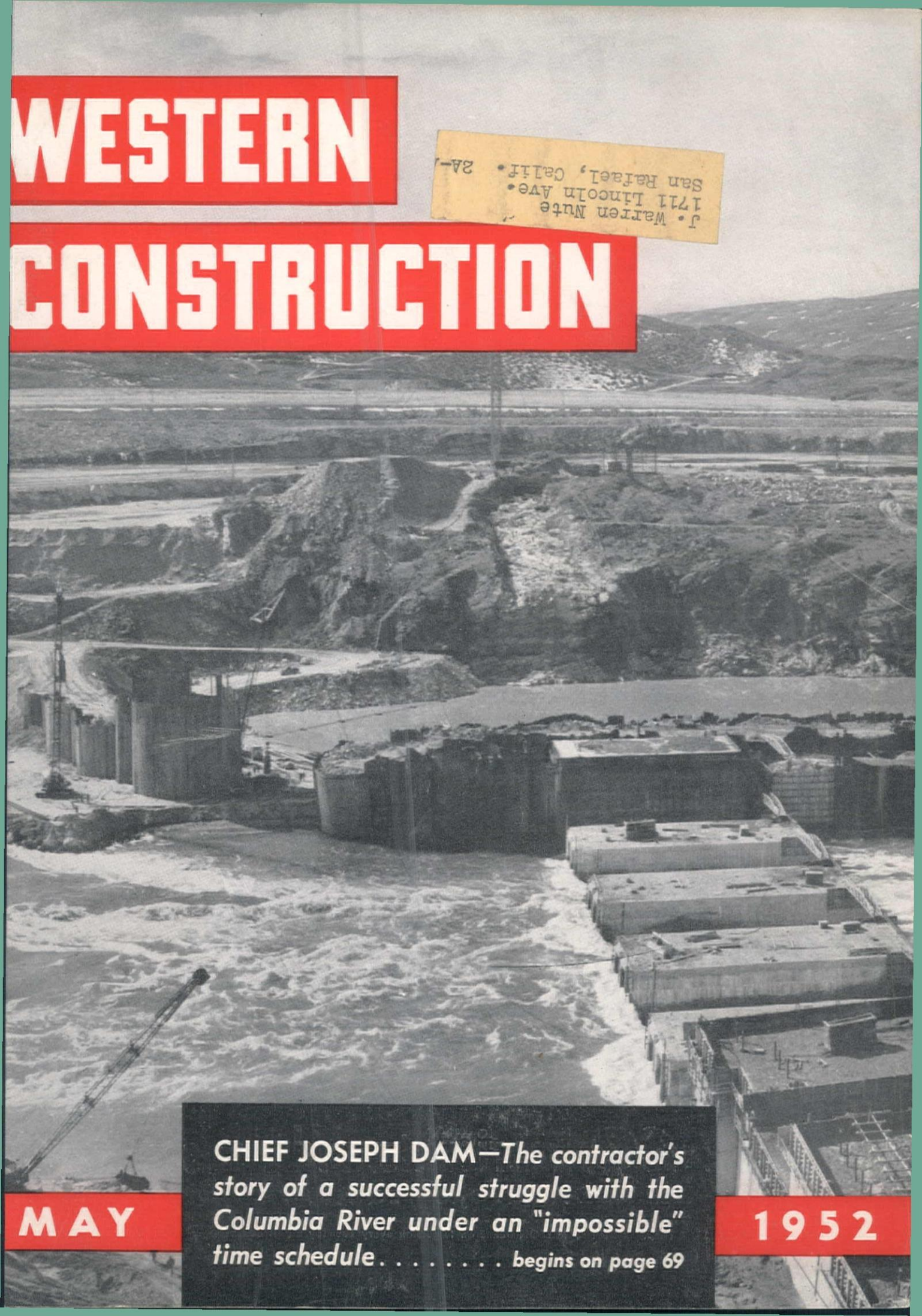
WESTERN CONSTRUCTION



CHIEF JOSEPH DAM—*The contractor's story of a successful struggle with the Columbia River under an "impossible" time schedule* . . . . . *begins on page 69*

MAY 1952

"TEXACO URSA OIL X★★ HELPS US KEEP OUR DAM WORK ON SCHEDULE"

— say Edward E. Morgan Co., Inc., and Jones & Gillis, Inc.

Construction equipment, lubricated and fueled with Texaco, at work on the Morganza embankment, part of the flood control program on the lower Mississippi. Joint contractors are Edward E. Morgan Co., Inc., and Jones & Gillis, Inc. Dirt-moving operations, started in June, 1949, call for placing 3,985,000 cubic yards of semi-compacted embankment. Equipment includes 4 draglines, 9 tractors and 53 trucks — all of which are lubricated with Texaco exclusively.

Heavy rains slowed early stages of placing nearly four million cubic yards of embankment for the Morganza Control Structure. Construction machinery was idled for days at a time. This made it vital that, when work could be resumed, there be no delays due to equipment failure.

"Diesel engines in all our earth-movers," report the contractors, "were lubricated with *Texaco Ursa Oil X★★*. They ran perfectly even under the severe conditions often imposed. We found, on this as on other jobs, that *Texaco Ursa Oil X★★* is a big help in reducing fuel consumption and keeping maintenance costs low."

Texaco Ursa Oil X★★ cleans as it lubricates. Its fully detergent and dispersive properties keep harmful carbon, sludge and gum from forming. Better compression and combustion result, wear is reduced, bearings are protected against corrosion. Engines run better; parts last longer.

Let a Texaco Lubrication Engineer tell you more about *Texaco Ursa Oil X★★* and how you can reduce your costs with the Texaco Simplified Lubrication Plan. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

☆ ☆ ☆

Make Savings Here, Too — Chassis parts last longer when protected by *Texaco Marfak*. This super-tough lubricant guards against wear and rust in the most severe service. *More than 400 million pounds of Marfak have been sold!*

Wheel bearing maintenance cost is less when you use *Texaco Marfak Heavy Duty*. It seals itself in, seals out dirt and moisture. No seasonal change required.

Crawler track bearings give long, trouble-free service when lubricated with *Texaco Track Roll Lubricant*. Protects against wear, dirt and moisture.

TEXACO Lubricants and Fuels

FOR ALL CONTRACTORS' EQUIPMENT

Faithfully yours 50 *for Fifty Years*

TUNE IN . . . TEXACO STAR THEATER starring MILTON BERLE on television every Tuesday night. See newspaper for time and station.

A PULLSHOVEL

-not just an attachment!

PERFORMANCE in the hands of leading sewer and pipeline contractors has established the Northwest Pullshovel as the standard by which other pullshovels and backhoes are measured. General shapes can be copied, but the tested know-how that delivers performance, reduces upkeep and insures output is beyond copying and results from experience only.

The Northwest Pullshovel is not just an attachment. It represents a group of features so combined that the ensemble represents an overwhelming advantage as excavation and trenching equipment.

The Northwest Pullshovel brings you proved boom design for maximum digging and better dumping ranges. You have the "Feather-Touch" Clutch Control for easier operation, the Cushion Clutch, Uniform Pressure Swing Clutches and a crawler design with demonstrated ability to stand up in the long travel service characteristic of usual pullshovel conditions.

Plan ahead and don't buy a one-purpose trenching machine.

NORTHWEST ENGINEERING COMPANY
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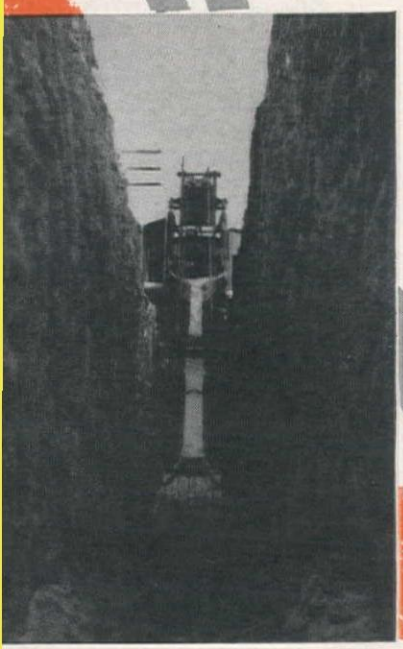

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Successful Contractors Stay Successful with Proved Equipment

WESTERN CONSTRUCTION

Volume 27 **MAY 1952** Number 5

ARTICLES

DEPARTMENTS

FRONT COVER

CLOSURE being completed for the second-stage diversion at Chief Joseph Dam. Behind this event is a story of how the contractors met an "impossible" time schedule after a cofferdam problem cut four months from the working schedule. The story, as told by the builders, begins on page 69 of this issue.

The Construction and Civil Engineering Publication of the West

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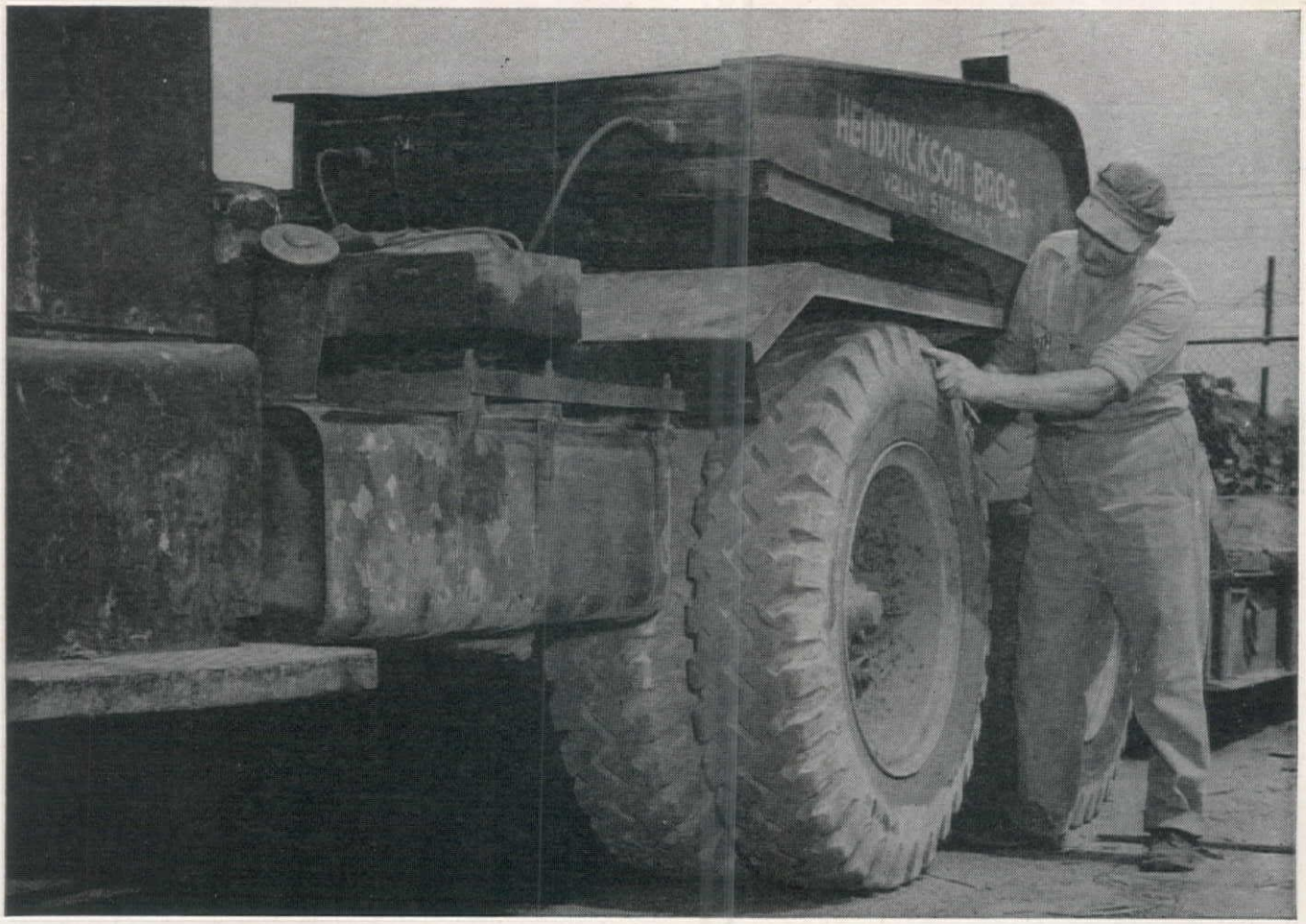
B.F. Goodrich



Off-the-road tires give general contractor better over-all service, more recaps

MAURICE HENDRICKSON (above) examines the tires on a low-bed trailer used for carrying 50 to 60 tons of heavy-duty equipment. As Motor Vehicle Supervisor for Hendrickson Bros., Inc., general contractors of Valley Stream, N. Y., it's his job to see that the tires on this company's excavating, grading and heavy construction equipment give good service and can take the rough treatment of off-the-road service.

"We have been using B. F. Goodrich tires for years," Mr. Hendrickson says, "and have found they give us better over-all service than other similar types of tires, better traction and a minimum of service trouble." And he adds: "We particularly like the greater number of B. F. Goodrich tires suitable for recapping."

Mr. Hendrickson's experience is typical of that of off-the-road operators throughout the country. They report B. F. Goodrich tires, built with the exclusive nylon shock shield, give excellent service and more recaps under the toughest operating conditions. The strong, elastic nylon cords under the tread rubber stretch together under impact, actually protect the tire body from smashing road shock. This means BFG tires wear longer, give you a 4-way saving:

(1) increased tire mileage (2) greater resistance to bruising (3) less danger of tread separation (4) more recappable tires.

Whatever your off-the-road job, there's a BFG tire designed to do it better and save you money. Hendrickson Bros., Inc., for example, uses B. F. Goodrich Rock Logger, Universal and Highway Express tires, depending on the job to be done. See your local dealer for the full story or write *The B. F. Goodrich Co., Akron, Ohio.*

"Big Red"

Choice of the Nation's Fleet Owners*

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Armston Company, W. H.	Dunedin, Florida
Armstrong Company, J. D.	Ames, Iowa
Arute Brothers	Meridan, Connecticut
Asphalt Paving Company	Jacksonville, Florida
Atkinson, Guy F.	San Francisco, California
Atlas Constructors	New York City, New York
Bair & Company, Roy L.	Spokane, Washington
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Bianchi and Co., Inc., C.	Framingham, Massachusetts
Blaw-Knox Construc. Company	Pine Bluff, Arkansas
Bloomer & Son, John S.	Appleton, Wisconsin
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Braden Constr. Company	Griswold, Iowa
Brewster & Son, Inc., G. M.	Bogota, New Jersey
Brown Brothers	Memphis, Texas
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Brown Constr. Co., G.	Glenburn, California
Brown and Root, Inc.	Houston, Texas
Broyhill & Sons, M. P.	Arlington, Virginia
Campanella & Cardi	Hillsgrove, Rhode Island
Campbell & Collins	Fargo, North Dakota
Chessher, Ben	Kingsbury, Texas
Cianchette, J. R.	Pittsfield, Maine
Clarkson Constr. Company	Kansas City, Missouri
Collins and Sons, Wm.	Fargo, North Dakota
Construction Aggregate	Newark, New Jersey
Cordell & Johnson	San Diego, California
Crawley Constr. Co., P. E.	Cambridge City, Indiana
Daufenbach, Wm.	Mankato, Minnesota
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Dickinson, W. M.	So. Charleston, West Virginia
Delta Drainage & Const. Co.	Greenville, Mississippi
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DeSalvo Construction Co.	Redwood City, California
DeShong, Leno	Plant City, Florida
Devoss Brothers	Grand Island, Nebraska
Dickerson & Winkleman Co.	Savannah, Georgia
Easley Construction Co.	Marion, Kentucky
Eckdahl, Hilding	Cumberland, Iowa
Farino Equipment Company	Jamaica, L. I., New York
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Fisher Contracting Co.	Phoenix, Arizona
Foley Brothers	St. Paul, Minnesota
F and S Contracting Co.	Butte, Montana
Fuller-Davies	Newport, Kentucky
Funderburk Constr. Company	Arlington, Washington
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Gilbert Engineering Co.	Statesville, North Carolina
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Gillissee, John and Paul	Grand Rapids, Michigan
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Granite Construction Co.	Watsonville, California
Gray, Inc., Leo C.	Dewitt, New York
Green Construction Company	Oaktown, Indiana
Griffis, Wm. C.	Bagley, Minnesota
Griffith Company	Los Angeles, California
Gurthrie Constr. Company	Spokane, Washington
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Hall, Fred	Valley Mills, Texas
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Hamann, Walter	Richardton, North Dakota
Harlan Construction Co.	Republican City, Nebraska

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Hodgman and Son, W.	Fairmont, Minnesota
Holloway and Thompson	Detroit, Michigan
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Hunt Constr. Co., Arlon	East Omaha, Nebraska
Hunter Construction Co.	Ada, Oklahoma
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James Constr. Co., Guy	Oklahoma City, Oklahoma
Jarrell, L. L.	Whistler, Alabama
Jeffers, Inc., P. R.	Toledo, Ohio
Jurgensen, John	Newton, Ohio
Kawano and Nishida	Hilo, Territory of Hawaii
Keeley Construction Company	Clarksburg, West Virginia
Kluck Construction Company	Appleton, Wisconsin
Kraus Company, Samuel	St. Louis, Missouri
Kuykendall, Crockett	Cotulla, Texas
Kuykendall, J. A.	Cotulla, Texas
Langenfelder & Son, Inc., C. J.	Baltimore, Maryland
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McKee Construction Company	Jackson, Alabama
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Millis Construction Company	Omaha, Nebraska
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Olson & Sons, G. A.	Marshall, Minnesota
Osburn & Co., Inc; H. T.	Franklin, Pennsylvania
Patterson Construction Co.	Monongahela, Pennsylvania
Perry Construction Company	Scranton, Pennsylvania
Petrillo, Inc., Edward	Yonkers, New York
Pioneer Constructors	Tuscon, Arizona
Pohl Constr. Co., Jos. L.	St. Louis, Missouri
Pool Construction Company	Shawnee, Oklahoma
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Pullen and Owens	Nashville, Tennessee
Rankin and Williams	Pearsall, Texas
Rapone Contracting Company	Hicksville, L. I., New York
Rayn & Sons, P. W.	Janesville, Wisconsin

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Rutherford Corporation	Oakland, California
Ryan Construction Company	Evansville, Indiana
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Serafini Constr. Co., Inc.	Binghamton, New York
Savin Constr. Co., A. I.	East Hartford, Connecticut
Scheel, Ralph D.	Del Norte, Colorado
Schlessinger and Patterson	Chandler, Arizona
Schutz Contracting Co., John	Garden City Park, L. I., N. Y.
Scott, Inc., W. H.	Franklin, Virginia
Sharrock & Pursel	Casper, Wyoming
Silver State Constr. Co.	Fallon, Nevada
S & M Construction Co., Inc.	Providence, Rhode Island
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Snare Corporation, Frederick	New York City, New York
Soto Constr. Company, Jos.	San Jose, California
Steers-Grove	New York City, New York
Steinkamp, Inc., E.	Los Angeles, California
Stewart, Howard	Brookville, Indiana
Stone City Constr. Company	Bedford, Indiana
Stovall, R. B.	Dallas, Texas
Stuart, J. O. and C. M.	Washington, D. C.
Sueltenfuss, James	Blanco, Texas
Tangmo Construction Company	Missoula, Montana
Teer Company, Nello L.	Durham, North Carolina
Teichert & Son, Inc.	Sacramento, California
Tenaku, J. M.	Hilo, Territory of Hawaii
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Tortington Construction Co.	Oneonta, New York
Tower Contracting Co., Doug	Homestead, Florida
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Wright Contracting Company	Columbus, Georgia
Wright, John D.	Talco, Texas
Wyner & Company, Inc., Gil	Malden, Massachusetts
Zara Contracting Company	Hewlett, L. I., New York

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NAME	
Allen Brothers	Oliver Springs, Tennessee
A & H Coal Co.	Shinnston, West Virginia
A. & P. Mining Co.	Enterprise, West Virginia
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Blair & Oldham Construction Co.	Pound, Virginia
B & M Coal Co.	Weedville, Pennsylvania
Bolling Construction Co.	Pound, Virginia
Bortz & Bortz Coal Co.	Stoneboro, Pennsylvania
Bowling, Tyler	Bluefield, West Virginia
Brown, Earl M.	Clearfield, Pennsylvania
Calvert & Youngblood	Trafford, Alabama
Casella Coal Co.	Buckhannon, West Virginia
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Cleveland Cliffs Mining	Nashwauk, Minnesota
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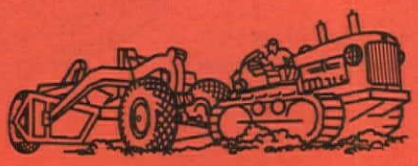
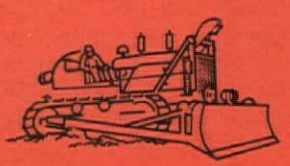
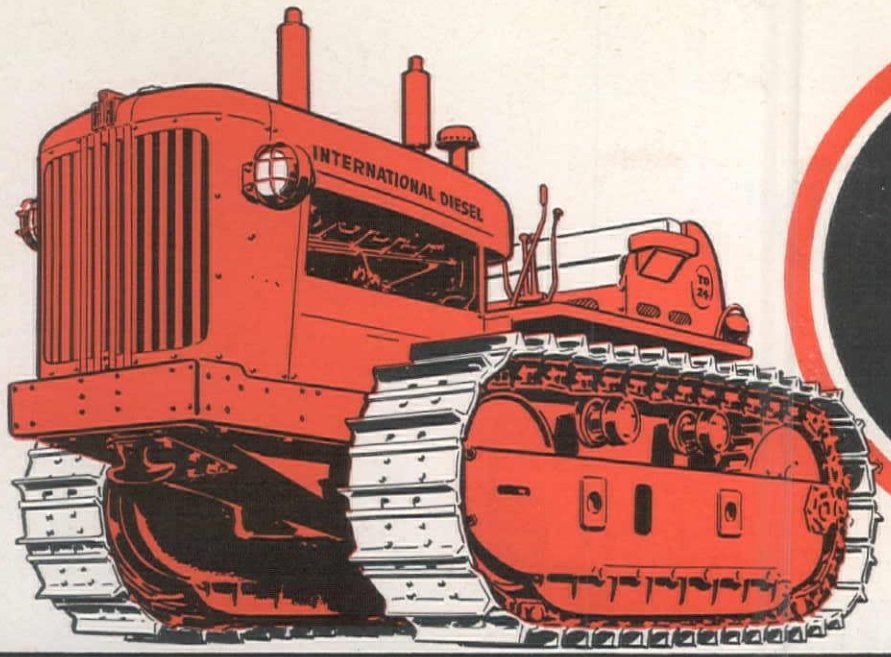
Compass Coal Co.	Philippi, West Virginia
Consolidated Coal Co.	Jenkins, Kentucky







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C. & P. Coal Co.	Fairmont, West Virginia
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Deanville Coal Co.	Weston, West Virginia
Drummond Coal Co., H. E.	Jasper, Alabama
Ford & Gaskill	Greensboro, Pennsylvania
Galloway Coal Mining Co.	Carbon Hill, Alabama
Georgia Kaolin Co.	Atlanta, Georgia
Greasy Ridge Coal Co.	Ironton, Ohio
Hanna Coal Co.	Adena, Ohio
Hanna Co., M. A.	Hibbing, Minnesota
Hazelwood, George F.	Cumberland, Maryland
Imperial Coal and Construction Co.	Rupert, West Virginia
Kelly Coal Co.	Beelick Knob, West Virginia
Liles and Son, H. B.	Winona, West Virginia
Mays Coal Co.	Clarion, Pennsylvania
McCarrell & Grimes	Sanders, Arizona
McComas Berkley	Scottown, Ohio
Michigan Limestone & Chemical Co.	Rogers City, Michigan
Mottern, Harry	Liberty, Pennsylvania
Nashville Coal Co.	Nashville, Tennessee
New Shawmut Mining Co.	Weedsville, Pennsylvania
Ohio River Colleries	Columbus, Ohio
Oliver Iron Mining Co.	Coleraine, Hibbing & Va., Minn.
Pendergrass, Zeb	Rainelle, West Virginia
Phelps Dodge Corp.	Douglas, Arizona
Pickands-Mather Co.	Hibbing, Minnesota
Putman & Greene	Osceola Mills, Pennsylvania
Quinn, Ted	Sterling Run, Pennsylvania
Rardin Bros.	Akron, Ohio
R. & V. Contracting Co.	Clarksburg, West Virginia
Sanbrac Coal Co.	Pittsburgh, Pennsylvania
S. B. & S. Co.	Pottsville, Pennsylvania
Scott Coal Co.	Clarksburg, West Virginia
Shatzer, Robert	Philippi, West Virginia
Sherman, Joe	Hawthorn, Pennsylvania
Snyder Brothers	Cowansville, Pennsylvania
Stripping Contractors	Clearfield, Pennsylvania
Trolino Bros., Inc.	Mt. Hope, West Virginia
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Usibelli Coal Mines	Healy River, Alaska
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Walls & Sons Coal Co., Charles	Oliver Springs, Tennessee
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Yates Coal Co.	Ashland, Kentucky

LOGGING

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Arch Cape Logging Co.	Tillamook, Oregon
Arrow Mills	Eureka, California
Bohemia Lumber Co.	Cottage Grove, Oregon
Brown and Berri Timber Co.	Bodega Bay, California
Brown Tie and Lumber Co.	McCall, Idaho
Buck Mountain Logging Co.	Shelton, Washington
Cal-Ida Lumber Co.	Downieville, California
Cawrse Lumber Co.	Myrtle Point, Oregon

LOGGING

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Denny Logging Co.	Willamina, Oregon
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Gooch Logging Co.	Lyons, Oregon
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Hines Lumber Co.	Westfir, Oregon
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Long-Bell Lumber Co.	Vaughn, Oergon
Marenakos Logging Co.	Renton, Washington
Matheney, S. P.	Sublimity, Oregon
McCallie Logging Co., B. L.	Eugene, Oregon
McCallie Bros. Logging Co.	Lebanon, Oregon
McNutt Bros. Construction Co.	Eugene, Oregon
Michigan-California Lumber Co.	Camino, Calif.
Mortensen, Inc., Lee	Roseburg, Oregon
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N.S.P. Logging Co.	Coquille, Oregon
Opperman, Ralph	Qualala, California
Paul Bunyan Lumber Co.	Susanville, California
Portland Creek Logging Co.	Oakland, Oregon
Potlatch Forests, Inc.	Lewiston, Idaho
Rasor Logging Co.	Eugene, Oregon
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Russell & Gillette	Cle Elum, Washington
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Smith, Ralph	Tillamook, Oregon
Snoqualmie Falls Lumber Co.	Snoqualmie Falls, Washington
Stoddard, Roy	Fort Bragg, California
Sweet Brothers Lumber Co.	Eugene, Oregon
Ulrich, William	Spokane, Washington
Union Lumber Co.	Fort Bragg, California
Vosbury & White	Alsea, Oregon
Westside Lumber Co.	Tuolumne, California
Wyerhaueser Timber Co.	Tacoma, Washington
White River Lumber Co.	Enumclaw, Washington
Willamette Valley Lumber Co.	Dallas, Oregon
Wooley, Harold	Drain, Oregon

PIPELINE

NAME	
Anderson Brothers	Houston, Texas
Anderson Construction Co.	Salem, Illinois
Associated Pipe Line Corp.	Houston, Texas
Bechtel Corp.	San Francisco, California
Bishop and Lock	Dallas, Texas
Britton Contracting Co.	Washington, Pennsylvania
Burden Construction Co., O. R.	Wichita Falls, Texas

PIPELINE

NAME	
Fulton, R. H.	Lubbock, Texas
El Paso Natural Gas Co.	El Paso, Texas
Gentry Construction Co., H. L.	Jackson, Mich.
Mahoney Contracting Co.	Lansing, Michigan
Midwestern Constructors	Tulsa, Oklahoma
Morrison Construction Co.	Austin, Texas
Oklahoma Construction Co.	Dallas, Texas
Price Company, H. C.	Bartlesville, Okla.
Saigh Company, N. A.	Campbellsville, Kentucky
Smith Contracting Co.	Ft. Worth, Texas
Smith Contractor Corp.	Altavista, Virginia
Texas-Louisiana M. K.	Ft. Worth, Texas

MISCELLANEOUS

NAME	
Alaska Road Commission	Alaska
Baltimore, City of	Baltimore, Maryland
Bethlehem Steel Co.	Bethlehem & Steelton, Pa.
Commonwealth Edison Co.	Chicago, Illinois
Consumers Power Co.	Jackson, Michigan
Dane County Highway Dept.	Madison, Wisconsin
DuPont, E. I. deNemours & Co., Inc.	Wilmington, Delaware
Duquesne Light Co.	Pittsburgh, Pennsylvania
Kehaha Sugar Co., Ltd.	Kehaha, Kauai, T. H.
Lone Star Steel Co.	Lone Star, Texas
Niagara Mohawk Power Corp.	Albany, New York
Northern Indiana Public Service Co.	Gary, Indiana
Public Service Co., No. Illinois	Chicago, Illinois
Sheboygan County Highway Dept.	Sheboygan, Wisconsin
Tennessee Coal and Iron Co.	Fairfield, Alabama
Tennessee Valley Authority	Knoxville & Chattanooga, Tennessee
U. S. Atomic Energy Commission	Oak Ridge, Tennessee
U. S. Engineers	Tulsa, Oklahoma
W. Virginia State Road Commission	Charleston, West Virginia

CANADIAN CONTRACTORS

NAME	
Iron Ore Company of Canada, Ltd.	Montreal
Bell Asbestos Corp.	Asbestos, Quebec
Fraser Brace Ltd.	Montreal
Shawinigan Power, Ltd.	Montreal
McFarland Construction Co., Ltd.	Picton, Ontario
Ontario Hydro Electric Commission	Toronto
Peel Construction Ltd.	Brampton, Ontario
Carter Construction Ltd.	Toronto, Ontario
Wasson Coal Stripping	Minto, N. B.
Sten Peterson	Winnipeg, Manitoba
Bird Construction Ltd.	Regina, Saskatchewan
Morrison-Knudson (Canada) Ltd.	Vancouver, B. C.
Alaska Pine Ltd.	Vancouver, B. C.
Steeprock Iron Mines Ltd.	Steeprock, Ontario
Aluminum Co. of Canada	Montreal, Quebec
Celanese Corp. Ltd., of Canada	

***The list of TD-24 fleet owners is growing every day, as is the vastly longer list of owners of single TD-24 tractors. For this reason the above list is not complete. If you're a TD-24 fleet owner whose name is missing, we'll catch you next time.**

INTERNATIONAL HARVESTER COMPANY
CHICAGO 1, ILLINOIS

INTERNATIONAL HARVESTER

INTERNATIONAL

POWER THAT PAYS

7-yard "D" beats output of bigger crawler-scrapers

Tournapull, Carryall — Trademark Reg. U.S. Pat. Off. DP-6-A

Here's how "D" Tournapulls handle typical

Units push-load 5½ pay yards

Both Tournapulls are equipped with dozer blades. First rig loads heading away from fill with second machine pushing. When first machine is loaded, both turn, and loaded unit push-loads empty machine in direction of fill. In common earth, each "D" gets 5 to 6 pay yards in about 30 seconds and 50 to 60 ft. Both Tournapulls are loaded in 1 minute.

Deliver 32 loads each per hour

Loaded Tournapulls hustle 400' to fill, spread, and return 400' in 65 seconds. That's an average speed of 11 m.p.h. for the 800' round trip. Total cycle time averages 1.6 minutes . . . production for each unit per 50-minute hour, 160 to 192 pay yards. Rigs stay close to each other during haul so that no time is wasted waiting or positioning in the cut.

Arizona — Phoenix
ARIZONA EQUIPMENT SALES, INC.

California — Los Angeles, Bakersfield
CROOK COMPANY

Idaho — Pocatello
ROCKY MT. MACHY. COMPANY

California — Oakland
BAY CITIES EQUIPMENT, INC.

Colorado — Denver
COLORADO BUILDERS' SUPPLY CO.

Montana — Helena, Billings
MONTANA POWDER & EQUIP. CO

16,500-yd. landleveling job

Self-load topsoil on final-grading

Kohler frequently operates his 2 "D's" independently in easy-loading material and on final-grading. Handling topsoil, each rig self-loads 5 to 6 pay yards in about 30 seconds. The 2 units, working without push-cat or grader assistance, have now completed a series of 5,000-yd. to 25,000-yd. landleveling jobs in central California for Contractor Kohler.

• Doubles yds. of 11-yd. scoop at 1200′

• Equals yds. of 18-yd. pan at 2400′

Roy Kohler, prominent Clovis, California, contractor, says his 2 D Roadster Tournapulls are the most profitable units he's had in 7 years of landleveling work. Compared with crawlers, Kohler reports the *two* 122 h.p. 7-yd. Tournapulls, push-loading each other, move more material than *four* 91 h.p. crawler tractors with 11-yd. LS Carryall Scrapers.

On short 1200′ cycles, his comprehensive time-study figures show the 2 dozer-equipped "D's" averaged 30 loads, 150 pay yards an hour . . . while the 4 bigger crawlers totalled only *18* trips, an estimated *144* pay yards for the same period.

On longer 4800′ cycles, the high-speed Roadsters held their own with a fleet of *pusher-loaded* 148 h.p. crawlers and 18-yd. FP Carryalls . . . each "D" delivering a load every 6½ minutes . . . each crawler completing a round trip every 17 to 20 minutes.

Drives 165 mi. to job in 7 hours

"Tournapulls also lose little time in moving," adds Kohler. While crawlers have to be shipped by rail or truck, rubber-tired Tournapulls drive fast under their own power job-to-job . . . for example, made a 165-mile trip, from Sacramento over U. S. 99 to Clovis, in 7 hours. That's an average of over 23 m.p.h. despite heavy city and country traffic.

Ability to deliver more yards per hour . . . handle more jobs per year . . . earn more profit per job are the reasons why successful dirtmovers everywhere are turning to high-speed, electric-control Tournapulls. Ask your LeTourneau Distributor to show you what these rubber-tired "D's" can do for *you*. He'll be glad to let you study performance figures from jobs like yours, or, if you wish, arrange a demonstration on your present job.

Nevada — Reno
IERRA MACHINERY CO., INC.

Oregon — Portland, Eugene
LOGGERS & CONTRACTORS MACHY. COMPANY

Washington — Spokane, Seattle
MODERN MACHINERY CO., INC.

New Mexico — Albuquerque
ONTRACTORS EQUIP. & SUPPLY CO.

Utah — Salt Lake City
ROCKY MT. MACHY. COMPANY

Wyoming — Casper
COLORADO BUILDERS' SUPPLY CO.

only Allis-Chalmers offers you

History-Making

Tracto-Shovel

Thousands of Allis-Chalmers HD-5G 1-yd. front-end shovels are making history . . . handling an endless variety of excavating and material handling jobs faster, at lower cost than ever before.

Now . . . to meet the challenge of ever-increasing production demands, Allis-Chalmers *multiplies the scope of tractor usefulness even more.* And here's how.

The same basic design — the same versatility that made the HD-5G so useful can now be yours in 2-yd., 3-yd., and 4-yd. Tracto-Shovels. Combined with the unmatched performance of the new Allis-Chalmers tractors, they give you a real competitive advantage by bringing you a new, faster and better way of getting the job done.

A NEW ERA OF TRACTOR USEFULNESS

Pioneering New Methods — Tracto-Shovels are blazing new trails in excavating and material handling . . . doing traditional jobs in a new, better way.

A Size for Every Job — Faster, more efficient operation; at lower equipment investment.

All-'Round Versatility — Not limited to a specific type of operation. Quickly interchangeable attachments adapt Tracto-Shovels to different assignments *in minutes.* Simple truck or trailer transportation between jobs.

Built to Take It — These new Tracto-Shovels are the toughest, strongest ever built. Every part has ample size and strength to do its job.

14 different attachments

Standard buckets, heavy-duty rock buckets, rock forks, bulldozer blades, light materials buckets (up to 7 cu. yd.) . . . plus other attachments for some models.

1 yd. HD-5G	2 yd.* HD-9G	3 yd.* HD-15G	4 yd.* HD-20G
40 Drawbar hp.	72 Drawbar hp.	109 Drawbar hp.	Hydraulic torque converter drive
Dumping height (bucket hinge pin): 9 ft., ¼ in.	Dumping height (bucket hinge pin): 11 ft., 4 in.	Dumping height (bucket hinge pin): 12 ft., 8 in.	175 net engine hp.
Total weight: 16,200 lb.	Total weight: 29,900 lb.	Total weight: 40,000 lb.	Dumping height (bucket hinge pin): 13 ft., 5 in.
			Total weight: 61,600 lb.

Advantages*

...OW IN 3 NEW, BIGGER SIZES!

World's Largest Front-End Shovel — handles toughest excavating and materials handling jobs in a new, faster, better way. Standard bucket capacity — 4 yd.; light materials capacity — 7 yd.

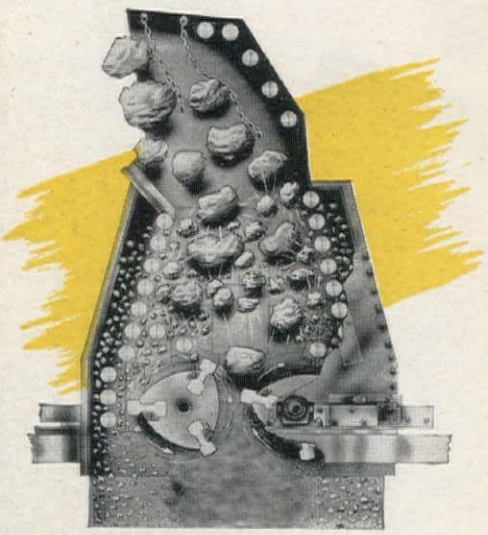
SEE YOUR **ALLIS-CHALMERS** DEALER

ARIZONA: Phoenix — Nell B. McGinnis Equipment Company. **NORTHERN CALIFORNIA: Oakland**—Buran Equipment Company; **Eureka and Willits**—Aikins and Williams Tractor Co.; **Modesto**—J. M. Equipment Co.; **Fresno**—Food Machinery and Chemical Corp.; **Salinas and King City**—Livingston Bros. Tractor Company; **Stockton, Fresno, No. Sacramento, Redding**—Moore Equipment Co., Inc.; **Mountain View**—Redwine Tractor Company; **Visalia**—Tulare County Tractor Company. **SOUTHERN CALIFORNIA: Bakersfield**—San Joaquin Tractor Company; **Los Angeles, San Diego and Riverside**—Shaw Sales & Service Company. **IDAHO: Idaho Falls and Boise**—Southern Idaho Equipment Company. **MONTANA: Missoula**—Mountain Tractor Company; **Sidney**—Northland Machinery Company; **Billings** — Seitz Machinery Company, Inc. **NEVADA: Elko**—A-D Machinery Company; **Reno**—Moore Equipment Company, Inc. **OREGON: Eugene, Roseburg and North Bend**—Farm and Industrial Equipment Company; **The Dalles**—Dielschneider Equip. Oreg. Ltd.; **Medford**—Tractor Sales and Service, Inc.; **Klamath Falls**—West Hitchcock Corp.; **Portland**—Wood Tractor Company. **UTAH: Salt Lake City**—Cate Equipment Company, Inc. **WASHINGTON: Seattle, Tacoma and Wenatchee**—A. H. Cox Company; **Spokane**—American Machine Company. **WYOMING: Casper**—Studer Tractor & Equipment Company.

"That's why Double

✓	Original schedule	400 tons per hour
✓	Daily average maintained	600 tons per hour
✓	Peak day production average	724 tons per hour

The Inside Story OF DOUBLE IMPELLER IMPACT BREAKER PRODUCTION



Approximately 50% less contact of stone on metal, because such a high percentage of material is broken in suspension.

Extremely high ratio of reduction at very low power costs.

Maximum output of cubical shaped aggregate required in so many specifications.

Minimum amount of accessory equipment such as secondary crushers, conveyors, hoppers, screens, elevators, etc.

U. S. Pat. Nos. 2373691, 2486421
Canadian Pat. No. 439371

WITH a contract for three quarters of a million tons calling for seven sizes of crushed rock ranging from asphaltic concrete stone to 3-inch base rock, Concrete Materials and Construction Company wanted a primary reduction unit that would give them big volumes of specification aggregate in one operation. That's why they selected a 5050 Cedarapids Double Impeller Impact Breaker!

Originally scheduled to produce 400 tons per hour, the big breaker consistently averaged more than 600 tons an hour of primary crushing and reached a peak average over a 20-hour period of 724 tons. The feed was quarry rock that would pass a 50-inch square opening. The output was a cubical, 3-inch minus that met the toughest specifications. No wonder more and more producers of cubical aggregate are depending on the low cost, big volume production of Cedarapids Double Impellers!

Whatever your requirements for crushing and screening or bituminous mixing equipment, be sure to talk to your nearest Cedarapids distributor. You'll be way ahead if you do.

THE **IOWA** LINE *of Material Handling Equipment Includes:* ROCK AND GRAVEL CRUSHERS • BELT CONVEYORS • STEEL BINS • VIBRATOR AND REVOLVING SCREENS • UNITIZED ROCK AND GRAVEL PLANTS • FEEDERS • PORTABLE POWER CONVEYORS • PORTABLE AND STATIONARY STONE, GRAVEL AND SAND PLANTS • REDUCTION CRUSHERS • BATCH TYPE AND VOLUMETRIC TYPE ASPHALT PLANTS • DRIERS • DUST COLLECTORS HAMMERMILLS • WASHING PLANTS • VIBRATING SOIL COMPACTION UNITS • DOUBLE IMPELLER IMPACT BREAKERS

we bought a Cedarapids Impeller Impact Breaker"

Says Concrete Materials and Construction Co.
Cedar Rapids, Iowa

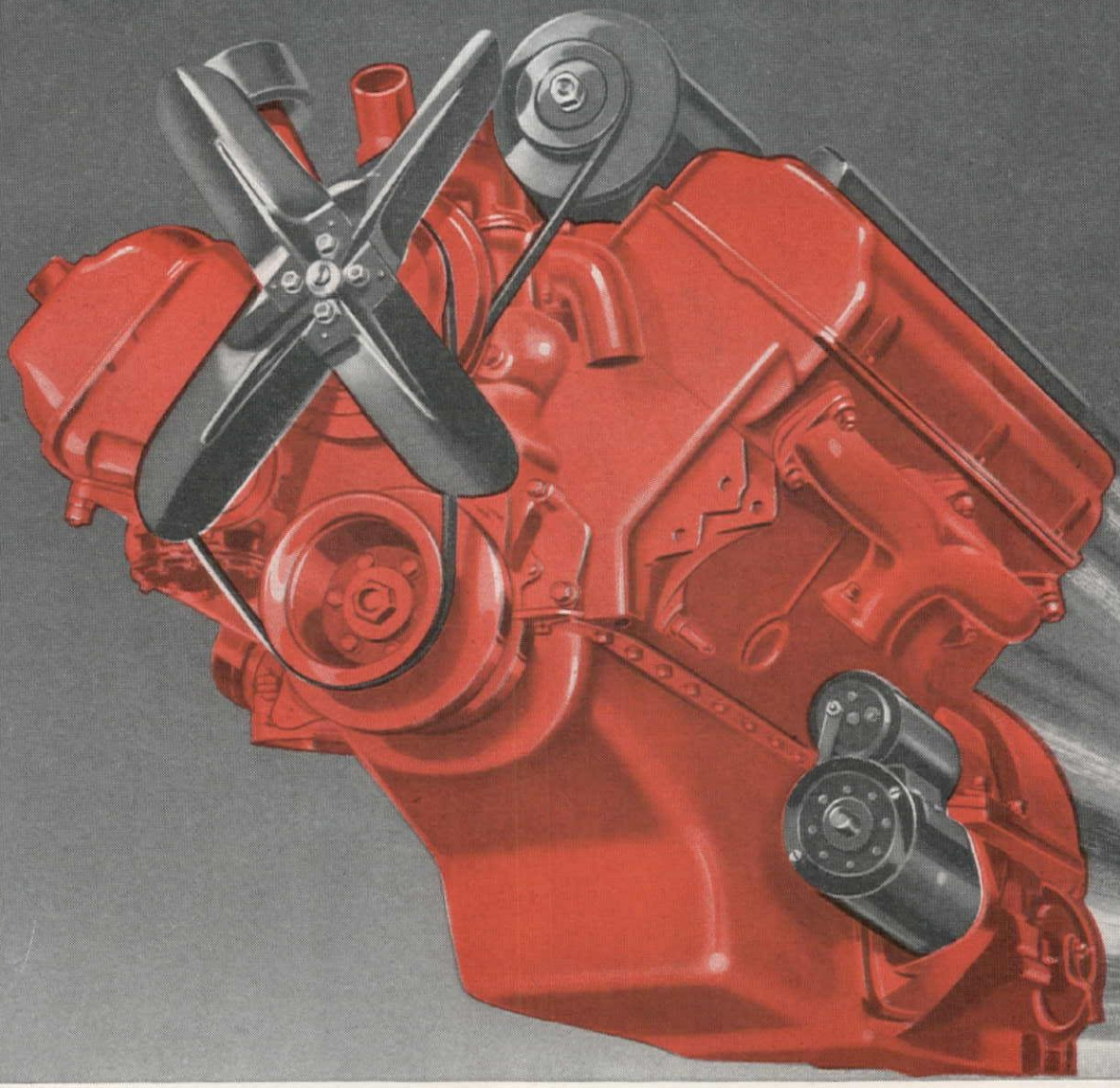
Cedarapids
Built by IOWA

Headquarters for
COST REDUCING EQUIPMENT

IOWA MANUFACTURING CO.

Cedar Rapids, Iowa, U.S.A.

NOW!... a Revolutionary



Chrysler Industrial Engineers Again Shatter Precedent! Develop Advanced Design With Larger Bore and Ingenious New Overhead Valve Arrangement! Make Long-desired Hemispherical Combustion Chamber Practical For Mass Production Methods

To the long list of Chrysler "Engineering Firsts" now is added another!

For many years, engineers have known that the Hemispherical Combustion Chamber produces the highest volumetric and thermal efficiency, exceptionally good combustion characteristics, and had excellent adaptability to high compression ratios. But all previous attempts to incorporate this design into a mass-produced engine had been unsuccessful. After five years of intensive research, Chrysler Engineers attained this goal.

With only 2.3 per cent more displacement, this mighty new Chrysler Industrial V-8 delivers *33 per cent greater maximum horsepower and a 16 per cent higher maximum torque.* Its performance is incredible. Its fuel economy is outstanding. Its durability unexcelled. In operation, it is amazingly smooth and quiet. Over-all efficiency is tremendously increased.

NEW CHRYSLER INDUSTRIAL

Most Sensational Engine Ever Developed For Industrial Power

Yet, it has greater compactness and less weight.

Among its unique design features are a water jacketed throttle body that prevents "icing," integral automatic choke and double breaker ignition distributor.

This sensational new Industrial Engine will give you a whole new conception of industrial power and Industrial Engine performance.

Let us show you what it will do for *you*. See your Chrysler Industrial Engine Dealer, or if your job involves special engineering, write us direct. **Marine and Industrial Engine Division, Chrysler Corporation, 12200 E. Jefferson Avenue, Detroit 31, Michigan.**

CHRYSLER

Industrial Engines

HORSEPOWER WITH A PEDIGREE

SUPERIOR

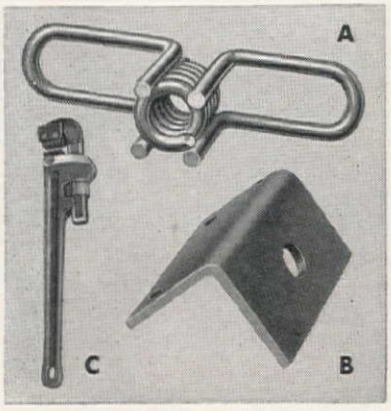
CONTINUOUS THREADED COIL RODS . . . . MAKES DIFFICULT TYING JOBS Easy . . . . .

Superior Continuous Threaded Coil Rods, with or without Coil Wing Nuts and Corner Brackets, are a valuable supplement to Superior Coil Ties and standard working parts when job conditions are unusual or difficult.

In three typical applications, shown at the right, these Continuous Threaded Rods are used; (1) to tie form corners; (2) as an anchor rod tie down and as coil bolts; and (3) as a coupling for two coil ties providing an adjustable form tie.

Available in ½", ¾", and 1" diameters and in any length up to 10 ft., Superior Continuous Threaded Coil Rods in quantities can be cut to length on the job with a heavy-duty hand Coil Rod Cutter.

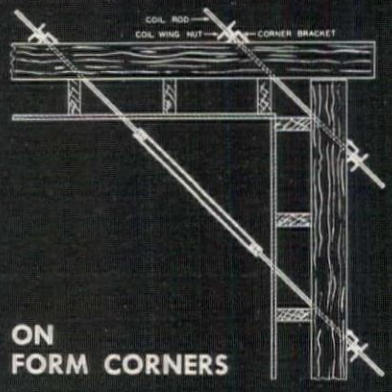
Superior Continuous Threaded Coil Rods are the answer to unusual or difficult tying problems. When you use Superior you are assured of the *best* in design, material, and workmanship.



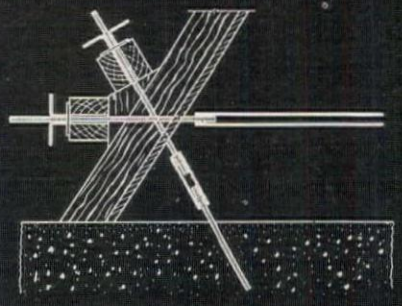
A-COIL WING NUTS
Coarse helix coils form the threads. Easily applied and removed from rod. Develops maximum capacity of rods.

B-CORNER BRACKET
An *exclusive* Superior feature. Provides simple, efficient method of tying form corners and bulkheads.

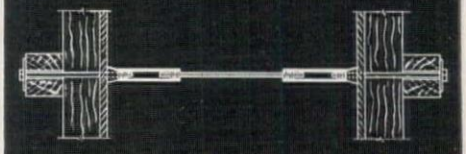
C-SPECIAL COIL ROD WRENCH
Heavy-duty Stillson type wrench with special jaws for gripping and turning Coil Rods with least damage to threads.



ON FORM CORNERS



FOR ANCHORAGE



AS AN INTERNAL TIE
Two Coil Ties and a length of Coil Rod make an adjustable form tie and spreader.

SUPERIOR CONCRETE ACCESSORIES, INC.
4110 Wrightwood Avenue, Chicago 39, Illinois
New York Office: 1775 Broadway, New York 19, N. Y.
Pacific Coast Plant: 2100 Williams St., San Leandro, Calif.

REQUEST A COPY OF OUR NEW CATALOG 500 . . .
It contains a valuable table for spacing studs, wales, and form ties.

NEW!
THE TR 200
REAR DUMP
MOTOR WAGON

Here's your *NEW* LaPLANT-CHOATE *ROCK WAGON*

HERE'S a new addition to the well-known LaPlant-Choate line of Motor Wagons and Earthmovers. The 18-ton TR 200 is a hydraulically-controlled rear dump wagon flexibly joined to the same big rubber-tired tractor so successfully used on the LaPlant-Choate TS 200 Motor Scraper. It combines rugged power, big capacity and high speed with a host of other features to make this unit outstanding in its field.

FEATURES YOU'VE BEEN LOOKING FOR IN A REAR DUMP WAGON

- ★ Stable wheel base assures absolute safety when dumping over edge.
- ★ Rock Lug tires.
- ★ Protected cab.
- ★ Your choice of two diesel engines in the T 200 Tractor . . . a 176 HP Buda or a 165 HP Cummins.
- ★ No obstructions in the wagon body.
- ★ Tilts to 70° from horizontal.
- ★ Full hydraulic control.
- ★ Rear dump advantages.
- ★ Available with heated body for use in cold climate to prevent freezing of material in load.

TR 200 MOTOR WAGON SPECIFICATIONS

GENERAL

CAPACITY	
Struck, cu. yds.	11
Heaped, cu. yds.	15
Tons	18
OVERALL DIMENSIONS	
Length	25'9"
Width	10'7"
Height	10'0"
WHEEL BASE	13'7"
WHEEL TREAD	
Tractor	6'8"
Wagon	8'8"
TIRES	4—21:00 x 25—24 ply rock lug
BRAKES	
4-wheel air Timken-Detroit	18" x 7"
TURNING	
Width required 180° turn	31'3"
Degree of turn each way	60°
HYDRAULIC SYSTEM	LPC Fluid Power Unit
Steering—25 GPM	Model HU25
Wagon operation—40 GPM	Model HU40
SHIPPING WEIGHT	
(Approx. in lbs.)	40,000

T 200 TRACTOR

ENGINE	
Buda Diesel Model 6-DA-779	176 HP
or	
Cummins Diesel Model HRB-600	165 HP
ENGINE CLUTCH	17" Lipe Rollway
TRANSMISSION	Fuller 5A1120
SPEEDS	
(at 1800 RPM—MPH)	From 2.46 to 21.63
STARTING METHOD	Electric 24 V
AIR COMPRESSOR	
Bendix-Westinghouse	7¼ cu. ft. capacity
ELECTRIC SYSTEM	12 V
FUEL TANK CAPACITY—U. S. gallons	70

R 200 WAGON

MISCELLANEOUS DIMENSIONS	
Loading height, rear	5'6"
Loading height, side	8'3"
Bowl width	8'0"
Bowl depth, maximum	4'8"
Bowl length	11'3"
OPERATING METHOD	
Type of ejection	Rear dump, hyd. lift
Number of jacks (double acting)	2
Size of jacks	8" x 31"
DUMPING ANGLE	70°

LaPLANT-CHOATE
MANUFACTURING CO., INC. ® CEDAR RAPIDS, IOWA, U. S. A.

Get the facts from your nearest LPC distributor

OWN-BEVIS-INDUSTRIAL EQUIP. CO.
4441 Santa Fe Avenue ANGELES 58, CALIFORNIA
1022 - 77th Avenue OAKLAND, CALIFORNIA

WESTERN EQUIPMENT COMPANY
. Box 2196, E. 3400 Olive St. SPOKANE, WASHINGTON

COLUMBIA EQUIPMENT CO.
1240 S. E. 12th Ave. PORTLAND 14, OREGON
5030 1st Ave. South SEATTLE, WASHINGTON

WESTERN CONSTRUCTION EQUIP. CO.
505 N. 24th Street BILLINGS, MONTANA
Stephens & Mount Ave. MISSOULA, MONTANA

ENGINEERING SALES SERVICE, INC.
410 Capitol Boulevard BOISE, IDAHO

STUDER TRACTOR & EQUIP. CO.
East Yellowstone Hwy., P. O. Box 779, CASPER, WYOMING

GENERAL EQUIPMENT COMPANY
1201 East 2nd Street RENO, NEVADA

EQUIPMENT SALES CO.
720 So. 19th Avenue PHOENIX, ARIZONA

ARNOLD MACHINERY CO., INC.
433 W. Second South St. SALT LAKE CITY 1, UTAH

N. C. RIBBLE CO.
1304 N. Fourth St. ALBUQUERQUE, NEW MEXICO

Day After Day After Day . . .

Tuffy® PERFORMANCE

The Correct Measure of a Wire Rope . . . Is not the length or the initial cost per foot but the yards of materials it will move and the number of days it will stay in service without breaking. By those measures TUFFY draglines and TUFFY scraper ropes will give you the lowest ultimate cost of any wire rope you've ever used.

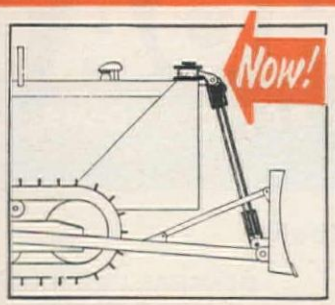
Here is Why . . .

EXTRA FLEXIBILITY — Without sacrificing other qualities, Tuffy draglines and scraper ropes are built of the finest steel and designed for the *special* purposes — to take sharper bends, angle pulls and rapid line speed.

EXTRA ABRASIVE RESISTANCE — Super tough construction of TUFFY special purpose ropes gives them maximum resistance to drum crushing abuse, crawling on guide roll flanges, etc.

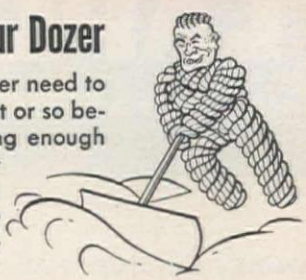
EXTRA TOUGHNESS — Union-formed (preformed) TUFFY construction resists heavy line pull, multiplied shock of load on slack line, the stresses of all types of material.

EASY TO HANDLE — Because TUFFY special purpose ropes are more pliable—spool better, ride better on grooves, hug drums when casting on draglines.



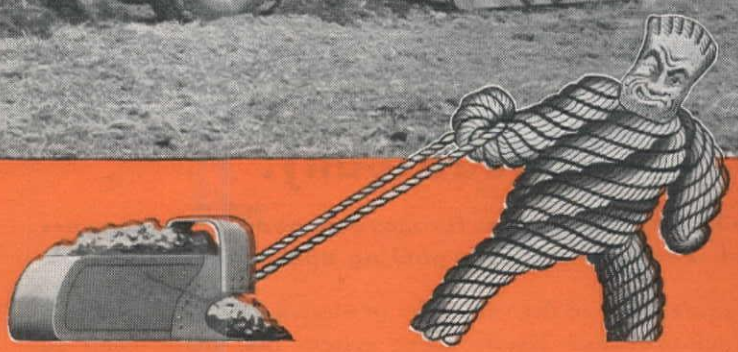
Mount a Reel of Tuffy DOZER ROPE on Your Dozer

Stop Wasting 75% of Your Dozer Rope. You no longer need to throw away 40 to 50 feet of dozer rope just because 10 feet or so becomes crushed or cut on the drum. Stop it simply by feeding enough new rope through the wedge socket to replace only the part that is damaged. Tuffy ½-inch Dozer Rope is now furnished in 150 ft. reels. Write for simple details on how to mount it on your dozers just back of the wedge socket. Save dozer rope footage and dollars.



. . . Yard After Yard After Yard . . .

REDUCES MATERIAL HANDLING COST



The Easy Way to Order TUFFY Special Purpose Ropes

is to forget all about complicated wire rope specifications — all you need to do is to specify the diameter and the length and the name TUFFY Scraper, TUFFY Dragline or TUFFY Sling. Union Wire Rope engineers have developed wire rope constructions and wire fabric constructions to serve universally in specific fields of operation. All you need is — Length, Diameter and the name TUFFY!

Tuffy SLINGS

SUPER-FLEXIBLE, Super-TOUGH—Tie Tuffy Slings into knots, kink them, flatten the eyes—and see how many more times you can straighten them without material damage, how cutting any one of the 9 parts of the interlaced wire fabric will not strand the sling. With every type of hitch, under any kind of load or pull, TUFFY Slings have proven their superiority. Each Tuffy sling is proof-tested to twice its safe working load. The interlaced construction makes possible eye splices with 95% of the fabric strength.

Tuffy Slings are available in 10 factory packaged types. Easy to order.

UNION WIRE ROPE CORPORATION

union *Wire Rope* **corporation**

Specialists in Wire Rope

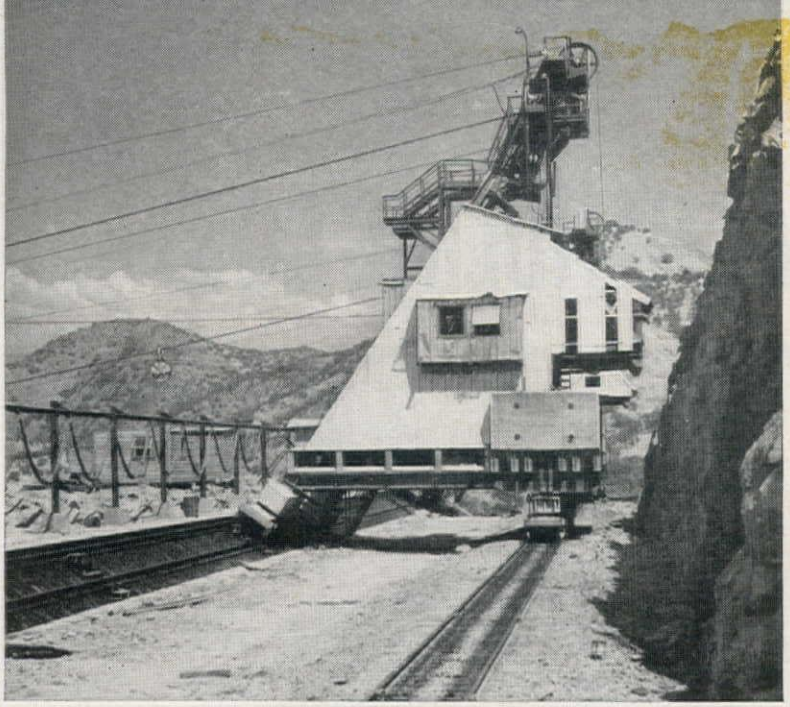
2146 Manchester Ave. **Kansas City, Mo.**

Please send information on TUFFY Slings . . . Draglines . . . Scraper Rope . . . Dozer Rope . . . Union-formed Wire Rope.

Firm Name _____

Address _____

City _____ *Zone* _____ *State* _____



Cableway head tower, and tail tower across the canyon, are both driven on straight parallel tracks by G-E drives. Another set of towers for the service rig operates on the same tracks. Main cableway was built by Willamette Iron and Steel Co.

Cableway towers kept in line . . . electrically!

At Pine Flat Dam, G-E drives for movable head and tail towers prevent skewing, help keep pouring operations continuous!

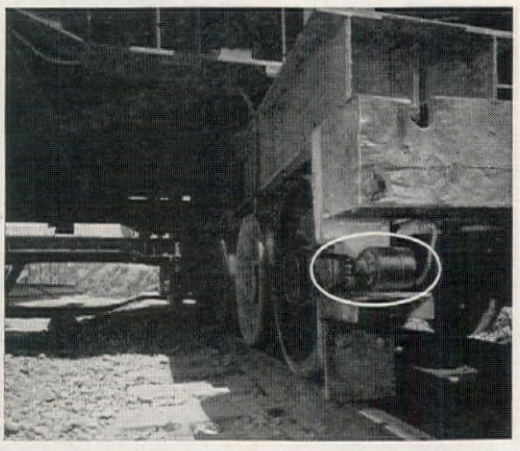
Here's an example of the versatility of electricity on construction jobs—a co-ordinated electric-drive system that helps keep an important project ahead of schedule. It's at Pine Flat Dam on Kings River in California, where a modern, high-speed G-E powered cableway—together with another rig for service functions—has set a pouring record of 4000 yards in one day.

All motors and control for the main cableway tower-drives on this Corps of Engineers dam, being built by Pine Flat Contractors Associated Companies, have been supplied by General Electric. In addition, the electric devices to keep the two cableways on the track, safely apart, and correctly aligned across the 2420-foot canyon, were all co-ordinated for the job by G-E application engineers.

This kind of engineering help—in application, installation, and service—regularly supplements G-E drives and power distribution systems, helps *you* get the most from *your* electrified construction equipment. *General Electric Co., Schenectady 5, N. Y.*

WESTERN PLANTS OR SERVICE SHOPS: Anaheim, Denver, Los Angeles, Oakland, Ontario, Portland, Richland, Salt Lake City, San Diego, San Francisco, San Jose, Seattle. WESTERN SALES OFFICES: Albuquerque, Bakersfield, Butte, Denver, Eugene, Fresno, Los Angeles, Medford, Oakland, Pasco, Phoenix, Portland, Riverside, Sacramento, Salt Lake City, San Diego, San Francisco, San Jose, Seattle, Spokane, Stockton, Tacoma.

Under the head tower, this G-E 75-hp wound-rotor induction motor is one of two that drive the tower. Motors for head and tail towers are controlled by a single master switch in the operator's station.



Tower alignment is maintained automatically. This selsyn generator, connected to a head-tower wheel, and another on the tail tower, feed signals to a differential selsyn which controls speed of the tower-drive motors.

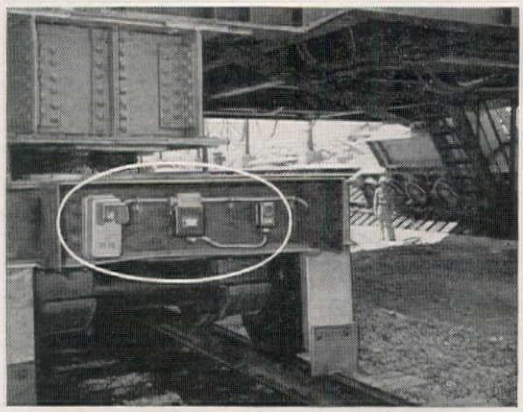


Photo-electric relays on each head tower automatically prevent the two rigs from colliding, and G-E limit switches keep towers from hitting stops at ends of the track. Thus operator can concentrate on spotting buckets.

Ask him today! **Whether you buy or build construction equipment, your G-E representative can show you how to do a better job—at lower cost—by complete electrification. Write him now, and he'll call on you at your convenience.**

GENERAL ELECTRIC

664-21

NEED A CRANE ON RUBBER?

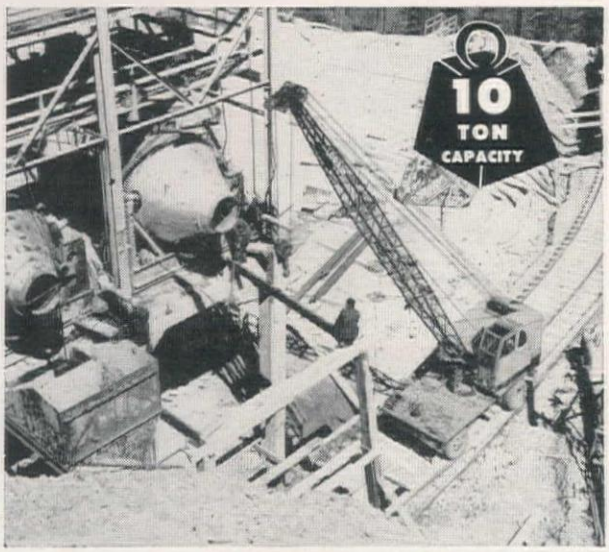
LORAIN BUILDS THE MOST COMPLETE LINE

FROM 10 TO 45 TONS

45 TON CAPACITY

WORLD'S LARGEST RUBBER-TIRE CRANE

Here it is — the largest crane on rubber in the world — the Lorain MC824 Moto-Crane. This is one of two working for Ebasco Service Corp., Joppa, Illinois. A number of these giant cranes have been proven in all types of service — all over the country.



LORAIN BUILDS CRANES FOR THE SMALL JOBS, TOO!
Here's the "baby" of the Lorain Rubber-Tire Crane family. This 10-ton Self-Propelled Crane, Model SP152, erects a concrete plant for dam construction. Big lifts or little, there's a Lorain on rubber to fit the job.

When your job calls for rubber-tire mobility in a crane, make your selection from the world's most complete line . . . LORAIN! You'll have more sizes, types of mountings and drive arrangements to fit your needs — no matter what they may be.

NEED CAPACITY? How big — or small — or in between? Lorain Crane capacities on rubber range from the versatile 10-ton Self-Propelled SP152 up to the world's largest crane on rubber — the mighty 45-ton MC824 Moto-Crane shown above.

NEED POWER & DRIVE? Select from 2 or 3 axle types with 4 or 6-wheel drive for plenty of tractive effort — plus big, multiple tires for soft ground flotation. There's a type to match your needs.

NEED 1 OR 2 ENGINES? 30 m.p.h. Moto-Cranes with 2 engines are especially Lorain engineered and built to match crane capacities. Single-engine, Self-Propelled machines (7 m.p.h.) round out the biggest rubber-tire crane selection in the field! Remember, Thew built the first crane on rubber tires and is still the leader in this field. *If you need a rubber-tire Crane . . . be sure to check with your Thew-Lorain Distributor to be sure of the best!*

THE THEW SHOVEL CO., LORAIN, OHIO

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FOR excavator service that combines dependability with speed, economy and efficiency, you'll find contractors all over the country prefer Bucyrus-Eries. Long experience has shown them that Bucyrus-Eries are reliable performers at any task — with easy convertibility that means the right front-end equipment for every job. They know, too, that unexcelled Bucyrus-Erie design provides the right combination of power, strength and responsive control that spells big, low-cost output — shift after shift, year after year. Choose from the complete Bucyrus-Erie line of ⅜- to 4-yard gasoline, diesel and single-motor electric excavators for "full speed ahead" performance on your shovel, crane, dragline, clamshell or dragshovel jobs!

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...with **HOMELITE**

Carryable Generators

There's no doubt about it, long electric cables eat up valuable power . . . which is bad for you and bad for your tools. This loss of power results in loss of tool efficiency . . . loss in production per hour. It puts a strain on the tool's motor; causes quicker dulling of a tool's cutting edge. It results in more down-time for costly repairs to tools.

You can eliminate this expensive waste by operating your tools with a Homelite Carryable Generator. Without delay, without trouble you can set your Homelite right where your tools are operating. No long cables will be necessary. You will get the power you need to run your cost-cutting electric tools at peak efficiency, at all times. Write for free demonstration.

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At all times Homelite Factory Branch Organizations are ready and equipped to give you fast and efficient service on Homelite Generators, Pumps, Blowers or Chain Saws. Another Homelite plus.

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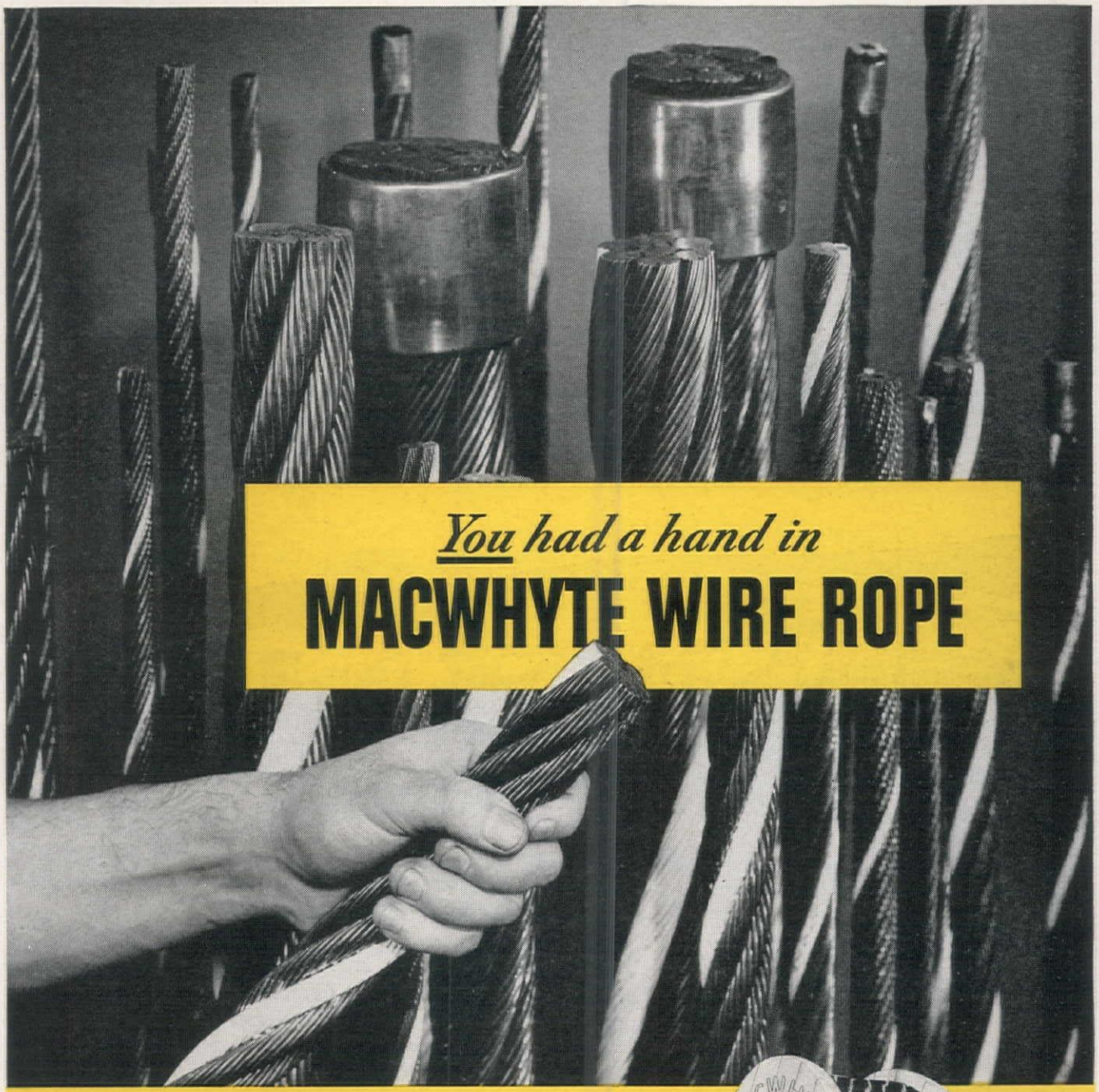

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The experience of hundreds of users—like yourself—goes into the making of Macwhyte Wire Rope. For more than half a century, their needs and yours have been studied by our engineers to produce the best wire rope for each job.

