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JANUARY 1953

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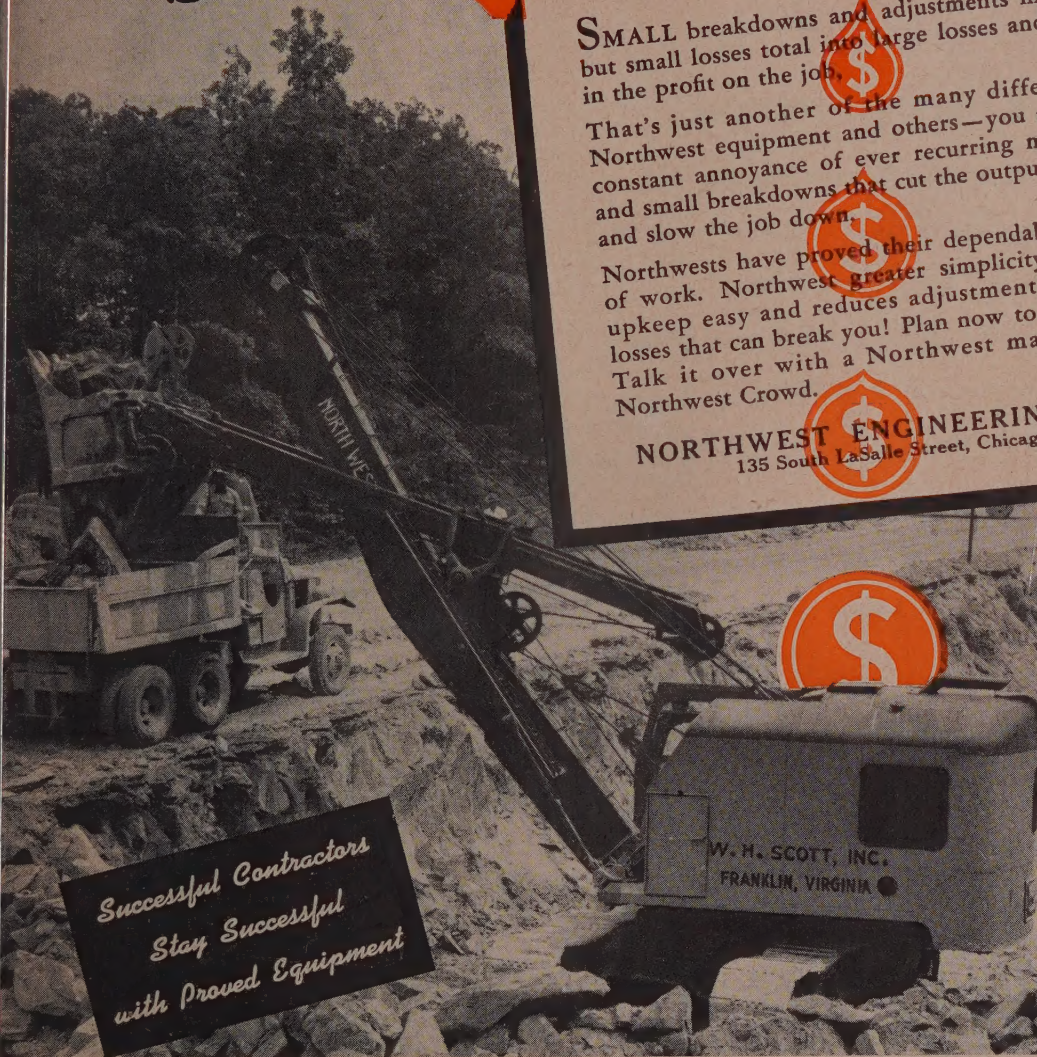
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WESTERN

CONSTRUCTION

Volume 28

JANUARY 1953

Number 1

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Editorial Director
JAMES I. BALLARD

Assistant Editor
Ralph Whitaker, Jr.

Managing Editor
John J. Timmer

Editorial Assistants
M. A. Carroll
June A. Siringer



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Please address all communications to
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District Offices

NEW YORK OFFICE
Richard J. Murphy, Eastern Manager
107-51 131st Street
Richmond Hill 19, New York
Telephone Jamaica 9-2651

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Telephone WEbster 8-8512

PACIFIC NORTHWEST
Arthur J. Urbain, District Manager
609 Mission St., San Francisco 5, Calif.
Telephone YUkon 2-4343



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1953—

A \$4,000,000,000 year for the West?

A \$4,000,000,000 construction volume for the West in 1953 is a good bet. This would top the record year of 1951 for engineering construction (excludes private residential) for the eleven Western states and Alaska. The increase over last year could be as much as 10%, or considerably higher than the national average. And in the coming years the relentless pressure from population growth in the West insures an expanding construction volume for this region.

During 1952 the contract totals reflected a conflict between pressure and restraint. Need for essential facilities here in the West, from highways to schools, resulted in demands that jobs be started, and Governmental control over critical materials provided a constant brake. In addition to the actual restriction on steel, there was a strong psychological effect of uncertainty hanging over the industry that resulted in placing many projects in the backlog status. Essential projects relating to the defense effort and urgent power development, however, provided the counter-effect that kept the total awards for 1952 from dropping far below the peak of 1951.

Restrictions on construction materials had a peculiar effect on many projects, because of the key position of a few tons of steel in the design plans. Municipal work was particularly hard hit by this shortage which tended to move the projects out of 1952 into the current year. Hydraulic projects planned for starts in 1952 were officially limited by the steel restriction to those where power could be delivered in a minimum of time. In all, the slump in the volume chart for 1952 represents, deferred work that will be ready for this season or the next.

As to the outlook for 1953 the entire atmosphere is changed. The

lid has been lifted on all types of construction. In the building field this removal of material restrictions will provide a big psychological lift for the start of commercial structures and schools where the pressure has been extreme. Highway construction will set a new peak, limited only by funds available, and if some of the plans for state bond issues are implemented in current legislative sessions, the rise in this classification may be spectacular. Alaska will have its biggest year. With a new and more friendly climate for private power the demand will put plans in action.

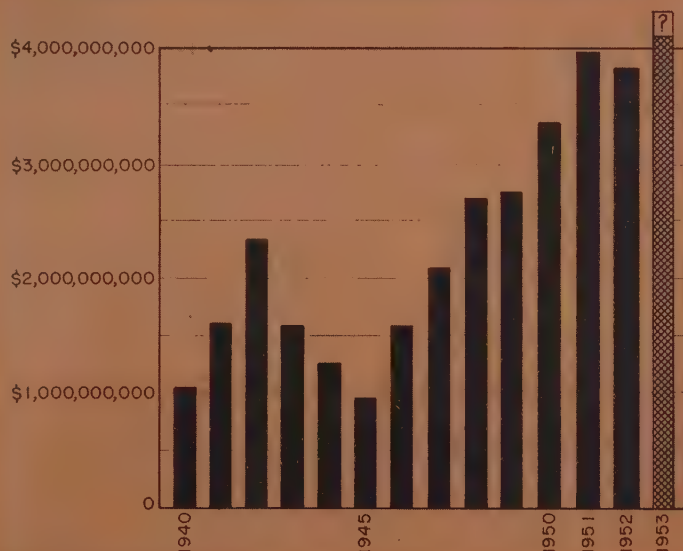
A look at the long-range prospect leads directly to the potency of population growth as a construction stimulant. Students of population trends refer to the West's continued absorption of new thousands as the

greatest migration in history. Ever since 1942, when civilian construction was first curtailed at the start of World War II, a decade of arrears has been accumulating.

In the meantime the West has become industrial—authorities say that potentially it is the industrial center of the Nation—and new construction demands are pyramided on the old familiar ones. Power demands have started a new and larger cycle of hydro and steam plants. Patterns of towns and transportation have changed. More water conservation, more concern over the flood menace and more need for the balancing effect of irrigated agriculture are some results from this industrial growth.

Thus the decade from 1942 to 1952 saw civilian construction curtailed, as compared to the population pressure. The rest of the 1950's will represent the years when the construction industry of the West will be required to work hard on this backlog of demand.

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WASHINGTON—COLUMBIA EQUIPMENT COMPANY.....Seattle

JANUARY 1953

Federal spending in the West is mostly military, as— **Corps of Engineers has a busy year**

THE CIVIL and military programs of the Corps of Engineers for fiscal 1953 total over two billion dollars. Civil work comes to more than \$560,000,000 and military work to \$1,785,500,000.

Of the civil works program, some \$184,000,000, or 33%, is for Western work. Of the military program, about \$360,000,000, or 20%, is definitely slated for Western defense projects. Thus, Western expenditures during this fiscal year by the Corps of Engineers total at least \$540,000,000 in new work, plus continued expenditures under earlier programs.

Disposition of military funds is largely unavailable for publication. Much of it is classified; some is in-

completely programmed. Even beyond a significant amount undoubtedly ticketed for overseas bases, there will be some of this unknown total applied to Western bases. Coupled with known totals for the West and Alaska, it is bound to boost the 20% cited above to an even higher figure.

Of the \$360,000,000 in Western military money that has been identified with particular regions, \$140,000,000 is to be poured into Alaska. An additional \$100,000,000, remaining from earlier budgets, also is scheduled for expenditure this year in Alaska. Therefore, it is appropriate that this review of current and upcoming Corps of Engineers work begin there.

ALASKA—187 jobs to contract by April

ALASKA LEADS the parade of Western districts of the U. S. Corps of Engineers in 1953. Exceeding any previous year, the construction program there comes to \$240,000,000, largely to be placed under contract during the next four months. By far the greatest portion of this money, if not all of it, is tied up in defense construction; the Corps' civil works functions in Alaska are presently very few. The rough allocation of funds for Alaskan work is shown in the following table:

U. S. Army.....	\$ 71,000,000
Alaskan Air Command..	67,600,000
Alaska Communication System	1,500,000
Available from earlier programs	100,000,000
Total for current proposed construction....	\$240,100,000

Most of the Alaskan work, being for defense purposes, is construction for Army and Air Force bases. The role of the Corps of Engineers in both cases is its usual one, that of supervising design and construction for the

two military branches. In calling for bids and in awarding contracts during the coming year, the Corps will hew to an orderly schedule conceived in the interests of appropriate economy, priority, and coordination of engineering management.

Jobs of every size

An index to the volume of work planned for what was once derided as "Seward's ice box" (Seward was the Secretary of State in 1867 who negotiated purchase of Alaska for the U. S. when the territory and its resources were unknown and virtually inaccessible), is gained from the number of contracts involved. About 130 have been completed in the past four years, about 100 are now in progress, and the new year will see over 200 awarded.

The big boys of construction definitely have their place in Alaskan defense construction, as may be seen from brief note of a few typical jobs presently under way: outside utilities and railroad construction, \$7,400,000 total, Morrison-Knudsen Co., Inc.; family quarters, \$5,500,000, Boen-Sea-

land of Seattle; composite housing, \$5,800,000, Haddock Engineers of Oceanside, Calif.; and a heating and power plant, \$4,100,000, Valle-Sommers of Seattle.

However, not all work is ladled out in jobs of this magnitude. Smaller contracts include: a theater, \$476,600, J. B. Warrack of Seattle; and a telephone exchange, \$264,000, Braund and Wright of Anchorage.

Change orders to be held down

By way of familiarizing Engineer personnel in Alaska with the accelerated schedules they are about to undertake, Col. L. H. Foote, the district engineer, called a conference in the latter part of November and sketched the situation. The responsibility for meeting contract requirements was emphasized at that time, and at least one "recommended practice" was put forth as a partial solution to the delays that might otherwise accrue.

"Changes on the original plans and specifications of construction are often unavoidable," Foote said, "but there are many requested changes



PERMAFROST is located by borings in suspected areas. It is then thawed, often by steam lines as shown at this Fairbanks job, and completely excavated. Backfill is selected granular material, not frost susceptible.

which are not necessary. These unnecessary changes are to be strenuously resisted under the new program. There simply will not be any time to consider matters beyond essentials."

Another problem in connection with the new program, one that cannot be solved merely by resolution and engineering skill of Alaska District personnel, is getting responsible bidders for the work as it comes up. The contractors, large and small, who have been working in Alaska during recent years have gained considerable experience in the working conditions there. And other contractors are prone to feel that competition with these "entrenched" firms is useless. Such is not the case, as has been emphasized by the governmental awarding agencies responsible for the work. The Corps of Engineers, in particular, has published a periodic prospectus describing not only upcoming work, but also the labor, material, housing, weather, and other conditions that exist in Alaska. Most recently, Col. Foote last month made personal visits to the contracting centers of the Pacific Coast, augmenting the information contained in the Alaska prospectus and answering many questions. For example, a San Francisco questioner was told by Col. Foote that Anchorage weather is about like that at Missoula, Montana, and Fairbanks weather about like that at Havre, Montana.

The various construction and other trades are represented in Alaska as elsewhere, many of them having locals headquartered in Alaskan cities and towns as well as in Seattle. Likewise, the Associated General Contractors organization has established a chapter with offices in Anchorage. Thus, it has been possible for a characteristically Alaskan pattern of wage scales to develop, and negotiations for the coming year are presently under way. Full information can therefore be obtained by interested individuals

and contracting firms before bidding Alaskan work.

Construction materials

Materials availability has been spurred to new adequacy by the Corps of Engineers. Concrete for military construction near Anchorage and Fairbanks is furnished by the government in ready-mix form, with delivery details stated in contract specifications. On jobs where concrete supply rests with the contractor, the

component materials are obtainable in the usual way. Cement storage by commercial handlers comes to about 75,000 bbl., and aggregates may usually be had near a given job site.

Other building materials, parts, and supplies are available through the usual commercial channels, though commercial representation in Alaska is somewhat limited in view of the large construction volume.

Where it is necessary to import equipment and material from the States, service is maintained by water, air, railroad, and highway. Principal sea connections are at Seward and Valdez. Air travel pioneered Alaska in recent decades and, as a result, almost any locality is accessible in that manner. International airports are located at Anchorage and Fairbanks, and large airlines number additional cities among their regular scheduled points of call.

Most of the work in Alaska falls along the Alaska Railroad at various points. Materials brought into the territory by other means may conveniently be distributed and delivered by rail.

Finally, highways have been extended and improved, and they now offer new convenience to construction contractors as well as territorial residents. Most of the primary roads are surfaced with crushed stone and are constantly maintained. Principal routes, such as those connecting Valdez, Anchorage, and Fairbanks, are

Alaska construction, by base and general type

U. S. ARMY CONSTRUCTION

Big Delta—Family housing, troop housing, ammunition, liquid fuel, open, closed, and cold storage, community, operational, research and development and test facilities, training buildings and utilities.....	\$ 5,109,000
Eielson Air Force Base, Fairbanks—Administrative, operational and maintenance facilities, ammunition storage and utilities.....	2,969,000
Kenai—Family housing, operational, maintenance, community and waterfront facilities, liquid fuel storage, training building and utilities.....	3,907,000
Ladd Air Force Base, Fairbanks—Family housing, administrative and maintenance facilities, ammunition storage and utilities.....	4,737,000
Fort Richardson, Anchorage—Family housing, troop housing, administrative, operational and maintenance facilities, open, covered, ammunition and cold storage, and utilities.....	20,257,000
Whittier—Family housing, troop housing, administrative, operational and maintenance facilities and utilities.....	2,847,000

U. S. AIR FORCE CONSTRUCTION

Eielson Air Force Base, Fairbanks—Airfield pavements, liquid-fuel storage and dispensing facilities, communications facilities, aircraft maintenance facilities, administrative and community facilities, and utilities....	14,479,000
Elmendorf Air Force Base, Anchorage—Airfield pavements, liquid-fuel storage and dispensing facilities, communications facilities, administrative and community facilities, and utilities.....	31,325,000
Galena Air Force Auxiliary Field—Utilities.....	130,000
Ladd Air Force Base, Fairbanks—Airfield pavements, liquid-fuel storage and dispensing facilities, communications facilities, operational facilities, utilities, medical facilities, and storage facilities.....	14,865,000
Naknek Air Force Auxiliary Field, Naknek—Liquid-fuel storage and dispensing facilities, communications and navigational aids facilities, operational facilities, utilities, and storage facilities.....	3,914,000
Various locations—Communications facilities, administrative and community facilities, and utilities.....	880,000

Here are the ten biggest jobs coming up

Location	Item	Estimated Cost	Bid opening date	Contract days
1. Elmendorf AFB	heat power plant	\$9,100,000	26 Mar.	900
2. Elmendorf AFB	apron parking	8,415,000	27 Mar.	555
3. Elmendorf AFB	utilities	6,139,000	?	?
4. Elmendorf AFB	family housing	5,733,000	29 Feb.	660
5. Whittier Port	utilities	4,649,000	26 Feb.	510
6. Elmendorf AFB	utilities	4,212,000	?	570
7. Ladd AFB	outside utilities	4,115,000	?	?
8. Eielson AFB	outside utilities	3,932,000	?	?
9. Whittier Port	family quarters	2,896,000	26 Feb.	510
10. Ladd AFB	family housing	2,872,000	16 Feb.	660

now paved over much of their length. The Alaska Highway, connecting to the States, is open the year around, and contract freighters travel this route constantly.

Heavy equipment has been accumulated by the Corps of Engineers in Alaska and is still available for rental this year to contractors on various types of agreement. Rates are based on those of the Pacific Northwest, with upward adjustment for transportation and handling costs. In subsequent years contractors will furnish their own equipment in entirety.

Construction camps are located at the four main centers of Alaska District work—Elmendorf, Ladd, and Eielson Air Force bases, and at Whittier. These camps are commercially operated for the government, with job specifications usually requiring contractors' personnel to utilize them when available. Mess halls are included in the camps, and their menus include air-freighted fresh foods from outside the territory.

Bid calls are advertised in the conventional manner, with additional early notices going out to firms that

have indicated an interest in Alaska work. It is necessary only to advise the Alaska District Engineer in order to receive these notices. Plans and specifications for construction work are obtainable both at the Alaska District Office in Anchorage and at the district's branch office in Seattle.

Lump sum contracts

Contracts are usually of the lump sum type, with specifications for their performance divided into four parts. The first is a brief description of the job, the second incorporates the general provisions common to government contracts for construction. The third part covers details of beginning and completing the work, inspection, payments, drawings, etc. The fourth part includes all technical provisions for the specific job.

In addition to construction contracts, the Alaska District administers contracts for surveying, material supply, architect-engineer services, housing, etc. All these are awarded by competitive bidding procedures.

The Alaska District is a part of the North Pacific Division of the Corps of Engineers. Col. E. C. Itschner is division engineer, and Col. L. H. Foote is district engineer.

THE NORTHWEST—Columbia River work dominates

Though combined with Alaska as an administrative division of the Corps of Engineers, the Pacific Northwest differs emphatically in character and thereby calls for entirely separate treatment. Whereas military construction accounts for most of the Corps activity in the northern territory, civil works continues to be the major area of expenditure in the states of Washington, Oregon, and Idaho. Here, the civil works program of the Corps comes to about \$132,000,000 in work yet to be awarded during the present fiscal year, ending in June of 1953. On the other hand, accountable military construction totals only about \$46,509,000 for the entire fiscal year. The general nature and location of this latter work is given in an accompanying table.

Civil works progress

A round-up of progress during 1952 and an indication of the scope of 1953 operations on major multi-purpose projects in the Northwest follows, complementing an itemized presentation also on these pages. The table shows current fiscal appropriations for the work, all lying in the Columbia River basin and making that basin the biggest such area of improvement (in dollars) presently administered by the Corps. Of the remaining contracts to be awarded, \$100,000,000 will be supervised by the Portland District, \$28,000,000 by the Seattle District, and about \$3,500,000 by the Walla Walla District.

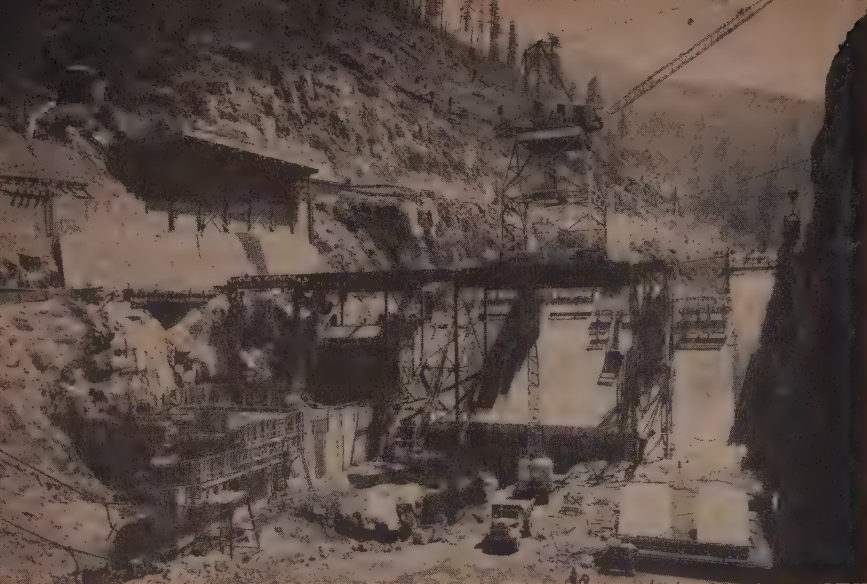
Lookout Point Dam, a unit of the comprehensive plan for the Willamette River Basin, is located on the middle fork 22 mi. southeast of Eugene, Oregon. The project consists of an earth-and-gravel fill dam, concrete gravity spillway section with integral outlets, a powerhouse, and a reregulating dam with power facilities 3 mi. downstream. The power installation will be 114,000 kw. at Lookout Point and 15,000 kw. at Dexter reregulating dam.

All planning for major features of the project has been completed. Contracts have been awarded for all ma-

lating dam with power facilities 3 mi. downstream. The power installation will be 114,000 kw. at Lookout Point and 15,000 kw. at Dexter reregulating dam.

CHIEF JOSEPH DAM will represent over \$200,000,000 in federal expenditure upon completion. Construction progress was about 25% in mid-October, date of this picture showing second stage cofferdam closure around spillway area.





BIG CLIFF DAM on the North Santiam River in Oregon will provide reregulation for Detroit Dam 3 mi. upstream. Under way for 1½ yr., the \$6,500,000 prime contract is held by a joint venture of Guy F. Atkinson Co. and Ostrander Construction Co.

for construction. The project is 64% complete as of January 1, 1953, and with funds available in fiscal year 1953 the entire project will be 69% complete. The physical construction of Dexter reregulating dam has not been started although contracts have been awarded for the manufacture of a turbine and a generator, and for clearing a portion of the reservoir area. Bids will be taken on February 24 for construction of the dam and powerhouse.

Detroit Dam

Detroit Dam, also in the Willamette Basin, is located on the North Santiam River 45 mi. southeast of Salem, Oregon. Its companion unit, Big Cliff, is a reregulating dam 2.5 mi. downstream from Detroit. The project consists of a concrete gravity dam and powerhouse with two 50,000-kw. generating units at the Detroit site and a concrete gravity type dam and powerhouse with one 18,000-kw. generating unit at Big Cliff.

At the end of fiscal year 1952 the engineering planning and design was about 93% complete. As of January 1, 1953 progress is estimated at 81%, and with funds available through June 30, it will be about 92%.

Power from the first unit at Detroit powerhouse is scheduled to be on the line in June 1953.

The Dalles Dam

The Dalles Dam is located on the Columbia River between Oregon and Washington about 3 mi. upstream from The Dalles, Oregon, and 193 mi. above the Columbia's mouth. The project includes power plant with fourteen 78,000-kw. units installed initially, substructure for eight additional powerhouse units, a single-lift barge lock, three gravity non-over-flow sections, a gravity overflow gated

spillway, rockfill closure dam across the main river channel, and fish passage facilities.

Construction was started in February 1952. As of January 1953, it is

estimated that the project is about 3% complete and, with the funds available through June 1953, will advance to 7% of completion.

The present status for construction features now under way and the estimated status on the basis of funds available through June 30, are as follows:

A contract for the powerhouse excavation and cofferdam was awarded in February 1952 and work is actively under way. Scheduled for completion by August 15, 1953, it is about 57% complete and will be about 92% complete by June 30, end of the fiscal year.

Construction of the powerhouse substructure for units 1 to 14 will follow a bid opening scheduled for April 1, and work will be about 5% complete by the end of the year.

A contract for construction of the spillway dam, including excavation for the tailrace and approach channels, was awarded last October. Construction is about 1% complete, and it is estimated that by June 30, this contract will be approximately 17% complete.

Power from the first two units of The Dalles Dam is scheduled to be on the line in November 1957, and successive units are scheduled to be placed on the line at 3-month inter-

Northwest construction, by base and general type

U. S. ARMY CONSTRUCTION

Oregon:

Umatilla Ordnance Depot, Ordnance—Ammunition facilities.....\$ 750,000

Washington:

Auburn General Depot, Auburn—Shop, warehouse and office building..... 1,480,000

Camp Hanford—Igloos and rehabilitation of buildings..... 485,000

Fort Lewis—Repair shop, storage building and gas station..... 272,000

Madigan Army Hospital, Tacoma—Heating plant, laboratory and X-ray building..... 274,000

Mount Rainier Ordnance Depot, Tacoma—Repair shop..... 900,000

Pasco Engineer Depot, Pasco—Maintenance shop..... 640,000

U. S. AIR FORCE CONSTRUCTION

Oregon:

Portland International Airport, Portland—Airfield pavements, liquid-fuel storage and dispensing facilities, aircraft maintenance facilities, utilities, and storage facilities.....\$ 973,000

Idaho:

Mountain Home Air Force Base, Mountain Home—Airfield pavements, liquid-fuel storage and dispensing facilities, communications and navigational aids facilities, operational facilities, aircraft maintenance facilities, utilities, land acquisition, and medical facilities..... 12,568,000

Washington:

Fairchild Air Force Base, Spokane—Liquid-fuel storage and dispensing facilities, operational facilities, aircraft maintenance facilities, training facilities, administrative and community facilities, utilities, land acquisition, and storage facilities..... 9,421,000

Geiger Field, Spokane—Operational facilities, aircraft maintenance facilities, utilities, and storage facilities..... 744,000

Larson Air Force Base, Moses Lake—Airfield pavements, liquid-fuel storage and dispensing facilities, navigational aids facilities, operational facilities, aircraft maintenance facilities, utilities, medical facilities, and storage facilities..... 10,866,000

McChord Air Force Base, Tacoma—Airfield pavements, navigational aids facilities, operational facilities, aircraft maintenance facilities, administrative and community facilities, utilities, and storage facilities..... 5,885,000

Paine Field, Everett—Operational facilities, utilities, and storage facilities..... 1,251,000

vals. All 14 units are scheduled to be in operation by November 1960. Fish facilities and the navigation lock must be essentially complete and in operation before power can be generated.

McNary Dam is located on the Columbia River 292 mi. above the river's mouth. The project, which is 3 mi. east of Umatilla, Oregon, consists of a dam; power plant; navigation lock; a system of levees to protect the cities of Pasco, Kennewick and Richland; and fish passage facilities.

Construction was started in 1947. The entire project is now 66% complete and will be 77% complete on June 30.

The first two 70,000-kw. power units are scheduled to go on the line in December 1953 with other units following at three-month intervals. Four power units will be in place by the end of fiscal 1954.

Chief Joseph Dam

Chief Joseph Dam is a multiple-purpose project on the Columbia River in Washington. Located near the town of Bridgeport, Washington, it is about 51 mi. downstream from Coulee Dam. The project provides for a straight concrete gravity overflow dam, a powerhouse and intake structure of sufficient capacity to utilize future upstream storage. The powerhouse will have 16 units installed initially and a substructure for four additional units. All power units will be 64,000-kw. capacity, with a total initial installed capacity of 1,024,000 kw. Although the primary purpose of the project is hydroelectric power, incidental benefits will accrue through the use of the reservoir for slackwater navigation in the pool. Also under study, by the Bureau of Reclamation, are possibilities for irrigation service to about 15,000 acres by gravity diversion from the reservoir.

Construction was started in June 1949 and the project is about 26% complete with the expectation that by the end of the present fiscal year the figure will be 30%. The power-

Corps of Engineers, 1953 Northwest Civil Works

Lucky Peak Dam, Idaho.....	\$ 5,000,000
Detroit Dam, Oregon.....	10,350,000
Lookout Point Dam.....	16,625,000
Willamette River Basin, Oregon (bank protection)	400,000
McNary Dam, Oregon and Washington	63,000,000
Chief Joseph Dam, Washington	15,000,000
Albeni Falls Dam, Washington	7,000,000
The Dalles Dam, Oregon and Washington	20,000,000

house and intake structure contract is about 5% complete and will be about 20% complete by June 30. Supply contracts have been awarded for procurement of sixteen 100,000-hp. turbines, eight 64,000-kw. generators, main transformers for 12 units, governors for 10 turbines, 4,160-volt switchgear, station service unit substation, two 165-ton bridge cranes, intake gantry crane, 21 intake gates and minor items. These contracts are collectively 5% complete.

The first three power units will be placed on the line in September 1955 following completion of the main dam, scheduled for August of that year. One additional unit will go on the line thereafter as follows: December 1955, March 1956 and June 1956. After fiscal year 1956 units will be placed on the line at the rate of four per year until a total of 16 units is reached December 1958. The entire project is scheduled for completion in January 1959.

Albeni Falls Dam is a multiple-purpose project on the Pend Oreille River, a tributary of the Columbia River, in northern Idaho. Initial regulation of Pend Oreille Lake for downstream power generation began in June 1952. Located 2 mi. upstream

and east of the Idaho-Washington boundary, the dam consists of a gated, concrete-gravity spillway in the left (south) channel, and an intake structure and powerhouse in the right channel. The dam will develop an average head of about 22 ft. for production of power upon installation of three 14,200-kw. generating units.

Construction began in January 1951. Spillway and powerhouse cofferdams were completed in June 1952 and water impounded for downstream use. At the present time the project is approximately 50% complete, and funds available through June will bring the project to about 65% completion. In fiscal year 1954 the intake and powerhouse construction will be completed. In April 1955 the last of the three generators will be placed in operation.

Lucky Peak Dam

Lucky Peak Dam is primarily a flood-control project on the Boise River, 9 mi. southeast of the city of Boise, Idaho. It consists of an earth-fill dam 340 ft. high, 1,700 ft. long, with an outlet tunnel 23 ft. in diameter and 1,319 ft. long, and a 600-ft. ungated spillway.

Construction was started in 1949, and the project is now about 60% complete. It will be about 77% complete on June 30, 1953.

During fiscal year 1954 manufacture of the intake gates, tower machinery and manifold valves will continue, as will the completion of the intake and outlet works. Relocation of Highway 21, Arrowrock and Robie Creek roads will be completed. Reservoir area will be cleared this year.

The entire project is scheduled for completion in fiscal year 1955.

Personnel

Col. E. C. Itschner is division engineer for the North Pacific Division. District engineers at Portland, Seattle, and Walla Walla are Col. Thomas H. Lipscomb, Col. Norman A. Mathias, and Col. William H. Mills.

THE SOUTHWEST—\$139,000,000 in coming awards

In the southwestern states, military spending comes again to the fore in dollar volume of construction work supervised by the Corps of Engineers. In California, Nevada, Utah, and Arizona, military work yet to be awarded under the program for fiscal 1953 comes to over \$139,000,000, while civil work accounts for only \$45,100,000.

The latest compilation of figures for military work included some \$17,000,000 in projects to be awarded during December 1952. Thus, the accompanying table totals somewhat more than the \$139,000,000 figure cited above. This table includes practically all types of facilities for both Army and Air Force. Most of the work lies

in California, but there is some construction slated for the other states as well. It is planned that \$93,000,000 of this will go to contract in the next three months, and another \$41,300,000 between April and July. There will remain a little residual money carrying over into the next fiscal year.

Civil work is, of course, better defined as to locale of expenditure on construction. As elsewhere, it consists largely of multi-purpose project work, undertaken by the Corps primarily in the interest of flood control. It therefore centers in California's flood susceptible San Joaquin-Sacramento Valley.

Pine Flat Dam, a multiple-purpose

project on Kings River, 25 mi. east of Fresno, will be approximately 81% complete at the end of the 1953 fiscal year. It will provide flood control, irrigation and other beneficial uses, and will have provisions for future power development. The dam structure is approximately 92% complete and an estimated 2,130,000 cu. yd. of concrete will be in place when the dam is finished. Completion of the dam is scheduled for about March 15, 1953. Three contracts totaling about \$300,000 are to be advertised during the months of January, March, and May of this year. These contracts include the dolies for slide gates appurtenances, bridge and measuring

weir, and hydrologic telemetering facilities. Total cost of the project is estimated at \$47,850,000.

Folsom Dam

Folsom Dam, on the American River, 20 mi. east of Sacramento, will be 56% complete by June 1953. This project will provide much needed flood protection for the capital city of Sacramento and adjacent metropolitan area, as well as have irrigation benefits and power development. Three contracts were advertised during December 1952 with costs estimated at \$600,000. These include experimental grouting, relocation of telephone lines, and relocation construction of the Natoma feeder ditch. About a \$1,000,000 contract for clearing the reservoir area is scheduled to be advertised in February. Cost of the entire project is \$58,560,000.

Isabella Dam

Isabella Dam, another unit in the comprehensive plan for the Sacramento-San Joaquin Basin, will be completed during the 1954 fiscal year. Work on the main dam is scheduled to be completed about April 1, 1953. A contract for hydrologic telemetering facilities will be advertised in May. The total estimated cost of this project is \$21,710,000.

Farmington Dam, on Littlejohn Creek, was completed for operational purposes during the 1952 fiscal year. Two contracts are scheduled for advertising early this year. These include downstream channel clearing and the removal of floating structures in the reservoir area. Cost of these two contracts is estimated at about \$100,000. Work on the Cherry Valley Reservoir, a unit of the Tuolumne River project, is continuing under a cooperative agreement with the City and County of San Francisco and the Turlock and Modesto irrigation districts.

The Sacramento River flood control project received an appropriation of

\$1,000,000 for the 1953 fiscal year, which will bring this \$61,535,000 project to 71% of completion.

Channel improvements

Construction on the Sacramento-Yolo deep water channel, designed to make Sacramento a deep water port 100 mi. inland from the Golden Gate, is approximately 8% complete. It was initiated in the 1949 fiscal year.

The San Diego River and Mission Bay project, a program designed to provide small craft harbor facilities through cooperative efforts of the federal government and local interests will be approximately 66% complete prior to June 30, 1953. Total estimated cost of this project is \$9,820,000.

Whittier Narrows Dam

Whittier Narrows Dam on the San Gabriel River protects 60,000 acres of highly-developed land from flood. Contracts to supply the gates and operating equipment will be advertised in February of this year. Cost of this equipment will run in excess of \$1,000,000. Estimated to cost about \$36,320,000, this project will be 59% complete by June, 1953.

San Antonio Dam

San Antonio Dam is a unit of the comprehensive plan for flood control and other purposes in the Santa Ana River basin. The project is located in Los Angeles and San Bernardino counties about 30 mi. east of Los Angeles. San Antonio reservoir will have flood control storage capacity of 7,110 acre-feet and debris control storage capacity of 2,000 acre-feet. The drainage area behind the reservoir covers nearly 27 sq. mi. Federal cost of the project is estimated at \$8,351,000. Construction was initiated in April 1952 and by June 30, 1953 the project is expected to be 34% complete. It is scheduled for completion in 1955.

Two maintenance dredging contracts, estimated to cost about \$100,-

Corps of Engineers, 1953 Southwest Military Works

Item	Estimated Cost
Troop and family housing	\$14,200,000
Warehouses	21,600,000
Shops and laboratories	19,900,000
Hangers	16,700,000
Administration buildings	6,100,000
Theaters, chapels, clinics, etc.	5,300,000
Roads, streets and hardstands	5,500,000
Railroads	2,000,000
Airfield pavements (asphalt and portland cement)	29,000,000
Fuel storage and distribution	5,900,000
Utilities (water, sewers, power)	16,900,000
Air navigation aids	2,000,000
Classrooms and training facilities	4,800,000
Miscellaneous	6,300,000

Southwest Civil Works

Cherry Valley Reservoir, Calif.	\$ 2,250,000
Folsom Dam, Calif.	17,000,000
Isabella Dam, Calif.	4,000,000
Merced County stream group, Calif.	200,000
Pine Flat Dam, Calif.	8,750,000
Sacramento River, Calif.	1,000,000
Los Angeles County drainage area, Calif.	5,000,000
Whittier Narrows Dam, Calif.	5,500,000
San Antonio Dam, Calif.	1,000,000
Tucson, Ariz.	400,000
	\$45,100,000

000, will be advertised in April for work at Moss Landing and Monterey, Calif.

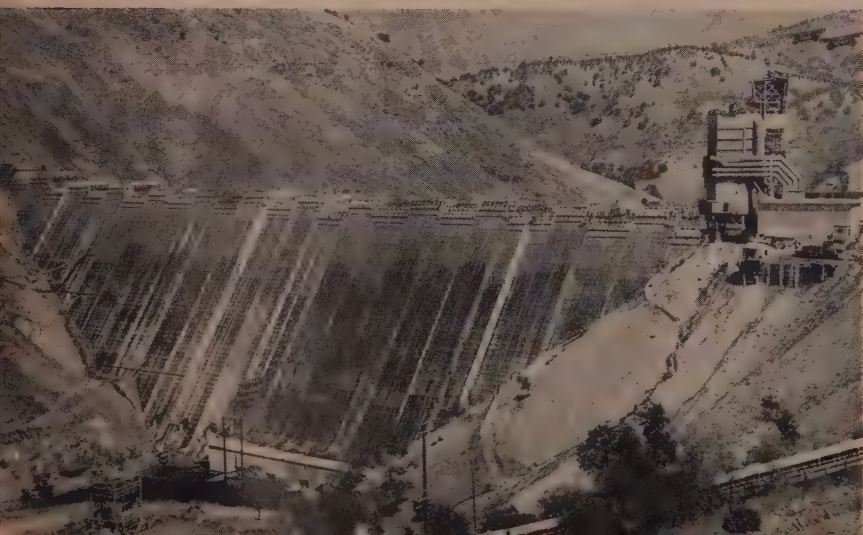
Los Angeles County

The Los Angeles County drainage area project has an estimated federal cost of \$326,087,600. This does not include Whittier Narrows Dam. Located along the Los Angeles and San Gabriel rivers, Rio Hondo, Ballona Creek, and their tributaries, the overall project encompasses three flood control dams, 17 debris basins, improvement of 49 mi. of main channels and 53 mi. of tributary channels, and reconstruction of 109 bridges.

Up to now, something over \$113,000,000 has been expended on the work, which will be about 35% complete at the end of the present fiscal year. Four contracts totaling about \$7,000,000 will be advertised in January and February 1953, furthering the work.

Work on the Merced County stream group in California provides for construction of small detention reservoirs on four creeks and con-

PINE FLAT DAM construction on California's Kings River is fast nearing an end. The dam structure is 92% complete, other works lag only slightly behind. This job was a laboratory in concrete practice now being applied at Folsom Dam.





AIRPORT PAVING constitutes the largest volume of military work handled in the Southwest by the Corps of Engineers. Pictured are operations of Ball & Simpson, H. Earl Parker, Harms Bros., and Fred J. Early at Castle Air Force Base.

struction of two diversion canals interconnecting streams. All the work lies south of the Merced River, east of the San Joaquin, and is located in an area between 5 and 20 mi. east of

the town of Merced. To date, three of the detention dams have been finished, and the overall project is considered to be about 65% complete.

Col. Donald S. Burns is division

engineer for the South Pacific Division. District engineers at San Francisco, Sacramento, and Los Angeles are Col. Henry Walsh, Col. William R. Shuler, and Col. Clarence C. Haug.

MOUNTAIN STATES—Albuquerque District busiest

The "border states" of the West, Montana, Wyoming, Colorado, and New Mexico remain as the uncovered area of activity on the part of the Corps of Engineers. There are military and air bases of long standing throughout this mountain region, and they are the locale of construction programs of various magnitudes aimed at the provision of well-built permanent facilities. However, the accelerated character of construction found farther west is not so marked here.

The civil works function of the Corps of Engineers also is not so much in evidence in these states. The character of the watersheds precludes navigation on the streams to any significant degree and also renders flood control a largely localized problem. Only at the eastern boundaries of the states, where they flatten out into the Missouri Basin, does the Corps of Engineers program touch the area in a big way.

Variety of work

Among specific military construction projects is the program for shop buildings at Pueblo Ordnance Depot, where \$6,150,000 has been assigned during the current fiscal year. Elsewhere there is, for instance, a contract for completion of bachelor officers' quarters at Ent Air Force Base in Colorado Springs. Award on this work was expected to be made prior to January 31.

Bids were taken in December for construction of cold storage facilities at Fort Warren Air Force Base at Laramie, Wyoming, and a large program of work is coming up at Lowry Air Force Base at Denver. Items there include roads, ammunition storage

facilities, runway rehabilitation, dormitories, and mess halls. These jobs will go to contract in March and will be followed in May by a contract for utilities construction.

Heavy award schedule

The Albuquerque District has a heavy load of military construction under the current program of defense. During the three fiscal years since the Korean war began, the design of \$155,000,000 worth of facilities has been authorized and \$132,000,000 of this has been authorized for construction. Already \$50,000,000 worth of construction has been completed, and \$25,000,000 more is now under construction contract. A heavy schedule of awards has been set for the first three months of 1953.

Civil work in the district includes Jemez Canyon Dam and reservoir, which is in the last phase of construction and is scheduled for completion in the latter half of 1953. The dam and spillway, under contract to Hinman Brothers Construction Co. for about \$1,500,000, is scheduled for completion in July. The Santa Ana Pueblo protection works and operators quarters are expected to be placed under contract during the first half of 1953. This \$4,460,000 project forms an important unit in the Rio Grande program, providing 73,000 acre feet of flood control storage. Jemez Dam is 780 ft. long and controls the runoff from 1,034 sq. mi. of drainage area. Allotments from fiscal 1953 appropriations for this project were \$2,144,000.

Flood control

Construction of the Rio Grande Floodway, reaching from Elephant Butte Dam in southern New Mexico

above Albuquerque to Espanola, is expected to get under way this year; however, only the initial work in the Albuquerque area can be placed under contract with the \$349,000 available this fiscal year for the Corps of Engineers' portion of the work. The Corps' portion of the \$11,785,900 project is \$3,811,500. Initial contracts will be for levee construction and protective works in the Albuquerque area. Altogether, the project encompasses about 181 mi. of 12-ft. levees.

A fiscal 1953 appropriation of \$350,000 covers Corps of Engineers work currently under way in the vicinity of Havre, Montana. Purpose of the project is local flood protection, and the first money permits award of a contract for construction in the Bull Hook unit for diverting flood flows around the city of Havre. This unit consists of two rolled-earthfill dams, one on Scott Coulee and one on Bull Hook Creek about ½ mi. south of Havre; a diversion channel connecting the coulee and creek just above the dams; and other diversion and spillway structures required for the project. The two main dams are 54 and 83 ft. high, respectively, and 1,700 and 1,815 ft. long. The diversion channel is 3,950 ft. long. The entire unit should be completed by 1955.

Another unit of the project at Havre is the Milk River unit, consisting of 14,175 ft. of 16-ft. levee along the river's right (south) bank where it flows in eastward along the north side of town.

Division engineer for the Southwestern Division is Col. Herbert D. Vogel. Col. Lynn C. Barnes is Albuquerque District Engineer, replacing Col. Charles H. McNutt in January 1953.

WESTERN HIGHWAY PROGRAMS

1953 will see faster acceleration than national average—Bond issues could provide the funds

IN THE WEST all factors point to a long range highway program that will expand and accelerate faster than the national average. Highway construction results from three well established pressures: (1) growth in population, (2) number of cars operated per unit of population and (3) dependence of a region on highways as a means of transporting passengers and freight. In each of these essentials the West put unusual emphasis on the need for highway improvement.

Western population continues to increase at several times the national average, putting corresponding pressure behind the need for expansion in

highway construction. As to the number of vehicles per unit of population, the West has grown up with the modern highway, and is accepted as the area of "two-car families." Rail transportation began to give way to highways in this Western region at a time when the East was still dependent on its extensive network of railroads. Today this entire region is dependent on its highway system, and growth of the West and highway construction will accelerate together.

Further, the growth-factors that are emphasizing the need for more highways are also creating the mounting deficiencies in existing facilities.

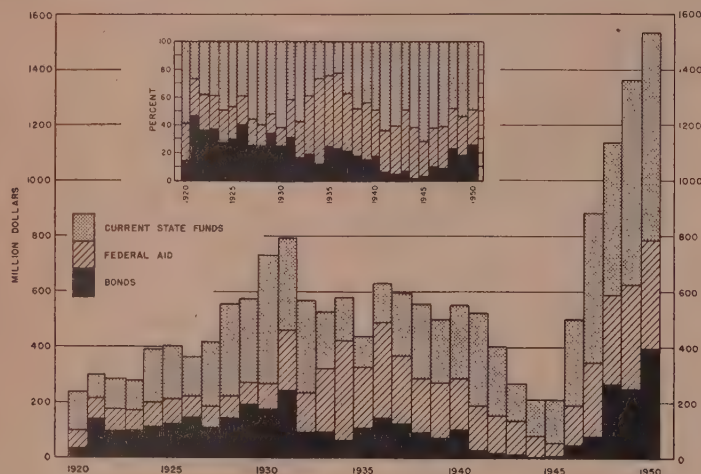
Example of deficiency

An outstanding example of highway deficiency, which is paralleled throughout the entire West, is the fact that California should spend almost \$3,500,000,000 during the next 15 years to bring its highway program up to proper standards. Compare this estimated expenditure with the existing budget for highway work and the extent of the long-range highway program of the West comes into clearer focus. Going further with this examination into increasing highway deficiency, six years ago the California Division of Highways stated that about 7,900 mi. of the system were substandard and \$1,500,000,000 would be required for this rehabilitation. Only four years later the state found that the deficient mileage had decreased to 11,300 and the cost estimate had risen to \$3,000,000,000. Such highway deficiency, when translated to all of the eleven Western states, indicates the backlog of work required to modernize existing highways. Add to this the required expansion in the systems to care for present volume of traffic and the constantly accelerating traffic paralleling population increase.

Deficiencies critical in some areas

These highway deficiencies are accentuated in any of the metropolitan areas with the classic example in Los Angeles where freeways become overloaded before they can be completed. Demand for arterial highways in any metropolitan area of the West lags behind the corresponding demand for rural improvements. Here again, the peculiar characteristic of the West in the use of private transportation accentuates the problems. Whereas large cities in the East grew up with rapid transit facilities, the automobile took over the corresponding position in mass transportation for Western metropolitan areas. People in Western cities—particularly the younger generation—refuse to accept mass transportation facilities. An example of this situation is the traffic count on the San Francisco-Oakland Bay Bridge where public transportation handles a daily load of 72,600 as compared to 131,000 in private cars; the corresponding figures are 40,000 brought into San Francisco by public transportation from the peninsular

TREND IN U. S. IS TOWARD BOND FINANCING



UPSWING in bond financing for state highway construction (national figures) is indicated for the period of 1945 to 1950, with the trend continuing. The chart shows several significant developments during the 3-decade period: (1) In the 1920s the use of bond financing was a major factor in the "out-of-the-mud" programs; (2) this form of financing dropped sharply with the depression and Federal Aid began to have an important share in the over-all program; (3) during

World War II the over-all highway expenditures dropped to a \$200,000,000 low, which was only a third of the program of the depression years, accounting for the deficiencies that the postwar upsurge cannot overtake. Since 1945 the use of bond financing has increased from 5% to 25% of total highway funds, as part of the effort to rebuild and modernize highway systems. This chart taken from "Public Roads" published by the Bureau of Public Roads.

suburbs as compared to 188,000 in private vehicles. These figures illustrate the dependence of Western municipal growth on adequate urban freeways and the refusal of people in this region to revert to mass transportation facilities.

Financing problems

Any review of highway needs in the West, both statewide and urban, runs up against the stern problem of available money as compared to mounting traffic. Many interests now urging additional highway facilities stop short of suggesting a program for the additional financing.

State legislatures meet this month and each will be faced with the problem of adding to existing highway funds. Public pressure will not allow the legislators to ignore some solution which will enable the highway departments to accelerate their present construction programs. Last year Washington and Oregon both accepted bond issue financing to step up their state highway programs. In California a \$1,000,000,000 bond issue was proposed but was not approved. The same plan or a corresponding program will be advanced at the present session. Utah is seriously considering bond issue financing. In all probability the volume of highway construction in the West may be increased faster by state bond issues than by any increase in the existing fuel taxes. Petroleum interests are inclined to hold back on any suggested increase in fuel tax and trucking interests are even more strongly opposed. The levying of a general public tax for highway construction based on the theory that the general public benefits from truck transportation on these highways represents proper theory in taxation levy but will not obtain legislative acceptance at the present time.

The trend is to bonds

There is a strong national trend toward bond financing since 1945 in making up for highway deficiencies. This form of financing increased from 1% to 25% of total highway funds during the five years from 1945 to 1950, as indicated by the accompanying chart. It is logical that this national trend will make itself felt in the West.

Up to the present time this has not been true, and the map shows how much more Eastern states have resorted to borrowing for highway needs. A similar expansion of bond financing in the West would represent a marked increase in highway construction activity for the region.

A further element in the expanding highway construction program could be the planning and carrying out of toll roads at strategic locations in the West. At present, the Boulder-Denver turnpike is the only modern toll road in this region, if bridges are expected.

THE WEST HAS LAGGED, BUT MAY MOVE FAST



THE WEST LAGS behind the Eastern states in the use of bond financing for highway purposes (combined state, county and municipal). The chart covers the years 1946-1950 and does not reflect recent bond issues in Washington and Oregon. Apparently the East has decided highway pro-

grams must be accelerated beyond pay-as-you-go financing. If this trend extends into Western states during the next few years, highway expenditures could more than double in this region. This map taken from "Public Roads" published by the Bureau of Public Roads.

Concluding the outlook for highway financing during the next few years, funds will be materially increased by any one of several means,

including higher fuel taxes and bond issues, not to mention the normal increase in use tax as vehicles and mileage mount. This will insure a corresponding rise in construction activity.

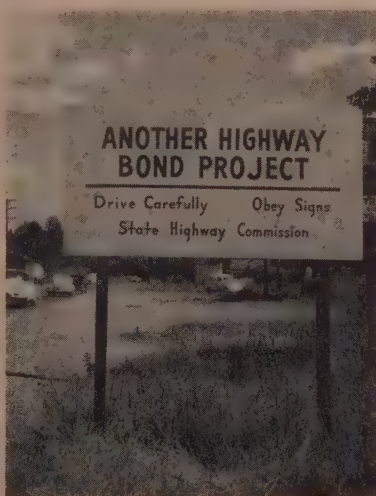
Federal funds and attitude

In November the Federal highway funds for the coming fiscal year were apportioned by the Secretary of Commerce and the allocation for Western states is presented in the accompanying table, including the present program and work to be done under the new allocation. Another table presents figures for the allocation of the Forest Highway Program for the same period.

The last official tabulation of the U. S. Bureau of Public Roads for highway mileage in the United States was based on the State highway planning survey data for 1951. These figures show that 18% of the rural mileage is in the eleven Western states, with 13½% in urban mileage. Totaling both rural and urban, the West includes 17.8% of the national total. Of the highways under Federal control 85% are found in the eleven Western states.

The Federal attitude toward the national highway program is of inter-

WASHINGTON and Oregon have both stepped up highway programs by means of bond financing. Signs like one below tell the Washington motorist where the money comes from.



est because of the change in administration. Excerpts from a statement made by President-elect Eisenhower and released by the ARBA appear in the accompanying box.

1953 STATE PROGRAMS

ARIZONA—

ARIZONA'S total 1952-53 construction budget embraces a total of almost \$31,000,000 with something over \$12,000,000 expected to be spent during the next calendar year.

The final contract to complete the initial phase of the Tucson Expressway is scheduled to be let in January. This project will consist of 1 mi. of four-lane divided highway with a traffic interchange structure at the junctions of U. S. 80 and 89 south of Tucson. Future phases of construction will consist of providing additional roadways and interchange structures for the first 5 mi. of the expressway. The 1952-53 budget provides \$600,000 for the above 1-mi. section, plus an additional \$160,000 to begin construction of an additional roadway at the north end of the expressway.

Another major item in the Tucson area is \$835,000 for three projects of about 20 mi., to complete the construction of the new high-standard Tucson-Nogales highway. A new bridge over the Santa Cruz River is under construction now about 20 mi. south of Tucson. The work between Tucson and Nogales will coincide largely with the opening of the Nogales-Mexico City highway, which is expected to take place within the next eight months.

