

# WESTERN

# CONSTRUCTION

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## FEATURED THIS ISSUE

Keeping the water flowing  
in 1700 miles of canal

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Sliding falsework 60 ft. for  
record concrete arch bridge

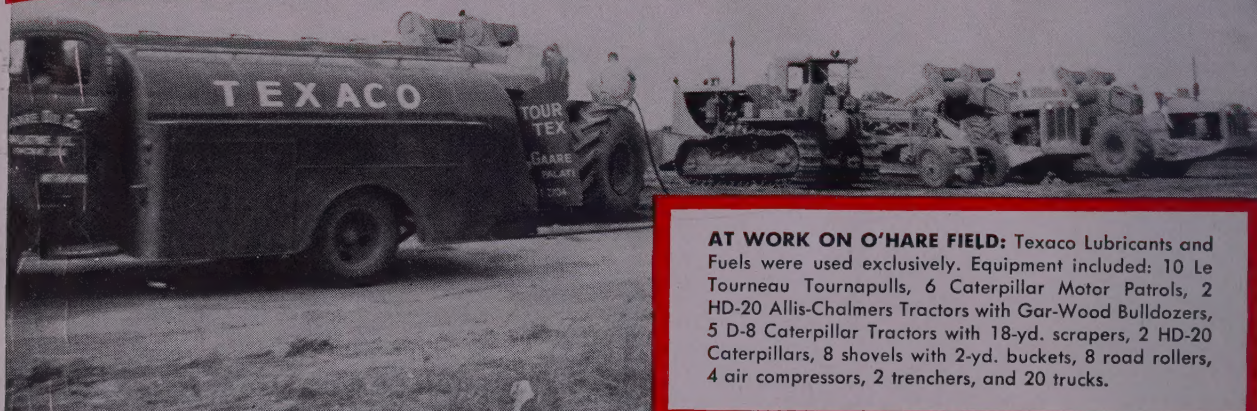
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P.R.\* gains good will for  
Colorado contractors

\*Public Relations

## JULY 1952

# TEXACO SIMPLIFIED LUBRICATION PLAN SPEEDS O'HARE FIELD CONSTRUCTION...



**AT WORK ON O'HARE FIELD:** Texaco Lubricants and Fuels were used exclusively. Equipment included: 10 Le Tourneau Tournapulls, 6 Caterpillar Motor Patrols, 2 HD-20 Allis-Chalmers Tractors with Gar-Wood Bulldozers, 5 D-8 Caterpillar Tractors with 18-yd. scrapers, 2 HD-20 Caterpillars, 8 shovels with 2-yd. buckets, 8 road rollers, 4 air compressors, 2 trenchers, and 20 trucks.

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# WESTERN

# CONSTRUCTION

Volume 27

JULY 1952

Number 7

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## FRONT COVER

EVERYBODY FALLS—both on and off the job—but simple rules and constant vigilance will prevent most falls. Worker shown on cover, working on forms at Hungry Horse Dam, is extending his life expectancy by using safety belts and rope. For common sense rules on preventing falls, see pp. 69-71.

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## Highway engineers manage public utilities

Keynote for the recent conference of the Western Association of State Highway Officials was contained in the president's address by W. A. Bugge, when he said: "It isn't our job, as highway officials, to protect the traditions of the past; it is our job to serve the motoring public." Other speakers expanded the theme that the highways of the West are public utilities belonging to all the people, with the highway departments acting as management agents. Legislatures occupy the middle position, possibly responding to Boards of Directors. In such an organizational concept the management must design, construct, maintain and operate the highways with the funds they obtain from the owners—the public. It is the further responsibility of management to report to these owners at regular intervals on the condition of the properties, and commend measures required to maintain and expand a sound investment. These recommendations should embrace plans for today, and tomorrow.

Half of this responsibility falls definitely under one heading of public relations, in its truest sense, and the other half is engineering. There are unfavorable connotations in the term "public relations." Some highway executives prefer to keep the title out of the department, but the function remains. Executives charged with responsibility for public facilities, such as highways, have duty in keeping the public properly informed and sympathetic to management's problems. Reports must be completely honest, factual and presented in a manner that can be understood and appreciated by all levels in the owner groups. It is an advantage if they can be made available to both public and legislature directly by management, thus assuring that both directors and owners of the highway system are equally informed. It has been this phase of management's responsibility that has been either neglected or misunderstood in the past.

The other half of highway management function is more strictly engineering in nature and more readily appreciated. Good management does not say to owners, "This is the problem, now what do we do about it?" An answer, in the form of a definite long-range program must be formulated with due consideration for all factors. There must be included a plan for financing the program.

Only by this combination of keeping the public owners of the highway systems informed on the conditions of their properties, and by providing a sound engineering plan for betterment and operation, can the departments carry out their duty in managing these indispensable public utilities in the Western region.

## Per day, per shift, per hour . . .

Reports from construction jobs usually include facts on the rate of work, or the output of machines or crews during a given unit of time. This type of information is important in establishing yardsticks for construction activity and contractors operations. However, such references are meaningless—at least confusing—unless the unit of time is specific, so that results can be accurately compared with other jobs. The old, standard unit was "per day." This is no longer an adequate measure.

Output per day may mean one or more shifts, and even the length of shifts may vary as to actual working time. At least, the unit of time should be stated to include the number of hours. Better yet, if all job figures of output relating to production could be accumulated over a period of time and then stated in units of "average per hour" the figure would be expressed in a fixed unit of time and available for handy, and exact comparisons.

## Anglo-Saxon is good enough

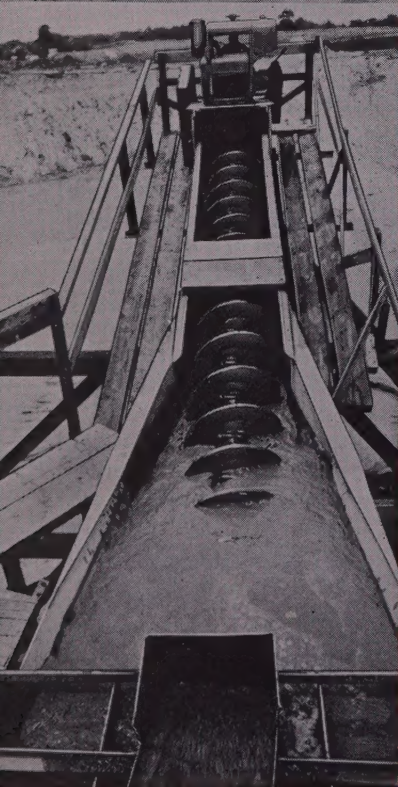
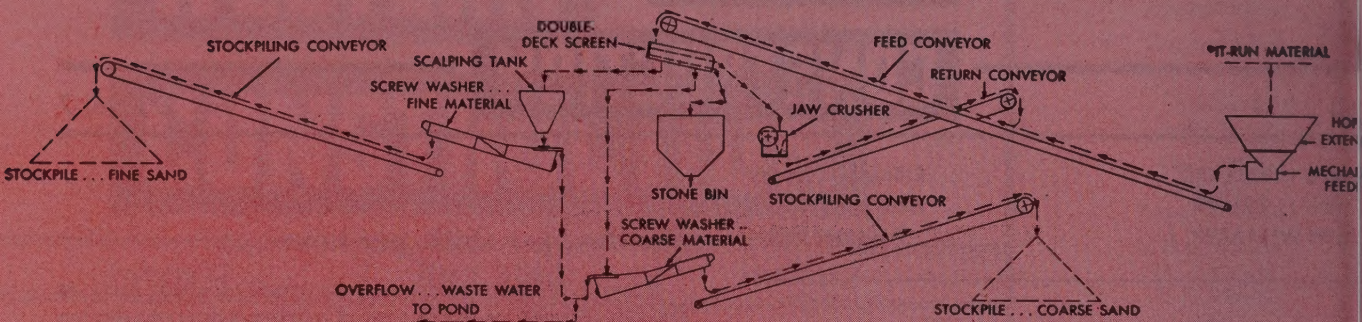
Why is the word "approximate" so appealing to engineers? It is obvious that they feel the need for a qualifying word, whenever a dimension or quantity is mentioned. But, if one is needed the good old Anglo-Saxon word "about" has the same meaning, and is two syllables shorter. In case an engineer writes that the crest of a dam is "1500 ft. long," he can assume that readers will not conclude this figure is actually 1500.000 ft., but is a reference to length intended to indicate a practical dimension, subject to the natural vagaries of the site. Why say "approximately 1500 ft. long"? A round number is a generalized dimension and in the significance of figures needs no qualifier.

Apparently there is an engineering dread to be caught without a qualifying word to hide behind, whenever a number is used. Accepting this urge for playing safe, why not skip the latin and say "about"? After all, remember that any dimension is never exact and must always be considered an approximation.

## No building codes for equipment

What would have been the historic development of construction equipment if it had been hampered with code-like restrictions during the last two decades? When an idea developed for a new type of machine to do an old job better, there was no code to cripple initiative or dictate by precedent. Standardization and control of building design is probably essential in the interest of public safety, but the genius of structural engineers would be advancing the progress in building design at a much faster rate if there were no restriction and dictates of building codes.

# Engineered for Maximum Production Per Dollar of Investment



Close-up of screw washer for coarse material

"Adding washing equipment to what was already a highly efficient crushing and screening plant has made my Austin-Western set-up **DOUBLY SUCCESSFUL** and **PROFITABLE**."

Edward Schneider, Elgin, Illinois

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large settling tank where the sand settles to the bottom. Then, with some of the water, it goes to the final washer where the fine sand is again thoroughly cleaned. As it settles, it is taken out by screw conveyor. Washed material, from which silt, clay and vegetation have been removed, always brings **TOP** prices!

Whatever your requirement, there's an Austin-Western plant to meet it . . . a plant that means **MORE ROCK** for **LESS MONEY**. Why not talk things over with our engineering department?



Return conveyor provides closed-circuit operation



View of settling tank and screw washer for fine

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# Maintaining 1700 miles of irrigation canals

**Imperial Irrigation District keeps 615,000 acres irrigated each year with a vigorous program including check construction, brush control and constant ditch dredging—Portable steel forms speed construction of variable-sized concrete structures**

**M**AGNITUDE of the operations carried out by the Imperial Irrigation District in maintaining over 1,700 miles of canals can be indicated by the fact that the district constructed 491 concrete structures during 1951 in addition to regular maintenance. Part of these were new installations and part were replacements for deteriorated wooden structures. The district delivered a flow (1951) of 933,000 cfs. days of Colorado River water to some 615,000 ac. in the Imperial Valley. Water is diverted from the river by the Imperial Dam and carried to the valley through the All-American Canal. Due to the year-round agricultural production, unwatering of ditches or canals for long periods to carry out construction and maintenance work is not feasible. These operations must be geared to a fast schedule which requires getting the water back into the canals in the shortest possible time. A fast construction method for installing or replacing control and delivery structures is essential.

## Installing checks

Various conditions and uses require variations in the size and types of structures. Generally the size of the structure is governed by the quantity of water it must carry and the type by the use to which it must serve. The structures or checks, built with portable concrete forms can roughly be divided into three classifications: (1) delivery turnouts—the most common, used for turning water directly onto a user's ranch. (2) maintenance drops—used for compensating for the slope of the land and maintaining proper grade of water. (3) control checks—for maintaining the required water surface elevation for delivery turnouts to the ranches.

There are two types of delivery checks, close fitted with a concrete pipe for inlet and outlet and those without pipe. The smallest of the checks used in the district, delivery structures are designed to carry 20 cfs. with a maximum of 30 cfs. Requiring 4.7 cu. yd. of concrete for their construction these checks consist of two wing walls, set 3 ft. apart and

joined at the base with a concrete invert. The walls are 5 ft. high, 9 ft. long, and 12 in. thick. A metal gate is set between the walls for controlling the water. In some instances the quantity of water to be carried or other conditions require the walls to be set 4 ft. apart. Checks with pipe attached are constructed with a rear wall making the structure resemble a three-sided box.

A summary of the number of structures built in 1951 and available for cost purposes shows that 40 of the small checks with walls 3 ft. apart, without pipe, were constructed at an average cost of \$212, and 81 checks with pipe were constructed at an average cost of \$319.

As part of its long-range program the district is endeavoring to install all delivery checks with pipes so that interruptions to the road on the ditch bank will be eliminated. At present when using maintenance equipment on the banks it is often necessary to halt operations to lay timbers across the breaks to permit the machines to continue. By extending pipe under the bank to link the check with the user's ditch such delays in maintenance operations will be eliminated. It is hoped that eventually each ditch will be bordered by two uninterrupted roads.

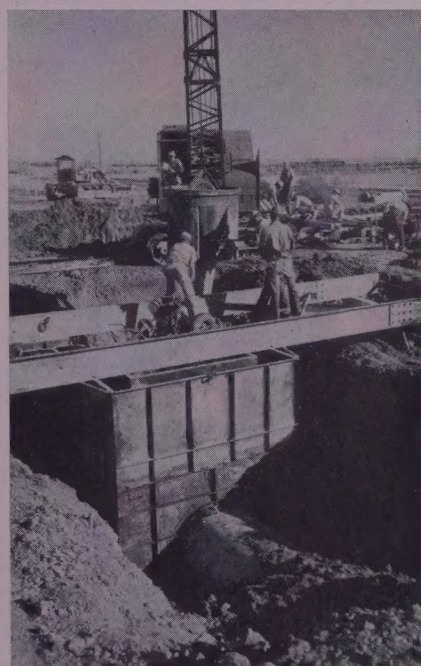
## Larger structures

There are five sizes of the larger concrete structures built with the portable check forms. The largest of these is designed to carry 75 cfs. (maximum of 110 cfs.). If necessary to control larger quantities of water, such as in the main canals, the structures are built with more than one bay. The larger structures, used primarily as control or maintenance checks, are as a general rule not constructed with an attached pipe. However, in some instances, when the quantity of water warrants it, they are used as intake and outlet structures for pipes passing under highways and railroads.

The largest size of these checks requires 29 cu. yd. of concrete and has walls 10 ft. high, 20 ft. long (including straight shank and wing wall), and 12 in.



**SPEEDING** check construction by use of portable steel forms. Concrete is placed in form as it hangs from horizontal steel beams supported by timber cribbing.



**FOR CHECKS** that will have a solid back and connecting pipe, a form with an additional back section is used. The entire construction operation is planned for minimum shut-down time on the ditch.

thick. Walls are 7 ft. apart and connected by concrete invert. During 1951 the average cost of constructing these checks was \$764. One interesting feature of all sizes of checks is the use of metal gates with a watertight rubber seal instead of wooden gates or weir boards that have a relatively short life. The structures are constructed with the normal slot for wooden fixtures and a rubber extrusion piece with a thin slit running its full



**AS DRAGLINE BACKFILLS** around completed check, workmen re-assemble steel form. Thus, time is saved at the next job location. Form shown here is 10 ft. high and 20 ft. long.



**IN DITCH MAINTENANCE** a Ruth bucketline dredge is used to deep and clean ditch bottoms. Recently, mule pulled tow cable out snubbing was replaced by a small tractor.

length is inserted in the slot. The edges of the metal gate fit into the slit in the rubber. A similar rubber unit is placed in the slot in the invert to act as a water-stop at the base of the gate. The rubber extrusions are held in the slots by narrow pieces of timber. At present plans call for eventual elimination of the timber supports as they do not last the life of the rubber and the swirling action of the moving water has a tendency to loosen them.

#### Portable forms

Two form sections are used in constructing a check, one for each wall. When the check is to be connected to a pipe and has a solid rear wall a third section is used. Each form section is made from four pieces of sheet steel. Two large pieces, for walls, are curved at the ends to provide the wings on the structures. Strips of steel, set on edge, are welded horizontally and vertically across the large pieces for reinforcement. Strips are also attached to the ends for holding the connecting end pieces. These end pieces, 14 in. wide, are bolted to the larger pieces to complete the section. Forms for the smaller checks are made from No. 12 gauge metal and those for the larger from No. 11 gauge material. Forms are made in heights of 5, 7, 10, and 11 ft. If necessary to increase the height of the form on the job they are made so 1-ft. sections may be attached. Each set of forms is sent into the field equipped with two 10-in. steel I-beams for supporting them when placed in the ditch.

#### Construction

In constructing the checks the ditch is unwatered and the site excavated with dragline. Excavation is held to a minimum and is just sufficient to provide room to install the structure. Wellpoints are used when additional unwatering is required. When practical the work in replacing a deteriorated wooden structure is delayed until the unit is in such condition that it can be readily removed by the dragline when excavating.

With the excavation completed the steel I-beams are laid across the ditch from bank to bank and the form sections attached and suspended beneath. By raising or lowering the beams the forms

can be set to proper grade. Beams are usually supported on the ditch banks by wooden blocks. Forms are usually placed so that the base is about 3 in. above the bottom of the ditch to allow the concrete to flow out and connect with that in the invert. The form sections are held apart at the bottom with pieces of timber. In constructing checks with a connecting pipe, this pipe is set in place first, the form placed over it and the concrete poured around the pipe to seal the connection.

Truck-mixed concrete is placed with crane and bucket in alternate sections to provide practically a monolithic pour. Concrete is vibrated in the forms and the top surfaces are hand finished. Generally concrete with a 3-in. slump is used. When the forms are filled, concrete is placed in the invert on the bottom of the ditch and hand troweled.

By using unreinforced concrete, even though the section must be thicker, it has been found that a saving is obtained due to the time which would be required to set and tie steel.

#### Stripping and re-assembling forms

Forms are stripped usually 24 hr. after concrete is placed. Stripping is accomplished by merely removing the bolts holding the individual sections together, detaching them from the supporting I-beams, and lifting out of the ditch. When

forms are set on the bank after stripping they are reassembled so that when us for a subsequent operation no time lost in getting them in place.

After the forms are stripped the area between the walls of the new checks and the ditch banks are backfilled and compacted and the ditch generally cleaned up. As soon as the gates and waterstop are installed water is turned back in the ditch. Generally the district can complete all phases of the operation—unwatering, construction, flooding—with three days. Normal operations are geared to the construction of about three replacement structures of various sizes per week.

#### Other construction work

Another phase of the construction program carried out by the Imperial Irrigation District includes installing underground pipe beneath roads, highways and railroads. For running lines under county roads the district has a bilateral working agreement with Imperial County. Under this agreement the county furnishes material and the district the labor for the work. The district has found that the agreement, which is such that either organization can call upon the other for their part in carrying out a particular project, works to its advantage in that it is insured of proper installations.

**TO CLEAN DITCHBANKS** of weeds and brush, the district uses a Briscoe Sloper mounted on D-8 Caterpillar. Averaging about 12 mi. per day, this machine covered some 2,000 miles of canals during the past year.



**FOR CONTROLLING** larger amounts of water, checks with several bays are constructed, such as this one recently installed on a main canal. A timber bridge will be placed across check when it is completed.



One correction project carried out recently was driving a pipe under a railroad and installing large structures at each end. Prior to the work a major drain was intersected by a railroad track. At the point of intersection the drain angled to the right and extended parallel to the tracks for some 300 ft. to a trestle. Passing under the trestle to the other side of the track, the drain turned again and extended back along the tracks to its original line. Due to the four turns involved in the detour maximum free flow of drainage water was not being obtained. The drain was temporarily cut down and excavations were made at each side of the rail bed. A 48-in. pipe was driven through the rail bed and structures 11 ft. high were constructed at each end of the pipe.

#### **Tile drainage systems**

In order to prevent undesirable concentration of salt in the top layers of soil, land owners install tile drainage systems about 6 ft. underground to permit free passage of irrigation and leaching water through the soil. To carry the runoff from such operations the district constructs drains 7½ ft. deep. When constructing a drain for a landowner the district requires a right of way and charges \$800 per mile for the work. Generally a drain is set up for each 160 acres of land and is placed on the low side of a field, opposite the delivery lateral.

Drainage ditches are excavated by dragline and the material is placed on

the ditch banks during excavation. It is then leveled and brought to grade by bulldozers. Drainage construction and other ditch construction requiring the use of dragline and bulldozer is carried out on a 2-shift basis.

#### **Seepage control**

Another phase of what may be termed the construction program is seepage control. With the exception of test areas and two short sections in the All-American Canal all canals and ditches in the district are unlined. Rows of eucalyptus trees along the ditch banks are one of the major causes of leaks. When such trees are removed their root sections, part of which extend into the ditch, remain and begin to rot. After reaching an advanced state of decay the roots act as drains to allow water to leak from the ditch.

Correction work for this type of seepage is done by using a dragline to excavate a narrow trench along the ditch bank and backfilling and compacting the material. In operation the dragline is actually digging a trench at the end of its boom and backfilling and compacting with its bucket close to its tracks. In 1951 over 51,000 ft. of ditch bank at 44 locations were machine corrected by this procedure.

#### **General maintenance**

For operational purposes in its irrigation and drainage functions, the Imperial Irrigation District is divided into a headquarters unit and seven divisions

with a separate division to handle the All-American Canal. The headquarters unit supervises overall operations and carries out the various construction projects and some of the heavier types of maintenance. The divisions take care of actual water deliveries and general maintenance in their areas. Each division maintains labor, carpenter and utility crews for its work in addition to the *zanjeros*, or gate men, who take care of water deliveries.

#### **Ditch maintenance**

Basically there are four different types of ditch maintenance operations carried out on a year-around program by the district. These different operations and the mileage over which they were used during 1951 are: Bucket line dredge—435 mi.; ditch wall sloping—1,745 mi.; angle dozer work—3,012 mi.; and dragline work—249 mi.

Bucket line dredges (Ruth) are used generally to deepen ditches and improve the slope of the sides. By replacing a mule with a small track tractor recently, the district was able to increase the speed of this operation from 1 mi. in 10 hr. to 1 mi. in 8 hr. When using the mule the cable by which the dredge pulls itself forward was pulled out by the animal to a distance of about 600 ft. in front of the machine. At this point a snubbing post was driven into the ditch bank to act as an anchor for the cable. Now, the small tractor pulls out the cable and when it reaches the 600-ft. mark the dredge operator starts taking in line and freezing the forward motion of the cable. Being unable to pull the larger machine the small tractor slips its tracks and literally digs itself in to become a snubbing post. When ready to move ahead again, after the dredge has moved up the length of the cable, the small tractor is merely backed out of its self-made hole. When using a mule the snubbing operations required a total of from 45 min. to 1 hr. per day. With the tractor the snubbing only requires a total of 15 min. per day.

Brisco slopers, mounted on large track tractors, are used for cleaning weeds and brush from the sides of the ditch and the top of the bank and to put a berm on the side of the ditch. To complete a section as it progresses the sloper usually traverses one side of the ditch during part of the day and returns along the

**OR WEED** and brush burning, and spraying, specially equipped trucks with movable booms are used from May through November. Several thousand miles of ditches are treated annually.



other side during the second part. Generally covering about 12 mi. per day the sloper is accompanied by a work crew that lays timbers over breaks in the ditch bank so forward movement of the rig will not be interrupted. Sloper operations totaled 2,021 hr. during 1951.

As roads are considered essential they parallel the ditches whenever possible. The importance of the roads for reaching portions of the ditches for maintenance and emergency work is one of the prime reasons pipes are being used for farm outlets. Angledozerers are used to maintain roadways on top of the ditches with motor graders maintaining permanent roads that parallel the ditches. Angledozerers were operated 10,849 hr. during 1951.

Draglines are used for general cleaning where larger quantities of material must be removed and for improving alignment of levees. During 1951 dragline operating time in this work totaled 15,995 hr.

#### Moss—brush—weeds

Moss in the ditches, a perennial problem common to most irrigation ditches, is controlled by several methods in the Imperial Valley. It has been found that the best control method is to drain the ditch. In ditches where this can be done, such as drainage units, the usual method is to dig a smaller ditch along the center of the invert of the larger unit. This small ditch carries the water below the moss line leaving the growth to die out. By taking away the water moss dies a natural death. Current moss control operations include, the small ditch, chemical applications, burning and spraying. Brush and weed control are carried out by using specially equipped tank trucks with movable booms for applying the spray or burning along the ditch and channel banks.

During 1951 brush and weed control work was done as follows:

Aromatic oil sprayed along channels—9,472 man hr. were utilized in spraying 490,705 gal. of aromatic oil along 3,974

#### Major equipment used by Imperial Irrigation District

- 6 Ruth bucketline dredges
- 6 Farmall rubber-tired tractors
- 7 Caterpillar D-7 tractors with angle dozers
- 4 Caterpillar D-8 tractors, 2 with slopers and 2 with dozers
- 1 Austin motor patrol
- 1 Caterpillar No. 12 grader
- 17 Bucyrus-Erie draglines (15-B to 38-B)
- 1 Browning truck crane
- 1 Bucyrus-Erie 22-B truck crane
- 10 Truck-mounted spray rigs
- 7 Five-ft. portable steel forms
- 334 Vehicles, including 106 pickups and 99 coupes
- 74 Miscellaneous pieces—jeeps, trailers and hauling rigs

mi. of waterways. About 124 gal. of oil was used per mile and the work cost an average of \$29.54 per mi.

Burning operations—In 1951, using a light oil 2,589 mi. of ditch bank weeds and brush were burned. A total of 298,692 gal. of oil and 7,225 man hr. were required for the work. Oil was used at the rate of 115 gal. per mi. and the cost of the work averaged \$18.15 per mi.

Chemical spray—Two types of chemical sprays are used in the district. One, a solution of 60% 2,4-D with a sodium salts base was applied at the rate of 9 lb. per mi. along 790 mi. of ditches in 1951. In this work 1,833 man hr. were used in applying a total of 7,316 lb. of material at an average cost of \$12.98 per mi.

The other type of chemical spray is adding TCA to the 2,4-D. Using the combined chemicals a total of 53,995 lb. of material was used to treat 1,350 mi. of waterways in 1951. This material was applied at the rate of 11 lb. of 2,4-D and 47 lb. of TCA per mi. Utilizing 4,467 man hr., the cost was an average of \$20.50 per mi.

Cost figures are computed for a 12-ft. strip along the ditches and canals. If the area treated was 24 ft. wide the cost was

computed at two 12-ft. strips.

Brush and weed control operation are also carried out along the All-American Canal. Part of this work is done from an amphibious duck that travels through the water while carrying out the operations. Near the large control structures in the canal short roads leading from the bank to the edge of the water have been constructed to facilitate the duck's entry and exit from the canal. Due to the considerably larger dimensions of the All-American Canal, greater quantities of material are used in the control work and the average cost per mile is greater.

#### Personnel

General administration of Imperial Irrigation District, covering its irrigation and drainage operations as well as its power generation, transmission and distribution system, is under the direction of E. T. Hewes, Executive Superintendent, and B. A. Weiss, Executive Engineer.

The irrigation and drainage operation are handled by two departments: (1) The All-American Canal Department under the superintendency of W. K. Bowker, Jr., responsible for maintenance and operation of the diversion works at Imperial Dam and the entire All-American canal; and (2) the Department of Water Distribution and Drainage Construction under the superintendency of W. E. Hartzog, which is responsible for operation and maintenance of the water distribution system and the drainage system. In the latter department, O. L. Fudge and R. D. Reynolds are assistant superintendents of water distribution, H. C. Chisholm is superintendent of drainage construction, and F. W. Fifield is superintendent of heavy construction.

All surveys and plans are performed by the Department of Engineering, under the direction of A. J. Boles, chief civil engineer. L. V. Hess, master mechanic is responsible for repairs and maintenance of all construction equipment.

## All-American Canal now operated by Imperial Irrigation District

OPERATION and maintenance of the California end of the Imperial Dam on the lower Colorado and the All-American Canal in California is now being carried on by the Imperial Irrigation District, El Centro, Calif., under the supervision and control of the Secretary of the Interior.

The transfer of operation and maintenance to the District from the Bureau of Reclamation followed the execution of a supplemental contract between the District and the United States, dated March 4, 1952. Actual transfer was effective as of May 1 of this year. Regional Director E. A. Moritz, of the Bureau of Reclamation at Boulder City, represents the Bureau of Reclamation in connection

with carrying out the provisions of the contract.

Imperial Irrigation District now operates and maintains the diversion and desilting works on the California side of Imperial Dam, the main All-American Canal, and the common section of the Coachella Canal to the Riverside County line in California. The Bureau of Reclamation, in addition to the supervision of the operation and maintenance by Imperial, continues to operate and maintain the sluiceway sections of Imperial Dam as well as the works at the Arizona end of the dam which serve as the diversion and desilting facilities for the Gila Project in Arizona. The Bureau also operates the turnouts in

the All-American Canal serving the Yuma Reclamation Project in Arizona.

#### Contract background

The supplemental contract was made necessary by the provisions of the Mexican Water Treaty of 1944 and was negotiated under a directive of the Senate Appropriations Committee in connection with the 1952 Interior Appropriation Act. The supplemental instrument adjusts the 1932 contract between Imperial and the United States so as to provide an increased measure of supervision and control over operations by the Secretary of the Interior in pursuance of the Mexican Water Treaty. Execution of the supplemental contract also clears the way for installation of the Imperial Irrigation District if it chooses so to do, of a power plant at the Pilot Knob site on the Canal in accordance with the Boulder Canyon Project Act of 1928.

Colorado contractors find that—

# P. R.\* program pays off in good will



By

**EARLE W. DEVALON**

Managing Director  
Colorado Contractors  
Association, Inc.  
Denver, Colo.

THE COLORADO Contractors Association has learned that it has a vital interest in the opinions and attitudes of the man on the street. For it is his money—tax dollars—which are to a great degree responsible for keeping the wheels of the heavy construction industry turning.

In recognition of this fact, the association has come to regard public relations activities as a part of its regular function in behalf of the industry. The public relations committee is one of the standing committees which takes an active part in the affairs of the association. To assist this committee in its work, and to gain the advice of professionals in the field of public relations, the association has retained the services of William Kostka and Associates, Inc., Denver public relations consultants.

## the problems . . . and the program

In Colorado the contracting industry was faced with unique problems. For several years the state highway department was under bitter attack from the press of the state for what was claimed to be its mis-management of highway affairs. Charges were made that construction was not keeping pace with the need for new roads, that the highway program lacked a base in sound planning, that money was being wasted on poor highway construction. In some cases the criticism centered upon personalities rather than upon the actual accomplishment of the department. Protestations from the state highway engineer served only to add fuel to the fire. Inevitably the criticism rubbed off on the contractors, the people who built "those lousy roads."

Under this strain, the relations of the highway department with the contractors became self-conscious at times. There even existed some feeling in the department that, by failing to rally to its support, the contractors were willing to "throw the department to the wolves."

Obviously, the situation demanded a review of the activities of the association with a view to determining a course of action which would bring about improvement of the relations.

Due primarily to the efforts of the association, a joint cooperative committee had been established, consisting of representatives of the contractors and officials and engineers of the highway department. It was the function of this committee to discuss the mutual problems of the two groups in an effort to solve them before they had a chance to become

a source of real irritation. The committee has been in operation since 1948. It has served its intended purpose well. Between the highway department and the contractors there exists today an understanding that has served to expedite the work of both groups.

While the association had made progress in its relations with the state highway department, it was found necessary to embark upon another phase of its public relations program. It was apparent that much of the criticism focused upon the highway department resulted from lack of understanding of the problems of highway construction, both on the part of the press and the general public.

The association recognized that it had an educational job to do. Tax funds devoted to public construction must be accounted for by the industry if it is to expect the taxpayer to go along with increased expenditures necessary today. Show a man where and how his money is spent—gain his understanding of construction costs, techniques, and problems—and he is far more likely to lend his support. While highway budgets and reports are available, this is not enough to reach the ordinary taxpayer. The story must be told in terms he understands and in a manner that will interest him.

To fill this information vacuum the association, with the assistance of its public relations consultants, embarked upon a long range program designed to familiarize the press and the people with the accomplishments of highway department-contractor teamwork.

An editorial background memorandum, containing information and illustrations concerning the construction industry, its method of operation, and its equipment, was prepared and sent to all of the papers of the state. Over a period of time articles dealing with highway construction, designed to appeal to a regional audience, were prepared and sent to the newspapers serving the particular region. Progress of construction jobs was reported with consistency to keep the public mindful of their expanding and steadily improving highway system.

## The results . . . and the lesson

The program has proved to be effective. The press of the state has adopted the attitude of an interested citizen. Some of the blistering attacks of former years have disappeared from the editorial pages of the newspapers. Editors seem eager to print information concerning construction progress.

In the long run, it is the confidence of the people in their units of government which helps to build highways, bridges, and water mains. Lacking public confidence, agencies of government are unable to operate with efficiency and purpose. The errors with which they are charged by the public inevitably reflect unfavorably upon the people with whom they are associated. In the public mind, the blame for a new highway that shows construction defects a year after construction, even though it might have been built to specification, rests not only with the unit of government responsible, but also with the builder of the highway.

It is no longer enough for contractors to build what they are required by contract and specification to build. The industry must take an active role in encouraging competence and efficiency in the units of government responsible for public construction. It must join with those agencies in promoting the understanding of their functions and accomplishments.

**\*PUBLIC RELATIONS.** Joint action of contractors and highway engineers in Colorado has proved that "it is no longer enough for contractors to build according to contract and specification. They must join governmental agencies in promoting the understanding of their functions."



In this view of the first barrier placed across the main Columbia River, lettering indicates the procedure for—

# RAISING ROCK ISLAND DAM

*Historic dam and power plant built in 1931 near Wenatchee is being completed to original plans by a raise and the addition of six generating units—Cost to P.U.D. for 165,000 kw. additional generating capacity is about \$33,000,000*

THE FIRST power plant to be constructed on the main stem of the Columbia River—Rock Island Dam—is now being completed by adding 165,000 kw. to its generating capacity and raising the dam structure. Current construction consists of extending the initial hydroelectric development built in 1931 by Puget Sound Power and Light Co., and was contemplated in the original design for the project.

The present program is being done by Public Utility District No. 1 of Chelan County, Washington, an agreement having been made with Puget Sound Power and Light Co. whereby the company leased to the district the right to complete the plant, with the company to operate the entire plant upon completion.

The Rock Island Hydro-Electric Project was designed by Stone and Webster Engineering Corp., who constructed the original portion for Puget Sound Power and Light Co. and who are now acting

as engineers and constructors for the completion of the dam and powerhouse for the Public Utility District.

## Design provisions

The dam consists of a flat concrete slab on the river bed on which rests heavy concrete piers. Steel gates that may be opened wide during flood periods are used to close the 32 openings between piers. In either single or double height arrangement, the 54 steel roller crest gates, each 30 ft. wide and 22.5 ft. high control 1,365.5 ft. of spillway. The powerhouse, built of reinforced concrete and structural steel, forms an integral part of the remaining dam structure and when completed in 1953 will be 746 ft. long, 114 ft. wide and 162 ft. in height from bedrock to parapet. In addition to the four existing generators it will house the six new generating units and one station unit. Total generating capacity will be 245,000 kw. Step-up transformers and transmission tower structures are

mounted on the roof of the powerhouse.

Two roller drop gates provide the attraction for two fishways located adjacent to each river bank, and a third fishway is located near the center of the dam. The right and left fishways are 600 ft. long and 20 ft. wide, and are built in 12-in. steps. Extensions are being made to the upstream end of the center fishway and modifications are being made to the other two fishways to provide adequate and suitable facilities for the passage of migratory salmon.

Work under construction for the completion of the dam involves completing the 21 piers in the west spillway, installing 36 additional steel crest gates, completing the concrete deck over the east and west spillways and installing an additional 80-ton gantry crane. The powerhouse will be extended 418 ft. to house the six additional generating units. Hydraulic turbines will be Allis-Chalmers (Kaplan type) 34,000-hp., 100-rpm. machines designed for an average effective

head of 45 ft. The turbines will drive 5,000-kva, 90% power factor, Allis-Chalmers generators having a continuous guaranteed capacity of 28,750 kva. The 13,800-volt generator bus will be housed in Westinghouse metalclad switchgear, using air circuit breakers for generator and transformer main circuits. Generator control will be carried to a central control room to form one integral control station for the 10 units.

A transfer bus will connect the main station bus of the old and the new plant. The new generators will be arranged in groups of three, each group feeding through a 75,000-93,750-kva. General Electric, three-phase power transformer. These two transformers will connect with two 115-kv. transmission lines having 636,000 circular mil ACSR conductors extending 2.5 mi. to the nearby site of the Aluminum Company reduction plant.

Cost of the expansion program at Rock Island is estimated to be \$33,000,000.

#### Schedule is tight

The project is unusual in that its construction schedule and the commercial operation schedule of the generators is probably the most rapid ever attempted. Practically all structural design is being done coincident with construction and design which normally requires six months to a year of preliminary work has been accomplished without delaying progress.

The project was officially authorized in May 1951. Contracts for the generators, turbines and transformers were confirmed immediately and on the first of nine bids were requested for the structural work for the dam and powerhouse. On July 3, 1951 the contract was awarded to Atkinson-Ostrander Co., a combination of Guy F. Atkinson Co., and Ostrander Construction Co.

Atkinson-Ostrander immediately assigned an organization to the project and a field office was set up July 9 in Venatchee, 9 mi. from the job site. In view of the fact that the contract has a liquidated damage clause and the work covered in the clause was low water work with the beginning of low water estimated as August 15, the contractor had to start in high gear immediately, both with equipment and manpower.

Substantially all the structural work has been done under extremely short time limits by reason of this necessity of working within the low water limits of the river at the same time being restricted by the need of continuing operation of the existing powerhouse with maximum river head.

#### Contractor moves fast

At the start of the job the piers that had to be raised in the west channel were under 14 ft. of water. Powerhouse foundations were also under water. Construction was scheduled to start either on August 15, 1951, or when the river level reached 581 and the work below elevation 595 was to be completed within a 60-day period. Unusually severe penalty provisions were set up in the contract for failure to meet construction

requirements as the power company would suffer heavy production losses. Fortunately the contractor was able to schedule and do his work within the time limits and no penalty was incurred.

The project is also unusual in that it includes the aspects of a major alteration rather than what might be considered normal dam construction. All new work started on work which was left incomplete more than twenty years previously and since the turbines and generators for the new units are substantially larger it became a major operation to build onto the existing powerhouse work.

Since the scope of this article is pri-

marily progress, the plans and photographs provide an effective method of indicating the site conditions and the work being carried out.

#### Personnel

For Stone and Webster Engineering Corp., D. N. McCord is project manager, C. P. Weaver is construction superintendent and I. R. Kline is resident engineer.

For Atkinson-Ostrander Co., J. A. Kier is job manager, Aubrey Horn is chief engineer, J. C. (Dinty) Moore is construction superintendent, and Kieth Center is assistant to superintendent.

#### STEPS IN THE RAISE:

1. Raising piers above existing foundations in the West spillway.
2. Second stage, showing method of forming piers and deck, using the deck as an access bridge as the work advanced.
3. Completed section, with deck now extended across the river to support 80-ton gantry crane for handling gates. Extension of powerhouse under way in background.

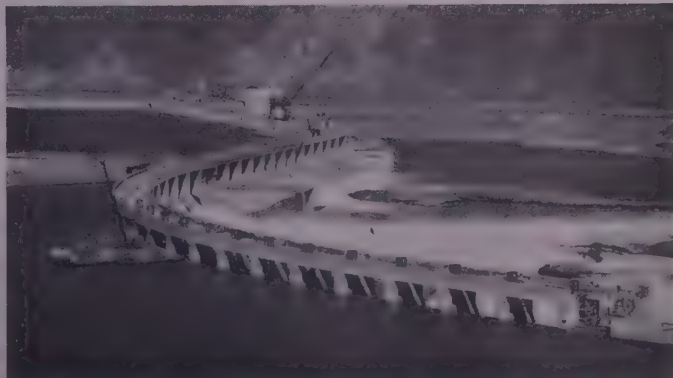
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# Highway officials present first annual merit award

**Conference of Western Association of State Highway Officials at Seattle featured by first presentation of "Dr. L. I. Hewes Award"—Mark Watrous, State Highway Engineer of Colorado, named president—Progress reported on the test road in Idaho**

WITH A REGISTRATION of 428 and a well-balanced program of general and technical sessions, the Western Association of State Highway Officials held its 31st annual conference in Seattle June 5-7. The 1952 conference featured the initial presentation of the annual "Dr. L. I. Hewes Award." General arrangements for the conference were under the direction of W. A. Bugge, President of WASHO and Director of Highways for the State of Washington.



MARK WATROUS, new president

Officers elected for the coming year were: President, Mark Watrous, State Highway Engineer of Colorado; Vice President, E. V. Miller, Chief Engineer, Idaho Highway Department; Secretary-Treasurer, W. E. Willey, Engineer of Economics and Statistics, Arizona. In addition, G. C. Greer, State Highway Engineer of Texas and W. C. Williams, Assistant State Highway Engineer of Oregon, will serve on the Executive Committee along with Past President Bugge.

## Dr. L. I. Hewes Award

The non-technical features of the program included the annual dinner presided over by President Bugge, featured by the presentation of groups from each state, with vocal responses. An excursion took those attending the conference by boat from Seattle south through the Sound, under the Tacoma Narrows Bridge, followed by dinner in Tacoma.

Following the action of WASHO one year ago, plans were initiated for the selection of the first recipient for the an-

nual award sponsored by *Western Construction* to commemorate the career of Dr. L. I. Hewes and his service to highway development in the West. Dr. Hewes was for many years the Western Regional Chief of the U. S. Bureau of Public Roads. Final selection of the recipient was made by the executive committee of WASHO from names presented by the member states. The committee reached the conclusion that two nominees were equal in meriting the award "for an outstanding contribution to highway development in the West."

Without establishing a precedent for dual-recipients, the committee decided to make the award to both individuals for 1952 and divide the \$500 fund. Announcement of the two recipients was made by President Bugge at the concluding session and certificates (see opposite page) were awarded to the two engineers by James I. Ballard, editor of *Western Construction*.

The two engineers thus honored were:

**Herbert W. Humphres**, District Soils Engineer of the Washington Department of Highways, for his outstanding work in soils mechanics and soils stabilization, with particular emphasis on meeting the needs of counties and cities;

**James T. McWilliam**, Assistant Engineer, California Division of Highways, who received the award as a result of his exceptional work in developing gyroscopic survey methods for rapid road inventory.

## WASHO Test Road

Of unusual interest to the conference was the progress report on the WASHO test road now being constructed near Malad, Idaho. This is the test road of bituminous construction which was initiated and financed by the Western states. Actual test studies will be conducted by the Highway Research Board under the general direction of Fred Burggraf, Director. Work at the site for the board is under the direction of W. N. Carey, Jr. These two engineers presented a joint paper outlining the background for the project and the field work to date. General features of the program and the design of the test section were reviewed in *Western Construction*, April 1952, pp. 65, 66.

Work at the site is active at present, with plans for surfacing to be placed during the month of August. On this schedule, possibly one month to six

months of testing can be completed this fall, with the remainder of the program to be carried out next spring and summer.

The program for the State of Arizona in attracting motorists was reviewed by Melvin Goodson, executive secretary Arizona Highway Commission. He described in particular the success of "Arizona Highways" in acquainting the public in Eastern states with the natural features of Arizona, as well as adjoining states. In an effort to improve public relations with those tourists arriving at the state boundaries, a program has been initiated for modernizing control stations and improving the type of personnel required at these checking points.

Arthur S. Horner, president of A. S. Horner Construction Co., Denver, Colo., and National President of AGC, addressed the conference, indicating some of the current problems faced by highway contractors and reiterating the desire of Western chapters of the AGC in cooperating with the highway departments of these states.

The subject of toll roads was reviewed by Mark Watrous, State Highway Engi-



W. A. BUGGE, retiring president

neer of Colorado, who traced the history of this development and indicated that the pendulum was swinging back toward more toll roads at the present time. He then discussed in some detail the design and building of the Boulder-Denver turnpike, which is the first modern toll road to be built in the West.

Problems resulting from efforts to control access to state highways were presented in an illustrated talk by R. N. Gillis, Deputy State Highway Engineer California. Mr. Gillis presented case histories, pointing out that local commercial interests need not have any fear about losing business as a result of being cut off from a limited access highway or a freeway. In all of the cases he cited the business in such communities had increased at a faster rate than the state average.

The activities of the Western Interstate Committee on Highway Policy Problems were reviewed by Mrs. Juli Butler Hansen, Chairman of the Washington Legislative Fact Finding Committee on Highways. Mrs. Hansen re-

viewed the establishing of this committee by the Washington State Legislature and the growth of its cooperative efforts with other similar committees throughout the West. At the present time this Western group has developed a regional approach to the long range highway problems and secured the Institute of Transportation and Traffic Engineering under the direction of Harmer E. Davis to develop a program for long range research in highway problems.

#### resident's address

The keynote address for the conference was presented by President Bugge and some of its salient features are abstracted in the following paragraphs.