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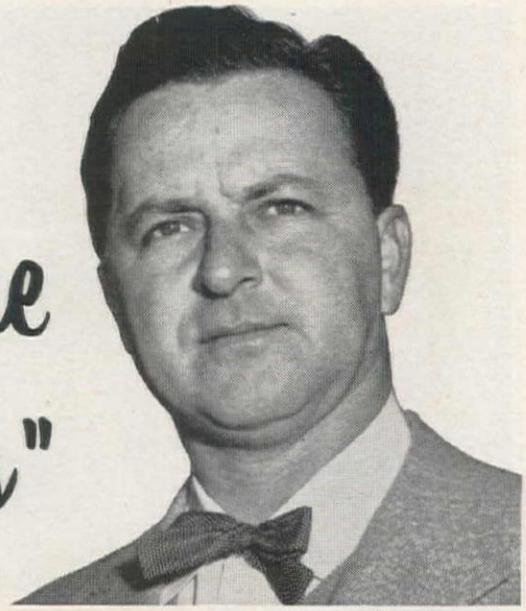
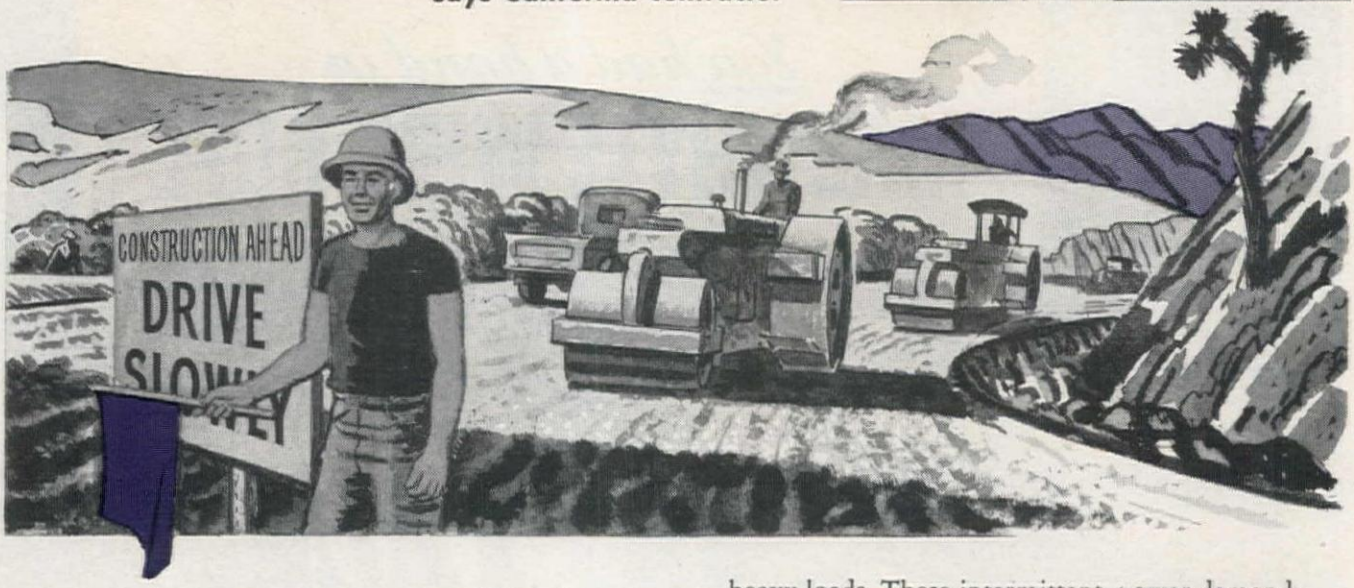
Catalogs are available on request

1017-L

"T5X has prolonged the time between overhauls"



says California contractor



For the past five years, the N & K Paving Company in Los Angeles has used T5X motor oil in all its trucks, motor patrols and skip loaders.

Mr. Peter R. Kisich, company owner, reports: "T5X has held my operating costs to a minimum and prolonged the time between overhauls. The fact that I need to carry only one oil for all my requirements has simplified my maintenance problems. I cannot speak too highly of this splendid all-purpose motor oil."

Heavy construction work demands that engines operate at varying speeds under continual heavy loads. These intermittent, power-demanding speeds often result in excessive engine wear and high maintenance costs. Construction men such as Peter Kisich rely on the superior lubricating ability of T5X to protect their engines under *all* operating conditions.

T5X—the amazing *purple* motor oil—is made from the finest base stocks that modern chemistry and present-day refinery equipment can produce. Special-purpose compounds have been added to these superior base stocks to give you an oil that is unexcelled in heavy-duty lubricating ability.

Developed by the manufacturers of UNOBA—the industry's original multi-purpose grease

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76 UNION OIL COMPANY OF CALIFORNIA

RECLAIM WORN-OUT *Surface Material on* BITUMINOUS ROADS *with* HYSTER® Grid Roller

On this black top salvage job in California, Hyster Grid Roller did in 10 HOURS what would have taken 7 or 8 DAYS to do with old methods.

Saves 5 Ways

✓ **TIME** — The Grid Roller pulverizes old surface material, compacts, lays down new surface courses faster and better.

✓ **MATERIAL** — On normal salvage, the Grid Roller provides sufficient mix from old material for laying down new surface.

✓ **BINDER** — Usable binder in salvaged material often reduces new oil required from 3/4 to 3/8 gal. per sq. yd.

✓ **EQUIPMENT** — The Grid Roller does triple duty — reclaims old mat, compacts base, rolls new surface courses.

✓ **LABOR** — One operator performs simultaneously the pulverizing and scarifying or blading operations.

With the Hyster Grid Roller it is economically possible to salvage, rejuvenate and use the old, worn-out surface material for re-laying the new road surface.

The procedure: (1) SCARIFY; (2) PULVERIZE; (3) PREPARE BASE; (4) LAY DOWN new surface; (5) TURN OVER TO TRAFFIC.

From coast to coast, CITY, COUNTY, STATE, FEDERAL and PRIVATE ROADS are being reclaimed at great savings in time, oil, material, labor and equipment. The nature of the job determines whether the Grid Roller should be towed by a motor grader or tractor.

See your Caterpillar-Hyster dealer. Write for literature.

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WYOMING
WORTHAM MACHINERY COMPANY

Flood control levee gets a lift from "Caterpillar" power

BUILDING a 13-mile section of flood control levee in the Florida Everglades, Hooper Construction Company of Coral Gables relies heavily on "Caterpillar" equipment. A D17000 Engine powers the Link-Belt Speeder 2½-yard Dragline. A D8 Tractor with No. 8S 'Dozer works with the dragline. And two D13000 Engines with two Gardner-Denver 500-foot compressors on tracks, pulled by a D6 Tractor, provide the blast hole power for shooting coral rock. In all, Hooper's "Caterpillar" lineup includes 12 tractors, 5 motor graders and several engines.

On this project, holes are drilled 14 feet deep and shot 72 at a time, each shot loosening about 30 cu. yds. of coral. 260,000 cu. yds. are excavated a month. The resulting canal is 75 feet wide and 14 feet deep.

Like Hooper, many other contractors have found that it pays to standardize on "Caterpillar" units. They are engineered for steady performance with a minimum of down-time. As sturdy as they are, they'll do even *more* work at *lower* cost if given good care. You don't have to coddle them — proper maintenance takes only a few minutes a day. And remember, your nearby "Caterpillar" Dealer has the facilities for specialized service — any time you need it, call on him!

CATERPILLAR, SAN LEANDRO, CALIF.; PEORIA, ILL.

CATERPILLAR

REG. U. S. PAT. OFF.

DIESEL ENGINES
TRACTORS • MOTOR GRADERS
EARTHMOVING EQUIPMENT

SUCCESSFUL USERS PROVE

TERRA COBRA ADVANTAGES

.... from Coast to Coast

Do you judge equipment by the company it keeps? Then look at the number of successful contractors who use Terra Cobras in their earthmoving operations. They're specialists who buy equipment because of its production and performance, not because of appearance or color of paint. Most are repeat Terra Cobra purchasers because Terra Cobras have proved their productivity together with their simplicity, extreme ruggedness, and ease of maintenance. Many have Terra Cobras now in their seventh season still going strong with thousands of hours to their credit.

You can't have all the Terra Cobra advantages unless you have Terra Cobras. If you've never owned a Terra Cobra, it will pay you to investigate their profit possibilities in your earthmoving operations with your Wooldridge distributor.

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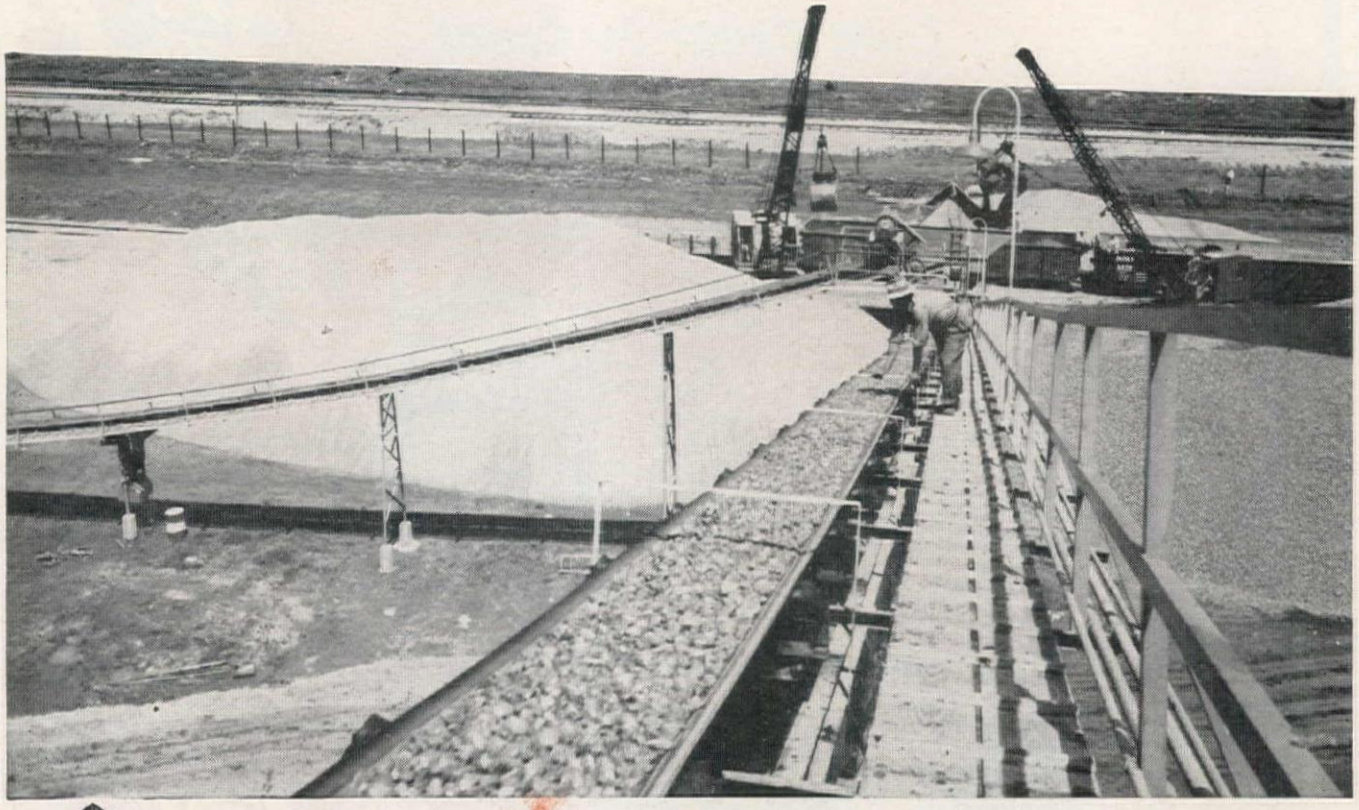
POWER CONTROL UNITS


TRACTOR DRAWN SCRAPERS


RIPPERS


BULLDOZERS

How U. S. Rubber belt engineers cut installation costs



View of 24" U. S. Giant Conveyor Belt carrying aggregate from mixing hopper to loading hopper in plant No. 2, Builders Supply Co., Houston, Texas.

Junction between cross belt and incline belt. They convey the aggregate to concrete mixing tower, which in turn supplies the waiting trucks.

In a new concrete mix plant, original plans called for the installation of a 5-ply, 36 oz. duck conveyor belt to handle the aggregates. But United States Rubber Company engineers pointed out that their 4-ply, 42 oz. duck belt would not only cost less, but would be more flexible crosswise to trough, would train more easily and provide high-tensile strength as well. This 1,275-foot, 4-ply U.S. Giant Conveyor Belt was installed. It travels 300′ per minute and delivers 294 tons per hour.

This is another instance of why it pays to consult "U.S." engineers before going ahead on a conveyor belt problem. Remember that they are backed by a wealth of experience and vast research facilities. Finally, they will work with your engineers and with the designers of conveyor equipment—a 3-Way Engineering teamwork that always pays off in higher output at lower cost. Write to address below.

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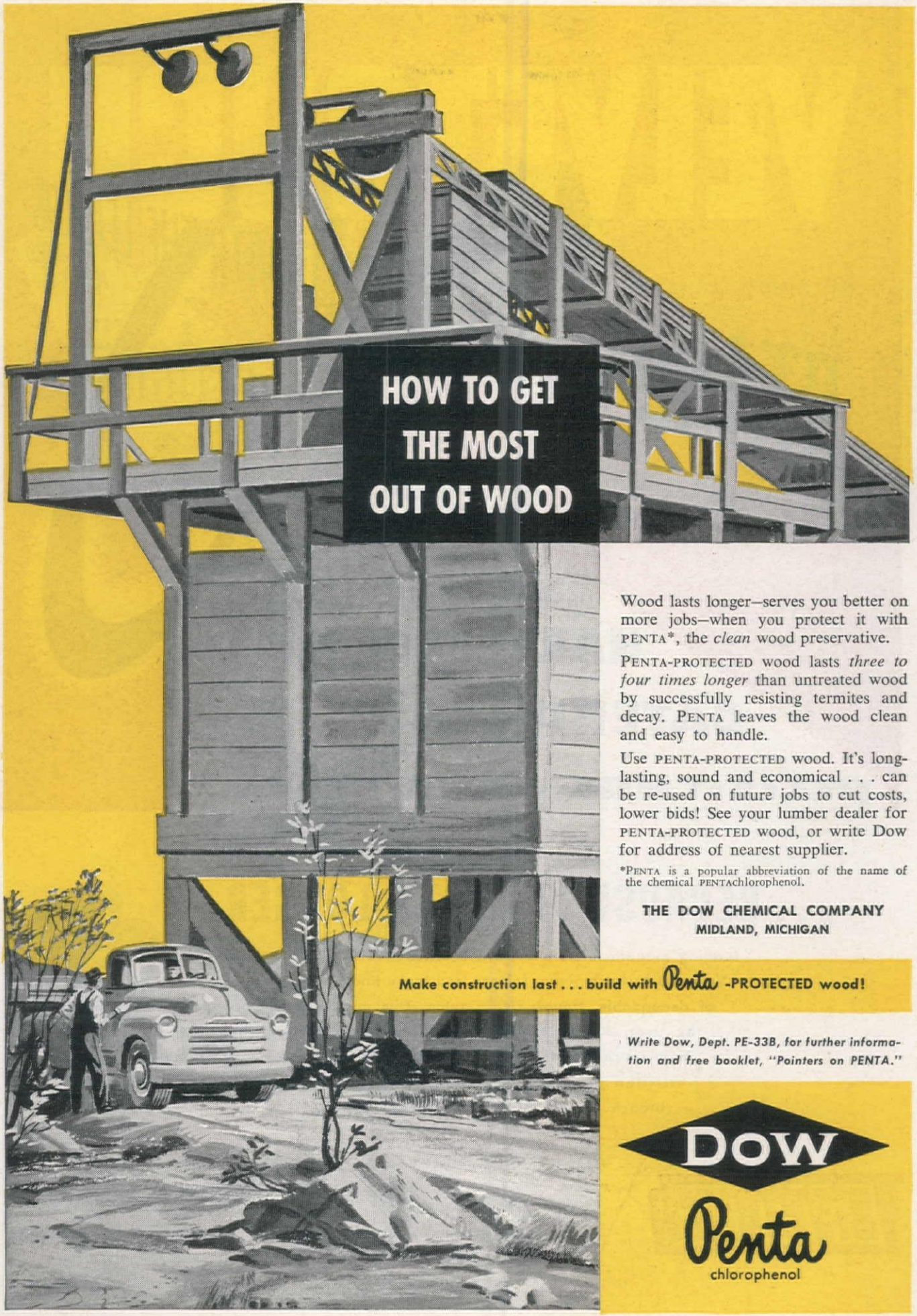
UNITED STATES RUBBER COMPANY

MECHANICAL GOODS DIVISION · ROCKEFELLER CENTER, NEW YORK 20, N. Y.



HOW TO GET THE MOST OUT OF WOOD

Wood lasts longer—serves you better on more jobs—when you protect it with PENTA*, the *clean* wood preservative.

PENTA-PROTECTED wood lasts *three to four times longer* than untreated wood by successfully resisting termites and decay. PENTA leaves the wood clean and easy to handle.

Use PENTA-PROTECTED wood. It's long-lasting, sound and economical . . . can be re-used on future jobs to cut costs, lower bids! See your lumber dealer for PENTA-PROTECTED wood, or write Dow for address of nearest supplier.

*PENTA is a popular abbreviation of the name of the chemical PENTAchlorophenol.

THE DOW CHEMICAL COMPANY
MIDLAND, MICHIGAN

Make construction last . . . build with Penta -PROTECTED wood!

Write Dow, Dept. PE-33B, for further information and free booklet, "Pointers on PENTA."

DOW

Penta
chlorophenol

Eaton 2-Speeds are designed and built for simple, low cost maintenance

Eaton 2-Speeds will take years of heavy-duty operation. Eaton's exclusive planetary gearing better distributes gear-tooth loads, and the exclusive forced-feed oiling system provides positive lubrication even at slowest vehicle speeds. Extra rugged construction eliminates the possibility of distortion or misalignment under heaviest loads. When repair *is* necessary, practical down-to-earth design makes the work quick, easy, and economical. Eaton 2-Speeds also reduce maintenance cost on the vehicle through lower stress and less wear on engines and power transmitting parts. Ask your dealer to explain how Eaton 2-Speeds will help *your* trucks haul more, faster, longer, at less cost.

EATON

2-Speed Truck

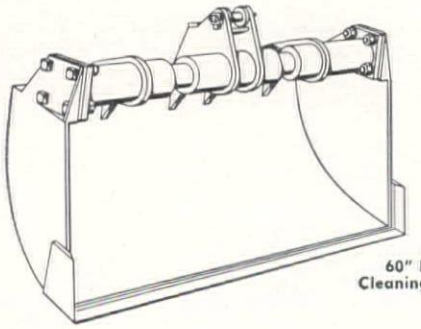
AXLES

Axle Division

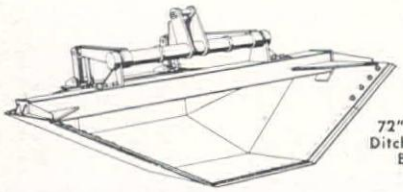
EATON MANUFACTURING COMPANY

CLEVELAND, OHIO

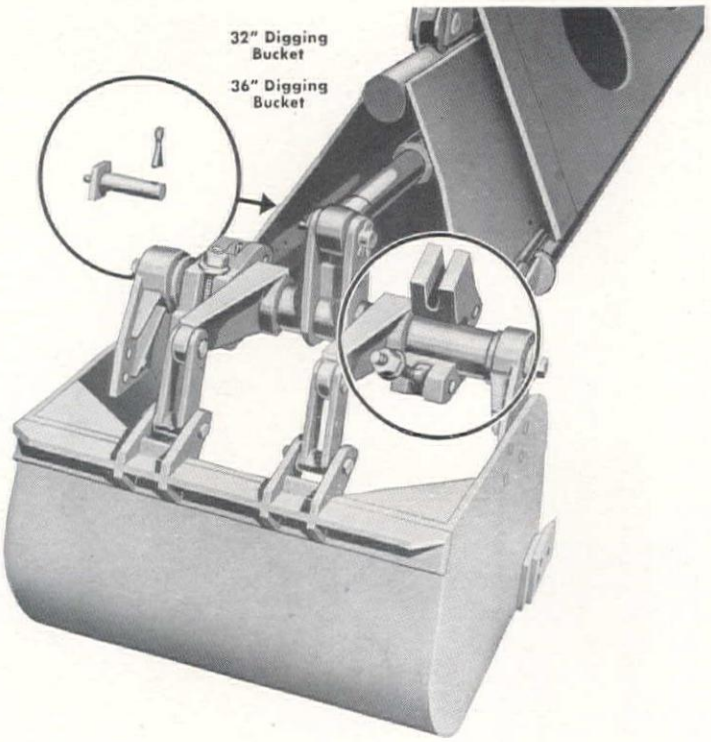
PRODUCTS: Sodium Cooled, Poppet, and Free Valves • Tappets • Hydraulic Valve Lifters • Valve Seat Inserts • Jet Engine Parts • Rotor Pumps • Motor Truck Axles • Permanent Mold Gray Iron Castings • Heater-Defroster Units • Snap Rings Springtites • Spring Washers • Cold Drawn Steel • Stampings • Leaf and Coil Springs • Dynamatic Drives, Brakes, Dynamometers



60" Ditch Cleaning Bucket



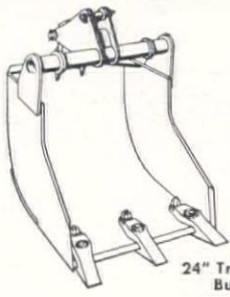
72" Formed Ditch Digging Bucket



32" Digging Bucket

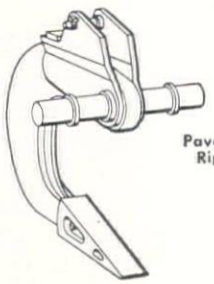
36" Digging Bucket

In less time than changing a tire... your GRADALL is a "new" machine

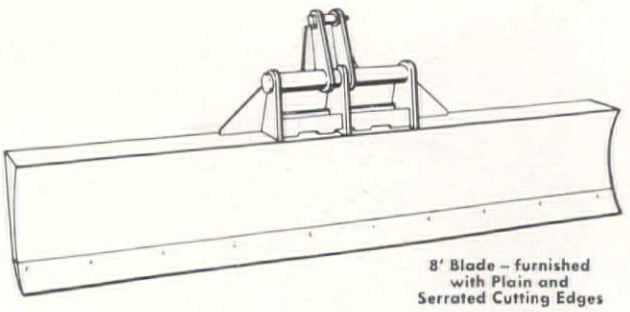


24" Trenching Bucket

15" Self-cleaning Bucket for Wall Footings



Pavement Ripper



8' Blade – furnished with Plain and Serrated Cutting Edges

NOW YOU CAN REPLACE several specialized construction machines, and practically all clean-up labor, with one versatile machine—the Gradall.

Shown are some of the wide variety of tools for the many specialized jobs performed by the Gradall. All can be carried right on the Gradall. And because they can be quickly interchanged, in a matter of minutes you can have a "new" machine for the job at hand—whether it's trenching, excavating, pavement removal, ditch cleaning, grading, or backfilling.

If your construction involves various types of jobs, this should give a good idea of how the Gradall can cut costs for you. Ask your Gradall Distributor for a field demonstration.

Gradall®
DIVISION OF WARNER & SWASEY Cleveland

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WESTERN CONSTRUCTION EQUIPMENT CO. • *Billings, Great Falls, and Missoula, Montana*

GRADALL—THE MULTI-PURPOSE CONSTRUCTION MACHINE *with Controlled Down Pressure*

This TRIPLEX TAMPER — three CP pneumatic backfill tamper power units on a Gunderson-Taylor mounting — has 75 square inches of compaction area and enables one man to do the work of five individually operated tampers. Greater thickness of fill can be compacted to specifications; lifts can be increased as much as 20%; compactness is more uniform.

Seven different models of CP PNEUMATIC and ELECTRIC VIBRATORS enable the contractor to select the proper model for any specific job. Two-man vibrators speed the heaviest mass concrete placement. For reinforced walls, columns, floors, and similar work, there are small diameter pneumatic and electric models for one-man operation.

GET THE JOB DONE IN FEWER HOURS...

This 600 foot Diesel-driven CP PORTABLE COMPRESSOR is providing air for sheeting driving. Ranging in capacity from 60 to 600 cfm — gasoline and Diesel-driven models — there is a CP Compressor for any air requirement. Gradual speed regulator, adapting engine speed to air demands, assures economical operation and minimizes maintenance.

CHICAGO PNEUMATIC TOOL COMPANY

General Offices: 8 East 44th Street, New York 17, N. Y.

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STANDARD ENGINEER'S REPORT

DATA

LUBRICANT: RPM Delo Oils

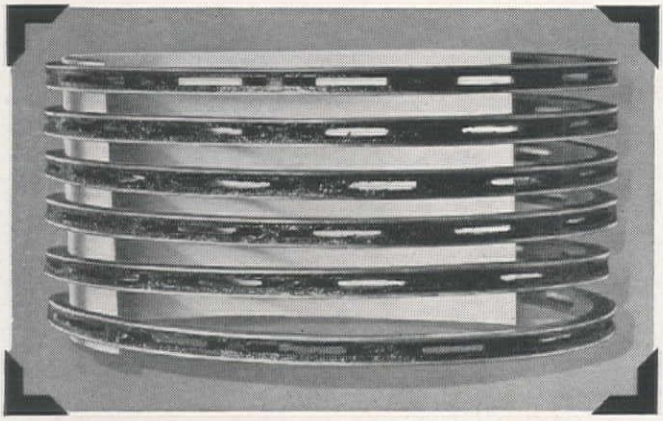
UNIT: D-8 Caterpillar

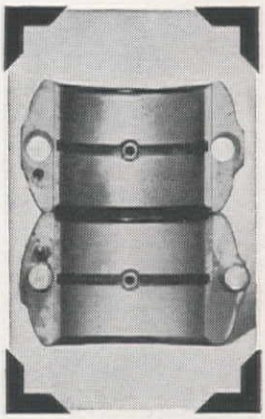
SERVICE: Earthmoving contract work

CONDITIONS: Heavy loads—dirt, dust

FIRM: T. H. Walsh-Argo Engineering Company Los Angeles

Engine parts "like new" after 7721 hours!





THIS SET OF OIL RINGS and the piston and con-rod bearing at right—all from a D-8 Caterpillar using RPM DELO Heavy Duty Lubricating Oil—appear just as they did when removed after 7721 hours of earthmoving work. There were no broken or stuck rings; the oil-return holes were open; all parts were free from deposits. The crankshaft was not more than 0.001 inch out of round at any point and was reinstalled.

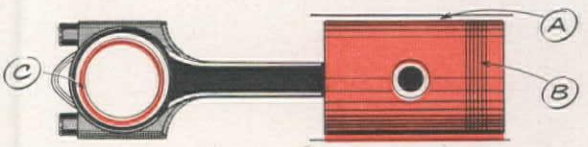
THE D-8 "CAT" above is the one from which the parts came. It is one of 11 large diesel tractors operated by the T. H. Walsh-Argo Engineering Co., Los Angeles. By using RPM DELO Oils, the company regularly gets 5000 or more hours between overhauls.

FREE BOOKLET on the RPM DELO Oils gives you complete information on how to meet any heavy-duty engine operating condition with one of these oils. Write or ask for it today.

RPM DELO LUBRICATING OILS

TRADEMARK "RPM DELO" REG. U.S. PAT. OFF.

How RPM DELO Oils reduce wear, corrosion, oxidation in all Heavy-Duty Engines



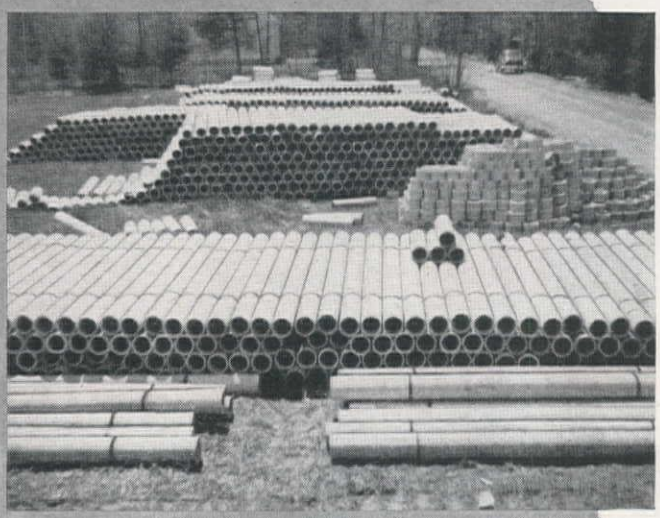
A. Contain special additives that provide metal-adhesion qualities...protect parts whether hot or cold, running or idle.

B. Anti-oxidant resists deterioration of oil and formation of lacquer...prevents ring-sticking. Detergent keeps parts clean...helps prevent piston scuffing.

C. Special compounds stop corrosion of any bearing metal and foaming in crankcase.

STANDARD TECHNICAL SERVICE checked this product performance. For expert help on lubrication or fuel problems, call your Standard Fuel and Lubricant Engineer or Representative; or write Standard Oil Company of California, 225 Bush St., San Francisco.

STANDARD OIL COMPANY OF CALIFORNIA



Storage of "Century" Pipe and "Century" Simplex Couplings is shown here on site in New England preparatory to installation.

"Century" Pipe awaiting installation.

K&M ASBESTOS ROPE

For yarning bell and spigot joints will not promote the breeding of bacteria. Write for details.

WRITE FOR FREE BOOKLET, "Mains without Maintenance". Gives valuable data, specifications, and reference material for anyone interested in water main pipes.

"CENTURY"

ASBESTOS-CEMENT PIPE

gives a New England town 19 miles of trouble-free water mains

Thus, another community is added to the growing and already large number of places in every State where this modern water main has been adopted.

Right from the start this modern water system provides economical operation by the relatively low cost of installation and reduced carrying charges plus the advantages inherent in the pipe itself.

Made of two practically indestructible materials, asbestos fiber and portland cement, "Century" Pipe is strong and durable. It is highly resistant to external corrosion and internal corrosion (tuberculation) cannot take place due to its non-metallic composition. The permanently smooth inner surface guarantees continuous flow and minimum pumping costs.

It will pay you to investigate the many cost saving features of "Century" Asbestos-Cement Pipe.

Nature made Asbestos . . .
Keasbey & Mattison has made it serve mankind since 1873

KEASBEY & MATTISON
COMPANY • AMBLER • PENNSYLVANIA

"See us at Booths No. 13 and 14, American Water Works Association Convention, Kansas City, Missouri, May 4-9, 1952"

in WIRE ROPE, too

It's all in the RIGHT KIND of Muscle

The powerful, rugged muscles of a charging rhino enable him to propel his tremendous bulk and weight at truly remarkable speed. Nature designed them well for the purpose they have to serve.

In wire rope, too, the right kind of muscle is vitally important... because different types of jobs present different types of destructive forces. Bending fatigue! Shock stress! Abrasion! Load strain! Each demands wire rope that best combines the required resistance characteristics.

Wickwire Rope gives you the benefit of long experience and specialized know-how which assures you of exactly the right kind of rope your particular job demands.

For additional information write or phone our nearest sales office.

LOOK FOR THE YELLOW TRIANGLE ON THE REEL

EAST: WICKWIRE SPENCER STEEL DIV.—Boston • Buffalo • Chattanooga • Chicago • Detroit • Emlenton (Pa.) • Philadelphia • New York
WEST: THE COLORADO FUEL & IRON CORP.—Abilene (Tex.) • Denver • Houston • Odessa (Tex.) • Phoenix • Salt Lake City • Tulsa
PACIFIC COAST: THE CALIFORNIA WIRE CLOTH CORP.—Los Angeles • Oakland • Portland • San Francisco • Seattle • Spokane

WICKWIRE ROPE

CF&I

PRODUCT OF WICKWIRE SPENCER STEEL DIVISION
THE COLORADO FUEL & IRON CORPORATION

GM Diesel
Case History No. 519-18

USER: Becker & Tuckwood, Lancaster, Wisconsin

INSTALLATION: GM 4-71 Diesel powering Universal Model 1836 portable jaw crusher, replaced gasoline engine six years ago.

PERFORMANCE: Crusher produces 600 cu. yds. daily. Operates 6 days a week. Owners report 10% to 15% higher production with GM Diesel, and 40% lower fuel costs. Engine overhauled once in six years.

THIS DIESEL CRUSHES 600 YARDS A DAY and cuts fuel costs 40%

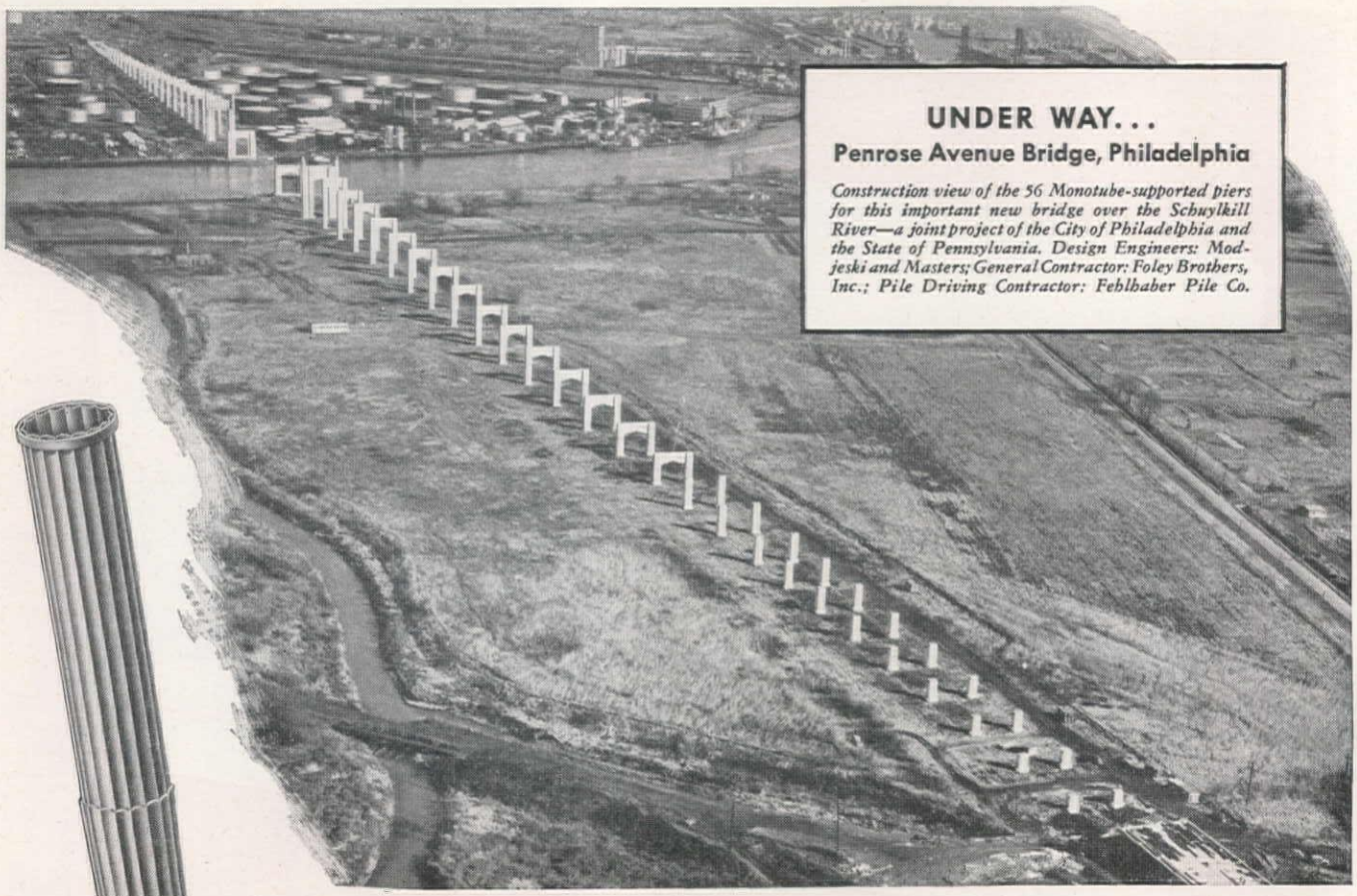
The engine in this crusher started Becker and Tuckwood off with General Motors Diesel power in 1946. Now they have eight GM Diesels powering crushers, tractors, shovels and pulverizers. These 2-cycle engines pack more power in less space—provide the rugged, dependable, economical power needed for all kinds of applications from 32 H.P. up. Then too, maximum interchangeability of working parts cuts downtime—helps keep maintenance costs at a minimum. Why not ask your GM Diesel distributor for all the facts?

DETROIT DIESEL ENGINE DIVISION
GENERAL MOTORS • DETROIT 28, MICHIGAN
SINGLE ENGINES..32 to 275 H.P. MULTIPLE UNITS..Up to 800 H.P.

It pays to Standardize on

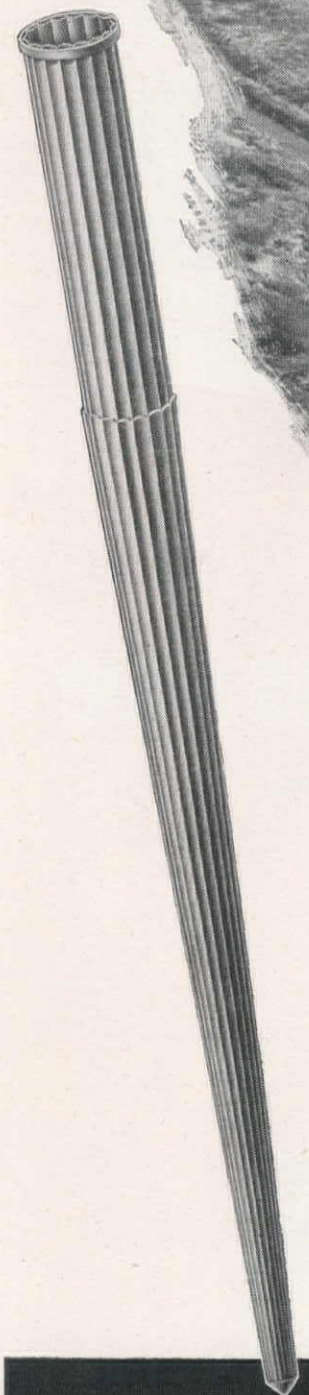
GM GENERAL MOTORS DIESEL POWER

Write for booklet, "A 50,000,000 Horsepower Insurance Policy" that tells you why.



UNDER WAY...
Penrose Avenue Bridge, Philadelphia

Construction view of the 56 Monotube-supported piers for this important new bridge over the Schuylkill River—a joint project of the City of Philadelphia and the State of Pennsylvania. Design Engineers: Modjeski and Masters; General Contractor: Foley Brothers, Inc.; Pile Driving Contractor: Fehlhaber Pile Co.



MONOTUBES...

best for holding structures up —and holding costs down!

ALMOST 38 miles of Monotube piles, from 26 to 82 feet long, support the 56 piers (above) for the new Penrose Avenue Bridge, Philadelphia. It's one of the many types of construction where Monotubes are again and again the preferred choice. For with Monotubes, engineers and contractors always stand to gain important advantages . . .

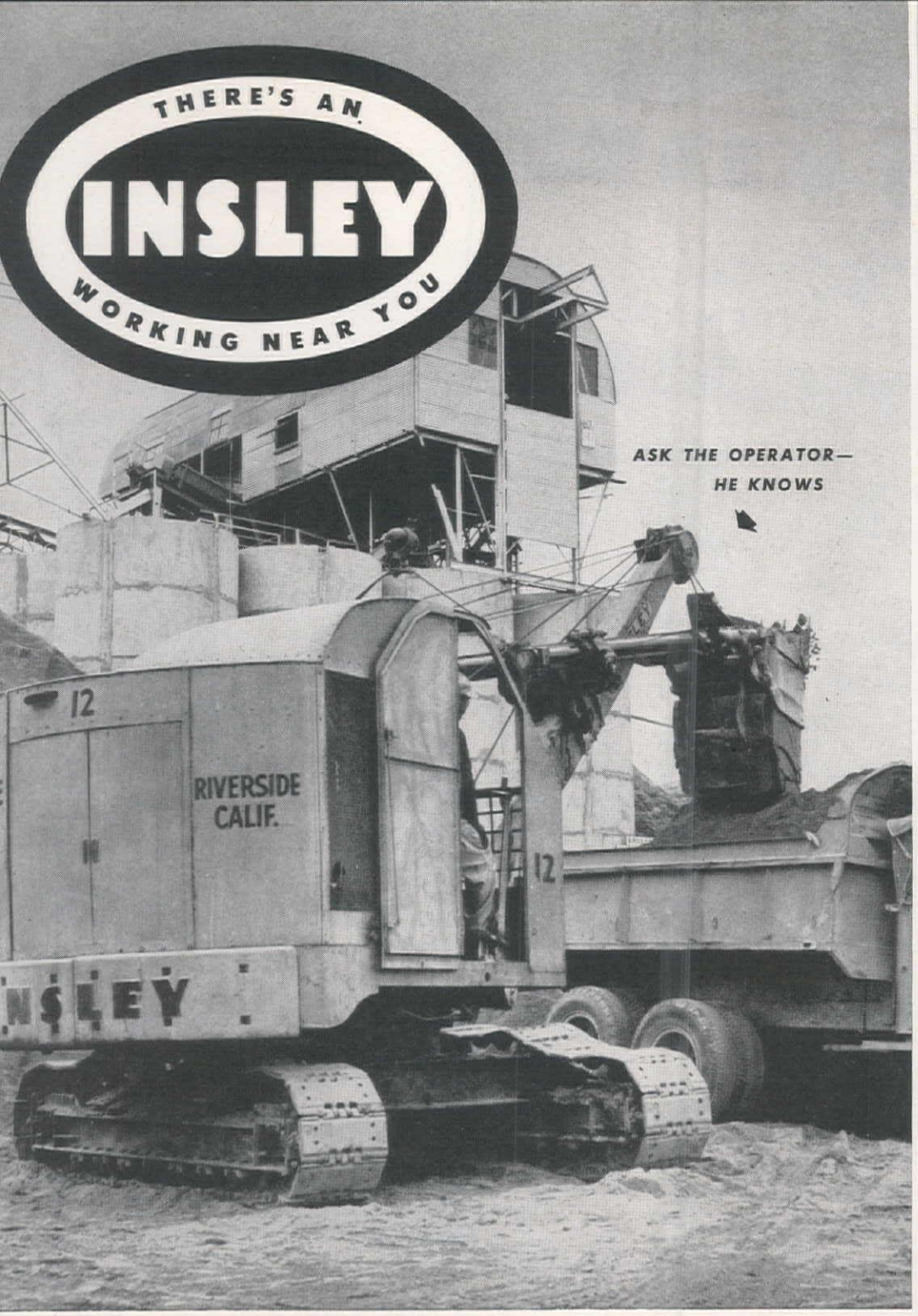
First, Monotube taper-flute, *cold-rolled* construction means *extra* strength, extra structural value that can be utilized in designing for heavy loads, often requiring fewer piles. Moreover, their tapered tubular design makes inspection before concreting rapid and easy for positive assurance of condition after installation.

Secondly, you simply can't match light weight Monotubes for ease of handling, locating and driving . . . nor for simplified field splicing with fast cut-off and minimum waste.

On job after job it adds up to sound foundations with a new low in installation time and cost. Get all the facts on why these gains are possible with Monotubes. Just write to The Union Metal Manufacturing Co., Canton 5, Ohio.

UNION METAL
Monotube Foundation Piles

THERE'S AN
INSLEY
WORKING NEAR YOU



he INSLEY operator

knows..

PROJECT RATED
INSLEY
BY THE USER—FOR THE USER

that Insley equipment can be rated-for-the-project...he knows that specification alternates make it possible to buy the exact equipment to do his job best.

STAR MACHINERY COMPANY
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CAIRD ENGINEERING WORKS
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CONTRACTORS EQUIPMENT CORP.
2727 Southeast Union Avenue
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CHEYENNE TRUCK EQUIPMENT CO.
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H. H. NIELSEN COMPANY
216 Paxton Avenue
Salt Lake City, Utah

M & F EQUIPMENT COMPANY
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KING & EAST MACHINERY CORP.
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P. O. Box 1270, 1756 Grand Avenue
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Angelo & South Market Sts.
Redding, California

SCOTT EQUIPMENT COMPANY
P. O. Box 49
Sacramento, California

ALLIED EQUIPMENT COMPANY
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BAY EQUIPMENT COMPANY
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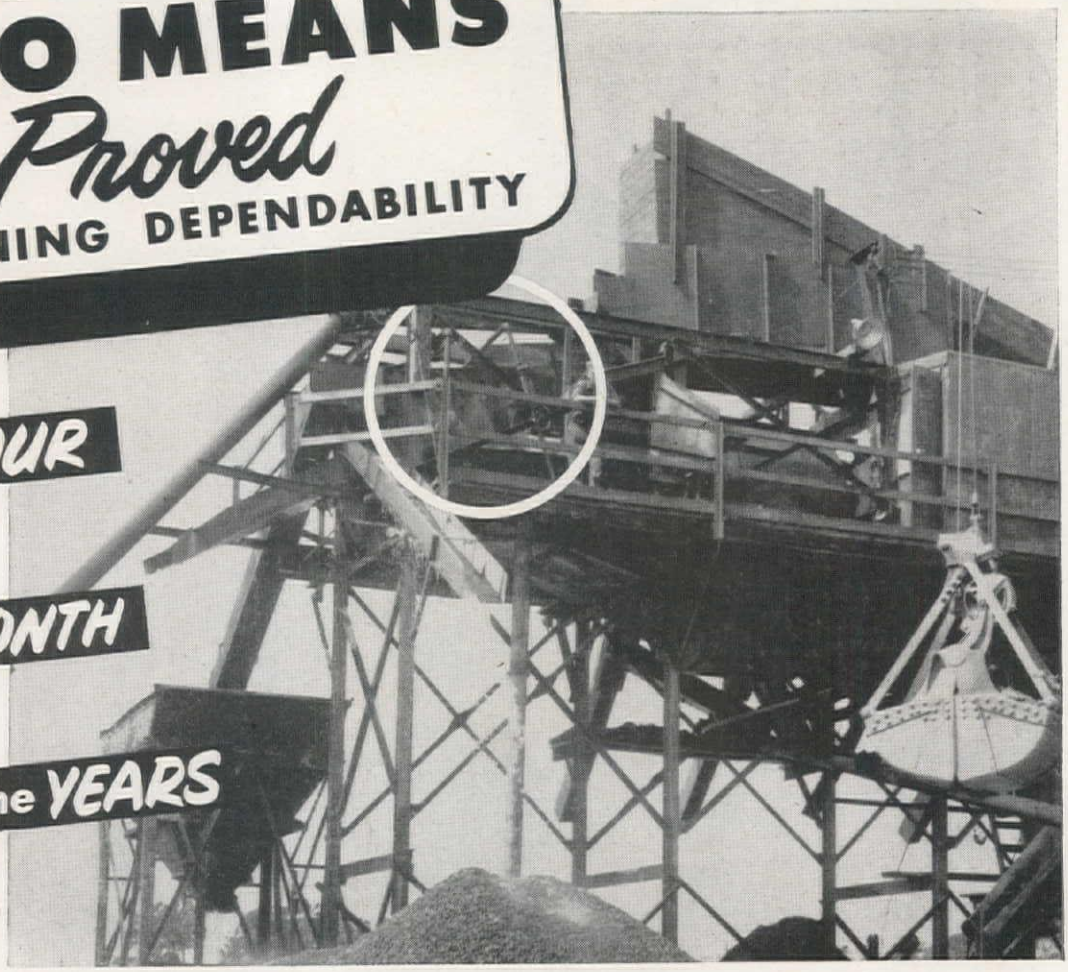
SLEY MANUFACTURING CORPORATION • INDIANAPOLIS 6, INDIANA

SECO MEANS *Proved* SCREENING DEPENDABILITY

by the HOUR

by the MONTH

through the YEARS



After all . . . it's performance that counts . . . it's the day after day, year after year ability to stay on the job without constant maintenance that makes any vibrating screen worth its salt.

So when we talk about Seco performance . . . we're talking from your viewpoint. Hundreds of operators like you have found out from actual experience that Seco vibrating screens are built to endure . . . under all types of load requirements.

That's it in a nutshell! 94% of all Seco screens ever built are still in service . . . Many are in their 12th, 13th, 14th and 15th years of dependable service.

May we talk to you soon about a dependable Seco for your screening job.

SECO

TRUE CIRCULAR ACTION

VIBRATING SCREENS

FOR INFORMATION SEE YOUR LOCAL SECO DISTRIBUTOR

BALZER MACHINERY COMPANY.....Portland, Oregon
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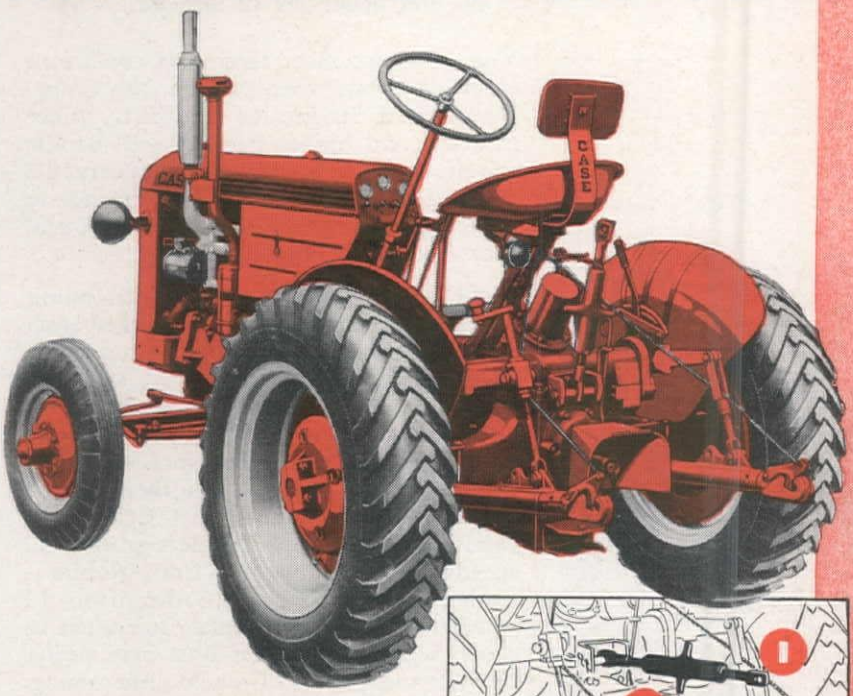
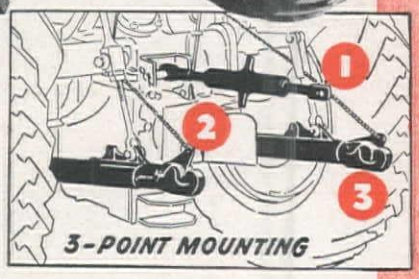
SCREEN EQUIPMENT CO., INC.

1750 Walden Avenue Buffalo 25, N. Y.

One of America's Leading Makers of Vibrating Screens Exclusively

New FOR CASE "VAI" INDUSTRIAL TRACTOR





EAGLE HITCH FOR LATCH-ON EQUIPMENT

A fast, sure coupling unit for rear-mounted equipment—do ditching, grading, scraping, bulldozing, backfilling, snow handling—dig post holes, remove posts, lift and carry sacks of cement, planks, construction equipment, etc. Many uses on lighter jobs where big, heavy equipment is not needed—also a cost-saver on clean-up and auxiliary work where heavy equipment is on the job.

You can change rear-mounted equipment on the Case "VAI" quicker than you can fill the gas tank. The lifting arms are hydraulic controlled to raise the equipment for quick transport, to lower and hold the equipment at proper working depth. The coupling arms also adjust the tilt and cutting angle of the mounted tools.

The versatility of the Case "VAI" Tractor is matched by its all-around strength and durability—built to take the jars and jolts of contracting and construction work. Get all the facts—send for free literature on the Case "VAI." J. I. Case Co., Racine, Wis.

LESS TIME GETTING READY

MORE TIME ON THE JOB

Changing from one rear-mounted tool to another is quick and easy. Simply remove a pin and touch the hydraulic control. You can even hook to many tools without getting off the tractor seat! Saves hours of get-ready work. The Latch-On tools shown below, and many others, are available.

SCOOP on "VAI" Tractor with Eagle Hitch digs, lifts and carries 10 cu. ft. of material in forward or reverse position. Reinforced cutting edge is replaceable.

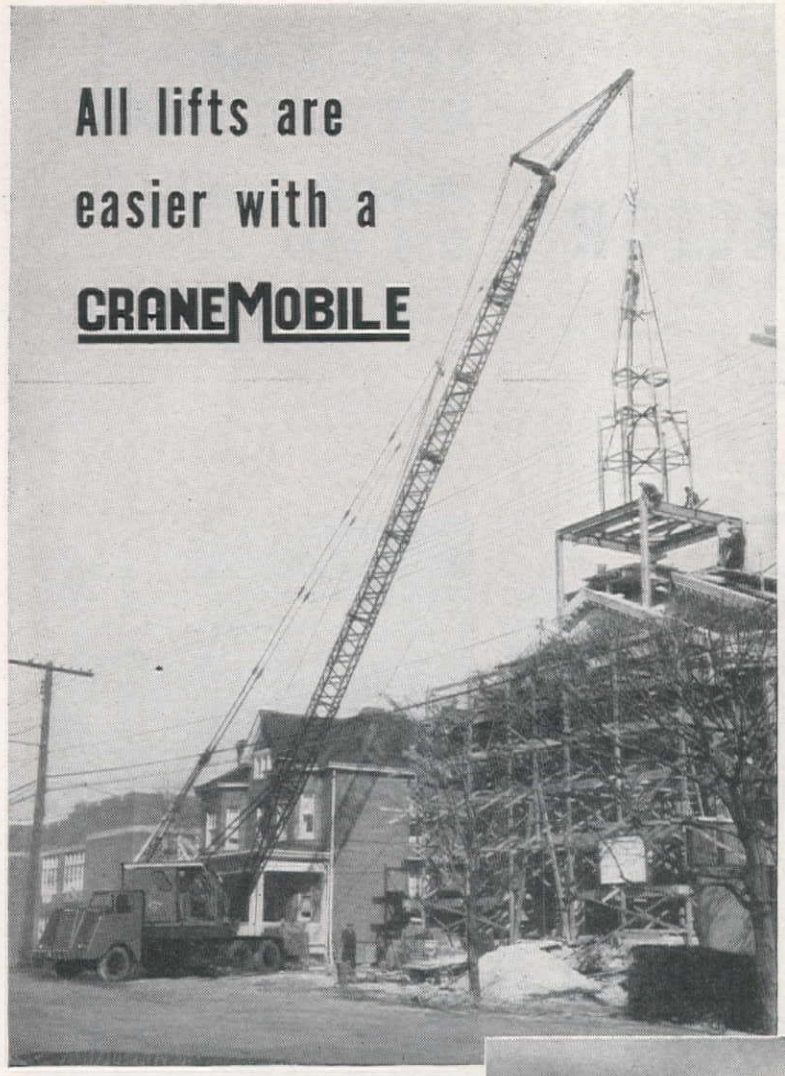
BLADE can be tilted or angled to any position from tractor seat for scraping, ditching, grading, bulldozing and backfilling.

POST HOLE DIGGER does the work of eight or ten men. Dig holes for fence posts, tree nursery settings, highway guard-rails, foundation footings and other construction work. Eight auger sizes, 4" to 24" diam.

SEE YOUR CASE INDUSTRIAL DEALER

Superior Equipment Co., Phoenix, Ariz.; Hayward Equipment Co., Los Angeles, Calif.; Growers Tractor & Implement Co., Sacramento, Calif.; Contractors Machinery Co., San Francisco, Calif.; Lake County Equipment Co., Lakeport, Calif.; Electric Tool & Supply Co., San Bernardino, Calif.; Contractors Equipment & Supply Co., Fresno, Calif.; Liberty Truck & Parts Co., Denver, Colo.; Western Equipment Co., Boise and Idaho Falls, Idaho; Hilton's, Inc., Las Vegas, New Mexico; Farmers Machinery & Supply Co., Reno, Nevada; Foulger Equipment Co., Salt Lake City, Utah; Wortham Machinery Co., Cheyenne, Rock Springs and Casper, Wyoming; Montana Powder & Equipment Co., Helena, Montana; Columbia Equipment Co., Portland, Oregon.

CASE



All lifts are easier with a CRANEMOBILE

Do you . . .

— want to handle a 25 ton machinery base?

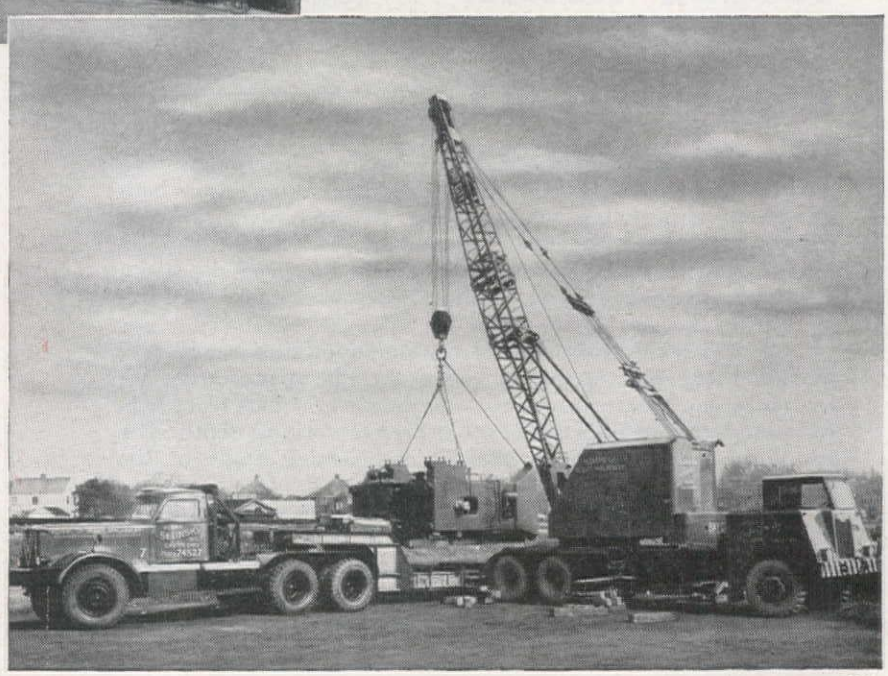
— want to set a church spire with 90 foot boom and 15 foot jib?

You may not meet these job conditions every day—but when you do, the CraneMobile with its greater flexibility, wider mobility and higher stability will handle the lift easier. The BAY CITY has earned a reputation for dependable performance in working long booms for high reach and short booms for heavy loads.

The CraneMobile offers many outstanding operating advantages—and is packed with refinements. A deep-section pin-connected boom for quick assembly . . . an independent worm boom hoist which raises or lowers only under power . . . a power load-lowering device for precision handling of heavy loads. Then there is the specially designed and BAY CITY built carrier which has a wide selection of road speeds up to 35 mph. The CraneMobile is made in several sizes with ratings from 10 to 25 tons. For the complete story, get in touch with your nearest BAY CITY dealer or write today for the CraneMobile catalog. BAY CITY SHOVELS, INC., BAY CITY, MICH.

CHECK THESE FEATURES

- √ Pin-Connected Boom
- √ Hi-Collapsible Gantry
- √ High Road Speeds
- √ Independent Power Boom Hoist
- √ Precision Power Load Lowering
- √ Removable Counterweight
- √ Specially Designed Carrier
- √ 20-25 Ton Capacity



206

BAY CITY

SHOVELS • CRANES • HOES • DRAGLINES • CLAMSHELLS

Only BARRETT gives you these

two big services

for better pipe protection

1 The Barrett Field Manual

2 On-the-Job Technical Aid

When you buy Barrett* Coal-Tar Enamels, you get the best pipe-protection products on the market. But even finest enamels must be properly applied for best *protection*.

That's why it's so important to take advantage of the two Barrett services designed to help you *get* best protection. They're yours for the asking—the Barrett Field Manual, which gives detailed procedures for proper application—from cleaning to back-filling—and on-the-spot service by a Barrett Technical Service Representative.

Barrett Coal-Tar Enamels, plus these two services, are a sure-fire combination.

Phone, wire, write for complete information.

Check this list of Barrett Coal-Tar Enamel advantages

The right product and procedure for every gas and oil pipe line need
Resistance to extreme atmospheric temperatures
High ductility and flexibility
High resistance to soil stresses
High dielectric properties
Moisture impermeability
Resistance to gas or petroleum attack
Easy availability and application
On-the-job technical assistance
Dependable deliveries

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5551 St. Hubert St., Montreal, Que.

Barrett*

**Reg. U. S. Pat. Off.*

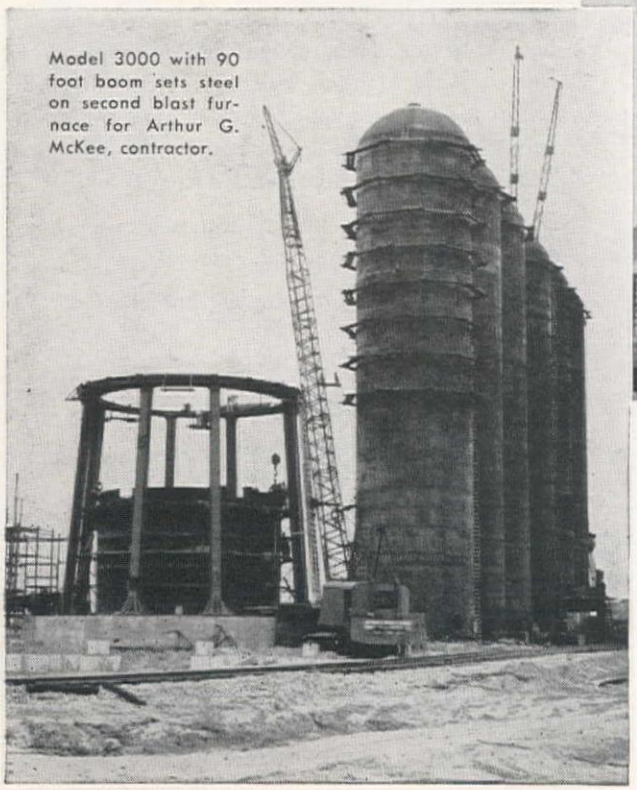
Coming Up - More Steel

23 Manitowocs Speed Construction at U. S. Steel Fairless Works

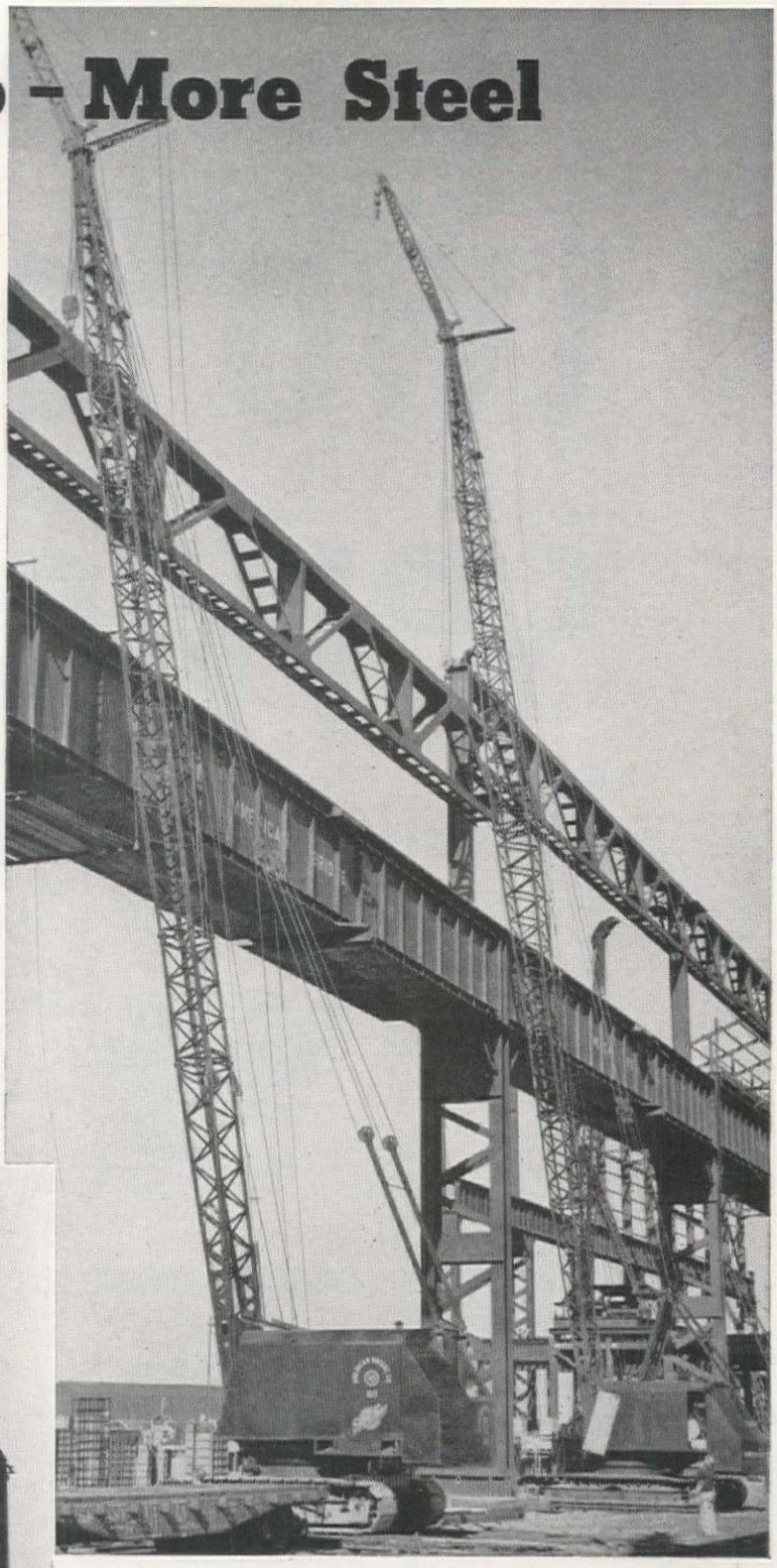
On this huge Pennsylvania project 23 Manitowoc Cranes and Draglines, more than any other make, are carrying the brunt of the work excavating and steel erecting for the major contractors.

Such preference means only one thing, satisfactory performance—ability to handle heavy loads, high up with pin point precision and utmost safety.

And on most other major projects whether it be earth excavation or steel erection you'll find those big, husky Manitowocs handling the toughest parts of the job. They'll handle *your* job too. Manitowoc Engineering Works, Manitowoc, Wisconsin.



Model 3000 with 90 foot boom sets steel on second blast furnace for Arthur G. McKee, contractor.



American Bridge uses a Model 3500 and a Model 3900 Speedcrane to set a heavy girder for the Open Hearth building. Reach plus stability means speed and safety.

BAY EQUIPMENT COMPANY
3254 East Shore Highway
Richmond, California

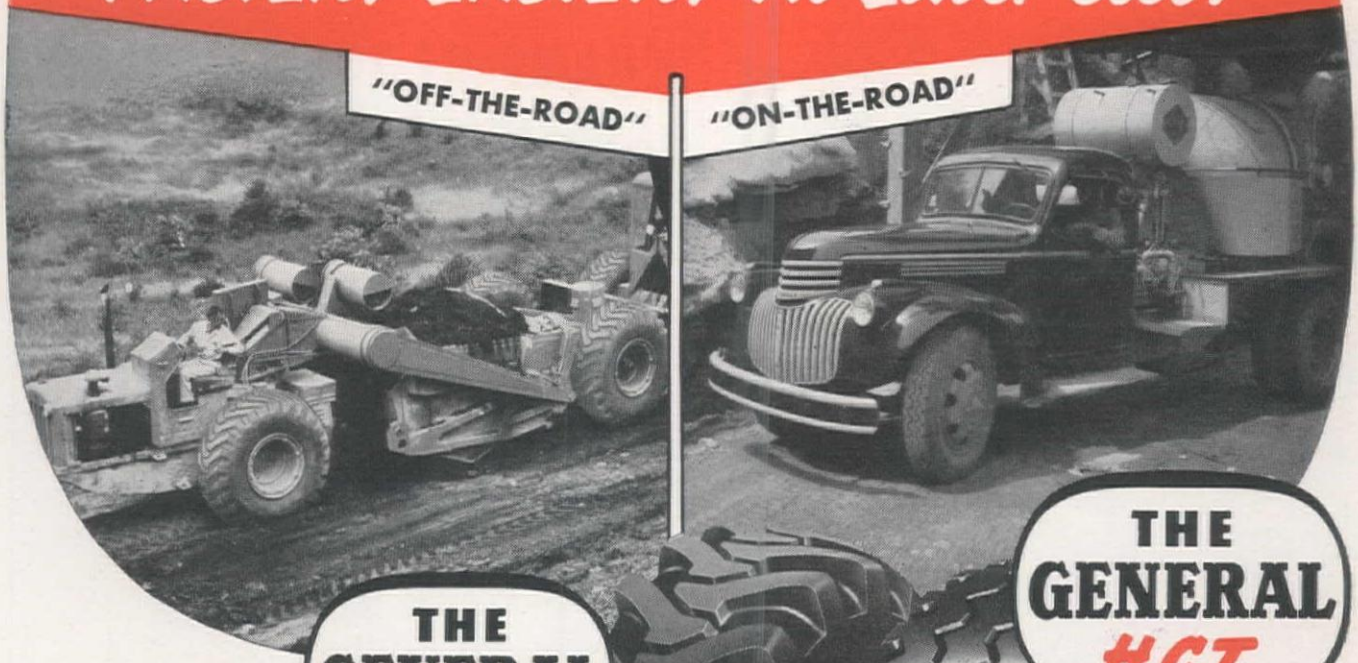
2605 Second Avenue
Seattle 1, Washington

OLSON MANUFACTURING COMPANY
4001 Springs Avenue
Boise, Idaho

GENERALS

GO IN—GET THE LOAD—CARRY IT OUT AND OVER THE HIGHWAY

FASTER! EASIER! At Lower Cost!

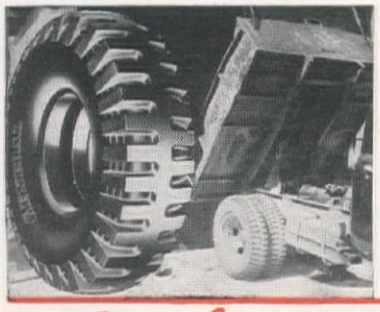


THE GENERAL D.T.L.

THE GENERAL H.C.T.

GENERAL D. T. L. with deep, sharp, angled cleats and sturdy, high shoulder lugs. Designed for maximum traction on soft surfaces—forward or backward.

GENERAL H. C. T. for trucks that go off-the-road to pick-up, deliver loads. Free-rolling tread and stronger body for more miles, more safety.



GENERAL NON-DIRECTIONAL CLEATED

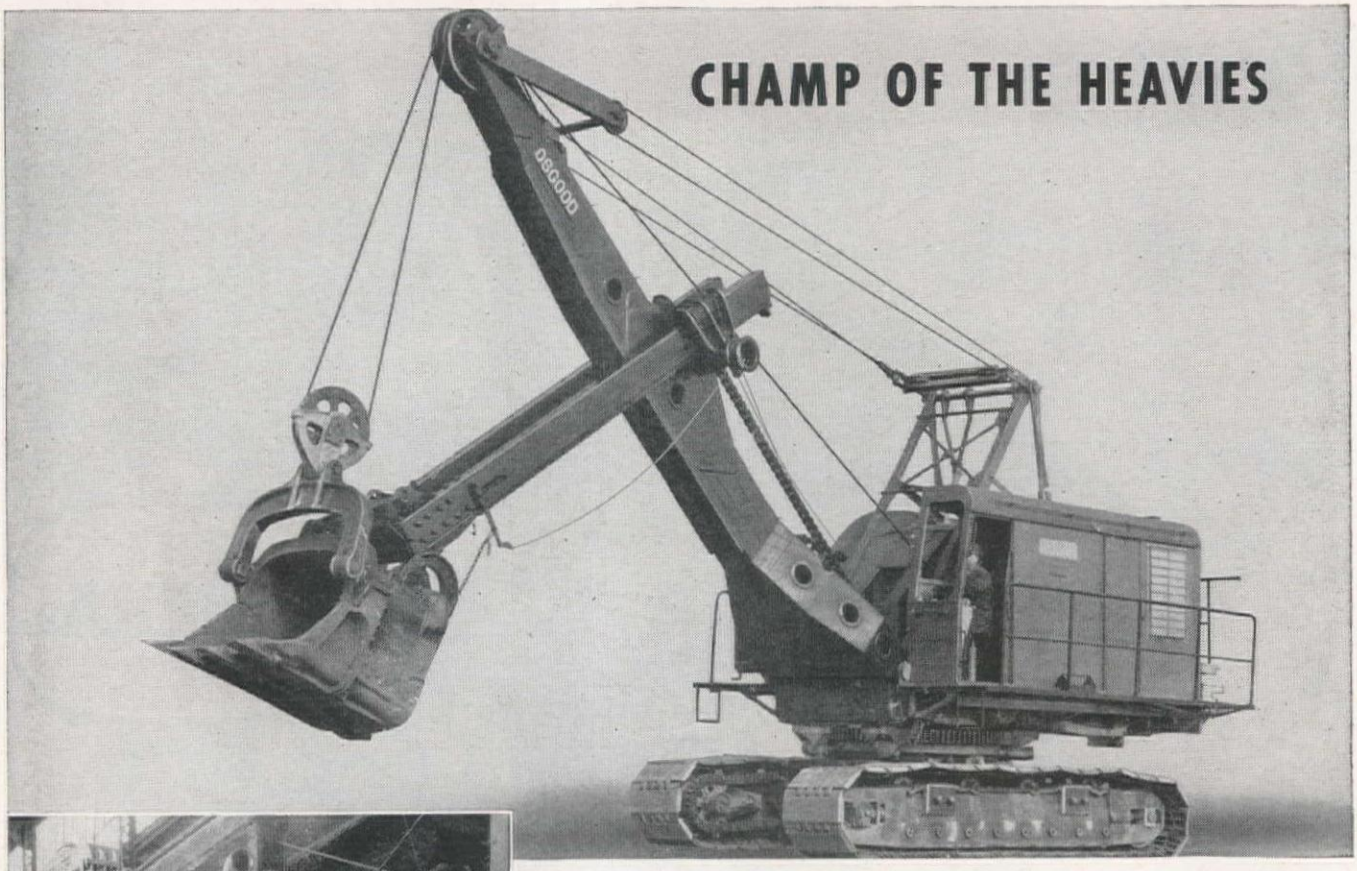
Best for dump trucks. Self-cleaning tread for extra drive-wheel traction forward or backward.