A third major item in the Tucson area is the new alignment of U. S. 80 at Pantano, about 25 mi. east of Tucson. A sum of \$800,000 is in the budget to begin construction on this 10 mi. which will eliminate the old, narrow, dangerous section including the present Pantano Wash Bridge. Bids on this road are scheduled for early spring of 1953.

Major projects scheduled for the Phoenix area include the beginning of construction on the new Black Canyon Highway entering Phoenix from the north. This will be a four-lane divided highway with interchange structures. About \$600,000 is in the present budget to begin work this spring.

Other items scheduled for Phoenix and the Salt River Valley include \$230,000 for an interchange structure at the junction of U. S. 60-70-80-89 and East Washington Blvd. at Tempe. Also \$400,000 for another 4 mi. of widening on U. S. 60 east of Mesa and \$150,000 to extend McDowell Road through Papago Park to Scottsdale Road is also earmarked.

Other projects for 1953 include:

Globe>Show Low
Continue reconstruction..... \$600,000

Kingman-Ashfork 9 miles of widening.....	325,000
Ashfork-Williams New alignment.....	500,000
Winslow-Holbrook New alignment and widening	450,000
McNary-Eagar New alignment and paving....	475,000
Cordes Jct.-Camp Verde 8 miles new highway.....	425,000
Yuma-Phoenix 16 miles reconstruction.....	775,000
Wickenburg-Kingman Burro Ck. Bridge and 4 mi....	450,000

R. C. Perkins is State Highway Engineer of Arizona.

CALIFORNIA—

WITH \$76,114,000 allocated for major construction projects (exclusive of right-of-way) the California Highway Commission has adopted a budget of \$169,970,000 for the fiscal year from July 1953 to June 1954. The previous 1952-53 budget allocated \$72,093,000 for major construction.

Included in the highway budget are the following items:

Major construction projects, \$76,114,000; rights-of-way, \$33,921,000; maintenance, \$24,000,000; preliminary engineering, \$10,000,000; construction engineering, \$8,000,000; administration, \$5,000,000; buildings and plants, \$3,500,000; highway planning, \$1,750,000; maintenance and insurance of the San Francisco-Oakland Bay Bridge, \$1,200,000; minor improvement and betterment, \$1,000,000; and a contingency reserve of \$5,485,000.

Other non-highway functions under supervision of the commission were approved in the amounts of \$23,200,000 from the gas tax fund for major city streets administered by the cities; \$5,760,000 for Federal Aid Secondary roads, the majority of which is ap-

portioned to county roads; and \$70,000 for administration of outdoor advertising.

Geo. T. McCoy is State Highway engineer of California.

Some of the major projects are:

Humboldt County, grading and surfacing 2.9 mi. of U. S. 101 at Arcata, \$600,000. Mendocino County, grading 4.9 mi. of U. S. 101 from 4 mi. north of Forsythe Creek, \$900,000. Shasta County, grading and structures on U. S. 99, 4.2 mi., \$750,000. Siskiyou County, grading, surfacing, and structures on U. S. 99 north of Dunsmuir, \$630,000.

Butte County, base and surface on 9.6 mi. of U. S. 99E from the junction of State Route 87 to Chico Ave., \$600,000. El Dorado County, grading and structures on U. S. 50 (second construction unit of the freeway through Placerville), \$595,000. Sacramento-Placer counties, grading and structures on the freeway from Ben Ali to Roseville, a distance of 12.7 mi., \$2,200,000.

Sacramento County, for the freeway from C Street in Sacramento to U. S. 99E to connect with the North Sacramento Freeway, grading, surfacing, and structures on 2.3 mi., \$1,110,000.

Alameda County, grading, paving, and structures on 2.1 mi. of U. S. 50 easterly of Center Street to Foothill Boulevard, \$1,540,000. Also grading, paving, and structures on the Eastshore Freeway south of Asby Avenue, 3 mi., \$4,600,000. Contra Costa County, Orinda Road Interchange, grading, paving, and structures on Sign Route 24, \$1,800,000. Marin County, grading and structures, 3.9 mi., on U. S. 101 north of the Golden Gate Bridge, \$510,000.

San Francisco, viaduct and connecting ramps at intersection of Bayshore Freeway and 13th Street, \$1,015,000. Also grading, paving, and structures on Bayshore Freeway from Hester Ave. to Alemany Boulevard, 1.7 mi., \$3,350,000. San Mateo County, grading and surfacing portions of Sign Route 5 at its junction with Sign Route 1, 2.2 mi., \$950,000.

Sonoma County, for bridge across Petaluma Creek on U. S. 101, \$900,000.

Statement on Federal policy by the President-elect

PRESIDENT-ELECT Eisenhower has said:

"New roads to meet the requirements of today and the foreseeable future, instead of the era when autos were a luxury and roads were minor shipping lanes, will be the foundation for the progress ahead.

"But, the federal government must not tackle this problem in the position of a boss, directing the local governments how and when tax dollars can be spent.

"The obsolescence of the nation's highways presents an appalling problem of waste, death and danger.

"Next to the manufacture of the most modern implements of war as a guarantee of peace through strength, a network of modern roads is as necessary to defense as it is to our national economy and personal safety.

"We have fallen far behind in this task—until today there is hardly a

city of any size without almost hopeless congestion within its boundaries, and stalled traffic blocking roads leading beyond those boundaries.

"A solution can and will be found through the joint planning of the federal, state and local governments.

"In this, the national government can supply leadership to band all units of government in an efficient and honest attempt to build America into the great and prosperous nation it can become.

"More than at any time in history, modern roads are necessary to defense, and traffic is an interstate problem of concern to the federal government.

"Once a determined and honest effort is made, this crisis, too, will be solved by the ingenuity of America."

* * *

These remarks are part of a statement made by Gen. Eisenhower prior to the election. They appeared in "Local Roads" of the ARBA.

STATUS OF FEDERAL-AID HIGHWAY PROGRAM

As of September 30, 1952

ACTIVE PROGRAM

STATE	PROGRAMMED ONLY		PLANS APPROVED Construction Not Started		CONSTRUCTION UNDER WAY		Total Available for *
	Total Cost	Federal Funds	Total Cost	Federal Funds	Total Cost	Federal Funds	
Arizona	\$ 2,688,000	\$ 1,754,000	\$ 1,121,000	\$ 667,000	\$ 8,074,000	\$ 4,978,000	\$ 7,781,000
California	8,742,000	4,570,000	10,137,000	5,348,000	93,166,000	44,243,000	112,045,000
Colorado	6,424,000	3,620,000	1,931,000	1,065,000	10,329,000	5,629,000	18,684,000
Idaho	8,958,000	5,358,000	2,884,000	1,842,000	6,830,000	4,350,000	18,672,000
Montana	9,166,000	5,306,000	4,231,000	2,405,000	13,563,000	8,201,000	26,960,000
Nevada	6,938,000	5,497,000	547,000	458,000	4,726,000	3,923,000	12,211,000
New Mexico	3,177,000	2,033,000	3,450,000	2,211,000	8,832,000	5,623,000	15,459,000
Oregon	1,973,000	1,086,000	2,625,000	1,619,000	14,911,000	8,378,000	19,509,000
Utah	4,620,000	3,539,000	1,540,000	1,147,000	9,072,000	6,826,000	15,232,000
Washington	9,458,000	5,095,000	2,827,000	1,647,000	13,339,000	6,938,000	25,624,000
Wyoming	1,359,000	903,000	1,704,000	1,134,000	9,442,000	6,215,000	12,505,000
TOTAL	\$63,503,000	\$38,761,000	\$32,997,000	\$19,543,000	\$192,284,000	\$105,304,000	\$288,784,000
							\$123,018,000

* Federal funds only. Consists of 1954 fiscal year apportionments (available November 1, 1952), plus unprogrammed balances from previous fiscal years.

Monterey County, reconstruction of U. S. 101 from San Lucas to 2.5 mi. north, \$190,000. Also grading and structures on U. S. 101 in Salinas, \$635,000. San Benito County, a bridge and approaches across San Benito River on State Route 22, \$470,000. San Luis Obispo County, grading and structures on U. S. 101 for a freeway between Paso Robles and San Miguel, 6.4 mi., \$940,000. Santa Barbara County, grading and structures for a freeway on U. S. 101 from 1 mi. east of Carpinteria 3.7 mi., \$1,270,000.

Los Angeles County, grading, paving, and structures on Santa Ana Freeway-Ramona Freeway connection, \$1,335,000. Also, grading, paving, and structures on U. S. 99 north of the north city limits of Los Angeles at Newhall Junction, 2.8 mi., \$3,140,000. Grading, paving, and structures on Ramona Freeway-San Dimas Road to San Bernardino County line, 6.2 mi., \$4,100,000. Los Angeles, grading, paving, and structures on portions of Harbor Freeway, 1.2 mi., \$3,160,000. Also, structures on Los Angeles River Freeway, \$2,740,000.

Orange County, grading, paving, and structures on U. S. 101 in Tustin, 1.8 mi., \$1,610,000. Ventura County, grading, paving, and structures on U. S. 101 in Camarillo, 5.7 mi., \$1,395,000.

COLORADO—

A RECORD YEAR for highway construction in Colorado is predicted, with a program totaling in excess of \$26,000,000 by the State Highway Department. During 1952 the department placed \$24,000,000 under contract, which was a record up to the program just getting started.

Funds available for the first half year will include \$8,500,000 from state sources and about \$4,500,000 of Federal Aid. For the entire year of 1953 the state is scheduled to receive a record allocation of over \$8,900,000 in Federal funds. About \$3,000,000 of highway funds are being carried over from 1952.

An important change in the administration of the Colorado Highway

Department is the switch from calendar to fiscal year budgeting starting on July 1 of this year. During the month the commission gave preliminary consideration to a work program to cover the period until July 1, 1954, which would be the end of the first fiscal year. This program, for the first time, will be based on a priority listing of needed projects.

Mark U. Watrous is Chief Engineer of the Colorado State Highway Department.

IDAHO—

THE IDAHO Board of Highway Directors has adopted a construction program for the calendar year 1953 and an advance construction program for 1954 and 1955. The advance program is set up to expedite the work of the Department of Highways in the early preparation of surveys, plans and estimates for later construction.

For 1953 the Department of Highways has scheduled 18 new projects on the state primary system, and 12 new projects on the secondary system, estimated to cost about \$9,400,000 and \$2,900,000 respectively. In addition, four projects on the primary and 10 projects on the secondary systems which were scheduled for 1952 but deferred for right-of-way or other compelling reasons, estimated to cost \$1,400,000 and \$2,400,000 respectively, are rescheduled. About \$2,700,000 in additional construction, including \$800,000 carried over from the 1952 construction program, is scheduled on 36 county road projects on the Federal-aid Secondary System. This county road construction will be financed by Federal-aid Secondary funds and county matching funds, but will be handled under state contract.

Notwithstanding this already large allocation of Federal-aid Secondary funds to county roads, additional

sums can be made available at the counties' request, and in such amounts as they are able and willing to match on the basis of 38% county money and 62% Federal-aid.

The advance 1954 and 1955 construction program includes 29 projects on the primary system and 17 projects on the secondary system. Total estimated cost will be about \$15,000,000 and \$3,700,000 respectively. Surveys and plans and right-of-way investigations will be carried out during the 1953-1954 seasons so that construction may be contracted in 1954 and 1955. Similarly, several proposed county road projects, estimated to cost \$600,000 will probably not be ready for 1953.

E. V. Miller is State Highway Engineer of Idaho.

MONTANA—

DURING 1953 the Montana Highway Commission plans to award a total of 28 road and bridge contracts on the state primary system. Estimated cost for these projects is \$6,700,000. In addition, 25 projects will be placed under contract on the state secondary system at an estimated total cost of \$5,400,000.

Troy Carmichael is State Highway Engineer of Montana.

NEVADA—

FOR THE CALENDAR year 1953, the total expenditure for reconstruction and new construction is estimated at \$6,500,000. This will provide for the improvement of approximately 160 mi. of road, both primary and secondary. Estimated maintenance expenditures are \$2,180,000.

Contracts awarded during 1952, according to reports, totaled almost \$6,000,000, and for the first time in several years all Federal funds allocated to the state were placed under

contract. At the close of last year 17 contracts were in the active stage.

Among the important units in the Nevada highway program is the plan to widen and improve U. S. 40 from Verdi west to the state line. Negotiations are under way for relocating utility and railroad line. Another section of U. S. 40 in the Truckee River canyon east from Vista, estimated to cost \$1,500,000 is scheduled for start this season.

H. D. Mills is State Highway Engineer of Nevada.

NEW MEXICO—

NEW MEXICO'S construction program will have approximately \$2,000,000 more of construction money to spend during 1953 than during 1952. It will total approximately \$16,500,000. For the first time an allotment of Federal Aid Funds has been earmarked for construction on the Interstate Highway System in addition to the regular Federal Aid Primary allotment. Roughly, \$750,000 will be spent on the Interstate System and \$6,250,000 on the Primary Road System. As the Interstate Highway System is also part of the Primary Road system it is possible that more will be spent on the Interstate System and correspondingly less on the Primary System. In all events, \$7,250,000 will be spent on main highways in New Mexico.

The farm-to-market roads or the Federal Aid Secondary System highways will benefit to the extent of \$4,250,000 while the Urban highways will have another \$750,000.

State funds (100%) will amount to about \$4,250,000, making a total in all of \$16,500,000 available for construction projects during 1953. It is estimated that the total for 1952 will be approximately \$14,500,000.

C. O. Erwin is Chief Highway Engineer of New Mexico.

OREGON—

OREGON enters the year 1953 with \$26,500,000 of construction remaining to be performed under contracts awarded and in progress. Additional contracts to the amount of \$23,500,000 are scheduled for letting during 1953. On this program, we expect to expend during 1953 \$34,000,000, \$20,500,000 to apply on the contracts contracted prior to 1953 and \$13,500,000 on projects to be contracted during 1953.

Funds with which to meet the contemplated expenditure are to come \$8,000,000 from Federal Aid, \$7,500,000 from road-user revenues and \$18,500,000 from the sale of bonds.

The bond money to be expended in 1953 is a part of a \$40,000,000 bond authorization approved by the 1951 State Legislature to advance construction on some of the more urgent of the reconstruction projects in Oregon's \$400,000,000 "needs" program.

Contracts to be let during 1953 will

Status as of November 18, 1952 of Forest Highway Construction in Western States

Area	Projects Programmed but not under Contract— Estimated Cost	Apportionments of \$22,500,000 Authorization for Forest Highways for Fiscal Year 1954
Alaska	\$ 700,000	\$ 1,962,886
Arizona	910,000	1,278,120
California....	1,940,000	3,220,955
Colorado	510,000	1,613,827
Idaho	2,185,000	2,291,973
Montana	1,935,000	1,789,397
Nevada	600,000	403,921
New Mexico ..	1,220,000	904,800
Oregon	1,555,000	3,100,639
Utah	364,000	747,581
Washington ..	601,000	1,564,131
Wyoming	560,000	960,490
Totals.....	\$13,080,000	\$19,838,720
Apportioned to Eastern States		\$ 2,661,280

range in size between \$20,000 and \$2,000,000. The kinds of work principally involved will be grading, reinforced concrete structures, rock base construction and asphaltic concrete paving. In lesser volumes, there will be oiling, bituminous macadam, landscaping, traffic lights, guard rail, et cetera.

R. H. Baldock is State Highway Engineer of Oregon.

UTAH—

ABOUT \$9,000,000 will be expended by the Utah State Road Commission for construction and \$3,000,000 for maintenance during 1953, according to a preliminary estimate. This program will represent construction of 150 mi. of bituminous surfacing and 10 mi. of gravel road. Federal highway funds available to the state include \$2,824,000 for the primary system, \$1,868,000 for secondary roads, \$568,000 for urban highways and \$287,000 on the interstate system.

During 1952 the State Road Commission prepared a comprehensive report on the state's highway needs. This report begins with the challenging statement, "There were enough passenger cars registered in Utah in 1951 for every resident of the state to go riding at one time without crowding anything except the highways." The report indicates that on the basis of a priority study an urgent improvement program is indicated that would cost \$71,000,000. In the conclusions reached in the report there is the statement, "To obtain the initial sum of money necessary for major highway improvements would probably require a bond issue." This method has previously been used by Utah and the bonds would probably be a general obligation on the state, with repayment by fuel tax. In reference to toll roads, the report indicates that the distribution of Utah's population does not lend itself to a consideration of toll routes in the

general solution of the present highway problem.

E. G. Johnson is Chief Engineer for the State Road Commission.

WASHINGTON—

PLANS CALL for the spending of about \$41,000,000 for highway construction in Washington during 1953 with another \$10,000,000 for maintenance. Details of this program will not be available until the Governor's budget has been prepared.

During the past two years the Washington Department of Highways has concentrated much of its effort and money in the major project to improve U. S. 99 and develop a 4-lane route north and south of Seattle. At the present time four lanes are available from Seattle south through Tacoma to Olympia. Several projects are under way in the program to extend this 4-lane route to Vancouver. Large sums have been made available for expediting this work from the bond issue.

Before the plan is complete about 120 separate construction projects will have been placed under contract and about 50 of these will be for bridges. When completed, about 130 mi. of existing 2-lane pavement will be converted into 4-lane limited access highway, with 79 mi. on entirely new location. The program is scheduled for completion in 1955, four years after bond funds became available. An important phase of this work has been the \$5,000,000 program to construct a freeway through Vancouver where U. S. 99 enters the state from the south.

One of the major bridge projects under construction, financed by the bond issue, is a new crossing of the Columbia River between Pasco and Kennewick. The atomic energy program in the vicinity of Pasco increased the traffic volume to such an extent that the existing bridge, built in 1922, was entirely inadequate. The new structure will be a steel arch bridge with steel girder approaches. Roadway width will be 56 ft. The contract for the substructure is well advanced and the \$3,000,000 contract for the superstructure has been awarded.

W. A. Bugge is Director of Highways.

WYOMING—

FUNDS AVAILABLE for construction and maintenance by the Wyoming Highway Department total \$14,400,000 for the year 1953. This program breaks down into the following calculations: New construction—interstate, \$480,000; primary, \$4,700,000; secondary, \$3,200,000; urban, \$220,000; state projects, \$1,000,000; state-county, \$500,000; county, farm-to-market, \$1,300,000. The sum of \$3,000,000 will be allocated for maintenance.

J. R. Bromley is Superintendent of the Wyoming Highway Department.

Jubilee year sees construction in 9 states by —

U. S. Bureau of Reclamation

Of seven new project "starts" this year, five are in the Western states — Palisades Dam jumps ahead of schedule in first season — Columbia Basin irrigation begun, Colorado-Big Thompson to follow in spring of 1953

THE RECORD of construction activity on Bureau of Reclamation projects during 1952—the Golden Jubilee year—contributed substantially to Reclamation's half century of engineering progress in the Western States.

On the Columbia Basin Project in Washington, first major delivery of irrigation water to project lands was begun. In Montana, Hungry Horse Dam, world's third highest dam, was completed. Palisades Dam in Idaho, largest earth-fill dam ever undertaken by Reclamation, was placed under construction. Keyhole Dam and Boysen Dam and Power Plant in Wyoming were completed on the Missouri River Basin Project. On the Colorado-Big Thompson Project in Colorado, construction advanced to a stage of over-all completion which assures the beneficiaries of the project

that large-scale delivery of water to irrigable lands and related benefits will be available within the next year. Irrigation distribution systems for large areas of the Central Valley Project in California were brought to completion and other systems neared completion. In December, Davis Dam and Power Plant on the Arizona-Nevada border were dedicated.

New projects

Under a program of "new starts" authorized by the Congress at its last session, the Bureau was directed to begin new construction on seven projects in the West. Pactola Dam in South Dakota, Tiber and Missouri Diversion dams in Montana, and Webster Dam in Kansas were authorized to be built on the Missouri River Basin Project. Other structures authorized to be started included Monti-

cello Dam on the Solano Project in California; Sly Park Dam on the Central Valley Project in California; Chandler Power and Pumping Plant on the Yakima Project in Washington; and the Gateway Tunnel on the Weber Basin Project in Utah.

The following brief survey, outlined against a geographic pattern of the Bureau's area of activity in the West and Alaska, summarizes the construction progress on the principal undertakings of the Bureau during 1952 and discusses the current program and major construction activity planned for the next 6 months ending June 30, 1953.

PACIFIC NORTHWEST

On the Columbia Basin Project in Washington the first delivery of irrigation water to about 66,000 ac. was begun during the 1952 irrigation season. Extension of irrigation facilities now under construction or planned for construction will provide additional blocks of about 55,000 ac. of new lands each year in the years to follow. This first major delivery of irrigation water was made possible by the completion of installation in 1951 of the first two of the 1,350-cfs. pumps of the Grand Coulee Pumping Plant. Work is proceeding on the installation of the motors for four additional pumping units (ultimate installation in the pumping plant is to consist of twelve pumps).

In other areas of the Columbia Basin Project, the two Lake Lenore pumping plants and 2.5 mi. of connecting channel and discharge line on the West Canal are virtually completed; the 292-cfs. capacity Babcock Pumping Plant is more than 75% completed; and construction of the 236-cfs. capacity Ringold Pumping

PALISADES DAM on the south fork of the Snake River in Idaho, is biggest USBR earthfill. Diversion channel excavation overcame tunnel delays so that 650,000 cu. yd. could be placed in main dam during first season of work by Palisades Contractors.





TIBER DAM, an upstream unit of the Missouri Basin project in Montana, got under way in September. Main dam will be 205 ft. high and 4,300 ft. long, accompanied by an earthen dike 17,000 ft. long. Location is Lower Marias River, near Chester.

Plant on the Potholes East Canal is about 50% completed. Construction of the Lower and Upper Scooteneey Pumping Plants on the Potholes East Canal is nearing completion, and the Lower Saddle and Upper Saddle Gap pumping plants on the same canal were more than 60% completed by the end of the 1952 construction season.

Also on this project, the Quincy Pumping Plant structure was completed in July and installation of the 350-cfs. capacity pumps is virtually completed. Other major completions during the year included: the Potholes East Canal headworks at O'Sullivan Dam; about 21 mi. of lines and laterals for Area P-2 on the Potholes East Canal; about 77 mi. of laterals and pipe lines for the East Low Canal; 15 mi. of the West Canal; and 40 mi. of pipe lines and laterals for the Main, East Low, and the West Canals.

New work in Basin

New work on the project planned to be started by the spring of this year includes the following: an additional 34-mi. reach of the East Low Canal; 85 mi. of laterals and 9 pumping plants including the 135-cfs. capacity Warden Pumping Plant for Area E-5 on the East Low Canal; a 9-mi. section of the Potholes East Canal; laterals on the Potholes East Canal's Area P-9 to irrigate 28,000 ac.; 56 mi. of laterals and sublaterals for Area P-8 on the Potholes East Canal; a 16-mi. reach of the West Canal, and laterals on the West Canal to serve 20,000 ac. of land.

Yakima Project

On the Yakima Project in Washington, rehabilitation of Keechelus Dam was completed in September. Planned to be started next summer is construction of Chandler Power and Pumping Plant which will include a 12,000-kw. power plant of two generating units and a 500-cfs. capacity turbine-driven pumping plant having an initial two and an ultimate three 167-cfs. units. Invitations were issued

in November to bid on construction of the 8-mi. long Chandler Power Canal. Work is planned to be started next spring on the 7-mi. first section of the Chandler Irrigation Canal, to be followed in early summer by start of construction of the 8-mi. second section of the canal.

Hungry Horse Dam

Four years of high-speed construction activity at Hungry Horse Dam on the Hungry Horse Project in northwestern Montana was climaxed on October 4, with placement, nearly 1 year ahead of schedule, of the last bucket of concrete in the 564-ft. high dam. Approximately 3,057,000 cu. yd. of concrete were placed in the dam since construction started in July 1948. Power from the first of Hungry Horse Power Plant's four 71,250-kw. generators was made available on October 1 when the unit was placed in operation. The second unit was placed in operation in December. Work is proceeding on installation of the remaining five generators, and full generation of power from the 285,000-kw. plant is planned to be available by 1954. The completion contract for the dam and power plant is more than three-fourths finished.

Palisades Dam

Following special appropriations by the Congress in the fall of 1951, work was begun in May on Palisades Dam and its 114,000-kw. power plant. The structures are being built on the Snake River in southeastern Idaho near the Wyoming border. Palisades Dam is to have a volume of about 13,600,000 cu. yd. of fill and will be about 260 ft. high above river bed and 2,100 ft. long at the crest. Initial storage of water is planned by the summer of 1956 and production of power by late 1956. Construction, under a separate contract, for open-cut and tunnel excavation for the power and outlet tunnels for the dam is being completed early this month.

Elsewhere in the Pacific Northwest, work is scheduled to begin early this year on rehabilitation of Savage

Rapids Dam, a concrete diversion structure on the Grant's Pass Project in Oregon. At about the same time, work is to be started on alterations to Arrowrock Dam, a concrete dam on the Boise Project in Idaho.

CALIFORNIA

The Central Valley Project in California has completed in 1952 its first full year of integrated operation. Current emphasis on the project is directed toward completion of the extensive network of irrigation distribution systems and related structures, particularly on the Friant-Kern Canal. During the year, 68 mi. of pipe laterals for the Lindmore Irrigation District on the Friant-Kern Canal distribution system were completed, and an additional 52 mi. of pipe lines were essentially completed by the end of the year. Also on the Friant-Kern Canal, installation of 80 mi. of concrete pipe lines for Unit 2 of the Southern San Joaquin Municipal Utility District was essentially finished in October; remaining pipe lines will be installed by February.

Construction is nearing the midway point for 70 mi. of laterals and sublaterals, 9 reservoirs, and 10 pumping plants of Unit 3 of the same utility district. Installation of 20 mi. of pipe lines for the Exeter Irrigation District was completed in November, and 40 mi. of pipe line for the Ivanhoe Irrigation District, also a segment of the Friant-Kern system, were substantially completed in November. The 120-cfs. capacity Trauger Pumping Plant, a feature of the Friant-Kern Canal distribution system, was completed in November, and the Columbia and Mowry pumping plants, structures of the Delta-Mendota Canal distribution system, were completed in September.

Folsom power plant

In April, construction began on the 162,000-kw. Folsom Power Plant on the Central Valley Project's American River Division near Folsom, California. This plant is a semioutdoor type structure of reinforced concrete. Work to the present time has consisted almost entirely of excavation, largely in rock, for the structure, and preparation for drilling the three penstock tunnels. The contract for furnishing and installing the plant's three 54,000-kw. generators was awarded in April. (Folsom Dam is being constructed by the United States Corps of Engineers.) Also on the American River Division of the project, Nimbus Dam, a concrete diversion structure, and Nimbus Power Plant, 14,000-kw. capacity, were placed under construction in July.

Transmission lines completed in 1952 on the Central Valley Project included 42 mi. of the 230-kv. Shasta-Tracy Lines No. 1 and 2 extending from Madison to Rio Vista. In March, an additional 26 mi. of this

transmission line from Rio Vista to Tracy, California, were added to the project's transmission system.

Central Valley

New work on the Central Valley Project planned to be placed under construction early this year includes: Sly Park Dam, an earth-fill structure about 760 ft. long and 175 ft. high, with a 600-ft. length of 100-ft. high dike, near Camino; Camp Creek Diversion Dam, a concrete structure near Sly Park; 59 mi. of concrete pipe laterals for Unit 1 of the Delano-Earlimart Irrigation District on the Friant-Kern Canal distribution system, and 64 mi. of concrete pipe line for Unit 2 of the same district; 9 mi. of pipe lines for the Contra Costa Canal distribution system; 32 mi. of laterals for Unit 1 of the Madera Canal distribution system, and 17 mi. of laterals and sublaterals for Unit 3 of the same distribution system; and 10 mi. of concrete pipe lines for the Plainview Water District distribution system on the Delta-Mendota Canal.

Cachuma Project

On the Cachuma Project of Santa Barbara County, California, Lauro Dam was completed in October, and Glen Anne Dam is virtually completed. Construction of Cachuma Dam on the Santa Ynez River neared completion at year's end. All three are of earth-fill construction. Lining of part of the 6-mi. long Tecolote Tunnel is in progress, although 7,000 ft. remain to be excavated. The 6,000-ft. Sheffield Tunnel of the Carpinteria Section of the South Coast Conduit was holed through in October, and lining of the tunnel is in progress. Ten miles of concrete pipe lines for the South Coast Conduit were completed last January. In May, construction started on 16 mi. of concrete pipe conduit for the Carpinteria Section. Bids were invited in November for construction of the project's Carpinteria and Ortega Regulating Reservoirs.

Invitations to bid on construction of Monticello Dam on the Solano Project in California are expected to be issued in February. The dam, about 39 mi. west of Sacramento, will be a 260,000-cu. yd. concrete-arch structure about 295 ft. high and 1,000 ft. long at the crest.

Invitations to bid on construction of 29 mi. of pipe line for the San Diego Aqueduct's second pipe line were issued in October. The pipe line under this contract, which calls for completion of construction of the second pipe line (32 mi. are under contract) will parallel the present one between San Jacinto Regulating Reservoir near Hemet and the San Vicente Reservoir near San Diego. (The aqueduct is being constructed by the Bureau for the Navy Department.)

On the All-American Canal System in California, work is to start this spring on construction of Parts 1 and

2 of the Coachella Canal distribution system's Unit 8, which involves construction of 18 mi. of concrete pipe lines and 7 small pumping plants.

SOUTHWEST

In December, Davis Dam and Power Plant were dedicated. The dam and power plant are on the Arizona-Nevada border, 67 mi. downstream from Hoover Dam. The 225,000-kw. power plant was placed in service in the summer of 1951, while the earth-fill structure was completed in 1949. Current construction on the project includes completion of the dam's spillway stilling basin, about 75% finished at year's end.

On the Boulder Canyon Project, Units A-3 and A-4, both 82,500-kw. capacity, and Unit A-9, a 50,000-kw. unit, were installed in the Hoover Dam Power Plant. Placement in service of these units brings the total capacity of the Hoover plant to 1,249,800 kw. (Ultimate capacity of the plant is 1,332,300 kw.)

Gila Project

Other progress in the Southwest during the past year includes completion in April of Pumping Plants No. 1, 2, and 3 on the Wellton-Mohawk Division of the Gila Project in Arizona. The pumping plants have a total capacity of more than 2,200 cfs. Also on the Gila Project, 29 mi. of the Mohawk Canal were completed in March, and an additional 9 mi. of the canal were completed the following month. Construction of 12 mi. of the Wellton Canal were completed in April. New work to be undertaken early this year on the Gila Project includes the following: Construction of about 29 mi. of concrete-lined laterals and sublaterals for Unit 3 of the Mohawk Lateral distribution system, and 22 mi. of concrete-lined lat-

erals and sublaterals for Unit 4 of the same system; and construction of 5 mi. of the Dome Canal and laterals.

In New Mexico the 53-mi., 115-kv. Belen-Willard transmission line on the Rio Grande Project was completed in July. Invitations to bid on construction of the North Branch Dam on the Rio Grande Project near Las Cruces were issued in December. The dam is to be an earth-fill flood detention structure about 1,600 ft. long and 45 ft. high at maximum section. On the Vermejo Project, bids were invited in December for construction of three small earth-fill dams for reservoir rehabilitation near Maxwell, New Mexico, and work is planned to be started by next summer on the rehabilitation of Vermejo Diversion Dam, 11 mi. of the Vermejo Canal, and 24 mi. of the Eagle Tail Canal.

Middle Rio Grande Project work continued channelization of 38 mi. of the Rio Grande in New Mexico from 10 mi. north of San Marcial to the narrows of Elephant Butte Reservoir. Bids were asked in December for improvement of 7 mi. of low-flow channel near Bernardo.

INTERMOUNTAIN

Construction progress during 1952 on the Colorado-Big Thompson Project in Colorado brought this transmountain diversion development to a level of completion which will assure full project operation in 1953. The project is to furnish supplemental water from the western slope of the Rocky Mountains to irrigable lands in northeastern Colorado.

Major features completed during the year were Rattlesnake and Willow Creek dams, both earth-fill structures, and Carter Lake Reservoir. Also completed were the 1.7-mi. Rattlesnake Tunnel, the 1.8-mi. Olympus

DAVIS DAM, on the Colorado River between Nevada and Arizona, was the scene of dedication ceremonies in December that marked virtual completion of the dam and its works. Some stilling basin construction remains, under contract to Grafe-Callahan Construction Co.





CACHUMA DAM, above Santa Barbara, Calif., stands nearly completed, as do two other earth-fill structures on the Cachuma Project. Feature of project is Tecolote Tunnel, a 6.4-mi. bore with 7,000 ft. yet to go through treacherous formations of Coast Range.

Tunnel, the 5.4-mi. Pole Hill Tunnel, the 1.3-mi. Bald Mountain Pressure Tunnel, and the 1.8-mi. Carter Lake Pressure Tunnel. Other completions on the project were the $\frac{1}{2}$ -mi. Windsor Section of the Poudre Supply Canal; the 59-mi., 115-kv. Salida-Gunnison transmission line; and the 36-mi., 115-kv. Flatiron-FortCollins-Cheyenne Tap transmission line.

At year's end the diversion dam, headworks, and tunnels of the North Poudre Supply Canal were complete and the $9\frac{1}{2}$ -mi. canal is about 75% completed. The $\frac{1}{2}$ -mi. reach of the Pole Hill Canal was completed in November. The 33,250-kw. Pole Hill Power Plant structure and diversion and afterbay dams were substantially completed at the end of the year and the turbine is being installed. Flatiron Power and Pumping Plant, 69,700-kw. capacity, was about 75% completed, and preparations are being made for installing turbines and generators. Invitations are to be issued by early spring to bid on construction of the 17-mi. Boulder Creek Supply Canal.

In Utah, the 6-mi. Duchesne Tunnel and Diversion Dam on the Provo River Project was finished in 1952. Invitations were issued in October for construction of the 3-mi. Gateway Tunnel on the Weber Basin Project in Utah.

Big Sandy Dam on the Eden Project in Wyoming was completed in October. Construction of the 5.5-mi. Means Canal and the 1-mi. Big Sandy Canal was also finished in October. Enlargement of 6.5 mi. of the Eden Canal and construction of a $\frac{1}{2}$ -mi. reach of the Means Canal were about one-third completed at year's end. Construction is expected to be started by early summer on the Eden Project's Prospect Diversion Dam, a $\frac{1}{2}$ -mi. reach of the Prospect Canal, about 4 mi. of the Eden Canal, and about 21 mi. of laterals for the Eden Canal.

On the Kendrick Project, also in Wyoming, construction of the Alcova Power Plant at the existing Alcova Dam is about 25% complete. The plant is to house two 18,000-kw. units. Completed on the project were

the 26-mi., 34.5-kv. Sinclair-Hanna transmission line in February, and the Seminole-Baird 36-mi., 34.5-kv. transmission line, in July.

For the Riverton Project in Wyoming, work is planned to be started this summer on the 20-mi. Muddy Ridge Canal.

MISSOURI RIVER BASIN

On the Missouri River Basin Project, the largest of the Bureau of Reclamation's basin-wide multiple-purpose developments, the 1952 construction record was notable for completion of two major dams and more than 600 mi. of transmission lines. Completed during the year were Keyhole and Boysen Dams in Wyoming.

An additional five dams are under construction on the project: Canyon Ferry in Montana, about 85% completed; Trenton in Nebraska, about 80% completed; Jamestown in North Dakota, about 50% completed; Tiber in Montana, started in September; and Pactola in South Dakota, started in November. With the exception of Canyon Ferry, these dams are all earth-fill structures.

Kirwin Dam

Bids were invited in November for construction of Kirwin Dam, an earth-fill structure in Kansas. The dam will be about 105 ft. high and 12,600 ft. long, and will have a total volume of about 9,500,000 cu. yd. Construction of the Kirwin Dam foundation was completed late in 1952 under a separate contract. Relocation of 9.5 mi. of Missouri Pacific Railroad near Kirwin is planned to start this spring. A contract was awarded in November for construction of the Webster Dam foundation. As currently planned, construction of the dam embankment will start under a separate contract late this summer. The dam is on the south fork of the Solomon River near Webster, Kansas. It will be an earth-fill structure about 2 mi. long and about 108 ft. high.

In February, bids are planned to be invited for construction of the Mis-

souri Diversion Dam and the associated Little Porcupine Power Plant, near Wolf Point, Montana. The dam comprises 2.3 mi. of earth-dike embankment across the Missouri River and a gated concrete overflow section 80 ft. long and 40 ft. high. The earth dike is to be about 30 ft. high for 11,000 ft., and 50 ft. high for 1,000 ft. Excavation for the dam foundation was undertaken under a separate contract and is substantially completed.

Progress on the power generation facilities on the project was emphasized by completion of the 15,000-kw. Boysen Power Plant during the year. Canyon Ferry Power Plant now nearing completion, will provide an additional 50,000 kw. of electrical energy to the project's hydroelectric generating capacity. The Little Porcupine Power Plant associated with the Missouri Diversion Dam will be a three-unit, 18,000-kw. capacity installation.

Irrigation features

Extension of irrigation facilities on the Missouri River Basin Project proceeded during the year. Construction of the 92-mi. Angostura Canal in South Dakota neared completion at year's end. On the project's Bostwick Division in Kansas and Nebraska, 29 miles of laterals for the Superior Canal were completed, and in August, 16 mi. of laterals and sublaterals were placed under construction for the Courtland Canal. Also essentially completed at year's end was the Franklin South Side Pumping Plant and associated canal and laterals. Other project work in Nebraska planned to be started by early summer includes the following: 11 mi. of the Naponee Canal and laterals; 35 mi. of the Cambridge Canal; 19 mi. of the Upper Meeker Canal; and a 20-mi. reach of Bartley Canal. Invitations are expected to be issued in May for construction of 7 mi. of laterals for the second section of the Courtland Canal in Kansas.

Invitations are planned to be issued in January for construction of the 100-cfs. Crow Creek Pumping Plant in Montana. In the following month, bids are to be invited for construction of the associated 7.5-mi. Toston Canal and the 3-mi. Lombard Canal.

ALASKA

On the Eklutna Project in Alaska, construction of the $4\frac{1}{2}$ -mi. Eklutna diversion tunnel is about 25% completed. Construction of the 30,000-kw. Eklutna Power Plant was begun in September. The 15 mi., 115-kv. Eklutna-Palmer transmission line was essentially completed in November. The Eklutna Project, first project undertaken by the Bureau of Reclamation outside the Western States, is to make available critically needed power for the Anchorage, Alaska area. It is to provide irrigation and other benefits later.

Hydro power projects of the future

DURING the past year the Federal Power Commission at its regional office in San Francisco has received applications for a large number of proposed hydroelectric projects. Applications have been received from private power utilities, municipalities and public districts. A brief description of each of these major projects for which applications have been received follows.

Leshner S. Wing is regional engineer of the Federal Power Commission in San Francisco.

Tacoma on Cowlitz River

A 50-year license has been issued to the City of Tacoma, Wash., for a hydroelectric project on the Cowlitz River. The Commission conditioned the authorization to require the city to make further tests and experiments, and to obtain FPC approval, before constructing any permanent fish handling facilities or fish protective devices. The proposed project, which has attracted wide-spread public interest because of the controversy over its fish passage facilities, will include two dams. One, to be built near Mossyrock, Wash., will be about 510 ft. high and 1,300 ft. long at the crest. A powerhouse, at the toe of the dam, will contain three 75,000-kw. units, with provision for a fourth. The other dam, near Mayfield, Wash., will be 240 ft. high and have a crest length of 350 ft. The powerhouse will have an initial installation of three 40,000-kw. units with provision for a fourth. The matter of issuance of this license is before the Ninth Circuit Court of Appeals for review.

P. G. & E. on the Kings River

The Commission has affirmed, with certain modifications, its licensing orders of Nov. 10, 1949, authorizing power developments by Pacific Gas and Electric Co., San Francisco, in the Kings River Basin of Central California. The 1949 orders, subsequently appealed by the Secretary of the Interior, authorized: (1) a license to PG&E for a hydroelectric development in the Kings River Basin; (2) an amendment of PG&E's license to enlarge its existing Balch plant on the North Fork of the Kings River; and (3) a preliminary permit to Fresno Irrigation District for investigation of the proposed development of a power plant at the Pine Flat Dam on the North Fork of the Kings River. The matter of issuance of this license is before the Ninth Circuit Court of Appeals for review.

Portland G. E. on Deschutes

A 50-year license has been issued, conditioned to conserve the fishery resources of the Deschutes River, to Portland General Electric Co., of

NON-FEDERAL agencies—private or public—planning a hydroelectric development normally make their initial move through an application to the Federal Power Commission. Control on government lands, including sites for dams, reservoirs or access roads, makes FPC approval of these plans mandatory.

Files of the FPC San Francisco office include such preliminary data on the applications that represent construction projects of the future. The major hydro programs reaching the study stage during 1952 are briefed in this summary.—Editor.

Portland, for the proposed Pelton project in Jefferson County, Oregon. The Commission said that the project, which will have a dependable capacity of 108,000 kw., is probably the most readily available source of new power supply in the Pacific Northwest since only two years will be required to put the plant into operation. The project, estimated to cost approximately \$22,070,000, includes a 205-ft. concrete arch dam; side channel and tunnel spillway; 3 short penstocks; an outdoor type powerhouse, located immediately downstream from the dam, containing three 52,000-hp. turbines connected to three 36,000-kw. generators; a 7-mi., 230-kv. transmission line; and a reregulating dam. Total cost of the project includes \$4,430,000 which the company will spend for the reregulating dam and other fishery conservation facilities. Conflict with fishery interests has prevented this project from being constructed.

Washington P. U. D. at Box Canyon

The Commission issued a 50-year license to Public Utility District No. 1 of Pend Oreille County, Wash., for its proposed Box Canyon hydroelectric development on the Pend Oreille River. The project will include a dam about 260 ft. long at the Box Canyon site, north of Ione, Wash., forming a reservoir extending upstream 55 mi. to the Albeni Falls Project of the Corps of Engineers. The powerhouse will contain four vertical turbine-generator units, each of 24,500 hp. This project is now under construction.

P. U. D. on the Packwood Project

A one-year preliminary permit has been issued to Public Utility District No. 1 of Lewis County, Wash., for a proposed project near Packwood in Lewis County. The development,

which has been designated the Packwood Project, would include: (1) a dam on Johnson Creek, with flume for the diversion of water from Glacier Creek; a forebay and penstocks; and powerhouse with ultimate installed capacity of 45,000 hp.; (2) a dam on Lake Creek at the outlet of Packwood Lake; tunnel, pipe line, surge tank, and penstocks; and powerhouse with ultimate installed capacity of 30,000 hp. on Snyder Lake; (3) a dam on Snyder Creek at Snyder Lake and a canal from Snyder Lake to the Johnson Creek forebay.

The California Oregon Power Co., of Medford, filed an application with the Federal Power Commission for a preliminary permit for a proposed project on McCloud River and Squaw Valley Creek in Shasta and Siskiyou Counties, Calif. The company proposes to investigate two alternate schemes for a plan of development to utilize waters of the McCloud River basin.

Washington W. P. Co. on Clark Fork

The Commission issued a preliminary permit to The Washington Water Power Company, of Spokane, for a proposed project on the Clark Fork River in Sanders County, Mont. The development, known as the Noxon Rapids project, would include a concrete dam at the Noxon Rapids site, a powerhouse with an installed capacity of 197,000 hp. and provision for additional capacity; and a 230-kv. transmission line connecting the plant with the company's transmission system.

California on the Feather

The Water Project Authority of the State of California applied to the Federal Power Commission for a license for a proposed project on the Feather River near Oroville. Total project installation would be 465,000 kw. Electric energy would be sold in northern California to public agencies or to the PG&E, and used at the pumping plants of the proposed Sacramento-San Joaquin Delta Diversion Projects. The project would include a 710-ft. main dam across the Feather River, an afterbay dam and two auxiliary dams. The main reservoir would have a storage capacity of 3,500,000 ac. ft. The main powerhouse is to contain five units of 88,000 kw. each, and two units of 12,500-kw. capacity each would be installed in the afterbay powerhouse.

P. G. & E. on the Pit River

Pacific Gas and Electric Co. of San Francisco filed an application for a proposed project on the Pit River near Redding, Calif. The proposed "Pit No. 6" project is a part of a

Continued on page 132

Plans for the Upper Colorado River

ONE OF THE MOST important construction programs of the entire West will unfold during coming years as the upper basin of the Colorado River is put under control and developed for beneficial use. In this forecast issue it is logical to have the outline of this program, as well as a pre-

liminary estimate of construction quantities presented by an authority on these development plans. The four dams selected for the immediate program only will involve figures which can be rounded off at: 10,000,000 cu. yd. of concrete, 30,000,000 cu. yd. of excavation, 60,000,000 lb.

of steel work, and 15,000,000 cu. yd. of compacted embankment. Total cost of these four initial projects would be about \$675,000,000. Growth in the five states of Wyoming, Colorado, Utah, New Mexico and Arizona will be supported and nurtured as this program is activated.

By **JOHN GEOFFREY WILL**
Secretary and General Counsel
Upper Colorado River Commission
Grand Junction, Colorado

THE HIGHEST SKILLS of engineers and contractors of the West will be needed to carry out the first stage of construction of the Colorado River Storage Project and Participating Projects which are outlined in this brief description of the program that means so much to the Upper Basin States.

The Colorado River System has been described as a menace. It does, in fact, rob the Upper Colorado River Basin of 131,472,000 tons of good soil per year. Most of this good soil is deposited each year in Lake Mead where it piles up in volumes such that, in a comparatively few years, as history goes, the useful life of Lake Mead will be concluded. In addition, in every year, on the average, there is wasted into the Gulf of Mexico and the Salton Sea enough water to supply the domestic needs of more than 50 million people.

What would be accomplished

The Colorado River Storage and Participating Projects would provide a means for the full development of the water resources of the Colorado River system above Lee Ferry. It would regulate the flow of the river, assure the delivery of water to the Lower Basin as required by the Colorado River Compact, and further the use in the Upper Basin of water apportioned by the Compact. The Colorado River Storage Project and Participating Projects will, in fact, constitute one reclamation project, consisting of certain agricultural, municipal and industrial water, power and other features, none of which is independent of another, and all of which combine into one comprehensive attack on the problem of the development, conservation and utilization of water resources in the Upper Colorado River Basin.

The Upper Colorado River Commission will press vigorously for authorization by the 83rd Congress of

the Colorado River Storage Project and Participating Projects.

In the initial stage proposed for authorization at this time, the project will consist of at least four high dams (see map) as follows:

Echo Park Colorado
Flaming Gorge Utah
Glen Canyon Arizona
Navajo New Mexico

There are also plans for six additional dams which would be author-

ized for a second stage of development.

Echo Park Dam

The Echo Park dam will be located on the Green River near the Utah-Colorado line, about 3 mi. downstream from the confluence of the Green and Yampa rivers. It will be a concrete, curved gravity type structure rising 525 ft. above the river bed. The reservoir will have a capacity of 6,460,000 ac. ft., and will extend 63 mi.

REGULATING RESERVOIRS AND POWER PLANTS

Name	Storage capacity (acre feet)	Height of Dam (feet)	Power Installation (kilowatts)	Estimated Cost
Echo Park	6,460,000	525	200,000	\$165,000,000
Flaming Gorge	3,940,000	440	72,000	82,700,000
Glen Canyon	26,000,000	580	800,000	363,900,000
Navajo	1,200,000	335	30,000	63,000,000
Curecanti	940,000	360	125,000	156,900,000
Crystal	510,000	595		
	39,000,000		1,225,000	\$831,500,000

PARTICIPATING PROJECTS

Project	Total Area Irrigated	Estimated Cost
Central Utah (initial phase)	160,380	\$198,840,000
Emery County	24,080	7,840,000
*Gooseberry	—	—
Florida	18,950	6,211,000
*San Juan-Chama	—	—
*South San Juan	—	—
*Shiprock Indian	—	—
Hammond	3,670	1,892,000
La Barge	7,970	1,476,000
Lyman	40,600	9,847,000
Pine River extension	15,150	4,088,000
*La Plata	—	—
Seedskaadee	60,720	20,379,000
Silt	7,300	3,190,000
Smith Fork	10,430	3,148,000
	349,250	256,911,000
†Paonia	17,040	6,355,000
†Eden	20,000	5,986,000
	37,040	12,341,000
TOTAL	386,290	\$269,252,000

* Final reports not available.
† These projects are authorized.

p the Green River and 44 mi. up the Yampa River. The Echo Park power plant will consist of four 50,000-kw. units for a total installed capacity of 200,000 kw. Construction will involve: 2,645,000 cu. yd. of excavation, 2,770,000 cu. yd. of concrete, and 15,000,000 lb. of steel and other metal works.

Ashley Dam

Ashley Dam, which would form Flaming Gorge Reservoir, is to be located in northeastern Utah about 32 mi. north of Vernal, Utah, and only a few miles south of the Utah-Wyoming line. The dam will be a concrete, gravity-type structure, rising 440 ft. above the river. Flaming Gorge Reservoir would have a total capacity of 940,000 ac. ft. The power plant would consist of three units with a total installed capacity of 72,000 kw., producing 337,000,000 kwh. annually. Construction will involve 497,000 cu. yd. of excavation, 1,758,000 cu. yd. of concrete, and 19,630,000 lb. of steel and other metal.

Glen Canyon Dam

Glen Canyon Dam is to be located near the Utah-Arizona state line, upstream from Lee Ferry. The dam would be a concrete, arch-type structure rising 580 ft. above the river. The reservoir formed will have an initial capacity of 26,000,000 ac. ft. The power plant will contain seven generating units with a total capacity of 300,000 kw., producing 4,337,000,000 kwh. annually. Construction will include 4,320,000 cu. yd. of excavation, 5,190,000 cu. yd. of concrete, and 23,390,000 lb. of steel and other metal work.

Navajo Dam

Navajo Dam is to be located on the San Juan River in northwestern New Mexico, about 3½ mi. downstream from the confluence of the Pine and San Juan rivers. The structure will be a rolled, earth-fill embankment rising 335 ft. above stream bed. The reservoir will have a total capacity of 1,200,000 ac. ft., with a water surface of 10,800 ac. The Navajo power plant will consist of three 10,000-kw. units with an installed capacity of 30,000 kw. Construction will include 15,186,000 cu. yd. of earth and rock fill, 101,500 cu. yd. of concrete, and 8,130,000 lb. of steel and 21,960,000 cu. yd. of excavation.

Assistance is required by nearly all potential irrigation projects in the Upper Basin since those already constructed have utilized the least expensive sites and most convenient water supplies. Because of their relatively high cost, most of the future irrigation projects cannot be completely paid for by those who would benefit directly. The far-reaching indirect benefits, however, will justify financial assistance from other sources. Such assistance would be provided from power revenues from the four fore-



going high dams being proposed for initial construction.

Participating Projects

There are present plans for sixteen Participating Projects (see table).

Each of these participating projects must meet the following stipulations in order to be included in the Colorado River Storage Project:

- 1—A project may be eligible only when all sources of estimated revenue directly available to said project are insufficient to return its reimbursable costs during its payout period.
- 2—It shall be a project for use in one or more of the states of the Upper Colorado River Basin.
- 3—Its total benefits shall exceed its total costs.
- 4—It shall be able to pay the operation, maintenance and replacement costs allocated to irrigation. Also it must pay in a period of 50 years following a suitable development period at least part of the construction costs

allocated to irrigation.

- 5—There shall be an appropriate district to aid such participating project.
- 6—It shall not require assistance in an amount that will leave the Upper Colorado River Account in a deficit position at the end of the payout period for the participating project.
- 7—Charges to the Upper Colorado River Account shall not exceed an appropriate share of the construction cost of the works of that project.
- 8—It shall be feasible from engineering and economic points of view.

The Colorado River Storage Project and Participating Projects is the culmination of almost 50 years of planning by engineers of the Bureau of Reclamation, working with the States affected. It is sound from both engineering and economic points of view. It will produce enormous benefits, not only for the Colorado River Basin, but for the country as a whole. It is expected to have the support of all five Upper Basin States.

California contractors' licensing

Approaching a quarter century of control over the largest industry in the state, the regulating procedure for 63,220 contractors is described here — The oldest licensing law in the West for contractors, it has served as a model for similar legislation in other states

By
**N. J.
MORRISEY**
Registrar of
Contractors
State of
California



IN 1929, a little over 23 years ago, the construction industry of California pioneered the principle of regulation through a state license law. At that time, the industry was second in size and importance in the state; agriculture being first. It is now in first place and the dollar volume of the construction industry has doubled that of agriculture.

First successful attempt

With no background of experience from which to requisition, no basis on which to establish unified desires of both the industry and the public, the Contractors' License Law was enacted as a compromise measure after several previous attempts had failed. It was a rather weak legislative instrument, acceptable only to its proponents because of their belief that the small measure of value which could come therefrom might in itself be well used to secure future amendments which the Legislature at that time refused. Their foresight has been well vindicated.

