precautions against frost damage. Especially in low areas, where the constructed section includes far more imported subbase, this material must be carefully surveyed for suitability. It must not contain more than 3% by weight of material finer than 0.02 mm. Such material permits the entrance of moisture by capillary action and thereby heightens the chances of frost heave.

A run-down of the various courses comprising the design apron section gives some idea of the succession of precise operations that must be car-

CORPS OF ENGINEERS GRADING SPECIFICATIONS

(Standard spec applicable to Kuney contract for apron paving at Eielson Air Force Base. Job-mix formula for binder and surface courses may be further fixed within these limits.)

CRUSHER-RUN BASE	
Sieve	Percent passing
1"	100
3/4"	70-100
3/8"	50-80
#4	38-65
10	27-50
20	18-35
40	14-27
80	8-17
200	3-8

BINDER COURSE

Sieve	Percent passing
3/4"	100
1/2"	82-100
3/8"	68-88
#4	52-70
10	36-54
40	18-30
80	10-20
200	4-8

SURFACE COURSE

Sieve	Percent passing
3/4"	100
1/2"	88-100
3/8"	78-90
#4	60-73
10	43-57
20	33-45
40	25-35
80	15-23
200	4-7

ried out to achieve the desired results. It does not indicate the precision with which binder and surface courses must be put together, however. Here is the typical section:

Surface course	1½ in.
Binder course	2½ in.
Crusher-run base (comp. to 100% mod. AASHO density)	6 in.
Select pit-run subbase (comp. to 100% mod. AASHO density)	20 in.
Select pit-run subbase (comp. to 95% mod. AASHO density)	10 in.
Subgrade (comp. to 95% mod. AASHO density, as against natural state of 90% or better)	13 in.
	53 in.

Grading specs are tight

The problem of the job arises from the grading specified for base, binder, and surface courses. The permissible percentage of variation for any given fraction is smaller than heretofore, even in the "standard" spec. But the picture is complicated when materials available for the individual job are run through sieves. The curve of percentages may lie wholly within the standard curves representing maxima and minima. But, if the job materials curve bounces back and forth between the standard curves, then it must be corrected to a smoother, more consistent contour. Here is where the necessity for further processing comes up.

Making the job-mix

On the Kuney work at Eielson, there was, for all practical purposes within the meaning expressed above, a "hump" in the curve indicating an excess of plus-80 fraction. The question arose as to how best this condition might be corrected. The contractor had an idea of wasting all pit material smaller than 40 and replacing it with another sand having a better grading. The Corps of Engineers was dubious as to the efficacy of such a method, however; in fact, they were quite firm about it. It appeared preferable to them that Kuney should waste the excess plus-80 in achieving the desired job-mix. A middle ground was finally struck when Kuney brought in a portable crushing plant, added it to his aggregate plant, and processed a portion of the excess material in the larger fractions. Adding these in proper proportions to the finer sizes resulted in production of a greater quantity of suitable material from a given quantity of raw feed than would otherwise have been possible. His plant was therefore not overworked in handling raw feed that would be wasted while turning out specification base material for the job.

Binder and surface courses resulting from the tight grading specifica-

BIG YARDAGE calls for a big plant setup. It starts out at the Army borrow pit, where Kuney has a Lima 1201 and a Northwest 80 loading out belly-dump Euclids that supply raw feed to the processing plant and subbase material direct to the job.

SCREENING PLANT, with a portable crusher worked into the circuit, has processed pit run to produce specification material for base course, binder and surface courses. Staying well ahead of demand, the plant in June had put through the stockpiled material shown here.

NOT YET in production in mid-June, the asphalt plant stretched out like this below its stockpile. Note "transit tanks" of asphalt lying ready for work to begin. Flat country, going for many miles to the nearest rounded hills, is typical of Alaska "north of the Range".

tions are properly termed dense-graded. These asphalt elements of the apron work are to have a Marshall stability of 1,000, Marshall flow of 16. In the total mix, binder course voids are limited to a range of 4-7%, surface course voids to 3-5%. Even within this fraction, 65-72% of binder course voids must be asphalt-filled, and 75-82% of surface course voids the same.

Material quantities

Quantities on the work were indicated to be considerable. It is estimated that the designed apron thickness—all courses, including 13 in. of processed subgrade—represents 260,000 cu. yd. The work as carried out involved another 139,000 yd. of striping in bad spots. Total yardage of backfilling, uncompacted, comes to about 420,000 cu. yd.

And there are other items of work, principally drainage and some other utility work related to airfield lighting and aircraft control. Most of the work was scheduled for completion this season—last month, in fact—but the east runway extension to the parking apron runs until July of 1954.



For the Alaska District, Col. L. H. Foote is district engineer. D. K. Joselyn is chief of projects, north, encompassing construction at Ladd and Eielson Air Force bases and at Big Delta. Lt. Col. John K. Addison is resident engineer for Ladd and Eielson construction, and Judson H. White is assistant resident engineer. Major William E. Anderson is chief project engineer at Eielson Air Force Base. Assistants include Roy H. McAndrew and Lieut. Robert E. Martin. From Alaska District headquarters at Elmendorf AFB, H. G. Herrington has been consulting specialist to the Eielson work, with reference to asphalt technology. Project engineer for the Kuney work is Forrest A. Norton.

Max J. Kuney's superintendent is Jay L. Johnston, and W. R. "Tex" Wiginton is project manager. W. W. Johnson is master mechanic. Ted Johann is crushing superintendent, with Rudy Antonich and H. Hoilien as pit foremen. A. F. Jackson and R. Quakenbush are grade foremen. S. E. Erickson is office manager. Sub-contractor on electrical duct work is Agutter Electric of Seattle.



HINDSIGHT can be an especially bothersome thing for Alaska's highway engineers. Larry Hatchett, assistant district engineer for the ARC at Anchorage, tells it this way:

In an ordinary year in his district, there is the temptation to commence stripping overburden on new highway alignment as early as March. But it isn't done. After all, the material underneath is still frozen, and the intermittent spring rains getting to it (without its protective overburden and vegetation) would only offset its tendency to thaw faster and dry out for processing. So, in an ordinary year nothing is done until late in May.

In June 1953, hindsight revealed to Hatchett that full work schedules could have started in March. A mild spring had been unusually rain-free. Three months could have been added to the season, if foresight were as accurate as hindsight!

The next two articles review similar conditions and considerations that beset Alaska's highway builders.



Rogers and Babler have a big plant for the big job —

54 miles of highway surfacing

Five set-ups for highly portable rock and asphalt plants take this contractor down the road from start to finish in one summer season — Anchorage-Seward highway work has involved most of Alaska's usual roadbuilding problems, and some all its own

When the job was visited in June, the contractor's rock plant was at its second setup—a little prematurely, to be sure. The first pit had not held up in quality; so the contractor had moved on, accepting longer hauls on some of the rock in favor of getting better raw feed. As it is, the average haul from any plant setup is about $5\frac{1}{2}$ mi., one way; and the maximum is 8 mi.

Portable crushing rigs

A feature of the contractor's crushing setup is that it is their own, both in design and manufacture. According to the crushing and grading superintendent, Howard McInroe, Rogers Construction has had a high interest in portable plants for some time, but has not been able to find complete satisfaction in any standard portable. Therefore, in recent years they have rigged up their own.

Of course, their criteria for a portable plant are perhaps peculiar to Rogers. For instance, it is not their idea that a plant should be completely portable as a single unit. Nor that it should be a scaled-down affair in capacity. The equipment on the Anchorage-Seward work makes this obvious—there are separate wheeled units all over the lot. They represent portability without sacrifice of capacity: plant output averages between 180 and 200 tons per hr., and the whole thing can be ready for the road in 5 hr.

Each of the scalping screens and crushing units comprises a single hauling assembly. Each such combi-

rebuilding and connecting minor existing systems of roads in Kenai National Forest. The new highway route itself is a part of the Alaska Road Commission's major network in Alaska, but for many reasons, including of course the fact that National Forest lands are involved, the work of surveys, investigations, and construction engineering—and the funds for this—was turned over to the Bureau of Public Roads. The present work by Rogers and Babler Bros. falls in this province.

Basic geometry of the Seward-Anchorage highway includes a 26-ft. roadway width which Rogers and Babler are paving to a 20-ft. width. Their work includes reworking the already constructed roadway, adding a 4-in. base course, and laying the 2-in. plant-mixed bituminous surfacing. (Not on this work in particular, but in Alaska generally, a 20-ft. width of paving of this type is usually estimated to cost about \$20,000 per mi.)

The work is spread out over 54 mi. of alignment, along which have been surveyed five borrow pits to furnish base and surface course aggregates.

ILLUSTRATING the way contractors in Alaska wear seven-league boots is the \$1,323,340 contract held by Rogers Construction Co. and Babler Brothers for paving 54 mi. of highway between Seward and Anchorage. The current work winds up a program of construction, reconstruction and paving which, on this important link, has been active for several recent seasons. Begun in the later part of August 1952, the present contract is scheduled for completion this month, October 1953.

Around Turnagain Arm

The construction program between Anchorage and Seward began with the so-called Turnagain Arm project, almost entirely new construction. Turnagain Arm is the neck of water branching off from Cook Inlet south of Anchorage and extending eastward for several miles. The Alaska Railroad alignment along this stretch was revamped shortly after the war, and the new highway utilizes some of its abandoned cuts and fills.

Much of the work on the south side of Turnagain Arm consisted of



PANORAMA shows contractor's crushing and screening set-up, except for jaw crusher. General features of portable design are evident here, as DW10 and W10 wagon load out of bins in left background.

nation is mounted on a Rogers-designed semi-trailer frame. Jack up the rear wheels, let the fifth wheel pivot down on blocks, and you're in operation. The 4-compartment bin setup is also a separate semi-trailer unit. When on the road, this unit carries all the timbering used in setting up the plant. Power panel trailer and a semi-trailer mounting the diesel power units are all Rogers' own.

Among the conveyors, almost all are short enough to be carried on

OPERATIONAL improvement of Rogers-designed conveyors is longer taper at ends. This enables the belt to be at ground level with less excavation needed for the framework. Design requires smaller head and tail pulleys, which Rogers also designs—carefully, so as not to damage belts and lacing on reduced diameter.



Rogers' other hauling equipment, if not atop the crusher-screen units. An exception is the long, high conveyor used on this job for discharging finished product into stockpile. This one is fitted with its own single-axle wheel assembly, which may be locked in one position for road travel, or 90 deg. out of this position for using the rig as a radial stacker.

When the job was visited in June, the contractor had decided to go into production on $\frac{3}{4}$ -in. sealing aggregate. This meant adding another screen to his plant circuit. In the Rogers tradition, this screen was first mounted on a semi-trailer, and on a fifth wheel pivot at that, so that it could rotate freely and thus more conveniently be placed in the circuit among the other units. Its complete assembly in advance was a good move. There are five plant setups on this job, and it's good to know ahead of time that the plant can be broken down and gotten on the road in its usual fast style, without special consideration for one non-portable component.

Conveyor features

The conveyors of this plant, in addition to being conveniently short, have other features in their home design. Principally, it was noted that they are proportionately shallower for their length than are their commercially manufactured counterparts. It's all a matter of how rigid you want them, and how long you think they'll last anyway, according to McInroe. Rogers has had no structural failures with its equipment. Where the conveyors do come apart, they have been built with improved assembly fittings. Lugs for connecting bolts are welded outside the frame for easier access—speedier assembly.

The plant circuit on this job consists of three main processes. Raw feed is run from the raw surge reclaiming tunnel to a 30 x 42 Telsmith jaw crusher. Material smaller than

2 in. is scalped and bypasses this unit, joining the crushed product on its way to the second process.

A single deck 4 x 10 Simons screen passes all minus 1-in. material at this point and runs it directly to the finished product hopper. Scalpings go through 54-in. Pioneer corrugated rolls and on to the third point in the circuit. Another Simons single-deck passes finished product at this point, and remaining oversize goes through 54-in. Pioneer smooth rolls. This material is conveyed back into the circuit ahead of the last Simons screen for rescreening. Most of it passes as finished product. Some goes through the smooth rolls again.

Compartmented bins

Babler and Rogers' use of the compartmented bins on this job is interesting. Each bin has two gates. One of these discharges to a reclaiming conveyor running under all bins; the other may be tapped by individual conveyors leading laterally from the unit as desired. For the present work, all finished product goes into a single bin, which is used only as surge. The reclaiming conveyor is used to load out the W10 wagons that come by for base course material. A radial stacker has been arranged to tap the other gate of this bin, and material in excess of bin capacity is delivered into a finished product stockpile.

In view of plant capacity, this stockpile can grow quickly at any setup, and plant operation is not re-

MAJOR EQUIPMENT OF ROGERS AND BABLER

- 7 Caterpillar DW10 tractors and W10 wagons
- 3 Caterpillar DW10 tractor-scrappers
- 3 Caterpillar 12 Motor Patrols
- 3 Buffalo-Springfield rollers
- 1 $\frac{3}{4}$ -yd. Koehring shovel
- 1 Caterpillar D6 tractor
- 1 Caterpillar D2 tractor
- 3 Caterpillar D8 tractors
- 2 Barber-Greene bituminous pavers
- 1 Hough Payloader
- 1 Huber roller
- 1 Ford F8 truck tractor pulling water trailers
- 1 Kenworth truck tractor pulling water trailers

CRUSHING PLANT

- Pioneer reciprocating feeder
- 30 x 42 Telsmith jaw crusher
- 4 x 10 Simons single-deck screens
- 54-in. Pioneer corrugated rolls
- 54-in. Pioneer smooth rolls
- Hewitt-Robins conveyor belting
- 1 Caterpillar 397, 500-hp. generating set (plant power)
- 1 Caterpillar D17000 generating set (welding and lights)

ASPHALT PLANT

- 1 Pioneer Model 101 asphalt plant, 120 ton/hr.
- 1 Bros portable steam generator
- 2 Caterpillar D17000 generating sets

stricted by bin capacity. Instead, the n is used only for easier loading of hauling equipment, and a ¾-yd. shovel stands by the stockpile to handle occasional jam-ups of hauling traffic or to take over in case of plant breakdown.

asphalt plant

Making its own five jumps along the job a few steps behind the crushing plant is the contractor's asphalt plant, a Pioneer having a capacity of about 120 tons per hr. At each location it is fed out of stockpile through reclaiming tunnel and a series of conveyors. Asphalt is laid by in good supply too, there being a pair of 12,000-gal. tanks storing RC-3 and a couple of smaller ones for MC-0, used for prime shots. These latter tanks hold 10,000 and 6,500 gal., respectively. The asphalt, incidentally, is trucked in from Anchorage directly to the tanks on the job. There are no adequate bulk storage facilities available in Seward. The material is supplied by Weaver Bros. of Valdez.

Although not included in the present surfacing contract, several significant points relating to construction of this highway were brought out by A. K. Neeley, district construction and maintenance engineer for the Bureau of Public Roads at Seward. The points are illustrative of difficulties encountered in Alaska highway work, particularly since, like many others among Alaska's highways that have been built or rebuilt in recent years, this road was brought up to standard by construction contracts that called for the utmost practicable speed.

The season problem

A result of this urgency, which can still be seen along the road, properly had its beginning in a recommendation of the engineers to the construction contractor who rebuilt the road a couple of seasons ago. The recommendation was that July would be the best month for construction of a particular portion of sidehill alignment. By that time the frost would be out—the forest mantle of moss and vegetation holds frost later than elsewhere—and the contractor could then conveniently strip the right-of-way, having the best chance to dry out the material underneath for later controlled use in the necessary sidehill fills. In its natural state the soil was unsuitable. Dried out, and compacted upon incorporation into the road, it would perform well and not be susceptible to renewed infiltration of moisture. Its use was the economical alternative.

However, the contractor preferred, in consideration of his overall operation, to neglect this part of the work until later in the season. When he came to do it, the tempo of rainfall had stepped up from its intermittent summer character. There simply was



THE NEW LOOK between Anchorage and Seward is typified by this stretch. Geometric standards for this road are higher than elsewhere in Alaska, since design followed idea that present Seward-Anchorage rail traffic might instead travel by truck.

FIRING UP for the first time, Rogers and Babler's Pioneer hot plant turned out paving material on June 25. Big tanks for RC-3 (left) are semi-trailers, set down to grade in pits. Note truck in position for load at discharge gate (foreground).



no dry period of sufficient length to dry out the excavated material for re-use. The contractor had to waste all the material down the hill with long casts of his dragline, and then he had to import river gravel several miles from the next convenient canyon crossing in order to build up his fill. The wasted material lies below the road now, slowly being obliterated under returning forest cover.

No pat answers

Neeley's discussion of this situation led him to also make comment on other aspects of construction and maintenance in the Seward area (but not peculiar to it) that cannot be met by formula or pat answer. All these aspects have their basis in the weather and in the soils.

The weather is severe in the winter, and occasionally somewhat more than temperate in the summer. Only 11 mi. out of Seward, at an elevation of only 600 ft., a snowpack of over 12 ft. accumulated last winter. With the coming of summer one would

surely count on fast melting and flash floods in the many, many changing flood courses and establish stream channels.

Such an event is no annual certainty, however. Conditions of the previous autumn, brief as it characteristically is, must be considered. If snow falls before appreciable frosting has occurred, then the snow acts to insulate the ground during subsequent winter months. The ground does not freeze extensively and, upon the coming of summer, it lies ready to act as a great sponge, soaking up the snowmelt to a great degree. Result: no floods.

On the other hand, the autumn season may have a hard freeze before the winter snows. In this case, the snow again acts to insulate—to insulate the frozen ground from spring thaws until the snow itself has melted. The frozen ground has a high runoff coefficient, and practically all the melting snow is released to cause high flows and floods below.

... Concluded on page 103



The Alaska Road Commission

It's putting through more highway than mere roads nowadays, but pioneering through country like this is still tough—"Stage" construction copes with permafrost, as one thawed layer at a time is scraped away—Beefed-up Kenworth trucks make snowplows to cope with snowiest spot on highway system

LESS than a dozen miles of passable wagon roads in the territory. That was the situation in 1905 when the Alaska Road Commission was founded by congressional action. Today, under its responsibility for the construction and maintenance of highways throughout the public domain of Alaska, the Commission has pioneered roads into all corners of the territory and has developed a connected system of arteries totaling 3,720 mi. of road. And mileage is being added at the rate of about 200 per year.

The principal road system of Alaska consists of a network of highways connecting the ice-free ports of Seward, Valdez and Haines with the interior cities and with the United States itself. The connection between this system and the United States is by way of the Alaska Highway through the Yukon Territory and British Columbia in Canada. These principal roads, the interconnected system of Alaska, total 2,638 mi. in length. Two-thirds of Alaska's total,

By A. F. GHIGLIONE
Commissioner of Roads
Alaska Road Commission
Juneau, Alaska



they serve only one-fourth of a 836,000-sq. mi. area. (Alaska is one-fifth the size of the United States).

Adequate transportation to and within this vast area is recognized as being one of the prime requisites for its development and for the realization of its economic potential. Much remains to be accomplished in this field although rapid progress has been made during the last few years, particularly on the development of roads. There is no connected road system, railroad or other land transportation access to three-fourths of Alaska's area. However, on 20 different isolated road systems (totaling 1,082 mi. in this largest portion of Alaska, the Road Commission is maintaining and pioneering additional mileage.

In the performance of its functions the Road Commission recognizes the contract method and considers it to be the most efficient way of executing work under normal conditions. The policy is to advertise for competitive bids on all work of reconstruction and paving of the principal highways and

construction of major bridges in the territory. Appropriations for this work have been greatly increased since 1948 through recognition of the immense value of land transportation in Alaska. These appropriations have averaged \$20,000,000 per year since 1948. During the past season alone, there were 19 highway contracts and bridge construction contracts in effect, totaling over \$40,000,000. About half of the highway contracts covered grading only. The remainder covered both grading and paving, with individual jobs covering about 40 mi. of road.

Pioneer problems

Construction of pioneer mileage—extensions on the 20 isolated road systems—in the sparsely settled areas of Alaska is another matter. In order to cope with the abnormal climatic, geographic and economic conditions of the sparsely settled arctic and sub-arctic areas of Alaska, the procedure has been to build by force account and hired labor methods. Consider the situation:

The individual road systems serve mining, farm, industrial and inhabited areas that are in only the first stages of development. Their only connections are with other modes of transportation, such as river and ocean navigation and air fields. Overland access is difficult, costly, and impossible during many months of the year. Movement of equipment from the main system of highways into most of these areas requires transportation over distances varying between 1,000 and 5,000 mi., where no overland commercial service exists. Routing by way of Seattle is often necessary in transferring equipment from the main highway system to these road areas.

Climatic extremes in Alaska result in sub-zero temperatures at least six months each year, restricting con-



PUZZLE PICTURE: Find the TD-24 tractor on this grading job! This happened in 1948, but it could happen today. The crawler was scraping off thawed permafrost at Mile 44 on the Glenn Highway, when suddenly . . . ! It could have brought down a slide, it could have just gotten in too deep. But it certainly couldn't get out.

struction work to the very short summer season. The result is highly seasonal employment of crews, with long periods of idle equipment and consequently increased mobilization costs.

The geographical characteristics of much of Alaska are not experienced in normal highway construction. They include both permafrost and the phenomenon of icing normal to permafrost areas. Permafrost underlies about 80% of Alaska, and due to its impermeability it results in lake and swamp-covered "tundra" terrain which impedes earth moving.

The abnormal economic conditions which result from the above factors seriously affect the cost of construction. In addition, the justification of new roads on an economic basis is generally so slight that only low standard, low-cost pioneer roads are

possible. Only after the areas tapped by such pioneer roads begin to prove worthy of further development is it possible to improve the roads to standards comparable with the secondary roads of the United States.

Methods

The Road Commission's practical solution to this knotty problem is to accomplish pioneer construction work on a "stage" basis, whereby the work is handled by small crews using principally maintenance equipment available in the area, and opening up the frozen ground as the permafrost recedes over a period of several seasons. No detailed engineering or balancing of quantities is possible since the line must frequently be altered and shifted as adjustment in the permafrost province progresses and the final

ALASKA ROAD COMMISSION Major contracts under way September 1, 1953

Highway	Type of work	Mileage	Contractor	Bid price	Bid date	Completion date	Progress
Seward-Anchorage	Paving	54.33	Rogers Const. Co. & Babler Bros.	\$1,323,340	8-22-52	10-15-53	55%*
Glenn	Grade and drain	43.33	Stock & Grove	768,610	6-16-52	10-1-53	76%
Glenn	Grade and drain	19.84	Oaks Construction Co.	288,432	6-16-53	11-15-53	65%
Glenn	Paving	60.83	McLaughlin, Inc.	1,445,424	6-16-53	12-1-54	8%
Richardson	Grade and drain	45.37	Morrison-Knudsen	2,083,853	3-20-53	11-1-54	47%
Richardson	Grade and drain	42.68	Morrison-Knudsen	2,543,575	7-21-53	11-1-55	0
Alaska	Grade and drain	49.84	Lytle-Green-Birch	2,196,710	3-3-53	11-1-54	32%†
Alaska	Paving	20.00	Lytle-Green-Birch	incl. above	3-3-53	11-1-54	32%†

* Surveys, investigation, and construction engineering by Bureau of Public Roads through agreement with Alaska Road Commission.

† Surveys and investigation by BPR through agreement with ARC.

ALASKA ROAD COMMISSION Major bridge contracts under way September 1, 1953

Highway	Bridges	Contractor	Bid price	Bid date	Completion date	Progress
Richardson	Jarvis Creek and Moose Creek	Lloyd Martin	106,567	6-9-53	11-1-53	52%
Richardson	Section G	Morrison-Knudsen	243,687	4-15-53	10-1-54	30%

roadway is stabilized. This stage construction and maintenance, as it proceeds over a period of years, results in deterioration of the permafrost along the right-of-way, thawing of borrow areas, and stabilization of the subgrade to a point where accurate engineering for improvement and reconstruction may realistically be accomplished. The eventual completion of such preliminary developments makes possible the execution of further improvement work by competitive contract. Only then, with relatively normal access to the area provided by the pioneer grade, can reasonably definite time limits be applied to work involved.

Maintenance

Maintenance of Alaska's highway mileage and bridges is no small chore. It differs from comparable procedures in the States principally in the manner of handling the completely isolated sections of road and in meeting the extreme climatic conditions characteristic of the arctic and sub-arctic areas. In Southeastern Alaska—the warm part of the territory—temperatures drop to the low 30's in the winter. In the interior of Westward Alaska, winter temperatures of minus 70 deg. have been recorded. In these coldest areas, however, snowfall is fortunately rather light—an average of about 36 in. of very dry snow. On the other hand, annual snowfall along the coastal range exceeds 900 in., the snow usually being wet and heavy.

A particular winter phenomenon of Alaska is land ice. It occurs typically in permafrost areas where subsurface drainage is perched on the permafrost. The coming of seasonal frost during the sub-zero winter season forces this drainage to the surface, forming ice. Over a short period of time, this ice chokes ditches and culverts and overflows the highways. It may form virtual glaciers several feet thick and covering thousands of feet

along one section of road. Prevention of the formation of this ice on the traveled road surface is the best maintenance measure. Erection of ice fences is undertaken, also ripping and channeling—generally, pre-season measures to induce icing where it will not be injurious to the road. Heating and thawing is also done as necessary.

For the most part, winter maintenance equipment on Alaska highways is the same as elsewhere—motor graders mounting snow wings, trucks with under-body blades, and rotary plows. Outstanding in this equipment inventory are four special plows used on Thompson Pass, a point on the Richardson highway 26 mi. from Valdez. One of the worst spots on the highway system, this pass has known a seasonal snowfall of 982 in., temperatures below minus 50 deg., and winds of over 100 mph.

The basic units on the Thompson Pass work are four Kenworth Model 888 dump trucks, 106,000 GVW rating, carrying 20-yd. dump boxes. These rigs were converted into three rotary plows and one V-plow. Bros Model M9 plow heads were used for the three rotaries, while the fourth unit is fitted with a specially designed Carco V blade which, with adjustable wings, can clear a 20-ft. road width in one pass. Power for two of the rotaries is provided by twin GMC 6-cylinder diesels, while the third rig uses an 8-cylinder Climax gas engine. All these plows are equipped with two-way radio whereby they can maintain communications with the maintenance camp near Thompson Pass summit.

The use of these beefed-up plows and, especially, the two-way radio system, has made possible the maintenance of Thompson Pass under snow conditions that are sometimes terrifying. "White darkness" is a problem. It is a condition wherein a man's eyes cannot distinguish between earth and sky, nor between

objects close at hand and those some distance away. Absolutely everything is white; there are no shadows—nothing upon which an operator can gauge the focus of his eyes. Because of this phenomenon, routine plowing is done at night whenever possible—and in the winter, the nights are long.

The situation is no better for the traveler who drives through Thompson Pass in the short daylight hours. The white darkness assails him all. Various tricks have been devised to give drivers some visual reference point. At one time it was suggested that the plow be fitted with a tank of some colored liquid, or oil. A controlled leak of such fluid along the side of a new snow cut would remain as a visual tell-tale establishing the limit of the roadway.

Personnel

The Alaska Road Commission is an agency of the Department of the Interior. It is administered by the author, Commissioner of Roads for Alaska, with headquarters at Juneau. William J. Niemi is chief engineer. Other principal headquarters personnel include H. B. Schultz, chief of the engineering division; B. D. Stewart, Jr., chief of the operations division; F. E. Baxter, chief of the survey and road design branch; R. J. DeLaHunt, chief of the bridge design branch; and Adam J. Marshall and John C. Shepard, highway construction and maintenance engineers.

The Commission maintains district offices under the supervision of district engineers at Nome, Fairbanks, Anchorage and Valdez. These engineers and their assistants are John M. Cooley, Nome; M. C. Zimmermann and William P. Cameron, Fairbanks; E. J. White and L. A. Hatchett, Anchorage; and H. W. Johansen and E. M. Harding, Valdez. Similarly there is a sub-district office at Haines where John C. Fox is construction and maintenance engineer.

Functions of the Alaska Road Commission also include construction and maintenance of National Park Service highways in Mt. McKinley National Park and in Glacier Bay National Monument. In addition, the Commission constructs highways, air fields, canals and similar works throughout the territory for other agencies of the federal and territorial governments. Because of the strategic location of its maintenance camps throughout the territory, the Road Commission is able to furnish fuel, supplies, transportation and other services to about 38 other governmental agencies.

Alaska is big. Its highway system even at present, sprawls over areas so different in their characteristics that conventional summarization or generalization is virtually impossible. In spite of the great advance of the road in recent years, the remoteness and isolation are still the toughest factor bearing upon the economic value of Alaska's resources.

THERE ONCE was a dinosaur that looked like this one-eyed monster. He was called triceratops. This one is a Kenworth 888 equipped with a special Carco V blade for work on Thompson Pass near Valdez. The window in the blade gives the operator half a chance!



Driving the Eklutna tunnel

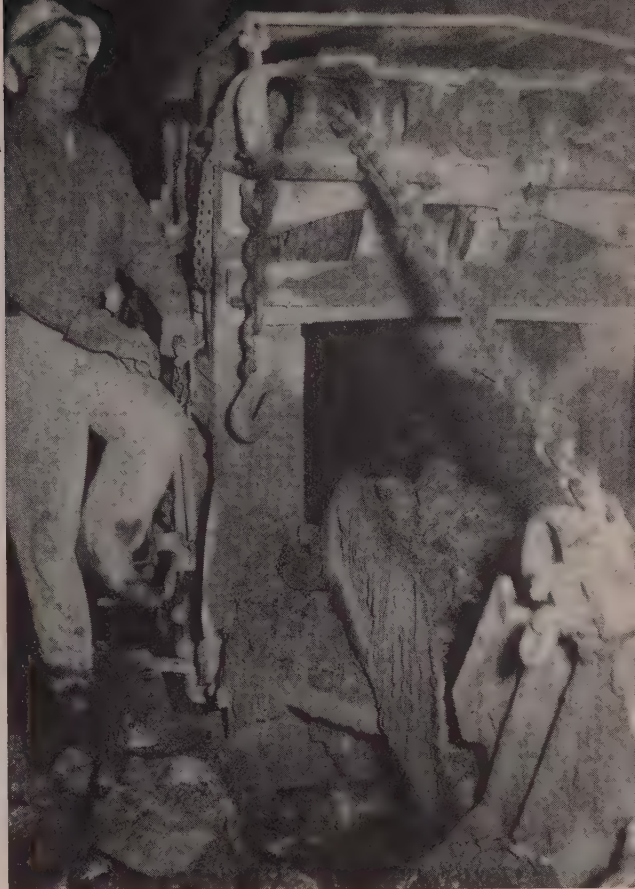
Palmer Constructors' 23,600-ft. tunnel for the Bureau of Reclamation is just about to hole through — A second heading saved the schedule on this job, when 16,000 gpm. came into the main heading last winter and stalled work there for three months

THE MEN who are driving the Eklutna tunnel are a very politically conscious bunch. It was easy to see why last spring as the days went by and it remained doubtful how much money, if any, Congress would appropriate to continue the project. But the pace of the work remained unchanged and when \$7,700,000 (including carry-over) finally did come through to complete the project and all its works, the contractor's personnel found something else to talk about.