GENERAL TRACTOR GRADER

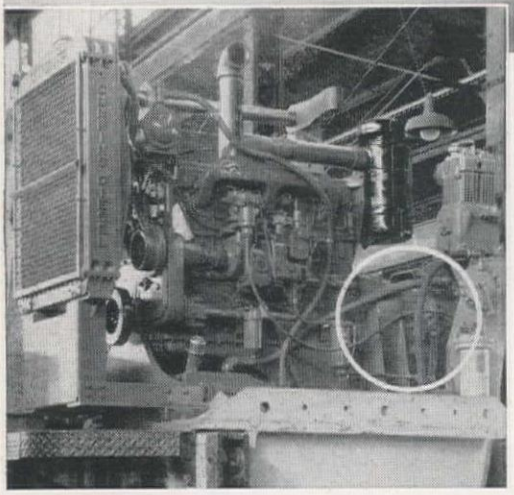
For power wheels—sharp, self-cleaning tread for extra traction. For front wheels—easy steering, smooth riding ribs.

Specify **GENERAL TIRES ON YOUR NEW EQUIPMENT**

OSGOOD



CHAMP OF THE HEAVIES



***TORQUE CONVERTER** is available as optional equipment on models 1½ Yds. and up.*

Here's a heavyweight that can get into the ring with any of 'em, and come out the winner! OSGOOD 2½-Yd. Shovel is not only big and tough, it's got poise, speed, stamina—everything it takes to slug it out on the roughest rock job, and for top performance in moving dirt or mining.

Torque Converter multiplies line pull without excessive load on engine . . . reduces shock loads on machinery and crawlers. OSGOOD Metered Air Control with Air-Cushion Clutches assures action that's fast, accurate and velvet-smooth. Entire machine is built to withstand lots of punishment with minimum time out for adjustments or repair. Good reach. Plenty of power: Caterpillar D-17,000, Buda 6-DC-1879 or GM8103 engine. Quick conversion to Dragline, Clamshell, or Crane. Let OSGOOD help you KO rising production costs now. Write today.

PCSA

EQUIPMENT DESIGNED WITH YOUR PROFIT IN MIND

5203

The OSGOOD COMPANY

MARION, OHIO

AFFILIATED WITH THE GENERAL EXCAVATOR CO.

POWER SHOVELS, CRANES, DRAGLINES, CLAMSHELLS, PILE DRIVERS & HOES. CRAWLER, TRUCK OR WHEEL MOUNTED. DIESEL, GASOLINE OR ELECTRIC POWERED. CAPACITIES ½ TO 2½ CU. YD.

from penstocks to water mains . . .

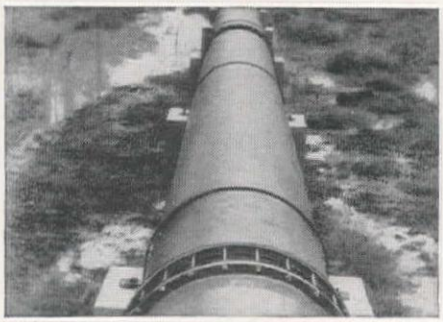
Dresser Couplings absorb pipe movement, prevent built-up stresses, speed construction

75" penstock of the British Columbia Electric Co. One of three installed at Bridge River, using Dresser Couplings specially designed for the job. With Dressers, construction time was cut from months to weeks, due to simplicity of installation. And penstocks have remained bottle-tight under very high pressures, despite severe weather conditions.

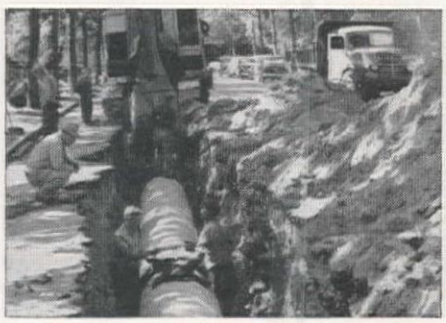
On either exposed or buried lines, from 3/8" to 72" diameter or larger, your best protection against vibration or movement stresses is a Dresser Coupling. Each of these "flexible-tight" joints takes up to 3/8" expansion-contraction movement . . . up to 4° deflection . . . cushions your line at every joint. Specially compounded rubber gaskets soak up vibration like a sponge.

Installation of Dresser Couplings is simplicity itself. Any workman can install them; the only tool needed is a wrench. And fast? On a typical 48" water line, 40 lengths of pipe were laid in one 8-hour day using a two-man joining crew.

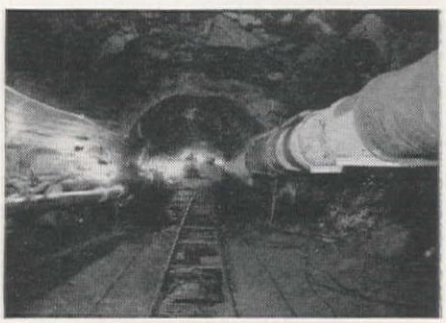
Performance on half a million miles of pipe proves Dresser dependability.



Over swamps and marshy ground, where earth movement must be considered, Dresser Couplings keep Savannah's, new 14-mile, 42" water supply artery completely tight.



In busy streets of Stoneham, Mass., simplicity and ease of installing Dresser Couplings gets the job finished sooner. Dressers absorb traffic vibrations.



Under New York Harbor, construction of the Brooklyn Battery tunnel was simplified by using Dresser Couplings to join air and water supply lines.

DRESSER

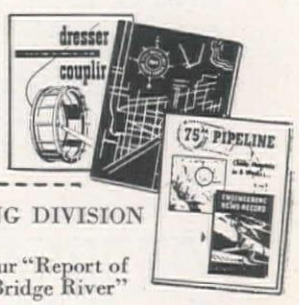
"FLEXIBLE-TIGHT"

COUPLINGS

Dresser Manufacturing Division, 319 Fisher Ave., Bradford, Pa. (One of the Dresser Industries.)

GET THESE FOLDERS NOW!

Interesting engineering data on varied types of lines installed with Dresser Couplings. This is file material.



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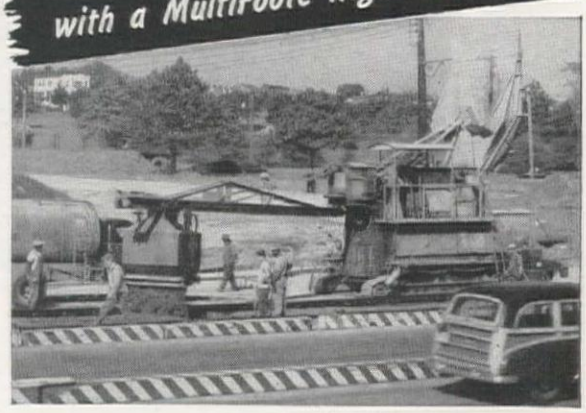

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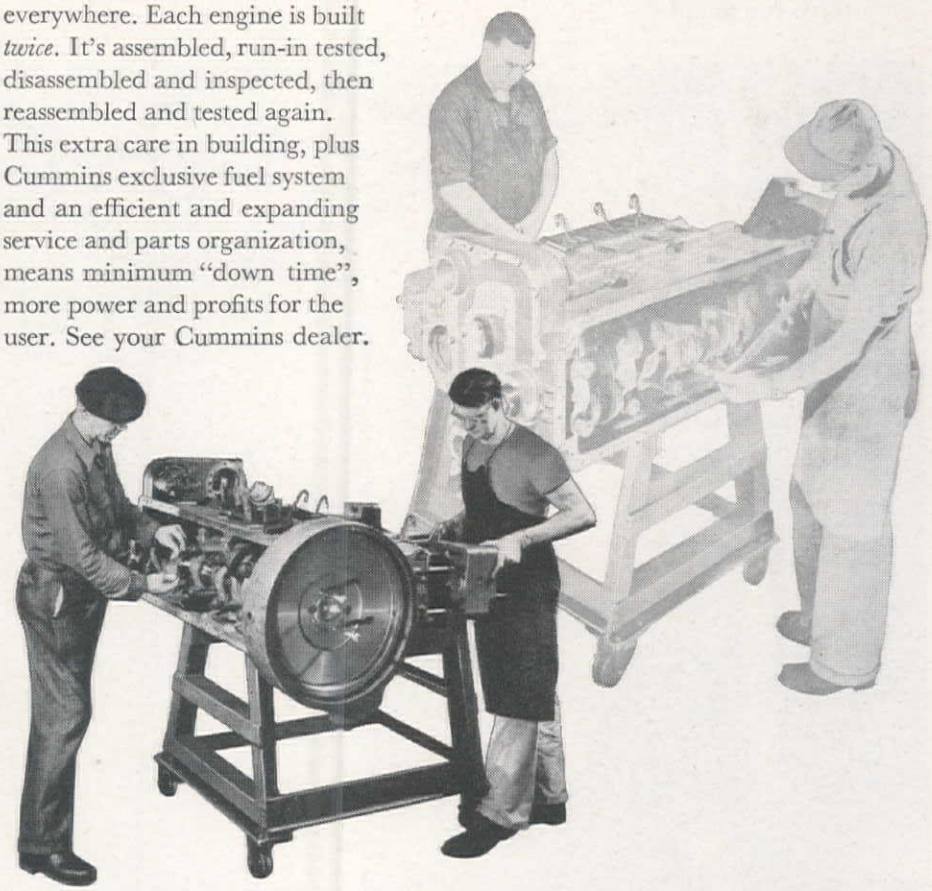

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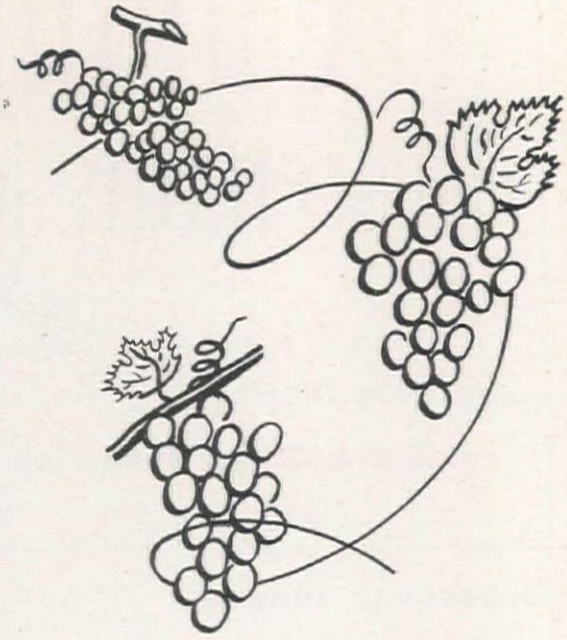
(1-11-52)

FROM THE VINEYARDS TO HORTON TANKS



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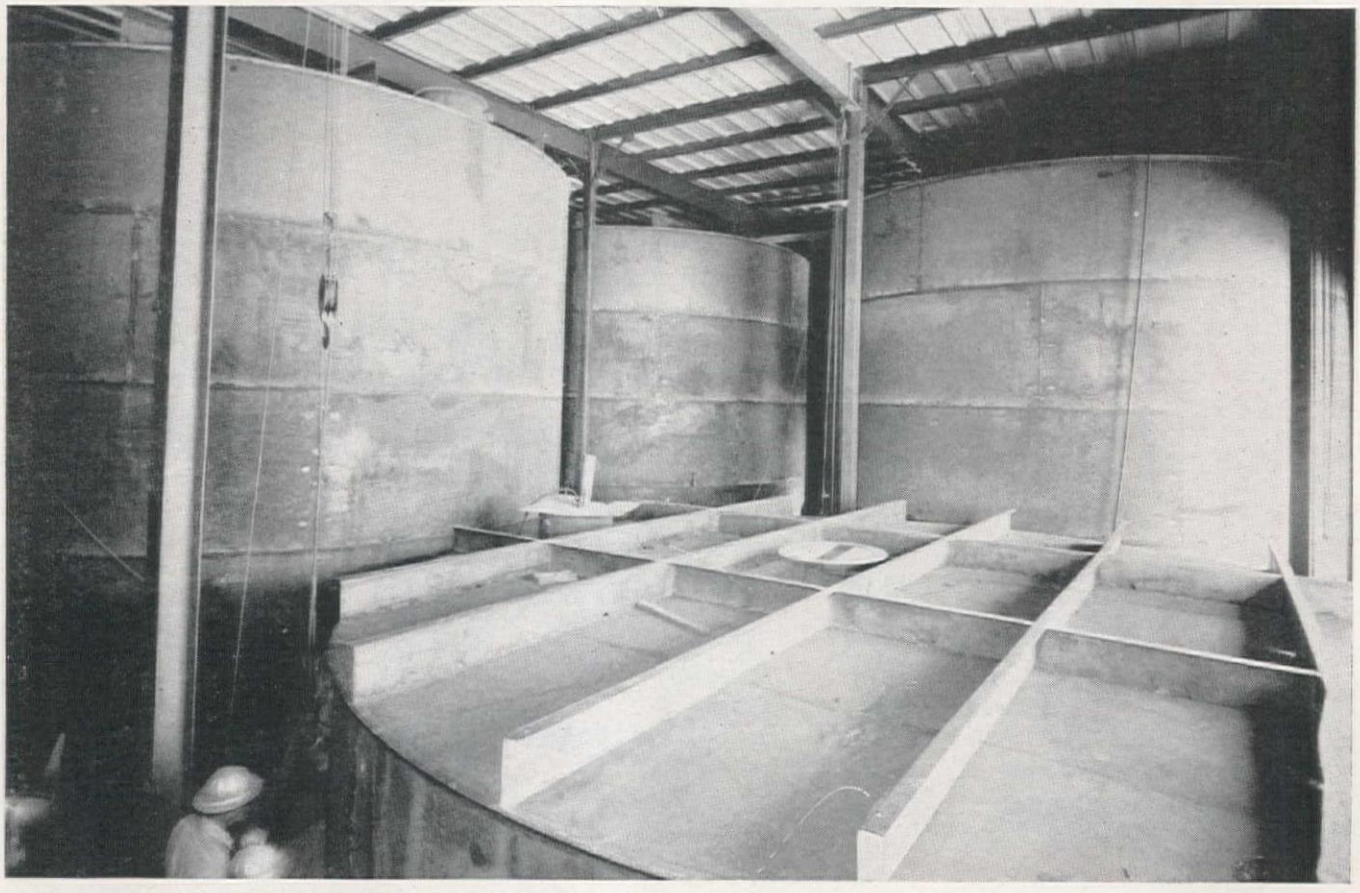
Special welded structures like these *stainless-clad* grape juice storage tanks are typical of the many types of steel plate structures we fabricate and erect. Write our nearest office for details.



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Chicago 4.....McCormick Building	San Francisco 4.....1569—200 Bush Street
Cleveland 15.....Guildhall Building	Seattle 1.....1355 Henry Building
Detroit 26.....Lafayette Building	Tulsa 3.....Hunt Building
Houston 2.....C & I Life Building	Washington 6, D. C.....1103 Cafritz Building

WESTERN CONSTRUCTION

May 1952 Vol. 27, No. 5

"A profession or a job"

Next month another annual crop of engineering graduates will begin to consider the question of whether it is "a profession or a job." Although the principles involved may remain unchanged, today's graduates are faced with conditions that demand realistic answers.

Any discussion based on comparison of words can logically start from definitions. Without taking the dictionary too literally, a profession is defined as "a vocation, if not purely commercial, mechanical, agricultural or the like," while the word job is described as "any definite piece of work, such as is undertaken for a fixed price or that is in the way of one's special trade or occupation." Further, the dictionary does mention specifically the "three learned professions" as if to imply that any other group would need up-grading to get into the same category.

Has there been a gradual change in the opinion of engineers themselves? Answers would probably show a marked difference if opinions were expressed by various age groups. In the older groups, the percentage of engineers considering their efforts as belonging to a profession might be higher than in groups a few years out of college. Whether young engineers of today will grow into the "professional attitude" makes interesting speculation.

If it is necessary to enter the ranks of the self-employed to achieve true professional status, records will show the profession is on the decline with respect to the total number of graduates. There is always the argument that doctors and lawyers who work for salaries consider themselves as members of their profession and on a par with their "hang-out-the-shingle" associates. But this comparison applied to engineers becomes a poor parallel, because the ratio is reversed.

Young engineers who go to work in engineering offices where there are several higher positions to aspire to may look upon themselves as sub-professional, and working towards the higher recognition. Registration by a state recognizes this step by using the term "in training." Those graduates who take positions where they do not work for or associate with engineers may not sense so readily this foot-on-the-ladder situation, and the goal of profession standing can easily become secondary to other considerations. Contact with trade unionism is another factor which will rather quickly line up those who consider themselves in professional ranks—even though going through a preliminary stage—from those who accept the philosophy of the "job" and what it implies. All factors finally reduce to whether the young engineer, within himself, has the attitude that places him in the ranks of professional men.

Consultants for municipal work

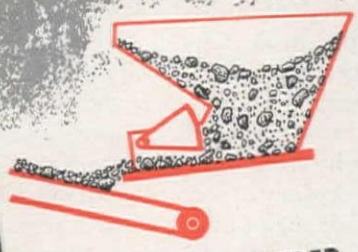
A not uncommon problem relating to the use of outside professional talent for the engineering design of municipal improvements has developed in the City of Albuquerque. The question involves whether or not the city engineer's office could or should design a major sewerage program provided by a $4,000,000 bond issue. The employment of outside engineering talent by cities has some rather widely accepted principles for the guidance of municipal officials. Assuming the average city is maintaining a fairly regular growth there will always be water and sewerage improvements of a routine nature, and the office of the city engineer is normally set up to handle this type and amount of engineering work—office and field. On the other hand, should the city be experiencing an accelerated growth the time arrives when a large-scale project must be carried out as a unified program, and in this case the sudden volume of the work may be beyond the capacity of the regular office. The employing of a capable firm of engineers is the logical and usual answer to this problem. This procedure will probably be faster and less expensive than to try to enlarge the city force on a temporary basis and then reduce it again. Another situation may involve unusual technical problems. In this case the employment of special engineering talent, usually for study, recommendation and possibly design is not only sound civic procedure, but the staff engineers of the city should be anxious to have such help and counsel. In general, routine engineering by the staff engineers, and the employment of outside talent for projects of unusual magnitude or complexity provides a balanced engineering plan for the average municipality.

A job to be proud of

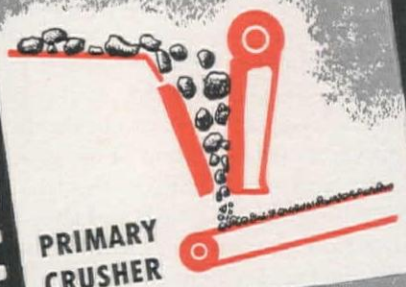
In the best tradition of Western contracting the group operating under the equally Western name of Chief Joseph Builders carried out the "impossible" when they were called upon to do nine months of dam building in five months. The seasonal cycle of the Columbia River being far beyond the efforts of mere man to modify it, it is necessary in the program for building Chief Joseph Dam, and others on the Columbia, to plan and complete elements of the projects within low-flow months. The usual non-flood period of nine months had been planned for concreting above the cofferdam stage on the north side. The time appeared adequate and the contractors planned accordingly as to plant and crews. Then, due to factors beyond their control, the first four months of this period were lost. The only way to keep from losing an entire year was to do the season's work in the five remaining months. The record of accomplishment within this tight, accelerated schedule is a worthy addition to the record of noteworthy achievements established by contractors of the West.

BASIC UNITS

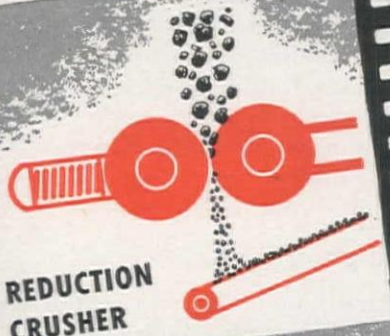
APRON FEEDER



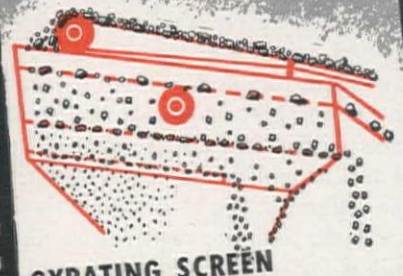
RECIPROCATING FEEDER



PRIMARY CRUSHER



REDUCTION CRUSHER



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GUNITE LINING TO STOP SEEPAGE

Service demands on 2,000-cfs. Arizona canal limit shut-down to one month, requiring rush schedule for preparation and placing 442,607 sq. ft. of lining 1¼ to 1½ in. thick

By DONALD E. WOMACK
Junior Engineer
Salt River Valley Water Users' Association
Phoenix, Arizona

HIGH BANKS required up to 150 ft. of hose between mixer and nozzleman.

ELIMINATION of a serious seepage problem in a section of main canal in the Salt River Valley Water Users' Association irrigation system near Phoenix has been corrected by placement of a 1¼ to 1½-in. gunite lining. Heavy irrigation demands made time of utmost importance and as the system is in use virtually all year, only a 31-day dry-up period could be permitted to carry out the lining project.

The waterway, known as the Arizona Canal, was constructed around 1890 and delivers water to some 240,000 ac. under cultivation in the Salt River Project of the Association. With a maximum capacity of 2,000 cfs., the canal extends for a distance of 38¼ mi. from its head at Granite Reef Dam, northeast of Phoenix, to its terminal at a lateral northwest of the city. It serves 205 mi. of laterals.

12% water loss

In the 13.3-mi. section from the dam to the initial delivery point (Lateral 1) losses from seepage and evaporation have averaged about 12%. Evidence of greatest loss occurred in the 1¼ mi. immediately below the head of the canal where the banks were rocky and porous, and on which grew numerous large trees with extensive root systems.

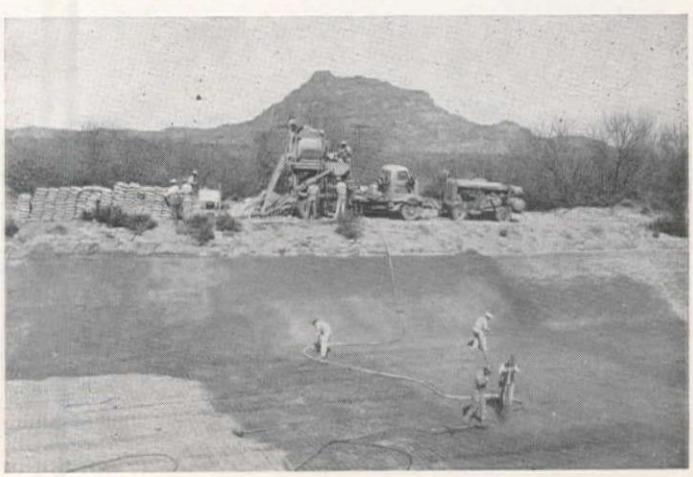
Through this section, the Arizona Canal runs parallel to the Salt River, separated from the river by only the south bank of the canal. Seepage water from the canal caused the development of a sizable pool between the canal bank and the river at a point ½ mi. below Granite Reef Dam. A pump of 900-gpm. capacity was installed south of the canal bank to return this seepage. An extremely low level of stored water during the summer of 1951 focused attention to the long-proposed lining to this critical section of the canal.

The project was scheduled for the first part of 1952 when a dry-up period could be granted with the work to be carried out under the Bureau of Reclamation's rehabilitation program. On January 15 a contract for the guniting of approximately 5,300 lin. ft. of 70-ft. perimeter canal was awarded to Vinson Construction Co., Phoenix. Payment was to be at the rate of $3.475 per sack of cement used. The sack basis of payment was considered best to compensate for uneven grades, cutoff walls and spillways. Final placing of gunite was finished at 5:20 p. m., February 20 and the water turned into the canal at 3:00 a. m., February 21.

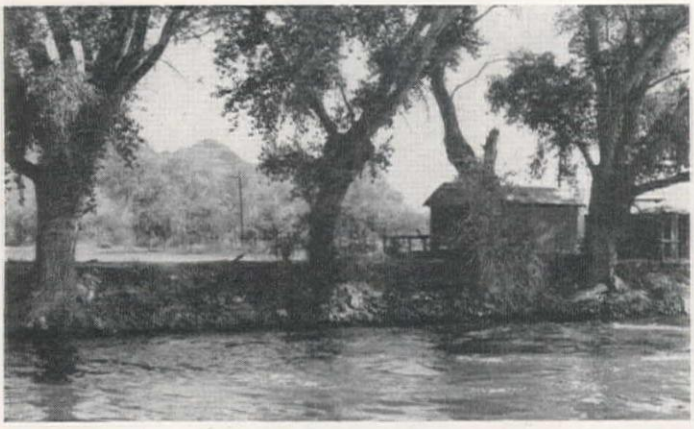
Lining will pay for itself

Total cost of the lining was approximately $125,000. Estimated saving of water in the lined section is 2% of normal flow of 35,000 miners' inches, which results in an annual saving of 12,660 ac. ft. At $3.00 per acre-foot, the value of this annual saving will be $37,980. Thus it is expected that the lining will pay for itself in less than four years, as well as conserving valuable water that might otherwise be lost.

Grading and earthwork necessary



AFTER DRAINING, bottom was graded (left) and banks machine trimmed to 1:1 slope. Mesh was then placed and gunite applied (right). Two outfits were used, one on each side of the canal. A total of 18,955 sacks of cement was used for job.



BEFORE AND AFTER. Unlined bank of canal (left) prior to start of work, showing porous type of material and large trees which aggravated the seepage problem. Completed section (right) near same location with banks graded to smooth 1:1 slope and gunited.

prior to placing the lining was carried out by crews of the Association. The canal was designed with a gradient of 0.0004 on the basis of a survey made under operating conditions. However, actual bottom elevations differed somewhat from those shown by the survey and to permit completion on schedule removal of an excessive amount of earth had to be avoided. This was done partly by reducing the gradient to 0.0001 for the last ½ mi. of the section lined.

About 5,000 cu. yd. of earth had to be removed in bringing the bottom and banks of canal to grade. Material was removed and grading carried out with two bulldozers, a 12-cu. yd. scraper and a motor grader. Some blasting was required to remove granite outcroppings in the canal bottom. The canal was to be lined to a height of 10 ft. with the banks trimmed to about a 1:1 slope. Shaping and trimming of banks was accomplished effectively with a Gradall which left only a very small amount of hand labor to be done before the reinforcing mesh could be laid and the lining placed. The bottom of the canal was rolled before the reinforcing was placed.

Reinforcing consisted of 14-gauge, 4-in. wire mesh on the banks and 10-gauge, 6-in. mesh on the bottom. The reinforcing fabric extended horizontally over the top of the banks for 12 in., and into a 3-in. cutoff. After the gunite lining was cured the cutoff was covered with soil to prevent surface water from running behind the lining.

Lining

Two gunite placing units were used, one on each bank of the canal. Each was a built-up mobile unit, with a skip-fed two-sack Jaeger mixer and a 420-cu. ft. Schramm compressor maintaining 60-lb. pressure. The high canal banks made it necessary to use as much as 150 ft. of hose between machines and nozzles.

From a point about ¼ mi. below the Granite Reef Dam the canal was lined towards the first lateral for a distance of 5,207 ft. Along this section the average perimeter was 85 ft. The section lined included two 35 x 18-ft. spillways. During the twenty-three 10-hr. days worked in the allowable dry-up period, 442,607 sq. ft. of canal was lined with an average thickness of 1¼ to 1½ in. The mix used was 376 lb. of sand to 94 lb. of cement. A total of 18,955 sacks of cement were used for the lining with an average coverage of 23.4 sq. ft. per sack of cement. Combined daily averages for the two units were 226 lin. ft. of canal, 822 sacks of cement and 19,244 sq. ft. of lining. The 2,750 cu. yd. of sand required in the lining was hauled 25 mi.

A second section of canal, 393 ft. in length, immediately below Granite Reef Dam, was also lined. This section was lined with an average thickness of 2 in., and has an average perimeter of 100 ft. Lining totaled 39,291 sq. ft., and was placed in 3 days. An average coverage of 16.6 sq. ft. per sack was obtained. (Before and after photos show this section.)

Curing

All lining was water cured. Sprinkling with hose was effective the first few days and after the length to be cured increased it was found that better results could be obtained by flooding the bottom to a depth of 18 in. This water was held back from the lining operations by sack dams across the bottom. As the lining advanced, a new dam was added every two days. For wetting the banks, a 1½-in. Marlow portable pump mounted on bicycle wheels and discharging through two spray nozzles proved very effective. One man using this pump could replace four or five men with hose.

Water problems

Work on the project started immediately after some heavy rains and as a consequence water seeping through the bottom formed mud bogs in two places. To correct this situation it was necessary to remove the fine material and mix it with dry soil and then replace it. To prevent any lifting action from groundwater, either during the construction or in future dry-ups, weep holes, made from 1-in. pipe were placed in the lining every 200 ft. Five pipes were placed at each section, one about 2 ft. below the top of each bank and three across the bottom of the canal.

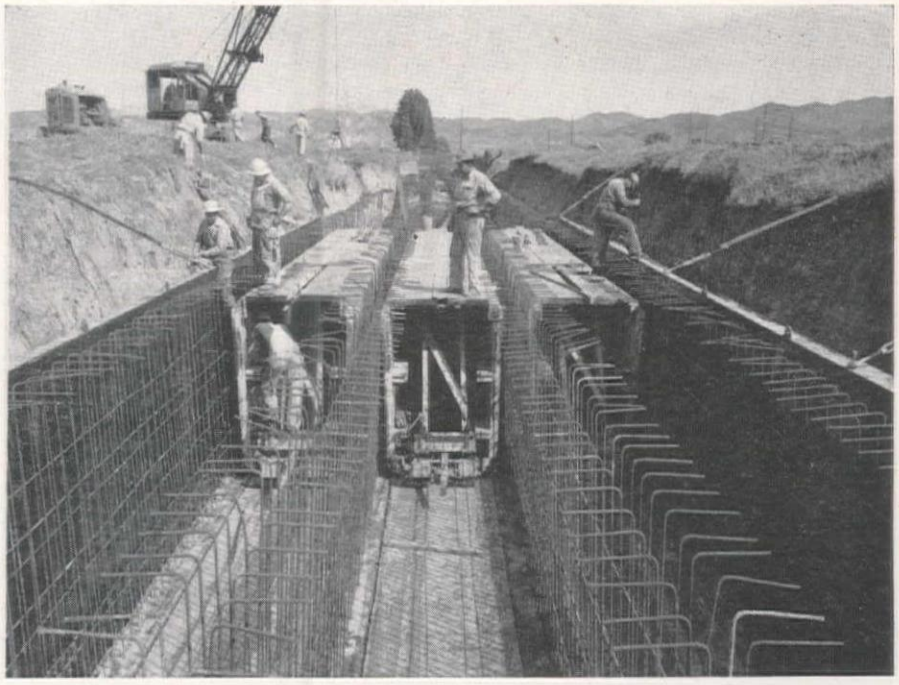
Immediately below the dam, ground water posed a problem due to the water impounded behind the dam and the high standing water table north of the canal. To counteract this situation 4-in. perforated pipes, 8 in. long, were set in gravel and gunited in place. Trenches were dug along the foot of each bank to permit the installation of a 4-in. concrete pipe that could transfer the underground water to a central weep pipe. These trenches were backfilled with ½-in. rock. To avoid ground water forcing its way through the lining before it had properly set, enough water to equalize the pressure was placed in the canal bottom as soon as the lining of this section was completed.

PERSONNEL on the project. L. to r.: H. Shipley, chief engineer; Don Womack, junior engineer; Jake Miller, senior engineer, and H. N. Ruppers, superintendent of construction and maintenance.

Personnel

R. J. McMullin is general manager of the Salt River Valley Water Users' Association. H. Shipley is Chief Engineer for the Salt River Project. Other personnel responsible for construction-maintenance operations are H. N. Ruppers, superintendent of construction and maintenance, Jake Miller, senior engineer, and Don Womack, junior engineer who acted as inspector on the canal lining project.

These carriage-mounted collapsible steel "tunnel" forms kept work rolling during construction of a 7,000-ft. 3-cell concrete box culvert under Marine air base runways — Self-supporting and self-aligning reinforcing system meant fast erection by a small crew



Box culvert forms re-used 50 times

By
DOMINIC J. BRESSI
Structural Superintendent
Bressi & Bevanda Constructors
and
A. Teichert & Son, Inc.

STEEL FORMS that could be quickly stripped, moved ahead, and set up for subsequent pours provided an economical method for constructing nearly 7,000 ft. of 3-cell reinforced concrete culverts at El Toro Marine Corps Air Station in California. Part of a $6,500,000 contract for extending and repaving runways, construction of the culverts is being carried out by a joint venture of Bressi & Bevanda Constructors and A. Teichert & Son, Inc. General features of the project were reviewed in *Western Construction* for March 1952, pp. 81-84.

The box culverts, which will carry the flow of two existing drainage ditches under new runway extensions, are divided into north and south sections, each about 3,500 ft. long. In the north section each cell is 4½ ft. high and 6 ft. wide, while in the south section the cells are 7½ ft. high and 5 ft. wide. Both structures are designed to carry heavy plane loads.

Highway headers for invert slabs

Concrete pouring was scheduled in two stages. The first operation was pouring the flat invert slab, and was followed by placing concrete for the walls and deck in a monolithic pour. The 16,000 cu. yd. of concrete was furnished by transit-mix trucks from a batch plant within the Marine base. Concrete for both culverts was placed with a 1-cu. yd. bucket handled by a 20-ton truck crane.

Forming for invert slabs featured the use of steel highway headers. After completion of fine grading by motor graders, steel headers with wooden extensions were set for outside forms. Since the floors of the culverts were to have a hand-troweled finish and were in three separate lanes, 2 x 4's were used for screeds. These were supported by adjustable clamps on steel pins driven into the subgrade.

Self-supporting reinforcing system

The plans called for wall reinforcing steel to be continuous from slab to deck. The conventional method of using wood templates and supports did not appear feasible. After much discussion between the contractor and his placing subcontractor, it was decided to use a welded self-supporting system. By welding every eighth vertical wall bar to the invert steel, and by tack welding longitudinal diagonal sway brace rods, the reinforcing system was made self-aligning and eliminated the constant set-up and removal of lumber for template and support material.

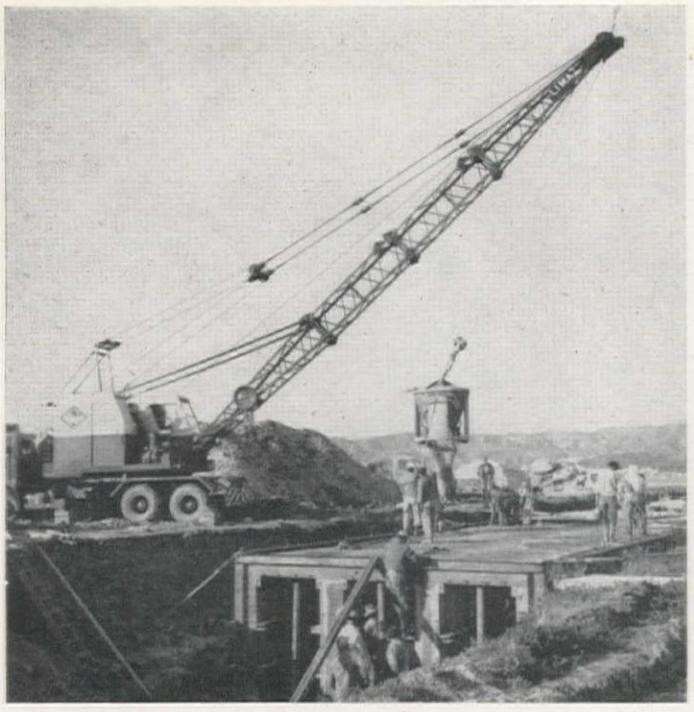
Fast erection, continuity of operations with a small fixed crew, and ease of form transportation determined the choice of forms for the upper portions of the culvert structures.

Consideration was given to three methods of form construction for the wall and deck portions of the culverts. Comparative studies were made of plywood panel form as well as of steel forms, both panel type and traveling steel forms. Although the traveling steel form was substantially higher in original cost, its lower labor cost for erection and stripping time gave the lowest combined cost—due to the reuse of the forms 50 times for each size.

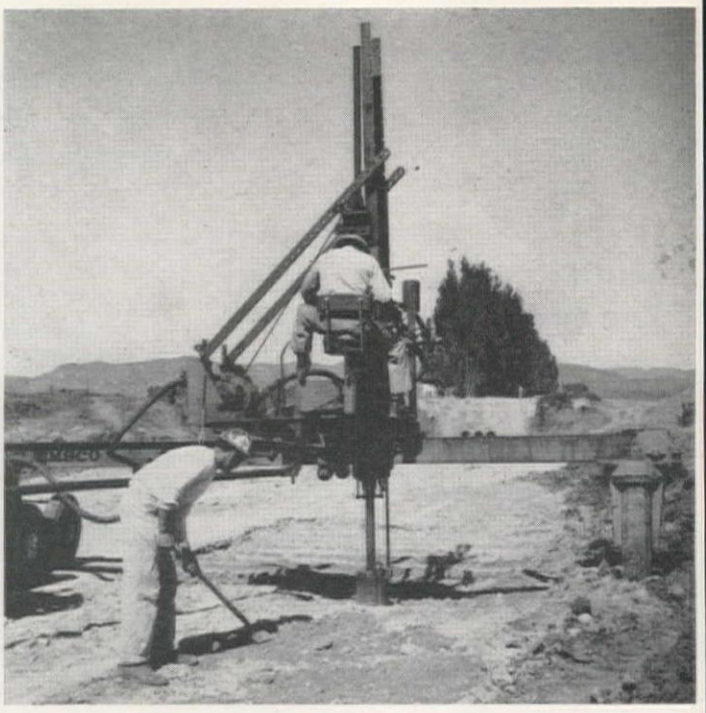
75-ft. forms in two sections

For ease of movement, the inside and outside forms for each 75-ft. length of culvert were made in two 37½-ft. sections. Both forms were constructed of 5/16-in. steel plate backed by structural

OUT IN THE OPEN, form carriage construction is apparent—a simple assembly of steel channels, rubber-mounted.



POURING a 75-ft. section of culvert from 1-yd. bucket supplied by transit-mix. After concrete had set, forms were stripped and re-set in one shift.



TAMPING 900 sq. ft. per day to 90% optimum density, this rig worked on 2½-ft. backfill lifts. Hammer was powered by a truck-mounted compressor.

steel angles. Wooden 2 x 8 double walers were used in conjunction with standard ½-in. form bolts. All-steel carriages for supporting and moving the inside tunnel forms were fabricated of structural steel channel sections with rubber lined wheels fore and aft. Raising and lowering of the carriages was accomplished by built-in screw jacks.

Handling forms

The normal sequence of stripping and re-erection of a 75-ft. length of form was done in a single 8-hr. shift. The first stripping operation was the removal of all form bolts, after which the three carriages were run into the "tunnels" and jacked up to receive the first half sections (37½ ft.) of tunnel forms. Simultaneously a truck crane cleared the outside panels at the ditch sides and held them suspended while they were cleaned and oiled.

With the tunnel carriages in position and jacked up, hinged haunches at the lower corners of the tunnel forms were raised and the carriages then screwed down again, clearing the forms from the concrete above. At this time also, the forms were pulled together by means of 1½-ton pull-lifts, closing a center split provided in each form for this purpose. A 2-ton air tugger hoist then pulled the carriages and forms ahead for re-use.

Automatic form spacing

In the new position, carriages were jacked up, haunches lowered into place and bolted, and the forms spread to proper dimension. The forms were then lowered into final position and placing of form bolts was begun. The spacing of form surfaces was automatically accomplished by means of removable spacer washers in the form bolts. The interior forms were moved simultaneously in all three tunnels by separate crews. Outside form panels were set into place and brought to line using angle iron braces equipped with turnbuckles. Expansion joints, featuring a continuous ring of copper water stop with a ½-in. premolded joint filler, were placed at 75-ft. intervals, the limit of each pour.

Compacting backfill

An interesting method of compaction of backfill of the excavation was employed. Consideration was given to the use of a jetted sand backfill, but lack of suitable local material made this method costly. The specifications called for a relative compaction of backfill material of 90% optimum density. Therefore, a mechanical tamper was used to compact native material. This unit, developed by Emsco Concrete Cutting Co. of Los Angeles, has a flat tamping head 12 x 16 in. in size and a driving double-acting air hammer suspended by cable from a traveling carriage. The power for the hammer is supplied by a truck-mounted compressor. Effective compaction to the required density was accomplished by tamping in 2½-ft. lifts. Average daily production of this tamper, operated by a two-man crew, was approximately 300 lin. ft. of trench 3 ft. wide.

Personnel

Work at El Toro is being performed under the direction of Commander Thos. B. McGlashen, USN, for the Bureau of Yards and Docks.

G. C. Weeshoff is project manager for the contractors and the author is structural superintendent.

Nevada considers two-way radio telephones for snow removal and maintenance equipment

TWO-WAY RADIO telephones may soon be installed on Nevada Highway Department snow removal equipment. State Highway Engineer H. D. Mills says that the Federal Communications Commission has granted the Department a special temporary authority permitting field testing of a radio telephone system on its vehicles. He pointed out that only when the results of this study are known could any statement be made concerning the probability of future installation in road maintenance equipment.

Many state highway departments now have two-way car-to-car and car-to-station radio communication in their trucks. In most all cases these departments agree that the original installation, as well as maintenance costs, are offset by savings in labor and equipment. Not only is breakdown time reduced, but there is no measurement to the possible saving of lives. During the recent January storm California's Highway Department estimates that without radio their road opening and rescue operations in the U. S. 40 area would not have been possible. Mentioning Nevada's rugged terrain and the current storm situation, Mills says that snow removal equipment can be out of touch for as many as four to six hours at one time, under present conditions. In case of breakdowns in the Lake Tahoe area, snow plow operators may have to walk several miles through the snow and blizzards until they can reach telephone or other help.

Cheyenne digs deep for more water

$1,500,000 program provides 14 new wells, collection piping, a 5-mg. covered reservoir and a 6-mi. transmission line as the latest round in a 75-year fight of growth versus aridity

By T. B. ROBINSON
Principal Engineer
Black & Veatch
Consulting Engineers
Kansas City, Mo.

CONSTRUCTION WORK to be completed in early 1952 is expected to increase by more than 50% the firm yield from the sources of water supply which serve the City of Cheyenne, Wyoming, as well as to make a significant improvement in the facilities for the transmission and distribution of water. Cheyenne is located at the extreme western edge of the plains country which lies east of the Rocky Mountains in a semi-arid country generally known for its lack of water. Development of an adequate supply of water for this rapidly growing city has covered a period of over three-quarters of a century and the record is replete with examples of achievement under adverse conditions.

Development has been difficult

Crow Creek, which drains about 90 sq. mi. of rather mountainous country on the east slope of the Laramie range, has been the principal source of supply. The first development involved direct diversion above the city but the demand soon exceeded the supply and it was found necessary to resort first to infiltration galleries and finally to upstream storage, long supply lines, and water treatment at the Round Top filter plant.

The fact that the rights acquired by Cheyenne in 1874 called for more than 100 sec. ft. of water is typical of the early thinking in regard to stream flow in this area. Drouth years of the early thirties provided hydrological data for a more realistic appraisal and it now appears that the firm yield of the Crow Creek watershed is approximately 4.5 mgd., although in normal years from 6 to 10 mgd. is available. Significant carry-over storage, from year to year, is impractical since suitable sites are not available, and it is believed that the existing reservoirs represent the practical limit of surface water development for Cheyenne.

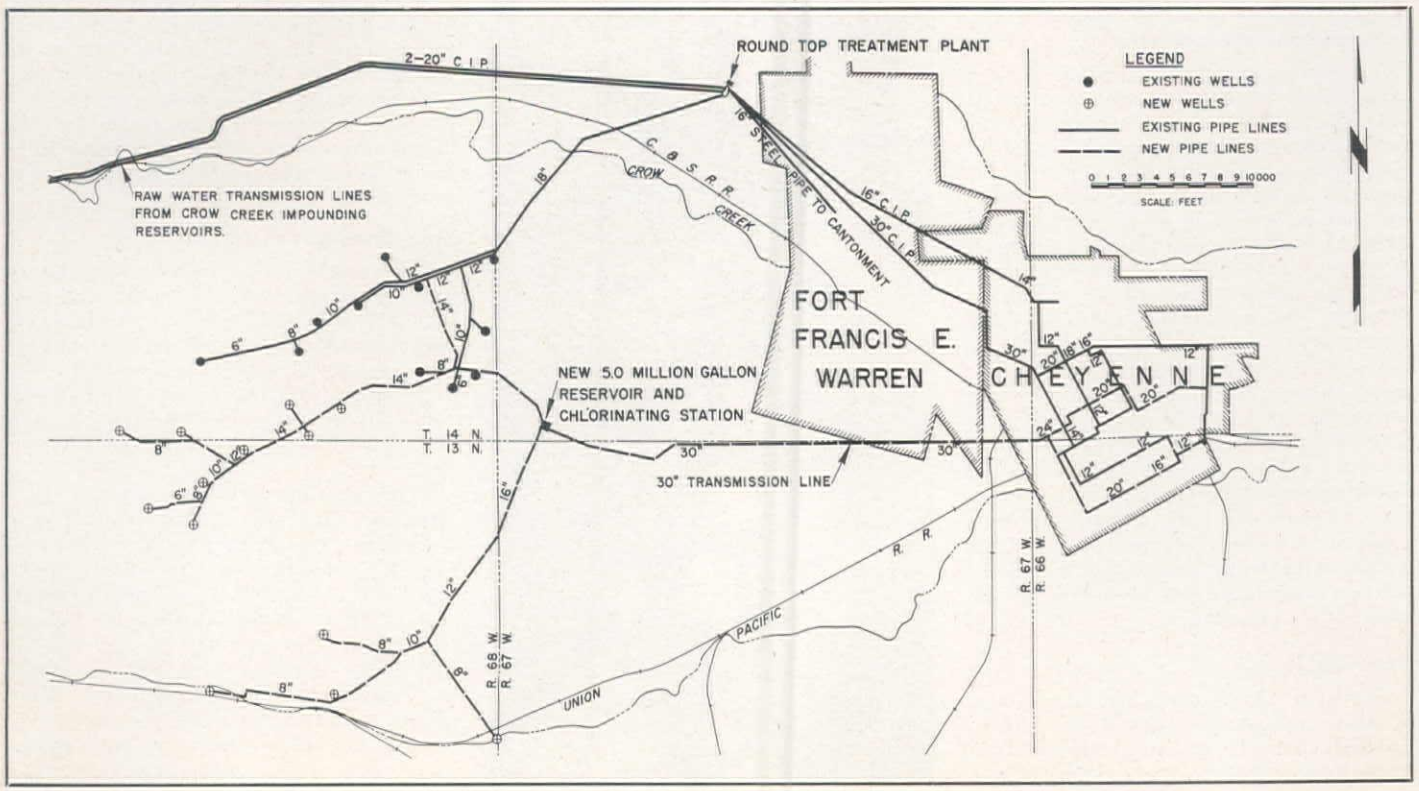
When it became apparent that surface water is limited in quantity, a program of well drilling was started and has been followed quite vigorously for nearly 20 years. This program, which has included test wells in all of the favorable sites within reasonable distance of Cheyenne, has demonstrated the feasibility of developing a usable supply of ground water in an area of about 20 sq. mi. located from 6 to 12 mi. directly west of the city. The accompanying general map of the area immediately west of Cheyenne shows the location of the well field and its facilities in relation to the city as well as to the surface supply works. During the period from 1934 to 1940 eleven producing wells were constructed in the northeastern section of the well field and in 1940 these wells were connected to the clear water reservoirs at the existing treatment plant. Since 1940, fourteen additional wells have been drilled and tested with the result that the firm yield of the entire well field is conservatively estimated at 5 mgd.

FEATURES of Cheyenne's water supply improvement program are indicated on map. Firm yield from the entire well field west of the city is conservatively estimated at 5 mgd.

Fourteen new wells

The project which is about to be completed has two objectives: (1) it will make all of the water from the well field available for use and, (2) it will provide another supply line which enters the system near the area of maximum demand.

The fourteen new wells are being equipped with motor-driven deep well pumps of the turbine type. Depth of individual wells varies from 176 to 285 ft., and their yields range from 250 to 500 gpm. Pumping heads at rated capacities vary from 190 to 230 ft., and, as a result, selection of suitable equipment for each well has been necessary. For the present, the wells will be manually controlled from starting equipment located in individual well houses, but considera-



CONCRETE for the 5-mg. covered reservoir was distributed from pump set-up (left) by elevated pipe to the point of pour on the slab (above). Primary function of the reservoir is to regulate and store output from the fourteen new wells. The structure adds 50% to Cheyenne's total storage facilities.

tion is being given to the installation of remote-control equipment to permit all of the well pumps to be operated from Round Top. The plan is to install such equipment when its economy can be demonstrated.

As constructed, the collecting lines have been connected to the old lines so that water from all but the four most southerly wells may be pumped to the clear water reservoirs at Round Top, or water from all the wells may be pumped to the newly constructed reservoir at the eastern edge of the well field. Should the necessity arise, surface water from Round Top may also be pumped to the new reservoir for transmission to the city through the new supply line.

Covered concrete reservoir

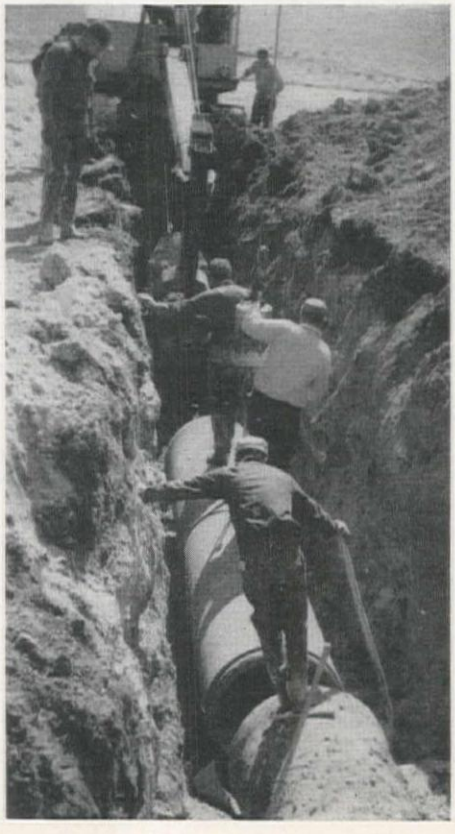
A covered, concrete reservoir with a capacity of 5 mg. has been constructed near the eastern edge of the well field and approximately 6 mi. west of the city. The elevation of this reservoir is about the same as that of the clear water reservoirs at Round Top and therefore the structure will add about 50% to the total of storage serving the distribution system and will also act as an equalizer between the well pumps and the new supply line.

The well water is chlorinated immediately above the storage reservoir and since the rate of flow is quite variable at this point duplicate chlorinators of the automatic type have been installed to maintain a fairly uniform rate of dosage. The chlorinating station located adjacent to the reservoir also houses telemetering equipment which transmits the reservoir level to a recording gauge located at Round Top.

New supply line

The new transmission line to the city, of 30-in. pipe, is designed to operate in parallel with the existing supply lines from Round Top to meet the demands which are expected to exist in 1973. Flow is measured by a venturi meter located a short distance above the city and the flow is regulated by a motor-operated throttling valve of the rotary cone type. The amount of flow through the venturi meter is transmitted by telemetering equipment to a recording instrument at Round Top and the throttling valve is controlled from this point. The supply line is approximately 6 mi. long and, with the exception of 4,600 ft. of cast iron pipe at its lower end, is constructed of pre-stressed concrete cylinder pipe.

TRANSMISSION LINE, 6 mi. long, to the city was laid mainly of 30-in. prestressed concrete pipe, as shown, with a 4,600-ft. section at the lower end of cast iron pipe.



It is worthy of note that this line enters the distribution system at a point quite close to the location of the pumping station which served the city for a period during the development of the system. This station was abandoned early in this century but the pertinent point is that the distribution lines once radiated from this area and the pattern still exists to the extent that this is the most favorable point of entry.

The cost of this recent program of construction is about $1,500,000 and may be broken down as follows:

Well Collection System	$340,000
Storage Reservoir	260,000
Supply Line	500,000
Distribution System	400,000

The water works of Cheyenne is the property of the city, but is administered through the Board of Public Utilities of which William Dinneen is chairman and J. K. Stoddard is office manager. The improvement project was conceived by this board and was financed by general obligation bonds which will be serviced from revenues.

Men, firms and materials

The reservoir was built by the Chambers Construction Co., Lincoln, Nebraska, under contract, but the materials and equipment for the remainder of the project were purchased by the Board of Public Utilities and the construction work was done by force account under the direction of Ray L. Sherard, superintendent.

Plans and specifications for all construction work were prepared by Black & Veatch, consulting engineers of Kansas City, Missouri, and this firm supervised the construction of the reservoir and acted as consultants to the board throughout the project.

A brief description of the materials and equipment used is as follows: Well pumps are of the turbine type furnished by the Layne-Western Co. of Kansas

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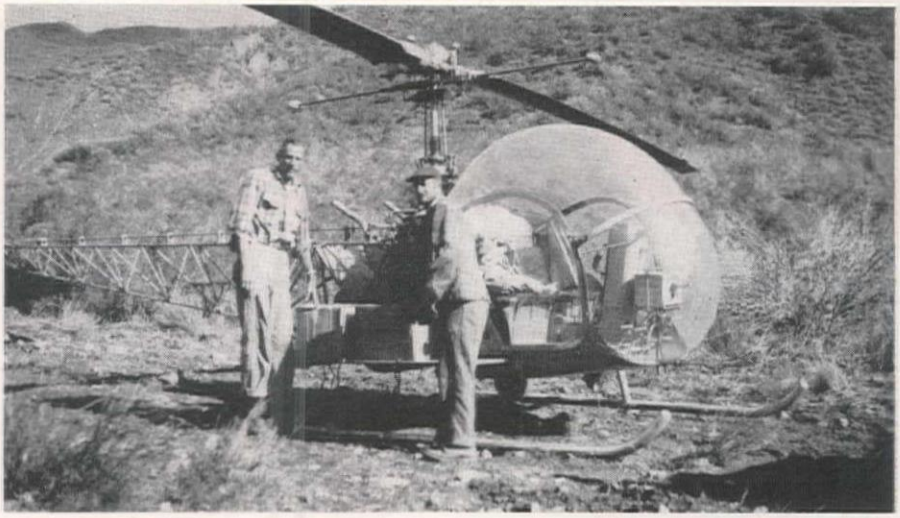


MAROONED by rains in January and March, drill crews at Topa Topa damsite in Ventura County were supplied by this hover-bug from a nearby town. Troy Callum, left, and John Blackketter unload supplies at the damsite.

Helicopter hops floods and saves a dam job

By
JULIAN HINDS
General Manager and Chief Engineer
United Water Conservation District
Santa Paula, Calif.

ONE HELICOPTER bested 17 fords (stream crossings, that is) last January when torrential floods on Sespe Creek in Ventura County, California, threatened to halt preliminary work at Topa Topa damsite, a new project of the United Water Conservation District. Drilling crews marooned early in the storm were forced to walk out, but both men and equipment were returned to work by helicopter long before road reconstruction would have otherwise permitted.

The water conservation district's work on Sespe Creek has been undertaken to alleviate serious ground water overdraft in the Santa Clara River valley of Ventura County. Organized in 1950, the district encompasses some 340 sq. mi., including about 125 sq. mi. of irrigable agricultural lands and the cities and towns of Piru, Fillmore, Santa Paula, Saticoy, Oxnard, and Port Hueneme. A future waste to the Pacific Ocean of over 100,000 acre-feet of water, as occurred last January, will largely be prevented by storage works being planned for Sespe and Piru creeks.

Delay threatened

Although close to civilization (12 mi. as the crow flies), Topa Topa damsite is difficult of access. The canyon between the site and Fillmore, to the south, is steep and rocky and could be converted into a road only at considerable expense. Consequently the damsite is presently reached only by a circuitous route, up the Maricopa road through Ojai, and down Sespe Creek from the upper watershed. Even this latter section of road is very provisional, with 17 stream crossings in 17 mi. Among the annoying results of the January floods was complete collapse of communications with diamond drilling operations at the site.

When the rains came, the road banks caved in from end to end. The mountain gorges were packed with snow sufficient to maintain an impassable stream flow for a considerable time. There was no telephonic communication, and the canyon is too deep to be reached by short-wave radio. Four drillers were trapped at the site on January 14 and forced to walk downstream to Fillmore, a strenuous and perilous 12-hr. trip. After the storm was over it was obvious that they could not return to the site by automobile until the flood subsided and the road was rebuilt—perhaps not for several weeks.

Time was precious, from many points of view, and alternative means of transportation were therefore sought. Horses were considered, but all passable trails were long and hazardous. Taking the men in, and keeping them supplied with food and fuel, would be a job. Furthermore, suitable stock was hard to find. Hence, it was decided to make good use of a helicopter.

A helicopter was made available by Rotor-Aids of Ventura. The machine was capable of carrying two passengers, plus the pilot, or 400 lb. of freight, at a charge of $100 per hour of actual flight time. It was agreed that shuttle trips would be made from Fillmore, the nearest point of easy access. Men and supplies for a week's operation were assembled at Fillmore on the morning of January 24. Since the local airport was found to be flooded, take-off and landing site was established in a clear space on the city dump!

Despite its lowly point of departure, the operation was eminently successful. About 45 min. were required for the round trip to Topa Topa, including loading and unloading. The Topa Topa terminal was an isolated clear stretch of access road. Five trips were made, three for personnel, one for food, and one for gasoline. Drillers flown in were John Blackketter, Troy Callum, A. "Whitey" Keuser, and Jack Keuser, all of the Frank L. Howard Engineering Co. of Los Angeles. Max Thiel and the author made the trip for the United organization.

A flying boat

The stream at Topa Topa was found to be impassable by any available means, isolating portions of the work. To meet this situation a small boat was flown in the following day. During the next 11 days, four more helicopter flights were made from the Ventura and Santa Paula airports to maintain the drilling operation. In all, ten trips were made, at a cost of $930.

Meanwhile, road reconstruction was carried out as soon as the many slides were dry enough to handle. A bulldozer crew worked for a whole week to gain the damsite, and the first other vehicle to drive downstream was a 4-wheel-drive Dodge power wagon equipped with a front-end winch. Specially procured for the job, it arrived at Topa Topa on February 5, just 23 days after the drill crew had walked out.

Heavy rains in March closed the road again, and transportation of supplies by helicopter was resumed, assuring continued progress of the damsite exploration. The cost of these flights and of the road reconstruction are chargeable to the January floods. To this extent are the water conservation district taxpayers "victimized." However, the few hundreds of dollars thus spent are trivial in comparison to the value of the rains to the same taxpayers. According to one old-timer, these are "the most profitable damages the District will ever be called upon to pay." While ground water overdrafts were not eliminated by the 1952 storms, they were reduced, and reservoirs have been filled, to boot.

Headquarters for the United Water Conservation District are in Santa Paula. J. T. Culbertson is chairman of the board, the writer is general manager and chief engineer.

On the crest of the Sierra Nevada—

Snow removal is high adventure

An on-the-spot report by the Field Editor after spending 3 days with crews of the California Division of Highways fighting a record fall of 794 in. on Donner Summit

AFTER BATTLING a record seasonal snowfall of nearly 800 in. to keep a section of main transcontinental highway (U. S. 40) open to traffic, the California Division of Highways' snow removal operations could well be described as an adventure story rather than a report on highway maintenance. And, the story would be complete with dramatic rescues, grueling 'round-the-clock operations, stranded equipment, and a fight against a blizzard in which over 8 ft. of snow fell during three days and a 100-mph. wind whipped it into drifts 35 ft. high.

A well-traveled route

While all of the state's snow fighting crews performed herculean tasks during the past winter, this report will be confined to work carried out on U. S. 40 in the Yuba Gap-Donner Summit-Truckee area across the crest of the Sierra Nevada.

A major link between population centers in central California, Reno, Nev., and the east, U. S. 40 normally carries more than 2,000 vehicles per day, with a large percentage of interstate transport trucks. In addition to the through traffic, weekends see an influx of automobiles in the Donner Summit and Tahoe areas as the winter sports enthusiasts arrive from nearby Sacramento and the San Francisco bay area.

High in the snow country

From Baxter, at about El. 3,500, where the highway enters the snow region proper, it winds leisurely for about 25 mi. to Donner Summit at El. 7,135. Crossing the summit of the Sierra it drops down to about El. 5,900 in a little less than 4 mi., and continues past Truckee, at El. 5,818, to the California-Nevada border dropping another 1,500 ft. in elevation. This section of U. S. 40 has an asphaltic surface with a 24-ft. roadway and shoulders varying from 3 to 5 ft. in width.

Heaviest snowfall on record

Official snow records, compiled since 1890, reveal the past winter's snowfall to be heaviest on record. Measurements taken daily at the U. S. Government's Snow Laboratory located about 3 mi. from Donner Summit show that by March 20 the area had received 793.7 in. of snow, and that the pack, or depth on the ground, was 247 in. A private record maintained at another location nearer the summit gave the pack as over 300 in. on the same date.

Located in one of the heaviest snow regions in the nation, the area has considerable sun during the winter and because of the prevailing warmth the snow is generally wetter, or closer to the melting point when it falls. Soon after falling the snow in the area has a density of from 5% to 10%. In two or three days this increases to about 15%, and within a week reaches 30%. The bottom of the snow, being packed, often has a density as high as 50%. Density also increases during slides due to the mechanical packing of the snow.

Four major snowstorms descended upon the area during the past winter, in addition to numerous small or easily-handled snowfalls. The largest of these was during a five-day period beginning January 11, in which a total of 149 in. fell while winds up to 100 mph. piled it into drifts from 15 to 35 ft. high. This blizzard caused the road to be closed for a period of 28 days, the longest closure in the modern history of the highway. The second longest closure was 15 days in 1938. Other major storms included: 103 in. in a 4-day period starting December 31, a sustained fall of 85 in. during an eight-day period in mid-February, and a two-day blizzard of 47 in. accompanied by high winds that closed the road and caught the field editor in mid-March.

Maintenance stations

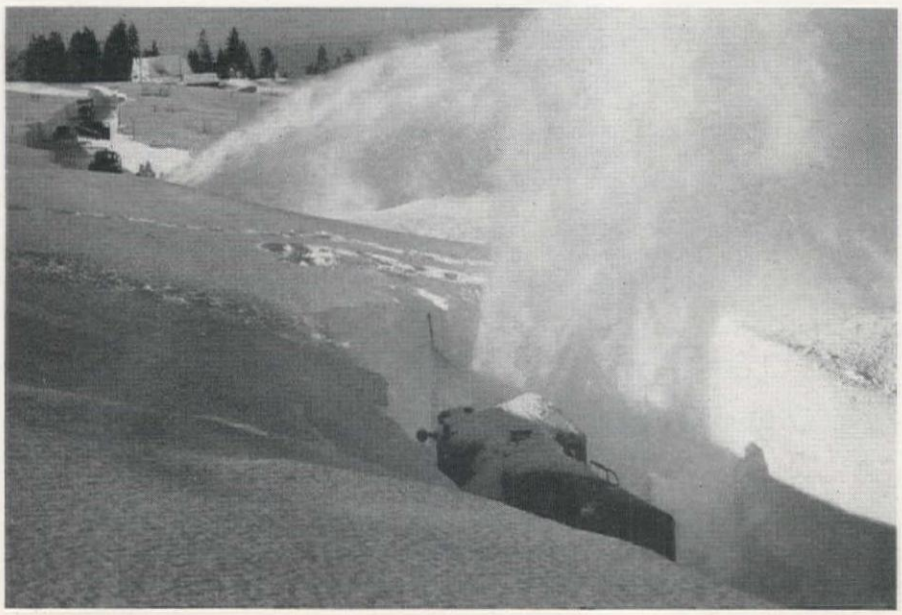
Snow removal operations are carried out from three maintenance stations: Yuba Gap, at the western end takes care of 21 mi. on U. S. 40 and a 14-mi. portion of Calif. 20; Donner Summit, which takes care of 17 mi. of the main highway including the east slope from the summit; and Truckee, which takes care of the highway from the bottom of the slope to the California-Nevada border and portions of California 89 northward and between the cities of Tahoe and Truckee, a total of 70 mi.

Facilities for housing and feeding the crews are maintained at each station and during the snow season the crews live in. Average crews stationed at each location are: Yuba Gap, 28; Donner Summitt, 32, and Truckee 16. Each station is supervised by a foreman with an assistant or leading man in charge during the night shift.

Equipment

In assigning equipment for snow removal to the various stations the general method practiced by the State Division of Highways is to send units to areas where needed most. During the big

TWO ROTARIES are about to meet after two days of working through 30-ft. drifts. Picture was taken day after dramatic rescue of passengers from stranded train.



storms equipment was moved in from as far as 300 mi. away to help handle the emergency. As the snow removal units are shifted about the number stationed at a particular location varies. A physical count made during the blizzard in mid-March showed the equipment number in the Yuba Gap to Truckee sector to be nine rotaries, 11 push plows, four motor graders, and four smaller trucks, plus necessary pickups.

Rotaries are primarily the Sno Go type and are mounted on Oskosh and FWD four-wheel drive trucks. Sicard and Bros Snow Flyer rotaries have also been used in the area during the past season. Push plows are mounted on Walters, Oskosh and FWD trucks. Graders are Allis-Chalmers and Austin-Western.

Breakdowns unavoidable

While downtime on equipment is a normal problem, it was intensified, especially with the rotaries, during the past season. Records show that the rotary plows worked three times as many shifts as in a "normal" year. Full shop facilities, with forge, lathes and welding equipment are maintained at each station and mechanics are on duty continuously, often working as many as 18 to 20-hr. periods to get a piece of equipment back on the road.

One major cause of rotary breakdowns is contact with objects buried in the snow. Skiers and motorists passing through the area often abandon cars along the road during storms and neglect to place markers. Completely covered, the plows move into them, damaging the rotaries as well as the automobiles. Rocks brought to the surface by heaving due to the freezing and thawing on the shoulders, trees and utility poles knocked down by slides, and heavy skid chains that have broken loose from the large trucks are other causes of breakdowns. In some cases the chains have wrapped around the augers to such an extent as to require the plow to return to the shop where a cutting torch was used. Shear-bolts between the auger and drive shaft aid in eliminating much damage to the equipment but after being broken by contact of the machine with an object, time is lost while the operator and swamper clear snow away from the auger and replace them. This often has to be done under severe weather conditions.

WITH SNOW STILL falling, a push plow shoves a windrow to the side with normal traffic on the highway.

BEHIND PUSH PLOWS motor graders are used to cut the crown left by the plow and remove the last few inches of snow on pavement.

ROTARIES FOLLOW to cast the windrow over the sides, widen the roadway opening and cut down the banks.

Parts supplies run low

When completely snowed in, such as occurred during January, the parts supply at the stations is apt to run low. During the big storm Truckee station experienced such a shortage and was forced to strip a rotary that was already in the shop for major repair work. This stripping was so complete that the vehicle had to be towed to the headquarters shop for overhaul after the road was open. Donner Summit station had a more complete stock of parts and also during the big storm would sled them about 3 mi. to the railroad station where they were picked up and taken to Truckee.

The occasional tricks used by the public to get their particular road cleared presents another problem. The general clearing program is to get the main highway open first, then clear secondary roads. Typical of such devices used by the public was one that occurred during the March blizzard. A snow-laden roof collapsed while a workman was installing supplementary shoring, and immediately a call was placed to Truckee headquarters. The man's condition was reported as serious and it was said that an ambulance was waiting to rush him to the hospital. In addition to the call to Truckee the citizen called the state offices in Sacramento. A rotary was taken from its work on the main highway and started towards the supposed emergency. After pushing through the snow all night it arrived at the scene to find the man just slightly bruised and when taken into town he went into the closest bar for medication. No sign of the ambulance that was reported as standing by was seen.

Parked cars are hazards

Although the financial life of numerous resorts in the area depends on skiers, they add to snow removal problems by parking and leaving cars along the road which not only clogs traffic but prevents rotaries from carrying out the work of widening the road. Partly as a public relations gesture and partly out of necessity parking areas are cleared in the resort area to accommodate the weekend guests, but many sportsmen who are not staying at any of the lodges

OVERHANGS were a constant threat to working equipment. Best method used to cut them down was the use of a cable looped between two tractors.

but just in the area for the day try to park their cars along the edges of the narrow trough that is the highway.

Special methods

Due to the severity of the blizzards and the high drifts that resulted it was necessary to develop some new methods for handling snow, especially on the east slope of Donner Summit where equipment faced drifts 35 ft. high. One innovation was the use of dynamite to loosen the high drifts. As snow is an unusual material to handle with explosives it was necessary to proceed on a trial and error basis. Experience indicated that different depths and compactions called for different loadings.

Generally a line of holes would be placed about 5 ft. back from the face of the snow bank. Holes were punched with a pointed pipe to a depth equal to ½ or ⅔ the depth of the snow. Each hole was loaded with 8 to 10 sticks of 20% dynamite and connected and fired in the conventional manner. The number and spacing of the holes across the drift was dependent upon depth and density. For drifted snow about 20 ft. deep two holes, 20 ft. apart, were sufficient to loosen the material. From this minimum the number of holes increased to five holes 4 ft. apart for the larger and heavier drifts.

After a shot was fired one rotary would move into the loosened snow to clear it away while workmen on top of the bank would be loading the next round. A second and third rotary would be a short distance back widening the initial cut.

To handle high drifts on another section of the highway a small track tractor was used on the snow to push it down to where the rotaries could reach it. This method also aided in eliminating the usual overhang that appears when rotaries cut into a high bank.

In several locations the drifting snow kept piling up and edging out from the top of a cut to form an overhang. These overhangs were a constant threat to the working equipment and had to be removed. For this operation a length of wire cable was laid across the overhang, parallel to the outer edge. Each end of the cable was attached to a plow and tightening the cable caused it to cut through the overhang.

As the snow season advanced the banks along the road increased until they reached a height that prevented the rotaries from blowing snow over their tops. To reduce these vertical banks an extension was added to the blades of the motor graders. With this extension and the blade turned to a vertical position, it was possible to slice the top from the snow wall to a 45-deg. angle, and permit the rotaries to discharge without interference.

KEY MEN for the Division of Highways on U. S. 40 snow removal. L. to r.: John Lloyd, foreman at Donner Summit; "Red" Alexander, loading man at Donner Summit; T. T. Buell, highway superintendent; Jack Snider, Yuba Gap foreman; R. I. Nickolson, district maintenance engineer, and Harry Rhud, district materials engineer.

Train rescue

Of course the most dramatic event of the season was the widely-reported rescue of 226 passengers from the stranded Southern Pacific streamliner on January 18 by members of the highway crew from Yuba Gap. For four days the road crews had been battling, and just keeping up, with a steady snowfall. On the fifth day, after a brief respite, the storm struck anew and winds up to 100 mph. soon caused the order to "abandon the road."

However, just as this order was given the Yuba Gap foreman, Jack Snider, with a rotary and his pickup was enroute to rescue six members of his crew and three pieces of equipment that were stranded 6 mi. west of the station. Reaching the stranded group during the height of the blizzard that afternoon, he immediately turned the rotary around and with the trucks following behind started back to the station. Cutting their own path the party was making slow progress and still had a long way to go at nightfall when the rotary's windshield wipers ceased to function.

Familiar with the road, Snider directed the plow by radio until finally the radio in the rotary froze and the machine plowed its way off the road. After trying to fight the blizzard for over two hours and dig the machine out, the equipment was abandoned and the crew hiked a grueling ½ mi. to a nearby lodge. An indication of the intensity of the storm is the fact that it required 2 hr. for the group to cover the short distance.

Reaching the lodge they were informed of the train's plight. The following morning, Tuesday, they returned to the snowed-in equipment and hacked out a trench 135 ft. long from one of the trucks to the rotary. Completing the trench at 4 p. m., they pulled the rotary back to the road and again started toward Yuba Gap. Just as they were getting started they were informed that the situation on the train was critical and the only hope of rescue lay with them.