Our nation today is faced with a critical highway problem. Vehicle-miles of travel in 1951 increased 48% over 1941. Highway problems in the West are more acute than elsewhere: population increased four times faster in the West than in the United States during the last decade; our deficiencies are more acute; our future is more challenging. Compounding the problem is the fact that the economy of the West is geared almost entirely to motor transportation.

We are having to build highways under unusual difficulties. Defense spending and rising taxes, plus increased retail costs, are making people reluctant to spend scarce dollars for highways. Steel supplies are unpredictable. We must operate with insufficient trained engineers. Costs are high and going higher (a composite mile in Washington, for example, costs twice now what it did in 1940).

Leading industries nationally have endorsed upon a program to inform the people of the seriousness of the problem. But we highway officials are the ones who should be more concerned. We have to satisfy the demands of the motor vehicle user for safe and efficient highway

## Certificate presented to the two recipients of the 1952 Dr. L. I. Hewes Award

**HERBERT W. HUMPHRES**  
District Soils Engineer  
Washington Department of Highways

*"For outstanding work in the field of soil mechanics with special reference to its adaptation to the needs of counties and cities."*

**JAMES T. McWILLIAM**  
Assistant Engineer  
California Division of Highways

*"For outstanding work in developing gyroscopic survey methods for rapid road inventory."*

### Introducing the successor to Dr. L. I. Hewes

RAYMOND ARCHIBALD is the successor to Dr. L. I. Hewes as Chief, Western Headquarters, of the U. S. Bureau of Public Roads at the Regional Office in San Francisco.

He is well known in the West, having graduated from Oregon State College in 1919 in civil engineering, followed by several years of service in the bridge division of the Oregon highway department. Later he was with the Idaho highway department, returning to the Oregon organization in 1933. Intervening years were spent with two Eastern highway departments.

In 1935 he was in charge of bridge work on the Inter-American Highway for the Bureau of Public Roads. In 1943 he directed bridge work on the Alaska Highway for the same organization. He became chief of the Bridge Division of BPR in 1944 and was named bridge consultant in 1949. This was his last assignment with the BPR before returning West to his present executive position which he assumed last January.



RAYMOND ARCHIBALD

On several occasions he has been on leave from the BPR to act as consultant or project engineer for several large bridge jobs in the East.

In his present capacity, Mr. Archibald directs the affairs of the Bureau of Public Roads for the Western Region, which includes the eleven Western states

way services; we are the fellows under the gun.

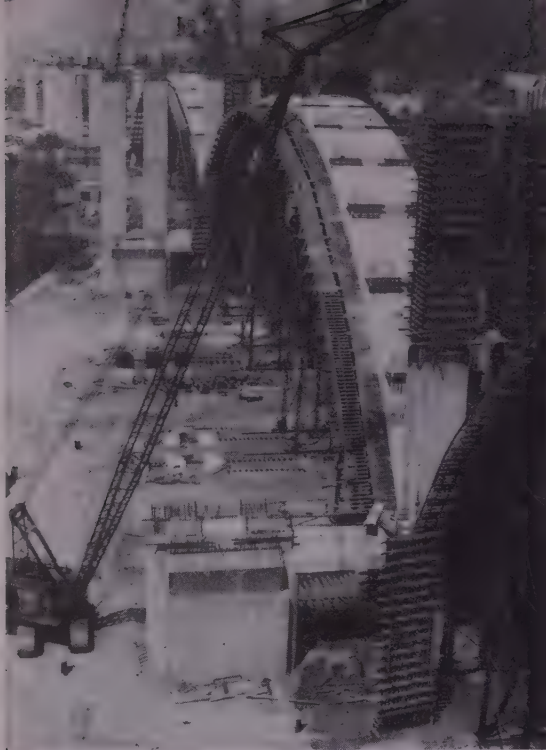
In performing our job, we must continually be aware of the need for providing all the information possible to the people. We must let them know how

bad the situation is, but at the same time tell them that the situation is not hopeless. We should tell them what we are doing to relieve the traffic muddle and how we plan to provide better highways. We should show them how we are going to build a highway system in the West that will care adequately for future traffic needs if they will stand behind us, understand our problems and support a real highway program.

We must in many instances tell the people that rearrangements are necessary in the methods used to finance highways. Obviously, we can't overcome deficiencies accumulated over a period of 10 or 15 years and maintain and administer our highways without altering our traditional methods of financing them. Traditionally, we here in the West have relied for the most part on gasoline taxes, registration and weight fees and other user fees to administer, maintain and modernize the system on a pay-as-you-go basis.

Under this system, funds for expansion of the highway plant and reconstruction and improvement of the existing one were paid by the highway user before he could use the facility. This was a sensible and conservative policy for a highway department to follow during the pioneer days when people didn't realize the potentialities of the motor vehicle.

Concluded on page 110



**At record concrete arch  
bridge in Pasadena —**

## FORMS AND FALSEWORK on the move

WITH CONCRETE in the center span cured, Atkinson crews in mid-May dropped the arch falsework 3 in. and winched it laterally to position for forming a southerly arch rib. First day's progress, about 36 in., is shown here, while form stripping proceeds on main pier column.

**G**UY F. ATKINSON CO. crews building the Colorado Freeway bridge over Pasadena's Arroyo Seco in Southern California knocked off work in a happy frame of mind on Friday, May 16. Their initial efforts at moving the steel framework used in forming the 320-ft. main span had met with success. Lowered 3 in. on its 120 supporting jacks, the falsework had also been winched about 36 in. laterally on its way to position for pouring the southerly of two main span arches. Commencement of the move was a high point in the \$3,389,650 job, largest ever let by the Division of Highways, and its success provided further reason to believe the contractor would stay ahead of schedule on the remaining work.

Reviewed in a general way as to background, planning, and construction preliminaries in *Western Construction* for March, 1952, pp. 65-67, the bridge job at that time featured structural preparations for pouring the arch concrete in three spans of 230-, 320-, and 230-ft. length. This article will complete the form description, note the conduct of arch concreting operations, and review the moving operations carried out in mid-May.

### Arch forms from the "scrap pile"

Detailed falsework description is difficult, inasmuch as the structural members are characterized by the contractors as "scrap pile stuff," gleaned here and there in his own yards and elsewhere as it was available for fabrication in its present state. Generally, the arch forms are supported on a flooring system carried in turn on 36-in. I-beams of varying lengths, these beams being chords that approximate the arch curvature. They are supported on towers made up of WF members. For the central span,

four such towers were built, each having two bents of three columns. The bents were constructed on structural steel skids that, in turn, rested on jacks, four under each column end. At the haunches next the bridge piers, additional single bents, also of three columns each, are supported in a similar manner. The side spans east and west of the central one have been formed in the same way except that only three towers have been necessary for their shorter lengths.

### Erecting falsework

In construction of the falsework, concrete footing pads were first poured and the screw jacks positioned on them. Towers were then erected, one bent at a time, and diagonal ties connected for lateral support and stiffness. Atop the towers were laid the 36-in. beams, three abreast, the central ones being placed last. End-to-end connections between beams were made by bolting through splice plates, two on each side of the beam webs. Purlins completed the steel construction. These were 40-ft. lengths of 12-in. 53-lb. H-pile, spaced at 4- to 5½-ft. centers. Wood flooring filled in between the beams as a safety measure, a solid deck being placed on the bottom flanges of the beams. Walkways with handrails and steps were constructed on the cantilever portions of the purlins outboard of the forms.

Fully enclosed forms were necessary only on the steepest portions of the arches. For all slopes to 35 deg. completely open forms were used, and from 35 to 45 deg. so-called open-face forms were used. Here the only containment provided was in the form of 2 x 12-in. timbers at 3-ft. centers. Without top forms acting to tie the sides of the forms together, other means had to be provided. The necessary stiffness was

achieved by laying extra steel purlin across the open forms and clamping their exposed ends securely to the bottom purlins under the forms—sandwiching the form. Enclosed forms were built for all slopes beyond 45 deg. to the maximum, 56 deg. at the haunches.

The falsework and form construction was completed in February, having been designed by the contractor and checked by Moffett and Nichols, consulting engineers of Long Beach, Calif. As completed, a typical tower stood with 8½ ft. between legs of each transverse bent. For the two central towers of the main span, the bents were 20 ft. apart. For the shorter towers, this spacing was 14 ft. Bents of all towers under the side spans were spaced at 20 ft. Heights of the towers ranged from 50 to 90 ft. under the central span. The height differential between towers of the side spans is proportionately greater, due to difference in ground elevations as the arroyo bank steepen away from the channel.

### Designed to be moved

The steel falsework, to the use of which the contractor had "keyed" his bid, was designed particularly to simplify the necessary support construction and to permit complete use without expensive striking and rebuilding. During the design and erection of the falsework there was some speculation as to the direction of forces that would result under concrete loading. The possibility of a racking action and horizontal pressure at the haunches might occur during the sequence of pours was discussed. However, the design using vertical towers proved perfectly satisfactory in this respect.

Longitudinal arch reinforcing consisted of 1¼-in. round bars at 9-in. centers placed in mats at top and bottom of the

rm, 32 bars in each mat. Additional 4-in. bars were placed against the sides of the forms, two on each side, between top and bottom mats. Spacers are 18-in. round bars at 18-in. centers.

All this steel, as well as the steel and wood used in falsework and form construction, was set from cranes. A Bucyrus-Erie Model 38-B, fitted with 110-ft. boom and 20-ft. jib, was used on span west of the central span. Spans 7 and 8 required a Bucyrus-Erie Model 88-B crane, rated as a 4-yd. shovel or a 70-ton crane. For the Colorado Freeway bridge job, this crane was fitted with a 130-ft. boom and a 30-ft. jib, with which it lifted 2-cu. yd. buckets of concrete to any point of the work on a given span. Great reach is necessary for this work, and the crane must frequently spot a load on the opposite side of the 24-ft. arch depth, clearing the 40-ft. lengths of falsework purlins in so doing. A structural change in the boom attachments that minimizes whipping for such operation and the substitution of angle iron for conventional cables in the tension members supporting the jib.

#### Pouring sequence

Pouring of arch concrete commenced on February 21, with operations concentrated on span 6. A 50-ft. segment at top center was poured first, followed by 15-ft. and 34-ft. segments adjacent to west and east haunches, respectively. The third pour was an isolated one on the east side of the arch. The fourth pour connected the third to the top segment and saw addition of a corresponding segment west of center. The fifth pour, adding concrete on each side, filled in above the haunch pours, leaving two 15-ft.

segments still open as key locations. Pouring here was deferred until completion of concreting elsewhere in the other two spans.

#### Open face forms

Concrete in the central and eastern spans followed a similar pattern, the number of segments and the sequence depending on the degree of symmetry in each span. Pouring of the keys came last—central, western, and eastern, in that order. As noted, completely open or open-faced forms were used extensively in the work. Specifically, only the pours adjacent to the haunches in the main span were completely enclosed, segments of 33 and 38½ ft. In the west span, segments totaling 53½ ft. on the west and 62 ft. on the east were enclosed. For the east spans, the comparable figures were 68 and 27 ft. These enclosed pours saw the use of tremies to ease hydraulic stresses on the forms. All inclined pours saw great care taken to prevent the start of an "avalanche" in the open-face forms.

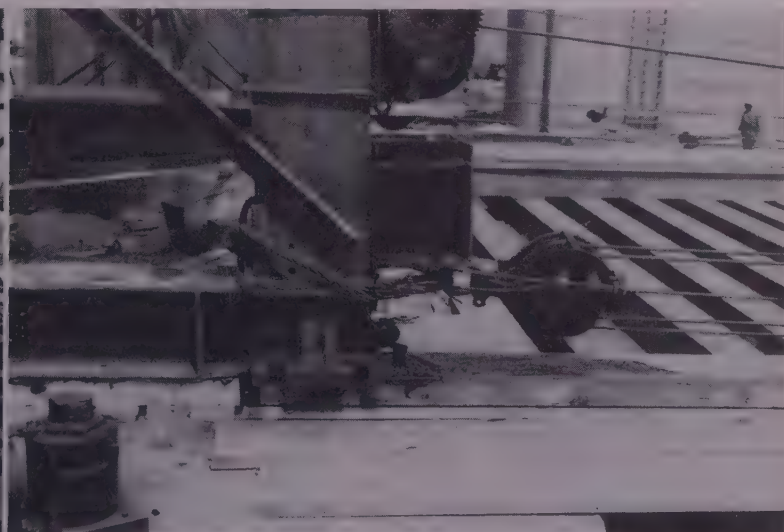
The described placing schedule was computed to produce the best balanced progressive loading of forms and falsework, the key pours being the critical ones for other reasons as well. The most rigidly controlled, these latter were poured in a definite sequence, and then only after all prior concrete had set, in the forms, for at least ten days. The keys were completed on May 8.

Shortly afterward, form stripping, to the extent necessary for the move, was begun. Generally this included removal of top forms and open-face planking, clearing of H-pile purlin clamps on the open form sections, striking of side

forms, and dismantling of the north handrail. Since the forms were to be lowered only slightly and skidded southward to the new position, other dismantling was unnecessary.

Though lowering and moving falsework of this magnitude in one piece was itself to be a trick, the problem was complicated by requirements for differential movement. The easternmost assembly, under span 8, lay under a decidedly flaring portion of the bridge deck, which leads into a multi-lane approach section at the east abutment. Thus, while one end of this falsework had to be skidded 70 ft., the other end had only 56 ft. to go. Similarly, for the central falsework, its east end was to be moved 56 ft., and its west end only 48. The westernmost span would appear to be the simplest to handle, as it remains on an apparently parallel alignment, moving 48 ft. laterally at both ends. However, a complication was introduced here, too, as the effect of longitudinal curvature (without change in width) had to be achieved. The means employed was to provide for shortening the span of the southerly arch rib, and this was done by hinging the form at its crown. Then, after movement horizontally, its ends would be dropped, 2.01 ft. at its east end and 1.30 ft. at the west, reducing the span length from 216.66 ft. to 211 ft. The central and east arch rib spans remained constant at 302 and 214 ft., respectively. (These lengths refer to the forms; center-to-center dimensions of the arch spans are 230 ft. for the spans 6 and 8, and 320 ft. for span 7.)

Preparations for moving the falsework were, in mid-May, completed only for the central span, which was moved at that time. Footings had been poured



BOXES welded to column legs (view at left) provided bearing for 50-ton hydraulic jacks. These relieved screw jacks for easier lowering of falsework. Placed during the move in the manner pictured, they decreased friction for each increment of falsework motion along skids.

RIGGING DETAIL on one of ten bents (above) shows how falsework moved. Hand winch and tackle are seen here, also greased skids supported at this location by WF caps to spread the load.



Bethlehem Pacific Coast Steel Corp. photo

**PATTERN** of reinforcing steel defines section of arch rib prior to completion of forms. Elaborate timbering for supporting and forming concrete is well shown, resting on steel purlins at 4- and 5 1/2-ft. centers.

in the new position, and skids laid between them and the original falsework position. Generally, there were no significant differences in ground elevations between these points, and skid support was not overly complex. It was a problem, however, to insure that no settlement could occur from the weight of the falsework in transit. Accompanying pictures show the cribbing used to support skids for the west central tower under the main span, and the "mat" of WF sections laid on soft ground over which skids were placed for the adjacent east central tower.

The actual stringers on which the falsework was to be moved were made up of 4 x 12-in. timbers, liberally daubed with grease and lying on 8 x 12-in. or 12 x 12-in. timber cribbing. For motive power, hand winches were secured to the southernmost column of each bent, a total of ten. Seven-part tackles were carried from the falsework at each of these locations to deadmen beyond the new position; after the initial lowering and moving, these were increased to 8 parts, easing the task for the men operating the winches. Wire cable of 1/2-in. diameter was rove through the blocks.

#### Hydraulic jacks take over

For the actual lowering of the falsework, it was expected merely to screw down on the 120 supporting jacks until the forms dropped clear of the arch concrete and, continuing, until the falsework load was transferred to the prepared timber skids. In practice, the scheme required some modification. Turning down on any one of the four jacks underlying a given column caused greater load and almost insurmountable bind on the remaining jacks—all being screw affairs. As a result, 50-ton hydraulic jacks, manually operated, were brought to the job and set up to act upon specially fabricated steel boxes that were welded to the end columns of each tower bent (see picture). These jacks could not perform the entire job—

that is, the whole load could not be transferred to them, as there would be distortion induced at the unsupported central column of each bent—but they could, and did, take enough of the load to ease the subsequent task of lowering the screw jacks.

#### Success

As the lowering proceeded, the forms finally broke clear of the concrete arch rib, but only after the structure had taken about 1 in. of load deflection. This deflection was of the expected order of magnitude, according to the design engineers; another inch is expected upon application of further loadings in the form of spandrel columns and the concrete deck structure. After the forms were clear of the concrete, lowering continued until a full 2 in. of clearance had been established at the crown of the arch. Naturally, this clear distance (measured normal to the arch surface) decreases as the arch slope increases, but never becomes too slight, as the arch curvature nowhere nearly approaches a semi-circle. A consideration in this regard was the plan for moving the falsework to its new, skewed position relative to the original: would such differential movement, undertaken progressively during the move, cause the falsework to bind before clearing the completed concrete? Engineers and contractor felt that it would not, and they were right.

With the central span falsework on its skids, and the tackles rigged, all was ready for the move. Control was essential to prevent distortion at this time; so lineal gauges were fixed along the skids by which the movement at each tower could be determined. At the east end gauges were calibrated in inches, totaling 56 ft. At the west end, where only 48 ft. was involved, the calibrations were in 7/8-in. increments. Thus, winch crews could count marks of progress without the need for converting to inches in determining progress. With all the winches

in operation, a strain was taken, continuing until the falsework suddenly shuddered and jerked along an inch or two. It was now known that the assembly would move!

The winching continued during the afternoon, and progress characteristically was marked by short, sudden movements rather than smooth continuous sliding. The only "trouble" that developed was at the east central tower. Here the second-hand steel skids underlying the columns and resting on the timber stringers tended to bind more than elsewhere. The reason was that, being salvage material from a cofferdam on other work, they were not precisely true, one being dished slightly and the other being crowned. Thus, in the one instance a disproportionate weight of the bent was concentrated on the timber underneath the central column of the bent; in the other instance, the weight was primarily taken at the ends of the bent. To aid in movement of this tower, and others as well, the 50-ton hydraulic jacks were maintained in position under the following end of each bent, being reset as necessary after each movement.

#### Finishing up

Having satisfactorily demonstrated the eventual success of the operation of the first day, by tackling the biggest of the three moves, Atkinson crews quit with about 36 in. of movement completed. The tackles were then rigged for the additional part of line, and preparation made for continuance the following week. At that time, Monday, May 1, the move began again, and was completed without incident on Monday, May 2.

As form work began on the new arch to the south, falsework moving activities were transferred to the remaining two arch spans, and the central span was readied for pouring of spandrel columns. Pier columns have been poured to deck soffit elevation already, and forming of the spandrel columns was completed in June. Pouring of concrete here, as with the arch itself, will be alternated from end to end of the arch to produce the most uniform sequence of loading.

Spandrel steel is typically 1 1/4-in. square bars, with hoops of 1/2-in. steel at 12-in. centers. The spandrels range in height from 8 ft. (crown of arch) to 6 ft. (adjacent to pier columns). The section of all at the top is 1 1/2 x 6 ft. Battered on east and west sides with a slope of 1.96, the cross-sectional areas vary to the column bases.

#### Personnel

Personnel for both the state and the contractor remain as mentioned in *Western Construction's* previous article of the Colorado Freeway bridge. Assisting project manager Bob Boyd on the falsework moving has been Ray McLellan, construction superintendent. Actual supervision of the move, rigging details and winch commands have been done by E. E. Baker, structural iron worker for many of the Atkinson organization's projects in the Long Beach district.



## Fairchild Air Force Base presents some — Tough runway construction problems

**Poor drainage and soil characteristics create a perched water table, making equipment operation a "swamper's" job as former marsh is beefed up to take 50-ton dual wheel loads**

RUNWAY and taxiway construction at Fairchild Air Force Base near Spokane, Wash., has been resumed with the advent of spring thaws which removed last season's remnants of a record 78-in. snowfall and uncovered once again the difficult foundation conditions that have marked this construction project. Slimy humus, unstable clays, and the susceptibility of both to displacement under frost conditions have created a design problem for the Corps of Engineers and an earthmoving problem for the contractor, Birch-McLaughlin of Spokane.

### Diverse foundation conditions

The topography of the site is gently rolling with closed depressions and low rounded hills. There are several basaltic rock outcrops to the south and east of the runway location. A mantle of loessial soils covers the area to a general depth of 2 ft., grading downward to sand or sandy gravel. Bedrock lies about 15 ft. below ground surface.

There is no defined drainage pattern in the area, and numerous areas in which perched water tables existed slowed runway construction. Excavation to suitable foundation conditions indicated the

former presence of open marsh areas in which tules had flourished. In the bottoms of these marshy areas a heavy black slime of humus had collected which had to be removed before the proper foundation compaction could be obtained. In other areas a very finely divided blue clay occurred over the basaltic rock. In these areas it was necessary to excavate to bedrock to prevent pumping of the unstable material in the upper layers of the runway subgrade.

Both the humus and finely divided blue clay soils were highly frost susceptible. For design purposes the frost index was determined from past weather data. This index is determined by the number of days and degrees on which

the temperature ranges below 32 deg. F. The index prior to 1949-50 had stood at 225 (based on the preceding 50 yr.), but the record lows of 1949-50-51 brought the index down to 280. In order to construct a foundation which would resist frost damage and which would withstand the pressures to be expected from present-day aircraft, an appreciable amount of material had to be removed and wasted. To replace these undesirable soils, sand or sandy gravel was brought in from outside the runway zone.

The runway and taxiway pavement design is based on a single landing gear loading of 100,000 lb. supported on dual wheels with a 267-sq. in. contact area. From an assumed bearing value of 5 for

By **SAM C. GUESS**

Project Engineer

and

**JOHN JACOBSON**

District Construction Engineer

for Air Fields

Walla Walla District

Corps of Engineers

### Principal quantities of items

|                                                |                 |
|------------------------------------------------|-----------------|
| Stripping .....                                | 213 acres       |
| Pavement removal.....                          | 119,200 sq. yd. |
| Excavation, unclassified ....                  | 500,000 cu. yd. |
| Sand or sandy gravel fill....                  | 220,300 cu. yd. |
| Crushed base course material .....             | 137,700 tons    |
| Crushed leveling course material .....         | 27,900 tons     |
| Asphaltic prime coat (MC-0, MC-1) .....        | 1,100 tons      |
| Asphaltic cement (AP-2)....                    | 8,900 tons      |
| Asphaltic concrete .....                       | 127,000 tons    |
| Turfing .....                                  | 195 acres       |
| 3x6-ft. concrete box culvert .....             | 320 lin. ft.    |
| Reinforced concrete pipe (12- to 42-in.) ..... | 24,680 lin. ft. |
| Removing drain pipe.....                       | 4,030 lin. ft.  |



**STRIPPING** of unstable material from runway area preceded placement and compaction of imported borrow. Work covered 213 acres and involved 500,000 cu. yd. of material.



**MAN-MADE DRAINAGE** establishes pattern where none existed before. Major item was installation of nearly 25,000 lin. ft. of 12- to 42-in. diam. reinforced concrete pipe.

clay and 26 for sandy silt when measured by the California Bearing Ratio method, it was determined that 90% compaction would be required at a depth of 30 in. below the pavement surface with 95% compaction between 24 and 30 in. For the strata between 24 in. and 4 in., a compaction of 100% was required. The density of compaction was based on AASHTO test methods, as modified by the following Corps of Engineers provisions: a 6-in. cylinder is used and material is compacted in 5 layers with 55 blows per layer from a 10-lb. hammer dropped 18 in. If the material being tested contains particles in excess of  $\frac{3}{4}$  in., this portion is replaced by an equal amount of No. 4 to  $\frac{3}{4}$ -in. material.

#### Stage rolling

In the field it was necessary to practice stage rolling, using two medium weight Bros Packers followed by a 100,000-lb. Bros pneumatic roller. Immediately after completion of the stripping of an area, two passes were made by the 100,000-lb. roller. The areas of perched water tables and unstable clays were quickly found, and excavation and backfill had to be accomplished before further con-

struction could be done. Since preconstruction borings had completely missed these areas, their occurrence came as a surprise and caused a certain amount of rescheduling on the contractor's part.

In order to obtain a material with no frost potential, sandy gravel fill material was brought in and compacted to 100% density in the layer from 24 to 10 in. below pavement grade. Fortunately, this material existed locally and a sufficient quantity was obtained within a 1-mi. haul zone. Specifications called for placement of 5 in. of crushed gravel base and 1-in. layer of  $\frac{3}{4}$ -in. crushed gravel leveling course. Difficulty was encountered in trying to place the 1-in. leveling course and a change order permitted the contractor to place all of the crushed gravel in one operation, with advantage to the government resulting in higher compaction densities.

Hot-mix bituminous concrete pavement, consisting of 2½-in. binder course and 1½-in. wearing surface with the standard 1-in. and  $\frac{3}{4}$ -in. maximum grading, respectively, was designed by the North Pacific Division laboratory of the Corps of Engineers around aggregate produced on the site by the contractor.

The design and control of the pavement was based on the Corps of Engineers modification of the Marshall method. Control specimens were compacted in 4-in. diameter molds, with 75 blows of compaction hammer on each side of the specimen for 200-psi. tire pressures.

Placement of the pavement was completed on the runway last year, with exception of a 200-ft. length on the north end where it would have interfered with winter use of the north-south runway. The lateral taxiway, which is parallel to the new runway, was also finished together with 11 of the 30 parking stubs.

Construction forces have been gratified to observe that the runway shows no signs of distress for having been used throughout the winter under heavy icing and frost conditions. Operations of highly efficient snow removal teams composed of Air Force personnel, kept the runway in operation at all times. Especially careful check has been kept on the runway in the touch-down areas.

### Heavy Equipment at Fairchild Air Force Base

#### Earthmoving

- 3 C Roadster Tournapulls
- 6 LaPlant-Choate motor scrapers
- 16 Caterpillar D-8 tractors
- 1 Caterpillar D-7 tractor
- 1 Allis-Chalmers HD-19 tractor
- 3 LeTourneau Model W scrapers
- 3 LeTourneau Model FP scrapers
- 1 Caterpillar Model 70 scraper
- 6 Caterpillar Model 12 motor patrols

#### Compacting

- 2 Bros Packers, pneumatic wheel
- 5 steel wheel rollers (Galion, Buffalo-Springfield, Austin-Western)

#### Crushing

- 2 CedaRapids master tandem crushers
- 1 Pioneer Model 150 PG crusher
- 1 Pioneer Model 46 V crusher
- 1 Universal SL jaw 20 x 36 crusher

#### Paving

- 1 Pioneer Model 101 asphalt plant
- 1 Barber-Greene Model 848 asphalt plant
- 3 Barber-Greene asphalt pavers

but no suspect areas developed as the frost dissipated.

#### Personnel

Construction of the runways at Fairchild Air Force Base is under the direction of Col. W. H. Mills, Walla Walla District Engineer. Sam C. Guess is project engineer for the Corps, and John Jacobson is district construction engineer for air fields. For Birch-McLaughlin, project manager is Al McIntyre, and construction superintendent is Lar Mahan. The contractor's project engineer is Richard Foster. Assistant superintendents include Charlie Ptacek and Slim Reiter on excavation and Red Munson on paving. The Helena, Mont., firm Morrison-Maierle, consulting engineer, was retained by Birch-McLaughlin in connection with the work.

n search for lower-cost canal linings, test made of —

# Macadam cover for membrane lining

*To reduce the required depth of loose backfill material over a buried asphalt lining, Bureau of Reclamation carried out an extensive experiment in Wyoming with a penetration treatment*

IN THE SEARCH for lower-cost canal linings a layer of asphalt macadam is being tested as an adjunct to buried asphalt membrane lining by Bureau of Reclamation on the Kendrick project, Wyoming. The lined section is located about 32 mi. southwest of Casper near the Alcova Dam at the outlet of Tunnel No. 1. At this point the canal has a bottom width of 28 ft., 2 on 1 side slopes, and a 7-ft. vertical height of lining. The average lined perimeter measured 72 ft. It is interesting to note that this construction was done last December in below freezing weather accompanied by high winds without any significant delays due to weather conditions.

Buried asphalt membrane canal lining is being extensively used by the Bureau of Reclamation in Wyoming to provide relatively low cost seepage control on many of the older projects. Where an erosion resistant gravel blanket is required for protection of the earth cover over the asphalt membrane, the unit cost is substantially increased, especially in areas where gravel supplies are not plentiful. The 2 to 3-in. layer of aggregate used in the construction of the macadam-type cover over a membrane could reduce the quantity of gravel needed to a point where nearly all localities can provide the material without resorting to long and costly hauls.

## Possible applications

There are at least two possible applications of this type of construction to canal work.

First, substituting a thin asphalt macadam for the earth and gravel cover used in construction of the buried asphalt membrane canal lining, where (a) rock outcroppings or deep cut sections make such installations expensive due to difficult excavation and backfill; and (b) where large quantities of pit run gravel are required as protective blanket over the earth cover to prevent excessive erosion.

Secondly, use of the asphalt macadam over the existing surface of a relatively light unlined canal is being investigated as a preventive for undercutting which requires costly maintenance and contributes to canal breaks.

Every engineer is familiar with the fundamentals of the macadam type of construction in which one or more layers of various sizes of aggregate are placed, rolled, and penetrated with a liquid as-

phalt. The sequence of the macadam operations occasionally is altered to produce the desired finished product. Rolling is omitted in the canal lining macadam to prevent injury of the asphaltic membrane. Asphalt macadam has been extensively used in the past for highway and airport surfaces. Excellent weathering and erosion-resistant qualities of these pavements give them good possibilities for use as canal linings provided construction techniques can be developed to insure a durable lining with a long life and relatively low cost.

## Asphalt membrane

The subgrade in the test section of canal was prepared as usual by excavating to specified cross-section, dragging the surface to remove objectionable irregularities, and smooth rolling. Over this surface, a membrane averaging 1.4 gal. per sq. yd. of catalytically-blown asphalt cement was applied. The application temperature was about 400 deg. F. Hand spray bars and an 18-ft. bar sus-

ended from the distributor were used at various times during the application. The 3/4-in. completed asphalt membrane was carefully checked for "holidays" before adding the cover. The membrane appeared tough and watertight yet flexible.

## Aggregate cover

Laboratory tests and small preliminary experimental sections indicated that the grading of the aggregate was of extreme importance to obtain deep and complete penetration with the hot asphalt. Fine material, under the 3/8-in. size, tended to fill the voids in the gravel resulting in a poorly bonded and inadequately penetrated macadam. An open graded material, which passed the 1-in. screen with 95% retained on the 3/8-in. sieve was specified.

Previous work also established that while an angular crushed gravel can be deposited and held on the side slope of a canal more easily than a screened product, a rounded, screened gravel of the same size provided ample stability and allowed deeper penetration of the asphalt.

## Placing aggregate

Development of a satisfactory and rapid method of deposition of the macadam aggregate over the membrane using a minimum of hand labor was of importance if costs for this type of construction were to be held within reason. Also, some concern was felt regarding possible injury to the membrane during the gravel placing operation. Aggregate was placed over the asphalt membrane by: (1) dragline and (2) trucks dumping

CHUTING AGGREGATE down to the top of the membrane, to be distributed by hand at a 2 1/2-in. thickness. This operation did not injure the membrane.





EXTENT of this field experiment is shown by the size of the canal, which had a bottom width of 28 ft. and a 7-ft. vertical height of asphalt lining.

directly into an iron trough or chute. After a short trial the chute method was employed to place the majority of the gravel.

The contractor made the chute by cutting a 26-in. smooth iron culvert in half lengthwise. This chute was about 30 ft. long and fitted with chains at the upper and lower end. The chains were fastened to the moldboard of a motor grader which moved the chute without disturbing the subgrade, or rolling earth into the membrane-lined section. A piece of canvas was wired onto the lower edge of the chute to prevent injury to the upper edge of the membrane at the point where the gravel left the chute. As the aggregate was tremied into the section, minor handling with rakes and shovels placed the gravel in a uniform  $2\frac{1}{2}$ -in. layer.

Observations failed to reveal any injury to the underlying membrane. The advantages of the chute method are that the asphalt membrane is less likely to be injured, the contractor eliminates one handling cycle and the screened gravel is not contaminated by dirt from

the canal berm. As an indication of the efficiency of the chute operation, the contractor placed over 1,000 sq. yd. of aggregate on one slope and one-half of the bottom (half of the canal section) in 3 hr.

#### Penetration procedure

A catalytically blown asphalt cement having a 50-60 penetration and 175-200 deg. F. softening point was used to obtain satisfactory stability in the mass rapidly without using rollers or equipment which might force the aggregate to rupture the membrane. Although the application temperature was between 410-425 deg. at the existing air temperatures (near freezing) the high softening point "cat" blown asphalt cooled or set quickly without appreciable run-down. The slope area could be walked on without disrupting the lining 30 min. after applying the asphalt.

Hand spray bars were used for this application requiring a different technique from the membrane application. The spray bars were moved slowly producing a flooding action rather than with

a rapid movement which tends to form a surface membrane preventing proper penetration into the dry aggregate. The 3/16-in. slot-type nozzles were held close to the surface (6 to 12 in.). Beginning at the top of the slope, the asphaltic material was applied quite rapidly. The entire section of 2,100 sq. yd. was penetrated in 7 hr. spraying time using an average of 2.9 gal. per sq. yd.

Examination revealed that, in general, thorough penetration to the membrane was accomplished. While some individual pieces of gravel and small local areas were not entirely coated, the completed lining appeared to be well bonded into a single mass which will provide resistance to erosion and ability to hold the buried asphalt membrane in place. Further, this type of surface should reduce costly maintenance since it would facilitate cleaning operation and probably harbor less surface weed growths than the usual earth cover.

Further installations in sections of higher water velocities are contemplated. Laboratory experiments are being continued using several variables. Included in the experimental work is macadam composed of finer aggregate penetrated with asphalt emulsions to be used as a cover over prefabricated membrane materials.

#### Personnel

The Lichty Construction Co., Riverton, Wyo., was the prime contractor with L. H. Weber Construction Co. subcontracting all earthwork and gravel production. The Studer Construction Co., Billings, Mont., furnished and applied the asphaltic material. The catalytically blown asphalt cement was produced by Husky Oil Co. at Cody, Wyo.

The North Platte District of the Bureau of Reclamation was in charge of the work; I. J. Matthews is the District Manager and M. M. Starr is District Engineer. O. F. Tucker is Construction Engineer. L. N. McClellan is Chief Engineer of the Bureau of Reclamation and Director of the Design and Construction Division.

## Diversion of Trinity River surplus for irrigation proposed by USBR

A BUREAU of Reclamation report recommending the addition of a Sacramento Canals Unit to the California Central Valley Project to provide irrigation water for 205,000 acres of land along the Sacramento River in Glenn, Tehama, Colusa and Butte counties, Calif., has been approved by Secretary of the Interior Oscar L. Chapman and sent to other Federal agencies and State officials for review and comment.

Water for the Sacramento Canals Unit would be supplied in part by diversion of surplus water from the Trinity River in California, proposed as a new feature of the Central Valley Project.

Briefly, the plan of development involves the distribution of approximately 660,000 acre-feet of water annually through three main canals diverting

from the Sacramento River. On the west side of the valley, the Corning Canal (formerly called Tehama Canal) would begin near Red Bluff and extend southerly a distance of about 25 mi. to serve lands in southern Tehama County. Water for this canal would be lifted 55 ft. from the Sacramento River by an electrically powered pumping plant.

Also on the west side of the valley, a gravity conduit, the Tehama-Colusa Canal, would be constructed, extending from Red Bluff to a point near the Colusa-Yolo county line, a distance of about 120 mi. The Redbank Diversion Dam, 25 ft. high and about 750 ft. long, would be constructed across the Sacramento River near Red Bluff to divert water into the canal.

On the east side of the valley, the

Chico Canal would serve lands in the vicinity of Chico by a 30-ft. pumping plant diversion near Vina, extending about 20 mi. to Butte Creek near Durham.

In addition to the main canals, distribution and drainage systems will be required to deliver the water from the canals to the farm headgates and to carry unconsumed water away.

The total construction cost of the three canals, including the diversion dam and pumping plants on the river, is estimated at \$54,510,000 on the basis of prices prevailing in the period April, July, 1951, and annual operation and maintenance costs, including a reserve for replacements, are estimated to \$527,000. The cost of the distribution systems, which might be built by local interests if they so desire, is estimated \$60,155,000, making a total construction cost of \$114,665,000. For other details of the Trinity diversion, see page 104.

What contractors should know about —

# Falls . . . and how to prevent them

**Everybody falls (both on and off the job) but this type of accident on construction jobs is usually serious — Observance of simple rules and constant vigilance are necessary**

ONLY A FEW WORDS are needed to indicate the importance of falls as a safety subject. Year after year, falls continue to kill or permanently disable hundreds of construction workers. The result of a fall is frequently disastrous to the individual, and to his family and friends. Needless to say, the company for which he works, or worked, and the industry at large are co-sufferers.

Many falls can be prevented by a minimum amount of study and an understanding of some of the causal factors.

It must first be recognized that the fall-hazard is universally inherent in human beings, at any time, and any place, on or off the job. When this is clearly understood, and remembered, it is easy to see why the inherent hazard is increased by normal construction activity that involves any work at elevations above ground level. Many serious falls occur even on the same level; these are usually caused by slipping, tripping, horse play, faulty vision, and a few other causes easily correctable. However, falls even on the same level often have serious consequences, and must therefore receive appropriate consideration for prevention.

As every construction man knows, most fatal and disabling falls occur from elevations and from steep working surfaces. Some of the elevated work places from which workers will eventually fall if not adequately guarded are:

1. Elevated platforms and scaffolds.
2. Elevated ramps, catwalks and roofs.

**EVEN IN THE SNOW**, a first-aid team stands ready at the Hungry Horse Dam project: (l. to r.) Harley Hartson, first aid attendant, and Peggy Watne, R. N., both of the Idaho Compensation Co. and Howard Mahler, safety engineer, General-Shea-Morrison.



By L. M. McKAY

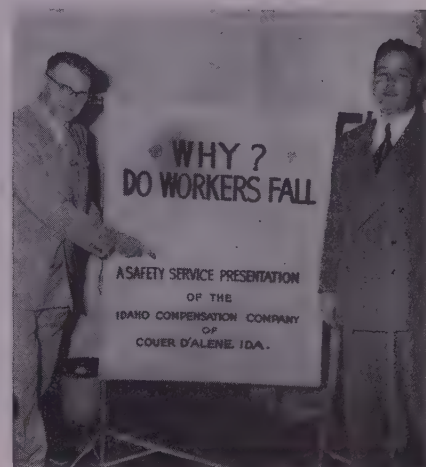
Safety Engineer  
Idaho Compensation Company  
Coeur d'Alene, Idaho

3. Swinging or suspended scaffolds, boatswains chairs, and skips.
4. Unguarded portable and stationary or fixed ladders; stairways.
5. Hillsides, banks and slopes.
6. Floor and wall openings, shafts and chutes.
7. Falls from moving equipment.
8. Falls from misuse of power tools.
9. Falls from misuse of hoisting and other equipment.

## Ordinary safety precautions

The common and easily applicable safety measures which help to reduce the incidence of falls from, and in connection with, the foregoing causes should be considered first. In this part of the fall-cause-analysis we are considering only the work place and the mechanical and physical conditions. To prevent falls from platforms, scaffolds, ramps, catwalks and roofs, every contractor should adopt a uniform method to insure that normal job set-up procedures include the provision of:

- (a) Standard guard rails,
- (b) Safe weight allowances for both men and materials,
- (c) Safe operating angles, and safe passing or climbing clearances, and,



AT A MEETING of the Idaho Chapter, AGC, a presentation was made by Paul V. Black (left), vice president, Idaho Compensation Co. and L. M. McKay, the author of this article.

- (d) Within possible economic limits to provide the safest type of scaffolding.

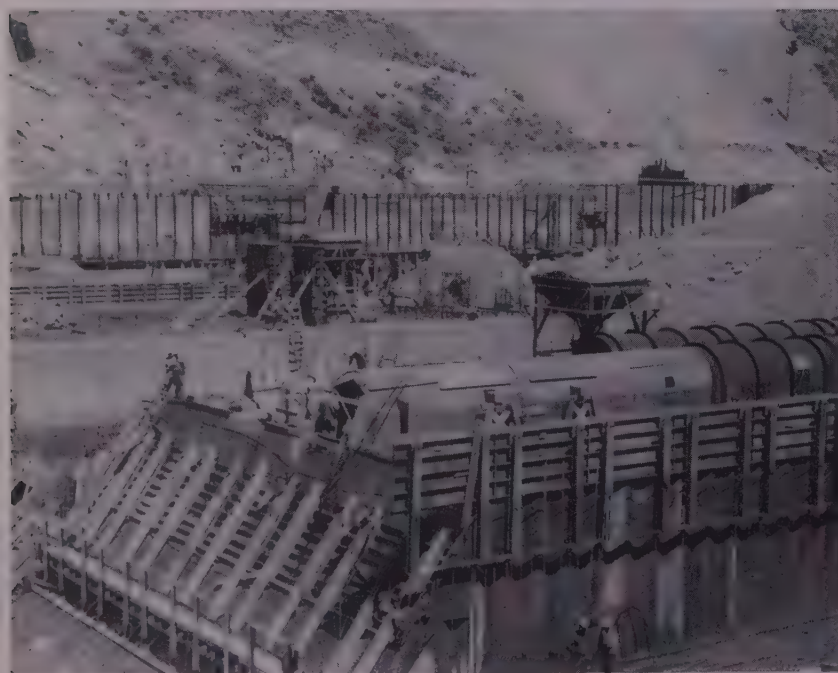
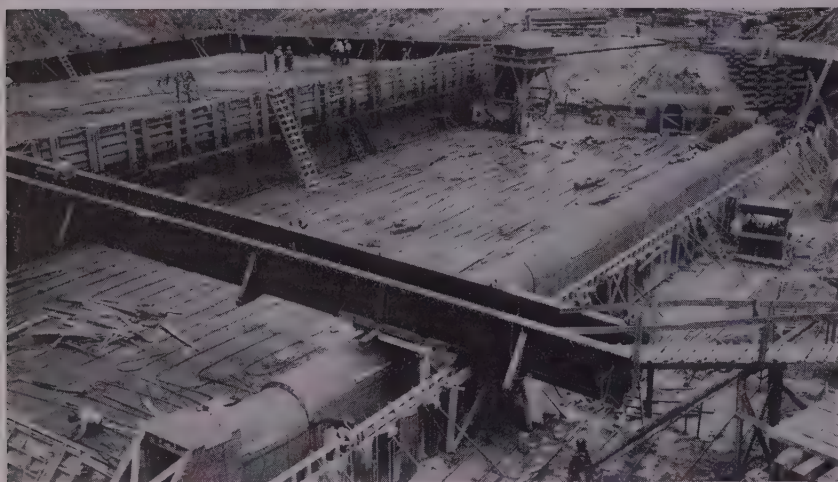
With respect to guard rails, the standard guard rail should be between 36 and 42 in. high and strong enough to support normally expected weights or shocks. The standard guard rail includes an intermediate rail spaced midway between top rail and working level. This intermediate or middle rail is very necessary to protect men from falling while working in a kneeling position or from falling off a scaffold, catwalk or platform following a slip or fall onto its working level.

It must be remembered that a sub-standard or weak guard rail offers a very false sense of security or safety, and a weak guard rail is very liable to be worse than no rail whatever. It follows that keeping guard rails in good condition, following their initial safe construction, is highly important.

For the safe construction of scaffolds, ramps, platforms, cat walks, etc., every construction foreman should be entirely conversant with all state safety codes, and if possible with the American Standard Safety Code (A.10-2-ASA).

## Falls from scaffolds

With respect to the prevention of falls from swinging scaffolds, boatswains chairs, and other types of suspended equipment, extreme care must be taken by the person in charge to keep this type of work down to the absolute minimum necessary to carry out the required operations. When suspended personal work must be done, continuous attention to all parts of the rigging is necessary if falling accidents are to be prevented. Cables, ropes, chains, and all attachments must be constantly maintained to insure adequate safety factors.



These factors include consideration of necessary or normal loads, and also for sudden stress or shock loads. A positive safety factor of not less than 10 is the normal requirement for any equipment on which a human load is suspended.

Workers on suspended scaffolds and other suspended equipment should also be provided with an independent safety line and belt whenever possible. Whenever falls cannot positively be controlled through the provision and use of safety devices and safety factors, nets will often be found to be beneficial. However, great care must also be taken whenever nets are used, to prevent the skip or suspended scaffold from falling through the net. An entire book could be written directed toward fall prevention from suspended equipment of all types. However, any recommendations would only reflect the great need for eternal vigilance as to the equipment, the men, and the work at hand.