In order to attempt regulation of the industry and correct abuses found therein, the original law allowed a license to an applicant and made it possible to suspend or revoke this license upon presentation of proof that the licensee had done any one of but four acts: (1) abandoned a contract, (2) diverted funds, (3) departed from plans and specifications and (4) violated building laws. To operate without a license was a misdemeanor and punishable accordingly. It is a fact that for a number of months after the inception of the law its small force of inexperienced administrators were even afraid to ask for a warrant for the arrest of a violator.

Educational work soon secured the support of California contractors, and education of court officers gradually changed the situation, until today the Contractors' License Law is firmly established as a law which can be and is enforced.

Between 1929 and today, or during a period of 23 years, we have seen a weak legislative instrument built up into the strictest of its kind in the

country. In place of the original causes of action under which a license could be suspended or revoked, the list has now been expanded to 16 provisions, covering the majority of construction industry ills, with the exception of the price cutter. However, sooner or later, this type of contractor comes to grief and into the hands of the Board for treatment; as he invariably finds himself unable to meet his obligations, and faces charges of failing to complete for the contract price.

How administration is handled

The law is administered by a non-partisan Board of seven members appointed by the Governor. The law provides that they must be actively engaged in the contracting business. Each member serves without pay and unselfishly devotes his time toward the betterment of the industry and the improvement of rules and regulations governing actions and activities. The law further provides that the seven members be composed of three general contractors, three subcontractors and one general engineering contractor. Each one of the Board members is outstanding in his field.

The Board appoints a Registrar of Contractors, who also acts as the Executive Secretary of the Board and carries out the administrative duties as provided in the law and as delegated to him by the Board. At the present time 87 persons comprise the staff: 45 investigators, 35 in clerical help, 2 examiners and 5 supervisory positions.

A self-supporting function

The Contractors' State License Board is an entirely self-supporting function of state government. Its sole revenue is that derived from license fees, with the exception of approximately \$30,000 which is secured from the sale of the "Register" to commercial concerns, failed examination fees, and delinquent penalties. The fee for an original license, and the annual renewal fee, which is the principal source of income, is determined by the Board. In 1929, when the law

was first enacted, the application fee was established in the law at \$10.00 and the annual renewal fee was established at \$5.00. In each year of operation the income exceeded the expenditures with the result a surplus was amassed. However, in the fiscal year 1949-1950 the expenditures exceeded the income by \$140,000. The increase was due to the raising of salaries and other costs of operation.

At a result, legislation was secured at the 1949 session of the state legislature whereby the application fee was raised from \$10.00 to \$15.00 and the Board was empowered to annually establish the renewal fee (the Board's principal source of income, between a minimum of \$3.00 and maximum of \$10.00. The Board has recently established, at a meeting last October 24 the renewal fee again at \$7.00 for next year, which starts July 1, 1953. Roughly, the annual income is \$500,000 and the expenditures are approximately the same. All monies are deposited with the state treasury and they can only be used for the administration of the license law.

A logical expansion

As of June 30, 1952, the end of the fiscal period, there were 63,220 contractors licensed in California, an all time high in its history, yet understandable when one realizes that the population of California has almost doubled since Pearl Harbor. The low in registration in the last ten years was a little over eight years ago when at the end of the fiscal year, June 30, 1944, the registration was 30,184. Thus, in this period of eight years there has been a 100% gain in registration. This has placed a tremendous work load on the Board and its staff.

As of June 30, 1952, the five classifications containing the greatest number of registrants were: general building contractor, 25,909; painting contractor, 8,750; plumbing contractor, 4,684; electrical contractor, 4,232 and plastering contractor, 2,330.

A definitely measurable item, and one which is a categorical budget item, is the application for license form. For every five applications

given out upon request, either through the mail or at the branch offices or through the investigators, but **one** results in the issuance of a license. The other four either fail the examination, or find that they do not have the required experience, or they are unwilling to submit to examination. So, we know that if we did not have a contractors' license law in California the registration would not be about 60,000 but five times as many,

or approximately 240,000 unqualified persons dealing with the public. An additional factor that can't be measured is: How many, in addition, are deterred merely because there is such a law on the statute books?

While on the subject of licensees a rather interesting fact presents itself. Our licenses are consecutively numbered, and in the year 1929 we started with license No. 1. Our headquarters office in Sacramento has now issued

license No. 134,462. In a little over 23 years we have issued 134,462 licenses, yet our present all-time high is now 63,220. Where are the other 71,000 licenses? Excluding deaths, retirement and changes from one entity to another you can readily see the mortality in the contracting business, and that it isn't for the unsound and unscrupulous operator.

The classification of contractors

Continued on next page

16 WAYS A CONTRACTOR CAN LOSE HIS LICENSE

1 Abandonment without legal excuse of any construction project or operation engaged in or undertaken by the licensee as a contractor constitutes a cause for disciplinary action.

2 Diversion of funds or property received for prosecution or completion of a specific construction project or operation, or for a specified purpose in the prosecution or completion of any construction project or operation, and their application or use for any other construction project or operation, obligation or purpose constitutes a cause for disciplinary action.

3 Willful departure from or disregard of, plans or specifications in any material respect, and prejudicial to another without consent of the owner or his duly authorized representative, and without the consent of the person entitled to have the particular construction project or operation completed in accordance with such plans and specifications constitutes a cause for disciplinary action.

4 Willful or deliberate disregard and violation of the building laws of the State, or of any political subdivision thereof, or of the safety laws or labor laws or compensation insurance laws of the State, or violation by any licensee of any provision of the Health and Safety Code or Water Code, relating to the digging, boring, or drilling of water wells constitutes a cause for disciplinary action.

5 Failure to make and keep records showing all contracts, documents, records, receipts and disbursements by a licensee of all of his transactions as a contractor and open to inspection by the registrar for a period of not less than three years after completion of any construction project or operation to which the records refer constitutes a cause for disciplinary action.

6 Misrepresentation of a material fact by an applicant in obtaining a license constitutes a cause for disciplinary action.

7 Failure in a material respect on the part of a licensee to complete any construction project or operation for the price stated in the contract for such construction project or operation or in any modification of such contract constitutes cause for disciplinary action.

8 Aiding or abetting an unlicensed person to evade the provisions of this chapter or knowingly combining or conspiring with an unlicensed person, or allowing one's license to be used by an unlicensed person, or acting as agent or partner or associate, or otherwise, of an unlicensed person with the intent to evade the provisions of this chapter constitutes a cause for disciplinary action.

9 Failure in any material respect to comply with the provisions of this chapter constitutes a cause for disciplinary action.

10 The doing of any willful or fraudulent act by the licensee as a contractor in consequence of which another is substantially injured constitutes a cause for disciplinary action.

11 Acting in the capacity of a contractor under any license issued hereunder except: (a) in the name of the licensee as set forth upon the license, or (b) in accordance with the personnel of the licensee as set forth in the application for such license, or as later changed as provided in this chapter, constitutes a cause for disciplinary action.

12 Knowingly entering into a contract with a contractor while such contractor is not licensed as provided in this chapter constitutes a cause for disciplinary action.

13 Willful failure or refusal without legal excuse on the part of a licensee as a contractor to prosecute a construction project or operation with reasonable diligence causing material injury to another constitutes a cause for disciplinary action.

14 Willful or deliberate failure by any licensee or agent or officer thereof, to pay any moneys, when due for any materials or services rendered in connection with his operations as a contractor, when he has the capacity to pay or when he has received sufficient funds therefor as payment for the particular construction work, project, or operation for which the services or materials were rendered or purchased constitutes a cause for disciplinary action, as does the false denial of any such amount due or the validity of the claim thereof with intent to secure for himself, his employer, or other person, any discount upon such indebtedness or with intent to hinder, delay, or defraud the person to whom such indebtedness is due.

15 Any person who has been denied a license, or who has had his license revoked, or whose license is under suspension, or who has failed to renew his license while it was under suspension, or who has been a member, officer, director, associate or responsible managing employee of any partnership, corporation, firm or association whose application for a license has been denied, or whose license has been revoked, or whose license is under suspension, or who has failed to renew a license while it was under suspension, and while acting as such member, officer, director, associate or responsible managing employee had knowledge of or participated in any of the prohibited acts for which the license was denied, suspended or revoked, shall be prohibited from serving as an officer, director, associate, partner or responsible managing employee of a licensee, and the employment, election or association of such person by a licensee shall constitute grounds for disciplinary action.

16 The performance by any partnership, corporation, firm or association of any act or omission constituting a cause for disciplinary action, likewise constitutes a cause for disciplinary action against any licensee who is a member, officer, director, associate or responsible managing employee of such partnership, corporation, firm or association, and who participated in such prohibited act or omission.

HERE ARE THE MAJOR CONTRACTS AWARDED IN WEST DURING 1952

ALASKA

S. Birch & Sons Construction Co. and Green Construction Co.—Utilities at Elmendorf	2,935,218
S. Birch & Sons Construction Co., C. F. Lytle and Green Construction Co.—Utilities at Elmendorf	3,525,549
Boen-Sealand Constructors—Housing at Eielson	2,438,118
Grove, Shepherd, Wilson and Kruege, Inc.—Dormitory at Elmendorf	4,294,470
Johnson, Drake & Piper and Puget Sound Bridge & Dredging Co.—Water main and buildings at Kodiak Naval Base	2,878,710
Peter Kiewit Sons' Co. and Fred J. Early Co., Inc.—Building at Eielson	2,334,635
Kuney-Johnson Co.—Buildings at Eielson	2,515,225
C. F. Lytle & Green Construction Co. and S. Birch & Sons Construction Co.—Heat and power plant at Ladd	13,482,260
Patti-MacDonald Construction Co.—Kenai army communications station	7,131,840
Puget Sound Bridge & Dredging Co. and Johnson, Drake & Piper—Direction-finder and transmitter facilities at Kodiak Naval Base	5,248,000
Rue Contracting Co.—Eklutna power plant	2,579,607
Valle-Sommers Construction Co.—Hospital at Bethel	3,932,000
Valle-Sommers Construction Co.—Housing at Elmendorf	10,014,370

ARIZONA

Daley Construction-Acme Materials Co.—Highway near Nogales	662,889
Macco Corp.—Canal on Mohawk Distribution System	1,099,033
Marshall, Haas & Royce—Mohawk Canal and Radium Hot Springs flood protection system	766,370
Martin Construction Co.—Highway near Tucson	737,024
Morrison-Knudsen Co., Inc.—Wellton Canal	1,318,474
Alex Robertson Co.—Sewer and water main at Davis-Monthan Air Base	749,919
R. P. Shea Co.—Levee on Lower Colorado River District	690,784
T. K. G. Construction Co.—Filter plant for Phoenix	1,272,840
Vinson Construction Co.—Lining and road through Queen Creek Tunnel	527,995
Del E. Webb Construction Co. and San Xavier Construction Co.—Preflight apron at Tucson airport	1,316,000

CALIFORNIA

L. C. Anderson Co.—Naval training facilities at San Diego	2,595,000
Arnold Construction Co.—Housing project at San Diego	5,000,000
Guy F. Atkinson Co.—Folsom power plant	5,772,955
Guy F. Atkinson Co.—Repairs to water supply tunnel in Oakland	1,214,338
Guy F. Atkinson Co.—Lexington Dam near Los Gatos	1,433,130
Guy F. Atkinson Co.—Bridge on Bayshore Freeway	2,986,961
Ball-Simpson, and Erickson, Phillips & Wiseberg—Highway in Oakland	1,196,230
Bein Construction Co. and R. J. Daum Construction Co.—Housing project at West Los Angeles	4,195,000
Bollenbacker-Kelton—Housing project at La Mesa	2,700,000
Bongiovanni Construction Co.—Highway in Los Angeles area	2,274,366
Bressi & Bevanda Constructors, Inc.—Highway and bridges in San Diego County	2,238,685
F. W. Case Co.—Walls and warehouses at Sharpe General Depot, Lathrop	1,762,482
Connolly-Pacific Co.—Quay wall at Long Beach	1,811,800
Dinwiddie Construction Co.—Storehouses for Navy at Alameda	3,252,200
Engineering Constructors, Inc.—Second barrel of San Diego Aqueduct	2,065,000
Roy H. Fraser—Housing at March Air Base	5,300,000
Mercer-Fraser Co. and Mercer-Fraser Gas Co., Inc.—Highway near Gannon Slough	6,292,937
Fredrickson & Watson Construction Co. and M & K Corp.—Eastshore Freeway	1,260,449
Fredrickson & Watson Construction Co. and M & K Corp.—Highway in San Francisco	1,386,336
M. H. Golden Construction Co.—Warehouses at Oceanside	2,617,653
Granite Construction Co.—Highway in Santa Clara and Alameda counties	2,529,391
Griffith Co.—Ramona Freeway	2,307,503
J. E. Haddock, Ltd.—Harbor Freeway	1,919,790
Guy H. Hall—School at Bakersfield	2,748,157
Haas & Haynie—St. Mary's Square underground garage, San Francisco	2,100,000
Haas & Haynie—Building at Monterey naval school	4,558,000
Healy Tibbetts Construction Co.—Sewer in Santa Ana	2,047,809
Allison Honer Co. and Cox Bros. Construction Co.—Facilities at Camp Pendleton	2,941,000
Allison Honer Co. and Cox Bros. Construction Co.—Facilities at Camp Pendleton	3,243,749
Johnson Western Constructors—Second barrel of San Diego Aqueduct	3,192,825
Kaiser Engineers—Additions to Kaiser steel mill, Fontana	65,000,000
Kemper Construction Co.—Reservoir at Eagle Rock	1,380,702
Peter Kiewit Sons' Co.—Highway in Antioch and Pittsburg	2,516,564
Peter Kiewit Sons' Co.—Eastshore Freeway	2,552,500

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CONTRACTORS' LICENSING

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stems from the guilds of the 12th century, and thereafter the segregation of construction and skills continued. In 1908 the American Federation of Labor created a Building Trades Department, thus recognizing and accentuating the specialized crafts and skills. Since this time we have seen further classified, the manual skills, materials, processes and tools. Today, in California we recognize 33 classifications of contractors; two were provided by law (general engineering contractors and general building contractors), the other 31 have been established by the Board in accordance with the usage and custom required by the law.

Defining the classification

It is one thing to state that a person is a plumbing contractor or an electrical contractor, but these as terms cannot suffice. As a result it has been necessary for the Board to actually define the work of each of the 31 classifications, and this has been accomplished only after countless hours of deliberation and consultation with the various crafts within the industry.

Realizing the laxity or folly of qualifying one in a sphere of activity and then not limiting one to that sphere, the Board, after years of thought and hearings devoted to the subject, by virtue of the authority granted to them by law, did, in July of 1947 pass a rule limiting one to that sphere of activity or classification in which he was experienced and had been qualified. The rule further provides that one operating without the scope of his classification be subjected to disciplinary action—that is, he subjects his license to suspension or revocation. Certain courts in the state have already deprived one from collecting for his services for acting without his classification, just as is one who operates without a license in the first instance.

Applicant requirements

The law provides that every applicant for license must be possessed of good character. This being broad, and the fact that only the person himself knows of his own character, the law goes on to define that which constitutes lack of character. It is done in four ways—and is applicable not only to the individual applicant, but to each corporate officer, each partner, and to a responsible managing employee of an applicant. They are:

That the applicant has committed or done some act which if committed or done by a licensee would be grounds for the suspension or revocation of license.

That the applicant has done some act involving dishonesty, fraud or deceit wherein he has benefited or someone has been injured thereby.

That the applicant bears a bad reputation for honesty and integrity.

That the applicant has been convicted of a felony.

On this latter a felon could, under the law, be forever refused a license. However, the Board's policy is to determine if this person has made an honest endeavor to rehabilitate himself, and if so to not deny him for character.

Experience rules

The law then allows the Board by rule to establish sufficient experience in an applicant for the safety and protection of the public and to examine the applicant. The Board has established a rule requiring the applicant to be possessed of four years of experience, within the last ten years, as a journeyman or foreman or superintendent in the craft or classification under which the applicant applies for license. The applicant is required to set forth a detailed record of his experience in the application form, which must be verified.

Application filing

The applicant files his application. If it is made out completely and he is possessed of the required experience, and no "flags" appear against his name, an admission card is sent him to appear for examination at the location of his choosing. Examinations are conducted every two weeks in three areas in the state. The law provides "that the Board require an applicant to have such degree of experience and such general knowledge of the building, safety, health and lien laws of the State and of the rudimentary administrative principles of the contracting business as the Board deems necessary for the safety and protection of the public."

Examinations

Based on this, the Board has established specific or craft type examinations and alternates for each of the 33 classifications of contractors.

Examinations are in two parts. The first part has to deal with the various state laws that the Board feels a contractor should have general knowledge of, along with questions on business, payroll computation and figuring a general estimate that embraces all of those items of overhead which are so many times overlooked. The second part of the examination is of a craft or technical nature. The questions for the craft part of the Board's examinations are suggested by representative persons of the craft involved. It might be well to point out that 36.7% fail at their first attempt at the examination. In California, one who would practice medicine, dentistry, or enter the legal profession can take but two examinations in a year period. However, one who would enter the vocation of contracting can

MAJOR CONTRACTS (continued)

Leonard Construction Co.—Acid and phenol plant at Avon.....	3,000,000
R. V. Lloyd & Co.—Second barrel of San Diego Aqueduct.....	2,574,800
R. V. Lloyd & Co.—Canal on Coachella Valley Distribution System.....	1,593,410
M & K Corp. and Fredrickson & Watson Construction Co.—Buildings at Moffett Field.....	2,366,000
Robert E. McKee—Building at Patton State Hospital.....	2,548,100
Morrison-Knudsen Co., Inc. and R. A. Westbrook—Garvey reservoir.....	3,143,695
Morrison-Knudsen Co., Inc. and River Construction Corp.—Isabella Dam.....	5,873,781
Gust K. Newberg Construction Co.—Hospital at Los Angeles.....	17,987,000
H. Earl Parker, Inc.—Canal on Madera Distribution System.....	2,096,200
C. L. Peck and Cahill Construction Co.—Anheuser-Busch brewery in San Fernando Valley.....	15,000,000
Piombo Construction Co.—Highway in San Mateo.....	1,673,277
Rothschild, Raffin & Weirick and James I. Barnes Construction Co.—Laboratory for Navy at San Francisco.....	4,418,300
A. Teichert & Son, Inc.—Los Angeles River improvements.....	1,079,070
A. Teichert & Son, Inc.—Highway in Siskiyou County.....	1,048,738
Ford J. Twaits Co., Morrison-Knudsen Co., Inc. and Macco Corp.—Construction for Marines at Twenty-nine Palms.....	8,898,200
Ukropina, Polich & Kral—Los Angeles Freeway.....	2,559,019
United Concrete Pipe Corp.—Hollywood-Eagle Rock conduit.....	2,627,005
United Concrete Pipe Corp.—Garvey-Ascot Cross Feeder.....	2,069,130
Del E. Webb Construction Co.—Buildings at Travis Air Base.....	6,021,590
Del E. Webb Construction Co.—Construction for Marines at Twenty-nine Palms.....	8,990,000
Webb & White—Hollywood Freeway.....	1,370,545
Western Area Housing Co.—Housing at San Diego.....	6,754,445
Winston Bros. Co. and Al. Johnson Construction Co.—Nimbus Dam power plant.....	6,067,353
Clyde W. Wood & Sons, Inc.—Bridge in Santa Barbara County.....	1,200,700
Wynn-Grinnan—Housing at Camp Pendleton.....	4,691,115

COLORADO

Eagle Erection Co.—Pole Hill and Flatiron power plants.....	1,097,324
Lowdermilk Bros.—Forest road in Boulder County.....	546,971
Marye-Northwestern Co.—Hangar at Lowry Air Base.....	1,171,417
Mead & Mount Construction Co.—National Bureau of Standards laboratory.....	3,123,000
Schmidt Construction Co.—Highway in Arapahoe National Forest.....	536,164
Swinerton & Walberg—Buildings at Rocky Mountain Arsenal.....	1,160,268

IDAHO

Aslett Construction Co.—Old Oregon Trail.....	701,660
Carbon Bros.—Highway in Lewis County.....	505,185
Elle Construction Co.—School at Twin Falls.....	1,540,754
Carl M. Halvorson, Inc.—Highway in Boise County.....	1,152,953
J. A. Jones Construction Co. and C. H. Tompkins Co.—Palisades Dam.....	29,180,346
Peter Kiewit Sons' Co. and Morrison-Knudsen Co., Inc.—Road and bridge at Reactor Testing Station.....	550,350
Russ Mitchell, Inc. and Bruce Construction Co.—Outlet works for Lucky Peak Dam.....	2,590,405
Duffy Reed Construction Co.—Old Oregon Trail.....	952,511
J. A. Terteling & Sons—Tunnels for Palisades Dam.....	1,242,700

MONTANA

F. & S. Contracting Co.—Highway near Whitehall.....	399,872
Holzworth Construction Co.—Highway in Custer County.....	485,125
James Construction Co. and Wunderlich Contracting Co.—Tiber Dam and dike.....	12,838,190
Kiely Construction Co.—Highway in Missoula and Granite counties.....	809,120
Lease & Leigland—Buildings at Great Falls Air Base.....	1,664,678
McLaughlin, Inc.—Highway in Broadwater County.....	549,127

NEVADA

Isbell Construction Co.—Highway in Clark County.....	437,522
Isbell Construction Co.—Highway in Elk County.....	415,577
Lembke-Clough and King Co.—Work at Nevada Proving Grounds.....	383,980
MacDonald, Young & Nelson, Inc. and Morrison-Knudsen Co., Inc.—Magazines at Naval Ammunition Depot, Hawthorne.....	2,855,699
Carl E. Nelson Co.—Highway in Clark County.....	547,185
Nevos Corp.—Housing project at Las Vegas.....	3,250,000
Nomellini Construction Co.—Buildings at Stead Air Base.....	1,472,120
Wells Cargo, Inc.—Highway in Clark County.....	559,829

NEW MEXICO

Brown Contracting Co.—Highway in Santa Fe County.....	537,202
Brown Contracting Co.—Highway in Hidalgo County.....	568,170
Brown Contracting Co.—Highway in Lincoln County.....	518,338
Irby Construction Co.—568 mi. of electrical distribution system.....	504,992
Lembke-Clough and King—Building at Sandia Air Base.....	1,636,120

Concluded on page 78

Tabulation continued on page 78

MAJOR CONTRACTS (continued)

List & Clark Construction Co.—Channelization of Rio Grande game

refuge	713,012
Lowdermilk Bros.—Highway in Taos County	609,017
Lowdermilk Bros.—Highway in Dona Ana County	474,747
Robert E. McKee—Magazines at Wingate Ordnance Depot	1,853,700
Skousen-Hise—Highway in Eddy County	551,557

OREGON

Guy F. Atkinson Co.—Wilsonville Bridge	1,112,370
Guy F. Atkinson Co. and Ostrander Construction Co.—Work at The Dalles Dam	14,437,978
Guy F. Atkinson Co. and Ostrander Construction Co.—Bridge near The Dalles	2,478,480
Babler Bros., Inc.—Pacific Highway	988,629
Donald M. Drake Co.—School at Salem	3,062,725
Funderburk & Stoen Construction Co.—Oregon Coast Highway	1,245,875
General Electric Co.—Generators at McNary Dam	7,763,750
S. A. Healy & Co.—Work at The Dalles Dam	4,888,600
Kuckenbergh Construction Co.—Water pipe line from Mt. Hood to Portland	4,975,675
Leonard & Slate Oregon, Ltd. and E. C. Hall Co.—Pacific Highway	1,530,464
McNutt Bros.—Highway and bridges in Lincoln County	963,787
Morrison-Knudsen Co., Inc., Macco Corp. and Peter Kiewit Sons' Co.—Powerhouse for Lookout Point Project	2,987,374
Parker-Schram Co.—Columbia River Highway	1,223,561
Parker-Schram Co.—Electrical transmission line in Clackamas and Multnomah counties	2,143,991
Ralph & Horwitz—Building for Bonneville Power Administration	4,002,625
White Bros. Construction Co.—Pacific Highway	1,158,818

UTAH

Gibbons & Reed Co.—Highway and bridge widening in Box Elder County	577,269
LeGrande Johnson—Highway betw. Rattlesnake Pass and Snowville	600,698
Rocky Mountain Contractors, Inc.—Basement and foundation for housing project in Ogden	1,804,330
Stolte & Sweeney—Sewer collection system for Murray	1,066,810
Strong Co.—Highway in Davis County	796,039
J. K. Thayne Construction Co.—Grids and facilities at Dugway Proving Grounds	639,800
Utah Construction Co.—Gateway tunnel for Weber Basin Project	2,486,615

WASHINGTON

Guy F. Atkinson Co.—Ebay Slough Bridge	1,192,822
Bechtel Corp.—Refinery for General Petroleum Corp. near Ferndale	35,000,000
J. C. Boespflug Construction Co.—Hospital at Seattle	1,960,000
Cascade Constructors—Main equipment installation and crane operation services at McNary Dam	3,254,725
Cherf Bros. Construction Co. and Sandkay Contractors, Inc.—Canal, West Canal laterals	1,031,574
Columbia River Constructors—Powerhouse and intake structures at Chief Joseph Dam	39,749,990
M. H. Hasler Construction Co. and D. & H. Construction Co.—Kenne- wick levees and pumping plants	3,173,561
Lewis Construction Co.—Housing project at Bremerton	3,000,000
MacDonald-Woodworth-Wright—Barracks at Ft. Lewis	9,368,994
MacRae Bros.—Alaskan Way Viaduct	1,063,659
Manson Construction & Engineering Co.—Snohomish River bridge	1,913,080
Morrison-Knudsen Co., Inc.—Alaskan Way Viaduct	2,384,061
Myers & Major—Housing on Whidby Island	2,769,550
Sound Construction & Engineering Co.—Building for Boeing Airplane Co.	3,929,600
Strand & Sons—Building for Boeing Airplane Co.	3,379,501
J. A. Terteling & Son—Railroad and highway relocation and bridge in Walla Walla and Benton counties	1,280,797
Howard S. Wright & Co., Inc.—Building for Boeing Airplane Co.	3,423,654
U. S. Steel Co. (American Bridge Div.)—Superstructure of bridge at Pasco	3,073,376
Zoss Construction Co.—Warehouse at Auburn Depot	3,793,180

WYOMING

Stanley H. Arkwright, Inc.—Highway in Sweetwater County	555,097
Big Horn Construction Co.—Highway and bridge in Campbell County	707,913
Brown Construction Co.—Highway in Albany County	674,983
A. S. Horner Construction Co.—Alcova power plant	2,324,224
Indiana Construction Co.—Highway and bridges in Campbell County	536,258
Northwestern Engineering Co.—Railroad overhead crossing in Laramie County	451,694
Strong & Co.—Parking areas and roads in Yellowstone National Park	396,000
Young and Smith Construction Co.—Means Canal and Eden Canal	514,379

(NOTE: Major contracts awarded during December are not included in the foregoing tabulation, but may be found on pp. 126-131 of this issue.)

CONTRACTORS' LICENSING

... Continued from page 77

take up to four examinations in a year since a 90-day waiting period is required between examinations which have been failed.

Grounds for suspension

There are presently in the law 16 grounds providing for the suspension or revocation of a contractor's license. Experience has shown that they amply cover the injurious acts or omissions that a contractor may commit. These 16 grounds appear in the Business and Professions Code of the State, of which the Contractors' Law is a part. Because of their importance to the administration of the law they are presented in full as a feature of this article.

Formal complaint cases charging violations of any of the grounds, quoted, along with charges filed against an applicant for not possessing the required character, have totaled 9,872 since 1929. These formal hearings are conducted by deputy registrars and hearing officers from the State Division of Administrative Procedure which provides a panel of trained hearing officers who are attorneys. Their proposed decisions are rendered to the Registrar, who in turn makes the final decision, whether it be suspension for a stipulated time or complete revocation or denial of license. Appeals from the decision are made to the Superior Courts of the State. Of this large number, the Registrar has been reversed by the courts but on nine occasions.

The formal hearing is comparable to any hearing held before a judicial officer. A written, sworn accusation, or complaint is filed against the licensee setting forth the charges. The defendant contractor is allowed to file answer to the charges after which a hearing is held. The defendant contractor is entitled to representation by counsel, is allowed to cross-examine all those who appear against him and is entitled to subpoena witnesses on his own behalf.

It is estimated that but 20% of the complaints brought to the Board result in formal hearing proceedings; the balance are settled by the investigator in the field when it is determined that the matter is not of sufficient gravity to seek suspension or revocation of the contractor's license. In fact, on many occasions, the contractor is the one who calls the Board's investigator in order to assist him in untangling a grievance with an owner.

No piece of regulatory legislation has ever been devised which is perfect. Even were this stage reached, changing conditions would probably render such a law obsolete in a fairly short length of time, so the Board is constantly watching to have the California Contractors' License Law made most workable.

End-point conditions for the test were first established by instrument records. Therefore, this review of the project before the main season of operation concentrates on—



WASHO Road Test instrumentation

OPERATION of heavy trucks on the WASHO Road Test in southeastern Idaho was suspended for the winter on November 27, 1952." With this sentence a release of the Highway Research Board signals completion of the 1952 phase of progress on the Western test road near Malad City.

During the past year construction was finished, conditioning traffic had its turn, and about 17,000 applications of heavy axle loads were recorded as the official testing program started.

During this early testing, some isolated instances of distress were observed, most of them being in sections where the total constructed thickness was only 6 in. (no subbase material at all). In general, slight depressions were the only signs in even these areas, and they have since been repaired according to the maintenance procedures outlined for the project.

The signal for cessation of testing this winter was a record of freezing temperature in the test road subgrade. Instrumentation giving this and other information for the test is described in the following paragraphs. Before the subgrade froze, however, test traffic had been operating on a round-the-clock basis since November 10. During the remainder of the winter, pavement and shoulders will be kept clear of snow (4 in. on December 3) and single-axle trucks loaded to 10,000 lb. will run uniformly over all the test sections for a few hours each day.

History

The WASHO Road has come this far in only one short year and a half. For it was at the June 1951 convention of WASHO, held in San Francisco, that the delegates passed a resolution setting up the test road program. This road test is one of three envisioned by regional associations of highway officials; it is intended to augment the body of engineering thought and comment that came from

conduct of tests of existing concrete pavement in Maryland.

A significant point of departure in the WASHO concept has been the specification that tests should be performed on a track built especially for the purpose. This concept has in part been responsible for the referral of at least one other proposed regional test (that of the Mississippi Valley Conference) back to the national association, AASHO. And, as a result, that body is presently contemplating an all-inclusive project, to encompass both rigid and flexible pavements, for construction and conduct at a mid-Western location.

Unique concept

The WASHO concept of a specially built test road was stimulated by a realization that a multiplicity of "unknowns" were plaguing engineers during and following the Maryland test. Admittedly, some of the factors clouding the intended objectivity of that test arose out of an early decision of the project committee to release data as they were accumulated. These early data were used by prejudiced interests seeking to prove one thing and another about highway construction and highway traffic.

The difficulty in refuting these interests lay in "unknowns." Some opposing arguments would be based on assumptions that, each of them, might well be true. However, lacking more definite knowledge of the character of the roadway itself, neither assumption and, hence, neither argument could positively be verified or refuted. This is not to say that comprehensive data were not secured on the physical character of the Maryland road. But spot borings, even at regular sections, and possession of original drawings and specifications cannot substitute for the intimate knowledge and controlled conditions that are implicit in special construction for test purposes.

To avoid these "unknowns," since there are plenty of variables in the

test equation anyhow, WASHO insisted on special construction. The idea, further, was as nearly as possible, to test a typical road surface in and of the West. For this reason, the test road committee of WASHO selected a site in southeastern Idaho, 10 mi. south of Malad City, and specified bituminous surfacing, which is most common in the Western states.

A detailed account of the Association's work and decisions in formulating test project policy, and in administering its progress nearly to the present time, appeared in *Western Construction* for April 1952, pp. 65-66. Background information contained in that article, a paper presented by G. Bryce Bennett of the Idaho Department of Highways at the Utah Highway Engineering Conference, is here very briefly summarized.

Cooperation

Active WASHO participation in the actual construction and operation of the test project is limited by the nature of the association to more or less of a supervisory or consulting capacity. The states (except Arizona, and it was prevented by legislative restriction) put up \$315,000 of construction funds. Other money, equipment, and services have come from outside agencies, including the Bureau of Public Roads, and from many commercial interests, including the petroleum industry and truck and trailer manufacturers.

The final major step undertaken by WASHO in active participation was the design of the test road. This was done cooperatively through the standards committee of WASHO. Plans and specifications were then drawn by the Idaho Dept. of Highways.

When it came to construction and operation, the Highway Research Board was called upon to function as administrative agency. This Board, an organization within the National Research Council, subsequently called for bids and later awarded the con-



MACK TRACTOR and Fruehauf semi-trailer carry 32,000 lb. on each set of tandems. Other unit, loaded to 40,000 lb., is International truck and Utility trailer.

struction contract to Carl E. Nelson Co. of Logan, Utah.

At the test site, construction was under the direction of A. F. Rath, resident engineer. Project engineer over the entire conduct of operations, both construction and testing, is William N. Carey, Jr., of the Highway Research Board. Other supervisory personnel during the test period include Theodore Dec, operations engineer (Bureau of Public Roads), and Harold S. Sweet, research engineer (University of Wyoming).

Description of loops

The test tracks—there are two—were built on the new alignment of U. S. Highway 191 about 10 mi. south of Malad City, Idaho, and just north of the Utah border. Eventually, the long sides of both ovals will become two-lane, one-way facilities for north- and south-bound traffic on a four-lane divided highway.

Tangent sections of each oval are 1,900 ft. long and 24 ft. wide. Banked turn-arounds at each end will make a constant 30-mph. speed possible for the test traffic. Between the ovals lies some 600 ft. of unpaved alignment in which are located engineering and maintenance headquarters for the test. The entire layout is oriented to a north-south direction.

Each tangent consists of five 300-ft. test sections connected by four 100-ft. transitions. Thus, there are 20 test sections, all of which are built of hot plant-mix. Turn-arounds incorporate a few road-mix test sections. Throughout all sections, subbase consists of 2-in. minus granular material from a single source. All asphaltic pavement incorporates ¾-in. minus granular material, likewise from one source.

Differences among the test sections relate only to the thicknesses of paving and of subbase. On each tangent, subbase thickness varies, in the direc-

tion of travel, as follows: 16 in., 12 in., 8 in., 4 in., and 0 in. Pavement over all these subbases totals 6 in. in thickness. However, on the northeast and southwest tangents this thickness is composed of 2 in. of granular base overlain by 4 in. of asphaltic concrete. On the northwest and southeast tangents, the figures are reversed: 4 in. of granular base overlain by 2 in. of asphaltic concrete.

The north loop will carry single-axle traffic exclusively; the south loop, tandem axle traffic. In the case of single-axle traffic, 22,400-lb. loadings will travel the outer lane of the north loop, and 18,000-lb. loadings will travel the inner lane. For the tandem-axle track, it will be 40,000 lb. on the outer lane and 32,000 lb. on the inner. In each case, two truck-trailer combinations will operate in each lane, a total of eight vehicles.

The test program has been built on a certain number of load applications for each test section. The number is something greater than 200,000. Within this figure, the truck action is controlled as to speed and position on roadway so that final results for the various sections and lanes can be analyzed on a common basis—at least insofar as these factors are concerned.

The lanes are each 12 ft. wide, to accommodate traffic when incorporated into the new alignment of U. S. 191. For the purposes of the test, however, representing many miles of existing Western highways, they will be used as 11-ft. lanes. That is, knowing that many highways have only 11-ft. lanes, and that truck (and other) traffic must often travel close to the edge, Highway Research Board engineers have outlined a pattern of driving conduct that will see the test trucks intentionally staying by the pavement edge a certain amount of the time.

A white stripe close by the outside

edge of each lane will serve as the guide line for drivers during 10% of their circuits. A yellow stripe 2 ft. in from the white will serve similarly for another 20% of the time. In each case, the outside wall of the outermost tire will be expected to roll down the centerline of the stripe! To achieve this, a sighting system has been arranged to guide the driver. Completing the plan for simulating actual traffic operation, trucks will be permitted random travel between stripes for the remaining 70% of the time.

By way of assuring that this time distribution of travel is maintained, the first of six principal systems of instrumentation has been provided. A stepping switch in each truck cab will be triggered by intercepting a radio signal beamed across the roadway on each test track. The stepping switch will move through a cycle of 10 positions, 7 of them flashing a light for random travel, 2 of them a light for yellow-stripe travel, and 1 of them a light for white-stripe travel. Thus, the driver is directed where to drive without reliance on memory.

Drivers checked

As a means of checking driver compliance with this set-up, transverse position tapes will be placed in the roadway, three on each loop. These tapes are the second instrument system. They measure ½ x 2 in., and are segmented in order to be sensitive to pressure only within narrow limits across the roadway. Signals from the various segments, actuated by truck passage, will be recorded on a counting device.

Various measures are being taken to obtain a continuous record of what happens to the test sections under traffic. The remaining four basic systems of instruments were devised and installed for this purpose.

Thermistors and moisture cells comprise one classification. Actually, of course, they will not record traffic effects, but they will assure precise knowledge of roadway "climate" at all times and permit analysis of deflection data from other instruments on a known common basis for both test loops. The thermistors and moisture cells both operate on the principle of electrical resistance of a material as it is affected by temperature and moisture change.

Deflection assemblies

At one location in each test section (two, counting both lanes), deflection assemblies are in place. Each group consists of five instruments, positioned in plan somewhat like the spots on a playing card. All are differential transformers, but they differ in the manner of core placement.

The center instrument and two others, one on each side, have as the basic member a reference rod about 7 ft. long. Coming to within a foot of the pavement surface, it obviously extends well into the subgrade mate-

rial. A 4-ft. section of the reference rod is greased to prevent any adhesion of subgrade soil and consequent application of tangential force that would move the rod. The "datum" for this type of installation is in the subgrade, well below the depth of any expected test effect.

Two similar but shorter rods are founded on perforated plates placed on the subgrade. The rods are tipped with a tapered screw that taps into any perforation of the plate, since the plates are placed before application of base and pavement courses and may be moved slightly in that process. They are surveyed in, of course, and reference stakes locate them for the rod installation.

In all five instruments a machined casting set into the pavement surface completes the initial installation. During the tests, a transformer is placed into a socket of the casting, and its wiring led to the roadside in grooves provided in the surface. Also, a core extending rod is placed upon the reference rod, to project upward through the transformer. Thus, differential transformer action upon passage of test traffic may be used to measure deflection of the section. The results are recorded on an oscillograph tape.

The presence of rods founded both on the subgrade and in it permits, by simple arithmetic, the calculation of compression within the constructed cross-section (pavement, base, and subbase) as well as deflection of the subgrade itself.

Settlement installations comprise the fifth system of instrumentation. They have been incorporated to determine permanent effects of the tests. There are four sets of settlement instruments in each test section, two sets referred to the subbase material and two referred to the subgrade. Somewhat similar in foundation to the deflection assemblies, each set consists of a line of 9 extender rods screwed into perforated plates spaced at equal intervals across the lane width (on subbase or subgrade). These installations are not fitted for deflection measurement by any automatic or recording system. Rather, the slim hole containing the extender rod is literally corked, except when a mechanical measurement is made.

The profilometer

This measurement is made by an Ames dial. The dial is mounted on what is called a profilometer, an instrument intended primarily for obtaining transverse profile records of the test section surfaces. The profilometer consists of a lightweight truss spanning the roadway and having a movable carriage on its lower chord. This carriage also carries the Ames dial. The whole rig is supported on support pins at either side of the roadway. Ames dial readings may be referred to these supports, which have been precisely surveyed for level.

Thus, permanent deflections can be measured for the test surface, in relation both to the subbase and to the subgrade.

In its intended function the profilometer is the sixth major form of instrumentation used on the WASHO Test Road. For obtaining roadway profiles there have been driven profilometer support pins at 60-ft. intervals around both test loops, in addition to the pins required for making measurements at the settlement installation sections. These pins are

firmly established in the roadway shoulders to a depth of about 7 ft., where they may be expected to remain fairly constant as to elevation. They will be checked by leveling from time to time.

The movable carriage on the profilometer carries a freely telescoping linkage culminating in a roller that rests on the pavement. This mechanism in turn incorporates a differential transformer. In operation the carriage is electrically driven across the profilometer truss, its suspended wheel

The economic and engineering problem

TRUCKS GOING NOWHERE on the WASHO Road are now posing questions that have long plagued highway engineers of the West.

Answers will first appear impressed directly on the bituminous surface of the two-looped test tracks, and will finally be made available when an analytical report is prepared at the conclusion of the test.

The Western Association of State Highway Officials sponsored this comprehensive field study of typical Western road design and construction. Every precaution has been taken to eliminate factors that would lead to controversy over the findings. Rather than a search for information on destructive forces, the purpose of the investigation is to provide constructive data. How can Western highways be designed with minimum cost for maximum service considering the types of traffic that serve the West today and tomorrow? As a corollary, conclusions will be helpful in determining equitable highway financing for the future.

The relationships between highway design and vehicle loads which form the basis for the study can best be expressed graphically. This has already been done by the American Association of State Highway Officials (1952) in a statement on its own proposal for a test road. The principles to be

correlated and the graphic presentation of factors follow:

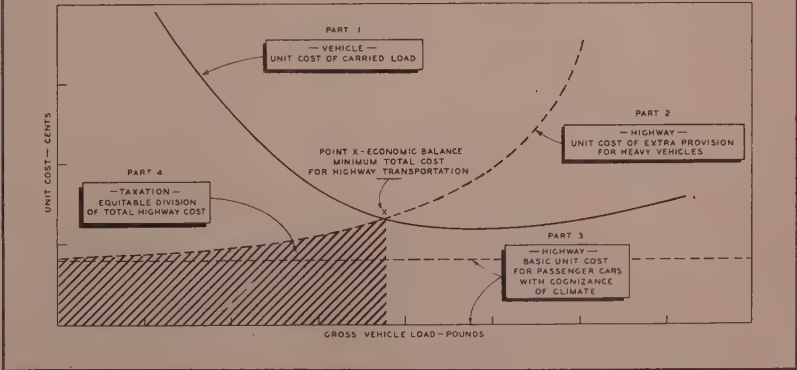
"The overall highway transport economic and engineering problem has four basic parts. The interrelationship of these four parts has been interpreted graphically . . . on the following assumptions:

"Part 1—The unit cost of carried loads: This is based on evidence that economies in commercial motor vehicle operations can be obtained by the use of vehicles with greater axle loads and gross weights than are now allowed. The law of diminishing returns will apply as some maximum limit, the magnitude of which has not yet been fully determined.

"Part 2—Unit cost of extra highway provision: This is also based on evidence that pavement construction costs increase with provision for increased load-supporting capacity in some relation not fully established.

"Part 3—Basic unit highway cost for passenger cars: There exists a basic cost necessary to provide highways for passenger cars with cognizance of the destructive effects of climatic conditions, a value which has not been firmly established for different types of highways.

"Part 4—Taxation: It is possible to determine the highway cost responsibility of various classes of highway users as a basis for more equitable taxation."



freely following all ups and downs of the pavement surface. These are converted through the transformer and other electronic apparatus into a profile record inked on paper. The major portion of this equipment, including the recording facilities, is carried in a station wagon.

For easy comparison of repeated profiles of a given section, artificial index "pips" are dubbed into the profile record. This is done by means of several cammed surfaces at regular intervals along the profilometer carriage rails in the truss. Passage of the carriage past these cams causes an artificial jog of the differential transformer and induces a new pip in the inked record. By superposition of pips in succeeding profiles, differences elsewhere between those profiles may be detected.

Both as it is used to obtain profile data and to refer settlement data, the profilometer must itself be calibrated for live and dead load deflections. This has been precisely done. Temperature change was one factor originally thought to be significant in this regard. Therefore, the profilometer was checked against a concrete beam. This beam, though relatively stable as compared with the profilometer, also reacted to temperature changes, the amount being calculated according to physical laws rather than by reference to yet another substance. The net effect of these studies was a conclusion that temperature differences would not be significant to the operation of the profilometer.

Longitudinal profiles

Additional graphic portrayal of the state of the test road surfaces will be obtained from a profilograph and a roughometer. Both these instruments will be operated along the axis of the test sections, giving longitudinal data. Owned by the California Division of Highways, they will be on loan to the project only occasionally.

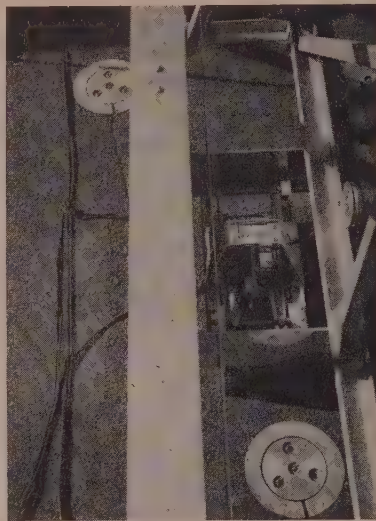
The profilograph gives a record of surface condition unaffected by the speed of travel. Like a land plane, it uses a long wheelbase to iron out the bumps over which it travels, thereby providing a fairly constant datum to which these same bumps can be referred by the recording wheel that is mounted near the center of the device. Its workings are entirely mechanical but, like the profilometer, it gives an inked record of the profile traversed.

The roughometer produces a profile of the roadway in terms of inches of roughness per mile traveled. Action of the instrument (described in *Western Construction*—October 1950, pp. 90-92) depends on the speed of travel. Therefore, calibration tests of the roughometer have been run at a standard speed over various types of road surface in order to provide a scale of roughness. The roughometer results may be equated only approximately to the condition of the roadway; essentially it provides a measure



SPANNING the test track between precisely leveled support pins, the profilometer (above) enables reference of transverse profile records to the project datum.

DRAWING the profile, the profilometer carriage rolls along the bottom chord, its suspended linkage transmitting the profile record by means of a differential transformer. Discs in roadway are deflection assemblies.



of riding comfort, and has been used largely to assign priority to highways and municipal streets that are due for improvement.

The usefulness of much of the data to be obtained from use of the instrumentation described above depends on condition of the road surface at the outset. That is, the effects of test traffic must be referred to some reasonable datum. Knowing that any new road "wears in" in various respects during its first months of operation, Highway Research Board engineers at the project set up a program of conditioning traffic to move onto the test loops after construction was finished. These loads consisted of one 8,000-lb. single axle load and

one 16,000-lb. tandem axle load operating in each lane designated for single- or tandem-axle traffic. The aim was 15,000 axle passes.

Only one further step was necessary. At this time, after conditioning traffic had completed its function, the "original" data for the road was recorded. The profilometer made its record at every 60-ft. interval, and elevations were checked on every settlement installation in the roadway. This mass of information will be one end point on the record for every section.

Driving regimen

Operation of the test to date has been according to the typical pattern that will be followed throughout the test. Drivers will stay at a constant 30 mph., enabling them to complete exactly one circuit of the 1.25-mi. track in 2½ min. They will drive continuously for 50 min., effecting 20 laps, then stop for a 10-min. rest. The entire shift is so spent, except for a 30-min. lunch break substituted for one of the rest stops.

A shift comes to 9 hr., 10 min., in which are nine 50-min. driving periods or 180 laps. With two-shift operation scheduled, each test section will be subjected to 360 truck passes daily under ideal conditions. Counting actual separate axles involved in what are known as single- and tandem-axle vehicles, this means 720 load applications on the north loop and 1,440 on the south loop.

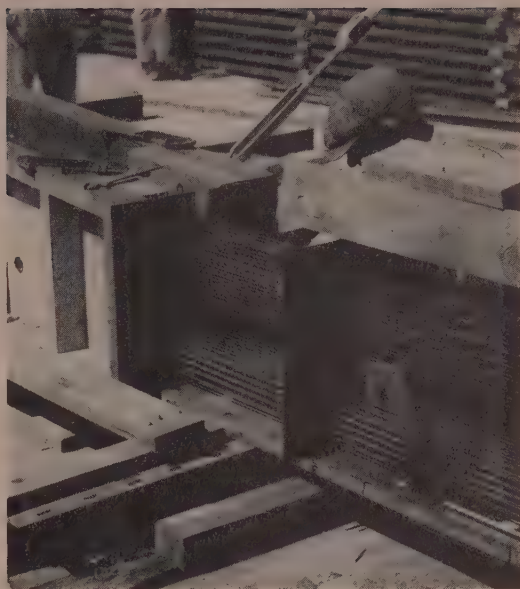
Most of the testing will be conducted during the summer months, extending into the fall of 1953. Activity this spring has not been fully decided yet. A little testing may be done during the winter when the weather is not at its worst, just in order to carry out the simulation of normal operating conditions. Actually, such test traffic is not expected to have much effect, as a frozen road is structurally sounder than ever and only slightly susceptible to damage from loads of the size used in this test.

During the entire test program, structural maintenance will be performed to Idaho standards by Idaho forces. A large supply of aggregate, the same as was used in construction, has been stockpiled for this purpose. Thus, the constant nature of materials incorporated in the road can be maintained.

The overall aim of reducing all possible influencing factors to constants is expected to contribute materially to the value of this test. Engineers of the Highway Research Board will have their analytical task greatly eased, and the clarity and significance of test results to Western highway engineers will likewise be enhanced. By this test, a great volume of needed engineering knowledge will be added to the Western engineering repertoire, to the benefit of all its road-building agencies and to the taxpaying highway users.

Prestressing knowledge must be authoritatively summarized — This is consensus at the West's first conference on . . .

PRESTRESSED CONCRETE



THE FIRST WESTERN Conference on Prestressed Concrete was held at Los Angeles in mid-November of 1952. The conference sponsors held the attention of 270 registered conference guests with a diversified yet well integrated program that filled four half-day sessions and one evening meeting and featured 17 speakers. Principal speaker at the dinner meeting was P. W. Abeles, consulting engineer from London who has been with prestressed concrete for several years.

It was in two of the four sessions that some of the most significant comment was made. These sessions dealt, respectively, with the principles of prestressing and prestressing materials, and with specifications and building code provisions. The remaining portions of the conference program were given over to behavior and design mechanics of prestressed concrete, and to discussions of completed installations or tests.

Development follows pattern

A recurring note in several papers disturbed the ghost of reinforced concrete design as it first existed about 100 years ago. At that time an attempt was made to patent or license design techniques in the newly developed construction medium. The result was laggard progress in the use of reinforced concrete, which became the universally studied and universally applied phase of civil engineering that it is today only when the intramural squabbles were put down.

Implications so broad that they could only have been intentional were included in three conference papers to the effect that prestressed concrete, in this country at least, is somewhat in the predicament that plagued reinforced concrete 100 years earlier. Although prestressing is not

patented as such, most of the few mechanical systems for its employment are so controlled. Presumably, these systems are, among them, the best ones (so far at least) for introducing either pre- or post-tensioning into structural elements. Thus, in a large part, the economical use of prestressing is controlled by patent holders and their licensees.

Two sides to the question

The existing situation not only has historical precedent but a certain amount of justification. These methods and, indeed, much that is known in prestressing theory, have been developed by private research privately financed. A large part of this study has been carried out in Europe but a significant portion has accrued in the United States as well, out of the necessity for modifying prestressing systems for U. S. construction economics. It is easy to conclude that the originators of these systems, having explored prestressing theory quite of their own accord and on their own resources, should be in line for certain rewards.

The opposing argument, if it be such, is that a first principle of engineering practice has long been the free dissemination and exchange of engineering knowledge. It was upon this premise that many of our technical societies were founded. Although patent rights do not prevent free circulation of knowledge, they do restrict its practical application. And, in engineering, such restriction makes further pursuit of a subject purely academic.

Indeed, much that is known about prestressing in this country has resulted from the academic pursuit of the subject. It may be said that not all engineers have the time or resources to devote to thorough ex-

ploration of the new design method, especially when they can gain no practical reward. Thus, it behooves the profession, through a committee of one of its societies, to survey the field, digest the current knowledge of prestressing, and summarize it for the benefit of the profession.

A procedure such as this may appear at first glance to be a leveling one that penalizes the advances made by a few in the profession. It may be said indicative of a deadly philosophy that calls for a new start, everyone again even at the post, whenever prior competition has established a natural order among individuals.

On the other hand, it may be that the long view of history affords a better look at the situation. Reinforced concrete has been mentioned in its similar early struggle for acceptance. Other materials and other methods have had their hotly competitive days, and have then settled down over an historical length of time to become accepted "fixtures" of the engineering profession, to be used when the economics and/or exigencies of a design situation require.