Reaching Yuba Gap at 4 a. m. Wednesday the rotary was serviced and with a new crew pushed on towards the junction with California 20, about 1½ mi. from the station. This junction was selected to be the base of the resuce operations as it was only ½ mi. from the stranded train and the only location where the rotary could cut a turnaround. Reaching this junction about 8 a. m., the rotary cut its turn-around

. . . Continued on page 140

CHIEF JOSEPH DAM

Here's an up-to-date progress report of this $206,000,000 hydroelectric development on the Columbia River 51 miles downstream from Grand Coulee

AS A FOREWORD to the contractor's story that starts on page 70, this brief outline describes the principal features of the project. The information is presented from the Seattle District Office, Corps of Engineers.—Editor.

CHIEF JOSEPH DAM is on schedule—an accelerated schedule to meet a Department of the Army request to place essential power on the line by December 1955.

To accomplish this schedule, the preliminary and first-stage contractors erected highway bridges across two rivers, constructed housing units and access roads, excavated the intake channel, and built the first stage cofferdam—all of this in 1950 and the first five months of 1951.

Chief Joseph Builders, another group of outstanding contractors, with L. E. Dixon Co. as sponsor, has the $27,000,000 second-stage contract, which covers construction of the main barrier dam. This organization came in and set up the aggregate plant, concrete batching plant, two 2,500-ft. highlines, excavated the first cofferdam area, placed 212,000 cu. yd. of concrete, removed the up- and downstream arms of the first cofferdam, and have closed the second cofferdam—all in less than 17 months.

This work has not been without its difficulties and its fight to maintain tight schedules. High, turbulent water raced down the Columbia with a peak flow of 300,000 sec. ft. last spring. To withstand this force the first-stage cofferdam area was re-flooded. To ward off the undermining action of the river, a "blister," or steel sheet-pile baffle wall was erected along the river arm. Major construction on the dam was held up three months.

This necessitated a speed-up program of dewatering again and concrete placing that entailed a catch-as-catch-can struggle with the weather on an around-the-clock schedule from mid-September until Christmas. Excavation in the powerhouse area was proceeding unabated two 10-hr. shifts a day.

After the holidays, work was begun on the dry arm of the second-stage cofferdam. As the weather moderated early in February, activity began on removal of the upstream and downstream arms of the first cofferdam and building of rock groins out from the left bank. Closure of the south half of the river, and diversion through the low monoliths constructed in the first cofferdam, was made on March 7 in a hard, fast drive, using granite boulders weighing up to 20 tons. Construction of the steel cells was started immediately and the cofferdam completed a month later (see illustration on this page).

Placing of concrete was resumed in March by Chief Joseph Builders who are working a two-shift schedule six days a week building up the dam's right abutment and right training wall, and starting placing concrete for the spillway's left abutment on the south bank of the river.

Excavation in the powerhouse area at Chief "Joe" was stepped up to an around-the-clock operation the last week in March. This work had been on a two-shift basis six days a week since last April. A total of more than 9,000,000 cu. yd. of rock and earth are to be removed on this project, a large portion of it from the powerhouse and intake area.

The second-stage contract of Chief Joseph Builders calls for completion of the preliminary powerhouse excavation by November 1952, removal of cofferdam No. 2 by August 1953, completion of the dam construction by August 1955.

A $39,749,997 contract for construction of the powerhouse and intake structures of Chief Joseph Dam was awarded April 2, by Seattle District, Corps of Engineers, to a nine-member joint venture carrying the name of Columbia River Constructors. Work on this new contract started last month and is scheduled for completion by July 1956.

All of the intake and powerhouse construction will be on the south bank of the river requiring 800,000 cu. yd. of concrete, and 37,100,000 lb. of reinforcing steel. The intake structure, which will form part of the dam will be 2,036 ft. long, and the powerhouse superstructure will be 1,336 ft. long in this contract, providing space for 16 generating units.

COL. JOHN P. BUEHLER
Seattle District Engineer

The first four generators, with a rated capacity of 256,000 kw., are to be in operation by December 1955. When the ultimate 27 units are in, the rated capacity will be 1,728,000 kw., making Chief Joseph Dam the world's second largest producer of hydroelectric power, next to Grand Coulee Dam only 51 mi. upstream on the Columbia. Total government investment in Chief Joseph Dam when completed is estimated to be $206,000,000.

Heading the Corps of Engineers staff for the project are Col. John P. Buehler, Seattle District Engineer; N. A. Bosley, chief, engineering division; C. H. Wagner, resident engineer, and Raymond F. Bracelin and Frank Thomas in the district office.

PROGRESS BY MID-MARCH is shown below. Closure of south half of river is completed (center left), the Columbia River is flowing through low monoliths (foreground) constructed within first cofferdam, and steel cells for second-stage cofferdam are being placed.

Twice the work, half the time in building Chief Joseph Dam

Fixed schedule for start of power output in 1956 from this Columbia River project requires the contractor to do the "impossible" ahead of 1952 flood season after cofferdam problem cuts 4 months from 9-month working season

By

W. N. EVANS
Project Manager

and

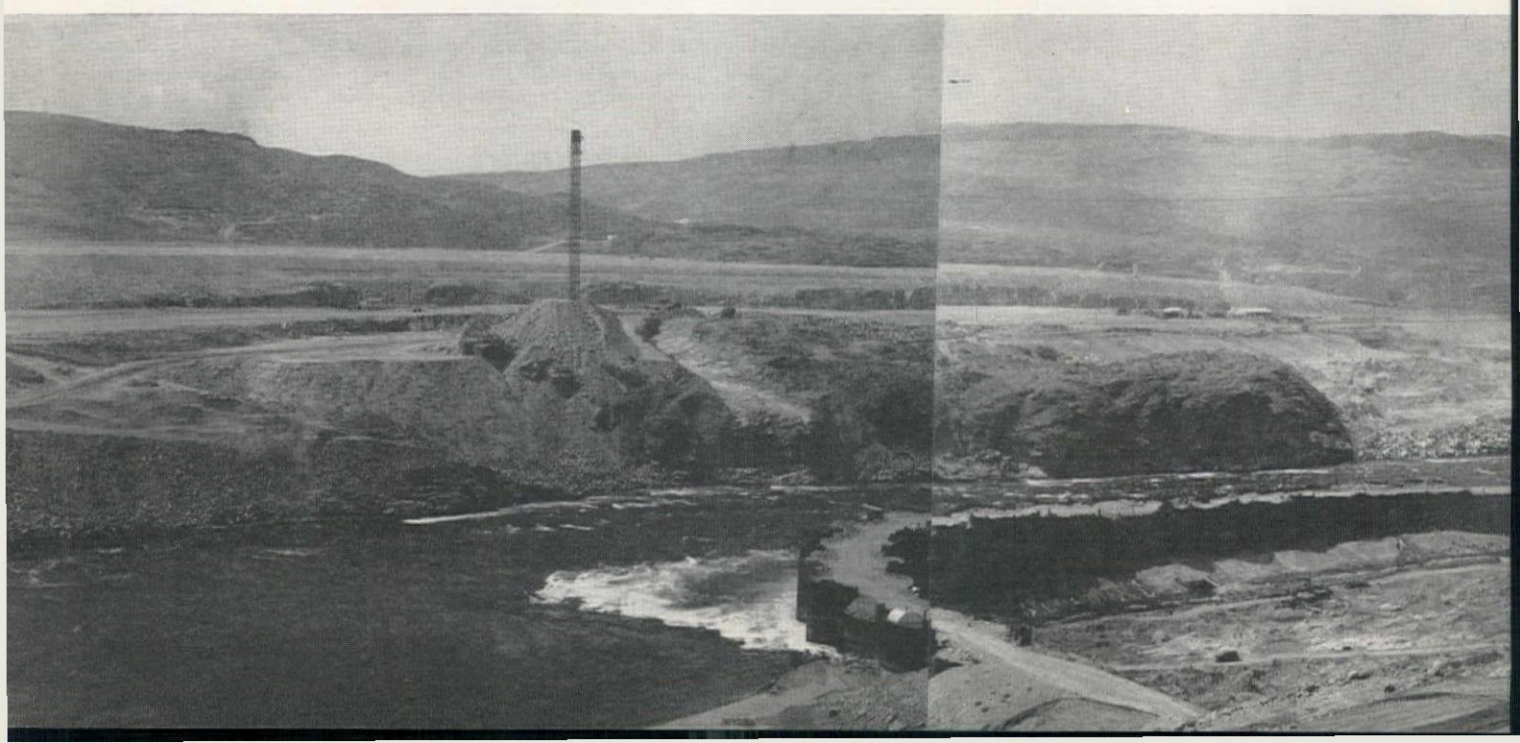
K. L. PARKER
Chief Engineer
Chief Joseph Builders

PUSHING the Columbia River around is not new to the contractors of the West, but it is not a job to be undertaken lightly. Problems of river diversion where flows never fall below 90,000 cfs., and may reach a flood of 640,000 cfs., are complicated enough in themselves, but when a rigid completion schedule does not permit loss of a season and an unavoidable delay cuts one season from nine to five months the result is a construction battle from start to finish. This battle was joined late in 1950 when the Corps of Engineers, Seattle District Office, awarded a contract for the construction of Chief Joseph Dam, located about 50 mi. downstream from Grand Coulee, to a joint venture organization known as Chief Joseph Builders. This group consists of four well known and experienced dam constructors, sponsored by the L. E. Dixon Company of San Gabriel, Calif., and including the Arundel Corporation, Baltimore; American Pipe and Construction Co., Los Angeles, and the Hunkin-Conkey Construction Co., Cleveland. Eighteen months later the job is moving on schedule despite the loss of four months in starting actual construction work, with concrete in the north half of the dam completed to allow flow through low monoliths provided for that purpose, and the river successfully diverted well in advance of spring high water.

Chief Joseph Builders well realized that the Columbia River must be treated with respect and that every phase of construction of the dam must be planned to coincide with the minimums and maximums of river flow. A miss in any step of construction would inevitably mean a full season or year of lost time.

Items in contract

The contract for construction of Chief Joseph Dam requires: (1) excavation and handling of more than 4,300,000 cu. yd. of rock and other material to provide for the dam and powerhouse foundations; (2) construction of a wrap-around fill at the north end of the dam and a turn-around fill on the south abutment; (3) completion of the intake channel for the powerhouse; (4) widening

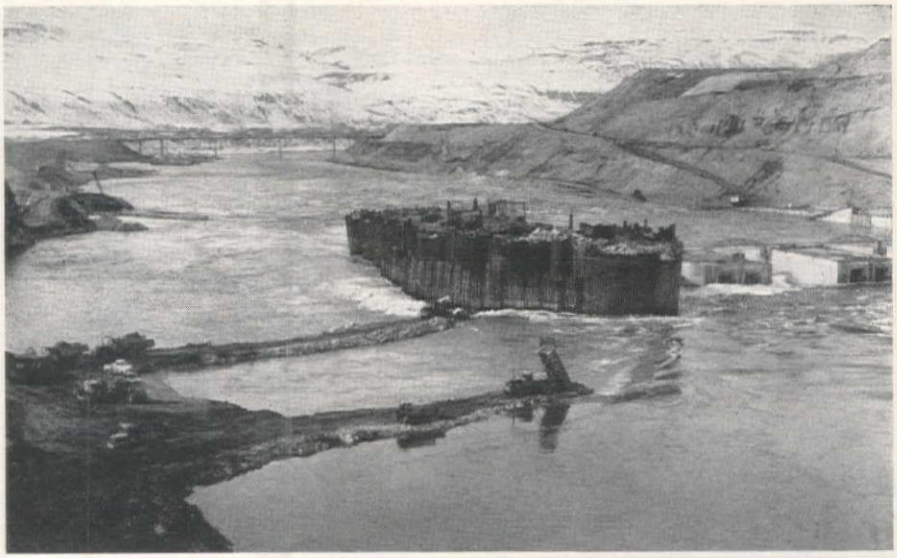


LOOKING SOUTH across the dam site, showing the first-stage cofferdam built under another contract. Mast on far bank is tail tower for the two 2,500-ft. cableways. Powerhouse excavation is under way on south bank.

and straightening of the north river bank and the provision of rock protection for that bank; (5) providing permanent access roads to the structure; (6) driving a 1,000-ft. drainage tunnel in the north abutment; and (7) construction and removal of cofferdams for diversion of the river. In addition the contract requires furnishing cement and procuring aggregate for, and mixing and placing 969,000 cu. yd. of refrigerated concrete in the dam, stilling basin, training walls and relief tunnel, including 4,070 cu. yd. of Prepakt concrete sluiceway plugs. About 4,700,000 lb. of reinforcing steel makes up most of the total of 6,426,700 lb. of metal to be purchased and installed under the contract, including structural steel for the nineteen spans of the roadway bridge over the dam spillway. The contract also provides for installing some 5,100,000 lb. of Government furnished spillway gates, sluice gates and stop log guides and logs. In addition to these principal quantities, the work involves 75,000 ft. of line drilling for foundations, 106,000 ft. of foundation rock drilling for drainage and grouting, foundation grouting, a drainage system throughout the dam, drainage and access galleries, access towers and an elevator, electrical installation, a spillway de-icing system, and roadway paving.

Basic design

The dam, which is 238 ft. high above the lowest foundation to the 22-ft. roadway across the top at El. 960, is of the straight gravity type, 2,260 ft. in crest length. Located almost in the center of the State of Washington some 70 mi. north of Wenatchee and immediately adjoining the town of Bridgeport, the dam will impound the flow of the Columbia in a lake extending 51 mi. upstream to the tailrace of Grand Coulee powerhouse. Designed primarily to produce power at a 165-ft. power head, provisions have been made for inclusion of irrigation features. Flanked on either abutment by non-overflow sections, the spillway section centers on the river and impounded water is controlled above



CLOSURE BEING COMPLETED for the second-stage diversion. The Columbia is flowing through low blocks on the north side. Area between the two rock arms was filled to provide a working area for driving piles for the cells to extend cofferdam to the south shore.

El. 901 by 19 taintor gates, each 40 by 38.5 ft. The powerhouse and intake structure parallel the river, downstream from the dam on the south (left) bank.

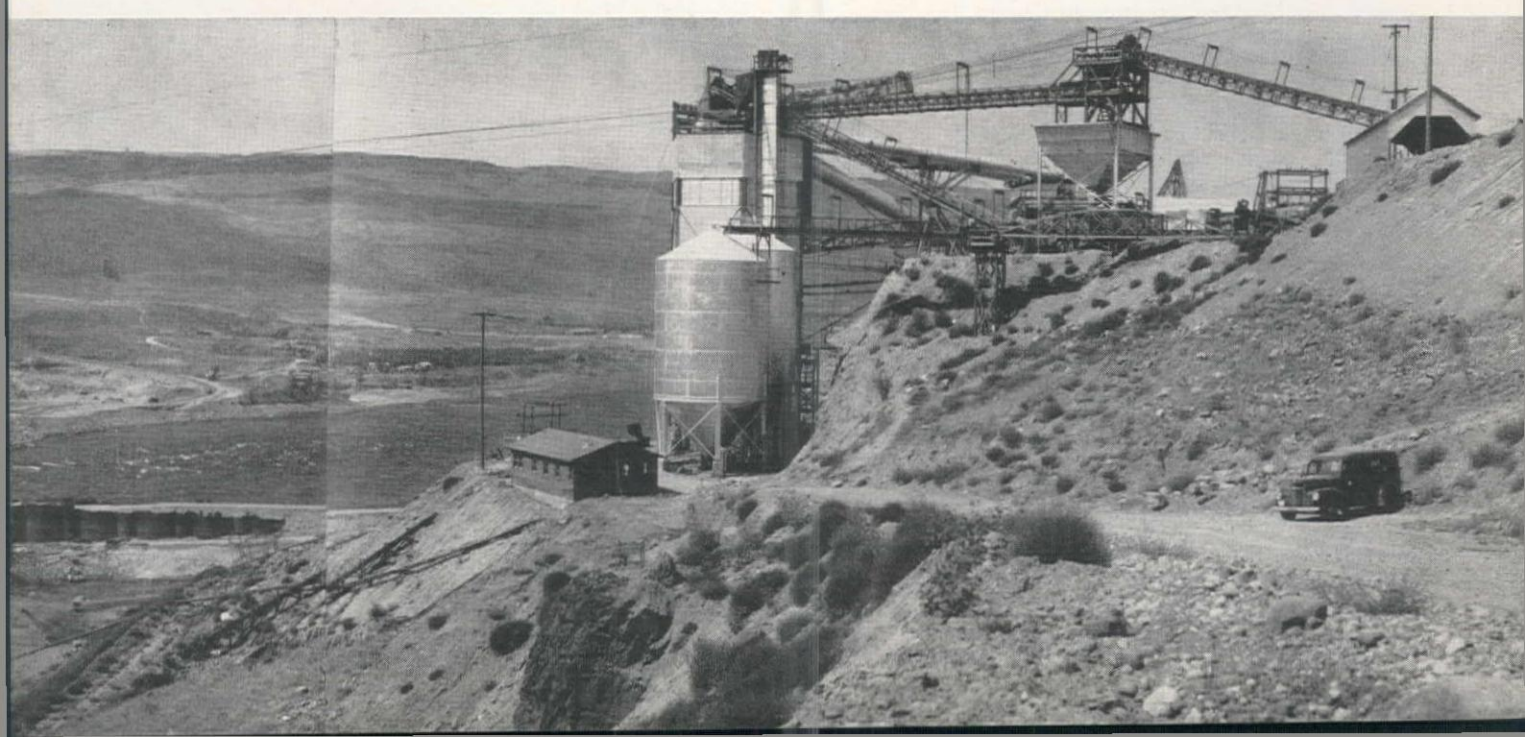
The dam and powerhouse are founded on excellent granite, except that the north abutment for the dam consists of glacially deposited impervious till overlaying cemented gravel. Excavation well into this material provided a keyway into which a compacted fill is being fitted, having an impervious core constructed of the glacial till. By separate contract the Corps of Engineers has provided an impervious blanket, covering the underlaying cemented gravel for a distance of 2,000 ft. upstream from the dam. Any possible seepage through this abutment will be intercepted by a drainage relief tunnel driven 1,000 ft. into the abutment at the top of the layer of cemented gravel, with drainage wells extending down to bedrock from the tunnel invert.

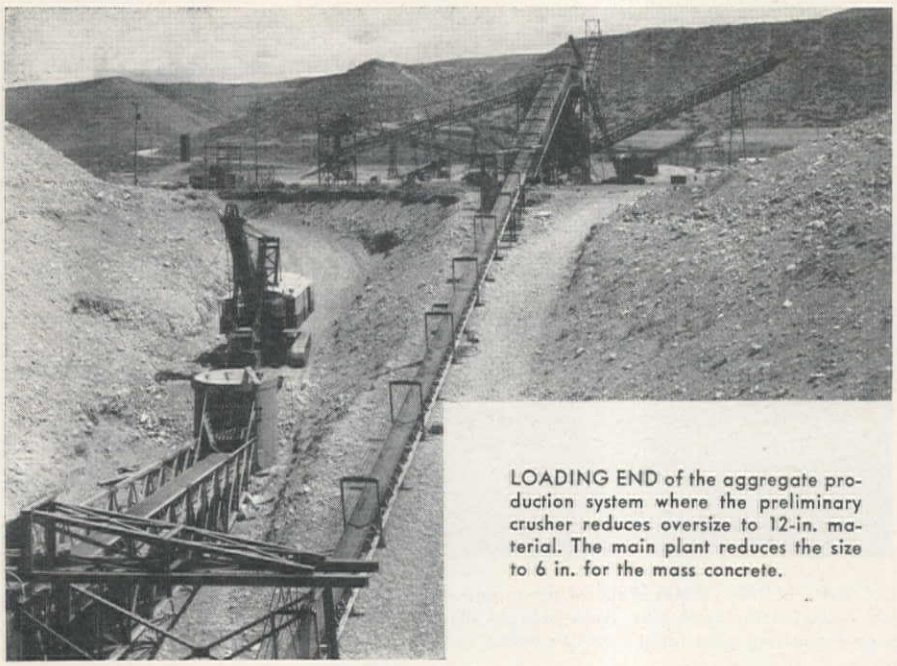
Provided at a low elevation through the spillway section of the dam are 24 temporary sluiceways, each 8 by 16 ft. in section to permit low river flow through the dam when the flow through the five low monoliths is stopped, before high water of 1953. For this purpose the contractor will install 50-ft. wide gates, 48 ft. high at the upstream face of the low monoliths to accomplish the third and final step in control of the river. When concrete has been placed behind those gates in the low monoliths, permanent plugs of Prepakt concrete will seal the temporary sluiceways.

BATCHING AND MIXING plant, with cold air ducts from refrigeration plant in background. The 4-yd. mixers charge 8-yd. buckets, which are carried by shuttle car to pick-up point under the radial cableways.

Cofferdam problem

By separate contracts, previous to the Chief Joseph Builders contract, the Corps of Engineers had excavated the powerhouse intake channel, averaging 1,000 ft. wide and 3,000 ft. long, and had constructed the first stage cofferdam to allow construction of the north half of





LOADING END of the aggregate production system where the preliminary crusher reduces oversize to 12-in. material. The main plant reduces the size to 6 in. for the mass concrete.

the dam. It was this cofferdam that caused the delay in the start of actual construction of the dam. Extremely high river velocities along the cellular steel sheet piling cofferdam literally sucked the fill out of some of the cells, at the maximum river flow (1951) of 385,000 cfs. at the site. The area within the cofferdam had been dewatered and excavation of overburden overlaying bedrock had been started. When it became apparent that there was danger of cofferdam cell collapse the area was allowed to refill with water until a steel sheet piling protective wall was built along the river side of the cofferdam.

9 months' work in 5

The cofferdammed area was again dewatered and excavation of overburden and bedrock started for the foundation of the north half of the dam, four months later than scheduled. Realizing that the second river diversion must be made before the 1952 spring high river flow, or power could not be on the line in 1956, the Corps of Engineers requested Chief Joseph Builders to make up the four months loss of time. This meant doing nine months work in only five months, as it was impracticable to protect concrete from sub-zero weather damage in such a massive structure, and such weather conditions could be expected any time after the middle of December. Unless the concrete could be completed in the north half of the dam before winter weather forced shutting down concreting operations there would not remain enough time this spring to complete necessary concreting and also accomplish river diversion, prior to river flood stage of 1952.

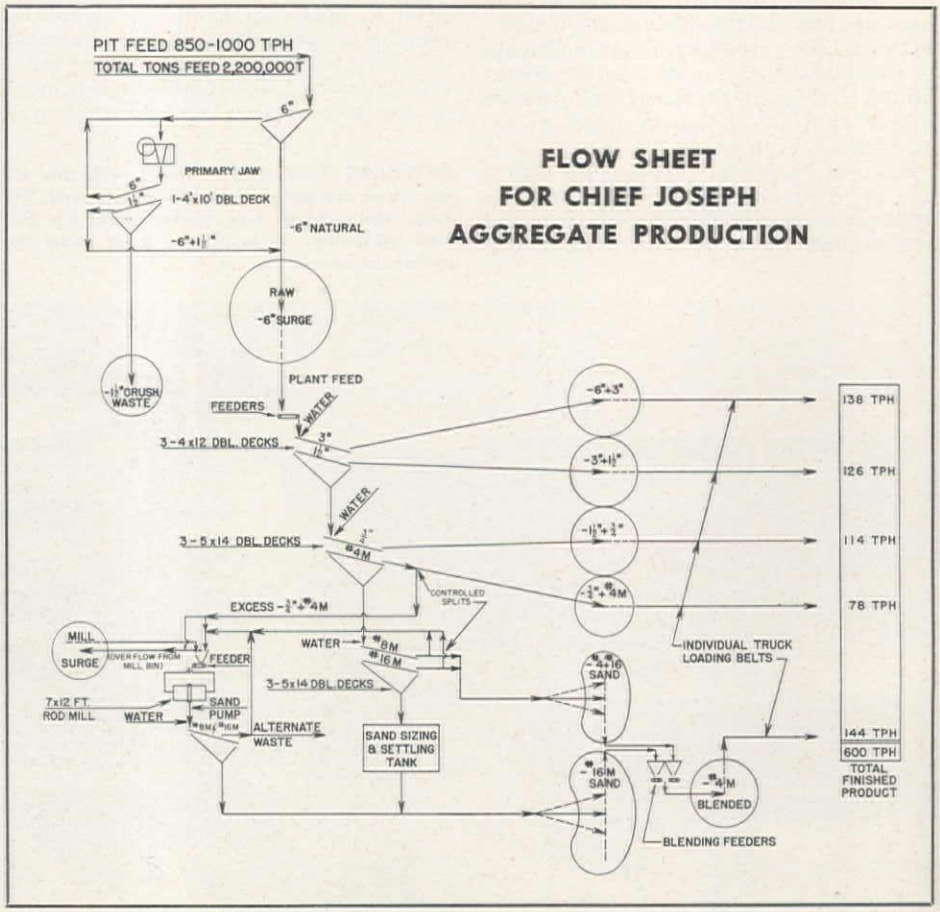
With the fullest cooperation of all concerned this task was undertaken, and by nearly doubling the normal working force, adding equipment as required and not missing a stroke, the last bit of concrete required to beat the Columbia before the 1952 spring high water was placed at midnight before the 1951 Christmas holiday. Second river diversion has proceeded on schedule.

Aggregate production

Natural aggregates are produced from a dry deposit, well above the north bank of the river, some 3 mi. downstream from the dam site. The producing, crushing, screening and washing plant was designed and furnished by the Conveyor Company of Los Angeles, and erected by Chief Joseph Builders forces. Raw aggregates are loaded by shovel into a portable hopper at the lower end of a 48-in. pendulum, 120-ft. length of conveyor, which moves the material to a portable 30 x 42-in. jaw crusher. This crusher is mounted on a car straddling a 42-in. conveyor which leads from the pit to the scalping plant. The shovel, working against a 50-ft. face and taking the hopper with it as it moves, makes a circular cut in the pit approximately 400 ft. in width. When a cut has advanced 120 ft. into the face (length of the pendulum conveyor), the crusher car is advanced and the conveyor from the pit to the scalping plant is lengthened to allow another 120-ft. cut. A grizzly ahead of the primary crusher allows materials under 12 in. in size to drop directly onto the conveyor to the scalping plant. The crusher is set to produce maximum 12-in. rock.

At the scalping plant all aggregates are screened on a 6 x 14-ft. single deck plate vibrating screen having 7-in. square openings. Material dropping through goes directly by 36-in. belt conveyor to a 10,000-ton raw surge pile. Rock passing over the scalping screen goes to a secondary 24 by 36-in. jaw crusher, set to produce 6-in. maximum size rock, or adjusted to balance any shortage in the 3-in. finished rock stockpiles. Rock from this crusher is returned to a double deck vibrating screen with 7-in. square openings in the upper deck plate and 1½-in. mesh wire lower deck, where any excess of crushed 1½-in. rock is drawn off by belt conveyor to a waste pile. Specifications require strict control of the amount of 1½-in. crushed rock in the finished aggregates.

A reciprocating feeder in a tunnel



under the raw surge pile feeds aggregates at a controlled rate onto a 30-in. conveyor to the top of the 57-ft. high structural steel screening and washing building. Here the material is split to duplicate double deck vibrating screens and divided into four sizes of coarse aggregate and two sizes of fine aggregate as they drop through or pass over screens on three floors of this building. Pressure spray washing is done on all screens in this building, using 1,500 gpm. of clean water pumped from the river.

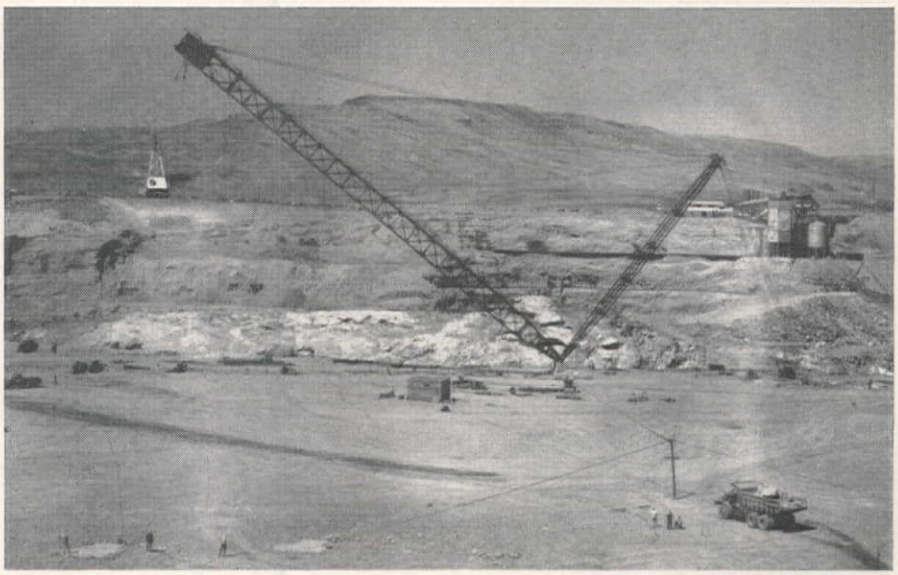
Sized and washed rock from these screens is conveyed by belt to individual stockpiles of some 5,000 tons capacity each. Rock is produced in four sizes, ¼-¾-in., ¾-1½-in., 1½-3-in., and 3-6-in. Rock ladders are provided to prevent excessive breakage in the stockpiles for the three larger sizes of rock.

Sand classification

Sand, plus 1/16-in. size, produced from the upper deck of the lowest duplicate screens is conveyed directly to stockpiles by a radial belt conveyor which provides elongated storage to allow specified drainage of one section of the stockpile while another section is being used. Part of this sand may be conveyed to a small surge pile from under which the sand is fed on a conveyor belt to a 6-ft. diameter by 12-ft. long rod mill for producing missing or short fractions in the sand. Pulp from the rod mill is pumped to a separate vibrating screen where it is again sized.

Sand, minus 1/16 in. in size, from the lower deck of the lowest screens is dropped into one end of the sand sizing settling tank. Eight compartments in each of four rows in this tank, with adjustable baffles between compartments and adjustable valves in the bottom of each compartment are designed to allow saving or wasting in chutes below the tank of any desired amounts of each fraction of sand, to produce any desired gradation in the final product. Some difficulty has been experienced in saving fines which are inclined to be drawn off with the necessary waste of larger factions of this sand. Wastes are conveyed away from the plant by chute with waste water. Desired sizes are chuted directly to an air vacuum rotary brush sand wheel where they are dried and conveyed by radial belt conveyor to an elongated stockpile.

Belt conveyors fed by manually operated gates in tunnels under the two sand stockpiles converge over a continuous weighing blender, where desired amounts of each size of sand are automatically weight-blended to produce required gradation in the finished product. From the blender the two sizes are mixed by dropping through vertical revolving paddles and then are conveyed to the final sand stockpile. High speed 42-in. conveyor belts, one under each finished aggregate stockpile, in a tunnel, feed 30-ton hopper bottom truck-trailer units for transporting about 3 mi. to the batch and mixing plant at the dam. Control of these belts is so arranged that trucks are filled in less than 1½ min., merely by pulling a cord as the truck arrives under the conveyor discharge chute.



TAIL TOWER MAST, weighing 118 tons, was completely assembled in a horizontal position and raised in a few minutes' time by the use of two crane booms which were set up on either side of mast base as erection poles. Tractors were used to pull booms down and mast up.

The Reynolds Trucking Company of Los Angeles holds the subcontract for hauling aggregates to the dam in five 30-ton truck-trailer units. Five self cleaning hoppers are provided on the mesa high above the north end of the dam, each holding only slightly over two truck-trailer loads, one for one size of aggregate. The fast loading provisions at the aggregate plant, instantaneous unloading of the hopper bottom trailers, short haul and good hauling road, coupled with adequate bin size in the batching plant, eliminate the necessity for the usual large aggregate storage piles adjacent to the batch plant. From under these hoppers each size of aggregate is conveyed on a single belt in sequence to its individual bin over the batchers.

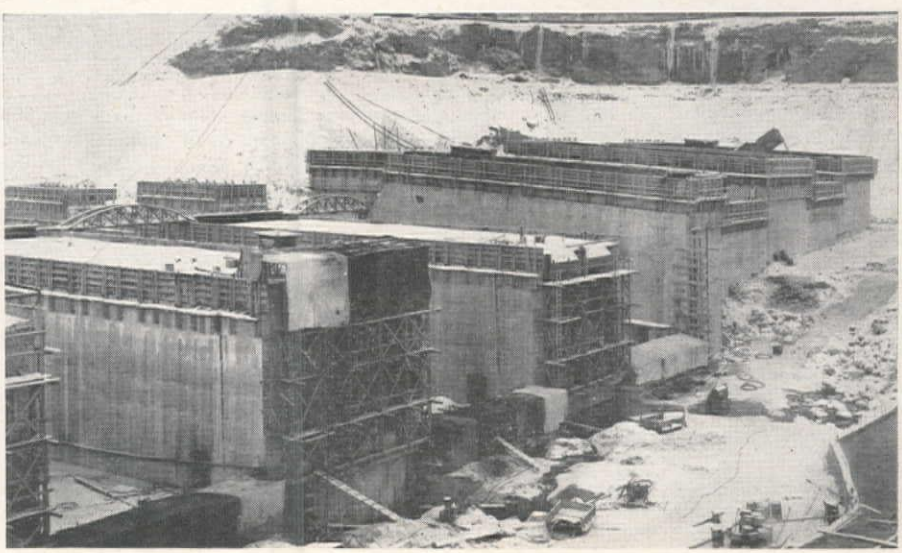
Batching and mixing

The batching and mixing plant is a 1,100-ton plant, with 400 tons of additional outside storage of sand provided to allow cooling of the sand, as well as to provide additional rock cooling capacity in the bins by cold air. All aggregates, water, cement, air entraining agent and ice are weighed and automatically recorded. Aggregate moisture compensation is provided and concrete consistency recorded on the three 4-yd. front charging mixers.

The mixers charge 8-yd. single compartment, fully controllable buckets, brought under the mixing plant on a two compartment car, pushed by a 10-ton diesel-electric dinkey. One compartment of the car is empty so that when the filled bucket is conveyed on the car from the plant to a cableway for conveying to the dam, an empty bucket may be set in the empty compartment before the filled bucket is picked up. During the high speed placing last fall, two cars and locomotives were used to service the two cableways. During normal concreting operations with one cableway, only one car is used.

Specifications require that concrete

CONCRETING FOR 1951 was concluded on December 24, with the monoliths as shown, leaving low blocks for handling river flow (view on page 71 shows flow over these low blocks). Concrete wall at extreme lower right was built by contractor to contain seepage from cofferdam.



Major units of equipment and materials at Chief Joseph Dam

EXCAVATION

- 1 Lima 2400 shovel, 6-yd.
- 3 Lima 1201 shovel-draglines, 3½-yd.
- 1 Bucyrus 120B shovel, 5-yd. (aggregate pit)
- 1 Bucyrus 54B, 2½-yd. combination
- 1 Manitowoc 2½-yd. combination
- 4 Northwest 80's 2½-yd. combinations
- 1 Northwest 95 3-yd. dragline
- 1 Northwest 6 1½-yd. combination
- 1 Browning 15-ton truck crane

HAULING

- 37 Euclids, 15- and 22-ton trucks, rear dump
- 8 Mack trucks, rear dump, 21-cu. yd.
- 12 Caterpillar D8 tractors
- 1 GMC tractor low bed haul unit
- 32 Pickups and flat bed Ford trucks
- 1 Caterpillar DW10 water truck
- 1 Mack water truck

CABLEWAYS

- Two 25-ton cableways designed by Chief Joseph Builders
- Washington Iron Works furnished 500-hp. hoists, carriages and fittings
- Westinghouse Electric Corp. supplied electrical controls
- Columbia Steel Co. furnished track and operating cables.
- Blaw-Knox steel form panels
- Superior Form Accessories, form hardware
- Dupont blasting powder and micro-second electric blasting caps, and Primacord
- Rail haul, Great Northern Ry.
- Truck haul, aggregates and cement, Reynolds Trucking Company

AGGREGATE AND CONCRETE PLANTS

- Conveyor Co. of Los Angeles designed and furnished aggregate preparation plant.
- 30x42-in. Pioneer primary jaw crusher
- 24x36-in. Lipman secondary jaw crusher
- 9 Allis-Chalmers vibrating screens
- Marcy rod mill for sand, 6'x12'
- Conveyco sand sizing tank
- Conveyco rotary vacuum sand drying wheel
- Feed-o-weight weighing blender
- Pioneer Rubber Co. and U. S. Rubber Co. supplied all conveyor belting.
- C. S. Johnson batching plant
- Goodall Rubber Co., hose and protective clothing
- Reinforcing steel, Northwest Steel Rolling Mills, Seattle
- Reinforcing subcontractor, Rutherford and Skoubye, Oakland
- 3 Koehring 4-yd. mixers
- 3 Koehring-Claggett consistency meters
- Vinsol NVX air entraining agent
- Gar-Bro controllable concrete buckets
- Superior Cement Co. and Northwestern Cement Co. supplied Type II cement in bulk.
- 18 Vibrators, Chicago Pneumatic, sizes 219, 325, 417 and 518.

COFFERDAMS

- 9 Fairbanks-Morse 20-in. vertical turbine pumps (200-hp.)
- U. S. Steel Co., MP-101 piling
- 2 McKiernan-Terry 9B3 hammers
- 2 McKiernan-Terry No. 7 hammers

COOLING PLANT

- 1 Worthington 7x7 ammonia compressor
- 1 Worthington 9x9 ammonia compressor
- 1 Worthington 10x10 ammonia compressor
- 2 Vilter VMC8 ammonia compressors
- 9 General Electric 50-hp. radial Freon compressors
- 2 Chrysler 50-hp. radial Freon compressors
- 4 30-ton Vilter Pak-ice machines
- J. D. Christian Co., Holoflight sand cooling screws
- John Hightower, contract for designing 1,000-hp. cooling plant

COMPRESSOR PLANT

- 2 Ingersoll-Rand 8x5x6½-in. stationary compressors
- 2 Sullivan 13x8x7-in. stationary compressors
- 1 Sullivan 15½x9½x7 stationary compressor
- 1 Chicago Pneumatic 19x11x10-in. stationary compressor
- 2 Chicago Pneumatic 15¼x9½ x7-in. stationary compressors
- 1 Chicago Pneumatic 23x13x16-in. stationary compressor
- 1 Gardner-Denver 365-cu. ft. stationary compressor
- 2 Gardner-Denver 365-cu. ft. portable compressors
- 1 Ingersoll-Rand 500-cu. ft. portable compressor
- 1 Ingersoll-Rand 105-cu. ft. portable compressor

DRILLING

- 2 Ingersoll-Rand quarrymasters
- 25 Ingersoll-Rand wagon drills, Model FM-3
- 24 Ingersoll-Rand J-50 jackhammers, I-R bits

must be pre-cooled so that it is at all times as near as possible to 40 deg., and never over 50 deg. when placed in the forms. To produce this result in the torrid summer temperatures encountered at the site, Chief Joseph Builders provided for: (1) cooling coarse aggregates by cold air; (2) cooling fine aggregates by passing them through sand cooling screws; and (3) introducing ice produced by four 30-ton machines. Concrete up to 3,500 cu. yd. per day was placed late last summer with temperatures well within the specified limitations.

The two 25-ton capacity cableways for placing concrete and for material handling anywhere in the dam were designed by Chief Joseph Builders. These cableways, with 3-in. locked-coil track strand, operate radially from a single tail-tower mast, 240 ft. high. Identical spans of 2,500 ft. allow 110-ft. high traveling head-towers to operate on the same pair of tracks, 1,300 ft. in length. These tower tracks are 55-ft. gauge between the standard gauge tracks, with the front track sloped to absorb tower thrust. Each tower contains hoisting equipment, and a 1,000,000-lb. concrete counterweight is carried on the rear to prevent overturning. Electric power at 2,300 v. is fed to each tower through a single overhead trolley system designed by Mel Prouty, chief electrician.

An interesting feature of the cableway installation is the 240-ft. tail tower mast to carry two 25-ton capacity cableways. This mast was planned by Chief Joseph Builders to eliminate the stresses inherent in the usual high tower for this type of service. One cableway track cable is fastened to the mast, near the top with the usual universal joint arrangement, with two 3-in. diameter backstays extending to anchors in rock attached directly to the mast at this point. Also at the top of the mast two 3-in. diameter forestays, again to anchors in rock, provide mast stability in all directions. The track cable for the second cableway enters the mast 17 ft. below the upper cable and is fastened to a universal joint carried on a ball and socket pendu-

lum so that harmonics from one cable are not carried to the other. Two 3-in. backstay cables to anchors in rock are also fastened to the pendulum. The base of the mast rests on a ball in a socket. No indeterminate stresses and no harmonics are involved in this tail tower design.

This mast, weighing 118 tons, was completely assembled in a horizontal position and erected in a few minutes by using two crane booms erected vertically on either side of the mast base as erection poles. Cables were attached from the tops of the booms to the mast and tackle from the tops of the booms to anchors in rock. Tractors then pulled the booms down and the mast up.

Placing concrete

Mass concrete for the 49-ft. wide monoliths in the dam is placed in the usual 5-ft. lifts, with a 72-hr. time lapse specified between pours. To assure proper consolidation of the concrete a lift is made in three layers, with the area of the layers restricted so that cold joints do not occur between layers.

When a monolith lift is completed and the concrete has taken its initial set, the surface is cut with an air-water jet to expose aggregate for bond to the next lift. Prior to placing the next lift, this surface is thoroughly washed with the air-water jet and any standing water blown off to provide a roughened, moist, perfectly clean surface upon which cement-sand grout is spread just before mass concrete placement begins.

For operation of the single-compartment concrete buckets used on the job, air connection is made through a railroad air brake coupling as soon as the bucket comes within reach at the pouring site. A three-way valve on the air supply hose allows control of dumping so that half the 8-cu. yd. contents may be deposited in one location and the bucket moved to an adjacent point for dumping the second 4 cu. yd. Little time is lost in this method, and there results no objectionable bounce of the bucket on the long cableway track cable. In this manner also, segregation is kept to a minimum, despite the high rock content and low water-cement ratio of the concrete, a lean, low-slump mix having a maximum aggregate size of 6 in. As the empty bucket is hoisted out of the pour, a slight jerk disconnects the air hose.

Concrete is consolidated by two 2-man pneumatic vibrators with a third one-man vibrator used against the forms to guard against honeycomb. These vibrators impart more than 6,000 impulses per min. in the concrete to produce proper consolidation of the mass.

Standard steel cantilever forms are used, with T&G facing specified on the exposed faces of the structure. Form panels are stripped and raised 48 hr. after concrete is placed by means of chain jacks hanging from portable A-frames. Panels are made in lengths of about 50 ft., normally requiring four A-frames for handling. A stripping crew strips and raises the forms, installing and roughly tightening anchor bolts to hold them for the next lift of concrete. Shortly prior to scheduled placing of the next lift, a carpenter crew brings the forms to true alignment, sets anchors for the future lift, does any necessary smoothing or repair of form surfaces, and finally tightens anchor bolts.

DIRECTING THE WORK for Chief Joseph Builders. From left: A. D. Haile, office manager; C. W. Black, executive vice president, The Arundel Corp.; S. E. Hunkin, president, The Hunkin-Conkey Construction Co.; W. N. Evans, project manager; L. E. Dixon, president, The L. E. Dixon Co., Chief Joseph sponsor, and K. L. Parker, chief engineer.

Bulk Type II cement is delivered at a siding, constructed by the Great Northern Railroad for the contractor approximately 12 mi. downstream from the dam, in hopper bottom railroad cars. Gravity unloaded and conveyed by screw and bucket elevator to a 2,500-bbl. surge silo and 750-bbl. truck loading silo at the siding, the cement is hauled to 12,000-bbl. silos adjacent to the batching plant in a single truck-trailer unit under subcontract to Reynolds Trucking Co. Hauling conditions are excellent over a heavy duty access highway constructed by the Corps of Engineers under prior contracts.

Siding tracks were also constructed at the unloading yard to provide for rail shipments of equipment and the permanent materials to be incorporated in the dam. Reinforcing steel, furnished prefabricated by the Northwest Steel Rolling Mills, is hauled by truck directly from its plant in Seattle. Electrical power is purchased from the Douglas County Public Utility District No. 1 at a substation near the town of Bridgeport at 13,200 v. Job power transmission lines and substations located at strategic points provide power at 2300/440/110 v. as required for electric motors totaling 9,300 connected horsepower.

Handling water

Part of this power was required for the nine 200-hp., 20-in. vertical turbine pumps with a total capacity of nearly 128,000 gpm., to dewater the area within the first stage cofferdam, constructed by separate contract, and to handle the leakage through that cofferdam. Minimum leakage at low river flow was 55,000 gpm., ranging to over 100,000 gpm. during higher river flows. Installation and operation of this pumping capacity, including power, was a unit bid item of the dam construction contract.

To control this leakage and provide a perfectly dry rock foundation for the dam and stilling basin inside of the first cofferdam, Chief Joseph Builders constructed a concrete wall completely around the permanent construction area.

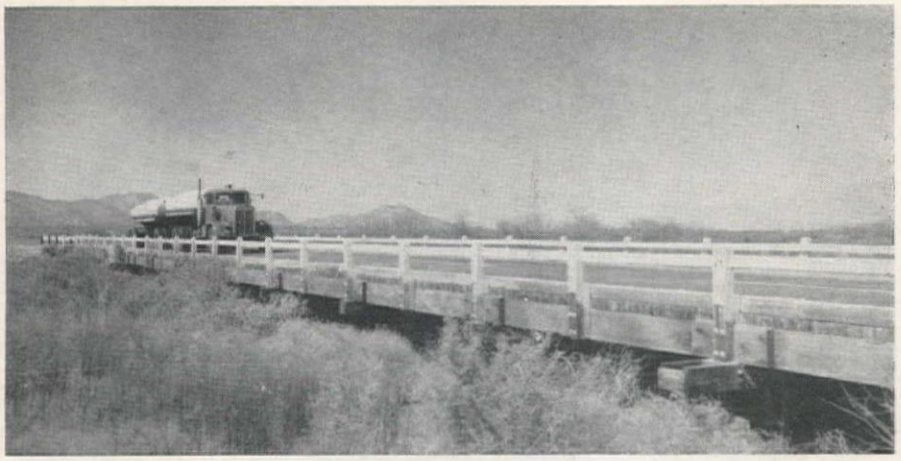
When the stilling basin and dam monoliths were completed to prescribed heights in the north half of the dam, together with the wrap-around fill around the end of the concrete dam, to allow diverting the river through five low monoliths, Chief Joseph Builders constructed the first leg of the second stage cofferdam. This leg, consisting of circular steel sheet piling cells was built on and across the stilling basin, connecting the river arm of the first cofferdam to the south monolith of the north half of the dam. With this portion of the second cofferdam completed, the upstream and downstream arms of the first stage cofferdam were removed, allowing the river to flow through the five low monoliths and over the stilling basin of the north half of the dam.

South channel closure

The main river flow continued in the south half of the river channel where it had been forced by construction of the first cofferdam. Closure of the south channel and forcing of the entire flow through the five low monoliths in the north half of the dam was successfully accomplished by dumping a rock dike outwardly from the south bank of the river to connect with the upstream end of the river arm of the cofferdam. Final closure of this dike was made, despite river flow of 77,000 sec. ft. and closure velocity of 22 ft. per sec., by dumping 15- to 30-ton rocks into the closure, these rocks being cable anchored to the upstream end of the cofferdam river arm against which the closure was made.

A second rock dike, upstream from the closure dike, was provided and the space between filled with impervious or common materials. Steel sheet piling cells were erected in the dry and driven to rock through this fill, thereby avoiding the troubles experienced by others due to high river velocities during con-

. . . Concluded on page 127, along with a full page of pictures of key personnel



TYPICAL 20-year old timber-stringer bridge in Arizona, and a sample of today's loads.

Arizona is adding steel stringers to scores of old structures like this at a cost of only $1.00 per sq. ft. and extending their useful life by 10 or 15 years

Steel adds life to old timber spans

By

R. A. HOFFMAN

Bridge Engineer

Arizona Highway Department

THE LIFE of many old, timber-stringer bridges on the Arizona state highway system has been extended for 10 to 15 years at a cost of only $1.00 to $1.15 per sq. ft. by a program of strengthening which was started about two years ago. Design for the auxiliary supporting system includes steel stringers carrying up the load from the original timber stringers at mid-span. This improvement program will be continued until a total of about 300 of the old structures are strengthened. To date, 32 bridges have been rejuvenated.

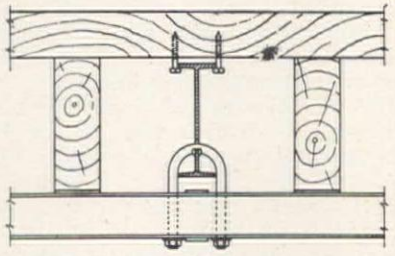
A 90% saving

In view of the fact that the cost to replace the bridges today would be at least $10 per sq. ft., the program has been considered most economical since the $1.00 cost figure represents about $450 to $500 per 19-ft. span. About two tons of steel are required for each span strengthening job.

Originally constructed some 20 to 25 years ago the bridges all have 23-ft. roadways with 19-ft. spans supported on ten 6 x 18-in. timber stringers. Due to Arizona's dry climate these timber stringers gradually developed longitudinal checking; that is, they developed planes of weakness that practically split them in two. The material used for the timber portions of the bridge was all pressure treated; but while the other components were in good condition, inspection revealed that about 80% of the stringers had a longitudinal split. As a result, the stringers would not safely support the imposed traffic load.

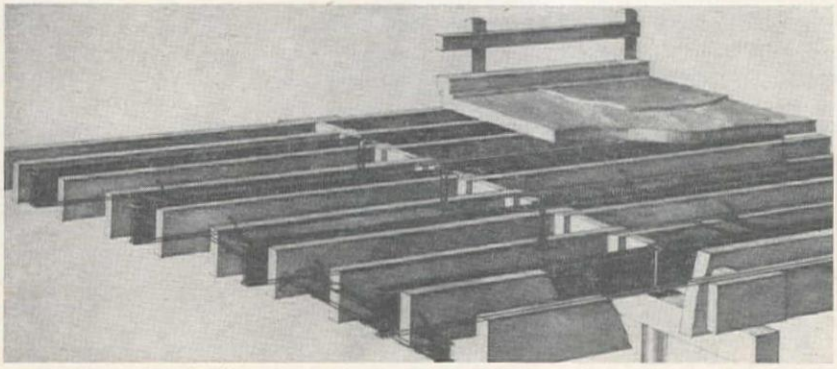
H-15 becomes H-20

In addition, the bridges were designed for H-15 loads, and the pounding of today's heavy trucks, moving at high speeds, requires a design based on H-20 loading. As the split stringers were not adequate for present loads, deflections were as much as 1¼ in. under a heavy vehicle. This deflection made it difficult to maintain the asphaltic wearing surface, and cracks and breaks were common. The system of auxiliary steel stringers and the transfer of the loads have reduced the deflection to ⅜ in., and surface cracking has been almost eliminated.



DETAIL of method by which loads are transferred from old timber stringers through a pair of transverse channels to the auxiliary steel I-beam. The lag screws are for lateral support.

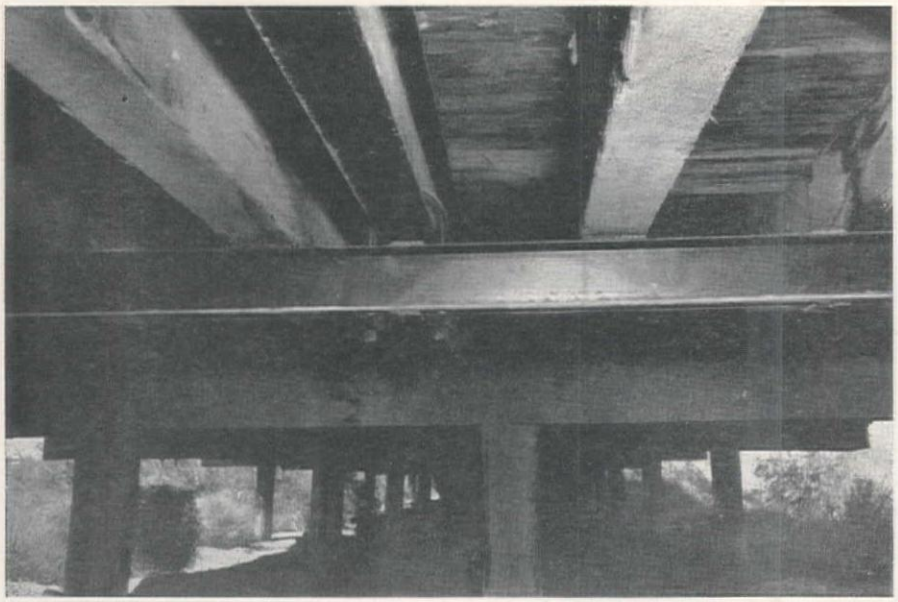
GENERAL DESIGN features of timber bridge providing ten 6 x 18-in. stringers which are given an auxiliary supporting system of four steel stringers.



The auxiliary stringer system consists of four steel 15-in., 42.9 lb. I-beams extending from cap to cap. A ½-in. steel plate is used for bearing between the beam and the cap. The ten timber stringers in each span are dapped 1 in. to fit the cap, thus supporting the floor of the bridge a nominal 17 in. above the top of the cap. The steel beams are inserted between pairs of stringers as shown in the accompanying cutaway drawing. As each timber stringer is dapped its lower surface is 1 in. below the top of the cap, and as the steel beam rests on a ½-in. plate its bottom surface is about 1½ in. higher than the bottom of the stringers, leaving about 1½ in. clear between the steel beam and the flooring.

Load transfer

To transfer the load from the timber to the new steel stringers two 6-in. channels, set back to back and held apart by 1¼-in. spacers, are placed under the timber stringers at mid-span and brought up to contact by means of 1¼-in. U-bolts (see drawing). Small plates welded to



COMPLETED JOB showing transverse channels brought up to contact with timber bridge stringers by means of U-bolts, which pass through a hole in the I-beams.

the top and bottom of the two channels hold them together.

Connecting beams and channels

The U-bolt connecting the beams and channels passes through a hole in the web of the I-beam, straddles its lower flange and passes downward between the two channels. Taking up on these U-bolts places the steel in position to take the load and takes out any permanent deflection. During the program it was occasionally found advisable to return in about two months and take up again on the bolts.

To provide lateral support for the steel beams, ½ x 7-in. lag screws were inserted up into the bridge decking, with their heads flush against the upper beam flanges. These screws were set at the middle and quarter points of the span.

Since the bridges undergoing the strengthening are across streams which are dry most of the year, field operations have generally been performed from the stream bed below, resulting in no interference with bridge traffic. Principal item of equipment used has been a front end loader, equipped with an extension on its hydraulic boom. A beam placed on this extension could then be raised into its position between timber stringers. The same loader was used to hold channel members in place while U-bolts were fitted. All necessary welding was done in the field using a small portable electric welding unit. A crew of four men was the usual labor detail on the work.

32 "new" bridges

Contracts for this work have been let in units of 40 to 50 spans, amounting to $20,000 to $25,000 per unit. Contracts to date have totaled $126,000 for strengthening 257 spans in 32 bridges. Resurfacing after placement of the steel stringers has been done by state maintenance forces. This portion of the rehabilitation program, naturally, does interfere with traffic for the short time involved.

The work has so far been restricted to bridges on Arizona's primary system, but with increased traffic and loads on secondary roads the bridges on these routes will be given the same treatment as required.

R. C. Perkins is state highway engineer of Arizona, and the author is bridge engineer. Field operations in the bridge strengthening program have been under direction of the district engineers.

Golden Gate Bridge misbehaves in high wind, alterations considered

ALTHOUGH structural integrity of the world's longest (4,200-ft.) suspension span is unimpaired, the severe wind-induced motion of the Golden Gate Bridge late last year did cause major damage to some minor details—the lateral connections of the main span at both north and south towers. For over three hours on December 1 the unprecedented westerly winds maintained a velocity of more than 50 mph., with gusts to a recorded maximum of 69 mph., and dictated closing of the famous span to traffic for an equal but not coincident period of time.

Ten instruments located at the centers of north and south side spans, at the center of the main span and at its quarter points recorded vertical vibrations. Lateral and torsional motion could only be estimated from eye-witness accounts and from scars on the cables caused by contact with lamp posts ordinarily standing nearly 3 ft. away. Greatest recorded motion took place at the south quarter point of the main span, and on its east side. Double amplitude of the vibration here, recorded at 5:50 p. m., was at least 130 in. (the instrument data are not reliable thereafter), occurring with a frequency of 8.4 cycles per min.

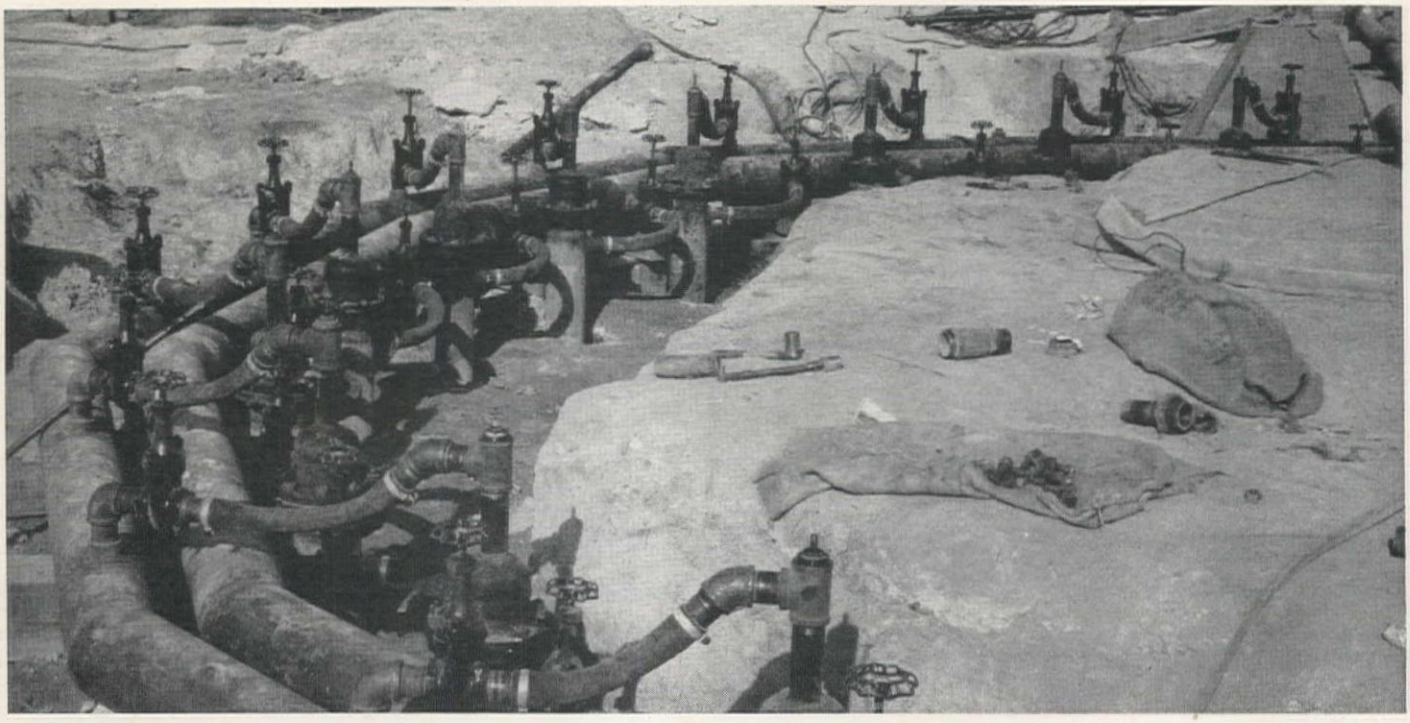
Inspection of the bridge and repairs required were carried out under the direction of Clifford E. Paine, consulting engineer, who had participated in the original design of the bridge. His report to the board of directors of the Golden Gate Bridge and Highway District, dated January 18, 1952, summarizes his inspection findings, decisions on repairs, and recommendations. The latter include future investigation and possible alteration of the span and its connections against the possibility of subsequent severe wind-induced motion.

The lateral connections suffering damage consist of slotted castings fixed to the north and south towers which receive sliding blocks fixed to the ends of the center span itself. Casting slots are lined with bronze bearing plates; sliding blocks are of Allegheny Metal 33. Lateral pressure from the west resulted in deep abrasion of the bearing plates. In addition, the sliding blocks actually cut into and "machined" off portions of the bronze. At some points a bearing plate itself tore away and the casting below was abraded by the sliding block.

Repairs, involving rebuilding of the castings (by arc welding) and installation of new blocks and bearing plates, were accomplished between December 9, 1951, and January 22, 1952. Necessary modifications in these connections (due to the short notice) were the use of different metals in the new parts. Steel bearing plates were installed, and sliding blocks of annealed SAE 1040 steel forgings. These parts in the new detail are lubricated, both to facilitate their action and to resist corrosion. Replacement with parts of the original materials will follow upon their availability. The recent work was performed by the Judson Pacific-Murphy Corp. of Emeryville, Calif.

Paine observed in his report that, to improve the bridge's behavior under future conditions of high sustained winds, "addition of a system of lateral bracing in the plane of the bottom chords in conjunction with cross bracing in vertical planes at regular intervals would be highly beneficial. . . . Other possibilities include the employment of open grating floor in some sidewalk areas and the use of damping devices."

In implementation of these and other recommendations, he offered his own services, on condition that he be authorized to engage the services also of at least two other qualified engineers if he should so desire. To facilitate such investigation as would then be conducted, and to enhance the body of instrument data available after any future extraordinary span movement, Paine also recommended the provision of vibration recording instruments having variable speed controls incorporated in their driving mechanisms. Such controls, whether automatic or not, would at critical times permit recording of vibrations to a larger scale for easier interpretation.



"DEEP FREEZE" IN NEW MEXICO

Cofferdam of ice permits excavation of mine shaft 360 ft. deep through otherwise unconsolidated water-bearing gravels and flowing quicksand—Method based on European experience

FREEZING A CYLINDER of ice about 360 ft. deep to consolidate layers of quicksand was the successful preliminary to sinking a new shaft at the mine of the Potash Co. of America near Carlsbad, New Mexico. The general program for the operations was developed by the management and engineers of both the Company and Winston Bros. Co., the contractor. Field work was carried out by Winston Bros. Co. Because the sinking of shafts is common to many construction projects, the principal features of this work at the Carlsbad potash mines are reviewed in this abstract of an article which appeared in *Mining Congress Journal* for January 1952, under the authorship of Russell G. Haworth, Resident Manager, Potash Co. of America.

Conditions at the site

The potash mine, located about 20 mi. east of Carlsbad, was developed through two shafts sunk in 1934 and 1936. These shafts encountered difficult conditions with zones of sandy material and heavy flows of water, but no actual quicksand.

The general area surrounding the mine does not provide drainage of surface water, which tends instead to fill up the limestone channels over the potash deposit, with the water level in the basin standing approximately 50 ft. below ground surface.

In 1947 two additional shafts located about 2 mi. south and north of the original two were started. Conditions, as determined by preliminary drilling, were considered to be no worse than those encountered in the original shaft. Plans were therefore made to grout any water bearing zones ahead of sinking. In the north shaft, water bearing sand was encountered at a depth of about 50 ft. and grouting was attempted. This work proved unsuccessful even after 1,000 sacks of cement had been used, since the grout followed along small water bearing channels in the sand and did not effect any consolidation.

Crews working in the south shaft struck small fissures with heavy flows of water at about 100 ft. and these were successfully grouted. However, at about 125 ft. flowing quicksand was encountered. An effort was made to bleed out this sand through drill holes and then replace the material with grout. This work proved so slow and expensive that operations were suspended for further study of the problem.

The use of solidifying chemicals was investigated and discarded. The final decision was to use a process of freezing the surrounding ground by methods which have been used on several occasions in Europe but are quite uncommon in this country. At this stage, Mr. Haworth visited Europe to study the methods used, particularly at shaft freezing operations in England and France.

Upon his return, the location of the shaft was moved as a result of drilling test holes which indicated more feasible conditions at another location. Churn drill test holes were also put down to determine the water in the various strata. The final decision was to freeze the zone around the new location before the start of sinking operations.

PICTURED ABOVE—

CONNECTING a 31-ft. diameter ring of 6-in. cased holes, inflow and return headers circulated brine to a depth of 360 ft., creating frozen barrier around mine shaft site.

Putting down pipes

Around the circumference of a 31-ft. diameter circle 28 holes were drilled to a depth of 360 ft. These holes were spaced about 3½ ft. apart, center to center, and penetrated below the deepest water-bearing formation, which was unconsolidated sand and silt.

Churn drilling was tried for these holes but lacked control, and rotary drills proved more successful. Drilling was at a slow rate in an effort to keep the holes straight. Direction of the holes was essential for proper freezing of the ice curtain to form a cylinder of uniform thickness.

A line of 6-in. casing was introduced in each hole, the bottom sealed with a welded plate. The casing was not cemented in the hole. Pipe of 2-in. diam-

eter was run down inside the casing.

Finally, a hole was drilled at the location of the center of the shaft and a slotted 6-in. casing was introduced in this hole to provide a means of escape for water forced to the center by the freezing process.

Plant and freezing

The refrigeration plant consisted of two ammonia compressors driven by 100-hp. motors. The remainder of the plant, which was established near the shaft, included the usual auxiliaries for this amount of refrigeration, including a small cooling tower. The brine was calcium chloride and was pumped by either of two 1,000-gpm. centrifugal pumps to the brine header. The 2-in. tube in each of the holes was connected up to the 8-in. brine header which extended in a ring around the circle of the drill holes. Each tube was provided with a valve to regulate the flow of brine so that the temperature of the return brine coming up from all holes would be about the same. By-passing the cold brine directly to the bottom of the hole through the small tube, the temperature could be maintained lower at the bottom of the hole and the rate of heat exchange was reduced. By the valve control at the top of each hole, temperatures were maintained uniform, with resulting ice formation equally uniform. The return brine flowed into a second header and was piped back to the cooling system.

Seven days after the refrigeration plant was put into operation, temperature at the bottom of the holes was 6 deg. F. Cylinders of ice began to form outside the 6-in. pipe where water was present in the ground and complete enclosure of the ice shell around the shaft was effected in 48 days.

As freezing advanced, water was forced up the pipe in the center of the circle, but because of this escape hole there was no heaving of the ground due to expansion as the ice formed. Levels were checked during this period and no ground movement was noted.

The purpose of the present shaft is to provide ventilation and its 15-ft. inside diameter is divided into two compartments by a concrete wall to provide for a two-way passage of air.

HEAD FRAME marked site of shaft, supported crosshead used in sinking operations.

STEEL FORMS followed excavation as 25-ft. vertical segments of concrete shaft lining were poured. Shaft was never mucked more than 30 ft. below completed lining, a precaution against possible hydrostatic pressure effects on the protective ice wall.

Lining operations

The concrete lining was placed in 25-ft. vertical sections through the water-bearing zone. Each of these 25-ft. rings is designed to be self-supporting with bearing at the bottom of the section. Where concrete was to be poured in contact with the frozen ground corrugated roofing was used as a temporary liner during sinking. This special feature maintained an air space between the concrete and the frozen ground. Also it provided an opening for subsequent grouting. A ring of evenly spaced grout pipes was set at 5-ft. vertical intervals in the concrete forms before pouring.

Temperature measurements in the ground indicated that the concrete would not actually come in contact with ground below 32 deg., but it was considered safer to establish the zone between the frozen ground and concrete.

European practice is to line such shafts with cast iron segments followed by a grout seal after thawing. The plan to line the shaft with concrete was without precedent and the 25-ft. pours were designed to compensate for any possible ground movement during final thawing of the ice wall. A ½-in. expansion joint was provided at the top of each 25-ft. pour, but when no evidence of ground movement was observed this joint was abandoned and a heavy coating of asphalt substituted. A rubber water seal was embedded in the concrete at the pour joints.

Grouting was carried out before the ice ring was completely thawed. As a preliminary to grouting, the ground was allowed to thaw back a few inches which assured the setting of the grout without freezing. Obviously the ice wall prevented the grout from flowing outward through fissures and cracks.

Sinking operations

Nothing unusual developed in the equipment, and sinking operations were quite conventional. The crew consisted of six men in the shaft and two at the top, including the hoist man. No mucking equipment was used because the limited space and size of the crew made it impractical. The rate of sinking and lining averaged 64 ft. per month through the frozen ground and no difficulties were experienced.

Observations

Because the operations were so unusual those in charge of the project have prepared the following summary of observations and conclusions:

1. Freezing was a markedly successful method in comparison with other methods tried in the same type of ground. It is the only successful method for combating highly fluid quicksands which cannot be grouted.

2. Churn drills with cable tools were not successful in drilling straight holes. Rotary tools were faster and drilled reasonably vertical holes. Frequent check surveys must be made during drilling for control. Directional surveys are advisable for a final check to make sure that a wide gap does not exist between any two holes.

3. Circular cross section is preferable because of its higher strength, especially when ground movement is likely to occur.

4. One or more holes inside the shaft should be drilled to provide for expansion of freezing water trapped inside the ice ring.

5. Expensive cast-iron tubbing is not necessarily required. Reinforced concrete lining is cheaper.

6. Cost of freezing is not excessive and in ground where grouting is difficult due to clays or sands with water, it may be less expensive.

7. Freezing provides a safe method of going through heavy and wet ground and if concrete lining is kept within 30 ft. of the bottom, danger of breaking of the ice wall is limited to the open section. This method appears safer than sinking through all of the frozen section with only a temporary lining, followed by lining with cast-iron tubbing or reinforced

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Removing the "guess" from flood warnings

When run-off in California's central valleys reaches flood proportions, engineering agencies combine talents for an effective fight—Aided by shortwave radio and electronic gadgetry, they apply reservoir operation techniques to entire river systems

WITH CONSTRUCTION of such dams as Shasta, Friant, Pine Flat, Isabella, Folsom, and the projected Oroville structure, the goal of optimum flood control becomes a physical possibility in California's Sacramento and San Joaquin valleys. The key to practical achievement of this goal then lies in operational techniques for these dams. Since it is not economically feasible in dam construction to provide protection against the maximum possible flood, or even against the "once in a hundred years" variety, the efficacy of any flood control dam (or any flood control reservation behind a multi-purpose dam) lies largely in its operation.

Lessons from experience

Careful observations over the years may dictate that flood control storage behind a dam be kept available during certain critical months by permitting all normal flows to pass. On the other hand, channel capacity (for inflow of uncontrolled downstream tributaries) must be available at other times by restriction of reservoir releases. Always, however, the best calculations based on experience can be upset. Such was the case in California in November and December of 1950, when unprecedented warm rains at low and high elevations melted an early Sierra snowpack and led to record floods on the Sacramento and San Joaquin rivers, and all their tributaries throughout both river valleys.

At that time, a flood warning service of sorts was available for coordination of the efforts of all who were involved in the flood fight. This service had developed over the years around the activities of the flood control section of the state Division of Water Resources and included the U. S. Weather Bureau and the U. S. Corps of Engineers as major participants. In observing the passage of flood flows through the valleys, in operating flood by-passes, and in transmitting warnings to affected areas, these agencies had long worked in complete accord. During the 1950 flood fight, however, new and valuable sources of flood flow information, and equally welcome communication and equipment facilities, were brought to bear. Among these were the radio networks of the state Highway Patrol, the state Division of Highways maintenance department, and the state Division of Forestry. Other aids were furnished by sheriffs' offices, city engineering offices, Pacific Gas & Electric Co., and many irrigation districts.

Although the traditional coordination of effort among the Division of Water Resources, the Weather Bureau, and the Corps of Engineers was maintained as in earlier flood years, an added "nerve center" manned by representatives of the principal new participants was established to afford better liaison among all agencies. This center was located in the Sacramento offices of the Highway Patrol, and was attended also by American Red Cross personnel, and officials of the state civilian defense organization. Thus centralized, the flood warning service directed engineering forces engaged in river levee patrols, sandbagging, and operation of river by-pass channels into lowlands where flooding easements permitted. It also transmitted notice to evacuate endangered areas, and thereby enabled concerned local agencies to marshall their equipment and services well in advance of need. And, from its intimate knowledge of highway conditions, the service was able to aid the continued movement of people and commerce throughout the 400-mi. length of the flood situation.

A dependable, automatic method

The most dependable method for determining time, location, and magnitude of flood peaks, the one giving earliest warning, was based on a system of automatic radio stream gauge transmitters maintained by the Division of Water Resources on major valley tributaries. Invented in 1931 by Irvin M. Ingerson of the Division, these water stage transmitters are equipped to furnish instantaneous reports of river channel water level by means of shortwave radio or telephone. Each of the former type of installation transmits, at predetermined intervals, its identifying code designation, followed by a series of dashes indicating the river stage, or level, in feet and tenths of feet. The telephone installation provides information in a similar code, but does so on demand: dialing a telephone number "triggers" the device into operation.