In regard to falls from ladders, and falls in connection with the use of ladders, here again the first requisite is a safely constructed ladder, and a ladder safely maintained. To prevent any portable ladder from falling, it must be securely fastened at the top to prevent

---

**A SAFE WALKWAY (top)** is provided across the keyway on the side of the canyon. Note the rope handrail along the path at the near end of the walk.

**THIS WALKWAY (center)** has completely closed sides to prevent dropping of materials or tools on men working below. Note handrails on the approach.

**WELL DESIGNED scaffolding (bottom)** is shown attached to the lower end of the downstream form ready to be moved up for the next pour.

---

side slipping, and adequately secured at the base. Landings at the top and bottom of ladders of all kinds must be safely guarded, to provide safe and ample step-off room. All ladder landings should be strongly guard-railed on step-off platforms.

Where fixed ladders are used, special construction details should include landings or off-sets every 26 to 30 ft. of vertical length, or a solidly constructed ladder cage. Safe nailing schedules should be rigidly adhered to throughout ladder construction. At least a 6-in. clearance must be maintained *behind* each fixed ladder rung to provide a safe footing. Workers should never carry materials up or down ladders, as they certainly need both hands on the ladder to prevent falling.

Every stairway used on a construction job should be uniformly constructed with respect to tread breadth and riser height, and also be equipped with adequate handrails. Adequate illumination on stairways, as on all working or walking surfaces, is also a very important safety precaution.

Falls on inclined working surfaces are frequent and usually severe due to distances and character of the material—hillsides, banks, or earth or rock slopes.

Falls down inclines usually occur from such causes as:

- (a) Non-provision or non-use of safety lines or belts.
- (b) Stumbling or tripping.
- (c) Losing balance due to pneumatic tool or part failure—such as a broken jack hammer drill shaft.

#### Unguarded openings dangerous

Floor and wall openings, if not properly guarded, contribute a ghastly toll of workers killed or maimed. There is no possible excuse for an unguarded floor or wall opening exposure. Every floor and wall opening should be adequately hand-railed and toe-boarded just as soon as the openings are made. Here again adequate illumination is also necessary.

Falls from moving equipment are not too frequent on well regulated jobs. However, many serious falls have resulted from unnecessary riding of conveyor belts, crane cabs, trucks, and other types of moving equipment. Falls from these sources can be prevented by the simple expedient of keeping men off moving rigs, and other moving equipment not specifically designed for the transportation of persons.

Falls resulting from the misuse of

vent this type of occurrence:

- (a) Complete and unobstructed vision for crane, derrick, or hoist operator.
- (b) Employment of a fool-proof signal system.
- (c) Installation, if necessary, of positive limit stops.
- (d) Daily inspection of all braking mechanisms, hoists, and controls.

No accident cause-and-prevention analysis pertaining to falls, however brief, can exclude the all-important accident cause arising from adverse physical conditions existing in some workers themselves. There appears to be quite a variety of pre-existing physical and psycho-physical defects that should keep some men on the ground, and away from any high work. These include defects in equilibrium, defective and uncorrected vision, heart disease, dizziness, marked obesity, chronic or sub-acute alcoholism or hangovers, and other types of pre-existing disabilities.

Among the most important psycho-physical defect that should certainly bar any person from "high work" is the one connected with deliberate chance-taking. The construction industry is no place for the dare-devil, and his place should

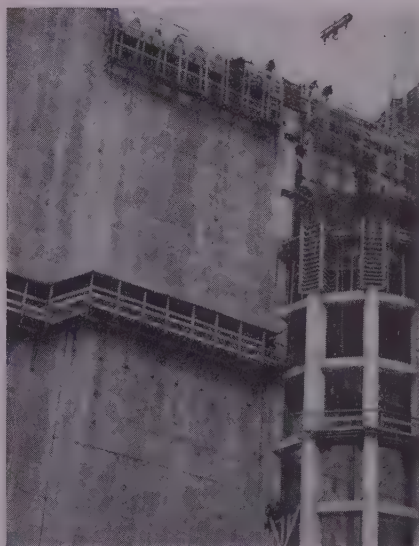


**A CARPENTER (top)** works on the face of the dam suspended in safe and properly secured safety belts (this month's front cover view).

**THE WALKWAY (center)** on upstream of dam to provide access to the trash rack is properly railed and roofed to prevent accidents from falling objects.

**RAPID AND SAFE** access across the working surface was provided by a system of well designed walkways spanning the low blocks (bottom).

(NOTE: Pictures on these two pages are from the Bureau of Reclamation's Hungry Horse and Canyon Ferry Projects.)



portable power tools, and hand tools, contribute heavily to the annual toll. Some of the common types of misuses include incorrect operation of jack hammers, power bolters, power saws, cement finishers; earth, rock and wood drills. Common safety precautions include:

- (a) Proper grounding of all portable electric equipment,
- (b) Proper and safe use of compressed air,
- (c) Proper use of mechanical deadmen and other mechanical holding devices on large drills of all kinds.

#### Misuse of equipment

Falls resulting from the misuse of hoisting equipment, and from improper set-up and maintenance of such equipment from the safety standpoint are numerous. While a variety of such causes may be found to exist, a common type of fall is one where the worker is literally knocked off the working platform or level, being struck by a crane, derrick, or hoist, or the boom, load, or hook. In some cases even the scaffold or platform is knocked down, carrying the worker or workers with it in the resultant fall. Several important safety measures can be employed to help pre-

be in the side-show in the circus. Deliberate chance taking often includes such unsafe practices as: jumping from one place to another, riding the hook unnecessarily, standing on guard rails and open beams unnecessarily, taking short cuts about the job, and in general violating all of the rules in the book. While such an employee is pretty sure to be run off the job if these practices persist, the chances are that he will "fall off," if he isn't run off for his own good, as well as for the safety of his more conscientious fellow workmen.

While all of the foregoing represents only a small fraction of the many things that must be thought about, and accomplished, if falls are to be reduced substantially in the construction business, the general subject is worthy of much continuing effort on the part of everybody concerned. Individual and collective efforts are being made all over the country to reduce the frequency and severity of falls.

No person who has experienced a bad fall, or who has seen one, would be apt to argue with Isaac Newton or his famous theory. However, they might say "Every man who goes up is pretty sure to fall down—unless thoroughly adequate safety precautions are taken."



# HOW IT WAS DONE...

## Steel plate she-bolt housing cuts damage, down-time on dam jobs

A STEEL PLATE she-bolt housing designed to eliminate any protrusion of the bolt from the wooden forms has been invented by William A. Seemann, operating engineer on the Pine Flat Dam, near Sanger, Calif.

In dam construction wooden cantilever forms are commonly used in block operations, and the customary 38-in. she-bolt protrudes from the form, although held in place by a cast iron face plate called a cathead. While low blocks are being poured she-bolts on the upper block forms are frequently hit by the bucket going up or down or swinging. The impact sometimes strips, bends, breaks or even pulls out the bolts in addition to breaking the cast iron catheads. This damage results in the concrete having to be mucked away from the form while another bolt is inserted, the form is again lined up and the space is filled. This, Seemann feels is a waste of time and manpower since it can result in considerable down-time.

The Seemann She-Bolt Housing is a barrel with a face plate, both made of  $\frac{1}{2}$ -in. malleable steel plate. The face plate is welded on and the opposite end of the barrel has an opening just large enough for a standard she-bolt. A free washer and a nut on the bolt fit against this to draw the housing tight against

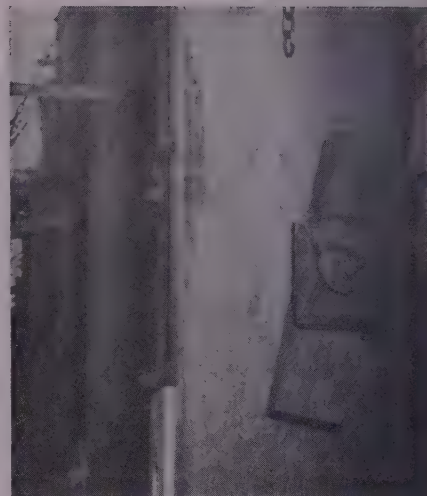
the form. The bolt is completely contained inside the housing. The housing is slightly recessed inside the form, eliminating any possibility of breakage to the bolt or the face plate.

### Adaptable to any form

The housing is adaptable to any form and can be used for any pouring and forming job. The present housing is 10 in. long with a face plate 10 in. square. The barrel insert is  $2\frac{3}{4}$  in. in outside diameter. Two or four corner holes are contained in the face plate in order to nail the housing to the form and secure preliminary placing.

The housing is used on the anchor bolt, dummy bolt and jack positions. The she-bolt can be 10 in. shorter since the housing with the draw nut inserts 10 in. into the form, closer to the anchor bolt. This eliminates the brittle cast iron bearing plate that is now exposed, and the wood blocking sometimes used to protect protruding she-bolts. The she-bolt is set tight on the anchor bolt and the form is drawn tight when the inner hexagonal nut is set against the housing with a deep socket wrench.

Richard Embersall, Corps of Engineers, said of the present sample constructed by Birch Welding in Madera, that in addition to preventing damage to



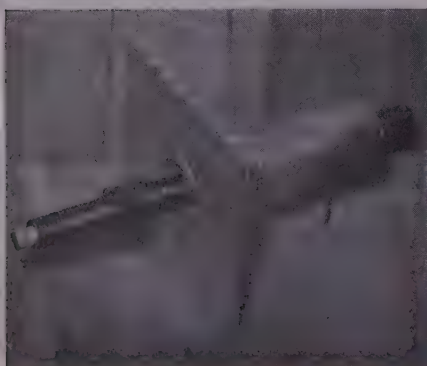
HOUSING (right) allows bolt to protrude and get in the way of swinging buckets, etc. Light-colored plate on side of form at bottom of picture is Seemann housing. The bolt is completely protected.

green concrete and to the form itself, the bolt has another safety factor. "... the concrete bucket, or loads on hook, when yarding, sometimes hang on protruding she-bolts causing extra tension on lines and cables and throwing extra swing on siwash in load. By using housing much shorter, she-bolts can be used."



LEFT—Note bolt is tightly within housing (top) when inserted in form. Free washer and nut on bolt (bottom) hold it firmly inside plate against form.

BELOW—Typical damage to unprotected she-bolt is shown. Its replacement cost down-time on the job.



RIGHT—Inventor Seemann stands next to one of his housings in place on the form.



# CRANE BOOM GUARD

*Its invention is another step toward*

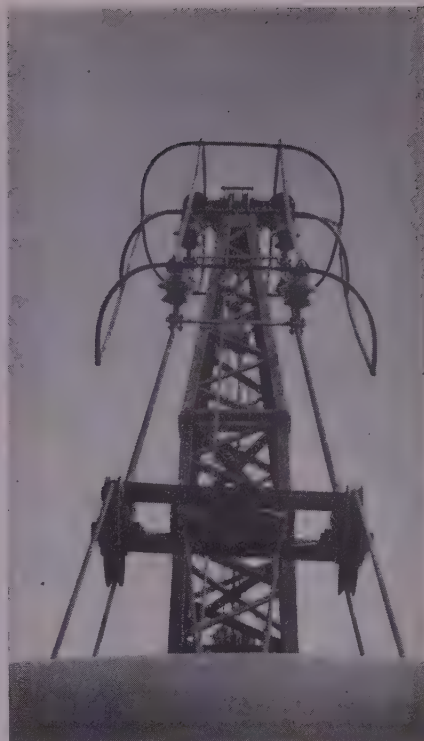
## CONSTRUCTION SAFETY

**A**CCIDENTAL electrocutions resulting from booming into high tension wires with cranes, etc., have taken many lives in the construction industry. The toll became so serious that the State of California made it a misdemeanor to operate boom equipment within 6 ft. of high tension lines.

United Concrete Pipe Corp. set about through research to combat this hazard. A. J. Thomas, safety director, and Gordon Zane, master mechanic, came up with a practical dielectric boom guard made of a  $\frac{5}{8}$ -in. steel rod covered with rubber and anchored to the boom through standard insulators. If the boom accidentally comes up into contact with an overhead power line, this insulated

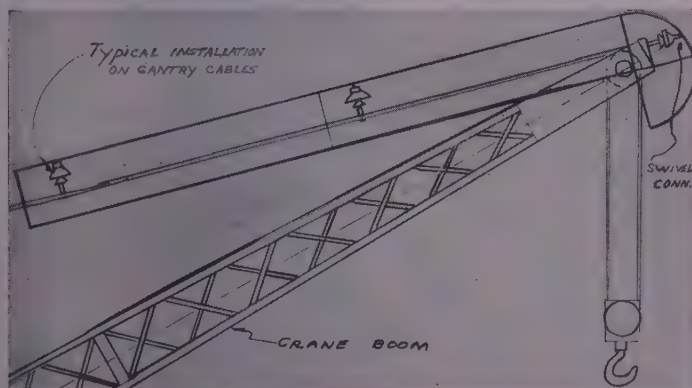
guard prevents the hot wire from coming into contact with the steel framework of the boom. Since past experience has proved that those who die are the ones standing on the ground guiding the load or leaning against the framework of the equipment, this should eliminate most of the electrocutions.

In some cases men have been electrocuted when the boom has worked into a high tension line vertically with the result that the load line, or sometimes the tag line, contacts the high tension line. Of course, the boom guard does not prevent this, but Thomas and Zane are currently working on an insulated contactor above the hook which will give the necessary protection.

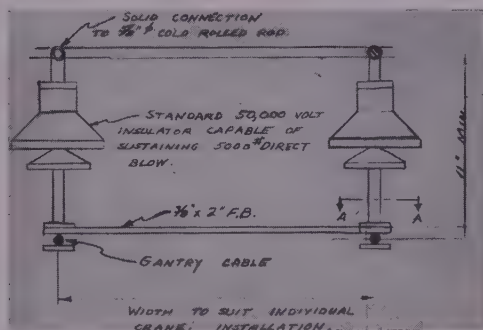


VIEW from top of cab shows how boom guard would keep high tension wires from metallic boom.

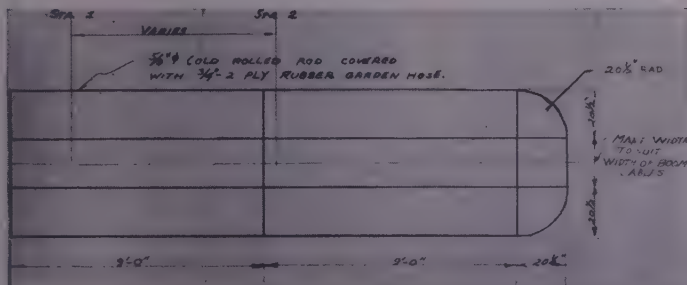
### DESIGN FEATURES OF BOOM GUARD



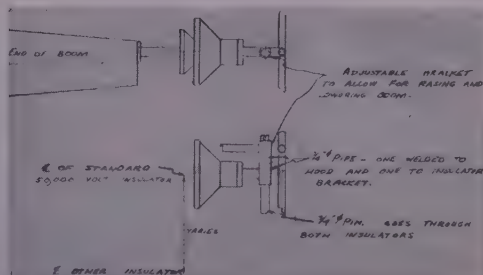
TYPICAL CONNECTION OF BOOM INSULATOR HOOD ON CRANE BOOM



CLOSE-UP OF TYPICAL CONNECTION



TOP VIEW OF HOOD



TYPICAL CONNECTION TO END OF BOOM



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## **Unusual water tank built in Southern California**

FIRST INSTALLATION of its type in the Far West, a 25,000-gal. Watersphere has been designed and erected in Los Angeles by Chicago Bridge & Iron Co. The owner, Southern California Edison Co., selected the unusual structure for its low maintenance cost and the availability of its base as a pump house. The "golf ball" tank, 19 ft., 4 in. in diameter, is "teed up" 70 ft. on a column 4 ft. in diameter.



Utilizing steel plate that ranges in thickness from 0.25 to 0.35 in., the design was executed to conform with specifications of the American Water Works Association and Los Angeles County building code provisions for 10% g. seismic loading. Its foundation is a concrete ring wall, 22 ft. in diameter and of an inverted-T cross section. The lower portion of this footing is 5 ft., 4 in. across and 2 ft. thick, surmounted by a wall 6½ ft. high and 2 ft. thick. Twelve 1½-in. anchor bolts spaced around the foundation provide connection for the steel structure above.

### **Erection**

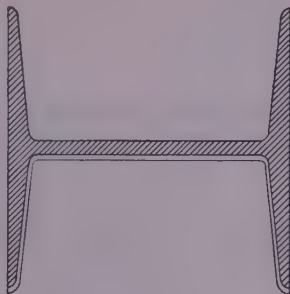
The components of the Watersphere were fabricated at the Torrance yard of Chicago Bridge & Iron Co., and were transported to the job site "knocked down." Using a truck crane, the elements of the bottom cone were assembled piece by piece. During this and later phases of erection, patented equipment of the contractor was used to make first connection, after which structural welding was carried out. The 44-ft. riser followed, placed in two parts. The sphere also required multiple lifts, largest of which was about 4 tons, completing the essentials of erection.

F. W. Schooley is manager of the Chicago Bridge & Iron Co. erection division at Torrance.

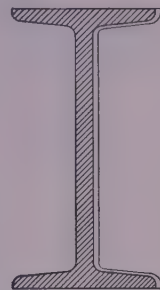
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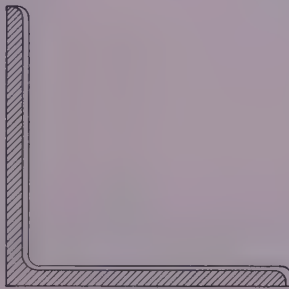
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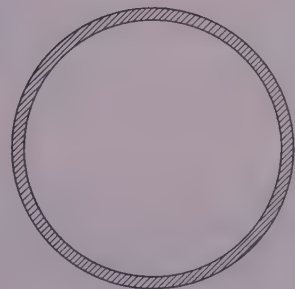
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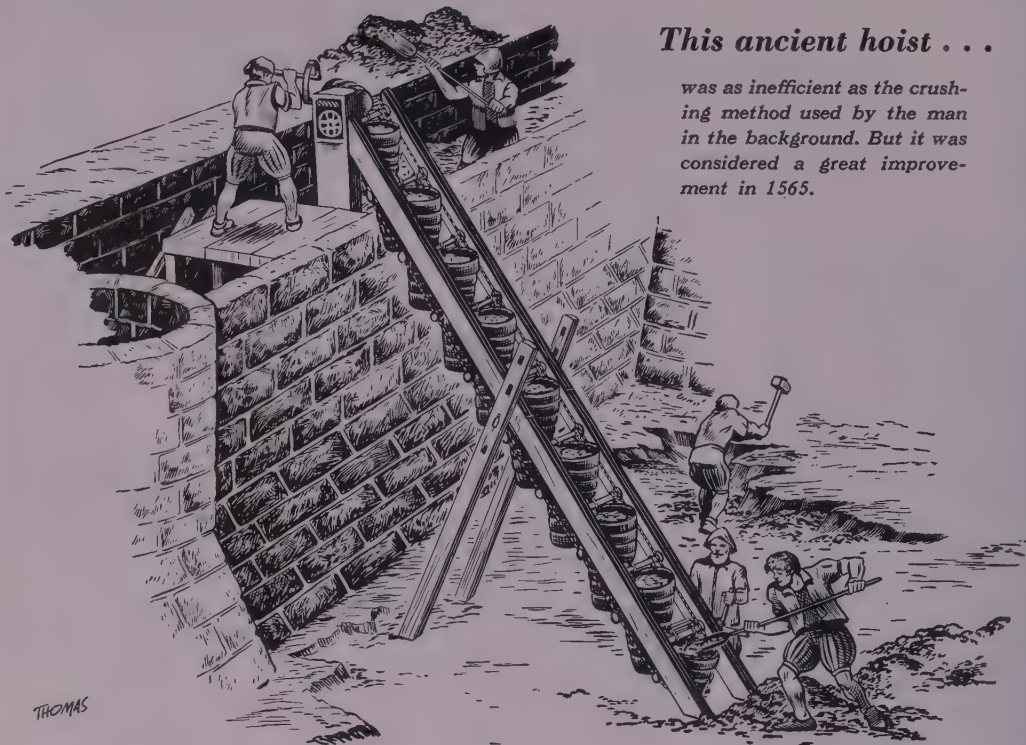
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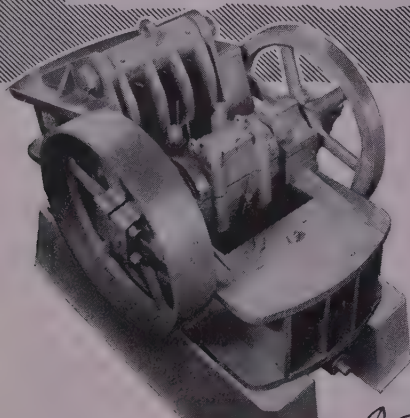
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*was as inefficient as the crushing method used by the man in the background. But it was considered a great improvement in 1565.*



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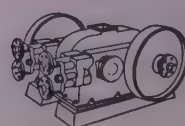
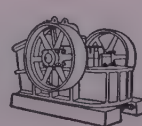
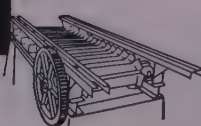
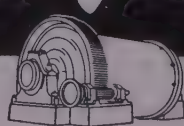
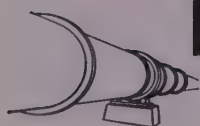
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# TIGHT PISTONS MEAN PROFITS

**A cylinder wall damaged during break-in, with resulting loss of compression, will cut power needed for full-load pulling—Loss is there, but hard to detect**

**P**ROFIT on a construction job relates directly to proper performance of pistons in the engines of construction equipment. Any damage to the pistons or cylinders, even if slight, may result in loss of compression, and the horsepower originally incorporated in the engine design is never thereafter produced. Speeding up the engine may compensate for the lost horsepower but not for lost torque power, and this is the power that is crucial in some applications of equipment—trucks, when starting with heavy loads; tractors, when loading scrapers; shovels, when crowding against hard material; cranes, when handling maximum loads; and graders, when scarifying, or turning heavy windrows. This loss of peak power represents a loss of dollars.

## Precision must be preserved

A new engine has proper performance built into the piston and cylinder area. This is done by research. Manufacturers spend huge sums of money in their own laboratories toward better piston and cylinder performance. This research is supplemented by information from actual field operations, where equipment works under every conceivable condition. The resulting pistons and cylinders are marvels of perfection. When properly fitted and lubricated, they can travel forth and back millions of times showing little, if any, wear. They perform more accurately, by comparison in number of strokes, than some expensive watches.

But pistons and cylinders can be damaged easily and this results from the very precision of their construction. Thus, the manufacturer's precision must be preserved, making it possible for the thin film of oil alone to prevent the slightest scratch.

## Preventing early damage

Damage to pistons and cylinders happens in different ways. The manufacturer "breaks in" the engine properly by running it for a certain number of hours. However, after the engine is installed in the equipment and leaves the factory, its pistons and cylinders are subject to treatment which may affect their performance for a long time. It is this treatment which preserves or destroys the total horsepower incorporated in the original engine design.

Damage can happen in using a so-called "break in" oil, or an engine preservative or light oil. These are cure-all



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Port Hueneme,  
Calif.

oils and are recommended only by self-proclaimed oil experts: these practices should be avoided, not studied. The manufacturer's recommendations are based on his own reliable information and represent his vital interest in the performance of his product.

Slight damage to pistons and cylinders, with or without correct lubrication, can occur when the equipment is new. With only 5 or 10 hr. of use recorded, the engine is still tight. It can be damaged inadvertently while, say, crawling up a ramp for loading and shipment. At such a time, total utilization of the engine's horsepower should be avoided. And, when the equipment first goes to work, the engine should not be run wide open for prolonged periods. A new engine should not be placed under heavy stress until necessary, no more than a car should be driven at high speeds during the first fifty miles of its operation.

## The effects of idle-time

Assuming now that the engine is still practically perfect—that it has been used for 20, or 30, or even 100 hr. There is still another chance of slight but significant damage to pistons and cylinders. Should the equipment lie idle for 30, 60, or 90 days, its lubricating oils drain down from the parts to be protected. In the cylinders, oil above and below the piston rings seeps away and leaves the metal surfaces devoid of lubrication, absolutely dry. Pistons resting in the top position may not be subject to the following phenomenon as much as those in the

down position, but one or more pistons and cylinder walls may become dried as indicated. Then, under the action of temperature change—the heat and cold of day and night, or of winds—expansion and contraction of the contacting surfaces occurs, which may do damage. The exact process is that the piston is tight, not being yet "worn in" to the cylinder, and metal scuffs unlubricated against metal.

This scuffing can be avoided by placing heavy oil in the top of cylinders of engines that are to be idle or in storage for long periods. Depending upon climate, 30 days seems, even so, to be the maximum time that engines should remain idle.

The damaging actions and conditions outlined above, resulting in loss of performance, constitute a sinister or subtle failure. Unlike most other new equipment failures, it doesn't always reveal itself. A clutch that is too tight is apparent at once. A leaking gasket is readily detected also, and so are many other failures, such as faulty ignition and carburetion. Not so with pistons and cylinders, wherein a scuffing, or slight scoring, has taken place.

## "Freezing" steals power

In some cases the occurrence of this damage may not even be known. Sometimes, however, the momentary abnormal heat increases the piston diameter so that it becomes altogether too tight. The remaining pistons cannot move it—the engine stops. This is called seizing, or freezing, of the piston. It may or may not be recognized by the equipment operator. Very likely it will not, for the mechanic who alone would recognize the symptom is usually not a good operator—particularly of a tractor, grader, crane, or shovel.

The operator may think something else has stopped the engine, because generally it will start again. It will almost always start again after a lapse of about 5 min., during which the cylinder cools. Heavy duty gasoline and diesel engines operate with the cooling water at about 180 deg., and the water is usually below this temperature when the seizure occurs (generally during the first 15 min. of operation).

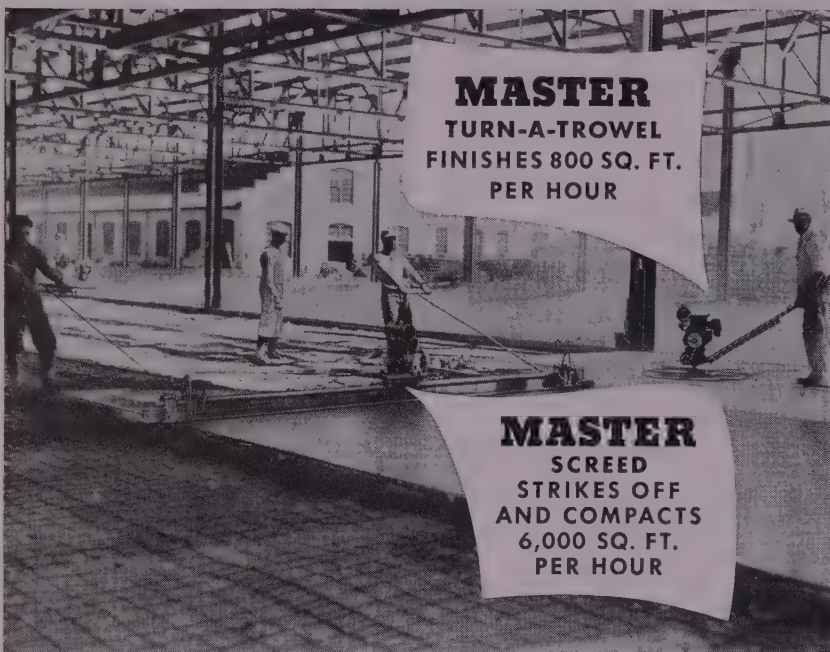
With the piston and its cylinder wall damaged, compressive power is reduced, by 5, 10 or 20%. In a 6-cylinder engine of 180 hp., each piston delivers 30 hp. to the crankshaft. With a loss of 5%—or 1.5 hp.—in each cylinder, the total loss becomes 9 hp. Thus, the 180-hp. engine produces only 171 hp. Furthermore, operation alone would not disclose such an even loss, because the engine would not be thereby prevented from running smoothly.

If, on the other hand, there is a 5% loss in several cylinders, but a 10 or 20% loss in only one or two, the skilled oper-

*The opinions and assertions contained in this article are those of the writer, and are not to be construed as official or reflecting the views of the Navy Department or Naval Service at large.*

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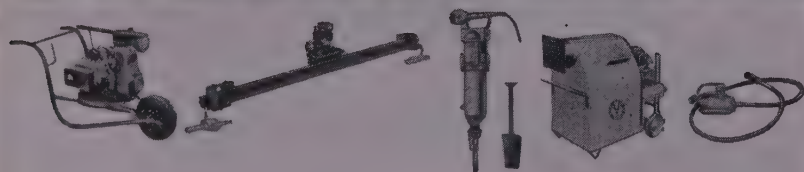
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ator will notice. The engine will become noisy due to uneven pressures between the wrist pin of the connecting rod and the crankshaft bearing.

The designed maximum power of gasoline and diesel engines can be retained by precise care of pistons and cylinder walls when they are new. This can be done by breaking in the engines at moderate speeds, and by frequent changes of lubricating oil during the first 50 or 100 hr. of operation. Such a procedure will wear in the pistons, rings, and cylinders uniformly, still leaving a tight fit. It is this fit which creates maximum power. Without it, part of the power is dispelled past the rings into the crankcase.

#### Torque can't be "souped up"

It is known that contractors increase the injector nozzle amounts of oil in diesel engines to speed up operation. They call it "highballing the job" in order to finish on time. This increase of fuel into the cylinders does nothing more than provide a heavier explosion to make up for lost compression. As such it is not a bad practice, because no greater load is thereby transmitted to the connecting rods than was originally intended in the engine design.

However, the "souped up" explosion, while increasing revolutions and horsepower, does not increase torque power. The only way to preserve torque power—the critical item—is to take good care of pistons and cylinders. Their good care is the only means of assuring production of the power which is expected, and was paid for. The power that was paid for, and was built in by the manufacturer certainly should be preserved.

In these examples, maximum available power directly affects the amount of work done and consequently results in more or less income per hour or day. The cost remains the same, whether or not maximum income, through power is achieved.

#### Colorado toys with idea of a mountain toll road

PLANS FOR a highway which would cross Devil's Thumb Pass, between Nederland and Tabernash, Colo., are gaining momentum in the state, as representatives of the cities to be aided by the highway joined together to project plans.

If the highway, perhaps a toll road were built, it would cut 20 mi. from the distance between Denver and Grand Lake and other western slope communities.

Presently, a 2,500-ft. tunnel, under the continental divide, and a gravel surfaced highway to cost \$3,000,000 would be involved.

Mark U. Watrous, state highway engineer, attended one meeting of interested citizens and stated that any plan which would shorten the route by 20 mi. just by building 14 mi. of highway was worth consideration. There are already stretches of road along the planned course of the highway, and these would have to be rebuilt in addition to the 14 mi. stretch of new construction.

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# REPORTS

## from the COURTS

By

HOWARD S.  
BURNSIDE

Attorney at Law  
Registered  
Professional Engineer



### The reserved right to reject all bids

THE FOLLOWING REPORT is of a case decided last fall which gives a clear perspective of judicial opinion on the purpose for cost estimates on public works and the discretionary power to reject all bids. It is noted that this case concerned a unit basis contract for which bids did not necessarily have to be below the estimate as required of other type contracts.

When the bids on a certain public improvement were opened it was learned that the lowest bid was about 17% above the approved cost estimate. It was agreed that the approved estimate was too low due to errors in its preparation; and recommendations were made to the Director of Public Works to accept the low bid in view of the errors and the apparent reasonableness of the bid. However the Director rejected all of the bids and issued a call for new bids. On the same day the bids were rejected a new estimate was presented by the state highway engineer which was higher than this particular bid.

The low bidding contractor sued to compel an award of the contract and the trial court determined that the Director had acted arbitrarily and capriciously and had abused the discretion vested in him by law. The court ordered the Director to award the contract and enjoined the re-advertisement for new bids. The Director appealed the decision.

At the trial the Director testified that he was motivated by his knowledge that a complete and accurate estimate was necessary to the award of a valid contract and the estimate was clearly inaccurate. He was concerned with the legal problems involved as well as the effect on the administration of the department of taking bids then revising an erroneous estimate. The state statutes required the Director to award contracts to the lowest responsible bidder except that he might reject all bids and proceed by day's labor or advertise for other bids.<sup>1</sup>

Upon reviewing the case on the Director's appeal, the appellate court upheld the Director deciding that he did not abuse his discretion. The trial court was reversed. In its opinion the appellate court emphasized the importance of an accurate estimate in providing the Director a yardstick by which to judge the bids. In concluding its opinion the court stated further, "This conclusion may seem a harsh one so far as (the contractor) is concerned. Admittedly its bid was honestly and fairly prepared. But competitive bidding statutes are not passed for the benefit of bidders but for

the benefit and protection of the public. No right exists in the lowest bidder to have his bid accepted where the statute confers the power to reject all bids."<sup>2</sup>

<sup>1</sup> California Govt. Code 14330, 14335.

<sup>2</sup> Charles L. Harney, Inc. v. Durkee 237 P2d 561.

### Surveyor denied mechanics lien

MECHANICS LIEN LAWS for laborers and materialmen in the several states are specific as to who may benefit under them and it should be carefully noted that they vary considerably from state to state. In a recent case in Arizona a surveyor was denied a mechanics lien against the property surveyed because the lien law did not apply to professional services.<sup>1</sup> It did apply however to manual labor; and the court suggests that if it is possible to separate the services into the professional component and the manual labor component, a lien will apply to the latter portion. An earlier case was cited by the court wherein a civil and mining engineer was denied a lien because of the professional character of the work.

In the present case, though the court did deny the claim of a mechanics lien, a personal judgment against the owners was awarded for the full amount of the claim; and this was affirmed by the Supreme Court of Arizona.

<sup>1</sup> Phoenix Title & Trust Co. 237 P2d 471.

### Writing required for two-year contract

ACCORDING TO THE LAW certain contracts within what is called the Statute of Frauds must be in writing otherwise the courts will not enforce them. One class of such contracts is illustrated by a case in New Mexico involving a construction foreman.

The plaintiff's complaint alleged that the City acting through the chairman of the City Water Board agreed to hire him as construction foreman for the Water Department for a period of not less than two years. Also, he was to be paid transportation cost to the city from his home daily or, if he moved into the city, then he would be paid the amount of his room and board. This was agreed to orally and no written contract or memorandum was made.

About fifteen months after commencing work, plaintiff was discharged. He seeks to recover the accumulated transportation costs and the amount of his salary for the remainder of the two-year term. His suit is based on the oral agree-

ment; but all recovery is denied him on his action of the contract.<sup>1</sup>

Reciting a portion of the Statute of Frauds the court says, "No action shall be brought \* \* \* upon any agreement that is not to be performed within the space of one year from the making thereof, unless the agreement upon which such action shall be brought, or some memorandum or note thereof shall be in writing, and signed by the party to be charged therewith . . ." In other words, unless the agreement could be performed within a year it had to be in writing for the court to enforce it. This agreement could not be performed within a year it is obvious; and since it was not in writing the plaintiff could have no recovery.

There was no basis here for application of equitable doctrines of part performance or equitable estoppel; nor was a recovery on a quantum meruit pleaded.

<sup>1</sup> Westerman v. City of Carlsbad 237 P2d 356.

### Professionals don't impliedly guarantee results

"A MEMBER of the learned professions \* \* \* impliedly represents that he possesses and will employ the degree of learning and skill usually possessed by those in good standing practicing their specialties in the same locality. He impliedly agrees to use his best judgment but does not guarantee results."<sup>1</sup>

Quoting from well-known legal writings the court points out that such a person holds himself out to the public as possessing a certain degree of skill. If his pretensions are unfounded then he commits a form of fraud on those who employ him on the basis of the pretensions. On the other hand, no person, skilled or unskilled, undertakes a task with the implied understanding that it will be completed successfully without fault or error. He undertakes for good faith and is liable for negligence, bad faith or dishonesty but not for losses due to errors of judgment. This rule has been applied to architects and engineers as well as lawyers and others.

"While the failure to achieve a guaranteed result is actionable, independently of negligence, this is not true where there is no guaranty of the results. Where the undertaking is to employ special skill there is no breach of duty if such skill and the operator's best judgment are put forth. Under such circumstances mere errors of judgment are not actionable. Where the duty is breached by negligent performance the cause of action is for negligence alone."

<sup>1</sup> L. B. Laboratories v. Mitchell 237 P2d 84.

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## USBR will design, construct San Diego's second barrel for Colorado River water

UNDER AN AGREEMENT between the Departments of the Interior and Navy, the Bureau of Reclamation will design and construct the second barrel of the San Diego aqueduct which will permit more than doubling the present delivery of Colorado River water to drought-stricken San Diego County in California.

Construction, which will take approximately two years, will be carried out under a contract between the Navy and the San Diego County Water Authority. However, the Interior-Navy agreement

transfers design and construction to the Bureau of Reclamation for administration.

Administration of the work on behalf of the Navy will be in the hands of the District Public Works Officer, Eleventh Naval District, San Diego. The designated representative of the Department of the Interior is Reclamation's Regional Director in Boulder City, Nevada. The design and construction of the aqueduct will be under the direction of the Bureau's Chief Engineer located in Denver, Colo.

The Bureau of Reclamation will do the job with funds to be advanced by the Navy, the agreement stipulates. Upon completion, the second barrel will be turned over to the San Diego County Water Authority which, with the Metropolitan Water District of Southern California, will operate and maintain it. Repayment with interest is to be made to the Government over a 40-year period.

The first barrel of the San Diego aqueduct which was designated by the Bureau of Reclamation under an agreement similar to the new agreement, was constructed by the Navy and placed in operation in November 1947, two years after construction began. It is now being operated by the Authority under a special

## ISABELLA DAM: 18-MONTH SCHEDULE CALLS FOR COMPLETION NEXT MARCH, BUT COFFERDAM CLOSURE AWAITS RIVER DROP

Here is how Isabella damsite looked May 21. On California's Kern River 50 mi. east of Bakersfield, the \$5,873,780 Corps of Engineers project has its upstream cofferdam partially built, here awaiting closure when the river falls from 7,000 cfs. to the 2,000 cfs. that the diversion tunnel can pass. With a contract time of 900 days, Macco-Morrison-Knudsen has set an 18-month schedule for completion in March 1953. The main dam will then stand 185 ft. high and span the canyon with a crest length of 1,725 ft., representing 2,900,000 cu. yd. of embankment. Together with an auxiliary dam to the south, Isabella Dam will impound a 550,000-acre foot reservoir covering 11,200 acres.

Partially built under a previous contract the auxiliary dam (right) is now being plugged and enlarged to full section, which will give it a height of 100 ft., length of 3,325 ft., and volume of 1,800,000 cu. yd. Closure has been delayed until this year in order that outlet works might be built to pass power diversions of the Edison Co. originating upstream.

Personnel at Isabella Dam for the Corps of Engineers include H. J. Dickinson as project engineer, assisted by James M. Chadwick. O. H. Tucker is project manager for the contractor (Macco Corporation, Morrison-Knudsen Co., Inc., and River Construction Corp.), while Ken Hayes and H. G. "Red" Mercer are day and night superintendents.





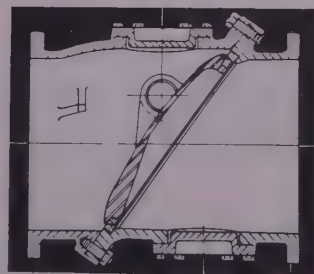
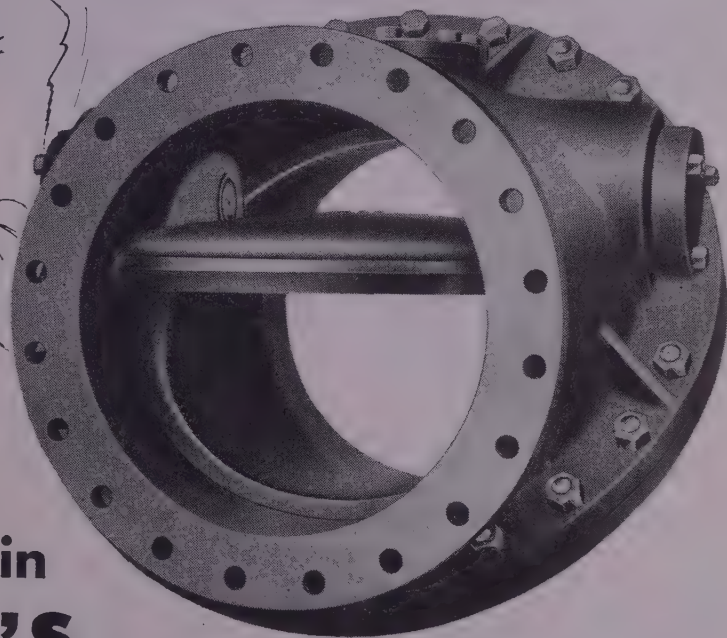
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agreement with the Navy pending final completion. Its cost, amounting to approximately \$15,000,000, also will be repaid by the Authority. Due to increased costs since construction of the first barrel, the cost of the second barrel is expected to equal that of its twin even though construction to full capacities of the tunnels and limited reaches of the pipe were included in the cost of the first barrel.

Paralleling the first barrel, the second barrel will start at the equalizing reservoir near the western outlet of the San Jacinto tunnel of the Metropolitan Water District's Colorado River aqueduct. It will extend southward 71 mi. to empty into the San Vicente Reservoir. The additional barrel will raise the rated carrying capacity of the aqueduct from 85 to not less than 165 cfs. throughout its length. A rated capacity of 95 cfs. will be provided for in the second barrel from the equalizing reservoir to a point near the Riverside-San Diego County boundary.

The present delivery of Colorado River water to San Diego County has averaged 66,700 acre-ft. annually (60,000,000 mgd.) since the first barrel was placed in operation. Completion of the second barrel will provide capacity to more than double the annual quantity.

Prolonged drought and heavy demands by the Navy and other military installations have caused a critical water shortage in San Diego County. This led to construction of the aqueduct which supplements local surface and underground supplies with Colorado River water diverted from Havasu Lake behind Parker Dam, more than 300 mi. to the east.

### Tucson, Ariz. to vote on water bonds in August

AUGUST 12 is the tentative date for a \$5,500,000 water bond election in Tucson, Ariz., according to the city council.

With an increase in the demand upon city water supply from surrounding suburban areas, it was felt that a doubling of the city's water supply was a necessity. Revenue bonds are considered a feasible means of financing the project. They would be paid off over a 30-year period.

### Fairchild Air Base to have construction boom

BETWEEN \$12,000,000 and \$13,000,000 in construction contracts will be let this summer at Fairchild Air Force Base in Washington.

Projects included in the program are: liquid fuel storage and dispensing facilities, operational and aircraft maintenance utilities, and miscellaneous office and community facilities.

Construction of a hangar that will cost more than \$4,000,000 is the biggest single project on the planned program.

**TWO LPC TS 300 MOTOR SCRAPERS WORKED 4000 HOURS EACH . . .**

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FROM March 1 to December 24, 1951, Concrete Materials & Construction Co. operated their LaPlant-Choate TS 300s two 10-hour shifts, six days a week, stripping 120-ft. of overburden on a job near Cedar Rapids. In 4000 machine hours, total repairs for each rig amounted to only 50¢ per hour, *and that included tires!*

To get ready for the new season, engines were completely overhauled and the only repairs found necessary were new rings and bearings. After 4000 hours, the cylinders showed only .002 of an inch wear!

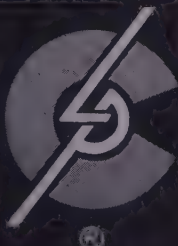
It's no wonder Concrete Materials is sold on Motor Scraper performance. On top of such low maintenance, their TS 300s give them the kind of power that easily handled materials varying from sandy loam to heavy blue clay in a pit loaded with springs, making the going plenty muddy.

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BY working their TS 300 Motor Scrapers two ten-hour shifts a day, with such little time out for maintenance or repair, Concrete Materials & Construction Co. completed two years' work in one. This was a job where the Motor Scraper's ability to keep punching, with little time out for tinkering, really paid off. Minimum maintenance is just another reason why it will pay you to follow the lead of so many big-time contractors who cut earthmoving costs with LaPlant-Choate Motor Scrapers. See your LaPlant-Choate distributor today for complete details about all Motor Scraper advantages.

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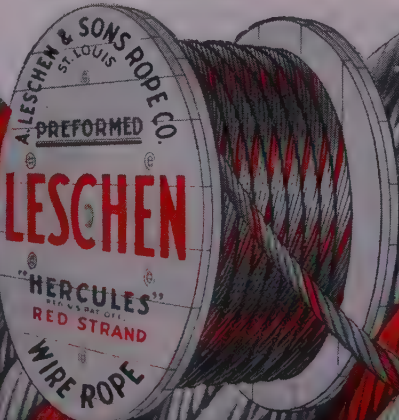
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## Dwyre out, Erwin in as New Mex. highway engineer

BURTON G. Dwyre, New Mexico State Highway Engineer since 1946, was discharged effective June 15 by the state highway commission. He was replaced immediately by C. O. (Pete) Erwin, formerly chief maintenance engineer for the department.