Contributing to the legitimacy of this viewpoint is another point that was mentioned more than once by various conference speakers. These men emphasized that, in the interest of proper balance within engineering practice, and for the good and logical development of prestressing, the new method must be specified by the economics of the situation and not by the (apparent transient) economics of one prestressing system. The implication here is that much of the hue and cry over the present proprietary nature of prestressing is unjustified by a comparable volume of engineering is controlled by patent holders.

Consideration of this problem at this time was germane to a Western

conference of prestressed concrete. For the body of knowledge is moving Westward, and the number of prestressed structures is increasing. In order that the use of prestressed concrete in the West be a proper use, and in order that Western engineers be properly appraised of the best in prestressing theory and construction, some means of codifying, or organizing that knowledge must be determined. Two years ago, a single pe-

destrian bridge over an Arroyo Seco flood channel stood alone as the single example of linear prestressed concrete construction in the West (*Western Construction*—December, 1950, p. 67; April 1951, p. 76). There were, it is true, several prestressed circular tanks and silos.

Now, the examples that stand erected, and those that are coming up for immediate construction are many—warehouse girders at Long Beach,

Calif.; a logging bridge in Washington; a highway bridge on U. S. 101 in Oregon (*Western Construction*—November 1952, p. 56); engineered plants for the mass production of prestressed, pre-tensioned structural elements in Tacoma (*Ibid.*, p. 74) and Denver; a highway overpass in Fresno, Calif.; applications in Southern California for further stabilizing the newly popular tilt-up pre-cast structural technique (*Western Construction*—December 1952, p. 66); and girders for the new Oregon Highway Department maintenance shops.

Speaking on design specifications for prestressed concrete in buildings and bridges, Professor C. P. Siess of the University of Illinois, led his conference audience through many considerations that must be undertaken in properly arriving at an accurate and usable specification for prestressing. Professor Siess is a member of the joint ASCE-ACI committee on prestressed concrete and has therefore studied some of the problems.

Developing a spec

By way of outlining the aims of his committee, which purports to represent the aims of the profession as a whole, Siess named three obligations which engineers have in regard to prestressing. One is to make knowledge available (here was a mention of that point, already discussed), another is to use prestressing properly and safely at all times, and a third is to "research" it and study it.

In connection with the first obligation Siess noted that the field of prestressing is presently dominated by a few. It was he, in particular, who noted that not all engineers have the resources to study this or any other complex new phase of engineering that comes about. And, doubtless reflecting the thought that led to his own committee work, Siess concluded that a professional committee to digest and summarize prestressing knowledge was in order. The result might be some form of specification.

A conflict arises when Siess' second and third obligations are considered together, and in line with the conclusion above. On the one hand, safety must be paramount in the use of prestressed concrete (no less and, one would well note, no more so than in conventional reinforced concrete). Should a specification be written that would assure safety of a structure only at the hands of a careful engineering practitioner, or one that would stand the rugged test of application by an engineering charlatan?

To promote the pursuit of the engineer's third obligation, the specification should be somewhat flexible. A rigid specification would stifle interest in improving the method and would effectively impede research by drumming "What's the use?" at any zealous researcher.

In order to get around this conflict,

Concluded on page 86

Principals of prestress program

THE WESTERN Conference on Prestressed Concrete, some of the more significant and long-range aspects of which are reviewed on these pages, was sponsored by several California universities and by the Naval engineering organization at Port Hueneme, Calif. The completeness of the two-day program could not have been had, however, without the active co-operation of several other groups, notably the Los Angeles office of the Portland Cement Association.

The program was organized in a logical sequence that led from the general principles and history of prestressing to a review of past and present examples of prestressed concrete.

Chairman for the first session, on principles of prestressing and prestressing materials, was C. W. McCormick, assistant professor of civil engineering at Caltech. Papers on prestressing materials were presented by C. Dobell of Preload Enterprises (steels and end connections), and Raymond E. Davis, emeritus professor of civil engineering at the University of California (concrete properties).

Technical aspects

Behavior and design mechanics were covered in the second session, with C. V. Armour, professor of civil engineering at the University of Southern California, as chairman. Tests of prestressed bridge girders were discussed, followed by papers on three aspects of design, presented by J. R. Libby, engineer, and Jean Muller, chief engineer, both of the Freyssinet Company, and by Allen Stubbs, office engineer for the Prestressed Concrete Corp.

An evening meeting of the conference was presided over by F. E. Lowance of the Naval civil engineering and research laboratory. An illustrated lecture was heard at that time, by

P. W. Abeles, consulting engineer of London. Moving pictures were also shown depicting tests to destruction of prestressed concrete beams built by the Naval laboratory at Port Hueneme, and showing the method of fabrication of prestressed concrete piles for marine platforms by Raymond Concrete Pile Co.

Practical aspects

Sessions on the second day of the conference moved into the construction phase of prestressed concrete. The first chairman was J. W. Kelly, professor of civil engineering at the University of California, introducing a series of speakers on specifications and building code provisions. Among these were C. P. Siess, professor of engineering at the University of Illinois (whose paper is discussed in the accompanying article); T. Y. Lin, professor of civil engineering at the University of California; and W. J. Jurkovich, senior bridge engineer with the California Division of Highways (whose paper also is reviewed on these pages).

A brief panel discussion on the same general subject had for its moderator Samuel Hobbs, structural engineer of the Portland Cement Association, Los Angeles office. Panel members included the previous speakers, and also F. K. Andrus, structural engineer for the Los Angeles County department of building and safety.

The final session of the conference saw a review of research, construction methods, and economics. C. M. Duke, professor of engineering at the University of California at Los Angeles, was chairman. Slides were presented by several of the speakers, illustrating various prestressing jobs in their experience, which covered Denver, Tulsa, Los Angeles, and San Francisco.

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to bypass it at least temporarily, it might be well to consider whether prestressing knowledge is first to be codified in specification form as a building code or as a recommended practice. A code would be stifling, since our present knowledge would require excessive conservatism. A recommended practice would leave final decision to the governing agency at the particular location, under the particular conditions of the job, and at the particular (future) time of its conduct. All in all, so long as protection may be had from those who would seek to mis-apply prestressing, a recommended practice is preferable.

Scope of specification

The specification to be written must cover a lot of ground. Engineers fascinated by prestress are clamoring for a specification that will be Bible to them in this new field, for the design of buildings, highway and railroad bridges. (Circular prestress is felt to be pretty well known and would be accorded a minimum of attention in the new work.) But, these same engineers forget that specifications for buildings, and for the two types of bridges, in reinforced concrete, have been the product of three separate bodies.

Nonetheless, Siess indicated, the present committee expected that it or its successor would hew faithfully to the all-inclusive task casually dropped its way. The specification would attempt to cover materials—especially those that are not presently well known such as high-early cements, steel problems in creep and relaxation, grout fluidity, etc.

The specification would also cover construction methods—manufacture and placement of concrete, inspection, tensioning precision and integrity (how to write a spec applicable to the many methods in use?). And, finally, it would deal with design—stress patterns, problems of flexure and shear, bond, proportions, working stresses and factors of safety.

How fast all this is done does not depend entirely on the activity of the joint committee of which Siess is a member. It depends on how soon the entire profession can learn what it doesn't know, by digging in, and by developing present knowledge.

The lack of a universal specification for prestressed work at the present has not greatly hindered larger engineering offices in their application of the new method. Where a conservative agency such as a state highway department designs for prestress, it is certain that engineering aspects have been thoroughly investigated and that, furthermore, rigorous control and inspection will follow.

California's Division of Highways, Bridge Department, has done two

jobs in prestress now, the Arroyo Seco pedestrian bridge, and the Weber Avenue bridge in Fresno, recently awarded to Thomas Construction Co. of Fresno on a bid of \$91,360 (which includes approaches as well). It was therefore with authority that W. J. Jurkovich, senior bridge engineer for the Division of Highways, spoke at the conference on job specifications.

Job specifications

Though the problem may sometimes seem rather delicate as between reinforced concrete and steel when a job is designed and specified, this is nothing compared to the difficulty of preparing specs for a prestressing project! For, although the construction medium has been selected, very little specific detailing can be done without appearing to give preferential treatment to one or another of the prestressing systems. Jurkovich drew upon his own experience, which is only with post-tensioning, and only in his own department's practice, to sketch some answers to this and other problems in job specifications.

The initial problem of presenting the design without apparent favoritism actually has a fairly simple solution: California's bridge department merely indicates the position of post-tensioning conduits in the structural elements. All details of anchorage and composition of the prestressing bars or wires are left to the contractor, who is put in the position of a fabricator. Shop or detail drawings thereby become his responsibility and are subject to review as would be drawings for conventional fabrication.

Also in this regard, specification must be made as to just which prestressing methods or systems are acceptable for the work. Among them in California for that state's bridge work are Freyssinet, Magnel, Preload, Prestressed Concrete Corp., and Stressteel. The latter, it might be noted, is specifically a manufacturer and vendor of prestressing materials. These may be bought by any contractor versed in their use. The inclusion of Stressteel here as a "system" is made because of the unique nature of the materials (large-diameter bars rather than clusters or strands of wire). The other systems exist principally as a contracting service, though in most instances they also include a specific "kit" of materials.

Since the various systems differ in their quantity of appurtenant apparatus, it is generally the case that specifications define precisely the scope of operations to be considered as "prestressing." Then, in order to put the companies on an equal bidding basis, the actual contract item of "prestressing" is called for as a lump sum. There are no separate provisions for anchorages, wires or bars, jacks, labor, test cylinders, etc.

Terms must be defined

There are many definitions of terms

necessary to job specifications in prestressing work. Unlike older, more established construction mediums, prestressing is for various reasons not yet a subject of general understanding. Specifications must therefore define and identify the various forces and loadings that are to be considered and applied during construction. Furthermore, governing magnitudes for these must also be included. Among the forces are initial prestressing force, anchoring stress, and stress to remain after creep and shrinkage.

The successful bidder is required to provide, among his details for conduct of the work, a description of the proposed anchorage, including the manner of distribution and bearing. His manner of conducting the required anchorage tests should be called for. In this connection, the original specification will probably have called for the use of hydraulic jacks and will, further, require the accompaniment of calibrated gauges with which to follow the operation precisely.

Specifications for prestressing begin with the method for forming holes in the member, through which prestressing elements are to be passed. Rubber conduit and various metallic sheaths are in use, the rubber conduit being removed after concrete has set, while sheaths are left in place. To some degree, the choice of method for forming these passages depends on whether or not the prestressing is later to be grouted into place. And here is another point for specification.

If grout is not to be used, then a method must be defined for preventing bond. Lubrication of various types can be used, and further assuredness can be had by insertion of metal saddles to enhance movement of the prestressing material during jacking or transfer, especially at such points in the member where the conduit changes direction.

If grout is to be used, its own specification as to components and composition, characteristics and method of intrusion, must be included.

The requirements for other reinforcing must be clearly set forth, and there may be some effect on the prestressing installation and operation.

With regard to the actual prestressing operation, the signal provision is when, in terms of concrete compressive strength, transfer may be undertaken. Following this, consideration must be given to the overstressing required before anchorage. Following through to completion of prestressing, allowable anchorage slip must be specified.

In actuality, many of these job specifications have their counterparts in the various requirements commonly attached to construction in steel or reinforced concrete. The emphasis of the conference upon this or any other aspect of prestressed concrete serves to underline the current demand for consolidation of this new body of engineering knowledge.



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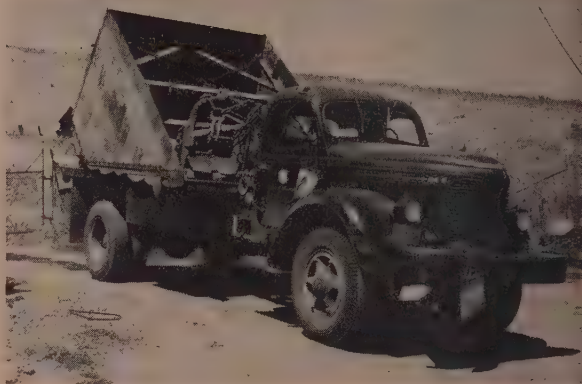
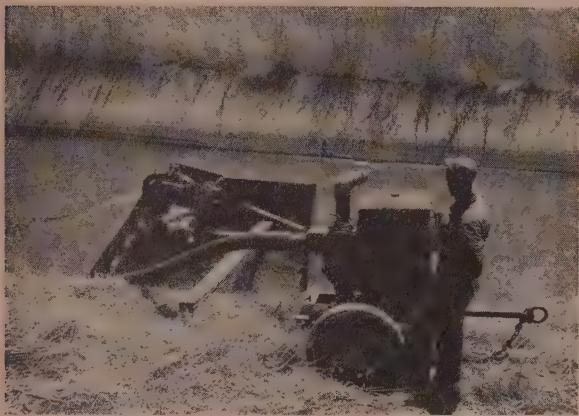
A portable cofferdam for repairs in any size canal

REPAIRS and maintenance on the Central Valley Project's Contra Costa Canal in California always have been something of a headache because of the unique operation of the waterway. Its function for domestic and industrial



EASY TO INSTALL—Crane lowers cofferdam into position.

READY TO GO—In minutes, the cofferdam is pumped dry.



EASY TO HAUL—Assembled cofferdam fits neatly on truck.

water delivery necessitates a year-around, 24-hour-per-day operation, so that work must be done in a full canal.

When there is repair work to be done on headgates, pipelines leading from the canal, canal lining, or leaks, a cofferdam had to be devised so that service could continue uninterrupted.

Canal Maintenance Foreman Alexander G. McIntyre tried several types but found each to be expensive and time-consuming. So the Bureau of Reclamation maintenance man set out to design a cofferdam which would be suited to the operation, and save time in effecting repairs. Several factors had to be considered, such as ease of loading and unloading, handling, erection, disassembly, and effectiveness.

After much study and experimentation, McIntyre finally came up with a model which filled the bill in all respects. For his ingenuity, the Contra Costa Canal foreman has received a meritorious suggestion award, and more important, maintenance work on the canal has been accomplished with a minimum of delay and without interruption of water service.

Simplicity and ease of adaptation to any situation are the keys to McIntyre's development. The cofferdam, constructed of metal, has a front section 5 x 8 ft. Side sections are built to fit the slope of the canal. Added versatility is achieved simply by adding sections, making possible use in a canal of any depth or cross-section. If additional weight is needed to hold the cofferdam in place, timbers are placed atop the structure and sandbags are added.

Special truck totes tires 1,350 mi. for recapping on B. C. dam project

A UNIQUE transportation service to maintain giant tires used on earthmoving equipment at the Nechako Dam project in British Columbia has been worked out. Bourne & Weir Ltd., tire recapping and repair specialists, now have an especially designed truck which is used to bring tires from the Nechako Dam to Vancouver for repairing and recapping. The trip represents 1,350 miles for the return journey.

The tires are used by Mannix Ltd. on their earthmoving rigs on the Nechako project of the Aluminum Co. of Can-

ada. The truck used in transportation is of aluminum construction and has a hydraulic-powered loading tailgate to handle some of the tires which weigh up to one ton. The rear axle on the truck is known as a "tag-a-long" and with its dual wheels can be raised from the ground for traveling light by a hydraulic device operated by the driver in the cab.

The tires are recapped three or four times with a subsequent reduction in the cost of the tire per ton and hours of operation on the big machines.

Bourne & Weir are maintaining a supply of reconditioned tires on the dam site at all times. Many of the tires require only a minor repair, although some, after being partially processed, are discovered to be non-serviceable.



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Like hundreds of other earthmoving units owned by Peter Kiewit Sons Co., this Manitowoc dragline is Caterpillar powered.

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Equipped with a 120-foot boom and 5- to 6-yard bucket, the machine requires plenty of power. And it has to be *dependable* power, for the dragline works 24 hours a day. Its D386 develops 360 HP to provide full power for top production.

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HOW IT WAS DONE...

A good (and cheap) way to free rusty nuts and bolts

By H. B. McDERMID, Retired Construction Engineer

IT IS WELL KNOWN among mechanics that threads can get so rusty that removal of a nut from a bolt by ordinary means becomes impossible. Trying to force a dry nut off a bolt by means of oversized wrenches may easily result in twisting the bolt in two, while the grip of the rusty threads on each other is in no wise affected.

Yet there is an easy way to avoid both troubles and greatly reduce the hard labor involved in dismantling the dry, rusty threads. Many mechanics are trained to use some form of penetrating oil to pre-soak the threads. This is all right, if the management is generous enough to furnish the high-priced product. But suppose there is no such material at hand. There is a less expensive liquid that can be used just as well, which can be gotten almost anywhere. If the worker will pre-soak the rusty threads with plain cold water, he will find that the stubborn parts will let go easily, without any damage at all.

Most experienced mechanics who have not tried this method will be dubious. They feel that, since a wet thread rusts more readily than one that is dry, exposure to lots of water cannot possibly be beneficial. The fact is that soaking a dry, rusty thread with water is one of the most beneficial things that can happen to it, if properly done and the thread correctly treated afterward.

Where the location will permit, the threads should be thoroughly soaked a short time before the wrench is applied, and the dismantling should proceed while the threads are wet. If the water is allowed to dry off, not too much help will be noticed. If not possible to soak the threads, often a rag or a bit of waste, well wet and placed on the projecting end of a bolt, will do the trick nicely.

Two examples (of many that could be cited) are brought to mind. One involved an old journeyman mechanic who was working on a repair gang re-conditioning coal-fired domestic heating furnaces. Most of the bolts encountered were stove bolts only, but their rusty threads were stuck as tight as any, and often had to be chopped off with a cold chisel and hammer, to get any fair speed in dismantling the furnaces. After a while the crew noticed that the old mechanic didn't seem to be having much trouble unscrewing nuts that no one else could handle. Pressed for a reason, the old man showed them a bottle of "magic formula" which seemed to loosen the rust almost miraculously. But never would the old man give up his secret, until one day when his bottle got empty. Someone caught him filling it at the water tap!

At a big government job in the Mississippi River Valley, some supervisor sent our yard a big headache which had been drifting around from one organization to another for some 10 yr. It was a gasoline-driven crane of fair size, built by a well-known manufacturer as a mobile unit. As fast as each new victim could size it up and get the necessary red tape straightened out, he shipped it on to his pet enemy!

When it arrived at our yard, the cause of its wanderings was easy to see. All the parts might be there (as afterwards proved to be the case), but the mess looked like a fugitive pile of junk from a careless junk dealer. But the old major who had handled our yard for many years had a reputation at stake: no one could bluff him. So the crew went to work on the mess, trying to set up a pile of scrap, without blueprint or even a picture of the completed machine.

Among the various rusty parts that had lain in the weather totally unprotected for many years was a set of

outrigger jacks. The threads on the adjusting bolts were 3 x 18-in., U. S. coarse type, and had to adjust as quickly and freely as possible, by hand. And they were rusted plenty, until ever getting them loose at all seemed impossible. It seemed as if re-manufacture were the only course that promised any progress. But the head mechanic remembered the rust treatment he had used before. He tied the bunch of four bolts together and hung them deep in the river at quitting time one night.

Next morning the bolts were set up on blocks between two pipe wrenches (one on the bolt and the other on the nut, and the only wrenches of sufficient size available). One good yank broke the nuts free. Thereafter the problem was to find a wrench light enough so its unnecessary weight would not wear the user to a frazzle while running the nut twice the length of the thread, to make sure it was fully free. When that operation was over, back the bolts went into the river, to be thoroughly sloshed up and down to wash off all loose rust, which then permitted the nuts to be placed anywhere needed on their bolts by easy hand manipulation. As soon as dried, all threads were coated with oil, completing the very satisfactory job.

These two object lessons should convince the men who have not seen the method tried. If not, any fair trial will. Remember to soak the threads in advance, but don't let them dry again before using the wrench. A day's drying will set the threads almost as tight as before.

80-ft. steel bridge erected by county crew in two working days

ERECTION of an 80-ft. steel bridge in two days was accomplished in December by the road department of Tulare County, Calif. A 13-man crew began assembly at 9 a. m. on December 3 and the completed span was jacked down onto its bearings before 5 p. m. on the following day.



TRACTOR PULLS 80-ft. Bailey-type bridge and 50-ft. launching nose, all on rollers, across the gap. Bridge has 12 ft., 4 in. roadway and a safe capacity rating of 53 tons.

The structure, now in place over the South Fork of the Kaweah River, is a standard military Bailey-type bridge as used by the U. S. and British armies. It was erected by the cantilever launching method without the use of cranes or temporary supports from the streambed. The winch on a tractor was used in towing the bridge across the 80-ft. gap on erection rollers.

The prefabricated bridge was furnished by the Bailey Bridge Co. of San Luis Obispo. The company also provided the launching gear and technical assistance.

Jack Hill is foreman of the county road crew which did the job and Bob Oliver is superintendent of the county district. General planning of the project was handled by Joe Garcia. T. W. Switzer is Tulare County Road Commissioner.

mixing black top in Florida...

EQUIPMENT

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MODEL FA BITUMINOUS MIXING PLANT
averages 700 tons per 10-hour day. Peak
production hit 835 tons per day for
Florida contractor.

Widening a rough 18-ft. concrete road to a smooth 22-ft. bituminous highway is the fourth job this Model FA has been on in Suwannee and Dixie Counties, Florida, for Jaxon Construction Co. of Jacksonville. Its consistent high production and extreme portability make the plant a winner, according to Charles E. Cobb, Jaxon's President.

Mr. Cobb says, "For making money on jobs ranging from 12,000 to 15,000 tons, in scattered locations, the Cedarapids Model FA can't be beat. On top of averaging around 700 tons a day, the plant can easily be taken anywhere to meet any specifications. In preparing for a job in Gilchrist County, only six days were required to take down the plant, transport it, set it up and begin operations."

The extreme accuracy of control in a plant as portable as the Model FA is another reason for its high popularity with quality-conscious contractors like Jaxon Construction Company.



Cedarapids

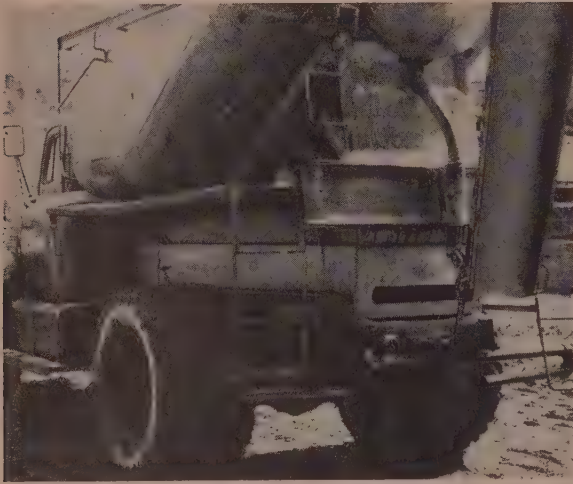
Built by
IOWA

IOWA MANUFACTURING COMPANY

Cedar Rapids, Iowa, U.S.A.

HOW IT WAS DONE

Converted Dumpcrete manages dust control and delivers concrete too



POWDERY DRY DUST kicked up by movement of trucks was a hazard to both vision and worker health on a Bates & Rogers Construction Co. tunnel job. The simple solution to the problem is illustrated here. The contractor was using four 4C Dumpcretes to haul centrally-mixed concrete from the job-site plant. An opening was made in the bottom of one of the Dumpcretes and a pipe fitted between the opening and a spray bar attached to the rear of the unit. The body was then filled with water to wet down the dust as often as needed. The remainder of the time the unit was kept busy supplying concrete along with the three others. On this job, Bates & Rogers also added a special sub-frame to provide their Dumpcretes with a discharge height of 7½ ft. (compared to average height of discharge for the 4C of 6 ft., 4 in.). With this added height concrete could be placed directly into forms of the 28-ft. railroad tunnel.

California highway crews report snow conditions faster than ever

BY MEANS of a far-flung radio network, teletype and a central "intelligence" system, the California Division of Highways this year is reporting highway ice and snow conditions faster than ever before. Here's briefly how the system is now set up.

On-the-spot information on such items as condition of road surface, need for tire chains, depth of snow, etc., is collected at the Division's eleven district offices throughout the state. This on-the-spot information comes from field stations by radio. Mobile transmitters mounted in maintenance vehicles and equipment are important adjuncts at this point. At a specified time each morning, and at other times if rapidly changing conditions warrant, these district reports are relayed by radio or teletype to the central communications office of the Division of Highways at Sacramento. A simple code conserves time.

In Sacramento, the road conditions are plotted on a large state map with colored markers. At the same time the information is transcribed onto duplicating machine forms. As soon as all the reports are in, usually within two hours after the coordinated system has begun functioning, the state-wide picture of road conditions as of 9 a. m. is run off and ready for distribution.

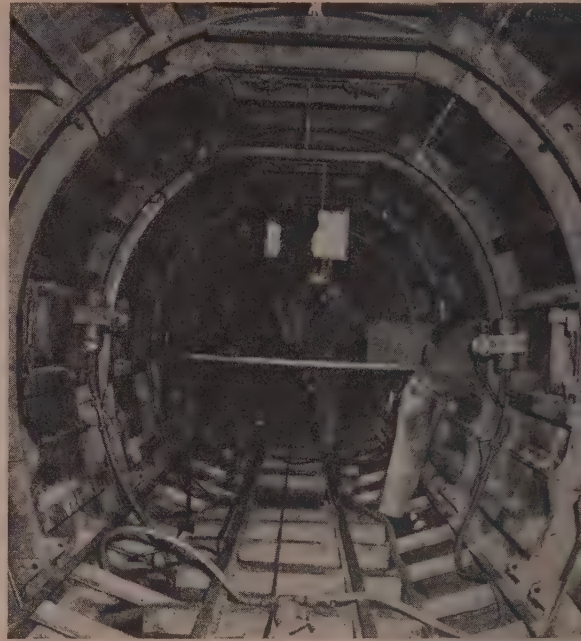
Internal and external vibrators combine for tunnel concreting

CONCRETE PLACEMENT in the Bureau of Reclamation's Duchesne Tunnel has been completed by Grafe, Callahan Construction Co. and Rhodes Brothers & Shofner of Los Angeles, and the \$4,400,000 job is near the wind-up. The 6-mi. bore is part of the Provo River project in Utah. The invert having been poured earlier, late efforts of the contractor were in placing arch concrete. Mixed in the tunnel, the concrete was pneumatically placed on a continuous advancing slope.

An interesting feature of the work was the extensive use of both internal and external vibration as the concrete was placed. Doors at spring line in the 9-ft., 3-in. diameter horseshoe section provided access through the forms for Viber electric vibrators (2½-in. head) used to consolidate the concrete just above the invert construction joint.

Because the advancing slope of concrete soon drowned out operations conducted through these doors, external vibration took over as the internal vibrators were moved further along in the tunnel.

The external vibrators were fitted with an air clamp recently developed by the Viber Company and were fastened to the stiffening ribs of the tunnel form just above springline. Two installations were used, one on each side of the tunnel, and were advanced in 8-ft. increments. A vibration period of 30 or 40 sec. was generally adequate. If the amount of overbreak was small, however, and the section correspondingly tight for the specified 11-in. lining thickness, more time was used.



INTERIOR of Duchesne Tunnel during lining shows external vibrator held in place on forms by air clamps and internal vibrators being operated through doors in form at springline.

Since the Duchesne Tunnel is not a pressure conduit no arch grouting was necessary, and neither was special vibration of arch concrete at the very top. The vibration provided by the two springline installations appeared to carry throughout the slope of concrete as it was poured except perhaps at the toe. Here, of course, the internal vibration more than made up for any possible "holidays" in the external vibration effect.

A third external vibrator was used by the contractor on the 8-in. discharge line of the concrete placer.

H I L O
I I [

Good Way to Spell "Western Progress"

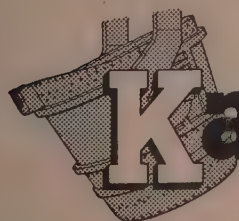
THE production of a wide range of structural shapes by Kaiser Steel spells progress for western industry—and for all the West.

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REPORTS

FROM THE COURTS

By
HOWARD S. BURNSIDE
Attorney at Law
Registered
Professional Engineer



Agreed damages provided by contract

IN GENERAL the law disfavors penalties or forfeitures in contracts where upon a failure of performance one party must pay a penalty to the other or forfeit something of value. An exception is made in those cases where the parties anticipate a non-performance may occur and it is extremely difficult or impossible at the outset to accurately fix the damages in event of such a breach. An example of an exception is the provision in construction contracts providing a penalty for each day construction extends beyond the agreed completion date. The penalty provided in the contract is referred to as liquidated damages.

It is important in these cases that assessment of damages for a breach be difficult, impossible or impractical. Two recent cases illustrate this aspect of a valid liquidated damage provision.

In *Atkinson v. Pacific Fire Extinguisher Co.*¹ the defendant installed a fire detecting system in plaintiff's mill

on a leasing agreement which provided that if it failed to perform and loss resulted defendants' liability would be \$25.00 as liquidated damages. Thereafter the mill was destroyed by fire and plaintiffs sued for breach of contract for damages from the fire. The jury returned a verdict for the plaintiff and assessed damages at \$97,437. Defendant appealed and contended that at the time of entering into the contract it was impractical and extremely difficult to fix damages and therefore the provision for liquidated damages was valid and should be binding. On this issue, the court pointed out that the jury found against the defendant on the difficulty of assessing damages noting further that a valid liquidated damage provision must represent a reasonable endeavor by the parties to estimate fair compensation for the loss and in this case there was obviously no such reasonable endeavor. "Where the provision for liquidated damages is found to be void the plaintiff may

maintain an action for his actual damages." Judgment affirmed.

In *Knapp v. Ottinger*² there was involved a contract for the purchase of paving and grading equipment. The price was to be paid in one installment of \$100,000 and two installments of \$50,000 due at specified dates. The sum of \$25,000 was deposited in escrow as liquidated damages in the event installment payments were not made as required. The contract was not completed and the right to the \$25,000 was litigated, the decisive question being whether the agreement for this sum was a void penalty provision, or a proper case for liquidated damages. In finding that this was a proper liquidated damages situation, the court reviewed the evidence finding that there was no fixed value for the secondhand equipment and that since delivery was made on a small part of the equipment prior to the agreement damages to be sustained were almost impossible of ascertainment.

¹ *Atkinson vs. Pacific Fire Ext. Co.* 109 A.C.A. 286.

² *Knapp vs. Ottinger* 240 P. 2d 1083.

Contract offending public policy is void

THE PLAINTIFF, a consulting geologist, had extensive knowledge of the geological aspects of the Arco, Idaho, area. He was retained under a subcontract by an engineering firm to make a comprehensive study of the availability of water supply at Arco and another prospective site and to report with respect to each site on geological conditions and other pertinent factors. Reference was made in the subcontract to the prime contract between the engineering firm and the Atomic Energy Commission.

A few days before submitting his report the plaintiff went to Arco and negotiated with defendants the purchase of certain real estate in his wife's name. About three months later selection of the Arco site for an atomic reactor plant was announced by the Atomic Energy Commission. Real estate values in the area boomed after the announcement and the defendants refused to perform the contract to sell. The plaintiff and his wife sued to compel the defendants to perform the contract.

The trial of the matter raised the question of the contract offending public policy and being void on that ground. The trial court gave judgment for the defendants and on appeal this problem is reviewed.

"It is the relationship which (plaintiff) has with a third party, that is with his government, which is of importance in this case; the very nature of his relationship to the public at the time he entered into the contract of purchase for the benefit of himself and his wife as joint adventurers should forbid him, as a matter of sound public policy, to refrain from using such confidential information and relationship to his own personal gain, where it even has a tendency to injuriously affect the public good or conflict with his public duty; more important, the temptation to color his report because of such personal interest is great and he should never have permitted such temptation to exist, and it is for such reasons and under such relationships that the courts have condemned such agreements as

highly offensive to sound public policy and have refused to lend their aid. (Plaintiff) voluntarily placed himself in a position where his own interests would have a direct tendency to conflict with his obligation to the public . . . The contract which is sought to be enforced in this case had at its inception a direct evil tendency to cause (plaintiff) to place conflicting personal interest above duty and, for such reason, even though he acted in good faith and no resulting injury to the government followed, the contract offends public policy and this court will not lend its aid to the enforcement thereof."¹

¹ Supreme Ct. of Idaho, Jan. 31, 1952 240 P 2d 833.

Notes

THE USE of land for a sewage disposal plant is a public use and disposal of sewage is a governmental function for which the city has a right to condemn property.

State v. Superior Court, 240 P 2d 1208; Supreme Court of Washington.

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JANUARY 1953

ASCE activities set for San Francisco convention

HAVING COMPLETED its centennial observance at the Chicago convocation last September, the American Society of Civil Engineers will kick off its second century of activity with a convention at San Francisco on March 3, 4, 5, and 6, 1953. Occasion of the convention falls coincident with the national Society presidency of Walter L. Huber, long an active member of the host section in San Francisco.

The convention will feature representation in the technical sessions of 11 divisions, plus excursions, a dinner dance, and a full program of tours and entertainment for delegates' wives. Headquarters for the convention and locale of all sessions is to be the Fairmont Hotel on Nob Hill. Concurrent activities will include a local sections conference, a student chapters conference, and the annual California sections conference.

Examples of going construction projects to be visited on convention excursions include the 600,000-kw. steam plant being built for P. G. & E. by Bechtel Corporation at Pittsburg (*Western Construction*—August 1952,

pp. 74-77), and the supersonic wind tunnel structure being erected at Ames Aeronautical Laboratory, Moffett Field, by Chicago Bridge & Iron Co. A shorter local tour will be made of the San Francisco Naval Shipyard at Hunters Point, to take in the outfitting facilities there, with a possible visit aboard a submarine.

Westerners of ASCE are urged to attend this convention of the Society, and are directed to the Society magazine, *Civil Engineering*, for details on all aspects of registration, hotel reservations, and the complete convention program, appearing in January. Full details will appear there also on the program arranged by Hawaii Section for delegates who undertake the post-convention tour to the Islands. The lure of a luau and orchards of orchids are presented by Hawaii engineers in the hope that many conventioning engineers will prolong their "vacations" and "bridge the Pacific" for this tour.

Morrison-Knudsen sets new tunnel records in B. C.

MORE TUNNELING records have been broken—several times—at the site of Morrison-Knudsen's project in

British Columbia for Aluminum Co. of Canada, Ltd. The Morrison-Knudsen workmen broke their own record both for weekly and monthly rates of tunnel driving which they had set in 1949 at Big Creek No. 4 Dam in California. Late in September they established another weekly record of 248 ft.; one month later they drove ahead 258 ft. in one week, and on the following work week ending November 1 they surpassed themselves by driving 261 ft. That productive month of October added up a total of 1,073 ft. driven in 26 actual working days. The tunnel is 25 ft. in diameter, horseshoe-shaped and is a ten-mile bore to bring water to an underground powerhouse at Kemano. B. C. A. O. Strandberg is project manager for Morrison-Knudsen of Canada, and R. E. Davis is general tunnel superintendent.

Northwest power cut-backs result from low stream flow

SEVERE POWER SHORTAGES in the Pacific Northwest have curbed the normal rate of industrial usage. Late in November the stream flow of five major rivers was less than half of that of the previous year, and it had already fallen below the winter low record of 1936-37. Outlook for power users will become increasingly bleak unless weather changes bring mild temperatures or rain to boost the ever-decreasing water levels resulting from a long, dry autumn.

Power for industries consuming more than 8,000 kwh. per week was curtailed on about November 18, and after one week of the shortage, those same 1,100 industries still needed nearly 100,000 kw. of power. Users fear even another 10% cut if the water supply is not soon replenished.

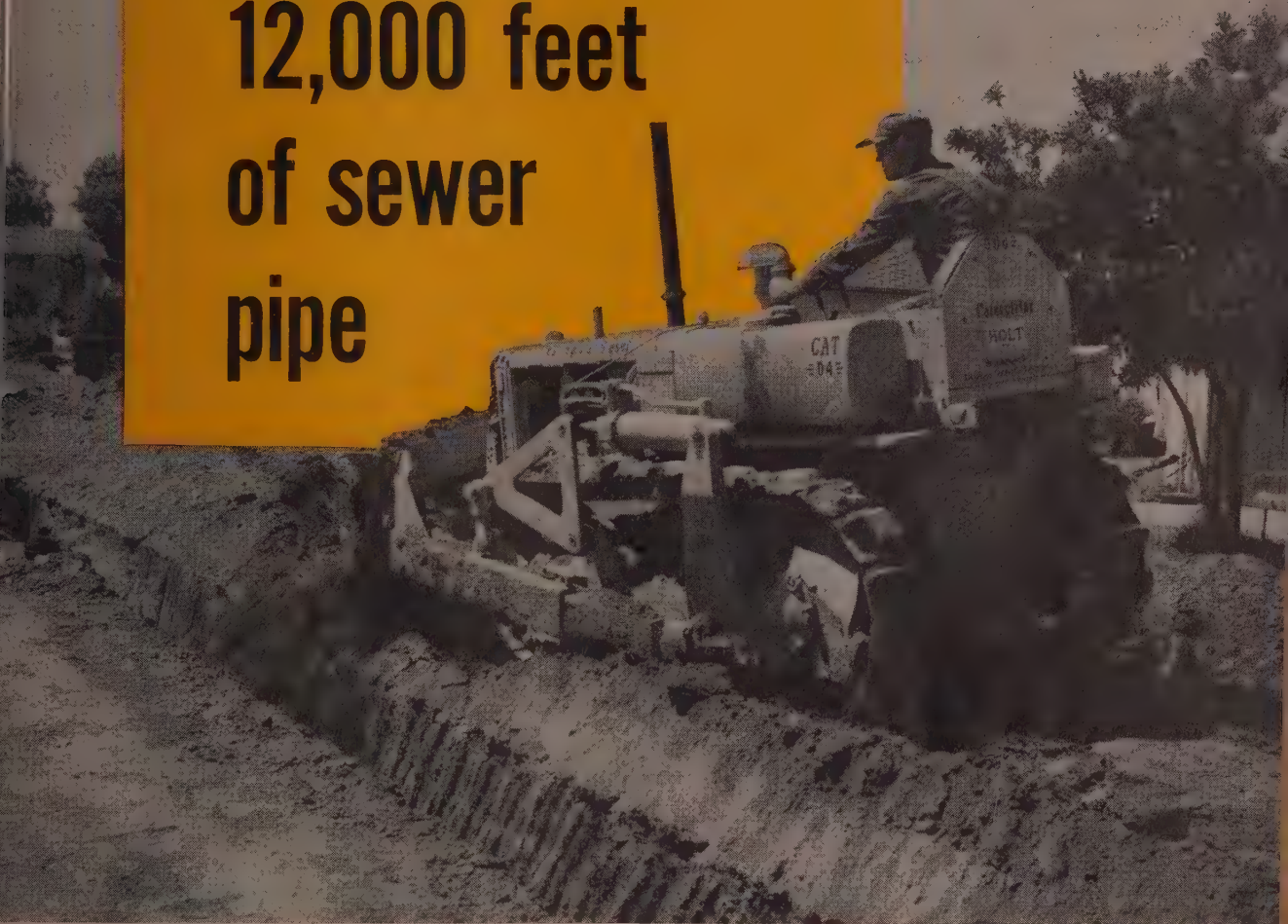
On September 4, water flow in the Columbia, Pend Oreille, Kootenai, Spokane and smaller rivers, measured 58,000 second-ft. flow. Shortly afterwards, 400,000 kw. was taken off the line, but less than two months later flow measurement had decreased 50%.

The Corps of Engineers predicted that usable shortage behind Albeni Falls Dam on the Pend Oreille River would be depleted by December 16 if the present rate of demand were to continue. Officials were hopeful that the 50,000-kv., second of four generators on Washington Water Power's Cabinet Gorge Dam would help raise power production.

PLANNING THE PROGRAM for the March 3-6 ASCE convention in San Francisco are (from left), **L. A. Elsener**, general convention committee chairman; **I. C. Steele**, ASCE director from San Francisco; **Walter L. Huber**, ASCE president; and **Rear Adm. Carl A. Trexel**, program committee chairman. The four-day meeting will include 20 half-day sessions of various ASCE technical divisions.



Tucking in 12,000 feet of sewer pipe



No big equipment is tied up in this backfilling operation of a sewer installation in Stockton, Calif. The job is being done without strain by a hustling, powerful Caterpillar D4 Tractor equipped with a No. 4A Bulldozer.

The big equipment is out on bigger phases of the project. That's the way it should be. But to replace big tractors with small, you need a rugged, compact unit like the Cat D4 Tractor and 'Dozer owned by D. A. Parrish & Sons of Stockton.

After this barrel-chested unit finished backfilling 12,000 ft. of 10-in., 8-in., 6-in. and 4-in. pipe laid for a new sanitary district covering 20 square blocks, R. V. Parrish reported:

"The hydraulic angle blade handles like a charm and is especially useful on this type of work. This wonderful team enables us to get a lot of work done fast and well."

High praise? Sure, but it's understandable to anyone who has had a dependable, tenacious D4 Tractor

working for him. Powered by an economical 4-cylinder Caterpillar Diesel Engine, its full load governed speed is 1,400 r.p.m. It develops 43 drawbar horsepower and 48 belt horsepower. And the No. 4A Bulldozer can be angled into three positions by one man.

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STATE-BY-STATE . . .

A miscellaneous review of construction planned in the West during 1953

ARIZONA

A new community will be built in Arizona by the Del E. Webb Construction Co. at a cost of more than \$20,000,000, designed to house employees of the Magma Copper Co. The project will be located in the desert about 5 mi. east of Oracle, and will house 7,000 persons. Surveys have begun on 3,000 ac. of land for the townsite and construction will follow as soon as roads are available.

A street improvement program for Phoenix during the coming year may exceed \$1,000,000. The work will involve repaving and improvement of truck routes through the metropolitan area. The City hopes to secure Federal funds to aid in financing the program.

A flood control project estimated to cost \$3,500,000 is projected for the agricultural area and military installations around Luke Field. The program has been approved by military officials, soil conservationists and irrigationists, with their recommendations made available to the Maricopa County Board of Supervisors for sponsorship. Plans call for a 10-mi. length of levee to divert flood flow. Federal financing is expected and the county recommendations will next be forwarded to the Corps of Engineers for consideration.

CALIFORNIA

A \$7,000,000 trunk sewer through the Santa Monica Mountains will go under construction about the middle of the year, according to the Los Angeles Board of Public Works. The project is part of a broad sewerage program being financed by the \$21,000,000 bond issue voted in 1951. It will serve part of the San Fernando Valley, which has completely exceeded its sewerage facilities. Engineering plans for the project are now being prepared.

Work continues on the rehabilitation of Sutherland Dam for the San Diego water supply system. Concrete pouring started last month. Excavation for the spillway and all access roads have been completed, with the construction program moving on schedule. The plan to complete the dam to its original height and capacity calls for completion by year-end.

The California Flood Control Conference has asked the State Water Resources Board to request a Federal appropriation of about \$80,000,000 for flood control projects in California. This sum would include almost \$35,-

000,000 for further work on the Los Angeles County Flood Control program.

The City of San Diego has voted to initiate five flood control projects as part of a storm drain improvement program. The five jobs would cost an estimated \$3,500,000 and are designed to eliminate local flooding during severe rains.

About the first of this month the \$13,500,000 program for completing a 4-lane divided highway from Los Angeles to Bakersfield over the Ridge Route was completed. The final link in this program was a 5-mi. section from the Los Angeles city limits to Pico Canyon. Completion of this section eliminated the last 2-lane part of the route. The over-all program which has required the modernization of 44 mi. of mountain highway with exceptional cuts and fills, has required almost six years, with the first contract awarded in 1947. Further work on this important highway (U. S. 99) will include extensive work in further arterial approaches on the Los Angeles city end of the job.

Confusion in bridges

At the beginning of the year the controversy over present and future bridges crossing various sections of San Francisco Bay remains confused. A recent decision of the California Supreme Court eliminated the possibility that additional bonds could be added to the present San Francisco-Oakland Bay Bridge for financing extensive and expensive improvements to approaches at both ends. This was a plan advocated by the State Toll Bridge Authority and would have made possible several important projects on the Oakland end, including a second tube under the estuary to Alameda.

This court decision emphasizes the plan proposed by Mayor Robinson of San Francisco to build simultaneously a second parallel bridge to Oakland and a causeway fill extending from the southern section of San Francisco (south of Hunters Point Naval Ship Yard) to a connection on the east side of the Bay. This causeway, with necessary provisions for locks and spillway, would represent one of the elements of the Reber Plan. The building of the two crossings at the same time was proposed as a compromise, since Oakland and the east bay cities favor the parallel bridge, while San Francisco has backed the southern crossing. This controversy remains in the talking stage and may result in some state legislative action.

On the Richmond-San Rafael project, construction bids were opened on December 19 (see news item on p. 117). A group of interests which have actively opposed this project have introduced a further legal hurdle and court action is a possibility before the contract awards can be made.

MWD expansion plans

The Metropolitan Water District has a \$12,000,000 expansion program under way, with the major part of this work scheduled for completion by July 1955. A major portion of this program will be the installation of additional pumping units, motors and discharge pipe at each of the five plants on the main aqueduct line. The second barrel of the line to San Diego is included in this improvement program since half of the \$18,000,000 cost will be met by the M. W. D. The outlet works at Lake Mathews, which were originally constructed to half the capacity, are being increased and will ultimately provide a distribution line across Orange County to an important industrial area and to Long Beach Harbor. The initial feature of this work is a 7,500-ft. tunnel. From the discharge end of the tunnel a pipeline of 25-sec. ft. capacity will benefit an area recently annexed in Orange County, and later a second line as capacity is required. Construction of the Garvey reservoir for distribution and regulating is another important part of this expansion program. Pipelines leading into and out of the Garvey reservoir will provide a grid system, improving service to several member cities.

COLORADO

With a traffic increase predicted at three times the present rate by 1970, the City of Denver has formulated a plan to speed construction of the Valley Highway, providing a freeway through the city. The plan, which involves the cooperation of the State Highway Department, would provide for issuing anticipation warrants up to possibly \$10,000,000 to be repaid by local funds to expedite the purchase of rights-of-way. During the past several years construction on this super highway project has been stalled because rights-of-way were not available for the construction work. The City provides the right-of-way from municipal and federal funds. The accelerated financing for right-of-way would expedite the construction program, which will represent a final cost of \$45,000,000.

An office and shopping center building estimated to cost \$15,000,000 has been announced for Denver, with work scheduled to start this spring. The program would include three buildings, one of them a 20-story office structure.

A \$500,000 improvement plan now

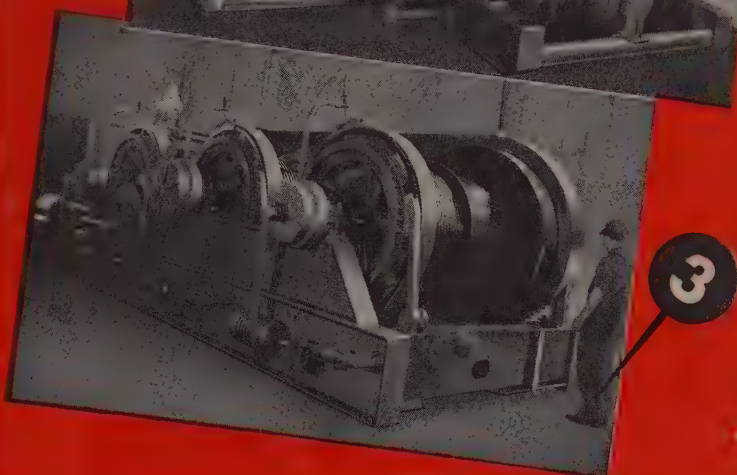
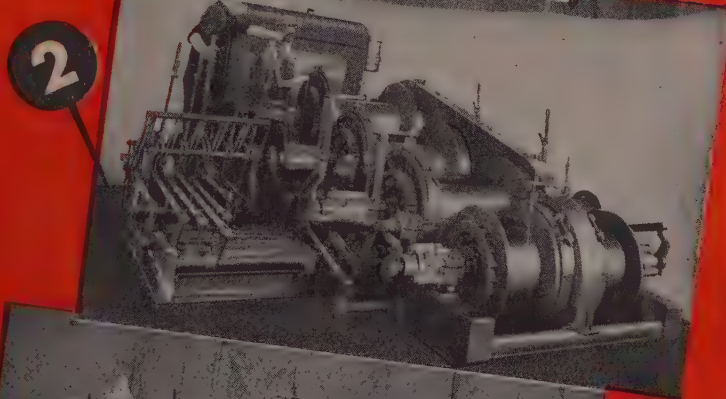
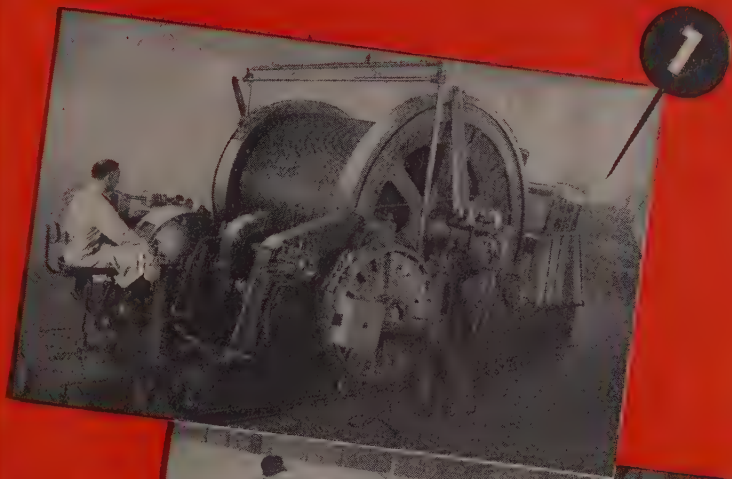
Continued on page 104

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under way will relieve a serious water shortage for the City of Aurora. Last summer residential areas of the city were without water for several periods. The work will include a 1.5-mg. reservoir and a new 30-in. distribution grid system. This distribution system will be tied into Denver's new Montclair reservoir and will assure Aurora's water needs for years in the future. The program will require a \$400,000 bond issue.

Construction of a \$17,000,000 flood control dam on the Purgatoire River has been recommended by the Corps of Engineers. Although proposed for several years, this is the first favorable report on the project presented by the U. S. District Office. The improvement would include both flood control and storage of irrigation water.

Long planned, new impetus has been given to the \$6,000,000 highway toll tunnel under Loveland Pass. Joint study of the program has been undertaken by both the Colorado State Highway Commission and the state's long range planning committee, with apparent agreement on the general plans. Further progress on the plan would depend on the financing of the project by tolls without committing state highway funds. Possibility of the formation of a tunnel district has been indicated for carrying out the project as a self-liquidating job based

on tolls for motorists using the tunnel. Apparent success of the Boulder-Denver turnpike has advanced plans for the tunnel project. Preliminary reports indicate the tunnel would be about 1 mi. long, with a width of 32 ft. and driven under Loveland Pass on U. S. 6, at a cost of \$7,000,000.

IDAHO

Idaho Power Co. has a plan for development on the Snake River, to include several dams in the stretch of river where the Bureau of Reclamation proposes the Hells Canyon Dam. The program, which was submitted to the Federal Power Commission, indicates that the private power company would be able to develop the stream for power without injury to irrigation needs, with incidental advantages of flood control. The proposed plan would involve 1,000,000 ac.-ft. of usable storage and the three dams would provide a power installation of 78,000 kw.

A second generator has been started on the \$45,000,000 Cabinet Gorge project of the Washington Water Power Co. The arch concrete dam, 200 ft. high, has been completed by Morrison-Knudsen Co. to provide a final power installation of 200,000 kw. Work started early in 1951, with first concrete poured in November of the same year. Power generation was

started just twenty-one months after Federal permission was obtained for the project by the power company.

MONTANA

A \$1,000,000 improvement in the water system of Great Falls was started late last year. Work will include installation of new distribution mains from 8 in. up to 24 in. in size, combined with expansion of the treatment plant facilities. The program is required by the population increase. Work is scheduled for completion by late spring on the mains, with plant improvements concluded by early summer. Serious deficiencies in the water supply last summer resulted in the urgency for the present program.

NEVADA

Plans for a large, municipal garage in Reno have advanced to the bidding stage under a plan for constructors to pay for the structure and secure a long-term lease, with ultimate ownership returned to the City. The parking facilities would be an above-ground structure, 4 stories high, with capacity for 430 cars. One of the contracting groups proposed to pay the City at the rate of 3½% of gross receipts, including parking and servicing facilities. A 40-year lease is suggested for the project.

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NEW MEXICO

Right-of-way problems confront the City of Albuquerque in securing state highway construction funds. Unless the municipality secures additional money for providing right-of-way on a 4½-mi. length of 4-lane highway, the State will not be able to carry out construction on the project. Default by the City on securing an extra 80-ft. section of right-of-way might result in withdrawal of State construction funds. The municipality has suggested that a State loan would be necessary for adequate funds to be repaid through an increase in the State gas tax.