In spite of its political aspects, the Eklutna tunnel is a solid construction job. Its completion and lining, along with construction of the powerhouse, will permit the generation of 33,000 kw. of electric energy which will be transmitted over an already-built transmission line to the city of Anchorage, some 50 mi. "downstream." And Anchorage needs the power, for that is the city which since the war years has been supplied from the power plant of the after half of a freighter which broke in two in heavy seas in the Pacific.

Scope of work

Eklutna Lake is a natural feature, but its supply of water has been firmed by construction of a dam several years ago. This dam regulates water for a small hydro plant built in the 20's. With completion of the new work, this plant will be put out of operation, the entire supply from Eklutna Lake being used instead for the new tunnel and hydro plant. Incidental to the present project is further raising of the dam on Eklutna Lake.



HOW OFTEN do you find a mucker operator who runs the rig with his left foot?

Major work to date has been performed by a joint venture of Coker Construction Co., Peter Kiewit Sons' Co., and Morrison-Knudsen Co., Inc. The combine is called Palmer Constructors. Their contract includes alterations to the existing dam, driving and lining a 4-mi. tunnel through Goat Mountain and its penstock tunnel at the downstream end, and construction of intake facilities in Eklutna Lake. This latter work was subcontracted to Ben C. Gerwick Co., Inc., of San Francisco, along with work on Eklutna dam.

The \$17,400,000 contract got under way in October 1951. It is scheduled

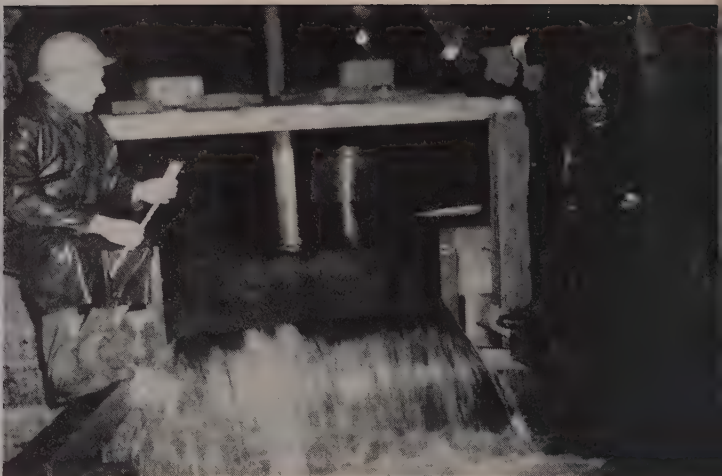
presently for completion in August 1954. The work has been conducted from two headings, known as the main and lake headings, which will be considered separately in this report.

First work on gate shaft

First item of work on the lake end of things was the sinking of a gate shaft that would provide access for tunnel construction part way under the lake to join the intake structure. This tunnel is located 70 ft. below the lake surface. The gate shaft itself was sunk from el. 996 and terminates at el. 795. It was begun in November

THIS REPORT on major fields of construction in Alaska today would be incomplete without note of public buildings and utilities construction. The spirit of such work is well expressed in the enabling legislation of the Alaska Public Works agency: "... to foster the settlement ... stimulate trade and industry ... develop Alaskan resources, and provide facilities for community life, through a program of useful public works."

Complementing the work of APW in assisting Alaskan public bodies to construct schools, utilities, street systems and public buildings is the program of the U. S. Bureau of Reclamation. Its major undertaking to date is the Eklutna Project, tunnel work for which is reviewed in the accompanying article.



PRETTY FAIR flow for a tunnel that isn't even holed through! Wasting down the hillside from the adit of Eklutna tunnel last November was 7,800 gpm. Maximum flow from bad spot at Sta. 208 + 75 was 16,000 gpm. Uncontrolled, the water ponded behind a highway embankment below, threatening that structure until the contractor breached it and installed a culvert. Even at Sta. 213 + 82 there was a lot of water, as shown by this view (right) at the contractor's weir. Before extra fan lines were installed to carry the water it spread across the full tunnel width in a knee-deep stream.

1951 and completed to 13-ft. diameter by the end of 1951. About 100 ft. of the tunnel was then driven into the mountain to provide working room from which the bore could be worked in the opposite direction out under the lake. Center line of the gate shaft is at Station 27+25, and the tunnel under the lake extends 725 ft. to a bulkhead structure. This portion of the tunnel was completed in April 1952 and was lined immediately with concrete, two bulkheads being installed, a terminal at Station 20+00 and a standby somewhat further in shore. Subsequent operations by Gerwick completed dredging offshore from this portion of the tunnel, including uncovering it in the vicinity of the terminal bulkhead. A mat of select backfill material was deposited in the lake bottom as foundation for the intake structure elements, which were precast on shore.

Assembly of intake structure

A total of 19 separate precast units are involved in this work. First, extending directly beyond the terminal bulkhead of the tunnel, are 14 sections of precast concrete pipe. Each of these is 16 ft. long and 9 ft. in diameter. Then comes a bulkhead section, followed by a transition section, and finally 3 trash racks of rectangular section. Each of these is about 30 ft. long. The trash racks are partially buried in the lake bottom and will admit water through a timber grid work which composes their entire top surface.

The bulkhead section is provided only for temporary use. The bulkhead was to be placed in this section upon completion of the Gerwick work, making it possible to unwater the section of precast concrete tunnel lying beyond the prime contractor's ter-

minal bulkhead of the tunnel. This in turn would permit removal of the terminal bulkheads. Operating machinery for the entire tunnel will eventually be installed in the gate shaft. Therefore, when water is first admitted to the tunnel, it will be dammed by the permanent gate so that pressure at the bulkhead section will be equalized, permitting removal of that bulkhead.

TECHNIQUE of sinking surge chamber is well shown here. Drill crews are preparing holes for anchor rods that will be welded to support rings (note finished work on rings above). Scalers are retained by safety lines while rodding loose rock down raise at center.



It was not originally intended to work the main tunnel from the lake end, and for the explanation of this it is necessary to consider the main heading. The main heading is reached from an adit high on the hillside directly above the power house site on the shores of Knik Arm. Early days of the contract saw the construction of a tortuous road giving access to this site, which necessitated carving out the side of the hill for a distance of about 300 ft. in order that there would be room for shops, materials and other facilities. The main heading was begun in February of 1952 and work on that heading proceeded generally without incident until November last year. By then the face had advanced about 4,700 ft., or about 20% of the entire length.

Three sour months.

Water had been a slight problem up to that point, but suddenly it became the whole story. Faulted material had been encountered and some extra support had been needed. In fact, in early November the ground was heavy and advance of the face had been temporarily halted while further support was put in. But the miners were unable to cope with the increasing flow of water and they fell back on November 9 as support failed extensively and the tunnel face sloughed off completely.

There had been 113 ft. of progress in the tunnel that month. There was none for the remainder of November and none in December as the contractor waited for the water to abate in order that he might provide means of controlling what could reasonably be expected to remain. In fact, there was no progress until the very last part of January when, after restoration of the damaged portion of the

tunnel, 17 ft. of advance was logged.

During this long period of time, which encompassed the better part of 3 months, Palmer Constructors installed two 22-in. fan lines in the tunnel to confine and convey the water out of the tunnel. Although the flow now is only about 2,000 gpm., including 900 gpm. from the "bad spot" of last winter, the piping system was cleverly arranged to convey a much greater quantity of water. The two fan lines dump their contents into a sump at the adit. From this sump three 6-in. lines extend down the hillside. Working on the siphon principle, they adequately handle all the water.

Extra muck and support

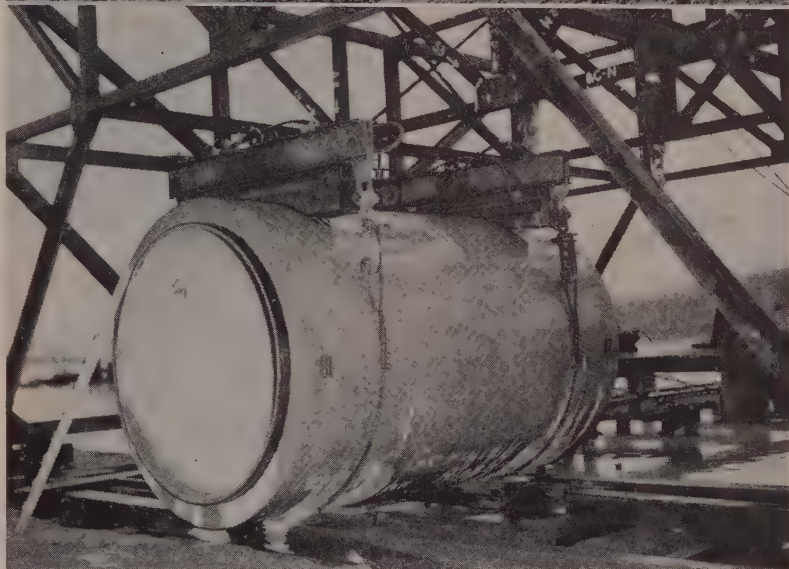
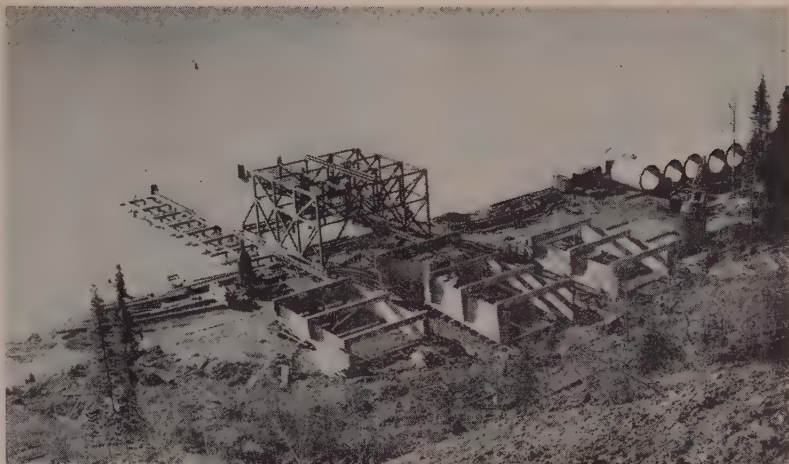
The extent of the faulted area which brought about this difficulty can best be realized by note of the chambers which remain in the area at the fault location. The gouge which washed out of these chambers originally slumped over 450 ft. into the tunnel. When mucking and new support had been completed, exploration was made, revealing two large chambers slightly above and to one side of the bore. Of definite dimension overall, they were estimated to be at least 40 ft. long, 20 ft. wide, and 15 to 20 ft. high. Fingers and irregularities of the cavities carried their maximum dimensions much beyond these. New support in this reach of the tunnel consists of 6-in. H-beams at 2-ft. centers, overlain with solid timber cribbing to act as a mat in the event of further rock falls in these caverns.

On account of the water troubles in the main heading, the lake heading was opened up in December of 1952 and work in it has continued since then. Of the 7,200 ft. driven in the lake heading as of mid-August 1953, about two-thirds has required support by 5-in. steel sections spaced at about 6-ft. centers. A daily average of about 40 ft. was being maintained in August, with the miners drilling 8 ft. and pulling about 6 ft. on each round.

Shift progress

In the main heading a daily average of 52 ft. was typical in August, achieved by drilling a 10-ft. round and pulling somewhat over 9 ft. of it. The main heading is in hard rock with no support required. Overall cycle times for operations in both headings are about the same, with the extra time needed for support work in the lake heading offset by the need for less time in mucking the shorter round. The main heading crews posted cycle times somewhat of the following order: Load, $\frac{1}{2}$ hr.; smoke, 15 to 20 min.; muck, $1\frac{1}{2}$ hr.; drill, 1 hr., 10 min. Total progress in the main heading totaled about 11,700 ft. as of mid-August, leaving about 3,860 ft. between headings.

There are slight differences in tunnel section to be noted. The lake heading is being driven to the originally specified circular section—about 10



GERWICK subcontract headed up at this installation on the shores of Eklutna Lake. Aerial view before precast units were placed shows gantry and its track piers, transition section (tapered), trashrack sections (uncribbed), and several pipe sections. Precast pipe sections (below) were handled like this 42-ton unit, rigged by $1\frac{1}{4}$ -in. cables under a special lifting saddle. Gantry transferred units to barge for hauling into position over final resting place.

ft., 7 in., which will be concrete lined to a diameter of 9 ft. In the main heading, the section has been modified in order to provide room for the extra fan lines used for carrying water. From a curved invert the section in the main heading rises 6 ft. to spring line, from which a circle of 5-ft., $3\frac{1}{2}$ -in. radius is struck.

Drilling and blasting

Both headings have been driven generally through rock of two types—argillite and graywacke. Powder used is a 40% Atlas gelatin with delays up to #8. The rounds are shot with 220 volts. There are variations in the drill pattern, of course, but generally a 3-, 5-, or 7-hole burn is employed. The number of relief holes varies between 2 and 6, the number of lifters between 4 and 6. Trimmers are spaced at about 2 or $2\frac{1}{2}$ ft., so the hole pattern comes to between 35 and

40 holes. Both faces are drilled from jumbos, and both jumbos mount five drills. In the main heading the center drill is on a column, as are the two lower drills. The jumbo has two jibs on the wings. In the lake heading the two lifters are on columns, as before, but there are columns also for both wings, and a jib at the center.

If things continue as they have in recent weeks (mid-August), the tunnel will be holed through well before Thanksgiving—and that's a conservative estimate at present progress, which leaves just about 4,000 ft. to go.

Other work

In addition to the gate shaft, the lake and main headings, there have been two other major tunneling elements of the project. These are the penstock raise and the surge tank. Work on the raise was begun in May of 1952 when a portal was set at the

outlet, Station 266+08, at an approximate elevation of 24 ft. The tunneling proceeded directly into the hillside a distance of about 500 ft. to Station 261+04, and thence upward on a 53-deg. slope, joining with the main tunnel at Station 255+84. Linking the two sections of tunnel required drilling a portion of the main tunnel back toward the face of the mountain from the point where its alignment is joined by the main adit. Work on the penstock raise was completed in February 1953 and was followed immediately by raising the initial pilot shaft of the surge chamber.

Surge chamber

The surge chamber is located slightly upstream from the point of intersection of main tunnel and penstock tangents. Commencing at el. 720, this element breaks through the natural ground surface about el. 880. The initial raise was about 7 x 9 ft. in section, and this was partitioned off into two parts, one reserved for the access of the miners and the other used for a muck chute. The raise was completed in the middle of May and excavation to full section was begun from the top early in June. Support steel—rings 33 ft. in diameter—was set at 4-, 5-, and 6-ft. centers vertically from the start of this excavation. They were continued all the way down—33 in. all.

Plans for lining

For concreting the entire tunnel, aggregate stockpiles have already been completed on the flat below the main tunnel adit, and work has recently begun on construction of a cableway which will convey the aggregates and cement and other materials up the hill in a double cable span to a discharge terminal beside the adit. This tramway will have two track cables, each carrying a single 65-cu. ft. bucket.

Dry batched adjacent to the discharge terminal, the concrete materials will be taken into the tunnel on batch cars. These will be pushed up a ramp (itself rail-mounted) and dumped on a conveyor belt feeding a 2-yd. mixer. Water will be added to the mix at this point and the mixed concrete discharged onto a conveyor leading to a hopper from which the mix may be discharged into a concrete pump. From the concrete pump the mix will be transported through several hundred feet of pipe to the actual site of lining operations at any given point. The series of flat cars over which the pipe will be carried in that interval will serve also as supply base for men and materials involved in setting circumferential and longitudinal reinforcing steel. It is estimated by the contractor's engineer that this entire "train" of concrete and steel lining equipment and facilities may extend for a distance of over 1,500 ft.



A FOSSIL zebra was the way Ray Blasongame's miners in the lake heading described this argillite, exposed last June near Sta. 74 + 60. Progress then and now has been about 40 ft. per day, with full support being placed on this end.

Steel in the main portion of the tunnel is generally a single curtain of 1- and 1½-in. round and square bars. Longitudinal bars are ⅝-in. round. The portion of the tunnel driven out under Eklutna Lake was reinforced with a double curtain of generally similar steel. The penstocks will be lined with steel pipe—30-ft. sections ranging in outside diameter

A VERY sober subject involves W. H. Nixon (left), assistant project manager for Palmer Constructors, and Ray Blasongame, superintendent in the lake heading. Blasongame is a tunnel man of distinction, as noted in article.



from 91 in. at the top of the penstock to 75 in. at the bottom. Thicknesses of the penstock also vary throughout this 700-ft. drop from a minimum of 5/16 in. to a maximum of 1 5/16 in.

Suppliers

In addition to Gerwick, doing the intake structure and alterations to Eklutna dam, major subcontractors and suppliers to Palmer Constructors include the following. The tramway has been furnished by Columbia-Geneva Steel Division of U. S. Steel. The batch plant is by the Noble Co. Tunnel forms—240 lin. ft.—and the traveler were furnished by Chicago Bridge & Iron Co. They were designed by William Schutte & Associates of Los Angeles. This same firm also designed the form traveler as well as the arrangement of concrete mixing and conveying and pumping equipment. The tunnel forms are circular, 9 ft. in diameter, and are so constructed as to telescope, enabling them to be passed through forms still in place for repositioning further along in the tunnel.

Personnel

In charge of the Eklutna project for the U. S. Bureau of Reclamation is L. M. Wylie, construction engineer. Field engineer is S. S. Westgate, and Ernest Burke is chief inspector. Charles Inman is office engineer and James Gibbs is head of the design section at the project office.

For Palmer Constructors A. M. Coker is project manager and W. H. (Bill) Nixon is assistant project manager. Al Aitken is general superintendent on the main heading and Ray Blasongame is superintendent on the lake heading. Blasongame will be remembered by many as the superintendent who, in the spring of 1950, drove 2,240 ft. of irrigation supply tunnel in 48 days of a 72-day contract. Occasion of the job was collapse of the old Tunnel No. 3 of the Grand Valley Project in western Colorado. Grafe-Callahan and Rhoades-Shofner teamed up on the \$609,800 contract let by the Bureau of Reclamation to drive a bypass tunnel 13 ft., 9 in. in horseshoe section, gunite lined, before crops were lost in summer heat.

Back up at Eklutna, Donald R. MacGregor is project engineer, assisted by George Knight and Stan Johnson. George Mardorf is office manager.

Principal personnel in the main heading are walkers Lawrence (Swede) Sandstrom, Danny Daggs, and Norman Keene. Walkers in the lake heading are William Roberts, Ted Prescott, and Cecil Passmore. The shifts excavating the surge tank are headed up by Ernest Moore, Robert Baer, and Sam Thornhill. George Stone is equipment superintendent at the main camp, and Archie Swett is master mechanic up at the lake.

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Why is Alaska highway construction done with seven-league boots?

We threw this question at Hugh Stoddart, BPR Division Engineer at Juneau. Here's the story behind the Bureau's policy.

ALASKA highway construction in recent years has been characterized by large material quantities, big equipment spreads, and fast work. Defense needs have been largely responsible for the program, which has seen much new construction, as well as the almost complete reconstruc-

tion and paving of existing roads. Certainly, the speed of construction has been dictated by strategic necessity.

But there is another side of the picture. Much that is characteristic of highway construction procedures in Alaska has come about through decisions of engineers as to the best way to administer highway construction in this isolated area.

A bold approach

Although the Bureau of Public

Roads has had plenty of experience with highway administration on the isolated forest road work in the Western United States, the projects were conventional as to size and volume of work. In planning the Alaska program the engineers adopted a bold approach or what might be called a new policy in setting up and administering highway contracts. Generally, the practice is to let the work in large contracts.

The idea behind this practice is to provide sufficient incentive for contractors to bid on isolated work, despite the long import hauls of men and equipment and materials and oftentimes, the need for setting up a construction camp.

"Mental" factors

It was natural that such a scheme would be followed for contracting highway work in Alaska. The isolation was not only physical; it was also what might be called "mental." That is to say, contractors knew they had to go a long way to the work, but they didn't know what they would face once they got there. And, having arrived on the scene, the contractors could not become veterans overnight. The peculiarities of Alaska's seasons and its moisture and permafrost problems, and the nature of its soils continued to present imponderables for the first few years. Large highway contract amounts have enabled contractors to invest in good plants and equipment, thereby lowering the risk of the unfamiliar conditions. Also, it has been possible to spread allowances for those very conditions over a broader base.

Another difficulty facing the contractor in Alaska was, and continues to be, high labor cost. Every possible contract item that can be executed by horsepower rather than by manpower tends thereby to become less expensive. But only on large contracts is such mechanization feasible. Here's another reason for the decision of the Bureau of Public Roads to set up its work for the contractor with seven-league boots.

Result: better standards

There has been a by-product result of these measures. It is, simply, a better job. Today's machines make possible a consistency of work that surpasses the efforts of laboring individuals. Control of the product is built into the machine that produces or processes it. There's a tendency to think of Alaska's highways as backwoods in character. This isn't so. Much of the highway network in Alaska has been conceived and built for defense reasons and must carry heavy loads fast and often. Working with the mechanized contractor on the big jobs, Bureau of Public Roads engineers have been able to specify and achieve better standards of highway construction.



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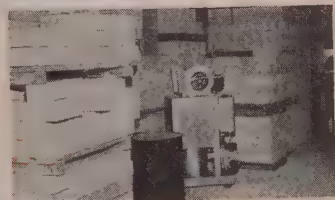
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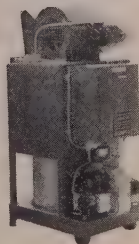
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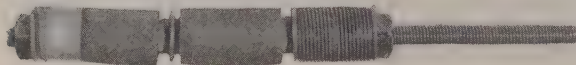
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HOW IT WAS DONE...

Special packer seals drill holes at Horse Mesa power plant

ENGINEERS around Horse Mesa Dam of the Salt River Power District in Arizona used to worry about six exploratory diamond drill holes located in the basement of the power plant. These holes were drilled some years ago to varying depths into bedrock below the dam and had not been grouted. What might happen if the pipe nipples at the top of the holes rusted or gave out to allow water into the power plant?

Years ago rigid sheet iron cover boxes had been installed over the holes as a protective measure so that little was known of the condition of the pipe nipples, the exact size of the holes, or the water pressure within these holes. The cover boxes were felt to be inadequate so that finding a more permanent means of sealing the holes became imperative.



HERE'S the device that sealed the six 1¼- to 1½-in. drill holes.

The decision was to set an expendable packer about 10 ft. in the hole and pack the top portion of the hole with 2 ft. of non-shrink mortar above the packer and the remainder of the hole with 1:2 cement mortar. It was assumed that these holes were 1¼- or 1½-in. diameter and that the water pressures might be from 20 to 60 psi. A pressure gauge attached to a drill hole elsewhere in the dam had registered 20 psi. and there were reports of 60 psi. in some of the holes to be sealed. So there was necessarily considerable preliminary experimentation for devel-

oping the expandable packer for this job.

A ⅜-in. rod 13 ft. long was to be the means of inserting the packer to position. The problem was to have a packer of a diameter that would allow water to flow around it while being inserted and yet would expand to the inside of the hole stopping all water flow and holding its position in the hole against water pressure.

One trial device was a 6-in. length of foam rubber turned to 1-in. diameter as packer material. It was tested by inserting the packer in a 1¼-in. pipe with water flowing and running the nut down to expand the rubber. This method was unsuccessful because the rubber lacked the required density and would not hold in the pipe against water pressure.

A ⅜-in. I. D. x 1½-in. O. D. rubber rotor tube ground to 1-in. O. D. and cut to a length of 6 in. was tried next but likewise failed against water pressure.

After various changes, a successful packer was devised using two 2-in. lengths of rotor tube. One tube was secured to the ⅜-in. rod with a metal band. Both tubes were separated from each other and the tightening nuts with metal washers and were backed with 7/16-in. rubber slip joint washers. The packer was expanded by turning a ½-in. pipe that slipped down over the length of a ⅜-in. rod with one end adapted to fit the tightening nut at the packer. The rotor tubes were turned to 1- and 1¼-in. diameters in anticipation of 1¼- or 1½-in. holes.

And then the sealing work began. After removing the cover boxes, the 1½-in. diamond drill holes were reamed with flue brushes, the packers were set, water was blown from the holes, the holes were flushed with grout, the bottom 2 ft. were packed with non-shrink mortar, and the remaining portions of the holes were packed with 1:2 cement mortar.

These packers worked successfully in all holes. It was estimated that water pressures in the holes ranged from zero to 30 psi.

Home-made mobile grizzlies speed screening on road job

WHEN McKinnon-Decker Co. of Helena, Mont., had to move 21,300 cu. yd. of unclassified excavation from a pit to the road job they had contracted they devised a speedy and ingenious method of screening material. Scorning either to build or buy a stationary grizzly they made up their own grizzlies to fit right over the bowls of three Caterpillar No. 10 scrapers, hauled by Cat DW10 wheel tractors, which were being shovel-loaded on the job. So ended all the problems of a stationary grizzly which would have to be moved around every time the shovel was transferred to a new location.

THERE GOES a shovel load of dirt into one of McKinnon-Decker's improvised grizzlies. ►

The way they fabricated these traveling grizzlies was by rigging up used mine rails, 2½- x 2½-in. angles and sheet steel sideboards. The rail was spaced to take rock as specified by the job and the slope was designed so that the oversize could clean out without jamming. Loading and spreading of the material was uniform, with minimum hoisting and tamping of the scraper box. One man easily kept the rock jam off the screen.



OCTOBER 1953

C. of E. will survey hydro sites on Snake

NEW SURVEYS for 8 hydroelectric storage dam sites in the middle Snake River basin have been ordered by the Corps of Engineers. All of which may result in either confusing or clarifying the much discussed Hells Canyon controversy.

Sites to be investigated are Nez Perce and Mountain Sheep on the Snake River; Crevice on the Salmon River, Kooskia, Forks and Penny Cliffs on the middle fork of the Clearwater River, and Elkberry and Bruce's Eddy on the north fork of the Clearwater. The Nez Perce, Mountain Sheep and Crevice sites formerly were assigned to the Bureau of Reclamation but due to an agreement in 1949 both the Bureau and the Corps will cooperate in these future reappraisals. The Corps of Engineers found in a 1950 study that the Nez Perce and Hells Canyon sites offered maximum benefits from the middle Snake River, that Crevice was the best site on the Salmon, and that Kooskia was best on the Clearwater. However, all four sites have provoked unfavorable reactions. For instance, the Kooskia project would flood out four towns and 183 mi. of roads. Forks, which is upstream from Kooskia, and combinations of Elkberry and Pennycliffs dams have been considered as alternatives to the Kooskia dam site. The surveys, for which \$140,000 has been appropriated, are to be made from the Walla Walla District office of the Corps of Engineers.

McKay speaks on purchase of CVP by California

THE INTERIOR Department's stand on California's proposed purchase of the Central Valley Project was outlined briefly by Douglas McKay on a visit to San Francisco late in August. Though he claimed that he does not oppose the state purchase he indicated two key points which must be taken into consideration. One, the price of the project would be set at present market levels to protect the public interest. Two, it must be determined who should be responsible for the non-reimbursable features of the CVP.

Elaborating, McKay pointed out that Shasta Dam was built prior to World War II when costs were drastically lower. He now believes that it would be impossible for the federal government to begin expensive new projects because of the present condition of the budget. Consequently, all possible capital, both public and private, must be used to develop power as rapidly as possible on the West Coast. What he favors is cooperative efforts between private and public agencies, though he realizes that private agencies are not in a position to construct large-scale, multi-purpose dams.

State officials who favor purchase of the Central Valley Project feel that the state should take over only

irrigation and power features and that the federal government should continue to be responsible for navigation, flood control, recreation and other phases of the project which produce little or no revenue.

Colorado plans toll tunnel

PRELIMINARY surveys for a trans-divide toll tunnel were expected to be completed during September, according to Mark U. Watrous, Colorado State Highway Engineer. Among sites under consideration are Loveland Pass, Straight Creek Pass, Jones Pass and Devil's Thumb Pass routes.

War over Colorado River water (continued)

LATEST SKIRMISH in the war over water in the lower basin of the Colorado River will be referred to the U. S. Supreme Court by the State of Arizona. Defendant is the State of California, which, fearing for water shortages in the growing Los Angeles and San Diego areas, claims up to 5,300,000 ac. ft. annually. Arizona, on the other hand, has its own demands, says that California needn't worry, claims that originally the Gila River flow was not expected to be included in estimating volume of water available in the lower basin, and that, anyway, Arizona supplies more water in the Colorado than does California. Besides, Arizona contends, California is either taking or claiming excessive amounts of water in violation of the original 7-state Colorado River Compact. What she wants is an injunction to limit California uses.

But this is an old argument nourished by a 6-year-old Congressional controversy over the Arizona proposed Central Arizona Rescue Project, an expensive stumbling block estimated to cost between \$700,000,000 and \$2,500,000,000. The question of Arizona's right to claim more water and to exclude the Gila River flow in measuring present consumptive uses is principal issue involved. The project would take an additional 1,200,000 ac. ft. annually from Hoover Dam to travel to the Phoenix Plateau by way of a 985-ft. pump lift and a 250-mi. canal system.

FIRST pedestal panel section for tower No. 254 near Patterson, Stanislaus County, Calif., on Pacific Gas & Electric Co.'s new Pittsburg steam plant-Panoche line is shown going up, with workmen aided by a 60-ft. gin pole. This 220-kv. double circuit line will require a total of 572 towers, each about 105 ft. high, and will be about 125 mi. long. About 4,130 tons of steel from Bethlehem Pacific are going into the towers. For more about the big new Pittsburg steam plant see *Western Construction*, April 1952, p. 121, and July 1953, pp. 79-80.



USBR funds cut, major goals outlined here

THIS FISCAL YEAR'S construction program of the Bureau of Reclamation is listed as a \$174,089,769 series of enterprises calculated to supply irrigation water to 248,194 acres of land and to add 297,250 kw. of hydroelectric generating capacity to the nation's power supply. Such are the plans as announced by Secretary of the Interior Douglas McKay. However, Bureau plans and Federal funds allocated by Congress, including new sums as well as carryover from past years, are at odds. Congress has allowed maximum expenditures of only \$154,960,322. Thus the Bureau is faced with a choice of maximum expenditure on certain projects and cutting funds on others.

Nevertheless, in addition to these current program goals the construction program to be accomplished will enable the Bureau to bring irrigation water for 385,227 additional acres in the fiscal year 1955 and 228,377 acres in the following fiscal year. At present 139,714 acres to be furnished with water this year are now irrigated by an insufficient supply. Most of this supplemental irrigation will be furnished by the Colorado-Big Thompson Project (now budgeted \$5,362,000) which will be able to serve an additional 122,000 acres by next year and 205,000 more acres by the end of the 1955 fiscal year. Work on the Colorado-Big Thompson's Pole Hill and Flatiron power plants is scheduled for completion this year and will add another 104,750 kw. to its system. This is part of the Bureau's power program which contemplates installation of

241,500 kw. of generating capacity in 1955 and 12,000 kw. in 1956.

A total of \$20,618,161 is scheduled for the Columbia Basin Project with another 55,000 acres of land to be under irrigation by next June 30. There are already irrigation facilities for 131,000 acres resulting from this project.