C. O. ERWIN  
newly appointed  
State Highway  
engineer of  
New Mexico



Dwyre first worked for the New Mexico State Highway Department from 1920 to 1925. He then was employed Grant County for about ten years, and rejoined the department in 1935 as a assistant state highway engineer. He held the position of state highway engineer two times—from 1939 to 1943, and from 1946 to the present time.

Erwin, the new state highway engineer, joined the department in 1920, starting as a rodman and working his way up to become district engineer in Las Vegas and Roswell, then second roads engineer, and finally maintenance engineer.

Dwyre has indicated that he will enter private engineering practice.

## P. G. and E. asks license for Feather River development

PACIFIC GAS and Electric Company of San Francisco, has applied to the Federal Power Commission for a license for a proposed hydroelectric project on the North Fork of the Feather River at Butte Creek in Plumas County, Calif.

The proposed project, to be constructed in connection with the company's

### CALENDAR OF MEETINGS

July 21-25—Conference on Clays and Clay Technology, Berkeley campus, University of California.

July 28-Aug. 1—USBR Conference of 1952, Cody, Wyo.

August 24-27—58th Annual Congress of the American Public Works Association, Los Angeles, Calif.

September 3-13—American Society of Civil Engineers, Centennial Celebration, Conrad Hilton Hotel, Chicago, Ill.

August 9 — Northwest Engineers Centennial, Multnomah Hotel, Portland, Ore.

isting Lake Almanor and Butt Valley reservoirs, would have two powerhouses with a total installed capacity of 5,000 hp. Estimated cost of developing the project is \$36,040,000.

Pacific plans to build an intake structure at its Lake Almanor reservoir, with a 11,000-ft. pressure tunnel extending easterly, toward the Butt Valley reservoir, from the intake to the beginning of the proposed penstock. The tunnel could be parallel to and cross-connected with an existing tunnel. A powerhouse, located at the north end of the Butt Valley reservoir, would have an installed capacity of 55,000 hp.

A second intake structure would be built at the southern end of the Butt Valley reservoir and a 9,200-ft. pressure tunnel would extend south to the beginning of a penstock which would continue on to the second proposed powerhouse. This powerhouse, on the North Fork of the Feather River, would contain two 75,000-hp. turbines.

The energy generated at the two proposed plants would be used with power generated at Pacific's other power plants for distribution and sale to the public in the central and northern parts of California, the application states.

The project, designated the Butt Valley-Caribou No. 2 project, is part of a proposed comprehensive scheme of development of the power resources of the North Fork Feather River, Pacific's application says. The ultimate development includes other existing and proposed hydroelectric projects.

## Ketchikan, Sitka projects urged in Alaska by USBR

CONSTRUCTION of a dam and power plant at Swan Lake in Alaska to eliminate recurring electric energy shortages and forcing temporary "brownouts" and hindering the economic development of the Ketchikan area, has been recommended by the Bureau of Reclamation.

The Swan Lake Project report is the second in a series of engineering and economic investigations conducted by the Bureau in Alaska under specific instructions and appropriations from the Congress for data relating to projects for the development of the water resources of the Territory. Construction already under way on the first to be studied—the Eklutna Project, providing a 30,000-kw. capacity power plant to meet the power demands in the Anchorage and Palmer areas in south-central Alaska.

Engineering details of the Swan Lake project include a 184-ft. high dam at the lower end of Swan Lake on Falls Creek, creating a reservoir of 132,000-acre-feet water storage capacity; the delivery of water through a penstock 9 ft. in diameter and 2,400 ft. long to a power plant with three generators having a total installed capacity of 13,500 hp. Power would be transmitted to load centers through 31 mi. of high-tension lines, with substation at Ward Cove and Ketchikan. Construction costs of the

project are estimated at \$13,562,000.

The Swan Lake Project would take at least three years. By that time the 71,000,000 additional kilowatt-hours of electric energy to be provided by the plant will be needed not only because of the normal steady growth of Ketchikan and its environs, but also because of the contemplated construction of a \$45,000,000 pulp mill which will bring in hundreds of workers and increase the area's service industries.

Meanwhile, the Bureau is taking steps in preparation for a hydro-electric plant at Blue Lake, 7 mi. south of Sitka. Survey parties are already investigating the site, according to J. M. Morgan, district director.

A concrete dam approximately 175 ft. high and 160 ft. wide at crest is called for in the proposed plan. The project would develop 15,000 hp. and 60,000 kw-hr would be supplied on a 24-hr. a day basis.

Preliminary surveys will determine whether it is feasible to provide the City of Sitka, Mount Edgumbe developments and private industry with electricity, and if results of the studies are successful Congress will be asked to grant permission. The Bureau has waited four years, according to its policy, for private industry to develop the area, but no development has taken place although a pulp mill development was attempted some time ago without success.

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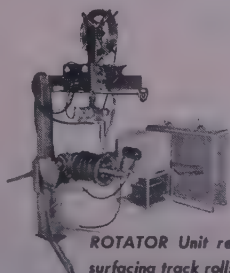
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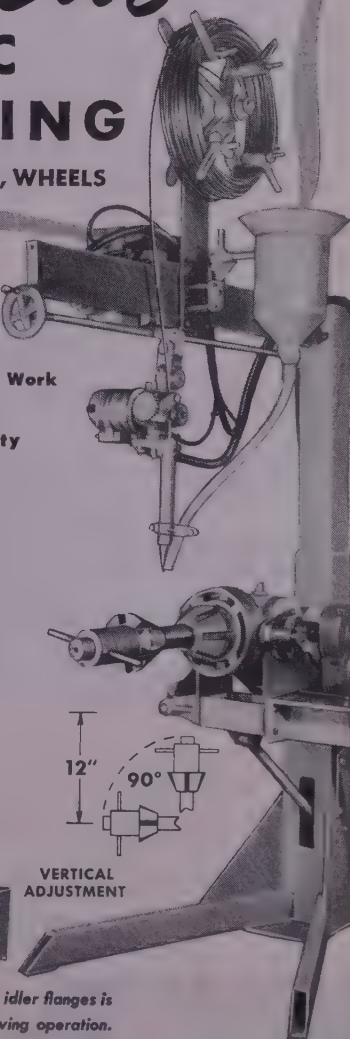
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## PUD plans Priest Rapids dam while others comment

GRANT COUNTY (Washington) Public Utility District has announced plans to build a \$250,000,000, 450-ft. high dam across the Columbia River at Priest Rapids.

P. U. D. commissioners met and (1) authorized their attorney to start condemnation proceedings at the damsite, (2) announced the project would be financed by issuance of revenue bonds, and (3) declared that bids would be called in October, 1953.

Several years ago the Corps of Engineers proposed the exact plan now

adopted by the P. U. D., but decided to revise plans to include flood control provisions after the devastating Columbia River flood of 1948. Congress authorized this revised plan, which would cost \$326,000,000.

Comment was not long in following the commission's announcement. Portland, Ore., area sources declared that the authorization of condemnation proceedings was considered premature since no notice of Federal Power Commission permission has been seen. Other groups declared that a non-federal power project of this magnitude (the project would be the third largest power producer in the Pacific Northwest) would be a good thing. Fishery interests object to the

plan and land groups protested the lack of flood control provisions.

Engineers pointed out that if the revised plan approved by congress was used, the height of the dam would be raised 40 ft. and an area of 53,000 acres would be inundated. The inundation would necessitate the relocation of approximately 18 mi. of Milwaukee railroad main line trackage, and construction of a bridge to span the river.

## Workers, equipment saved in Chief Joseph Dam mishap

EVACUATION of 65 workers from the south cofferdam working area at Chief Joseph Dam in Washington on May 2 demonstrated sound application of construction safety precautions, as Columbia River water penetrated a weakened cell in the cofferdam to flood an entire acre. A warning system of sirens and flashing red lights triggered the operation, which saw safe removal, not only of all workmen, but of two shovels and two tractors as well. Evacuation was directed by R. F. Murphy, excavation superintendent for Chief Joseph Builder whose operations were reviewed by *Western Construction* for May, 1952, p. 70-75.

Press reports at the time of the flooding indicated that resumption of work would take place within three or four days, depending upon the success of repair crews in dumping rock into the broken cofferdam cell. Collapse of the cell would mean additional delays, perhaps as much as two months, although work could continue on other phases of construction. In addition to the foundation excavation being conducted with the south cofferdam, crews totaling 80 men are presently engaged in concrete work in monoliths of the north section of the dam.

## Portland General Electric gets hydro project okay

PORTLAND General Electric Company, of Portland, Oregon, has been granted a two-year preliminary permit by the Federal Power Commission for proposed hydroelectric development in Jefferson County, Oregon.

The development, which would be known as the Round Butte project, would be located on the Deschutes, Metolius and Crooked rivers, upstream from the company's Pelton project, for which it recently received a license from the FPC.

The project would include a concrete gravity type dam on the Deschutes River, forming reservoirs on the Deschutes and Crooked rivers, each about 8½ mi. long above the dam, and a reservoir on the Metolius River about 10 mi. long above the dam. The proposed powerhouse, to be located immediately downstream from the dam, would have an installed capacity of about 310,000

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## Wyoming's costliest Archer overpass construction

WYOMING, work is under way on the state's most costly railroad overpass . . . east of Cheyenne in Laramie County.

Approximately 580 tons of structural steel will be required for the five-span project, which is to be 450 ft. long. Northwest Engineering Co. submitted the low bid of \$451,694.

J. R. Bromley, state highway superintendent, will call bids for surfacing of both this Archer overpass in Laramie County and the Dunn overpass in Cheyenne. Peter Kiewit Sons' Co. is completing the last section of the U. S. Highway project where the Archer overpass will be located.

## Denver-Boulder toll road is starting to pay off

THINGS are looking bright for the Denver-Boulder toll road in Colorado. Officials announced that more than 500,000 cars and trucks have already sampled the road since it officially opened in January.

There has been an average toll of \$911 per day, which is comfortably over the \$45 per day estimated as the minimum required to pay off the bond issue, and officials commented that the heavy summer traffic has not yet begun.

## TVA announces new book in its project design series

TVA announces publication of Volume "Civil and Structural Design," of its Technical Report No. 24, "Design of TVA Projects." This volume explains a part of the work on the primary structures of TVA included in the term "Civil Engineering."

"Civil and Structural Design" is the fourth of a series of special reports prepared to cover important phases of engineering and construction work common to all projects designed and constructed by TVA.

The scope of the report is indicated by the following listing of the principal chapters:

Project Layout, Hydraulic Design, Design of Concrete Dams and Walls, Design of Locks, Design of Fill Dams, Design of Powerhouses, Gates, Cranes, and Appurtenances, and Miscellaneous Structures.

Following the chapters are these appendices: The Design of Differential Large Tanks, Application of the Slip Circle Method to Design of Earth Dams, Design of Rip-rap Protection of Embankments, and Organization and Operation of TVA Division of Design.

"Civil and Structural Design" contains 99 pages with 184 illustrations. Copies may be purchased from the TVA Treasurer's Office, Knoxville, Tennessee, for \$1.00.

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Pennsylvania Turnpike**

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Jaeger Spreader is ideal for laying all base and surface aggregates — up to 12" thickness in widths to 11', lesser thicknesses to 12½'.

**Note that all traction is  
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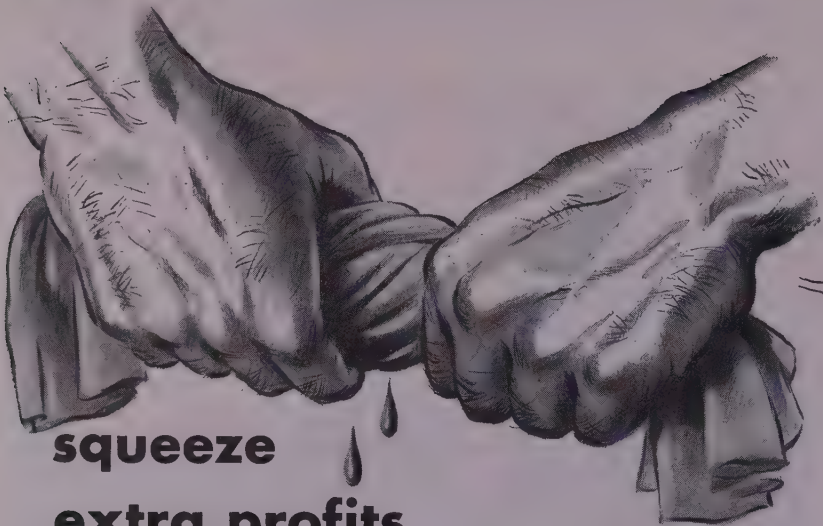
A Jaeger Aggregate Spreader, with either crawler or 4-wheel traction (interchangeable to suit subgrade conditions) costs only half the price of a bituminous paver. With it, you can lay all types of aggregates, plant-mixed stabilized soil or free-flowing bituminous mixtures, either hot or cold, in a much greater range of widths and thicknesses, as fast as your trucks can deliver and with the accuracy required for highway, street and airport base, and both base and top for secondary roads, parking areas and drives. Machine blends joints, places flush to curbs. Two models, to suit any size of trucks.

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## **B. C. highway costs outrun available funds**

IN BRITISH COLUMBIA, where typical highway construction costs are from \$75,000 to \$100,000 per mile, Evans Jones, Public Works Deputy Minister, declares that Public Works Department funds are insufficient to meet the highway needs of the province.

Jones points out that the present highway program is an excellent one for a province of the size and population of British Columbia, but that the outlying areas are not going to get the benefit of the highway system rapidly under present allocations.

Efforts have been made in the past to push inadequate highways to new developments in the province, but Jones states that these soon cost more money to maintain and repair than they are worth. The solution to this problem is still in the offing since limited funds are available to build the necessary highway system.

## **READER COMMENT**

### **Libby Dam forebay level will not be changed**

Editor, *Western Construction*:

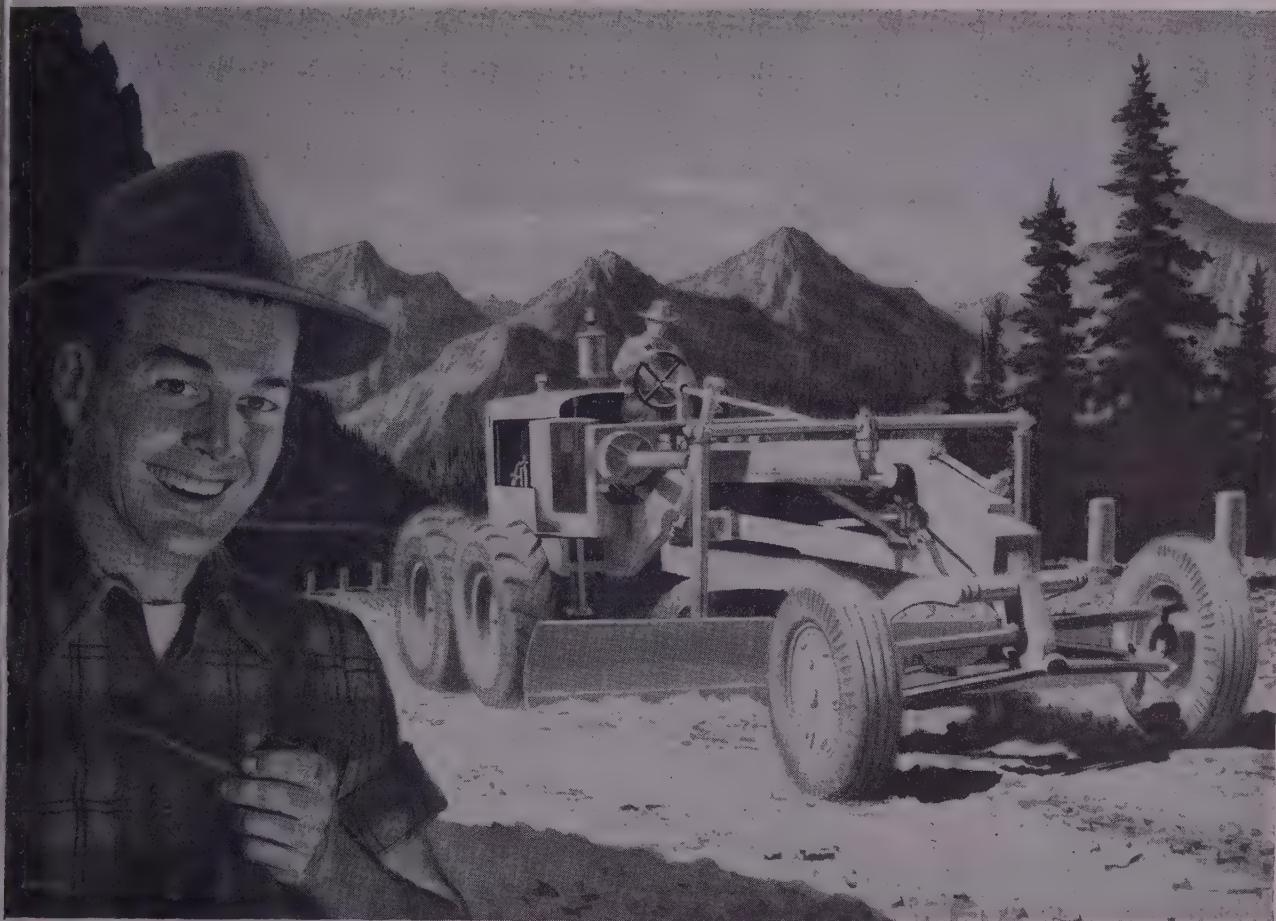
In the April 1952 issue of *Western Construction*, a [news item] on page 12 was headed "New Location Needed for Libby Dam Construction." The item stated that the new location was being sought by Army Engineers "in order to lessen problems of backing water in Canada." A correction of this statement is requested because it is erroneous.

The forebay level at Libby Dam will remain the same regardless of the location of the dam, and therefore the backing water in Canada will not be affected if an alternate site is selected. The originally designated site is about 11 miles upstream on the Kootenai River from the town of Libby. Foundation explorations have been in progress for some weeks at alternate sites within 2 to 4 miles upstream from Libby. Purpose of the surface investigation is to ascertain the most economical site for the dam.

It is estimated that the Libby reservoir will extend 42 miles into Canada. The forebay level being constant will permit the best comprehensive development of the project in connection with the Canadian plans.

It is anticipated that if an alternate site downstream is found to be the more favorable, the result will be a substantial increase in the amount of storage as well as increased flood-control and power benefits.

G. R. BEAN  
Chief, Technical Information Branch, Seattle District, Corps of Engineers



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# ENGINEERS ON THE MOVE

After 26 years of service to Oakland, Calif., **Arthur H. Abel**, manager and chief engineer of the Port of Oakland, is retiring. He came to Oakland in 1926, when the Port was in its infancy, to serve as assistant manager and chief engineer. In 1936 he assumed his present position, and it was under Abel's guidance that a conscientious plan of construction and development was instituted at the port and the Oakland Municipal Airport. As a result of his administration, Oakland achieved its present status as a major air and shipping terminus.

**F. Donald Moore**, until recently on the staff of the Bureau of Reclamation as a civil engineer at Colorado-Big Thompson project, is now acting as assistant to the range officer at the Department of the Army's White Sands Proving Grounds, Las Cruces, New Mex.

**R. A. Sharood**, formerly chief engineer for the Alaska Railroad, resigned this position to accept another as chief engi-

neer of the Saudi Arabia Railroad, which is government owned. Sharood, who came to Alaska in 1947 and was active in the huge development program staged by the railroad, will find a good deal of new construction activity in Saudi Arabia where that recently completed railroad line is planning additional construction activities.

**Carl M. Spainhour** is scheduled to go to Liberia to help that country select sites for shallow water harbors for coastwise shipping. Spainhour, who has some 41 years of engineering experience, was the only American Army officer to work with the British Army on construction of the famed artificial harbors placed on the Normandie beaches for landing troops and supplies in France in the last war. He is now with the Bureau of Reclamation, and will undertake his present mission under the Point Four program.

**Harvey Slocum**, supervisor of construction on both Shasta and Grand Coulee dams, is now in India as a con-

sultant to the government on construction of the Bhakra-Nangal project which will irrigate 3,600,000 acres. Interviews with Slocum which have dried back to this country indicate that he thinks this job will be "the goldmine of them all," since Bhakra will be second to Grand Coulee in spillway height.

**Floyd F. Murray**, chief engineer, Mt. Hood National Forest, is retiring after 30 years of service. Murray contributed much to the development of the area around Timberline lodge.

**James Faulkner Beall, Jr.** of Evergreen, Colo., and **William E. Wheeler** of Kalispel, Mont., are en route to Teheran, Iran, to assist the Iranian Government with a Point Four water resources development project.

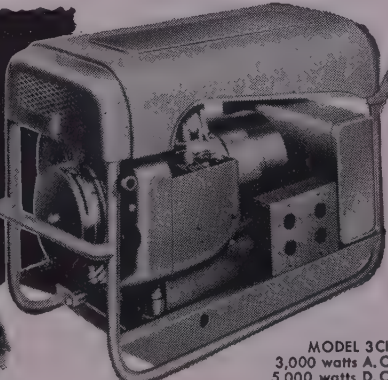
**John A. Ruhling** is the newly appointed Washington representative of the American Concrete Pipe Association according to **Howard Peckworth**, managing director. Ruhling, with some 25 years experience in various fields of construction involving uses of portland cement concrete will establish a Washington office for the Pipe Association. Part of his experience record was in the position of field engineer for the Portland Cement Association.

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Seattle, Washington

## DEATHS

**John N. Edy**, 68, former chief engineer for the Montana Highway Commission, died in Houston, Tex. Edy was engaged in contracting in Houston.

**William Bone**, general contractor, died in Watsonville, Calif.

**Herman Kagley**, 74, general contractor-retired, died May 6 in his Monrovia, Calif., home.

**James A. Liggett**, 59, civil engineer, died May 3 in Prescott, Ariz.

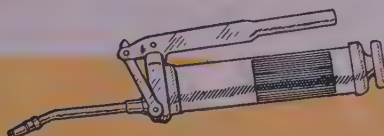
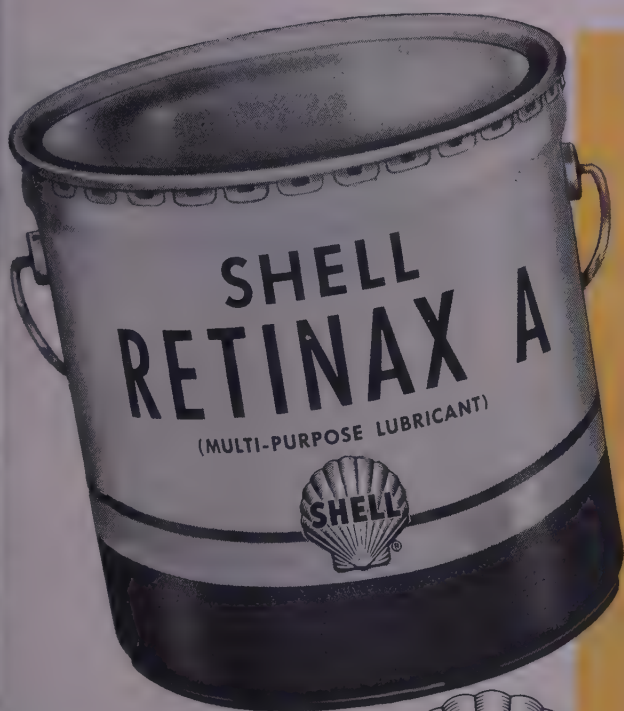
**William E. Burke**, 77, president Southwest Paving Co., died May 13 at Huntington Memorial Hospital, Pasadena, Calif. Burke founded his firm many years ago. He was a past president of the Associated General Contractors.

**Howard Dunford**, 54, construction foreman, died May 17, in Los Angeles, Calif. Dunford had worked on many jobs both inside and outside of the continental United States with The Raymond Concrete Pile Co. Prior to service as a Seabee in World War I, Dunford had worked with Hunkin-Corkey of Cleveland, Ohio.

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# SUPERVISING THE JOBS

Paul Snook is superintendent for Snook Bros. on 0.3 mi. of highway work and construction of a reinforced concrete viaduct, the Nehalem River Bridge, Oregon. Q. L. Ruffner is grading superintendent and E. R. Palmer is concrete superintendent on the \$124,746 project.

William Hilde is superintendent for Hilde Construction Co., Inc., on a \$253,614 project for grading, gravel surfacing, oiling, etc., between Stanford and Geraldine in Fergus and Judith Basin counties, Mont. Fay Ramsey is crusher foreman, John Hunter, oiling foreman and "Dutch" Cave, grading foreman.

C. R. Pilcher is supervising 5.3 mi. of gravel surfacing, plant mix oiling, etc.,

in Missoula and Granite counties, Mont. Kiely Construction Co. and Union Construction Co., joint venturers, hold the \$224,877 contract.

Construction of magazines at the Naval Ammunition Depot, Hawthorne, Nev., is under the general supervision of Lee Arnold. Carl Dybdal is superintendent on the \$2,855,699 project for MacDonald, Young & Nelson, Inc., and Morrison-Knudsen Co., Inc., joint venturers.

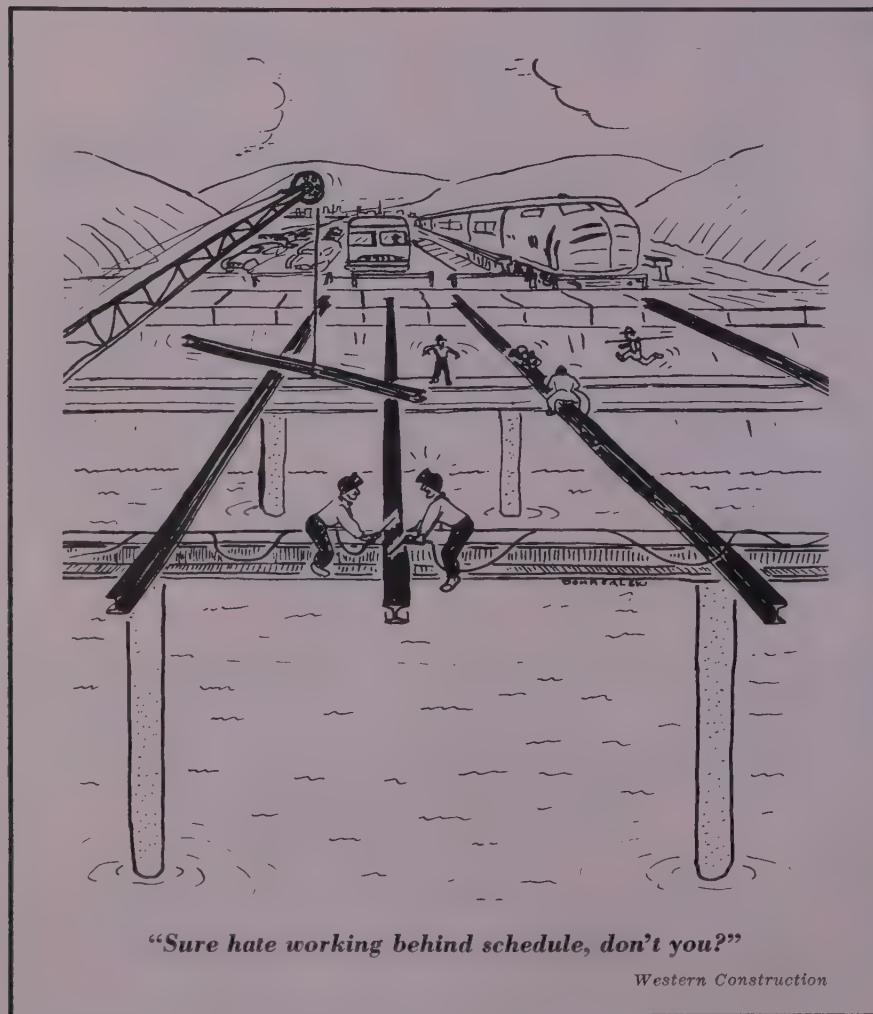
Construction of a new high school building in Eugene, Ore., is under the supervision of Ralph J. Gibbs, project manager. John H. Biglin is assistant superintendent for Ross B. Hammond Co. Ardell Haarsager is carpenter fore-

man along with Elgin Peoples, Edwin Relyea and William Short. Paul V. Tubbs is concrete foreman, Louis Suchenberg is labor foreman and Charles Turner is timekeeper. James Kirsch is cost engineer on the \$3,500,000 project. Harold Adams is steel foreman and Kenneth Vincent is cement finisher foreman.



Pictured above on the Wellton-Mohave Project are Jim Lacey, master mech., and Carl Mauer, gen. supt. Below: 1. to Bob Gunville, trimmer fore., A. E. McDonald, conc. supt., Art Garrett, pav. fore., and Richard O'Hanlan, batch plant supt.

## Down-time . . . . . By Domagalski



"Sure hate working behind schedule, don't you?"

Western Construction



J. E. Folston is superintendent of Babler & Rogers on 2.9 mi. of grading, 3.3 mi. of paving the Ontario-Evanston Corner section of Ontario-Lincoln School county rd., Ore. Lanny Faye is street foreman on the \$135,576 project.

Vernon S. Swanson is project manager and general superintendent for Stockton Construction Co., Inc., on a sewer construction project at Riverbank Ordnance Plant, Riverbank, Calif. John Allen is pipe layer foreman.

Leon Henry is the man in charge of Summit Construction Co., Rapid City, So. Dak., on grading and surfacing along Deadwood Rd., on U. S. No. 85. This is a Bureau of Public Roads project costing \$222,355.

Construction of a new high school building in Ephrata, Wash., by W. J. Edmiston & Sons, Inc., is under supervision of Hans Skov. E. J. Lind and N. A. Martin are carpenter foremen and Ernie Goodhue is plumbing foreman. J. M. Kriete is structural engineer and Vern Williams is lay-out man.

J. G. Watts Construction Co., Portland, Ore., has W. H. McKemie as

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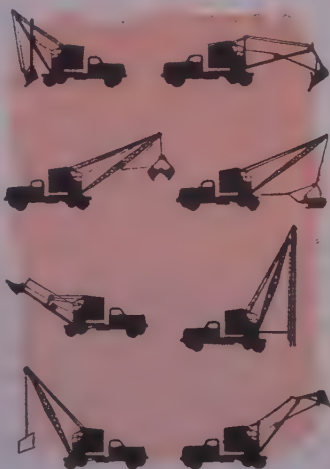
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superintendent on a Voice of America project. **J. U. Wright** is project engineer, **M. J. McGurrs**, project manager, and **Tony Peppercorn**, office manager.

Americans working on the Gal Oya Project on the Island of Ceylon for Morrison-Knudsen International Co., Inc., include the following: **Forrest D. Thorpe** is excavation superintendent in charge of heavy equipment operations. **E. Y. Chee** is Thorpe's assistant. **Paul Barnes**, **M. E. Hubbard**, **Bim Stephenson** and **Lloyd Jennings** are shovel foremen. **Bill Mauk**, **H. K. Utley**, **Lyndell Thorpe**

and **L. Wharton** are grade foremen. **Peter Looft** and **Frank Chuba** are drilling and blasting foremen. **Jack Randall** is master mechanic and **Wes Crawford** is in charge of concrete and steel work. Total cost of the earth fill dam and channel irrigation construction is some \$20,-000,000.

At Hungry Horse Dam, Mont., **Forrest Risken** is general superintendent and **J. L. Myers** is superintendent of power house construction for Grafe-Shirley-Lane, joint venturers for completion of the power house and scroll

case and turbine installation. The generators are being installed by subcontractor General Electric Co.

Construction of Las Lomas High School in Walnut Creek, Calif., is being supervised by **B. A. Wright**. **H. F. Botres** is foreman. The \$150,000 project being undertaken by Acalanes High School District.

Armstrong Construction Co. has **Ben G. Brant** as general superintendent of bridge and highway work in San Ramon, Calif. **George A. Murley** is in charge of

## Setting the hard rock tunneling record in Colorado

ON APRIL 10, G. L. Tarlton Contracting Co. of St. Louis, Mo., set a new hardrock tunneling record on the Bureau of Reclamation's North Poudre Supply Canal Diversion Dam and Tunnel contract in Colorado. Crews drove 111 ft. in 24 hr. to beat the previous mark by 7 ft. Here is the contractor's resumé of operations.

"The G. L. Tarlton Contracting Co. of St. Louis was awarded a contract by the Bureau of Reclamation on May 24, 1951, for the construction of the North Poudre Supply Canal Diversion Dam and Tunnels.

"The tunnels were of the Bureau's semi-elliptical design 8 ft. finish diameter, and 9 ft. 10 in. in the rough or better, depending on the bedding, blockiness and fracturization of the rock. These tunnels are now being lined with concrete.

"The tunnels were of various lengths and of various geologic formations. Tunnels No. 1 and 2 were about 4,600 ft. in length mainly in highly fractured and blocky pegmatite, Schist and Gneiss formations. Tunnel No. 3 was 1,255 ft. in length in the Fountain, Ingelside and Satanks sandstones. Tunnel No. 4 was 3,500 ft. in length, the first 1,650 ft. in the Benton Shales, the remainder in the

Dakota, Morrison, Sundance and Lykins Sandstone. A third of a second-foot of water was encountered in the driving, which water softened up the Benton shale and forced us to place tunnel steel supports and total lagging for 85% of Tunnel No. 4. The water forced us to take more than ordinary care in the laying and stabilization of our track.

"In the driving of these tunnels the pyramid cut was used, 36 to 42 holes were drilled depending on the type of formation. Maximum length of 11 ft. steel was used. The amount of powder used varied in accordance with the geologic formations from 115 lb. per round to 200 lb. per round.

"While working in tunnel No. 4, we encountered the Sundance sandstone formation about March 31st and went into rock section. We steadily increased our footage in this formation and on April 10th when Louis A. Stiles arrived on the job, he was advised by the graveyard shift that they made four shots and according to their measurements had made 37 ft. This information incited Stiles and the shift, and they endeavored to duplicate or better the graveyard progress. With everything functioning perfectly, at the end of their shift they measured 38 ft. of progress. Realizing the possibilities of having a banner day Stiles stayed over with the

swing shift and they were able to make 36 feet during their shift. Everything worked perfectly and only 30 minutes lost time was encountered by the swing shift when the jumbo left the track.

"Thirteen 10-ft. rounds were drilled in the 24 hours of 36 holes each. An average of slightly less than 2 hours per complete round. The average drilling cycle took about 30 min., loading and shooting 30 min., smoke time about 10 min., and mucking time 45 min.

"A four machine jumbo with 3½-in. drifters was used in the drilling, and Eimco 21 was used mucking into 90-cu. ft. Granby type side dump cars. Atlas and General Electric battery locomotives were used in the hauling.

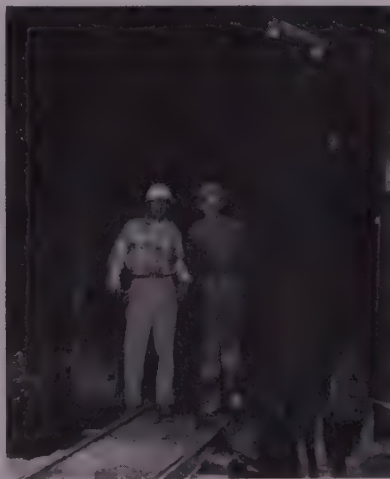
"We attribute this banner day to the intelligent cooperation of all of our forces. Our crews were experienced hard working men, supervised by what we believe the best supervision in the field, our equipment functioned perfectly and everything was excellently coordinated.

"Our superintendent, Louis Stiles, deserves the credit for this record and he was ably assisted by Arthur Stiles, walker; by Ray Hooper, Loren Huffman, Clinton O. Ross, shifters; and by Howard Cartee, William Coley and James Doggett, mucking machine operators."

**Art Stiles**, walker, left, stands with **Louis A. Stiles**, superintendent.



Inside tunnel opening, below, **Harry Werner**, engineer, left, and **Clinton O. Ross**, shifter.



**Loren Huffman**, left, and **Ray Hooper**, shifters, stand in front of drill jumbo on job site.



highway widening and culverts between Walnut Creek and Concord for the same firm.



**A. B. Overmyer**, superintendent for Diesel Oil Sales Co. on highway work in Washington. (See item below.)

Diesel Oil Sales Co. has two projects under way in Washington. **A. B. (Curley) Overmyer** is superintendent for the firm on 32.6 mi. of work from Nugent's Bridge to Deming on Primary State Highways 1 and 5, in Whatcom and King counties. **A. J. Osborn** is superintendent on 4.9 mi. of construction on K M Mountain easterly, Primary State Highway 12. The first project contract is \$105,113, while the second is \$158,563.

**Charles F. Lybecker**, superintendent of excavation work at the Bureau of Reclamation's Coulee Dam, is retiring from government service. He will act in a consulting capacity to contractors after his retirement. His long career includes many construction highlights on the big USBR project.

Construction of a 7-mi. aqueduct supply line in Oceanside, Calif., has **Guy Mayer** as project manager, **Ben Hoback**, project engineer, and **Bill Hurley**, field office engineer. **R. A. Wattson Co.** holds the \$257,125 contract.

Tilt-up construction at Marine Corps Artillery Training Center, Twenty-nine Palms, Calif., is under **C. P. Gaboury's** supervision. **D. G. Hall** is project manager and **J. F. McKee** is engineer. **Ford J. Twaits, Morrison-Knudsen Co., Inc.,** and **Macco Corp.**, joint venturers, hold the \$8,898,200 contract.

Construction of outside utilities at Elmendorf Air Force Base, Alaska, is under the supervision of **H. P. Bosworth** with **M. J. McCall** as construction superintendent. **I. T. Sawby** is project engineer for **S. Birch & Sons Construction Co., C. F. Lytle and Green Construction Co.**, joint venturers on the \$3,525,549 project.

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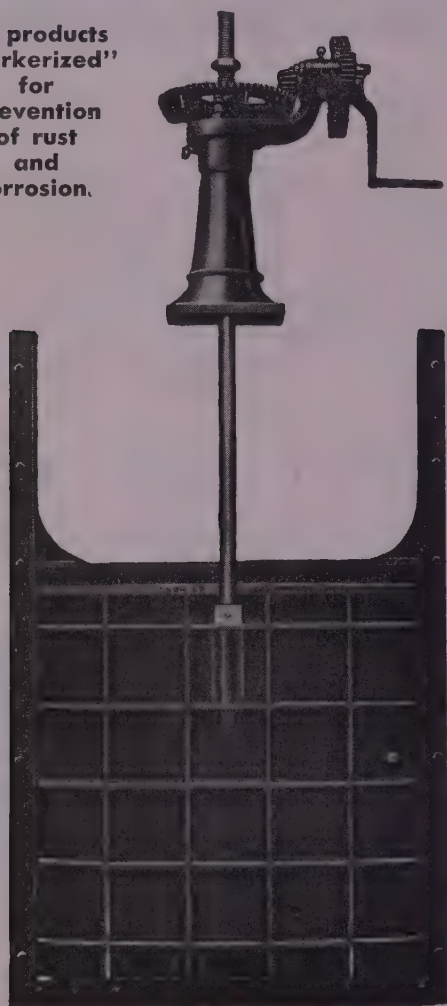
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# CONTRACTS

## A Summary of Bids and Awards For Major Projects in the West

\*\*\*\*\*

### Alaska

\$1,977,000—Anderson Construction Co. and Montin-Benson Corp., 234 Central Bldg., Seattle—Award for construction of a field house at Eielson Air Force Base; by C. of E.

\$1,944,900—Bethel Contractors, 420 Queen Ann Ave., Seattle—Award for construction of Bethel Hospital, Bethel; by Bureau of Indian Affairs.

\$2,579,607—Rue Contracting Co., 1338 Third Ave., North, Fargo, No. Dak.—Low bid for construction of the power plant, Eklutna Project; by USBR.

### Arizona

\$392,560—Arizona Sand and Rock Co., P. O. Box 596, Phoenix—Low bid for grading, draining, select material aggregate base and bituminous plant-mix over about 8 mi. of roadway, beginning at Hamilton Corner, about 4 mi. south of Chandler and extending north to Buds Corner about 2.5 mi. south of Mesa; by St. Hwy. Dept.

\$398,402—Arizona Sand and Rock Co., P. O. Box 596, Phoenix—Low bid for grading, draining, subgrade seal, select material, aggregate base and bituminous surface treatment, beginning about 8 mi. east of Ashfork and extending east for a distance of approximately 1.25 mi.; by St. Hwy. Dept.

\$425,474—W. J. Henson Contractor, P. O. Box 471, Prescott—Low bid for grading and draining about 9 mi. between Dewey and Prescott, Rock Springs-Prescott Highway; by St. Hwy. Dept.

\$737,024—Martin Construction Co., P. O. Box 934, Tucson—Low bid for grading, select material, aggregate base and bituminous plant-mix beginning about 8 mi. northwest of Tucson on State Route 84 for a distance of about 8 mi.; by St. Hwy. Dept.

\$1,176,494—D. O. Norton & Son, 3022 N. 26th St., Phoenix—Low bid for construction of a 2-story, reinforced concrete Yuma High School addition; by Yuma Union High School District.

\$455,403—Phoenix-Tempe Stone Co., P. O. Box 6170, Phoenix—Low bid for furnishing and placing select material, aggregate base and bituminous road-mix beginning about 18 mi. east of Topock and extending northerly for a distance of about 16 mi. to a point about 14.5 mi. south of Kingman; by St. Hwy. Dept.

\$291,681—Lyle Price, Contractor, P. O. Box 548, Flagstaff—Low bid for 3.2 mi. grading, base and bituminous surfacing from Grand Canyon Village via Yavapai and Mather Points, South Entrance Road, Grand Canyon National Park, Coconino County; by BPR.

\$334,906—Tiffany Construction Co., P. O. Box 6292, Phoenix—Low bid for grading, draining, furnishing and placing select material and aggregate base, furnishing and applying MC-2 or MC-3 prime coat, furnishing and placing a bituminous plant-mix using SC-6 liquid asphalt and furnishing and placing an emulsified asphalt seal coat, beginning at Wilbur Rd. in the City of Mesa and extending easterly on US Route 60-70-80-89 for 3.2 mi. to 0.1 mi. east of Eastern Canal, Mesa-Superior Highway; by St. Hwy. Dept.

\$259,665—Western Constructors, Inc., P. O. Box 1604, Phoenix—Low bid for grading and draining 6 mi. of Cordes Junction-Bridgeport Highway; by St. Hwy. Dept.

### California

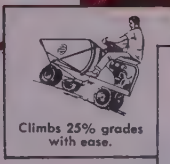
\$2,986,961—Guy F. Atkinson Co., 10 W. Orange Dr., South San Francisco—Low bid for constructing a portion of a bridge and doing miscellaneous road work on Bayshore Freeway, bet. 16th and 17th streets, San Francisco; by St. Div. of Hwys.

\$552,246—Gordon H. Ball and San Ramon Valley Land Co., Star Route, Danville—Low bid for 4.8 mi. grading and paving with portland cement concrete on cement treated sub-grade and the existing pavement to be resurfaced with plant-mix surfacing

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c/o Poirier & McLane Corp.



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Sincerely yours,  
*Larry O'Neill*  
c/o Poirier & McLane Corp.

"Our Whiteman Power Buggies are tireless workers. All day long they speed along the runways, climb steep grades, squeeze through tight spots and turn on a dime. They're doing a tremendous job, saving valuable time and cutting costs — for the simple reason they carry 13 cu. ft. of concrete at a time, which is equal to 4 hand buggies. For bridge slabs and floors, they are tops."

Larry O'Neill, Supt.  
c/o Poirier & McLane Corp.



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bet. 0.5 mi. north of Pixley and 1 mi. south of Tipton, Tulare County; by St. Div. of Hwys.

\$348,143—**Brighton Sand & Gravel Co.**, P. O. Box 2604, Sacramento—Low bid for 5.8 mi. of grading, imported sub-base material and crusher-run base to be placed and surfaced with armor coat and plant-mixed surfacing on El Centro River Levee and Elkhorn Rd., Sacramento County; by St. Div. of Hwys.

\$516,184—**Eaton & Smith**, 1215 Michigan St., San Francisco—Low bid for construction of a reinforced concrete arch culvert and a fill to be placed thereon, plus about 0.45 mi. of road to be graded and surfaced with road-mix surfacing on cement treated base at Rattlesnake Creek, about 1 mi. south of Cummings Post Office, Mendocino County; by St. Div. of Hwys.

\$382,000—**Foster & McHarg**, P. O. Box 272, Riverside—Low bid for clearing, preliminary grading at site of Veterans' Administration Hospital, Ft. Funston; by Veterans Administration.