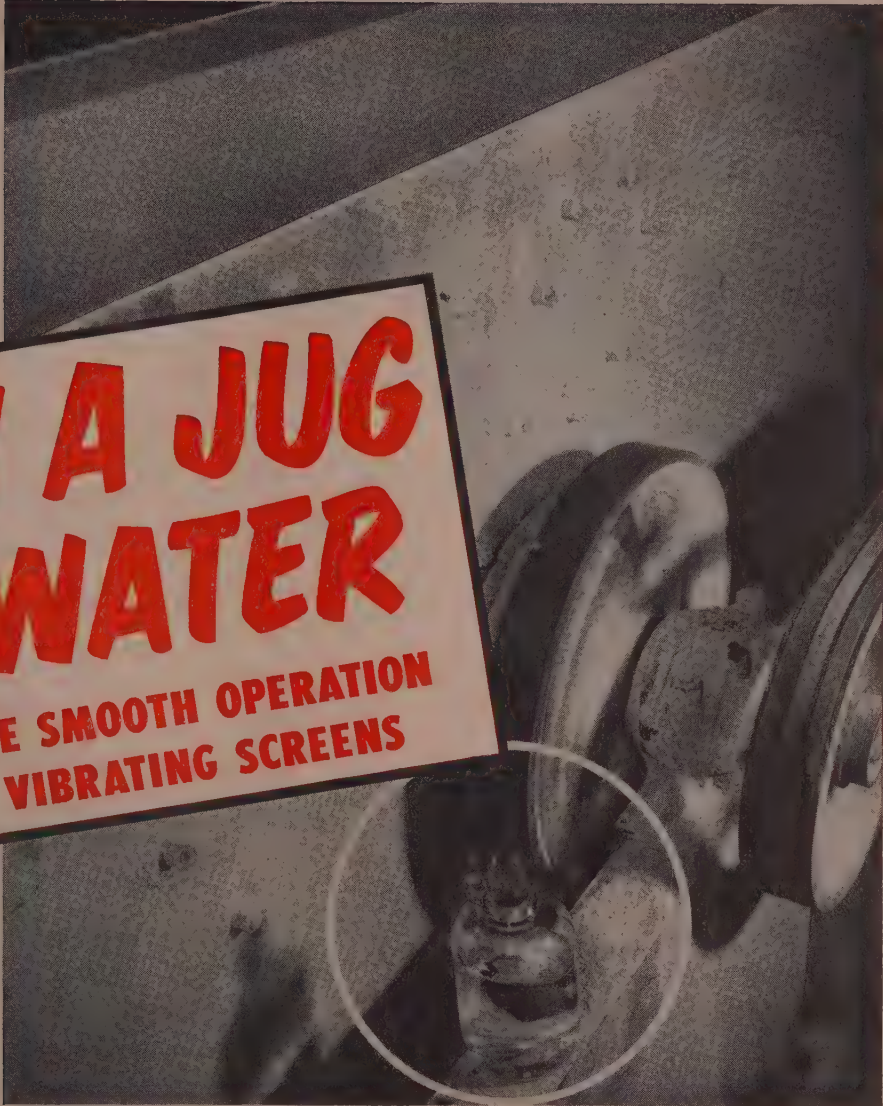
Controversy over the paving plant owned and operated by the City of Albuquerque resulted in an analysis which showed that the 38-yr. old plant was a profitable venture for the City.

OREGON

Plans for a \$8,700,000 expressway, Salem to Portland, have advanced a step further with approval of the route laid out by the State Highway Department. Groups, including representatives of both municipalities, have agreed that the route sponsored by the State is the most feasible and the least expensive for land acquisition. The program is still several steps from the construction stage, since the route must be approved officially by the highway commission and the municipalities. Actual construction would be several years in the future, although the providing of a 4-lane expressway represents an important improvement project for the state highway system.

Plans for a new toll bridge across the Columbia River between Portland and Vancouver, Wash., will be presented to the State legislators. The two state highway commissions have drawn a petition which advocates the new \$11,000,000 bridge. The proposed structure will parallel the existing Interstate Bridge, with each structure carrying one-way traffic. The present structure was built and paid for by tolls. Having been toll free since 1929, it is now part of the Oregon highway system. Plans for the new structure would be prepared by Oregon. The freeway program now under construction by the Washington highway department in Vancouver has been designed to connect with the proposed second bridge. Following official approval, one year would be required for design and two years for construction.

Construction projects totaling more than \$10,000,000 will be awarded this year by the Bonneville Power Administration. The work will include new transmission lines, and the projects have already been authorized but Congressional appropriations will be required for the work to be done the second half of the year. The transmission lines aggregate over 450 mi.



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UTAH

Salt Lake City is completing a major storm drain project involving 60-in. concrete pipe. The present project will enable the storm system to handle the average spring run-off, although it would not take care of the record flow of 1952. However, the system will carry the flow out of Parley's Canyon, which would be an important part in controlling any repetition of the record flow.

The Weber Basin Water Conservancy District plans to carry forward its improvement program, which involves an ultimate \$60,000,000, with initial work on a \$2,500,000 tunnel. This tunnel will be driven on the south side of Weber Canyon and will connect with branches extending north and south, to supply irrigation canals with supplemental water and domestic supply for communities in Davis County. A new treatment plant will be required.

Final completion of the Duchesne Tunnel on the Provo River project was scheduled for last month. Started before the war, the work on the tunnel was resumed in 1949, holed through in 1951 and lined during the past year. The tunnel, which is part of the Bureau of Reclamation program, is designed to carry an irrigation supply from the headwaters of the Duchesne River into the Deer Creek reservoir.

WASHINGTON

A floating bridge project across Puget Sound has been approved by the Washington State Highway Authority. The project would link the Seattle area with Bremerton and the Olympia Peninsula via Vashan Island. Present estimated costs of the project

are in excess of \$80,000,000. The structure would replace several state operated ferry routes across the Sound and would provide the first direct traffic connection to the important navy yard area and expanding communities on the peninsula. Recent approval of the plan by a consulting board precipitated the approval by the Authority. The consultants considered four different routes which had been proposed and selected the one mentioned for several reasons, including better service to the bulk of the local traffic. Success of the Lake Washington pontoon bridge undoubtedly stimulated the design for this new crossing, which would be the first permanent pontoon structure to cross salt water. Present plans call for the financing of the project as a public toll structure. At least two years would be required for design and financial planning, with the actual construction starting in 1955 and completed three years later.

The City of Spokane advances on its expansive sewerage improvement program with more than 60% completion and 5 mi. of sewers and pumping stations now under construction. The program began in 1948 and the work done to date represents an expenditure of more than \$2,500,000.

Possibility of a toll road from Tacoma extending north through Seattle to Everett has received backing for its introduction into the Washington state legislative session. No estimate of the cost for the project has been made or the tolls that would be required. A freeway extending through Seattle alone has been estimated to cost about \$80,000,000. The over-all plan would call for the establishment of a state toll road authority and the sponsoring group indicates that the Tacoma-Seattle route is the

only one which would justify toll financing in Washington at this time.

Work has started on the preliminary design for another bridge across the Spokane River in Spokane. Tudor Engineering Co. has been engaged to prepare a feasibility survey for the project. The engineering firm has indicated that another bridge across the river is essential to the continuing expansion for Spokane, with the work to be expedited in view of the present growth of the city. The State Toll Bridge Authority has indicated that it would assist in the program.

Study of highway needs will feature California meeting

A ROUND-UP of California's current study of highway needs will be a main event of the Fifth California Street and Highway Conference, meeting Feb. 4-6, 1953, at the University of California, Berkeley.

The highway needs review is scheduled for the first afternoon, Wednesday, Feb. 4. Senator Randolph Collier, chairman of the legislative committee that is making the study, will summarize over-all objectives and needs. Details will be filled in by others who have also been closely associated with the work. Carl E. Fritts, vice president of the Automotive Safety Foundation will discuss the study of deficiencies. The ASF was engaged to conduct the engineering phase of the study. Richard Zettel, executive secretary of the legislative fact-finding committee, will discuss some of the financial implications of the findings.

The annual Street and Highway Conference has come to be a principal forum for California and Western road men. Held each year by the Institute of Transportation and Traffic Engineering, and University Extension, University of California, it regularly attracts some 500 men. The program covers planning, administration, traffic, and safety, as well as construction, maintenance, and research.

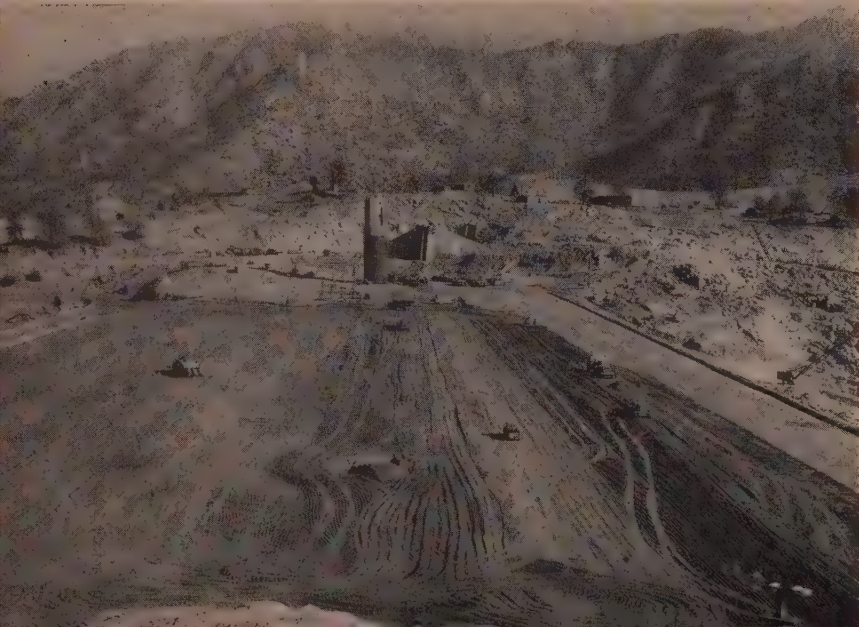
Among speakers scheduled for the second morning of this Fifth Conference are Frank Durkee, State Director of Public Works, and Ben H. Petty, of Purdue University.

Among speakers at small group meetings Thursday afternoon will be E. A. Radzikowski, chief maintenance engineer, U. S. Bureau of Public Roads.

Friday morning's program will include Edward H. Holmes, chief of the Highway Research Board Branch, U. S. Bureau of Public Roads; Richard Graves, executive director, League of California Cities; and Amos Neyhart, of Pennsylvania State College.

Chairman of the Conference is Raymond Archibald, chief of the Western Headquarters, U. S. Bureau of Public Roads. Vice-chairmen are Arthur L. Kiefer, Sacramento County Road Commissioner, and Wayne E. Thompson, city manager of Richmond.

ISABELLA DAM on the Kern River above Bakersfield, Calif., has been a high-speed job, with Macco-Morrison-Knudsen condensing a 900-day contract into a period of about 18 mos. Work is in the final stages now; the dam and its auxiliary dike will function for flood control as needed this spring.



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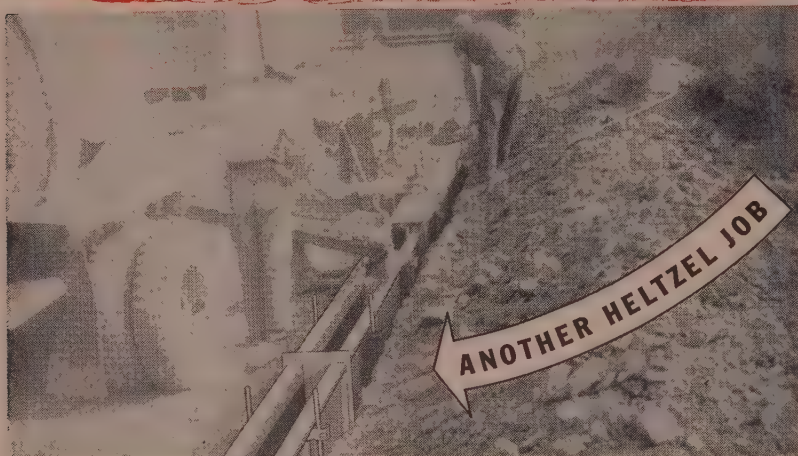
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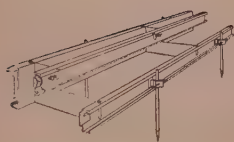


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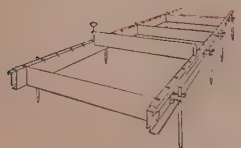
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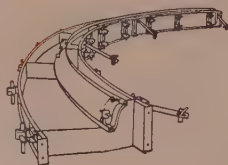
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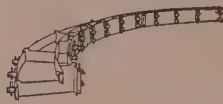
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Prestressed concrete tanks for Salt Lake City water



A PAIR of prestressed concrete tanks, the first of their type in Salt Lake City, were completed late last year and now serve to increase line pressure and provide terminal storage for part of the city's municipal water supply. Recent residential expansion against the Wasatch foothills north of Parley's Canyon absolutely required this step, and only slightly older developments were plagued by inadequate water pressures prior to the new construction.

The tanks each have a capacity of 1,000,000 gal., standing 28 ft., 4 in. high, with an inside diameter of 77 ft., 4 in. Domed roofs are 3 in. thick, surmounting concrete walls 7 in. thick.

Prestressed two ways

The tanks are prestressed both vertically and circumferentially. The vertical prestress was applied to wires 0.31 sq. in. in cross-section spaced at 2-ft. intervals around each tank. An initial prestressing force of 70,000 psi. was used, applied by take-up on turn-buckles.

Wrap-around prestressing worked from the bottom of the tank toward the top, being applied continuously by die-drawing the wire from a "merry-go-round" traveling around the tank. The wire was No. 8 gauge, originally 0.162 in. in diameter but drawn down to a diameter of 0.144 in. An initial prestressing force of 140,000 psi. was thereby applied. A force of 100,000 psi. was used in design.

The tanks were designed by Clarence G. Shupe, Salt Lake City consulting engineer, and built under the direction of Roy W. McLeese, city engineer. Harry F. Butcher was resident engineer.

The general contract was held by Paulsen Construction Co. of Salt Lake City. Prestressing was done on subcontract by Pacific Bridge Co. of San Francisco, using the Preload Co. system of prestress. A gunite coating to protect the wrap-around prestressing elements was applied on subcontract by American Gunite Co.

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Repair work completed on quake-damaged tunnel

REPAIRS of earthquake damage to the Southern Pacific Co. main line east of Bakersfield, California, were completed in mid-December with the restoration of traffic in Tunnel 5. A shoo-fly, or bypass, around the hillside pierced by the 1,170-ft. bore had permitted limited use of the line since mid-August, only 26 days after the disastrous Tehachapi earthquake.

Morrison-Knudsen Co., Inc., handling repairs for the railroad (*Western Construction*—September 1952, pp. 74-75), had moved 1,250,000 yd. of dirt in the first furious month to daylight two tunnels and part of a third, and to establish the side-hill cut on which the shoo-fly could be built by Southern Pacific bridge-and-building gangs.

Tunnel 5, however, required fancier treatment, though its repairs were begun along with the other work. Working two 10-hr. shifts, M-K miners moved in early to tackle the unknown quantity in the damaged tunnel—complete blockage 170 ft. from the west end and 600 ft. from the east. Pilot drifts in the tunnel crown proved that the two cave-ins carried for distances of 60 and 125 ft. respectively. In between was a badly shattered, but unblocked reach of 210 ft.

In the months since the quake, 370

ft. of this section has been re-lined with reinforced concrete. Actually, 8-in. WF sets were positioned at 4-ft. centers, and steel struts framed between them at invert level. An 18-in. thickness of concrete was placed by Pumpcrete.

Reason for this husky lining was that the entire depth of overburden within this section was shattered by the quake. The full treatment with spiling and lagging was necessary to hold out additional falls of material. As it is, the hillside far above now reveals a pair of "craters" about 10 ft. deep and 20 ft. across, indicative of the volume and extent of cave-in.

The rest of Tunnel 5 (some 800 ft.) required considerable rehabilitation. Large chunks of broken lining were cut away and hauled out, being replaced by heavily reinforced gunite. To prevent any more inward movement of the wall footings (which had come to as much as 8 in.), this length of tunnel was paved with a 12-in. concrete invert. Altogether, the repairs required 2,000 cu. yd. of concrete.

The work was conducted under the general direction of E. E. Mayo, chief engineer for the Southern Pacific Co. Frank Misch was resident engineer. H. L. Leventon was project manager for Morrison-Knudsen. P. M. Lee was tunnel superintendent, and David Agee was concrete and carpentry superintendent.

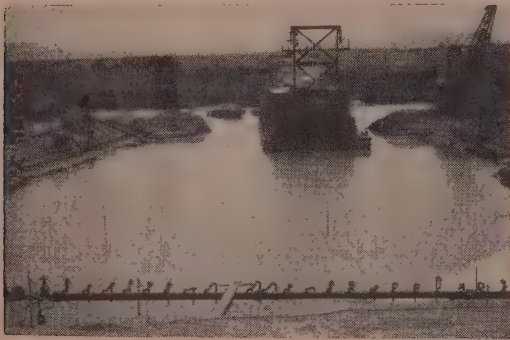
Foreign jobs available with Corps of Engineers

THE PERSONNEL Branch of the Portland District, Corps of Engineers, has announced it currently has listed 92 different types of civilian engineering vacancies at 15 foreign stations with salaries from \$3,175 to \$10,800.

Qualified personnel interested in the world-wide construction mission of the Corps of Engineers in Alaska, Austria, the Caribbean, the European Command, France, Germany, French Morocco, Greenland, Iceland, Japan, the Middle East District, Dhahran in Saudi Arabia, Tripoli in Libya, Okinawa and Turkey should contact Roy H. Lusch, 627 Pittock Block, Portland 5, Oregon.

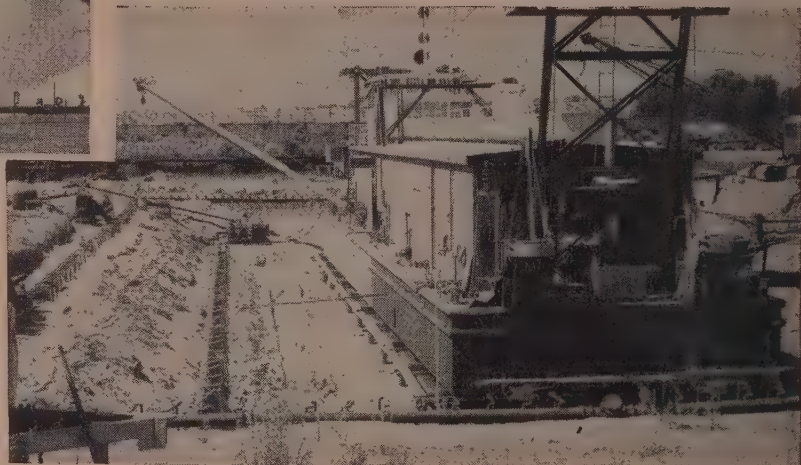
The openings include those for civil, electrical, industrial, materials, structural, hydraulic, soil mechanics, construction, construction management, architectural, photogrammetric, geodetic, fire prevention and steam operating engineers.

Other positions vacant include survey engineering aid, geologist, architect, draftsman, boiler inspector, power plant operator, supply cataloging supervisor, maintenance foreman, contract specialist, mechanical advisor, fiscal accountant, investigator, and mechanical shop supervisor.



BOAT BASIN TRANSFORMED INTO DRYDOCK ... By STANG WELLPOINTS

To provide temporary drydocking facilities for the dredge boat "Colorado" at Needles, California, the U. S. Bureau of Reclamation Engineers used the dredge itself to dig the basin, and Stang Wellpoints to dewater it and keep it dry. The method was to excavate the basin, back dredge out, build dike, install Stang Wellpoints and dewater. Then the dredge foundation was built, dike breached, basin flooded, dredge floated into position. The dike was then plugged, and the basin again Stang-dried. This unusual installation is another proven example of how Stang engineers and equipment solve tough construction problems and lower costs.



Small photo: Dredge floating into position (indicated by markers in water) over foundation for drydocking. Large photo: Basin dewatered, dredge settled on foundation, repairs proceeding "in the dry."

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You see here two structures, designed for opposite extremes of traffic movement. The twin stadium ramps, at the right, work upward in tight spirals, at the creeping pace of crowds on foot. The freeway over-pass, below, sweeps by in the trajectory of the high speed vehicles it carries. Each is perfectly adapted to its rate of flow, and both, inevitably, are built of concrete.

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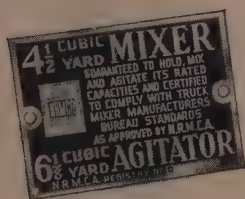
Curves — for 1 to 100 miles an hour



Photo Above: On the 15,000 seat addition to University of Washington Stadium, cantilevered spiral ramps, with elevator shaft between, meet the problem of unidirectional traffic due to lakefront location. George W. Stoddard & Associates, Architects.

Left: On Los Angeles Freeway System

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The Jaeger Machine Co.
Columbus, Ohio

The T. L. Smith Co.
Milwaukee, Wis.

Worthington Corporation
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Tunnel repairs made between train whistles

A FIRE-DAMAGED tunnel on the Western Pacific's Feather River route in California also required the emergency services of Morrison-Knudsen miners in 1952. (The same company had undertaken repairs of the quake-damaged Southern Pacific mileage in Southern California.) The 500-ft. Western Pacific tunnel, 30 mi. east of Oroville, had its timber lining burned out on August 15. In the following three months, the contractor installed a reinforced gunite lining and erected new portal structures—all under traffic.

Immediately after the fire, trains were stopped only long enough to clear out the burned and fallen timbers. With the interior sufficiently cooled, a temporary gunite coating was sprayed on. Ten days sufficed for this work, after which traffic was restored and, on September 1, the contractor moved in.

Working a two-shift, 16-hr. day sandwiched in "between trains," the contractor set reinforcing steel and mesh and placed a permanent gunite lining to a minimum thickness of 6 in. In places it ranges to 12 or 18 in. The portal structures are entirely new, the tunnel never having had this refinement before. Work on their construction was conducted along with the



DURING A VISIT in San Francisco on December 8, Col. L. H. Foote (right), District Engineer for the Corps of Engineers' Alaska District, is pictured with two of the advisers who accompanied him: M. R. Gilpin (left), chief of the construction division in Alaska, and Kenneth McCaskey, legal officer. Col. Foote spoke at Portland, San Francisco, and Los Angeles. (See review of Corps program in Alaska, on pages 55-61.)

interior repairs, the concrete being placed by Pumpcrete. The repairs were completed November 26.

F. R. Wolford, chief engineer of Western Pacific, was in general charge of the work. Gordon Switzer, assistant division engineer at Sacramento, acted as resident engineer. For Morrison-Knudsen Co., Inc., H. L. Leventon was project manager, James Ricker was tunnel superintendent, and Steve Miller was concrete and carpentry superintendent.

Handbook on welding various types of metals

"WELDABILITY of Metals" is a 141-page book which gives the answers to how to weld ferrous and non-ferrous metals. The Lincoln Electric Company has reprinted in this book a section of its standard welding reference the "Procedure Handbook of Arc Welding Design and Practice." Frequent requests for information on how to weld various types of metals led Lincoln to publish this information in a special book so that it could be made widely available at low cost.

The various types of carbon and alloy steels are described by giving nominal chemical analysis, properties, uses and characteristics. The best welding procedure for each is completely detailed. American Welding Society specifications for electrodes used to weld are also given. The same treatment is given to copper, aluminum and nickel as well as their various alloys. Cast iron, forgings, cast steel, wrought iron, ingot iron, galvanized steel, terne plate and enameling stock are similarly covered. A thorough analysis of the principles and practices of hardsurfacing is presented. Complete tabular data, drawings and pictures supplement the text. The book is available from The Lincoln Electric Co., Cleveland 17, Ohio. Price, 50 cents.

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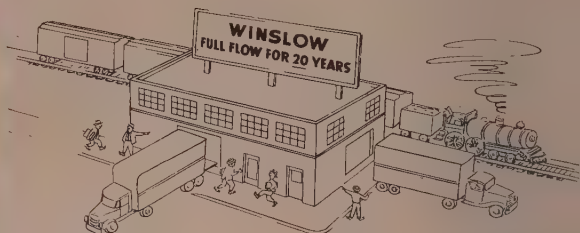
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Canadian hydro unit has highest head in No. Am.

POWER from the Wahleach development of the B. C. Electric Railway Co. in the Fraser Valley is now flowing into the Vancouver network. The drop of approximately 2,000 ft. from Wahleach Lake to the power plant, located on the Trans-Canada highway midway between Chilliwack and Hope, gives this development the highest head of water of any Canadian hydro unit. At present it is only exceeded in the world by three hydro projects in South Africa, India and South America. The Canadian distinction will be wrenched from Wahleach when the Alcan's Kemano plant is put into operation next year.

Wahleach is termed a "peaking plant" due to its ability to provide extra power during the B. C. Electric's winter peak demand. It will be in operation during the period from October to April when a large run-off in the Wahleach Lake watershed provides the necessary reservoir.

General contractor for the hydro development was Northern Construction & J. W. Stewart Ltd. The 340-tower transmission line was erected by Hume & Rumble Ltd. The water wheel was designed by Pelton Water Wheel Co. of San Francisco and manufactured at Vancouver by Vancouver Engineering Works. Both the generator and transformer were made by Canadian General Electric.

Barrett & Hilp celebrates fortieth birthday

A DINNER at San Francisco's Palace Hotel on October 29 marked observance of the 40th year of activity of Barrett & Hilp, San Francisco contractors. J. Frank Barrett and Harry Hilp met in 1908 on Palace Hotel reconstruction work where one was a timekeeper and the other a carpenter. They formed their partnership in 1912.

The following was quoted on the program at the dinner: "Theirs is the only major construction company in California where the two partners are still active together in business after 40 years of continuous service."

Lincoln Arc Welding has book on bridge design

"WELDED Highway Bridge Design" is a new book, edited by Professor James G. Clark, University of Illinois, presenting the major features and new and important ideas contained in designs submitted in the Lincoln Arc Welding Foundation's recent through highway design competition.

The authors of the designs include consulting engineers, bridge engineers of state highway departments,

Richmond-San Rafael bridge bids opened

BIDS for the Richmond-San Rafael Bridge were opened December 19 by the Division of San Francisco Bay Toll Crossings. Bidders on the substructure were:

Ben C. Gerwick, Inc.,
and Peter Kiewit
Sons' Co. \$14,234,550

Raymond-Pomeroy (a
group including Ray-
mond Concrete Pile,
J. H. Pomeroy &
Co., and five other
associated construc-
tion companies) 15,389,115

Pacific Bridge Co. and
General Construc-
tion Co. 16,429,420

Guy F. Atkinson and
United Construction
Co. 17,439,972

Merritt-Chapman &
Scott Corp. 18,067,900

Bidders on the superstructure
were:

Peter Kiewit Sons' Co.,
A. Soda & Son, Jud-
son Pacific-Murphy
Corp. (joint ven-
ture) \$21,099,319

American Bridge Co. 28,052,990

Bethlehem Pacific
Coast Steel Corp. 30,014,850

Award of contract and start of
construction on the project are
facing some new legal hurdles.

Norman C. Raab is project en-
gineer in charge for the Division
of San Francisco Bay Toll Cross-
ings.

structural engineers with govern-
mental departments, designers of
steel fabricating companies, struc-
tural engineers of research organiza-
tions and professors of structural en-
gineering. These professionally well-
known men are active designers in 17
different countries, including 20 dif-
ferent states in the United States.

The designs are original designs
for an all-welded two-lane through
highway bridge with a span of 250 ft.
The original drawings of elevations,
sections and details are presented
along with the author's discussion of
his designs. Major features of enough
of the program's designs are pre-
sented to insure that most of the new,
important and useful information de-
veloped for the program is included.

The book is divided into chapters
covering structural types, floor sys-
tems, new sections, connections and
details, and quantities and costs. This
arrangement facilitates comparison
between similar features of different
designs. Arches, trusses and other
types of designs are represented in
many variations. Floor systems in-
cluded concrete, steel grid and steel
plate.

Available from James F. Lincoln
Arc Welding Foundation, Cleveland
17, Ohio. Price, \$2.00.

Comprehensive system for construction estimates

IN EXHAUSTIVE checklist fashion, W. Earle Roche, construction consultant, has covered the subject of systematic preparation of construction estimates in his new book, "Roche Estimating Methods." Roche points out in his preface, "The prime purpose in presenting these estimating methods is to indicate how a practical application of common sense, coupled with a reasonable amount of practical experience and a proper conception of what is constructively required, will enable an estimator to arrive at the costs of a construction operation by a process that is standard in form."

The book is a result of Roche's own experience in the field, and of his conviction that the complexities of contracting operations today require a more systematic approach than heretofore. In support of this he observes the development of construction contracting on geographic and financial scales that are both unprecedented. The development has been accompanied by an increasing load of accounting paperwork required by various interests, and has been achieved in an atmosphere of keen competition. All these factors call for application of some system to construction estimating.

The estimating methods catalogued in this book are intended to meet the requirements of the individual estimator. Also, however, they should be of use and convenience to work authorities, contractors, students, architects and engineers—whoever is interested "in acquiring a knowledge of the art of reliable estimating procedures."

The contents of the book are carefully numbered, paragraph by paragraph, and are cross-indexed for ready reference. The 14 major subjects listed in the quick finder index are as follows:

1. Practical estimating procedure
2. The construction industry
3. Construction work information
4. Public and labor relations
5. Work investigations and reports
6. Agreements, schedules, quantity surveys
7. Work programs and progress graphs
8. Construction materials and supplies
9. Estimating construction plant costs
10. Estimating construction work costs
11. Estimating general and indirect costs
12. Summarizing construction estimates
13. Checking estimates and reports
14. Glossary of construction terminology

Published by W. Earle Roche, Glendale, Calif. 622 pages, plus appendices and supplements. 8½ x 11. Priced at \$100.

Highway conference in Colorado this month

THE APPLICATION of geology to highway engineering, practical aspects of base types, and development in concrete pavement design and construction are the chief topics to be discussed by qualified speakers at Colorado's 26th Annual Highway Engineering Conference. The two-day meeting, beginning on January 22, will be held in the Student Memorial Building on the University of Colorado campus at Boulder. Fourteen speakers are scheduled. Chairman of the conference is Professor Roderick L. Downing of the University of Colorado, Department of Civil Engineering.

P.G.&E. has "bucket-type" waterwheel on Bear River

A NEW SOURCE of electric power for California, and the first major installation of its kind in the United States, is ready for service high in the Sierra after 2½ years of dam-building, tunneling and powerhouse construction. It's Pacific Gas and Electric Company's Bear River Project on the Mokelumne River in Amador County, which will generate 29,000 kw. of electricity when full operation begins with the run-off of melting snow next spring. The project has cost about \$11,000,000.

A rock-fill dam 245 ft. high and containing 1,500,000 cu. yd. of granite blasted from a nearby cliff was wedged into a gorge between two rocky shoulders to form a reservoir with a capacity of 48,500 acre-feet of water. Meanwhile, a tunnel 8½ ft. wide and 11 ft. high was bored 2½ mi. through the mountain to divert the stored water to the generating unit.

The new unit is installed in Salt Springs Powerhouse, which was built in 1931, and stands alongside an existing unit operated by the main waters of the Mokelumne. Having two units side by side but driven by water from two different sources is an unusual arrangement in powerhouse construction.

The new unit has the added distinction of being the first sizeable installation in the United States of a high-speed, multi-jet impulse or bucket type waterwheel mounted on a vertical shaft. The normal mounting of this type waterwheel, which was invented in the Sierra during gold rush days, is with a horizontal shaft and a single jet of water to drive the wheel. The Bear River unit has three jets.

A model of the new-type turbine was successfully tested at P. G. & E.'s Halsey Powerhouse near Auburn in 1949, and the first full-scale installation in North America was made on the Bridge River in British Columbia.

This proved to be a milestone in hydroelectric construction for notably high efficiency.

In addition to the generation of new electric power by means of the Bear River unit, the additional water storage created on the Mokelumne watershed will serve to increase the annual power output of three other P. G. & E. plants down the river, the Tiger Creek, West Point and Electra powerhouses. It also supplements the water storage of the East Bay Municipal Utility District, which supplies water to cities on the east side of San Francisco Bay.

Two articles in *Western Construction* have described construction of the project (March 1951—pp. 63-66, and February 1952—pp. 61-65). An article in the February 1953 issue will describe completion phases of the project.

General Motors sponsors highway essay contest

ANYONE HANDY with pen or pencil and an eye to the solution of today's highway and traffic problems, has a chance to win as much as the \$25,000 first prize in General Motors' essay contest. The contest was announced at a recent dinner of the General Motors Club of San Francisco. It is a nation-wide contest offering \$194,000 in cash awards for a total of 162 national, regional and state prizes. State winners will receive \$1,500 each, with two \$500 honorable mention awards for each state. Title of the essay is "How to Plan and Pay for the Safe and Adequate Highways We Need." Closing date is not until March 1, so there is plenty of time to get started. Complete information may be obtained from General Motors' Detroit Diesel Engine Division distributors and dealers.

Watch your citizenship if you're going to Alaska

THE MOUNTAIN Pacific Chapter of AGC calls the attention of all contractors doing work in Alaska to the evidence of U. S. citizenship now required for all personnel traveling from Alaska into the States. For those who travel frequently between the two points, U. S. Citizens' Registration Cards may be obtained from any office of the U. S. Immigration and Naturalization Service or Collector of Customs.

For a single trip, legal evidence of citizenship must be furnished. For obtaining a Registration Card, the following documents must be submitted:

1. Birth certificate; or notarized statement from county clerk identifying applicant as a registered voter; or other evidence of citizenship, such as a U. S. military service discharge (honorable), etc.

2. Two photographs 1½ x 2½ in.

The new regulations, which went into effect last month, are specified in the recently enacted McCarran Immigration bill. Naturalized citizens are eligible for passage, as well as native citizens; but the clearance may take somewhat longer. Naturalized citizens should therefore make their applications for clearance well in advance.

Job accidents take their toll

THESE were the accidents that resulted in deaths on the West's construction jobs during November:

At Logan, Utah, two men were electrocuted in the shop of Olof Nelson Construction Co. The men, Rolan Olson, 42, and Russell Nelson, 44, were working with a winch truck moving planks from one area to another. In an attempt to tie the winch cable around a plank, the cable was pulled into contact with a high tension wire carrying 12,000 volts of electricity.

At Pocatello, Idaho, Leo Curzon, 31, bulldozer operator, was crushed to death when his bulldozer fell into an abandoned septic tank. He was engaged in leveling city-owned property when the accident occurred.

At Hungry Horse Dam in Montana, Ludwig Froeschle, 30, concrete vibrator operator, was killed instantly when a crane boom collapsed on him. The accident occurred on the right abutment of the dam.

ACCIDENTAL DEATHS and serious injuries on the West's construction jobs are reported each month in the interest of promoting safety-on-the-job.

At Chief Joseph Dam in Washington, Clarence Hendrickson, 34, was killed when he was struck by a backstay which broke on a pile driver. It was the fourth construction death on the project and the first in two years.

Near Yakima, Wash., Leo Hoover, 45, bulldozer operator, was killed when a bulldozer he was driving onto a truck bed upset and pinned him to the ground. He had cleared an irrigation canal with the bulldozer and was moving it to a new location.

At Colorado Springs, Colo., Milo (Bud) Miller, 28, was killed when an 11-ft. earth bank collapsed and buried him at the site of that city's new multi-million dollar electric generating plant.

At Davis Dam, Tony Ruddy, 45, operator of an electric dragline, was killed while checking the operation of his machine. His leg became caught in the mechanism and he was dragged underneath the machine.

CALENDAR OF MEETINGS

January 22-23 — Colorado Highway Engineering Conference, 26th annual, in Student Memorial Building, University of Colorado, Boulder.

January 26-28 — Association of Asphalt Paving Technologists, annual meeting, at Rice Hotel, Houston, Texas.

January 30 — Idaho Branch, AGC, annual meeting, at Hotel Boise, Boise.

January 30-31 — Colorado Contractors Association, AGC, annual convention, at Shirley-Savoy Hotel, Denver.

February 1-4 — Mason Contractors Association of America, Inc., national convention and show at Sherman Hotel, Chicago.

February 1-5 — Associated Equipment Distributors, 34th annual convention, at Conrad Hilton Hotel, Chicago.

February 5 — Wyoming Section, ASCE, annual meeting, at Connor Hotel, Laramie.

February 5-7 — Federal Civil Defense Administration, regional engineering symposium, at Saint Marys College, Calif.

February 9 — Colorado Section, ASCE, annual meeting for installation of officers.

February 10 — Tacoma Chapter, AGC, annual meeting at Tacoma.

February 17-19 — American Concrete Institute, annual convention, at Statler Hotel, Boston.

February 23-26 — National Sand & Gravel and National Ready Mixed Concrete Associations, annual conventions, at Fairmont Hotel, San Francisco.

February 25-28 — American Concrete Pipe Association, annual convention at Baker Hotel, Dallas.

March — Arizona Chapter, AGC, annual meeting at Westward Ho Hotel, Phoenix.

March 3-6 — American Society of Civil Engineers, national convention, at Fairmont Hotel, San Francisco.

March 23-28 — Associated General Contractors, 34th annual convention, at Miami, Florida.

September 14-16 — Associated General Contractors, mid-year board meeting, at Edgewater Beach Hotel, Chicago.

1954

March 1-4 — Associated General Contractors, 35th annual convention, at Statler Hotel, Los Angeles.

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ENGINEERS ON THE MOVE



OFFICERS past and present of the Montana section of the American Society of Civil Engineers. (See item and identifications below.)

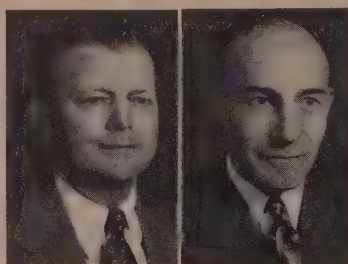
Newly elected officers of the Montana Section of the American Society of Civil Engineers are: **Joseph A. Maierle**, Helena, president; **O. C. Reedy**, Billings, **Frank Stermitz**, Helena, **Allen A. Johannesen**, Hungry Horse, and **George J. Hoge**, Great Falls, vice presidents, and **Donald H. Park**, Helena, secretary-treasurer. Four of these new officers are pictured above at the annual meeting on October 3-4: Seated, left to right, Stermitz, Maierle, Park and Reedy. Standing, left to right, are: **William P. Price, Jr.**, and **A. A. Van Teylingen**, retiring vice presidents; **William J. Wenzel**, past president, and **Henry G. Groves**, retiring vice president.

C. E. Schaff, one of Bechtel Corp.'s engineers in its San Francisco office, now is in Toronto, Ont., with Canadian Bechtel, Ltd. He will do engineering liaison and inspection for Imperial Oil refinery in Vancouver and for the trans-mountain oil pipe line from Edmonton, Alberta, to Vancouver, B. C.

Theodore E. Mann, field engineer for the Bureau of Reclamation, is now at work in Chester, Mont., the site of Tiber Dam and Dike construction. He formerly worked on Boysen Dam in Wyoming.

The Bureau of Reclamation has announced two promotions following the recent resignation of **C. S. Hale**, who left San Diego to become chief engineer and general manager of the Coachella Valley County Water District. **Jean R. Walton**, former con-

struction engineer at Davis Dam and power plant, has been named acting project engineer in charge of construction of the San Diego aqueduct's second barrel, and **Harold R. Orr**, office engineer at Davis Dam, now succeeds Walton at the helm.



Walton

Orr

Walton's new appointment is the latest of a number of continual advancements. He was with the Bureau of Indian Affairs from 1933 to 1936, and since 1936 he has had continual experience with the Bureau of Reclamation except for military service during World War II. He worked on the Vallecito Dam-Pine River Project at Bayfield, Colo., until Nov. 1941. He was then transferred to the Bureau's Denver office, where he returned after military service. He was at Davis Dam from 1946, beginning as field engineer and promoted to construction engineer in 1950.

Harold R. Orr has been associated with the nearly-completed Davis Dam project since 1941, when he was appointed office engineer and assisted with pre-construction work and initial construction activities. During the war he was in the Chief Engi-

neer's office in Denver as structural designer in the concrete dams sections where he had worked for eight years prior to his assignment at Davis Dam.



James B. Black
(See item below)

James B. Black, president of Pacific Gas and Electric Co., was the 1951 winner of the annual achievement award bestowed by San Francisco's Building Industry Conference Board. Presented at a banquet held on October 30, the award is given for contribution to the industry and service to the community. Last year's winner was **Stephen D. Bechtel**.

Merle L. Tillery has been appointed superintendent of the Bureau of Reclamation's Minidoka Project in southern Idaho, following the retirement of **James F. Spofford** on December 20. Tillery joined the Bureau in 1940 as Associate Reclamation Economist of the Payette Division of the Boise Project. Since 1944 he was Chief Land Use and Settlement Branch, Division of Operation and Maintenance, in the Bureau's Boise office.

Spofford, 70, was superintendent of the project since the fall of 1949. Prior to that he served 5½ years as irrigation manager of the 100,000-acre Owyhee Project in Oregon and Idaho. He joined the Bureau in 1941 as Associate Engineer in its Denver headquarters. From there he was transferred to the Boise office, and during the year of 1943 he was State Reclamation Engineer for the State of Idaho.

The Minidoka Project provides full or partial water supply for a million acres of irrigated land in the Snake River Valley. The Bureau feels fortunate to turn over this work to Tillery, who has had years of association with farmers and water users in the vicinity.

George Grove is new manager of Headman, Ferguson & Carollo's office in Tucson, Ariz.

City Engineer **C. Glen Smith** of Pullup, Wash., has recently resigned because of ill health.

Joseph F. Friedkin, San Diego resident engineer of the International Boundary and Water Commission for five years, was reassigned to El Paso, Tex., where he will become supervising engineer. He was succeeded by

6 JACKSON MONEY-MAKERS for '53

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(b) For COMPACTION OF GRANULAR SOILS — in concrete floor sub-bases, bridge approaches, close to abutments, and similar applications, the same machine described above, available with quickly interchangeable bases of 12" to 24" widths, will achieve specified density in 8" to 12" depths at the rate of 2400 sq. ft. per hour in granular soils of optimum moisture content. A tandem version is amazingly efficient in compacting sub-bases for pavement widening.

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4. 6 H.P. ENGINE-DRIVEN, FLEXIBLE-SHAFT VIBRATOR — provides the last word in uninterrupted service and reliability. Ideal for both thin and thick concrete sections.

5. 2½ H.P. ELECTRIC VIBRATOR (for light-socket operation) — Handy as a pocket in a shirt, powerful enough to handle all general construction concrete vibration.

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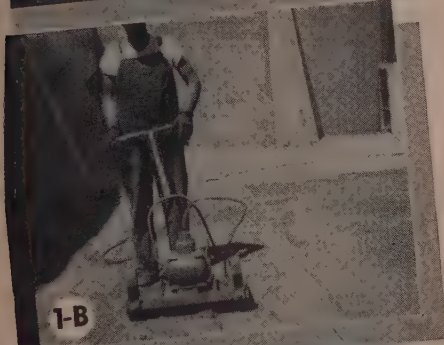
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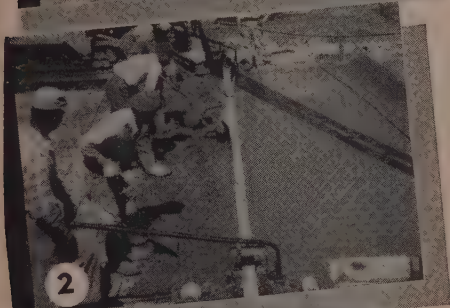
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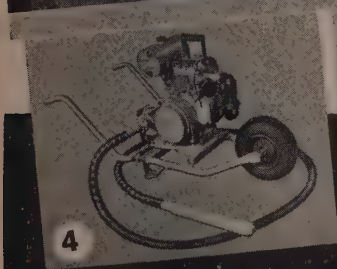
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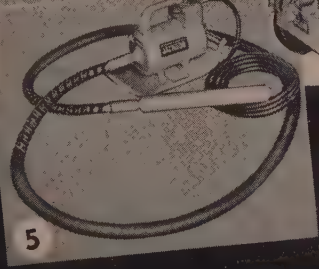
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4



5



James Wingo at his San Diego post. Work in the San Diego area concerns water and sanitary problems related to the Colorado and Tia Juana rivers.

The ASCE awarded **Don J. Bleifuss** the James W. Rickey medal for his paper, "Diversion Tunnel and Power Conduit of Nantahala Hydroelectric Development." Bleifuss is chief engineer of M-K's International Engineering Co.

James A. Foster, senior engineer of the Portland Cement Association's Highways and Municipal Bureau, Chicago, was appointed assistant

manager of the Bureau effective October 1. Foster succeeds **L. M. Arms**, who was appointed bureau manager last July. He joined the Association in 1936 as a member of the Highway and Municipal Bureau.

The Forest Service in Alaska has named **Vance Blackwell** regional engineer.

Kaiser Engineers Division of the Henry J. Kaiser Co. has appointed **Leo R. (Johnny) Manis** procurement manager for its construction at the Atomic Energy Commission's Hanford plutonium works. Manis will di-

rect the purchase of nearly \$60,000,000 worth of equipment and construction materials from the project's headquarters in Richland, Wash. Manis formerly held the same position at the \$150,000,000 aluminum reduction plant now being built at Chalmette, La., by Kaiser Engineers. He first became associated with Kaiser when the Six Companies built Hoover Dam.

Jack Y. Barnes figures in one of two important changes in the Portland Cement Association. The Association's 27th district office is now open in Helena, Mont., with Barnes, formerly field engineer with the Des Moines office, as district engineer in charge. Barnes joined the organization in 1937 as office engineer in Des Moines. In 1940 he was appointed field engineer for northwest Iowa with headquarters in Mason City, the post he held at the time of his promotion to district engineer. The Helena office will provide Montana cement users with all possible service and technical information not previously available.



Jack Barnes, engineer in charge of the Portland Cement Assn.'s new office in Helena (see item above).

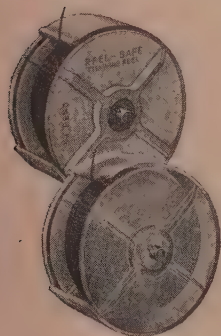
George C. Bestor, consulting engineer of Carmel, Calif., is quite active in the Monterey Bay area. Some of the large projects on which he is currently conducting surveys are: Likins Foster housing project, Alliance military housing project, Grove Highlands housing project, and the motor pool building project at Fort Ord.

Walter A. Brown is replacing **William Holmes** as engineer in charge of dam supervision for the California Division of Water Resources at Sacramento. Holmes recently retired.

The Bureau of Reclamation has appointed **P. R. Nalder** to succeed **H. A. Parker** as district manager for the Columbia Basin Project. Parker is now retiring after more than 42 years service with the USBR. He had directed the survey, design and construction of the irrigation phases of the Columbia Basin project for 14 years. In 1950 he succeeded **Frank Banks** as district manager. Nalder began working as a tracer on the project when it first began in 1933. He served successively as chief of the land division, acting office engineer, assistant to the district manager and assistant district manager.



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Major General Samuel D. Sturgis, is the new head of the Corps of Engineers, following the retirement of **Lt. General Lewis A. Pick** at the end of November. General Sturgis' appointment climaxes a long military career in the Corps of Engineers which began after his commission from West Point in 1918.

The General's experience in dealing with flood control problems began in 1935 when he was assigned as assistant to the District Engineer at Eastport, Maine, on the Passamaquoddy Tidal Power Development. In 1937 he was detailed with the Huntington, West Va., Engineer district to cope with flood control and navigation problems resulting from the disastrous flood of that year. He served as District Engineer at Vicksburg, Miss., from June 1940 to December 1942, during the time that the greatest flood control works on the Mississippi were prosecuted under the new Flood Control Act of 1941. From May 1949 to Feb. 1951 he was engineer of the Missouri River Division. At the present time he is commander of the Communications Zone of the European Command, an assignment which he has held since March. He will assume his new job as soon as he is able to terminate the affairs of his present command.

In the early '30's General Sturgis was stationed at Fort Riley, Kan., where he became aware of the need for modern equipment to keep abreast of mechanized warfare, and he applied for and received the first of such equipment for the Engineers. This action resulted in the subsequent provision of the bulldozer and other construction machinery for the troops in World War II.

Colonel N. A. Matthias, Seattle district engineer for the Corps of Engineers, has announced that **Colonel James G. Truitt** is now assistant district engineer, and will be in charge of military construction and supply and procurement for the area. Truitt's appointment is his second tour of duty in the District, having been employed as principal civilian engineer in charge of construction from 1932 to 1942. In the military field, his work will embrace construction projects at Fort Lewis, Madigan Army Hospital, Mount Rainier Ordnance Depot, Auburn Depot, Camp White and at other Army installations, plus McChord, Paine, Fairchild, Geiger and Great Falls Air Force bases.

Colonel Truitt is a veteran of both World War I and II. From 1919 to 1932 he served as a civilian engineer in Alaska. He was awarded by both the U. S. and Chinese governments during World War II for his work in locating the pioneer lines of the Ledo-Burma road. He gained outstanding recognition for organizing and conducting the survey for the proposed Trans-Canadian-Alaska railroad.

DEATHS

Walter A. Stebbins, 71, retired dam engineer, died Nov. 23 in San Diego. He was employed for 33 years by the H. G. Fenton Co., retiring in 1946.

Leo L. Jackson, 64, retired builder, died Dec. 19 in Salt Lake City.

William H. Johnson, 69, retired Seattle building contractor, died Nov.

14 in a fire which destroyed his home near Woodinville, Wash.

Palmer Holt, 65, an engineer with the California Division of Highways for many years, died Nov. 12 in Santa Cruz, Calif.

Herbert R. Wright, 76, retired construction superintendent for Western Union in Portland, died Nov. 6 in Seattle.

Donald MacDonald II, 72, well-known rail and highway engineer in Alaska, died Nov. 3 in Claremont, Calif.

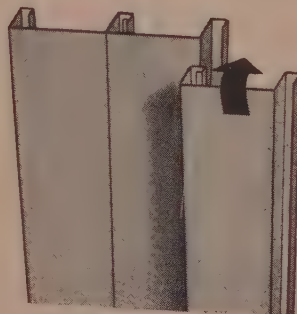
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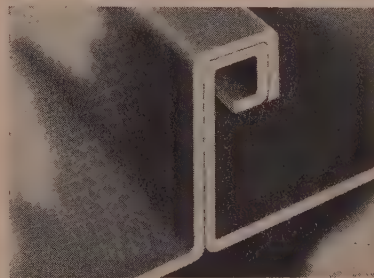
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SUPERVISING THE JOBS

General construction at the Country Club Center at Sacramento recently was undertaken by Erickson Construction Co. This \$2,000,000 contract was headed by **Harry Erickson**, project manager. **Tom Fogal**, **Lloyd Mechem** and **John Colvin** did the supervising. Office manager was **Frank N. Riddle**.

McKinnon-Decker Co. has named **O. W. Lane** superintendent of road construction in Glacier County, Mont. **Thomas H. Stevens** is foreman.

O. H. Rudolph is superintending construction of the First Church of Christ Scientist at San Jose, Calif. **Ray Tolliver** and **Ralph Martin** are foremen for this O. E. Anderson contract.

G. B. Armstrong is superintendent for 7.26 mi. of graveling, oiling and draining on the Red Lodge-Columbus road in Montana. **Irvin Dengel** and **M. L. Lehman** are foremen on the job for McKinnon-Decker Co.

Rice Bros. is grading and surfacing about 5.3 mi. of California highway. **Al Vercruyssen**, **Al Regalia** and **Carl F. Childs** are superintendent, project manager and project engineer, respectively.

Richard J. Lugo, for many years a superintendent for construction companies in the Southwest, recently has returned from Japan where he was C.P.O. in the C.B. Prior to going to Japan he supervised for Fisher Contracting Co. in Phoenix, Ariz. He is now reemployed by them in the same capacity.

Whiting & Haymond has named **J. H. Wardle** superintendent, and **Grant E. Palfreyman** and **Woodrow Winters** key men in road construction, Blanding to Hite in San Juan County, Utah.

Henry Hein, supervisor, and **Tom O'Donnell** are heading construction of sanitary sewers, sewer lines and manholes in Billings, Mont. **Barry O'Leary, Inc.**, holds the contract.