Other major goals in the Bureau program for this year and other fiscal goals include: first generator on the line at Canyon Ferry Dam in about November; beginning of Monticello Dam; a \$673,000 clean-up program at Hungry Horse Dam; \$7,750,000 to be spent on the Eklutna Project with 30,000-kw. capacity on the line by 1955; for the Gila Project in Arizona, \$4,500,000 with full irrigation for 19,700 acres in 1954, 20,700 acres in 1955 and 11,700 acres in 1956.

McNary Dam about to put out power

AUGUST 31 marked the beginning of the tight completion schedule for McNary Dam construction. On that date navigation locks were closed to all shipping for about two months, so that the sill blocks of the upstream navigation channel could be built up to the 320-ft. level. At the same time placing forms, concrete pouring, and placing of stop logs in the navigation locks began.

All these efforts tie in with others necessary to ready the big dam for the December 1 deadline set for the initial flow of power from the first two generators. Testing and completion of the upstream miter gate must be completed. The pool behind the dam will be raised to 335 ft. (maximum level is 340 ft.), the fish ladder on the Oregon side must be closed, the downstream lock gate must be closed, the generators must be test run, and a lot of other incidental—but essential—items. Of course officials are planning an appropriate ceremony to mark the release of McNary power into the Bonneville Northwest distribution grid.

Nearly half of Bayshore Freeway completed

PROGRESS on the Bayshore Highway marches to a tune of about \$65,000,000, which is what the California Department of Public Works has either spent or budgeted to date on converting that thoroughfare to a major multi-lane, divided freeway through San Francisco, San Mateo and Santa Clara counties. According to Frank B. Durkee, Director of Public Works, as of August 31 some 21 mi. of the 50-mi. route have been converted to full freeway or expressway.

The \$65,000,000 total was broken down approximately as follows: completed construction, \$18,250,000; going contracts, \$18,060,000; additional budgeted construction (authorized for advertising), \$4,500,000; right-of-way funds spent or budgeted, \$25,000,000.

Power project proposed on Alaska's Copper River

APPLICATION for a preliminary permit for a hydroelectric project on the Copper River in Alaska has been filed with the Federal Power Commission by Harvey Aluminum, Inc., Torrance, Calif. This proposed project, which would be about 65 mi. northeast of Valdez, would have a potential output of about 7,000,000 kw-hr annually. Its energy would be utilized by electro-chemical and electro-metallurgical industries and other purposes. If the preliminary permit is issued, the resulting investigations would cost about \$395,000.

The development would include a concrete dam about 560 ft. high, an 18,500,000-ac. ft. (total estimated capacity) reservoir extending about 51 mi. up the Copper River and about 55 mi. up the Chitina, and a powerhouse with an ultimate installed capacity of 1,475,000 hp.

So. Calif. water district plans dam in Piru Canyon

WATER USERS in the vicinity of Santa Paula, Calif., just north of the Los Angeles area, will be able to rest with a feeling of security. Directors of the United Water Conservation District tentatively adopted a plan calling for construction of a dam with a storage capacity of from 90,000 to 100,000 ac. ft. in Piru Canyon on the Santa Clara River, extension of the existing Saticoy spreading grounds facilities to take water to new spreading grounds at El Rio, and diversion systems to serve the Oxnard plain, Pleasant Valley areas, and Port Huene. The dam will be financed by a bond issue though as yet no action has been taken by the board on financing the diversion system. However, the directors feel that users themselves in the Oxnard plain should be responsible for those costs, which would amount to about \$1,990,000. Without the diversion system the project would cost an estimated \$8,949,000. Julian Hinds, chief engineer and general manager of the United Water Conservation District, has been authorized to go ahead with preparation of plans and specifications. This new dam eliminates an earlier one proposed on Sespe Creek which elevated the cost of last December's tentative water conservation bond issue to \$18,500,000.

NOT A ROCKER for the latest design of a 20th Century Trojan Horse, this steel structure is a retaining gate for Folsom Dam. It is the first of 8 gates to be fabricated by Consolidated Western Steel Div., U. S. Steel Corp. Each gate is over 50 ft. high.





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AT THE SITE of Vermillion Dam and reservoir construction in central California, one of the fleet of Kenworth 801 earthmovers takes on a load of excavation from a Manitowoc shovel for the 477,000 cu. yd. to be removed from the damsite. This large earthfill dam, being built for Southern California Edison Co., will require 5,135,000 cu. yd. of material, and the reservoir will have a capacity of 125,000 ac. ft. Bechtel Corp. holds the prime contract for the \$8,500,000 project.

\$5,000,000 bridge opens to traffic at Pasadena

PASADENA'S \$5,000,000 Pioneer's Bridge spanning Arroyo Seco was opened to traffic early in September. This portion of the Colorado Freeway (*Western Construction*, February 1953, pp. 57-60), which has been under contract to Guy F. Atkinson Co., links Holly St. and downtown Pasadena. But only three of the 6-lane bridge's north lanes were opened to public at that time for 2-way traffic. Meanwhile work continued on the west end of the old 2-lane Colorado St. bridge which it is replacing. And the adjacent sections of the Colorado Freeway and its maze of approaches and off-ramps along its entire length will not be completed before next March. An interesting incidental note is the fact that over 3,000 ft. of a new type of anti-suicide railing was installed along the sides of this bridge. It is the first of its kind to be installed on the Pacific Coast. (The old Colorado St. bridge had a death toll of 79.)

Record month in Colorado for highway construction

AUGUST was the greatest month in the history of the Colorado Department of Highways. It smashed all records for the awarding and advertising of major construction projects for a one-month or for an 8-month period, Mark U. Watrous, chief engineer, announced. A total of 29 projects covering 200 mi. of highway at a cost of \$6,150,000 were involved. This high volume was not reached even when contracts were awarded

on the \$6,300,000 Denver-Boulder turnpike, because such awards extended over a period of several months. From January to August of this year the construction program already undertaken consists of 148 projects, covering 1,085 mi. and representing expenditures of \$22,240,000. It is the all-time high record in any 8-month period and closely approximates the total for the entire year of 1952.

Santa Maria Basin study completed by USBR

A PLANNING REPORT recommending an integrated water conservation and flood control project in the Santa Maria Basin of California has been forwarded to Congress by Secretary of the Interior Douglas McKay. The report is the Interior Department's portion of a coordinated 10-year study in which the Corps of Engineers and Santa Barbara County have participated in detail. Santa Maria Basin with 50,000 gross acres of irrigable land is the largest agricultural district in Santa Barbara County. It has been seriously threatened by an overdraft of ground water which may not only force the return of 8,000 acres to dry farming but also poses the threat of sea water intrusion into the lower end of the basin.

The Interior Department's report proposes construction of the earth-fill Vaquero Dam and reservoir (capacity 214,00 ac. ft.) on the Cuyama River, a tributary of the Santa Maria, in order to retain water during flood periods and the release of this water during the dry season into the Santa Maria River channel at a rate slow enough to permit the entire stored

flow to seep into the underground reservoir. As such, the project is unusual because no surface-water delivery would be made to irrigators. The report also proposes that the Corps of Engineers construct a system of levees and channel improvements.

Ideal Cement Co. opens research lab in Colorado

A NEW LABORATORY costing about \$500,000 was recently erected by the Ideal Cement Co. at Boettcher, Colo., for the purpose of greater scientific research into the production and use of portland cement. According to Cris Dobbins, president, at the company headquarters in Denver, research will not be confined to the production of cement alone, but will delve into specialized end uses of cement, as well as into related fields such as the production of lightweight concrete aggregates.

Study and research at the new laboratory will have to do with subjects on which insufficient information exists or those specifically related to problems peculiar to the Western plants or to sales areas of the Ideal company. The laboratory will make use of basic data established by other research centers such as those of the Portland Cement Association and others, as a foundation in the application of such knowledge to production techniques of cement and its use, fitting it to Ideal's particular Western needs.

The company has made an extensive research into what these needs are. F. C. Wilsnack, research director, and Robert F. Blanks, research consultant for Ideal and general manager of Great Western Aggregates, Inc., are presently engaged in special projects in the fields of raw materials analysis, quality control of cement production, new products and testing of finished products in actual use. In the new laboratory and research center, scientists have at their disposal the finest, most modern facilities and research equipment obtainable.

Westerners win awards in AISC competition

THREE Westerners were among the winners of \$1,000 scholarships in civil or architectural engineering awarded by the American Institute of Steel Construction in its fourth annual scholarship program.

Western winners, and their sponsoring firms, were: Delano J. Ball, San Diego, Calif., National Steel & Shipbuilding Corp., San Diego; Ronald Morganthaler, Deming, Wash., Leckenby Steel Co., Seattle; and Keith Slatore, San Diego, also National Steel & Shipbuilding Corp.

Atkinson wins top award for a California highway

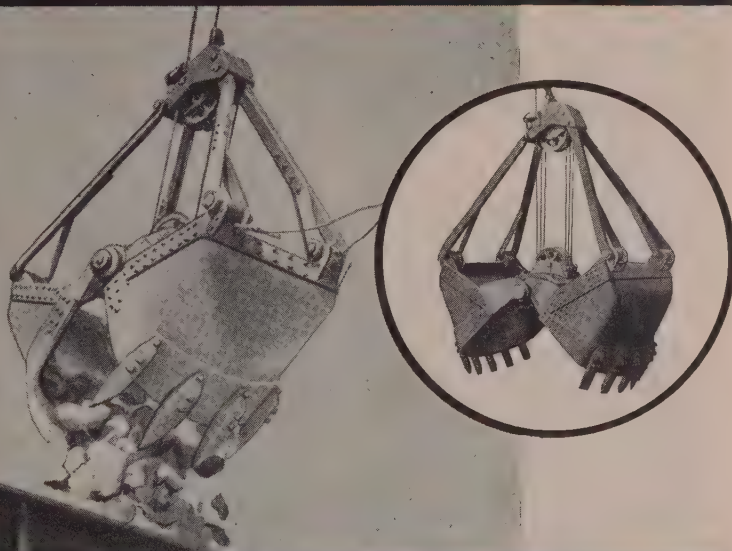
BIGGEST bid for a single highway project in the history of the State of California was submitted on August 19 by Guy F. Atkinson Co., which was low with \$4,122,382 for reconstruction of the 4-mi. section of U. S. 101 over the Waldo Grade north of the Golden Gate Bridge in Marin County. The Waldo job also claims another record, having the highest number of construction items—142—ever contained in a California state highway contract, chiefly the result of a variety of structures.

In addition to reconstructing the existing 4-lane highway into a divided, 6-lane freeway, the project also includes construction of a 1,000-ft. highway tunnel, two sidehill viaducts each about 300 ft. long, an overcrossing, an undercrossing, extension of two existing undercrossings, and extension of the military tunnel which passes under the freeway in the Fort Baker area just north of the Golden Gate Bridge. This work is planned in two stages. The Atkinson contract will take care of grading and structures, including the tunnel, and those portions of the base and surfacing required for the convenience of traffic and is expected to be completed by the end of 1954. The work will be financed largely from Golden Gate toll funds with the remaining funds supplied from State highway revenue.

USBR outlines Missouri Basin spending

A SUM of \$56,235,007 will be spent on the Missouri Basin Project by the Bureau of Reclamation during this present fiscal year ending next June 30. Biggest single item will be \$6,589,904 used to complete Tiber Dam on the Lower Marias River in Montana by June 1956. Other allocations scheduled for the current and other fiscal years over a 3-yr. period are: Bostwick Division, Nebraska-Kansas, \$4,183,571; Canyon Ferry, Mont., \$992,000 with 50,000-kw. capacity in 1954; Crow Creek Pump Unit, Mont., \$673,000, full irrigation service to 5,020 acres in 1954; Keyhole Unit, Wyo., \$351,602, will settle land condemnation proceedings; Missouri Diversion Unit, Mont.-No. Dak., \$2,000,000, construction of this unit to begin subject to findings of a consultant board; St. Francis Unit, Colo.-Kan., \$40,000, completion of definite plan report for irrigation facilities; Angostura, Boyesen, Dickenson, Ft. Clark and Savage units, \$258,494, drainage and minor completion work. The Bureau will also spend \$2,526,000 for planning and pre-construction activities in connection with project units in phases B and C.

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Eagle Rock Reservoir completed; water supply for Los Angeles up nearly 50%

PUBLIC CEREMONIES on August 18 dedicated the new 85,000,000-mg. Eagle Rock Reservoir and a 6-mi. section of the Eagle Rock-Hollywood conduit built by the Los Angeles Department of Water & Power. This major enterprise now provides Los Angeles with its primary connection with the Colorado River Aqueduct supply lines of the Metropolitan Water District. The 68-in. diameter pipeline has a capacity of 171 mgd., almost half the present average daily consumption of water in Los Angeles.

At present the pipeline is completed as far as Rowena Reservoir, and links with that reservoir, as well as Ivanhoe and Silver Lake reservoirs, to the Eagle Rock Reservoir. Areas which now can be served through these new facilities include central, downtown and south Los Angeles; Eagle Rock, Highland Park and the Rowena districts.

This Eagle Rock Reservoir and appurtenant structures were designed to regulate water from the Colorado River feeder lines into the city's water distribution system. Kemper Construction Co. did the work at a contract price of \$1,380,702 after the

Los Angeles Department of Water & Power had completed preparation of the site and preliminary construction. Work began on the reservoir in 1950 and the first section of the pipeline began in 1952.

This is how it was done: canyon slopes in the hills just north of Eagle Rock were cut to form the elliptical-shaped reservoir to form as much natural storage space as possible. Then an earthfill dam (crest elevation 962.5 ft.) was built at the lower end, and a 598,000-cu. yd. earth blanket was compacted on the slopes and the dam. A total of 750,000 cu. yd. of earth was excavated and 361,000 sq. ft. of asphaltic concrete was used to line the reservoir. All earth-moving operations on the reservoir were subcontracted to John F. Blackmore, and Schroeder Paving Co. placed the asphaltic concrete lining.

Water from the supply line flows through an 84-in. concrete encased steel pipe installed in a 1,037-ft. tunnel, and discharges into the reservoir from a concrete inlet tower. The outlet tower is connected to the Eagle Rock-Hollywood pipeline by 72-in. and 48-in. outlet tunnels. A 72-in. by-

pass line connects the two towers.

Unit No. 1 of the pipeline was installed by Steve Rados Co. at a price of \$712,176 and Unit No. 2 was installed by the United Concrete Pipe Co. at a price of \$2,504,781. Construction is now under way to extend the pipeline west to its termination point four miles away at Hollywood Reservoir. Unit No. 3 of the conduit, from Rowena Reservoir to Franklin and Oxford Aves., is now being installed by R. A. Watson Co. under a contract for \$1,411,773.

Completion of this reservoir and the first section of its \$7,000,000 pipeline is an important realization of Los Angeles' long-range efforts to establish a water lifeline from the Colorado River. First surveys of a route for the Colorado River Aqueduct were begun in 1923 by William Mulholland, chief engineer. Later Los Angeles joined with other Southern California cities to form the Metropolitan Water District, and citizens of the district voted a \$220,000,000 bond issue to build the aqueduct. The first Colorado River water was delivered to the Los Angeles area in 1941, and since then it has been used to augment the supplies from the Los Angeles River basin and Owens River Aqueduct.

USBR looks toward streamlining activities

A SURVEY of Bureau of Reclamation activities is now under way to determine best means of accomplishing streamlining, efficiency, and coordination within that organization. Expected to report on October 1 are E. A. Moritz (chairman), R. J. Newell, John G. Marr, George Abbott, and John S. Crout, who are conducting this survey in the Washington, Denver, and regional and other offices exclusive of the California Projects office, which is the result of an earlier reorganizational study and is now under the direction of C. H. Spencer, former construction projects engineer at Hungry Horse Dam. This work will exclude all matters pertaining to project investigation, findings of feasibility, and initiation of construction.

Last generator operating at Cabinet Gorge Dam

FOURTH and last generator at Cabinet Gorge Dam in northern Idaho began operating in late August. Installation of this unit raises the power potential of the \$46,000,000 project operated by Washington Water Power Co. to 230,000 kw., with a 200,000-kw. rated capacity for the power plant. Operation of the first 50,000-kw. generator began in September of 1952.

ABOUT 300 TONS of steel sheet piling is being used to build cofferdams for construction of foundations for the piers on the southern approach to the new Richmond-San Rafael Bridge across San Francisco Bay. Here a pile driver, operating on a floating barge, is shown driving a type ZP-38 pile for one of four 120-by-71-ft. piers. Each pile weighs one ton and is 36 ft. long, and each pier of this size requires 110 piles. After the sheet piling has been driven, steel bearing H-piles will be driven within the perimeter of the pier to a depth of 60 ft. below water level and extending about 10 ft. above the water. Then a special concrete will be poured under water to a depth of 2 ft. above the bottom of the Bay to reduce hydrostatic pressure. Water will be pumped out as layers of special aggregate and concrete are poured to fill up the interior of the pier. Ben C. Gerwick, Inc., and Peter Kiewit Sons' Co. are the general contractors in a joint venture. Steel is supplied by Bethlehem Pacific Coast Steel Corp.



If your jobs are rough on tractors...see why
you need a lubricant that's specially
made for track roller bearings...

SHELL TRACROL LUBRICANT

IN DUST

In dust, ordinary lubricants are quickly contaminated. Tough-bodied Shell Tracrol Lubricant seals out dust, dirt, sand and mud; protects against wear long after ordinary lubricants have become harmfully abrasive.



IN WATER

In water, ordinary lubricants are "watered down," lose body, or are flushed away. Water-repellent Shell Tracrol Lubricant resists dangerous scouring and keeps right on protecting vital bearing metals even after continuous immersion in water.



SIDEHILL LOADS

On sidehill loads, ordinary lubricants are squeezed away from vital bearing surfaces. Adhesive, squeeze-proof Shell Tracrol Lubricant sticks, stays and protects even under extreme pressure from sidehill loading and extra heavy power demands.



Whether your jobs are rough or easy
on tractors...it pays to use
the lubricant that's specially made
to protect track roller bearings...



SHELL TRACROL LUBRICANT

Package power plants for Calif.-Oregon Power Co.

THE California Oregon Power Co. will add 62,000 kw. of electrical capacity to its lines when its two new single unit automatic hydroelectric package power plants go into operation on the North Umpqua River east of Roseburg, Ore. Lemolo No. 1 is scheduled for 1954 and the other, Lemolo No. 2, is scheduled for the following year. The former will have a capacity of 29,000 kw. and the latter is a 33,000-kw. unit. Both plants, consisting of waterwheel generators, transformers and switchgear, will be furnished by Westinghouse Electric Corp. at a total cost of \$1,175,000.

Top USBR men will survey Colorado River project

A PERSONAL survey of both the area and the planning report for the proposed billion-dollar upper Colorado River storage project is on the agenda for Undersecretary of the Interior Ralph A. Tudor and Commissioner of Reclamation Wilbur A. Dexheimer. The project had been originally endorsed by former Secretary of the Interior Oscar Chapman last December but Congressional budgeteers in the present administration returned the report to the Inte-

rior Department for a study by McKay.

Another project recommended by Chapman has also been referred to McKay by the budget bureau. This is the \$13,500,000 Swan Lake hydroelectric project to provide power for Ketchikan, Alaska. A consulting board is now reported to be in Alaska making detailed studies of the area to see if the plan can be improved.

First all-electric welded pipeline done in Wyoming

WYOMING was the site of the dedication ceremonies by Platte Pipeline Co. for the nation's first all-electric welded major diameter pipeline. The ceremonies were held at the main pumping station 4 mi. west of Casper to unveil this 1,149-mi., 20-in. carrier line for crude oil transportation, built jointly by Ohio, Sinclair, Continental, Pure, and British-American companies. The line will provide economical transportation for excess crudes from the Rocky Mountain area to central and midwestern oil refineries. Its present transportation capacity is 110,000 barrels daily. The line runs from the Big Horn basin in Wyoming to Wood River, Ill., a major refining center and junction point for connecting lines eastward and northward.

Boise River dams will be integrated in operation

DUE TO an agreement between the Corps of Engineers and the Bureau of Reclamation, Anderson Ranch, Arrowrock and Lucky Peak dams on the Boise River will be operated as one system for irrigation and flood control purposes. This system, which has a joint capacity of 983,000 ac. ft. includes a guarantee to water use, rather than any deficiency in the Arrowrock and Anderson Ranch reservoirs will be made up by that stored behind Lucky Peak. According to Harold T. Nelson, USBR regional director in Boise, Idaho, the plan permits a more economical use of government funds.

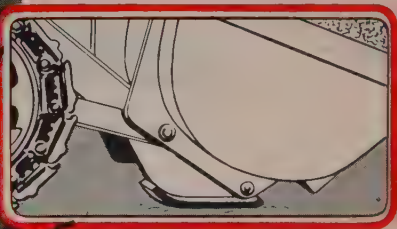
Asbestos-cement pipe specs

TENTATIVE specifications for asbestos-cement water pipe with maximum working pressures of 100, 150 and 200 psi. may be obtained from the American Water Works Association, 521 Fifth Ave., New York 17, N. Y., at a cost of \$0.20. Nominal pipe diameters covered by the specifications range from 4 to 36 in. Known as AWWA C400-53T, this 8-page booklet also presents requirements for flexural, bursting, and crushing strength, together with directions for conducting the necessary tests.

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4 mi. of surfacing

... Continued from page 79

Drainage structures call for important decisions during highway construction, and they can cause troublesome questions afterward. Along the Seward highway, reconstruction at several points included raising the profile along sidehill cuts. A decision had to be made: whether to build in new culverts atop the old grade and go on up from there, or excavate out to the old culvert invert level—near or at the intersecting stream course gradient—and put the new structure at that point.

Erosion, and the remedy

The decision was to build the culvert on the old highway grade and see what would happen. It did! That is, flow through the culvert caused extensive erosion and threatened the whole embankment. The remedy where this action occurred was to construct a half-round concrete spillway down from the culvert outlet to the toe of the fill. Expensive as a maintenance measure after construction, yes. But cheaper than to have done all the structural excavation for placing the new culvert down at the elevation of its predecessor.

At a few points where culverts pass beneath fairly shallow fills, winter has brought a curious phenomenon. A depressed bump developed in the roadway at the culvert. For a time, highway engineers worried that their fancy new culvert installations were settling, despite the season of the year. But further investigation showed instead that, by comparison to culvert structural backfill, the approach embankments were frost-susceptible. Entirely adequate in their function, they nevertheless were heaving slightly with winter frost action, while the more rigidly controlled granular backfill around and over the culvert itself remained unaffected at constructed profile elevation.

Personnel

The highway work between Anchorage and Seward strikingly illustrates the problems both of highway engineers and highway construction contractors. The engineers are those of the Seward office of the Bureau of Public Roads. H. A. Alderton is district engineer, and A. K. Neeley is district construction and maintenance engineer. Resident engineer on the current paving project is Howard M. Christenson.

Key personnel on the job for the joint venture of Rogers Construction Co. and Babler Bros. include Howard McInroe, crushing and grading superintendent, and his assistant, Lawrence S. Dupuis. Jim Folston is oil superintendent, and Charles Dupuis is finish grade foreman. Bill Telford is plant foreman.

WHEELWRIGHT Construction Company, Inc.



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Gentlemen:

You may be interested to know that we have been using Masonite Concrete Form Presdwood on the bridge structure we are building in Southern Utah

By using the screen side of your board for the surface of the bridge handrails, we realized a saving of approximately twenty-five per cent in stone finishing time. This method also resulted in an appearance which we feel is outstanding among similar bridge structures in Utah.

The Presdwood box forms used to make the handrail posts were simpler to build and stripped out a great deal easier than the lumber forms we had previously used, thereby causing less damage to the delicate edges of the concrete.

We are extremely pleased with the results attained by using your product, and be assured we shall use a great deal more of it in times to come.

Sincerely,

F. W. Wheelwright
F. W. Wheelwright

CONCRETE EVIDENCE

that MASONITE CONCRETE FORM PRESWOOD Cuts Finishing Time

This letter confirms what many contractors have discovered to their profit: the screen side of Masonite Concrete Form Presdwood® produces a concrete surface that substantially reduces finishing time—and finishing costs!

This tough, grainless, all-wood hardboard brings other benefits, too, no matter which side you pour against. For example:

- Can be used again and again
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ENGINEERS ON THE MOVE

One of the four men selected by the Board of Direction of the American Society of Civil Engineers for the highest distinction within its power, that of honorary membership in the society, is **John C. Page**, who was Commissioner of the Bureau of Reclamation from 1936 until his retirement in 1943. During his tenure with the Bureau, Page was responsible for supervision of 60 reclamation and irrigation works, 165 dams and 28 power plants in the West. The other three ASCE members to receive this distinction at the annual meeting in October are: **Othmar H. Ammann** of New York, **Dr. Arthur E. Morgan**, Yellow Springs, Ohio, and **Charles M. Spofford**, Professor Emeritus, Department of Civil Engineering, MIT.

Among recent Bureau of Reclamation assignments to foreign projects are: **T. A. Clark**, area engineer at Ogden, Utah, who has been in charge of construction of the Weber Basin Project, to Ethiopia as head of water resources development mission. Associated with Clark on this Foreign Operations Administration mission are: **George F. Stacey**, location engineer on the Columbia Basin Project; **William T. Walters**, Washington, D. C.; **Keith E. Davis**, Bismarck, No. Dak., and **Erle N. Meneely**, Spokane, Wash. **Gilbert G. Drake**, construction engineer at the Hungry Horse Project in Montana, received a two-year assignment in Pakistan, assisting **Forrest E. Byrns**, Reclamation advisor on that country's national water resource problems.

Robert W. Jennings has been named Alaskan district engineer for the Bureau of Reclamation, with headquarters in Juneau. Until his recent appointment he was area engineer at Grand Junction, Colo. **Joseph M. Morgan**, whom Jennings succeeds, returns to a new assignment in the Washington office after five years in Alaska.

Commissioner of Reclamation **W. A. Dexheimer** has reduced the number of assistant commissioners in his office to two, effective October 1. **G. W. Lineweaver**, who has been one of the three assistant commissioners, becomes assistant to the commissioner with his principal duties being an adviser on legislative and finance matters. The post of assistant commis-

sioner held by **Kenneth A. Markwell** is to be abolished. Commissioner **Dexheimer** also announced that **Harvey F. McPhail**, who has been serving with the Bureau continuously since 1919, will continue as an assistant commissioner.

Burge B. Kepford, formerly a Bureau of Reclamation engineer on the Boysen Unit in Wyoming, has located at Richland, Wash., as an engineer for the Blaw-Knox Company.

THE AMERICAN Road Builders' Association announces that the new 1953 edition of ARBA's Directory of "Highway Officials and Engineers" is now available.

This convenient, pocket-sized directory lists the administrative personnel of the 48 state highway departments, the District of Columbia and the Bureau of Public Roads. In addition, the 1953 edition contains a listing of the personnel of toll road authorities, as well as the names of the officers and directors of ARBA and its organized divisions.

The directory can be secured at \$1.00 per copy from the association office located in the World Center Building, Washington 6, D. C.

G. V. Reynolds, formerly connected with the Bechtel Corporation at Pocatello, Idaho, is now field engineer for Bechtel on the erection of industrial buildings in Sarnia, Ont., Canada, for Dow Chemical of Canada.

Bernie B. Heare of San Antonio, Texas, has moved to Glendive, Mont., where he is pipeline production engineer for the Montana-Dakota Utilities Co.

Donald C. Baer is with the Corps of Engineers as assistant project engineer, working at the March AFB in Riverside, Calif.

Maurice D. Glessner, formerly of the Corps of Engineers in the Sacramento, Calif., District, now has his own consulting engineering offices in Kernville, Calif., specializing in highways and dam construction. Besides

his experience in this country, he has worked in Alaska, Canada, Mexico and in Central and South America.

Frederic L. Copeland recently retired as vice president and director of **Bates & Rogers Construction Corp.** with offices in San Francisco and Chicago. He had been with the company for over 48 years.

Ken R. White, civil and structural engineer, announces the opening of his offices at 941 East Seventeenth Avenue, Denver, Colo.

R. J. Potter is now in France where he is working as construction engineer for the rehabilitation of an bombed-out German airbase. It was in January of this year that he was transferred from Fort Huachuca, Ariz.—where he was employed by the Army Engineers as chief of building and roads—to Bremerhaven, Germany, becoming resident engineer for the construction of an anti-aircraft training range, upon completion of which he was transferred to southern France.

F. Robert Preece, for six years area engineer for Bethlehem Pacific Coast Steel Corp.'s Los Angeles area, is appointed District Engineer, Fabricating Steel Construction, for the San Francisco area. He will maintain his office at Bethlehem Pacific's Alameda fabricating works.

H. Cedric Roberts was recently elected chairman of the California State Contractors' License Board, and **Joseph A. McNeil** was chosen to serve as vice chairman. Both men are prominent Southern California building contractors and each on a previous occasion had served as chairman of the license board.

R. G. Stapp of the Wyoming State Highway Department is heading department reorganization of the construction and maintenance division involving nearly five hundred employees. Under his new title of construction and maintenance engineer, Stapp will have two assistants, supervising five district engineers, who in turn will be concerned with construction and maintenance at the local level.

Among the engineers who are to receive awards announced by the American Society of Civil Engineers for outstanding technical papers are several from the West. **Arthur V. Anderson** and **Harold O. Sjoberg** both of Oakland, Calif., and **John A. Blume**, **Henry J. Degenkolb**, **Harold B. Hammill**, **Edward M. Knapp**, **Henry L. Marchand**, **Henry C. Powers**, **John E. Rinne** and **George A.**

edgwick, all of San Francisco, will receive the Leon S. Moisseiff Award for their paper on "Lateral Forces of Earthquake and Wind." Ben C. Gerwick, San Francisco, won the Construction Engineering Prize for his treatment of "Transmission-line Piers Built Under Water Without Cofferdams." The Rudolph Hering Medal will go to Ralph Stone and William Barber of the University of California at Los Angeles for their paper on Sewage Reclamation by Spreading Basin Infiltration." Presentations will be made at the national convention in New York Oct. 19-24.

Elton S. Saunders has resigned his position as a staff engineer with the Umpqua National Forest in Oregon to enter private practice. Dan D. Olin has been transferred from Siskiyou National Forest to fill his place.

Edgar E. Bilodeau writes in from Cali, Colombia, South America, to ask to have his future copies of *Western Construction* forwarded there. He is paying engineer on the highway being built in Colombia by Raymond Concrete Pile Co.

Charles A. Reed, city engineer of Oakland for the last 5 yr., has retired after 40 yr. service with the city. His replacement, whose appointment became effective on July 17, is John A. Morin, who had been supervising civil engineer in charge of construction inspection on city contracts.

Alfred E. Couto, formerly employed by the California Division of Highways, has accepted a position with Morrison-Knudsen Co., Inc., as field engineer on canal construction in Sao Paulo, Brazil. The work is in connection with the Cubatao power plant project, contract for which is held by the joint venture combination of M-K and Hydraulic Dredging Co., Ltd., of Oakland.

Edward L. Pine, commanding officer of the 365th Engineer Construction Group, a reserve organization sponsored by the Nevada Chapter of the Associated General Contractors, has been elevated to the rank of colonel.