\$2,617,653—**M. H. Golden Construction Co.**, 485 Noel St., San Diego—Award for construction of eight warehouses at Chappo Flats, Camp Pendleton Marine Base, Oceanside; by Eleventh Naval District.

\$674,331—**Granite Construction Co.**, Box 900, Watsonville—Low bid for widening existing lanes with plant-mix surfacing on cement treated base and new lanes to be surfaced with plant-mixed surfacing on cement treated base bet. 1 mi. south of Templeton and 0.2 mi. north of Paso Robles, about 9 mi. in all, San Luis Obispo County; by St. Div. of Hwys.

\$677,400—**Johnson-Western Constructors**, 2100 Wilmington-San Pedro Rd., Los Angeles—Low bid for construction of a rock and concrete quay in Long Beach Outer Harbor area; by Bd. of Harbor Comm.

\$2,552,500—**Peter Kiewit Sons' Co.**, 345 Kieways Ave., Arcadia—Low bid for 1.5 mi. grading, surfacing with portland cement concrete pavement and plant-mix surfacing on cement treated base and separation structures, Eastshore Freeway bet. Distribution Structure and Ashby Ave., Alameda County; by St. Div. of Hwys.

\$746,708—**Charles MacClosky**, 112 Market St., San Francisco—Low bid for construction of eight reinforced concrete bridges bet. the Los Angeles County Line and Route 192, San Bernardino County; by St. Div. of Hwys.

\$502,050—**Nomellini Construction Co.**, P. O. Box 1177, Stockton—Award for grading, draining, paving Tuxedo and Country Improvement Dist., Stockton; by San Joaquin County.

\$187,231—**Paris Bros.**, 2415 Oregon St., Berkeley—Low bid for construction of a sanitary sewerage system at Oakland Municipal Airport, Schedule I; by Port of Oakland.

\$1,206,625—**R. M. Price Co.**, 2285 Pinecrest Drive, Altadena—Low bid for construction of seven reinforced concrete bridges and 0.54 mi. of city streets to be widened and surfaced with asphalt concrete pavement on Ramona Freeway in Pomona and Claremont, Los Angeles County; by St. Div. of Hwys.

\$4,418,300—**Rothschild, Raffin & Weirick and James I. Barnes Construction Co.**, 299 Kansas St., San Francisco—Low bid for construction of a 6-story, reinforced-concrete and structural steel laboratory building for the Radiological Defense Laboratory, San Francisco Naval Shipyard; by 12th Naval District.

\$508,216—**A. Teichert & Son, Inc.**, 1846 - 37th St., Sacramento—Low bid for the completion of a partially finished contract for the construction of a state highway in Los Angeles County, bet. north city limits of Los Angeles, near Tunnel Station Bridge and Pico Canyon Rd., about 5.1 mi. in length; by St. Div. of Hwys.

\$2,069,130—**United Concrete Pipe Corp.**, Box 425, Baldwin Park—Award for construction of the Garvey-Ascot Cross Feeder, Alhambra and Monterey Park, Los Angeles; by Metropolitan Water District.

\$374,873—**Warren Southwest, Inc.**, P. O. Box 419, Torrance—Low bid for 2.5 mi. of grading a roadbed and surfacing with plant-mix surfacing on untreated rock base; portions of the existing roadbed to be surfaced with plant-mixed surfacing on existing pavement and seal coats to be applied to provide a four-lane divided highway on Artesia Ave. bet. east city limits of Long Beach and Palo Verde Ave., Los Angeles County; by St. Div. of Hwys.

\$1,155,929—**Webb & White**, 7220½ Melrose Ave., Los Angeles—Low bid for construction of two railroad underpasses and about 0.7 mi. of grading and surfacing with portland cement concrete pavement on cement treated subgrade over imported base material and imported subbase material or imported pervious material, for a six-lane divided highway on Los Angeles

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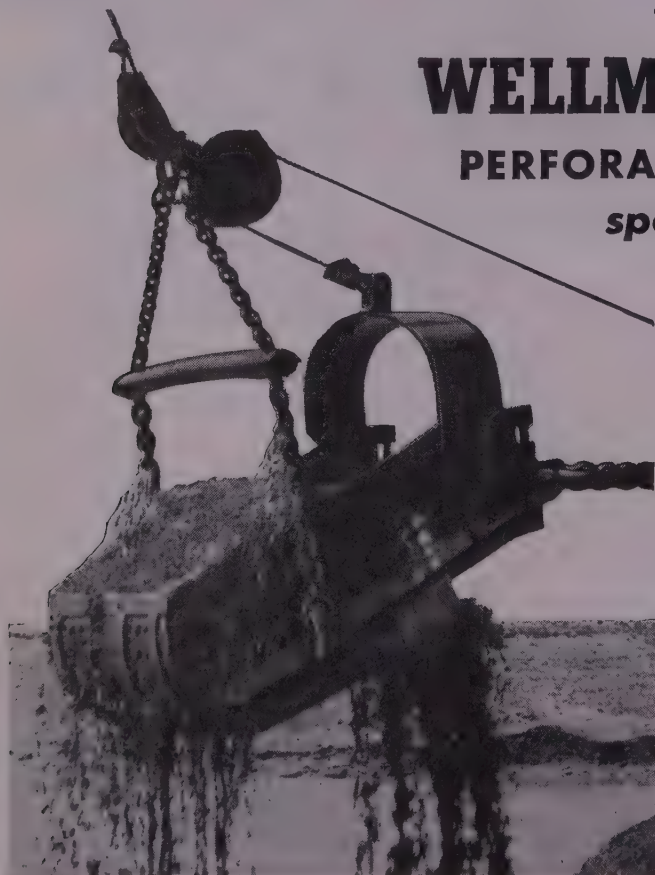
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River Freeway, bet. 0.2 mi. south of Dominguez St. and Del Amo Blvd., Los Angeles County; by St. Div. of Hwys.

\$361,574—**Claude C. Wood Co.**, P. O. Box 599, Lodi—Low bid for 4.5 mi. grading and surfacing with plant-mix surfacing on imported base material bet. 0.4 mi. southeast of Jackson and 1.5 mi. west of Mokelumne Hill, Amador and Calaveras counties; by St. Div. of Hwys.

\$1,693,500—**F. E. Young Construction Co.**, 2141 Main St., San Diego—Low bid for construction of a reinforced concrete library building, San Diego; by City of San Diego.

## Colorado

\$3,123,000—**The Mead & Mount Construction Co.**, Railway Exchange Bldg., Denver—Award for construction of a new building to house the National Bureau of Standards laboratories; by General Services Administration.

\$245,730—**Schmidt Construction Co.**, P. O. Box 66, Grand Junction—Low bid for 9.2 mi. construction of a 22-ft. base and bituminous surfacing on the Echo Lake Highway in Arapaho National Forest, Clear Creek County; by BPR.

## Idaho

\$257,801—**Morrison-Knudsen Co., Inc.**, 319 Broadway, Boise—Low bid for constructing the roadway and a plant-mix bituminous surface on 1.2 mi. of US 20-30 from Kimball Ave. to Parma Junction in Caldwell, Canyon County; by St. Dept. of Hwys.

\$416,930—**Carl E. Nelson**, P. O. Box 397, Logan—Award for constructing the roadway, a plant-mix bituminous surface and an 82.5-ft. concrete bridge on 8.2 mi. of US 30 N. from Bannock Creek to Pocatello in Power and Bannock counties; by St. Dept. of Hwys.

## Montana

\$151,021—**S. Birch & Sons Construction Co.**, 314 Ford Bldg., Great Falls—Low bid for 12.7 mi. grading, gravel surfacing and construction of small drainage structures on Wolf Point north highway, Roosevelt County; by St. Hwy. Comm.

\$368,846—**Albert Lalonde**, Sidney—Low bid for 13.4 mi. grading, gravel surfacing, road-mix oiling and construction of small drainage structures on the Wolf Point north highway in Roosevelt County; by St. Hwy. Comm.

\$152,676—**Taggart Construction Co.**, P. O. Box 560, Cody—Award 5.4 mi. grading, gravel surfacing, road-mix oiling on the St. Xavier south section of the St. Xavier-Hardin highway, Big Horn County; by St. Hwy. Comm.

## Nevada

\$194,410—**Dodge Construction, Inc.**, Fallon—Award for 28.23 mi. of work from a point approximately 38 mi. north of Austin to approximately 20 mi. south of Battle Mountain; by St. Dept. of Hwys.

\$1,472,120—**Nomellini Construction Co.**, P. O. Box 1177, Stockton—Award for construction of the administration building, housing facilities and utilities at Stead Air Force Base, Reno; by C. of E.

## New Mexico

\$215,633—**O. D. Cowart**, Albuquerque—Award for 6.6 mi. of work on the Penasco-Rock Wall road, Taos County; by St. Hwy. Dept.

\$385,671—**Floyd Haake**, 1111 Lovato Lane, Santa Fe—Award for 12.8 mi. of work on Mosquero-Logan rd., Harding County; by St. Hwy. Dept.

\$1,636,120—**Lemke, Clough & King**, P. O. Box 144, Albuquerque—Low bid for construction of a training building at the Sandia Air Base; by C. of E.

\$304,302—**D. D. Skousen**, 201 Springer Bldg., Albuquerque—Award for 7.7 mi. work on the Eagle Nest-Agua Fria road in Colfax County; by St. Hwy. Dept.

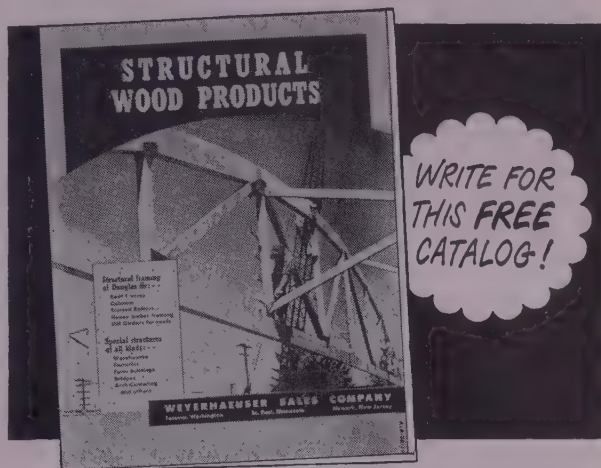
\$303,243—**Henry Thygesen & Co.**, P. O. Box 876, Albuquerque—Award for 20.4 mi. work on the Sanis-Romero rd. US 85, San Miguel County; by St. Hwy. Dept.

## Oregon

\$250,534—**J. C. Compton Co.**, McMinnville—Low bid for 2.2 mi. of grading and paving the Lafayette-North Yamhill river section of the Pacific Highway west, bet. Lafayette and McMinnville, Yamhill County; by St. Hwy. Comm.

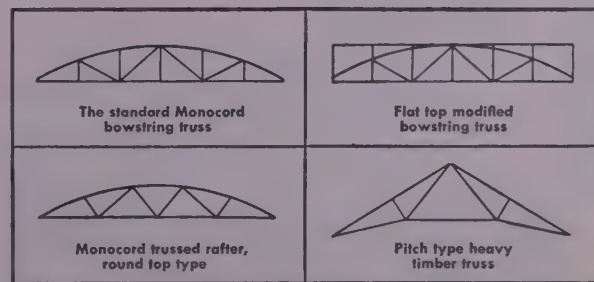
\$531,622—**Peter Kiewit Sons' Co.**, 8th and Douglas Sts., Longview, Wash.—Award for 1.99 mi. of grading and construction of 1 box culvert on the Gnat Creek-Bradley Park section of the

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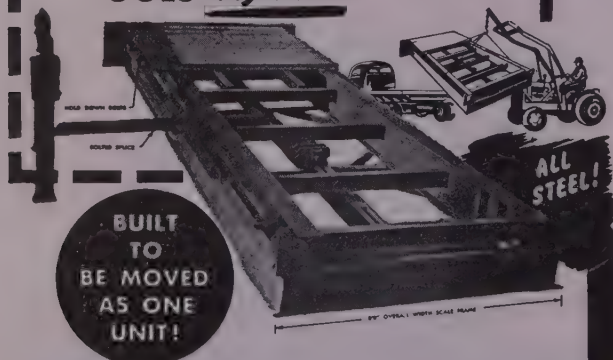
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Columbia River Highway about 19 mi. east of Astoria, Clatsop County; by St. Hwy. Comm.

\$963,787—**McNutt Bros.**, 351½ E. Broadway, Eugene—Low bid for 5.2 mi. of grading and paving plus construction of 5 reinforced concrete bridges, Newport-Toledo section of the Corvallis-Newport highway, Lincoln County; by St. Hwy. Comm.

\$326,014—**Rogers Construction Co.**, 11760 N. E. Glisan, Portland—Award for 6.7 mi. of grading, Middle Unit, Arlington-Heppner Junction section of the Columbia River Highway, bet. Arlington and Heppner Junction, Douglas County; by St. Hwy. Comm.

\$335,005—**Fred H. Slate Co., Ltd. & E. C. Hall Co.**, 12012 S. W. Barbur Blvd., Portland—Low bid for 3.8 mi. of grading and paving; 2 reinforced concrete bridges and 2,900 cu. yd. crushed material in stockpile on the Calapooya Creek-Sutherlin section of the Elkton-Sutherlin highway northwest from Sutherlin, Douglas County; by St. Hwy. Comm.

\$1,916,786—**Vieska & Post**, Box 60, Salem—Low bid for construction of a 4-story court house, Salem; by Marion County.

\$1,158,818—**White Bros. Construction Co., Inc.**, P. O. Box 376, Walla Walla, Wash.—Low bid for 5.7 mi. of grading and paving; also 2,000 cu. yd. crushed material in stockpile on the Oakland Junction-Deady unit, Cheoweth Park-Deady section of the Pacific Highway west of Oakland and Sutherlin, Douglas County; by St. Hwy. Comm.

## Utah

\$201,190—**W. W. Clyde & Co.**, Springville—Low bid for construction of a 5.8 mi. 3-in. plant-mixed bituminous road northerly for 5.8 mi. from Holden, Millard County; by St. Rd. Comm.

\$414,901—**Germer, Abbott & Waldron**, Tremonton—Low bid for 13.8 mi. of road-mixed bituminous surfaced road on sections of US 30-S and US 189, Morgan and Summit counties; by St. Rd. Comm.

\$600,698—**LeGrand Johnson**, 639 East 1st South, Logan—Award for construction between Rattlesnake Pass and Snowville; by St. Rd. Comm.

\$234,628—**L. A. Young Construction Co.**, Richfield—Low bid for construction of a 3-in. road-mixed bituminous surfaced road bet. Fairview and Mt. Pleasant, 5.4 mi. long, Sanpete County; by St. Rd. Comm.

## Washington

\$1,447,376—**J. C. Boespflug**, 1912 - 4th Ave. So., Seattle—Low bid for general construction of the initial unit of a teaching hospital; by Regents of the University of Washington.

\$273,989—**C & E Construction Co., Inc.**, P. O. Box 1545, Yakima—Award for 4.1 mi. of highway work on Primary State Highway 8, Klickitat County Line north, Yakima and Klickitat counties; by St. Dept. of Hwys.

\$219,461—**D-H Paving Co.**, 6800 Evergreen Highway, Vancouver—Award for 2.1 mi. of work easterly on Raymond Airport road, Pacific County; by St. Dept. of Hwys.

\$490,612—**F. R. Hewett & Co.**, P. O. Box 46, Parkwater—Award for 9.4 mi. of construction from Hesseltine to Wilbur, Lincoln County; by St. Dept. of Hwys.

\$581,333—**Otis Williams & Co.**, P. O. Box 1124, Helena, Mont.—Low bid for earthwork, pipe lines and structures, Area W laterals, sublaterals and wasteways, West Canal Laterals, Columbia Basin Project; by USBR.

## Wyoming

\$322,572—**Boatright-Smith Co.**, Rawlins—Low bid for grading 30 ft. and base surfacing 22 ft. on the Buffalo-Tensleep route 3.3 mi. in length in Big Horn National Forest, Big Horn and Washakie counties; by BPR.

\$317,546—**Peter Kiewit Sons' Co.**, P. O. Box 875, Sheridan—Low bid for base course surfacing, plant-mix surface course and miscel. work on 5.3 mi. of the Big Piney-Kemmerer Rd., plant mix surface course on 4.1 mi. of the Etna-Alpine Rd. and plant mix surface course on 10.6 mi. of the Cokeville-Kemmerer Rd. Lincoln County; by St. Hwy. Dept.

\$451,694—**Northwestern Engineering Co.**, P. O. Box 567, Denver—Low bid for grading, draining, an overhead crossing over the Union Pacific Railroad Co. tracks, near Archer and miscel. work on 0.5 mi. of the Cheyenne-Pine Bluffs rd. bet. Cheyenne and Archer in Laramie County; by St. Hwy. Dept.

\$178,060—**Teton Construction Co.**, P. O. Box 197, Cheyenne—Low bid for grading, draining, curb and gutter, base course surfacing, plant-mix surface course and miscel. work on 0.8 mi. Jackson st. on US 26, 89, and 187, and on 0.1 mi. of side street in the town of Jackson in Teton County; by St. Hwy. Dept.

# *A fleet* of Street Maintenance Equipment



## **HUBER Maintainer** Serves Small City Many Ways

- A community of 3,000 residents, more or less, has nearly the same variety of street maintenance problems as larger cities—but usually the amount of money available for the job is limited.

Many communities are solving such problems by purchasing a Huber Maintainer because this single machine, with attachments, serves as a fleet of maintenance equipment.

As a lift-loader, the Huber loads trucks, removes manhole covers and lays pipe. With a bulldozer attachment it does a variety of backfilling jobs. Its maintainer blade keeps alleys smooth and clean and handles grading jobs.

With other HYDRAULICALLY controlled attachments the 6,000-lb., 42½ H.P. Huber can serve as a highway mower, berm leveler, road planer, snow plow, broom or patch roller. Let your nearest Huber Distributor tell you more about the versatile Maintainer and how it can work for you.

### **HUBER MANUFACTURING COMPANY — MARION, OHIO, U. S. A.**

#### *Represented by*

Southern California Equipment Co. .... Los Angeles 21, Calif.  
Jenkins & Albright ..... Reno, Nevada  
Contractors' Equipment & Supply Co. .... Albuquerque, New Mexico  
Feenaughty Machinery Co. .... Portland 14, Oregon  
Feenaughty Machinery Co. .... Spokane 2, Washington  
Feenaughty Machinery Co. .... Seattle 4, Washington  
Foulger Equipment Co., Inc. .... Salt Lake City 8, Utah

The Colorado Builders' Supply Co. .... Denver 9, Colorado  
The Colorado Builders' Supply Co. .... Casper, Wyoming  
Montana Powder & Equipment Co. .... Helena, Billings, Montana  
The O. S. Stapley Co. .... Phoenix, Arizona  
Feenaughty Machinery Co. .... Boise, Idaho  
Flaherty Equipment Co. .... Idaho Falls, Idaho  
Coast Equipment Co. .... San Francisco 1, Calif.

## Credit to Consolidated Western at Chief Joseph

IN THE LIST of major units of equipment and materials which accompanied the article on Chief Joseph Dam Construction (*Western Construction*, May 1952—pp. 69-75), credit was not given to the manufacturer of the towers for the two 25-ton capacity cableways. Consolidated Western Steel Corporation, Los Angeles, furnished the towers and fittings. The special 240-ft. tall tower for the cableways, planned by Chief Joseph Builders to eliminate the stress inherent in the usual high tower, was designed and manufactured also by Consolidated Western.

## Officials review USBR plan for Trinity River

A BUREAU of Reclamation proposal to use presently wasted surplus waterflow in northern California's Trinity River to provide additional water for the Central Valley Project and power for the north and central regions of the state, has been sent to Federal agencies and California and Oregon State officials for review.

The project would provide an additional million acre-feet of water and, with firming energy, more than 1,600,000 kw-hr of electricity annually. The review by States and Federal agencies precedes its submittal to Congress.

The multiple-purpose project, which would also provide increased recreational opportunities and fish and wildlife conservation benefits, would form a newly established Trinity River Division of the California Central Valley Project and be an integral financial and operational part of that project. Included in the 1,000,000 acre-feet is irrigation water for the authorized Sacramento Canals Unit of the Central Valley Project.

Engineering features of the proposed water resources development are:

**Trinity Dam**, estimated to cost \$79,800,000, on the main stem of the Trinity River nine miles above Lewiston, in northern California, an earth-fill structure 410 ft. high and 3,300 ft. long at the crest. It would impound a reservoir 17 mi. long, with a capacity of 1,800,000 acre-feet of water.

**Trinity Power Plant and Switchyard**, \$12,625,000 at the right abutment of the dam, with a generating capacity of 75,000 kw.

**Lewiston Diversion Dam and Reservoir**, \$5,660,000, on the main stem of the river nine miles downstream from the main dam. It would be 140 ft. high, and back up a lake of 45,000 acre-feet capacity.

**Lewiston Power Plant**, \$574,000, with 2,000-kw. capacity, at the left abutment of the Lewiston Dam.

**Tower House Diversion Tunnel**, \$28,930,000, would be 8.3 mi. long, diverting from Lewiston Dam to Tower House

# UNIT BID PRICES

## Selected bid abstracts for Western projects

### Irrigation

#### Earthwork and structures, Potholes East Canal

Washington—Columbia Basin Project—USBR. Phil McInnis & Henry George & Sons, joint venturers, Spokane, submitted the low bid of \$562,216 for earthwork and structures, Potholes East Canal and Pasco Wasteway. Unit prices were as follows:

|                                                                                |                                               |
|--------------------------------------------------------------------------------|-----------------------------------------------|
| (1) Phil McInnis & Henry George & Son..\$562,216                               | (4) Peter Kiewit Sons' Co. ....\$616,139      |
| (2) Chert Brothers Construction Co. and Sandkey Contracting, Inc. .... 569,758 | (5) J. A. Terteling & Sons, Inc. .... 667,773 |
| (3) Marshall, Haas & Royce..... 584,061                                        | — Scheumann & Johnson ..... 292,840           |
|                                                                                | (Sched. 11 only)                              |
|                                                                                | (6) Engineers' estimate ..... 583,274         |

|                                                                                                                              | (1)     | (2)     | (3)     | (4)     | (5)     | (6)     |
|------------------------------------------------------------------------------------------------------------------------------|---------|---------|---------|---------|---------|---------|
| 761,700 cu. yd. excav., common, for canal.....                                                                               | .185    | .15     | .175    | .16     | .215    | .17     |
| 10,000 cu. yd. excav., intermediate, for canal .....                                                                         | .59     | .50     | .50     | .75     | .25     | .60     |
| 86,000 cu. yd. construction of core banks .....                                                                              | .21     | .26     | .30     | .30     | .23     | .20     |
| 860 thousand gals. water for core banks .....                                                                                | 8.20    | 8.00    | 5.00    | 5.00    | 10.00   | 4.00    |
| 50,000 cu. yd. excav., common, for drainage channels and ditches .....                                                       | .29     | .25     | .25     | .30     | .21     | .20     |
| 4,500 mi. cu. yd. overhaul .....                                                                                             | .51     | .62     | .50     | .50     | .60     | .43     |
| 8,000 cu. yd. compacting embankments .....                                                                                   | .37     | .55     | .50     | .40     | .60     | .35     |
| 100 cu. yd. excav., intermediate, for struts. ....                                                                           | 10.00   | 3.75    | 5.00    | 5.00    | 1.25    | 2.00    |
| 5,000 cu. yd. excav., common, for struts. ....                                                                               | 1.50    | .62     | 1.50    | .65     | .60     | .80     |
| 3,400 cu. yd. backfill about struts. ....                                                                                    | .35     | .50     | .50     | .65     | .31     | .50     |
| 1,550 cu. yd. compacting backfill about struts.....                                                                          | 3.20    | 4.00    | 3.00    | 3.00    | 3.85    | 3.00    |
| 200 cu. yd. one-course road surfacing .....                                                                                  | 3.10    | 5.25    | 3.00    | 4.00    | 4.60    | 3.50    |
| 950 sq. yd. 12-in. dry-rock paving .....                                                                                     | 6.00    | 7.50    | 6.00    | 5.00    | 5.50    | 5.00    |
| 685 cu. yd. concrete in struts. ....                                                                                         | 58.00   | 81.00   | 60.00   | 68.00   | 65.00   | 65.00   |
| 1,025 bbl. furnishing and handling cement .....                                                                              | 5.00    | 6.15    | 7.00    | 5.30    | 8.00    | 5.60    |
| 82,000 lb. furn. and placing reinf. bars .....                                                                               | .14     | .16     | .16     | .15     | .16     | .10     |
| 25 sq. ft. furn. and placing ½-in. elastic filler matl. in joints .....                                                      | 5.00    | 2.00    | 4.00    | 4.00    | 2.00    | 2.00    |
| 20 lin. ft. placing 9-in. rubber water stops in joints.....                                                                  | 4.00    | 2.00    | 4.00    | 2.00    | 1.50    | 2.00    |
| 68 M.b.m. furn. and erecting untr. timber in struts.....                                                                     | 200.00  | 270.00  | 300.00  | 316.00  | 342.00  | 275.00  |
| 52 M.b.m. furn. and erecting tr. timber in struts.....                                                                       | 280.00  | 290.00  | 350.00  | 316.00  | 371.00  | 325.00  |
| 76 lin. ft. furn. and laying 24-in. diam. corrugated metal pipe coated with asbestos and asphalt .....                       | 8.90    | 9.70    | 12.00   | 10.00   | 9.50    | 8.5     |
| 330 lin. ft. furn. and laying 30-in. diam. corrugated metal pipe coated with asbestos and asphalt .....                      | 10.50   | 11.00   | 12.00   | 11.00   | 12.00   | 10.5    |
| 264 lin. ft. furn. and laying 36-in. diam. extra-str. conc. culvert pipe .....                                               | 18.50   | 17.85   | 20.00   | 14.00   | 20.00   | 15.7    |
| 112 lin. ft. furn. and laying 48-in. diam. extra-str. conc. culvert pipe .....                                               | 29.80   | 28.90   | 30.00   | 19.00   | 34.00   | 24.8    |
| 0.04 mi. furn. and erecting type-B fence .....                                                                               | \$4,000 | \$1,500 | \$5,000 | \$2,500 | \$4,000 | \$2,000 |
| 2 gates furn. and installing 4-ft. metal gates in fence .....                                                                | 40.00   | 50.00   | 25.00   | 50.00   | 63.00   | 50.00   |
| Lump sum, furn. and installing 2 radial gates and hoists for check at Station 2678+00 .....                                  | \$2,200 | \$4,000 | \$4,000 | \$6,200 | \$5,050 | \$5,000 |
| Lump sum, furn. and installing 2 radial gates and hoists for check at Station 2946+00 .....                                  | \$2,200 | \$4,000 | \$4,000 | \$6,200 | \$5,050 | \$5,000 |
| Lump sum, furn. and installing 2 radial gates and hoists for check at Station 2794+50 .....                                  | \$2,200 | \$4,000 | \$4,000 | \$6,200 | \$5,050 | \$5,000 |
| Lump sum, furn. and installing one radial gate and hoist for check at Station 3115+00 .....                                  | \$1,100 | \$1,800 | \$2,000 | \$3,100 | \$2,300 | \$2,500 |
| Lump sum, furn. and installing one radial gate and hoist for check, drop, and stilling pool struct. at Station 3283+00 ..... | \$1,100 | \$2,000 | \$2,000 | \$3,100 | \$2,600 | \$2,500 |
| Lump sum, furn. and installing one radial gate and hoist at Station 3397+50 .....                                            | \$1,100 | \$1,800 | \$2,000 | \$3,100 | \$2,300 | \$2,500 |
| 12,100 lb. furn. and installing misc. metalwork .....                                                                        | .35     | .60     | .50     | .66     | .80     | .7      |

#### SCHEDULE 2

Potholes East Canal, Station 3460+00 to Station 3536+2707 BK, and Pascoe Wasteway, Station 0+00 to Station 15+96

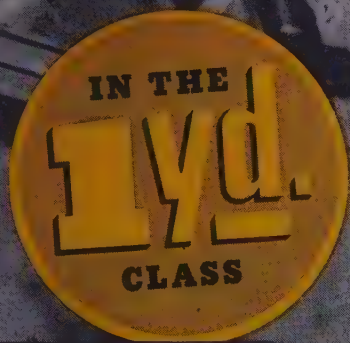
|                                                                                  |         |         |         |         |         |         |
|----------------------------------------------------------------------------------|---------|---------|---------|---------|---------|---------|
| 14,500 cu. yd. excav., common, for canal.....                                    | .23     | .15     | .20     | .16     | .215    | .17     |
| 1,000 cu. yd. excav., intermediate, for canal .....                              | .41     | .50     | .50     | .75     | .25     | .60     |
| 2,300 cu. yd. construction of core banks .....                                   | .21     | .26     | .30     | .30     | .23     | .20     |
| 23 thousand gal. water for core banks .....                                      | 8.10    | 8.00    | 10.00   | 5.00    | 10.00   | 4.00    |
| 5,000 cu. yd. excav., com., for drain. chans. and ditches .....                  | .30     | .25     | .25     | .30     | .21     | .20     |
| 20 mi. cu. yd. overhaul .....                                                    | 2.00    | .62     | 1.00    | .50     | .60     | .40     |
| 1,500 cu. yd. compacting embankments .....                                       | .37     | .55     | .50     | .40     | .60     | .35     |
| 18,000 cu. yd. excav., common, for struts. ....                                  | 1.30    | .62     | 1.00    | .65     | .60     | .80     |
| 150 cu. yd. excav., intermediate, for struts .....                               | 4.00    | 3.75    | 3.00    | 5.00    | 1.15    | 2.00    |
| 10,000 cu. yd. backfill about struts. ....                                       | .31     | .50     | .50     | .65     | .31     | .50     |
| 4,500 cu. yd. compacting backfill about struts.....                              | 3.10    | 3.10    | 3.00    | 3.00    | 3.85    | 3.00    |
| 150 cu. yd. riprap .....                                                         | 15.00   | 15.50   | 6.00    | 9.00    | 1.85    | 6.00    |
| 222 sq. yd. 12-in. dry-rock paving .....                                         | 15.00   | 7.40    | 6.00    | 5.00    | 5.30    | 5.00    |
| 2,765 lin. ft. furn. and laying 6-in. diam. sewer or conc. pipe for drains ..... | 2.10    | 1.80    | 1.00    | 3.00    | 2.00    | 2.00    |
| 2,280 cu. yd. conc. in struts. ....                                              | 54.00   | 52.50   | 50.00   | 68.00   | 65.00   | 60.00   |
| 3,300 bbl. furn. and handling cement .....                                       | 4.80    | 6.15    | 7.00    | 5.30    | 8.00    | 5.00    |
| 180,000 lb. furn. and placing reinf. bars .....                                  | .14     | .16     | .15     | .15     | .16     | .10     |
| 87,500 lb. placing reinf. bars .....                                             | .05     | .08     | .08     | .08     | .09     | .05     |
| 5 sq. ft. furn. and placing ½-in. elastic filler matl. in joints .....           | 5.00    | 2.00    | 5.00    | 4.00    | 2.00    | 2.00    |
| 265 lin. ft. placing 9-in. rubber water stops in joints.....                     | 4.00    | 2.00    | 3.00    | 2.00    | 1.50    | 2.00    |
| 0.7 M.b.m. furn. and erect. untr. timber in struts.....                          | 300.00  | 300.00  | 300.00  | 316.00  | 342.00  | 300.00  |
| 0.2 M.b.m. furn. and erect. tr. timber in struts.....                            | 500.00  | 300.00  | 350.00  | 316.00  | 371.00  | 350.00  |
| 1.7 mi. furn. and erect. type-B fence .....                                      | 900.00  | \$1,500 | \$1,000 | \$2,500 | \$4,000 | \$1,600 |
| 6 assemblies furn. and erect addtl. fence brace post assemblies .....            | 40.00   | 25.00   | 40.00   | 14.00   | 80.00   | 15.00   |
| 6 gates furn. and install. 4-ft. metal gates in fence.....                       | 40.00   | 50.00   | 40.00   | 50.00   | 63.00   | 50.00   |
| Lump sum, furn. and install. one radial gate hoist at Sta. 3480+43 .....         | \$1,100 | \$2,055 | \$2,000 | \$3,100 | \$2,600 | \$2,500 |

(Continued on next page)

Continued on page 106

# NEVER BEFORE SO MUCH

# Value



These 5 reasons are only a few of the many reasons why the Lorain-50 is your best bet in a 1-yard shovel-crane. Throughout the Lorain-50, there is more value, true "Balanced Quality" to give you fast, responsive, dependable performance in any kind of service. You will find more quality features in the "50" than in any other machine in the 1-yard class.

Be sure to obtain full facts on the "50" from your Thew-Lorain Distributor. Compare Lorain "Balanced Quality" in dollar value before you buy.

**THE THEW SHOVEL CO.  
LORAIN, OHIO**

## AIR CONTROLS

Air does the work on the "50". Air assist controls hoist, crowd, retract operations—full air control for crawler steering and tread lock operation.

## CHOICE OF 4 CRAWLERS

Standard, extra-long, extra-wide, wide and long . . . you can fit the "50" with a crawler to match exactly any ground, or working condition.

## HYDRAULIC COUPLING

No shocks, no engine stall with Lorain Hydraulic (fluid) Coupling. It's the only 1-yd. machine with Hydraulic Coupling as standard.

## 5 INTERCHANGEABLE FRONT ENDS

For complete job versatility, any one of 5 interchangeable front ends can be used on the Lorain-50 . . . shovel, crane, clamshell, dragline and hoe.

## CENTER DRIVE CONSTRUCTION

Here's direct power—where you want it. Gang-up full engine power in any one operation, or spread power over simultaneous, synchronized operations.

**ASK ABOUT THE  
THEW  
LORAIN**

**ANDREWS EQUIPMENT SERVICE  
OF WASHINGTON, INC.**

*Spokane, Wash.*

**CATE EQUIPMENT CO.**

*Salt Lake City 4, Utah*

**CENTRAL MACHINERY CO.**

*Great Falls, Havre and Lewistown, Mont.*

**COAST EQUIPMENT CO.**

*San Francisco 3, California*

**J. D. COGGINS CO.**

*1717 No. 2nd, Albuquerque, New Mexico*

**A. H. COX & COMPANY**

*Seattle 4, Tacoma & Wenatchee, Wash.*

**P. L. CROOKS & CO., INC.**

*Portland 10, Ore.*

**GENERAL EQUIPMENT CO.**

*Reno, Nevada*

**LE ROI-RIX MACHINERY CO.**

*Los Angeles 22. Branches: Bakersfield, Long Beach 6, Calif.*

**MCCOY COMPANY**

*Denver 17, Colo. Branches: Sterling, Alamosa & Grand Junction, Colo.*

**MOUNTAIN TRACTOR CO.**

*Missoula and Kalispell, Mont.*

**LEE REDMAN EQUIPMENT CO.**

*Phoenix, Arizona*

**SOUTHERN IDAHO EQUIPMENT CO.**

*Idaho Falls, Boise and Twin Falls, Idaho*

**TRACTOR & EQUIPMENT CO.**

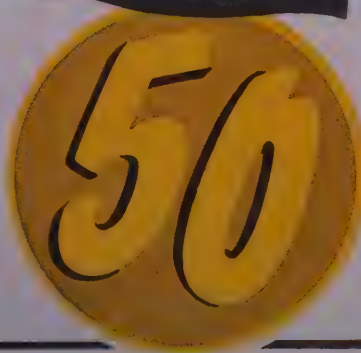
*Sidney, Mont. Branches: Miles City, Glasgow, Mont.*

**WORTHAM MACHINERY CO.**

*Chayenne, Wyo. Branches: Casper and Rock Springs, Wyo.*

**YUKON EQUIPMENT CO. (for Alaska)**

*Seattle, Wash. Branches at Fairbanks and Anchorage, Alaska*



TRINITY RIVER

Continued from page 104

Power Plant on Clear Creek. The tunnel would be 14 ft., 7 in. in diameter to carry a flow of 1,700 cfs.

**Tower House Power Plant and Switchyard**, \$9,270,000, on Clear Creek, with a capacity of 66,000 kw.

**Tower House Diversion Dam and Reservoir**, \$1,214,000, on Clear Creek, serving as afterbay for the Tower House Power Plant and forebay to divert water into Matheson Tunnel. It would be 48 ft. high and 810 ft. in length.

**Matheson Tunnel**, \$29,705,000, diverting from the Tower House Diversion Dam. This tunnel, with the same size and capacity as the Tower House Tunnel, would be 8.7 mi. long.

**Matheson Power Plant and Switchyard**, \$8,600,000, with a capacity of 75,000 kw., located on the western shore of Keswick Reservoir, on the Sacramento River.

Other features of the program will result in a total estimated project cost of \$207,334,000. Except for a small sum required for fishery preservation, all of that amount will be repaid to the Government from power and water revenues in accordance with the Federal reclamation laws.

According to the report, there is immediate need for supplementary sources of irrigation water supply for the Central Valley and increased electric generating capacity for northern California, since the Central Valley Project as now authorized will only partly satisfy the irrigation and power needs of the Central Valley Basin. The increasing population of the state, with an addition of over three and one-half million people since 1940 and the estimated increased irrigated plantings of 550,000 acres during the past 2½ years have placed a severe strain upon existing supplies of water and power. In the Sacramento Valley alone, over 1,500,000 acre-feet more water was diverted from the Sacramento River and its tributaries in 1950 than in 1938 when Central Valley Project construction was started. These developments have re-emphasized the fact that future growth is dependent upon the development of additional water and power resources.

Pointing out that more than one million acre-feet of water from the upper Trinity River Basin on the average is wasted annually into the Pacific Ocean, the Bureau project report shows that present and future water needs of the Trinity River area will not be impaired by the proposed diversion. The most practicable immediate source of supply appears to be the Trinity River, a stream in which a known surplus exists. The plan of operation recommended in this report is based on the premise that only water which is clearly surplus to all present and future needs of the basin should be transferred to another place of use.

Equally important, the surplus can be developed at an elevation high enough

Continued on page 108

UNIT BID PRICES . . . CONTINUED

|                                                              | (1)     | (2)     | (3)     | (4)     | (5)     | (6)     |
|--------------------------------------------------------------|---------|---------|---------|---------|---------|---------|
| 8,900 lb. furn. and install. metal slide gates.....          | .44     | .77     | .80     | .55     | 1.60    | .90     |
| 2,300 lb. furn. and install. misc. metalwork.....            | .35     | .68     | .80     | .66     | .80     | .70     |
| Lump sum, furn. and install. elect. sys. for control struct. | \$1,700 | \$1,300 | \$5,000 | \$1,000 | \$1,500 | \$1,000 |

Bridge and Grade Separation

Concrete and steel overhead structure in Utah

Utah—Summit County—State. Hilton & Carr Construction Co., Ogden, submitted the low bid of \$334,611 to the State Road Commission for construction of a concrete and steel overhead structure and approaches at Echo Canyon. Unit prices were as follows:

|                                        |           |                              |           |
|----------------------------------------|-----------|------------------------------|-----------|
| (1) Hilton & Carr Construction Co..... | \$334,611 | (4) Gibbons & Reed Co.....   | \$421,636 |
| (2) Young & Smith Construction Co..... | \$343,211 | (5) Engineers' estimate..... | \$385,032 |
| (3) Paulsen Construction Co.....       | 368,282   |                              |           |

|                                                                         | (1)     | (2)     | (3)     | (4)     | (5)     |
|-------------------------------------------------------------------------|---------|---------|---------|---------|---------|
| 7,000 gal. bituminous matl., Type SC-3.....                             | .17     | .20     | .19     | .13     | .15     |
| 1,700 cu. yd. cr. rk. or cr. grav. surf. crse. (from State skipl.)..... | .75     | 1.00    | 2.20    | 1.45    | .50     |
| 0.399 mi. scarifying and mixing.....                                    | \$1,800 | \$1,000 | \$1,650 | \$1,000 | \$1,000 |
| 38,000 cu. yd. unclassified excav.....                                  | .40     | 1.00    | 1.00    | .35     | .50     |
| 239,000 sta. yd. overhaul, Class "A".....                               | .03     | .02     | .016    | .01     | .015    |
| 7,000 yd. mi. overhaul, Class "B".....                                  | .15     | .20     | .165    | .20     | .15     |
| 700 1,000 gal. watering.....                                            | 3.00    | 1.50    | 2.20    | 2.00    | 1.50    |
| 500 hr. rolling.....                                                    | 10.00   | 7.00    | 10.50   | 7.00    | 5.00    |
| 3,540 cu. yd. channel excav.....                                        | .75     | 1.00    | .49     | .60     | .50     |
| 540 cu. yd. excav. for struct.....                                      | 3.00    | 4.00    | 2.20    | 10.00   | 4.00    |
| 124 lin. ft. 18-in. C.G.M. pipe.....                                    | 3.40    | 4.00    | 3.35    | 3.70    | 3.00    |
| 437 cu. yd. conc., Class "A".....                                       | 50.00   | 60.00   | 52.00   | 47.00   | 60.00   |
| 28,200 lb. reinf. steel (mesh).....                                     | .13     | .20     | .14     | .14     | .14     |
| Lump sum, furn. water equip.....                                        | 500.00  | \$1,000 | 850.00  | 500.00  | 500.00  |
| Lump sum, furn. constr. signs.....                                      | 300.00  | \$1,000 | 300.00  | 700.00  | 500.00  |

(1) Concrete and Steel Overhead Structure

|                                          |         |         |         |         |         |
|------------------------------------------|---------|---------|---------|---------|---------|
| 1,700 cu. yd. excav. for structures..... | 2.00    | 4.00    | 2.20    | 12.00   | 4.00    |
| 1,213 cu. yd. conc., Class "A".....      | 71.00   | 65.00   | 54.50   | 95.00   | 65.00   |
| 131,700 lb. reinf. steel.....            | .15     | .13     | .1125   | .14     | .14     |
| 826,000 structural steel.....            | .155    | .15     | .19     | .21     | .22     |
| 7,650 lin. ft. piles treated.....        | 2.25    | 2.40    | 2.80    | 2.60    | 2.50    |
| 875 lin. ft. steel handrail.....         | 15.00   | 5.00    | 12.00   | 13.00   | 15.00   |
| 105 lin. ft. test piles.....             | 10.00   | 5.00    | 20.00   | 21.00   | 5.00    |
| 1 ea. furn. pile driving equip.....      | \$1,200 | \$1,000 | \$6,000 | \$1,200 | \$1,500 |

Grade separation structure on Bayshore Freeway

California—San Francisco County—State. Guy F. Atkinson Co., San Francisco, submitted the low bid of \$2,986,961 to the Division of Highways for construction of a portion of a bridge and miscellaneous work on Bayshore Freeway, between 16th St. and 7th St. in San Francisco. Unit prices were as follows:

|                                                  |             |                                                                    |             |
|--------------------------------------------------|-------------|--------------------------------------------------------------------|-------------|
| (1) Guy F. Atkinson Co.....                      | \$2,986,961 | (5) Bates & Rogers Construction Corp.....                          | \$3,147,273 |
| (2) Peter Kiewit Sons' Co.....                   | 2,993,237   | (6) Stolte, Inc. and The Duncanson-Harrelson Co.....               | 3,117,205   |
| (3) Charles MacClosky Co. and Eaton & Smith..... | 3,076,555   | — Fredrickson & Watson Construction Co. and M & K Corporation..... | 3,168,143   |
| (4) Charles L. Harney, Inc.....                  | 3,083,537   |                                                                    |             |

|                                                                   | (1)       | (2)      | (3)      | (4)      | (5)      | (6)     |
|-------------------------------------------------------------------|-----------|----------|----------|----------|----------|---------|
| Lump sum, remov. conc.....                                        | \$20,000  | \$18,000 | \$10,000 | \$31,000 | \$35,000 | \$8,925 |
| 1,334 cu. yd. remov. conc.....                                    | 4.45      | 4.00     | 4.00     | 3.80     | 6.00     | 4.00    |
| 10 ea. remov. timber boxes.....                                   | \$25.00   | 20.00    | 50.00    | 60.00    | 30.00    | 29.00   |
| Lump sum, clear. and grub.....                                    | \$150,000 | \$18,000 | \$3,000  | \$15,000 | \$20,000 | \$2,100 |
| 27,000 cu. yd. rdwy. excav.....                                   | .84       | 1.00     | .71      | 1.00     | 1.00     | .63     |
| 5,860 cu. yd. struct. excav. (bridge).....                        | 3.40      | 1.80     | 4.00     | 3.90     | 5.50     | 3.70    |
| 3,130 cu. yd. struct. backfill (bridge).....                      | 3.50      | 2.50     | 3.00     | 2.60     | 3.50     | 4.00    |
| 1,575 cu. yd. struct. excav.....                                  | 4.10      | 2.75     | 6.80     | 2.80     | 6.00     | 5.25    |
| 63 cu. yd. ditch and channel excav.....                           | 3.75      | 2.00     | 3.90     | 3.30     | 6.00     | 3.15    |
| 39,000 sta. yd. overhaul.....                                     | .02       | .01      | .022     | .02      | .02      | .01     |
| 7,760 ton I.B.M.....                                              | 2.75      | 3.10     | 2.20     | 1.20     | 2.60     | 2.85    |
| 129 ton sand backfill.....                                        | 4.50      | 4.00     | 5.15     | 1.90     | 4.00     | 3.15    |
| Lump sum, dev. wat. sup. and furn. wat. equip.....                | \$2,000   | \$1,630  | \$22,500 | \$10,000 | \$8,000  | \$4,725 |
| 1,530 M. gal. applying water.....                                 | 2.25      | 2.80     | 2.45     | 1.00     | 2.00     | 2.85    |
| Lump sum, finishing rdwy.....                                     | \$4,000   | \$1,120  | \$4,000  | \$1,400  | \$5,000  | \$7,980 |
| 673 bbl. portland cement (cem. tr. base).....                     | 4.10      | 3.40     | 4.65     | 3.90     | 5.00     | 5.25    |
| 4,830 sq. yd. mix. and compact. (cem. tr. base).....              | .64       | .75      | .68      | 1.10     | .80      | .40     |
| 8 ton asph. emul. (curing sl., pt. bdr. and sl. ct.).....         | 65.00     | 70.00    | 80.00    | 50.00    | 50.00    | 50.00   |
| 1 ton liq. asph. SC-1 (pr. ct.).....                              | 100.00    | 90.00    | 105.00   | 70.00    | 70.00    | 61.00   |
| 65 ton paving asph. (P.M.S.).....                                 | 9.00      | 7.00     | 23.50    | 23.00    | 25.00    | 8.00    |
| 1,283 ton min. aggr. (P.M.S.).....                                | 9.00      | 7.00     | 6.70     | 5.20     | 7.00     | 7.30    |
| 135 cu. yd. Cl. "B" P.C.C. (parking strip and trench paving)..... | 24.00     | 27.00    | 47.00    | 22.00    | 26.00    | 20.50   |
| 2.5 M.f.b.m. Douglas fir timber.....                              | 270.00    | 180.00   | 500.00   | 220.00   | 300.00   | 265.00  |
| 9,769 cu. yd. Class "A" P.C.C. (struct.).....                     | 56.00     | 44.25    | 54.00    | 53.50    | 48.00    | 62.00   |
| 1,170 lin. ft. rubber waterstops.....                             | 3.25      | 2.75     | 4.00     | 2.60     | 3.50     | 5.25    |
| 12,200,000 lbs. struct. steel.....                                | .131      | .14      | .136     | .136     | .143     | .143    |
| Lump sum, clean and paint struct. steel.....                      | 155,000   | 148,100  | 158,000  | 195,000  | 150,000  | 68,810  |
| 47,930 lin. ft. furn. piling (Type A).....                        | 1.70      | 1.43     | 1.60     | 1.65     | 1.80     | 1.65    |
| 1,110 ea. driving piles (Type A).....                             | 30.00     | 40.00    | 50.00    | 30.00    | 30.00    | 37.00   |
| 22,510 lin. ft. furn. piling (Type B).....                        | 2.75      | 2.65     | 3.00     | 3.00     | 3.00     | 3.00    |
| 194 ea. driving piles (Type B).....                               | 90.00     | 107.00   | 120.00   | 95.00    | 80.00    | 120.00  |
| 10,620 lin. ft. furn. piling (Type C).....                        | 3.25      | 3.30     | 3.25     | 3.00     | 3.00     | 3.00    |
| 358 ea. driving piles (Type C).....                               | 40.00     | 42.50    | 50.00    | 40.00    | 40.00    | 40.00   |
| 447 cu. yd. Class "B" P.C.C. (curbs, gutters and sidewalks).....  | 35.00     | 40.00    | 37.10    | 32.00    | 40.00    | 42.00   |
| 220 ea. curb dowels.....                                          | 1.15      | 1.00     | .67      | .70      | .50      | .75     |
| 16 ea. guide posts.....                                           | 7.50      | 8.00     | 8.30     | 6.60     | 6.00     | 13.00   |
| 2 ea. horizontal reflector units.....                             | 10.50     | 15.00    | 12.20    | 16.50    | 15.00    | 16.00   |
| 892 lin. ft. 12-in. R.C.P. (std. str.).....                       | 2.50      | 4.25     | 2.95     | 2.00     | 3.00     | 2.85    |
| 352 lin. ft. 12-in. R.C.P. (3,000-D).....                         | 2.65      | 4.50     | 3.40     | 2.00     | 4.00     | 2.70    |
| 535 lin. ft. 10-in. vitrified clay pipe.....                      | 2.45      | 3.50     | 2.80     | 1.50     | 4.00     | 3.00    |
| 50 lin. ft. 12-in. vitrified clay pipe.....                       | 2.80      | 4.00     | 4.00     | 2.00     | 5.00     | 4.25    |
| 1,342,700 lb. bar reinf. steel.....                               | .10       | .094     | .09      | .09      | .09      | .086    |
| 85,700 lb. misc. iron and steel.....                              | .45       | .38      | .35      | .33      | .30      | .75     |

(Continued on next page)

# Here's the NEW *Thor* Clay Digger

**Field-Tested  
THREE  
YEARS!**

**30%  
More Power!**

- Inside Trigger or Outside Trigger!
- Closed Retainer or Latch Retainer!
- Choice of **FIVE** Chucks:



3/4" Square  
x 2 3/4"



3/4" Hex.  
x 2 3/4"



7/8" Hex.  
x 2 3/4"



7/8" Hex.  
x 3 1/4"



.882 Hex. and  
1.027 Round  
x 3 1/4"

Yes, Thor FIELD TESTED the new No. 16 for three years before putting it into production. And when Thor engineers found the demands of tunnel contractors in various territories conflicted—Thor incorporated all the demands in one tool giving the user option of INSIDE OR OUTSIDE TRIGGER, CLOSED OR LATCH RETAINER, choice of any of FIVE CHUCKS with only one part changel . . . YOU NAME IT!—THE NO. 16 HAS IT!