Charting the future

The present knowledge of river conditions given by the radio transmitters, considered by itself, serves to indicate future conditions only in a qualitative sense. In order to determine when and how high a coming flood crest will be, hydraulic engineers of the state and federal agencies must initiate a further step. From computations based on years of Central Valley flood records, they have devised a series of graphs and nomographs whereby the instantaneous river stage data transmitted from stations upstream may be used to determine the time and, within one or two tenths of a foot, the magnitude of a flood crest to be experienced at a given point downstream. The method is almost wholly empirical, past records being the measure of time lapse between flood crests at successive points along the rivers. Only the stage-discharge relationship for various river channels at the transmitter

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RECEIVING END of a system of automatic rain gauge transmitters is inspected by C. M. Daum (left) of the USBR laboratories in Denver; M. H. Blote, Central Valley Project operations superintendent; and I. M. Ingerson of the California Division of Water Resources. Ingerson pioneered in "push button flood control" with his automatic stream gauge transmitters, now in their 22nd year.

RUN-OFF FORECASTS
1952 water supply in Western States

Snow surveys indicate . . .
——Flood possibility in Northwestern States
——Drought partially broken in the Southwest
——15-year record supply in Mountain States
——Generally, ample supply for the entire West

By R. A. WORK
Senior Irrigation Engineer
Soil Conservation Service
Medford, Oregon

and

CLYDE E. HOUSTON
Irrigation Engineer
Soil Conservation Service
Reno, Nevada

WHEN FATE pushed Southern Pacific's crack streamliner, "City of San Francisco" into news headlines last winter, most people then became aware that a winter of heavy snowfall was indeed developing in the West.

Just how heavy was not generally known except to those whose business was affected by snow, and to the snow surveyors whose ski-trails ranged into the most remote cirques of the mountainous West.

The snow surveyors have found that not only was it a winter of deep, heavy snow in most places, but weather patterns of immediate past few years have shifted in such manner as to bring cheerful promise of the most water in years to states of the Southwest.

Generally ample water supplies for almost all parts of the West are forecast by the U. S. Soil Conservation Service* from a thousand or more snow survey reports just received.

A brief analysis of the April first snow surveys, traditionally presented by *Western Construction* shows unusually uniform run-off, considerably above average in most places, in prospect for 1952. New flow records are likely to be set in many basins, particularly in Oregon, Colorado, Utah and Nevada.

Water supplies will be generously above normal in a wide band extending easterly from the Pacific Ocean, including practically all of Oregon, California south at least to the Tehachapi, Nevada, Idaho, Utah, Colorado, most of Wyoming, and Montana and northern New Mexico.

Flood prospects

Again, as in the past four years, there are possibilities of local floods in the Columbia River Basin, and even more surely on the Rio Grande, on many streams in northern Utah, and on California's San Joaquin, Kings, Kaweah and Kern.

The development of this potential, of course, depends upon conditions affecting the rate of snow melt. The potential will be reduced by a warm early spring, but will be developed by a cold spring.

The serious drought which has plagued the Southwest shows signs of having been partially broken. Heavy mountain snow cover is reported from Oregon, Idaho, Nevada, California, Utah, Colorado, and parts of New Mexico. Only in west-central Wyoming, southern New Mexico, southern Arizona, northwestern Washington and parts of central Montana, is snow cover only normal or slightly below.

SNOW SURVEYOR uses his ski poles to hold the weight of sampling tube and scales. Surveyors make careful studies of 1,000 snow courses to predict the West's summer water supply.

Drought less serious

The long series of short water years, broken somewhat in 1949, has been eliminated in Nevada and throughout most of Arizona, and New Mexico, although the drought still persists in extreme southern parts of New Mexico, and Arizona and in parts of northwest Texas. Nowhere except in the above areas do the snow surveys promise important or worrisome water shortages for irrigation, power generation, and municipal industrial use.

In the following paragraphs the water supply network is reviewed state by state. Two charts illustrate graphically reservoir storage and expected stream run-off.

ARIZONA

Prospects for run-off into the reservoirs of the Salt and Verde rivers are the best in the past 10 years. The watersheds of these rivers now store more water in snow than in any previous year of record. Soils on these watersheds are saturated.

The Verde River reservoirs should fill and spill before the middle of April. By the end of May an additional 150,000 acre-feet will flow past the gauging station at Horseshoe Dam on the Verde.

It is forecast that for April-June, inclusive, 500,000 acre-feet of water will pass the gauging station at Roosevelt Dam. This should bring the reservoirs of the Salt River nearly to 90% capacity.

The outlook for run-off on the Gila River is not nearly as bright as on the other watersheds of the State. San Carlos reservoir on April first stored water only to about 13% of capacity. Run-off may bring this storage to no higher than 15% of capacity. Soil moisture conditions are good on the Gila watershed but there is not sufficient snow cover to insure a good run-off.

Run-off into the Little Colorado will be considerably above normal.

Storage in Carl Pleasant dam was at 75% of capacity, or about 136,000 acre-feet on April 1. It is possible that run-off may bring this storage to maximum of 150,000 acre-feet. Current irrigation requirements are keeping the storage down. Excluding San Carlos reservoir on the Gila River System, the state will enter the irrigation season with all reservoirs at or near capacity.

CALIFORNIA

Run-off from snow melt in California, as indicated from April first snow surveys will be the greatest since snow sur-

**The Division of Irrigation and Water Conservation is the Federal coordinating agency of snow surveys conducted by its staff and many cooperators, including the Bureau of Reclamation, Forest Service, National Park Service, Geological Survey, various departments of the several Western States, irrigation districts, power companies, and others. The California State Division of Water Resources conducts and coordinates snow surveys in that State, while the British Columbia Department of Lands and Forests, Water Rights Branch, has charge of the snow surveys in that Province.*

veys began 22 years ago. Only on the watershed above Shasta dam, among the major watersheds tributary to Sacramento Valley, is the forecast for less than the 1938 April through July flow. Run-off from the Upper Sacramento River watershed is expected to be about 92% of 1938.

On watersheds draining west from the central Sierra (Feather, Yuba, and American rivers) April-July run-off is expected to be the greatest since that recorded in 1890.

Sierra streams tributary to the San Joaquin Valley may produce flows that will cause local flooding of low-lying agricultural lands in vicinity of their confluence with the main stem of San Joaquin River.

On the extreme southern watersheds of the Sierra, indicated run-off will be of such proportions that Buena Vista Lake and Tulare Lake basins will be flooded to approximately the same extent as in 1938. However, it is understood that as much as 300,000 acre-feet of space may be made available in partially completed Pine Flat reservoir upstream on Kings River. If this should prove the case, in-flow to Tulare Lake could be materially reduced.

All major reservoirs fed by Sierra streams are expected to fill before the end of the snow run-off period, even though some have been materially lowered in anticipation of large in-flows to come.

All of the above predictions, in common with those for other states, are predicated upon assumption of near-normal temperatures and near-normal precipitation during the entire April-July period.

COLORADO

Water content of mountain snow on April 1, 1952, on 90% of the courses exceeds all previous measurements since snow surveys were started in 1936. The summer flow of all streams will be much above normal. The flow of most streams will be higher than for any year since 1936 and the flow of some may set new records. These unusually high flows are expected from the Rio Grande in Colorado, and on the San Juan and Dolores rivers in southwestern Colorado. The flow of all Colorado River tributaries in Colorado will probably exceed the last highest year which was 1941. The flow of the South Platte, Arkansas and their tributaries will be as high as for any year in the past ten and may exceed this record if rainfall of normal or greater proportions occurs before or during the snow melt season.

Storage in irrigation reservoirs on the South Platte system is well above average. On the Lower South Platte, irrigation reservoirs are near capacity. On the Arkansas and Rio Grande drainages, storage in irrigation reservoirs is much below average and in many cases reservoirs are almost empty.

Soil moisture conditions over the state are good except in the Arkansas River Valley where soil moisture is fair to poor.

IDAHO

All watersheds in Idaho have a heavy snow pack which assures excellent water supplies for irrigation and power generation within the state.

Snow at both high and low levels is well above average. Cool temperatures that have prevailed to date have prevented melt of all but snow at the very lowest elevations. A few weeks more of cool weather could result in serious high water potentials on the Big Wood, Boise, Big Lost, Payette, Weiser, and Kootenai rivers. Heavy volume flows are forecast on these rivers assuming normal melt conditions throughout the snow melt season. Several reservoirs have been lowered for maximum use in flood control.

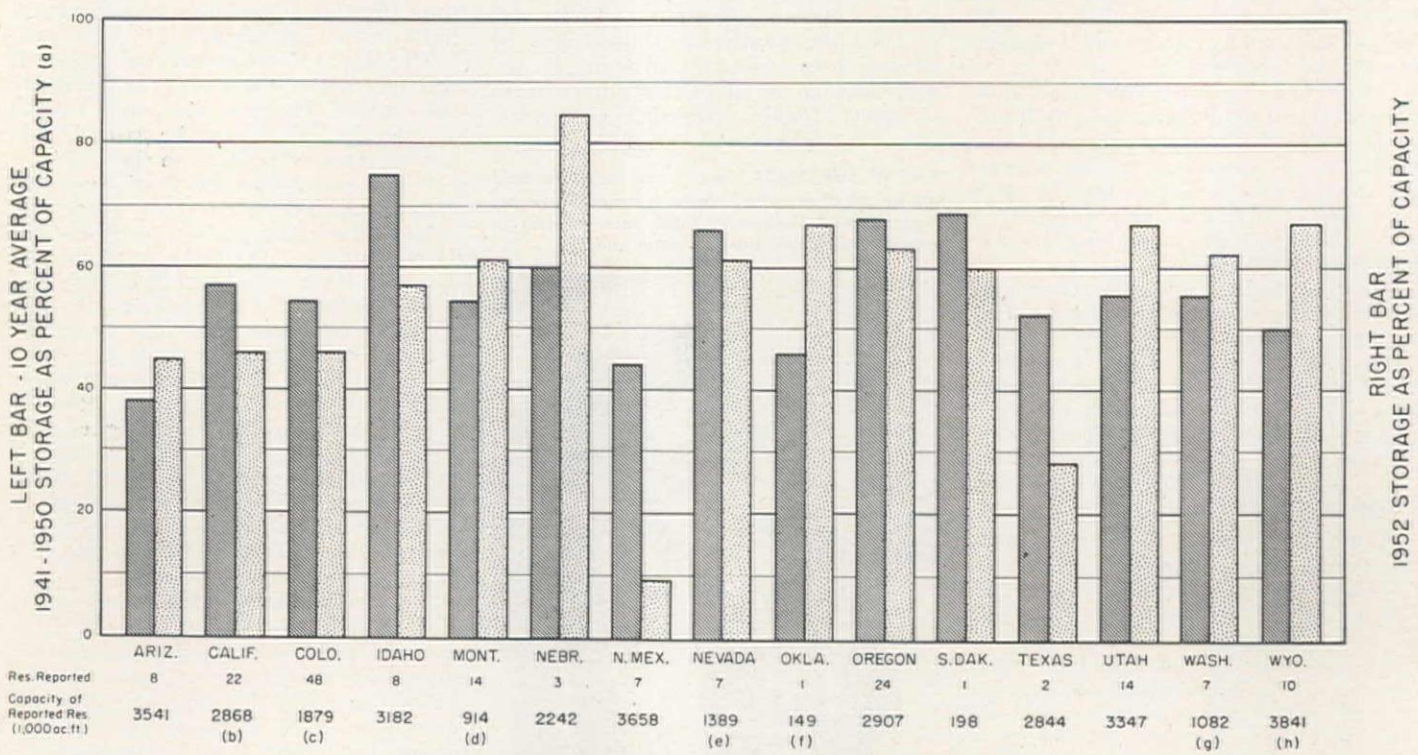
MONTANA

April 1 snow measurements made over the Upper Missouri and Upper Columbia River basins generally indicate a very good water supply for irrigation this coming season. Snow cover of the Upper Columbia basin in Montana is appreciably above average even though the snow accumulation during March was below average.

However, on the Sun River basin the water content of the snow is just slightly below normal, although not enough as to promise any serious shortage of later run-off.

Snow cover on the Missouri River is about 140% of the past 16-year average.

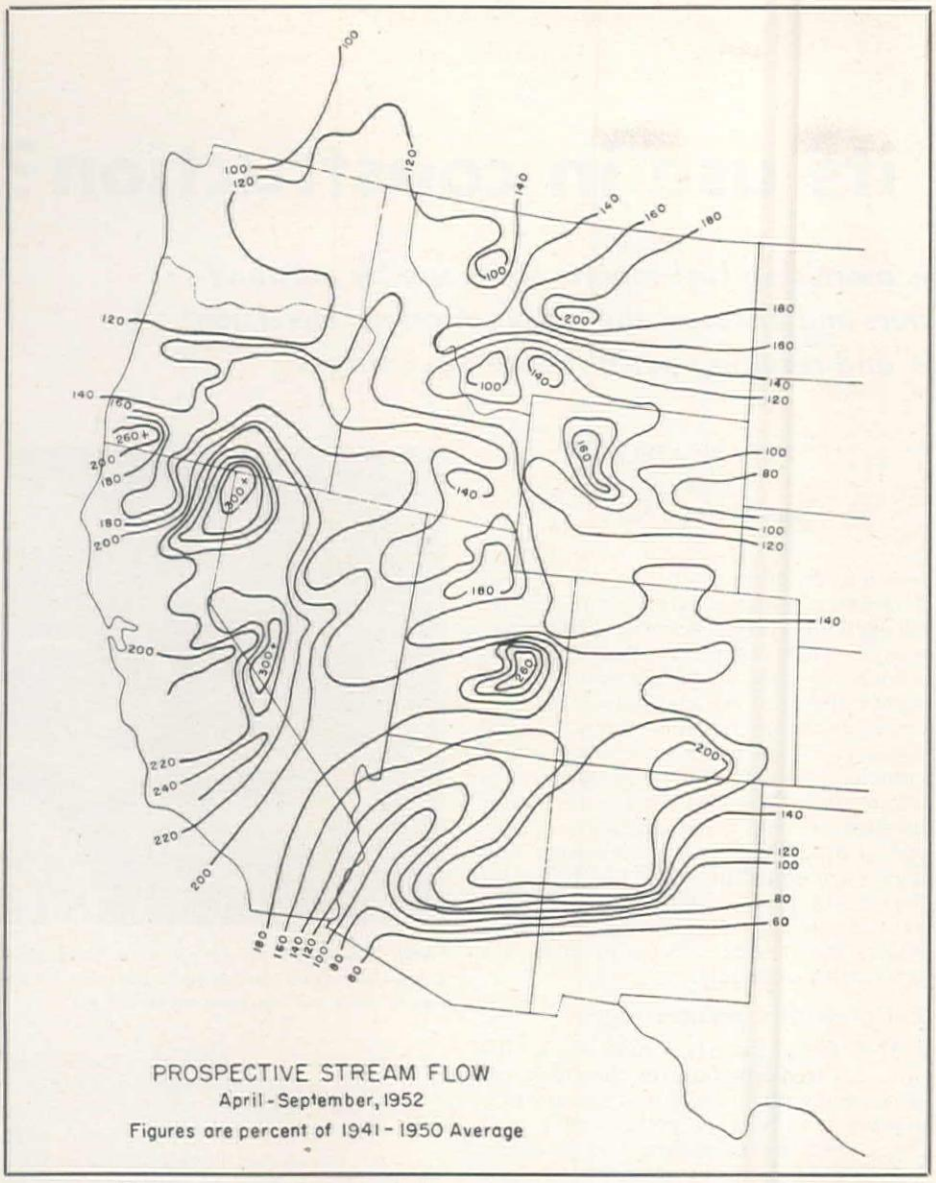
Reservoir storage throughout Montana is very satisfactory.



	ARIZ.	CALIF.	COLO.	IDAHO	MONT.	NEBR.	N. MEX.	NEVADA	OKLA.	OREGON	S. DAK.	TEXAS	UTAH	WASH.	WYO.
Res. Reported	8	22	48	8	14	3	7	7	1	24	1	2	14	7	10
Capacity of Reported Res. (1,000 ac-ft.)	3541	2868 (b)	1879 (c)	3182	914 (d)	2242	3658	1389 (e)	149 (f)	2907	198	2844	3347	1082 (g)	3841 (h)

RESERVOIR STORAGE AS OF APRIL 1, 1952

Explanation: (a) Most state averages for reported reservoirs are for full 10-year period, but in a few cases reservoirs having shorter records are included. (b) Does not include Millerton or Shasta reservoirs (combined capacity 5,020,500 acre-feet); April 1 combined storage 4,243,400 acre-feet. (c) Does not include John Martin reservoir (capacity 685,000 acre-feet); April 1 storage 46,000 acre-feet. (d) Does not include Fort Peck reservoir (capacity 19,000,000 acre-feet); April 1 storage 12,390,000 acre-feet. Does not include Flathead Lake (capacity 1,791,000 acre-feet); nor Hungry Horse reservoir which stored 68,080 acre-feet on April 1 and will store up to 1,000,000 acre-feet this spring. April 1 storage 572,300 acre-feet. (e) Does not include Lake Mead (capacity 27,217,000 acre-feet); April 1 storage 15,691,000 acre-feet. (f) New reservoir 1945. (g) Does not include Roosevelt Lake (capacity 5,220,000 acre-feet); April 1 storage 1,700,000 acre-feet.



PROSPECTIVE STREAM FLOW
April - September, 1952
Figures are percent of 1941 - 1950 Average

NEVADA

Snow stored water is greater than ever before measured on most of the courses in Nevada. High elevation snow throughout the State is about twice normal, while low snow ranges from three to four times normal.

October through March stream-flow along the Humboldt and Eastern Sierra is near normal. In these areas ground water levels are normal or above.

Summer stream-flow forecasts throughout the State range from a minimum of 140% of normal to a maximum of 307%.

Reservoir storage on April 1 was about 60% of capacity and 90% of the past ten year average. Storage in Eastern Sierra reservoirs is being decreased to furnish a cushion for the expected high summer flow.

NEW MEXICO

Snow accumulation in northern New Mexico is very high near the Colorado-New Mexico line. The amount of snow in respect to normal decreases rapidly to the south. Near Santa Fe and to the west in the Jemez Mountains the snow cover is near normal. Summer stream flow will follow the same general pattern. All Rio Grande reservoirs are practically empty. Residual storage in Elephant Butte reservoir at the end of the coming irrigation season will probably be less than one-half capacity. Soil moisture conditions in valley areas are reported as fair to poor.

Because of the relatively high flow expected for the Rio Grande and its tributaries in San Luis Valley the probability of extensive flood damage there is rather high. This is particularly true on the Conejos River where some flood damage occurs almost every year.

In view of the preparations that have been made to control the flow of the Rio Grande at Albuquerque, the probability of extreme flood damage will depend upon the strength of the levees. In other less well protected areas along the Rio Grande, damage may be expected.

OREGON

Water supplies for 1952, based on mountain snows should be abundant as statewide snow cover is 168% average. Snow cover below 5,000 ft. is even greater in relation to average than the higher snow levels. Stream flow for the April-September period should break many historical records on the following drainages: Owyhee, John Day, Harney Basin, Deschutes, Crooked, North Umpqua, Main Rouge, Applegate, Illinois, Williamson, Sprague, Deep Creek and Chewaucan rivers.

Extremes of high water with some record-breaking flows have already been received in many areas but the potential hazard remaining in the present snow cover is great and under adverse melting conditions could easily produce damaging flows in any of the above drainages.

Reservoir storage has improved considerably in the past month and is now satisfactory.

SOUTH DAKOTA

Snow cover in the Black Hills area of South Dakota is well above normal for this date. Soil moisture conditions are reported as fair to good in irrigated areas. Current storage and prospective run-off is considered to be adequate for irrigation needs.

UTAH

All parts of the state have an excellent water supply for the coming summer in snow storage on mountain watersheds. Present run-off expressed as a per cent of the April-September ten year (1941-50) average varies from 125% of normal on Ashley Creek in the Uintah Basin to 257% on the Price River. Since 55 of 69 snow courses having long time records have equaled or considerably exceeded previous record water content measurements, the great volume of snow water can be expected to produce record or near-record peak flows on nearly all streams, with considerable damage to farmlands, homes and other structures in vulnerable areas. Where possible, reservoir storage is being reduced to allow a cushion for peak flows.

Reservoir storage varies considerably over the state. The reservoirs of the Weber-Ogden system hold only 16% of capacity, having been drawn down so that they can reduce peak stream flows. In the Sevier and Beaver river reservoirs, storage is 42% of capacity and 52% of the ten year average, reflecting the low water supplies of the last two years.

Average for all reservoirs in the state is 69% of capacity and 124% of the ten year average.

WASHINGTON

Water supply forecasts in Washington are good to excellent for the 1952 season. Relatively heavy volume flows are expected on the Lower Columbia, Spokane, and Okanogan rivers. If these large volumes remain in the mountains until late in the snow melt season damaging high water could result then from a rapid snow melt.

The water stored in snow on the mountains in British Columbia, which furnish nearly half the water to the main stem of Columbia River ranges up to 125% of normal on the East Okanogan. The remainder of Columbia Basin in the United States has a heavy snow pack which will contribute to high run-off. The combination of heavy fall precipitation and snow stored water are higher

. . . Concluded on page 144

LP-GAS . . .
What about its use in construction?

An authority on this promising fuel reports on its use by outstanding Western contractors and discusses the factors of price, conversion of the engine and resulting performance advantages

By CARL ABELL
Editor
Butane-Propane News

EARTH for the record rolled-fill embankment at Garrison Dam, on the Missouri River near Minot, N. Dak., is being moved by butane power in a fleet of sixty-six 20-yd. bottom dump Euclids. When the project is completed in 1954 more than 125,000,000 cu. yd. of material will have been handled. This project is being carried on as a joint venture by Peter Kiewit Sons' Co., and Morrison-Knudsen Co., Inc. The latter company was one of the earliest users of butane in the construction field. They were one of the three major contractors on the All-American Canal, in the early thirties. Butane was at that time ridiculously cheap, and it avoided the vapor lock troubles which were so bothersome with gasoline engines in that hot climate, so all three contractors used the liquefied petroleum gas as fuel. In so doing, they discovered that engine wear was materially reduced. Power plants would run from two to three times as long between overhauls as they had been accustomed to with gasoline.

This extra engine life became an important factor in the Morrison-Knudsen operating program. They have been among the leading exponents of the "production line" type of operation, in which everything moves on schedule to perform work at a certain rate. Under this plan, a certain number of vehicles move at a certain speed to deliver a given amount of material. There must be the right number of vehicles in the line at all times, or the operation is thrown out of balance. There must be enough extra vehicles to replace those which must be taken out of the line for the necessary lubrication, inspection, and maintenance operations. The operations are also handled on a schedule, with the objective that every piece of equipment shall be kept in such good condition that there will be no service failures to upset the production schedule.

For preventive maintenance

M-K found that the longer engine life and less frequent failures that they experienced with butane fitted into the preventive maintenance picture very well. They used this procedure and power in building the Santa Fe Dam, near Azusa, Cal., in 1943. This was an 11,000,000 cu. yd. operation, in which they used thirteen Maxi side dump trucks with 20-yd. bodies, and a few 12-yd. end dump units. The large trucks were equipped with Hall-Scott engines developing less than 150 hp. This would be regarded as slow equipment in comparison with present equipment, but in those days it was outstanding. These jobs also ran on butane, and the same characteristic lengthening of engine life was observed.

TANK INSTALLED for LP-gas on a 20-yd. side-dump truck. These special fuel tanks must be designed for a working pressure of 250 psi.

For less down-time

Griffith Co. is another of the earliest users of butane in a heavy construction fleet. In the construction of the Cajalco Dam, near Riverside, which was started in December 1935, they used 30 new trucks with 10-yd. bodies, and butane fuel systems. Based on the capacity and speed of the trucks, the preliminary estimates called for three years construction time to move the 7,532,000 cu. yd. of earth. The converted engines handled the loads better than had been anticipated, and it was found that the loads could be increased to 13 yd. and still maintain satisfactory operating speed. The engines held up well, and with all factors added together, the job was completed one year ahead of schedule. The trucks were still giving satisfactory service several years after the completion of the project.

Griffith Co. still uses L-P gas in a great deal of its equipment, including trucks, cranes, and stationary and mobile compressors. The fleet has grown con-

WHAT IS LP-GAS?

NATURAL GAS, as it comes from the well, contains butane and propane gases which can be readily seprated out by compression and cooling. By this process of compression, accompanied by washing to eliminate undesirable impurities, the gases are liquefied. The liquefied-petroleum gas (LP-gas) can then be stored and transported in suitable tanks, much the same as gasoline, except that the pressure must be maintained. For many years in the future the supply of this product will be available in quantities above normal demand.

An important feature of this fuel is the fact it requires no anti-knock treatment, since its octane rating is high. In the mixture which makes up commercial LP-gas, the propane has an octane rating above 110, and the butane, which represents the smaller part of the combination, has a rating of 93. Thus, LP-gas provides a fuel which has a higher anti-knock rating than ethyl gasoline.

Conversion of a piece of contractor's equipment, which can be carried out on either new or used engines, involves several operations and may cost from $250 to more than $500, according to the author. First the special fuel tank designed for a working pressure of 250 psi. must be installed with its special fittings. The pressure reducer which brings the LP down to almost atmospheric pressure produces dry-gas which takes a special carburetor. Lastly, the compression ratio of the engine should be raised by the means best suited to the make of engine.

Cost of this conversion by the owner of the equipment must be balanced against possible saving in fuel costs (5¢ to 6¢ differential begins to be attractive), longer life for lubricating oil, longer periods between engine overhaul and the savings from down-time.

These factors and a brief record of some of the outstanding installations on Western contractors' equipment are reviewed by the author.—Editor.

siderably in the intervening years, and is now based in four operating groups, located at the main plant in Los Angeles, and branch plants at Wilmington, San Diego, and Bakersfield. The basic operating advantages which were apparent on the first job have continued—reasonable fuel cost, less "down-time" for engine repairs, and reduced oil consumption.

For engine protection

Construction work is rugged business. It is necessary to protect the engines against the effects of dirt, and it is customary to provide each engine with filters on the air intake, in the crankcase oiling system, and in the fuel lines. With these filters maintained on a systematic basis, phenomenal mileages between major engine overhauls are quite commonplace.

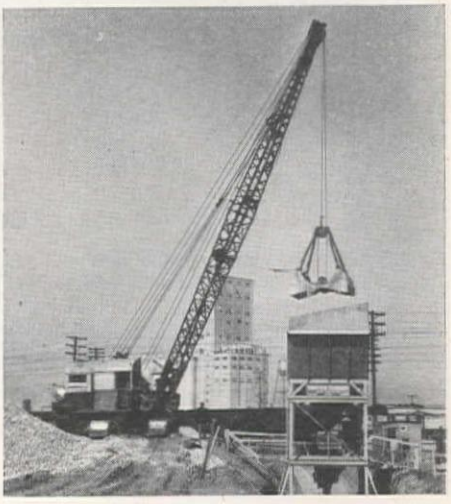
About three years ago, one of the company's mobile cranes which had been in almost constant service came in for an engine overhaul. The record showed that this was the first major engine job on this unit in seven years, and that the butane carburetion system had not been changed or repaired in that entire period. As it is the company's practice to overhaul the carburetion system at the time of the major engine overhaul, the fuel units were put through the shop. The regulator was found to be leaking slightly, and was exchanged for a rebuilt unit. The replacement unit has been on the engine for more than three years, and it and the engine are still going strong.

Engine maintenance

The L-P gas carburetion equipment on the Griffith fleet gives very little trouble. This is partly attributed to the maintenance practices in the fleet, which are unusual from a number of standpoints. Wherever possible, engine accessory units are maintained on an exchange basis. Equipment is standardized as far as possible. Ensign carburetion equipment is used throughout the fleet. Extra units are available, so it is possible to remove a defective unit and replace it quickly with one that is in perfect working order. This applies to carburetors, regulators, generators, starting motors, distributors, brake chambers, and all of the other accessory units which are subject to wear and failure. Each branch shop has these spare units on hand. When any such assembly is taken off an engine, it is sent to the main shop in Los Angeles for rebuilding. All electrical and carburetion work is performed by specially trained technicians at the main shop, where complete and modern testing and rebuilding equipment is maintained. All of the butane carburetion equipment is rebuilt by one specially trained technician.

To prevent drivers and others from tampering with butane equipment in the field, orders have been issued that no unauthorized person is to make any sort of adjustment on either the carburetor or the regulator. The central shop puts seals on these units to see that the orders are followed. This has been a major step in assuring satisfactory operation of the fuel system. Prior to the sealing of the adjustments, drivers were continually guessing that something was wrong with the carburetion, and trying in their bungling way to fix it up—just as they always want to do with gasoline carburetors.

ABOVE—Lined up for refueling with LP-gas, these Euclids are moving earth at Garrison Dam.



RIGHT—Small fleets and single pieces of equipment can be converted to LP-gas. Cost of conversion must be balanced against price of fuel, and longer periods between overhauls.

Price fluctuates

The prices of butane and propane fluctuate more with respect to location, and in response to supply and demand, than do those of most other petroleum products. The cost per mile of transporting the products is higher than with other fuels, because of the heavy containers which must be used. Until recently the price of butane in the Northwest was so high that there was no incentive to use it as engine fuel. This situation has recently been straightened out, and a 10¢ per gallon differential in favor of butane is now reported in parts of Washington. Price changes due to supply and demand have leveled off noticeably in the last three years. The profit margin is now quite low, and a moderate increase may be anticipated following the lifting of the present OPS restrictions. Industry opinion seems to point to a 1¢ raise.

Anti-knock qualities

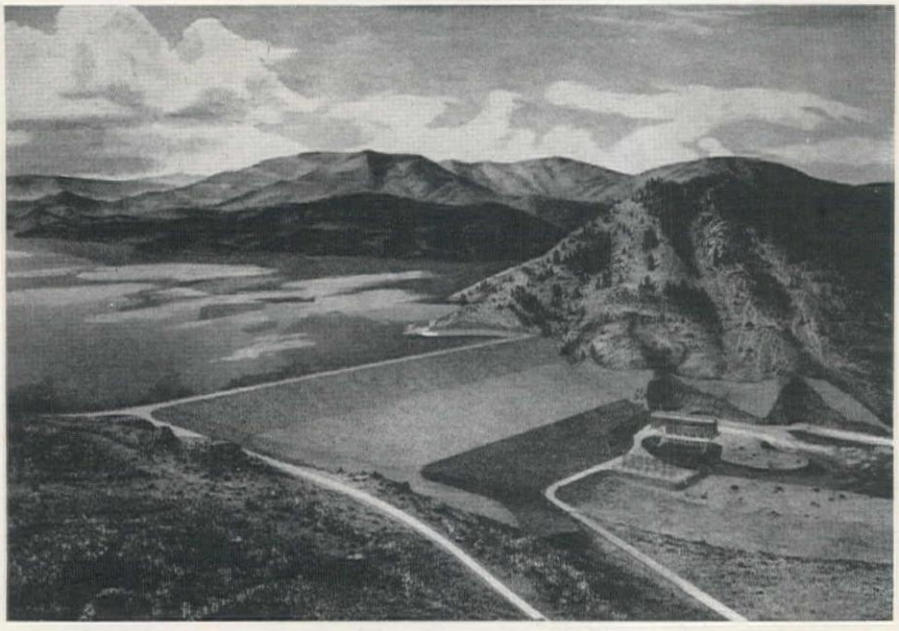
The heating values of both propane and butane are lower than that of gasoline, hence the use of either in a gasoline compression ratio may be expected to result in lower miles per gallon and reduced power. The superior anti-knock value of the two gaseous fuels makes it possible to operate in higher compression ratios than can be handled with gasoline, and some or all of these losses may be recovered by increasing the compression. This is ordinarily a part of the process of converting an engine for use of these fuels. If the ratio can be raised sufficiently high, complete recovery of the lost power and mileage may be made, but this seldom happens except in the cases of a few engines of particularly favorable design. The operator should therefore look for some price differential with which to justify the change. A figure of 4¢ is generally considered marginal. With a 5¢ differential, a careful investigation should be made, and from 6¢ up, it is a sure bet.

Conversion costs

Costs of conversion range from about $250 to above $500, depending on the engine, the carburetion equipment, and the relative completeness of working the engine over to enable it to get maximum results from the fuel. The gasoline tank must be replaced with a special heavy steel tank having a working pressure of 250 psi. Pressure reducing valves (called regulators) are required, as the gas must be introduced to the carburetor air stream at practically atmospheric pressure. A heated vaporizer is necessary, and this unit is generally built in combination with the regulating valves. A special dry-gas carburetor replaces the gasoline carburetor. Compression ratio should be raised, by whatever method works best with the engine in question. The intake manifold is either altered or replaced to eliminate as much manifold heat as possible.

The operator contemplating the change should balance the conversion cost against the possible saving in fuel cost and the advantages of longer oil life, longer engine life, and the reduced "down-time" for engine repairs. To make conversion attractive, the difference in fuel cost should save the cost of the conversion within a year, then the lowered maintenance cost will return a nice profit on the investment. For "production line" jobs, there will be a second profit in greater availability of equipment, or lessened requirement for reserve equipment.

Biggest earthfill yet for the USBR



PALISADES DAM: Here's how it will look 4 years from now—Work is starting this month on the 14,000,000-yd. structure, largest of its type yet engineered by the Bureau of Reclamation

UNDER BIDS invited February 19, construction of Palisades Dam, principal feature of the Bureau of Reclamation's Palisades Project in Idaho, is slated to start in May. The dam is located on the South Fork of the Snake River about 7 mi. upstream from Irwin, Idaho. Work to be undertaken includes construction of the dam; excavation of the spillway tunnel; placing concrete lining in the outlet, power, and spillway tunnels; construction of the gate structures for the spillway and outlet works; construction of the control house and stilling basin for the outlet works; construction of the spillway channel; construction of the Palisades power plant structure and tailrace; and relocation of 3 mi. of Idaho State Highway No. 29 and 18 mi. of a Forest Service road.

Largest earthfill

When completed, Palisades Dam will be the largest earthfill dam ever built by the Bureau, having a volume of about 14,000,000 cu. yd. The dam will be 260 ft. in height above riverbed and about 2,000 ft. long at the crest.

The power plant, to be constructed on the left downstream abutment, is to house four 28,500-kw. generators supplying a total installed capacity of 114,000 kw. It will be an indoor plant having a brick and structural steel superstructure. The power plant structure is to be about 250 ft. long, 100 ft. wide, and will have a maximum height of 116 ft. above foundation.

The Palisades Project, a multiple-purpose development originally authorized by the Congress in 1941, was reauthorized on a larger plan in September 1950. Major construction on the project was initiated under a $2,000,000 supplemental appropriation approved by the Congress at the close of its session in October 1951. The entire program of construction is being expedited to provide additional power for the Northwest power pool.

Irrigation and flood control

The 1,400,000 acre-foot Palisades Reservoir is to provide supplemental irrigation water for about 650,000 acres of land in the Snake River Valley. Of this gross storage capacity, 1,200,000 acre-feet will be active capacity used jointly for irrigation and flood control on the basis of runoff forecasts, and 200,000 acre-feet is to be reserved as inactive storage for power head. Direct flood protection will be made available for several thousand acres of irrigated land on the Snake River plain above Idaho Falls. Indirect flood control benefits will be made possible to more extensive areas farther downstream through coordinated operation of the reservoir with Corps of Engineers facilities downstream.

Power plant

Palisades Power Plant will provide about 500,000,000 kw-hr. of hydroelectric energy to serve irrigation pumping and municipal and rural cooperative loads. Production of power, however, will be incidental to the operation of the reservoir for irrigation and flood control. Firm power production is possible because a certain amount of water must be passed through the reservoir during the winter to fill the prior storage rights of the existing American Falls Reservoir downstream from Palisades on the Minidoka Project. During the spring and summer months, releases for flood control and for irrigation will be utilized for production of secondary commercial power and irrigation pumping power. The first 28,500-kw. unit is scheduled to generate power in December 1956.

Under the expedited program, initial work on the dam was started on December 17, 1951, following the award of a $1,242,700 contract to J. A. Terteling and Sons, Inc., Boise, Idaho. Principal features under this contract include open-cut excavation for the upstream portals of the power and outlet tunnels, excavation of the power tunnel, excavation of the outlet tunnel, and building the Palisades Dam construction substation. The substation having been installed, the remainder of the initial contract is to be completed by early August of this year.

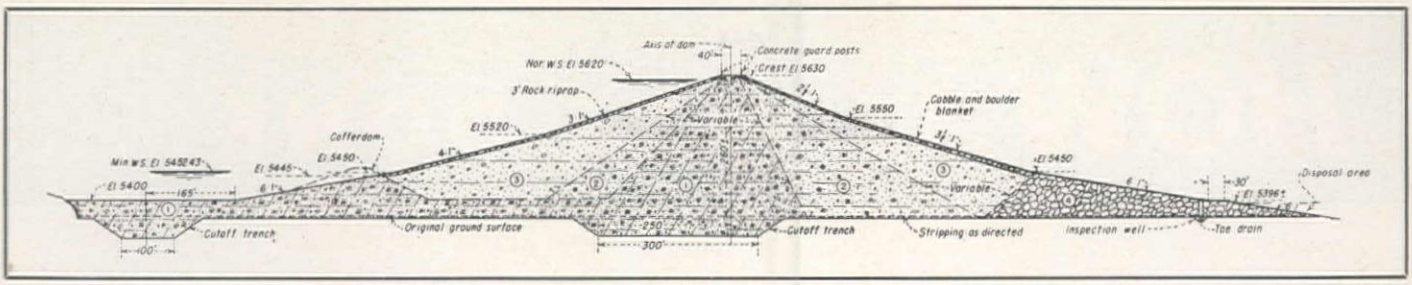
Geology of the site

An extensive geologic exploration was undertaken at the dam site prior to start of construction. The left, or west, abutment of the dam is composed of a large mass of andesite which rises more than 1,100 ft. above the valley floor. Along the dam foundation and on the right abutment is a series of compacted clayey silts, sands and gravels. The andesite forming the left abutment is a hard, igneous rock. Because a clay, silt, and gravel foundation forms the valley floor and right abutment, Palisades dam has been designed as an earthfill structure.

Exploratory work was also carried out to determine the extent and availability of necessary materials for the dam embankment. In the course of this work a large number of test pits, auger holes, and trenches were excavated. As a result of these investigations, four borrow areas were selected which, together with material from the excavation for structures and foundations, could be combined to form a satisfactory economical embankment.

Embankment zones

The dam embankment is to be constructed of four zones (see cut): the center zone, consisting of an impervious section of selected clay, silt, and sand, compacted by tamping rollers to 6-in. layers; upstream and downstream impervious zones adjacent to the central section, consisting of selected clay, silt, sand and gravel, with cobbles and rock fragments in excess of 5-in. size removed by passing the material through a separation plant—also compacted by tamping rollers to 6-in. layers; and a pervious zone, both upstream and downstream from the impervious zones, made up of



CROSS SECTION of dam shows four zones of material: (1) selected clay, silt and sand, compacted by tamping rollers in 6-in. layers; (2) selected silt, sand, gravel, cobbles and rock fragments to 5-in. maximum size, placed in 6-in. layers; (3) sand, gravel and cobbles compacted by crawler tractors in 12-in. layers; (4) dumped rock fill in 3-ft. layers.

sand, gravel, and cobbles compacted by crawler tractors to 12-in. layers. At the downstream toe of the dam a rockfill zone is to be placed in 3-ft. layers. A 3-ft. layer of rock riprap is to be placed over the upstream pervious zone, and a cobble and boulder blanket is to be placed over the downstream pervious zone. A modification of the zoning in the dam is made on the upstream right abutment covering. There, an 18-in. layer of sand, gravel, and cobbles is to be substituted for the pervious zone.

Two cut-off trenches are to be excavated under the impervious zone of the embankment, one near the axis of the dam, the other near the upstream toe. The dam is to have a 2-ft. camber above the designed crest elevation to accommodate settlement subsequent to completion.

Spillway and tunnels

Palisades spillway and outlet works are designed to discharge 90,000 cfs. at maximum water-surface elevation. The spillway, a 1,900-ft. tunnel, is to be driven through the andesite in the left abutment. It is designed to discharge 48,000 cfs. at maximum water-surface elevation. The spillway will be controlled by two 20 x 50-ft. radial gates installed in the upstream portal of the tunnel. Entrance to the tunnel is to be a section 46 ft. wide having a transition along a 222-ft. inclined shaft to a 34-ft. diameter section which, in turn, will have a transition to the 28-ft. diameter of the tunnel proper. The tunnel will be lined with unreinforced concrete, except portions near the portals, which will be reinforced. A 46-ft. long transition conduit will extend from the downstream portal of the tunnel into the concrete-lined section of the spillway outlet channel. At the end of the lined section a ski-jump-type sill is planned to protect the foundation of the unlined outlet channel.

Outlet works

The outlet works at Palisades Dam are to be located in the left abutment adjacent to the spillway tunnel. Principal elements of the outlet works are two circular tunnels, trashracks for each tunnel, manifold sections, a control house, and a stilling basin. The two tunnels, one an outlet tunnel and the other a power tunnel, are to be 26 ft. in diameter. From the axis of the dam to the downstream portals the tunnels are to be lined with 26-ft. I.D. steel pipe encased in concrete. Both tunnels will be used for diversion. The power tunnel and the conduit (in open cut leading from the tunnel) will be about 1,545 ft. long and the outlet tunnel about 1,575 ft. long. During diversion of the river the two tunnels are designed to discharge a total of 47,000 cfs. After diversion has been accomplished, the inlets for both tunnels will be plugged with concrete. Water will then rise to the sill of the trashracks. As designed, discharge of 10,000 cfs. can be passed through the power tunnel by-passes and 20,000 cfs. through the outlet tunnel at minimum power head. Discharges through the power tunnel will assure a firm power output of 15,000 kw.

The manifold sections which provide transition from the outlet tunnel to the control house will be installed after diversion. The outlet tunnel will have six discharge tubes for control of irrigation and of flood water. The power tunnel will have two by-pass tubes for routing floods and four penstocks for generation of power.

Regulating gates

Regulating and emergency gates and valves will be located in the control house. There are to be four regulating gates, four emergency gates, two 96-in. hollow-jet valves, and two 96-in. ring follower gates for the outlet tunnel. Two emergency and two regulating gates are to be installed for the by-pass tunnels. The emergency and regulating gates for both tunnels are to be rectangular in shape, 7½ ft. wide and 9 ft. high. They will be hydraulically operated. The hollow-jet valves will be mechanically operated. The control house, regulating gates, and emergency gates are to be built and installed subsequent to diversion of the river.

The stilling basin for the outlet works is to be a concrete structure 150 ft. wide and about 300 ft. long. Side walls of the basin are to be 55 ft. high and have a batter of ⅛:1 in rock. The stilling basin will be divided by vertical walls into four sections; three will be about 32 ft. wide for the outlet tunnel, and one 50 ft. wide for the power tunnel by-pass. The stilling basin is designed for a hydraulic jump which will reduce the velocity of discharge into the river channel to 10 ft. per sec. The outlet of the stilling basin is to be lined with 3 ft. of riprap.

The first major work of the prime contract will be completion of the outlet works and power tunnels for diversion of the river during construction. Concurrent with these activities, work will proceed on relocation of the 3-mi. section of Idaho State Highway No. 29 and the 18-mi. section of the Forest Service road. Early completion of these roads is necessary to permit the traffic to move through the dam site area, thereby eliminating costly detours.

River diversion

Diversion of the river through the tunnels will be accomplished by means of a cofferdam across the channel in the upstream portion of the dam site area. Work can then begin on excavation of the cutoff trenches, stripping of the foundation area, and placement of the dam embankment. The transition from diversion during construction to that of final reservoir operation is to be performed in two successive stages of tunnel closure. The first closure will consist of placing the tunnel plug, entrance structure, and discharge gate structure in the outlet works tunnel while the entire river flow passes through the power tunnel. During the closure of the second tunnel the river will be diverted through the completed outlet works tunnel, thus permitting completion of the power tunnel in a similar manner.

Initial work on the Palisades Project began with the construction of a 40-house government camp and facilities in July 1946. Other early work included construction of a 51-mi. transmission line by the Government between the vicinity of the Utah Power & Light Co. Goshen substation near Goshen, Idaho, and the vicinity of the dam site, and relocation of 2½ mi. of the state highway near the dam site.

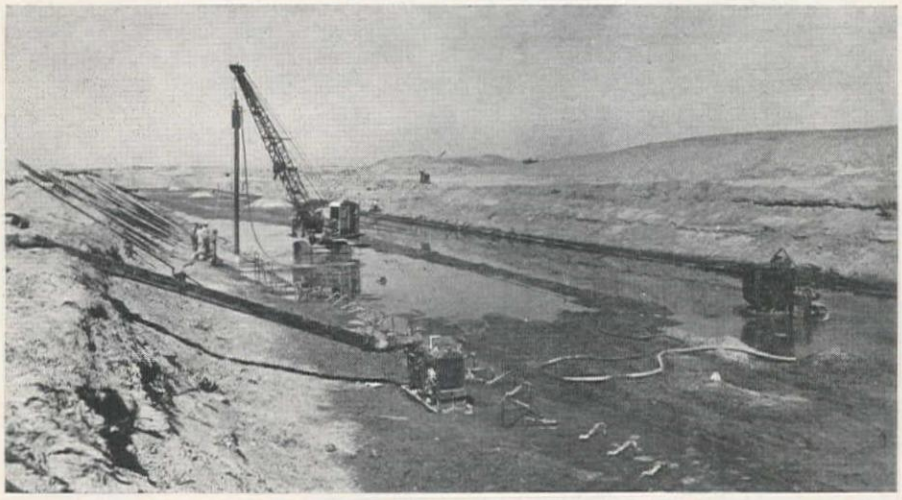
Power for defense

In addition to its primary functions, Palisades Project will also provide municipal water to the city of Pocatello through an exchange with the Fort Hall Indian reservation. Available power from the power plant will be put to use for defense as soon as possible. The development of phosphate beds for elemental phosphorus for defense needs and for fertilizer and the increased activity resulting from the Atomic Energy Commission installation at Arco, Idaho, have sharply increased power needs of the area. Additional recreational facilities will also be made possible near the dam site. Fish and wildlife benefits are included in the project plans.

Louis B. Ackerman is the Bureau of Reclamation's construction engineer for the Palisades Dam. L. N. McClellan is Chief Engineer of the Bureau and Director of its Design and Construction Division.

HOW IT WAS DONE...

Wellpoint installation solves rare desert water problem



GENERAL VIEW of the wellpoint installation at Norton Siphon, part of Arizona's Gila Project. A sudden storm sent water rushing down the Gila River for the first time in ten years.

CLOSE-UP of wellpoint jetting operations. Equipment had to be rushed from Los Angeles, Calif., to handle the unexpected dewatering operations.

LAYING the 96-in. diameter concrete pipe while the wellpoints keep things dry (pump and header pipe visible on bank at extreme left).

SOUTHWESTERN ARIZONA is normally considered a desert area and a water problem that would halt construction was only a remote consideration when Marshall, Haas & Royce began work on their $1,486,358 contract for earthwork, canal lining and structures in the Wellton-Mohawk Division of the Bureau of Reclamation's Gila Project. Nature had not sent a flash flood down the normally dry Gila River for ten years, but as soon as the contractor got well under way on the excavation of a 70-ft. wide trench for a 1,270-ft. siphon of 96-in. concrete pipe, the flood hit. Only a portion of the 50,000 cu. yd. of excavation for the trench had been removed when the flood raised the water table about 8 ft.

Faced with an elongated lake instead of a dry trench, project manager Sam Marshall decided to install a wellpoint system, and fast. Equipment was rushed to the site from Los Angeles; installation began immediately and was completed and ready for use in eight working days. Once installed the wellpoint system, pumping from 10,000 to 12,000 gpm. lowered the water table 15 ft. in 48 hr.

Equipment used for the dewatering job consisted of 635 Stang wellpoints, 2,540 ft. of 8-in. header pipe, 1,240 ft. of 8-in. discharge line, 960 ft. of 10-in. discharge pipe, eight Stang pumps and necessary casing and equipment for installing and placing filter material.

The 635 wellpoints were set at 4-ft. centers in two rows, 60 ft. apart, one row down each side of the trench. To install the units an 8-in. casing was sunk by jetting to a depth of 24 ft. The wellpoint was then placed in the casing and a filter material of sand and gravel placed around it. The casing was then withdrawn, leaving the wellpoint with its surrounding filter material that permits water from the saturated soil to descend to the base of the wellpoint where it is collected for drawing to the surface.

The 8-in. header pipe was laid along the two rows of points and the units connected to it as they were installed. As soon as a section of the installation was completed it was placed in operation, permitting pumping to begin before the entire system was completed. Four pumps were set on each side of the trench close to the header pipe at about 300-ft. intervals. The discharge pipe, connected to the pumps, passed over the top of the trench to carry the water a safe distance from the area being dewatered.

After the system was installed and the area dewatered excavation was continued with the trench cut between the rows of wellpoints to an elevation about 5 ft. below their tops and then a narrower trench cut for the pipe. Due to this method of excavation a berm ex-

isted between the edge of the pipe trench and the line of wellpoints.

In placing the 12-ft. lengths of the 96-in. concrete pipe a large crane lifted them from the edge of the excavation to the edge of the berm. Here a smaller crane, working in the final trench, picked them up and put them in place.

After placing the inside joints of the pipe were dry packed and a heavy paper band placed around the outside of the joints. Concrete grout was placed to complete the joints.

A Koehring Model 601 was used for installing the casings for the wellpoints and final laying of the pipe. A Bucyrus-Erie 54-B was used in placing the pipe on the berm.

In addition to project manager Sam Marshall other personnel included: Carl "Dutch" Mauer, general superintendent; Al Bloxham, project engineer; Dick Woods, office manager; Jim Lacey, master mechanic; A. E. McDonald, concrete superintendent, and Dick "Red" O'Hanlon, batch plant superintendent.

Sam Watkins of the Bureau of Reclamation took the accompanying photographs.

New synthetic rubber for asphalt road mixes

THE GOODYEAR Tire & Rubber Company has announced the development of an entirely new synthetic rubber powder for use in conjunction with asphalt road mixes. The product is described as a finely-divided, free-flowing powder made by co-precipitation of a butadiene-styrene latex and a mineral filler. The new material has been developed in cooperation with the Berry Asphalt Company of Magnolia, Ark.

Laboratory and pilot plant specimens of the new rubber indicate many advantages over rubbers—natural, synthetic or reclaimed—which have been used in various test installations. As a free-flowing powder the new rubber is easy to handle. It mixes freely with the asphalt, whereas other types of rubber display a certain resistance to rapid dispersion.

Several tons of the material have already been produced in Goodyear's pilot plant at Akron and a number of test installations are being watched carefully by research experts of Berry Asphalt and Goodyear, as well as highway construction engineers. Other test installations are planned this year.

The rubber can be made available in two forms: as the co-precipitate with some of the fine mineral aggregate normally used in bituminous concrete, or as a pre-mix with powdered asphalt. In either state, the rubber is equally effective.

Tests on asphalt surfaces incorporating Goodyear's new highway rubber show that from 1.5% to 2% of this rubber added to the weight of the asphalt is equally effective as a 5% conventional rubber-asphalt mixture in resisting the stripping action of water and frost. This advantage is credited to the fine particle size of the rubber and its ease of dispersion in the asphalt.

How to keep your diesel running

THE POWER PLANT of most construction machinery is a diesel engine whether used to drive crawler or wheel tractors or self-propelled rubber-tired scrapers. Diesels are the most common power plants for cranes, hoists, mixers—in fact, almost every machine found on construction jobs. The diesel engine is dependable, but it must be treated right or it cannot do its job.

The two essential items in the diesel's "food supply" are clean fuel and clean air. Diesels are economical with fuel, but they suck in air like a mile runner on the last lap. For example, a thousand-cubic-inch diesel engine, running at rated rpm., breathes in approximately 865 cu. ft. of air a minute, or more than 415,000 cu. ft. of air in eight hours. This is enough air to fill a building 100 ft. square and four stories high.

Above all, the fuel and air fed to the diesel must be clean. Clean lubricating oil is desirable and important, but not nearly so important as clean fuel and air. It pays big dividends to provide proper storage for fuel and give regular attention to the air cleaner.

Naturally, it is smart practice to use only the grade of fuel recommended by the manufacturer. Buying good fuel is only the first step toward insuring proper food for your diesel. Proper storage of fuel is equally important. Fuel may be properly stored either above or below ground, but the latter method is preferred since underground temperatures are more constant and there will be less condensation in the tank. In either method, provision should be made for accumulation and removal of water and sediment from the tank. A drain at the base of the tank should be provided to remove periodically the water and sediment that settles there.

The pump suction pipe should not reach this part of the tank so that there will be no chance of sucking up water when pumping fuel from the tank into tractors or other machinery. A screen filter should be provided in the storage tank filler neck, and, of course, the filler opening should be kept carefully capped. Also, the nozzle of the fuel tank hose should be hung in a protected place so that dirt and water cannot enter the supply from that spot.

Watch the glass water trap in your tractor engine. If water is accumulating in these traps at a rapid rate, it's a pretty good indication that contamination is taking place where the fuel is stored.

Fuel filters must be nearly 100% efficient to prevent foreign matter from entering the injection system where the extremely close tolerances cannot accept it. There are no rigid rules for changing fuel filters, but low readings on the fuel pressure gauge ordinarily indicate a stopped-up fuel filter. If the filter must be changed, replace it with the type approved by the manufacturer.

The other important item in a diesel's diet is air, and that, too, must be kept clean before the engine breathes it. On construction jobs the air is frequently extremely dusty, and under these conditions it is wise practice to extend the air cleaner intake pipe so that it will reach the cleaner air above the dust level. Erroneous claims have been made that extended air cleaner pipes tend to smother an engine. Actually, the opposite is true, since there is a greater column of air in the extended pipe.

Clean out the air cleaner at frequent intervals. The oil tray should be removed and washed and then filled to the proper level with the weight of oil recommended by the manufacturer. Be sure to remove the screens in the upper portion of the air cleaner and wash them in kerosene before replacing them. To insure a thorough job, follow the manufacturer's instructions.

Other points should be checked for leaks at frequent intervals by taking an oil "squirt" can filled with water or kerosene and squirting this fluid around the joints. If any liquid is sucked into the engine, there is an air leak at that spot.

The precautions mentioned here are not time consuming and require little effort. Yet they will extend the life and increase the efficiency of your diesel engines to a remarkable degree. The diesel's diet demands scrupulously clean fuel and clean air.

The foregoing tips were prepared by Fred J. Shreck, Supervisor of Service, Industrial Power, International Harvester Co.

DUSTY AIR means "bad breathing" for your diesel. If you're working in dust, an extended air cleaner intake does wonders in providing clean air.

How to warm up your diesel

BASED on 35 years of experience in the mechanics of diesel engine building, operation and maintenance the author presents warning and some useful advice on cutting repair costs in the use of these common power units. For the past 17 years Mr. Graves has been an instructor on diesel engines with the Oakland (Calif.) Board of Education. Many of his students are employed by contracting organizations throughout the West.—Editor.

By CHAS. B. GRAVES
Oakland, Calif.

HOW DOES a contractor get 300,000 mi., or a corresponding service in hours, out of his diesel trucks or tractors, and why do many engines fall short of this goal?

To do this (in some cases) requires plenty of new parts and a nice, sizeable bill, plus the labor involved to do the repair job. But nothing is ever said about how well the engine has been taken care of—and what rules have been set up to operate and maintain the engines. All the contractor remembers was that the engine and parts of the equipment had to be renewed, and that the cost was very high. Superintendents like to employ "highball" drivers, especially the ones who can make good time from one point to another.

One of the greatest mistakes, and the roughest way to take care of any diesel engine is to start the engine in the mornings and take off immediately for your destination without any thought given to warming up the engine before taking off. At the time of the morning start, the greatest wear and tear takes place, because the oil is not given a chance to trace itself throughout the engine before the load comes on.

Why is this so important? If any diesel engine is started up in the morning and given a half hour to stand and run on idle speed the oil will have a change to trace itself through the engine and the water temperature has a chance to come up from half way to normal temperature (160°). The crankshaft, pistons, bearings and cylinders will also come to temperature and allow the engine oil to get to all of its vital parts at idle speed when no harm can be done.

Now, the question is: "Why don't all "bosses" allow their drivers or mechanics on the job to perform this most important function? The usual answers are two: (1) it costs money to warm up the engine when it can be done going down highway, and (2) it will involve over-time for his mechanics to do the job.

No matter whether the operator of trucks and tractors or mechanics have to spend time to warm up the engines it is still the cheapest service that can be bought. Because, when bearings, liners, pistons, rings and valves are brought up to running temperature they are all expanded evenly and the entire engine will be on center line. When an engine is started cold and put under load without proper warming the cylinder heads, pistons, crowns and the upper parts of the liners are all hot and expanded, but the rest of the engine is still cold. Therefore, the engine will be warped out of line causing the bearings and the pistons to run slightly off-center. This will cause the crankshaft to run from one side of the bearings to the other side, giving the bearings, pistons and rings a chance to get scuffed up. These are the vital parts, and when the engine is pulling a load the crankshaft will warp that much more causing these parts to wear that much faster.

Contractors will have to ask drivers or operators to come in a half hour earlier, or have a night mechanic do this work to give all of the equipment a chance to warm up for a half hour before the drivers and operators go to work. Any man who starts a diesel engine and then romps on it to warm it quicker should be chased out of the country.

On some jobs where the engines are not required to run steady all day long, the engine should not be allowed to become cold, but should be kept running all day long.

The writer will challenge any equipment owner to try this for at least six months and see what a difference it makes in renewing parts and fewer breakdowns. Also, how smooth the diesels run and how easy they are to start in the mornings. This will save on batteries and time lost on the job, and as least 75% less maintenance all around.

Savings in maintenance alone will more than pay for an extra mechanic to start all of the engines a half hour early. Yes, there are some owners of equipment who allow all of their diesels to run 10 to 15 min. in the morning, but that is not enough. Diesel engines are on the average three times heavier than gasoline engines so it requires at least 15 min. more for the heat to travel through the thick iron.

This mechanic works tube repair miracles

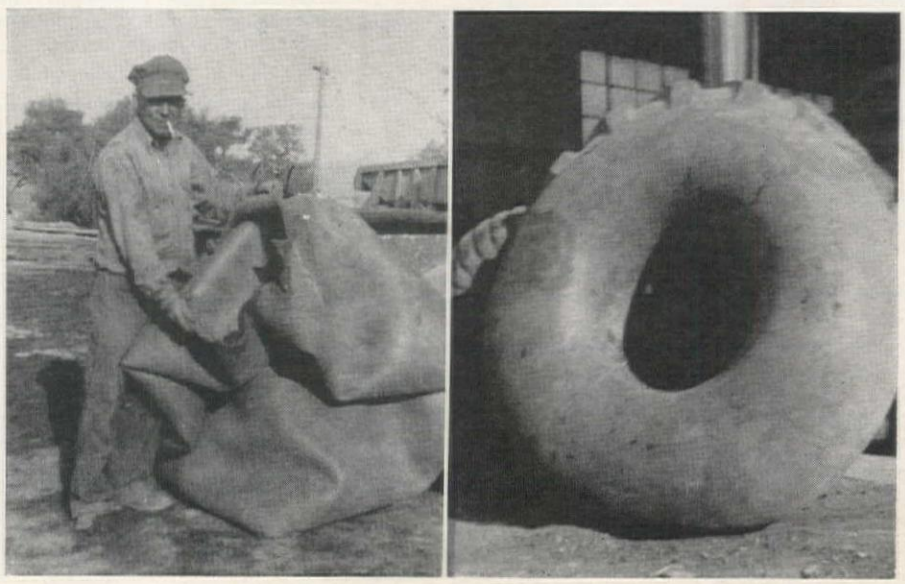
MIRACLES in heavy-duty tube repair are being performed on the Cachuma Dam Project by a journeyman mechanic named T. B. Potter. Potter is the inventor of a vulcanizing plate which uses 125-lb. pressure in forcing the tube against the hot plate.

Using this vulcanizing plate, gum rubber worth about 25¢ and some scrap rubber from an old inner tube, Potter repaired the cavernous hole in the 25.00 x 24 tube pictured. The job took one hour and 29 minutes ($3.45, labor). A new tube of this size would cost about $126.

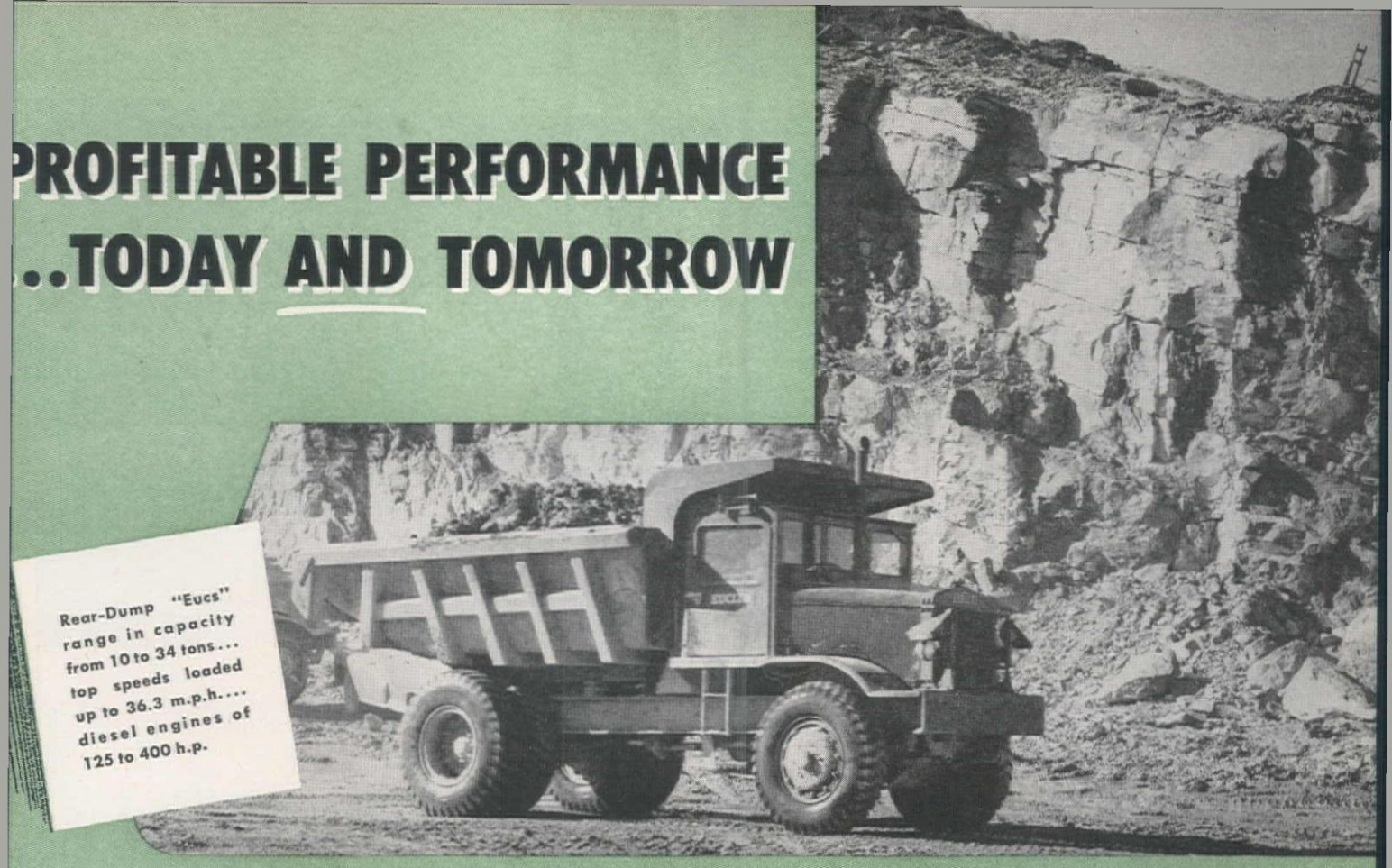
Potter developed his repairing techniques when he discovered that there was not anything on the market which would take tubes up to 25-in. diameter. He had charge of all tires on the Alcan Highway project during World War II and also worked on the tires used in Air Base construction in the Aleutian Islands.

He has performed miracles on repairs when everyone else who inspected the blown section of a tube pronounced it useless. He is inventor of several tire handling tools which make it possible for him to change tires up to 24.00 x 25 all by himself.

Potter is interested in marketing his techniques, and will discuss business with anyone who has the capital and business knowledge required to get the venture under way. He lives at 718 B West Victoria Street in Santa Barbara, Calif.



PROFITABLE PERFORMANCE ..TODAY AND TOMORROW



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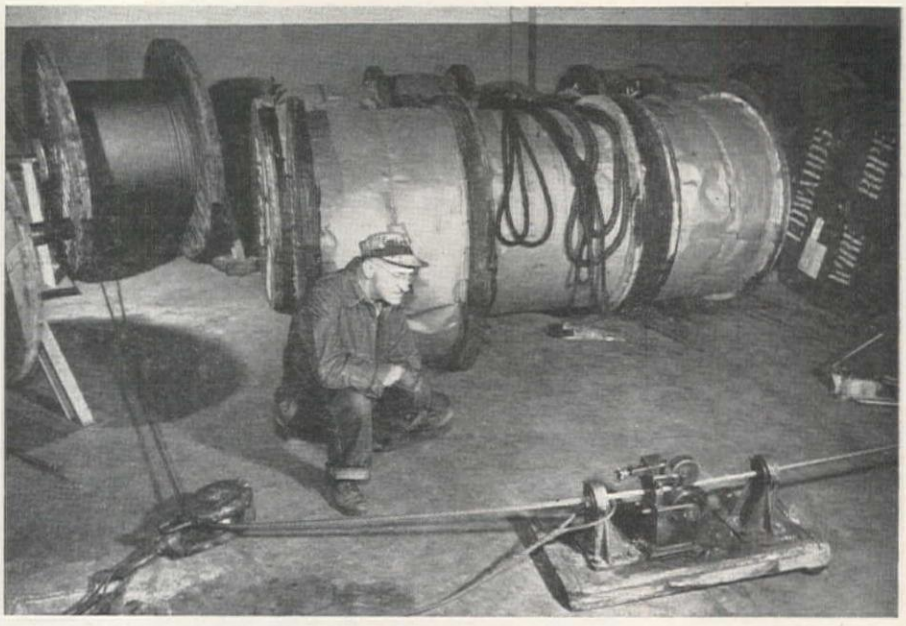
New device solves wire rope handling problem



A SPOOL OF WIRE ROPE weighing up to 14 tons presents a problem if it must be moved in a hurry to fill a will-call order. The situation is further complicated by the fact that when a large stock is maintained, many huge reels must be stored close together. Ordinarily, many of them would not be immediately accessible for filling an order. The problem has been solved however at the Los Angeles warehouse of the Republic Supply Company of California, which maintains a large stock of Edwards wire rope and a rigging service.

By an ingenious arrangement of blocks and pulleys, activated by a company-made winding machine, rope is drawn off otherwise inaccessible reels and around intervening objects without moving any of them.

Confronted with the problem of speeding up delivery of this hard-to-handle product, the manufacturing division of Republic Supply devised a series of heavy staples set into the floor at strategic intervals and below the floor level. To these, snatch blocks are hooked as required by the location of the wire rope reel needed. Several blocks are often required to by-pass intervening reels. From the spool and through these blocks, the rope is drawn through a counting machine on the floor by a special winding machine, designed and made in Republic Supply's manufacturing division. On this machine, a delivery spool is placed on a horizontal spindle where it engages a finger which fits into a hole on the delivery spool flange to furnish leverage for winding. Power is applied and the operator reels off the required length of rope for delivery within a matter of minutes.

How to lift objects safely and efficiently

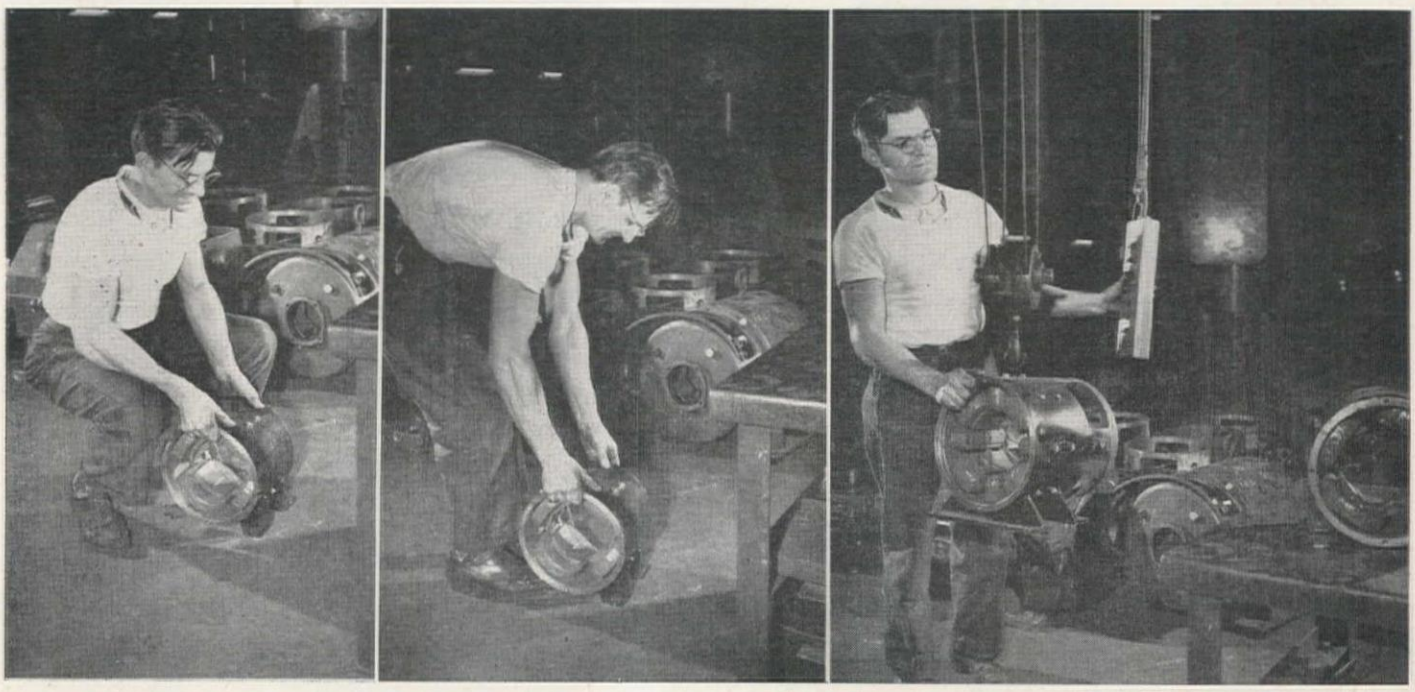
AS A PART of the safety program of the Westinghouse Electric Corp., safety has been continually stressed through carefully posed photographs. The current set is one on the ever important matter of manually lifting a heavy object. Left view demonstrates the proper lifting posture while the center photo illustrates the lifting posture that so often causes injuries.

The rules set forth when lifting are:

1. Bend the knees, placing the strain on the leg muscles instead of on the back.
2. Keep the load close to the body and lift in a smooth, gradual motion instead of an uneven, jerky movement.
3. If necessary, use a hoist, as illustrated at right.
4. Whether using a hoist or not, clear vision over the load should be maintained at all times.

Always a good general rule to remember is: Do not take unnecessary risks! It does not take any additional time to lift safely.

RIGHT **WRONG** **RIGHT**



Machine chases Indians back to the reservation

Arizona's Salt River Project speeded by use of versatile machine in preparing ditches for guniting, cleaning out weeds and moss, etc.

1. Until two years ago 20-man crews recruited from nearby Indian villages were used by Salt River Valley Water Users' Association to carry out the preparatory work for guniting operations.

2. Now, this versatile machine equipped with a specially fabricated bucket takes the place of the crews. When a ditch is to be gunited, it is filled in by bulldozer, compacted and then re-excavated with the special bucket. The 1/3-yd. bucket cuts ditch with a 3-ft. bottom, 5-ft. depth and 3/4:1 slopes at a rate of 100 lin. ft. per hr.

3. Another use for the four Gradalls on the project is backfilling a lip to prevent surface water from entering the ditch after the gunite has been placed. Standard Gradall bucket is used for this work, which is done by applying forward or backward pressure on the bucket's edge.

4. During a recent project in which the Association and a small city were jointly involved in replacing an open ditch with a pipeline of 54-in. concrete pipe, the machines were able to move in close between trees along the ditch bank to deepen and widen it for the pipe. They also set the pipe and worked easily under utility lines.

5. Moss, a constant problem to irrigation projects, is no match for Gradall. Using a special de-mossing bucket the machine travels along the bank at the rate of about 1 mi. per day cutting the moss and also removing weeds and grass.

6. Close-up view of the 6-ft. wide de-mossing bucket shows serrated edge that cuts moss and holes to permit drainage when bucket is removed from water.