Capt. Richard P. Carlson, CEC, USN, is now chief engineering consultant for matters involving public works, public utilities, and construction for the Twelfth Naval District. Carlson was most recently at Guam, where he served as staff civil engineer in charge of the base development program. He has also served as public works officer and district engineer of the Seventeenth Naval District with headquarters at Kodiak, Alaska, and as public works officer at the Naval shipyard, Bremerton, Wash.

Here's where Power pays off—power to lift and dump big payloads. These new heavy-duty Gar Wood Series 2825 and 2025 hoists with dual, double-acting cylinders and double or triple lifting links give you power to spare—power to lift and dump 30-ton payloads . . . with quality, strength and stamina that deliver incomparable performance on tough jobs. Heavy 1/2" steel sub-frame means extra strength and rigidity for long life, low maintenance costs and profitable payloads.

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New Gar Wood Series 2825 and 2025 hoists are rated at 25 and 30 tons with 14' to 17' scoop end rock type bodies. Dump angle is 70°.



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DEATHS

Paul E. Jeffers, 64, prominent Western structural engineer, died recently in Los Angeles. He was one of the founders of the Structural Engineers Association of Southern California and its first president.

Ernest F. Godso, at one time consulting engineer for the Union Pacific Ry. on construction and relocation in several Western states, died in Southern California on July 22.

Frank A. Hermann, a consulting engineer, died recently in San Jose, Calif.

D. E. Osborn, owner of the Osborn Construction Co., Medford, Ore., was accidentally killed on April 7.

Frank L. Frole, 78, who headed a heavy construction and building contracting business in Southern California, died Aug. 19, in Los Angeles.

J. Paul Howell, 64, building contractor of Sacramento, Calif., died July 30.

Samuel A. Kennedy, 85, a one time consulting engineer, steel company executive, and since its inception, a member or chairman of the board of the Metropolitan Water District of Salt Lake City, died on July 29.

Julian T. Stafford, 53, consulting structural engineer of Southern California, died in August while vacationing at Jackson, Wyo.

James H. Colvin, 40, construction company superintendent who resided in Inglewood, Calif., died August 2 in Bridgeport, Wash.

Ernest E. Howard, 72, national president of the American Society of Civil Engineers in 1950, died at his home in Kansas City on Aug. 19 of a heart attack. He was a senior partner of Howard, Needles, Tammen & Bergendorff, consulting engineers and bridge designers.

R. J. Daum died recently. He was president of R. J. Daum Construction Co. of Inglewood, Calif., and Albuquerque, New Mex.

J. A. Bryant, contractor whose offices were located in Vallejo, Calif., died August 29 in Vallejo.

CALENDAR OF MEETINGS

- Oct. 6-9—Pacific Coast Building Officials Conference, annual business meeting at Hotel Huntington, Pasadena, California.
- Oct. 7-9—Western Association of State Highway Officials, annual meeting at La Fonda Hotel, Santa Fe, New Mexico.
- Oct. 7-9—Advanced Base Water Supply and Sanitation Symposium, meeting at U. S. Naval Civil Engineering Research and Evaluation Laboratory, Port Hueneme, California.
- Oct. 8-10—Region 11, Associated Equipment Distributors, annual meeting at Pebble Beach, Calif.
- Oct. 8-10—American Concrete Pressure Pipe Association, annual convention at Ponte Vedra Inn, Ponte Vedra, Florida.
- Oct. 8-10—Structural Engineers Association of California, fall convention at Ahwahnee Hotel, Yosemite National Park, Calif.
- Oct. 14-16—National Reclamation Association, annual meeting at Mapes Hotel, Reno, Nevada.
- Oct. 15-18—Region 12, Associated Equipment Distributors, annual conference at Gearhart Hotel, Gearhart, Oregon.
- Oct. 19-23—American Society of Civil Engineers, annual meeting at Statler Hotel, New York City.
- Oct. 29-30—Southwest Regional Meeting, American Concrete Institute, at Rice Hotel, Houston, Texas.

1954

- Jan. 5-7—American Road Builders' Association, annual meeting, Chalfonte-Haddon Hall, Atlantic City, New Jersey.
- March 1-4—Associated General Contractors, 35th annual convention at Statler Hotel, Los Angeles.

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New 7" Box Point- for rock shovels in the 6 yard class



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Point life goes up, cost per yard goes down—with this new 7-inch shovel point. The self-sharpening R7R is made bigger to give longer point life in tough digging. For example, on one rock digging job, average point life jumped from 10 to 44 hours when the new R7R was used—a 340% increase! At another installation, where tonnage had been averaging 76,000 tons per set of teeth, the new R7R points boosted production to 155,000 tons—a 100% increase! *In both cases the ESCO R7R points cost less than the teeth they replaced.*

ESCO Points and Adapters speed your digging. You change a box point in 1½ minutes. Result: less down-time, increased profit per yard. Your ESCO dealer has box points available in six different shapes to meet all digging conditions...widths from 3" to 7". Ask him for details, or write for Bulletin 187-A:

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2½ minutes to take off 4 points.



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C. of E. allocates \$660,000 for flood control surveys

THE CORPS OF ENGINEERS has allocated \$660,000 for flood control surveys in 25 states and Alaska. Included are surveys to be made on the Middle Snake River in Idaho and Oregon; on the Tualatin River (lower Columbia) in Oregon; on the Sun River in Montana, and on the Okanogan River (lower Columbia) in Washington.

SUPERVISING THE JOBS

George W. Colton is superintendent for the Eagle Construction Co. on a state highway job south of Roberts, Idaho. "Mitch" Humphries and "Buddy" Pulliam are grade foremen on this \$258,145 contract. Bob Perry is master mechanic; Robert Cruikshank, office manager; and "Bill" Crowl, resident engineer.

T. F. (Honest Tom) Grady is superintending for Kiely Construction Co., who has the big highway fill job at Palisades Dam (*Western Construction*—June 1953, pp. 103, 104, 144). Master mechanic is Joe Howell; and the following foremen are working at the site: J. B. (Tex) Battenfield, rock; Keith Christensen and Leonard Osborne, grade; Mack Moorehead, shop.

"Chuck" Loser is superintendent for S. Birch & Sons on their \$599,000 contract for grading and surfacing in connection with relocation of Highway 26 at the Palisades Dam project site. Austin Tayer is master mechanic. Grade foremen are: John Hogan, Jim White, Ed Kivenen and "Blackie" Neal. Jim Wagner is clearing foreman. Bob Tiegen is office manager.

G. G. McAfee is superintendent for Atlantic Constructors on 3.8 mi. of concrete paving and five structures in Compton, Calif., for the state highway department. Assisting on the job are: Ralph L. Bitter, grade superintendent; James M. Crittenden, pipe superintendent; Olyn L. Saine, master mechanic. Office manager is R. L.

Carpenter and Peter J. Scharwark is accountant. Resident engineer is Howard F. Meinke. I. W. Black is engineer for the state bridge department. William W. Webb is engineer for the construction company.

K. A. Ethridge is job superintendent on the \$358,720 contract recently awarded to Pioneer Constructors for highway work on U. S. 80 consisting of 2.8 mi. grading and draining, beginning 27 mi. from Tucson, Ariz.

There wasn't room to mention everyone in the picture captions on page 71! The Kiewit-Early work at Eielson AFB, Alaska, a \$2,513,200 contract for eight BOQ's utilidor and railroad trackage, has Oscar Buchanan, Arley Decker, and Perry Robiataille on the job as indicated. In addition, Bill Willis is labor foreman on the utilidor work. The BOQ's have another table of organization, headed by Lou Welch, superintendent. With him are Frank Testo, labor foreman, and Jim McCoy and W. M. Welch, carpenter foreman.

Bill Gudgel is supervising Tirrell & Co.'s contract covering forest road construction work in Montana. On this \$291,975 job Bob Root is acting as foreman and Arden Reibe master mechanic.

Gail Loop is Peter Kiewit Sons' Co.'s superintendent on their \$359,694 contract covering 1.3 mi. grading, storm sewer, curb and gutter work in

North Main St., Sheridan, Wyo. Other key men on the job are H. R. Martelon, utility superintendent; E. W. Temple and C. M. Montgomery, foremen, and M. C. Namtvedt, assistant engineer.

Andy Stolzenburg, superintendent for Albert Lalonde Co., is heading 6.8 mi. of highway work between Glasgow and Opheim in Montana. Contract was recently awarded to Lalonde at \$129,391.

O. J. Brown is in the superintendent spot on a \$149,465 contract to raise Bear Creek dam and erect a control house at Astoria, Ore. L. A. (Pete) Pederson is foreman on the same job. J. A. Troxell recently was awarded the contract.

B. F. Kelly, Jr., job superintendent, assisted by Robert L. Dever, grading foreman, and T. C. Carr, bridge foreman, is heading road construction and erection of three concrete bridges at Roswell, New Mex., for contractors Armstrong & Armstrong who received the contract on a low bid of \$555,467.

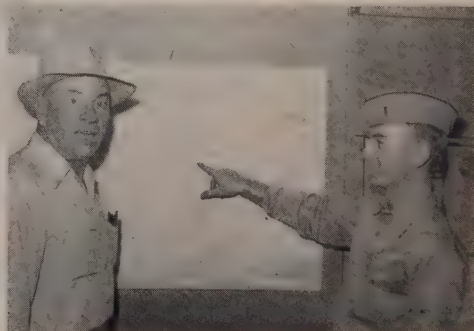
Ross Bevan is job superintendent working at the Mountain Home Air Force Base, Idaho, on a \$1,299,059 contract for installation of a central heating plant and water distribution system. Jno. R. Detweiler is mechanical engineer; G. E. Edgar, general project manager, and E. S. Jensen, electrical engineer. Detweiler & Detweiler is the contractor.

Ken Baird is in the superintendent spot for Woodward Construction Co. on this company's \$413,245 contract for road work in Power County, Idaho.

H. A. Bohne is supervising the construction of the California state medical facilities at Vacaville, for gen-



CORPS OF ENGINEERS work in Interior Alaska calls for a separate engineering residency, established at Ladd AFB. Work there and at Eielson AFB and Big Delta is administered by Lt. Col. John K. Addison (left). His principal assistant is Judson H. White. Chief project engineer at Eielson AFB is Major William E. Anderson (center). His staff is headed by Roy H. McAndrew (concerned with the photographer!), and 2nd Lt. Robert E. Martin (concerned with the map).





MANHANDLING THE KAW RIVER

People of Kansas City, Kan., know the rebellious Kaw River doesn't tame easily. They saw it run roughshod over the old levee in 1951. They intend to see it doesn't happen again.

But it takes tough, durable equipment to contain the Kaw. That's why a burly Caterpillar No. 12 Motor Grader is working the tough, sticky soil on the new levee.

Explains M. C. Green, general superintendent of Storms & Frew Construction Co., Kansas City, Mo., which is building the levee:

"We always favor Cat* Motor Graders because they take more abuse than other makes but still are easier to operate."

These motor graders are built of quality materials and are designed to take it! Only Caterpillar Motor Graders have frame, engine and controls made by the same manufacturer. With frame strengths engineered to match engine power, these rigs co-operate with operators in getting work

done. The blade stays where he puts it! No creeping of controls or unwanted blade shifting.

You can't help getting years of efficient, trouble-free work from the No. 12. Its circle is built of box section that weighs 35 pounds per foot. That's the strongest circle ever used on any grader.

Let your Caterpillar Dealer show you the full line of motor graders. Big yellow graders on the job build your profits with real performance.

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THESE MEN were administering and engineering the work of Palmer Constructors on the Eklutna tunnel in June. From left: **Bill Nixon**, assistant project manager; **Norman Grauerholz**, field engineer; **George Mardorf**, office manager; **George Knight**, field engineer; and **Don MacGregor**, project engineer. Their operations are reviewed in an article in this issue.

eral contractor **Robert E. McKee** who won the award on a low bid of \$2,-875,900. **E. R. Farrell** is general foreman. Other key men are **D. E. Waters**, office engineer; **R. A. Johnson**, field engineer, and **H. H. Perkins**, field office manager.

F. R. (Fritz) Melbye, superintendent for **J. S. Anderson Construction Co.**, heads the 5.4-mi. grading job on the St. Joe River road in Shoshone County, Idaho, contract for which was recently awarded Anderson on a \$257,240 bid. Equipment foreman is **Fred Poole** and drilling and powder foreman is **John Fosdahl**. **D. F. Tapert** is office manager.

Frank O. Muren is superintending the \$593,954 contract recently awarded to **Fredericksen & Kasler** for grading and surfacing and erecting three steel bridges at the Visalia Airport Exchange, Tulare County, Calif. **Bill Loy** is supervising the grading. "Grouting" **Beetles** is pipe foreman and **E. C. Skaggs** carpenter foreman.

Page Theirs is job superintendent and **Foy Pickering** general superintendent for **Fisher Contracting Co.** on 3.8 mi. of grading and surfacing work on the Winslow-Holbrook highway, Arizona. Contract was won by Fisher on a bid of \$370,778.

Ted Carl is superintending for **Murphy Bros.** on this company's recent contract award of \$128,640 for 6.9 mi. clearing, grubbing, grading and drainage work in Bonner County, Idaho. On the same job, **Carrol Peck** is the maintenance superintendent.

Ellis A. Bunn is supervising rock crushing work in connection with **Union Pacific R.R. Co.** construction at Inkom, Idaho, for **Morrison-Knudsen Co., Inc.** Other key person-

nel are: **Arlo Jones**, master mechanic; **Royal Robie** and **Fred Schwartz**, foremen. **W. D. Hooton** is office manager.

William J. (Bill) Perry is superintending for **Gus J. Bouten** on the construction of **St. Gertrude's Academy** high school in Cottonwood, Idaho, contract for which is just about completing. Assisting Perry on this \$500,000 project are: **E. J. (Red) Nissen**, carpenter foreman, and **Alfred (Guy) Bray**, labor foreman.

A. H. Cranmer is supervising the surfacing work in **Sevier County, Utah**, for **Whiting & Haymond** who recently received the award at \$177,-003. **Grant Palfreyman** is foreman on the same job.

Gunner Nygard is superintendent on the **Morrison-Knudsen Co., Inc.**, contract for construction of an earth-fill dam on the **Frog Lake** forebay project in **Clackamas County, Ore.**, at a cost of \$880,110.

N. E. Parson and **Sam Gillette**, general superintendent and job superintendent respectively, are top men for **Carl E. Nelson** who received a \$374,026 contract award for 9.9 mi. of cement stabilized base and plant-mix bituminous surfacing on the **Yellowstone/Park** highway in **Bannock County, Idaho**.

Elmer Cheff is project manager and general superintendent on the \$800,-000 joint venture contract of **Charles A. Power** and **A. J. Cheff Construction Co.** for the interceptor sewer at **Spokane, Wash.** Assisting Cheff are **W. G. Allen** and **Nicholas Flynn**. Tunnel foremen working on the job are: **R. C. Oglesby**, **Darwin Osterhout**, **Ben Werner** and **Andrew Kempainen**. Other key men are:

carpenter foreman **Garner J. Rutter**; master mechanic **Walter Gaub**; chief electrician **Clare L. Ely**; office manager **R. A. Shoemaker**. **Dwight Myers** project engineer for the City of Spokane.

A. G. Carbone, superintendent for **Cts-Hokin & Galvin**, is in charge of installing of highway lighting and illuminating sign equipment in Los Angeles County, Calif. Another key man on this \$168,479 job is **John J. Breget**.

Paul H. Swanson, project manager; **William J. Kennish**, general superintendent, and his assistant **Roy S. Crawford**, are the top men for **Palisades Contractors** who are building **Palisades Dam** in Idaho for the Bureau of Reclamation at a cost of \$29,180,000. They are being assisted by the following personnel:

Carpenter—superintendent **M. C. Silva**; general foreman **H. P. Russell** and foremen **Charlie Agee**, **Virgil Haag**, **L. R. Haag**, **Charles Clifton**, **W. H. Emerson**, **H. Coldwell**, **W. I. Linneberger**, **M. Nelson**, **N. G. Davis** and **Donald L. Enfield**, as well as **Jim Stalnaker**, bridge foreman.

Plumbing foreman **Robert Warren**; plant superintendent **E. A. Bray** and foremen **W. E. Gates** and **Lloyd Clark** (batch) and **A. L. Gates** and **William A. Blanton** (separations). Concrete superintendent **Ed Eaton** and foremen **J. B. Dimock**, **Eugene Hall**, **Arnold J. Bush**, **Francis L. Crossman**, **Joe Markowski**, **J. D. Combs**, **Ralph Winner**, **John Alakamovitch**, **James R. Mason**, **Ed. F. Miller**, **Don Johns**, **Cecil L. Sessions**, and cement finish foreman **Ervin Thomas**.

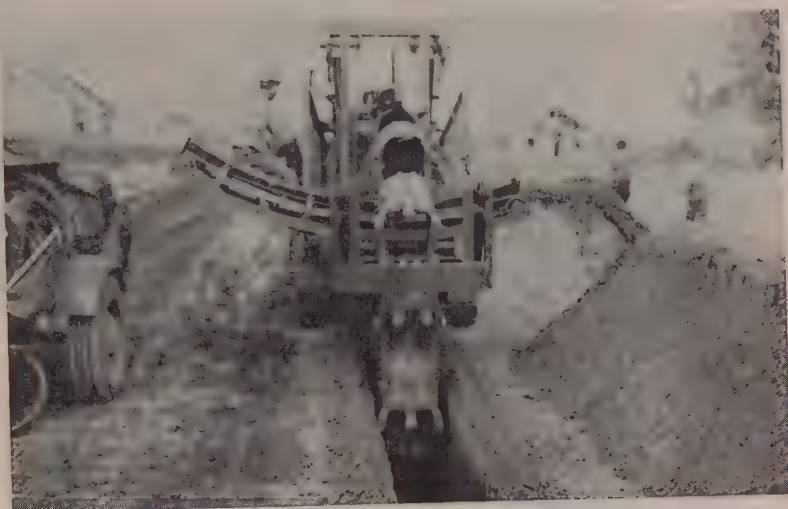
Rigging superintendent **John H. Hanson**; ironworker foremen **Elbert J. Johnson** and **Ernest J. Kesler**. General labor foreman **H. L. Morris** and foremen **Louis B. Kontos**, **Winslow Weber** and **Earl Haderlie**. Rock superintendent **Richard Fegert** and foremen **H. L. Goodwill**, **R. H. Lont**, **A. R. Townsend** and **W. E. McDonald**.

Excavation superintendent (day) **Harold Taylor** and foremen **Sam Ware**, **Monroe Cordel**, **George Carey** and **L. W. Haymond**. Excavation superintendent (swing) **Gears Bierhaus** and foremen **R. C. Cain**, **H. Sisk**, **Vern Storey** and **Bill Clark**, as well as fill foreman **Dave Sims**. Master mechanic **James L. Brown** and shop foremen **Joe Hamby**, **William L. Ellis**, **D. D. Patterson** and **R. B. Whitmore**.

Office manager **George A. Watson**; chief accountant **B. D. Bithell**; purchasing agent **P. E. Jaeger**; paymaster **Don Orcutt**; personnel manager **Wayne Call**; chief warehouseman **Oliver S. Marriott**; parts manager **M. L. Newbold**, and camp manager **H. G. Moore**.

Project engineer **L. B. Kuhnle**; office engineer **Quentin Holmes**; field engineer **Richard Corry**; party chief

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1/2" x 20'	17.2%
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1/4" x 5'	15.5%
3/16" x 8'	13.0%
3/32" x 10'	8.5%

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Cordell B. Stock; safety engineer Arthur McGown; designer Richard C. Carleton and engineer Joseph S. Hare.

American Pipe & Construction Co. has the subcontract for tunnel lining, with Bob Lowe superintendent and Al Zito foreman. Boyles Brothers Drilling Co. is the drilling contractor. Fairless Plumbing & Heating Co. holds the plumbing subcontract, with Fred S. Dunning as foreman. Oscar Hahn is supervising the electrical work for the Hahn Electric Co. Rush Construction Co. is doing the aggregate work with Carl Miller acting as job superintendent.

Statewide Steel Erection Co. is handling the reinforcing subcontract. Steel superintendent is Melvin Sandy, assisted by Wesley Hansen, with foremen Johnny Faulkner, E. P. Dereu and L. C. Sandy.

Tunnel work is subcontracted to J. A. Terteling & Sons, Inc., and is being supervised by Eugene C. Williams. Foremen are: Roy Lee, Al Kennedy, Byron Maginnis and Harry Seyton. Other key men on this work are: John I. Hale, master mechanic; Robert Morris, office manager; Dick Leard, job engineer; H. G. Olson, powder foreman; Ray Morris, paymaster and O. E. Looney, carpenter foreman.

C. F. Briggs is job superintendent on a \$268,424 contract held by Natt McDougall Co. for grading and drainage structures on Vancouver Freeway, Clark County, Wash. R. E. McGary is general superintendent and Don N. Forrester is paymaster.

E. P. Johns, superintendent for the Umpqua River Navigation Co., is in charge of installing a sewer system and sewage pumping station at Reedsport, Ore., contract for which was awarded to Umpqua at \$194,685.

John Tucker is head man on the \$1,134,680 contract awarded to George A. Fuller Co. for the erection of shop and hangar building at the Palmdale Airport in California. General superintendent on the work is Frank J. Reiner.

Paul W. Wise is project manager and Paul O. Varner is assistant project manager for a \$4,500,000 job to erect Jackson Lake Lodge and appurtenant construction at Moran, Wyo., for the Grand Teton Lodge & Transportation Co. Other key men on this large Morrison-Knudsen contract are: Superintendents—Ancil D. Knowles, concrete superintendent; Dean W. Straw, grading superintendent; Bob Harris, general foreman; C. Vern Harder, superintendent, and William W. Drake, master mechanic. Foremen—Jack Booth, George Kimble, Charles Decker, Clyde Briggs, Ed Ellis and Russell Mault, carpenter;

by Butler and Francis Pilcher, for; Dan Crawford, ironworker; Norman Crapo, warehouseman; Dan Verett, roofer, and Bert Wood, finisher foreman. Office manager is Charles A. Pittman. Jim Armistead is pump manager; Douglas L. Ellis, accountant; Clarke L. Collins, paymaster; Harold W. Mendenhall, warehouse manager, and E. J. O'Neil purchasing agent. Job engineer is Lowell Norman.

E. E. Frost is supervising a stretch of grading and surfacing on Sonora Pass in Stanislaus National Forest, Calif., for Ball & Simpson, contractor, who won the award on a bid of \$856,700. Also working at the site are: L. Jackson, grade foreman; J. Lester, powder foreman; K. Clark, labor foreman, and A. Reimer, structures foreman. Tony Yung is master mechanic; J. Wigell is in charge of the office and I. Davis is engineer.

Virgil Graham is superintendent on a contract awarded to Clements & Co. at \$361,640 for 14.87 mi. grading in Sierra National Forest, California.

Owen D. McCarty, assisted by George Griffith, pilebucks foreman, and Enoch R. Stevenson, bridge raising foreman, is heading a road relocation job near Lowell, Ore., recently awarded W. H. Shields Construction Co. on a bid of \$149,000.

G. J. Keely, heavy construction superintendent, and E. F. Starbard, structural superintendent, are heading a \$1,278,395 job, contract for which is held by Woodworth & Co., Inc., for grading, draining and paving 3.9 mi. of PSH 1 in Pierce County, Wash. Foremen in key spots are: Henry Christian, structural; Ralph E. Sheriff, Jr., heavy construction; and H. E. Klasell, paving.

O. M. Barbre is job superintendent for the joint venture contracting firm of Gordon H. Ball, San Ramon Valley Land Co., and John M. Ferry on a \$286,440 highway job on U. S. 99 in Los Angeles County. Plant superintendent is J. C. Lawson and office manager is Jack Hoekenga.

William A. Denten, general superintendent, and Glenn C. Johnson, project manager, together with the following men are just about completing work on the \$3,607,000 construction of Lucky Peak Dam, Boise, Idaho, for Morrison-Terteling-Macco-Puget Sound: Foremen—Millard F. Cochell, electrical; G. A. Coonse, lubrication, and Kenneth L. Swan, excavation. John D. Linn, master mechanic; Frank B. Morrison, office manager; Robert M. Schaber, ware-

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house manager; **Walter F. Travis**, job engineer, and **Harry G. Parker**, paymaster.

Bruce Shumway is project superintendent on a \$2,543,755 contract in Alaska for 41 mi. on the Richardson highway including 12 bridges recently awarded Morrison-Knudsen Co., Inc. Superintendents are **Al Doyle** and **Howard (Casey) Elliott. H. M. (Ham) Hines** is office manager. **Donald W. Wolf** is project engineer.

Ray Revell is project manager on another job recently awarded to Morrison-Knudsen in Alaska. It is a \$4,525,825 contract for the erection of hardstands, taxiways and hydrant refueling facilities at Eielson Air Force Base. Superintendent on this work is **Carl King. Al Spornak** is the project engineer and the office is in charge of **Walter W. Sabin**.

L. O. (Larry) Grossnickle is supervising Guy F. Atkinson Co.'s \$1,031,000 contract for the demolition of present bridge and erection of a new bridge over the Skagit River at Mount Vernon, Wash., for the State. Grossnickle just got off two large bridge jobs for Atkinson at Marysville, Wash. Other key personnel with him at Mount Vernon are: **Ben Veinhuizen**, master mechanic; **Harold Percival**, carpenter superintendent; **Whitey Berg**, day pile-driver fore-

man; **Harry Joy**, labor and concrete foreman. **George Hornung** is office manager.

James W. Gadberry is serving as project manager for Paul E. McCollum, Inc., who has the \$175,000 contract for earthwork and road surfac-



Kreuger

Gadberry

ing in Placer County, Calif. **D. L. Krueger** is resident engineer on the project. Foremen working at the site are: **Al Foote, Dick Macy, Pres Watson** and **Jack Boesch. Charles Christian** is master mechanic. Contract is just about completed.

M. L. Clark is superintendent for Ryan & Haworth Co., who are building an oil pipe line terminal at Spo-

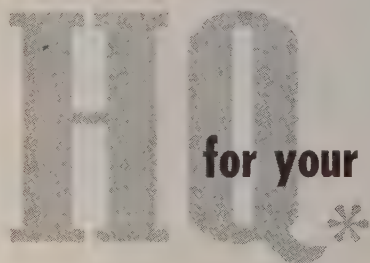
kane, Wash., for Salt Lake Pipe Line Co. at a contract price of \$30,000. Foremen are: **Chris Soran**, pipe; **John Halvorson**, carpenter, and **Bo Green**, electrical.

Jim Henry is job superintendent for Harms Bros. on highway construction from Walker bridge to new Horse Creek bridge in Oregon for the Bureau of Public Roads. Assisting in key positions are **Bill Tregembo**, plan superintendent; **Joe Rogers**, mechanic; **Ward M. Moyer**, chief operator; and **Roy Ziegler**, carpenter foreman. **H. W. Baugh** is resident engineer, and **George Bohn** is acting resident engineer.

Jim Norton, superintendent for Marye-Northwestern Co., is supervising the building of a hangar at the Lowry air base at Denver, Colo., for the Corps of Engineers. Contract price was \$1,200,000.

Carroll Glenn is superintending the construction of a wharf at Outer Harbor, Long Beach, Calif. This is a \$1,199,215 project, contract for which is held by Guy F. Atkinson Co. **W. C. (Bill) Husemann** is the project engineer.

Charles Cheney is superintendent for McAtee & Heath on a plant-mix-



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ituminous surfacing job on U. S. 95 in the vicinity of Genesee, Idaho. Joe Lujan is plant foreman. This is a 209,281 contract. F. H. DeAtley Co. has the subcontract for crushing.

Garth Culp is the superintendent on Peter Kiewit Sons' Co.'s contract recently awarded at \$117,337 for road work in Big Horn County, Mont. Foremen on the job are: Orville Bronson, oiling; Lee Witte, surfacing, and Mark Bradley, crushing.

H. A. Kenyon is superintendent for Morrison-Knudsen Co., Inc., on its recent contract for excavating and grading the site of the new General Petroleum Corp.'s refinery at Ferndale, Wash. Don Clark is office manager. M-K received the bid at \$223,000.

Virgil Graham and his assistant Lee Burton are heading a job in Madera County, Calif., for Clements & Co., who recently received an award amounting to \$361,640 for 14.9 mi. of grading and paving in the Sierra National Forest.

William E. Sonju has the superintendent spot for Parker-Johnson Co. who got the \$132,370 contract for the reinforced concrete deck girder work on the N. Corvallis viaduct in Denton County, Ore.

A. L. Acton, superintendent for Taggart Construction Co., heads a 5½-mi. stretch of grading on the Hoback Canyon route in Teton National Forest, Wyo. Others working at the site are Gail George, grade foreman; Glen Harvey, foreman, and George Monighan, timekeeper. This is almost a half million dollar contract.

Al (Dutch) Willems is supervising a \$155,445 contract held by Nilson-Smith Contracting Co. The work consists of clearing, grubbing, grading and draining a road in Flathead County, Mont.

John Harrington is superintendent for J. M. Arenz on two grading and paving jobs in Grant County, Ore. One contract amounts to \$342,813 for 7.28 mi. grading and 7.75 mi. paving on John Day Highway, and the other is a \$332,061 contract for over 10 mi. of grading and paving in the same county. William H. Arenz is foreman on both jobs.

Les Carter and Clyde Weatherly are supervising highway work at Denver, Colo., for C. L. Hubner Construction Co. The construction is part of the Denver Valley highway project. Jim Nolan is carpenter foreman and Les Elliston is master mechanic on this \$700,000 job.

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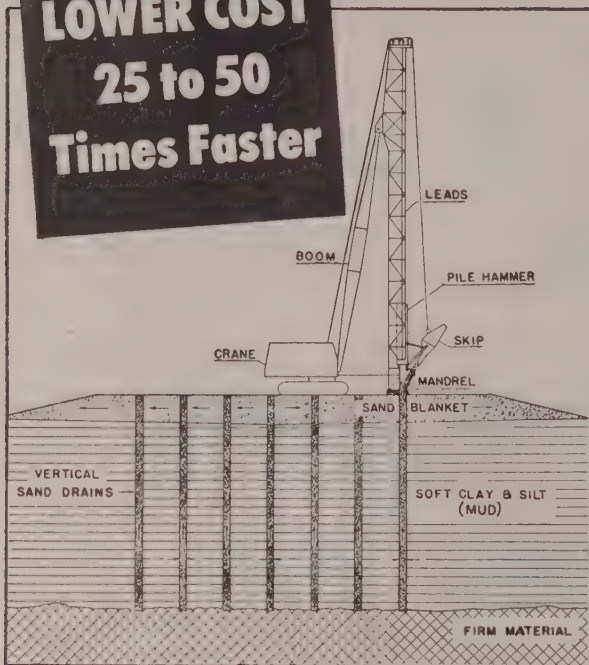
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CONTRACTS

Summary of bids and awards for major Western projects

Alaska

\$565,592—**Peter Kiewit Sons' Co.**, 1300 Aloha, Seattle—Low bid for construction and installation of 6 fuel storage tanks pump station with fuel distr. system, roads, drainage systems and appurtenances, Elmendorf Air Force Base; by C. of E.