Write for Data Sheet No. JE-1394  
INDEPENDENT PNEUMATIC TOOL CO.  
Aurora, Illinois  
Branches in Principal Cities



TRINITY RIVER

... Continued from page 106

to be conveyed into the Central Valley through power plants which will assist the project financially and insure that water conveyance costs can be met by reasonable payments from water users. At the same time, through this conversion of water to power, energy will be available to help meet the needs of the local service area in Trinity and neighboring counties and the growing northern California power market. The project, if constructed immediately, would be available to assist in supplying water and power to meet present and prospective defense needs.

Annual benefits from the Trinity River Division Project are evaluated in the report at \$35,364,500 which, with annual equivalent cost of \$11,509,000, result in a benefit-cost ratio of 3.07 to one.

FPC reports on fuel use in electricity production

A REPORT on "Consumption of Fuel for Production of Electric Energy" for 1950 has been issued by the Federal Power Commission.

The report presents information on the amount of coal, gas and oil consumed in 1950 by the electric utility generating plants in the production of electric energy, and contains related data on the kilowatt-hour production from each fuel. The information contained in the publication is based on individual generating plant monthly reports solicited from all electric utilities in the United States, including both the privately-owned and publicly-owned operations.

The report is for sale by the Publications Division, Federal Power Commission, Washington 25, D. C., at 25 cents per copy. The order number is FPC S-92.

Invention might convert sea water inexpensively

A HUNDRED different ways to convert sea water into fresh water have been conceived and promoted during the last few years. There's no doubt that discovery of a cheap method could be the long range solution to the water problems of the West. But the stumbling block has always been—the method has to be economical.

Now, a 79-year old inventor, Claude Inman of Redondo Beach, Calif., has proposed a plan that would be both simple and cheap. According to press reports, this is the plan.

Inman recalls that he used to sit along the beach and watch huge waves pound in against a breakwater and think what an amount of power was going to waste. He says he designed a hundred machines that would harness this power, but all were too complex and costly.

Then, on a recent engineering job in the Sandwich Islands, he happened upon

UNIT BID PRICES... CONTINUED

|                                                                                                   | (1)      | (2)      | (3)      | (4)      | (5)      | (6)      |
|---------------------------------------------------------------------------------------------------|----------|----------|----------|----------|----------|----------|
| 11,157 lin. ft. pipe railing .....                                                                | 6.50     | 6.00     | 5.60     | 6.00     | 6.00     | 5.75     |
| Lump sum, sign frames on bridge .....                                                             | \$4,500  | \$7,800  | \$4,000  | \$6,000  | \$5,000  | \$6,140  |
| 5,000 lin. ft. chain link fence .....                                                             | 2.65     | 2.70     | 2.55     | 2.40     | 2.60     | 2.60     |
| 18 ea. gates .....                                                                                | 120.00   | 100.00   | 125.00   | 123.00   | 100.00   | 100.00   |
| 176 lin. ft. placing saliv. granite curb .....                                                    | 1.75     | 1.50     | 1.70     | 1.20     | 2.50     | 1.80     |
| 6 ea. cast iron water traps .....                                                                 | 37.50    | 25.00    | 40.00    | 40.00    | 30.00    | 47.00    |
| 5 ea. adj. manholes to grade .....                                                                | 50.00    | 50.00    | 47.00    | 50.00    | 60.00    | 52.00    |
| 14 ea. saliv. manholes frames and covers and catch basin frames and grates .....                  | 20.00    | 20.00    | 35.00    | 25.00    | 25.00    | 19.00    |
| 6 ea. reset saliv. catch basin frames and grates .....                                            | 30.00    | 15.00    | 41.00    | 25.00    | 30.00    | 42.00    |
| 3 ea. yellow reflectors .....                                                                     | 4.50     | 5.00     | 4.20     | 7.00     | 15.00    | 6.00     |
| Lump sum, highway and street lighting .....                                                       | \$11,500 | \$11,500 | \$10,000 | \$11,000 | \$11,000 | \$11,865 |
| Lump sum, electrical work on struct. ....                                                         | \$22,500 | \$22,500 | \$20,000 | \$21,000 | \$20,000 | \$20,339 |
| Lump sum, demolishing reinf. conc. and brick bldg. ....                                           | \$5,000  | ???      | \$6,500  | \$10,000 | \$3,000  | \$2,960  |
| Lump sum, saliv. and reinstal. saliv. high pressure hydrant (auxiliary water supply system) ..... | \$2,750  | \$5,000  | \$3,470  | \$4,000  | \$4,000  | \$4,460  |

Steel superstructure for Columbia River Bridge at Pasco

Washington—Franklin and Benton Counties—State. U. S. Steel Co., (American Bridge Division), Pittsburgh, Penn., received a contract from the State Highway Department for the superstructure for the Columbia River Bridge at Pasco. Unit prices were as follows:

|                                                      |             |                                              |             |          |          |
|------------------------------------------------------|-------------|----------------------------------------------|-------------|----------|----------|
| (1) U. S. Steel Co. (American Bridge Division) ..... | \$3,073,376 | (3) Allied Structural Steel Cos. ....        | \$3,220,607 |          |          |
| (2) Peter Kiewit Sons' Co. ....                      | 3,118,170   | (4) Judson Pacific-Murphy Corp. ....         | 3,224,430   |          |          |
|                                                      |             | (5) Bethlehem Pacific Coast Steel Corp. .... | 3,288,441   |          |          |
|                                                      | (1)         | (2)                                          | (3)         | (4)      | (5)      |
| 3,500 cu. yd. concrete, Class A .....                | 92.00       | 85.00                                        | 97.00       | 80.00    | 95.00    |
| 865,000 lb. steel reinforcing bars .....             | .14         | .10                                          | .15         | .14      | .15      |
| 4,273,000 lb. structural carbon steel .....          | .252        | .27                                          | .265        | .29      | .275     |
| 5,192,000 lb. structural low alloy steel .....       | .28         | .285                                         | .29         | .29      | .298     |
| 127,000 lb. cast steel .....                         | .48         | .50                                          | .60         | .40      | .55      |
| 54 only bridge drains complete .....                 | 75.00       | 65.00                                        | 100.00      | 70.00    | 90.00    |
| 490 lin. ft. downspouts .....                        | 9.00        | 7.00                                         | 8.00        | 5.00     | 11.00    |
| 575 lb. copper seals .....                           | 2.00        | 4.00                                         | 5.00        | 6.00     | 4.00     |
| Lump sum, lighting system complete .....             | \$29,150    | \$28,000                                     | \$25,000    | \$18,000 | \$21,500 |

Steel superstructure for American River bridge

California—Sacramento County—State. B. J. Ukropina, T. P. Polich and Steve Kral, Baldwin Park, submitted the low bid of \$1,003,903 to the Division of Highways for constructing the superstructure for a bridge across American River, near Elvas, about 1 mi. northeast of Sacramento. Unit prices were as follows:

|                                                       |             |                                    |             |           |           |           |
|-------------------------------------------------------|-------------|------------------------------------|-------------|-----------|-----------|-----------|
| (1) B. J. Ukropina, T. P. Polich and Steve Kral ..... | \$1,003,903 | (6) Charles L. Harney, Inc. ....   | \$1,071,338 |           |           |           |
| (2) Bates & Rogers Construction Corp. ....            | 1,026,825   | Granite Construction Co. ....      | 1,072,645   |           |           |           |
| (3) George Pollack Co. ....                           | 1,053,374   | John C. Gist .....                 | 1,091,355   |           |           |           |
| (4) Lord & Bishop .....                               | 1,054,655   | Rothschild, Raffin & Weirick ..... | 1,106,222   |           |           |           |
| (5) Carl N. Swenson Co., Inc. ....                    | 1,058,185   | A. Teichert & Son, Inc. ....       | 1,108,760   |           |           |           |
|                                                       |             |                                    |             |           |           |           |
| 4,400 cu. yd. Class "A" P.C.C. ....                   | 44.00       | (1) 60.00                          | (3) 56.50   | (4) 51.00 | (5) 57.00 | (6) 58.00 |
| 4,235,000 lb. structural steel .....                  | 1534        | .14                                | .145        | .155      | .1425     | .15       |
| Lump sum, cleaning and painting structural steel....  | \$45,000    | \$48,360                           | \$60,000    | \$50,000  | \$59,193  | \$54,000  |
| 13,000 lb. misc. iron and steel .....                 | .45         | .70                                | .50         | .35       | .75       | .13       |
| 7,546 lin. ft. steel railing .....                    | 6.95        | 7.10                               | 8.25        | 7.50      | 8.25      | 8.00      |
| 617,000 lb. bar reinf. steel .....                    | .08         | .0814                              | .085        | .0862     | .10       | .09       |
| Lump sum, lighting equip. ....                        | \$8,000     | \$8,665                            | \$9,500     | \$9,000   | \$11,000  | \$9,300   |

Streets and Highways

Grading and asphaltic concrete paving

Washington—King County—State. Western Asphalt Co., Seattle, received a contract from the Department of Highways for construction of a portion of highway on Primary State Highway No. 2 from Issaquah to North Bend, et al. Unit prices were as follows:

|                                                                 |           |                                  |           |          |          |          |
|-----------------------------------------------------------------|-----------|----------------------------------|-----------|----------|----------|----------|
| (1) Western Asphalt Co. ....                                    | \$306,472 | (4) Pieter Construction Co. .... | \$345,058 |          |          |          |
| (2) Asphalt Paving & Engineering Co. ....                       | 321,736   | (5) Lige Dickson Co. ....        | 366,343   |          |          |          |
| (3) J. D. Shotwell Co. ....                                     | 337,034   | (6) Peter Kiewit Sons' Co. ....  | 377,810   |          |          |          |
|                                                                 | (1)       | (2)                              | (3)       | (4)      | (5)      | (6)      |
| Lump sum, clearing and grubbing .....                           | \$12,000  | \$12,500                         | \$6,000   | \$18,000 | \$15,000 | \$20,000 |
| 24,660 cu. yd. common excav., incl. haul .....                  | .70       | .65                              | .50       | .80      | .60      | 1.00     |
| 490 cu. yd. excav., unsuit. matl., incl. haul .....             | 1.00      | 1.00                             | 1.50      | 1.00     | 1.00     | 2.00     |
| 10 cu. yd. com. trench excav., incl. haul .....                 | 5.00      | 5.00                             | 10.00     | 2.00     | 2.00     | 5.00     |
| 6,410 cu. yd. stripping borrow and surf. pits, incl. haul. .... | .10       | .30                              | .50       | .44      | .50      | .35      |
| 60 cu. yd. struct. excav. ....                                  | 3.00      | 3.00                             | 5.00      | 2.50     | 5.00     | 6.00     |
| 19 day smooth wheeled power roller .....                        | 60.00     | 65.00                            | 60.00     | 50.00    | 60.00    | 70.00    |
| 19 day pneumatic tired roller .....                             | 60.00     | 65.00                            | 60.00     | 50.00    | 60.00    | 60.00    |
| 3,250 lin. ft. slope treatment, Class "A" .....                 | .10       | .10                              | .15       | .14      | .12      | .20      |
| 51,824 lin. ft. reconstr. roadway ditches .....                 | .10       | .10                              | .25       | .15      | .20      | .35      |
| 596.6 sta. (100-ft.) finishing roadway .....                    | 5.00      | 5.00                             | 7.50      | 12.00    | 12.00    | 15.00    |
| 630 M. gal. water .....                                         | 3.00      | 2.00                             | 3.00      | 2.50     | 3.00     | 2.50     |
| 14,150 ton selected roadway borrow .....                        | .75       | .75                              | 1.00      | .75      | .70      | 1.00     |
| 29,860 ton cr. stone surf. top course .....                     | 1.60      | 1.90                             | 1.65      | 1.70     | 1.50     | 1.60     |
| 7,000 ton cr. stone surf. top course, in stkpl. ....            | 1.20      | 1.20                             | 1.80      | 1.00     | .90      | 1.00     |

MINERAL AGGREGATE FOR NON-SKID SEAL TREATMENT SCHEDULE A IN STOCKPILE

|                                                                   |      |      |      |      |      |      |
|-------------------------------------------------------------------|------|------|------|------|------|------|
| 4,000 ton coarse cr. screenings 1/2-in. to 3/4-in. in stkpl. .... | 1.20 | 2.00 | 2.25 | 1.00 | 2.00 | 1.25 |
| 2,000 ton fine cr. screenings 3/4-in. to 0-in. in stkpl. ....     | 1.20 | 2.00 | 2.25 | 1.00 | 2.00 | 1.25 |

TYPE I-1 ASPHALTIC CONCRETE PAVEMENT

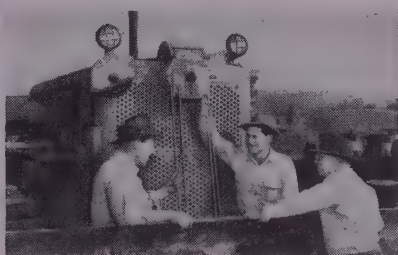
|                                                |        |        |        |        |        |        |
|------------------------------------------------|--------|--------|--------|--------|--------|--------|
| 10,730 ton Class "C" wearing course .....      | 5.30   | 5.30   | 5.85   | 5.94   | 6.80   | 6.30   |
| 20,320 ton Class "L" leveling course .....     | 5.30   | 5.30   | 5.75   | 5.94   | 6.80   | 6.00   |
| 11.16 mi. preparation of untr. roadway .....   | 200.00 | 200.00 | 150.00 | 250.00 | 200.00 | 250.00 |
| 1,696 cu. yd. new fine mineral aggregate ..... | 2.25   | 3.50   | 1.75   | 3.00   | 2.30   | 3.50   |
| 160.4 ton asphalt cement MC-3 prime coat ..... | 36.45  | 38.00  | 40.00  | 45.00  | 43.00  | 42.00  |

(Continued on next page)

Continued on page 112



Even wear-rate of a Tiger Brand line on one of the cranes at left, is pointed out to Mr. Furgeson by Master Mechanic Bob Rice, who says: "We've used Tiger Brand Wire Rope almost exclusively on this job. By giving us uniformly long life, it has cut replacement costs and reduced down-time expense on our equipment."



Free services of a Tiger Brand Representative have been available to Winston Bros. Company during construction of the \$3 million left embankment and gate structure of the Whittier Narrows Dam, on California's San Gabriel River. By using the correct rope for each job, the company has secured better results.

"We've gotten long life from our Tiger Brand lines here at the Whittier Narrows Dam project," says B. H. Furgeson, above, grade foreman for Winston Bros. Company, Monrovia, Calif. "Despite strong water suction and heavy loads of wet sand, we've had to replace far fewer lines than usual!"

## Winston Bros. cuts building costs with Tiger Brand Wire Rope!



For any construction job you handle, rely on tough American Tiger Brand, the wire rope that's rigidly controlled by United States Steel from raw ore to finished product. To get all the stamina engineered into it, you're welcome to the services of a Field Specialist. Contact your local distributor or write Columbia-Geneva Steel, Room 1422, Russ Building, San Francisco 6.



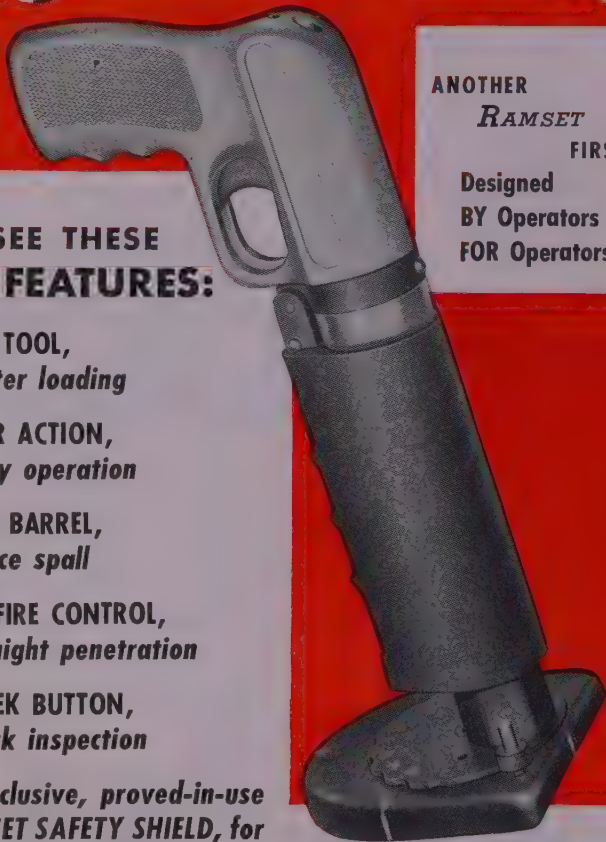
## U·S·S TIGER BRAND Wire Rope

Columbia-Geneva Steel Division, United States Steel Company, San Francisco

UNITED STATES STEEL

**NEW** smoothness... **NEW** efficiency  
in powder-actuated fastening...

# Ramset JOBMASTER



**ANOTHER  
RAMSET  
FIRST**  
**Designed  
BY Operators  
FOR Operators**

## SEE THESE NEW FEATURES:

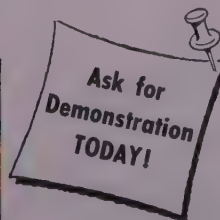
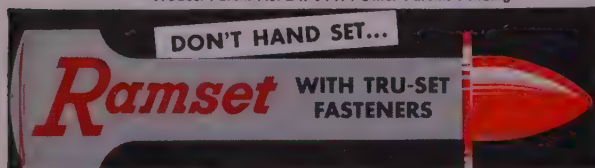
- **1-PIECE TOOL,**  
*for faster loading*
- **TRIGGER ACTION,**  
*for easy operation*
- **PORTED BARREL,**  
*to reduce spall*
- **ANGLE-FIRE CONTROL,**  
*for straight penetration*
- **VISI-CHEK BUTTON,**  
*for quick inspection*
- **Plus exclusive, proved-in-use  
ROTO-SET SAFETY SHIELD, for  
accurate positioning**

Faster, lighter, easier handled, the new RAMSET JOBMASTER sets a record pace for steel and concrete fastenings. Properly trained workmen quickly become skilled operators because of smooth, simple, natural motions of loading, placing, firing. Positive controls bring improved accuracy and efficiency . . . and still lower fastening costs. Ask your dealer for demonstration of how RAMSET's years of pioneering have made the new JOBMASTER the proved-in-performance leader.

**Ramset Fasteners, Inc.**

12117 BEREA ROAD • CLEVELAND 11, OHIO

Product Patent No. 2470117. Other Patents Pending.



**WASHO**

... Continued from page 61

Bond issues for highways in the West have largely been avoided because of the experience of some states early in highway construction history and the feeling a pay-as-you-go method was in the public interest. Toll roads were simply not to be tolerated—possibly as a carry-over of the campaign in the late twentieth century to make all roads free to all users.

Some states have found it necessary to utilize other sources for funds for capital expansion and in recent years have issued bonds to provide the money for a more rapid elimination of deficiencies in their highway system. Under this credit method of financing highway improvements, the motor vehicle operator gets to ride on the new highway while he pays for it. He doesn't have to pay his money and wait for a number of years to realize the benefits.

If current revenues are sufficient to pay full depreciation charges plus maintenance and administration of the highway plant and interest on outstanding bonds, there is little danger of default in payment of interest or principal. Since the early period of highway financing, revenues from highway user fees have increased year by year with only minor setbacks and there is no indication revenues for state highways will not continue to increase. If present funds are adequate to support bond issues then there is every reason to believe they will be in the future.

I should like to point out that all our states should be concerned with the equitability of the highway user fee schedules. One of the messages we should take to our customers should be the necessity, from an economic and social point of view, that highway user fees be adjusted so that each class of user pays its proper share for highways. All of us here hope for the day when sufficient knowledge will have been accumulated to determine the extra highway costs brought about by the need for providing for the heavier vehicles. When these incremental costs are known, much of the controversy will have been quieted and certain agreements can be reached. However, until that knowledge is available we must follow the practice of adjusting fees on a logical basis free from legislative bickering and public misunderstandings.

We as highway officials must remember that we are in the business of providing highway services for the motoring public and if the public wants toll roads and demonstrates the demands for such roads by paying special fees for their use, we must satisfy their wishes and built a toll road. In the current transportation crisis we must use all the means possible to modernize our roads. Traditional methods of course have their place, but bonds and tolls have theirs also.

It isn't our job, as highway officials to protect the traditions of the past, it is our job to serve the motoring public.

# UNIT BID PRICES CONTINUED

## OTHER ITEMS

|                                                             |        |        |        |        |        |        |
|-------------------------------------------------------------|--------|--------|--------|--------|--------|--------|
| 1,833 lin. ft. Type "A" precast white reflecting curb.....  | 2.30   | 2.10   | 2.20   | 2.00   | 2.65   | 2.25   |
| 220 lin. ft. Type "C" precast white reflecting curb.....    | 2.75   | 2.50   | 3.00   | 2.40   | 3.00   | 3.20   |
| 3 only illuminated terminal nosing Type No. 1.....          | 80.00  | 100.00 | 75.00  | 80.00  | 70.00  | 130.00 |
| 175 lin. ft. galvanized conduit pipe 1-in. diam.....        | 1.50   | .75    | 1.00   | 1.20   | .42    | 1.20   |
| 60 lin. ft. plain conc. culvert pipe 12-in. diam.....       | 1.90   | 2.50   | 2.00   | 2.50   | 2.00   | 2.10   |
| 48 lin. ft. stand. reinf. conc. culv. pipe 18-in. diam..... | 4.00   | 4.50   | 3.00   | 3.00   | 3.50   | 3.90   |
| 33 lin. ft. relaying conc. culv. pipe 12-in. diam.....      | 1.50   | 2.50   | 1.50   | 1.25   | 2.00   | .70    |
| 521.5 lin. ft. standard beam guard rail.....                | 3.50   | 3.00   | 3.50   | 3.25   | 3.00   | 3.00   |
| 10 only remov., reset, and repaint. conc. spot posts.....   | 8.00   | 5.00   | 5.00   | 10.00  | 7.00   | 10.00  |
| 27 only stand. monument cases and covers.....               | 50.00  | 35.00  | 42.50  | 40.00  | 40.00  | 50.00  |
| 23 cu. yd. hand placed riprap.....                          | 15.00  | 15.00  | 15.00  | 10.00  | 12.00  | 25.00  |
| 4,686 sq. yd. removing asph. conc. pavement.....            | .25    | .40    | .20    | .20    | .45    | .40    |
| 1,218 sq. yd. removing cement conc. pavement.....           | 1.00   | .75    | 1.00   | 1.00   | .95    | 1.25   |
| 240 lin. ft. removing timber guard rail.....                | .30    | .20    | 1.50   | 1.00   | .30    | 1.50   |
| Lump sum, removing railroad tracks and ties.....            | 500.00 | 250.00 | 300.00 | 100.00 | 300.00 | 250.00 |
| Force account, removing soft spots in roadway.....          | 500.00 | 500.00 | 500.00 | 500.00 | 500.00 | 500.00 |

## Plant-mix surfacing on crushed gravel base in Wyoming

Wyoming—Natrona County—State. J. H. - N. M. Monaghan & Assoc. Cos., Derby, Colo., received a contract from the State Highway Department for the low bid of \$242,352, for base course surfacing, plant-mix surface course and miscellaneous work on 10.9 mi. of the Midwest-Casper Rd. Unit prices were as follows:

|                                              |           |                                       |           |
|----------------------------------------------|-----------|---------------------------------------|-----------|
| (1) J. H. - N. M. Monaghan & Assoc. Cos..... | \$242,352 | (5) Summit Construction Co.....       | \$264,719 |
| (2) Taggart Construction Co.....             | 246,928   | — Peter Kiewit Sons' Co.....          | 265,345   |
| (3) Northwestern Engineering Co.....         | 250,116   | — Read Construction Co.....           | 266,581   |
| (4) Inland Construction Co.....              | 258,178   | — Western Paving Construction Co..... | 271,833   |
|                                              |           | (6) Engineers' estimate.....          | 241,384   |

|                                                         | (1)    | (2)     | (3)    | (4)    | (5)    | (6)    |
|---------------------------------------------------------|--------|---------|--------|--------|--------|--------|
| 47,100 ton crushed gravel base course (1-in. max.)..... | 1.10   | 1.32    | 1.22   | 1.26   | 1.26   | 1.25   |
| 15,600 ton plant mix surface course.....                | 4.00   | 4.30    | 4.00   | 3.50   | 4.70   | 3.40   |
| 1,200 ton sand.....                                     | 1.60   | 6.00    | 3.00   | 4.00   | 5.00   | 5.00   |
| 472,850 ton mi. haul of surfacing material.....         | .09    | .065    | .11    | .115   | .08    | .12    |
| 270 ton asphaltic material MC-prime.....                | 30.00  | 31.00   | 30.00  | 32.00  | 32.00  | 27.00  |
| 130 ton asphaltic material MC-seal.....                 | 35.00  | 33.80   | 31.00  | 37.00  | 32.00  | 28.00  |
| 1,010 ton asphaltic material AC (120-150).....          | 33.50  | 22.50   | 24.00  | 26.00  | 28.00  | 24.00  |
| 945 M. gal. watering (base).....                        | 2.00   | 4.00    | 2.50   | 2.00   | 2.75   | 2.00   |
| 505 hr. roller operation.....                           | 10.00  | 6.00    | 10.00  | 8.00   | 7.50   | 7.00   |
| 6,156 lin. ft. corr. metal port. snow fence.....        | 3.00   | 3.70    | 3.00   | 4.20   | 4.00   | 2.50   |
| 210 ea. reflectorized guide posts.....                  | 6.00   | 4.00    | 5.00   | 4.00   | 15.00  | 5.00   |
| 15 cu. yd. grouted riprap.....                          | 10.00  | 30.00   | 30.00  | 30.00  | 35.00  | 30.00  |
| 15 cu. yd. structure excavation.....                    | 5.00   | 3.00    | 10.00  | 5.00   | 5.00   | 3.00   |
| 30 hr. scraper operation.....                           | 15.00  | 18.00   | 18.00  | 17.00  | 15.00  | 15.00  |
| 1,125 ton cr. grav. surf. Type B (shoulder treat.)..... | 1.50   | 3.00    | 2.00   | 2.00   | 3.00   | 1.30   |
| 1 ea. prov. and maint. field test lab. bldg.....        | 500.00 | \$1,000 | 300.00 | 300.00 | 400.00 | 400.00 |
| 255 ton asphaltic material MC-shoulder treat.....       | 30.00  | 33.00   | 30.00  | 35.00  | 32.00  | 27.00  |

## Grading and select material surfacing in Utah

Utah—Emery, Wayne and Garfield Counties—State. Ross Construction Co., Provo, submitted the low bid of \$87,100 to the State Road Commission for 77 mi. of graded and select material surfacing between Green River and Henry Mountain. Unit prices were as follows:

|                                      |          |                                   |           |
|--------------------------------------|----------|-----------------------------------|-----------|
| (1) Ross Construction Co.....        | \$87,100 | (5) V. C. Mendenhall Co.....      | \$ 96,100 |
| (2) Germer, Abbott and Waldron.....  | 92,900   | (6) Reynolds Construction Co..... | 107,500   |
| (3) Thorn Construction Co., Inc..... | 95,100   | (6) Engineers' estimate.....      | 87,900    |

|                                                                  | (1)     | (2)     | (3)     | (4)     | (5)     | (6)    |
|------------------------------------------------------------------|---------|---------|---------|---------|---------|--------|
| 2,200 hr. motor grader.....                                      | 12.00   | 11.50   | 10.00   | 11.00   | 12.00   | 10.00  |
| 700 hr. 100 h.p. crawler tractor with angle dozer or ripper..... | 14.00   | 15.50   | 15.00   | 15.00   | 16.00   | 15.00  |
| 400 hr. crawler tractor with 12 cu. yd. scraper.....             | 15.00   | 15.50   | 15.00   | 18.00   | 18.00   | 15.00  |
| 200 hr. wheel tractor and 12 cu. yd. scraper.....                | 15.00   | 16.50   | 20.00   | 18.00   | 18.00   | 15.00  |
| 800 hr. 3/4 cu. yd. power shovel.....                            | 16.00   | 14.50   | 15.00   | 16.00   | 17.00   | 15.00  |
| 5,400 hr. 4 cu. yd. dump truck.....                              | 4.50    | 5.75    | 7.00    | 6.00    | 7.50    | 6.00   |
| 1 ea. turn. and maintain. transport, truck and trailer.....      | \$3,800 | \$3,500 | \$2,000 | \$4,000 | \$4,000 | 500.00 |
| 100 hr. transport truck and trailer.....                         | 10.00   | 11.00   | 10.00   | 14.00   | 10.00   | 15.00  |

## Plant-mix surfacing on cement-treated base

California—Siskiyou County—State. A. Teichert & Son, Inc., Sacramento, submitted the low bid of \$1,048,738 for grading and plant-mix surfacing on cement-treated base between Dunsuir and Big Canyon, about 4.3 mi. in length. Unit prices were as follows:

|                                                   |             |                                  |             |
|---------------------------------------------------|-------------|----------------------------------|-------------|
| (1) A. Teichert & Son, Inc.....                   | \$1,048,738 | (5) Ball & Simpson.....          | \$1,164,521 |
| (2) Fredrickson & Watson.....                     | 1,128,009   | (6) Granite Construction Co..... | 1,166,665   |
| (3) B. J. Ukropina, T. P. Polich, Steve Kral..... | 1,133,023   | — Peter Kiewit Sons' Co.....     | 1,239,901   |
| (4) H. Earl Parker, Inc. and Harms Bros.....      | 1,143,156   | — McNutt Brothers.....           | 1,359,736   |
|                                                   |             | — L. A. & R. S. Crow.....        | 1,437,692   |
|                                                   |             | — McCommon & Wunderlich Co.....  | 1,990,743   |

|                                                        | (1)     | (2)      | (3)     | (4)     | (5)      | (6)      |
|--------------------------------------------------------|---------|----------|---------|---------|----------|----------|
| Lump sum, remov. exist. bridge (Hedge Creek).....      | \$1,200 | \$3,800  | \$1,200 | \$3,500 | \$2,000  | \$4,000  |
| Lump sum, remov. conc.....                             | \$4,300 | \$33,296 | \$2,000 | \$5,200 | \$16,000 | \$20,570 |
| 2,000 cu. yd. remov. pavement.....                     | 8.50    | 2.00     | 3.00    | 5.50    | 3.00     | 4.00     |
| 90 acre clearing and grubbing.....                     | 650.00  | 800.00   | 660.00  | 630.00  | 600.00   | 725.00   |
| 628,000 sq. yd. roadway excav.....                     | .50     | .49      | .58     | .54     | .67      | .543     |
| 113,000 sq. yd. compact. orig. ground.....             | .05     | .05      | .05     | .055    | .04      | .045     |
| 9,000 cu. yd. struct. excav.....                       | 3.00    | 3.40     | 3.00    | 3.10    | 4.00     | 3.00     |
| 4,400 cu. yd. ditch and channel excav.....             | 2.20    | 2.10     | 2.00    | 1.38    | 1.50     | 1.80     |
| 17,500,000 sta. yd. overhaul.....                      | .003    | .0035    | .005    | .0055   | .003     | .004     |
| 2,600 cu. yd. imported topsoil.....                    | 2.00    | 1.85     | 1.80    | 1.60    | 2.30     | 1.55     |
| Lump sum, dev. wat. sup. and furn. wat. equip.....     | \$3,900 | \$18,000 | \$3,600 | \$8,000 | \$40,000 | \$29,500 |
| 18,600 M. gal. applying water.....                     | 1.30    | 1.70     | 1.50    | 1.35    | 1.45     | .55      |
| 227 sta. finishing roadway.....                        | 20.00   | 38.50    | 10.00   | 12.00   | 20.00    | 20.00    |
| 39,250 ton min. aggr. (cem. tr. base).....             | 2.27    | 2.00     | 1.92    | 2.40    | 1.29     | 2.60     |
| 7,000 bbl. portland cement (cem. tr. base).....        | 4.70    | 5.20     | 5.58    | 5.00    | 5.40     | 5.35     |
| 124,000 sq. yd. mix. and compact. (cem. tr. base)..... | .15     | .20      | .11     | .14     | .37      | .08      |
| 128 ton asph. emul. (curing sl. and pt. bdr.).....     | 60.00   | 50.00    | 48.00   | 50.00   | 56.00    | 58.00    |

(Continued on next page)



HERE'S ALL YOU NEED  
TO CUT, SPLICE AND  
INSTALL THIS  
**LABYRINTH  
WATERSTOP!**

Just a hammer and a knife... and you're in business. Nail flexible, polyvinyl Labyrinth Waterstop to the wall—inside your form—and forget about water seepage between concrete pours. Here's a real time, trouble and money saver.

- No Special Forms needed since no fins protrude into new pour.
- No Metal Fins to tear or bend out of place.
- No Welding or Vulcanizing expense. A hot knife joins sections in two or three minutes.
- No Maintenance. Polyvinyl lasts indefinitely, resists temperature changes and chemical action of concrete.
- For further information—clip coupon!

### Labyrinth Waterstop

The first really satisfactory water seal—eliminates seepage problems, simplifies form work.



## WATER SEALS, INC.

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Chicago 6, Illinois

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Chicago 6, Illinois

Please send further information on LABYRINTH WATERSTOPS

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Company.....  
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City..... Zone..... State.....

a place where waves pounded into a coral cave which had only a small hole for the water to escape under pressure. He says he realized then that Nature had provided him with a simple, cheap way to harness the power in the waves.

Now, Inman has patented a design for a unit installation which he estimated could be built for about \$250,000 and provide cheap electrical power for sea water conversion. Briefly, this is how the unit would work.

A triangular structure, hollow, with an open base 250 ft. across, would be built in the ocean. The top of the base would be at the surf line to receive incoming waves as they break. Sides of the structure would be about 450 ft. long and 10 ft. high, meeting at an apex. Two intake pipes at the apex would lead to storage tanks. Waves breaking into the open base would compress air ahead of them, similar to a giant piston. Inman claims that about 100 psi. pressure would be created. Check valves would release air into a giant compressor to operate air jets and air turbines. Estimates are that 2,800 waves per day would produce 6,000,000 lb. of compressed air every 24 hours.

New method announced for cleaning water wells

WATER WELLS are in for quite a "shock" if a new method of cleaning is adopted on a larger scale.

Harvey A. Mylander, district engineer of water supply analysts, South Pasadena, Calif., presented the fine points of the new method to the American Society of Mechanical Engineers in Seattle, Wash.

According to Mylander, small explosive charges are placed in the well's wall casings and detonated at prescribed intervals. The result is a constant series of shock waves which loosens foreign matter and clogging factors to permit a greater flow of water—sometimes increasing flow as much as 300%.

Arizona makes progress in road maintenance rating

BASED on the state's road sufficiency rating system, Arizona highways, primary and secondary, were being replaced last year faster than they were wearing out.

The State Highway Department's rating system is based upon 100 points, which are accorded a perfect road for today's needs. Three criteria go into the judging of a road: condition, 35 points; safety, 30 points, and service, 35 points. This year Arizona roads rated 76.2% against the 75.1% accorded the network last year. This 1.1% increase reversed a downward trend which had appeared in previous years, and officials are hopeful that the upward swing in statistics will continue in future tabulations.