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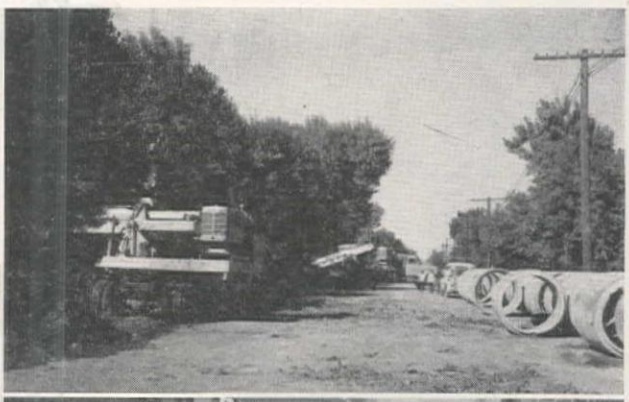

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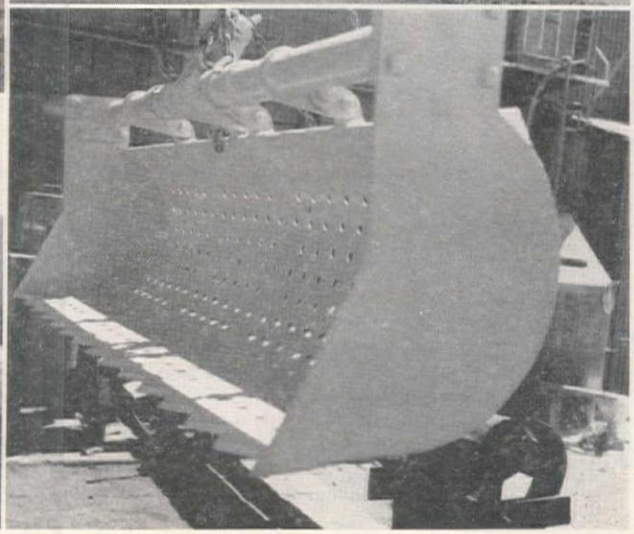


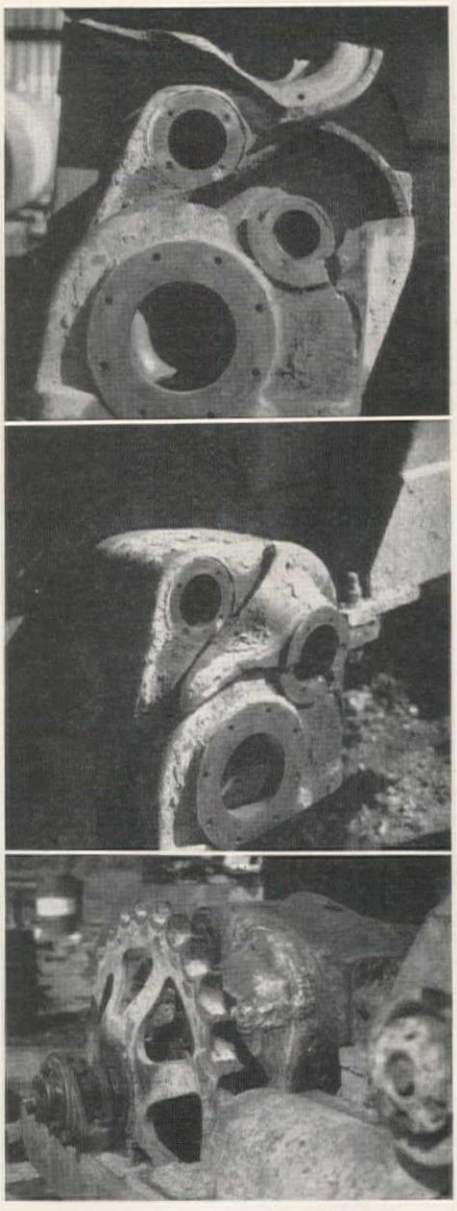
New electrode gives fast repair on tractor breaks

A NEW ELECTRODE that cuts iron and steel and a variety of other metals without the use of oxygen served importantly in a repair that saved $1,305 and 12 days of down-time for a contractor at San Jose, Calif.

An accident had happened to an Allis-Chalmers HD-5 crawler tractor. A broken cap-screw in the grease had caused a series of breaks in the final drive housing. The seriousness of these breaks is evident from the photographs. A new housing would have cost $900. It was estimated that 256 man-hours would have been required for disassembly and reassembly with the new part.

By undertaking the repair by welding with only partial disassembly, total labor on the job involved only 64 man-hours. Supplies consumed cost $34.32. Repair was completed in 4 days as against 16 days estimated for putting in a new casting if one could be promptly obtained.

Credit for the repair and for the innovation which enabled its quick completion goes to Frank Booth, welder, Materials Equipment & Supply Co., San Jose, and Jack Garrels, manager of welding department at Pacific Hardware & Steel Co., distributor for All-State Welding Alloys Co., Inc., whose cutting electrode and brazing alloy were used.



TOP: Partial disassembly of crawler tractor showing breaks in the final drive housing. CENTER: Broken pieces were pressed back in place with jacks and tack-welded. Casting was then veed along the broken line with the cutting electrode. BOTTOM: View of the completed welds showing distribution of the 18 lb. of brazing alloy used in making the repairs.

A cost comparison would probably be as follows:

Materials—	
18 lbs. All-State No. 41 General Purpose Brazing Rod	$21.42
10 lbs. All-State All-Purpose Cutting Electrode	4.90
1 tank Acetylene	4.00
1 tank Oxygen	4.00
Labor—	
64 hr. @ $2.29 for partial disassembly and reassembly and for weld preparation and completion	146.56
Total	$180.88
Estimated cost of new part and attendant labor	$1,486.24
Saving	$1,305.36

Time: 4 days vs. 16 days.

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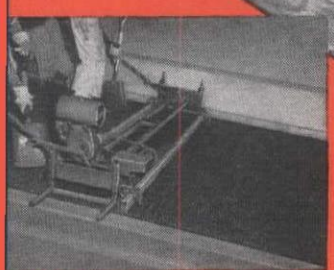
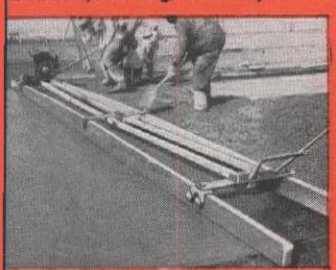


del RS-11 with overhead screeding achments, showing versatility of use.



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NEWS OF WESTERN CONSTRUCTION MAY 1952

Owens Gorge hydro project delays cause a flurry of legal action

THE $42,000,000 Owens Gorge hydroelectric project of the Los Angeles Department of Water and Power, originally planned for completion by December 1950 and now estimated as being two years behind schedule, is currently the subject of many suits and countersuits filed by the Department and the various contractors for the work, according to press reports. Included among the subjects of litigation is alleged contract breach by the Department in its failure to provide sufficient lining materials for two of the three project power tunnels, driving operations in all of which were reviewed in *Western Construction* for February 1952, pp. 76-79.

This suit, its claims totaling $466,038, was filed in Inyo County, where the work has been conducted, in behalf of Owens Tunnel Contractors, a joint venture whose low bid for the tunneling was $8,947,520. Participating firms were Bressi & Bevanda Constructors, Inc.; Guy F. Atkinson Co.; A. Teichert & Son, Inc., and David G. Gordon of Denver. In addition to the matter of materials, the suit asserts that surge chamber designs were changed by the Department after work commenced. In regard to the contractors' claim for materials, the Department's chief engineer, Charles P. Garman, has claimed that tunnel overbreak was excessive and that the Department was under no obligation to furnish extra materials thereby required.

Suits by the Department of Water and Power have also been filed, totaling $2,128,000 and naming six contractors and subcontractors for various portions of the work. Most of the total figure is sought in payment for delays incurred in the work, the Department claiming $1,123,000 for the Owens Tunnel Contractors' failure to meet contract dates and for delays by Joe Bush Electric of El Centro, Calif., in stringing the project transmission lines. Aluminum Co. of America, supplier of the cables, was also named.

Troubles with penstock fabrication and erection have led to $1,005,000 in Department suits naming Stanley H. Koller of Crockett, Calif., Southwest Welding & Manufacturing Co., and Consolidated Western Steel Corp. Following alleged abandonment of the work by Koller, the Department itself completed penstock erection and repair of faulty welds. Consolidated Western Steel Corp. and Southwest Welding & Manufacturing Co. are involved as a means of determining if the steel supplied, and the penstocks fabricated, were defective.

Not yet filed by Owens Tunnel Contractors at this writing is a damage suit in excess of $1,000,000, predicated on existence of unrepresented geological conditions encountered in one of the tunnels. The contractors seek repayment by the Department of additional tunneling costs unexpectedly incurred.

BRIDGING THE GAP IN SAN DIEGO FLOOD CONTROL CHANNEL

Beginning the long span across San Diego River Flood Control channel in San Diego's Mission Bay Recreational Area, bridgemen of Bethlehem Pacific Coast Steel Corporation erect heavy steel girder on the new Sunset Cliffs Bridge. When completed it will be 1,150 ft. long, with spans of 108 ft. over ten supporting piers and will connect the two residential areas of Ocean Beach and Pacific Beach with four lanes of traffic. The bridge has been designated by San Diego officials as a main artery in that city's transportation system which is now taking shape. More than 1,200 tons of steel will be required.

$7,705,000 sewerage plan for Salt Lake City

AFTER an eight-months study of Salt Lake City sewerage problems, the San Francisco engineering firm of Clyde C. Kennedy last March recommended adoption by the Utah capital of a $7,705,000 improvement program to include collection system, pumping station, and treatment facilities. Also in the engineering report were economic studies indicating feasibility of financing by 25-year revenue bonds, to be amortized by annual revenues of $540,000. An additional operating budget of $203,500 would be required annually for the sewage treatment plant.

Principal feature of the project would be the $3,908,000 treatment plant, justified for immediate construction by evidence of extensive pollution in Great Salt Lake near the city's outfalls, and by hazardous health conditions existing along the present sewage canal. As a breeding place for mosquitoes and flies, this latter feature constitutes a direct avenue for contamination of food. In addition, it was pointed out in the report that the completed project would permit reclamation of water for industrial usage.

The present sewage pumping station, at 11th West St. and 9th North St., is overloaded, handling 62 cfs. of sewage when designed for only 40 cfs. The new plant site lies north of this pumping station, between 13th North St. and the Utah Oil Co. tank farm, and extending west from the present drainage canal to 13th West St.

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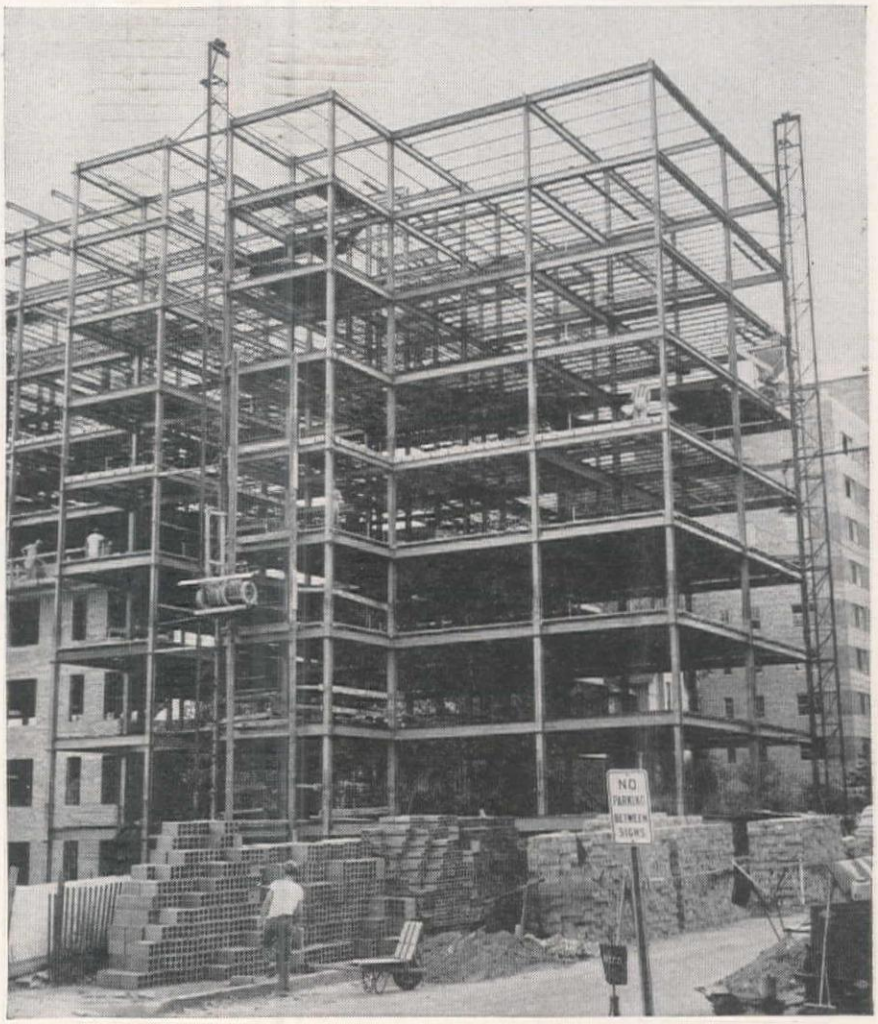

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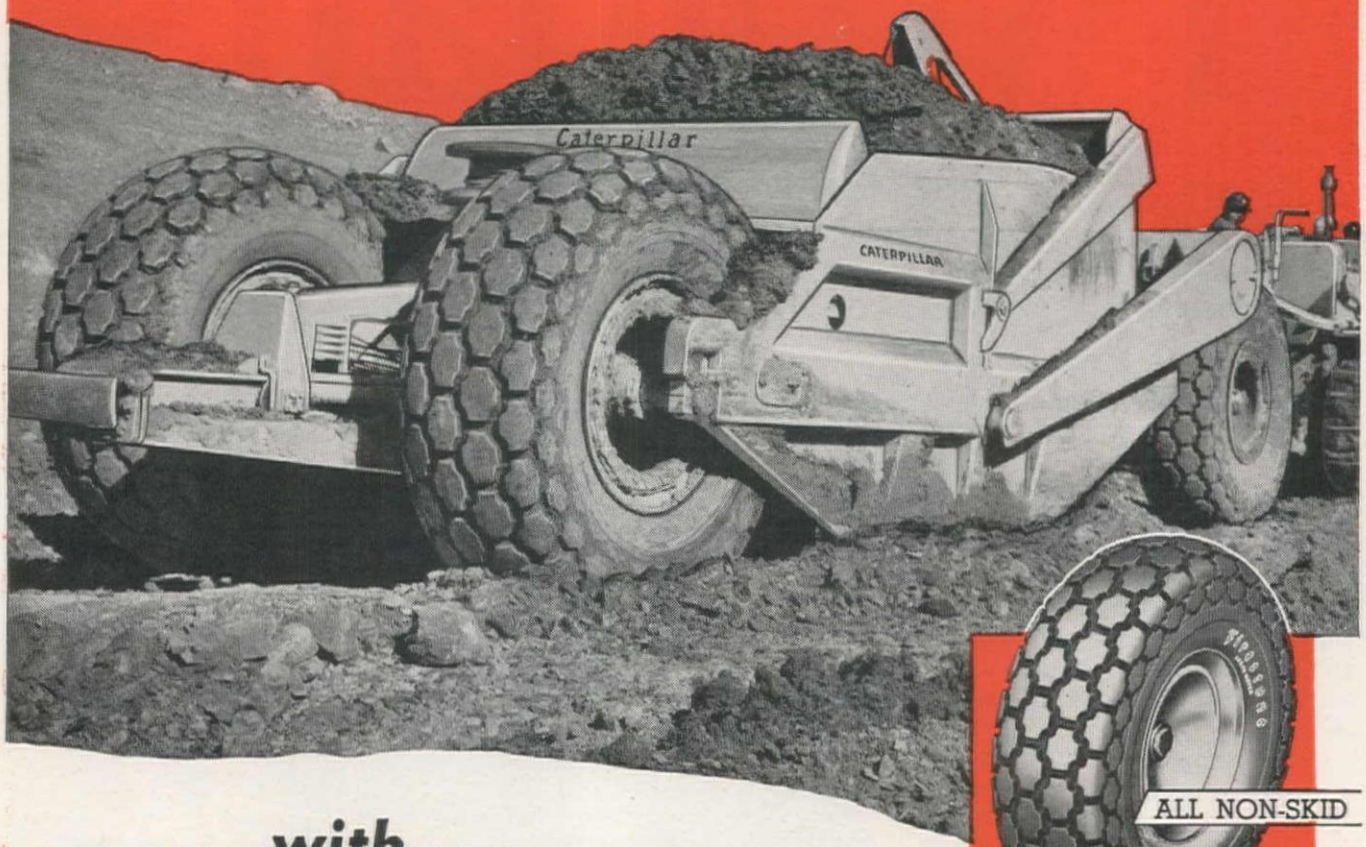

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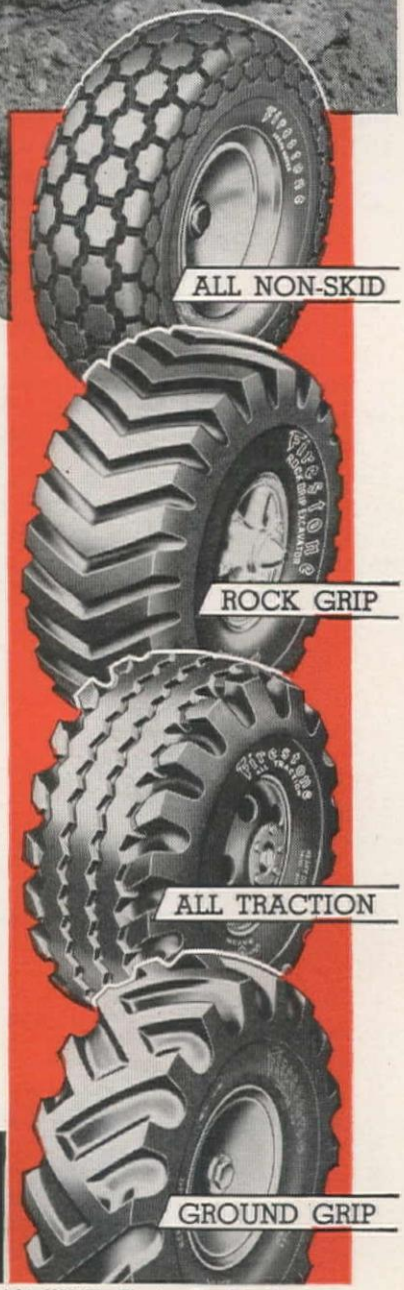

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Hells Canyon Dam project approval urged by Secretary of Interior Chapman

LEADOFF MAN in House Interior subcommittee hearings on Hells Canyon Dam late last March was Oscar Chapman, Secretary of the Interior, who urged authorization of the record-setting structure planned for the Snake River in Idaho. Chapman's stand reiterated his recommendations made last October, when a USBR report on the Snake River reclamation project originally was forwarded to Congress, bolstered by the approval of President Truman. The multi-purpose dam and reservoir, estimated at $357,000,000 in December 1950 and now pegged by some at $476,000,000, was the subject of a seven-day hearing under the chairmanship of Clair Engle (D-Calif.), and came in for concerted opposition as well as support by many groups. Chief opponent of the program continues to be Idaho Power Co., planning five low-power, low-head dams in the spectacular Snake River gorge which would be flooded by a 4,400,000-acre-foot reservoir 93 mi. long.

Statistics used by the various groups suffered perhaps the most, as estimates of hydroelectric power to accrue from the respective schemes were shown by each side to exceed those of the other. The USBR proposal, which permits credit to Hells Canyon Dam of power produced downstream through more effective utilization of the big dam's regulated releases, establishes prime power production at 1,124,000 kw., including 688,000 kw. at the Hells Canyon site. Idaho Power Co. plans, as outlined in the same proposal, total only 530,000 kw.

Opposing testimony before the House subcommittee added the proposed Kooskia Dam, on tributary Clearwater River, to the five Snake River dams planned by Idaho Power Co. Power generation on this new, six-dam basis, including augmented firm capacity downstream also, comes to an estimated 1,611,000 kw. Admitted costs of such a development were estimated at $390,000,000; but it was added that official estimates for the federal dam came to a comparable figure when allowance is made for the necessary power transmission lines to Hells Canyon.

Allowing three days each for proponents and opponents of Hells Canyon Dam, the committee heard spokesmen from similar interests take both sides. Angus McDonald, assistant legislative secretary to the National Farmers Union, pledged his organization as being 100% in favor of the project, while Fred M. Taylor, a Boise attorney representing 6,000 Idaho farmers, pointed out potential dangers to upstream water rights on the Snake River as argument against the dam.

Adjourning on April 3 to an undecided date in May or June, the committee did not hear officials of Idaho Power Co., who will appear at the later time. Principal opponents heard before adjournment included Governor Len B. Jordan of Idaho and C. H. Welteroth, president of the Idaho Reclamation Association, both of whom expressed concern for the state's water rights, and Holland Houston, engineering consultant to Washington State's Governor Arthur B. Langlie.

As both sides settled back for a breather until resumption of committee hearings, the continuation of election year activity fostered the singular idea that Hells Canyon Dam might prove a failure even before it can be built.

Bid calls by USBR for three major projects

AMONG the anticipated bid calls from the Bureau of Reclamation in the latter half of April was a call for bids on construction of Nimbus power plant and diversion dam on the American River, near Folsom, Calif., part of the Central Valley project. Work includes construction of the semi-outdoor type 14,000-kw. Nimbus power plant, to house two 7,500-kva. generators, and the construction of a concrete diversion dam.

Calls were also anticipated for construction of Franklin Canal which diverts from Harlan County dam and runs along the north side of the Republican River Valley to about 3 mi. beyond Bloomington, Neb. Work includes construction of 15 mi. of Franklin unlined earth canal of 14-ft. bottom width and 230-cfs. capacity, plus construction of fourteen 78-in. precast concrete pipe structures, mostly siphons in lengths up to 3,000 ft., 33 precast concrete pipe culverts, 24 to 78 in. in diameter; 27 turnouts, 2 orifice checks, etc.

Bids were called for construction of the Eklutna Power Plant, near Palmer, Alaska, part of the Eklutna Project. Work includes the two-unit, 30,000-kw. capacity Eklutna hydro-power plant, which requires construction of a powerhouse superstructure having steel framing, concrete curtain walls, and concrete roof; and a substructure using steel piles for the foundations. It will measure 71 by 74 ft. in area and 50 ft. in height from generator floor to ceiling. The contract includes construction of the tailrace, tailrace conduit and channel, and installation of part of the penstock and penstock anchor block. The contractor will install embedded parts of two 25,000-hp. government furnished turbines, governors, a 40-ton traveling crane, transformers, 115-kv. circuit breakers and switches, heating and ventilating, etc.

WASHO schedules talks for summer meeting

SOME OF THE EVENTS planned for the annual meeting of the Western Association of State Highway Officials to be held in Seattle, Wash., June 5, 6 and 7 are briefed here.

The first day of the meeting, June 5, there will be registration (9:00 a. m.) and women's get-acquainted hour. The call to order will be at 10:00 o'clock by William A. Bugge, president, followed by the Invocation, welcome message, response, and committee appointments. Bugge will make the president's address at 11:00, followed by a speech by Raymond Archibald, chief, Western Headquarters, Bureau of Public Roads.

The afternoon session will commence with an address by Charles M. Ziegler, vice president, AASHO. Mark U. Watrous, State Highway Engineer, Colorado, will then address the group on the "Time and Place for Toll Roads," D. G. Dwyre, State Highway Engineer, N. Mex., will speak on "The Defense Access Highway Program"; R. M. Gillis, Deputy State Highway Engineer, California, is scheduled to speak about "Controlled Access Highways," and Arthur Butler, director, National Highway Users' Association, will discuss "Project—Adequate Roads."

Friday, June 6, the assembly will meet in group discussion sections which consist of the maintenance group, construction and design group and the right-of-way group.

Saturday morning, with J. R. Bromley, Superintendent, Wyoming Highway Department, presiding, the meeting will go into general session once more for a speech by Fred Burggraf, director, Highway Research Board, on "The Idaho Test Road"; R. C. Perkins, State Highway Engineer, Arizona, on "Tourist Promotional Activities"; Hal Hale, executive secretary, AASHO, "Controlled Materials," and Mrs. Julia Butler Hansen, chairman, Washington Legislative Joint Fact Finding Committee on Highways, Streets and Bridges, "Activities of the Western Interstate Committee on Highway Policy Problems."

Columbia Basin Project festival starts May 22

BETWEEN May 22 and June 1 the Columbia Basin Water Festival will be held to commemorate the instigation of the nation's largest reclamation project.

The program is designed to be a celebration in the real sense with fairs, pageants, etc. The Voice of America will be on the spot to record the whole epic for broadcast overseas.

The Columbia Basin Project is the largest reclamation project in the nation. Ultimately, it will irrigate 1,029,000 acres. Water will be available for approximately 920 farms in 1952. It is estimated about one-half of these will use water the first year. An additional 60,000 acres will receive water each year for the next seven years following 1952, at which time approximately 500,000 acres or one-half of the total project area will have water available.

B. C. natural gas decision prompts varied opinions

NATURAL GAS interests in the Pacific Northwest squared off and took sides when the Alberta Conservation Board announced its decision on the limited export of natural gas from the Peace River Gas Fields to Northwest cities.

The exclusive right to handle the exporting of the gas was granted to West Coast Transmission Co., Ltd. Burl Hagadone, vice president of Trans-Northwest Gas Co., hailed the decision as "good news" for eastern Washington and northern Idaho. His firm would tie in the pipe line at a point near Osoyoos, B. C., and bring gas to Spokane, Pasco, Hanford, Yakima, Walla Walla, Wash., and Coeur d'Alene, Idaho. Officials of Trans-Northwest announced that they did not believe a recent federal injunction, prohibiting them from competing with Northwest Natural Gas Co., would affect this project since the latter firm has been denied the right to import Canadian gas.

Expressing the belief that the Alberta Board's decision clouds the hopes of Seattle and other Pacific Northwest cities for a natural gas supply was N. H. Gellert, president of Seattle Gas Co. Gellert feels that the failure of the board to okay the export of gas from the larger fields in southern Alberta, rather than the Peace River area, makes construction on the expensive pipe line tie-in impractical. Gellert, however, stated that his firm intended to bring natural gas to Washington from Texas, and that action was in the immediate future on this plan. Only 300,000,000,000 cu. ft. are available from the Peace River fields to serve Vancouver, B. C., as well as the cities in Washington.

Meanwhile, the Pacific Northwest Pipe Lines Corp. of Houston, Tex., announced plans to build a $130,000,000 natural gas pipe line from Texas to the Pacific Northwest. The line would start in Northwest Texas and New Mexico, through Salt Lake, and follow the course of the Snake River in Idaho to the Pacific Northwest.

Colo. highway department finally gets building site

AFTER MONTHS of disagreement and controversy between state and city officials, the site for the new home of the Colorado State Highway Department has been selected (*Western Construction* March, p. 138).

It was announced that city-owned land south of Buchtel Blvd. and west of University Blvd., near the Denver Valley highway route, is to be the location for the $2,000,000 structure. Negotiations are in the offing for the purchase of the land from the city.

This new decision means that the State will sell the 9-acre site it originally purchased for the building. This site, near East Alameda Ave., was protested by residents of the area and months of controversy and negotiation were required to settle upon this new location.

Mark U. Watrous, State Highway Engineer, estimates that about two years will be required to build the structure and relocate a myriad of department offices within it. The department's shop facilities will remain in a separate building on East Colfax Ave., but all other offices of highway administration will be centralized in the new location. Plans are not yet complete, but they will call for a modern functional structure.

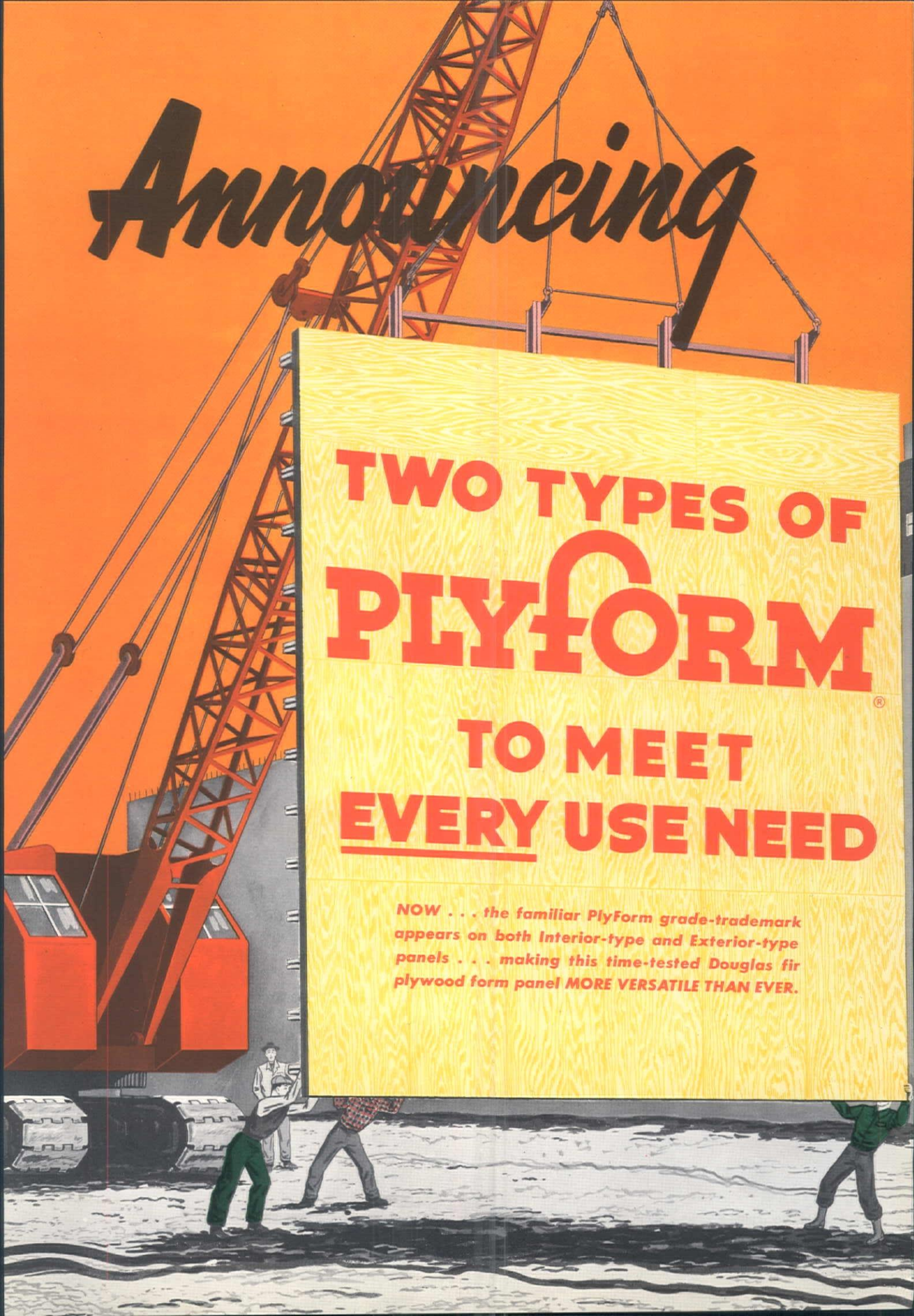
Not enough income for Wyoming highways

J. R. BROMLEY, Wyoming Highway Superintendent, recently announced that the $15,753,899 State Highway Department income is not enough to meet the demands faced by the department.

Wyoming roads are wearing out more rapidly than they can be replaced, according to Bromley. About 92% of all departmental funds goes into maintaining and building roads and the remaining 8% to administration and equipment.

It was stated that $2,000,000 of the operating fund went into county, farm-to-market roads, while other amounts were given to cities for street and alley improvements, repayments for sales of gasoline to airplanes, payments on bond issues, and adjustment of overpayments.

This left $4,099,978 from gas tax funds for road building and maintenance.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D.F.P.A. INSPECTED DOUGLAS FIR PLYWOOD EXTERIOR PLYFORM CONCRETE FORM Grade B-B EXT-DFPA *new!*

Exterior-type PlyForm, a new grade-trademark, replaces the old grade-name, Exterior Concrete Form; the EXT-DFPA continues to identify the Exterior-type panel. Bonded with completely waterproof phenolic resin adhesives, Exterior PlyForm should be specified where forms will be re-used until the wood itself is literally worn away, in excessively humid areas, or under other extreme use or storage conditions. Exterior PlyForm is identified by the new diamond-bar grade-trademark shown at left. Edges sealed with distinctive red sealer.

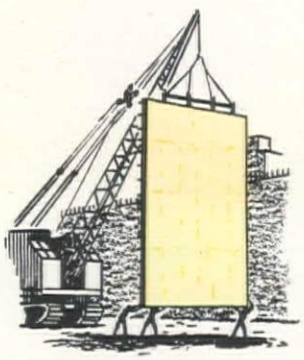
Specifications: Completely waterproof bond. Both faces of B veneer which is smooth and solid, but may contain small tight knots and neat circular repair plugs. Inner-ply construction (as in all Exterior fir plywood) of C veneer contributes to strength and superiority of panel. Sanded both sides; edge-sealed with red and, unless otherwise specified, mill-oiled. Width 4'. Length 8'. Thickness: 5/8" and 3/4", 5-ply.

2 INTERIOR-TYPE *for multiple re-use*

GENUINE DOUGLAS FIR PLYWOOD PLYFORM CONCRETE FORM PANEL INTERIOR-TYPE GRADE B-B D.F.P.A. INSPECTED

Interior-type PlyForm is now manufactured with improved glues to provide greater service than ever. These newly fortified glues are *not* waterproof, although highly moisture-resistant. Interior PlyForm panels will withstand several pourings of concrete . . . up to 10 or 15 are not unusual, dependent upon care on the job and between pours. Interior PlyForm continues to be identified by the familiar diamond-shaped grade-trademark. Edges sealed with distinctive green sealer.

Specifications: Highly moisture-resistant fortified glues (not waterproof). Interior PlyForm is identical in face-ply characteristics and inner-ply construction to Exterior PlyForm. Sanded both sides; edge-sealed with green and, unless otherwise specified, mill-oiled. Width 4'. Length 8'. Thicknesses: 1/2", 9/16", 5/8", 3/4", all 5-ply, and 1/4" 3-ply for form liner.



COVER ILLUSTRATION: Artist's conception of Exterior plywood form sections used for foundation walls of Port Authority Bus Terminal, N.Y.C. Consultant Engineer Jacob Feld, N.Y.C., who designed 28'-high by 24'-long pre-assembled plywood sections, reports "forms very successful. Six re-uses on walls, plus re-use on other parts of building, but forms could have been used indefinitely." Contractor: Foss, Halloran & Narr, Inc., Long Island City, N. Y.

OTHER PLYWOOD CONCRETE FORM PANELS

PLYSHIELD EXT-DFPA A-A

PLYPANEL INTERIOR A-A-DFPA

For special architectural concrete which requires the finest possible finish, specify new overlaid plywood or either Exterior or Interior grades with one or both faces of "A" veneer [veneers of highest appearance quality]. Such grades include: EXT-DFPA PlyShield [A-C], EXT-DFPA A-A; Interior PlyPanel A-D and Interior A-A.

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New overlaid panels [plastic surfaced plywood and hardboard-faced plywood] have all the inherent strength properties of plywood plus hard, glass-smooth surfaces. Fir plywood industry symbol [above] on overlaid plywood panels indicates product craftsmanship and quality.

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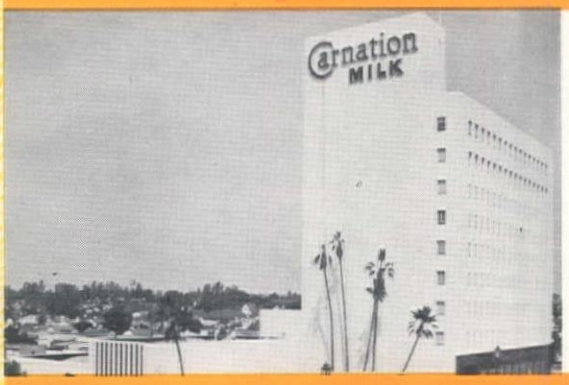
PlyForm Creates Smooth, Fin-Free Surfaces



PlyForm was specified on the new Carnation Company western headquarters building, Los Angeles, by Stiles Clements Associated Architects and Engineers for "smooth, fin-free concrete, ease of handling and overall job economy." According to the architects, "Plywood offered the simplest, most direct medium for achieving the smooth concrete because it permits an even-textured monolithic surface to be cast simultaneously with the structure." Smooth walls required a minimum of finishing before painting. Contractors on the job: William Simpson Construction Co., Los Angeles.

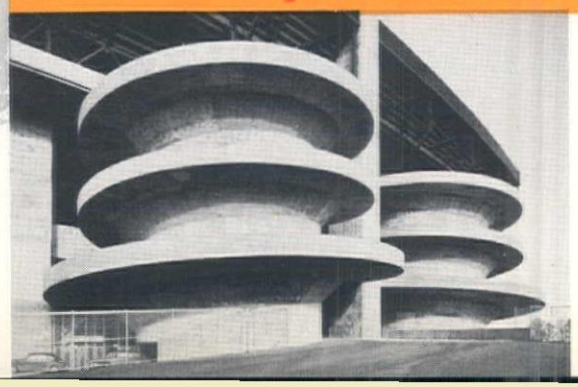
PlyForm Can Be Used Over and Over

"We've found plywood forms to be the most economical for several reasons," says C. J. Rollo, job superintendent for Brown & Root, Inc., contractors for the new Rice Institute Stadium, Houston. "Given proper care, they can be re-used again and again; they're easier to handle, produce better looking concrete." On the job, built-up Interior-type PlyForm seat forms were still in good condition after ten re-uses. An even greater number of re-uses was recorded for wall and fence forms. Architects: Floyd & Morgan and Milton McGinty, Houston, Texas.

PlyForm Saves Time and Labor Costs

"Plywood speeded form work all along the line," says Earl Starbard, job superintendent of Woodworth & Co., contractors for all concrete work on the new mile-long Tacoma Narrows Bridge. On the job, contractors report, use of built-up plywood form sections "cut time and labor costs by 15%." Plywood forms were used to form the reinforced concrete roadway and for all above ground concrete on the anchors, toll houses, bents and viaduct. Structure built by the Washington State Bridge Authority; Charles E. Andrew, chairman and principal engineer.

PlyForm Offers Design Adaptability



Plywood forms were called on to solve an unusually intricate concrete job in building the spectacular twin-spiral ramps at the University of Washington grid bowl addition. "Plywood forms offered the simplest and least expensive solution," reports Elmer Strand, partner of Strand and Son, General Contractors, Seattle, Wash. "The panels can be re-used many times. They're easy to fabricate into cost-cutting built-up form sections and are easily bent to form curved surfaces." Architects: George W. Stoddard and Associates, Seattle, Washington.

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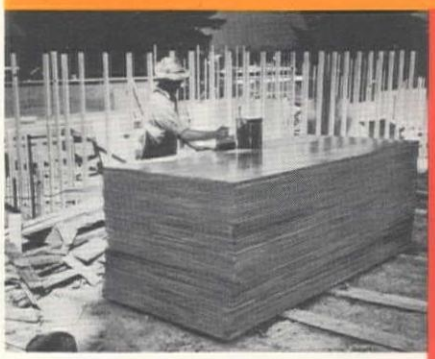

Care On Job

Although plywood is far more rugged than other panel materials, maximum serviceability and re-use depends largely on the care it receives on the job.

After each use, nails should be pulled and panels cleaned with a wide blade, stiff broom or wire brush. Wipe clean with a burlap pad. After each use, panels should be re-oiled with a uniform coating of good form oil. (For plastic surfaced plywood, see individual manufacturers' directions on whether to oil.)

Attention should be given to corners and edges. All saw cuts and other workings should be "doped" with lead and oil, aluminum primer, shellac or similar material as the job progresses. Open cracks in joints should be pointed up or caulked with lead, putty or plaster of Paris filler.

Application

Plywood forms require proper support from studs or joists. Height, rate of pour and fluidity affect pressures and spacing of supports. Desired smoothness of finished wall also affects form specifications.

The following values are offered as guides to thicknesses of Douglas fir plywood for concrete form construction. Allowance is made for the decreased stiffness (about 20%) of the panel by wetting, the period of loading, and the increased stiffness developed when the panel is continuous over two or more spans. Values calculated on panels with face grain across the studs.

PlyForm Thickness	Stud Spacing	Deflection Permissible	Load
⅝"	12"	1/270 of Span	880 lbs./sq. ft.
⅝"	16"	1/270 of Span	375 lbs./sq. ft.
¾"	12"	1/270 of Span	1,330 lbs./sq. ft.
¾"	16"	1/270 of Span	560 lbs./sq. ft.
⅝"	12"	1/360 of Span	660 lbs./sq. ft.
¾"	16"	1/360 of Span	420 lbs./sq. ft.

Stripping, Storing

Large, rigid plywood form panels strip quickly, easily. The resilience of the wood distributes pull over a large area to minimize any danger of spalling. If wedging is required, use only wood wedges, lightly rapped to break the adhesion. Panels should not be allowed to drop from ceilings or walls, but should be removed using scaffolding or platforms.

After stripping, panels should be cleaned and re-oiled (see directions at left). If form sections are completely dismantled, panels should be stacked evenly on a dry and level platform, protected from rain, sun, and traffic abuse. Long-time storage should be indoors. Interior PlyForm panels should *not* be stored under tarpaulins.

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New Keely PlyForm calculator gives construction data for plywood forms, based on hourly rate of pour. Complete with leaflet, "Design Assumptions for new Keely Calculator." Send $1.00 to Douglas Fir Plywood Association, Tacoma 2, Wash.

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U. P. line change is under way in Wyoming

CONSTRUCTION is under way on Union Pacific's major line change which will reroute 42 mi. of line between Cheyenne and Dale Creek, Wyoming. (See *Western Construction* — March, p. 61.)

Morrison-Knudsen Co., Inc., Boise, Idaho, holder of the grading contract on the $16,000,000 project, took advantage of fair weather to put two field crews into action. One of the crews at work near Dale Creek has already engaged in rock blasting. Full scale employment which should reach about 400 men, will not be under way until early summer. At the present time 60 men are at work.

The contractor estimates that about 7,000,000 cu. yd. of earth, including 3,000,000 cu. yd. of rock, will be involved in this stage of the construction. Completion for the entire project should be effected by August 1953.

J. A. Harker, manager of M-K's railroad division, is the general head of the operations, with Murray Burns, vice president, as general director. R. E. Denham is project manager, with Ralph Jones as his assistant. Tom Cushing is office manager. Offices at Laramie are managed by Arthur Heward. J. A. Bunjer is assistant chief engineer for the Union Pacific Railroad.

Contractor held to low bid in Oregon reservoir project

A CITY COMMISSION in Bend, Ore., handed down a decision which meant bad news to State Construction Co., Seattle, Wash. The firm will be held to its low bid of $187,839 for reservoir construction despite the fact that unexpected difficulties have been encountered in excavation.

Site of the 5,000,000-gal. reservoir is located on an extinct volcanic formation which contains many hard boulders, and the difficulty will cost the contractor an additional $15,000 to $18,000.

The commission's decision to hold State to the contractural terms was based upon the fact that all bidders were permitted test drills on the site before submitting their bids.

Seattle looks ahead to a north-south freeway

THE DRIVE for perfecting through-traffic facilities in the West's largest cities found expression again in Seattle, Wash. Faced with a traffic congestion problem in the city, planners have turned up with an elaborate plan for a north-south freeway in Seattle which would be another link in the highway system joining the Washington-Oregon border with the Canadian border at British Columbia.

The gigantic undertaking which would not be attempted for perhaps another five or ten years would cost an estimated $100,000,000 to build. It would divert traffic away from the congested heart of Seattle's business district and connect with Highway 99 at both the north and south city limits.

Plans prepared in the city engineer's office and looked upon with interest by the State Highway Commission show the freeway taking off from a high-level, double-deck bridge near E. 43rd St., swinging parallel to the westerly slope of Capitol Hill above Eastlake Ave., skirting the main business district, passing east of the south business district to extend along the south side of Beacon Hill, east of Airport Way.

The proposed freeway would be virtually free of traffic lights. They would only be required to regulate lanes that were reversible for north and south traffic during rush-hour needs.

Overflow in San Diego, —but everyone's happy

FOR THE SECOND TIME in recent months a reservoir owned by the City of San Diego, Calif., has overflowed and signified the end of the long dry spell.

This time Lake Hodges Reservoir, fed by the San Dieguito River, sent a thin stream of water over the top to the delight of water users in the big Southern California city. Not long ago the smaller Upper Otay Reservoir also overflowed. The city announced that its reservoir system now contains 45.1% of capacity.

Building settlement test data clarified

Editor, *Western Construction:*

It was with considerable interest and some disappointment that I read the article entitled "Building settlement tests on two foundation types" in the March 1952 issue of *Western Construction.* The foundation engineers referred to without name in the article are my firm. I regret that my sense of professional responsibility requires me to request that this letter be published in the interest of correcting some impressions which I feel are important to the engineering profession.

The projects described in the article offer an excellent opportunity to obtain valuable scientific information. Unfortunately, there appear to have been omissions of such material facts as to result in significantly misleading impressions.

For example, the impression given by the article is that the Animal Industries and the Food Technology buildings are of substantially similar types, and spread foundations would have behaved satisfactorily for both buildings. The captions on the photographs of the buildings were interchanged, and the following facts were not clearly presented. The Food Technology Building is of uniform height and quite regular L-shaped plan. The Animal Industries Building has an irregular plan consisting of three joined portions, three stories, one story, and two stories in height, respectively. These features result in quite radically differing column loads; also, the maximum column loads for this building are nearly three times as great as those for the Food Technology Building. The interior finishes and uses of the Animal Industries Building required restricting differential settlements to smaller amounts than would be acceptable for the Food Technology Building. These differences in the patterns of column loads, in the requirements for uniformity of settlements, and in the inherent structural uniformity of the buildings were important considerations in the selection of pile foundations for the Animal Industries Building. Also, we were informed by the structural engineer that the pile foundation as developed in the final design was less expensive than the required spread footings would have been for this particular structure.

The placing of some two or more feet of general fill for support of the floor slab for the Food Technology Building was a major factor in studying the probable settlements for this building. The weight of the fill would probably exceed the weight of the building itself. In preparing this site for the use of spread foundations, we are informed that some preloading or temporary surcharging of the area was employed. The use of this temporary fill would cause an appreciable proportion of the total expected settlement to be realized before the building was constructed. From data available to us, it appears that the settlements which occurred during the surcharging period are not covered by the

Jr., president of Salt Lake Pipe Line Company. Petersen said that the need for additional transport capacity into the Northwest area has been increasing since completion of the first portion of the line, and that as more oil products became available at Salt Lake it was decided to lay a parallel line.

Work on the project is expected to get under way within a few months, if the steel pipe is made available. It is hoped that it can be completed by late 1952. The new 8-in. diameter line will tie into existing take-off points along its route in southern Idaho. Additional tankage of about 200,000 barrels capacity will be built at the line's Boise terminal to handle the increased flow of oil.

Gibbons and Reed win Utah's 2nd largest road job

A CONTRACT has been let in Utah for that state's second most expensive road project scheduled for this spring.

Gibbons and Reed received the $577,269 contract for replacement of a 5-mi. stretch of U. S. 91, between Brigham City and Mantua. The job consists of widening the road from its present 18 to 20 ft., to the more practical 36 ft., and eliminating some of the dangerous curves, which have made the highway a menace to motorists.

Utah's most expensive summer project is the new $1,200,000 divided highway to be constructed between Layton and Lagoon.

McNary Dam crews race to beat spring floods

ABOUT 3,500 MEN are working three shifts daily to rush work on the Corps of Engineers' McNary Dam. The contractors are racing against the floods which will cause water to fill the area where work is now in progress.

Although this year's flood should be as great or greater than the 8 ft. of water that rolled over the cofferdam last year and kept workers out of the area for several weeks, construction is farther along. Concrete has been poured across the river to the eventual width of the dam, but, of course, it is not as high as it will eventually be. Thirteen bays have been completed, which leaves 8 to go, and the powerhouse walls are beginning to rise on the Oregon side of the project.

Quake and blast effects to be conference topic at UCLA

DEPARTMENTS of Engineering on the Los Angeles and Berkeley campuses of the University of California, together with the Earthquake Engineering Research Institute, will sponsor a symposium on Earthquake and Blast Effects on Structures to be held June 27 and 28 on the Los Angeles campus.

Designed to make available for application by practicing engineers the results of the latest research and professional advances in engineering design for earthquake and blast effects, the symposium will be concerned with the nature of the forces caused by earthquakes and atomic blasts, and effects of these forces on stationary structures. It is offered through the facilities of University of California Extension.

With sessions meeting in the University's Chemistry Building, observations and theories of structural failure will be presented and panel discussions will be held on lateral force building code provisions, and the design of structures for earthquake and blast loadings. Detailed programs and registration information are available on request to the Department of Conferences, University Extension, University of California, Los Angeles 24.

When in Alaska—take a bath and save the sewer system

CITY ENGINEER in Fairbanks, Alaska has asked his city's residents to take at least one bath a day; and it's not because "their best friends won't tell them" as one might think. No, sir! The extremely cold winter in which temperatures often were more than 50 deg. below zero for days left the ground frozen as deep as 10 ft. The frost is beginning to affect the city's drain pipes. It is thought that if lots of water is kept running down the drains that perhaps the underground sewer system won't freeze up.

Perhaps this will mean an increase in Fairbanks' social life with residents all cleaned up looking for places to go.

Northwest ASCE groups to meet at Richland May 15-17

MEMBERS of the American Society of Civil Engineers from Alaska, Washington, Oregon, Idaho, Montana and several student chapters will attend The Pacific Northwest Conference in Richland, Washington, May 15, 16 and 17.

The Columbia Section is playing host to the regional group this year, and an interesting program of events is slated for the gathering. Among the technical topics to be discussed are: an elementary introduction to atomic energy; selection of materials for use under radiation conditions; engineering aspects of atomic energy; heavy aggregate concrete and engineering opportunities in the field of atomic energy.

Other highlights of the meeting will be a discussion of planning the public use of McNary Reservoir; a tour of levees, Richland to Pasco; a barge trip down the Columbia River to McNary Dam and inspection of the dam.

Bridge raising jobs at McNary reservoir

TWO DIFFICULT JOBS will be carried out this summer as part of the relocation program made necessary by construction of McNary Dam on the Columbia River. Both jobs, for which bids are already in, involve raising railroad bridges without interruption to train traffic.

One project is to raise the Union Pacific Railroad bridge near Pasco, Wash., by 6.92 ft., and place steel grillages and masonry plates to support the bridge in its raised position. This project includes construction of steel girder spans at each end of the present approach trestles. Low bidder for this job was Condick Co., Berkeley, Calif., and Thomas Rigging Co. of Emeryville, Calif. The joint-venture firm bid $449,-850.

The second project calls for raising all spans of the Northern Pacific Railroad bridge crossing over the Snake River near Burbank by 1.22 ft. The same joint venture presented the low bid for this job, at $83,810.

CHEWING UP A HIGHWAY

Between Colorado Springs and Pueblo, Colo., Schmidt Construction Co. has this Gar Wood cable-operated dozer blade on an Allis-Chalmers HD-20, tearing up old concrete slab.

7,000-ft. tunnel part of Orange County water plan

ORANGE COUNTY, Calif., Municipal Water District has requested the National Production Authority to allot 30,000 tons of steel for feeder lines to bring more Colorado River water to the new district.

Work is scheduled to start this July on the 7,000-ft. tunnel near Lake Matthews for the untreated water line, which will be brought to a point near Santiago Dam by September 1954. Branches of this line will carry water to the Santa Ana Valley Irrigation Co., the Anaheim Union Water Co., and to the Santa Ana River channel for underground water basins.

Concrete and plastic mix may have many advantages

CONCRETE fortified with plastic to make it twice as strong as ordinary concrete is in the realm of possibility according to three chemists who described the preparation before the American Chemical Society.

The preparation can be used for roads, floors and masonry and will resist cracking, corrosion, abrasion and impact.

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Charles Bratton, right, talks lubrication with G.P.'s Mote Dizney.

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Concreting at Queen Creek Tunnel in Arizona

FINAL TRIMMING has been completed and concrete lining operations are getting under way on the 1,240-ft. Queen Creek Tunnel being constructed by the Arizona Highway Department near Superior. Construction of tunnel was reviewed in *Western Construction* (October 1951—pp. 61-64). The lining operations are being carried out by the Vinson Construction Co., Phoenix, Ariz. The contract includes lighting and ventilating facilities. The tunnel section is 25 ft. high and 44 ft. wide.

An estimated 12,500 cu. yd. of concrete will be placed for the lining, which will be 18 in. thick at the side walls and 12 in. thick at the top of the arch. Concrete will be batched in a 120-ton Noble batching plant located near the mouth of the tunnel and hauled to a Rex pumpcrete by two transit-mix trucks. Aggregate will be brought to the site from a plant located about 3½ mi. away.

Two sets of 30-ft. steel forms with 17 intake ports each will be used for placing the lining. Form sections ride on tracks laid on the tunnel floor and will be pulled ahead with an air tugger hoist. When in operation the concreting cycle will be to set form, pour, set second form, pour, then strip and set first form. Forms will be stripped after concrete has set for about 72 hours. Alternate pours will be made to permit moving both form sections ahead together as work progresses.

It is believed the project will be completed early next fall.

Ariz. groundwater code voided by state court

ARIZONA'S revised groundwater code, proposed in January by Governor Pyle's 8-man committee, has been rendered void by state supreme court action. Built around the court's decision of January 12, which enunciated a doctrine of public ownership and the priority of appropriative rights to groundwater, the proposed code was reviewed in *Western Construction* for March 1952, page 76. However, on February 26 the court granted a motion for rehearing to the defendants in the precedent breaking case, thereby effectually rejecting its earlier decision. Under Arizona court procedure there will be no further argument of the case, only the writing of a new decision by the new majority.

The case involved suit by several domestic water users near Laveen who charged that heavy pumping for irrigation by a nearby dairy, among others, had caused domestic wells to go dry in 1948. Under the state's implicit acceptance of English common law as governing water rights, landowners have a right in everything above and below their property, from the sky to the center of the earth. The original court majority held that retention of this theory, even if modified to specify "reasonable use," would prove unworkable. They sought to adopt the theory of public ownership of groundwater, and to establish priorities among appropriative rights to its use.

Several points made by the dissenting minority on January 12 will doubtless come up for closer inspection now that their viewpoint prevails. Justice La Prade, a dissenter, favored the English common law, modified by reasonable use. In the instant case, where he felt the irrigators to be acting in good faith, he proposed injunctive relief only for the plaintiff. Justice De Concini saw four possible solutions in the case, among them the view of La Prade. He also suggested merely upholding the preferential priority of plaintiff's domestic use over the irrigation use of the defendants.

Cheyenne sewage plant now in operation

CHEYENNE'S new sewage disposal plant is now in operation.

The actual use of the new system means that sewage will no longer be dumped into Crow Creek, which health authorities had condemned as poor practice for many years.

Citizens voted through a $1,100,000 bond issue to finance the project, but a court decision was necessary to validate the plan. After a year's delay construction began on the $683,000 plant, $80,000 outfall sewer and service structures.

May water bills will show the first effects of the new sewerage system, though the cost is not expected to exceed $1.25.

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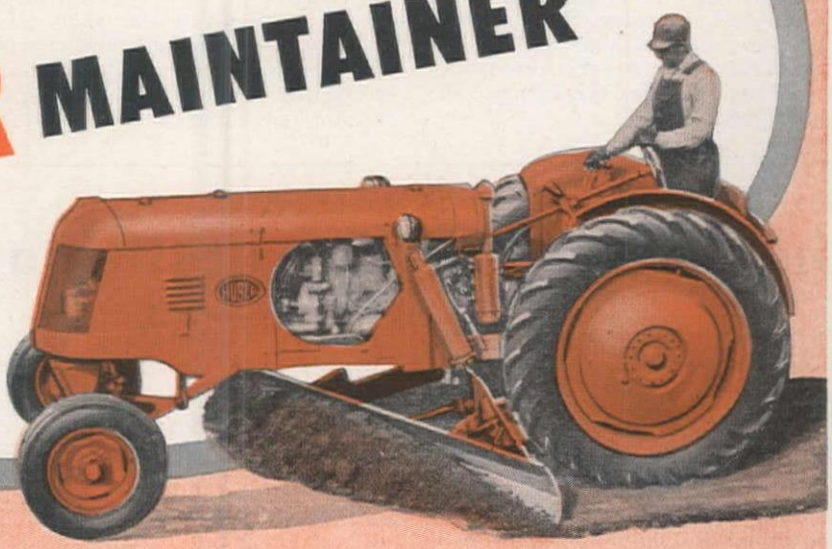

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APWA schedules 58th annual meeting for August in Los Angeles

THE 58TH ANNUAL Congress and Equipment Show to be held in Los Angeles by the American Public Works Association from August 24 to 27, promises to be the largest in attendance and interest ever held by the organization. Membership is composed of city engineers and public works officials of virtually every city, county and state in the United States.

The official headquarters hotel for the convention will be the Ambassador, and meetings will be held in the exhibit hall at the Shrine Auditorium. Free and continuous bus service will be available between the two points for registered delegates and their families, according to the announcement.

The Equipment Show, as in past years, will be one of the outstanding features of the Congress. Exhibitors will show new equipment suitable for municipal and public works use. Well qualified speakers have been obtained and panel discussions of important topics relating to public works construction will be held.

The social side of the Convention will not be neglected. A special trip which will undoubtedly be one of the outstanding features of the Congress is a post-conventin all-expense nine-day Hawaiian holiday for delegates and their families. Also, a get-together party, tours of interesting points in Los Angeles, a convention banquet at the Ambassador, and specially arranged tours for the ladies are planned.

The Hawaii trip is being planned and organized by Pan American Airways and will leave Los Angeles on August 28 for an overnight flight to Honolulu. A full schedule of tourist activities is planned for seven days. On September 5 the overnight return flight to Los Angeles, San Francisco, Portland, or Seattle will end the Hawaii vacation. An all-expense plan amounts to $64.81 per person, on the basis of two to a room. This covers all expenses except meals. A partial payment plan is available for the Hawaii trip. Information and reservations may be had from C. R. Kirk, Pan American World Airways, 300 N. Michigan Ave., Chicago 1, Ill.

Planning for the Congress and Equipment Show is being carried out by a committee with C. Don Field, president of the Los Angeles Board of Public Works, as general chairman.

Kings River plan for USBR outlined for comment

A PROPOSED PLAN for a $196,000,000 Federal hydroelectric power development on the North Fork of the Kings River in California as a part of the Central Valley project has been forwarded by the Bureau of Reclamation to State and Federal officials for review and comment.

The program contemplates the generation of power at six plants on the river, including a 45,000-kw. installation at Pine Flat Dam now under construction by the Army Corps of Engineers, and acquisition and enlargement to 115,000-kw. capacity of the 31,500-kw. Balch power plant now operated by the Pacific Gas and Electric Company. The six plants would have a total installed capacity of about 350,000 kw. and, with firming assistance from the proposed Central Valley Project steam-electric plant enlarged by 90,000 kilowatts as a part of this unit plan, would produce an estimated annual output of almost 2,000,000,000 kw-hr of electric energy.

A license to develop a portion of the hydroelectric potential of the North Fork of the Kings River, which will be made possible by the construction of Pine Flat Dam by the Federal Government, was recently granted to the Pacific Gas and Electric Company by the Federal Power Commission. Acting at the request of Secretary Chapman, the Department of Justice has petitioned the Ninth Circuit Court of Appeals to review and set aside the Federal Power Commission action.

Commissioner of Reclamation Straus said the Kings River hydroelectric development is very similar in principle to the American River development which the Congress decreed should be made a part of th Central Valley Project. The hydroelectric development there is also made possible as the result of dam construction by the Federal Government and the Pacific Gas and Electric Company was seeking a license to construct a power plant before the matter was decided by the Congress.

The plan of operation for the new power development, officially designated the North Fork Kings Unit, Kings River Division, Central Valley Project, includes the following features:

1. **Helms Dam and Reservoir,** about ½ mi. downstream from San Meadow on Helms Creek. A concrete dam 320 ft. high and 1,000 ft. long, providing for storage of 103,000 acre-feet of water. Estimated cost of $11,540,000.

2. **A diversion system,** including about 6 mi. of tunnels, to divert the flow of Post Corral Creek, Fleming Creek and the North Fork of Kings River into Helms Reservoir for storage and release when required. Estimated cost, $16,060,000.

3. **Wishon Dam, reservoir and power plant,** at the lower end of Collidge Meadow on North Fork Kings River. The dam will be a combination earth-and-rockfill structure, 267 ft. high and 4,350 ft. long. The reservoir, with storage capacity of 128,000 acre-feet, will create a lake almost 3 mi. in length with a surface area of 1,000 acres. Wishon power plant, with a capacity of 10,000 kw., will be located at the downstream toe of the dam. The dam and reservoir have an estimated total cost of $25,600,000 and the power plant, $1,375,000.

4. **Helms Power Plant:** Located on the shore of Wishon Reservoir, will have a capacity of 41,000 kw. A 2½-mi. tunnel, nearly 8 ft. in diameter, will carry water from Helms Reservoir to the power plant penstocks. Estimated to cost $11,770,000.

5. **Haas power development,** on the west side of the North Fork of Kings River, 2,000 ft. downstream from Wishon Dam. A diversion tunnel, 6.1 mi. in length and 9½-ft. inside diameter, will be driven through rock canyon walls to penstocks leading to four generators of 26,500-kw. capacity each, with a total installed capacity of 106,000 kw. for the entire plant. Estimated to cost $26,975,000.

6. **Balch power development,** to include acquisition from the Pacific Gas and Electric Company of the existing diversion dam, tunnel, penstock, power plant and afterbay, together with installation of additional penstocks and enlargement of the power plant to a total capacity of 115,000 kw. The estimated total cost, including acquisition, is $16,226,000.

7. **Kirch power development** will utilize the available drop between the afterbay at the Balch plant and Pine Flat Reservoir. A tunnel will be bored on the north side of the North Fork, and a power plant located on the shore of Pine Flat Reservoir where Sycamore Springs Creek flows into the reservoir, would consist of two power-generating units, each of 18,000-kw. capacity. Total cost estimated at $13,761,000.

8. **Pine Flat Power Plant.** Construction by the Corps of Engineers of the 1,000,000-acre-foot capacity Pine Flat Reservoir is in progress and outlets for penstocks are to be provided in the dam. The power plant will have an installed capacity of 45,000 kw., at an estimated cost of $5,180,000.

The power development program also provides for transmission and substation facilities at a total cost of $43,242,000, to distribute the power to the Kings River service area and surrounding territory and to provide the necessary interconnection with the Central Valley Project power system. It also includes a 90,000-kw. enlargement to the proposed Delta steam-electric power plant of the Central Valley Project, at a cost of $14,231,000.

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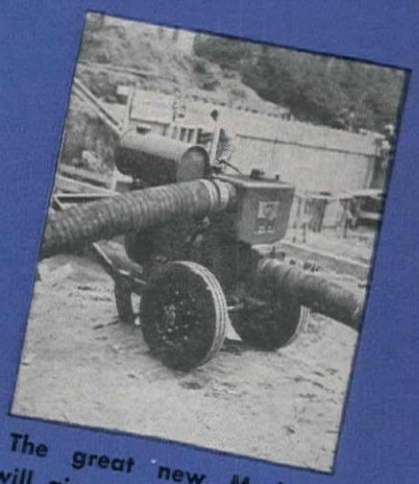

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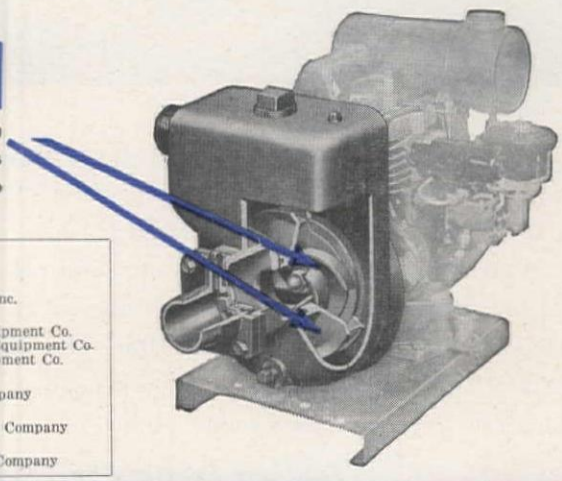

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BUILDING TRADES BLUEPRINT READING AND SKETCHING

This is a basic course in blueprint reading and sketching, presented between the two covers of a loose-leaf type manual. The entire text is presented in such a way that the reader can teach himself the fundamentals of this subject. The book is divided into units, which progress from an introduction to the blueprint to specific applications. Each unit closes with several test questions, which give the reader a chance to determine how much he has gained from reading the section. There are also pages where the reader is to apply the knowledge gained by drawing a certain view, etc. Several pages of actual blueprints fold out of the book to illustrate points. In conclusion, sets of true-false and multiple choice questions are included to cover the entire course. The convenient study manual is published by Delmar Publishers, Inc., Albany, New York. 193 pages, 8½ x 10½. $1.95.

BUILDING CONSTRUCTION COST DATA, 1952—by Means

The author carefully considered the needs of those making engineering estimates when he compiled the information contained in this price profile. Source material for the prices collated includes: prices in the entire U. S. and in certain localities during 1951; actual job costs in 1951; quotations of prices in 1952 and January 1952 labor rates. The book's introduction offers a few tips on estimating techniques, as well as an explanation of how the book can be used to aid in estimating. The book is indexed alphabetically in Part I for easy reference to any particular material. When the desired material is found its price, labor cost and the total of the two costs is presented. Part II gives breakdowns. The material is printed in engineering lettering. Published by Robert Snow Means, Architectural Engineer, Duxbury, Mass. 7¼ x 10¼. Price $2.75.

A REFERENCE HANDBOOK FOR CONSTRUCTION ENGINEERS, ETC. —by Richey

In this practical volume, H. G. Richey offers the knowledge gained during many years in the construction business. He believes that this book will fill the needs of construction engineers, builders, superintendents, and foremen for a field or office reference book on a wide variety of operations. Richey includes sections on foundations, waterproofing, building stones, brickwork, limes and cements, concrete, iron, steel, timber, etc. Diagrams and tables are included to illustrate points. Richey's years of experience have taught him many interesting techniques which are not contained in other printed matter. The personal approach to the handbook is an interesting one. Published by H. G. Richey, New Orleans, La. 4½ x 6¾ x 1¾ (thickness). $10.00.

ENGINEERS AND IVORY TOWERS— Cross and Goodpasture

Taken from the extensive writings of Hardy Cross, chairman of the department of civil engineering, Yale University, and edited by Robert C. Goodpasture, this book is a milestone in engineering literature. It presents Cross' philosophy of engineering and general education in an interesting fashion which should appeal to the field. The relationship of the engineer and engineering to science and other fields such as the humanities is presented. Here also are Cross' views on education, graduate study, the application (and misapplication) of standardization and the responsibilities and obligations of engineers. Published by McGraw-Hill Publishing Co., Inc., New York. 150 pages. Price $3.00 (approx.).

LAND FOR TOMORROW is an interesting study by an eminent geographer, Dr. L. Dudley Stamp, of the undeveloped lands in the world, and the fact that increasing population will make it necessary to develop these lands as a source of food supply. Surprisingly enough, Stamp points out that these lands of tomorrow will not be in the unpopulated tropical areas, but in places like the U. S., which are heavily populated already. This is interesting to irrigation engineers since any increase in agricultural production on perhaps marginal land would be sure to present irrigation problems. Published by Indiana University Press. 230 pages, 5½ x 8¼. Price $4.00.

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.

More money for Grand Coulee third powerhouse study?

THE APPROPRIATION of an additional $225,000 for a Bureau of Reclamation study of a possible third power house at Grand Coulee is in the offing, according to a prediction of Representative Jackson, (D-Wash.)

The President's original budget allotted only $125,000 for the work, but Jackson, a member of the committee, feels that his suggestion for an additional amount will be granted for studies and exploration.

Approximately 1,000,000 kw. of added energy would be added by a third power house. Jackson estimates that the studies will take about a year to complete and that the power house construction will be finished by 1957 if appropriations are granted.

Hardrock tunneling record beaten in Colorado

Editor, *Western Construction:*

It might interest you to know that on April 10th we drove 111 ft. of tunnel through solid rock in 24 hr. This exceeds the old world record of 104 ft., by 7 ft.

This new record was made on Tunnel No. 4 of the Bureau of Reclamation North Poudre Supply Canal job.

L. A. STILES, Superintendent
G. L. Tarlton Contracting Co.

April 14, 1952

CALENDAR OF MEETINGS

June 5-7—**The National Society of Professional Engineers,** Annual Meeting, Tulsa, Oklahoma.

June 5-7 — **Western Association of State Highway Officials,** Annual Meeting, Olympic Hotel, Seattle, Wash.

June 16-21 — **American Society of Civil Engineers,** Denver Convention, Cosmopolitan Hotel, Denver, Colo.

June 23 to July 5—**4th Institute of Northwest Resources,** Oregon State College Campus, Corvallis, Ore.

June 23-27 — **American Society for Testing Materials,** Annual Meeting, New York City, New York.

June 26-28—**Symposium on Earthquake and Blast Effects on Structures,** University of California campus, Los Angeles, Calif.

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

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

IT TAKES ONLY ONE

to install pipe

but FIVE to repair it!

One of the most convincing demonstrations on the economy of using *durable* material is a repair job where low-first-cost material has failed—and is being replaced.

The original installation had been quickly made by pipe fitters. But the replacement calls for hours of work by as many as five crafts: pipe fitter, mason, plasterer, carpenter, painter. And this is only part of the cost story. The loss in production or utilization during the shut-down may amount to far more than the maintenance charge.

True, you pay a little more to *begin* with for Byers Wrought Iron pipe . . . but you pay a lot less to *end* with. In literally thousands of applications where corrosion costs you more than wrought iron, the use of this material is the soundest kind of economy move.

WHY WROUGHT IRON LASTS

This notch-fracture test specimen illustrates the unusual fibrous structure of wrought iron—which is responsible for the unusual corrosion resistance of the material. Tiny threads of glass-like silicate slag, distributed through the body of high-purity iron, halt and disperse corrosive attack, and discourage pitting and penetration. They also anchor the initial protective scale, which shields the underlying metal.

You will find a lot of helpful information on the control of excessive maintenance through the use of Byers Wrought Iron pipe in our technical bulletin, WROUGHT IRON FOR PIPING SYSTEMS. We will be glad to send you a copy.

A. M. Byers Company, Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Atlanta, Chicago, St. Louis, Houston, San Francisco, Export Division: New York, New York.

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WROUGHT IRON

TUBULAR AND HOT ROLLED PRODUCTS

ELECTRIC FURNACE QUALITY ALLOY AND STAINLESS STEEL PRODUCTS

ENGINEERS ON THE MOVE

Albert I. Buchecker, assistant city engineer of Spokane, Wash., retires after 43 years of service to the community. Buchecker was a pioneer in the department and recently has been specializing in sewer projects. Among his biggest projects is the $3,500,000 intercepting sewer project.

* * *

George R. McGee is now city engineer of Coos Bay, Ore. He was formerly with Stevens & Thompson engineering firm, Portland.

* * *

The sale of the J. R. Porter Construction Co., Phoenix, Ariz., to **George J. Blecick** is announced. Blecick has been the firm's general manager for two years. No change in the company name is anticipated.

* * *

Six Bureau of Reclamation engineers will go to India to advise the government on construction problems. They are: **Clarence Rawhouser,** Denver, Colo., engineering consultant on dam design; **Paul von der Lippe,** Denver, reclamation specialist in canal, dam and power plant design; **Clifford L. Mutch,** Arapahoe, Neb., reclamation construction engineer. The other three members of the group have not yet been namd.

* * *

N. F. McCoy is the new administrative director of the reorganized State Highway Department in N. Mex. McCoy comes to his new position from a post as principal engineer of the Bureau of Public Road's western district. McCoy was a key man on construction of the Alaska Highway. In his new post, he will be one of the three top officials of the department, under **Burton Dwyre,** state highway enginer.

* * *

Edward E. Morris is now engineer for Flathead National Forest, Montana, succeeding **W. L. Morris,** who moves up to the roads and trails section of the division of engineering. Edward Morris joined the Forest Service in 1935. He has returned from a two-year assignment in Venezuela for developing secondary roads to accept his new position.

* * *

New county road superintendent for Bernalillo County, N. Mex., is **George Harp,** who was county road superintendent in 1947 and 1948. Harp was construction superintendent for Wylie Brothers.

* * *

North Pacific Division of Corps of Engineers announces several changes in personnel. **James E. Reeves** leaves the Corps to accept a post with the Atomic Energy Commission in Albuquerque, N. Mex. Reeves was chief of the engineering division. He will be replaced by **Franklin S. Brown,** formerly chief of the engineering division, Seattle District. **Noble A. Bosley,** former head of the engineering design branch, Seattle, succeeds Brown as chief of the engineering division in Seattle. **Ray Bracelin** moves from his position as project engineer, Chief Joseph Project, to head the Seattle design branch. Bracelin will be replaced by **M. Frank Thomas.**

* * *

Whitney H. Owen is now electrical engineer for Provo, Utah's municipal electric power system. Owen was formerly with the Bureau of Reclamation in research on electric power operation. In his new position he will be staff head of the electric power department and consultant for the entire department.