\$565,757—**S. Macri Construction Co.**, Anchorage—Award for outside utilities for rehabilitation of Sunflower area No. 1 Elmendorf Air Force Base; by C. of E.

\$2,850,000—**Patti-MacDonald Construction Co.**, Pouch 6, Anchorage—Low bid for Anchorage High School gym., auditorium, swimming pool and shops; by Anchorage Independent School District.

\$738,382—**United Contractors**, Fairbanks—Award for outside concrete utilities to serve Butler bldgs. at Eielson Air Force Base; by C. of E.

Arizona

\$433,846—**Arizona Sand & Rock Co.**, Box 959, Phoenix—Award for 4.4 mi. of grading, draining, borrow, select material, aggregate base, prime coat, bitum. plant-mix, and seal coat, Phoenix-Rock Springs hwy., Maricopa County; by St. Hwy. Dept.

\$286,723—**W. J. Henson**, Box 471, Prescott—Low bid for 5 mi. of grading, draining, select material, aggregate base, bitum. rd. mix and seal coat, U. S. 60-70, Quartzsite West, Yuma County; by St. Hwy. Dept.

\$153,485—**Martin Construction Co.**, Box 934, Tucson—Low bid for 1.2 mi. of approaches, 3 conc. slab bridges, 1 conc. box culvert on about 7½ mi. of State 84 west of Casa Grande; by St. Hwy. Dept.

California

\$1,019,890—**John A. Artukovich Sons, Inc.**, and **Artukovich Bros. Investment Co.**, 16200 S. Atlantic St., Paramount—Low bid for Section 2, La Cienega and San Fernando Valley relief sewer, Unit A, Los Angeles; by City.

\$1,333,059—**Vido Artukovich & Son, Inc.**, and **Papac Construction Co., Inc.**, 1140 Singingwood Dr., Arcadia—Low bid for Section 3, La Cienega and San Fernando Valley relief sewer, Unit A, Los Angeles; by City.

\$7,162,800—**Guy F. Atkinson Co.**, 10 West Orange Ave., South San Francisco—Low bid for Cherry Valley Dam, Cherry River Project; by Public Utilities Commission of San Francisco.

\$4,122,382—**Guy F. Atkinson Co.**, 10 West Orange Ave., South San Francisco—Award for 4 mi. of grading, U. S. 101 betw. Manzanita and Golden Gate bridge, and construction of a conc. lined vehicular tunnel and misc. reinf. conc. structures, Marin County; by Div. of Hwys.

\$712,575—**J. S. Barrett**, 1300 Coast Hwy., Newport Beach—Award for Allison Canyon tunnel and lines, and Beach interceptor lines in Beach tunnel, South Laguna Beach; by South Laguna Beach Sanitary District.

\$287,189—**W. H. Darrough & Sons**, Box 392, Yuba City—Low bid for 7.2 mi. of grading and a reinf. conc. bridge, betw. Kansas Ave. and 1 mi. north of Corcoran, Kings County; by Div. of Hwys.

\$1,451,980—**Fredrickson & Watson Construction Co.** and **M & K Corp.**, 873 81st Ave., Oakland—Low bid for 1.2 mi. of grading and paving and a reinf. conc. box girder bridge, Sign Rte. 24 nr. Orinda Junction, Contra Costa County; by Div. of Hwys.

\$2,327,000—**Kemper Construction Co.** and **MacDonald & Kruse**, 3701 Overland Ave., Los Angeles—Low bid for Section

, La Cienega and San Fernando Valley relief sewer, Unit A, Los Angeles; by City.

1,626,000—**M & K Corp. and Fredrickson & Watson Construction Co.**, Financial Center Bldg., San Francisco—Award for office bldg. for St. Personnel Board, Sacramento; by State.

343,552—**Ofcco Construction Co.**, 2650 Cherry Ave., Long Beach—Award for earthwork, pipe lines and structures, Carinteria Distr. System; by USBR.

1,669,000—**The Pacific Co.**, 801 Cedar St., Berkeley—Award for high school, Antioch; by Antioch-Live Oak Unified School District.

201,735—**C. Norman Peterson, Inc.**, 2832 9th St., Berkeley—Award for sewage treatment plant, Paso Robles; by City.

341,198—**Pipe Linings, Inc.**, 4675 Firestone Blvd., South Gate—Low bid for relining San Joaquin pipe line No. 1, Coffee Rd. to San Joaquin River; by Public Utilities Commission of San Francisco.

441,893—**Stolte, Inc.**, 8451 San Leandro St., Oakland—Low bid for Schedules 1, 2, and 3, earthwork, pipe lines and structures, incl. pumping plants, Plain View Water District, Delta-Mendota Canal distr. system; by USBR.

254,127—**Sully-Miller Contracting Co.**, 1500 W. 7th St., Long Beach—Low bid for 5.8 mi. of grading and plant-mixed surf. on untreated rock base, Wright St. betw. St. 60 and Wintersberg Ave., Orange County; by Div. of Hwys.

6,181,354—**Vinnell Co., Inc.**, 1145 Westminster Ave., Alhambra—Low bid for entire project, La Cienega and San Fernando Valley relief sewer, Los Angeles; by City.

848,752—**Matt J. Zaich Co.**, 6828 Farmdale Ave., No. Hollywood—Low bid for Section 4, La Cienega and San Fernando Valley relief sewer, Unit A, Los Angeles; by City.

Colorado

342,685—**Gardner Construction Co.**, Box 360, Glenwood Springs—Award for 12 mi. of grading and structures for replacement of North Washington St. arterial, Denver; by St. Hwy. Dept.

\$473,940—**Harrison & Atchison Co.**, 1566 S. Bannock, Denver—Award for 5 mi. of U. S. 160 betw. Hesperus and Mancos; by St. Hwy. Dept.

\$334,833—**Herren & Strong**, Platteville—Award for 5 mi. of improvement of St. No. 1, Pueblo County; by St. Hwy. Dept.

\$132,776—**Inland Construction Co.**, Hynds Bldg., Cheyenne, Wyo.—Low bid for 6.6 mi. of Bear Lake rd., Rocky Mt. Natl. Park, Larimer County; by BPR.

\$930,060—**Peter Kiewit Sons' Co.**, Box 8787, University Park Sta., Denver—Award for 14 mi. of conc. paving, U. S. 6 betw. Barr Lake and Hudson, Adams and Weld counties; by St. Hwy. Dept.

\$552,485—**Lowdermilk Bros.**, 1950 W. Dartmouth, Denver—Award for cloverleaf traffic interchange, So. Colorado Blvd. and Valley hwy.; by St. Hwy. Dept.

Idaho

\$343,850—**Asphalt Paving & Construction Co., Inc.**, 3206 Pleasanton Ave., Boise—Award for 1.9 mi. of 4-lane hwy., Old Oregon Trail betw. Cole School and Fairgrounds, Ada County; by St. Dept. of Hwys.

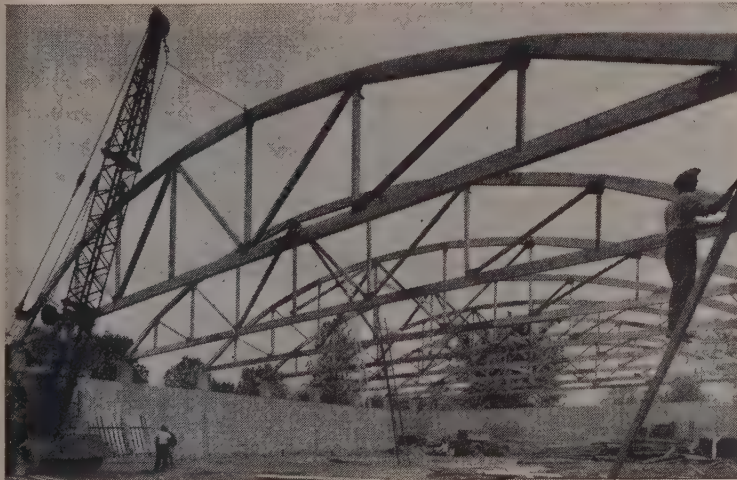
\$152,852—**Asphalt Paving & Construction Co., Inc.**, 3206 Pleasanton Ave., Boise—Award for 4.2 mi. of plant-mixed bitum. surf. and widening a 31.2-ft. conc. bridge, U. S. 30 from New Plymouth-West, Payette County; by St. Dept. of Hwys.

\$176,675—**McNutt Bros.**, 351½ E. Broadway, Eugene, Ore.—Award for clearing, grubbing and draining, 8 mi., Deer Creek-Canuck Creek rd., Boundary and Lincoln counties; by BPR.

\$6,112,015—**Morrison-Knudsen Co., Inc.**, Box 450, Boise, and **J. A. Terteling & Sons, Inc.**—Low bid for extension of runways, strengthening existing runways and taxiways and air-field lighting and utilities systems, Mt. Home Air Force Base; by C. of E.

\$1,174,188—**Thorn-Marble Co.**, 916 E. 64th St., Seattle—Low bid for Schedule A, bulk storage facilities and hydrant refueling systems, Mt. Home Air Force Base; by C. of E.

\$263,630—**Wangsgaard Construction Co.**, 685½ Darwin Ave.,



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Spokane 2, Washington, Boise, Idaho
HALL-PERRY MACHINERY CO.....Butte, Montana
LUND MACHINERY CO.....Salt Lake City, Utah

Logan, Utah—Low bid for Boundary Creek-Stagger In forest rd.; by BPR.

Montana

\$497,909—James Crick & Sons, 210 Cliff Dr., Spokane, Wash.—Award for a 686-ft. steel and conc. bridge, Somers-Bigfork hwy., Flathead County; by St. Hwy. Comm.

\$150,130—James Crick & Sons, 210 Cliff Dr., Spokane, Wash.—Low bid for Peet Creek forest rd., Lincoln County; by BPR.

\$153,725—James Crick & Sons, 210 Cliff Dr., Spokane, Wash.—Low bid for 7.5 mi. of grading, Burnt Creek-Cool Creek rd., Lincoln County; by BPR.

\$113,115—Francis H. Holland, Billings—Award for Teepee Creek rd.; by BPR.

\$323,134—Holzworth Construction Co., 1st Natl. Bank Bldg. Miles City—Award for 9.9 mi. of grading, gravel surf., road mix oiling and draining, Unit 1, Gendive-Sidney hwy., Dawson and Richland counties; by St. Hwy. Comm.

\$371,670—Miller & Strong, Inc., Box 292, Eugene, Ore.—Award for 17 mi. of clearing, grubbing and grading, Gravel Creek-Trail Creek rd. and Theriault Lake rd., Lincoln County; by BPR.

\$173,921—Ed Tangmo, Milltown—Award for 4.4 mi. of grading, draining, gravel surf. and road-mix oiling, Round Butte Ronan hwy., Lake County; by St. Hwy. Comm.

\$788,095—J. Kenneth Thayne Construction Co., 2670 Berkeley Circle, Salt Lake City, Utah—Low bid for flood control project for diverting Bull Hook Creek from present course through Havre, Hill County; by C. of E.

Nevada

\$268,695—Wells Cargo, Inc., 1800 E. 4th St., Reno—Award for 7.5 mi. of grading, draining and surf., beginning 16½ mi. north of Pioche, Lincoln County; by St. Dept. of Hwys.

New Mexico

\$164,674—Allison & Haney, Box 1507, Albuquerque—Award for 7.3 mi. of ballast, grading, draining and surf., Valdez to Taos hwy., Taos County; by St. Hwy. Dept.

\$522,565—Brown Contracting Co., Box 1479, Albuquerque—Award for 12.7 mi. of grading and draining, Cebolla to Chama rd. (U. S. 84), Rio Arriba County; by St. Hwy. Dept.

\$124,497—P. R. Burn, Box 1111, Las Cruces—Award for 1.4 mi. of roadway and a conc. bridge, vicinity of Las Cruces Dona Ana County; by St. Hwy. Dept.

\$214,374—Daniels & Glisson, Albuquerque—Award for 10.8 mi. of grading, draining, and ballast, SR 65, Corazon Hill to Variadero, San Miguel County; by St. Hwy. Dept.

\$204,629—Floyd Haake, 111 Lovato Lane, Santa Fe—Award for 7.2 mi. of grading, draining and surf., U. S. 285, Chamito to Ojo Caliente, Rio Arriba County; by St. Hwy. Dept.

\$3,000,000 (est.)—Kerr-McGee Co., Kerr-McGee Bldg., Oklahoma City, Okla.—Award for uranium ore processing plant, Shiprock; by AEC.

\$223,808—G. I. Martin, 520 Tulane Dr., S.E., Albuquerque—Award for 8.2 mi. of grading, draining and surf., N. M. 76, Chimayo to Truchas, Rio Arriba County; by St. Hwy. Dept.

\$138,145—G. I. Martin, 520 Tulane Dr., S.E., Albuquerque—Award for 10.6 mi. of surf., N. M. 400, U. S. 66 to McGaffey, McKinley County; by St. Hwy. Dept.

Oregon

\$2,186,915—American Bridge Co., U. S. National Bank Bldg., Portland—Award for superstructure, bridge crossing Columbia River betw. Umatilla and Paterson, Wash.; by Umatilla County.

\$676,305—Cascade Construction Co. and Austin Construction Co., 3920 Whitman, Seattle—Award for substructure and approaches for bridge crossing Columbia River betw. Umatilla and Paterson, Wash.; by Umatilla County.

\$185,611—J. N. Conley, 4332 N.E. Royal Ct., Portland—Low bid for 5.6 mi. of improvements in Amazon Creek channel in the vicinity of Eugene, Lane County; by C. of E.

\$339,100—Cosmo Gilo, Lowell—Low bid for 8.8 mi. of grading, Smith River rd.; by BPR.

\$132,370—Parker-Johnson Co., 2002 S.E. Clinton, Portland—Low bid for North Corvallis overcrossing, Pacific West hwy., Benton County; by St. Hwy. Dept.

Utah

- \$150,598—**L. T. Johnson**, 709 Wall Ave., Ogden—Low bid for 1.2 mi. of 2-in. road-mixed bitum. surf. and a 199½-ft. conc. bridge, Plain City to Hooper rd., Weber County; by St. Rd. Comm.
- \$122,708—**Olof Nelson Construction Co.**, 620 S. Main St., Logan—Low bid for 4.7 mi. of 2-in. road-mixed bitum. surf., Moroni South and West, Sanpete County; by St. Rd. Comm.
- \$173,746—**Waterfall Construction Co.**, 1685 Wall Ave., Ogden—Award for sidewalks, curbs and gutters, Bountiful; by City.
- \$336,325—**Whiting & Haymond**, 250 W. 2nd, North, Springville—Low bid for 2.2 mi. of 2½-in. road-mixed bitum. surf., U. S. 91, St. George to Washington, Washington County; by St. Rd. Comm.

Washington

- \$206,929—**Associated Sand & Gravel Co.**, 2508 Colby, Everett—Award for 3.7 mi. of asph. conc. paving on cement-treated base, P. S. H. No. 1, Broadway cutoff, Everett South, Snohomish County; by St. Hwy. Comm.
- \$242,903—**Barrow & Shaffer Construction Co.**, 415 Colby Bldg., Everett—Award for Union Slough bridge, P. S. H. No. 1, Snohomish County; by St. Hwy. Comm.
- \$343,819—**Fiorito Bros.**, 1100 Leary Way, Seattle—Award for 3 mi. of grading, asph. conc. paving, and cement conc. paving, P. S. H. No. 1, Chicken Coop Inn to Kalama River, Cowlitz County; by St. Hwy. Comm.
- \$148,250—**Ben C. Gerwick, Inc.**, 112 Market St., San Francisco, Calif.—Low bid for dredging lower navigation lock approach, McNary Dam; by C. of E.
- \$446,660—**Paul C. Helmick**, 7015 Riverton Hgts., Seattle—Award for Schedule 1, clearing Columbia River to Halford section, Chief Joseph-Snohomish 345-kv. transmission line; by BPA.
- \$237,232—**Lockyear & White, Inc.**, Box 687, Longview—Award for railroad overcrossing near Maytown, P. S. H. No. 1, Thurston County; by St. Hwy. Comm.
- \$163,332—**Materne Bros.**, W. 1204 Francis Ave., Spokane—Award for 8.3 mi. of surf., various hwy., Adams County; by St. Hwy. Comm.

\$139,685—**Milone & Tucci, Inc.**, 3215 South M St., Tacoma—Low bid for over 5 mi. of storm sewer construction, Vancouver; by City.

\$182,540—**Morrison-Knudsen Co., Inc.**, 603 Hoge Bldg., Seattle—Award for first unit of Aurora Ave. grade separation, Broad and Mercer Sts., Seattle; by City.

\$1,321,555—**Odegard Construction Co.**, 2417 Hewitt Ave., Everett—Low bid for fuel storage and handling facilities, U. S. Naval Supply Depot, Manchester; by U. S. Navy.

\$409,613—**Pacific Sand & Gravel Co.**, Box 628, Centralia—Award for 3.6 mi. of asph. conc. paving on cement-treated base, P. S. H. No. 1, National Ave. to Borst Park, Lewis County; by St. Hwy. Comm.

\$392,974—**Alton V. Phillips**, 4055 21st Ave. West, Seattle—Award for structural steel and conc. bridge and approaches, Nooksack River crossing on S. S. H. No. 1-A, Whatcom County; by St. Hwy. Comm.

\$151,843—**Thomas Scalzo Co.**, 3211 Airport Way, Seattle—Award for 1.7 mi. of grading, surf., and a conc. undercrossing, P. S. H. No. 1, Hickox Rd. to Blackburn St., in Mt. Vernon, Skagit County; by St. Hwy. Comm.

\$1,278,895—**Sound Construction & Engineering Co.**, 1300 Aloha St., Seattle—Low bid for Phase 2, construction and completion of consolidated transportation center, Hanford Works; by AEC.

\$429,075—**Urban Plumbing & Heating Co.**, 103 S. 26th St., Tacoma—Award for extension of steam facilities, Fairchild Air Force Base; by C. of E.

\$258,140—**Washington Utilities Construction Co.**, 5235 So. Tacoma Way, Tacoma—Award for Schedule 2, clearing Columbia River to Halford section, Chief Joseph-Snohomish 345-kv. transmission line; by BPA.

\$490,285—**Otis Williams Co.**, Kennewick—Low bid for 23 mi. of unlined canals, 8 mi. north of Corfu, Columbia Basin Project; by USBR.

Wyoming

\$266,636—**Peter Kiewit Sons' Co.**, Box 875, Sheridan—Low bid for 4 mi. of grading and surf., Norris-Canyon cutoff, Yellowstone National Park; by BPR.

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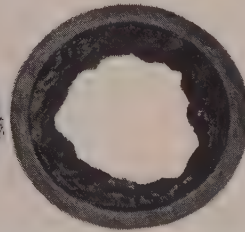
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Prevents leakage

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Reduces pumping costs



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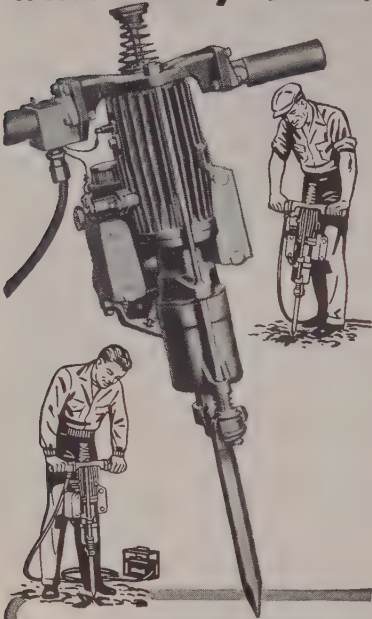
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UNIT BID PRICES

Selected abstracts for Western projects

Dam

Cherry Valley Dam embankment

California—Cherry River Project—City and County of San Francisco. Guy F. Atkinson Co., South San Francisco, was awarded a contract by the Hetch Hetchy Water Supply of the City and County of San Francisco on the basis of a low bid of \$7,167,800 for Alternate scheme "C" construction of the embankment for Cherry Valley Dam. The project was offered to prospective bidders on three basic proposals. Alternate scheme "A" included construction of the dam to elev. 4,640 ft. and construction of a temporary spillway; Alternate "B", construction of the dam to elev. 4,715 ft. excluding the spillway and permanent roadway excavation; Alternate "C", construction of the dam to elev. 4,715 ft. including the spillway and permanent roadway excavation. Atkinson was also low with \$6,489,400 and \$7,044,800 for Alternates "A" and "B", respectively. On Alternate scheme "C" height of the dam will total 320 ft. above the lowest foundation and it will be approximately 2,600 ft. long at its crest. Location will be on Cherry Creek, a tributary of Cherry River, which flows into the Tuolumne just downstream from the existing Hetch Hetchy aqueduct power tunnel intake. An extensive design preview of this project was published in WESTERN CONSTRUCTION, March 1952, pp. 86-87. Unit prices were as follows:

	Alternate Scheme "A"	Alternate Scheme "B"	Alternate Scheme "C"
(1) Guy F. Atkinson Co.	\$6,489,400	\$7,044,800	\$7,162,800
(2) Winston Bros. Co. and Al. Johnson Construction Co.	7,643,100	8,407,500	8,567,500
(3) T. E. Connolly, Inc., and Wunderlich Contracting Co.	7,394,000	8,531,000	8,581,000
(4) Utah Construction Co. and Western Contracting Corp.	7,646,019	8,634,350	8,707,780
(5) The Arundel Corp., L. E. Dixon Co., D. & H. Construction Co. and Hunkin-Conkey Construction Co.	7,892,500	9,209,200	9,265,000
— Macco Corp., Morrison-Knudsen Co., Inc., and River Construction Co.	8,298,200	9,479,400	9,669,400
— Mitty Construction Co.	8,378,500	9,614,000	9,954,000
(6) Engineer's estimate	7,296,800	7,967,500	8,117,500

ALTERNATE SCHEME "A"

	(1)	(2)	(3)	(4)	(5)	(6)
2,300 sq. ft. foundation preparation	10.00	20.00	10.00	35.08	17.00	1.00
4,000 cu. ft. slushing	6.50	5.00	4.00	8.77	13.00	3.00
16,000 cu. yd. excavation, spillway	3.00	3.00	.50	1.84	3.15	2.50
3,100,000 cu. yd. excavation, borrow areas A and D	.20	.20	.20	.20	.20	.20
3,000,000 cu. yd. excavation, quarry rock	.50	.50	.50	.50	.50	.50
2,400,000 cu. yd. embankment, Zones 1 and 2	.43	.45	.52	.59	.66	.33
160,000 cu. yd. embankment, Zone 3	.94	.80	.67	1.25	1.15	2.00
240,000 cu. yd. embankment, Zone 4	1.30	1.19	.67	.90	2.65	1.50
3,100,000 cu. yd. embankment, Zones 5 and 6	.842	1.19	1.09	1.04	1.00	1.10
2,500 hr. hand tamping	8.00	6.00	4.00	14.03	7.00	5.00
4,000 lin. ft. fence	.70	1.00	.50	.81	.50	2.00
250 acre clearing	300.00	550.00	1,000	866.00	150.00	600.00
50,000 dollars allowance for road maintenance	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000
20,000 dollars allowance for control of seepage and miscellaneous excavation	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000

ALTERNATE SCHEME "B"

	(1)	(2)	(3)	(4)	(5)	(6)
2,500 sq. ft. foundation preparation	10.00	20.00	10.00	34.00	17.00	1.00
6,000 cu. ft. slushing	6.10	5.00	4.00	8.60	13.00	3.00
No Item 3 in this Alternate						
3,900,000 cu. yd. excavation, borrow Areas A and D	.20	.20	.20	.20	.20	.20
3,400,000 cu. yd. excavation, quarry rock	.50	.50	.50	.50	.50	.50
3,000,000 cu. yd. embankment, Zones 1 and 2	.40	.43	.52	.55	.60	.30
240,000 cu. yd. embankment, Zone 3	.91	.80	.67	1.20	1.50	1.75
360,000 cu. yd. embankment, Zone 4	1.15	1.10	.67	.88	2.55	1.40
3,400,000 cu. yd. embankment, Zones 5 and 6	.735	1.10	1.09	1.01	1.00	1.00
3,000 hr. hand tamping	8.00	6.00	4.00	13.75	7.00	5.00
4,000 lin. ft. fence	.70	1.00	.50	.80	.55	2.00

Continued on page 122

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UNIT BID PRICES . . . CONTINUED

	(1)	(2)	(3)	(4)	(5)	(6)
250 acre clearing	300.00	550.00	\$1,000	858.00	150.00	600.00
50,000 dollars allowance for road maintenance	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000
20,000 dollars allowance for control of seepage and miscellaneous excavation	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000

ALTERNATE SCHEME "C"

	(1)	(2)	(3)	(4)	(5)	(6)
2,500 sq. ft. foundation preparation	9.60	20.00	10.00	34.00	17.00	1.00
6,000 cu. ft. slushing	6.10	5.00	4.00	8.25	13.00	3.00
100,000 cu. yd. excavation, spillway	2.20	3.00	1.00	1.80	1.98	2.00
3,900,000 cu. yd. excavation, borrow Areas A and D	.20	.20	.20	.20	.20	.20
3,300,000 cu. yd. excavation, quarry rock	.50	.50	.50	.50	.50	.50
3,000,000 cu. yd. embankment, Zones 1 and 2	.40	.40	.52	.55	.60	.30
240,000 cu. yd. embankment, Zone 3	.91	.80	.67	1.20	1.25	1.75
360,000 cu. yd. embankment, Zone 4	1.15	1.10	.67	.88	2.65	1.40
3,400,000 cu. yd. embankment, Zones 5 and 6	.72	1.10	1.09	1.00	.98	1.00
3,000 hr. hand tamping	8.00	6.00	4.00	13.80	7.00	5.00
4,000 lin. ft. fence	.70	1.00	.50	.77	.50	2.00
250 acre clearing	300.00	550.00	\$1,000	776.00	150.00	600.00
50,000 dollars allowance for road maintenance	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000
20,000 dollars allowance for control of seepage and miscellaneous excavation	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000

Streets and Highways

41 miles on Alaska's Richardson Highway

Alaska—Richardson Highway Project—Alaska Road Commission. Morrison-Knudsen Co., Inc., Anchorage, was awarded a contract by the Alaska Road Commission on the basis of a low bid of \$2,543,757 for 41 miles of grading, draining and riprap on Section D of the Richardson Highway. Work also involves construction of two concrete and steel bridges. Unit prices were as follows:

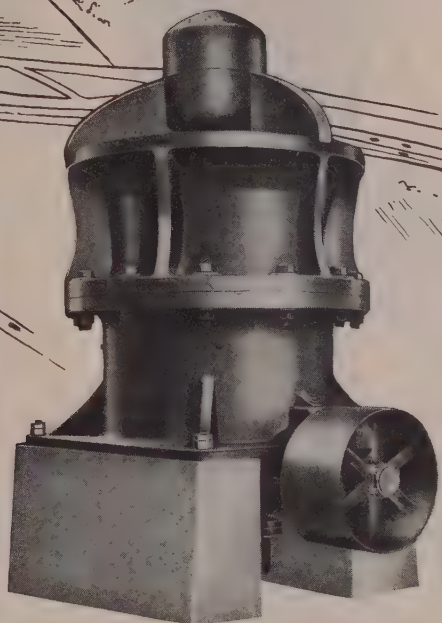
(1) Morrison-Knudsen Co., Inc.	\$2,543,757	(5) William A. Smith Contracting Co., Inc. and Brown & Root, Inc.	\$3,333,627
(2) Rogers Construction Co. and Babler Bros.	2,609,083	— J. A. Jones Construction Co.	3,387,652
(3) McLaughlin, Inc.	2,661,984	— Yett & Conley	3,409,850
(4) Lytle-Green-Birch	2,917,782	(6) Engineer's estimate	2,662,473

	(1)	(2)	(3)	(4)	(5)	(6)
Lump sum, miscellaneous force account work	\$15,000	\$15,000	\$15,000	\$15,000	\$15,000	\$15,000
13 acre clearing and grubbing	300.00	390.00	500.00	900.00	500.00	400.00
407,000 cu. yd. unclass. excav., Unit A	.80	.90	.85	1.05	1.00	.80
116,000 cu. yd. unclass. excav., Unit B	1.40	1.40	2.00	2.75	2.20	1.60
59,000 cu. yd. channel excav.	1.20	1.50	1.30	.50	1.00	.80
2,800 cu. yd. unclass. excav. for structs.	6.00	6.00	7.00	6.00	7.50	6.00
48,000 cu. yd. unclass. excav. for structs.	1.50	1.50	1.30	.62	1.00	1.70
1,200,000 cu. yd. unclass. excav. for borrow	.60	.75	.75	.90	1.05	.75
4,200 cu. yd. unclass. excav. (loose rock) for borrow	2.00	1.00	1.50	1.10	2.00	1.00
608,000 sta. yd. overhaul (1000-ft. free haul)	.04	.02	.04	.03	.03	.03
67,000 cu. yd. mi. spec. overhaul of borrow (1000-ft. free haul)	.40	.25	.40	.25	.25	.30
5,000 M. gal. watering	3.00	1.00	1.50	2.50	2.00	2.50
Lump sum, providing and maint. water pl. or pits	\$4,000	\$15,000	\$5,000	\$4,000	\$10,000	\$2,500
24 acre pit clearing	300.00	500.00	200.00	500.00	250.00	200.00
46,000 cu. yd. pit stripping	5.00	4.00	35	40	45	35
106 lin. ft. 18-in. corr. galv. S.M. culvert pipe	8.00	5.00	6.00	8.00	8.00	7.00
56 lin. ft. 21-in. corr. galv. S.M. culvert pipe	9.00	6.00	9.00	9.00	8.50	8.50
7,400 lin. ft. 24-in. corr. galv. S.M. culvert pipe	11.00	8.00	9.00	10.00	11.00	10.00
162 lin. ft. 30-in. corr. galv. S.M. culvert pipe	14.00	9.00	12.00	12.00	15.00	12.00
730 lin. ft. 36-in. corr. galv. S.M. culvert pipe	23.00	15.00	20.00	17.50	19.00	20.00
128 lin. ft. 48-in. corr. galv. S.M. culvert pipe	35.00	20.00	30.00	27.00	28.00	30.00
142 lin. ft. 60-in. corr. galv. S.M. culvert pipe	60.00	30.00	47.00	40.00	40.00	40.00
68 lin. ft. 72-in. corr. galv. S.M. culvert pipe	80.00	35.00	60.00	50.00	60.00	55.00
350 lin. ft. remove, clean and sktple. salvaged culv. pipe	6.00	4.00	5.00	4.50	4.50	5.50
40 lin. ft. remove, clean and relay salvaged culv. pipe	8.00	7.00	7.00	20.00	10.00	10.00
3,000 lin. ft. removal of pipe culverts	2.00	2.00	3.00	2.00	4.50	3.00
24 lin. ft. 30-in. x 19½-in. corr. galv. S.M. nestable culv. pipe arch	14.00	10.00	10.00	14.00	15.00	15.00
330 lin. ft. 72-in. x 44-in. corr. galv. S.M. culvert pipe arch	60.00	35.00	55.00	45.00	50.00	40.00
1 ea. 72-in. x 44-in. galv. S.M. pipe end sect.	760.00	600.00	500.00	500.00	500.00	350.00
70,000 cu. yd. loose riprap (quarry rock)	5.50	4.75	3.60	3.80	7.50	5.50
3,400 cu. yd. loose riprap (loose rock)	2.50	4.00	3.60	2.00	6.50	1.50
Lump sum, removal and disposal of exist. wood bridges and culverts	\$6,000	\$10,000	\$20,000	\$19,000		\$7,000
3,000 hr. rolling	12.00	10.00	13.00	11.00	14.00	12.00
15,000 ea. meals served ARC employees	1.50	1.50	1.50	1.50	1.50	1.50
5,000 ea. lodging furn. ARC employees	1.25	1.25	1.25	1.25	1.25	1.25