Louis Stiles, superintendent for G. L. Tarlton Contracting Co., has the job to construct California's Camp Creek Tunnel with a 7-ft. diameter horseshoe-shaped tunnel. Stiles is



THE THREE VETERAN construction men pictured here are at the frontier site of Project British Columbia, Alcoa's half-billion project which will utilize the resources of the Coast Range Mountains to provide power for what will be the world's largest aluminum manufacturing center. Left to right are: **A. O. Strandberg**, project manager for Morrison-Knudsen Co. of Canada, Ltd., **F. T. Matthias**, assistant project manager for Aluminum Co. of Canada, Ltd., and **Walter Abrahamson**, assistant resident engineer at Kemano for Alcan.

without a doubt the best man for the job for it was he who recently set the hard rock tunneling record at the site of Tarlton's contract for the Bureau of Reclamation's North Poudre Supply Canal Diversion Dam and Tunnel (*Western Construction*—July 1952, p. 96). Crews under Stiles' supervision drove 111 ft. in 24 hr. to beat the previous mark by 7 ft. Stiles will be assisted on the Camp Creek Tunnel work by **Harry Wermer**.

Dan Harris is superintendent for Pacific Bridge Co.'s contract for river-channel slope protection below Grand Coulee Dam.

A \$222,380 contract for road work in Island County, Wash., is held by **Herman Kathman**, who also is serving as project manager on the job. **Charles H. Calkins** is Kathman's assistant, and **Fred W. Muth** is superintendent.

C. A. McMahon, who recently finished supervising construction of Los Angeles' Pershing Square Garage, took a well-deserved vacation and now will superintend work on the \$15,000,000 brewery for Anheuser-Busch, Inc. This large-scale project will be built in Van Nuys, Calif., by Peck-Cahill Co., a joint venture of C. L. Peck and Cahill Bros., Inc. Ground-breaking ceremonies on December 17 called for can't-guess-how-

many acre-ft. of Budweiser beer. **M. Mahon** has just received notification of his transfer from Associate Member to Member in the American Society of Civil Engineers.

Sam Lowy is superintending \$782,875 worth of highway work in Coville and Lewis counties, Wash., for Goetz & Brennan, contractor. **Te Nelson** is master mechanic and **George McAdoo** is foreman.

Ross Schupbach is superintending for Fisher Contracting Co.'s contract for Verde filter plant additions at Phoenix, Ariz.

In Tuolumne County, Calif., 3.8 mi. of grading and plant-mix surfacing are going on under the supervision of **W. R. Southworth, Jr.** **Al Foote** is mechanic and **J. R. Hodgson** is foreman for this Paul E. McCollum contract.

A. Teichert & Son, Inc., has various jobs currently under way in California. **R. B. Reith** is Teichert's general superintendent for all of the northern California area and will be seen at the site of the different jobs in his territory, among them sewer construction going on in Sacramento and Antioch. The \$639,761 Antioch contract has as its project manager **W. W. Staring, Jr.**, and **W. A. Peckham**, timekeeper. In Sacramento, **Howard Gould** is project manager. **S. E. Buchanan** is assisting Reith for that particular job. Buchanan, incidentally, is general superintendent for the Sacramento area.

Also in Reith's territory is a nearly completed highway job in Yolo County. **Frank Ahlgren** is project manager, and **J. Stanley Harris, Jr.**, is Reith's assistant. McClellan Field paving construction is superintended by Reith (when he isn't looking over some of his other jobs); otherwise we'll find **Robert Brock**, project manager, and **F. Maxwell**, timekeeper, with eyes down to earth.

Marc Fosgate is heading work at the Tuxedo Country Club, Stockton. His assistant is **John A. Tyler**, timekeeper.

Operating a gravel plant at Perkins are **Abe Newman**, plant foreman, **Red Batchelor** and **Charles Johnson**, master mechanics; and **Bob Blake**, assistant master mechanic.

Vern Hallberg and **John Kauffman** are Readymix plant foremen at Brighton, location of another Teichert job.

An account of Teichert's Sacramento vicinity work is herewith completed by the names of **C. A. Williamson**, general plant superintendent, and **C. H. Wahl**, master mechanic.

Work in the Southern California area is under the general supervision of **Robert T. Skinner**. Skinner recently has completed working on a \$508,

216 highway job in Weldon Canyon, Los Angeles County, where Roy Hill was project manager and J. Milner was timekeeper. Two jobs for the improvement of flood control in Los Angeles also have been on the agenda. One, just being completed, has James P. Cagle as project manager and Robert J. Smith as timekeeper. Arthur Murphy is project manager for the other flood control project. Harry Bowman is timekeeper.

Returning to northern California and the territory of R. B. Reith, there are two highway jobs currently under way, one for \$1,048,738 in Siskiyou County and the other for \$310,780 in Lassen County. Adolph Bauer, project manager, and Charles Hite, office manager, head work at the former location. H. L. Morissette and R. J. Latimer hold the same positions, respectively, in Lassen County.

Herman Smith, project manager; Marc Fosgate, superintendent; and John A. Tyler, office manager, recently handled Teichert highway work located by Calaveras River.

Martin Bassett, assisted by Don Yates, is superintending construction of a frame building in Sacramento for Lawrence Construction Co. Roberts Plumbing Co.'s work on the job is headed by Ralph Williams.

Guy F. Atkinson Co. has a \$2,000,000 contract to construct the pier and facilities at Swan Island for the Port of Portland. Project manager on the job is H. H. Hunt. L. E. (Lee) Cox is superintendent, assisted by R. M. (Bob) McKee. Joe B. McNabb is project engineer. Foremen are: Clyde Estep and Joe Pixler, carpentry; Harvey Swanson, pile driving; Gordon Hamm, general labor, and Bud Kemp, mechanical foreman. This Atkinson contract which began in February 1952, and is expected to end next month, is one of the largest pile driving jobs in the world.

Work going on at the Nevada proving grounds is headed by Henry T. McNeil, superintendent, and R. D. Chase, manager. Lembke-Clough & King Co. have the contract.

W. C. Treadwell heads the McNary reservoir clearing going on under contract to Schutt Construction Co.

Del E. Webb Construction Co. has a \$7,000,000 contract for building construction at Travis Air Base. R. G. Fleming is superintendent, assisted by A. La Rue. F. P. Kuentz is job engineer, L. Dave Saunders is field engineer, and John Meeker is office engineer. Clyde W. Adams holds the position of general carpentry foreman, and Jack Childers, J. D. Dunn, T. C. Jeffords and Harvey Cates are carpentry foremen. Foreman for labor is



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B. B. Johnson, M. D. Redick, P. D. Clothier and **L. Kracht** are time-keeper, office manager and cost accountant, respectively. The Corps of Engineers is represented by **A. F. Kull**, project engineer, and **Steve Bonnemort**, assistant project engineer.

In Portland, a \$4,200,000 structural steel building to house the Bonneville Power Administration is being built by **Lloyd Corp. Ralph & Horwitz** is building contractor. **Ralph Shook** is general superintendent for this job. **Ed Westhefer** and **Bert Greene** are foremen for carpentry and labor, respectively. **Ed Curtin** is job engineer and **Chuck Neale** is steel foreman. The architect, **John Sherman**, has **E. W. Mac Brayne** superintending. **Roy Nelson** is foreman for **Watco Electric Co.**, which has the subcontract for electrical work.

R. L. Branaman is superintending for **Emil H. Krall's** project to construct the Squaw Creek presedimentation basin and raw water pumping station which will serve Phoenix, Ariz.

The Las Vegas, Nev., high school is getting a new auditorium. **Ven Cass** is superintending the work for **Lemke-Clough & King Co.** Foremen are **Charles Lotspeich**, carpentry, and

Leon Pullins, labor. **Jim Griswold** is engineer for the school board. The same company is completing additions to the sewage plant of North Las Vegas. **Fred Pestel** is superintendent.

John Hickey is superintendent for **Telson Ross Co.'s** project to put up 392 homes in Las Vegas, Nev., at a cost of \$4,000,000.

Also in Las Vegas is **Sam Earl**, project manager for **J. A. Tiberti**, who is constructing a building for the First National Bank. **Don Page** is general foreman on the job.

U. C. L. A. is getting a costly new building which is being constructed by **Baruch Corp.** **Frank Parker** is superintendent, assisted by **Eddy Holmsdahle**.

Emil Bettega, superintendent, and **Cliff Peterson**, job foreman, head **C. Norman Peterson's** \$358,250 contract for crashboat and barge handling facilities at **Moffett Field, Calif.**

Neil Snyder is project manager for **Erickson & Campbell Construction Co.** for general construction work just ending at **McClellan Air Force Base.** **Lynn Fetch** and **Lance Trent**

are general superintendents. Engineer is **Ray Mackey**, and **Don Gibboney** is office manager. The \$5,500,000 job is part of large-scale construction at the base.

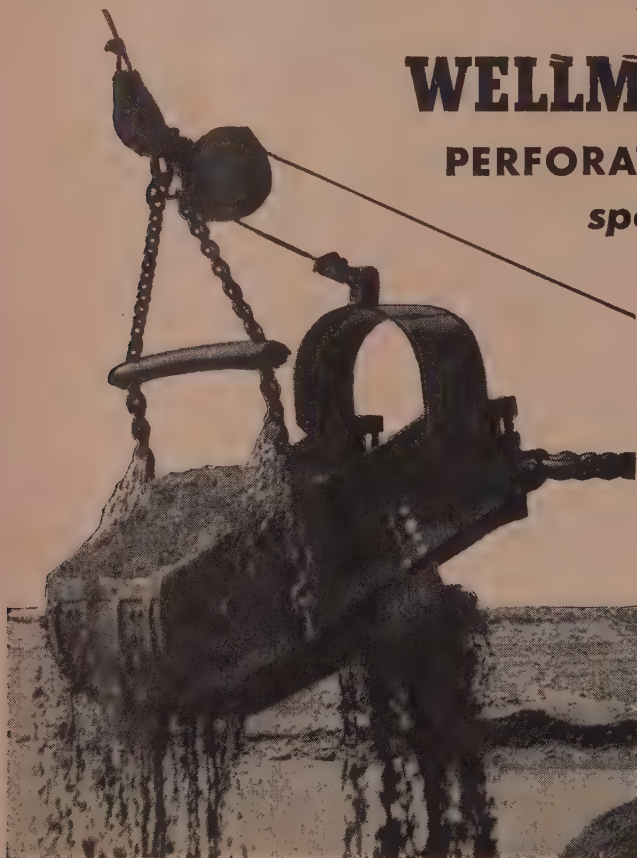
A road job going on in Calaveras County, Calif., has **LeRoy Morse** superintending for **M. J. Ruddy & Son.** **Fred Sather** is job engineer and **Russ Haskins** is master mechanic.

Matich Bros. and **Matich Bros. Paying Co.** have two contracts for grading and surfacing in **San Bernardino County, Calif.**, and both jobs are headed by the same men. Job superintendent is **John N. Matich**; project manager is **Martin A. Matich**; office engineer is **A. E. Smith**, and **Jim P. Whelen** is purchasing agent.

Dave Mather is superintending construction of 117.3 mi. of power transmission and distribution lines in Oregon for **R. C. Hughes**, contractor.

Walter Roeder heads **Pipeline Construction Co.'s** work for pump sump and South **Perris Valley** supply line in **Hemet, Calif.**

J. C. Hubbard, general superintendent, and **A. O. Oakley**, job superin-



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tendent, are heading a job to widen a concrete bridge over the North Platte River in Wyoming. E. E. Peterson is contractor for this cold weather work which is just beginning.

C. B. Anderson is superintending building construction in South San Francisco for Van Bokkelen-Cole Co., contractor.

The Sacred Heart High School, San Francisco, is being built by Robert McCarthy Co., with C. Tadlock, superintendent, and J. Martin, carpenter foreman.

Frank Floyd is superintending construction of the Fort Lewis Ordnance area in Washington. Hall-Atwater Co. holds the \$357,914 contract.

In the vicinity of Las Vegas, Nevada, there is a \$574,185 job going on with Sam Gillette, superintendent, and Bill Hanserd, general foreman, for Carl E. Nelson Co. Norm Jones is office manager, and H. C. Christianson is field timekeeper.

Eaton & Smith has a father and son combination supervising on one of its jobs. R. Trask, Sr., is assisted by R. Trask, Jr., on a \$732,384 project involving six miles of grading and surfacing and bridge construction in Fresno County, Calif.

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In all cases, the handbook describes "preferred practices," while admitting that special circumstances can and often do call for deviation. An understandable favoritism given du Pont products in the material on explosives and their accessories does not detract significantly from the authoritative nature of the handbook in its overall coverage of blasting agents and practices. The book is well illustrated with photographs and diagrams. Published by E. I. du Pont de Nemours & Co. (Inc.), Wilmington, Del. 477 pages, 5½ x 8 in. Priced at \$1.75. Available through any branch office of the du Pont company.

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NEW BOOKS

CONCRETE ROADS—Sparks and Smith

This treatment of problems in the techniques of construction of concrete roads is Vol. IX in the publishers' "The Roadmakers' Library." It is a thorough study of the specific subject of concrete roads, dealing very briefly with conditions common to all forms of roads. Its treatment is up-to-date for the authors are writing for today's highway engineer who has access to the post-war developments which have made great changes in the construction of concrete roads. Emphasis is made on three phases of the problem. First, briefly, properties of soil and methods for its testing, treating and manipulating, because design of the concrete surface must be related to the soil supporting it. Second, mechanical methods of handling, placing and compacting the concrete, and third, the necessary tests and arrangements needed to control the quality of the concrete, which includes a section on batching and batching plants. Also, the authors have devoted some space to the theoretical aspects of concrete slabs. The

book is very well illustrated with photographs and diagrams. Published by Edward Arnold & Co., London. 474 pages, 6 x 9½. Priced at \$15.50.

ANALYSIS OF STATICALLY INDETERMINATE STRUCTURES (3rd ed.)—Williams

Original existence of this book grew out of the realization of Clifford D. Williams, head professor of civil engineering at the University of Florida, of the need for structural engineers to have a working knowledge of the subject, one which previously had not been well-treated except in graduate courses. The author has developed his material to secure continuity of principles throughout all the work, to impress the student with the simplicity of those principles, and to provide him with varied problems

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.

for some working knowledge of the principles. Intention has been to present only fundamental methods of approach, such as study of the elastic curve in presenting the clearest mental picture of the action of beams. The Slope-Deflection Method and the Hard Cross Moment-Distribution Method both are well covered. Published by International Textbook Co., Scranton, Pa. 392 pages, 5½ x 8½. Priced at \$4.50.

WATER SUPPLY AND PURIFICATION (3rd ed.)—Hardenbergh

Hardenbergh's book is a presentation of the theories underlying the collection, transportation, delivery and treatment of water, as well as a treatment of those theories in connection with practical phases of the work. It tells how the engineer may select the best source of supply by showing him how to establish the quantity of water that can be obtained by each available source, even in times of drouth. It covers factors governing the amount of water that a certain pipe line will deliver, and the principles governing the design of a distribution system. Finally, most emphasis is on the purification of the water, because of its relation to public health. Use of modern equipment and materials is given full consideration. Published by International

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ges, 5½ x 8½. Priced at \$6.50.

THE LOOK OF MAPS—Robinson

The author of this book, Arthur H. Robinson, was in charge of the Map Division of the Office of Strategic Services during the war and is now professor of geography at the University of Wisconsin, so he has had long familiarity with the good and bad points of cartography. Here he analyzes the important elements of the cartographic technique to show not only what is now known about the subject but what is not known. He questions specific methods of presenting data on maps, lettering, color and symbols, for though modern scientific advances provide data making maps more accurate than ever before, certain conventional methods have not improved. Published by The University of Wisconsin Press, Madison. 95 pages, 6½ x 9½. Priced at \$2.75.

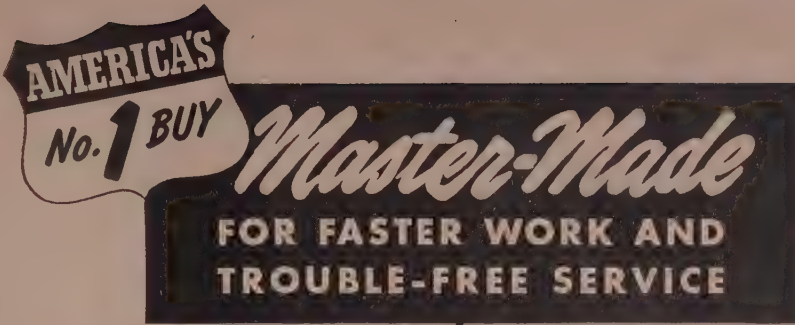
A PROSPECT OF CITIES

—Stewart

An English publication by an examiner for London's Town Planning Institute, this is a well-done and thoughtful treatment of, to quote the title page, "... Studies toward a History of Town Planning." It is not intended to be a definitive study, nor is it directed toward only the technically-minded civil servant; it was written for people "who know even less about town planning than I do," the author modestly confesses. The examples and illustrations are chosen to show how certain typical communities of an age provided for the development of civilized life, and how the towns fitted into their contemporary social and economic backgrounds. It is well illustrated with photographs, maps and sketches. Published by Longmans, Green and Co., London. 186 pages, 5½ x 9. Priced at \$4.50.

STEAM POWER STATIONS (New 4th ed.)—Gaffert

The latest edition of this fifteen-year-old textbook on steam power stations has been modernized to include the most timely data on the subject, all treated from the station designer's point of view. First part of the book covers equipment and steam-machinery characteristics, and the second part deals with design of steam power stations, in which economy and integration of machinery are considered. It covers only the steam electric plant. The book also reviews performances, costs, trends toward unit plant construction, and the more efficient cycles (including reheat), which have lately become important. Published by McGraw-Hill Book Co., Inc., New York. 627 pages, 6 x 9½. Priced at \$8.00.



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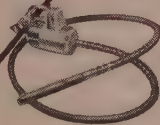
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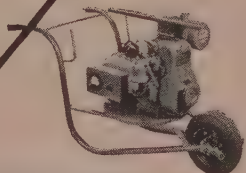
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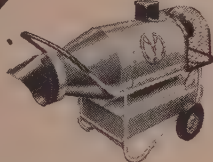
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POWER PROJECTS

... Continued from page 71

planned development of the Pit River, the application states. Estimated total cost of the proposed Pit No. 6 project is \$20,120,000. The company plans to build a concrete gravity dam, on the Pit River, about 230 ft. high. The reservoir would extend upstream to the company's existing Pit No. 5 powerhouse. Two penstock pipes about 160 ft. long would extend from the dam to the powerplant, immediately downstream. The powerhouse would contain two 42,500-hp. units. This project is under construction.

Portland G.E.'s Pelton project

Portland General Electric Co. of Portland was granted a two-year preliminary permit for a proposed development in Jefferson County, Ore. The development, 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. The proposed powerhouse, to be located immediately downstream, would have an installed capacity of 310,000 hp.

Sacramento on the Rubicon

Sacramento Municipal Utility District asked the Commission for a preliminary permit for a proposed development in Eldorado County. It would be located on the Rubicon River and tributaries. Sacramento proposes to distribute the power within its District through its presently owned and operated distribution system. The development would include diversion, regulating and storage reservoirs, which have a total capacity of about 246,000 ac. ft., and about 16.4 mi. of diversion tunnels connecting the reservoirs to each other or to the proposed three powerhouses. The project also would include a 55-mi. transmission line and appurtenant hydraulic and electric facilities.

P. G. & E. on the Feather

Pacific Gas and Electric Company has applied for a license for a proposed project on the North Fork of the Feather River and Butt Creek in Plumas County. The proposed project, to be constructed in connection with the company's existing Lake Almanor and Butt Valley reservoirs, would have two powerhouses with a total installed capacity of 205,000 hp. PG&E has also requested a three-year preliminary permit for a proposed development on the McCloud River and

its tributaries in Shasta and Siskiyou counties, Calif. The development would utilize waters through four successive projects, designated McCloud Nos. 1, 2, 3, and 4, with a total installed capacity of 374,000 hp. Another application by PG&E proposes a license for its Poe hydroelectric project on the North Fork of the Feather River in Butte County. The proposed project, which has a total estimated cost of \$40,490,000, is a part of the company's planned comprehensive scheme of development of the power resources of the North Fork of the Feather River. Water would be diverted through a 33,700-ft. pressure tunnel connected to two welded steel pipe penstocks extending approximately 780 ft. to the powerhouse which would have an installed turbine capacity of 146,000 hp.

Oroville Irrigation District

The Commission issued a 50-year license to Oroville-Wyandotte Irrigation District, of Oroville, Calif., for its proposed South Fork hydroelectric project, to be generally centered about 25 mi. east of Oroville. The project, which will have a total installed capacity of 75,000 hp., will include two rock-fill storage dams and two concrete arch storage dams, one already constructed; two diversion conduits; three concrete arch

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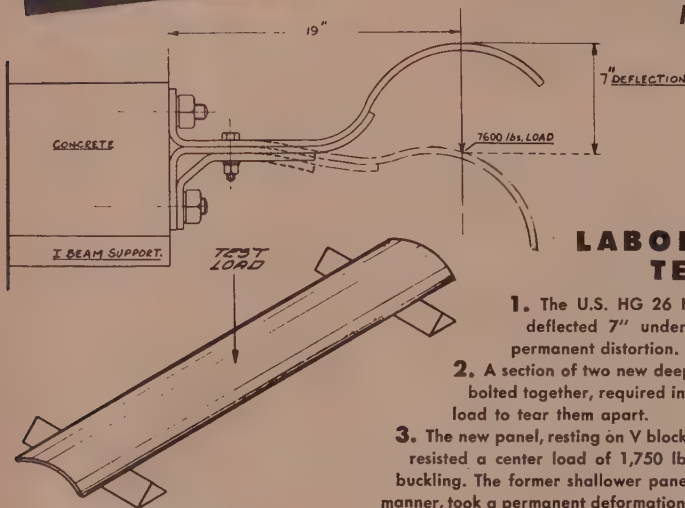
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New Guard Rail Panel has twice as much arch as former design ... will stand 2 1/4 times as much load before buckling.

New U.S. HG 26 Supporting Post, made of heat-treated Chrome Vanadium Steel has 3 leaves securely anchored to concrete base. It can absorb more energy from impact because it YIELDS without breaking.



LABORATORY TESTS

1. The U.S. HG 26 Highway Guard Post deflected 7\" under 7,600 lbs. without permanent distortion.
2. A section of two new deep arch design panels, bolted together, required in excess of 90,000 lbs. load to tear them apart.
3. The new panel, resting on V blocks spaced 10 ft. apart, resisted a center load of 1,750 lbs. before permanent buckling. The former shallower panel, tested in the same manner, took a permanent deformation at only 795 lbs. load.



Manufactured by

United States Spring & Bumper Co.

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diversion dams; two powerhouses served by tunnels and penstocks.

Pacific Power on the Lewis

Pacific Power & Light Co. of Portland filed applications requesting preliminary permits for two proposed hydroelectric projects on the Lewis River in Skamania County, Washington. One of the two proposed projects, the Swift, would include a rock-fill dam, 225 ft. high. Powerhouse, about 3½ mi. downstream, would be connected to the reservoir by power tunnel and two steel penstocks. The other proposed project, the Muddy, would include a 200-ft. rock-fill dam. The powerhouse, connected to the reservoir by a 16,000-ft. tunnel and two penstocks, would house two turbines, tentatively rated at 25,000 hp.

PUD on the Columbia

Public Utility District No. 2, Grant County, Wash., applied for a 24-month preliminary permit for the Priest Rapids hydroelectric project on the Columbia River, planned for initial installation of 23 generators to develop 1,725,000 hp., with an ultimate installation of 30 generators. The project would consist of a combination concrete and earth-filled embankment dam across the Columbia River with a total length of about 11,780 ft., with a height of 560 ft. Provisions for installation of future navigation locks will be made in a short gravity non-overflow section.

The Toketee Project

California Oregon Power Co., Medford, Ore., has filed requesting an amendment of its license for the Toketee Project to include two additional hydroelectric developments. The two proposed additional developments on North Umpqua River would be designated Lemolo No. 1 and Lemolo No. 2.

W.W.P. on the Clark Fork

The Federal Power Commission has extended for one year, to Oct. 31, 1953, the period of a preliminary permit issued to The Washington Water Power Co. of Spokane for a proposed project on the Clark Fork River in Sanders County, Mont. The permit originally was issued for a period of seven months, effective April 1, 1952. The proposed development, known as the Noxon Rapids Project, would include a dam; a 17-mile-long reservoir; and a powerhouse with an installed capacity of 197,000 hp., and provision for additional capacity.

Election in Arizona

Officers-elect for the Arizona Building Contractors Association are: Wilbur F. Conelly, Tucson, president; Charles H. Trigg, Yuma, first vice president; Dan Mardian, Phoenix, second vice president; Bill Laing, Phoenix, treasurer, and John A. Murphy, Phoenix, executive secretary.

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CONTRACTS

Summary of bids and awards for major Western projects

Alaska

\$1,060,311—Baker & Ford Co., Bellingham, Wash.—Low bid for a dormitory and a mess-and-administration bldg., Ladd Air Force Base; by C. of E.

\$149,006—Carson Construction Co., Inc., 1236 E. 6th Ave., Helena, Mont.—Low bid for water supply and distr. system Cordova; by Alaska Public Works, Juneau district.

\$5,422,540—Lease & Leigland and M-B Contracting Co., 150 N. 35th St., Seattle—Award for furnishing wet-mixed concrete aggregates and grout for Ladd Air Force Base; by C. of E.

\$1,300,000—J. H. Pomeroy & Co., Inc., 333 Montgomery St., San Francisco—Award for Adak Helix bldg.; by U. S. Navy.

Arizona

\$168,645—Arizona Concrete Pipe Co., 1746 W. Fillmore, Phoenix—Low bid for 12 mi. of sewer lines in St. Margaret improvement district, Tucson; by Pima County.

\$109,714—Fisher Contracting Co., P. O. Box 4035, Phoenix—Low bid for 2.5 mi. of grading, draining, select material, aggregate base and bit. plant mix surf., Indian School Rd., Maricopa County; by St. Hwy. Dept.

\$456,436—Martin Construction Co., P. O. Box 934, Tucson—Award for 6.2 mi. of improvement on Tucson-Nogales hwy. by St. Hwy. Dept.

\$483,085—Phoenix-Tempe Stone Co., Box 1670, Tempe—Low bid for improvements on 5½ mi. of Bee-Line Hwy., Phoenix to Payson; by BPR.

\$1,318,474—Morrison-Knudsen Co., Inc., 411 W. 5th St., Los Angeles—Award for earthwork, conc. lining and structures Wellton Canal, Gila Project; by USBR.

California

\$1,053,725—John A. Artukovich Sons, Inc., 16200 S. Atlantic St., Paramount—Award for Victoria St., 223 St. Cross Feeder for Colorado Aqueduct, Wilmington, Los Angeles; by Metropolitan Water Dist. of Southern California.

\$223,500—Guy F. Atkinson Co., Box 259, Long Beach—Low bid for Santa Cruz By-pass Bridge and to demolish Ocean Blvd. bridge, Long Beach; by Long Beach Harbor Dept.

\$2,500,000—Austin Co., 618 Grand Ave., Oakland—Award for pipe and conduit manufacturing plant including equipment Newark; by Orangeburg Mfg. Co., Inc.

\$444,750—Stanley Ball, 1101 Westminster St., Alhambra—Low bid for runway extensions at Armitage Field, Inyokern by U. S. Navy.

\$1,489,890—Barringer & Botke, 333 Riverside Dr., Santa Paula—Low bid for junior high school at Ventura; by Ventura High School District.

\$161,210—Beerman & Jones, Sonora—Award for sanitary sewers and disposal plant, Angels Camp; by City.

\$202,020—Charles L. Burch & Sons, 2419 N. Chico St., E. Monte—Award for replacing sewer lines in Harbor St., Beach Court and vicinity, Venice; by Los Angeles County.

\$14,234,550—Ben C. Gerwick, Inc., 112 Market St., San Francisco, and Peter Kiewit Sons' Co.—Low bid for substructure of Richmond-San Rafael Bridge; by Div. of San Francisco Bay Toll Crossings.

\$1,169,750—Engineers Ltd. Pipeline Co., 12714 Inglewood

Ave., Hawthorne—Award for sewer, gas and water systems at Edwards Air Force Base, Muroc; by C. of E.

\$110,310—Sim J. Harris Co., 1691 Hancock St., San Diego—Low bid for, repairing pavement, seal coating, paving and re-marking runways, Auxiliary Landing Field, Ream Field, San Ysidro; by U. S. Navy.

\$2,300,000—Havstad & Jensen, 1721 New Jersey St., Los Angeles—Award for 6-story reinf. conc. hospital addition, Los Angeles; by College of Medical Evangelists.

\$6,798,100—S. A. Healy Co., 20 N. Wacker Dr., Chicago—Low bid for San Diego County section of the second barrel of the San Diego Aqueduct. Work will include 34 mi. of construction and 6 tunnels; by USBR.

\$144,685—George Herz & Co., P. O. Box 191, San Bernardino—Award for grading and surf. 2.4 mi. on Milliken Ave. betw. Mission Blvd. and Valley Freeway, San Bernardino County; by Div. of Hwys.

\$21,099,320—Peter Kiewit Sons' Co., 1024 Omaha Nat. Bank Bldg., Omaha, Neb., **A. Soda & Son**, and **Judson Pacific-Murphy Corp.**—Low bid for superstructure of Richmond-San Rafael Bridge; by Div. of San Francisco Bay Toll Crossings.

\$1,300,000—Lindgren & Swinerton, 605 W. Olympic Blvd., Los Angeles—Award for 278,000 sq. ft. factory addition, East Los Angeles; also factory office bldg. about 14,000 sq. ft., \$200,000; by Crown Willamette Div. of Crown Zellerbach Corp.

\$116,560—Paul E. McCollum, 6201 Sonoma St., Richmond, and **Carl L. Cypher**—Low bid for 2.7 mi. of grading, rock base and seal coating on Auburn-Folsom hwy., Placer County; by Div. of Hwys.

\$3,988,200—Robert E. McKee General Contractor, Inc., 4700 San Fernando Rd. W., Los Angeles—Low bid for 9-story reinf.-conc. hospital, Los Angeles; by City.

\$2,786,440—Robert E. McKee General Contractor, Inc., 4700 San Fernando Rd. W., Los Angeles—Award for communicable diseases unit of Los Angeles County Hospital; by County.

\$7,057,000—Robert E. McKee General Contractor, Inc., 4700 San Fernando Rd. W., Los Angeles—Award for Imperial-Compton low-rent housing; by Housing Authority of Los Angeles.

\$165,420—M. S. Mecham & Sons, 11125 S. Garfield Ave., South Gate—Low bid for improvements on Rosecrans Ave., Paramount; by Los Angeles County.

\$3,143,695—Morrison-Knudsen and R. A. Westbrook, 411 W. 5th St., Los Angeles—Award for Garvey Reservoir for Colorado River Aqueduct Distr. System, Monterey Park, Los Angeles; by Metropolitan Water Dist. of Southern Calif.

\$818,770—H. Earl Parker, Inc., 12th and F Sts., Marysville—Award for repairing 10 mi. of the Sacramento River levee betw. Sacramento and Freepport; by C. of E.

\$839,300—San Francisco Bridge Co., 140 Montgomery St., San Francisco—Award for sea wall and dredging at U. S. Naval Air Station, Alameda; by U. S. Navy.

\$243,800—San Leandro Construction Co., 16411 E. 14th St., San Leandro—Low bid for collection sewers, East Ave. area, San Lorenzo; by Ora Loma Sanitary Dist.

\$712,000—Stockton Construction Co., P. O. Box 1177, Stockton—Award for 72-in. influent and 78-in. effluent lines for Sacramento; by City.

\$239,415—Stolte, Inc., 8451 San Leandro St., Oakland—Low bid for pipe conduit sewer and box culvert, Oakland; by City.

\$3,597,500—Stolte, Inc. and Fred J. Early, Jr., Co., Inc., 369 Pine St., San Francisco 4—Award for 54-mgpd. capacity sewage treatment plant, Sacramento; by City.

\$1,643,500—Carl N. Swenson Co., Inc., 1095 Stockton Ave., San Jose—Low bid for central and test chamber bldgs. for the supersonic wind tunnel at Moffett Field; by National Advisory Comm. for Aeronautics.

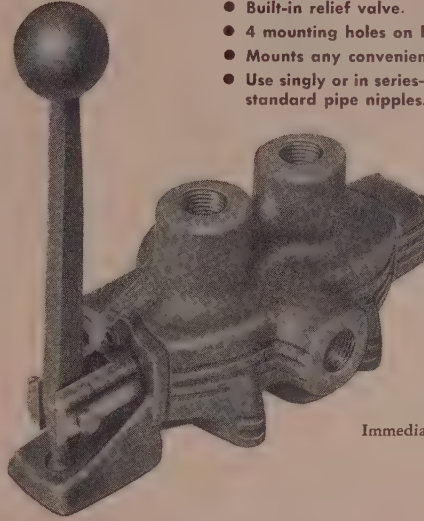
\$1,805,415—A. Teichert & Son, Inc., 1931 Stockton Blvd., Sacramento—Award for Pacoima Wash improvement, Turunga Wash to Arleta Ave., Los Angeles; by C. of E.

\$505,338—A. Teichert & Son, Inc., 1931 Stockton Blvd., Sac-

For Construction Equipment GRE-SEN HYDRAULIC CONTROL VALVES

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- 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 g.p.m.; pressure to 1250 p.s.i.

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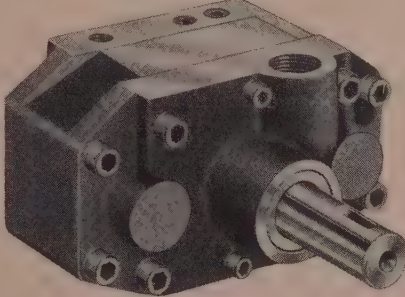
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- All bearings pressure relieved.
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- Built-in relief valve
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Gear and bearing wear is practically eliminated because pump operates on 3-gear principle that keeps hydraulic forces in balance. Pump mounts either (1) by use of simple splined coupling and anchor bar with fulcrum at least 12" from center of pump shaft, or (2) by use of rigid bracket and flexible coupling.



Model KJ (shown) has pump capacity of 12 g.p.m. Shipping wt 22 lbs. Model KJH, 8 g.p.m., shipping wt. 20 lbs. Both develop 1000 p.s.i.

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ramento—Low bid for East Storm Water Separation Project, Sacramento; by City.

\$444,801—Treppe Construction Co., Inc. and Gunther & Shirley Co., 2001 Kettner, San Diego—Award for improvements at Miramar Naval Air Station; by U. S. Navy.

\$1,177,265—Ford J. Twaits Co., Morrison-Knudsen Co., Inc., and Macco Corp., 449 S. Beaudry St., Los Angeles—Award for training facilities for Marine Corps artillery at Twenty-nine Palms; by U. S. Navy.

\$2,476,702—Ukropina-Polich-Kral and Ukropina, 201 E. Las Tunas Dr., San Gabriel—Low bid for 2.1 mi. of grading and PCC paving on cement treated subgrade, and miscellaneous work including 5 bridges and a pedestrian overcrossing, on Santa Ana Freeway betw. Pioneer Blvd. and 0.3 mi. southeast of Rosecrans Ave., Los Angeles County; by Div. of Hwys.

\$585,640—N. P. Van Valkenburg Co., 8609 San Vicente St., South Gate—Award for 4½ mi. of 45- to 51-in. modified prestressed conc. main supply line pipe, Hemet; by Eastern Municipal Water District, Hemet.

Colorado

\$649,615—C. L. Hubner Co., 4200 E. Jewell Ave., Denver—Low bid for grading, structures and oil process surf. on 1.4 mi. of Denver Valley hwy. in midtown Denver; by St. Hwy. Dept.

\$505,978—John H. Keller, 3613 E. 44th Ave., Denver—Low bid for sewage treatment plant, Englewood; by City.

\$212,405—Peter Kiewit Sons' Co., Box 8787 University Pk. Sta., Denver—Award for grading, structures and asph. paving, 3.3 mi. betw. Norwood and Naturita on State 145; by St. Hwy. Dept.

\$368,250—K. S. Mittry, Ft. Collins, Colo., and N. M. Saliba, 4833 San Fernando, Los Angeles, Calif.—Award for approx. 3,160 ft. of the Vasquez-St. Louis Diversion Conduit, Winter Park, Denver; by City and Denver County.

\$194,420—Western Paving Construction Co., 5105 Washington St., Denver—Award for asphaltic conc. paving, curbs, gutters, sidewalks, etc., Denver; by City and Denver County.

Idaho

\$225,492—Grant Construction Co., Coeur d'Alene—Award for roadway and crushed gravel surf. on 9.01 mi. of the Dufort Rd., Bonner County; by St. Dept. of Hwys.

\$111,430—LeGrande Johnson, 595 E. 1st So., Logan, Utah—Award for bridge and approaches on 1.06 mi., Grace-Preston hwy. at Cleveland; by St. Dept. of Hwys.

\$2,590,400—Russ Mitchell and Bruce Construction Co., Box 7421, Ft. Worth, Tex.—Award for completion of Lucky Peak Dam, Ada County; by C. of E.

\$110,595—Morrison-Knudsen Co., Inc., 319 Broadway, Boise—Low bid for gallery entrance, Arrow Rock Dam, and 110-ft. access rd., clearing, draining and reinf. bridge, Ada County; by USBR.

\$199,004—Morrison-Knudsen Co., Inc., 319 Broadway, Boise—Award for roadway and conc. bridge on 4.04 mi. of Boise Valley Hwy., Desert Junction to Middleton, Canyon County; by St. Dept. of Hwys.

\$465,455—Nottingham Construction Co., 329 Grove, Boise—Award for utilities, Mountain Home Air Force Base; by C. of E.

\$178,090—Sather & Sons, Yardley, Wash.—Award for municipal bathing beach at Sandpoint; by C. of E.

\$372,001—Yerrian Construction Co., Hamilton, Mont.—Low bid for 140 mi. of electric distr. lines; by Salmon River Electric Cooperative.

Montana

\$694,185—Eisenman, Seabrook & Elliott, Chula Vista, Calif.—Low bid for completion of Canyon Ferry Dam power plant and switchyard; by USBR.

\$1,664,700—Lease & Leigland, 1501 N. 35th St., Seattle—Award for dormitories, mess-and-administration bldg., Great Falls Air Force Base; by C. of E.

Clearing the Way

for a brand new city of 75,000



Bill Jarvis, right, discusses day's activities with Aubrey Warren, one of his superintendents.



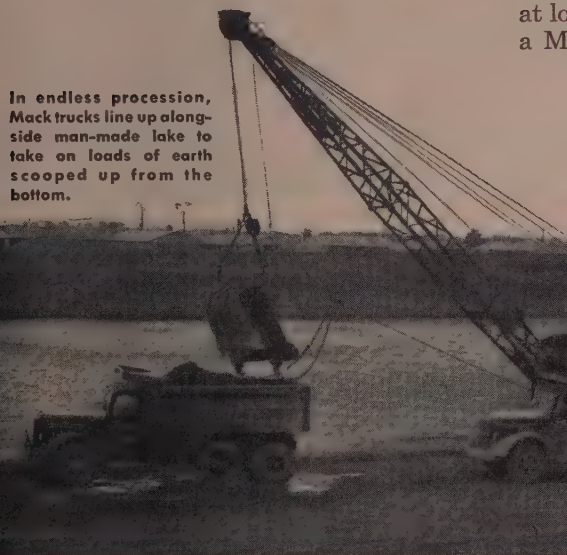
Hub deep mud holds no terrors for Mack's six-wheel Balanced Bogie.

A completely integrated city being built from scratch . . . right from the ground up—that's Levittown, Pa., whose 16,000 homes will house a population of 75,000, making it the tenth largest city in Pennsylvania. Here will live the families of workers who will man the huge, half-billion dollar Fairless Works of the U. S. Steel Corporation.

Clearing the way for the new city now springing up is a fleet of 52 Mack trucks operated by William A. Jarvis, to whom is entrusted the tremendous task of seeing that the earth is graded, drainage canals built, and sewer, drainage and water pipe ditches dug.

Working under floodlights at night, Bill Jarvis' Macks keep to a round-the-clock schedule, 24 hours a day, seven days a week. It is estimated that when the big job is completed, the Jarvis fleet of Macks will have dug out and hauled away a total of 2½-million cubic yards of fill, much of which will be used as aggregate in the making of concrete for the foundations of thousands of new homes.

Here again, as on so many of America's biggest and toughest earth-moving projects, Mack trucks get first call because of their proved ability to dependably move greater yardage at lower cost. As Bill Jarvis puts it: "There's nothing to beat a Mack when you've got a big, tough job on your hands."



In endless procession, Mack trucks line up alongside man-made lake to take on loads of earth scooped up from the bottom.

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\$227,880—**Union Construction Co., Inc.**, P. O. Box 1506, Missoula—Low bid for 6.7 mi. of constr. of Yellowstone Trail, Cabinet Natl. Forest, Mineral County; by BPR.

New Mexico

\$116,960—**Brown-Olds Plumbing & Heating Corp.**, Albuquerque—Low bid for a dust and erosion control project, incl. water lines for sprinklers, sprinkler heads, 24 ac. of lawn, trees, shrubs, for Sandia Air Base; by C. of E.

\$192,960—**C & C Contractors**, 1907 N. 4th St., Albuquerque—Award for well collector lines and improvements to Atrisco No. 2 plant, and installation of pumps at 4 stations; by City of Albuquerque.

\$1,167,153—**Campbell & Kay**, Box 4091, Station A, Albuquerque—Award for range instrumentation sites, Las Cruces; by C. of E.

\$147,855—**Floyd Haake**, 11 Lovato Lane, Santa Fe—Award for 10.9 mi. of construction and blacktopping on State 89 nr. House, Roosevelt County; by St. Hwy. Dept.

\$165,885—**Hugh McMillan**, Box 1227, El Paso, Tex.—Low bid for auxiliary landing strips, Holloman Air Force Base; by C. of E.

\$138,355—**Miller & Smith**, P. O. Box 6007, Station B, Albuquerque—Award for laying storm sewer pipe in North Albuquerque; by City.

\$835,800—**Newport News Shipbuilding and Dry Dock Co.**, Newport News, Va.—Award for three 8,400-hp. hydraulic turbines for Little Porcupine Power Plant nr. Frazer; by USBR.

\$156,365—**Skousen-Hise Contracting Co.**, 201 Springer Bldg., Albuquerque—Award for 10.85 mi. of construction and blacktopping on State 129 betw. Newkirk and Conchas Dam, Guadalupe County; by St. Hwy. Dept.

\$599,315—**Skousen-Hise Contracting Co.**, 201 Springer Bldg., Albuquerque—Award for 13.6 mi. of construction and black-

topping on U. S. 66 betw. Barton and Moriarty, Bernalillo Santa Fe and Torrance counties; by St. Hwy. Dept.

\$214,217—**Henry Thygesen & Co.**, 424 E. McKinley Ave. Albuquerque—Award for 4.14 mi. on State 180 nr. Hillsboro Sierra County; by St. Hwy. Dept.

\$442,545—**Henry Thygesen & Co.**, 424 E. McKinley Ave. Albuquerque—Award for 9.04 mi. of construction and blacktopping on U. S. 85 betw. Wagon Mound and Watrous, Mora County; by St. Hwy. Dept.

\$259,905—**H. H. Via, Inc.**, Santa Fe—Low bid for road work and installation of pipe lines at Walker Air Force Base, Roswell; by C. of E.

\$709,853—**Western Contracting Corp.**, 400 Benson Bldg., Sioux City, Ia.—Low bid for an aircraft parking apron at Kirtland Air Force Base; by C. of E.

Oregon

\$20,025,770—**Baldwin-Lima-Hamilton Corp.**, Philadelphia, Pa.—Low bid for Schedule A, the delivery f.o.b. railroad cars at The Dalles Dam of fourteen 123,800-hp. turbines; by C. of E.

\$207,710—**A. T. Fox**, Box 831, North Bend—Award for a sewage disposal plant for Coos Bay; by City.

\$197,841—**E. L. Gates & Co., Inc.**, 444 Center St., Salem—Award for 8 mi. of rd. construction, Rock Creek to Gravel Creek, Suislaw Natl. Forest, Benton County; by BPR.

\$183,298—**C. H. Grimstad & Vandervelt**, Astoria—Award for grading and paving 1.17 mi. of Oregon Coast Hwy. nr. Winchester Bay, Douglas County; by St. Hwy. Comm.

\$251,648—**Inter-city Sand & Gravel Co., Inc.**, 3698 Hwy. 99, So., Eugene—Award for grading and paving 2.18 mi. of McKenzie hwy. in Springfield, Lane County; by St. Hwy. Comm.

\$231,470—**Peter Kiewit Sons' Co.**, Longview, Wash.—Award for 7.4 mi. of road construction in Fremont National Forest, Lake County; by BPR.

\$2,987,375—**Morrison-Knudsen Co.**, **Peter Kiewit Sons' Co.**, and **Macco Corporation**, P. O. Box 450, Boise—Award for hydroelectric powerhouse, Lookout Point Dam; by C. of E.

\$104,784—**Porter W. Yett**, 6500 N.E. Ainsworth St., Portland—Award for 2.78 mi. paving, Catching Slough-Enegren Ferry, portion of the Coos River Secondary Hwy. 3 mi. east of the city of Coos Bay; also furnishing 5,000 cu. yd. crushed material in stockpiles; by St. Hwy. Comm.

Utah

\$345,213—**Olof Nelson Construction Co.**, 620 S. Main St., Logan—Award for 6 mi. of highway construction, 35th South to 78th South on Redwood Rd. in Salt Lake County; by St. Rd. Comm.

\$207,885—**Parson & Fife Construction Co.**, 620 E. 5th So., Brigham City—Low bid for 13½ mi. of gravel surf. rd. on State 21 betw. Frisco and Wah Wah Summit, Beaver County; by St. Rd. Comm.

\$2,486,615—**Utah Construction Co.**, 142 E. 3rd So.—Award for Gateway tunnel, Weber Basin Project; by USBR.

\$219,235—**L. A. Young Construction Co.**, Richfield—Low bid for 10.6 mi. of 2-in. bit. surf. rd. on State 63 in Sevier and Millard counties; by St. Rd. Comm.

Washington

\$103,058—**Don Akins, Inc.**, Ellensburg—Low bid for water and sewer lines and street work in new housing area, Richland; by AEC.

\$257,600—**Anderson Construction Co.**, Rt. 1, Box 210-A, Vancouver—Low bid for service bldg., raceway, ponds, etc., fish cultural station, Carson; by U. S. Fish & Wildlife Service.

\$106,314—**D. H. Paving Co.**, 6800 Evergreen Hwy., Vancouver—Award for grading and asph. paving and a conc. bridge, 1.7 mi., Benton County; by St. Hwy. Comm.

\$1,381,881—**English Electric Export & Trade Co., Ltd.**, 23-25 Beaver St., New York, N. Y., and Stafford, England—Low



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bid for ten main transformers for Chief Joseph Dam; by C. of E.

\$691,621—**English Electric & Export Trading Co., Ltd.**, 23-25 Beaver St., New York, N. Y., and Stafford, England—Award for two 230-kv. transformers for Shoreline substation, Seattle; by Seattle City Light.

\$4,406,495—**English Electric Export & Trading Co., Ltd.**, 23-25 Beaver St., New York, N. Y., and Stafford, England—Low bid for four generators, each of 64,000 kilowatts rating, for Chief Joseph Dam; by C. of E.

\$104,265—**Fiorito Brothers**, 1100 Leary Way, Seattle—Award for draining and riprap on 3.6 mi. of P.S.H. No. 12 betw. Chinook and Megler, Pacific County; by St. Hwy. Comm.

\$300,491—**N. Fiorito Co.**, 844 W. 48th St., Seattle—Award for clearing, draining, grading and twin reinf. conc. slab bridges, 2.7 mi. on State No. 1, Tulalip rd. to Marshall rd., Snohomish County; by St. Hwy. Comm.

\$197,001—**General Construction Co.**, P. O. Box 3244, Seattle—Award for bulkhead construction at Naval and Marine Corps reserve training center, Seattle; by U. S. Navy.

\$176,235—**Goodfellow Bros., Inc.**, Box 1337, Wenatchee—Award for grading, Stevens Pass hwy., 4.15 mi.; by BPR.

\$202,821—**Hart Construction Co.**, 3536 E. 11th, Tacoma—Award for dredging, bulkheads, mooring floats, net house, paving and installation of water mains and lighting facilities for fishing boat haven, Tacoma; by Tacoma Port Comm.

\$271,615—**Lewis A. Hopkins Co.**, 2205 Lincoln Ave., Yakima—Low bid for roads, levees and pumping plant nr. Pasco; by C. of E.

\$852,621—**Lewis A. Hopkins Co.**, 2205 Lincoln Ave., Yakima—Award for tactical area facilities, Camp Hanford; by C. of E.

\$1,968,800—**Max J. Kuney Co.**, N. 120 Ralph St., Spokane—Low bid for two central heating plants with distribution systems in permanent troop facilities area, Fort Lewis; by C. of E.

\$1,398,000—**P. S. Lord Mechanical Contractors**, 4507 S.E. Milwaukie Ave., Portland—Award for two reinf. conc. pumping plant structures on Columbia River, Hanford area; by AEC.

\$154,156—**David Nygren**, 309 Lloyd Bldg., Seattle—Award for steel truss bridges on State No. 5 over Nisqually River at Elbe, Pierce and Lewis counties; by St. Hwy. Comm.

\$199,437—**George Ohicha Co.**, E. 2817 Sharp, Spokane—Low bid for replacing filter material by tunneling and backfilling at left abutment of McNary Dam; by C. of E.

\$228,000—**P. L. Saddler**, Wenatchee—Award for draining, grading and light bit. surf. on 4.44 mi. of State No. 10, East Wenatchee to Rock Island, Douglas County; by St. Hwy. Comm.

\$178,055—**Sather & Sons**, Yardley, Wash.—Low bid for replacing municipal bathing beach, Sandpoint; by C. of E.

\$677,701—**Roller Smith Co.**, Bethlehem, Pa.—Low bid for Schedule B, 15-kv. bus structures, switchgear and generator grounding equipment, McNary Dam; by C. of E.

\$2,612,515—**Sound Construction & Engineering Co.**, 1300 Aloha St., Seattle—Award for 8 barracks, a mess hall and a cold storage bldg., Ault Field, Whidby Island; by U. S. Navy.

\$238,480—**R. J. Strasser Drilling Co.**, Portland—Award for four wells, Camp Hanford; by C. of E.

\$235,675—**Strong & MacDonald, Inc.**, 4045 Ruston Way, Tacoma—Award for access rd. and bridge, Finney Creek area, Mount Baker National Forest; by USBR.

\$529,507—**Strong & MacDonald, Inc.**, 4045 Ruston Way, Tacoma—Award for clearing, grading and surf. 4.6 mi., P.S.H. No. 5, Kiona Creek to Randle, Lewis County; by St. Hwy. Comm.

\$1,613,278—**J. A. Terteling & Sons, Inc.**, P. O. Box 1428, Boise—Low bid for 7.6 mi. of the conc.-lined Chandler power canal, incl. 13 timber bridges, pipe and box culvert, etc., Kennewick div. of Yakima Project; by USBR.

\$540,000—**J. H. Trisdale, Inc.**—Low bid for Schedule 1, clearing Alder reservoir; by Tacoma City Light.

\$200,160—**University Brick & Tile Co.**, Seattle—Award for completion work on McNary Dam; by C. of E.



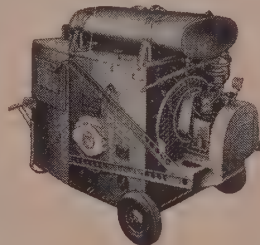
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New edition of "Review Questions for Surveyors"

THE LATEST edition of "Review Questions for Surveyors" is now available for the aid of teachers, students and field men. It is a comprehensive set of 2,020 surveying questions of all types and is the result of 20 years of collecting by the author, R. C. Brinker. Earlier editions ("1313" and "1575 Review Questions for Surveyors") have had wide popularity, and this "2020" edition should be a welcome supplement to the older editions or a fresh, helpful source of information to those who are not acquainted with the earlier works. The author has included registration and/or Civil Service examination questions from 14 states, an increase of answers to over 1140, and a three-page tabulation of survey abbreviation and symbols and hand symbols. Most of the problems and examinations are those used at a dozen colleges and universities. This 152-page pantographed aid to surveyors sells at \$3.00 per copy, or \$2.50 per copy on orders of five copies or more, from R. C. Brinker, Box 153, Blacksburg, Va.

Finke, former Seattle city engineer, joins contractors

Seattle's city engineer, R. W. Finke, recently resigned to begin an association with MacRae Bros., the contracting firm which is now completing the south unit of the Alaskan Way Viaduct. Finke's experience has been primarily with bridge engineering, and his work in that field is well-known throughout the West. He was State bridge engineer from 1939 to May 1948 when he was appointed Seattle engineer.