UNIT BID PRICES ... CONTINUED

|                                                                       | (1)     | (2)     | (3)     | (4)     | (5)     | (6)     |
|-----------------------------------------------------------------------|---------|---------|---------|---------|---------|---------|
| 700 ton untreated rock surfacing .....                                | 4.70    | 2.60    | 2.50    | 3.10    | 2.50    | 2.40    |
| 32,000 sq. yd. prepar., mix. and shaping surf. (bit. surf. tr.) ..... | .04     | .17     | .12     | .14     | .23     | .10     |
| 200 ton liq. asph., SC-3 or SC-4 (bit. surf. tr.) .....               | 35.00   | 40.00   | 35.00   | 35.00   | 34.00   | 36.80   |
| 77 ton liq. asph., SC-2 (pr. ct.) .....                               | 45.00   | 40.00   | 38.00   | 36.00   | 42.00   | 39.00   |
| 250 ton sand (curing sl. and dr. ct.) .....                           | 5.00    | 7.00    | 8.50    | 5.30    | 4.00    | 4.00    |
| 30,000 ton min. aggr. (P.M.S.) .....                                  | 4.00    | 4.15    | 4.46    | 4.80    | 2.82    | 5.15    |
| 1,800 ton paving asph. (P.M.S.) .....                                 | 30.00   | 34.80   | 34.00   | 32.00   | 27.60   | 35.50   |
| 12,600 lin. ft. placing P.M.S. dikes .....                            | .12     | .23     | .12     | .12     | .20     | .11     |
| 300 lin. ft. placing P.M.S. gutter drains .....                       | 1.00    | 1.50    | 1.20    | .70     | .97     | 1.75    |
| 395 cu. yd. Class "A" P.C.C. (struct.) .....                          | 75.00   | 83.00   | 72.00   | 75.00   | 88.00   | 85.00   |
| 50 cu. yd. rubble masonry (ditch lining) .....                        | 60.00   | 75.00   | 42.00   | 60.00   | 37.00   | 40.00   |
| 485 cu. yd. Cl. "B" P.C.C. (curbs, gutters & steps) .....             | 50.00   | 53.00   | 50.00   | 55.00   | 46.00   | 45.00   |
| 115 ea. right-of-way monuments .....                                  | 7.00    | 7.00    | 7.50    | 6.90    | 8.00    | 7.00    |
| 17 ea. center line monuments, Type "A" .....                          | 17.00   | 16.00   | 20.00   | 12.00   | 15.00   | 7.00    |
| 17 ea. center line monuments, Type "B" .....                          | 25.00   | 35.00   | 30.00   | 15.00   | 25.00   | 27.00   |
| 23 lin. ft. timber barricades .....                                   | 10.00   | 6.00    | 6.00    | 7.75    | 7.00    | 8.00    |
| 65 lin. ft. pipe handrail (steps) .....                               | 15.00   | 5.00    | 5.00    | 1.20    | 4.00    | 10.00   |
| 350 ea. guide posts and markers .....                                 | 6.50    | 7.00    | 8.50    | 6.90    | 8.00    | 6.80    |
| 18 ea. horiz. reflector units .....                                   | 8.00    | 9.00    | 10.00   | 9.00    | 10.00   | 9.00    |
| 7.3 mi. new property fences .....                                     | \$2,300 | \$1,700 | \$2,400 | \$2,175 | \$2,700 | \$2,100 |
| 4,600 lin. ft. chain link fence .....                                 | 2.00    | 2.00    | 2.00    | 1.97    | 2.00    | 1.75    |
| 92 lin. ft. 8-in. C.M.P. (16 ga.) .....                               | 2.00    | 2.10    | 2.50    | 2.00    | 2.20    | 2.25    |
| 480 lin. ft. 12-in. C.M.P. (16 ga.) .....                             | 3.00    | 2.70    | 3.00    | 2.70    | 2.70    | 2.80    |
| 4,334 lin. ft. 18-in. C.M.P. (16 ga.) .....                           | 4.00    | 3.65    | 4.00    | 3.65    | 4.00    | 3.50    |
| 3,366 lin. ft. 24-in. C.M.P. (14 ga.) .....                           | 6.00    | 5.37    | 6.00    | 5.65    | 5.50    | 5.00    |
| 234 lin. ft. 30-in. C.M.P. (14 ga.) .....                             | 7.00    | 6.50    | 7.00    | 7.00    | 7.00    | 6.00    |
| 208 lin. ft. 36-in. C.M.P. (12 ga.) .....                             | 10.00   | 10.00   | 10.00   | 11.00   | 11.00   | 12.00   |
| 212 lin. ft. 48-in. C.M.P. (12 ga.) .....                             | 14.00   | 15.50   | 13.00   | 16.90   | 17.00   | 12.00   |
| 3 ea. 8-in. C.M.P. elbows (16 ga.) .....                              | 14.00   | 26.00   | 25.00   | 11.00   | 26.00   | 24.00   |
| 8 ea. 18-in. C.M.P. elbows (16 ga.) .....                             | 17.00   | 36.00   | 25.00   | 14.00   | 37.00   | 25.00   |
| 2 ea. 24-in. C.M.P. elbows (14 ga.) .....                             | 22.00   | 67.00   | 85.00   | 20.00   | 75.00   | 45.00   |
| 1 ea. 36-in. C.M.P. elbows (12 ga.) .....                             | 80.00   | 100.00  | 100.00  | 110.00  | 450.00  | 95.00   |
| 2 ea. 36-in. x 24-in. C.M.P. tapers (12 ga.) .....                    | 160.00  | 175.00  | 140.00  | 200.00  | 175.00  | 139.00  |
| 29 ea. corr. metal catch basin units (12 ga.) .....                   | 1.80    | 1.80    | 2.30    | 1.60    | 2.20    | 2.30    |
| 3,680 lin. ft. 8-in. perf. metal pipe undrns. (15 ga.) .....          | 6.00    | 7.70    | 6.00    | 6.00    | 5.25    | 5.30    |
| 1,000 cu. yd. filter matl. .....                                      | 2.50    | 2.84    | 2.50    | 1.85    | 2.40    | 2.25    |
| 632 lin. ft. 8-in. C.M.P. down drains (16 ga.) .....                  | 30.00   | 43.00   | 30.00   | 35.00   | 34.00   | 44.00   |
| 17 ea. spillway assemblies .....                                      | 25.00   | 48.00   | 30.00   | 35.00   | 90.00   | 95.00   |
| 4 ea. 16-in. x 8-in. C.M.P. tapered inlets (down-drains) .....        | 25.00   | 26.20   | 25.00   | 25.00   | 22.00   | 21.00   |
| 14 ea. spillway assemb. down drain slip joints .....                  | .13     | .14     | .15     | .12     | .14     | .16     |
| 61,000 lb. bar reinf. steel .....                                     | 130.00  | 124.00  | 85.00   | 100.00  | 105.00  | 125.00  |
| 6 ea. drop inlet steel frames and grates .....                        | 200.00  | 253.00  | 250.00  | 240.00  | 230.00  | 193.00  |
| 1 ea. manhole unit .....                                              | 10.00   | 13.00   | 11.00   | 17.50   | 11.00   | 15.00   |
| 96 lin. ft. 36-in. C.M.P. catch basin exten. (12 ga.) .....           | 140.00  | 230.00  | 160.00  | 185.00  | 180.00  | 158.00  |
| 2 ea. 48-in. x 36-in. C.M.P. "Y" branches (12 ga.) .....              | 3.50    | 3.25    | 3.75    | 3.15    | 4.00    | 3.40    |
| 4,730 lin. ft. metal guard railing .....                              |         |         |         |         |         |         |

Miscellaneous

Aerial reconnaissance survey for mountain highway

Washington—Grays Harbor, Jefferson and Clallam counties—State. Photographic Surveys (Western), Inc., Seattle, received a contract from the Department of Highways on its low bid of \$9,900 for a reconnaissance survey from Moclips to Port Angeles. Unit prices were as follows:

|                                               | (1)     | (2)      | (3)           |
|-----------------------------------------------|---------|----------|---------------|
| (1) Photographic Surveys (Western), Ltd. .... | \$9,900 |          |               |
| (2) Aero Service Corp. ....                   |         | \$19,580 |               |
| (3) Delano Aerial Surveys .....               |         | 22,496   |               |
| 60 sq. mi. topographic maps .....             |         | 110.00   | 324.00 364.10 |
| 2 (sets) stereoscopic contact prints .....    |         | \$1,500  | 60.00 175.00  |
| 2 only photo-index maps .....                 |         | 150.00   | 10.00 150.00  |

Drilling investigation holes at Grand Coulee Dam

Washington—Columbia Basin Project—USBR. Lynch Bros., Seattle, submitted the low bid of \$13,359 to the Bureau of Reclamation for drilling holes in right riverbank investigations, Grand Coulee Dam. Unit prices were as follows:

|                                                                                                                            | (1)      | (2)      | (3)     | (4)    | (5)     |
|----------------------------------------------------------------------------------------------------------------------------|----------|----------|---------|--------|---------|
| (1) Lynch Brothers .....                                                                                                   | \$13,359 |          |         |        |         |
| (2) R. S. McClintock .....                                                                                                 | 14,199   |          |         |        |         |
| (3) Mac Exploration Co. ....                                                                                               | 14,983   |          |         |        |         |
| (4) Forest H. Majors .....                                                                                                 |          | \$16,425 |         |        |         |
| (5) Engineers' estimate .....                                                                                              |          | 11,340   |         |        |         |
| Lump sum, moving to and from site .....                                                                                    | 650.00   | \$1,259  | \$1,500 | 250.00 | \$2,000 |
| 375 lin. ft. drilling 2 1/4-in. holes in stage between depths of 0 ft. and 140 ft., no recovery of samples required .....  | 9.50     | 9.95     | 11.50   | 11.50  | 6.60    |
| 80 lin. ft. drilling 2 1/4-in. holes in stage between depths of 140 ft. and 220 ft., no recovery of samples required ..... | 10.25    | 10.95    | 12.25   | 16.00  | 7.15    |
| 85 lin. ft. drilling 2 1/4-in. holes in stage between depths of 0 ft. and 160 ft., recovery of sample required .....       | 12.00    | 10.95    | 12.75   | 12.00  | 7.80    |
| 380 lin. ft. drilling 2 1/4-in. holes in stage between depth of 160 ft. and 320 ft., recovery of samples required .....    | 12.75    | 12.95    | 13.50   | 16.00  | 8.40    |
| 30 lin. ft. drilling holes in bedrock, recovery of core required .....                                                     | 15.00    | 12.95    | 15.50   | 15.00  | 10.50   |
| 955 lin. ft. furn. and placing 1/2-in. slotted pipe and sand packing .....                                                 | 2.00     | 2.00     | 1.45    | 3.00   | 2.00    |
| 21 lin. ft. placing 1 1/2-in. pipe .....                                                                                   | 2.00     | 2.00     | 2.50    | 3.00   | 3.00    |
| 3 guards setting pipe guards .....                                                                                         | 20.00    | 50.00    | 25.00   | 35.00  | 50.00   |

Equipment rental bids for various types of equipment

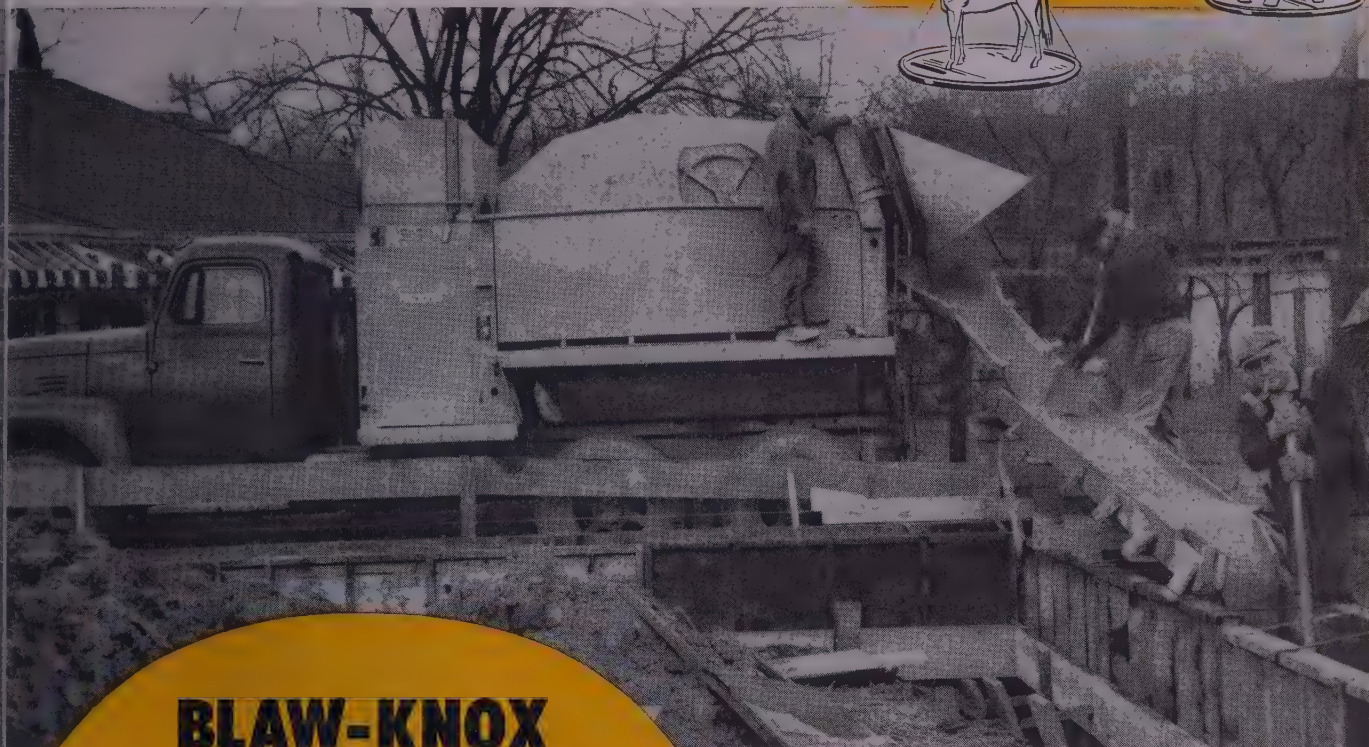
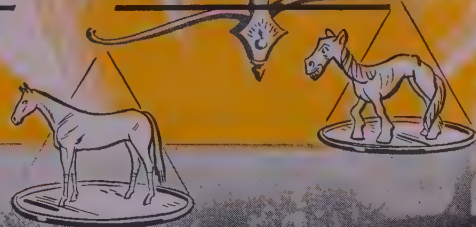
California—San Luis Obispo County—State. The following is a resumé of equipment rental bids received by the State Division of Highways for various pieces of equipment. Descriptions of the equipment and the rates quoted follow:

- Item "B" One (1) Crawler Type Tractor, diesel propelled, with Power Rating as a D-8 Caterpillar, or equal, to be equipped with bulldozer blade; to be fully operated, fueled and maintained.
- Item "C" One (1) Crawler Type Tractor, diesel propelled, with Power Rating as a D-8 Caterpillar, or equal, to be equipped with bulldozer blade; to be fully operated, fueled and maintained.

(Continued on next page)

# There's a big difference between **LIGHTWEIGHT** and **UNDERWEIGHT**

The difference is in performance. The Blaw-Knox Hi-Boy gives you all the big performance advantages of a standard, heavy-duty truck mixer, because that's exactly what it is. It's complete in every part necessary for efficient, maximum production, yet by careful redesign, the weight of the 3-yd. Hi-Boy has been reduced by a full ton, and the 4½-yd. model by half a ton!



## **BLAW-KNOX** *Hi-Boy* **TRUKMIXERS** LITE-WEIGHT **are Standard, Complete Heavy-Duty Models**

3-cu. yd. Hi-Boy weighs 5580 lbs.  
4½-cu. yd. Hi-Boy weighs 6830 lbs.

26 *Hi-Boy* LITE-WEIGHT Ask about the  
**FEATURES THAT ASSURE**  
BIGGER PAYLOADS • HIGHER PRODUCTION  
• LOWER MAINTENANCE • BETTER AND  
EASIER OPERATION • GREATER EFFICIENCY

# BLAW-KNOX

**BLAW-KNOX DIVISION**  
of Blaw-Knox Company  
Farmers Bank Building, Pittsburgh 22, Pa.



Light weight is important, BUT ... it takes a *complete*, standard truck mixer to handle every ready-mix job that comes along, and at a profit. The heavy-duty Hi-Boy is the lightest weight *complete* truck mixer on the market! Dead weight is eliminated, yet the Hi-Boy retains all the features and sturdy construction for peak performance that have made it first choice for so long, on so many jobs that call for big production at low cost.

With the lightweight Hi-Boy, you're sure of bigger payloads at lower cost per yard ... and you have a heavy-duty truck mixer at a lower capital investment. For example, the 3-yd. Hi-Boy can be mounted on a single rear axle chassis of proper wheel base capable of carrying 18,000 lbs. total load, without exceeding legal limitations for weight on the rear axle.

It will pay you to get the low-down on the Hi-Boy today. Your Blaw-Knox distributor will give you complete details.

### Check the advantages of the BLAW-KNOX "Complete Package" of Ready-Mix Equipment

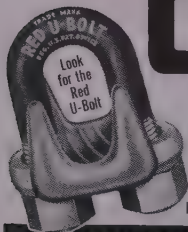
Now you can get all your ready-mix equipment in one "Complete Package" ... clamshell buckets, mixing, batching and charging plants, and Hi-Boy Trukmixers ... all on one order, with just one financial arrangement and backed by one undivided responsibility. You have one competent distributor source for expert repair and maintenance, and prompt service on parts. Ask your Blaw-Knox distributor to explain every benefit of the "Complete Ready-Mix Package".

**Riggers PLAY IT SAFE  
on "high wire" jobs!**



...that's why they  
demand **GENUINE**

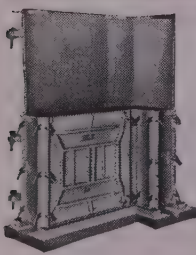
# CROSBY CLIPS



Drop-forged,  
hot-dip galvanized  
wire rope fasteners  
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WIRE ROPE  
DISTRIBUTORS EVERYWHERE

**AMERICAN HOIST & DERRICK CO.**  
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When placing concrete, use this nationwide Form Rental and Engineering Service to increase profits, reduce costs.

Standard units of Economy Forms fit most jobs. But where needed, special forms can be built to specification.

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FORMS**  
metal forms for  
concrete construction

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- Water or Sewage Treatment Plants
- Tanks — Circular and Rectangular
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Decatur, Ga.  
Dallas, Texas  
Los Angeles, Calif.  
Oakland, Calif.  
Denver, Colo.

## UNIT BID PRICES ... CONTINUED

Bid awarded to M. J. B. Construction Co., Santa Maria, Calif.

| Bidder                                    | Item | Make            | Year | Rental Rate<br>Per Hour | **Transportation<br>Lump Sum Bid |
|-------------------------------------------|------|-----------------|------|-------------------------|----------------------------------|
| M. J. B. Const. Co.<br>Atascadero, Calif. | "B"  | Caterpillar D-8 | 1949 | \$12.50                 | \$100.00                         |
|                                           | "C"  | Caterpillar D-8 | 1950 | 12.50                   | 100.00                           |
| Hermreck & Easter<br>Santa Maria, Calif.  | "B"  | Caterpillar D-8 | 1949 | \$13.50                 | \$150.00                         |
|                                           | "C"  | Caterpillar D-8 | 1949 | 13.50                   | 150.00                           |

\*Rental rate per hour includes fully fueled and maintained equipment complete with operator.

\*\*From Vendor's Headquarters to the top of the Cuesta Grade and return upon completion of work.

Item "A" One (1) Crawler Type Tractor as a D-4 Caterpillar or equal, equipped with front end loader having a capacity of approximately one cubic yard, to be fully operated, fueled and maintained.

Bid awarded to L. E. Webb Construction Co., Inc., Santa Maria, Calif.

| Bidder                                                  | Make            | Year | Rental Rate<br>Per Hour | **Transportation<br>Lump Sum Bid |
|---------------------------------------------------------|-----------------|------|-------------------------|----------------------------------|
| Valley Paving & Construction Co.<br>Pismo Beach, Calif. | Caterpillar     | 1951 | \$10.50                 | \$50.00                          |
| L. E. Webb Const. Co., Inc.<br>Santa Maria, Calif.      | Caterpillar D-4 | 1946 | 7.75                    | 50.00                            |

\*Rental rate per hour includes fully fueled and maintained equipment complete with operator.

\*\*From Vendor's Headquarters to the top of the Cuesta Grade and return upon completion of work.

Three (3) each 5 1/2 to 7 cubic yards approximate capacity dump trucks with power hoists and steel bodies to be completely operated, fueled and maintained.

Bid awarded to Alvin H. Fry in drawing by lot.

| Bidder                                                   | Equipment | Make          | Year | *Rental Rate Per Hour<br>SLO Co. | SB Co. |
|----------------------------------------------------------|-----------|---------------|------|----------------------------------|--------|
| Alvin H. Fry<br>Grover City, Calif.                      | Truck "A" | Chevrolet     | 1946 | P.U.C.                           | P.U.C. |
|                                                          | Truck "B" | Dodge         | 1947 | P.U.C.                           | P.U.C. |
|                                                          | Truck "C" | Studebaker    | 1948 | P.U.C.                           | P.U.C. |
| H. G. Iliff & Son<br>Santa Maria, Calif.                 | Truck "A" | International | 1951 | \$5.79                           | \$5.27 |
|                                                          | Truck "B" | International | 1950 | 5.79                             | 5.27   |
|                                                          | Truck "C" | Ford          | 1950 | 5.79                             | 5.27   |
| Valley Paving & Constr. Co., Inc.<br>Pismo Beach, Calif. | Truck "A" | G.M.C.        | 1951 | 5.79                             | 5.27   |
|                                                          | Truck "B" | G.M.C.        | 1951 | 5.79                             | 5.27   |
|                                                          | Truck "C" | G.M.C.        | 1951 | 5.79                             | 5.27   |
| Hubbs Bros.<br>Colton, Calif.                            | Truck "A" | Ford          | 1947 | P.U.C.                           | P.U.C. |
|                                                          | Truck "B" | Ford          | 1947 | P.U.C.                           | P.U.C. |
|                                                          | Truck "C" | Ford          | 1947 | P.U.C.                           | P.U.C. |

\*Includes dump truck completely fueled, maintained and with operator.

Three (3) self-propelled tamping-leveling-finishing machines as the Barber-Greene, or equal, to be fully fueled, maintained and with operators, to be further described and designated as Machines "A", "B" and "C".

Bid awarded to: Edward Keeble for Machine "A"; Valley Paving & Constr. Co., Inc. for Machine "B"; Valley Paving & Constr. Co., Inc. for Machine "C".

| Bidder                                                   | Machine | Make   | Year | Rental Rate Per Hour<br>Mon & Sbt SLO & SB<br>Counties Counties | *Transportation<br>Lump Sum Bid |
|----------------------------------------------------------|---------|--------|------|-----------------------------------------------------------------|---------------------------------|
| Edward Keeble<br>San Jose, Calif.                        | "A"     | Jaeger | 1950 | \$14.50                                                         | \$100.00                        |
| Valley Paving & Constr. Co., Inc.<br>Pismo Beach, Calif. | "B"     | Adnun  | 1950 | \$13.50                                                         | \$250.00                        |
|                                                          | "C"     | Adnun  | 1950 | 13.50                                                           | 250.00                          |

\*Transportation: Machine "A" from Vendor's Headquarters to Salinas and return.  
Machine "B" from Vendor's Headquarters to Bradley and return.  
Machine "C" from Vendor's Headquarters to Santa Barbara and return.

Two (2) Electric Arc Welding Machines with Operators and including welding rods.

Bid awarded to Jerry W. Nunn in drawing of lot.

| Bidder                                            | Equipment | Make    | Year | Rental Rate<br>Per Hour |
|---------------------------------------------------|-----------|---------|------|-------------------------|
| Jerry W. Nunn Contractor, Santa Maria, Calif.     | Unit "A"  | Lincoln | 1944 | \$6.125                 |
|                                                   | Unit "B"  | Lincoln | 1952 | 6.125                   |
| L. E. Webb Constr. Co., Inc., Santa Maria, Calif. | Unit "A"  | Lincoln | 1948 | \$6.25                  |
|                                                   | Unit "B"  | Lincoln | 1948 | 6.00                    |
| Santa Maria Welding Works, Santa Maria, Calif.    | Unit "A"  | Lincoln | 1947 | \$7.25                  |

One (1) Motor Grader, extra heavy duty as a "Caterpillar 12" or equal, diesel propelled with 12-ft. blade and scarifier attachment, to be fully operated, fueled and maintained.

Bid awarded to Hermreck & Easter, Santa Maria, California.

| Bidder                                                         | Make               | Year | Rental Rate<br>Per Hour | *Transportation<br>Lump Sum Bid |
|----------------------------------------------------------------|--------------------|------|-------------------------|---------------------------------|
| Hermreck & Easter, Santa Maria, Calif.                         | Caterpillar No. 12 | 1946 | \$11.00                 | \$100.00                        |
| Valley Paving & Construction Co., Inc.<br>Pismo, Beach, Calif. | Caterpillar No. 12 | 1950 | \$12.50                 | \$ 25.00                        |

\*From Vendor's headquarters to the City of Santa Maria, and return to Vendor's headquarters at completion of the work.

One (1) Windrow Sizer. The Windrow Sizer shall be approximately 9 ft. wide, mounted on pneumatic tired wheels and be capable of spreading a windrow of 1.5 cu. ft. per lineal foot minimum and approximately 6 cu. ft. per lineal foot, maximum. It shall have an adjustable opening for regulating the size of windrow and be capable of receiving material from dump trucks without spilling over the front end. It shall be complete with chains for hooking box to dump trucks.

Bid awarded to Phoenix Construction Co., Inc., Bakersfield, Calif.

| Bidder                                                | Make               | Year  | *Rental Rate<br>Per Month                         | **Transportation<br>Lump Sum Bid |
|-------------------------------------------------------|--------------------|-------|---------------------------------------------------|----------------------------------|
| Phoenix Construction Co., Inc.<br>Bakersfield, Calif. | Homade             | ----- | 1st Mo. \$80.00<br>2nd Mo. 60.00<br>3rd Mo. 40.00 | \$ 80.00                         |
| Gardner Road Mixers, Inc.<br>Redlands, Calif.         | Woods Spreader Box | 1950  | \$100.00                                          | \$100.00                         |

\*Monthly rate shall be prorated for use of the equipment for period of less than a month.

\*\*From Vendor's headquarters to San Luis Obispo and return upon completion of work.

# 3 LIDGERWOOD high speed electric Cableways . . .



## HELP BUILD EUROPE'S TALLEST DAM

Rising 592 feet above the ground, the Tignes Dam, located in the French Alps, presents many unusual construction problems. Freezing temperatures cut the working season to less than six months. To handle the vital job of placing concrete, engineers for Electricite de France selected



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- Two 25-ton Cableways for handling 8 cubic yard buckets.
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All three are radial type with traveling head towers and a common pivotal tower. Spans average 1950 feet.

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and Construction Equipment;  
Cableways up to 150 ton capacity.*

# LIDGERWOOD INDUSTRIES, INC.

7 DEY STREET, NEW YORK 7, N. Y.

# NEW LITERATURE

701

## Soil compaction cost data

"Cost Data for Soil Compaction in Restricted Areas" is the title of a new technical bulletin from **Barco Manufacturing Co.** Aimed at contractors and construction engineers, the cost figures are based on a survey of actual jobs and are intended to be helpful to contractors in preparing bids and maintaining cost records. The Barco Portable Gasoline Rammer figures prominently in the data.

702

## Water line report

**Dresser Manufacturing Division** offers the fifth annual report of water lines entitled, "A Report of Dresser-Coupled Steel Water Lines in the Year 1951." This 12-page report gives details and illustrations on principal steel water lines laid during the past year.

703

## Excavator operation and maintenance guide

The time tested rules of excavator and crane operation and maintenance are listed and explained along with some

new slants and tips on operation, lubrication, adjustments and preventative maintenance in an illustrated, two-color booklet recently published by **Bycyrus-Erie Co.** Titled "Ways to Make Your Excavator Work Harder—Live Longer," the 32-page publication covers subjects close to any excavating man's purse.

704

## Very versatile valves

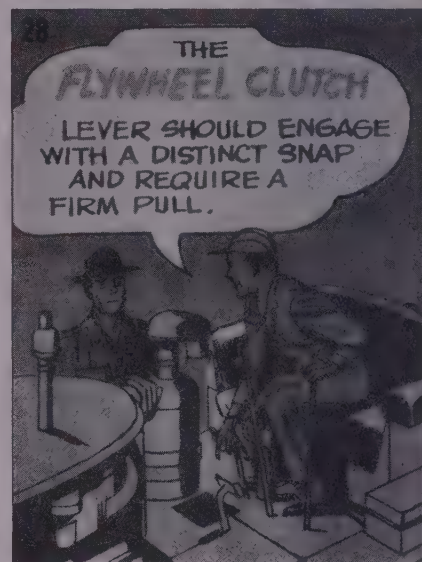
Up-to-the-minute information on the **POV Power Operated Valves**, manufactured by **Ledeer Manufacturing Co.** is contained in Bulletin 1000, just issued by the firm. The bulletin provides the reader with illustrations, operating and circuit diagrams, dimensions and weights, plus applicable pilot valve information.

705

## "Cat" offers track-type tractor maintenance guide

In the four-color cartoon format which has become so familiar to readers of **Caterpillar Tractor Co.'s** maintenance literature, the firm is now offering a "Maintenance guide for track-type tractors D8, D7, D6, D4 and D2." This new

booklet tells what happens when an owner and service technician compare job notes. The two discuss basic methods of making tractors last much longer and do better work at lower cost. The technician points out many practical hints which can prevent down-time in the field by explaining operating adjustments simply (with the aid of diagrams, statistics, and drawings). There is also an explanation of how owners can economize by having the dealer rebuild worn parts. This 24-page booklet is being used by Caterpillar dealers in combination with a tractor maintenance movie called "A Thing or Two." The local Caterpil-



Above is one panel of **Caterpillar Tractor Co.'s** color tractor maintenance guide, which provides practical advice this interesting way.

lar dealer will discuss a movie-booklet presentation with you, but in the meantime, you can write for this free piece of literature.

706

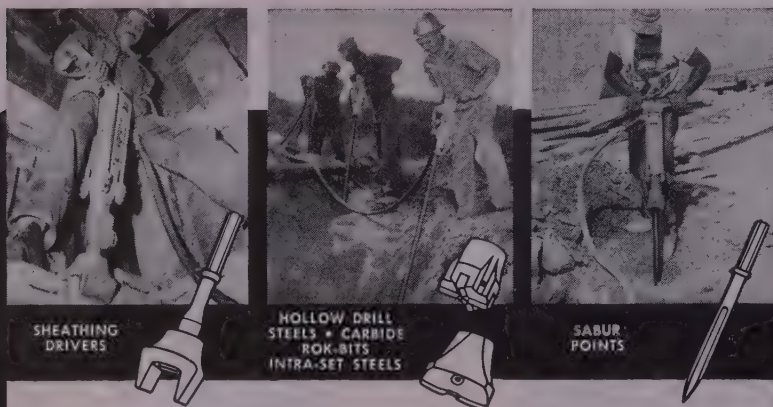
## Grouter performance data

Two illustrated folders are announced by **C. L. Ballard**, successor to **The Prehy Co.**, concerning the firm's grouter and concrete gun. Specifications and diagrams appear in both folders to show how the tools provide sturdy construction, economical operation and perfect work control. There is also a list of the accessories for the concrete gun unit. The grouter information includes a list of various job applications where the grouter can be put into general use.

707

## Crane hoist control booklet

All the facts about the new **AC crane hoist control Load-o-matic** are told in an 8-page booklet just released by **Westinghouse Electric Corp.** The features of the automatic "load detector," which diverts torque from speed and permit coordination of speed and load to suit crane requirements, are explained in the



## ... a tool for every job!

Having the proper tool for the job saves time and money for you . . . makes work easier on the operator. That's why you will find the wide range of tools offered by **Brunner & Lay** of such importance. For every tool there are many sizes . . . each type and size designed for a definite purpose. Shown are a few of these tools. For the exact tool to fit your job . . . let your dealer show you the complete **Brunner & Lay** line.

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booklet. Construction, mounting and performance characteristics are also covered in the booklet.

708

#### Guillotine cutting catalog

Six series of Guillotine cutting tools, and 26 different models are paraded in this catalog just released by **Manco Manufacturing Co.** The uses, capacities, and specifications are also in this catalog which offers many illustrations. Besides a complete picture of the Guillotines, the catalog provides information on the complete line of special and accessory equipment, fully described and photographed.

709

#### Paving catalog

This catalog is keynoted by its easy reference to lines of expansion, tongue and groove, dummy joints and base plates, as well as sealer and curing compounds. State and Federal specifications are given for materials and a section on their non-rotting Fiberglas Expansion Joint is included. This Kapco brand paving products catalog is available from **Leystone Asphalt Products Co.**, division of American-Marietta Co.

710

#### Electric fittings booklet

The complete line of solderless wire connectors manufactured by **Buchanan Electrical Products Corp.** is described and illustrated in this 12-page booklet from the firm. Cable and conduit fittings and wiring devices are also fully described. Complete specifications, dimensional data, application instructions and ordering information appear.

## Literature briefs . . .

711

**OIL HYDRAULIC EQUIPMENT**—This 20-page booklet describes the products manufactured by **Superdraulic Corp.** and includes photographs and layout drawings on typical hydraulic designs.

712

**CONCRETE CURING PAPERS**—Reinforced, waterproof papers meeting federal specifications are described in a new, colorful illustrated folder, released by **Angier Pacific Corp.** Included are suggestions for re-use of these extra strong concrete curing papers for other construction needs.

713

**LIFTING AND HAULING**—The Hydra-Lift, which in the new model can be mounted on the frame of any truck, 1½ tons or larger, is fully portrayed and explained in this 8-page folder. **The Pitman Manufacturing Co.** is offering the truck-crane literature.

714

**RAINCOAT FOR MASONRY WALLS**—Here is detailed information on Hydrocide S. X. Colorless, which makes all types of above-grade porous masonry water-repellent immediately after drying. **L. Sonneborn Sons, Inc.** has released Bulletin No. 2.

715

**CUTTING**—"Oxygen Cutting of Defense Equipment Materials" is now available as a reprint (Form ADR 78) from **Air Reduction Pacific Co.** The article originally appeared in the *Welding Journal*.

716

**PLENTY OF PLANTS**—**Mines Engineering and Equipment Co.** is offering Bulletin 278 to show the way a Tel Smith plant will suit your needs. Quarry plants, sand and gravel plants and portable plants are covered.

717

**PORTABLE FINISHER**—In Bulletin M-111 you can find out all about the Flex-Plane Portable Finisher, which offers mobility and time saving operation. **The Flexible Road Joint Machine Co.** is offering the booklet.

718

**APPLYING THE CAT**—Own a Caterpillar D4 diesel tractor? If you do, here is an illustrated catalog showing the many applications of the machine. From its construction to its performance—the D4 is all explained here by **Caterpillar Tractor Co.**

719

**COMPACTOR RESULTS**—This bulletin on the Cedarapids Compactor details and gives specifications of the 60,000 lb. and the 25,000 lb. models. On-the-job test reports are contained in this release by **Iowa Manufacturing Co.**

720

**ROAD MIXING SET**—**Seaman Motors, Inc.** is offering a set of booklets on various types of highway surfaces. The booklets are: No. 40, "Bituminous Construction," No. 50, "Soil Cement Construction," No. 60, "Macadam Base Construction" and No. 65, "Gravel Stabilization."

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## Bitumuls makes shell and coral suitable for paving

**N**EPTUNE'S CAST-OFFS—from Gulf Coast oyster and clam shell to South Pacific coral—are made into good paving material with BITUMULS® by economy minded road-builders. This cellular aggregate entraps water which is miscible only with aqueous asphaltic emulsions.

Bitumuls mixes easily with virtually every type of shell or coral to give proved paving materials for new construction—highway maintenance—surfacing work.

Bitumuls Mixing Grades are ideal for mixing with all available aggregates. Medium Viscosity grades are favored for penetration macadam work. High Viscosity Bitumuls is standard for surface treatments and seal coats. Both are quick-setting grades. Both provide long-lasting performance.

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ing and varied experience to consult with you, about your paving needs: roads, parking areas or airports.

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Oakland 1, Calif. Portland 7, Ore. Seattle, Wash.  
Offices in Principal Cities

#### 721

**RESURFACING UNIT**—The circular offered by Penn Tool & Machine Co. gives complete details, specifications and prices on this automatic resurfacing unit called the Berkeley ConSERVall. Details are presented on how to reclaim track links, rolls, idlers, shears, etc.

#### 722

**COAL-TAR ENAMELS**—From cleaning to back-filling, pipe line advice is given in this Field Manual issued by The Barrett Division, Allied Chemical & Dye Corp.

#### 723

**ALL ABOUT MARION**—In Bulletin 403-A, Marion Power Shovel Co. offers a complete description of every machine in its line of excavating and material handling machines. Condensed specifications are given in the bulletin.

#### 724

**WOOD FRAMING**—Fabricated structural wood products appear in this excellent catalog from Weyerhaeuser Sales Co. There is a wide variety of roof truss types displayed. The catalog explains that the products are delivered to the job site complete with hardware, ready for local crews.

#### 725

**SERVICE MANUAL**—The line of OTC tools especially designed for servicing International Tractors is described and illustrated in this 12-page manual.

Both manually and hydraulically operated pulling tools are shown. Owatonna Tool Co. is the manufacturer.

#### 726

**PROTECTIVE COATINGS**—The entire line of Prufcoat Protective Coatings is contained in this 4-page folder. In addition there are five different types of applications presented in case-history form by Prufcoat Laboratories, Inc.

#### 727

**WINCHES**—The Wayne Division, Gar Wood Industries, Inc. is offering an informative bulletin (No. 149T) which provides capacities and applications of the Gar Wood Model 2U and 3U Low-Mount winches.

#### 728

**TRANSIT**—Booklet WE6 gives you information on the optical transit made by Henry Wild, Surveying Instruments Supply Co. Original features of the transit are listed in the booklet.

#### 729

**BOOT BULLETIN**—If you don't like to watch your step, B. F. McDonald Co. is offering a bulletin which tells you all about the safety boot that does it for you.

#### 730

**TOOTH ACHE?—REPLACE IT!**—This is a colorful 4-page folder devoted to Blaw-Knox's die-forged, alloy steel tooth bases with reversible and renewable cutters. Full specifications are given.

## USBR offers canal lining information in new book

**LOW-COST CANAL LININGS** installed and tested by the Bureau of Reclamation during the past six years are described in a new Bureau publication "Canal Linings and Methods of Reducing Costs." Keynoting the introduction to the book and the importance of the subject, is the significant fact that, at the 25% seepage rate on unlined canals and laterals in 1949, some 3,900,000 acre feet of water lost on 36 Federal irrigation projects would be enough to irrigate one million acres of land for crop production.

Although it is pointed out that canal lining now on the market can be called an ideal preparation, each possesses certain characteristics of value and the important thing is to get the right lining for the job.

Described in the booklet are the use of concrete, airjet-sprayed mortar and asphaltic canal linings (both buried asphalt membranes and asphaltic concrete). The effectiveness of the various types of linings developed and installed since the Bureau's test program was initiated in 1946 is discussed.

Copies of 70-page illustrated book may be obtained for 25 cents each from L. N. McClellan, Chief Engineer, Bureau of Reclamation, Denver Federal Center, Denver, Colorado.

## NEW BOOKS

### PRACTICAL ACCOUNTING AND COST KEEPING FOR CONTRACTORS—Walker

Recognizing that contractors face a unique problem when it comes to keeping accounts and cost records, Frank Walker has prepared this excellent book on the subject to lend the contractor a hand in this important phase of his operations. Walker recognizes the fact that the contractor lets and receives contracts, works under varied circumstances, sometimes on many projects simultaneously, so that customary methods of accounting do not exactly suit his needs. He considers that there are roughly three types of contractors, small, medium and large, and he tries to make the suggestions in this book applicable to all three categories. Walker offers many years experience in cost recording, etc., and the book should provide a workable system for many a hard-pressed contractor. To complete the information provided, the author includes illustrations and descriptions of many of the common types of forms which must be considered in accounting, such as social security, purchasing orders, estimate sheets, etc. Published by Frank R. Walker Co., Publishers, Chicago, Ill. 70 pages, 8½ x 11. Priced at \$3.00.

### THE CONSERVATION OF GROUND WATER—Thomas

Here is an up-to-the-minute report on the development and use of ground water in the United States which should interest engineers concerned with the ground water supply. This is the first book of its kind on the subject. It is the result of a careful survey by The Conservation Foundation in cooperation with federal, state and private groups. There were more than 70 areas in 35 states covered by the survey, and much important information was obtained as a result. The author presents a view of what is being accomplished in ground water management today, and how it can be improved, as well as providing a clear view of ground water conditions. He includes a selected bibliography for reference as well as a complete subject index.

This is a "first" in the field. Published by McGraw-Hill Book Co., Inc., New York, N. Y., 327 pages, 6½ x 9½. Priced at \$5.00.

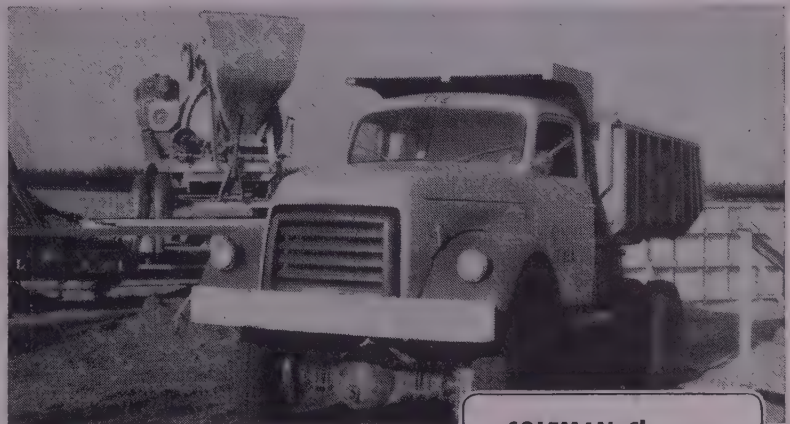
### PRE-STRESSED CONCRETE STRUCTURES—Komendant

August E. Komendant, a consulting engineer, has written this book with an eye toward practicability, and a desire to eliminate guesswork from design and stress analysis. Devoting a portion of the text to a general view of the subject, the author then provides information easily applied to the design of pre-stressed truss girders, shells, continuous beams, etc. Included is the theory for

design of various types of prestressed systems, remarks on structures already in existence, and many other useful points which should interest engineers engaged in the field. Published by McGraw-Hill Book Co., Inc., New York, N. Y., 261 pages. 6½ x 9½. Priced at \$6.00.

**QUARRYING STONE FOR CONSTRUCTION PROJECTS** is a book by Ir. H. Streefkerk, a civil engineer of The Netherlands, writing about current quarrying practices in the United States for the attention of civil engineers. Published in English by Uitgeverij-Waltman, Delft, The Netherlands. Priced at \$5.00.

## Coleman 4-Wheel Drive Equipped GMC Trucks Help Build Railroad to World's Biggest Iron Mine In Labrador



Here is one of a large fleet of Coleman 4-Wheel Drive equipped GMC's chosen by construction firm Cartier, Mannix, Morrison and Knudson to help build the railroad to the World's Largest Iron Mine near Knob Lake, Labrador. This railroad, the Quebec North Shore and Labrador Line, runs for 357 miles through Quebec wilds. On-the-job photograph (above) shows large load of gravel being hauled to cement mixers. Coleman equipped GMC trucks had the necessary 4-wheel drive power to travel this terrain—hauling capacity loads of all kinds of materials — wherever needed.

With a Coleman Front Drive Axle, the front wheels of your truck become pulling wheels. You can haul capacity loads on soft ground and up steeper grades under all conditions.

If you have a job where standard trucks might bog down and stall, contact your nearest Coleman distributor today.



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TRUCK WELDING & EQUIP. CO.  
737-739 Ninth Avenue North  
Seattle, Washington

THE WINTER WEISS CO. OF NEW MEXICO, 6130 North Second Street, Albuquerque, New Mexico

Books reviewed in this section are made available by J. W. Stacey, Inc., retailers of technical books (stores at San Francisco and Denver). You may obtain a copy of any book reviewed this month by sending an order to J. W. Stacey, Inc., c/o Western Construction, 609 Mission St., San Francisco 5, California. C.O.D. orders will be accepted.

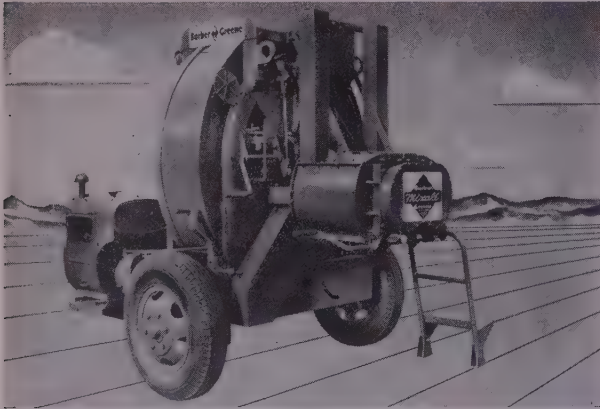
# NEW EQUIPMENT

More information on any of the items in this section may be obtained by using coupon on page 117.

731

## Patching and small job paving are right up this machine's alley

Here is an important step in the field of road and street maintenance equipment. **Barber-Greene Co.** is announcing its highly portable "Mixall," a one-unit dryer-mixer combination for patching breaks and failures in both asphalt and

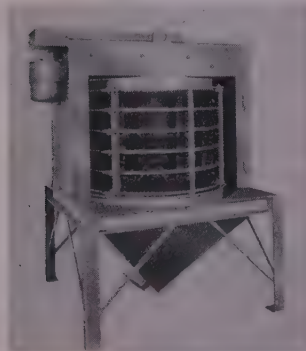


concrete roads. The new unit provides on-the-spot production of the same type hot bituminous mix used in highway construction. The unit is mounted on a sturdy, two-wheel pneumatic-tired chassis, with an adjustable towing hitch to accommodate trucks of varying sizes, and it is designed expressly for towing at normal truck speeds. When the machine is at the job site, it can be operated without unhitching, or it can be detached from the truck and set in a level position through use of a hydraulic jack-leg support built into the towing hitch. The machine has been thoroughly tested in the field with excellent results.

732

## Unit offers separation of wet or dry materials from 4 mesh and finer

Products that were previously difficult to screen can now be utilized in many cases with the aid of this V Screen high capacity unit produced by **Nordberg Manufacturing Co.**



Screening of difficult materials is said to be much easier when this Nordberg Manufacturing Co. unit is placed on the job.

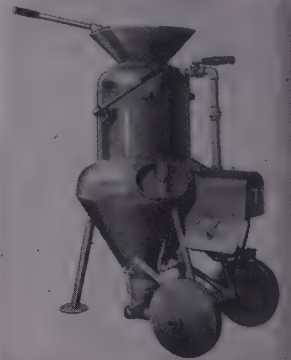
Operating by centrifugal action and gyratory movement, the new screen can considerably increase existing capacities of some materials. Since the screen is used in circuit with other equipment, however, its capacity depends on factors other

than the screen itself. The "Symons" V Screen requires little floor space and is easily installed. Vertical design has its advantages, along with perfectly enclosed construction to assure dustless operation with an easily removable cover to permit access to screen. At present the screen is obtainable in the 3-ft. high, 12 ft. in circumference size, which offers 36 sq. ft. of screening surface.