BRIDGE ITEMS

678 cu. yd. foundation excavation	11.40	20.00	30.00	13.50	16.00	20.00
899.0 cu. yd. concrete, Class A	190.00	150.00	180.00	195.00	180.00	170.00
206.8 cu. yd. concrete, Class B	185.00	140.00	180.00	185.00	85.00	150.00
584.0 sq. yd. concrete grout, dike facing	40.50	12.00	20.00	14.00	9.00	40.00
91,828 lb. structural steel (old) hauled & erected	.15	.30	.15	.15	.10	.20
120,070 lb. structural steel (new) furn. & erected	.38	.45	.40	.50	.45	.35
97,637 lb. rein. steel, int. gr., furn. and installed	.24	.29	.30	.30	.25	.25
7,011 lin. ft. rail piles, 2 rail, hauled, fabr. and driven	6.70	7.00	8.00	7.00	9.00	8.00
25 ea. pile splices	125.00	75.00	70.00	95.00	16.00	30.00
5,409 lb. hardware, galv., furn. and installed	.50	.60	1.00	1.10	1.00	1.00
36,380 M.B.M. cresosted lumber, furn. and installed	695.00	475.00	700.00	550.00	600.00	600.00
.571 M.B.M. untr. lumber, furn. and installed	500.00	475.00	400.00	450.00	400.00	600.00
14 ea. pile base fabrication	72.00	150.00	100.00	30.00	10.00	20.00
1,233 lin. ft. grouted rock scour wall, 2-ft. width	26.00	12.00	16.00	8.00	15.00	20.00

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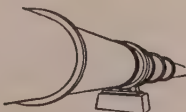
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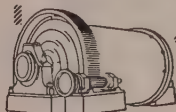
Primary Gyratory Crushers



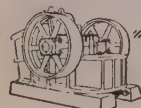
Rotary Kilns



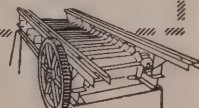
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UNIT BID PRICES... CONTINUED

Grading, gravel surfacing and road mix oiling in Montana

Montana—Lake County—State. F & S Contracting Co., Butte, submitted a low bid of \$271,328 before the State Highway Commission for 3.8 mi. of grading, gravel surfacing, road mix oiling and draining on the Arlee-Ravalli highway. Unit prices were as follows:

(1) F & S Contracting Co.	\$271,328	(4) S. Birch & Sons Construction Co.	\$340,759
(2) Miller & Strong, Inc.	310,464	(5) Glenn Geery, Inc.	345,779
(3) Peter Kiewit Sons' Co.	315,666	(6) Tirrell & Co.	349,721

	(1)	(2)	(3)	(4)	(5)	(6)
235,474 cu. yd. uncl. excav. and borrow	.55	.70	.44	.78	.84	.85
1,225 cu. yd. culvert excavation	1.50	2.00	2.00	3.50	3.25	2.00
7,747 mi. yd. overhaul	.20	.40	.19	.18	.27	.25
1,282 ton cr. gravel cover course	4.50	4.00	3.00	4.25	3.50	2.40
15,956 ton Type A top course st. ¾-in. gr.	1.00	1.10	1.35	1.10	.90	1.00
69,140 ton gravel base course	.80	.75	1.06	.77	.65	.70
67,714 gal. appl. MC-3 ARO for mix	.14	.17	.14	.16	.18	.17
14,651 gal. appl. MC-1 ARO for prime	.15	.17	.17	.17	.18	.16
25,638 gal. appl. MC-5 ARO for seal	.16	.17	.15	.17	.18	.18
3,786 mi. processing	\$1,200	900.00	\$1,600	\$1,200	\$1,000	900.00
1,644 sq. yd. processing	.40	.45	.35	.50	.40	.50
5,200 M. gal. watering	1.50	1.50	1.40	1.46	1.50	1.50
235 units rolling embankment	7.00	8.00	8.50	9.00	7.50	8.00
380 units rolling surface course	7.00	8.00	6.50	8.00	7.00	8.00
7,304 cu. yd. Type B random riprap	1.75	2.00	7.50	2.50	3.75	3.50
2,225 cu. yd. subballast	1.00	.75	2.15	1.00	.75	.80
420 lin. ft. reinf. conc. P. cul. 15-in. diam.	4.00	3.60	4.00	4.50	3.05	3.25
90 lin. ft. reinf. conc. P. cul. 18-in. diam.	5.00	4.60	5.00	5.50	3.70	4.75
556 lin. ft. reinf. conc. P. cul. 24-in. diam.	6.50	7.00	8.00	10.00	5.85	6.50
152 lin. ft. reinf. conc. P. cul. 30-in. diam.	9.00	9.00	10.00	13.00	7.94	8.00
122 lin. ft. reinf. conc. P. cul. 36-in. diam.	13.00	13.00	14.00	18.00	10.65	10.00
108 lin. ft. reinf. conc. P. cul. 24-in. diam., extra strength	7.50	7.00	8.00	10.50	6.29	7.50
92 lin. ft. corr. met. syphon P. 24-in. diam.	7.50	8.00	10.00	13.50	7.00	12.00
50 lin. ft. corr. met. asbestos-bonded-paved cul. P. 24-in. diam.	11.00	10.00	19.00	25.00	10.65	14.00
23.34 cu. yd. Class AD concrete	85.00	95.00	96.00	100.00	125.00	150.00
1,320 lb. reinforcing steel	.20	.20	.19	.25	.20	.30

23 miles of excavation and asphalt surfacing in Nevada

Nevada—White Pine County—State. Gibbons & Reed Co., Salt Lake City, Utah, was awarded a contract by the Department of Highways on the basis of a low bid of \$383,152 for 2.4 mi. of grading, draining, and asphalt surfacing. Work involves 218,165 cu. yd. of excavation. Unit prices were as follows:

(1) Gibbons & Reed Co.	\$383,152	(3) Isbell Construction Co.	\$435,904
(2) Wells Cargo, Inc.	412,713	(4) Dodge Construction Co., Inc.	444,444

	(1)	(2)	(3)	(4)
Lump sum, signs	800.00	500.00	500.00	\$1,000
218,165 cu. yd. roadway excavation	1.00	1.14	1.28	1.25
160 cu. yd. drainage excavation	5.00	2.50	3.50	1.25
99 sta. slope rounding	10.00	15.00	10.00	28.00
208,235 yd. sta. overhaul	.02	.02	.02	.02
2,781 yd. mi. overhaul	.20	.20	.20	.29
910 cu. yd. structure excavation	3.80	4.00	3.50	3.00
1,410 cu. yd. backfill	2.00	2.00	2.00	2.00
8,537 M. gal water	3.80	3.00	1.50	3.00
Lump sum, furnish water equipment	\$7,500	\$10,000	\$15,000	\$10,000
135 hr. power roller	8.00	6.00	10.00	10.00
11,632 ft. hr. tamping roller	.75	.30	.60	.60
18,356 ton Type 1 gravel base	.56	.60	.65	.80
9,780 ton Type 2 gravel base, one inch	1.15	1.00	1.35	1.50
79 ton liquid asph., Type MC-1 (Prime)	40.00	35.00	42.50	37.50
10 ton sand blotter	3.00	2.50	5.00	5.00
48 ton emulsified asphalt (seal)	44.00	40.00	45.00	40.00
307 ton screenings	4.00	4.00	5.00	4.00
370 ton asphalt cement, 120-150 pen.	36.00	35.00	34.50	34.00
6,712 ton Class F-2 plantmix surface	3.30	5.00	3.75	4.00
22 cu. yd. special Class A concrete	80.00	100.00	100.00	125.00
440 lb. reinforcing steel	.25	.25	.16	.20
1,744 lin. ft. 24-in. corrugated metal pipe	6.50	5.75	6.00	5.75
110 lin. ft. 30-in. corrugated metal pipe	7.50	6.50	7.00	6.75
214 lin. ft. 30-in. corrugated metal pipe (12 gauge)	9.70	8.50	9.00	9.00
146 lin. ft. 36-in. corrugated metal pipe	12.00	10.00	11.00	11.50
270 lin. ft. 48-in. corrugated metal pipe (8 gauge)	24.00	20.00	23.00	25.00
1,600 lin. ft. beam type guard rail (Type A)	3.80	4.00	4.00	4.00
94 ea culvert markers and guide posts	7.00	7.00	6.00	7.50

Construction of approaches to an Idaho bridge

Idaho—Lewis and Clearwater Counties—State. Sather & Sons, Yardley, Wash., was awarded a contract by the Department of Highways on the basis of a low bid of \$129,694 for the roadway and bituminous surfacing on 0.3 mi. of State No. 11 and on 0.5 miles of State No. 9. This work is construction of the approaches to Greer Bridge. Unit bids submitted were as follows:

(1) Sather & Sons	\$129,694	(2) Clifton & Applegate	\$134,468
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	(1)	(2)
64,500 cu. yd. unclassified excavation	.75	.85
475 cu. yd. excav. for structures	3.00	3.50
7,800 yd. mi. haul	.30	.25
880 M. gal. watering embankments	1.50	2.00
220 M. gal. watering base and surface course	2.00	2.00
10 days rolling power roller	50.00	60.00
55 days rolling tamping roller	20.00	50.00
340 cu. yd. mechanical tamping	2.00	2.00
14,800 ton cr. grav. surf. course ¾-in. max.	1.95	1.65
2,050 ton cr. grav. in windrows ¾-in. max.	1.95	1.65
5,000 ton cr. grav. in stklp. ¾-in. max.	1.60	1.50
118 bbl. MC-1 asph. rd. matl. for prime	10.30	10.00
80 ton blotter matl. Class "B"	6.75	3.00

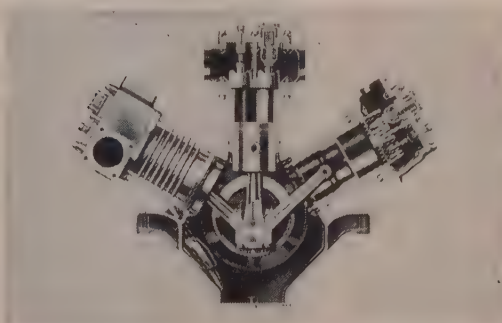
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How long since you checked your compressor's fuel consumption?

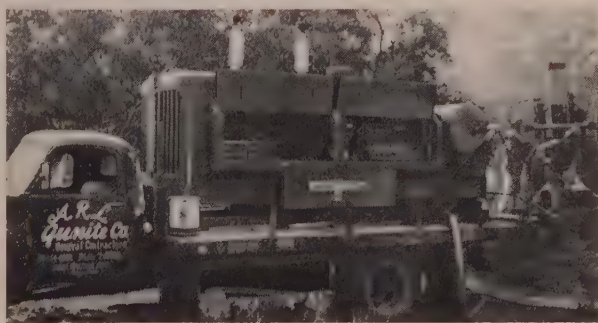
These figures will show you how Worthington Blue Brutes may save you as much as 1500 gallons of fuel during an average operating year

COMPRESSOR SIZE	ENGINE TYPE	GALLONS OF FUEL PER HOUR AT 80 PSI	GALLONS OF FUEL PER HOUR AT 100 PSI
60'	GASOLINE	1.31	1.42
105'	GASOLINE	2.16	2.35
	DIESEL	1.66	1.73
160'	GASOLINE	3.18	3.44
	DIESEL	2.45	2.60
210'	GASOLINE	4.32	4.70
	DIESEL	2.89	3.06
315'	GASOLINE	6.25	6.75
	DIESEL	4.38	4.64
600'	DIESEL	6.30	9.20

HOW DOES YOUR COMPRESSOR STACK UP in comparison with the Blue Brute for fuel economy? The figures shown have been determined under normal field operating conditions.



"SURE ARE EASY TO SERVICE." That's what we hear about Blue Brutes from mechanics all over the country. No special tools or complicated disassembly procedures are needed. And compressor uses same oil as engine.



PLENTY OF RESERVE HORSEPOWER is standard with the Blue Brutes. It takes thousands of hours of normal operation before engine wear affects the compressor's output. This means you get full-rated output even though the engine hasn't been in the shop for a long time.

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UNIT BID PRICES ... CONTINUED

	(1)	(2)
755 bbl. SS-1 asph. rd. matl. for roadmix	10.50	10.00
0.943 mi. mix finish and roll Class "B"	\$1,800	\$3,500
132 bbl. MC-5 asph. rd. matl. for seal	10.30	10.00
250 ton cover coat matl. Class "2"	6.75	9.5
6.7 cu. yd. concrete Class "A"	100.00	115.00
400 lb. metal reinforcement	.20	.1
80 lb. ft. 12-in. pipe culverts	3.00	2.8
500 lin. ft. 18-in. pipe culverts	4.50	4.7
280 lin. ft. 36-in. CMP (10 gauge)	14.00	16.00
90 cu. yd. hand placed riprap	15.00	15.00
1,750 lin. ft. comb. conc. curb and gutter Type A	3.00	3.00
175 lin. ft. steel beam type guard rail	4.00	4.00
30 ea. guide posts Type "4"	10.00	9.00
230 sq. yd. concrete sidewalk	3.00	5.2
8 ea. 12-ft. bit. driveway Type "A-1"	50.00	50.00
600 lin. ft. remove plank sidewalk	.40	.1
100 lin. ft. 6-in. helical CMP	2.00	2.5
300 lin. ft. 3/4-in. galvanized iron pipe	2.00	.7
20 lin. ft. 8-in. cast iron pipe	5.00	5.7
200 lin. ft. 6-in. concrete sewer pipe	2.50	1.4
140 lin. ft. 8-in. concrete sewer pipe	3.00	2.4

2 1/2-in. road-mixed bituminous surfacing

Utah—Sevier County—State. Whiting & Haymond, Contractors, Springville, submitted a low bid of \$177,003 before the State Road Commission for road construction from Salina Canyon Forest boundry easterly to a tunnel totaling a distance of 6.6 mi. Unit prices were as follows:

(1) Whiting & Haymond, Contractors.....	\$177,003	(5) Young & Smith Construction Co.....	\$220,030
(2) L. A. Young Construction Co.....	188,714	— J. M. Sumson & Sons	221,580
(3) W. W. Clyde & Co.	216,544	— Olof Nelson Construction Co.....	243,570
(4) Thorn Construction Co., Inc.	218,403	(6) Engineer's estimate	208,710

	(1)	(2)	(3)	(4)	(5)	(6)
182,000 gal. bituminous material, Type MC-3.....	.15	.16	.14	.16	.16	.1
35,000 gal. bituminous matl., Type MC-1 or MC-2	.1525	.165	.14	.16	.16	.1
11,000 gal. bituminous material, Type RC-1.....	.155	.15	.14	.17	.165	.1
6.583 mile scarifying and mixing	700.00	800.00	800.00	800.00	800.00	800.00
38,000 ton gravel surface, Type "A"	.75	.70	.72	.90	.70	.7
5,000 ton gravel surface, Type "A" stockpiled.....	.65	.70	.60	.80	.60	.7
1,500 ton cover material, Type "A" in stockpile.....	2.00	2.00	2.50	3.00	2.00	2.2
34,000 ton gravel base course	.65	.65	.80	.60	.65	.7
105,000 cu. yd. unclass. roadway excrav.	.42	.52	.80	.60	.80	.7
9,300 cu. yd. imported borrow	.30	.40	.40	.40	.30	.3
372,000 sta. yd. Class "A" overhaul	.015	.015	.015	.02	.02	.0
11,500 yd. mi. Class "B" overhaul	.18	.15	.15	.15	.20	.1
1,980 1,000-gal. watering	1.50	1.00	1.25	2.00	1.00	1.5
690 hr. rolling, tamping roller	8.50	5.00	10.00	10.00	10.00	10.00
200 hr. rolling, pneumatic tire or power roller.....	7.00	6.00	7.50	10.00	10.00	8.00
60 lin. ft. 18-in. corr. metal pipe	4.00	5.00	3.75	4.50	5.00	3.3
273 lin. ft. 24-in. corr. metal pipe	6.00	6.00	5.70	6.00	6.00	5.2
194 lin. ft. 36-in. corr. metal pipe	10.00	10.00	11.40	13.00	11.00	10.00
64 lin. ft. 48-in. corr. metal pipe	15.00	20.00	15.40	18.00	15.00	13.7
60 lin. ft. 12-in. underdrains (C.M. perforated)	3.00	4.00	3.00	3.50	3.00	2.4
1 ea. 48-in. metal end sect. for C.M. pipe.....	175.00	200.00	200.00	200.00	200.00	180.00
500 cu. yd. excav. for struts, unclass.	2.50	2.00	2.00	2.00	2.00	2.0
100 cu. yd. small ditch excavation	1.00	1.00	1.50	1.00	1.00	.6
50 hr. mechanical tamping	6.00	6.00	7.00	6.00	6.00	10.00

2 mi. of grading, draining, base course surfacing and oil treatment

Wyoming—Converse County—State. Taggart Construction Co., Cody, was awarded a contract by the Wyoming Highway Department on the basis of a low bid of \$88,936 for grading, draining, base course surfacing, oil treatment by the road mix method and miscellaneous work on 2.0 mi. of the Douglas-Glenrock road. Unit prices were as follows:

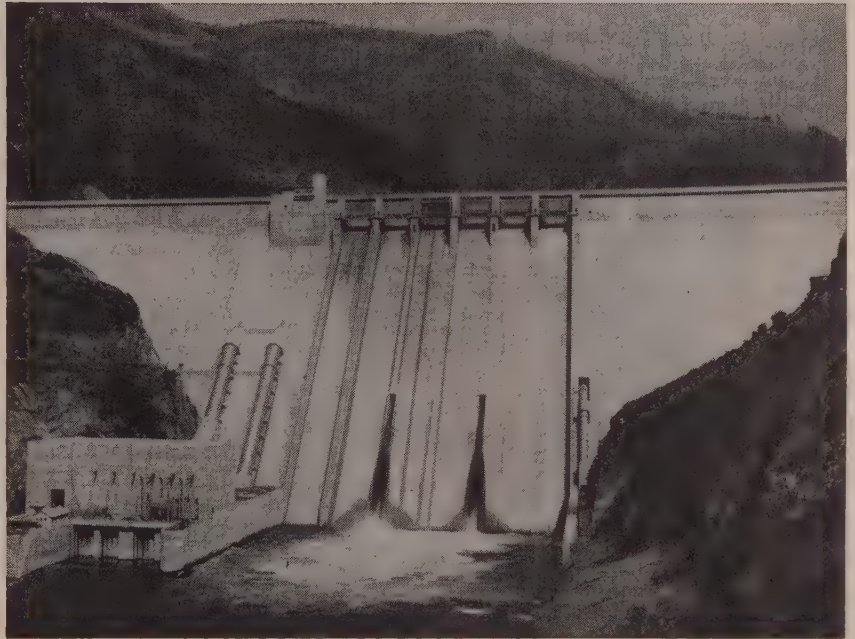
(1) Taggart Construction Co.....	\$88,936	(5) Wyoming Improvement Co.....	\$121,430
(2) Knisely-Moore Co.	104,781	— Teton Construction Co.	129,490
(3) Lichty Construction Co.	110,796	(6) Engineer's estimate	113,120
(4) Big Horn Construction Co.....	115,644		

	(1)	(2)	(3)	(4)	(5)	(6)
107,000 cu. yd. excavation	.18	.23	.25	.24	.38	.2
206,000 cu. yd. sta. overhaul	.01	.01	.01	.01	.01	.0
28,000 cu. yd. mi. haul	.08	.19	.165	.20	.15	.1
17,900 cu. yd. excav. (selected embankment).....	.345	.35	.42	.50	.33	.4
13,300 ton selected matl. surfacing—Type I.....	.31	.40	.55	.50	.62	.5
14,000 ton cr. gravel base crse. (1-in. max.)	.60	.65	.68	.90	.67	.7
4,800 ton cr. gravel surfacing	.60	.65	.70	1.00	.75	.8
450 ton cr. gravel surfacing (shldr. treatment)	3.00	3.00	2.80	3.00	2.50	4.0
450 ton cr. sand-gravel seal coat (1/2-in. max.)	4.00	3.00	3.00	4.00	2.50	4.0
36,000 ton mi. haul of surfacing matl.	.08	.14	.135	.10	.12	.1
205 ton asphaltic material MC-3	28.00	30.00	27.00	30.00	29.00	35.00
80 ton asphaltic material MC-Prime	28.00	31.00	32.00	30.00	29.00	37.00
40 ton asphaltic material RC-Seal	30.00	32.00	32.00	34.00	30.00	38.00
35 ton asphaltic material MC-Shldr. Treat.....	30.00	35.00	32.00	30.00	31.00	40.00
375 hr. sheepfoot roller operation	12.00	11.00	14.00	10.00	12.00	12.00
40 hr. equipment roller operation	11.00	14.00	16.00	15.00	15.00	14.00
80 hr. pneumatic tired roller operation	6.50	7.50	7.00	7.00	7.00	7.0
120 hr. roller operation	7.00	8.00	7.00	8.00	8.00	8.0
47,000 sq. yd. processing	.12	.10	.11	.10	.08	.0
1,900 M. gal. watering (embankment)	1.50	2.00	2.00	2.00	2.00	2.0
280 M. gal watering (base)	1.50	2.75	2.00	3.00	2.50	2.0
342 lin. ft. 18-in. C.M.P.	4.00	4.50	4.75	5.00	4.15	4.0
100 lin. ft. 24-in. C.M.P.	6.00	6.50	7.65	7.00	6.90	6.0
220 lin. ft. 30-in. C.M.P.	7.00	9.50	10.15	10.00	9.25	10.00
60 cu. yd. excav. for pipe culverts	3.00	2.00	2.00	3.00	2.00	2.5
50 hr. mechanical tamping	6.00	8.00	8.00	6.00	6.00	5.0
700 lin. ft. 6-in. drain tile	2.00	2.75	1.30	1.00	1.50	3.0
175 cu. yd. gravel for drains	2.00	5.00	2.50	6.00	2.50	2.5
175 cu. yd. excav. for drains	2.00	2.00	.90	3.00	2.00	2.5
135 cu. yd. structure excavation	2.00	1.00	3.00	3.00	2.50	3.0
120 cu. yd. grouted riprap	12.00	15.00	20.00	25.00	25.00	25.00
25 cu. yd. Class 1 riprap	10.00	10.00	20.00	17.00	20.00	15.00

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PERMANENTE CEMENT is specially prepared to meet Western construction problems. Thirteen types of standard and special purpose cements are available in stock, for immediate shipment, to meet every category of concrete specifications. In addition, the Company maintains well equipped laboratories and an engineering staff of specialists who carry on constant research for improvements in the manufacture and uses of cement.

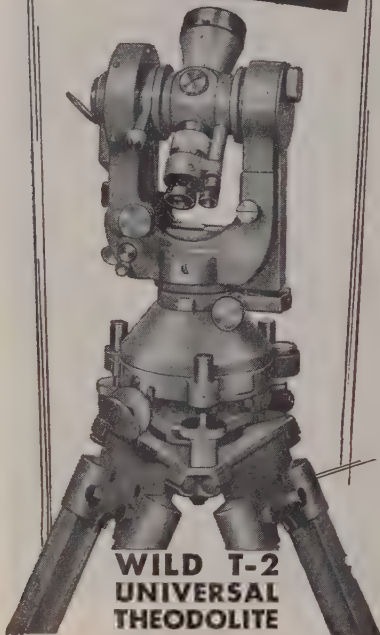
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NEW LITERATURE

1001

The Swedish method of mining and tunneling

A highly informative 18-page brochure published by Atlas Diesel describes in detail the modern rock drilling technique known as the Swedish method. Descriptive text, photographs and drawings tell you why the Swedish method has become widely accepted throughout the world. This Scandinavian firm inaugurated this technique which is based upon the use of the lightweight jack-type Atlas Diesel rock drills and the Sandvik Coromant hard metal tipped steels. Each product is described and illustrated and specification charts are supplied for such items as the rock drills type RH, pneumatic pushers, Sandvik Coromant drill steels, loaders, and couplings. This 2-color literature should be valuable to all concerned with drilling and tunneling.

1002

Information on hydraulic power control units

Information offered by Be-Ge Manufacturing Co. covers its line of hydraulic power control units, including both single and double valve units; pumps and valves used in these units; single, dual and triple valve units for rear mount only; Models U-600 remote control valve groups, Model 1200-B control valve groups for split installations, and Model HP-4 hydraulic hand pump. This colorful 16-page booklet gives you illustrations and specifications for these items and tells how they can be best applied. Also includes a lubrication chart.

1003

All about Thor electric tools

A new catalog (No. 39-A) for the users of electric tools gives complete illustrations, descriptions, specifications, and prices of Thor Power Tool Co.'s line of universal electric industrial and automotive tools, including drills, grinders, hammers, saws, screw drivers, nut setters, sanders, polishers, tappers, nibblers, balancers, impact wrenches, as well as automotive valve refacers, valve seat grinders, body and fender air hammers and air impact wrenches.

1004

Conveyor belt idlers for every need

Book No. 2416 pictures, describes and provides specifications for more than 500 belt conveyor idlers in 34 types which are designed to meet practically every requirement. The

48-page booklet covers light, medium and heavy-duty 20-deg. troughing idlers, two styles of 45-deg. idlers, flat belt, belt training, rubber cushion and the new Link-Belt variable troughing idlers, together with return belt idlers and such accessories as idler stands, grease pipe extensions and a grease seal and bearing extractor. Detailed information is provided for selection and spacing, based on weight and lump size of material to be conveyed. Schematic drawings and dimensional data are included for each type of idler. This literature has been released by Link-Belt Co.

1005

Catalog on arc welding machines

Over 20 different models of arc welding machines are fully described in a new catalog offered by Air Reduction. AC, DC and inert-gas models are illustrated with complete descriptions covering specifications, features and electrical data. This 44-page publication also contains sections on the accessories and electrodes required to perform a particular job, and various types of running gear, foot controls and an automatic arc welding head. Here are some of Airco's complete line of arc welders which are included: DC motor-generator and engine-driven sets, DC selenium rectifiers, AC machines specifically developed for Heliwelding applications and a wide range of AC transformer welders.

1006

Concerns Miller scrapers

Consolidated Distributors, Inc. of Colorado is offering literature on Models E and B of the Miller Rotary Scraper. Colored illustrations and specification charts for each model are included.

1007

How to pick right electrodes for the job

An up-to-date 50-page pocket guide (Catalog 1318) offered by Air Reduction Pacific tells you how to select the right electrode for the particular job at hand. Conveniently divided by thumb tab index, over 30 different electrodes are treated by type: general, mild steel, high tensile steels, low hydrogen weld metal, stainless steels, surfacing, non-ferrous, and cast iron. Includes data on mechanical properties and testing of electrodes, AWS-ASTM specifications, and two large folded comparison charts, one on stainless steel electrodes and the other on mild steel and alloy electrodes.

Literature briefs . . .

1008
PACKINGS—United States Rubber Co. is offering a comprehensive 112-page booklet on the proper installation and care of packings. Also contains metric engineering tables, conversion charts for both centigrade and Fahrenheit temperatures, information on maintenance for rod and plunger packings and gaskets, a complete chart on the chemical resistance of gasket materials as well as tables on melting points and specific gravity of various materials, and a handy 4-page index.

1009
PNEUMATIC TIRE ROLLERS—The complete story of Bros pneumatic tire rollers featuring improved king pin design is contained in a 4-page illustrated booklet issued by William Bros Boiler & Manufacturing Co.

1010
LEVELS AND TRANSITS—Union Mercantile Co., Inc., has issued three new booklets presenting photographs and specifications of the UMECO 18-in. dump level, the UMECO 11-in. builder's level and the 5¾-in. survey transit.

1011
WATER LINES—A state-by-state annual report for 1952 construction details on principal Dresser coupled steel water lines laid during that period has been issued by Dresser Manufacturing Div., Dresser Industries, Inc. Waterworks engineers and con-

tractors should find this up-to-date data on waterline construction methods and materials of value.

1012
BALLS, SOCKETS, SLINGS AND PENNANTS—Two bulletins by Atlas Rigging & Supply Co. describe the Howe overhaul ball and the open wedge socket, and the Atlas wire rope slings and wire rope pennants. Illustrations and specifications are included.

1013
WIRE ROPE FITTINGS—Users of wire rope fittings should be interested in this illustrated brochure by Sauerman Bros., Inc. Contains information about applications, blueprint drawings, tables and ordering, for open and double wedge sockets, pins and continuous cable clamps.

1014
DANGERS UNDER PRESSURE—All safety-minded individuals should be interested in this booklet by Hose Accessories Co. It tells hose users how to secure long, trouble-free service life out of both hose and hose couplings, and constantly emphasizes the necessary care in handling and selecting to avoid serious or fatal accidents.

1015
WOOD SCHOOLS—Engineering progress with wood in school building construction, now helping communities solve crowded classroom problems quickly and economically, is given detailed treatment in an illustrated bulletin issued by Timber En-

gineering Co. The text features an address by Harry W. Bolin at a recent wood symposium.

1016
HOISTS AND BODIES—In a 3-color, 8-page descriptive catalog St. Paul Hydraulic Hoist tells all about its line of heavy-duty dump bodies and hoists for on- and off-highway service.

1017
CUMMINS & EUCLID—Five Cummins diesels manufactured by Cummins Engine Co. and 17 standard models of Euclid equipment they power are described in a 16-page booklet by Euclid Road Machinery Co. Copies may be obtained from all Cummins dealers and Euclid distributors in the U. S. and Canada, a complete list of which is included in the publication.

1018
ELECTRODES—The Wear-Arc hard-facing electrodes and Wear-Flame hard-facing rods are the subject of a 12-page bulletin by Alloy Rods Co. Tells you how to use these products by extensive use of photographs and charts.

1019
STEPHENS-ADAMSON—A new bulletin by Stephens-Adamson Manufacturing Co. announces and describes the products handled by its new S-A Standard Products Division. Includes the firm's line of centrifugal loaders, car pullers, bin level controls, hoists and winches, speed reducers, conveyor belt cleaners, holdbacks and carriers.

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NEW EQUIPMENT

More information on any of the items in this section may be obtained by using coupon on page 129.

1020

Speedall front end loader ups results by use of torque converter

The Speedall Model 15 front end loader equipped with torque converter is reported to provide extra yardage, higher daily output, faster cycles, less breakage, and smoother operation. Use of the torque converter on this 1½-cu. yd. materials handling machine is what makes its operations more profitable. It takes care of the damaging



effects of shocks, jars and jolts, sees that the engine operates at maximum efficiency with full power for full loads and just enough power for light loads, and prevents the engine from stalling. Manufacturer is Pettibone-Mulliken Corp.