Finke was replaced at his post in Seattle by Robert R. Hubbard, now acting city engineer. Hubbard, a city employee since 1911, spent the last four years as principal engineer in charge of construction for the City's engineering department. During a leave of absence at Guam in 1941 he was captured by the Japanese and remained their prisoner for 45 months. He is a past president of the Engineer's Club of Seattle.

Dames & Moore in new offices at Seattle

Dames & Moore, civil engineering firm, moved its Seattle office on December 1 to 421 Third W. Dames & Moore specialize in foundation investigations and soil mechanics engineering. They also have offices in Los Angeles, San Francisco, Salt Lake City, Portland and New York.

The Los Angeles regional office also has a new address, 2333 W. Third. The Los Angeles general office of the firm remains at its old location.

UNIT BID PRICES

Selected abstracts for Western projects

Bridge and Grade Separation

Prestressed concrete girder bridge

California—Fresno County—State. Thomas Construction Co. of Fresno submitted the low bid of \$91,363 before the California Division of Highways for a project to construct a prestressed concrete girder bridge in Fresno, and about 0.24 mi. of approaches to be graded and surfaced with P.M.S. on an untreated rock base. Signals and the lighting system would be relocated and revised. Unit bids submitted were as follows:

(1) Thomas Construction Co.	\$ 91,363	(4) Norman I. Fadel	\$113,888
(2) Tumblin Co.	99,962	(5) L. H. Hansen & Sons	166,856
(3) Trewhitt-Shields & Fisher	111,795	(6) Volpa Brothers	187,818

	(1)	(2)	(3)	(4)	(5)	(6)
234 cu. yd. removing concrete	12.00	12.00	12.00	12.00	23.50	20.00
Lump sum, clearing and grubbing	\$4,055	\$6,000	\$1,000	\$2,000	\$3,500	\$14,000
700 cu. yd. roadway excav.	1.75	1.50	4.00	2.00	2.60	1.50
190 cu. yd. structure excav.	4.00	3.00	3.00	3.00	6.20	8.00
740 cu. yd. structure excav. (bridge)	12.50	8.00	12.50	10.00	6.30	20.00
570 cu. yd. structure backfill (bridge)	2.00	3.00	5.50	3.00	3.20	3.00
2,300 sq. yd. compacting original ground	.10	.10	.30	.15	.21	.10
7,800 cu. yd. imported subbase matl.	1.00	1.20	1.25	1.50	1.65	1.50
Lump sum, dev. wat. sup. and furn. wat. equip.	\$25.00	\$2,500	\$500.00	\$1,500	\$1,800	\$5,000
520 M. gal. applying water	1.00	1.00	2.50	2.00	3.10	2.50
Lump sum, finishing roadway	200.00	200.00	\$1,600	\$500.00	\$2,100	\$1,000
600 ton untreated rock base	4.35	5.00	5.10	5.00	5.30	4.00
2 ton asphaltic emulsion (sl. cts. and pt. bd.)	60.00	50.00	60.00	60.00	6.50	50.00
15 ton screening (sl. ct.)	7.00	6.00	7.00	10.00	8.50	10.00
4 ton liquid asph., SC-2 (pr. ct.)	60.00	50.00	60.00	60.00	6.40	50.00
570 ton P.M.S.	6.30	7.00	8.10	7.60	10.40	8.00
40 lin. ft. raised traffic bars	2.50	3.00	4.00	1.00	4.00	2.00
60 lin. ft. placing P.M.S. (dikes)	.50	.50	.50	.50	.50	.50
290 sq. ft. placing P.M.S. (slope drains)	.50	.50	.50	.50	.50	.50
295 cu. yd. Class "A" P.C.C. (structs.)	48.00	54.00	50.00	75.00	77.00	79.00
90 cu. yd. Class "E" P.C.C. (girders)	68.00	115.00	185.00	100.00	413.00	418.00
275 lin. ft. concrete railing	11.20	12.00	8.00	10.00	27.00	29.00
3,930 lb. misc. iron and steel	.48	.40	.55	.50	.54	.59
32,000 lb. bar reinforcing steel	.10	.135	.11	.12	.105	.11
145 cu. yd. Class "A" P.C.C. (curbs, gutters and sidewalks)	40.00	30.00	55.00	50.00	75.00	76.00
100 ea. curb dowels	.50	1.00	.25	2.00	1.00	1.00
6 ea. r/w monuments	8.00	10.00	15.00	10.00	7.00	8.00
13 ea. installing guide posts	6.00	6.00	5.00	10.00	26.00	28.00
815 lin. ft. chain link fence	1.90	2.00	2.10	2.00	2.00	2.10
67 lin. ft. 6-in. non-reinf. conc. drainage pipe	1.00	1.00	1.00	2.00	7.00	8.00
92 lin. ft. 8-in. non-reinf. conc. drainage pipe	1.00	1.00	1.20	2.00	9.00	10.00
Lump sum, prestressing reinf. and prestressing (girders)	\$8,500	\$7,290	\$6,000	\$10,000	\$19,200	\$19,600
Lump sum, traffic signals and highway lighting sys.	\$11,000	\$12,000	\$14,000	\$15,000	\$13,345	\$13,845

Steel bridge over Snohomish River in Washington

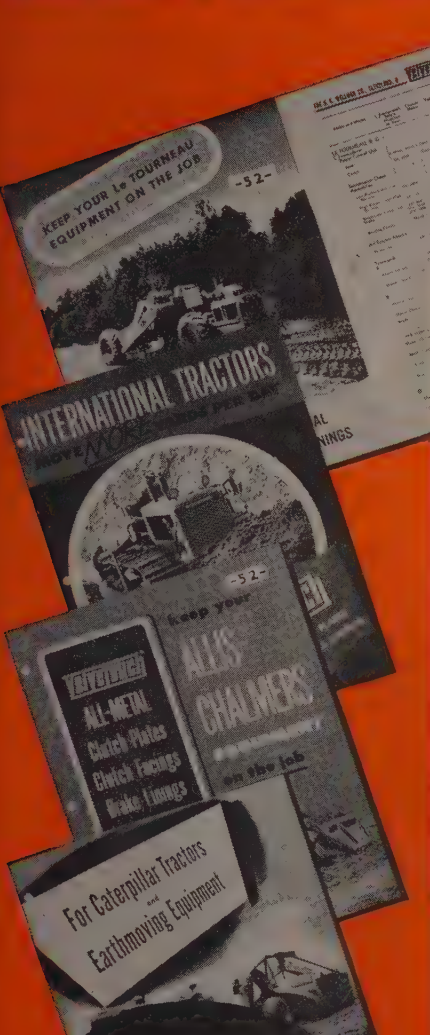
Washington—Snohomish County—State. Manson Construction & Engineering Co., Seattle, was awarded a contract by the Washington State Highway Commission on the basis of a low bid of \$1,913,082 for construction of a 0.467 mi. bridge crossing the Snohomish River on Primary State Highway No. 1. Unit bids submitted were as follows:

(1) Manson Construction & Engineering Co.	\$1,913,082	(5) Guy F. Atkinson Co.	\$2,168,361
(2) General Construction Co.	1,974,486	— N. Fiorito Co.	2,220,445
(3) Peter Kiewit Sons' Co.	2,065,612	— MacRae Bros.	2,471,826
(4) M. P. Butler	2,808,392	— Morrison-Knudsen Co., Inc.	2,676,261

	(1)	(2)	(3)	(4)	(5)
13,860 cu. yd. struct. excav.	3.00	4.00	1.75	3.00	4.00
Lump sum, shoring and cribs	\$165,000	\$160,000	\$250,000	\$318,000	\$336,000
15 days mechanical tamper	100.00	64.00	80.00	45.00	70.00
4,840 cu. yd. conc. Class A	52.00	68.00	66.00	45.00	75.00
5,330 cu. yd. conc. Class F	35.00	28.00	25.00	45.00	32.00
2,660 cu. yd. conc. Class H	35.00	25.00	25.00	45.00	30.00
184 cu. yd. conc. Class B in counterweight	85.00	70.00	85.00	45.00	70.00
2,941 lin. ft. reinf. conc. bridge railing	7.50	8.00	8.00	8.00	8.00
1,544,000 lb. steel reinf. bars	.10	.10	.10	.105	.10
2,300,000 lb. structural carbon steel	.23	.24	.26	.20	.23
282,000 lb. structural low alloy steel	.23	.24	.26	.20	.235
28,000 lb. cast steel	.40	.42	.40	.40	.45
20 only, bridge drain complete in place	85.00	70.00	65.00	60.00	70.00
102 only, special bridge drains complete in place	80.00	60.00	62.00	55.00	54.00
25 lin. ft. downspouts	1.00	7.00	8.00	5.00	12.00
110,000 lb. machinery complete in place	70	1.00	.92	1.00	.80
Lump sum, mechanical and elect. equip. compl. in place	\$90,000	\$100,000	\$93,000	\$100,000	\$85,000
Lump sum, operators house (1) compl. in place	\$5,000	\$4,350	\$7,000	\$6,500	\$6,500
Lump sum, machinery houses (2) compl. in place	\$30,000	\$12,000	\$16,500	\$17,000	\$14,000
Lump sum, wire rope and fittings compl. in place	\$13,000	\$13,200	\$14,000	\$13,000	\$8,000
Lump sum, barriers (2) compl. in place	\$32,000	\$35,000	\$30,000	\$30,000	\$30,000
295 lin. ft. waterstops	3.00	2.00	1.50	2.00	3.00
80,000 lin. ft. furn. timber piling (untreated)	.40	.60	.45	.80	.58
1,000 lin. ft. furn. timber piling (creosote treated)	1.70	1.50	1.50	1.85	1.50

(Continued on page 142)

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UNIT BID PRICES... CONTINUED

	(1)	(2)	(3)	(4)	(5)
1,979 only, driving timber piles (untreated)	35.00	22.00	37.00	30.00	30.00
25 only, driving timber piles (creasote treated)	35.00	20.00	100.00	40.00	40.00
19 M.B.M. timber and lumber (creasote treated)	300.00	350.00	300.00	350.00	320.00
1.3 M.B.M. timber and lumber (salts treated)	350.00	350.00	300.00	280.00	300.00
5 only, furn. and driving timber test piles	350.00	500.00	800.00	400.00	700.00
Lump sum, removing portions of exist. struct.	\$7,000	\$5,000	\$1,600	\$2,000	\$6,000

Water Supply

Steel siphon for San Luis Rey River pipeline crossing

California—San Diego Project—USBR. P. & J. Artukovich, Inc. and M. Miller Co. submitted a joint low bid of \$671,380 before the Bureau of Reclamation for steel siphon and structures of the second pipe line of the San Luis Rey River crossing. Unit bids submitted were as follows:

(1) P. & J. Artukovich, Inc., and M. Miller Co.	\$671,380	(4) R. A. Wattson & Sons	\$762,294
(2) F. W. Case Co. and Harry Gast	697,945	(5) Gunther & Shirley Co. and Treppe Construction Co., Inc.	775,000
(3) Ukropina, Polich & Kral.	742,410	(6) Engineer's estimate	616,445

	(1)	(2)	(3)	(4)	(5)	(6)
15,000 cu. yd. excavation and backfill	3.00	13.00	8.00	7.50	15.00	4.80
300 cu. yd. rock fill	5.00	8.00	5.00	2.40	10.00	2.50
10 sq. yd. dry-rock paving	10.00	25.00	15.00	12.00	15.00	8.00
615 cu. yd. concrete in struts.	80.00	60.00	78.00	115.00	70.00	75.00
47,000 lb. furn. and pl. reinf. bars in struts.	.20	.15	.15	.16	.18	.18
3,000 lb. furn. and install. steel blow-off piping and fittings	.30	1.00	.30	.80	.60	.60
1 valve furn. and install. 6-in. valve	300.00	200.00	200.00	195.00	240.00	250.00
3,300 lb. furn. and install. miscel. metal-work Lump sum, furn., install., and test. 48-in. diam. welded plate-steel pipe	.60	.65	.80	.74	1.00	.64
	\$563,000	\$451,000	\$562,000	\$565,672	\$490,000	\$485,000

Tunnel

Camp Creek Tunnel, 6- and 7-ft diameter horseshoe

California—Central Valley Project—USBR. Low bidders for construction of Camp Creek Tunnel, Sly Park Unit of the American River Division of the Central Valley Project, were: R. A. Wattson Co., North Hollywood, Calif., for Schedule I, \$432,277 to construct the tunnel with a 6-ft. diameter horseshoe-shaped section, and G. L. Tarlton Contracting Co., St. Louis, Mo., \$412,655 for Schedule II, to construct the tunnel with a 7-ft. diameter horseshoe-shaped section. Unit bids were as follows:

	Sched. I	Sched. II
(1) G. L. Tarlton Contracting Co.	no bid	\$412,655
(2) R. A. Wattson Co.	\$432,277	no bid
(3) Morrison-Knudsen Co., Inc.	439,878	445,534
(4) Kemper Construction Co.	445,330	451,995
(5) Stolte, Inc.	457,271	484,123
(6) Norman I. Fadel and N. M. Saliba Co.	462,678	540,504
(7) Utah Construction Co.	no bid	501,491
— Cherry River Constructors	508,046	569,778
— Grafe-Callahan Construction Co.	no bid	512,993
— Owl Truck & Construction Co.	532,659	548,673
— M & K Corp.	580,491	656,994
(8) Engineer's estimate	334,053	373,775

SCHEDULE I

	(2)	(3)	(4)	(5)	(6)	(8)
800 cu. yd. excavation in open cut	4.00	5.50	3.50	8.00	10.00	3.00
4,500 cu. yd. excavation in tunnel	61.00	50.00	65.50	62.00	69.00	48.00
100 cu. yd. excavation for tunnel enlargement	30.00	65.00	30.00	70.00	90.00	50.00
30 cu. yd. backfill about structures	3.00	5.00	3.50	3.00	3.00	2.70
20 cu. yd. compacting backfill about structures	6.00	5.00	5.00	4.00	6.00	4.00
19,000 lb. furn. and install'g perm. stl. tunnel supts. 9 M.B.M. furn. and erect'g perm. timbering in tunnel	.53	.35	.13	.30	.30	.20
1,800 lin. ft. furn. and install'g tunnel roof-supt. bolts	332.00	425.00	150.00	400.00	450.00	275.00
300 lin. ft. drilling fecer or pilot holes ahead of tunnel excav.	.95	2.50	1.50	2.50	1.30	3.00
300 lin. ft. drilling grout holes through conc. tunnel lining	4.00	2.00	3.40	5.00	6.00	1.50
500 lb. furn. and placing grout strips and conn. 1,500 cu. ft. pressure grouting	3.00	6.00	3.00	5.00	3.00	2.50
27 cu. yd. concrete in struts.	1.80	1.25	1.50	1.00	1.00	1.00
1,400 cu. yd. concrete in tunnel lining	3.50	5.50	2.00	5.00	6.00	2.70
2,250 bbl. furn. and handling cement	60.00	115.00	101.00	160.00	100.00	75.00
4,700 lb. furn. and placing reinf. bars	79.80	114.00	80.00	85.00	62.00	55.00
69 lin. ft. placing rubber water stops in joints.	5.75	5.00	4.80	6.00	8.00	5.00
1,630 lb. furn. and installing weep pipes in tunnel lining	.16	.20	.18	.25	.30	.20
	2.60	2.00	4.25	4.00	2.00	2.00
	.70	1.50	1.30	1.00	1.00	.80

SCHEDULE II

	(1)	(3)	(4)	(5)	(7)	(8)
700 cu. yd. excavation in open cut	6.00	5.50	3.50	8.00	5.00	3.00
5,900 cu. yd. excavation in tunnel	45.00	39.20	50.50	50.00	40.50	42.00

(Continued on page 144)



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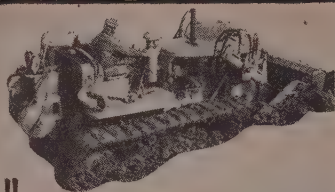
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UNIT BID PRICES... CONTINUED

	(1)	(3)	(4)	(5)	(7)	(8)
100 cu. yd. excavation for tunnel enlargement.....	90.00	51.00	30.00	70.00	50.00	50.00
30 cu. yd. backfill about structures	5.00	5.00	3.50	3.00	1.00	1.20
20 cu. yd. compacting backfill about structures..	10.00	5.00	5.00	4.00	5.00	4.00
24,000 lb. furn. and install. perm. steel tunnel supts.	.25	.35	.11	.30	.35	.22
12 M.b.m. furn. and erect. perm. timbering in tunnel	400.00	375.00	150.00	400.00	350.00	275.00
1,800 lin. ft. furn. and installing tunnel roof sup't. bolts	6.00	2.25	3.50	2.50	4.00	3.00
300 lin. ft. drilling feeler or pilot holes ahead of tunnel excav.	1.00	2.50	3.40	5.00	3.00	1.50
300 lin. ft. drilling grout holes through concrete tunnel lining	2.00	6.00	3.00	5.00	3.00	2.50
500 lb. furn. and placing grout pipes and conns..	2.00	1.25	1.50	1.00	2.00	1.00
1,500 cu. ft. pressure grouting	3.00	5.50	2.00	5.00	3.00	2.75
32 cu. yd. concrete in struts.	100.00	115.00	100.00	160.00	150.00	75.00
1,570 cu. yd. concrete in tunnel lining	55.00	100.00	72.00	80.00	131.50	52.00
2,500 bbl. furn. and handling cement	4.00	5.00	4.80	6.00	5.00	5.00
5,100 lb. furn. and placing reinf. bars	.20	.20	.18	.25	.25	.20
77 lin. ft. placing rubber water stops in joints	5.00	2.00	4.25	4.00	3.00	2.00
1,550 lb. furn. and installing weep pipes in tunnel lining	3.00	1.50	1.30	1.00	1.00	.80

Waterway

Channel excavation in Los Angeles County

California—Los Angeles County—County. Charles J. Rounds submitted the low bid of \$412,136 for the Los Angeles County Flood Control District for channel excavation and appurtenances, San Gabriel River, Seventh St. to Pacific Coast Highway. Unit prices were as follows:

(1) Charles J. Rounds.....	\$412,136	(3) Clyde W. Wood	\$451,980
(2) Guy F. Atkinson Co.	422,748	(4) Engineer's estimate	434,258

	(1)	(2)	(3)	(4)
920,000 cu. yd. channel excav.	.52	.44	.454	.48
Lump sum, const. two, single line auto flap gate guards.....	900.00	\$1,400	\$1,100	\$2,600
Lump sum, const. one, two line auto. flap gate guard	800.00	\$1,300	\$1,000	\$2,000
Lump sum, const. one, three line auto. flap gate guard	\$1,100	\$1,300	\$1,300	\$3,000
556 lin. ft. 48-in C.M.P. drains	5.50	6.00	3.00	5.00

Channel changes along Washington highway

Washington—Grant County—State. Among 20 bidders, Ellis Construction Co., Ephrata, was low bidder at \$25,493 before the Washington State Highway Commission for the construction of channel changes along Primary State Highway No. 18 in the Grant-Adams County line vicinity. Unit bids were submitted as follows:

(1) Ellis Construction Co.	\$25,493	— Sather & Sons	\$42,289
(2) C. E. Oneal	30,503	— W. J. Halleran	43,939
(3) Birch McCartney	34,245	— Clifton Applegate	47,235
(4) Goodfellow Bros., Inc.	34,541	— Stong & MacDonald	48,638
(5) Carl Hohner	34,575	— F. R. Hewett Co.	51,155
(6) Goetz & Brennan	36,328	— Harbert Bros.	51,618
— Herman Kathman	38,303	— Roy L. Bair & Co.	51,813
— Burd & Bush & Vanderwall	38,696	— C. J. Painter	52,268
— J. A. Terteling & Sons, Inc.	39,386	— P. J. Anderson & Sons	56,947
— Murphy Bros.	39,795	— Lige Dickson Co.	71,229

	(1)	(2)	(3)	(4)	(5)	(6)
Lump sum, clearing and grubbing	100.00	500.00	\$1,000	\$1,000	800.00	\$2,000
95,830 cu. yd. common excav., including haul	.20	.23	.23	.28	.29	.25
4,015 cu. yd. solid rock bor. for bank protection including haul.....	1.20	1.60	2.40	1.50	1.10	2.25
16 day tamping roller	40.00	45.00	50.00	20.00	60.00	40.00
322 M. gal. water	2.00	2.00	2.00	.75	1.50	1.70
25 only reinf. conc. right-of-way markers	5.00	7.00	5.00	5.00	5.00	6.00

Streets and Highways

3-in. plant-mix surfacing in Utah

Utah—Salt Lake County—State. Olof Nelson Construction Co., Logan, Utah, submitted a low bid of \$345,213 before the State Road Commission of Utah for 6.058 mi. of a 3-in. plant-mix bituminous surfaced road, from 35th South to 78th South to Redwood Road in Salt Lake County. Unit bids were as follows:

(1) Olof Nelson Construction Co.	\$345,213	(4) Thorn Construction Co., Inc.....	\$421,315
(2) W. W. Clyde & Co.	357,476	(5) Engineer's estimate	357,072
(3) Gibbons & Reed Co.	380,878		

	(1)	(2)	(3)	(4)	(5)
24,500 ton plant-mix bitum. surface, Type "A"	2.25	2.30	2.35	2.80	2.50
316,000 gal. bitum. matl. Type 100-120 penetration	.105	.10	.10	.12	.12
74,000 gal. bitum. matl., Type MC-1 or MC-2	.105	.115	.11	.12	.12
43,000 gal. bitum. matl. Type RC-4	.12	.15	.12	.16	.14
430 gal. bitum. additive	2.25	2.10	2.50	2.50	2.00
1,400 ton cover matl., Type "B"	3.40	3.30	3.15	3.50	2.50
5,000 ton cover matl., Type "B" in stockpile	1.80	2.00	1.75	2.00	2.25

(Continued on page 146)

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UNIT BID PRICES . . . CONTINUED

	(1)	(2)	(3)	(4)	(5)
124,000 ton gravel surface, Type "B"	.64	.75	.79	.80	.80
20,000 ton gravel surface, Type "B" stockpiled	.47	.60	.60	.55	.65
15,000 cu. yd. unclassified roadway excav.	.50	.50	.73	.75	.35
30,000 sta. yd. Class "A" overhaul	.01	.02	.03	.03	.02
6,000 yd. mi. Class "B" overhaul	.15	.20	.20	.25	.20
2,500 1,000-gal. watering	1.25	1.00	1.45	1.00	1.00
140 hr. rolling, "Tamping Roller"	8.00	10.00	12.00	8.00	9.00
210 hr. rolling, "Pneumatic Tire or Power Roller"	6.00	7.00	7.40	8.00	7.00
156 lin. ft. 12-in. concrete pipe	2.11	2.20	2.65	3.20	2.40
39 lin. ft. 15-in. concrete pipe	2.78	3.00	3.00	4.00	3.00
1,995 lin. ft. 18-in. concrete pipe	3.65	3.90	4.05	5.00	3.90
1,552 lin. ft. 24-in. concrete pipe	4.90	5.30	5.30	6.00	5.20
2,098 lin. ft. 12-in. underdrain	1.25	1.55	1.85	1.70	1.50
1,763 lin. ft. 15-in. underdrain	1.85	2.23	2.35	2.20	2.00
2,943 lin. ft. 18-in. concrete sewer pipe	2.85	3.35	2.90	4.40	3.20
250 lin. ft. 8-in. underdrain (perf. C.M. pipe)	1.60	1.65	1.90	2.00	1.65
1,700 lin. ft. 10-in. underdrain (perf. C.M. pipe)	2.00	2.10	2.25	2.25	1.80
1,250 lin. ft. 12-in. underdrain (perf. C.M. pipe)	2.46	2.55	2.65	2.50	2.20
1,306 lin. ft. 15-in. underdrain (perf. C.M. pipe)	3.00	3.10	3.05	2.80	2.70
26 lin. ft. 18-in. C.M. pipe	3.60	3.55	4.00	4.50	3.10
13 lin. ft. 24-in. C.M. pipe	5.68	5.80	5.50	6.80	4.80
64 lin. ft. C.M. pipe arches 29-in. x 18-in.	5.71	5.80	5.80	6.00	5.00
36 lin. ft. relaying 18-in. concrete pipe	2.00	2.50	2.00	3.00	1.00
91 lin. ft. relaying 24-in. concrete pipe	2.00	3.00	2.00	3.00	1.25
20 lin. ft. relaying 18-in. C.M. pipe	1.00	2.00	1.75	3.00	1.00
8 lin. ft. relaying 24-in. C.M. pipe	1.00	3.00	1.75	3.00	1.25
21 cu. yd. concrete, Class "AA"	75.00	90.00	125.00	90.00	70.00
224 cu. yd. concrete, Class "B"	90.00	90.00	25.00	90.00	80.00
120 cu. yd. concrete, Class "B"	65.00	65.00	42.00	90.00	65.00
27,500 lb. reinforcing steel	.14	.145	.16	.16	.13
29,000 lb. structural steel	.50	.28	.28	.35	.20
506 lin. ft. concrete curb and gutter, Type 3-H	2.75	3.00	3.50	3.00	2.50
40 lin. ft. concrete curb and gutter, Type 3-C	2.75	3.00	4.10	6.00	2.50
22 lin. ft. concrete driveway, Type A-2	4.00	15.00	8.00	6.00	10.00
9,000 cu. yd. excav. for structs., unclassified	2.25	1.50	2.85	2.50	2.00
2,200 cu. yd. granular backfill	1.50	2.00	3.40	2.00	2.00
2,500 cu. yd. small ditch excav.	.50	1.00	2.20	2.00	.60
230 lin. ft. guard rail	3.50	4.00	4.00	4.50	4.00
130 hr. mechanical tamping	6.00	5.00	4.00	6.00	4.00
15 ea. reconstr. cleanout, manhole and monum. boxes....	100.00	25.00	45.00	50.00	30.00
150 ea. moving mail boxes	3.00	3.00	5.00	5.00	6.00
308 sq. yd. removal of exist. conc. pavement	1.00	1.00	3.00	1.00	1.00
100 ea. removal of trees	20.00	25.00	23.00	70.00	15.00
5,100 lin. ft. right-of-way fence, Type "B"	.35	.32	.40	.40	.30
4 ea. 4-ft. gates	25.00	15.00	26.00	20.00	25.00
4 ea. 10-ft. gates	35.00	25.00	40.00	25.00	30.00
6 ea. 14-ft. gates	40.00	35.00	45.00	35.00	35.00
160 ea. right-of-way markers	7.00	6.00	5.00	7.00	5.25
2 ea. F.A.P. marker	40.00	25.00	25.00	25.00	20.00
Lump sum, furn. water equipment	500.00	\$1,500	500.00	\$5,000	\$1,500
Lump sum, furn. constr. signs	\$1,000	500.00	\$4,000	\$1,000	\$1,500

Crushing and stockpiling crushed gravel

Wyoming—Bighorn, Hot Springs and Washakie counties—State. Rollins Construction Co., Thermopolis, was awarded a contract by the Wyoming Highway Department on the basis of its \$16,050 low bid for crushing and stockpiling crushed gravel surfacing at various locations. Unit bids submitted were as follows:

(1) Rollins Construction Co.	\$16,050	(5) Mize Sand & Gravel Co.	\$21,200
(2) W. E. Barling, Inc.	17,620	Boatright-Smith	22,000
(3) Taggart Construction Co.	18,025	Big Horn Construction Co.	26,900
(4) Gilpatrick Construction Co.	18,270	(6) Engineer's estimate	20,800

	(1)	(2)	(3)	(4)	(5)	(6)
3,000 ton cr. gravel surf. Type A	.65	.68	.625	.73	.75	.80
3,000 ton mi. haul of surf. matl.	.10	.12	.20	.10	.20	.15
4,000 ton cr. gravel surf. Type A	.65	.68	.70	.73	.80	.75
1,000 ton cr. gravel surf. (¾-in. max.)	.90	.90	.87	1.05	.95	1.15
20,000 ton mi. haul of surf. matl.	.08	.10	.07	.10	.10	.10
3,000 ton cr. gravel surf. Type A	.65	.95	.80	.73	.95	1.00
5,000 ton cr. gravel surf. Type A	.65	.65	.80	.73	1.00	.85
4,000 ton cr. gravel surf. Type A	.65	.65	.80	.73	.85	.85
1,000 ton cr. gravel surf. (¾-in. max.)	.90	.90	.82	1.05	.95	1.15

Plant-mix surfacing on concrete-treated base

California—San Diego County—State. A low bid of \$339,743 was submitted before the California Division of Highways by Griffith Co., Los Angeles, for about 2.9 mi. of grading and plantmix surfacing on cement treated base on Sweetwater Valley Road, between Highland Ave. and Bonita Bridge. Unit bids were submitted as follows:

(1) Griffith Co.	\$339,743	(3) Cox Bros. Construction Co.	\$376,806
(2) Daley Corp.	374,360		

	(1)	(2)	(3)
205 cu. yd. removing concrete	10.00	15.00	14.50
Lump sum, clearing and grubbing	\$4,100	\$7,500	\$7,500
43,000 cu. yd. roadway excavation	1.15	.85	1.30
2,300 cu. yd. structure excavation	3.50	3.50	3.50
1,000 cu. yd. ditch and channel excavation	1.50	1.50	2.95
250,000 sta. yd. overhaul	.007	.01	.015
16,500 ton imported subbase material	1.40	2.00	1.20
8,000 ton I.B.M.	1.70	2.00	1.25
Lump sum, dev. water supply and furn. water equip.	\$1,200	\$2,500	\$5,000
2,550 M. gal. applying water	2.40	2.00	2.25
155 sta. finishing roadway	14.00	15.00	12.50
18,100 ton mineral aggregate (C.T.B.)	2.25	2.85	2.50
4,800 bbl. portland cement (C.T.P.)	4.60	4.50	4.75
160 ton asphaltic emulsion (cur. sl. pt. bdr. and Cl. "D") sl. ct.)	45.00	50.00	42.00
50 ton high viscosity asphaltic emulsion (Cl. "C-Med.") sl. ct.)	35.00	55.00	42.00

	(1)	(2)	(3)
600 ton screenings (sl. ct.)	4.50	7.00	6.65
14,500 ton mineral aggregate (P.M.S.)	5.70	5.50	6.60
725 ton paving asphalt (P.M.S.)	5.70	26.00	6.60
15,300 lin. ft. placing P.M.S. dikes	.20	.25	.25
220 sq. yd. placing P.M.S. ditch lining	1.50	1.50	2.20
120 sq. yd. placing P.M.S. down drains	1.50	1.50	3.25
340 lin. ft. raised traffic bars	1.00	1.25	1.20
165 cu. yd. Class "A" P.C.C. (structures)	75.00	80.00	95.00
6 cu. yd. broken concrete riprap	35.00	10.00	44.00
360 cu. yd. Class "A" P.C.C. (curbs and sidewalks)	40.00	45.00	52.00
1,330 sq. ft. concrete ditch lining (3-in. thick)	.75	.50	.95
3,270 sq. ft. concrete ditch lining (½-in. thick)	.35	.75	.27
124 ea. r/w monuments	8.00	9.00	10.50
738 lin. ft. metal plate guard railing	4.00	4.50	3.00
222 ea. guide posts, culv. markers, and horiz. reflect.	8.00	8.00	7.50
14 ea. W21R reflectors	11.00	20.00	10.00
410 lin. ft. new property fence	.80	1.00	2.40
Lump sum, salvaging and reconstructing exist. wood fence	350.00	500.00	500.00
468 lin. ft. 18-in. R.C.P. (std. str.)	5.50	5.25	5.00
4 lin. ft. 21-in. R.C.P. (std. str.)	8.00	6.50	7.20
996 lin. ft. 24-in. R.C.P. (std. str.)	7.50	7.00	6.25
68 lin. ft. 30-in. R.C.P. (std. str.)	9.50	8.50	9.00
68 lin. ft. 36-in. R.C.P. (std. str.)	11.50	9.00	10.30
74 lin. ft. 12-in. C.M.P. (16 ga.)	3.00	3.00	3.50
32 lin. ft. 18-in. C.M.P. (16 ga.)	4.00	3.75	4.25
96 lin. ft. 24-in. C.M.P. (14 ga.)	6.00	5.50	6.40
420 lin. ft. 29-in. x 18-in. C.M.P. arch (14 ga.)	6.50	6.50	6.85
106 lin. ft. 36-in. x 22-in. C.M.P. arch (14 ga.)	8.00	8.00	8.25
168 lin. ft. 65-in. x 40-in. C.M.P. arch (10 ga.)	25.00	23.00	19.25
14,500 lb. bar reinforcing steel	.14	.13	.14
8,000 lb. misc. iron and steel	.45	.50	.40
143 sq. yd. mesh reinforcement	.90	1.00	.95

Heavy grading for Arizona forest road

Arizona—Maricopa County—BPR. Phoenix-Tempe Stone Co., Phoenix, was awarded a contract by the Bureau of Public Roads on the basis of a low bid of \$483,083 for grading in Tonto National Forest. The work covers a 5.533 mi. stretch from the foot of Screw Tail Hill to Sunflower Store. Unit bids were submitted as follows:

(1) Phoenix-Tempe Stone Co.	\$483,083	(5) Fisher Construction Co.	\$556,696
(2) Lyle Price, Contractor	488,195	— Isbell Construction Co.	563,479
(3) Wallace & Wallace	522,662	— R. P. Shea Co.	592,642
(4) Larsen Construction Co.	546,548	— Arizona Sand & Rock Co.	619,659

	(1)	(2)	(3)	(4)	(5)
Force acct., extra and misc. force acct. work	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000
403,000 cu. yd. unclassified excav.	.80	.76	.84	.91	.89
3,750 cu. yd. unclassified excav. for struts.	2.50	5.00	4.00	3.00	4.00
494,000 sta. yd. overhaul (1,000-ft. free haul)	.02	.02	.02	.02	.03
13,200 lin. ft. furrow ditches	.08	.10	.20	.10	.08
520 M. gal. watering of surf. erse., Item 100	3.00	1.00	2.00	2.00	1.75
Lump sum, providing and maintaining water plant or plants	\$1,000	\$2,000	800.00	\$1,500	\$3,500
13,000 cu. yd. selected borrow surface course	.65	1.26	1.20	.80	1.00
582 cu. yd. Class A concrete	60.00	67.32	65.00	65.00	70.00
76,900 lb. reinf. steel	.12	.12	.12	.14	.14
372 lin. ft. 18-in. CGSM culvert pipe	3.30	3.75	4.10	4.00	4.00
950 lin. ft. 24-in. CGSM culvert pipe	5.00	5.60	6.00	6.00	6.50
358 lin. ft. 30-in. CGSM culvert pipe	6.50	6.75	8.00	8.00	7.50
66 lin. ft. 36-in. CGSM culvert pipe	9.50	10.25	11.00	11.00	12.00
330 lin. ft. 48-in. CGSM culvert pipe (12 ga.)	14.50	14.75	15.00	16.00	19.00
44 lin. ft. 48-in. CGSM culvert pipe (10 ga.)	18.00	18.00	20.00	20.00	21.00
72 lin. ft. 72-in. CGSM culvert pipe (10 ga.)	30.00	29.10	33.00	32.00	35.00
66 lin. ft. 72-in. CGSM culvert pipe (8 ga.)	35.00	34.00	39.00	38.00	41.00
148 lin. ft. 90-in. field assemb. metal plate culv. (510-18)	55.00	62.00	65.00	60.00	68.00
32 lin. ft. 90-in. field assemb. metal plate culv. (58-17)	60.00	67.00	69.00	65.00	75.00
50 lin. ft. 90-in. field assemb. metal plate culv. (57-15)	65.00	70.00	72.00	68.00	79.00
4 ea. r/w monuments, Type A	20.00	12.00	20.00	10.00	13.00
4 ea. conc. maint. marker posts	20.00	15.00	25.00	25.00	15.00
4,900 lin. ft. barbed wire fence (5 wire)	.30	.25	.25	.30	.27
216 ea. metal guide posts, Type B	6.00	5.00	6.00	7.00	6.60

Grading and plant-mix surfacing in Idaho

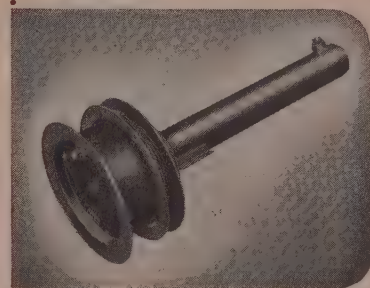
Idaho—Cassia and Power counties—State. Among 15 bidders, Aslett Construction Co., Twin Falls, was low bidder at \$701,657 before the Idaho Department of Highways for 8.4 mi. of Old Oregon Trail highway between Raft River and Fall Creek, the work consisting of grading and plant-mix bituminous surfacing. Unit bids were submitted as follows:

(1) Aslett Construction Co.	\$701,657	— Pickett & Nelson	\$798,174
(2) Marion J. Hess	724,749	— Carl E. Nelson	805,664
(3) Paron & Fife Construction Co.	727,692	— F. C. Scott Construction Co.	822,255
(4) Hoops Construction Co.	754,322	— Woodall Brothers	822,923
(5) S. Birch & Sons	763,398	— Carl Halvorsen	887,284
(6) J. L. McLaughlin	769,822	— Quinn Bros. & Robbins	940,597
— Duffy Reed	783,310	— McNutt Brothers	999,600
— Peter Kiewit Sons' Co.	792,655		

	(1)	(2)	(3)	(4)	(5)	(6)
1 ea. removal of bridge	\$2,500	\$1,610	\$3,500	\$2,500	\$2,500	\$4,000
2,075 lin. ft. remove guard rail	.50	.50	.50	.50	.24	1.00
4 ea. remove concrete headwalls	10.00	15.00	25.00	15.00	31.00	30.00
870,000 cu. yd. unclassified excav.	.20	.22	.21	.22	.19	.223
1,500 cu. yd. excav. for struts.	3.50	2.00	3.00	3.00	5.40	2.00
64,600 cu. yd. borrow	.25	.24	.20	.25	.22	.20
204,000 yd. mi. haul	.18	.15	.25	.20	.20	.15
37,500 M. gal. watering embankments	1.35	1.50	1.50	1.50	1.50	1.50
3,000 M. gal. watering base and surface courses	1.25	1.50	1.25	1.50	1.50	1.50
18 day rolling power roller	40.00	40.00	40.00	50.00	48.00	50.00
1,170 day rolling tamping roller	35.00	40.00	42.00	40.00	50.00	50.00
150 day rolling pneumatic tire roller	45.00	50.00	40.00	40.00	56.00	50.00
4,900 cu. yd. mechanical tamping	1.50	2.00	1.00	2.00	1.64	2.00
330 sta. furrow ditches	.10	10.00	10.00	6.00	2.50	8.00
3,500 lin. ft. small ditches	.12	.10	.07	.20	.50	.10
290 sta. obliteration of old road Class 1	10.00	10.00	10.00	12.00	12.50	20.00
57,000 ton select base course 3-in. max.	.55	.50	.48	.65	.77	.65

(Continued on page 148)

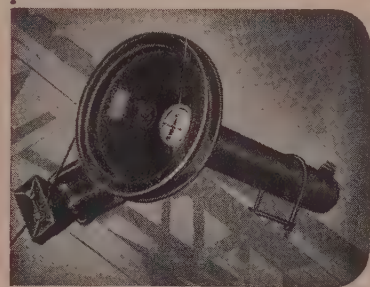
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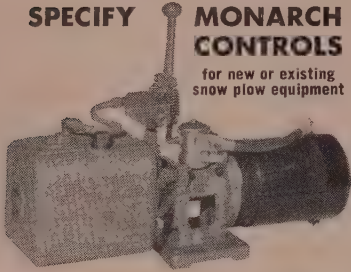
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ECONOMY METAL FORMS

UNIT BID PRICES... CONTINUED

	(1)	(2)	(3)	(4)	(5)	(6)
54,000 ton cr. gr. surface course 3/4-in. max.	.90	.80	.78	.95	1.04	.80
870 bbl. MC-1 asph. road matl. for prime	5.80	6.33	5.75	6.00	7.00	6.75
680 bbl. MC-2 asph. road matl. for prime	5.80	6.33	5.75	6.00	7.00	6.75
910 ton blotter material Class C	1.00	2.00	2.50	1.00	2.20	3.00
4,160 bbl. 201-300 pen. asph. rd. matl. for plmix..	5.50	6.26	5.50	5.58	5.50	5.50
14,500 ton plant mix bituminous surface Class B..	3.00	3.00	3.00	2.75	3.36	3.40
1,450 bbl. MC-5 asph. rd. matl. for seal coat	6.20	6.33	5.75	6.00	7.60	7.50
3,240 ton cover coat matl. Class 3	4.00	3.00	3.00	3.00	4.00	4.00
9,930 ton cr. gr. surf. 3/4-in. max. for shoulders ..	1.00	.85	.80	1.00	1.04	.80
375 cu. yd. concrete Class A	57.00	65.50	65.00	57.00	65.00	77.00
46,000 lbs. metal reinforcement	.14	.14	.14	.14	.12	.15
Lump sum, furn. pile driving equip.	800.00	\$1,000	\$1,000	800.00	\$1,800	500.00
2,100 lin. ft. furn. timber piles untreated	1.10	1.56	1.25	1.10	1.00	1.35
2,030 lin. ft. driving timber piles untreated	1.00	.44	1.50	1.50	1.50	1.00
70 lin. ft. driving test piles	1.50	10.00	10.00	4.00	6.00	6.00
0.1 M.F.B.M. No. 1 com. mtn. region fir, untreated.....	200.00	200.00	300.00	200.00	400.00	400.00
120 lin. ft. 8-in. pipe culvert	1.39	2.25	1.25	1.20	1.25	1.50
1,200 lin. ft. 18-in. pipe culverts	2.82	3.50	2.75	3.15	3.02	3.25
2,300 lin. ft. 24-in. pipe culverts	3.97	4.30	4.00	4.50	4.34	4.50
500 lin. ft. 30-in. pipe culverts	5.50	6.00	5.50	6.30	6.13	6.25
150 lin. ft. 36-in. pipe culverts	7.20	9.50	7.50	8.50	8.25	8.50
350 lin. ft. 42-in. pipe culverts	9.25	13.30	10.00	11.00	10.64	11.00
250 lin. ft. 48-in. pipe culverts	12.92	15.50	13.00	13.00	13.65	15.00
500 lin. ft. 60-in. pipe culverts	19.30	20.00	19.00	19.00	20.38	21.00
92 lin. ft. salvage 18-in. CM pipe	1.00	1.00	1.00	2.00	1.24	2.00
82 lin. ft. salvage 24-in. CM pipe	1.25	1.00	2.00	2.00	1.55	2.00
102 lin. ft. salvage 36-in. CM pipe	1.75	1.00	2.50	2.00	2.00	2.50
26 lin. ft. relay 12-in. CM pipe	1.00	1.00	1.00	1.00	2.00	1.50
42 lin. ft. relay 36-in. CM pipe	1.50	1.50	2.00	2.00	2.50	2.00
280 lin. ft. 18-in. bit. coat CM pipe siphon	7.50	5.50	5.00	6.00	5.80	5.50
600 cu. yd. loose riprap	4.00	4.00	8.00	6.00	4.00	7.00
7,800 lin. ft. steel beam type guard rail	2.75	3.25	3.50	2.75	2.81	3.00
80 ea. guide posts	6.50	13.50	8.00	6.50	9.00	10.00
32,000 lin. ft. wire fence Type 1	.22	.17	.23	1.22	.20	.20
17,000 lin. ft. wire fence Type 4	.29	.25	.30	.29	.35	.20
6 ea. standard wood gate	65.00	90.00	50.00	65.00	50.00	50.00
40 cu. yd. special backfill Class A	2.00	2.50	2.00	4.00	2.50	2.50
4 ea. 8-in. CM embank. protector	50.00	21.00	50.00	40.00	40.00	40.00
1 ea. steel floor grating	25.00	75.00	50.00	50.00	50.00	40.00
12,600 lin. ft. C. M. snow fence	3.60	3.30	3.50	4.20	3.40	3.50
150 lin. ft. corr. sec. plate stockpass	59.00	56.00	30.00	59.50	65.00	65.00
4,200 lin. ft. move and reconstruct woven wire fence	.18	.20	.20	.18	.20	.20
13,000 lin. ft. move and reconstruct barb wire fence	.16	.16	.15	.16	.18	.20
6 ea. 30-ft. wire gate	25.00	25.00	25.00	25.00	20.00	20.00
5 ea. 40-ft. wire gate	25.00	30.00	30.00	25.00	25.00	30.00
2,300 lin. ft. paved gutter	.75	.25	.50	1.00	.60	1.00

Earth and gravel canal blankets

Washington—Columbia Basin Project—USBR. Otis Williams & Co., Kennewick, submitted low bid of \$250,876 for Schedules 1 and 2, earth blanketing the Potholes East Canal, Columbia Basin Project. Unit bids were as follows:

(1) Otis Williams & Co.	\$250,876.00	(3) J. A. Terteling & Sons, Inc.	\$399,555.40
(2) Osberg Construction Co.	353,700.00	(4) Engineer's estimate	217,120.00

	(1)	(2)	(3)	(4)
16,000 cu. yd. excavation from canal	.41	.85	1.35	.55
11,000 cu. yd. excavation from borrow	.56	.70	.70	.35
12,000 mi. cu. yd. overhaul	.28	.35	.65	.30
2,700 cu. yd. placing gravel base course	.58	1.85	.95	1.00
7,400 cu. yd. constructing earth blanket	.58	.75	.65	.25
1,800 cu. yd. placing gravel blanket	1.03	1.85	.90	.40
270 M. gal. water for earth blanket	3.90	8.00	7.68	5.00

SCHEDULE 2—Station 881/00 to Station 967/00

103,000 cu. yd. excavation from canal	.41	.50	.50	.45
90,400 cu. yd. excavation from borrow	.56	.70	.70	.35
231,000 mi. cu. yd. overhaul	.28	.35	.65	.30
9,800 cu. yd. placing gravel base course	.58	1.85	.95	1.00
68,000 cu. yd. constructing earth blanket	.58	.75	.65	.25
10,300 cu. yd. placing gravel blanket	1.03	1.85	.90	.40
15,800 cu. yd. placing gravel backfill	.25	.65	.40	.30
2,260 per M. gal. water for earth blanket	3.90	8.00	7.68	5.00

Miscellaneous

Plant-mix playground surfacing

California—San Joaquin County—City. S. M. McGaw, Stockton, submitted the low bid of \$6,164 to the Board of Trustees, Ripon, for plant-mix surfacing the playground at Ripon Grammar School. Unit prices were as follows:

(1) S. M. McGaw	\$6,164	(3) M. J. Ruddy and Son	\$7,540
(2) Biasotti & Sons	7,047		

	(1)	(2)	(3)
43,310 sq. ft. of 1 1/2-in. plant-mix surfacing	.105	.12	.14
300 lin. ft. "Vee" gutter	2.00	2.40	1.90
215 lin. ft. 4-in. x 10-in. curb	1.00	1.25	1.60
217 lin. ft. 10-in. conc. pipe	3.35	3.60	2.25
1 each catch basin	75.00	80.00	75.00

NEW LITERATURE

1 TECO product catalog

Timber Engineering Co. has a new catalog on the variety of TECO timber connectors developed and manufactured by this industry-owned organization. Among the items described and illustrated are the TECO wedge-fit split rings, shear plates, toothed rings, spike grids, clamping plates and framing anchors with proper installation tools prescribed for each. Factory list prices for the items are given in a separate folder.

2 Construction ideas that pay off

Here is the first in a series of new bulletins aimed at saving money or time for you men in the building and construction fields. Each bulletin will feature an actual use-history to provide ideas for adaptation to your own purposes. The first bulletin deals with an inexpensive and practical method of constructing offices, storage buildings and shelters at job sites. Construction details and recommended material illustrated. Valley Plywood

Co. will send you the first and succeeding issues upon request.

3 Concrete forming tables

Symons Clamp & Mfg. Co. is offering a folder of tables compiled to serve as an aid in the erection of form work for slabs, columns and beams. Subjects covered are spacing of girts or stringers, spacing of shores and spacing of column clamps.

4 Welding guide

A guide to the ordering of both welding and flame cutting torches is offered in a catalog by National Welding Co. Completely illustrated is the company's line of heavy, medium and light range welding tools.

5 Plastic pipe information

The advantages and applications of plastic pipe in the construction field are comprehensively described in this bulletin offered by Triangle Conduit & Cable Co., Inc. A ready reference chart of four types—flexible, semi-

rigid, rigid high impact and rigid P. V. C. pipe, is a feature of this booklet and tables show dimensions, physical data and chemical resistance ratings for this type.

6 Facts on concrete curing

Four types of concrete curing compounds that can be sprayed on are discussed in this new Hunt Process Co. bulletin—"Clear," for preserving natural color of concrete; "Tilt-up," for curing and bond breaking in tilt-up or precast construction; "Black," for curing and waterproofing with a blend of asphalts simultaneously, and "Pigmented," for temperature control in the concrete. A general discussion of concrete curing necessities and methods is presented, along with the where, what and how of Hunt Process compounds.

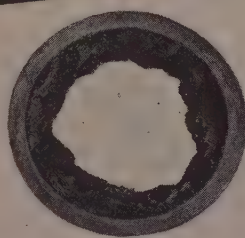
7 Attachments for your Caterpillar diesel engine

Here is a 32-page booklet from Caterpillar Tractor Co. published especially for anyone considering Caterpillar engine installation. It contains the most complete selection of attachments for the Company's 12 sizes of industrial, electric set, and marine diesel engines ever presented in booklet form. Attachments are pictured and described in such a way as to show just where they are used

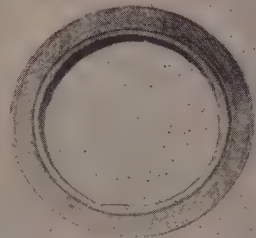
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8

Marlow pump bulletin

Marlow Pumps has released a bulletin (G-52) covering its complete line. Designed as a review and reference guide, the bulletin contains pictures of representative units and general descriptive matter covering self-priming centrifugal, straight centrifugal and diaphragm pumps.

V

Signal chart shows safe sling load

This wall chart (5237) offered by Macwhyte Co. combines crane signals and suggestions for proper use of slings. On the reverse side are tables listing strengths and safe load limits for Atlas 8-part braided slings and Monarch single-part slings for 4/10 of a ton to 243.4 tons.

10

Complete information offered on "Quick-Way" shovel

This informative booklet, offered by Quick-Way Truck Shovel Co., is jam-packed with field photographs showing the "Quick-Way" shovel, in combination with different attachments, handling a variety of projects.

By means of pictures and descriptive text, the reader can also see the actual part-by-part assembly of the basic unit. Digging ranges and ratings for 4 models, from 3 to 10 ton crane capacity, are given.

11

Advancements in timber research described

Over-all activities of Timber Engineering Co. to advance the use of lumber and wood products is the subject of a booklet issued by the Company, an affiliate of the National Lumber Manufacturers Association. Engineers and architects, as well as contractors, will be interested in this report of the services available from the TECO laboratory and the discussion of various projects in progress to solve various timber engineering problems. Also included is a discussion of the TECO trussed rafter construction, wedge-fit split rings and framing anchors.

12

Steel pile catalog available

Recently released by The Union Metal Manufacturing Co. is a 24-page catalog (81) on the subject of fluted steel piles. In addition to complete descriptive information and greatly simplified specifying data, the new catalog includes a broad range of typical installation photos, test driv-

ing figures and other technical information of particular interest to engineers and contractors.

13

Here's how flame cutting works

This instructive booklet on flame cutting, offered by National Welding Equipment Co., contains much information which the novice or experienced operator, as well as the buyer of welding equipment, has been seeking. Starting with an explanation of what flame cutting is, the booklet tells the reader how a cutting torch works, the purpose of the mixer and what gas and pressure to use for the job. Illustrations show the component parts of the National flame cutting torch and attachments.

14

Wire rope book

E. H. Edwards Co. has a 24-page book which contains daily working information on wire rope. Tables arranged for quick reference give rope and sheave diameters, breaking strengths and working loads for each standard type.

15

Foundation pipe information

Armco Drainage & Metal Products has brought out a revised edition of its booklet on foundation pipe. The



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.
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ocket deals with pipe shells, pile
ells and caissons—sizes, end prepa-
tion, mill service and field advan-
ges. Specifications and tables on di-
mensions and properties of spiral
elded pipe piles are given.

16

Speeding up scaffolding

An 8-page catalog (No. 952) de-
scribing in detail the Adjustomatic
special tubular scaffolding is offered
by **Automatic Devices, Inc.** The four
new features of this scaffolding, which
cuts vertical erection time in half
according to the Company, are de-
scribed and two pages show the basic
panels and various types of bracing
actions available.