733

## With this machine you can shoot your materials into place

A wide variety of materials can be handled by this Blastcrete machine. Cement, sand, light weight aggregates, refractories, light gravels and other sandy or granular or pow-



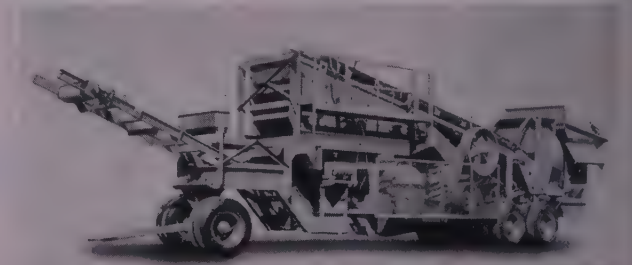
Here is a view of Blastcrete Equipment Co.'s new machine which will handle a wide variety of materials.

dery materials. The operator has complete control of air pressure and material volume and all adjustments can be regulated while the machine is in operation. Efficient design of the agitating and material metering mechanisms means that a very small amount of air is required for adjustments, so smaller capacity air compressors can be used. All wearing parts have been reduced to a minimum, thereby cutting maintenance costs. Blastcrete Equipment Co. offers the machine in three sizes.

734

## Portable crushing, screening plant gets increased capacity—meets weight limits

This latest addition to **Universal Engineering Corp.**'s 880 Gravelmaster Series features a 10-in. x 36-in. roller bearing jaw crusher, 30-in. diameter by 22-in. face star gear roller



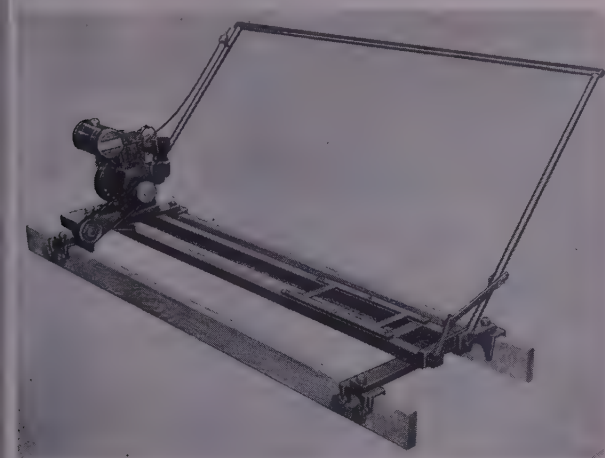
bearing crusher, and a 4-ft. x 10-ft. 2½-in. deck inclined gyrating screen. The plant is driven by a single 115-125 hp. power unit mounted on the plant, or by a separate side drive

through a universal joint connection from separate truck mounted power. The 880 Senior "R" can be fed by shovel, truck or dragline direct from pit to hopper or with optional 30-deg. swivel feed conveyor.

735

### Screeding machine model offers convenient telescopic frame

With the new telescopic frame designed for this screeding machine, the versatility is increased considerably. This model, RS-11, will screed slabs as narrow as 3 ft., and expand to screed slabs 15 ft. wide. The heavy-duty model 52-15 ad-



justs for slabs from 6 ft. to over 20 ft. wide. More powerful engines give these machines finer performance, and by mounting engines at the end of the machines instead of in the center, sag of screed sticks is eliminated. Attachments are available for overhead screeding. The machines, manufactured by Whiteman Manufacturing Co., are adaptable to slab floors, walks, driveways, narrow winding roads, bridges and many other construction applications.

736

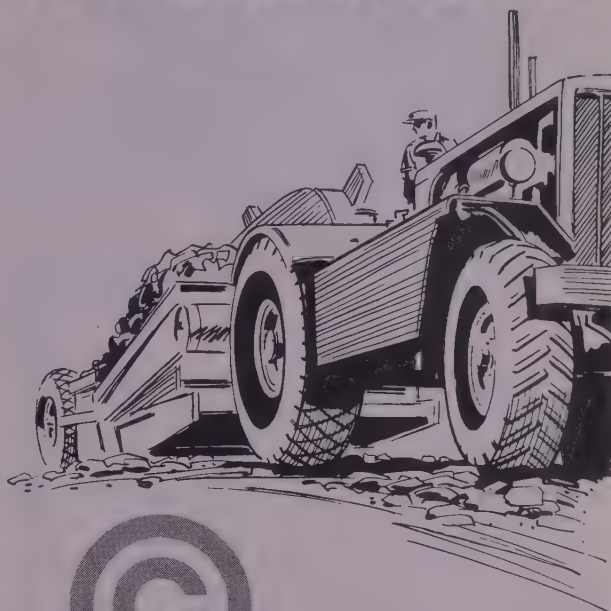
### Latest Hydra-Lift for mounting on any truck 1½ tons or larger

Two advantages of this new model are: (1) a big increase in the unit's safety margin and (2) the fact that it now is shipped almost completely pre-assembled, cutting the time and cost of installation. Those familiar with the previous



model Hydra-Lift know it requires but 40 in. behind the cab of a truck, has a loadline capacity of 6,400 lb., and a swinging boom which telescopes from 12 to 17 to 22 ft. Rated capacities of the Hydra-Lift are based on the tipping factor of a 1½-ton truck, with outriggers down, and thus have not been increased. The wider safety margin means less strain is placed on the crane when any given load is picked up. This, in turn, means less maintenance trouble and longer crane

# NOW- FEWER OVERHAULS



## **RICHFIELD** "CIRCLE C" MOTOR OIL KEEPS TOUGH JOBS MOVING

When it comes to keeping your heavy duty trucks and tractors free from engine-wearing, power-wasting deposits, the sure answer is RICHFIELD "Circle C" Motor Oil. You get better performance, longer periods between overhauls, longer-lasting equipment.

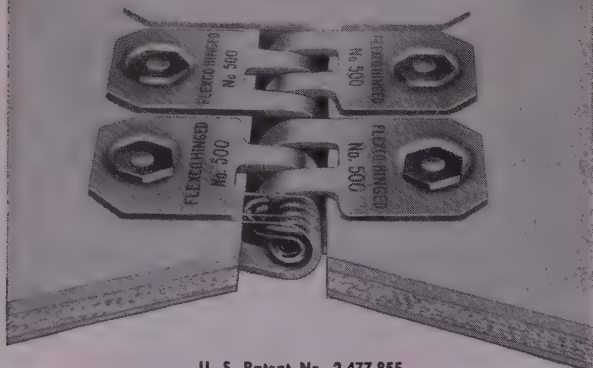
"Circle C" contains extra amounts of new-type additives that reduce harmful deposits caused by the high sulphur content of Western Diesel fuels. Keeps pistons, rings and valve stems cleaner... Actual performance has established "Circle C" at a quality level above average heavy duty motor oils. It is equally effective for gasoline engine service under extreme operating conditions.

Your local RICHFIELD Agent can supply you with "Circle C" and help you with all your lubrication and fuel requirements... RICHFIELD Oil Corporation, 555 South Flower Street, Los Angeles 17, Calif.



## **IF IT'S RICHFIELD IT'S RIGHT**

... the new separable  
**FLEXCO HINGED  
 BELT FASTENERS**



U. S. Patent No. 2,477,855

- ✓ For joining grader, trencher, ditcher and other earth moving conveyor belts.
- ✓ For belts  $\frac{3}{8}$ " to  $\frac{1}{2}$ " thick.
- ✓ A FLEXCO fastener that is HINGED. Has removable hinge pin.
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- ✓ Strong, durable . . . pull or tension is distributed uniformly across joint.

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life. Other changes which provide a new look and improved operation in Model B are the addition of a bail bar on the topping cable and replacement of the old hammerhead boom-tip casting with a new casting of swivel design. It is assumed that this improved Hydra-Lift will provide an even more valuable piece of equipment for paving contractors, general contractors, pipeline contractors, etc. The Pitman Manufacturing Co. is the manufacturer.

737

**Conveyor draws hydraulic power  
 from McCormick tractors**

The Con-Vay-It 12-30, mounted on the McCormick Cub or Super A tractor, is more versatile than previous models,



but it is not altered except in the mounting and application of hydraulic power from the tractor instead of from air-

*Kelley and Meyer Co.*  
 at  
 YOUNGSTOWN, OHIO



**"We Have HOPKINS UNITS  
 On All 4 Asphalt Plants,**

*Have Had Excellent Results With Them!"*

Does your plant need an efficient, low cost burning system? Let Kelley & Meyer give you the buy-word: This company converted its first three plants to Hopkins . . . from high-pressure to low-pressure equipment. The result: Says Mr. R. P. Shorts, President—"It's proven more economical . . . has given us good performance. The service is good, and we've had no trouble at all mechanically." When the company

added a fourth plant (on New Jersey Turnpike) . . . "we installed the Hopkins unit instead of the mechanical-type burner offered as original equipment with the new plant."

Here's added proof that Hopkins is your best bet for increased production, greater efficiency, and lower fuel cost. Complete details and descriptive literature are yours for the asking. Just phone, wire, or drop us a line today.

**HOPKINS VOLCANIC SPECIALTIES, INC.**  
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ooled engines and electric motors. The new model is being  
sed to handle wet concrete mortar, bricks, concrete blocks,  
mber, etc. Cleats are omitted to permit easy cleaning. The  
esign and construction method means friction is reduced  
a minimum and segregation is prevented. Rubber, wood  
plastic scrapers replace the steel scrapers which caused  
cessive wear on the belt and the lacing. This conveyor  
eeps the entire mixture together at the point of discharge.  
he model will move wet concrete at the rate of 1 to 3 cu. yd.  
er minute varying with the slump and the elevation of the  
onveyor. It is primarily engineered to handle wet concrete  
nd mortar, and the design features take this into considera-  
on. American Conveyor Co. is the manufacturer.

738

## Two new "Cat" scrapers aid abilities of DW10 tractor

To help the user match his rig more closely with the job  
requirements Caterpillar Tractor Co. is offering two new  
scrapers for the DW10 tractor. No. 10 (top photo) is some-  
what lighter than before with a capacity of 7 cu. yd. struck



and 9 cu. yd. heaped. Where pusher is more important, there  
is the Cat No. 15 scraper (bottom photo) with a capacity  
of 10 cu. yd. struck and 13 cu. yd. heaped. Top extensions  
(sideboards) may be attached to either scraper where the  
material does not exceed a weight of 2,800 lb./cu. yd. No. 10  
totals 15,440 lb. with a carrying capacity of 11.5 tons. Shipping  
weight for the No. 15 is 17,850 lb., and a 17-ton maximum  
carrying capacity.



**Fisher**

## NEW SINGLE LOOP METAL DETECTOR

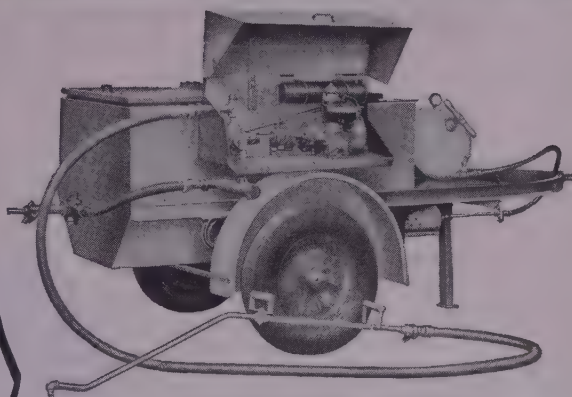
### LOCATE:

- Covered Manholes
- Survey or Property Markers
- Pavement Covered Valves
- Metal Beams and Plumbing Behind Walls
- Concealed Electric Cables
- Buried Metal Objects
- Weight only 7 lbs.

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## CONSIDER THE LENGTH OF SERVICE



## LITTLEFORD 84 HD Kettle for MAINTENANCE



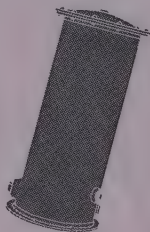
When purchasing an item for a particular job, we  
all want to get value for our dollar. Something that  
is the best, will last long and give service. The same  
is true when buying a Kettle for Road Maintenance  
work, value is what City, State & County Highway  
Departments and Contractors are looking for. This  
Littleford 84-HD Kettle is an item that gives value  
for every dollar invested. The 84-HD gives years of  
service without spending additional money in repairs.  
Many 84-HD Kettles have been in service for 20 years  
or better. That's why Littleford can say "consider  
the length of service" when buying a Kettle. Patented  
Features have made the 84-HD the low cost operating  
unit in addition to its sturdy, efficient, and long life.  
Why purchase anything but the best in Black-Top  
Maintenance Equipment, invest your dollar wisely  
and get a Littleford 84-HD Kettle.

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EDWARD R. BACON COMPANY.....San Francisco 10, Calif.  
SHRIVER MACHINERY COMPANY.....Phoenix, Arizona  
SMITH BOOTH USHER COMPANY.....Los Angeles, Calif.  
YUKON EQUIPMENT COMPANY.....Seattle, Washington  
FEENAUGHTY MACHINERY CO.....Portland 3, Oregon, Seattle 4, Washington  
Spokane 2, Washington, Boise, Idaho  
HALL-PERRY MACHINERY CO.....Butte, Montana  
LUND MACHINERY CO.....Salt Lake City, Utah

*who else protects you  
with this kind of a*  
**WARRANTY?**

Many a manufacturer will guarantee his own products and replace them if they are defective. But the makers of Winslow Filters and Elements go further than that. Their written warranty guarantees not only the quality of Winslow products but also the safety of your equipment when these products are properly used on it. For this *extra* protection, look first and only to Winslow!



**WINSLOW  
FILTERS**

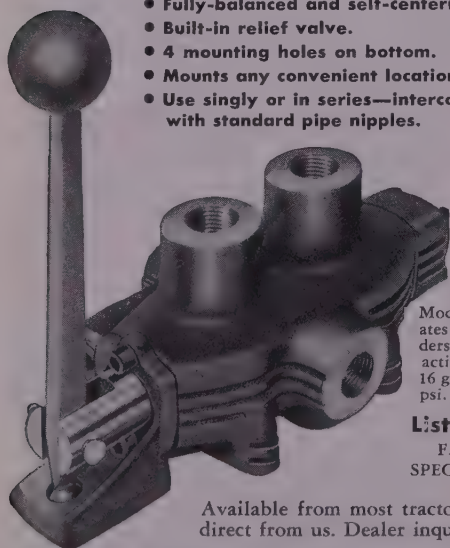
**Winslow Engineering Company**

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**GRE-SEN HYDRAULIC CONTROL VALVES  
FOR CONSTRUCTION EQUIPMENT**

Ideal for operating bulldozers, scrapers, front-end loaders, landlevelers, and other hydraulically-controlled rigs. Low in cost, yet you get these top-value features:

- Smooth, positive, easy control.
- Fully-balanced and self-centering.
- Built-in relief valve.
- 4 mounting holes on bottom.
- Mounts any convenient location.
- Use singly or in series—interconnect with standard pipe nipples.



Model 400 (shown) operates double acting cylinders; Model 300, single acting cylinders. Capacity 16 gpm.; pressures to 1250 psi.

**List . . . \$20.25**  
F.O.B. OAKLAND  
SPECIAL O.E.M. PRICES

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SPECIALISTS IN FLUID POWER SYSTEMS

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1855 Industrial Street, Los Angeles 21, Calif. . . . .TRinity 9667

739

**Stable wheel base important feature  
of this new rear-dump wagon**

Four-wheel air brakes on this TR200 Motor Wagon make it possible to back the unit over the edge of a fill with complete safety. An obstruction-free body interior on the hydraulically operated rear dump wagon, plus a 70-deg. tilting



angle assure the complete and easy discharge of all types of materials. The bottom of the body is of the double type construction, housing oak plank fillers to absorb landing shock. High tensile steel is used for added strength and wearing quality. The unit is equipped with 21.00 x 25.24 ply Rock Lug tires. Top speed is 22 mph. at a governed engine speed of 1,800 rpm. The T200 two-wheeled rubber-tired tractor that powers the wagon is the same tractor used with the TS200 Motor Scraper. It is available with a choice of diesel engines. One is a Cummins with 165 hp., and the other a Buda with 176 hp. Both are six cylinder engines. Scraper and wagon units are interchangeable. LaPlant-Choate Manufacturing Co., Inc., is the manufacturer.

**White Heating Kettles  
Have Fire-Proof Tops**

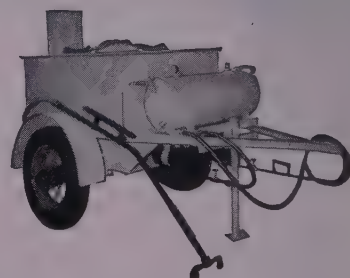
Cut-back and highly inflammable road repair material can be heated safely in White kettles. FIRE-PROOF top reduces fire hazard.

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

740

### Concrete ceilings ground by "Giraffe" without scaffolding

When this "Giraffe" grinding device goes to work for you there is no need for face masks, hand-rubbing stones, horses, plankings, decking or scaffolds, etc. The "Giraffe" is fully adjustable (see photograph) and various stones are available



to suit different grinding needs. The machine will remove fins, ribs and board marks on the concrete as well as nails used to secure light boxes, hangers and the like to formwork before pouring. A 3/4-hp. Mall motor operates on 110-volt AC or DC power and, turning at 3,450 rpm., is connected to the grinding head through a 7-ft. flexible shaft. As in all Mall motor units a 3-conductor wire is supplied to properly ground the motor. The device is adjustable for heights from 7 to 9 ft. and a twist of the turnbuckle changes pressure for various jobs. Only 28 in. wide it will pass through doorways in existing buildings for modernization and renovation work. It's easily moved from floor to floor since total weight is only 148 lb. Concrete Grinding Corp. is the manufacturer

741

### One man can now drill holes in green concrete

Using an electric or pneumatic hammer equipped with the Thunder-Twist Carbide Drill Bit, one man can for the first time drill holes in green concrete.



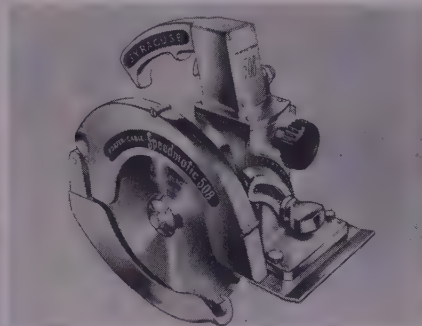
The bit, manufactured by New England Carbide Tool Co., Inc., has two deep spiral vanes (see photograph) which speedily and easily remove dust, putting an end to packing or binding of bit. Faster drilling is also made possible in granite and other hard masonry materials. Thunder-Twist is capable of drill-

ing holes 3/16-in. to 1 1/2-in. in diameter, up to 36-in. deep. Available lengths are 3 in., 4 in., 6 in., 12 in., 18 in. and 24 in. Special diameters, shanks or extra-length bits can be furnished upon request.

742

### Saw stresses safety with kickproof clutch

When this saw is being used there is no danger of kickback since the friction or kickoff clutch makes it possible for the motor to operate while the blade stops running. This means that when the blade binds in a cut or strikes a knot there can be no kickback, no damage to



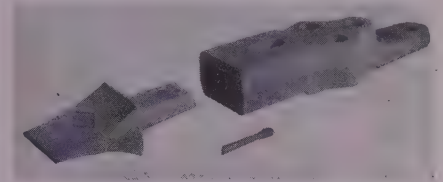
the gears and the work, and a considerable reduction in motor burn-out. These new Speedmatic saws are equipped with an instant depth adjustment which can be set accurately in a few seconds. The saw moves up and down on dovetail

ways which are precision machined to maintain accuracy of cut at any depth. There are many other safety features on this saw which is available in models to cut from 0 to 2 1/2 in., 0 to 1-27/32 in., 0 to 2 3/4 in., 1/32 to 2 in. Porter-Cable Machine Co. is the manufacturer.

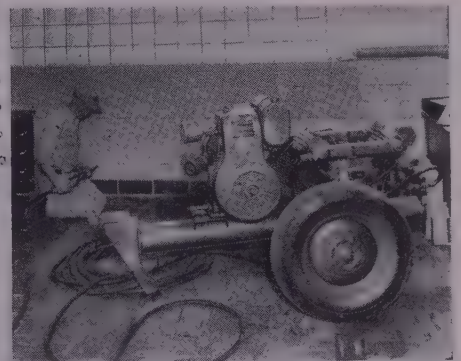
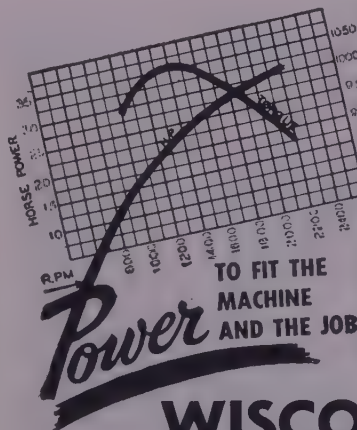
743

### Reversible, replaceable cutter for clamshell buckets

Similar in principle to the two-part tooth used so successfully in draglines and trenchers, the new tooth consists of a base which is permanently attached to the scoop, or lip, in the usual manner, and a reversible and renewable tip which fits into a slot and wedges itself into the base. Replaced in a fraction of the time required to install old style teeth, the



new unit not only reduces costly shut-down time, but further effects savings by requiring only the replacement of that portion of the tooth which wears out. Bases and cutters are available from stock for many Blaw-Knox buckets now in use and in addition blank bases (without drilling) can be applied to bucket sizes where the bolt hole patterns come



## WISCONSIN-POWERED Ingersoll-Rand Compressor

Wheeling a modern, mobile compressor to any spot it's needed is easy when it's an Ingersoll-Rand. Then doing a day's work on location is also a "sure thing" if a Wisconsin Heavy-Duty Air-Cooled Engine supplies the power.

The search for full-rated power that's dependable ends almost always with Wisconsin Engines . . . first choice everywhere, 3 to 30 hp. For example, every Wisconsin Engine crankshaft rides at both ends on tapered roller bearings, reducing the chance of bearing failure. Also, Wisconsin Engine magnetos mount on the OUTSIDE for easy servicing, but most important each magneto is equipped with an impulse coupling for quick starts in any weather. Steady running is assured, too, because of fool-proof air-cooling, summer and winter. Follow the lead of many who say, "Wisconsin Engine Power fits the machine and job." And, write today for "Power Magic" covering all 4-cycle single-cylinder, 2-cylinder and V-type 4-cylinder models, 3 to 30 hp.



### WISCONSIN MOTOR CORPORATION

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

MILWAUKEE 26, WISCONSIN

A 7034-1/4

125

## "BERG" "BERG" HI-WAY SURFACERS with the new POWER TAKE-OFF



Unmatched for grinding uneven expansion joints and all surface irregularities from concrete and asphalt highways, airports, etc. Effectively used for smooth finishing concrete bridges, culverts, ramps, and all kinds of concrete work, both wet and dry rubbing, wire brushing, sanding, channeling, and so on.

Get your free copy of the latest illustrated catalog showing the new Hi-Way Surfacers and the complete line of accessories! Learn how efficiently you can dress concrete structures with minimum effort. Send your name and address on a 2¢ post card to the address below. GET YOUR COPY TODAY!

**The Concrete Surfacing Machinery Co.**  
4665 Spring Grove Ave., Cincinnati 32, Ohio  
"Pioneers in Concrete Surfacing Machinery"  
Sold through leading equipment distributors in the 11 Western States

within a range of the base outline. The adaptability to existing buckets can readily be determined by the factory from the serial number of the bucket. Blaw-Knox Co. is the manufacturer.

744

### Popular lamp is now available in convenient portable model

Equipped with a convenient handle and a substantial pedestal base, the new portable Sturdilite weighs in at a tidy 12 lb. The lamp is right at home around heavy construction projects. Available in all voltages with a 4-ft. cord and connector. Phoenix Products Co. is the manufacturer.

745

### 4-point, carbide tipped drill steel offered

This 4-point Intra-Set steel is made in 1½- to 2¼-in. gauge sizes and in lengths up to 12 ft., with shanks to fit any hammer. As the alloy drill steel and carbide bit are of one-piece construction, there are no attachments to lose, bind or strip. In the field, the 4-point steel drills faster and further, offers longer life and leaves a neat round hole for follow-up work. Rock Bit Sales & Service Co. is the manufacturer.

746

### Short-dimension feature added to International trucks

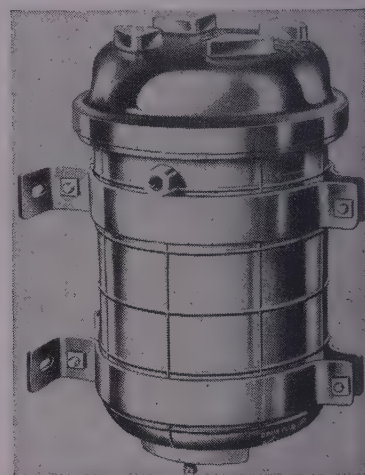
The advantages of a conventional truck with the added short dimension

feature which will permit the truck tractor to haul 35-ft. semi-trailers in states where there is a 45-ft. length limit are obvious. To answer the need for such a design, International Harvester Co. has developed a 102-in. from bumper-to-back-of-cab dimension available on International truck models ranging from model L-185 to the six-wheel model F-210. The new dimension represents a 6-in. reduction. The change was made without destroying driver comfort, visibility or space within the cab. The "102 Space Saver" seems to be a sensible solution for contractors operating in the 20 states which have a 45-ft. length limit.

747

### Oil filter developed for long, economical service

The manufacturer of this new oil filter guarantees that it will (1) neutralize destructive crankcase acids that form from oxidation of mineral lubricating oil and



from combustion of fuel containing sulfur; (2) remove dirt, metallic particles, abrasives and other foreign substances in engine lubricating oil which cause wear on cylinder walls, rings and bearings; (3) prevent excessive dilution; and (4) vaporize water condensation, the cause of metal corrosion and sludge. The unit is encased in a reinforced die-cast housing. It may be transferred from one engine to a similar one. Its handmade, densely packed element often lasts up to 60,000 mi. without the need of a change, but can easily be replaced when necessary. The unit is made in capacities of 3 qt. to 16 gal., and up to 75 gal. for industrial applications. Oilpure Refiner Sales Co. is the manufacturer.

748

### Paint spray gun works right from original containers

This air-operated, double-action, reciprocating pump is designed for easier handling of paints and materials. It can be used as a portable sprayer with the Sta-Level hand truck, and it is easily operated by one man. Large rubber-tired wheels roll over rough areas smoothly—or for stationary operation, the truck simply disengages from the trunnion arms—no bolts or pins to remove or lose. The separate air-operated, dual-

## "COMMERCIAL" STEEL TUNNEL SUPPORTS



## To build for permanency use COMMERCIAL STEEL SUPPORTS

For permanent stability in any kind of ground, you'll find COMMERCIAL Tunnel Supports are stronger and last longer . . . Your future tunnel projects will benefit materially—both in lower cost and faster schedules with COMMERCIAL supports . . . These easy to install supports are available in every size and radii for every job . . . Details upon request.

**THE COMMERCIAL SHEARING AND STAMPING CO.**  
YOUNGSTOWN 1, OHIO

bladed agitator keeps the materials perfectly mixed — independent of paint pump operation. A 10-gal. lined container is provided for special mixing. Gray Company, Inc. is the manufacturer.

749

### Economical safe steering aid for construction equipment

This is a fully automatic, compressed air-operated Power Steer Booster to provide easier, safe steering for trucks, tractors, Moto-cranes, etc. The device



can be adjusted by the operator at the steering panel to give desired amount of steering assist for any load, condition of road, speed or any combination of these variables. The compact, self-contained, lightweight Power Steer Booster is constructed mainly of anodized aluminum, and power comes from compressed air. One end of Booster is fastened to a stationary member of the vehicle. The other end of the accessory is attached to a movable part of the steering linkage (pitman arm, drag link, tie rod, etc.). Only one air line is needed. The device requires no oiling, and can't jam or freeze. Maintenance cost is low because there are no reservoirs to fill, no expensive pumps to replace and no fluid to leak away. Air-O-Matic Power Steer Corp. is the manufacturer.

750

### Series of storage batteries for stationary applications

Exide Type PLX is the name given a new series of two-cell and three-cell batteries manufactured by The Electric Storage Battery Co. The batteries are in



transparent poly-styrene plastic cases designed to show at a glance the level of the electrolyte and the approximate state of charge. Markings on the transparent case indicate the recommended high and low electrolytic levels. Built into each outer cell is a chamber in which a red, a white and blue ball float in electrolyte (see picture) when the battery is fully charged. When the battery is 10% discharged the blue ball sinks. When it is 1/3 discharged the white ball sinks, and when 2/3 discharged the red ball goes down.

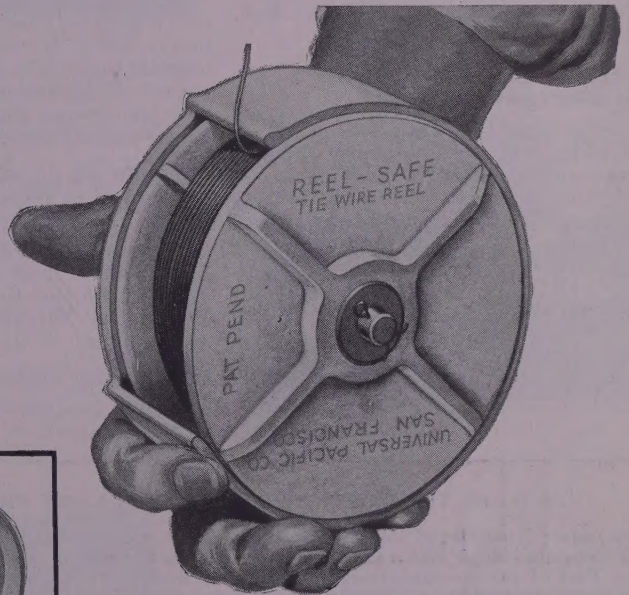
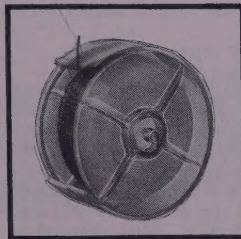
751

### Portable electric drills go to work on any material

These 1/4-in. capacity drills are available with pistol grip, spade handle and center contour handle design in free drilling speeds of 600, 800, 1,000, 1,750, 2,500 3,500 or 5,000 rpm. This selection is deemed sufficient to solve all types of installation problems, such as installing electrical outlets, and fixtures, heating systems and other drilling jobs in metal, wood, plastic or combination materials. Weight varies from 3 1/2 to 4 lb. for operating freedom, and lightweight aluminum construction is coupled with balanced armatures and precision matched gears to reduce tiring vibrations. All



three models feature universal type AC-DC motors and can be had for either 115 or 230 volt, 25 to 60 cycle current. They can be operated up to 200 ft. from their power source with extension cords. Price \$46.00 F. O. B. Chicago. Mall Tool Co. is the manufacturer.



## CAL-TIE WIRE in the Safe Dispenser

In concrete reinforcement tying jobs, CAL-TIE in the safe dispenser steps-up work and brings down costs. It's a sound *safety* measure too, for CAL-TIE wire in a Universal Pacific Reel-Safe leaves no loose pieces underfoot. And the savings in wire will surprise you.

Get complete information on CAL-TIE in the handy pack that hangs on the belt...it keeps CAL-TIE always in reach yet always out of the way. Write the office nearest you.

THE CALIFORNIA WIRE CLOTH CORPORATION, OAKLAND  
THE COLORADO FUEL AND IRON CORPORATION, DENVER

# CAL-TIE WIRE

THE COLORADO FUEL AND IRON CORPORATION



# NEWS *of*

## DISTRIBUTORS AND FACTORY BRANCHES

### AED moves offices in Chi

New headquarters are announced by the Associated Equipment Distributors who are moving executive office, Construction Equipment Facilities, and AED group Insurance Trust Fund offices to a new location at 30 East Cedar St., Chicago, Ill.

### Nichols becomes Horn Co.'s field sales supervisor

A. C. Horn Co., Inc., subsidiary of Sun Chemical Corp., announces the appointment of Norman D. Nichols as field sales supervisor. A graduate civil engineer, Nichols has specialized in the production of concrete and concrete products for industrial and home use.

### Trackson sales mgr. moves to "Cat" position

John G. Montag, export sales manager of Trackson Company, now a wholly-owned subsidiary of Caterpillar Tractor Co., moves into a new post with "Cat"

as export divisional manager. His immediate responsibility will be the integration of Trackson orders and shipments into Caterpillar operation.

### Worthington district changes

H. W. King, formerly manager of the San Francisco District office of Worthington Corp., is now regional manager of West Coast sales for the firm. He succeeds J. P. McArthur, who moves into a new position as manager of the firm's Philadelphia District sales office.

### Motorola sets up parts department in West

John Jipp heads Motorola's new parts department at 811 South B Street, San Mateo, Calif. Jipp was formerly sales manager of the Communications and Electronics Division's Southwestern states region.

### Worthington supervisor

Walter D. Johnson is now Western Regional supervisor of the sale of weld-

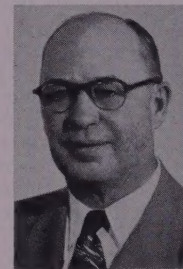
ing positioners and industrial mixers for Worthington Corporation. He will headquarter in Worthington's San Francisco, Calif., offices.

### Republic Supply merges two facilities in Calif.

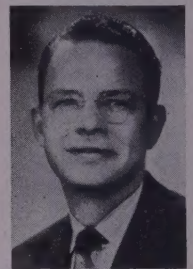
To provide better service to residents of California's San Jose and Santa Clara Valley areas, the Republic Supply Co. of Calif. has absorbed the San Jose branch of the firm into the newly completed Northern Division headquarters at San Leandro. Personnel were transferred to the San Leandro site to continue to accommodate their customers.

### Foulger adds to sales staff

Joseph Parmley, former vice president in charge of purchasing for Utah Fuel Co., is now on the sales staff of Foulger Equipment Co. Jack Holland, sales manager of Foulger, announced Parmley's appointment and pointed out that the executive will bring a vast knowledge of the area to his new position.



Parmley



Kramm

### Traylor announces Kramm appointment

Douglas J. Kramm is the new district sales manager in charge of the Western District for Traylor Engineering & Mfg. Co. Kramm comes to his new post from the position of sales engineer with Allis-Chalmers Manufacturing Co. His headquarters will be at 55 New Montgomery St., San Francisco, Calif.

### Johnson joins Bucyrus-Erie

Donald K. Johnson is now with Bucyrus-Erie Co. at the firm's Spokane, Wash., office. Johnson is returning from a tour of duty with the Corps of Engineers in Germany.

### Fort leaves Caterpillar

J. H. Fort, for 18 years a member of Caterpillar Tractor Co.'s sales department, is retiring from the firm. He had served as a special and district representative in the West for the firm. Upon his retirement, Fort will vacation and then join Preco, Inc., of Los Angeles, Calif. as a special Western area sales representative.

### Hensley Equipment Co. opens Salt Lake branch

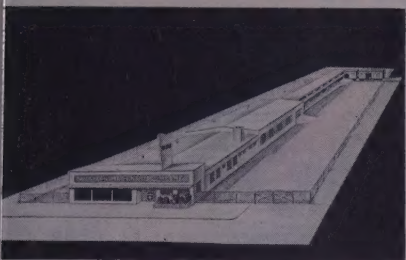
A new branch of Hensley Equipment Co. opened in Salt Lake City, Utah, May 1. The store, to be known as the "Intermountain branch," is located at 150 East 39th So. Street. W. D. Startup will manage the new store. He was formerly in the firm's Southern California branch.

### DEALERS TURN OUT TO AID "FARM-IN-A-DAY PROJECT"

Since water from Grand Coulee Dam now can be used to irrigate 1,000,000 ac. of arid Columbia River Basin lands, farmers are encouraged to settle and develop the area. Part of the encouragement consisted of building a \$75,000 farm—complete with house, buildings, irrigation, etc.—during a 24-hr. period which began May 29th. Retailers and producers of many products combined efforts on the simple design (plywood and concrete slab), which permits construction all at once or in stages, depending upon time and money. Among those represented at the event was Skilsaw, Inc. Below, Hank Linder (left), of Skilsaw, shakes hands with W. C. Bell, managing director of the Western Retail Lumbermen's Association. Bell is congratulating Linder on the job performed by Skil tools in the construction of the house. The mobile, trailer-generator Skil Radial Saw handled all the heavy sawing on the project and was in use continuously for 17½ hr.



## TEMCO TO OPEN SALT LAKE PLANT



Artist's conception of the new Western Machinery Co. building at 2300 S. Main St., Salt Lake City, Utah. Building sits on 3½-c. tract.

## Huber Mfg. appoints new F. distributor

Coast Equipment Co., San Francisco, Calif., is a new distributor for Huber Manufacturing Co.'s complete line of Huber road maintenance equipment. The Coast Equipment Co., 444 Eighth St., directs sales and service activities in about 50 counties in central and northern California.

## Death claims Fitzgerald of Loggers & Contractors Mach.

Alfred G. Fitzgerald, 60, manager of the Klamath Falls and Eugene, Ore. branches of Loggers & Contractors Machinery Co., died in Eugene May 28 of cerebral hemorrhage. Fitzgerald was well known in the construction machinery field. He began with Warren Construction Co. at Pendleton, Ore., and later worked for Caterpillar Tractor Co.

and Allis-Chalmers Mfg. Co. as a district representative in the Northwest.

## Allis-Chalmers changes in two Western branches

Changes in personnel affecting the Oakland, Calif., and Pocatello, Idaho, branches of Allis-Chalmers Manufacturing Co. are announced. Both branches supervise sales of industrial as well as



Schierman

Reichard

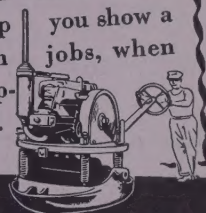
agricultural products of the firm's tractor division. G. W. Schierman transfers from Pocatello to Oakland to succeed L. W. Davis, who becomes Pacific Coast territory manager. A. D. Reichard, as sales manager at the Omaha branch, becomes branch manager at Pocatello.

## Independent Pneumatic Tool shifts branch managers

M. A. Sorenson, former manager of Independent Pneumatic Tool Co.'s Salt Lake City, Utah, branch, transfers to Philadelphia. R. J. Horrocks, former service engineer at Salt Lake, becomes manager, replacing Sorenson.

## HOW TO CUT THE COSTS OF SOIL COMPACTING

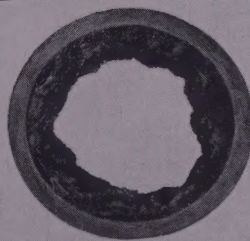
Send for our bulletins describing the Vibro-Plus Terrapac Soil Compactor. The Terrapac combines great compacting ability, deep penetration, excellent maneuverability—with light weight and low cost. They'll save time and money in operation and maintenance. They'll help you show a profit on jobs, when other equipment can't.



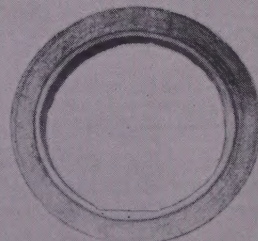
**VIBRO-PLUS**  
PRODUCTS, INC.  
54-11 Queens Blvd., Woodside, L. I.

## REHABILITATE YOUR OLD PIPE LINE AT MUCH LESS THAN THE COST OF A NEW LINE

Without appreciably disturbing present service... you can get new pipe line performance from old cast iron or steel pipe line. Line that pipe to give a new, continuous, smooth-surface. Ask PIPE LININGS, INC. to use the patented processes that apply cement mortar lining quickly to pipe line interiors... with only momentary interruption to install sectional by-pass lines. You can do it at much less than the cost of installing a new pipe line. Write TODAY! Tate process used on Line 4" to 16". Centriline Process used on Line 16" to 144". Consult our hydraulic engineers... they are at your service.



BEFORE



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## CEMENT MORTAR LINING WILL...

- Protect against discoloration and contamination
- Protect against corrosion
- Improve flow coefficients
- Prevent leakage
- Reduce maintenance costs
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## PIPE LININGS, Inc.

A subsidiary of  
American Pipe and Construction Co.  
4675 Firestone Blvd.  
South Gate, California

(In the East—CENTRILINE CORP.,  
140 Cedar St., New York 6, N.Y.)

PIPE LININGS INC.  
4675 Firestone Blvd., South Gate, Calif.  
Please send complete information on how we can obtain new pipe line performance from our old line.

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609 Mission Street  
San Francisco 5, Calif.

### Superintendent Building Department

Wanted to head Building Department of City of Burbank in Los Angeles County, Calif. Salary \$683 month. 5 years administration experience in charge of building project is requisite. Full information may be secured from

PERSONNEL BOARD  
CITY HALL, BURBANK, CALIFORNIA

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**CIVIL ENGINEER**—graduate, 32, 2 1/2 years experience surveying, design, and responsible charge of construction of domestic and irrigation water works, 5 years with Air Force. Desires position with contractor, builder, or consultant. Available September. Write or wire BOX 73, WESTERN CONSTRUCTION, 609 Mission Street, San Francisco 5, California.

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GOOD CONDITION. GOOD RUBBER.

**HEIDRICK BROTHERS**

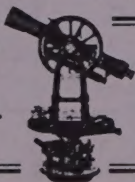
Woodland, Calif. Phone 2-5983

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PORTLAND 4, ORE., AT 3598



## EQUIPMENT FOR SALE

### 1—BUCYRUS-ERIE SCRAPER

Model 250B—27 1/2 cu. yd.  
Used on only one job—perfect condition

### 1—WD9 RUBBER TIRE TRACTOR

1800 x 26 tires—weighted wheels

### 1—TAMPO PNEUMATIC TIRE ROLLER

The above combination used on only one job. Excellent condition.

### 1—40 V PIONEER CRUSHING PLANT

Recently overhauled—good condition  
10 x 36 crusher—40 x 22 rolls  
UD24 Power Unit

### 1—SEAMAN BITUMINOUS MIXER

Ser. #72-133-44—Used very little

### 1—TD18 INTERNATIONAL TRACTOR

(Ser. #TDRM7179) with LeTourneau Power Control Unit—Excellent condition

### 1—CLEAVER-BROOKS PORTABLE CAR HEATER (3 car capacity)

Model DS-3-1  
Mounted on 2-wheel trailer—750 x 20 tires

### 1—BITUMINOUS DISTRIBUTOR

Etnyre Black Topper—Full circulating bar  
LeRoi Engine—1250 gallon tank

### 1—BUCKEYE 12' SPREADER BOX

### 1—CATERPILLAR MODEL 12 MOTOR GRADER

Serial #9K-7210—Good condition

*This equipment can be purchased on "Rental-Purchase" plan.*

## GRANT CONSTRUCTION COMPANY

P. O. Box 351

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Phone—Hayden Lake 4121

## FOR SALE

### Standard 3,000 Pound Reconditioned Asphalt Plant

REASONABLY PRICED — AVAILABLE IMMEDIATELY — (SUBJECT TO PRIOR SALE)

Box 71, Western Construction, 609 Mission Street, San Francisco 5, Calif.

## FOR SALE

1 Practically new 318 cu. in. GMC truck motor. Fully equipped, ready to run. Has Clark 5-speed transmission, Model No. 204V344. New list price for complete unit, \$1738.00. Our price \$895.00. Would make a good donkey or loader.

### JACK SWANK PONTIAC

HILLSBORO, OREGON

Phone Hillsboro 6061

### MUST SELL — CASH TALKS!

INSLEY BACKHOE, 1/2 cu. yd. with 30 ft. crane boom. KOEHRING SHOVEL, 1/2 cu. yd. shovel front, backhoe, 45-ft. crane boom and dragline bucket. HD-5G-A.C. TRACTO SHOVEL, with capacity bucket and Carco winch. HYDRAULIC SCRAPER, 4-5 cu. yd. with pump and fittings. CONCRETE MIXER, Quickmix 6-s with power skip.

*All this equipment needs is a job.*

**DON AKINS, INC.**

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## STOP that WATER

With FORMULA NO. 640. A clear liquid which penetrates 1' or more into concrete, brick, stucco, etc., seals—holds 125 lbs. per sq. ft. hydrostatic pressure. Cuts costs: Applies quickly—no mixing—no cleanup—no furring—no membranes. Write for technical data—free sample. Haynes Products Co., Omaha, Neb.

## FOR SALE

Blaw-Knox Batch Plant #PB100, modified for batching and mixing lightweight and normal concrete.  
2 Compartment bins of 22 cu. yd. ea.  
2 Compartment bins of 11 cu. yd. ea.  
4 Air operated gates.  
1—2 1/2 cu. yd. volume batcher.  
1—2 1/2 cu. yd. weigh batcher.  
2—4 1/2 cu. yd. Smith Mixers.  
1—Agitating hopper.  
2—400 bbls. cement storage tanks.  
1—RR car hopper and screw.  
1—Cement elevator.  
1—Automatic cement weigh scale.  
1—69' lift belt conveyor 225' long.  
6—Air operated aggregate gates.  
1—Hot water heating unit complete.  
Price \$32,000.00.

### ALSO

Blaw-Knox Batch Plant model P-4120—120 ton capacity with 3—30 ton aggregate compartments.  
1—165 bbls. cement compartment.  
Cement and aggregate hoppers with bucket type elevators.  
2 cu. yd. batch scales for cement and aggregate.  
Price \$10,000.00.  
Both of the above machines are in very good condition, used one year.

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