1021

Portable crushing and screening plant designed for use in gravel pits

Primarily designed for use in gravel pits is the new 56,350- to 58,550-lb. Model 35-S, a lightweight, in-line duplex crushing and screening plant. The in-line feature means that the basic flow of material is in line, longitudinally, with the axis of the plant, the material being fed into the rear and discharged at the front end. Though the plant is equipped with the largest units possible, it still complies with weight limitations, enabling it to be removed frequently and rapidly and pulled in and out of a pit without dismantling or removal of conveyors or other accessories.

This plant consists of a 1036 jaw crusher, a 3042 double roll crusher, a 2½-deck vibratory screen and the necessary



conveyors. All units are assembled on a welded steel truck frame which in turn is mounted on a rear equalizer and single front dolly with pneumatic tires. Manufacturer is Pioneer Engineering Works.

1022

"Snakes alive!"—brand new pants brush 'em off



The onslaught of rattler's teeth, as indicated in the accompanying photograph, at last has met an impregnable barrier in the form of a pair of snakeproof trousers. Made of heavy canvas with a detachable lining of rugged Monel-wire cloth, a light-weight flexible material (50 by 40 mesh), the trousers are said to provide nearly complete protection from the bite of any one of 250 varieties of snakes found in this country. Manufacturer is the Gokey Co.

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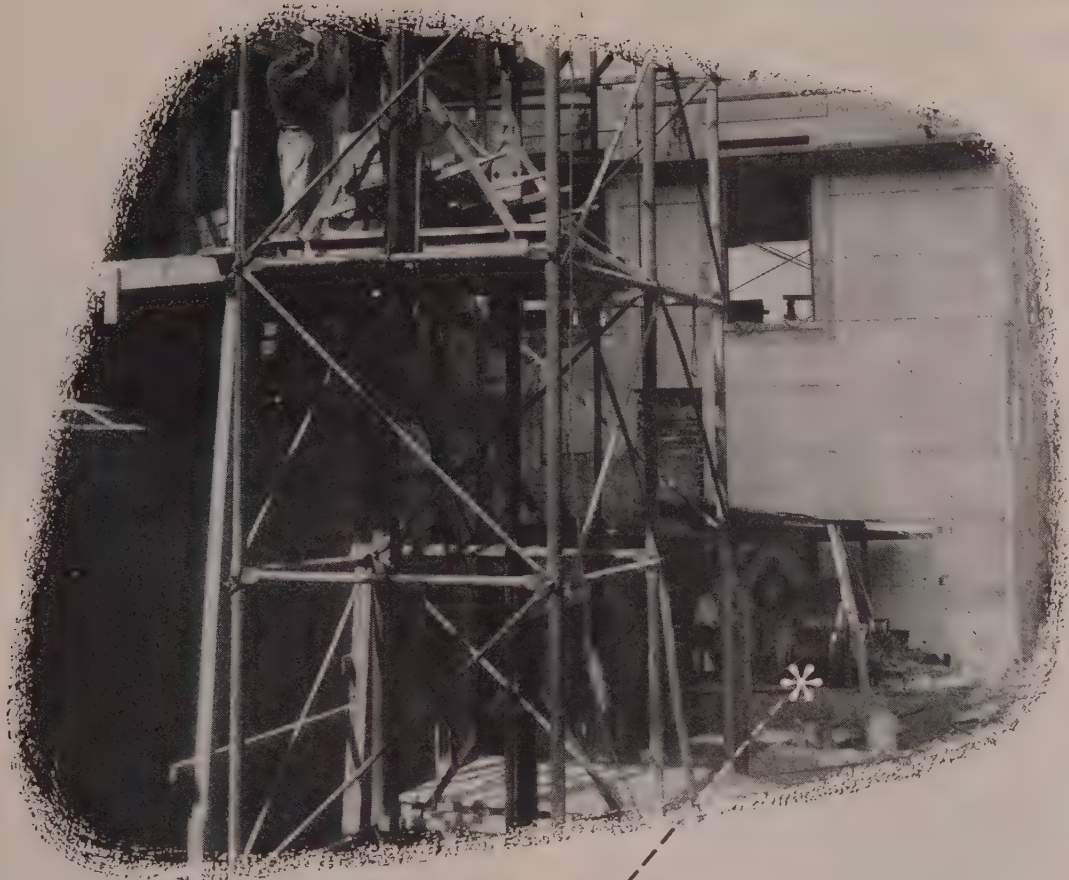
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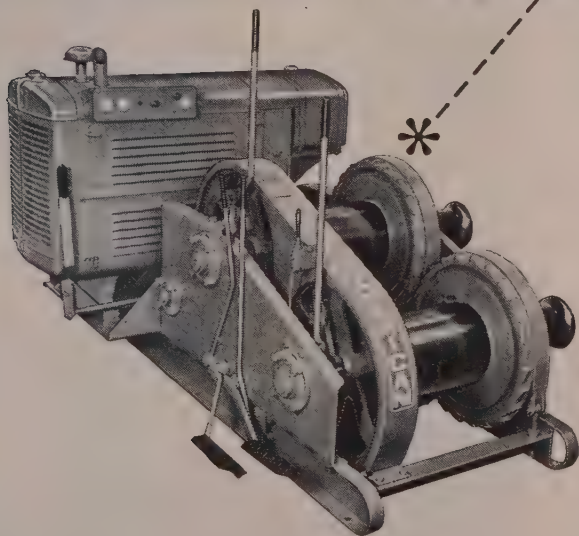
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1931

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THE COLORADO FUEL AND IRON CORPORATION

1023

Koehring's new 1/2-cu. yd. excavator has 10-ton lift capacity

Koehring Co. has redesigned its Model 205 crawler-mounted excavator with an increase in lift crane capacity rating from 7 3/4 to 10 tons. This 29% increase is reported



ONE OF THE FIRST of the new 10-ton lift capacity half-yard Koehring excavators to be delivered is this one, shipped by rail to Deerlodge County, Montana.

to be due to radical changes in engineering design which relocated upper machinery behind the excavator's center of rotation. The excavator, which is rated at 1/2 cu. yd.-dipper capacity for shovel and hoe, has a simplified upper machinery arrangement involving only 2 horizontal shafts. Other new improvements which promote operating ease and reduce maintenance costs are fully enclosed gears, automatic brakes, a new cab design and operating lever arrangement, adjustable hook rollers, an electric dipper trip arrangement, carburized steel gears, and self-energizing brakes.

1024

Truck-mounted ditching machine features jack-knife boom

A new design feature on the truck-mounted Earthripper ditching machine—a jack-knife boom—increases this machine's maneuverability and performance. The boom so reduces the head room of the ditcher that it can travel under any structure which provides clearance for the truck. Also, the bucket line can be extended at an angle behind the machine so that the ditch can be started flush against walls or embankments. When digging a slope, the boom and bucket line remain in a vertical position, thus maintaining the original vertical ditch walls regardless of the angle at which the truck is running.

Power is derived from the truck motor through an improved transmission system permitting the differential of



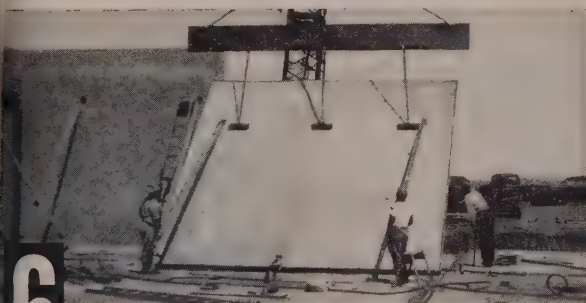
ne truck to be synchronized with the bucket line. Digging speeds are from one to 44 ft. per min., with the speed of the bucket line variable to meet conditions. The standard Earthmover digs ditches from 8 to 24 in. wide from round level to 6 ft. deep. Machines for digging 8 ft. deep can be supplied on special order. Manufacturer is Owen-Pewthers Manufacturing Co.

1025

New model Wooldridge scraper introduces open bowl design



A new type of bowl design on the Model OS-152 tractor-drawn scraper is said to result in faster and easier loading. Other important design features attributed to this machine are: extremely low gravity center which insures stabilized balance in all positions; high, 25-in. ground clearance offering increased maneuverability, and a wide, 75-in. apron opening which allows unrestricted discharge of sticky materials. Capacities of the Model OS-152 are 19.0 cu. yd. heaped and 15.2 cu. yd. struck. Manufacturer is Wooldridge Manufacturing Co.



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Arizona Cedar Rapids Co. Phoenix, Arizona
Southern Idaho Equipment Co., Idaho Falls and Boise, Idaho
Allied Equipment Co. Reno, Nevada
Studer Tractor & Equipment Co. Casper, Wyoming
Cate Equipment Co. Salt Lake City, Utah

1041

New operating principle does the job on Quick-Way attachment

A brand new type of attachment has been inaugurated by **Quick-Way Truck Shovel Co.** for various digging jobs where tough digging materials are a problem. Moreover, the same attachment is a fast materials handling bucket as well as a strong-jawed grapple for picking up rubble, cement blocks, rocks, etc.

What makes this attachment special is its new operating principle. The bucket is suspended from a specially-designed frame of which the hammer



drive is a part. The hammer lifts and drops with a pile-driver action. As the bucket stands open, the hammer impact travels straight to the teeth of the bucket, driving them into black top, shale, macadam, and other hard surfaces. When hammer is not needed it can be bolted to the bucket head to provide the same digging weight as if used as a hammer, to force the bucket teeth into the material. Closing with a single line, the bucket is reported to give faster action than a conventional bucket. It digs a vertically-walled hole, and the surface hole is only slightly larger than the spread of the open bucket. This small sized hole is advantageous to street repairmen. With a trench hoe boom this new attachment digs to a depth of 10 ft. or more when provided with extensions; with a crane boom 30 ft. or more. Various sized buckets can be furnished to meet requirements. Manufacturer is **Quick-Way Truck Shovel Co.**

1042

Smaller Model 550 electric plant made by Universal

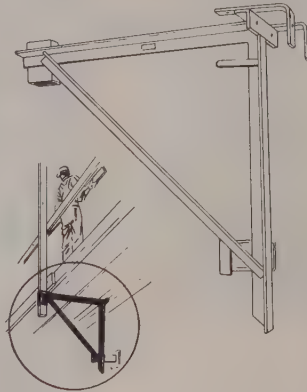
The popular Model 550 electric plant has been completely re-engineered and has a new driving unit. Though it weighs 5 lb. less (73 lb.) than the former Model 550 it develops the same power, 500-550 watts AC, 110-120 volts. It is easily transportable, making it well suited for construction projects, for lighting and powering tools in remote areas, and serving in general wherever a dependable source of electric power is re-

quired. Manufacturer is **Universal Motor Co.**

1043

Superior Waler Jack eliminates side sway

A new piece of scaffolding equipment, the Superior all-steel Waler Jack, features a double hook which

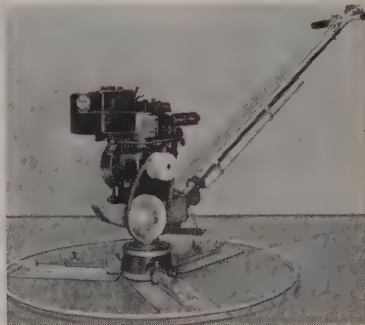


slips over the waler for a firm, snug grip, so that side sway is reported to be impossible. Recommended for use on a wide variety of concrete construction jobs, it may be used on the bottom waler. It can be bolted to the wall or stud, and used on either 2 x 4 or 2 x 6 walers. Manufacturer is **Superior Scaffolding Co.** (West) or **National Plaster Block Co.** (East).

1044

Concrete floating-finishing machine easy to operate

There have been six basic improvements in the new Whiteman Model J-1 concrete Floating-Finishing Ma-



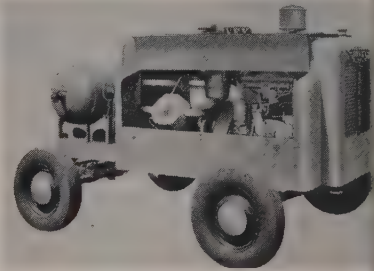
chine which provides smoother, easier operation and longer life. The gear case is equipped with Timken bearings; the handle has a safety switch; ball bearings in top and base of handle make trowel pitch adjustment easier when machine is operating; a rubber collar protects trowel adjustment arms around the base; a Briggs & Stratton engine offers easy, quick starting and automatic lubrication, and there are "snap-on" trowels for floating, centrifugal clutch which automatically tightens belt and trowel pitch adjustable with machine in

motion. Trowel diameter is 34 in. Manufacturer is **Whiteman Manufacturing Co.**

1045

Davey is offering new 160-cfm. compressor

The Super Chief 160, a new 160-cfm compressor, is reported to be from 200 to 1,000 lb. lighter than other compressors of the same capacity. Available in 2-wheel and 4-wheel trailer and in skid mountings, it has 2 low pressure cylinders with 6-in. bore and 3 3/4-in. stroke. Standard features include automatic compressor-engine controls; individually-finned cylinders; full force feed lubrication; cast aluminum crankcases; multi-port valves; electric starting; automotive



type steering; full spring suspension and double, built-in, full-length tool boxes. Offered in both gasoline and diesel-powered models. Manufacturer is **Davey Compressor Co.**

1046

New hitches feature special locking mechanism

Two new hitches incorporate an improved safety feature, a new type locking mechanism which makes it impossible to have "false locking." The latch will raise to the open position automatically if locking is not complete. If the latch stays down, the hitch is securely locked. In addition to this safety feature, the hitch is easily operated with one hand. The medium-duty model No. 380 has a breaking strength of more than 90,000 lb., and weighs 27 lb. The No. 480 heavy-duty model will accommodate a 2 1/2-in. drawbar eye, has a breaking strength in excess of 150,000 lb., and weighs 37 lb. **Premier Manufacturing Co.**



1026

carbide-tipped saw blades designed for radial saws

A new line of low-cost, carbide-tipped saw blades has been designed for use on radial saws. Claimed to increase the utility and scope of these saws, the lower price has been made possible because of mass production. The tungsten carbide tips are reported to last almost 100 times longer than standard blades. They will cut woods, plastics, metals and other abrasive materials, easily cutting through nails, wires and similar obstructions. Because of a built-in swage design only the carbide cutting edges touch the work, reducing friction and power loss, and also reducing the danger of kickback. They are offered in 10-, 12- and 14-in. diameters to fit standard arbors in 24-, 30- and 36-tooth types respectively. Manufacturer is Delta Power Tool Div., Rockwell Manufacturing Co.

1027

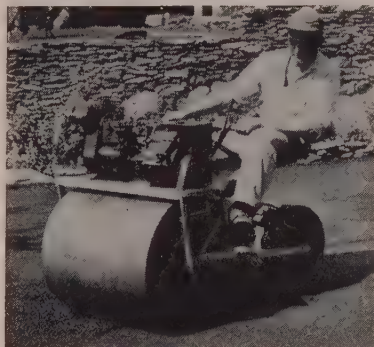
Remote control drive system available for Gradall carrier unit

Operation of Gradall now can be in the hands of only one man because of a new remote control drive system for the carrier unit of this multi-purpose earthmoving and construction machine. By means of a pneumatic electric control system operated by a

panel mounted within the cab the operator can achieve maximum control of the machine. He can start or stop the carrier motor, drive the Gradall in any direction, control the carrier engine speed, or even blow the horn, all without leaving the control cab. This control panel and equipment is optional to the purchaser of a Gradall and must be factory installed. Manufacturer is Warner & Swasey Co.

1028

1/2-ton roller for small compaction jobs



Originally designed as a lawn roller, the 1/2-ton tandem Model AR Moto-roller now has added accessories, such as a water tank and reverse gear, which makes it a good unit for use on

1029

All-purpose heavy-duty saw introduced by Porter-Cable

A new 7-in., 12 1/2-lb. portable electric saw featuring high power and speed is an all-purpose heavy-duty model recently introduced by Porter-Cable Machine Co. Designated Model 115, it cuts full 2-in. stock at 90 deg. and bevel cuts 2-in. dressed lumber at a 45-deg. angle. The telescoping guard is designed to move into the cut without "drag." The saw, which has instantaneous bevel and depth adjustments, is made of die-cast aluminum with a center-balanced full-hand grip and trigger switch, and is said to reduce operator fatigue and permit one-hand operation in any position. Several available new accessories include a portable steel table to convert Model 115 into a lightweight table saw, and three types of abrasive blades which enable the saw to cut stone, metals, and other tough materials.

WELLMAN *Williams Type* FAST BUCKET OPENING SPEEDS OPERATIONS

- Double-hinge construction on Wellman's multiple-rope bucket permits faster opening than a single hinge. This speeds up operations, also gives a bigger spread in the open bucket for the same headroom.

Wellman's welded-design buckets offer you better performance and longer service. In all types and sizes you'll do better with Wellman!

Want Facts?

Write for free descriptive bulletins.

CLAMSHELL • DRAGLINE
CUSTOM-BUILT BUCKETS
STONE AND WOOD GRABS

THE WELLMAN ENGINEERING COMPANY
7000 Central Avenue • Cleveland 4, Ohio

ARIZONA—Lee Redman Company, Phoenix, Ariz.

CALIFORNIA—Coast Equipment Co., San Francisco, Calif.

OREGON—P. L. Crooks & Co., Inc.

Portland, Oregon

WASHINGTON—Construction Equipment Corp.

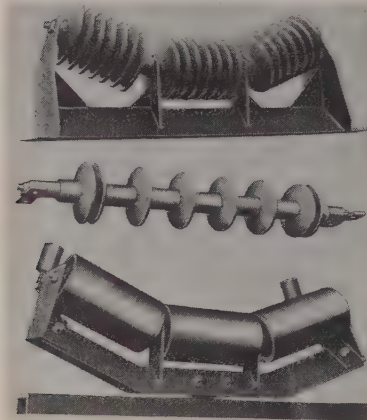
Spokane, Wash.

Clyde Equipment Company, Seattle, Wash.

1030

Three new conveyor idlers available

Three new conveyor idlers now on the market are pictured in the accompanying photograph. Mesabi-type impact idlers (top) are primarily designed to absorb the shock of falling material, thus preventing undue cutting and wear of the belt. Flexibility of the segment permits the belt to run smoothly over the idlers even though the material may not be evenly distributed on the roll. Self-cleaning return idlers (center) permit the conveyor belt to travel freely without a



build-up of material on the roller. Two of the segments are mounted side by side on each end of the roll. Self-aligning troughing idlers (bottom) swing freely when the weight of the material on the conveyor belt is unbalanced. These three idlers are available for 24-, 30- and 36-in. conveyors. Manufacturer is Pioneer Engineering Works, Inc.

1031

Igniter cord is basis of new blasting technique

Igniter cord, a new device which is safer and more efficient than older methods, has been developed by The International Nickel Co. of Canada, Ltd., for use in drift-driving at its mines in the Sudbury district of Ontario. The igniter cord requires a blaster to remain at the loaded face only long enough to light a single fuse instead of having to light the fuse in each drill hole separately. This obvious safety advantage is reported to be particularly desirable where the path of retreat from the working place is difficult and time-consuming, or where staging has to be removed. It is possible to delay the actual lighting of the round by employing an extra long fuse. The safety fuse is attached to the igniter cord by means of a connector in the form of a shell with a composite ignition charge

consolidated under pressure. A slot on one end of the connector holds the igniter cord securely.

1032

New conveyors designed for builders

How to get various building materials where you want them is handled by the Fairfield Builder, a conveyor specially designed for contractors and builders. It is available in two models. The flare top (Model 270) has a deeper trough and conveys all building materials except those wider than 16 in. For elevating wide insulating board, corrugated roofing or siding the flat top (Model 271) is available. The builder can carry 70 bricks, concrete blocks or 35 balls of roofing in 1 min. from ground to roof. By adding one or two 8-ft. boom sections



HOPKINS VOLCANIC UNITS

Help Set "Fireball" Pace on New Jersey Turnpike Project

The 118-mile New Jersey Turnpike is the biggest paving project of its type in the world, and the longest asphaltic-concrete job ever undertaken on so short a schedule. With only 5 months actual working time, and tough spex to meet, a terrific production schedule had to be maintained. So, to supply concrete for Sections 3 and 4, four huge asphalt plants were erected at Cranbury. Sitting side by side, each plant turned out 2-ton loads every minute. That's 8 tons a minute, or almost 500 tons per hour . . . a really "fireball" pace!

The four asphalt plants were all equipped with Hopkins Volcanic Dryer Units, and Mr. John McGarry, Vice President of the Tioga Construction Company, later wrote us as follows: "We were producing 25,000 tons of asphalt paving material a week. We found the Hopkins equipment does its assignment efficiently and with a minimum of maintenance."

Contractors throughout the country are setting new production records, and cutting costs, with Hopkins Volcanic Units. Want to know more? Your letter or phone call will bring descriptive literature, complete details, and follow-up by a Hopkins representative.



HOPKINS VOLCANIC SPECIALTIES, INC.
ALLIANCE, OHIO

e 24-ft. base machine can be converted into a 32- or 40-ft. conveyor. Manufacturer is **Fairfield Engineering Co.**

1033

Drilling machine features integral air-leg feed and automatic air-water back-head

The No. 380 automatic drilling machine is an 80-lb., one-man-operated unit featuring an integral air-leg feed and automatic air-water back-head. Equipped with a specially designed 5-lb. sinker rock drill and a 2¼-in. diameter feed leg, it is available in either 36- or 48-in. length to make it adaptable for all types of drilling. The drill can be removed from the leg and used as a sinker by loosening only one nut. Other features include: 6-position throttle control, a single air hose, hinge joint between drill and leg with tension adjustment, convenient and safe location of controls on back-head, and aluminum cylinder and piston. Manufacturer is **Thor Power Tool Co.**

1034

Membrane spraying unit makes concrete curing easy



A new, portable hand-spraying rig is designed for spraying membrane curing compounds on concrete. Capable of dispensing up to 6 gal. per min., it is easily operated by a 1½-hp. engine. Entire unit, including 55 gal. of compound, weighs 735 lb. and easily can be pulled on rubber-tired wheels. Manufacturer is **Flexible Road Joint Machine Co.**

1035

P & H has new line of generating sets

New diesel-electric generating sets in capacities of 20 to 75 kw. have been released by **Harnischfeger Corp.** Powered by the easily-maintained P & H 2-cycle diesel engines, the new units come with four types of control: emergency automatic, which takes over on full load the instant of regular power source failure; semi-emergency automatic, which handles partial service upon failure; electric starting, which is manually controlled, and remote electric starting by push button control.



"MINE KING"



The Hose That's Built to Keep Your Drills in Action!

STRONG . . . Molded-and-braided construction, with materials and workmanship meeting the very highest standards for quality and assurance of long service life.

TOUGH . . . Extra durable smooth brown cover withstands severe abrasive wear; resists the shock of falling rock, tools and timbers; and prevents penetration of water into carcass. Easier to handle under crowded, tight-spot drilling conditions, and when coiling for movement between locations.

EXTREMELY FLEXIBLE . . .

Availability in long lengths—up to 500 feet—permits "Mine King" to be used with fewer intermediate connections, reducing the time required for coupling and uncoupling.

Contact Our Nearest Branch for Further Details and Prices



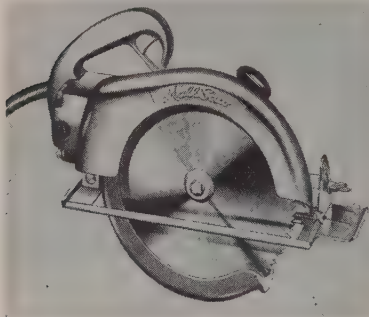
GOODALL RUBBER COMPANY

GENERAL OFFICES, MILLS and EXPORT DIVISION, TRENTON, N. J.
Branches: Philadelphia • New York • Boston • Pittsburgh • Indianapolis • Chicago • Detroit • St. Paul
Los Angeles • San Francisco • Seattle • Spokane • Portland • Salt Lake City • Denver
Houston • Goodall Rubber Company of Canada, Ltd., Toronto • Distributors in Other Principal Cities

1036

Portable saw developed for cutting heavy timber

A new 20-lb. portable electric saw has been developed for cutting heavy building timbers and outsize lumber. The 10-in. blade has the following



cutting capacities: 3.62-in. maximum and 2.38-in. minimum for straight cuts, and zero to 45 deg. with 2.88-in. maximum depth cut at 45 deg. for bevel cuts. Blade speed is 3,500 rpm. free. Equipped with a combination blade, a wrench, lubricant and instructions. Available accessories are cross cut, rip, planer and flooring blades, dado head assembly, saw-tooth set gauge, saw set, 1-lb. hammer, cant saw file, and metal carrying case. Manufacturer is Mall Tool Co.

1037

High pressure air hose offers unusual flexibility

A new high-pressure air hose for mining, tunneling and construction work combines strength and ruggedness with extreme flexibility. Steel wire used in its horizontal braided construction enables the hose to carry working pressures as high as 2,000 lb. per sq. in. Designated Concord Yellow Jack, its specially compounded yellow cover is readily visible in underground work. Manufacturer is Boston Woven Hose & Rubber Co.

1038

Lima Type 44 shovel-crane

A new 1-cu. yd. shovel or 25-ton capacity crane, Lima Type 44, is now in production. Adaptable for a wide variety of work, it is available with either crawler or rubber mountings. As a shovel, it is equipped with a 20-ft. boom and 18-ft. dipper handle. Crane booms are available up to and including 100 ft., less jib. The crawler truck frame consists of two structural H-beams welded integral with the side frames forming a strong support for the truck base casting. The standard crawler is 12 ft., 3 in. long with 30-in. tread pads. However, a 15 ft. long crawler can be furnished for crane, dragline or clamshell operations requiring greater bearing area. Weight



is equally distributed because the front rollers are mounted in tandem on equalizer beams and the 2 rear rollers are mounted on rigid supports. The Lima 44 can be easily converted in the field from one combination to another by changing the front-end attachment and making a few minor changes. Manufacturer is Baldwin Lima-Hamilton Corp.

1039

Baker-Lull Shovel loader has 5,000-lb. capacity

The combination of front-end loading of up to 5,000-lb. capacity with the use of inexpensive diesel power is featured in the Baker-Lull Shovel loader

BAXCO THE STAMP OF INTEGRITY ON
CREOSOTED OR UNTREATED
DOUGLAS FIR PILING

POLES • TIMBER • LUMBER • TIES

Other BAXCO Pressure Treated Forest Products include: BAXCO Creosoted Douglas Fir Posts and Ties—BAXCO Creosoted and Salt Treated Lumber and Timbers—Protexol Fire Retardant Treatment.

J.H. Baxter & Co.

200 Bush Street • San Francisco 4, California
3450 Wilshire Blvd. • Los Angeles 5, California

J. H. Baxter & Co. of Oregon
P. O. Box 752, Eugene, Oregon

Baxco Corporation
541 Pittock Block, Portland 5, Ore.

White Heating Kettles Have Fire-Proof Tops

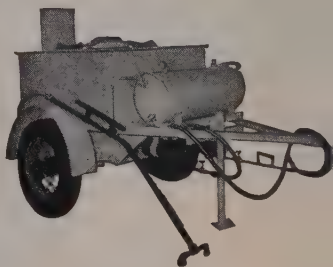
Cut-back and highly inflammable road repair material can be heated safely in White kettles. FIRE-PROOF top reduces fire hazard.

White asphalt and tar kettles are extensively used. They give long life and satisfaction.

Plain kettles or with hand or engine driven spray pumps for patching pavement. Thermometer, barrel hoist, warming hood extra. All oil burning, Semi-elliptic springs, pneumatic tires.

65, 110, 165, 220, 300 gallon capacities.

Model F-10 is oil jacketed, to heat elastic joint filler.



Other Products

CONCRETE VIBRATORS

Gasoline Engine and Electric Motor Driven Models

ASPHALT PLANTS

Portable—Stationary

FRONT END LOADERS

for Industrial Tractors

KEROSENE TORCHES

3 to 20 gal. Capacities

Write for Circulars and Name of nearest Dealer

White Mfg. Co.

Elkhart 24

Indiana

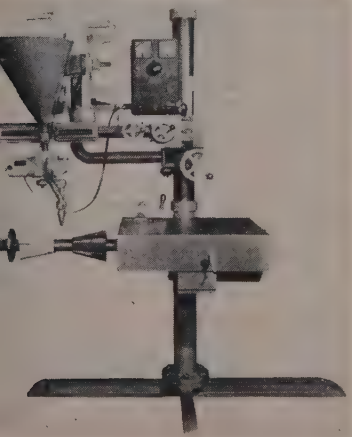


which is mounted on a Sheppard industrial wheel-type tractor. According to the manufacturer, the diesel power will save the contractor up to 50% in fuel costs, compared with the operation of gasoline-powered equipment. In addition, the unit is reported to have low replacement costs, an 8-speed transmission which permits full throttle operation at each job speed, and the tractor is designed for use on hard ground conditions. Available with materials-handling tools, it will load and dig below tractor level, lift 5,000-lb. capacity load to 10 ft., 3 in., dump it at 8 ft., 6 in., and reach 5 ft., 6 in. ahead of the tractor. Lift speed 12 sec.; lowering speed, 9 sec. Manufacturer is Baker-Lull Corp.

1040

Automatic rebuilder cuts replacement costs

An automatic rebuilder, the Mir-O-Col K-2, is reported to enable shops to rebuild wheels, pulleys, track rollers, idlers and cones faster, better and at a fraction of new-part replacement cost. This precision-built machine handles work of any size up to 40 in. diameter and welds 30 in. of bead per in. It handles all types and sizes of automatic wire up to 3/4 in. Utilizing the submerged arc principle of automatic welding, it has an automatic welding positioner and simplified control panel. The K-2 needs no anchoring to the floor, yet it is lightweight and can be moved at any time. Mir-O-Col K-2 Twin Head is also in production. Employing the same features as the single head, the Twin Head can handle two jobs of different diameters at the same time. Only one operator is required. Manufacturer is Mir-O-Col Alloy Co.



you play it

SAFE

with

Safety-Pulls

Just as important as the time- and labor-saving advantages of Coffing Safety-Pull Ratchet Lever Hoists is the way each one protects your men from injury . . . your equipment from damage. Here's why:

Load cannot slip even if handle is accidentally released —



because of dual Ratchet and Pawl principle, developed by Coffing and an outstanding Coffing advantage for over a quarter of a century.

Load is held positively at all times — there is no friction brake to slip or freeze.

Hooks will not break or straighten out.

"Safety-valve" handle will bend before any other part of hoist gives way.

Safety-Pulls are single-chain tested at 100 percent above warranted, rated capacity.

Find out more about how Coffing Safety-Pulls provide extra protection on the job. Write for Bulletin WC10SP.

COFFING HOIST COMPANY

ORIGINATORS OF RATCHET LEVER HOISTS
DANVILLE, ILLINOIS



Coffing Safety Pull
Ratchet Lever Hoists
2 coil chain models,
3/4 and 1 1/2 tons
10 roller chain models,
3/4 to 15 tons



Quik-Lift Electric Hoists
Hoist-Alls • Mighty-
Midget Pullers
Spur-Gear Hoists
Differential Chain Hoists
I-Beam Trolleys
Load Binders

DAVEY

Super Chief

... the lightweight champion
with the heavy-duty work punch!