17

Cleveland trencher bulletin

A new bulletin (S-112) fully de-
scribing the model 95 trencher is
available from the **Cleveland Trench-
er Co.** Described as the standard ma-
chine for city and suburban work, the
text and on-the-job photographs
stress job applications and outstand-
ing features. Complete dimensions,
including table of optional trench
widths and digging wheel and trac-
tion speed combinations, are given.

18

Steel guide

A 4-page bulletin, offered by **Joseph
F. Ryerson & Son, Inc.,** covers in
condensed form the characteristics,
mechanical properties and uses of a
comprehensive list of hot rolled and
cold finished carbon and alloy steel
bars. Designed to make comparisons
of different types quick and easy, this

bulletin serves as a convenient guide
to selection of the most suitable bar
steel for the jobs that come up fre-
quently in the average shop.

19

U. S. has new motor

An attractive, illustrated catalog
(F1784) is now available on the **U. S.
Electrical Motors'** fully enclosed unit.
A cutaway drawing in color demon-
strates why this motor is safe for
dangerous, damp or dusty locations.

20

Anchoring devices charted

An elaborate selection chart for
anchoring devices is made available
to our readers by **United States Ex-
pansion Bolt Co.** The chart classifies
each anchoring device according to
load type, masonry, safe working load
and metallic content. This is an easy,
quick way to pick the right device for
your purpose.

21

Turret truck catalog

A new catalog featuring the **Hyster
Company's** line of turret trucks for
"horizontal" materials handling is
now available. Said by the manufac-
turer to be a low cost economy unit,
the turret truck handles loads up to
4,000 lbs.

22

Oil booster described

For fast, low cost heating of oils,
bituminous and heavy viscous mate-
rials in storage tanks, bulk plants
and refineries, the "Peak-Temp" oil
booster is described in bulletin AD-

108 by **Cleaver-Brooks Co.** Illustrated
throughout, the bulletin points out
the features of the equipment and
explains how water and weather
problems often encountered in heat-
ing units can be eliminated.

23

Plaster-mortar mixers catalog

A handy reference table comparing
features, dimensions and capacities of
three plaster-mortar mixers has been
issued by **Kwik-Mix Co.** Models il-
lustrated are the recently redesigned
6-P tilting and non-tilting units.

24

CONCRETE SEAL—Product data
sheet comprehensively describes
Flintkote Company's rubber asphalt
hot-poured joint sealing compound
for concrete pavements. Illustrations
show latest equipment used for melt-
ing and pouring compounds, also
methods used in cleaning and prepar-
ing joints for sealing. (I-H 601)

25

WELDING—New catalog (17) of-
fered by **Air Reduction** on Aircomatic
welding, inert gas shielded metal arc
process. Explaining how the process
works, the catalog describes the
model 3 recommended for welding
aluminum and magnesium and model
20 recommended for copper, bronzes,
stainless steel and nickels. Accessories
and directions for ordering are given.

26

TRAILERS—Bulletin giving speci-
fications on the **Fabco** semi, full and
special trailer line is available from
F. A. B. Manufacturing Co.

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Organization _____

NEW EQUIPMENT

More information on any of the items in this section may be obtained by using coupon on page 151.

27

Mobile hydraulic lift with 6,000-lb. capacity

A new mobile hydraulic lift, combined with a heavy-duty hydraulic jack is now being used in construction and maintenance work. A crew can lift itself or 6,000 lb. of building material 38 feet above ground on the 8-ft. platform by means of dual hydraulic controls. The platform can be rotated 360 deg. from the top, and for such difficult jobs as raising trusses, tank tops or heavy pipes, the lift is equipped with a removable jack post with the same lifting capacity.

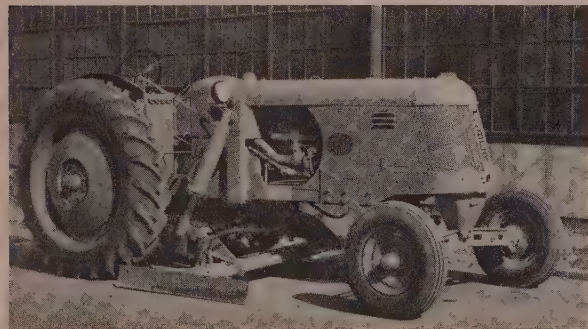
Built around a heavy, pneumatic-tired trailer, the readily mobile lift is powered by a 7½-hp. Wisconsin engine with a self-starter which drives the hydraulic columns. Fully retracted, the lift with guard rail collapsed, requires only 13 ft., 6 in. clearance. The base is equipped with four stabilizing screw jacks on folding arms for use with heavy loads and high lifts. Many safety features are provided to insure safe lowering, even in case of complete rupture of a hydraulic line or of control failure. A 6-in. kickboard around the platform prevents loss of tools, and the stabilizing jacks provide a strong, rigid base. Manufactured by Hamlin-Klock Corp.



28

For getting under the rail try Huber's new side dozer

A special machine for scalping berms and shoulders under guard railings, a job heretofore done by hand operations, is the Huber side dozer, recently announced by Huber Manufacturing Co. This side dozer is hydraulically powered for removing sod, gravel and other accumulated



debris under railings, and is mounted on the blade suspension system of any existing Huber Maintainer. The 48-in. long cutting blade made of high carbon steel is designed to scrape cleanly and efficiently under any guard

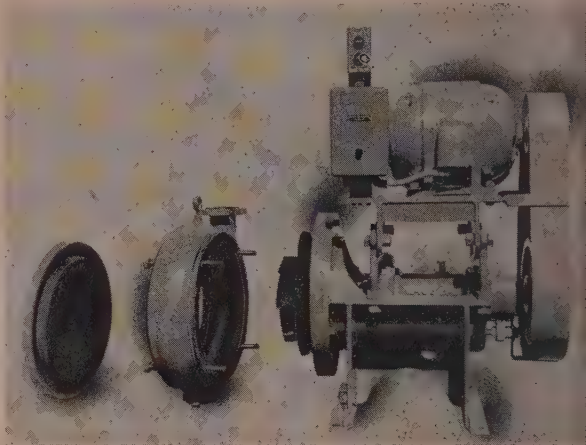
railing clearing the ground by 6 in. Its maximum reach is 72 in., and it weighs approximately 520 lb. The overall width of the Huber Maintainer with side dozer in retracted position is 96 in.

The side dozer is the 10th attachment for the Huber Maintainer, a road maintenance machine with standard blade. Other attachments include: bulldozer, lift loader, berm leveler, road planer, highway mower, patch roller, broom and one-way and two-way snow plows.

29

New Vacseal solids and acid handling pumps

New Vacseal solids and acid handling pumps now are on the market. These pumps operate on the patented "vacuum-seal" principle which prevents fluids or the entrained solids from being forced into the gland. The pumps are virtually glandless and require no sealing water to protect the gland and packing. All of the features which enable the pump to produce suction are retained. Suction lifts of from 10 to 12 ft. are possible. They are particularly applicable for service in the construction and cement industries for handling sand, gravel and cement.



The rubber lined pumps have the lining vulcanized to the cast iron parts with a thermosetting cement. They are suitable for heads up to 100 ft. This type of "Vacseal" can be made acidproof by changing the gland bushing and installing a shaft sleeve. The illustration shows a 2-in. rubber-lined Vacseal pump with the suction cover and casing removed. These pumps are available in rubber-lined and all metal types in various sizes with capacity ranges up to 3,000 gpm. Manufactured by Galigher Co.

30

Small wellpoint pump saves on the job

The 646, a 4-in. portable gasoline engine wellpoint pump with a capacity of 1,000 gal. per min., is announced by Foundation Equipment Corp. The small pump has been designed with an eye toward economy. It can replace the larger units where soil conditions permit, thus eliminating the high purchase, fuel and maintenance costs for a

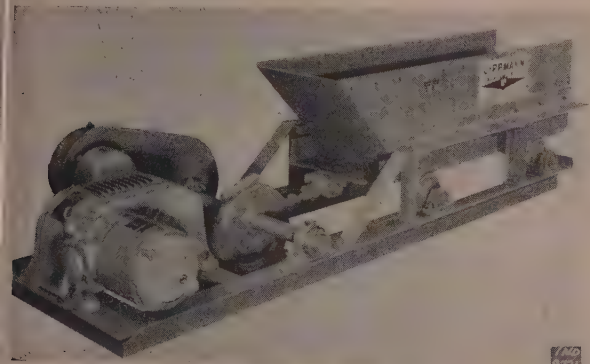
large pump. Horsepower is more than sufficient, assuring long engine life and low maintenance costs. The manufacturer claims that vacuum pump displacement is ample for most wellpoint jobs to guarantee a positive prime at all times and an even flow regardless of the amount of water being pumped.

The 646 pump and larger (6-in., 8-in., and 10-in.) Foundation wellpoint units can also be used as sump pumps.

31

New Lippmann reciprocating plate feeder features quick adjustment

Lippmann Engineering Works has a new entirely ball bearing 20-in. x 5-ft. reciprocating plate feeder with babbit lined eccentric drive for easy adjustment or replacement accessibility. It is driven by a 3-hp. variable speed electric motor gear reducer with belt drive operating over



adjustable pitch sheaves for finer feed control of pit run material for use in pits with excessive varying pit deposits. Speed is varied by a dial at the rear of the machine. More efficient operation is encouraged by constant flow regardless of material deposit conditions.

32

Rip, root and doze at the same time with this tooth that clamps on dozer

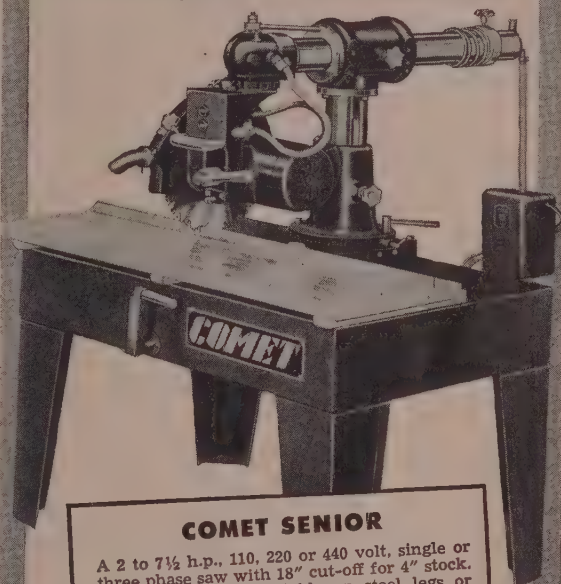
Completely new is the description given the ESCO Buck Forte dozer-rooter announced by Electric Steel Foundry Co. The device is a heavy-duty tooth shank hous-



ing which mounts on the moldboard of a bulldozer by means of a special clamp used in combination with adapters and saddles which enable it to fit most popular makes of heavy-duty dozers. The rooter shank has four adjustments of ripping depths below the dozer's cutting edge and is equipped with ESCO Box Type replaceable points. Rooters can be attached in pairs or used singly on the dozer. One of its principal advantages is that it enables

COMET RADIAL ARM CUT-OFF SAWS

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For More Accurate Cutting!
For Lower Operating & Maintenance Cost!



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A 2 to 7½ h.p., 110, 220 or 440 volt, single or three phase saw with 18" cut-off for 4" stock. Rips up to 32". Available on steel legs or trailer mounted. Priced as low as \$622.00 F.O.B. Los Angeles, Calif.

Comet saws can help you build more forms, runways, shoring, or scaffolding in less time! They are high production cut-off saws for construction work. The fully retracting radial arm design makes Comets easier to use because the work table is always in plain view of the operator — more accurate because layout marks are easier to follow. Comet saws are built to take hard usage under tough job conditions and still maintain their precision and accuracy. Maintenance and repair cost on Comet saws is lower than on any other radial saw.

WHAT IS YOUR CUTTING PROBLEM?

Comet saws are made in twenty-two standard models that swing blades from 8" to 44" with a maximum cut-off capacity of 17" x 24". There is a Comet Saw to fit your cutting requirements. For specific information: See your dealer or write...

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6029

Holding Back the Ohio

FOR A BIG EXCAVATION



A McKiernan-Terry Pile Hammer helps build a cofferdam for the large Philip Sporn power plant on the left bank of the Ohio River near New Haven, W. Va.



A protecting earth dike could not stop the waters of the Ohio River from seeping into a huge 500,000 cu yd excavation. That's why the contractor, Sollitt Construction Company, Inc., built a water-tight cellular sheet pile cofferdam • A McKiernan-Terry 9-B-3 Double-Acting Pile Hammer quickly and efficiently drove length after length of 63-ft steel piling down to rock to form eight 54-ft diameter cells. The concrete foundation for the large power plant could then be poured without being menaced by the river • Contractors everywhere know they can count on powerful, fast-driving McKiernan-Terry equipment. Bulletin describes 16 sizes of pile hammers and 2 sizes of pile extractors. Write for your copy.

McKIERNAN TERRY

McKIERNAN-TERRY CORPORATION
Manufacturing Engineers
16 PARK ROW, NEW YORK 38, N. Y.
Plants: Harrison, N. J. and Dover, N. J.



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COAL TOWERS



TRANSFER BRIDGES



HONING TO 42" I. D.

the operator to rip, root and doze at the same time. It is easily mounted and demounted from the dozer without special equipment and it can be carried from job to job in a pickup truck or on the dozer. Examples of types of work in which it has excelled are: boulder and stump removal, land clearing, ditch work, tearing up old pavements, ripping and handling overburden or cutting seamy rock, roadbuilding pioneering, initial cuts in solid rock, boulders or dirt, punching out logging roads, etc. For more information and literature, put key number on coupon.

33

Transit damage made nil with Canton's load protectors

New metal Hinge-Guard load protectors by Canton Manufacturing Co. do just that in transporting such material as steel coils, sheets, pipe, tubing, lumber and machinery.



As illustrated, any chain or cable contact with the load is prevented. The device also allows increased chain tension which makes loads more compact and less likely to shift.

Two pieces of the load protectors hinge-lock together, creating a unit which will angle from 90 to 180 deg.; or a protector can be used singly by lifting it from its mate. The protectors accommodate chains or cables up to and including 1/2-in. If a grabhook already is secured to the chain it will thread through the unit. Hinge-Guard load protectors also aid protective unloading.

34

Combination gas engine and chain saw has added attractions, too

This 5-hp., 29-lb. combination gasoline engine and chain saw has some added attractions. Attachments assemble quickly and convert the completely die cast chain saw to: (1) an earth auger for digging post and pole holes, boring grease traps and drainage sink beds; (2) a wood drill, using 1/4-in. to 3/4-in. chucks, for boring holes for all types of construction; (3) a concrete vibrator for fast, com-



plete compaction; (4) a concrete surfacer for smoothing hardened concrete and removing form marks and irregularities, and (5) a sump pump, which pumps around 5,000 gal. per hr., for draining trenches, excavations, caissons, tunnels, sewers and rain-swamped areas. This versatile machine is the Mall 2MG, manufactured by Mall Tool Co.

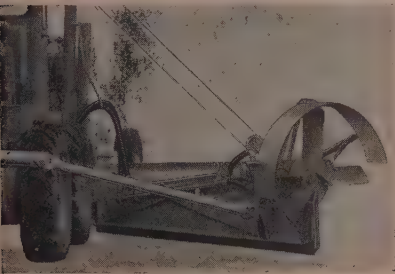
Hercules announces new cinder spreader

A cinder spreader for combatting ice and snow is the latest addition to the line of truck-mounted spreaders manufactured by Hercules Steel Products Corp. The new machine spreads full-road or half-road width at one pass and is controlled from the cab by a single driver-operator. It may also be controlled manually. Precision-control baffles keep cinders from scattering and hitting parked cars or other vehicles. Conveyor and spinner mechanisms are powered by a regular truck-transmission type power take-off, through a protected drive line and universal joint arrangement. A heavy-duty gear-reduction box completes the basic speed to power take-over. A new preheater uses the truck engine's exhaust heat to prevent large chunks of moist or wet cinders from forming next to the body conveyor chair, automatically eliminating load hangup due to freezing conditions and assuring a uniform spread of cinders. Standard hopper sizes of 5 and 9 cu. yd., with 11-ft. length, give optimum gross load on front and rear tires.

36

Propeller added to wing— makes snow fly

A Sno-Blo attachment for snow wings on Adams Motor Graders is announced by J. D. Adams Manufacturing Co. As snow is delivered off the end of the snow wing, a 52-in. propeller blows it off the right-of-way. Thus, Adams motor graders with V snow plows and snow wings equipped with the Sno-Blo attachment can completely dispose of snow falls as they occur, or the wing with blower can be used to blow away snow banks built up by plows.



The Sno-Blo attachment may be ordered as original equipment on Adams snow wings or it can be applied to any Adams wing of current design in the field. It is driven by a heavy-duty hydraulic motor, and its power is derived from the grader engine.

37

Compact transmitter weighs less than 2 lb.

A hand-sized Handie Micro-Talkie Transmitter is announced by the

Communications and Electronics Division of Motorola. It is a compact unit, weighing under two pounds, and it may be operated very easily for communication within its tested optimum range up to five miles. The instrument has a power output of 20 to 40 milliwatts and is designed to operate in the 152-174 mc. frequency band. The complete transmitter, including self-contained dry batteries and microphone, is contained within a sturdy seam-welded housing finished with a gray baked enamel.

38

Structural plastic weighs 4 oz. per square foot

Fiberglass reinforced sheet plastic weighing only four ounces per square ft. is available at Plexolite Sales Co. It will transmit up to 80% of softly diffused light when used for skylights, and may be obtained in five different colors. The material will sneer at all weather conditions, is non-corrosive, and may be sawed, nailed or drilled.

39

A sharpener for the teeth of circular saws

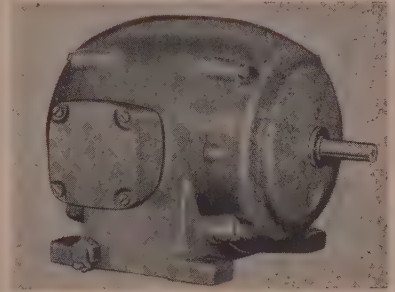
Circular saws can be precision filed by anyone with the use of a Speed Circular Saw Sharpener. The sharpener is clamped to the work bench, the saw is placed upon it with the

proper mandrel, and after two simple adjustments filing begins. The entire job takes only twenty to thirty minutes. Cross cut, hollow ground combination, and rip saw blades can all be sharpened. The sharpener is fully guaranteed by the manufacturer, Speed Corp.

40

Totally-enclosed motor for explosion-proof service

A totally-enclosed motor is available for service where dampness, dust, fire hazards and corrosive fumes are prevalent. This machine, Type SS, has been approved for explosion-

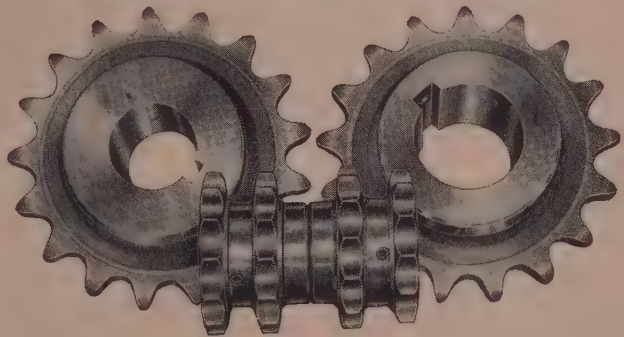


proof service by Underwriters' Laboratories, Inc. It is self-cooling, eliminating the use of an exterior fan and heat-dissipating fins. This totally-en-

**NEED
SPROCKETS?**

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Sprockets for Mill and Roller Chain



YUBA-Schrock sprockets are flame cut from steel plate. Patented cam-generated action produces sprocket teeth guaranteed to fit standard mill or roller chain with wearing qualities equal to sprockets made by other manufacturing methods. "Special" sprockets with "non-standard" number of teeth readily cut to order without penalty charges. Most emergency orders filled in 24 hours.

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NOW for quotations and deliveries.**



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Pulley and Sprocket Dept.

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Stockton Iron Works - Stockton 7-7091

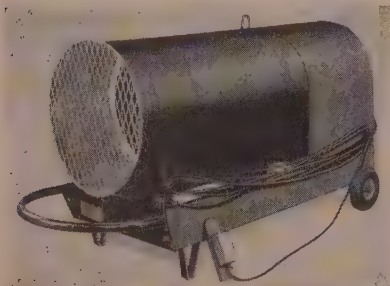
47

closed motor has a drain plug which will release water from the interior while still retaining its explosion-proof characteristics. In that way, the manufacturer has made it possible to overcome the moist condensation which may cause grounding of the motor. These new motors are immediately available in a range from $\frac{1}{3}$ to 2 hp. (also fan-cooled to 75 hp.), and later will be produced in larger ratings. Manufactured by U. S. Electrical Motors, Inc.

41

Air heater for cold weather jobs

A portable oil-fired heater called Eco-Temp Super Air Heater has been recently developed for cold weather



jobs. This machine delivers 375,000 Btu's at 2.75 gal. per hr., providing

3,680 cfm., 240 degrees F. temperature rise. The manufacturer claims that the unit gives perfect combustion resulting in no soot, smoke or odor because it is fired by a new principle of combustion. The 325-lb., easily-manuevered unit blows out heat in a straight line from a 22-in. air outlet opening. It is equipped with a thermostat for automatic operation. Contractors will find the machine well suited for drying plaster, paint, concrete and other surfaces during construction; for space heating to reduce the cold in unheated buildings, or for preheating of engines and equipment. Its drum or storage tank stores fuel on the job. Manufactured by Arthur C. Baumann.

42

Strength and flexibility highlight this hardboard panel

A new high-strength hardboard panel, extremely flexible and with a highly durable polished surface particularly adaptable to concrete forms, is in volume production at Anacortes Veneer, Inc. According to the company's announcement, laboratory tests show that the panel has a degree of shock resistance unparalleled in the board field, and that a strip of board $\frac{1}{8}$ in. thick can be bent into a tight circle about the size of a hatband without cracking the surface. The volume production has made it

possible to offer the special hardboard for the same price as standard hardboards. Armorboard is the appropriate name for this new wood product. It is made in $\frac{1}{8}$, $\frac{3}{16}$ and $\frac{1}{4}$ -in. thicknesses.

43

Hole-A-Minit digs just that fast!

Hole-A-Minit is a post hole digger that digs a hole up to three feet deep in hard or soft soil in just one minute. The instrument operates electrically from a $\frac{1}{2}$ -in. or larger drill. In operation, it has a grinding action which powders and breaks up the earth as



it digs. The Hole-A-Minit, manufactured by Eugene John Freeman & Co., is a valuable, time-saving assistant in construction and maintenance. It is available in a wide range of diameters.

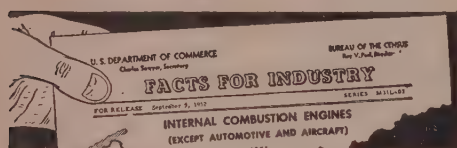
44

Burrs out in a hurry with new pipe reamer

Here's a new spiral reamer that cuts inside burr from pipe and conduit clean and fast with minimum effort and pressure. Reamer capacity is $\frac{1}{8}$ to 2 in. Also useful for cutting



holes in sheet metal. Long tool life is assured by high-quality tool steel construction. Made by Ridge Tool Co.; known as the Ridgid Spiral 2-S Pipe Reamer.



**Proof of
Top Preference
for**

WISCONSIN HEAVY-DUTY Air-Cooled ENGINES

Based on data contained in a "Facts for Industry" report released on Sept. 5, 1952 by the U. S. Bureau of the Census, an aggregate average of 50.61% of all carburetor type internal combustion engines produced during 1950-'51 within an 11 to 175 cu. in. displ. range (approx. 3 to 40 hp.) were WISCONSIN HEAVY-DUTY AIR-COOLED ENGINES (exclusive of aircraft, automotive, outboard marine and "captive" engines built by various manufacturers for use on their own equipment).

Here is positive proof of top preference for Wisconsin Engines both by original equipment manufacturers and users of power-operated equipment. Proof of constantly growing recognition of the special adaptability of these fine engines to fit both the machine and the job. Proof of heavy-duty dependability and trouble-free air-cooling under weather and climatic extremes.

Wisconsin general-purpose Air-Cooled Engines have been pre-judged and pre-selected by more power-wise purchasers than ALL other makes of engines combined, within a 3 to 40 hp. power range. Perhaps it's your turn to specify "Wisconsin". Descriptive literature and engineering data on request.



WISCONSIN MOTOR CORPORATION
World's Largest Builders of Heavy-Duty Air-Cooled Engines
MILWAUKEE 46, WISCONSIN

A 7388-1/4

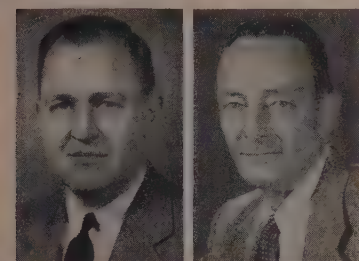
NEWS of DISTRIBUTORS AND FACTORY BRANCHES

West Coast rep. for Marlow Pumps

Marlow Pumps of Ridgewood, N. J., has appointed W. M. Coopman district engineer to cover its newly-created territory of Southern California, Nevada, Utah and Arizona. Coopman was former division chief engineer for Republic Supply, and his new headquarters for Marlow Pumps are in Burbank, Calif.

Isaacson Truck Co. opens for International Harvester

Isaacson Truck Co., a new organization which recently purchased International Harvester Co.'s motor truck retail outlets in Seattle and Tacoma, is headed by Robert W. Isaacson. Isaacson is a son of the late John Isaacson, founder of the Isaacson Iron Works, Seattle. The transfer in ownership is said to be in accord with Harvester's policy of encouraging sale of its product through local independent dealerships. International's Portland district sales office now handles wholesale distribution of its motor truck sales, formerly handled in Seattle.



Isaacson

Roden

Truscon Steel appointment

G. R. Roden is the new Pacific Coast manager for Truscon Steel Division of Republic Steel Corp. He will direct Truscon's sales in Los Angeles, San Francisco, Seattle, Portland, Phoenix and Salt Lake City. Roden, an employee of the steel company since 1932, was formerly district sales manager of the Los Angeles office, and will continue to maintain headquarters in that city.

Foulger Equipment Co. adds to sales staff

Harold (Hal) McGee is a new member of the sales staff of Foulger Equipment Co., Salt Lake City.

Distributor for Peterbilt Motors

Peterbilt Motors Co., Oakland, announces the appointment of Kaer Truck & Equipment, Inc., as its new dealer for Peterbilt trucks, parts and service in the Denver area. Hans Kaer, long active in the Western

trucking industry, heads the dealership. He formerly was with the Fruehauf Trailer Co.

Sales mgr. for Atlas Mineral Products Co.

Kenneth Snyder is Western division regional sales manager for Atlas Mineral Products Co., a new post created as part of the company's expansion program.

Hensley Equipment expands

Hensley Equipment Co. announces \$50,000 investment in construction of new plant facilities and offices at 816 98th Ave., Oakland, adding 6,000 sq. ft. of floor space giving them 12,000 sq. ft. of plant under cover. New area will house general offices, presently located in San Leandro, parts facilities, and show room area for display of equipment, which includes dozer and scraper accessory equipment for earthmoving and land clearing operation. Manufacturing and heat treating operations will continue to be conducted in adjoining property at 828 98th Ave. General offices will be for Hensley Metal Treating Corp., Hensley Equipment Co., Roller Division, as well as parent company. The move to new quarters takes place in January with the addition of six more employees.

New rep. for M. W. Saussé & Co.

M. W. Saussé & Co. now has Sanford's Mechanical Equipment Co., Oakland, Calif., as its exclusive representative in northern California and Nevada. E. C. "Sandy" Sanford operates the new distributorship.

Fuller Co. opens in Seattle

Fuller Co. announces the opening of an office in Seattle. Marius W. deBruyn, representative, will serve customers in the Northwest.

Welding distributor

Gibson Welding Supplies, Spokane, now distributes for Nelson Stud Welding, division of Gregory Industries, Inc., Lorain, Ohio. Territory includes eastern Washington and northern Idaho, where users will be able

to buy or rent Nelson stud welding equipment. Vernon B. Finch is president of the Spokane firm, and John R. Morrill is Gibson's partner and general manager.

Allis-Chalmers appoints Oregon rep.

Allis-Chalmers Manufacturing Co.'s new sales representative in the Portland district office is Kenneth J. Fletcher. Fletcher, who graduated in electrical engineering at Oregon State College, recently completed Allis-Chalmers' graduate training course.

Watson & Meehan opens up in Redding, Calif.

Watson & Meehan, Cummins Diesel dealer for Northern California and Nevada, has this new parts store in



Redding, Calif., conveniently located at 1127 Parkview Ave., one block east of U. S. 99. J. R. (Dick) Canny will continue to be in the Redding territory in sales and application engineering, and Carroll Reed handles parts sales and exchanges at the new store. Watson & Meehan specializes exclusively in selling, installing and servicing Cummins Diesel engines. The Redding headquarters handles a complete line of Cummins parts, plus many exchange units such as fuel pumps, fuel pump towers, distributor discs and pressure pumps.

Lang Co. sales engineer dies

John Ellis Lattin, sales engineer and consultant at Lang Co., died November 1 in Salt Lake City. Lattin had been with Lang Co. since 1929. He was 68 at the time of his death.

NEW REGIONAL HEADQUARTERS and service depot for White Motor Co. is this building at Fifth and Brannan streets in San Francisco. Constructed by tilt-up of precast concrete panels, the structure gives White 37,000 sq. ft. of space for offices, showroom, and service facilities. It is adjoined by over 100,000 sq. ft. of asphalt paved yard. Work on the new building was undertaken in July by Haas & Haynie, San Francisco contractor who completed the job in 91 working days. Plans were prepared by Harlan E. Rathbun, Denver architect, and Thomas F. Chace, San Francisco structural engineer.



NEWS of MANUFACTURERS

Koehring chief engineer

Koehring Co. announces the appointment of John W. Poulter as chief engineer, a post formerly filled by E. O. Martinson, who earlier was named vice president in charge of engineering for Koehring and its subsidiaries. Poulter, who has been with the company since 1931, is responsible for the invention and development of the Mud-Jack, a machine which provides an inexpensive method of stabilizing subgrades under concrete slabs.

U. S. Pipe & Foundry executive

Charles S. Northern is new vice president in charge of sales for United States Pipe & Foundry Co., Burlington, N. J. He succeeds D. B. Stokes, who is retiring after being with the company for 42 years.

Pabco names gen. sales mgr.

W. H. Young is the newly appointed general sales manager of the building materials division of Pabco Products, Inc. Young has had many years of experience in the merchandising and sale of building materials, and for the past seven years he has

been an executive with a San Francisco construction firm. Under Young's leadership the company plans further expansion of its merchandising service to include all of its building materials customers. Young succeeds Russell R. Galloway, who was transferred to another division.

W. H. Young
(see item above)



American Hoist & Derrick Co. appointment

James F. Bishop, secretary-treasurer of American Hoist & Derrick Co., has been appointed its general manager. Bishop has been with the company for 30 years and will continue his duties as secretary-treasurer.

Major changes at U. S. Steel

Benjamin F. Fairless, chairman of the board and president of United States Steel, announced the election of Clifford F. Hood to the presidency of the corporation. He also becomes a member of the finance committee.

Fairless will continue as chairman of the board and chief executive officer. The second major change was the appointment of Walter F. Munford to the presidency of American Steel & Wire Division of the steel concern.

Hood joined American Steel & Wire in 1917. In 1935 he was made vice president in charge of operations of American Steel & Wire and became president in 1938. He became president of the former Carnegie-Illinois Steel Corp. in 1950, and when it became part of U. S. Steel the next year he was made an executive vice president. Munford has been with American Steel & Wire since 1923. He was elected vice president in charge of operations in 1950.

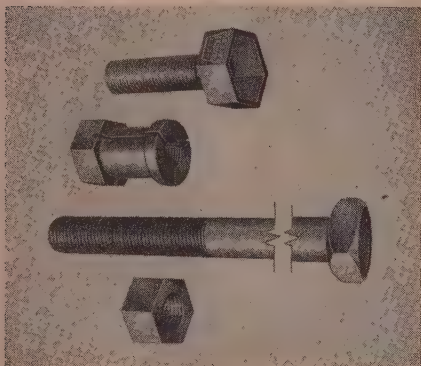
Cummins promotion

E. D. "Don" Tull holds the newly created position of vice president and general manager of Cummins Engine Co., Inc. With the company since 1928, Tull was named vice president of personnel and plant in February and was recently elected to the board of directors.

John E. Jackson president of AISC

John E. Jackson, president of Pittsburgh-Des Moines Steel Co. since 1939, is the newly elected president of the American Institute of Steel Construction, succeeding R. D. Wood, chairman of the Mississippi Valley Structural Steel Co., Chicago. Jack-

NEW QUICK-ON TRACK TENSION BOLT PARTS



SBM-No 8
QUICK-ON
(U. S. Pat. No.
2506619)

No. 808
ADJUSTING
NUT

No. 801
TENSION
BOLT
(37 1/4" long)

No. 802
SPRING
TENSION
NUT

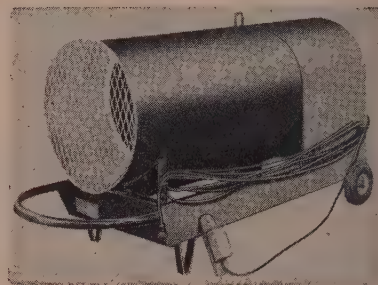
...for D8's only

SILVER BOOSTER now gives you a complete "package" of tension bolt parts. Keep one of these Quick-On emergency kits on hand for every D8 . . . and guard against those costly delays due to broken tension bolts. Quick-On bolts can be installed right on the job! Saves you 6 to 8 hours on every breakdown. Order from your tractor dealer today or write direct. Immediate delivery.

SILVER BOOSTER MANUFACTURING CO.

132 W. VERDUGO AVE., BURBANK, CALIFORNIA

NEW SUPER AIR HEATER GIVES MORE HEAT AT LOWER COST



"ECO-TEMP" Portable Oil-Fired Unit

Delivers 375,000 BTU's on 2.75 gallons of No. 2 fuel oil per hour. Perfect combustion—no soot, no smoke, no odor. Instant heat—240° F. temperature rise. Easily moved on semi-pneumatic rubber tired ball bearing wheels. Oil is drawn through hose direct from separate drum or storage tank. Uses 110 volts, 60 cycles, single phase. Strong, durable steel construction. 35" high, 64" long, 24" wide. Weighs 325 lbs.

ARTHUR C. BAUMANN, Mfr., 7019 Grays Ave., Phila. 42, Pa.

Also sold by:

Western Machinery Co.
Salt Lake City - Denver

Huebner Machy. Supply Co.
Saginaw, Mich.

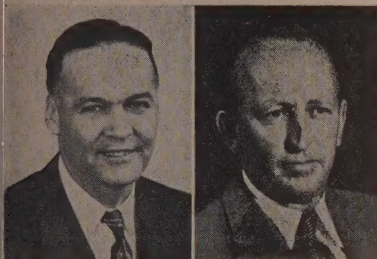
Construction Equipment Co.
Spokane, Wash.

Schuster Equipment Co.
Detroit, Mich.

on, a member of the Institute's board since 1947, served as first vice president for the preceding two years. He joined Pittsburgh-Des Moines in 1924 as a construction engineer.

Conway and Chadwick promoted by Koehring

John S. Conway and John E. Chadwick have been promoted at Koehring Co. Conway, formerly general sales



Conway

Chadwick

manager, is now vice-president in charge of sales, filling the vacancy created earlier this year when Julien R. Steelman became president. He joined the company in 1941 and became general sales manager in 1948. Chadwick, who has taken over Conway's former position, came to Koehring in 1945 and was assistant sales manager prior to his promotion.

J. A. Robinson sales manager for Viber Co.

Viber Co. announces the appointment of J. A. Robinson as sales manager. Robinson, an electrical engineer, formerly was with McGraw Hill Co. and General Electric. He will work with Viber's distributors throughout the nation, with emphasis on Eastern markets for the company's high frequency internal and external vibrators.

Cook Bros. Equipment Co. expands

Cook Bros. Equipment Co., manufacturers of heavy duty trucks and truck equipment, announce formation of their Crane and Shovel Equipment Division. The new division will handle Cook Bros. series "MC" trucks, which are crane and shovel carriers. Robert H. Fox has been appointed its sales director.

Bushwacker appoints sales mgr.

Vernon Mandt is now sales manager of the Bushwacker Div. of American Steel Dredge Co., Inc., Fort Wayne, Ind. Mandt was formerly sales manager of Mandt Manufacturing Div. of Pettibone-Mulliken Corp., and founder of Mandt Manufacturing Co.

AITC executive

Frank J. Hanrahan is the newly appointed permanent executive vice president of American Institute of Timber Construction, Washington,

D. C. Hanrahan formerly was chief engineer of the National Lumber Manufacturers Association where he was responsible for the development of "National Design Specification for Stress-Grade Lumber and Its Fastenings." In addition, T. C. Combs, president of the Arch Rib Truss Corp., Los Angeles, serves as secretary-treasurer of this technical organization for the business of engineered timber construction.

ADDITIONAL CLASSIFIED

See Also Pages 160, 161

WANTED

CATERPILLAR DIESEL ENGINE for use in 60 tractor complete with reduction gears. Also interested in 60 Cat. with this engine already installed. Motor of primary interest. Also interested in buying used corrugated iron roofing in good shape.

H. H. PETERSON & SONS, INC.

Route 4, Box 546, Chico, California. Phone 1291-M

FOR SALE

90 CARRYALLS—LeTourneau, LS, LP, Wooldridge, BBU, BBS, TOR; Bucyrus-Erie, Garwood, La Plant-Choate.

RECONDITIONED AND "AS IS" CRANES—P&H, Byars, Osgood, Unit, Bay City, Browning, Buckeye, Bucyrus-Erie, Michigan.

THE ELLIS COMPANY

15601 S. Broadway Los Angeles, Calif. Menlo 9-1177 P. O. Box 229 Gardena, Calif.

ROADS

bad

MAKE THEM

good

WITH THE NEW



...THE SMALL BITUMINOUS MIXER THAT MEETS THE NEED FOR ALL MAINTENANCE AND SMALL PAVING JOBS

see your B-G distributor or write

Barber-Greene
AURORA, ILLINOIS, U. S. A.

**CONCRETE
TILT-UP
Construction
Saves Time,
Money and
Material**



TILT-UP, the fast and economical method of concrete construction was used in the Luthe Hardware Co. warehouse in Des Moines—covering more than two acres.

Tilt-up buildings are firesafe, decay-proof and neat in appearance. Modifications of one story or more. It reduces form building to a minimum.

Wall panels are cast flat on the concrete floor with only edge forms—and then tilted up into position with power cranes. Cast-in-place piers and beams tie the panels into one unit.

Tilt-up construction is adaptable to individually designed or standard build-erate first cost, long life and low maintenance make them true low-annual-cost construction. Write for free technical bulletins, distributed only in U. S. and Canada.

Photos show 5½-ton wall section being tilted into position and completed building. Engineering and construction by The Weltz Company, Inc.; Brooks-Borg, architects, consultants on design.

PORTLAND CEMENT ASSOCIATION

816 W. Fifth Street, Los Angeles 17, Calif.

A national organization to improve and extend the uses of Portland cement and concrete . . . through scientific research and engineering field work.

Space is sold as advertisers' inches. All advertisements in this section are 1/8 in. short of contracted space to allow for borders and composition.

CLASSIFIED SECTION

Rates are \$8.50 a column inch. Copy should be sent in by the 20th of preceding month if proofs are required; by the 23rd if no proofs are required.

LIQUIDATING JOINT VENTURE

Equipment for Sale — All 1951 Models

- 3—DW 20 CATERPILLAR**
Tractors & Scrapers
- 1—LARGE BRISCOE DITCHER**
(For 4, 5, & 6 foot bottom canals)
- 1—SMALL BRISCOE DITCHER**
(For 2 & 3 foot bottom canals)
- 1—TD 9 INTERNATIONAL**
Shovel Dozer
- 1—210 CU. FT. SCHRAMM COMPRESSOR**
on 4 pneumatic wheels
- 1—210 CU. FT. INGERSOLL-RAND COMPRESSOR**
(Rotary Type)
- 1—300 AMP HOBART COMPRESSOR**
on 4 pneumatic wheels

This equipment can be inspected at our Yard at Moses Lake, Wash.

MINNIS & SHILLING and UNITED CONCRETE PIPE CORPORATION
Box 906 • Moses Lake, Wash.

BARGAINS!

- 3—Euclid End Dumps,
Model 2FD (each) . . . \$ 9,500.00
- 1—D8 Cat, Angle Dozer,
2 PCU, S/N 2U7054 . . . 11,500.00
- 1—500 CFM Cat Power
Portable LeRoi
Compressor 2,500.00
- 1—500 CFM Cat Power
Portable C. P.
Compressor 5,000.00
- 1—500 CFM Cat Power
Portable Worthington
Compressor 5,500.00
- 1—315 CFM Herc Diesel
Portable Sullivan
Compressor 3,500.00
- 1—500 CFM V-Type Electric
Stationary Compressor 5,000.00
- 4—4 cubic yard Blaw-Knox
Roller Bottom Concrete
Buckets (each) 400.00
- 10—FM3—6' Change
Wagon Drills, like new—
(each) 2,000.00

Above equipment
F.O.B. Newport, Washington

ALBENI CONSTRUCTORS
P. O. BOX 519
NEWPORT, WASHINGTON
Phone 275

WILLIAMS "Super-Hi" Tensile Steel

CONCRETE FORM HARDWARE
CLAMPS — TIE RODS — COUPLINGS
AND PIGTAIL ANCHORS

Greater Safety — Less Weight to Handle
Investigate Williams Economy

WILLIAMS FORM ENGINEERING CORP.
1501 Madison Ave., Grand Rapids 7, Mich.
Phone 5-9209
Western Branch—Phone TW 6453,
2914 N. Lombard, Portland 17, Ore.

FOR SALE

**10 TON WHITE 2500
GALLON WATER WAGON**

Model 1064, Serial No.
301920 — Rear Axle, Tim-
ken Model SD 353-W-X-7
— Cummins HB Engine

Contact:

**JOHNS-MANVILLE
PROD. CORP.**
LOMPOC, CALIFORNIA
ATT.: F. E. HENDERSON

FOR SALE: MOBILE INDUSTRIAL STEAM CLEANING PLANT

Slightly used Marlbury Model 522 Comb. Steam
Cleaner, 500-gal. cap. Portable, on steel base, mtd.
on '37 GMC truck, low mileage; 3 nozzles, 250 ft.
steam hose. \$2,750 f.o.b. S. F., includes vehicle.
L. V. HUBER
2340 Van Ness, San Francisco PRospect 5-6116 (Eve.)

FOR SALE

3 LeTourneau Model D-Roadster
Tournapulls (powered with GMC
471 diesels engines. Excellent
condition.

Forced to sell due to ill health.

Contact

PAUL CLONTZ

Kimberly, Idaho • Phone: 159 J

WANTED:

Hammerhead crane similar to Colby or Brute
crane. Four to six ton capacity with 85 to 95
foot boom.

L. D. McFARLAND COMPANY
Sandpoint, Idaho

STOP that WATER

With FORMULA NO. 640, a clear liquid which penetrates
1" plus in concrete, brick, stucco, plaster, etc. Seals out
water, dirt. Holds 20' head. Use outside and in. Preserves
all absorbent materials. Sold 14 years. Quick, economical,
sure. \$3 in 55's. Free sample. See Sweet's.

HAYNES PRODUCTS CO., OMAHA 3, NEBR.

SAVE MONEY ON THIS EQUIP.

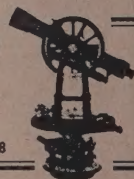
24 x 36 Lippmann Grizzly King jaw crusher,
feeder and power unit • 20 x 36 Universal
jaw crusher • 3/4-yd. 10-B shovel.

All above equipment in good shape.

RALPH C. STEELE
1190 Columbia St., Salem, Ore., Ph. 3-5471

SOLD • RENTED • REPAIRED

Transits • Levels
Steel Tapes • Compasses
PORTLAND INSTRUMENT CO.
334 S.W. 5th nr. Stark
PORTLAND 4, ORE., AT 3598



STEEL SHEET PILING

LARGEST RENTAL STOCKS IN U.S.

The exact lengths and sections of Steel Sheet
Piling to meet all needs—shipped "FASTER
From FOSTER." RENT: Corrugated Steel
Piling, File Hammers & Extractors.

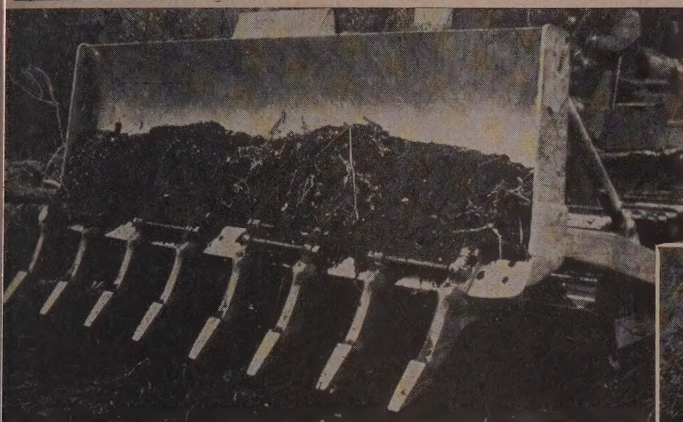
• RAILS • PIPE • WIRE ROPE

L.B. FOSTER co.

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



REMOVABLE CLEARING UNITS and BRUSH RAKES for dozer blades



Easily and quickly mounted. Turns dozer into efficient clearing blade for uprooting brush and thoroughly combing roots and debris out of soil. Stacks brush for comparatively dirt-free burning.



HENSLEY REPAIR PARTS for Caterpillar Tractors



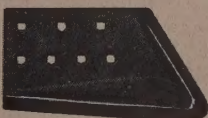
5F-9872-H
D-8 Water Pump
Impeller
(Brass).



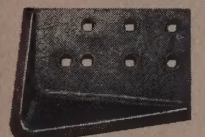
5F-9873-H
D-8 Water Pump
Shaft.



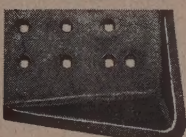
4F-6907-H Hensley
End Bit for D-7 and D-8
Caterpillar Angle Dozer.



4F-6908-H Hensley
End Bit for D-7 and D-8
Caterpillar Angle Dozer.



4F-6890-H Hensley
End Bit for D-7 and D-8
Caterpillar Straight Dozer.



4F-6889-H Hensley
End Bit for D-7 and D-8
Caterpillar Straight Dozer.



D-7 and D-8 Rollers
complete or any
component part.



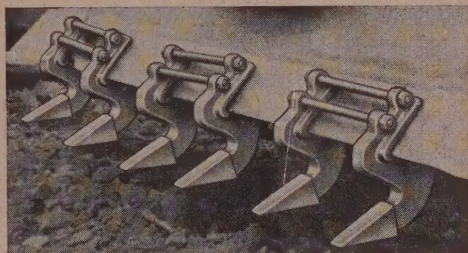
MOTOR GRADER PARTS



1. 101-H (5B-946) Scarifier Point. 2. 102-H (5B947) Scarifier Shank 3". 3. 1D-3537-H Wedge Pin for Scarifier Block. 4. 3F-2819-H Overlay End Bit for No. 12 Grader. 5. 3F-2820-H Overlay End Bit for No. 12 Grader.

RIP and DOZE at the same time with Removable DOZER RIPPERS

Rip through concrete, hardpan, blacktop, red rock or other hard surfaces. 12 models.



Removable Carryall SCRAPER RIPPERS

... for all dirt-holding scrapers with independently operated apron or door.



Write for **FREE CATALOG**

HENSLEY EQUIPMENT CO.

816 Ninety-eighth Avenue

Oakland, Calif.

**SEE YOUR DEALER
DEALER INQUIRIES INVITED!**

BACKFILL, uncompacted

Take another look at this month's cover

We think we came up with an interesting way to illustrate the theme of this month's issue. The "Review" portion of the cover shows seven views of important Western jobs that were active during 1952. Here's what they are: (1) a trimming jumbo on the Wellton-Mohawk canal job in Arizona; (2) Manitowoc shovel loading dirt on Union Pacific's big railroad relocation job in Wyoming; (3) the West's first all-welded steel viaduct going up in San Francisco; (4) Canyon Ferry Dam in Montana all lit up for night work; (5) Toketee hydroelectric plant on the North Umpqua River in Oregon; (6) the West's first natural rubber and asphalt road being laid at Los Angeles, and (7) heavy rock work for a road

relocation job near Yale Dam in Oregon.

The "Forecast" section of the cover is made up of a group of miscellaneous extracts from specs on major Western projects that will be booming in 1953. If you can identify any part of this "blueprint" and tell us what job spec it came from, we'll be happy to send you a free autographed copy of this month's cover.

You might figure pigeons into your next bid

It's not too uncommon for Western jobs to be at sites where no man or beast can go without some difficulty. This factor often has to be kept in mind when bids are being prepared.

Last year, we ran an article titled, "Helicopter hops floods and saves a dam job" (May issue, page 65). This year it's possible we might run one called, "Pigeons hop floods (etc.)." If we do, it will be the same job—the Topa Topa Dam project in Southern California, to be built by the United Water Conservation District.

No telephone line exists in the rugged area where this dam is being built. Last spring, Topa Topa diamond-drill crews were cut off entirely from the outside world when heavy rains swelled streams and washed out the project's only access road. The helicopter arrived after a few days but the situation was becoming serious.

This year, when the rains come, workers at the site will be able to maintain a more relaxed attitude toward the possibility of being marooned, thanks to pigeon-fancier Selden Rockwell, a UWCD employee. He came up with the obvious idea.

So, this year, seven pigeons are on hand sidewalk-superintending the exploration work at the Topa Topa Dam job—and waiting for their chance to wing any urgent message back to civilization.

Like to join the artillery?

If you have a yen to operate a howitzer, the Colorado State Highway Department may have a place for you.

Here's why. The department is experimenting this year with a technique for controlling snow slides on mountain pass highways. Two howitzers (75 mm. and 105 mm.) have been borrowed from the state's National Guard. The cannons will be mounted on 11,992-ft. Loveland Pass west of Denver for the sole purpose of shooting down threatening avalanches.

The department tried the same idea

some years ago without much luck. Evidently, shell must be fired into the snow at just the right places and at certain times in order to make avalanches "run." More scientific data promise some success this season.

"Eisenhower stands on wood"

That's the title of a tongue-in-cheek press release received from the National Lumber Manufacturers Association.

We are told that nearly a million board feet of lumber will support on-lookers, dignitaries and the President-elect during inaugural ceremonies January 20.

And, significantly, the nation's lumbermen are quoted as believing "the new president will thus be able to begin his term in office on a strong, sound platform."

It is pleasing to note that economy will be achieved by this historic use of wood (the press release cites first-cost economy and the fact that all the wood can be used again).

But we are somewhat disappointed that press-agentry fell short. Editors can prepare more meaningful stories if more facts are available. We would like to have received more data to document and enhance the significance of Mr. Eisenhower's standing on wood.

For instance, did Mr. Truman stand on wood to be inaugurated? Did Mr. Roosevelt? . . . Mr. Hoover? . . . Mr. Washington? If they did (or, just as important, if they didn't!) what effect did it have on the successes of their administrations?

Also, since we are told that Southern pine and Douglas fir are two of the five woods to be used, another obvious extension of the subject would have been appreciated. Will the platform be so constructed that the President-elect will stand partly on "Southern" pine? And what will be his position relative to the "Douglas fir?"

Possibly, the NLMA is prepared to supply us with these facts. Otherwise, we may not be able to use the story.

Tunnel men available

Seven inhabitants of the Washington state penitentiary escaped Dec. 22 through a 200-ft. tunnel dug 15 ft. under a wall. We know of at least three going tunnel jobs in the West where they could be used. So this is to let our contractor friends know that these men are free and probably looking for a place to "hole up."

COMING UP . . .

On "manufacturing" sand

"Manufacturing" sand will be required on more and more jobs as specifications for fine aggregate get tougher. Grading and blending of natural and made-sand is becoming an important part of concrete production, and represent many new problems for contractors and their superintendents. To help understand this modern construction problem, an article that discusses the "why" and the "how" of made-sand will appear in the February issue.

So you want to be a superintendent?

Read the helpful ideas from one of the "big time" superintendents who has bossed jobs of record size all over the West. A "must" article for anyone who wants to advance in the construction game. Appears in the next issue.

Airports of the future

Revolutionary ideas are not common, but a completely new concept of airport design is to be presented in next month's issue. It should stimulate thinking that might change the conventional pattern for airport runways and lead to new types of construction for all base facilities.

By THE EDITORS