* * *

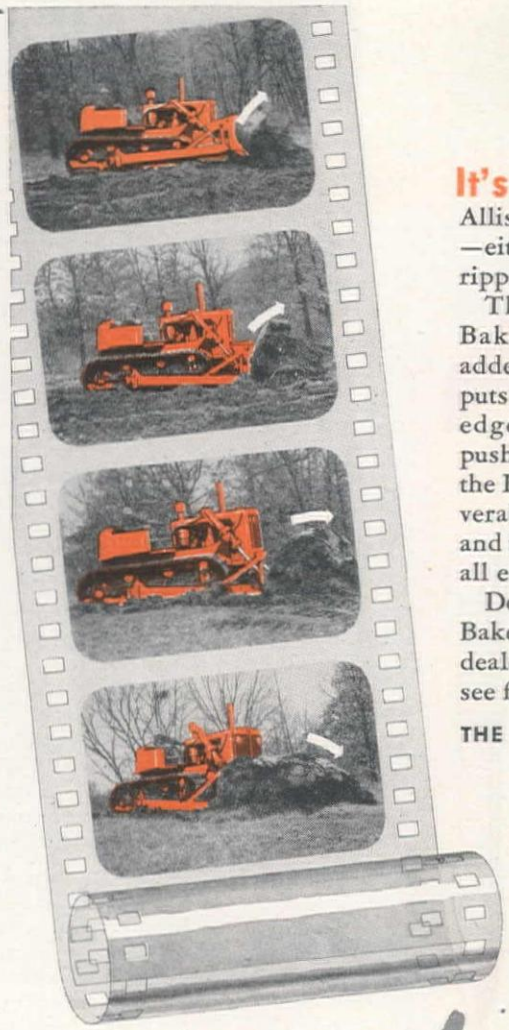
NEW OFFICERS of the Structural Engineers Assoc. of So. Calif. Seated, l. to r., *Harold King*, 1952 president; *C. M. Corbit, Jr.*, sec.-treas.; standing: *Ben Benioff*, vice president; *Donald Shugart*, past president and now president of the state organization and *Robert Short*, past sec.-treas.

* * *

Clifford L. Mutch, Bureau of Reclamation construction engineer, is now on the way to New Delhi, India, as a member of a team which will advise the government on major river development programs. He will advise the Central Water and Power Board. **Clarence Rawhouser** of Denver, Colo., a member of the group, has been in India since late in January. **Paul von der Lippe,** Denver, is en route.

* * *

James H. C. West, Salt Lake City general contractor, has filed as a candidate for state representative from Salt Lake County on the Democratic ticket. West Construction Co. is the firm which West operates.



It's easy dozing with Baker, Allis-Chalmers matched equipment—either for dozing, gradebuilding or ripping roots and rocks.

The "move-more-dirt" curve of Baker's famous involute blades, added to the design feature which puts the tractor weight on the cutting edge, leaves maximum power for push. These Baker features help make the Baker, A-C team the most maneuverable—the most easily operated, and thus by far the most *productive* of all earth moving equipment.

Don't settle for anything less than Baker, A-C! See your Baker, A-C dealer. Get on the bandwagon and see for yourself—

THE BAKER MANUFACTURING CO.
Springfield, Illinois

Wherever you see the Baker, A-C team at work, you see action like that pictured above, in photos of a conservation job near Lanark, Illinois. It's an Allis-Chalmers HD-9 with Baker Bulldozer.

Thar she rolls!

P. S. Have you seen the new 9-X *no push beam dozer?*

They're sold together
A-C BAKER

Seitz Machinery Company, Inc.
Billings, Montana

Mountain Tractor Company
Missoula, Montana

Northland Machinery Company
Sidney, Montana

•

Harry Cornelius Company
Albuquerque, New Mexico

Smith Machinery Company, Inc.
Roswell, New Mexico

•

Dielschneider Equipment Oregon, Ltd.
The Dalles, Oregon

Farm & Industrial Equipment Co.
Eugene, Oregon

West-Hitchcock Corporation
Klamath Falls, Oregon

Oregon Tractor Company
LeGrande, Oregon

Tractor Sales & Service, Inc.
Medford, Oregon

Wood Tractor Company
Portland, Oregon

•

Cate Equipment Company, Inc.
Salt Lake City, Utah

•

A. H. Cox & Company
Seattle, Washington
Wenatchee, Washington
Tacoma, Washington

Northern Harris
Walla Walla, Washington

Yukon Equipment, Inc.
Seattle, Washington
Fairbanks, Alaska
Anchorage, Alaska

American Machine Co.
Spokane, Washington

•

Studer Tractor & Equipment Co.
Casper, Wyoming

DEATHS

Peter Louis Peterson, 76, Arizona construction pioneer, died March 15 in a Mesa hospital after a long illness. Peterson came to Arizona with the U. S. Bureau of Reclamation and worked on the construction of Granite Reef Dam, and several canals in the irrigation system. In later years he was a well-drilling contractor.

☆ ☆ ☆

Joseph Leahy, 78, railroad contractor, died February 18 in his Los Angeles, Calif., home. He was a member of the former firm of White, Brown & Leahy Co., which built railroads throughout the West.

☆ ☆ ☆

C. U. Smith, 66, building inspector and former constructing engineer for Lindsay, Calif., died February 25 in Lindsay from a heart attack.

☆ ☆ ☆

Edgar T. Ham, 66, city engineer and city manager of Redlands, Calif., died February 29 at Redlands Community Hospital. Ham was a former county surveyor and city engineer in San Bernardino.

☆ ☆ ☆

Conrad C. Schrepferman, 87, founder of Denver, Colo.'s oldest contracting firm, died March 2 in his Denver home. He founded the Brown-Schrepferman Co. in 1892. Schrepferman was active on the Denver board of water commissioners for 21 years.

☆ ☆ ☆

James Rhea Luper, 63, former civil engineer with the Walla Walla, Wash., Corps of Engineers, died March 16 in Vancouver.

☆ ☆ ☆

Lt. Col. James Garland, 59, contractor and former construction specialist with the U. S. Army, died in Denver, Colo., March 7 at Veterans Hospital. Garland served the army in construction operations in World War I and II.

☆ ☆ ☆

John Owen Miller, supervising engineer with the California Division of Water Resources, died March 7 in Sutter Hospital, Sacramento, Calif.

☆ ☆ ☆

Peter S. Forbes, 69, road superintendent for the Idaho Department of Highways, died February 1 in a Spokane, Wash., sanitarium.

☆ ☆ ☆

Wilbur O. Hogue, 42, died April 12 in Chicago, Ill. Hogue was a former civil engineer for Firestone Plantations Co., Liberia, Africa, and later held special assignments under the U. S. State Department in Africa and Lebanon. He was the son of Gilbert Hogue, civil engineer, Fresno, California.

SUPERVISING THE JOBS

William Simpson Construction Co. has **Nels Ronneberg** as general superintendent on construction of a $1,500,000 building for Rand Corporation at Santa Monica, Calif. **George Howse** is general foreman, **Knut Roder** is carpenter foreman and **L. W. Martin** is general labor foreman. **Harold Putt** is civil engineer.

* * *

John Woinoski is superintendent for Stolte, Inc., on the $218,199 construction of interceptor and force main sewers in Pacific Grove, Calif.

* * *

H. H. Listerud is superintendent for E. L. Gates Co. on the construction of the Winchester Bay-Clear Lake Unit, Winchester Bay-Forest Boundary Section of the Oregon Coast Highway, in Oregon. **Lyman Smallwood** is clearing superintendent, **John Folden** is foreman, along with **Leo Lockman, Lynn Johnson,** and **Lester Quigley. Olaf Minde** is timekeeper on the $731,139 project.

* * *

N. P. Menard is superintendent for Erland & Blickle on 1.9 mi. of construction on the Woodland East section of Secondary State Highway No. 1-8, Wash. The project cost is $241,840.

* * *

Tom Lillebo is superintendent for his own firm on the $237,709 construction of Scholfield Creek Bridge, on the Oregon Coast Highway in Douglas County, Oregon.

* * *

J. A. Massag is superintendent on construction of Chico Junior High School, Chico, Calif. Ellis W. Barker holds the $1,380,300 contract.

* * *

H. Baker is general superintendent for William P. Neil, Ltd., on construction of a Goodyear Tire and Rubber Co. plant in Los Angeles, Calif. **Fred Maas** is job superintendent. The dirt moving operations are being handled by C. H. Jorgensen, contractor, with **C. P. Dunsmoor** as his superintendent.

* * *

Construction of 100 units for Marble Manor Housing, a Public Housing Authority project in Las Vegas, Nev., is under the supervision of **Norman F. Barber. M. H. Yarter** is carpenter foreman and **Chester B. Foss** is office manager. Daum Construction Co. and M. J. Brock & Sons, Inc., joint venturers, hold the contract.

* * *

Roy Wells is superintendent for Funderburk Construction Co. on a $267,180 grading and oil mat surfacing job on the Lone Rock-Rock Creek section of the North Umpqua County Rd. in Oregon.

* * *

J. E. Folston is superintendent for Babler & Rogers on 4.9 mi. of grading, cinder base and oil mat surfacing operations between Powell and Butte and Deschutes County line on the Powell-Butte Secondary Highway in Oregon. **Nathan J. Newell** is master mechanic on the $134,211 job.

* * *

The $2,500,000 expansion of the Bingo Club, to be called the Sahara Hotel, in Las Vegas, Nev., is under the supervision of **J. E. Salmon. W. C. Turner** and **T. B. Hilton** are carpenter foremen, **L. V. Mansor** is steel foreman and **E. Suring** is labor foreman. **Ed Regalada** is office manager for Del E. Webb Construction Co.

* * *

Extensions to the Antioch steam plant of the Pacific Gas & Electric Co. in California are under the supervision of **E. Garbarini.** Two 125,000-kw. turbo-generator units are involved in this Bechtel Corp. project. **John Shea** is project superintendent for the firm and **Ray Owens** is job superintendent. The same

firm is working on construction of a 600,000-kw. steam plant in Pittsburg, Calif. **E. J. Garbarini** is general superintendent, **Ray L. Stater** is project superintendent and **D. K. Bruner** is job superintendent. **Charles Copeland** is job engineer.

In Marysville, Wash., where Guy F. Atkinson Co. is constructing an overcrossing for Great Northern Railway tracks, **L. O. Grossnickle** is general superintendent with **Ben Veenhuizen** as his assistant. **W. E. Hay** is the firm's district manager. This is a state project.

Paul Everton is general superintendent for M. H. Golden Construction Co. on the construction of University Heights Reservoir for the City of San Diego, Calif. **W. E. Lance** is general foreman, **J. P. Cummings** is grade foreman and **Mike McMahon** is labor foreman. **Al Fuentes** is excavating and equipment superintendent, and **Mauro R. Morales** is saw and yard foreman. **Tom Huff** is resident engineer for the City of San Diego.

Construction of automotive maintenance facilities at Elmendorf Air Force Base in Alaska is being supervised by **Ole Kvernenes. W. B. Akers** is carpenter foreman and **C. E. Jacobsen** is material superintendent. **E. H. Elwin** is general manager for Denali Construction Co., Inc., holder of the $2,108,000 contract. **Jean Nihart** is secretary and **R. H. Penwarden** is office manager. **Ernie Sawyer** is the job engineer.

Lloyd Gilmore is the superintendent and **George Carver** is carpenter foreman for A. Ritchie & Co. on construction of a high school building in Hermiston, Oregon. This is a $867,361 project.

Walter Nordstrom is superintendent for Carl M. Halvorson, Inc., on construction of the Hood River overcrossing on the Columbia River Highway, east of Hood River Depot, in Oregon. **Fred C. Peters** is the project engineer. **Floyd O. Neff** is pile buck foreman, **Ed Ferrenburg** is shovel operator, and **John Helt, Jr.**, is labor foreman on the $196,630 project.

Crushing operations at Isabella, Calif., by Polk, Inc., are under the supervision of **H. W. Polk** with **Glen Winfrey** as his assistant.

William May is superintendent for Garrett Construction Specialties, Inc., on a truss repair job at Goodyear Air Force Base, near Phoenix, Ariz. **Phil Patch** is engineer.

J. N. McPhee is superintendent for Del E. Webb Construction Co. on the army barracks project at Ft. Ord, Calif. **Les Benton** is general carpenter foreman with **Jack Dodd. C. Maslen** is labor foreman. The project cost is $12,600,000.

Down-time Dopes. . . . . by Domagalski

"It says right here in *Western Construction* that we're empire builders."

Drawn especially for Western Construction

Frank T. Hickey Inc., excavating and grading subcontractor, has **Don P. Mosley** as general superintendent with **Otto Prestesater** as job superintendent. **Durward Douglas** is master mechanic.

Construction of the Paradise cut-off bridge, between Stockton and Tracy, Calif., is under the supervision of **Joe Hurtado. John Vrieling** is general foreman for Nomellini Construction Co. Macco Construction Co. holds the pile driving subcontract and **Marshall Dietrich** is the superintendent.

C. C. DeArmond is general project superintendent on the $4,500,000 project for construction of barracks, miscellaneous facilities, roads and utilities at NAAS, Miramar, San Diego, Calif., for the F. E. Young Construction Company. **L. W. Cook** is assistant superintendent, **F. V. Wells, Jr.**, is project engineer,

***C. C. DeArmond*, general superintendent for F. E. Young Const. Co. on Naval construction at Miramar, Calif. (See item).**

Claude L. Morris, project manager. **George Lukesh** is general labor foreman. **Chuck Meech** is master mechanic. **R. Rose** is superintendent for Soulé Steel on reinforcing. **B. J. Moore** is superintendent for C. D. Wailes Corporation on precast concrete panels.

Jack Bain is superintendent on the construction of the reinforced concrete Stockton State Hospital, Stockton, Calif. **Earl Schmidt** is carpenter foreman and **Frank Dashler** is labor foreman for Spears Construction Co.

Herb Myers is superintendent for Nomellini Construction Co. on the firm's $2,000,000 contract for Stockton State Hospital. **Ted Wall, Cliff Finley, H. F. Myers** and **Vern Wilkinson** are carpenter foremen. **Roy Beckner** is labor foreman on the job.

Construction of a church and rectory building for St. Leo's Parish in San Jose, Calif., is under the supervision of **C. C. Anderson.** Carl N. Swanson Co. holds the $520,000 contract.

P&H STABILITY

MEANS FASTER DIGGING!

Whatever the attachment . . . shovel, dragline, hoe, clamshell or pile driver . . . P&H gives you more production. Why? Because P&H's lower center of gravity and better weight distribution let you apply more power at the business end. You can put "more on the hook" — dig harder — work faster!

Modern design contributes still more speed with advantages like true tractor-type crawlers, easy hydraulic control, all-welded construction, live roller circle — and many others. See your P&H dealer today.

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LOS ANGELES 21, California....Lee & Thatro Equipment Co., Inc., 820 Santa Fe Ave.
SACRAMENTO, California.....Sacramento Valley Tractor Co., 1901 Broadway
SAN DIEGO 13, Calif.....Southern Equipment & Supply Co., 2025 East Harbor Drive
RENO, Nevada.....Jenkins & Aibright Mack Truck Sales, 1131 W. 4th Street
EUGENE, Oregon.....Loggers & Contractors Machinery Co., 540 Filmore Street
PORTLAND 14, Oregon....Loggers & Contractors Machinery Co., 240 S.E. Clay Street
SALT LAKE CITY, Utah.....Western Machinery Company, 748 West 8th, South
SEATTLE 8, Washington.....Bow Lake Equipment Co., Inc., 300 Michigan Street
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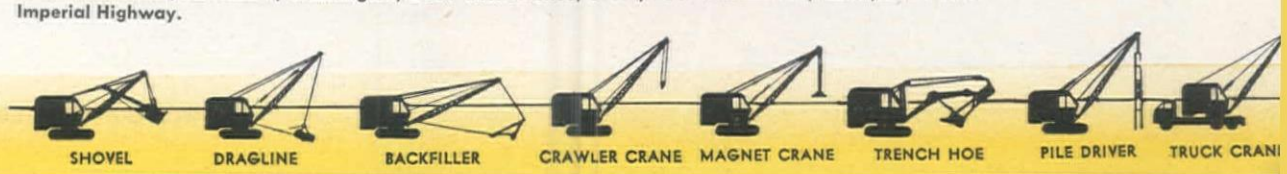
The P&H Line



SHOVEL DRAGLINE BACKFILLER CRAWLER CRANE MAGNET CRANE TRENCH HOE PILE DRIVER TRUCK CRANE

SUPERVISORS AT CHIEF JOSEPH DAM

Pictured below are key personnel at the Chief Joseph Dam project on the Columbia River in Washington. A full report of the project begins on page 69 of this issue.

1. TOP ROW: *R. F. Murphy*, excav. supt.; *C. F. Hansen*, excav. fore., drilling and blasting; *Frank Warthen*, asst. excav. supt. BOTTOM ROW: *W. L. Woodworth*, mech. fore.; *Harold Schmidtgal*, excav. cost engr.

2. TOP ROW: *T. E. Curtis*, gen. supt.; *J. W. Drinnon*, batch and mix supt.; *Floyde Steele*, rigger asst. supt.; *L. R. (Doc) Kramer*, safety engr. BOTTOM ROW: *R. H. Miller* and *Frank Stevens*, shift walkers. *William Jones*, rigger supt., and *Joseph De Milita*, shift walker, not shown.

3. TOP ROW: *G. A. Henningsgard*, purch. agent; *R. E. Moen*, storekeeper. BOTTOM ROW: *R. J. Jones*, inventory control clerk; *William Service*, storekeeper.

4. TOP ROW: *J. O. Gossett*, master mech.; *A. M. Freitas*, aggregate plant supt.; *W. B. Hughes*, elect. fore. BOTTOM ROW: *M. L. Prouty*, elect. supt.; *W. T. Gossett*, shop fore. *Stanton Fraser*, carp. supt., not shown.

5. TOP ROW: *John Cooney*, field engr.; *Bruce Gibson*, office engr.; *R. W. Whiteley*, plant design engr. BOTTOM ROW: *Michael Graves*, chief design engr.; *C. A. Lindberg*, quantity engr. *Morris Hayes*, field engr., and *W. B. Evans*, design engr., not shown.

(All captions read left to right unless otherwise indicated.)

CHIEF JOSEPH DAM

. . . Continued from page 75

struction of the first cofferdam. The downstream arm of the second cofferdam is being constructed in a similar manner. Pumps, used in the first stage cofferdam, will soon be installed to dewater the area within the second stage cofferdam to allow excavation for the foundation of, and construction of the south half of the dam.

Nearly 6,000 tons of steel sheet piling is involved in the construction of the cofferdams, all U. S. Steel Company section MP-101 piling. Special inspection guaranteed 15,000-lb. strength per lineal inch of piling. This special strength piling is required because of the high tensile stresses induced by high cells 63 ft. in diameter. Piling lengths ranged from 50 to 72 feet.

Subcontractors on the job include the Reynolds Trucking Company; Power City Electric Co. of Spokane, for permanent electrical installations; Rutherford and Skoubye of Oakland, placing reinforcing; and the Continental Drilling Co., Los Angeles, foundation drilling and grouting.

Personnel

Col. John P. Buehler is District Engineer, Corps of Engineers, Seattle, with Charles H. Wagner as resident engineer on the project.

For Chief Joseph Builders, W. N. Evans is project manager, K. L. Parker is chief engineer, T. C. Curtis is general superintendent and A. D. Haile is office manager. Haile also takes the job pictures, some of which are used with the article. Key men, most of whom have been with the L. E. Dixon Company, sponsor for Chief Joseph Builders, for ten years and more on construction of many dams, include: Wm. C. Jones, chief rigger; Mel Prouty, chief electrician; James Drinnon, plant superintendent; A. M. Freitas, aggregate plant superintendent; R. F. Murphy, excavation superintendent; Stanton Fraser, carpenter superintendent; and John Cooney and Morris Hayes, chief field engineers. Shift superintendents are J. Demilita, R. H. Miller and Frank Stevens.

Safety and first aid man is L. R. (Doc) Kramer, the office engineer is J. B. Gibson, the master mechanic is John Gossett, and his brother Wm. Gossett is shop foreman. The Gossetts are notable for having first developed the now universally used air-operated concrete bucket. Their original model, made for Arundel-Dixon operations at Allatoona Dam in Georgia, was later refined and mass-produced under agreement with the Gar-Bro Manufacturing Co. of Los Angeles.

This crew really work together as a team, and as a result of their know-how and cooperation it has been a safe, clean, efficient job. Their record for safety on heavy construction is second to none, having successfully completed many millions of dollars of dam building without a fatal or crippling accident since 1945.

Change TIMKEN® bit types as the ground changes, right on the job!

YOU can quickly change to the most economical bit as the ground changes when you use Timken® interchangeable rock bits. And you can do it *right on the job.* That's because both Timken multi-use bits and Timken carbide insert bits fit the same threaded drill steel.

No need to stock drill steels for both types. No need to waste drilling time while you go back for another set of drill steels. No need to spend costly shop time preparing two sets of drill steels.

Use Timken multi-use bits for ordinary ground. With correct and controlled reconditioning, they'll give you the lowest cost per foot of hole when full increments of steel can be drilled.

When you hit hard and abrasive ground, switch to Timken carbide insert bits for greatest economy. They're your best bet for maximum speed drilling, constant-gauge holes, small diameter blast holes and very deep holes. With both types of Timken bits on hand, you'll have the answer to every one of your drilling problems.

Timken carbide insert bits and multi-use bits are interchangeable in each thread series. And remember that both types of Timken rock bits have these three important advantages: (1) they're made from electric furnace Timken fine alloy steel, (2) threads are not subject to drilling impact because of the special shoulder union developed by the Timken Company, (3) they're quickly and easily changed.

Call upon the 20-years' experience of our Rock Bit Engineering Service for help in selecting the best bits for *your* job. Write The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

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your best bet for the best bit ... for every job

CONTRACTS

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

****

Alaska

$2,935,218—**S. Birch & Sons** and **Green Construction Co.,** 208 Central Bldg., Seattle—Award for construction of outside utilities at Elmendorf Air Force Base; by C. of E.

$150,752—**Ray James Construction Co.,** Palmer—Low bid for construction of a water system at Cordova; by Alaska Public Works.

$2,878,710—**Johnson, Drake & Piper** and **Puget Sound Bridge & Dredging Co.,** 2929 16th Ave. S.W., Seattle, Wash.—Low bid for construction of water main, buildings and related work, Kodiak Naval Base; by 13th Naval District.

$458,050—**Sealand Construction Co.,** 3647 Stone Way, Seattle—Low bid for construction of two high frequency communications stations at Angoon and Rogers Pt.; by USCAA.

$444,423—**Wiggins Construction Co., Inc.,** Anchorage—Low bid for construction of a 115-kv. transmission line from Eklutna to Anchorage, a distance of 26 mi.; by USBR.

California

$131,908—**Affiliated Engineers, Contractors, Inc.,** Chamber of Commerce Bldg., Sacramento—Low bid for construction of a sewage treatment plant, Folsom; by City of Folsom.

$117,890—**Associated Pipeline Welders, Inc.,** P. O. Box 563, Colma—Low bid for improvements and extensions to utilities at U. S. Naval Air Station, Oakland; by 12th Naval District.

$5,772,955—**Guy F. Atkinson Co.,** 10 W. Orange Ave., So. San Francisco—Low bid for construction of the Folsom power plant on the American River; by USBR.

$857,980—**Gordon Ball, San Ramon Valley Land Co.** and **Trewhitt, Shields & Fisher,** 926 Parallel Ave., Fresno—Low bid for construction of six overcrossings, portions of a roadway for a divided highway, connecting roads, frontage roads, and approach ramps to be graded, and imported base material and plant-mix surfacing to be placed on designated ramps, connecting roads and frontage roads; by St. Div. of Hwys.

$193,745—**Basich Bros. Construction Co.** (Corp.), **N. L. and R. L. Basich,** 1148 N. San Gabriel Blvd., Garvey—Low bid for widening 11.8 mi. of roadbed, applying bituminous surface treatment and resurfacing with plant-mix surfacing; between East Highline Canal and the junction with route 202; by St. Div. of Hwys.

$354,024—**Basich Bros. Construction Co.** (Corp.), **N. L. and R. L. Basich,** 1148 N. San Gabriel Blvd., Garvey—Low bid for grading about 1.7 mi. of divided highway and placing imported subbase material; cement-treated base to be constructed and surfaced with plant-mix surfacing; construction of a reinforced concrete slab bridge across New River, bet. the south city limits of Brawley and 1.1 mi. west of Brawley; by St. Div. of Hwys.

$360,290—**Baun Construction Co.,** 324 Princeton Ave., Fresno—Low bid for 4.2 mi. of grading and paving with plant-mixed surfacing on cement-treated base, bet. 1 mi. north of Corcoran and ¾ mi. south of Kings-Tulare County line; by St. Div. of Hwys.

$1,471,258—**Joseph Bettencourt,** 1015 San Mateo Ave., San Bruno—Award for construction of a junior high school in Vallejo; by Vallejo City Unified School District.

$2,238,685—**Bressi & Bevanda Constructors, Inc.,** P. O. Box 439, North Hollywood—Low bid for 4.4 mi. construction of graded roadbeds, surfacing the freeway with portland cement concrete pavement on cement-treated subgrade; surfacing front roads, ramps and intersection streets and roads with plant-mix surfacing on cement-treated base and on selected material, applying seal coats. Construction of 2 reinforced concrete bridges, an overhead crossing over the tracks of the A. T. & S. F., a pedestrian undercrossing and 6 grade separation structures, betw. 2.2 mi. south of Carlsbad and Buena Vista Creek, San Diego County; by St. Div. of Hwys.

$183,225—**Brown-Ely, Contractors,** 7360 Schmidt Lane, El Cerrito—Low bid for constructing about 0.9 mi. of state highway, cross roads, and road approaches, imported subbase material, crushed rock base, cement-treated, portland cement concrete pavement and plant-mix surfacing to be placed and a reinforced concrete slab bridge (undercrossing) to be constructed, Marin County; by St. Div. of Hwys.

$407,251—**Eaton & Smith,** 1215 Michigan St., San Francisco—Low bid for construction of 4.2 mi. on the Chilcoot grade section of the Feather River Highway, betw. Beckworth Pass and Route 29, Plumas and Lassen counties; by St. Div. of Hwys.

$404,707—**J. E. Haddock, Ltd.,** P. O. Box 188E, Pasadena—Low bid for construction of a reinforced concrete bridge and about 0.3 mi. of approaches to be graded and surfaced with plant-mix surfacing, over Los Angeles Freeway at Artesia St., Long Beach; by St. Div. of Hwys.

$119,453—**M. W. Hongola & Son,** P. O. Box 382, Ontario—Award for construction of a sewerage system for 22nd District Agricultural Association, Del Mar; by St. Div. of Arch.

$620,000—**Peter Kiewit Sons' Co.,** 345 Kieways Ave., Arcadia—Award for strengthening taxiways and parking aprons, Brown Field; by Dept. of the Navy.

$175,487—**Vido Kovacevich,** 5300 Imperial Highway, South Gate—Low bid for about 4.1 mi. of plant-mix surfacing to be placed over existing pavement on a portion of the project and a portion to be widened with imported subbase material and untreated rock base and plant-mix surfacing placed over the new and existing pavement, betw. Anaheim-Telegraph Rd. and Garvey Ave., Los Angeles County; by St. Div. of Hwys.

$102,261—**Macal Improvement Co., Inc.,** Rt. 1, Box 99, Antioch—Low bid for grading about 3.1 mi. on Willits-Ft. Bragg road, betw. 10 mi. west of Willits and 6.9 mi. west of Willits, Mendocino County; by St. Div. of Hwys.

$191,654—**McGuire & Hester,** 796 66th Ave., Oakland—Award for construction of Section 4 of the Alameda Interceptor sewer and Section 7 of South Interceptor; by East Bay Municipal Utility District.

$2,548,100—**Robert E. McKee,** 4700 San Fernando Rd., West Los Angeles—Low bid for construction of a building at Patton State Hospital, Patton; by St. Div. of Arch.

$1,384,000—**Nomellini Construction Co.,** P. O. Box 11777, Stockton—Low bid for general construction of buildings at Mendocino State Hospital, Talmage; by State Div. of Arch.

$104,305—**C. W. Peterson,** 6856 Vantage Ave., North Hollywood—Low bid for 2.1 mi. of grading, imported base material to be placed and bituminous surfacing treatment to be applied bet. Chiquita and 2.1 mi. southeasterly, El Dorado County; by St. Div. of Hwys.

$1,673,277—**Piombo Construction Co.,** 1571 Turk St., San Francisco—Low bid for grading and paving 2.6 mi. with portland cement concrete on cement-treated subgrade, and separation structures to be built, betw. the north city limits and 0.1 mi. south of the south city limits of San Mateo, San Mateo County; by St. Div. of Hwys.

$1,545,208—**Pozzo Construction Co.,** 2403 Riverside Dr., Los Angeles—Award for construction of a 5-story and basement, reinforced concrete St. Joseph Hospital addition, Burbank; by Sisters of Charity of the House of Providence.

$129,956—**Rice Bros., Inc.,** 8th and Yuba St., Marysville—Low bid for 17.6 mi. of grading and surfacing with plant-mix surfacing and untreated rock base, bituminous surface treatment to be applied to shoulders on portions and a Cl "B-single" seal coat applied to other portions; betw. Kern County line and Dunmovin; by St. Div. of Hwys.

$379,848—**Rice Bros, Inc.,** 8th and Yuba Sts., Marysville—Low bid for 5.2 mi. of surfacing with plant-mix surfacing on cement-treated imported base material and seal coats to be applied, Monterey County; by St. Div. of Hwys.

$254,129—**M. J. Ruddy & Son,** 922 J St., Modesto—Low bid for plant-mix surfacing on untreated rock base along 7.9 mi. bet. junction with Route 41 and 6.5 mi. west of Modesto, San Joaquin and Stanislaus counties; by St. Div. of Hwys.

$130,008—**Arthur B. Siri, Inc.,** 1357 Cleveland Ave., Santa Rosa—Low bid for about 1.3 mi. of grading and surfacing with road-

mix surfacing on cement treated base at two locations, betw Boonville and 0.9 mi. east of Shearing Creek; by St. Div. o Hwys.

$245,718—**L. G. Smith,** P. O. Box 610, San Mateo—Low bid fo resurfacing about 5.1 mi. with plant-mix surfacing; on Bayshor Freeway betw. Colma Creek and Broadway; by St. Div. of Hwys

$174,019—**Tomei Construction Co.,** 4737 Orion Ave., Van Nuy —Low bid for construction of runways and taxiways, portion o Stage 1 construction; by Los Angeles Dept. of Airports.

$117,771—**Transocean Engineering Corp.,** 15890 Hesperian Blvd. San Lorenzo—Low bid for construction of a reinforced concrete box girder bridge and approaches; surfacing with road-mix surfacing and seal coats applied across Indian Creek, about 5 mi northwest of Boonville, Mendocino County; by St. Div. of Hwys

$8,898,200—**Ford J. Twaits, Morrison-Knudsen Co., Inc.,** and **Macco Corporation,** joint venturers, 449 S. Beaudry St., Los Angeles—Low bid based on tilt-up method of construction for work on Marine Corps Artillery Training Center, Twenty-nine Palms; by Bureau of Yards and Docks.

$125,124—**United Concrete Pipe Corp.,** Box 425, Baldwin Park—Low bid for 7.6 mi. of work on Santa Fe Ave. and Geer Rd., bet. 1 mi. south of Empire and Monte Vista Rd., a portion to be surfaced with plant-mix surfacing on untreated rock base and a portion to be widened with untreated rock base and resurfaced with plant-mix surfacing, Stanislaus County; by St. Div. of Hwys.

$477,545—**United Concrete Pipe Corp.,** Box 425, Baldwin Park —Low bid for construction of a reinforced concrete girder bridge and approach embankments on Santa Ana Freeway over San Gabriel River; by St. Div. of Hwys.

$8,990,000—**Del E. Webb Construction Co.,** Box 4066, Phoenix, Ariz.—Low bid based on precast concrete construction work for Marine Corps Artillery Training Center, Twenty-nine Palms; by Bureau of Yards and Docks.

$764,976—**Webb & White,** 7220½ Melrose Ave., Los Angeles—Low bid for grading of about 12 mi. of roadways for a 4-lane divided highway with frontage roads and interchange connec-

tions; surfacing with portland cement concrete on cement treated subgrade and plant-mix surfacing on untreated rock base and two grade separation structures, on Santa Ana Freeway, bet. 0.2 mi. westerly of Los Angeles St. and Orangewood Ave.; by St. Div. of Hwys.

Idaho

$145,309—**Arrington Construction Co.,** P. O. Box 881, Idaho Falls—Award for construction of 1.0 mi. of the Yellowstone Park Highway, applying a plant-mix bituminous surface, Bonneville County; by St. Dept. of Hwys.

$1,152,950—**Carl M. Halvorson, Inc.,** 218 Builders Exchange Bldg,. Portland—Low bid for construction of Section 3 of the Lucky Peak Dam road relocation in Idaho; by St. Dept. of Hwys.

$29,180,346—**J. A. Jones Construction Co.,** and **C. H. Tompkins Co.,** 907 S. 16th St., Washington, D. C.—Low bid for construction of Palisades Dam, Irwin; by USBR.

Montana

$84,366—**Bert Miller & John Weiser,** 440 Edgewood St., Inglewood, Calif.—Low bid for West Side Service Road bridge construction, Hungry Horse Project; by USBR.

$259,611—**Naranche & Konda,** Butte—Award for 14.9 mi. grading, gravel surfacing and drainage structure, betw. Idaho line and Armstead, Beaverhead County; by St. Hwy. Comm.

$123,100—**Glenn Geery, Inc.,** 302 Wilma Bldg., Missoula—Award for crushing and stockpiling 70,000 cu. yd. crushed gravel surfacing in Sanders, Missoula and Granite counties; by St. Hwy. Comm.

$351,862—**McKinnon-Decker Co.,** 1520 Hauser Blvd., Helena—Award for 7.7 mi. grading, gravel surfacing, road-mix oil on the Ethridge-Shelby Highway in Toole County; by St. Hwy. Comm.

$549,127—**McLaughlin, Inc.,** 327 Ford Bldg., Great Falls—Award for 10.4 mi. grading, gravel surfacing and road-mix oil treatment, Three Forks-Toston, Three Forks-Townsend, Broadwater County; by St. Hwy. Comm.

$228,513—**Nilson-Smith Construction Co.,** P. O. Box 1147, Great Falls—Award for 18.3 mi. gravel surfacing, road-mix oiling and drainage structures, Hogan-Simms section, Rogers Pass-Simms Rd. Highway, Lewis and Clark, and Cascade counties; by St. Hwy. Comm.

$679,777—**W. L. Ridge Co.,** Spokane, Wash.—Award for construction of schedule No. 2, Hot Springs-Anaconda, 230,000-kv. power line; by Bonneville Power Administration.

$296,664—**Charles Shannon Co.,** 502 So. Washington St., Butte—Award for 4.5 mi. grading, gravel surfacing, bituminous surfacing treatment on Bearmouth-Deer Lodge Highway, Powell County; by St. Hwy. Comm.

$367,931—**L. A. Woodward Construction Co., Inc.,** and **Ed Tangmo,** 1203 Wyoming St., Missoula—Award for 7.0 mi. grading, gravel surfacing, plant-mix oiling, Missoula-Arlee Highway; by St. Hwy. Comm.

Nevada

$3,250,000—**Nevos Corp.,** 12235 Ventura Blvd., Los Angeles—Construction of 390 dwellings, Sunnyside Tract, Las Vegas; by Nevos Corp.

$313,623—**Silver State Construction Co.,** Fallon—Award for the construction of a portion of the state highway system in Churchill County, from approximately 9 mi. northeast of the Lyon-Churchill county line to the Churchill-Pershing county line; by St. Dept. of Hwys.

$203,758—**Young & Smith Construction Co.,** 204 Beason Bldg., Salt Lake City, Utah—Award for 10.2 mi. of highway work from Mountain Springs Summit to the junction with the Blue Diamond Mine Road, Clark County; by St. Dept. of Hwys.

New Mexico

$504,992—**Irby Construction Co.,** Jackson, Miss.—Award for construction of the 568 mi. distribution system; by New Mexico Electric Cooperative, Inc.

$220,346—**Skousen Construction Co.,** 201 Springer Bldg., Albuquerque—Award for 20.4 mi. of construction on the Taos-Junction-Tres Piedras road in Taos County; by St. Hwy. Dept.

Oregon

$685,349—**Jess W. Briggs Co.**, Bend—Low bid for 11.63 mi. of high standard logging road in Linn County; by BPR.

$400,505—**G. D. Dennis & Sons**, P. O. Box 5328, Portland—Low bid for construction of 4.2 mi. of county road in Lane County, in the vicinity of Lookout Point Reservoir; by C. of E.

$164,320—**Donald M. Drake Co.**, 904 Lewis Bldg., Portland—Low bid for construction of the Tualatin River Bridge, West Portland-Hubbard highway, Washington County; by St. Hwy. Comm.

$731,139—**E. L. Gates & Co., Inc.**, 444 Center St., Salem—Low bid for grading and paving the Winchester Bay-Clear Lake Unit of the Winchester Bay-Forest Boundary Section of the Oregon Coast Highway, Douglas County; by St. Hwy. Comm.

$152,125—**Heavy Hauling Co.**, Astoria—Low bid for grading and oil mat surfacing the North Unit, Princeton-Pollyfarm Section of the Diamond Valley and Rome-Princeton Highway, Harney County; by St. Hwy. Comm.

$190,687—**Roy L. Houck & Son**, Salem—Low bid for grading the Hayesville School-State Street Unit of the Salem By-Pass Section of Pacific Highway East, Marion County; by St. Hwy. Comm.

$120,640—**Inland Construction Co.**, Milwaukie—Low bid for grading and paving a bridge across Eagle Creek, Clackamas Secondary Highway, Clackamas County; by St. Hwy. Comm.

$120,577—**Vernie Jarl**, Gresham—Low bid for grading and paving the Union Ave. service roads section of Pacific Highway East in Multnomah County; by St. Hwy. Comm.

$709,707—**Vernie Jarl**, Gresham—Low bid for grading and rock base on the Shogren-Rowena Creek Unit of the Mosier-The Dalles Section, Columbia River Highway, Wasco County; by St. Hwy. Comm.

$4,975,675—**Kuckenberg Construction Co.**, 11104 N.E. Holman St., Portland—Low bid for construction of a water pipe line from headworks at Bull Run Lake on slopes of Mt. Hood 25 mi. to reservoir within Portland; by City of Portland.

$467,836—**McNutt Bros.**, 351½ E. Broadway, Eugene—Low bid for grading and paving the Chenoweth Park-Oakland Junction Unit of the Chenoweth Park-Deady Section of Pacific Highway, Douglas County; by St. Hwy. Comm.

$407,629—**Rogers Construction Co.**, 11760 N.E. Glisan, Portland—Low bid for grading and paving the Modoc Point-Barkley Springs Unit, Modoc Point-Algoma Section of The Dalles-California Highway, Klamath County; by St. Hwy. Comm.

Utah

$577,269—**Gibbons & Reed Co.**, 259 W. 3rd So., Salt Lake City—Low bid for construction of a 3-in. plant-mix bituminous surfaced road and bridge widening between Brigham and Mantua, Box Elder County; by St. Rd. Comm.

$202,001—**Thorn Construction Co., Inc.**, Springville—Low bid for a 2½-in. plant-mix bituminous surfaced road between Provo and Vineyard, a distance of 5.3 mi., in Utah County; by St. Rd. Comm.

$205,168—**Floyd S. Whiting**, P. O. Box 158, Murray—Low bid for construction of a 2½-in. road-mix bituminous surfaced road between Kanab and 3 mi. north of Kanab, Kane County; by St. Rd. Comm.

Washington

$109,844—**American Terrazzo Co.**, 211 So. Maple Ave., South San Francisco, Calif.—Low bid for terrazzo work in Grand Coulee power plants, pumping plant, machine shop and dam, Columbia Basin Project; by USBR.

$171,703—**Associated Sand & Gravel Co.**, 2508 Colby Ave., Everett—Award for 5.0 mi. of work on Broadway Cut-off, Primary State Highway No. 1, Snohomish County; by St. Dept. of Hwys.

$954,144—**Cherf Bros. Construction Co.** and **Sandkay Contractors, Inc.**, Ephrata—Low bid for construction of the laterals and other structures to deliver water to approximately 14,000 ac. in the Columbia Basin Project; area is located northeast of Warden.

Pardee Place, contractor of East Stroudsburg, Pa., digs and loads old concrete paving at a rebuilding project.

9500 POUNDS OF APPLIED POWER

MAKE *HASH* OF CONCRETE...

Contractor digs and loads old paving with HT4 TRAXCAVATOR!

One man on the seat of the HT4 TRAXCAVATOR controls 9,500 pounds of pushing power concentrated on the rugged bucket . . . he has a lifting power of over 6000 pounds. This applied power digs out old, cracked concrete paving in loadable chunks.

The HT4 will handle this job and hundreds more just as tough. It's built with durability . . . a machine that can turn in profitable production on concrete-busting and easily make big money on "soft" digging, loading and grading tasks.

TRAXCAVATORS are unit-engineered to "Caterpillar" Diesel Tractors for longer life, greater production and lower costs. Ask your "Caterpillar" Dealer for information on the model that can do your work — at a profit . . . or write direct for further information.

TRACKSON COMPANY, Milwaukee 1, Wis.
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TRACKSON

TRAXCAVATORS®
TRACLOADERS
PIPE LAYERS
EARTH AUGERS

Construction includes the building of approx. 40 mi. of unlined laterals and sub-laterals, about 7 mi. of concrete pipe, and other structures; by USBR.

$121,127—**J. H. Collins & Co.,** P. O. Box 678, Walla Walla—Award for 0.5 mi. of work on So. 9th St., PSH No. 3, in Walla Walla; by St. Dept. of Hwys.

$39,749,997—**Columbia River Constructors,** Boise, Idaho (9-firm venture)—Award for construction of the powerhouse for Chief Joseph Dam on the Columbia River above Wenatchee; by C. of E.

$562,205—**Henry George & Sons,** Hutton Bldg., Spokane—Low bid for construction of the fourth section of Potholes East Canal and the Pasco Wasteway, Columbia Basin Project; by USBR.

$226,550—**Goodfellow Bros., Inc.,** Wenatchee—Low bid for construction of laterals located approx. 2 mi. west of Mesa on the Columbia Basin Project; by USBR.

$9,368,990—**Macdonald Building Co., Woodworth & Co., Inc.,** and **Howard S. Wright & Co.,** 1717 S. Tacoma Way, Tacoma—Award for construction of 40 barracks buildings at Ft. Lewis; by C. of E.

$211,197—**Manson Construction & Engineering Co.,** 821 Alaskan Way, Seattle—Award for construction of 1.2 mi. Oso Bridge and approaches on Snohomish County Rd., Snohomish County; by St. Dept. of Hwys.

$187,685—**Osberg Construction Co.,** 1132 N. 128th St., Seattle—Low bid for 4.7 mi. of grading on the Olympic Highway in Jefferson County; by BPR.

$108,660—**F. O. Repine Co.,** 2585 Portland Rd., Salem, Ore.—Low bid for painting at Grand Coulee Dam and right power plant, Columbia Basin Project; by USBR.

$1,388,900—**Strand & Sons,** 3939 University Way, Seattle—Low bid for general construction of dormitory building at Campus Parkway; by University of Washington.

$183,161—**Otis Williams & Co.,** Kennewick—Low bid for construction of the Ringold pumping plant, 15 mi. north of Pasco, Columbia Basin Project; by USBR.

$1,280,797—**J. A. Terteling & Son,** P. O. Box 1428, Boise, Idaho—Award for construction of 19.6 mi. of Union Pacific Railroad and Northern Pacific Railway relocation trackage and 1.9 mi. of highway relocation, including a railroad bridge and the Walla Walla River Highway bridge, all located in Walla Walla and Benton counties; by C. of E.

Wyoming

$674,983—**Brown Construction Co.,** 17 Belle Aire Rd., Colorado Springs, Colo.—Award for grading, draining, base course surfacing, base course stabilization and miscellaneous work on 5 mi. of the Laramie-Cheyenne Rd., Albany County; by St. Hwy. Dept.

$536,258—**Inland Construction Co.,** 3867 Leavenworth St., Omaha—Award for grading, draining, cement stabilized base course, plant-mix surface course, 2-3 continuous reinforced concrete girder span bridges and miscellaneous work on 7.1 mi. of the Gillette-Moorcroft Road in Campbell County; by St. Hwy. Dept.

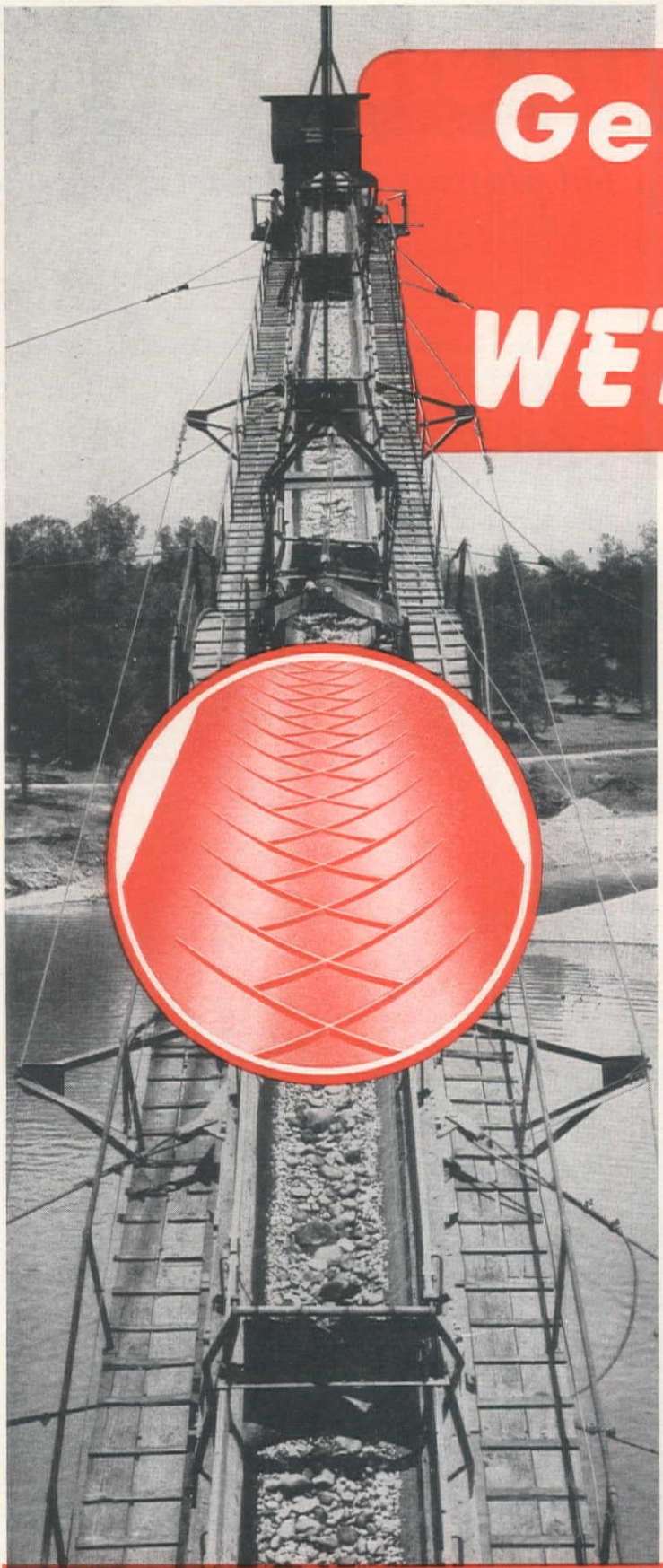
$156,000—**Linebuilders, Inc.,** Billings—Award for construction of 62 mi. of power line through the Big Trails section of Washakie County; by Big Horn Rural Electric Co.

$129,743—**Read Construction Co.,** 706 W. 19th St., Cheyenne—Award for grading, base course surfacing, asphaltic treatment by the road-mix method and miscellaneous work on 4.8 mi. of the Laramie-Cheyenne Rd. between Ozone and Boris, Laramie County; by St. Hwy. Dept.

Miscellaneous

$1,315,574—**R. B. Potashnick,** Box 205, Cape Girardeau, Mo.—Low bid for stage 1 earthwork for Gavina Point, Reservoir Project, near Yankton, So. Dak.; by C. of E.

$223,186—**Summit Construction Co.,** 728 St. Anne St., Rapid City, So. Dak.—Low bid for construction of a 30-ft. grading and 22-ft. base surfacing along 3.1 mi. of the Deadwood-Custer-Hot Springs Route in Pennington and Lawrence counties, So. Dak., Black Hills National Forest; by BPR.



Get a grip on WET LOADS

LIGHTNING
Ribbed Conveyor Belts
PREVENT LOAD SLIPPAGE

A slipping load greatly shortens the life of a conveyor belt . . . just as a tire wears faster when the wheel is out of alignment. Slowly, but surely, this added abrasion wears the surface away. So, for longer belt life . . . prevent slippage.

Lightning Conveyor Belts have a patented raised "tread" that grips wet rocks and rubble and holds the load tight. That's why you will find them on so many gold dredges such as the Yuba dredge pictured here.

Whenever you have a wet load or difficult delivery situation, you'll find Lightning Conveyor Belt unequalled for the job. In fact, no matter what your conveying problem may be—wet or dry load—there's an American Rubber Conveying Belt engineered to fit the job.

Typical dredge-stacker belt showing wet gravel load on a Yuba dredge operating in a California placer gold field. Inset: Detail of patented Lightning Conveyor Belt...the belt with the "tread" that grips and holds the load, wet or dry.

The AMERICAN RUBBER Mfg. Co.
OAKLAND, CALIFORNIA
ALSO MAKERS OF IMPERIAL, AMERICAN, MUNICIPAL AND TIGER FIRE HOSE

FLOOD WARNINGS

. . . Continued from page 80

stations can be even in part computed from knowledge of channel gradients, cross-sectional areas, and velocities of flow. Here too, the relationship, plotted as a curve, has end points and intermediate critical points that have been established by actual past surveys and measurements under each such condition of flow.

This invaluable method of flood warning will, as the Central Valley dams continue to be built, be applied to river reaches farther upstream; and the results obtained will greatly enhance operations of these dams. However, recent developments of the Bureau of Reclamation at its Denver laboratories are aimed at evaluation of imminent flood conditions even earlier than is possible with the present technique, and even farther upstream.

Automatic rain gauges

At the request of Martin H. Blote, Central Valley Project operations superintendent, an automatic precipitation gauge transmitter has been built which, in a manner similar to the water stage recorders described above, can feed instantaneous precipitation data into a central headquarters. In the present device, however, the information is received as an electronic trace on an oscilloscope, similar to a small television tube.

Six of the new automatic rain gauge transmitters are now being located on tributaries of the Sacramento River downstream from Shasta Dam. Their impulses will be relayed by a station on Mt. Bass to the control room of Shasta power plant. Here, the information will be received and evaluated, enabling engineering personnel at the dam to restrict or terminate reservoir releases in order to provide extra downstream channel capacity for heavy anticipated storm runoff. Some 4,600 sq. mi. of watershed are involved, ranging southward from Shasta Dam to Chico Landing and including the principal Sacramento River tributaries in this reach: Cow, Battle, and Deer creeks on the east side, and Clear, Cottonwood, and Elder creeks on the west.

Isolation is no problem in locating the transmitters, for they are built to be largely maintenance free. Housed in protective structures, they will be provided with controlled heating systems. Antifreeze solution will insure their operation regardless of weather, and small wind machines will actuate generators for recharging their batteries.

Though the Sacramento River watershed is the only one immediately to be "equipped" with the new detection system—and coverage there is only partial—other major streams will follow. First on the list will likely be the American River, following completion of Folsom Dam. The hindsight provided by historical flow records, combined with electronic technology, has led to the foresight embodied in "push button flood control."

UNIT BID PRICES

Selected bid abstracts for Western projects

Dam

Box Canyon concrete dam in Washington

Washington—Pend Oreille County—County. Pacific-General-Shea, joint venture, Seattle, submitted the low bid of $7,721,389 to Public Utility District No. 1 for construction of the dam, powerhouse and substation on Box Canyon Dam Project. Unit prices were as follows:

(1) Pacific-General-Shea $7,721,389
(2) J. A. Jones Construction Co. 7,808,646
(3) Al Johnson Construction Co. 8,238,925
(4) Guy F. Atkinson Co. 8,480,501
(5) Morrison-Knudsen Co., Inc. ..... $ 9,551,100
(6) — J. A. Terteliing & Sons, Inc. 10,413,311
(6) Engineer's estimate 8,159,960

	(1)	(2)	(3)	(4)	(5)	(6)
Lump sum, moving in	1,000	594,000	672,856	286,000	730,018	50,000
Lump sum, furn. and const. office and conc. laboratory	15,000	7,600	12,720	24,000	13,000	15,000
Lump sum, clearing	32,000	9,350	7,530	26,000	52,000	10,000
Lump sum, cofferdams, diversion and care of water	690,000	900,000	477,666	510,000	830,000	500,000
68,000 cu. yd. excav., dry common	.75	.68	1.15	3.20	1.00	1.25
16,000 cu. yd. excav., wet common	1.60	1.37	1.15	3.20	2.00	2.00
345,000 cu. yd. excav., dry rock	3.00	1.92	2.28	3.20	2.80	3.00
37,000 cu. yd. excav., wet rock	4.60	4.50	4.60	3.20	6.20	8.00
5,000 sq. ft. line drilling and broaching	2.00	1.50	3.60	4.00	1.70	2.50
5,000 sq. yd. rock foundation preparation	3.00	2.80	3.88	9.00	12.35	6.00
7,800 cu. yd. excav., tunnel	10.00	10.75	11.74	18.00	30.00	17.00
10,000 F.B.M. timbering	.40	.40	.475	.52	.45	.45
800 lin. ft. drilling tunnel grout holes	3.00	5.20	6.00	6.00	1.00	4.00
200 cu. ft. pressure grouting (all except cement)	8.00	7.25	6.30	8.00	3.50	1.00
2,730 lin. ft. drilling and grouting for anchor bars	3.00	1.75	2.90	3.00	3.30	2.00
7,000 lin. ft. drilling grout holes for pressure grouting	2.00	4.40	4.50	4.50	4.00	3.00
10,000 cu. yd. furn. and place random fill or backfill	1.00	.68	2.96	.50	3.90	1.00
17,000 cu. yd. furn. and place spillway backfill	1.50	1.12	4.04	2.50	2.45	1.50
10,000 cu. yd. furn. and place filler matl.	3.00	4.10	4.08	3.50	3.90	4.00
10,000 cu. yd. furn. and place dumped riprap	.70	1.50	5.40	2.00	1.65	5.00
70,600 cu. yd. concrete, Class A (all except cement)	10.00	19.00	14.00	22.50	18.90	19.00
5,400 cu. yd. concrete, Class B	15.00	21.15	18.00	22.50	22.90	32.00
50 cu. yd. concrete, Class C	60.00	39.00	34.00	30.00	35.20	60.00
86,800 bbl. furn. and handle cem., port., Type II or IIa	3.70	4.40	5.15	4.00	4.40	4.25
4,600 bbl. furn. & handle cem., port., Type III or IIIa	4.60	4.40	6.65	4.80	5.30	5.00
376,000 sq. ft. const., erect and strip forms, other than water passages to powerhouse and tunnel	.90	1.49	1.98	2.00	2.55	1.50
110,000 sq. ft. constr., erect and strip forms, water passages in powerhouse and tunnel	2.00	2.86	5.22	3.20	3.10	4.00
200 lb. furn. and place joint sealing compound	2.50	.56	.91	1.00	.50	1.00
500 lb. furn. and apply coating for breaking bond	2.00	.36	2.80	1.00	.45	.50
1,000 sq. ft. furn. and place preformed expan. jt. filler, bitu. Type ½-in. thick	.60	.50	.88	.75	.70	.60
25 cu. ft. furn. and place preformed expan. jt. filler, styrofoam or equal	24.00	10.00	12.80	40.00	9.00	20.00
200 sq. ft. furn. and place preformed expan. jt. filler, corkboard, ½-in. thick	1.00	.75	1.60	3.00	1.15	1.50
1,600 lin. ft. furn. and place rubber plastic water stop	2.50	3.75	2.68	3.00	3.10	4.00
75,000 sq. ft. furn. and place form liner	.20	.25	.40	.15	.37	.35
1,000 lb. furn. and place copper water stop	1.50	1.55	3.10	2.00	2.00	5.00
7,217,000 lb. furn. and place steel reinforcement	.097	.127	.153	.14	.136	.15
100 lin. ft. furn. and place precast, reinf. conc. culv. pipe, 24-in.	7.50	5.00	9.20	8.00	9.80	10.00
378,000 lb. furn. and place steel sheet piling	.11	.11	.16	.14	.16	.20
460,000 lb. furn. and erect structural steel	.22	.2175	.275	.22	.25	.25
125,000 lb. furn. and install track rail for crane	.25	.165	.262	.20	.21	.18
60,000 lb. furn. and install sheet metal hatch covers	.35	.38	.64	.35	.48	.40
3,000 lb. furn. and install perf. stainless steel plate	1.20	1.40	2.32	1.25	1.60	2.00
57,000 lb. furn. and install miscl. metawork	.55	.58	.86	.60	.65	.75
480,000 lb. installation of guide for trashracks, aux. spillway, stoplogs and intake and draft tube gates	.10	.115	.144	.15	.06	.10
590,000 lb. installation of trashrack, lifting beams, intake and draft tube gates	.10	.05	.117	.08	.06	.08
4,000 sq. ft. furn. and const. conc. block wall	.75	1.10	1.54	1.75	1.90	.75
2,640 sq. ft. furn. and place ceramic glazed struct. tile wall	2.00	3.70	2.75	4.00	2.00	4.00
630 sq. ft. furn. and install ceramic glazed struct. tile soap	3.00	3.70	3.40	3.50	2.70	2.00
50 sq. ft. furn. and install glass block	5.00	6.20	4.80	7.00	5.90	4.00
700 sq. ft. furn. and lay rubber tile flooring	1.00	.90	2.10	1.25	2.60	1.00
2,900 sq. yd. furn. and const. bonded conc. floor finish	4.50	2.80	6.10	7.50	15.50	6.00
700 sq. ft. furn. and const. suspended ceiling	4.00	1.60	1.80	2.00	11.20	2.00
1,390 sq. yd. furn. and const. roof insulation	6.00	3.40	2.30	4.00	5.40	2.00
5,000 sq. ft. furn. and install insulation for hatch covers	.70	.20	.70	.90	.90	.60
400 sq. ft. furn. and install swing doors	5.00	10.00	9.30	7.00	8.00	6.00
120 sq. ft. furn. and install glazing (including trim)	8.00	3.70	4.00	5.00	4.00	2.50
6 ea. river hole drill set-up	500.00	125.00	600.00	110.00	625.00	125.00
30 ea. land hole drill set-up	250.00	60.00	300.00	65.00	315.00	80.00
300 lin. ft. river hole drilling	14.00	17.50	15.00	17.00	15.70	15.00
1,200 lin. ft. land hole drilling	10.00	8.70	10.80	9.00	11.35	8.00
200 lin. ft. casing	3.00	3.10	3 60	3.00	4.00	2.25
100 hrs. sampling and testing	18.00	12.50	18.00	11.00	19.10	9.00
60 ea. furn. and const. core boxes	10.00	7.50	10.80	8.00	11.75	7.50
2,000 lin. ft. furn. and install wrapped steel pipe, 4-in.	4.00	6.20	4.80	8.00	4.80	2.00
28,500 lb. furn. and install cast-iron soil pipe and fittgs., embedded XH hub and spigot, Class A	.13	.50	.48	.45	.34	.50
46,500 lb. furn. and install cast-iron bell and spigot pipe, Class 150, embedded	.35	.40	.37	.45	.34	.55
13,000 lb. furn. and install black steel pipe over 6-in., embedded	.70	.50	.49	.38	.36	.40
33,000 lb. furn. and install black or galv. steel over 6-in., exposed	.32	.40	.45	.48	.36	.45

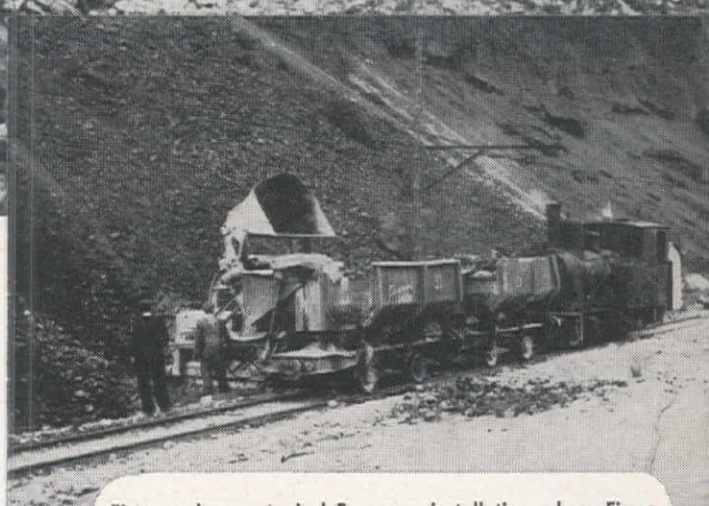
(Continued on next page)

Rock Loading in Quarries

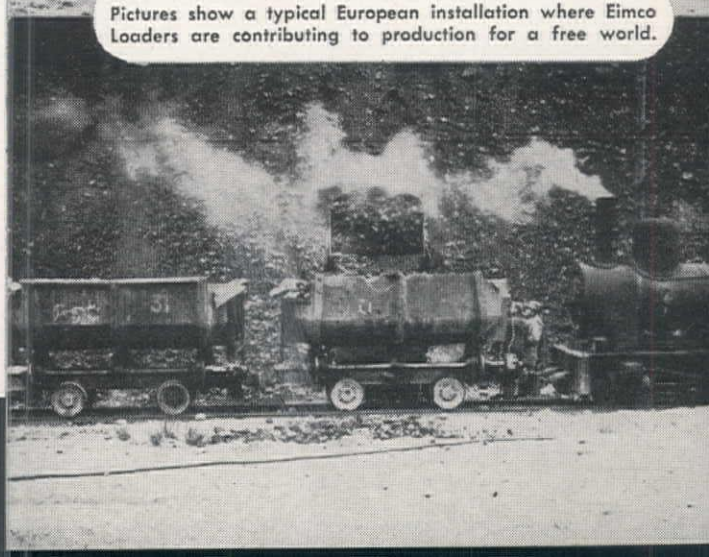
The versatile Eimco 104 loader will dig and load rock more economically than any other equipment.

It's easily moved from place to place in the quarry. Equipped with a 1¼ yd. rock bucket, the 104 will load at the rate of 4 to 6 yds. per minute.

Eimco 104's are low cost, high production, dependable loaders. Write for more information.



Pictures show a typical European installation where Eimco Loaders are contributing to production for a free world.



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AGENTS IN ALL PRINCIPAL CITIES THROUGHOUT THE WORLD

Snow removal costs 400% more than usual in Nevada

MOTHER NATURE is playing havoc with the Nevada State Highway Department's budget, according to Houston Mills, state highway engineer.

The huge snow fall has created snow removal problems which made it necessary for the department to spend $376,000 through March 4—a total of 400% above normal. Additional storms have increased the total expenditure even more since that date.

More rainfall for West during next 50 years!

IT'S GOING TO GET WETTER! Next month, next year, and next decade (and the next half-century for that matter). At least, that's the considered opinion of Dr. H. C. Willett, head of the department of meteorology of the Massachusetts Institute of Technology. In a recently-published technical article, Dr. Willett predicts climatic conditions in the West, and the rest of the world, based on a correlation of sunspot activity with the earth's weather. His prediction covers a future 150-year period.

The lakes in the Great Basin of the West (Great Salt Lake, Salton Sea, etc.) will reach their maximum levels of the near future in 1960, due to steadily increasing rainfalls and a significant drop in temperatures. Rainfall will increase annually to a maximum in about eight years, according to Dr. Willett. Excepted are the northwest areas of the United States and western Canada, where it will neither get colder nor wetter.

DEEP FREEZE

. . . Continued from page 79

concrete from the bottom of the frozen zone to the top.

8. Where no ground movement is found, it is considered preferable to grout between the partially thawed ground and the concrete ring before complete thawing. This prevents the possibility of lateral movement of large blocks, bringing a high pressure at one point on the circumference of the shaft as well as eliminating a period when full hydrostatic pressure would be exerted on the shaft wall. It is also possible to grout at low pressures, there being no necessity for overcoming the hydrostatic head of the water in the ground.

Personnel

The project was carried out under the general direction of Russell G. Haworth, resident manager, Potash Co. of America, assisted by R. R. Kmill, mine superintendent and J. E. Edmunds, chief mine engineer. Winston Bros. Co. was general contractor, with V. H. Montgomery as project superintendent. C. R. Rankin was consulting engineer for the contractor.

UNIT BID PRICES . . . CONTINUED

	(1)	(2)	(3)	(4)	(5)	(6)
500 lb. furn. and install black steel pipe, 6-in. and under, embedded	2.00	.60	.60	.52	.40	.60
7,000 lb. furn. and install black or galv. steel pipe 6-in. and under, exposed	1.25	.70	.70	.60	.40	.50
13,000 lb. furn. and install corrugated metal pipe	.60	.30	.55	.30	.37	.25
1,000 lb. furn. and install, Type "L" or "K" hard or seamless cop. tubing and brass solder jt. ftgs.	2.00	1.85	1.76	1.75	1.55	2.50
300 lb. furn. and install std. I.P.S. brass pipe and std. brass fittings	3.00	1.80	1.70	2.00	1.70	2.00
7,000 lb. furn. and install valves, cast-iron over 6-in.	.70	1.00	1.00	.70	.53	1.00
1,000 lb. furn. and install valves, cast-iron flanged, 6-in. and under	2.30	1.10	1.08	1.40	.66	1.50
400 lb. furn. and install valves, screwed brass	4.00	2.00	1.90	3.00	1.65	5.00
150 lb. furn. and install valves, solder joint	2.00	2.30	1.40	4.00	2.00	5.00
250 lb. furn. and install floor and gutter drains	2.00	3.10	3.00	1.25	.80	1.00
3,500 lb. furn. and install twin strainers and misc. strs.	1.50	1.20	1.16	1.10	.52	1.40
200 lb. furn. and install press. reducing valves and misc. valves and gages	6.00	4.25	4.10	3.00	1.80	7.50
3,700 lb. furn. and install water storage tanks	1.30	.50	.50	.40	.45	.40
800 ton install erection of embedded turbine parts	200.00	187.50	238.00	175.00	306.00	200.00
600 ton install erect. of removable turbine parts	190.00	187.50	143.50	175.00	323.00	250.00
225 ton install powerhouse ganty crane	180.00	125.00	142.40	160.00	100.00	100.00
6,000 lb. install station serv. air compr. and access.	.25	.25	.26	.07	.17	.40
1,500 lb. install spillway bubbler compressors	.35	.30	.30	.14	.28	.40
350 lb. install portable governor compressors	.30	.30	.30	.50	.28	1.50
2,300 lb. install fans and exhausters	.70	.60	.70	.30	.26	.75
170 sq. ft. install adjustable and fixed louvers	2.00	2.20	2.40	1.50	1.60	5.00
1,750 lb. install elect. heaters (forced air, unit conn.)	1.00	.85	.94	.25	.60	1.00
900 lb. install air conditioning unit	.50	.40	.50	.60	.70	.25
5,350 lb. install unit unwatering pump	.20	.25	.24	.10	.16	.20
7,200 lb. install sump pumps	.25	.30	.29	.08	.15	.20
900 lb. install raw water pressure pumps	.35	.30	.30	.40	.15	.40
500 lb. install sewage effluent pump and equip.	1.00	.85	1.00	.40	.28	.40
Lump sum, install plumbing fixtures	—	—	—	—	—	—
1,500 lb. install fire protection equip.	.10	.10	.10	.20	.40	.30
2,000 lb. install oil purification equip.	.25	.30	.27	.25	.40	.50
5,000 lb. install mach. shop and maint. equip.	.16	.20	.15	.12	.15	.50
Lump sum, installation of four generators, incl. excitation cubicles	45,000	71,500	79,515	93,509	160,000	200,000
Lump sum, installation of four power transformers	25,000	12,300	12,198	18,000	7,000	20,000
5 ea. installation of outdoor oil circuit breakers	1,600	2,000	2,064	2,500	2,100	1,300
100,000 lb. installation of switchgear, switchboards and accessories	.30	.37	.378	.22	.26	.17
30,000 lb. furn. and install conduit—metallic	.80	1.00	1.02	.75	1.73	1.00
30,000 lb. furn. and install conduit—non-metallic	.70	.85	.82	.50	1.45	.60
55,000 lb. furn. and install cable, 15 kv., 11c 750 mem, Class C	.80	1.20	1.14	2.20	2.25	1.40
12,000 lb. furn. and install control and communication cable, etc.	2.25	2.80	2.70	2.00	1.40	2.50
6,000 lb. furn. and install conductors, connectors, clamps, fittings (grounding system)	1.75	2.20	2.10	1.40	2.50	1.50
40 ea. furn. and install ground rods, copperweld, ¾-in. x 8-ft. 0-in.	30.00	32.00	31.25	24.00	31.00	10.00
6,000 lb. furn. and install conduit, boxes, fittings (lighting system)	.90	1.05	1.01	.90	1.55	1.50
1,000 lb. furn. and install wiring and connections, 600 v. Type RW (lighting system)	3.00	3.35	3.24	3.00	3.70	2.50
100 ea. furn. and install switches and conv. outlets (lighting system)	3.00	3.20	3.00	6.00	7.30	5.00
300 ea. install fixtures (lighting system)	10.00	12.70	42.00	8.00	14.80	10.00
1,500 furn. and install cable trays	3.00	3.80	4.20	5.00	3.00	3.00
Lump sum, furn. and install house telephone system	2,000	1,000	978.00	1,200	1,300	1,400
Lump sum, furn. and const. substation	240,000	110,800	107,454	85,000	200,000	76,000
Lump sum, furn. and install substation lighting, complete	2,000	1,900	1,836	3,000	2,700	2,000
Lump sum, field tests	15,000	6,000	6,971	6,000	7,400	10,000
1,200 cu. yd. furn. and apply gravel surfacing	3.20	5.00	3.35	5.00	4.50	2.00
15 ton furn. and apply bituminous cement	85.00	90.00	67.00	70.00	95.00	60.00
150 cu. d. furn. and apply screened cover stone	7.00	6.00	7.16	6.00	6.10	3.00
Lump sum, furn. and maintain performance bond	60,000	57,500	70,000	50,000	100,000	68,000
Lump sum, furn. and maintain railroad prop. dam. insur.	5,000	5,000	5,000	5,000	5,000	5,000
530,000 lb. installation of spillway, vert. lift. gate guides	.075	.11	.082	.14	.05	.11
1,320,000 lb. installation of spillway vert. lift gates	.075	.055	.041	.07	.05	.08
80 ton install spillway gantry crane	250.00	175.00	109.00	160.00	100.00	125.00
230,000 lb. installation of spillway hook gate guides	.09	.11	.107	.14	.06	.12
2,100,000 lb. installation of spillway hook gates	.11	.07	.046	.08	.06	.10
620,000 lb. install fixed gate hoists	.07	.075	.027	.05	.06	.08

Bridge and Grade Separation

121½-ft. steel and concrete bridge, Idaho

Idaho—Bonner County—State. The State Department of Highways rejected all bids submitted March 11 for construction of a 121.5-ft. concrete and steel bridge and approaches across the Pack River on the Colburn Culver Road. Unit prices were as follows:

(1) Roy L. Bair ..... $64,008 (2) Clifton & Applegate $68,327

	(1)	(2)
1 ea. removal of bridge	$2,500	$3,350
4,500 cu. yd. unclassified excavation	.70	.90
450 cu. yd. excav. for structures	10.00	16.00
25 M. gal. watering base and surface courses	4.00	1.50
3 day rolling power roller	200.00	70.00
580 cu. yd. crushed gravel surface course ¾-in. max.	4.00	2.75
255 cu. yd. concrete, Class A	80.00	79.00
25,500 lb. metal reinforcement	.15	.13
Lump sum, steel bridge	$8,500	$9,500
238 lin. ft. structural steel handrail	9.00	9.60
Lump sum, furn. pile driving equipment	$2,000	$4,200
780 lin. ft. furn. timber piling, treated	2.00	2.20
3,450 lin. ft. furn. timber piling, untreated	1.00	.75

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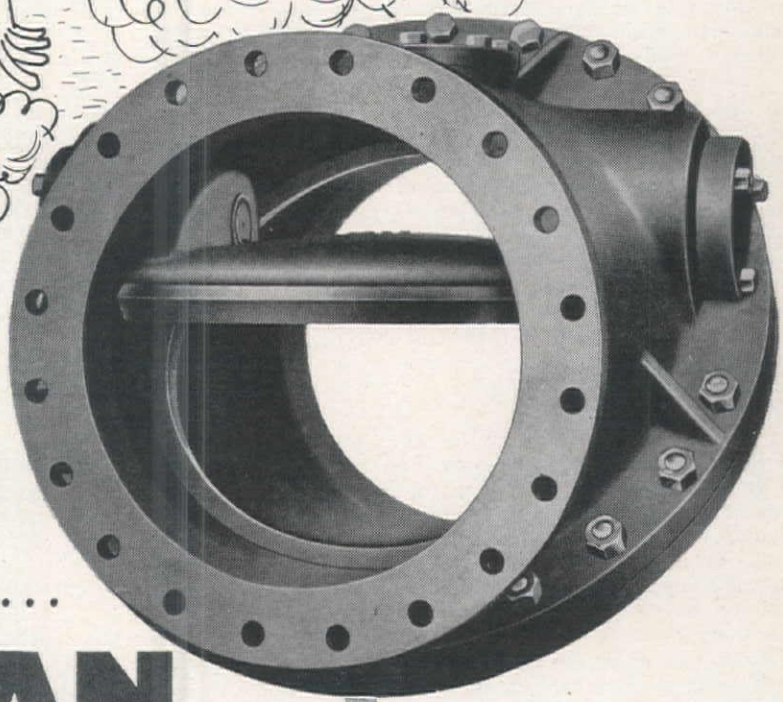


Complete Seating Contact!