Capacity—60 c. f. m.
completely air-cooled
(engine and compressor)

DAVEY

Pioneers of
Air-Cooled Air

● Here, for the first time, is an economically-priced, lightweight compressor (1250 lbs.) that is designed for constant, heavy-duty service. ● Features include clutch between engine and compressor, full force feed lubrication, built-in unloader system, air receiver integral with frame . . . highest speed chassis and tow bar ever placed on a compressor. ● Like the famous bigger Daveys, the Super Chief has PERMANENT PEAK EFFICIENCY VALVES. These never carbon or foul. They guarantee the utmost in operating satisfaction, low cost operation and long compressor life. ● DAVEY COMPRESSOR CO. ● KENT, OHIO

A-6698

NEWS OF DISTRIBUTORS

Here are the distributors who are serving Alaska's needs

The construction equipment distributor in Alaska is awfully good at estimating the delivery time on machinery that must be ordered from the States. In his service and parts operations, he is on a par with his Western U. S. counterpart—perhaps a little better on parts, since he often finds it necessary to keep a

bigger inventory. But the question he catches constantly from his clients is "When?"

It is the physical isolation of Alaska alone that really sets the distributors there apart. And they have become experts in transportation scheduling and expediting!

There are three major distributors

in the territory—all of them member of AED—and they all have more than one branch. Home offices of a three are in Seattle. Another half dozen or more distributors operate locally in Alaskan towns, some of them organized in a broad manner to serve other industries as well.

For the benefit of contractors and engineers presently working in Alaska, or contemplating a role in the territory's construction program *Western Construction* has assembled the following summary of distributors, their outlets, personnel and manufacturers' lines represented in Alaska. The material will be extended for subsequent publication in the 1954 *Western Construction Handbook* of distributors, manufacturers, and factory branches.

NORTHERN COMMERCIAL COMPANY.....SEATTLE

427 Colman Building PH: MU 2300

President.....Volney Richmond, Jr.
Vice President.....H. D. Stephens
Mgr. Machinery Dept.....Truman Sage
Secretary-Treasurer.....J. E. Larson

BRANCH OFFICES

Anchorage.....Manager.....C. F. Bashaw.....PH: 35051
Fairbanks.....Manager.....Gragg Gilkey.....PH: 2176
Juneau.....Manager.....E. G. Whitehead.....PH: 867
Ketchikan.....Manager.....M. S. Roe.....PH: 9724
Nome.....Manager.....Steve Andersen.....PH: Main 22

LINES HANDLED

Aithey Products Corp.
Blackhawk Manufacturing Co.
Broderick & Bascom Rope Co.
Bucyrus-Erie Co.
Caterpillar Tractor Co.
Chain Belt Co.
Clayton Manufacturing Co.
DeWalt Inc.
Essick Manufacturing Co.
General Electric Co.
Goodyear Tire & Rubber Co.
The Hyster Co.
Joy Manufacturing Co.
Kohler Co.
La Crosse Trailer Corp.
Lincoln Electric Co.
Linde Air Products Co.
McCulloch Motors Corp.
Herman Nelson
Pioneer Engineering Works
Preco, Inc.
Ramset Fasteners, Inc.
Sauerman Bros., Inc.
Stoody Co.
White Manufacturing Co.
Witte Engine Works

YUKON EQUIPMENT, INC.....SEATTLE

327 Colman Building PH: SE 6355

President.....Stanley B. Tatom (Fairbanks)
Vice President.....N. A. Ruthruff
Secretary-Treasurer.....Everett P. Wood

BRANCH OFFICES

Anchorage.....Manager.....H. A. Floyd
Fairbanks.....Manager.....Les E. Nappe
Juneau.....Manager.....Glen Chambers

LINES HANDLED

Allis-Chalmers Manufacturing Co.
(Tractor and Electrical divisions)
American Tractor Corp.
Baker Manufacturing Co.
Berger (logging yarders)
William Bros Boiler & Mfg. Co.
Buffalo-Springfield Roller
Gar Wood Industries (dozers)
Gates Rubber Co.
General Motors
(Diesel Engine Div.)
Hobart Bros. Co.
The Jaeger Machine Co.
A. Leschen & Sons Co.
Lincoln Engineering Co.
Littleford Bros., Inc.
D. W. Onan & Sons, Inc.
Oshkosh Motor Truck Co.

(Listing continued at above right)

Pacific Car & Foundry Co.
Pettibone-Mulliken Corp.
Schield Bantam Co.
Thew Shovel Co.
Thor Power Tool Co.
Timken Roller Bearing Co.

Tractomotive Corp.
Universal Engineering Co.
Viber Co.
Whiteman Manufacturing Co.
Willard Storage Battery Co.
Wisconsin Motor Corp.

GLENN CARRINGTON AND CO.....SEATTLE

91 Columbia Street PH: Main 0804

President.....Glenn Carrington
Vice President.....A. F. Erickson
Secretary.....E. D. Whitner

BRANCH OFFICES

Fairbanks (parts and service), Branch Manager, C. A. Roust, PH: 2187
Office Manager.....V. P. Guzzard
Parts Manager.....J. H. Chandler
Anchorage.....Manager.....C. E. Kiger.....PH: 2-1948
Nome.....represented by Builders Supply Co.

LINES HANDLED

J. D. Adams Manufacturing Co.
American Hoist & Derrick Co.
Barber-Greene Co.
Barco Manufacturing Co.
Bucyrus-Erie Co.
Buda Co.
Clayton Manufacturing Co.
Cleaver-Brooks Co.
Columbia-Geneva Steel Division
Construction Machinery Co.
Corley Manufacturing Co.
Delta Manufacturing Co.
Dempster Bros.
Eagle Iron Works
Eimco Corp.
Electric Steel Foundry Co.
E. D. Etnyre & Co.
Fairbanks, Morse
Four Wheel Drive Auto Co.
Goodman Manufacturing Co.
Harnischfeger Corp.
The Heil Co.
Highway Equipment Co., Inc.
Frank G. Hough Co.
Huber Manufacturing Co.
Ingersoll-Rand Co.
International Harvester Co.
Isaacson Iron Works
Jacuzzi Manufacturing Co.
H. C. Little Co.
Mall Tool Co.
Maxon Construction Co.
Palmer Electric Mfg. Co.
The Ready Power Co.
Rodgers Hydraulic Co.
Silent Glow Oil Burner Corp.
Simplicity Engineering Co.
A. O. Smith Co.
Smith Engineering Works
U. S. Rubber Co.

NORTHERN SUPPLY.....ANCHORAGE

334 Fourth Avenue PH: 3-5191

Owner.....H. A. Faroe

LINES HANDLED

Atlas Powder Co.
Colorado Fuel & Iron Corp.
(Wickwire Spencer Steel Div.)
Fairbanks, Morse
Gardner-Denver Co.
Goodall Rubber Co., Inc.
Nordberg Manufacturing Co.
Skilsaw, Inc.
Victor Equipment Co.

new Pac. Coast mgr. for Truscon

Truscon Steel Division, Republic Steel Corp., announces the appointment of N. J. Cavalier as Pacific Coast manager with headquarters in Los Angeles. Cavalier will direct the sales activities of Truscon's district sales offices in Los Angeles and San Francisco; Seattle, Wash.; Portland, Ore. and Phoenix, Ariz. He succeeds G. R. Roden, who has been transferred to Youngstown, Ohio, to fill another assignment.

Masonite elevates Ashley

The promotion of Harry D. Ashley to manager of Masonite Corporation's Western division is announced by F. O. Marion, general sales manager. He succeeds George M. Syversen, resigned. With Masonite for 20 years, Ashley has had various sales assignments and for the past year was manager of dealer sales in the Western division. His headquarters are in San Francisco. Marion announced at the same time that Lewis C. Kummerow has been promoted to assistant manager in charge of dealer sales.



H. D. Ashley
for Masonite



M. Staben
for Gar Wood

New NW mgr.

for Gar Wood's Findlay Div.

Appointment of Melvin Staben as district manager of the Northwest district for the Findlay division of Gar Wood Industries was recently announced. He is well known in the Pacific Northwest, where he has covered the logging and construction industries for the past twenty years. In his new position Staben will cover the states of Washington, Oregon, Montana, Idaho and Wyoming. Temporarily, he will also cover Utah, California, Arizona and Nevada in conjunction with A. M. Guthrie, Findlay West Coast district manager.

Doug-Lynn announces distributors

The appointment of four new distributors in the West for the True-Lay paver has been announced by Doyle L. Hallum, president of the Doug-Lynn Co., Inc., Walnut Creek, Calif. Edward R. Bacon Co., San Francisco; Western Machinery Co., Phoenix, Ariz.; Smith Booth Usher Co., Los Angeles, and Western Machinery Co., Spokane, Wash., will distribute this relatively new equipment in their respective territories. The

You **SAVE** when you **RENT**

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ALL LENGTHS—ALL SECTIONS
FROM COMPLETE STOCKS

**"FASTER
FROM FOSTER"**

ONE TON OR A THOUSAND

**NOW A
LOS ANGELES
OFFICE
FOR
BETTER SERVICE
TO THE
WESTERN STATES**

The exact length and exact section of piling that the job requires—exactly when you need it, and at minimum cost . . . that's what you get when Foster services your piling requirements. And Foster Rates on all standard piling sections give you a low fixed expense, providing an added competitive advantage when you bid on jobs. Try us, whatever your needs; you can count on an exacting, prompt service on all sections and makes for ANY steel sheet piling job.

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L.B. FOSTER co.

3460 WILSHIRE BLVD., LOS ANGELES 5, CALIF.

Pittsburgh 30, Pa. • New York 7, N. Y. • Chicago 4, Ill. • Houston 2, Texas

True-Lay paving machine, recently introduced to the Western market, is said to give 80% compaction of mechanical tamper equipment and requires only three men to operate it.

St. Paul Hydraulic Hoist has two new distributors

Sierra Tank and Steel Corp., Reno, Nev., has received the distributorship of the St. Paul Hydraulic Hoist full line of equipment for the following sales territory: Nevada — Washoe, Ormsby, Douglas, Storey, Lyon, Mineral, Humboldt, Pershing, Churchill, Esmeralda, Lander, Nye and Eureka counties. California — Lassen, Plumas, Sierra counties, and that portion east of the Sierra-Nevada in Placer and Nevada counties.

Utility Body Co., Oakland, Calif., is named St. Paul distributor for the following counties in California: Mendocino, Lake, Sonoma, Napa, Marin, Contra Costa, San Francisco, Alameda, San Mateo, Santa Cruz, Santa Clara, Monterey, San Benito, Merced, Mariposa, Tuolumne, Calaveras, San Joaquin, Stanislaus and Mono.

Sweden comes West

Hiab Crane Co. of Sweden has announced appointment of Versatile Hydraulic Crane Co., 1522 No. La Brea, Los Angeles, as sales agent for the Hiab crane in the eleven Western

States, as well as Alaska, Mexico and the Hawaiian Islands. Southern California dealerships are under consideration by Holly Leeds of Versatile. Hiab cranes are designed to operate on truck or tractor, have a capacity of 2,000 lb. and are of one-man operation.



T. H. Allison,
new director
of sales for
Shepherd Tractor
at Los Angeles

Shepherd promotions

W. W. Shepherd, general manager of Shepherd Tractor & Equipment Co., Los Angeles and Orange County Caterpillar-John Deere distributor, announces the following promotions in his staff: Thomas H. Allison has been appointed director of sales. He has been with Shepherd for more than 25 years and his experience and knowledge of the industry qualify him admirably for his new position. Josh L. Wilson has been made industrial sales manager and will have as his assistants W. J. (Bill) Selman and R. T. (Ray) Smith. Edwin E.

Peck becomes farm sales manager and E. Russell Olsen is his assistant.

New home for Fornaciari

With more than 11,000 sq. ft. of floor space for expanded sales and service, the Fornaciari Company of Los Angeles is now located at 5350 F. Washington Blvd.

Lovegreen becomes white cement sales rep. for Calaveras

Appointment of Harold Lovegreen as white cement sales representative in southern California, western Nevada, Arizona and Utah is announced by Calaveras Cement Co. Lovegreen will make his headquarters in Los Angeles at 832 West Fifth St. He was formerly in the company's main office in San Francisco.

Coast Equip. named MM distributor

Announcement is made of the appointment of Coast Equipment Co. in San Francisco, as distributor for Minneapolis-Moline equipment.

New Hyster store mgr. named

Appointment of Fred F. Welch as general manager of Hyster Co. retail store in San Francisco is announced by Ray Ronald, Western sales manager. At the same time announcement was made of the appointment of Robert Golden as sales manager. The firm supplies materials handling



WORKING "ROUND THE CLOCK"

**BARNES' BIG SELF-PRIMING
CENTRIFUGALS AID DALLAS
WATER SHORTAGE**

Faced with the most critical water shortage in years, Dallas, Texas, last fall, reached for all available water in the area. One of the sources tapped for this critically needed water was Willow Lake, about fifteen miles from Dallas. Here, two Barnes 90M Self-Priming Centrifugal Pumps worked 24 hours a day — day in and day out — pumping the lake into the Trinity River where it then flowed to the Bachman filtration plant at Dallas. Even as Dallas was kept in water during this trying period, if it's water that is wanted or water that is not wanted, remember a Barnes Pump will move more of it — faster, steadier, and cheaper. Capacities from 480 to 120,000 G.P.H. Pressures up to 600 ft. or 260 P.S.I.

Distributors:

Central Equipment Co., Berkeley, Calif.
P. L. Cooks Co., Portland, Oregon
R. L. Harrison Co., Inc., Albuquerque, New Mexico
The C. H. Jones Equipment Co., Salt Lake City, Utah
Lee & Thatro Equipment Co., Los Angeles, Calif.
H. W. Moore Equipment Co., Denver, Colorado
The Rix Company, Inc., San Francisco, Calif.
Universal Equipment Company, Seattle, Wash.



BARNES MANUFACTURING CO., Mansfield, Ohio; Oakland 21, Calif.

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New York Office: 7 Day Street, New York, N. Y.

equipment for northern California and northwestern Nevada.

Rucker distributes Hydreco

Appointment of The Rucker Co. as exclusive distributor for Hydreco products in California, Oregon, Washington, Idaho, Nevada and Arizona is announced by Clark E. Rucker, president. Sales, service and engineering on the Hydreco line will be available from Rucker offices in Oakland, South Gate, Calif., and Seattle, Wash.

Denver branch of U. S. Rubber

The new Denver branch of the United States Rubber Co. was recently put into operation at 4800 Colorado Blvd. Built to serve the rapidly expanding markets in the Rocky Mountain area, comprising all of Colorado and portions of nine other states, the branch represents four major divisions of the company: U. S. tires, Fisk and Gillette tires, footwear and general products, and mechanical goods.

Bacon named distributor for Liddicoat bits

Edward R. Bacon Co., with headquarters in San Francisco, is designated distributor of Liddicoat Bits in northern California and western Nevada by Western Rock Bit Manufacturing Co., Salt Lake City, makers of Liddicoat bits in two types, the single

use steel and the Tee Cee tungsten carbide insert.

Columbia takes on Sargent shovel

According to an announcement by F. B. McBath, president, the Columbia Equipment Co., Portland, Ore., has taken on the Sargent Engineering Co.'s shovel account for the territory of Oregon, Washington and north Idaho. Manufactured at the Sargent plant in Fort Dodge, Iowa, this truck-mounted unit is reported to be the latest thing in engineering development in small shovels.

Southern Idaho dealership

Walter Motor Truck Co. recently appointed the Southern Idaho Equipment Co., Idaho Falls, as dealer in the southern Idaho territory for the Walter line of four-point positive drive, snow fighters, tractor trucks, and off-the-highway heavy haulers.

Upton names Ostheimer Western Div. sales mgr.

Eugene S. Ostheimer has been made Western Division sales manager for the Upton Company, with headquarters in Kansas City, Mo.

Foulger reorganization

Foulger Equipment Co., Salt Lake City, has reorganized and expanded its sales and mechanical force, according to announcement by B. L. Foulger, president and general manager. New salesmen are Frank E. Hoagland and Virgil Bullock. Joining the heavy duty section of the mechanical department is Keith J. Perry. Ben B. Banks will assist C. G. Vincent, sales manager.

Euclid appoints new dist. mgr.

Euclid Road Machinery Co. announces the appointment of Melbourne W. (Skip) Miller as district manager for the following area: Montana; Alberta, Canada; North Dakota; and South Dakota exclusive of Fall River, Shannon, Custer, Pennington, Lawrence, Meade, Butte, Harding and Perkins counties. He will headquarter in Great Falls, Mont., at 1201 Sixth Ave., South.

New factory rep for Webb

R. B. Ingebretsen, manager of Modern Equipment Co., Salt Lake City, has been appointed by Jervis B. Webb Company of California as factory representative in the Utah area. The Webb Company designs, manufactures and installs conveyors of all types.

Kyle new Skil distributor

Kyle & Company, Northern California distributor of steel products and other industrial supplies, is appointed industrial distributor for the products of Skilsaw, Inc., including saws, drills and a wide variety of contractor tools. Kyle maintains plants and offices at Fresno, Stockton and Sacramento, Calif.

Caterpillar news

Among recent personnel changes at Caterpillar Tractor Co. are four new promotions announced by B. L. Hagglund, Western sales manager. Frank J. Stafford, since 1929 a member of Caterpillar's organization in the West, has been made Western representative for the company's governmental sales division. Dale S. Grönsdahl is succeeding to Stafford's former position of sales division district representative. Named to the position of special sales department representative is Dean Arnholt. He moves from the sales training division at Peoria to San Leandro, Calif. Orlan Shoopman is promoted to special representative, working closely with Cat dealers in the West.

Peerless Pump promotions

B. A. Tucker, general sales manager, announces the appointment of Everett W. Lundy, to assistant sales manager, Peerless Pump Division, Food Machinery & Chemical Corp., Los Angeles. Lundy, previously Pacific district manager, is succeeded by Robert H. Hull, who was Central district manager at Indianapolis. Waldo T. Harman of Peerless' Chicago branch succeeds Hull.

Marshall is Flexible Steel rep.

John Marshall, well known in Portland and surrounding areas, has been named to represent the Flexible Steel Lacing Co. in Oregon and Washington. Flexible manufactures belt fasteners for joining conveyor and transmission belts. As a factory and field trained representative, Marshall is well grounded in the problems pertaining to fastening of conveyor and transmission belts and is well equipped to serve his territory.

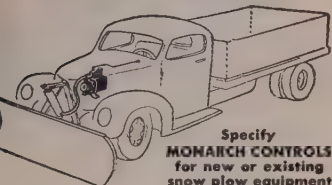
Two C & D appointments

W. W. Wilson has been appointed sales manager and T. H. Rutherford field analyst in the Sierra Loader sales and service program of the C & D Manufacturing Co., Perkins, Calif. With a wide background of manufacturer-distributor sales work and experience with Caterpillar earthmoving equipment sales, Wilson is well qualified to direct C & D sales activity. Rutherford is well known among earthmoving contractors, with years of experience in this field both as operator and as superintendent of earthwork on many large projects.

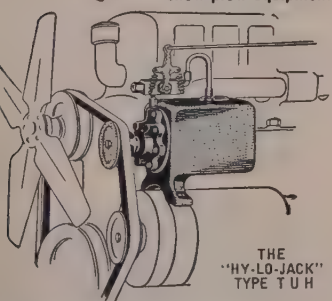
New sales rep. for Calaveras Cement

Calaveras Cement Co., through Mel J. London, vice president and general manager, announces the appointment of James A. White as sales representative in Stanislaus, Merced and Mariposa counties in California, with headquarters at 1331 Twelfth St., Modesto. In addition to the three counties named, White will serve portions of southern San Joaquin and northern Madera counties.

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Space is sold as advertisers' inches. All advertisements in this section are 1/4 in. short of contracted space to allow for borders and composition.

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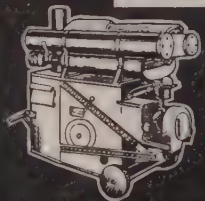
Office of the District Engineer
U. S. Engineer's Office
180 New Montgomery Street
San Francisco 19, California

Office of the District Engineer
U. S. Engineer's Office
751 S. Figueroa Street
Los Angeles, California

Office of the District Engineer
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Herman Nelson portable, powerful 250,000 B.T.U. gas-oil or oil burning heaters with turbine-type blowers. 1 1/2 h.p. air-cooled, ball bearing engine. 108 ft. of flexible, flameproof, waterproof ducts.

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PRE-HEATING engines, tractors, trucks, freight cars, equipment.

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WESTERN CONSTRUCTION, 609 Mission St., San Francisco 5, Calif.

I-H personnel changes

International Harvester Company, through Vice President Harold T. Reishus, Industrial Power Division, announces several personnel changes. H. E. Broadwell is made Western regional sales manager and Jack Bess is named assistant. Listed as managers of the six territories within the Western region are A. H. Mason, D. J. Doerschlag, I. S. Strand, H. C. Barlow, P. D. Evans and H. W. Pals. The Western region embraces Washington, Oregon, California, Nevada, Arizona, Idaho, Utah, Montana, Colorado, Wyoming, in addition to Alaska and Hawaii. The eleventh Western state, New Mexico, comes under the supervision of L. A. Coomer, head of Central regional sales.

Another new appointment is that of I. P. (Crip) Payne who is made manager of Industrial Power sales, assisted by C. E. (Skip) Jones and W. M. Holland. L. J. Lange is named general supervisor of sales development, and E. A. Braker, general supervisor of sales engineering. In addition to the appointment of sales personnel, Reishus announces that W. W. Black is made general supervisor of service and parts merchandising. With the exception of Bess, all of the appointees will be located at Melrose Park, Ill.

Two new Hensley dealers

Hensley Equipment Co., Oakland, Calif., manufacturer of dozer rippers and brush rakes, end bits, D-7 and D-8 track rollers, scraper rippers, scarifier shanks and teeth, and allied tractor attachments, recently appointed the Diesel Construction Equipment Co., San Diego, Calif., as exclusive dealer in that area. In Wyoming, Hensley appointed Wilson Equipment & Supply Co., Cheyenne and Casper, to serve that area on an exclusive basis.

New Knapp news

Knapp Industrial Service Co., Sacramento, Calif., distributor for Lincoln lubricating equipment, Rol-Pak filters, and Jorgensen scraper blades, has recently moved into larger quarters at 515 Twelfth St. The company also made two other announcements simultaneously. Fred DeRuchie is made new sales engineer, with headquarters at Redding, Calif., replacing Walter Karr who died early this year. Serving as sales-engineer in Reno, Nev., the firm has George Thomas.

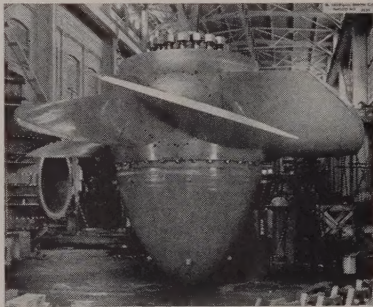
Muchmore joins Petersen

Appointment of Richard W. Muchmore as chief engineer in direct charge of all production at Petersen Engineering Co. is announced by Gerald A. Petersen. Muchmore comes to the Petersen organization from Federal Mogul Corp. in San Francisco, where he was division manager. He has already taken over his new production duties at the Petersen plant in Santa Clara, Calif.

NEWS OF MANUFACTURERS

Major plant expansion for S. Morgan Smith Co.

The first phase of a major expansion of manufacturing facilities was completed in August by S. Morgan Smith Co., York, Pa., manufacturer of hydraulic turbines and related products. A 100,000-sq. ft. plant building, first to be completed of four similar plants contemplated, was opened on the firm's 136-acre tract near York. The new plant is designed to handle the manufacture of large turbines and turbine parts, as well as to house



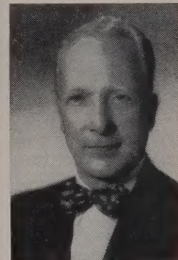
SHOP VIEW of the runner and hub of one of 14 turbines for McNary Dam now being manufactured by S. Morgan Smith Co. The turbine, of the Smith-Kaplan variety, has six blades, each one weighing 30,000 lb. and measuring 12 in. thick at the heaviest portion. The blades and hub, which is filled with oil during actual operation, will be removed for shipment. Each turbine unit has 111,300 hp. and travels at 85.7 rpm. under an 80-ft. head. One complete turbine unit weighs 2,000,000 lb.

all plate steel and welding fabrication. The manufacture of hydraulic turbines has been the firm's major activity since its inception 76 years ago, and it is the only firm in the country that offers turbines of all types in sizes from the smallest to the largest. The company also manufactures related equipment for power plants such as intake and crest gates, valves and trash rakes and racks. Pumps for large volume low-lift applications is another activity. The firm is also revamping and expanding

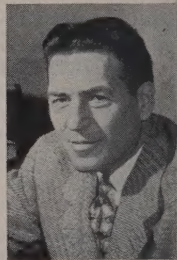
its research laboratory for increased large turbine research work. A current large project under way by the firm is on an order for 14 McNary Dam turbine units (see cut).

Leschen appoints new sales mgr.

Russell J. Dickson is appointed general sales manager, Leschen Wire Rope Division of H. K. Porter Co. Inc., St. Louis, according to D. W. Vernon, vice president and general manager. Dickson's entire business experience has been in the wire rope industry, for the past three years at Chicago area manager for Leschen



R. J. Dickson
for Leschen



C. H. Rieman
for Gardner-Denver

Rieman named Gardner-Denver sales mgr.

C. H. Rieman, who has been associated with Gardner-Denver Co. for the past 16 years, was recently appointed sales manager of the mining and construction divisions. He joined Gardner-Denver in 1937 at the Quincy, Ill., branch, and in 1940 moved to the San Francisco branch where he remained until 1948, when he became district manager at Duluth, Minn., subsequently returning to Quincy. In his new post, he succeeds R. H. Pearson, retired.

National Welding expands

National Welding Equipment Co. of California, now in its 43rd year in the welding equipment business, has purchased buildings and parking area adjacent to its present plants, giving added space for display, shop and storerooms, and expanding the engineering and development departments. The substantial increase in floor area is partially required for immediate expansion of production and also permits of future growth of National Welding.

National Welding Equipment Co. of San Francisco expands plant and production capacity (see item).



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BACKFILL, uncompacted

Sharpen up!

We have heard here and there of a thing called "keen competition" in today's bidding. So we made a rough check ourselves, selected the best unit bid summaries for the purpose received last month from Western highway departments, and came up with the following:

At various bid openings in a one-month period (mid-July and mid-August), seven Western states opened 109 bids on just eight contracts! Total of the eight low bids was \$4,840,263.80. Considering the low bid as a base, the most deviation between low and high was 113%. Another was 90% high, but the remainder were all within 40% of the respective low bidders. Fewest number of bidders on one of these jobs was 11; the greatest was 17. There were 14 bidders on a job that went for a little over \$3,000,000.

These are good days for pencil-sharpener salesmen!

Calm down!

We're indebted to the Stoodly welding accessory people for reviving a first-rate highway joke. It's the one about the old-time road foreman who accompanied a state inspector up and down a nearly-completed job. The foreman didn't say anything during their tour, but the inspector went on at great length—the crown hadn't been established right, the shoulders weren't to specification width, ditch slopes hadn't been trimmed properly, joints hadn't been cut carefully, finish work left something to be desired, and on and on.

When they got back to the job office, the foreman walked out and straddled the centerline. He beckoned the inspector over beside him, shifted his tobacco, waved idly down the road, and asked,

"How is she for length?"

Answer enough

We talked a while back about these questionnaires we send out. And all of a sudden people have taken to writing us letters on them. Here's part of an interesting one from Caldwell, Idaho:

"As it is rather inconvenient for our son, James C. Martin, to answer your questionnaire I will attempt to give you the information . . .

" . . . graduated from the University of Idaho, in June 1952, with a degree in civil engineering. Shortly afterward he was called to the Army as a

2nd Lieut. in the Army Engineers. He eventually landed in Korea and was assigned to the 84th Construction Battalion. This battalion built a \$2,000,000 bridge across the Imjin River near Seoul, which was dedicated July 4th, this year. It is the largest bridge ever built entirely by GI labor. This battalion is now working on the peace site and prisoner exchange camp at Panmunjom.

"Jim expects to follow construction engineering on his return and release from the Army."

First, of course, we're glad that a man of Martin's talents didn't get sent to Cooks and Bakers School. Other than that, we're tickled to know that he is still engaged in Western construction—so far West that he's East.

Twenty-five years ago in Western Construction

"Oro McDermith has resigned as president and general manager of the Derbon Construction Co., of Seattle, to re-enter the field of consulting engineering in the Northwest."

* * *

"The State Highway Department of New Mexico is expending considerable money in state highway construction. . . . Veater & Davis, contractors, of El Paso, recently started work on their contract for 15 mi. of highway in the southern part of the Rio Grande valley, contract price being \$236,694. This contract consists of grading, drainage, and surfacing with crushed rock or gravel."

* * *

An article by Ivan E. Houk, research engineer with the Bureau of Reclamation, described the planning and actual work of "Moving the City of American Falls, Idaho" to permit construction of American Falls Dam.

* * *

"R. G. LeTourneau, of Stockton, is now putting some husky equipment for caterpillars [sic] on the market. Mr. LeTourneau completed his contract with the Kaiser Paving Company a year ago and has been back at the Stockton plant for the past year developing a line of heavy grading machinery."

Same game, new teams

We don't wear green eye shades and we don't yell "Stop the presses!" every half hour in magazine work, but we do try to have a "scoop" occasionally. That is, we try to have articles on significant jobs or subjects that haven't been "discovered" by any other editor.

There is a limit to such efforts, however, and we work hard to remember it and be guided by it. After all, it isn't slipshod to come back to subject after a 10-year lapse with a review of important developments and fundamentals in the use of, say, steel bearing piles. Look at it this way: According to the Round Chain Companies, here are some differences between 1940 and 1953:

14,000,000 "old" customers have died, more than 30,000,000 babies have been born. More than one-third of a present U. S. families have been formed. About 63% of our population doesn't remember the first World War. Until just recently, 52% could not remember a Republican administration. And 48% have no significant memory of conditions before the second World War.

These figures include engineers and construction men. Although we don't like to think of our readers as just statistics, we are impressed by what statistics tell us of the natural turnover among our subscribers. Every 10-year period is like one-half of a football game under the old free substitution rule. We have new teams, but we have the same basic goals.

A memory buried

Eight years ago detonation of the first atomic bomb pounded a vast crater in the dry, lonely earth of southern central New Mexico. As sand turned molten from the tremendous release of heat and slowly cooled, all that remained was a strange, glassy floor seething with radioactivity. Weather and time brought progressive disintegration of the "glass," and random winds carried more and more dust still radioactive, from the lonely site to nearby areas.

It remained for the trundling earth-movers of an Albuquerque construction firm, Campbell and Kay, to apply the coup de grace to the sick earth. Today the 1,100-ft. diameter and 10-ft. deep crater has been scraped clean of its glassy crust, and this has been dumped in nearby pits and covered with sand. The original contour of the historic hole has been preserved and a shed keeps vigil over an undisturbed patch of the glass at its center.

It was a small job, quickly done by the men of Campbell and Kay.

By THE EDITORS