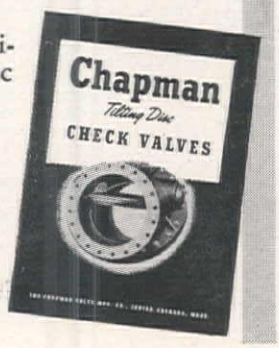
You know you've got it with . . .

CHAPMAN

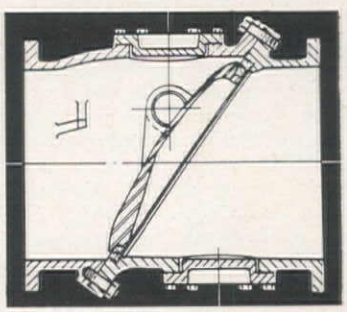
Exclusive TILTING DISC *Check Valve*

Nothing can "unseat" the disc-ring of this valve from its *drop-tight* contact with the body-ring . . . because clearance at the hinge-pins means that this contact is *complete.* There is no sliding action, consequently no wear, no leakage. And the pivoted disc is cushioned to an easy, silent closing . . . without slam . . . in installations that don't have unusual piping arrangements.

What's more, hydraulic laboratory tests at a top engineering school prove that the specially designed disc and streamlined valve-body reduce head loss as much as 80% under conventional swing-type check valves. See the graphs of these tests . . . and illustrations of the unique construction features of Chapman Tilting Disc Check Valves . . . in Catalog No. 30 (yours for the asking). *Write.*



THE CHAPMAN VALVE MFG. CO.
INDIAN ORCHARD, MASSACHUSETTS



Cross-section of the Chapman Tilting-Disc Check Valve. A feature of the design is that the disc seat lifts away from the body seat when opening, and drops into contact when closing, with no sliding or wearing of the seats.

SNOW FIGHTING

. . . Continued from page 68

and immediately headed back towards the west in its own tracks. Just before noon it had passed the station and arrived at a lodge large enough to accommodate the passengers. Arriving at the lodge, the rotary stood by while Snider and a convoy of eleven vehicles carried out the rescue. Later that evening the rescue was history and the rotary was back at its ordinary work of hacking through 12- and 14-ft. drifts.

While members of the Yuba Gap crew were carrying out the train rescue a crew from Donner Summit was busy digging out six stranded pieces of equipment that had become stuck within 200 yd. of each other when the wind caused the snow to pile in the road faster than the rotaries could throw it out. After digging out the equipment it was necessary to haul gas to the equipment in a tank mounted on skis. A six-man "dog team" made eight trips up and down the mountain hauling up to 50 gal. at a time to the equipment.

A short time later when the town of Truckee was running low on food and fuel a rotary from that station plowed through a blizzard to the Nevada border where it picked up a convoy of trucks and brought them back to Truckee. When the trucks were unloaded the rotary plowed a path back for them. After reaching the border the rotary returned to Truckee station, having made the four trips during the day.

Opening hill

Following the blizzard of January 11 to 16 all equipment was worked on a 24-hr. basis with 12-hr. shifts for the crews. The first task was to secure a lifeline from Donner Summit to the west. As soon as this line to the west was obtained all available equipment was put to work cutting through the heavy drifts on the east slope of the summit. The work was carried out from both sides with a crew from Truckee moving up to meet the Donner Summit crew. Work started on the 4-mi. section January 27 with the crews meeting February 6 and the road opened to traffic on February 8.

Moving up the hill the crew from Truckee made nearly 2 mi. the first 24 hrs., ½ mi. the next, and after that felt good if 8 ft. were made in a day. Compared to these figures, normal rotary speed is 3 to 5 mph. At one point it required over 48 hr. to get past a tank truck that was buried beneath a slide. In several places the rotary was unable to move straight ahead due to the hardness of the snow. Although later the snow was loosened by dynamite, the first method was to work across the bank at an angle, first cutting in at one side and then working diagonally across the resulting face.

The Donner Summit crew, heading down the hill, was only able to make 500 ft. the first 26 hr. No sooner had this cut been made when another storm struck

. . . Continued on page 142

UNIT BID PRICES . . . CONTINUED

780 lin. ft. driving timber piling, treated	1.00	1.40
3,250 lin. ft. driving timber piling, untreated	1.50	1.25
200 lin. ft. driving test piling (2 piles)	4.00	2.25
40 lin. ft. 30-in. pipe culverts	8.00	8.35
480 cu. yd. loose riprap	4.00	4.15
116 ea. salvage guide posts	1.00	1.00
30 ea. remove and reset guide posts	5.00	3.00

Reinforced concrete girder bridge

California—San Bernardino County—State. Lars Oberg, Los Angeles, submitted the low bid of $126,004 to the State Division of Highways for construction of a reinforced concrete girder bridge across Etiwanda-San Sevaine Flood Control Channel, about 8 mi. east of Ontario. Unit prices were as follows:

(1) Lars Oberg $126,004
(2) Stuckey & Carroll Construction Co. 132,139
(3) O. B. Pierson 136,481
(4) Tumblin Company ..... 137,183 (irregular)
(5) George Herz & Co. 137,520
(6) Dimmitt & Taylor 138,998
— E. L. Yeager Co. 139,642
— John Strona 140,832
— K. B. Nicholas $143,208
— Thomas Construction Co. 148,176
— J. E. Haddock, Ltd. 151,176
— E. S. & N. S. Johnson 153,130
— Hubbs Equipment Co. and Baker Construction Co. 153,138
— C. B. Tuttle Co. 157,545
— M. M. Saliba Co. 173,367
— Byerts & Sons and George K. Thatcher 210,513

	(1)	(2)	(3)	(4)	(5)	(6)
270 cu. yd. removing concrete	5.00	4.00	6.00	5.00	2.45	5.00
Lump sum, clearing and grubbing	500.00	580.00	$1,000	$9,655	$3,900	$1,200
27,000 cu. yd. roadway excav.	.40	.40	.50	.35	.35	.38
420 cu. yd. struct. excav.	5.00	5.60	3.00	1.00	2.35	5.40
Lump sum, dev. wat. sup. and furn. wat. equip.	$2,000	870.00	$1,186	$2,500	$1,700	$3,000
1,350 M. gal. applying water	1.50	2.00	2.00	1.00	1.50	1.70
3,100 cu. yd. I. B. M.	1.00	1.40	1.50	1.50	.80	.70
Lump sum, finishing roadway	200.00	232.00	200.00	$1,000	130.00	625.00
820 ton P.M.S.	6.00	4.87	5.00	6.00	5.90	5.50
5 ton liquid asph., SC-2 (pr. ct.)	40.00	46.40	35.00	50.00	58.00	55.00
500 lin. ft. raised traffic bars	1.00	1.22	.85	1.00	1.15	1.10
500 lin. ft. remov. raised traffic bars	.50	.29	.10	1.00	.30	.50
46 cu. yd. Class "B" P.C.C. (pavement)	25.00	23.00	22.00	25.00	15.00	25.00
61 ea. pavement tie bolt assemblies	1.00	2.30	1.60	1.00	.85	1.30
970 cu. yd. Class "A" P.C.C. (struct.)	50.00	53.00	57.00	50.00	61.65	58.45
4,320 lin. ft. furn. concr. piling	3.00	3.48	3.25	3.50	3.40	3.36
100 ea. driving piles	110.00	103.25	120.00	100.00	100.00	103.00
4 ea. instal. clearance markers	5.00	4.65	3.00	20.00	4.50	10.00
62 ea. instal. guide posts	5.00	4.65	2.00	5.00	3.90	5.00
62 ea. salv. guide posts	1.00	2.32	1.00	1.00	.35	2.00
10 ea. port. timber barricades	30.00	46.40	25.00	25.00	8.50	30.00
5 sta. salv. exist. prop. fences	15.00	11.60	20.00	25.00	11.00	50.00
5 sta. reconstr. salv. prop. fences	15.00	69.50	20.00	20.00	28.00	50.00
176,800 lb. bar reinf. steel	.095	.0975	.09	.10	.093	.10
900 lin. ft. steel railing	7.50	8.50	7.35	8.00	9.00	9.50

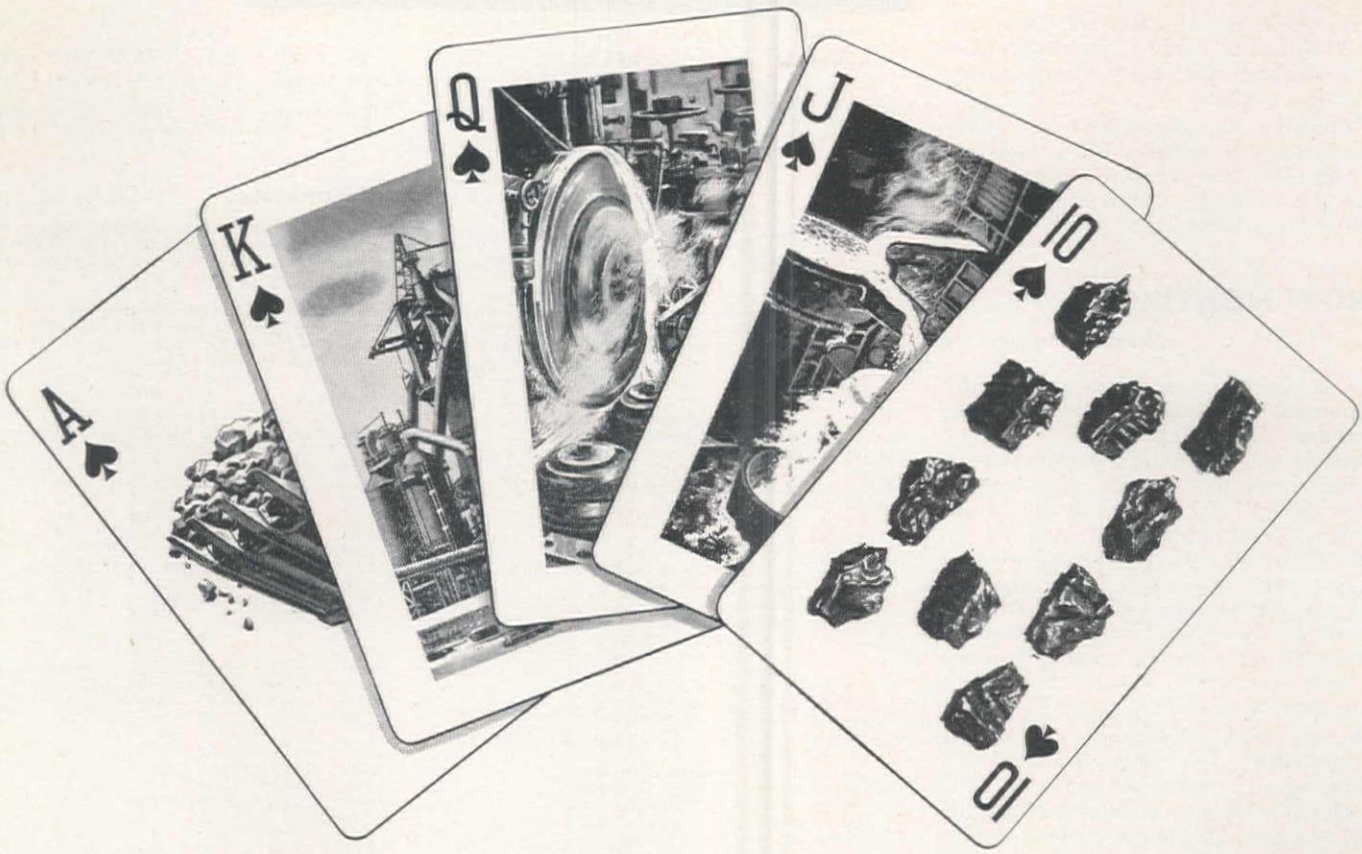
Reinforced concrete bridge and approaches

Washington—Mason County—State. David Nygren, Seattle, received an award from the State Department of Highways on his low bid of $123,172 for construction of the Sherwood Creek Bridge and approaches on Secondary State Highway No. 14-A. Unit prices were as follows:

(1) David Nygren $123,172
(2) Lige Dickson Co. 123,630
(3) Herman Kathman 124,741
(4) Port Construction Co. 127,412
(5) F. E. Wilder $127,531
(6) Hamilton Buildings 127,953
— M. P. Butler 139,880

	(1)	(2)	(3)	(4)	(5)	(6)
9.3 acre clearing	350.00	600.00	300.00	500.00	400.00	300.00
6.2 acre grubbing	350.00	500.00	300.00	500.00	300.00	300.00
46,250 cu. yd. uncl. excav. incl. haul of 600 feet	.50	.55	.53	.50	.40	.58
960 cu. yd. common trench excav. incl. haul of 600 ft.	2.00	1.50	2.00	2.00	1.00	2.50
38,030 cu. yd. sta's overhaul	.02	.02	.03	.02	.03	.015
180.5 M. cu. yd. sta's overhaul	5.00	10.00	6.00	7.00	5.00	4.50
170 cu. yd. structure excav.	3.00	3.00	3.00	3.00	3.00	3.50
52 days tamping roller	60.00	55.00	50.00	40.00	50.00	50.00
6 days mechanical tamper	50.00	38.00	40.00	40.00	50.00	50.00
3,200 lin. ft. slope treatment Class A	.15	.20	.15	.20	.15	.15
30.9 sta's (100-ft.) finishing roadway	15.00	13.00	20.00	30.00	20.00	12.00
35 M. gal. water	5.00	2.50	4.00	5.00	5.00	3.00
910 ton cr. stone surf. top course	5.50	3.75	3.50	5.50	4.70	4.03
730 ton cr. stone surf. top course in stockpile	5.50	3.75	3.50	5.50	4.70	3.22
MINERAL AGGREGATE FOR BITUMINOUS SURFACE TREATMENT "ROADMIX" TYPE C IN STOCKPILE						
360 ton coarse aggregate ⅞-in. - ¼-in. in stockpile	5.50	3.50	3.50	6.00	4.70	3.22
570 ton fine aggregate ¼-in. - 0 in stockpile	5.50	4.50	3.50	6.00	4.70	3.22
OTHER ITEMS						
60 lin. ft. metal lined wooden spillway	3.50	2.00	2.50	5.00	2.50	3.80
80 lin. ft. bit. coat. corr. met. culv. pipe No. 16-ga., 8-in. diam., Type No. 2	3.00	3.00	2.00	4.00	2.75	3.00
33 lin. ft. plain conc. culvert pipe 12-in. diam.	2.00	2.50	2.50	2.00	2.00	2.00
126 lin. ft. stand. reinf. conc. culv. pipe 18-in. diam.	4.00	4.50	3.50	4.00	3.75	4.00
33 lin. ft. relaying conc. pipe 12-in. diam.	1.50	2.50	1.50	1.00	2.25	2.00
30 lin. ft. relaying conc. pipe 24-in. diam.	3.00	4.50	2.00	2.00	5.00	7.00
200 lin. ft. standard beam guard rail	3.50	3.00	2.50	4.00	3.00	4.50
17 only reinf. conc. spot posts	10.00	10.00	10 00	12.00	10.00	12.00
18 only reinf. conc. right-of-way markers	7.00	6.00	8.00	8.00	5.00	8.00
610 cu. yd. loose riprap, Class A	10.00	7.00	5.00	6.00	10.00	12.00
Lump sum, removing existing timber trestle	$1,000	$1,000	$1,000	$1,500	$1,000	$1,800
2 only reflector units	15.00	15.00	10.00	20.00	20.00	20.00
BRIDGE						
425 cu. yd. structure excavation	10.00	10.00	15.00	7.00	10.00	5.00
330 cu. yd. concrete Class A	60.00	70.00	90.00	80.00	93.35	65.00
50 cu. yd. concrete Class B	60.00	30.00	55.00	60.00	83.35	65.00
215 cu. yd. concrete Class D	60.00	40.00	45.00	55.00	73.35	65.00

(Continued on next page)



Winning hand for the West

On the West Coast, only one steel plant—Kaiser Steel—holds the five "cards" necessary for complete integration—iron ore, coal deposits, blast furnaces, open hearth furnaces and finishing mills.

This integration provides an important source of *new* metal, produced from iron ore and smelted in a blast furnace. This is especially important because of the limited supply of steel scrap. *New* metal means an increase in the output of finished steel products.

In addition, users of Kaiser Steel structural shapes get this pay-off:

Uniform quality, completely controlled at every step of production.

More dependable supply, because all these facilities are owned and operated by Kaiser Steel.

Add to this Kaiser Steel's wide range of structural shapes and nearby location . . . and it's clear why—

It's good business to do business with

Kaiser Steel

built to serve the West

PROMPT, DEPENDABLE DELIVERY AT COMPETITIVE PRICES • plates • continuous weld pipe • electric weld pipe • hot rolled strip • hot rolled sheet alloy bars • carbon bars • structural shapes • cold rolled strip • special bar sections • semi-finished steels • pig iron • coke oven by-products
For details and specifications, write: **KAISER STEEL CORPORATION, LOS ANGELES, OAKLAND, SEATTLE, PORTLAND, HOUSTON, TULSA, NEW YORK**

Del E. Webb Construction Co. receives safety award

THE CORPS OF ENGINEERS honored the Del E. Webb Construction Co. for its outstanding safety record in construction last year.

A plaque attesting to the firm's safety record was presented by Col. E. G. Herb, in Amarillo, Tex., where the firm rushed to completion 221 dormitory buildings and 13 large mess halls.

SNOW FIGHTING

... Continued from page 140

and it was necessary to remove the equipment to keep it from becoming stranded. Returning to the cut they found it was filled to a depth of 6 ft. Three times the summit crew had to leave the hill either to save the equipment or keep the highway open to the west. After the work was well started temperatures rose and it rained. This rain packed the snow tighter. After commencing to use dynamite good progress was made and the crew coming up from the east was met 2 mi. from the summit nine days later.

R. I. "Nick" Nickolson is District maintenance engineer for the area with Harry Rhud as materials engineer. T. T. Buell is highway superintendent for the Yuba Gap to Truckee area. Jack Snider is foreman at Yuba Gap with John Lloyd and Kenneth Fuday foremen at Donner Summit and Truckee respectively. Leading men are L. H. Frink, Yuba Gap; O. G. "Red" Alexander, Donner Summit, and Robert Luck, Truckee.

CHEYENNE WATER

... Continued from page 64

City. Facilities for transmitting power to the well field were constructed by the Cheyenne Light, Fuel and Power Co. Mechanical joint cast iron pipe was used for all lines in the well field, 14 in. and smaller in diameter and for the lower end of the 30-in. transmission line. The small pipe in the well field was furnished by the U. S. Pipe and Foundry Co., while the larger pipe was furnished by the American Cast Iron Pipe Co.

Prestressed concrete cylinder pipe furnished by the Lock Joint Pipe Co. was used for all lines larger than 14 in. in diameter in the well field and for the major portion of the 30-in. supply line.

All gate valves and check valves were furnished by the Iowa Valve Co., and the motor-operated cone valve was furnished by the S. Morgan Smith Co. Economy Steel forms were used in the construction of the concrete reservoir, and the concrete was placed by Pumpcrete. Chlorinating equipment was furnished by the Wallace & Tiernan Co. Water level gauge on the reservoir and the venturi meter on the flow line as well as the telemetering equipment for remote control was furnished by Builders-Providence, Inc.

UNIT BID PRICES ... CONTINUED

	(1)	(2)	(3)	(4)	(5)	(6)
300 lin. ft. reinf. conc. bridge railing	10.00	11.00	10.00	10.00	10.00	9.50
95,000 lb. steel reinforcing bars	.10	.11	.11	.11	.12	.12
2 only bridge drains	60.00	100.00	37.50	70.00	80.00	100.00
Lump sum, shoring and cribs	$10,000	$12,000	$10,000	$8,000	$5,000	$12,000

Excavation and bridge foundation

California—San Francisco County—State. Charles L. Harney, Inc., San Francisco, submitted the low bid of $458,072 to the State Division of Highways for construction of foundations for a portion of a bridge and miscellaneous road work on 13th St., between Mission St. and Route 68 in San Francisco. Unit prices were as follows:

(1) Charles L. Harney, Inc. $458,072
(2) Piombo Construction Co. 464,101
(3) Healy-Tibbitts Construction Co. 493,046
(4) Eaton & Smith 501,500
(5) Fredrickson & Watson Construction Co. and M & K Corporation $540,327
(6) Guy F. Atkinson Co. 545,332
— Duncanson-Harrelson Co. 595,941

	(1)	(2)	(3)	(4)	(5)	(6)
2,650 cu. yd. removing concrete	4.00	4.00	5.50	3.60	4.70	5.40
Lump sum, clearing and grubbing	$15,000	$10,000	$6,000	$10,270	$11,000	$15,000
14,800 cu. yd. roadway excav.	1.00	.65	1.50	1.27	.70	.85
5,820 cu. yd. struct. excav. (bridge)	3.00	2.25	4.75	5.05	4.10	3.30
3,200 cu. yd. struct. backfill (bridge)	1.60	2.75	1.58	3.00	2.30	3.25
4,562 cu. yd. struct. excav.	2.70	2.75	5.00	4.20	4.10	3.50
377,000 sta. yd. overhaul	.01	.015	.005	.01	.01	.01
5,910 ton I.B.M.	1.90	1.30	2.65	3.80	3.00	2.90
607 ton sand backfill	1.80	1.25	1.50	3.40	3.90	2.50
Lump sum, dev. wat. sup. and furn. wat. equip.	$3,000	$3,000	$3,000	$14,000	$5,000	$1,500
1,320 M. gal. applying water	2.80	1.75	1.50	2.05	3.00	2.15
Lump sum, finishing roadway	$2,200	$3,000	$4,000	$4,000	$5,000	$6,000
484 bbl. portland cement (C.T.B.)	3.00	5.00	4.00	5.10	3.25	3.75
3,500 sq. yd. mix. and compact. (C.T.B.)	.30	1.00	.75	.70	.50	.55
6 ton asph. emulsion (curing seal paint binder and seal coat)	50.00	40.00	50.00	55.00	90.00	50.00
1 ton liq. asph., SC-1 (pr. ct.)	100.00	70.00	80.00	85.00	120.00	65.00
61 ton pav. asph. (P.M.S.)	24.00	25.00	30.00	30.00	7.50	25.00
1,232 ton min. aggr. (P.M.S.)	6.00	6.50	7.00	6.65	7.50	6.50
36 cu. yd. Cl. "B" P.C.C. (parking strip and trench paving)	20.00	60.00	35.00	31.20	45.00	36.00
35 M.F.B.M. Douglas fir timber	240.00	350.00	275.00	220.00	200.00	270.00
1,900 cu. yd. Cl. "A" P.C.C. (struct.)	42.00	34.00	36.00	39.35	38.00	35.00
11 cu. yd. Cl. "C" P.C.C. (struct.)	40.00	60.00	25.00	57.00	60.00	50.00
98,000 lb. struct. steel	.20	.40	.18	.20	.33	.38
44,865 lin. ft. furn. piling (Type A)	1.63	1.20	1.40	1.20	1.35	1.75
890 ea. driving piles (Type A)	31.00	63.00	55.00	51.00	87.50	55.00
20,608 lin. ft. furn. piling (Type B)	2.90	2.75	3.00	2.60	3.00	3.70
481 ea. driving piles (Type B)	60.00	50.00	65.00	50.00	77.50	65.00
165 cu. yd. Class "B" P.C.C. (curbs, gutters and sidewalks)	42.50	50.00	40.00	40.50	45.00	40.00
240 ea. curb dowels	.60	.65	1.00	.81	1.10	.75
165,000 lb. bar reinf. steel	.10	.10	.11	.14	.10	.13
830 lb. misc. iron and steel	.44	.40	.40	.83	.50	.65
37 lin. ft. 10-in. cast iron pipe	6.00	12.00	10.00	12.30	17.00	12.00
1,030 lin. ft. 8-in. vit. clay pipe	2.00	1.60	1.40	1.80	1.45	2.40
315 lin. ft. 10-in. vit. clay pipe	2.70	2.25	2.00	2.10	1.95	2.85
1,860 lin. ft. 12-in. vit. clay pipe	2.70	2.75	2.40	2.35	2.50	4.20
720 lin. ft. 15-in. vit. clay pipe	3.90	4.00	4.20	4.05	4.00	5.40
21 lin. ft. 18-in. vit. clay pipe	10.00	5.25	6.00	7.00	5.25	9.50
680 lin. ft. chain link fence	3.20	2.70	3.25	3.35	3.25	3.00
2 ea. gates	230.00	220.00	225.00	245.00	240.00	215.00
6 ea. red reflectors	4.50	4.00	5.00	8.00	5.00	3.00
6 ea. cast iron water traps	35.00	35.00	50.00	43.00	36.00	35.00
172 lin. ft. new manholes	24.00	45.00	25.00	46.50	50.00	25.00
21 lin. ft. jct. boxes (drainage)	37.00	20.00	35.00	53.40	54.00	22.00
2 ea. adj. catch basins and manholes to grade	50.00	25.00	40.00	44.00	50.00	45.00
19 ea. new manhole frames and covers (pav. type)	52.00	120.00	80.00	72.00	85.00	95.00
3 ea. new manhole frames and covers (sdwlk. type)	37.00	100.00	70.00	67.00	60.00	80.00
24 ea. salv. manhole fr. and covers and catchbasin fr. and grates	20.00	16.00	20.00	18.00	36.00	17.50
10 ea. reset. salv. manhole fr. and covers and catch basin fr. and grates	24.00	20.00	30.00	41.00	36.00	30.00
700 lin. ft. remov. street railway tracks (dbl. tracks)	3.80	2.20	5.00	5.20	3.60	9.00
19 ea. brass manhole steps (cisterns)	7.00	7.00	15.00	9.80	16.00	15.00
2 ea. salv. and reinstall. manhole frames and covers (cistern)	21.00	35.00	50.00	63.00	60.00	35.00

Streets and Highways

Grading and rock surfacing, Oregon

Oregon—Coos County—State. John A. Logan, Portland, submitted the low bid of $218,144 to the State Highway Commission for grading and rock surfacing on the Catching Slough-Enegren Ferry Section of the Coos River Secondary Highway. Unit prices were as follows:

(1) John A. Logan $218,144
(2) E. L. Gates & Co. 218,961
(3) Coos Bay Dredging Co. $248,494
(4) McNutt Bros. 306,329

	(1)	(2)	(3)	(4)
Lump sum, clearing and grubbing	$30,000	$25,000	$37,500	$41,597
1,250 cu. yd. structural excav., unclassified	3.00	4.00	4.00	5.00
148,000 cu. yd. general excav., unclassified	.75	.88	.87	1.28
376,000 yd. sta. short overhaul	.02	.02	.02	.02
7,200 cu. yd. sta. long overhaul	.50	.70	.60	.60
2.59 mi. finishing roadbed and slopes	$1,000	750.00	965.00	$1,200
5,900 lin. ft. rounding cutbanks	.20	.20	.25	.20
230 lin. ft. 12-in. corrugated metal pipe	3.00	2.90	3.75	3.15
1,190 lin. ft. 18-in. corrugated metal pipe	4.50	4.00	5.00	4.65
180 lin. ft. 24-in. corrugated metal pipe	6.00	6.30	7.75	6.90
330 lin. ft. 30-in. corrugated metal pipe	9.00	7.95	9.75	8.80

(Continued on next page)

Grandpa Never Threw a Thing Away

It's only human to want to hold on to things after they've outlived their usefulness. That's why today millions of tons of worn-out and obsolete equipment and machinery are lying forgotten in the country's plants and factories and on farms.

The steel industry needs these millions of tons of dormant scrap, needs it in the worst way. With this vital dormant scrap the entire steel supply picture would brighten up, with more steel for everybody. But without it, the steel industry cannot hope to keep up production at present levels.

Call in a scrap dealer now, today. He will buy your dormant scrap and start it moving toward the steel mills.

BETHLEHEM STEEL

BETHLEHEM PACIFIC COAST STEEL CORPORATION

Steel Plants: South San Francisco, Los Angeles, Seattle

More Scrap Today... More Steel Tomorrow

RUN-OFF FORECASTS

... Continued from page 83

as of April first than in any other year of the 17-year period of snow recorded.

WYOMING

The snow water stored in the high watersheds of western Wyoming varies from 26% to 46% above average. An excellent water supply is forecast for the Jackson Hole area and adjacent irrigated land in Idaho. The possibility of damaging high water in the Jackson bottoms if the snow melt run-off is delayed cannot be overlooked.

Snow water measured on the Green River watershed was slightly above normal and is probably the least above normal snow cover in the Rocky Mountain area.

Summer run-off of North Platte River will be very high. April-September flow of the North Platte at Saratoga will probably exceed 1,000,000 acre-feet. Because the available capacity of the North Platte reservoir system as of this date is about one-half of this amount the whole system will probably spill this year for the first time since the system was completed. The flow of the Laramie River will also be high. Soil moisture conditions on the irrigated areas of the North Platte in eastern Wyoming and western Nebraska are good.

Snow cover on Wind River basin in Wyoming averages slightly below normal. Water supplied from this basin is not expected to be as great as during the past two years, but should not be much below normal.

BRITISH COLUMBIA

Snow surveys in British Columbia indicate that to date little early melting has taken place except at the lower elevations in the southern and central portions of the Province. Most observers report low to medium density snow which indicates that the snow has not ripened appreciably in preparation for the spring thaw. This applies particularly to snow packs above the 3,000-ft. level. The snow line varies from 1,000-ft. elevation in the lower coastal area to 2,000 ft. in the southern Okanogan and Columbia.

The overall snow situation this year throughout the Province is rather mixed. Snow is considerably less than measured in 1950 and 1951. Above normal snow packs on the West Kootenay, Columbia, Okanogan and North Thompson should contribute to an above-normal run-off providing normal or above-normal temperature and precipitation prevail until and during the run-off period. For similar conditions of weather the run-off in the West Kootenay, Skagit and Similkameen areas should be slightly below normal.

However, all areas report at least equal or greater snow-water contents than in 1948. The possibility of flooding cannot be ignored and will depend upon the temperature and precipitation distribution during the snow melt season. The watershed soils in all areas are well primed for run-off.

UNIT BID PRICES ... CONTINUED

100 lin. ft. 6-in. metal drain pipe, coated	2.00	1.95	1.95	1.80
200 lin. ft. salvaging culvert pipe	3.00	3.00	3.00	5.00
280 lin. ft. ¾-in. galvanized water pipe	.80	.40	.50	1.00
200 lin. ft. 1¼-in. galvanized water pipe	1.00	.55	.95	1.50
3 only 18-in. tide gate	40.00	34.00	45.00	80.00
4 only 30-in. tide gate	80.00	75.00	100.00	190.00
8,900 cu. yd. 2½-in. - 0 material in surfacing	3.65	2.55	3.75	3.00
3,500 cu. yd. ¾-in. - 0 material in surfacing	3.80	2.60	4.00	3.50
320 M. gal. sprinkling	3.00	2.00	3.00	2.50

2-in road mix, and 20-ft. concrete box girder bridge

Utah—Uintah County—State. Whiting & Haymond, Contractors, Springville, submitted the low bid of $265,881 to the State Road Commission for construction of a 2-in. road mix bituminous surfaced road and a concrete box girder bridge over 20-ft. span between Gusher and LaPoint, a distance of 7.3 mi. Unit prices were as follows:

(1) Whiting & Haymond, Contractors.....$265,881
(2) W. W. Clyde & Co..... 269,987
(3) Germer, Abbott & Waldron 275,120
(4) Young & Smith Construction Co..... 287,832
(5) Thorn Construction Co., Inc.....$314,861
— Reynolds Construction Co..... 426,668
(6) Engineer's estimate 259,572

	(1)	(2)	(3)	(4)	(5)	(6)
164,000 gal. bituminous material, Type SC-3	.12	.125	.125	.13	.14	.115
30,000 gal. bituminous material, Type MC-1 or MC-2	.13	.14	.135	.14	.15	.135
28,700 gal. bituminous material, Type RC-4	.15	.15	.145	.15	.17	.145
287 gal. bituminous additive	2.25	2.50	2.20	2.00	3.00	2.00
7.399 mi. scarifying and mixing	750.00	700.00	625.00	700.00	800.00	700.00
1,400 ton cover material	3.50	3.50	3.75	3.50	4.00	3.00
2,000 ton cover material (place in stockpile)	2.25	2.50	2.50	2.50	2.50	2.50
39,500 ton crushed rock or crushed gravel surface crse.	.80	.80	1.05	1.00	1.00	.80
15,000 ton cr. rk. or cr. grav. surf. crse. (placed in stkpl.)	.65	.65	.80	.65	.70	.75
21,000 ton gravel or crushed rock base course	.70	.75	.80	.80	1.00	.75
57,000 cu. yd. imported borrow	.25	.25	.25	.35	.25	.25
44,000 cu. yd. selected material base course	.57	.60	.55	.50	.80	.70
63,000 cu. yd. unclassified excavation	.35	.50	.38	.50	.50	.40
502,000 sta. yd. overhaul, Class "A"	.01	.01	.015	.015	.02	.015
62,500 yd. mi. overhaul, Class "B"	.15	.15	.15	.16	.15	.15
3,600 1,000 gal. watering	1.00	.75	1.00	1.50	2.00	1.00
1,800 hr. rolling	4.75	4.00	5.00	5.00	7.00	5.00
80 lin. ft. 12-in. C.G.M. pipe plain bituminous coated	2.50	2.75	2.50	5.00	2.70	2.25
176 lin. ft. 15-in. C.G.M. pipe plain bituminous coated	3.25	3.30	3.00	4.00	3.00	3.00
770 lin. ft. 18-in. C.G.M. pipe plain bituminous coated	4.00	3.90	3.85	5.00	3.70	3.55
866 lin. ft. 24-in. C.G.M. pipe plain bituminous coated	6.00	6.00	5.75	6.50	5.30	5.40
74 lin. ft. 30-in. C.G.M. pipe plain bituminous coated	7.50	7.30	7.25	8.00	7.00	6.50
126 lin. ft. 36-in. C.G.M. pipe plain bituminous coated	12.00	11.60	11.10	.13	11.50	10.75
94 lin. ft. 54-in. C.G.M. pipe plain bituminous coated	20.00	20.00	18.00	20.00	18.00	17.00
122 lin. ft. C.M. pipe arches 22-in. x 13-in. plain bit. coated	5.00	4.20	4.50	5.00	3.80	3.70

		(1)	(2)	(3)	(4)	(5)	(6)
354	lin. ft. C.M. pipe arches 29-in. x 18-in. plain bit. coated	7.00	6.35	7.00	7.00	5.00	5.65
46	lin. ft. C.M. pipe arches 36-in. x 22-in. plain bit. coated	9.00	8.00	8.35	10.00	7.80	7.00
128	lin. ft. C.M. pipe arches 43-in. x 27-in. plain bit. coated	14.00	12.60	13.00	14.00	12.00	11.25
80	lin. ft. C.M. pipe arches 65-in. x 40-in. plain bit. coated	22.00	20.00	20.00	21.00	20.00	18.00
8,500	cu. yd. channel excavation	.75	.50	.60	.60	.50	.30
58	acre clearing and grubbing	100.00	100.00	60.00	70.00	100.00	20.00
22	ea. removal of trees	50.00	50.00	30.00	50.00	70.00	35.00
300	cu. yd. excavation for structures	2.00	1.50	2.00	2.00	3.00	1.50
56.5	cu. yd. concrete, Class "A"	75.00	80.00	80.00	85.00	80.00	75.00
10,200	lb. reinforcing steel	.15	.15	.14	.14	.15	.14
400	cu. yd. loose rip rap	10.00	4.00	7.00	7.00	6.00	2.50
85	ea. guide posts	5.50	6.00	6.00	7.00	7.00	5.00
1,540	lin. ft. right-of-way fence Type "A"	.30	.30	.30	.35	.30	.25
4,300	lin. ft. right-of-way fence Type "B"	.35	.35	.32	.35	.30	.30
6	ea. 14-ft. gates	35.00	40.00	40.00	40.00	35.00	30.00
6	ea. 16-ft. gates	40.00	42.00	45.00	40.00	40.00	35.00
Lump sum,	furnish water equipment	$2,000	$4,000	$2,000	$1,000	$2,000	$3,600
Lump sum,	furnishing construction signs	800.00	500.00	$1,500	600.00	$1,000	500.00
90	ea. right-of-way markers	7.00	5.00	6.50	7.00	7.00	5.25
2	ea. F.A.P. markers	35.00	25.00	25.00	35.00	25.00	20.00
100	cu. yd. excavation for structures	5.00	5.00	3.50	6.00	10.00	10.00
240	cu. yd. concrete, Class "A"	75.00	65.00	75.00	70.00	70.00	65.00
37,600	lb. reinforcing steel	.15	.15	.13	.14	.15	.15
1,100	lb. structural steel	.50	.40	.40	.50	.50	.50
1	ea. removal of existing structure	$1,000	500.00	500.00	500.00	$5,000	500.00

Street paving in Albuquerque

New Mexico—Bernalillo County—State. E. M. Silver, Albuquerque, received a contract from the State Highway Department on his low bid of $31,792 for 2.2 mi. of work on the City of Albuquerque Rd., US 66. Unit prices were as follows:

(1)	E. M. Silver	$31,792	(5) Wylie Bros. $37,843
(2)	Miller & Smith	32,612	— J. H. Ryan 40,460
(3)	F. D. Shufflebarger	33,609	(6) Engineer's estimate 27,640
(4)	Allison & Haney	35,775	

		(1)	(2)	(3)	(4)	(5)	(6)
Lump sum,	removal of obstructions	$1,000	265.00	525.00	750.00	$1,000	200.00
33	cu. yd. Class "AE-AR" conc. curb and gutter	35.00	37.50	36.00	40.00	35.00	30.00
2	cu. yd. Class "AE-AR" conc. curb	40.00	37.50	95.00	75.00	100.00	30.00
32	cu. yd. Class "AE-AR" conc. light stand. base	25.00	25.00	33.00	42.00	50.00	30.00
820	cu. yd. Class "AE-AR" conc. median strip	34.00	35.50	35.50	38.00	40.00	30.00
320	sq. yd. prime coat	.17	.20	.20	.15	.06	.06
320	sq. yd. tack coat	.17	.15	.15	.15	.06	.05
320	sq. yd. base course	1.12	1.50	2.80	1.50	1.50	1.00
380	sq. yd. surface course	.60	.95	1.20	.75	1.00	.75
380	sq. yd. grading	.48	.40	.20	.50	.50	.50

Heavy grading south of San Francisco

California—San Mateo County—State. Edward Keeble, San Jose, submitted the low bid of $136,260 to the State Division of Highways for about 0.5 mi. of grading between south city limits of San Francisco and 0.6 mi. south. Unit prices were as follows:

(1)	Edward Keeble	$136,260	— S.A.E. Co. $280,000
(2)	Piombo Construction Co.	172,320	— Ball & Simpson 289,950
(3)	Eaton & Smith	227,634	— Charles J. Rounds 341,370
(4)	United Concrete Pipe Corp.	229,160	— Fredrickson & Watson Construction Co. and M & K Corp. 350,000
(5)	Guy F. Atkinson Co.	307,810	— Fredrickson Bros. 360,460
(6)	L. A. & R. S. Crowe	301,300	— H. Earl Parker, Inc. 373,600
—	C. G. Willis & Sons, Inc.	242,732	— C. V. Kenworthy 394,000
—	Charles L. Harney, Inc.	254,180	
—	L. C. Smith Co.	267,545	

		(1)	(2)	(3)	(4)	(5)	(6)
418,000	cu. yd. excavation	.295	.34	.513	.47	.67	.60
2,100,000	sta. yd. overhaul	.003	.01	.002	.007	.005	.005
Lump sum,	dev. wat. supply and furn. wat. equip.	$5,000	$3,500	$2,500	$3,500	$1,000	$5,000
2,500	M. gal. applying water	.50	1.00	1.00	1.80	2.50	2.00
400	hr. idle time	1.00	8.00	10.00	25.00	25.00	75.00

Irrigation

Canal lining, structures, monolithic-concrete and concrete pipe siphons and tunnel in Colorado

Colorado—Colorado-Big Thompson Project—U.S.B.R. Winston Bros. Co., Monrovia, submitted the low bid of $1,618,557 on Schedule I, earthwork, canal lining, and structures, St. Vrain Supply Canal, to the Bureau of Reclamation. On Schedule II, alternate to Schedule III, monolithic-concrete siphons, Adler Construction Co. submitted the low bid of $374,570. On Schedule III, concrete pipe siphons, Peter Kiewit Sons' Co. submitted the low bid of $320,833. On Schedule IV, tunnel construction, K. S. Mittry Construction Co. submitted the low bid of $661,382. Unit prices were as follows:

SCHEDULE I

(1)	Winston Bros. Co.	$1,618,557	(4) Adler Construction Co. $1,919,891
(2)	Colorado Constructors, Inc.	1,712,030	(5) Guy F. Atkinson Co. 2,146,883
(3)	Peter Kiewit Sons' Co.	1,739,122	(6) Engineer's estimate 1,684,509

		(1)	(2)	(3)	(4)	(5)	(6)
223,000	cu. yd. excavation, common, for canal	.50	1.10	.72	.40	1.30	.50
163,000	cu. yd. excavation, rock, for canal	1.65	1.10	.72	2.00	1.30	1.50
117,000	sta. cu. yd. overhaul for canal and roads	.03	.05	.02	.03	.04	.03
71,000	cu. yd. compacting embankments	.27	.35	.40	.30	.35	.30
42,000	cu. yd. excav., common, for drainage channels and ditches	.50	.60	.45	.50	1.00	.40
5,500	cu. yd. excav. rock, for drainage channels and ditches	2.70	3.00	3.50	3.00	3.00	2.50
6,000	sq. yd. trimming earth foundtns. for conc. canal lining	1.25	1.50	2.25	1.90	2.50	.80
65,000	sq. yd. preparing rock foundtns. for conc. canal lining	1.25	1.50	2.25	1.90	2.50	1.60
42,900	cu. yd. excav., common, for structs.	.85	1.55	1.18	1.00	1.00	1.10

(Continued on next page)

UNIT BID PRICES . . . CONTINUED

		(1)	(2)	(3)	(4)	(5)	(6)
20,500	cu. yd. excav., rock, for structs.	2.20	1.55	1.18	3.00	5.00	3.50
38,000	cu. yd. backfill about structs.	.50	.50	.85	.50	.75	.60
9,800	cu. yd. fill at top of conc. lining	.90	1.50	1.25	1.00	1.50	1.00
11,500	cu. yd. compacting backfill about structs.	2.50	4.00	4.25	4.00	5.00	3.50
1,450	sq. yd. dry-rock paving	6.00	6.00	5.50	4.00	6.00	5.00
450	cu. yd. loose rock backfill	2.00	3.00	6.00	5.00	3.00	1.50
200	lin. ft. furn. matls. and constr. graded and gravel drains with 4-in. sewer pipe	2.00	2.00	4.00	3.00	4.00	2.75
550	lin. ft. furn. matls. and constr. graded sand and gravel drains with 6-in. sewer pipe	2.10	2.50	4.00	3.00	4.50	3.00
80	lin. ft. furn. and laying 4-in. sewer pipe with cemented joints	2.00	2.00	3.00	3.00	2.50	1.75
250	lin. ft. furn. and laying 6-in. sewer pipe with cemented joints	2.00	2.50	3.00	3.00	3.00	2.00
1,100	cu. yd. 18-in. riprap	2.20	6.00	6.00	5.00	7.50	6.00
1,000	cu. yd. 24-in. riprap	2.20	7.00	9.00	5.00	7.00	5.00
320	cu. yd. gravel bedding under riprap	6.00	6.00	6.00	5.00	6.00	5.00
10,000	cu. yd. excav., all classes, for roads	1.00	1.50	1.50	1.80	1.50	1.25
2,800	cu. yd. selected surfacing for roads	3.60	2.50	3.00	3.00	1.75	2.00
5,350	cu. yd. concrete in structs.	75.00	60.00	79.00	70.00	75.00	60.00
8,000	cu. yd. conc. in unreinforced-conc. canal lining	18.00	23.00	19.50	38.00	30.50	25.00
500	cu. yd. conc. in reinf.-conc. canal lining	18.00	24.00	25.00	40.00	31.00	28.00
23,025	bbl. furn. and handling cement	4.60	5.00	5.25	5.50	5.00	5.50
928,000	lb. furn. and placing reinf. bars	.135	.13	.14	.14	.17	.16
30	sq. ft. furn. and placing elastic filler matl .in joints	2.00	2.50	1.50	3.00	4.00	2.00
3,600	lin. ft. placing rubber water stops in joints	1.00	1.50	2.00	1.50	2.40	1.50
36.5	M.b.m. furn. and erecting untr. timber in structs.	400.00	320.00	400.00	265.00	400.00	300.00
4	M.b.m. furn. and erect. treated timber in structs.	450.00	370.00	500.00	350.00	450.00	350.00
20	lin. ft. furn. and lay. 12-in. std.-str. conc. culv. pipe	2.50	4.00	5.00	3.00	5.00	3.00
72	lin. ft. furn. and lay. 30-in. std.-str. conc. culv. pipe	9.00	10.00	14.00	10.00	11.00	10.00
152	lin. ft. furn. and lay. 36-in. std.-str. conc. culv. pipe	11.00	13.00	16.00	13.00	13.00	13.00
32	lin. ft. furn. and lay. 36-in. ex.-str. conc. culv. pipe	15.00	15.50	19.00	16.00	15.00	13.90
154	lin. ft. furn. and lay. 42-in. std.-str. conc. culv. pipe	15.00	17.00	20.00	17.00	17.00	16.60
20	lin. ft. furn. and lay. 42-in. ex.-str. conc. culv. pipe	18.00	18.00	22.00	20.00	19.00	17.80
503	lin. ft. furn. and lay. 48-in. std.-str. conc. culv. pipe	20.00	21.00	26.00	21.00	22.00	20.80
72	lin. ft. furn. and lay. 48-in. ex.-str. conc. culv. pipe	23.00	24.00	30.00	25.00	25.00	22.25
363	lin. ft. furn. and lay. 54-in. std.-str. conc. culv. pipe	27.00	27.00	34.00	30.00	27.00	25.10
48	lin. ft. furn. and lay. 54-in. ex.-str. conc. culv. pipe	28.00	28.00	36.00	33.00	30.00	27.10
363	lin. ft. furn. and lay. 60-in. std.-str. conc. culv. pipe	33.00	34.00	42.00	33.00	35.00	31.30
50	lin. ft. furn. and lay. 60-in. ex.-str. conc. culv. pipe	34.00	35.00	44.00	37.00	36.00	33.70
414	lin. ft. furn. and lay. 66-in. std.-str. conc. culv. pipe	38.00	38.00	48.00	40.00	40.00	36.70
25	lin. ft. furn. and lay. 66-in. ex.-str. conc. culv pipe	42.00	40.00	50.00	45.00	43.00	39.50
89	lin. ft. furn. and lay. 72-in. std.-str. conc. culv. pipe	46.00	45.00	55.00	50.00	52.50	42.50
96	lin. ft. furn. and lay. 24-in. corrugated-metal pipe	6.00	6.50	6.00	6.00	6.00	6.80
66	lin. ft. furn. and lay. 36-in. corrugated-metal pipe	10.00	11.00	12.00	12.00	11.00	12.25
64	lin. ft. furn. and lay. 42-in. corrugated-metal pipe	12.00	13.00	15.00	14.00	14.00	14.30
84	lin. ft. furn. and lay. 43-in. by 27-in. corr.-metal pipe arch	11.00	15.00	14.00	15.00	12.00	12.50
112	lin. ft. furn. and lay. 58-in. by 16-in. corr.-metal pipe arch	16.00	18.00	23.00	25.00	20.00	17.70
44	lin. ft. furn. and erect. 7-ft. 9-in. by 5-ft. 4-in. multiplate corru.-metal pipe arch	37.00	48.00	50.00	45.00	40.00	51.30
2	cattle guards furn. matls. and const. cattle guards	900.00	550.00	$2,800	500.00	$1,500	400.00
1.6	mi. removing fences	400.00	400.00	300.00	300.00	500.00	300.00
12.4	mi. furn. matls. and const. barbed-wire right-of-way fences	$1,700	$2,000	$2,500	$1,700	$2,500	$1,800
1	gate furn. and install. metal fence gate in right-of-way fence	80.00	100.00	45.00	60.00	125.00	60.00
7	structs. furn. and construct. canal fence structs.	320.00	75.00	400.00	150.00	150.00	100.00
240	lin. ft. furn. and erecting wire cable guard fences	4.70	5.00	5.00	4.00	5.00	3.50
1	gate furn. and install. 30-in. 1 to 1 slope screw-lift gate	600.00	280.00	300.00	300.00	300.00	500.00
1	gate furn. and install. 36-in. 1 to 1 slope screw-lift gate	725.00	300.00	300.00	400.00	350.00	600.00
1	gate furn. and install. 4-ft. by 4-ft. slide gate and hoist	$1,100	700.00	750.00	500.00	$1,200	$1,300
6	shelters furn. and erect gaging sta. shelters	900.00	300.00	300.00	300.00	400.00	400.00
5,500	lb. furn. and install. miscl. metalwork	.85	1.00	.90	.70	1.25	.60

SCHEDULE II

(1) Adler Construction Co. $374,570
(2) Winston Bros. Co. 442,556
(3) Guy F. Atkinson Co. $538,105
(4) Engineer's estimate 309,300

		(1)	(2)	(3)	(4)
12,200	cu. yd. excav., common, for structs.	2.00	3.50	4.00	1.00
7,900	cu. yd. excav., rock, for structs.	5.00	3.50	4.00	3.50
16,100	cu. yd. backfill about structs.	.70	1.30	1.50	.60
1,200	cu. yd. compacting backfill about structs.	6.00	3.50	6.00	3.50
1,880	cu. yd. concrete in structs.	70.00	80.00	112.00	55.00
2,820	bbl. furn. and handling cement	6.00	5.00	5.00	5.50
475,000	lb. furn. and placing reinf. bars	.14	.16	.17	.16
1,220	lin. ft. placing rubber water stops in joints	1.50	1.30	2.50	1.50
3,500	lb. furn. and installing miscl. metalwork	.70	1.00	.75	.60
223,000	lb. furn. and install. plate-steel liner for monolithic siphon	.30	.43	.49	.25
4	jts. furn. and install. contraction jts. in steel-lined siphon	$1,500	$1,400	$1,500	250.00

SCHEDULE III

(1) Peter Kiewit Sons' Co. $320,833
(2) Colorado Constructors, Inc. 343,690
(3) Winston Bros. Co. 407,785
(4) Guy F. Atkinson Co. $511,960
(5) Engineer's estimate 288,760

		(1)	(2)	(3)	(4)	(5)
10,500	cu. yd. excav., common, for structs.	.75	3.50	3.50	4.00	1.00
7,100	cu. yd. excav., rock, for structs.	2.25	3.50	3.50	4.00	3.50
12,800	cu. yd. backfill about structs.	.75	.75	1.30	1.50	.60
1,650	cu. yd. compacting backfill about structs.	4.00	5.00	3.50	6.00	3.50
300	cu. yd. concrete in structs.	90.00	80.00	100.00	120.00	70.00
2,440	bbl. furn. and handling cement	5.00	5.00	5.00	5.00	5.50
51,000	lb. furn. and placing reinf. bars	.14	.16	.17	.20	.16
3,500	lb. furn. and install. miscl. metalwork	1.00	1.00	1.00	.75	.60
257	lin. ft. furn., laying, and testing 102-in. noncyl. conc. pipe, symbol 5-A-50	111.00	124.00	132.00	175.00	83.00
104	lin. ft. furn., laying, and testing 102-in. noncyl. conc. pipe, symbol 5-A-75	115.00	124.00	138.00	180.00	89.00
104	lin. ft. furn., laying, and testing 102-in. noncyl. conc. pipe, symbol 5-A-100	120.00	124.00	144.00	190.00	95.00
104	lin. ft. furn., laying, and testing 102-in. noncyl. conc. pipe, symbol 5-A-195	125.00	124.00	147.00	195.00	100.00

188 lin. ft. furn., laying, and testing 102-in. noncyl. conc. pipe, symbol 10-A-50	120.00	124.00	141.00	180.00	93.00
32 lin. ft. furn., laying, and testing 102-in. noncyl. conc. pipe, symbol 10-A-75	122.00	124.00	146.00	185.00	96.00
72 lin. ft. furn., laying, and testing 102-in. noncyl. conc. pipe, symbol 15-A-50	127.00	124.00	150.00	190.00	103.00
120 lin. ft. furn., laying, and testing 102-in. cyl. conc. pipe, symbol 5-B-150	133.00	124.00	155.00	200.00	114.00
120 lin. ft. furn., laying, and testing 102-in. cyl. conc. pipe, symbol 5-B-175	137.00	124.00	160.00	205.00	122.00
120 lin. ft. furn., laying, and testing 102-in. cyl. conc. pipe, symbol 5-B-200	140.00	124.00	164.00	215.00	126.00
120 lin. ft. furn., laying, and testing 102-in. cyl. conc. pipe, symbol 5-B-225	145.00	124.00	167.00	220.00	131.00
120 lin. ft. furn., laying, and testing 102-in. cyl. conc. pipe, symbol 5-B-250	147.00	124.00	171.00	225.00	136.00
56 lin. ft. furn., laying, and testing 102-in. cyl. conc. pipe, symbol 5-B-275	150.00	124.00	175.00	230.00	141.00
228 lin. ft. furn., laying and testing 102-in. cyl. conc. pipe, symbol 10-B-275	162.00	124.00	180.00	235.00	145.00

SCHEDULE IV

(1) K. S. Mittry Construction Co. $661,382
(2) Winston Bros. Co. 712,835
(3) Guy F. Atkinson Co. 780,680
(4) G. L. Tarlton Contracting Co. $908,834
(5) Peter Kiewit Sons' Co. 994,329
(6) Engineer's estimate 728,369

	(1)	(2)	(3)	(4)	(5)	(6)
3,500 cu. yd. excav., common, in open cut	1.75	3.00	2.00	3.00	4.00	1.50
8,000 cu. yd. excav., rock, in open cut	1.75	3.00	2.00	3.00	4.00	4.00
13,900 cu. yd. excav., all classes, in tunnel	25.00	28.00	28.00	39.00	40.00	28.00
150 cu. yd. excav., all classes, for tunnel enlargment	30.00	30.00	60.00	40.00	45.00	40.00
100 cu. yd. backfill about structs.	1.00	2.00	6.00	3.00	2.00	1.00
50 cu. yd. compacting backfill about structs.	2.75	4.00	7.00	9.00	5.00	3.50
260,000 lb. furn. and install. perm. steel tunnel supports	.18	.17	.24	.18	.25	.20
140 M.b.m. furn. and erect. perm. timbering in tunnel	275.00	200.00	275.00	300.00	100.00	275.00
2,600 lin. ft. furn. and install. tunnel roof support bolts	3.25	2.10	3.00	3.00	3.50	3.00
450 lin. ft. drilling feeler or pilot holes ahead of tunnel excav.	1.60	1.50	2.00	1.00	1.00	1.50
450 lin. ft. drilling grout holes thru conc. tunnel lining	1.40	1.50	3.00	2.00	1.50	2.00
450 lb. furn. and placing grout pipes and connections	1.00	1.00	.75	2.00	3.00	1.00
4,350 cu. ft. pressure grouting	3.50	2.50	4.00	2.70	2.00	2.00
120 cu. yd. conc. in structs.	70.00	85.00	100.00	50.00	100.00	65.00
4,200 cu. yd. conc. in tunnel lining	29.00	35.00	42.00	40.00	57.00	32.00
7,570 bbl. furn. and handling cement	6.00	4.50	5.00	5.00	4.20	5.50
15,400 lb. furn. and placing reinf. bars	.15	.15	.20	.16	.15	.16
200 lb. furn. and installing miscl. metalwork	.45	1.00	1.00	1.00	.50	.60
125 lin. ft. placing rubber water stops in joints	1.80	1.00	2.50	3.00	2.00	1.60

Miscellaneous

Bank excavation to correct potential slide condition

Oregon—Lane County—Corps of Engineers. Henry H. Miller, Lee Mortensen, Inc. and Ed A. Miller, joint venturers, Roseburg, submitted the low bid of $84,375 to the Corps of Engineers for excavation of material to correct potential slide condition at the left side of the cut on the relocated Southern Pacific Co.'s Cascade Line railroad, approximately 10 mi. northwest of Oakridge. Unit prices were as follows:

(1) Henry H. Miller, Lee Mortensen, Inc. and Ed A. Miller ..... $ 84,375
(2) Fred H. Slate Co. Oregon Ltd. and E. C. Hall 93,750
(3) Inter City Sand & Gravel Co., Inc. 110,250
(4) Halvorson Contracting Corp. $111,000
(5) Morrison-Knudsen Co., Inc., Peter Kiewit Sons' Co. and Macco Corporation 213,750
(6) Contracting officer's estimate 90,750

	(1)	(2)	(3)	(4)	(5)	(6)
75,000 cu. yd. excavation, unclassified	1.125	1.25	1.47	1.48	2.85	1.21

Bituminous surfacing of storage area

Oregon—Multnomah County—Corps of Engineers. Parker & Fuhrman, Portland, submitted the low bid of $9,602 to Corps of Engineers for grading and surfacing storage area at U. S. Government Moorings, Portland. Unit prices were as follows:

(1) Parker & Fuhrman ..... $ 9,602
(2) Oregon Asphaltic Paving Co. 11,770
(3) C. T. Malcolm & Co. 14,965
(4) Portland Road & Driveway Co. $12,605
(5) Contracting officer's estimate 12,302

	(1)	(2)	(3)	(4)	(5)
550 cu. yd. excavation, unclassified	1.00	1.50	1.50	1.50	1.30
800 cu. yd. base course, in place	2.80	3.00	3.50	3.60	3.10
400 cu. yd. crushed-stone leveling course, in place	3.50	3.30	4.15	4.25	3.55
25 M. gal sprinkling	3.00	3.00	3.00	4.00	3.50
6,250 sq. yd. bituminous macadam surface in place	.35	.40	.35	.40	.40
1 job cleaning and plastering 30-ft. section rock revetment	500.00	850.00	566.00	600.00	350.00
1 job removing, storing and replacing stored material	$2,650	$3,800	$6,852	$4,000	$4,750

NEW LITERATURE

501

20-page manual on milli-second blasting

Eight methods of blasting in quarries with milli-second delays are described and illustrated in this new 20-page manual released by the **Atlas Powder Company.** The manual contains previously unpublished machine-gun photographs and methods of shooting to illustrate both progressive and alternate milli-second delay techniques. Principles of milli-second delay blasting, diagrams, and a series of photographs showing alternate and progressive blasts and sketches explaining why the Rockmaster "16" blasting system gives better breakage, reduced vibration, reduced air blast, etc., are presented.

502

A handbook on wire rope assemblies

Any reader who uses wire rope would do well to get a copy of this 24-page catalog on Macwhyte Safe-Lock wire rope assemblies. It is filled with How-to-order information which can save the user time and money. Specifications and diagrams for the various terminals are included in this well-prepared catalog, issued by **Macwhyte Company.**

503

Equipment guide for cement, rock products industries

An example of the valuable information contained in this 44-page booklet is a table which shows how easy it is to select a stronger chain if the chain now in service is not suitable for current operations. Complete details and specifications of all chains used in this industry are given. Cutaway and diagrammatic views of chain clearly show points of importance to observe in specifying equipment of these types—elevating, conveying and power transmission. Several pages on sprockets and traction wheels explain the correct type to order for almost every application. Basic types of bucket elevators are illustrated and described with correct applications noted. A section on Rex Belt Conveyor Idlers and accessories together with application photographs of belt conveyor systems simplifies the selection of this type of equipment. **Chain Belt Co.** of Milwaukee is offering a lot of information here.

504

Revised edition of the Euclid estimating book

"Estimating Production and Costs of Material Movement with Euclids" is the title of **The Euclid Road Machinery Co.'s** revised and enlarged edition of this fully-illustrated, two-color book. Part I covers job analysis and the method of estimating production and the number of hauling units required for a specific job. Part II deals with cost estimating which includes the hourly cost of ownership and the cost of operation and maintenance. Samples of two very useful work sheets that are also available from Euclid are shown in this section. Part III contains formulas to determine grade ability, rim pull, engine torque, etc., and pages of tables with commonly used dimensions, weights and other data.

505

Sewer joint packing

The introduction of Ropax sewer joint packing, to be used in conjunction with bituminous joint sealing compounds,

occasions the release of new literature from **Presstite Engineering Co.** The way in which Ropax is engineered to meet the need for tighter sewer joints where there are adverse soil conditions, excessive ground water, etc., is fully explained in the literature.

506

GM diesel details

Various design features of the General Motors 2-cycle diesel engine are covered in the firm's **Detroit Diesel Engine Division** release called a "50,000,000 horsepower insurance policy." Action photographs of installations in the construction, transportation and mining fields, plus a map showing the location of the extensive sales and service facilities throughout the United States appear in the booklet.

507

Adams machinery in action

In-action photographs of **J. D. Adams Manufacturing Co.** motor graders at work on all types of jobs appear in this 8-page bulletin just released by the firm. The Adams Traveloader is shown at work on summer and winter loading operations. Pull-type graders are also shown on representative jobs. Brief specifications and catalog views on all machines in the Adams line are included.

508

Hydrocrane close-up

In an informative 24-page booklet called "Busy as a Bee," **Bucyrus-Erie Co.** offers a written and pictorial close-up of the all-hydraulic Hydrocrane's versatility. The booklet shows the equipment doing everything from digging ditches to moving furniture through second story windows. The booklet has a section of pictures devoted to each phase of Hydrocrane's operations along with a catalog page which presents the attachments which serve the "big lifter"!

509

Pre-fab steel buildings

Containing diagrams of structural features in simplified architectural form, this bulletin also contains illustrations that can be used in single or multiple series for the erection of almost any size industrial warehouse or large utility building, plus other suggested applications. Many component parts of the structures, such as windows, doors, openings, etc., are discussed in the bulletin which gives a thorough picture of this convenient and economic method. **Brookville Manufacturing Co.** is offering the literature.

510

Electric power drive guide

This comprehensive catalog contains complete descriptive information on variable speed drives, geared motors and constant normal speed motors in drip-proof, geared motors and constant normal speed motors in drip-proof, splash-proof, totally enclosed and pipe ventilated designs. Diagrams, photographs and specifications make for easy understanding of this **Sterling Electric Motors, Inc.** release.

511

Water repellent for all masonry

Crete-Driseal is the trade name of this new silicone water repellent which has received wide acceptance already in the construction industry. This 12-page booklet issued by **Williams Form Engineering Corp.**, the distributor, tells the story of Crete-Driseal (formerly called Sili-Duc) and the many ways in which it can help you with masonry jobs. The preparation is colorless, but can be obtained dyed red to use below grade to meet FHA inspection code. All the details you would want to know about the preparation are contained in this little booklet.

512

"The Surveyor's Notebook" tells, solves unusual field problems

Here is a collection of short articles on unusual surveying problems solved by the ingenuity of the surveyor or engineer in the field with the help of his instruments. In one article, a county surveyor gives his method for quickly determining a quarter-section line when it is completely blocked by railroad cars. There is interesting information on surveying techniques employed in the Arctic, and by the Corps of Engineers in gaining the first accurate survey of the Niagara River bed. Remedies are given for "frozen" tripods—and a method is presented for leveling over 10 ft. of corn. **W. & L. E. Gurley** is offering this interesting and informative material, reprinted from engineering journals.

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513

Concrete form equipment guide

All the information on **H. J. Krueper Co.'s** taper-type concrete form clamps is contained in this 6-page folder of diagrams, specifications and photographs. This folder is packed with information on the advantages and techniques of this form clamp on twistyes, form button assemblies and she-bolt assemblies.

514

16-page crusher bulletin

Detailed photographs, complete specifications, and exact diagrams are contained in **Stephens-Adamson Mfg. Co.'s** 16-page bulletin on crushers. Included in the bulletin is information about the latest addition to the S-A line, the double rotor Knittel crusher for damp coal and similar sticky materials. The bulletin gives capacity and power requirements for all types of crushers reducing run-o-mine bituminous coal to various finished product sizes. Important installation dimensions are also tabulated.

515

V-drive selections

Selections of V-drives can be quickly and accurately made with the practical aid offered by **Ft. Worth Steel & Machinery Co.'s** Engineering Guide. Simple formulas for standard quarter-turn and V-flat drives are augmented by tables of drives in all belt sections which have been compiled for quick selection of drives of required ratio and speed. This bulletin also contains engineering information on other types of V-belt drives.

516

Airport lighting guide

In 18 pages of photographs, specifications, etc., **Westinghouse Electric Corp.** offers a guide to airport lighting equipment. CAA Equipment and Installation Specifications are stated in the booklet and several typical wiring diagrams for runways and taxiways are included.

Literature briefs . . .

517

VIBRATORS—A circular is available from **White Mfg. Co.** describing the exclusive features of the firm's vibrator line.

518

PUMPING PROSE—The ins and outs of Carver pumps are explained in bulletin 110 now available from **Carver Pump Co.**

519

WATER CONDITIONING—Containing 77 valuable tables, this 102-page leatherette bound volume is available to practicing engineers and those who work with water conditioning problems. Hydraulics, water impurities, chemical conversions, etc., are included in this handsome book, available to practicing engineers and those who work with water problems from **The Permutit Co.**

520

STEAM GENERATORS—Specific applications of steam generating equipment are given in this fully-illustrated booklet announced by **Clayton Manufacturing Co.** Operational data are also given.

521

MASONRY RAINCOAT — Flexseal, invisible water repellent, is discussed in a folder released by **Flexrock Company.** Application techniques, special jobs and characteristics appear.

522

ADJUSTABLE STEEL SHORES — In this 4-page booklet there is detailed information and typical application data on steel shores. Economy of the method is stressed. **Acrow, Inc.,** offers the booklet.

523

HAVE HARDSURFACING? — The advantages of hardsurfacing over the cost of machinery part replacement along with specific information as to recommended application procedures are contained in this bulletin released by **Rankin Manufacturing Co.**

524

MARION MACHINES — Complete specifications in catalog form are now available for the **Marion Power Shovel Co.'s** line of equipment. Catalog 403 gives you the low-down.

525

TRAILER TELLS-ALL — Here is a completely illustrated catalog which gives specifications for the **Fruehauf Trailer Co.'s** line. Pole trailers to hopper dumps are included.

526

THE BUGGIE MEN—Full facts, specifications, and illustrations of **Whiteman Equipment Co.'s** power buggies are contained in this literature. The name of your distributor is also included.

527

LOAD LIMIT—**The T. L. Smith Co.** is offering a brand new bulletin (251) which shows you the way to meet highway weight limits with the firm's models of transit mixers, etc.

528

WHAT A COMBO—A fully illustrated booklet is available from **The Cleveland Trencher Co.** which tells all about the Cleveland 80, which backfills, tamps and lays pipe. The literature is fully illustrated.

529

HOISTING A FEW — How you can hoist a few of anything is answered in **American Hoist & Derrick Co.'s** catalog on general purpose hoists. Complete details are available here.

530

CONVEYOR MESSAGE — How to move it fast with **The Fairchild Engineering Co.'s** construction conveyors, is explained in a new catalog just released by the firm.

Contract system versus force-account at Phoenix

WHO CAN BUILD roads cheaper—private contractors or county road crews? This was the subject of a debate recently in Maricopa County (Phoenix), Arizona, in connection with a bill introduced in the Arizona legislature that would require county supervisors to let out on bid all county road projects costing $25,000 or more.

The debate started when Howard L. Shelp, Maricopa County engineer, prepared some figures which indicated that county crews could build roads 33% more cheaply than private contractors. Shelp said he selected 10 road jobs done by contractors and 14 county jobs for similar work. Results were that the per-mile cost on contractor-built roads was $12,816; for county-built roads, $9,729. He claimed that contractors have to charge 25% profit because their work isn't steady and they have to make uneconomical moves from job to job.

Some of the other side of the story came from Joseph P. Condrey, executive secretary of the Arizona Chapter, Associated General Contractors. Condrey pointed out that the county doesn't have to pay any taxes, doesn't take into account equipment depreciation and pays its workers at a lower wage scale. Condrey stated that it has been demonstrated private contractors build better roads for less money than government agencies, when all such ultimate costs are uncovered and taken into consideration.

Ranchers tire of waiting, build their own road

THERE'S MORE than one way to get a road according to the antics of Lawen, Ore., ranchers.

The rancher group wanted road improvements in the area, but was told by county officials that adequate sums were not available for the project.

Citizens of the community still wanted a road, however, so they donated the sum of $4,800 toward the idea. Public spirited ranchers did the rest by coming through with the necessary time, labor and equipment.

That is the reason that a 7-mi. section of improved, 8-in. cinder surfaced road now exists between Lawen store and Silvies River, a satisfactory link to the highway.

Merritt-Chapman starts a company magazine

"BLACK HORSE NEWS," a new company magazine published by Merritt-Chapman & Scott Corp., will be distributed regularly to the company's employees and friends. Magazine features articles covering the firm's various spheres of work in the fields of marine, heavy, industrial and building construction, marine salvage and derrick heavy hoisting. Publication will also feature personnel items regarding activities of the M-C&S staff.

NEW EQUIPMENT

More information on any of the items in this section may be obtained by using coupon on page 149.

531

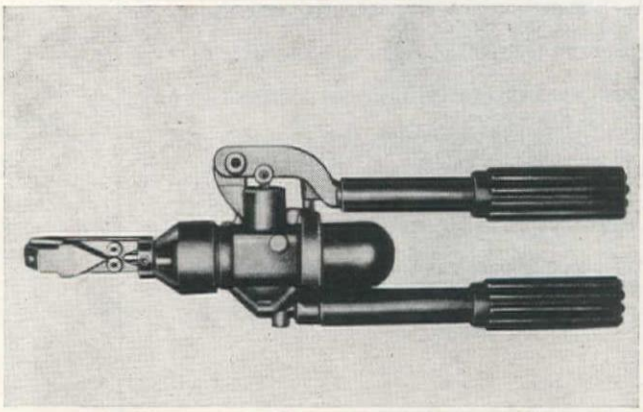
Power roller is a pal for paving and patching projects

Rollpac is the name given this new power roller, ideal for highways, municipal street patching, black top paving, etc. It features all steel construction, built of formed steel channels and plates. It is powered by a Briggs & Stratton 5-hp. engine, has twin disc clutch, Toro planetary transmission, hollow rolls built of 3/16-in. plate and a double seat position for forward and reverse operation. Weighs from 720 lb. light to 1,725 lb. loaded (includes operator). **Soilaire Industries** offers the machine at $795 delivered.

532

Guillotine cutter snips ½-in. reinforcing rods

This Model 200-A Guillotine Hydraulic Cutter weighs only 12 lb., is 21 in. long and is designed to replace larger, more cumbersome bolt cutters. Feature included in the new



Manco Model 200-A is a pressure of 8,500 psi., exerting 10 tons thrust in a hand operated unit. Also important is a newly designed dual ratio pump which combines rapid traverse with high power to minimize cutting time. Blades, which can be easily resharpened, are alloy steel. **The Manco Manufacturing Co.** is the manufacturer.

533

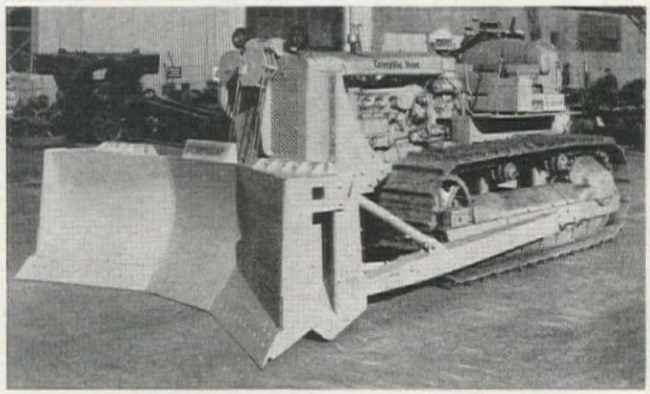
Hydraulic track adjuster for standard crawler tractors

A few shots from a standard grease gun take up the slack in the track, thereby eliminating the laborious time-consuming task of manually adjusting the track with adjusting screw and nut. Unnecessary wear on rails, idlers, rollers, sprockets and other mechanical parts is eliminated since the Hydrajuster makes it so easy for the operator to keep his crawler tractor adjusted properly. The device can be installed in the field. Once the tracks have been broken, it can be installed in approximately 1½ hours, which is about the time required to adjust the tracks on large model tractors by the old method. The Hydrajuster is available from **Machinery Parts Sales Corp.**

534

Angle wing attachment for all makes of bulldozer

Shepherd Tractor & Equipment Co. is making this angle wing attachment available for all bulldozers, regardless of manufacturer. They provide the advantage of a "U" type



bulldozer for carrying large yardages greater distances, together with the ability to side cast, back fill and pioneer hillside cuts, excavations and roadways by the use of single wing. Users with a regular bulldozer blade can now have the above advantages and can, of course, easily remove the Angle Wing and use the bulldozer as a pusher.

535

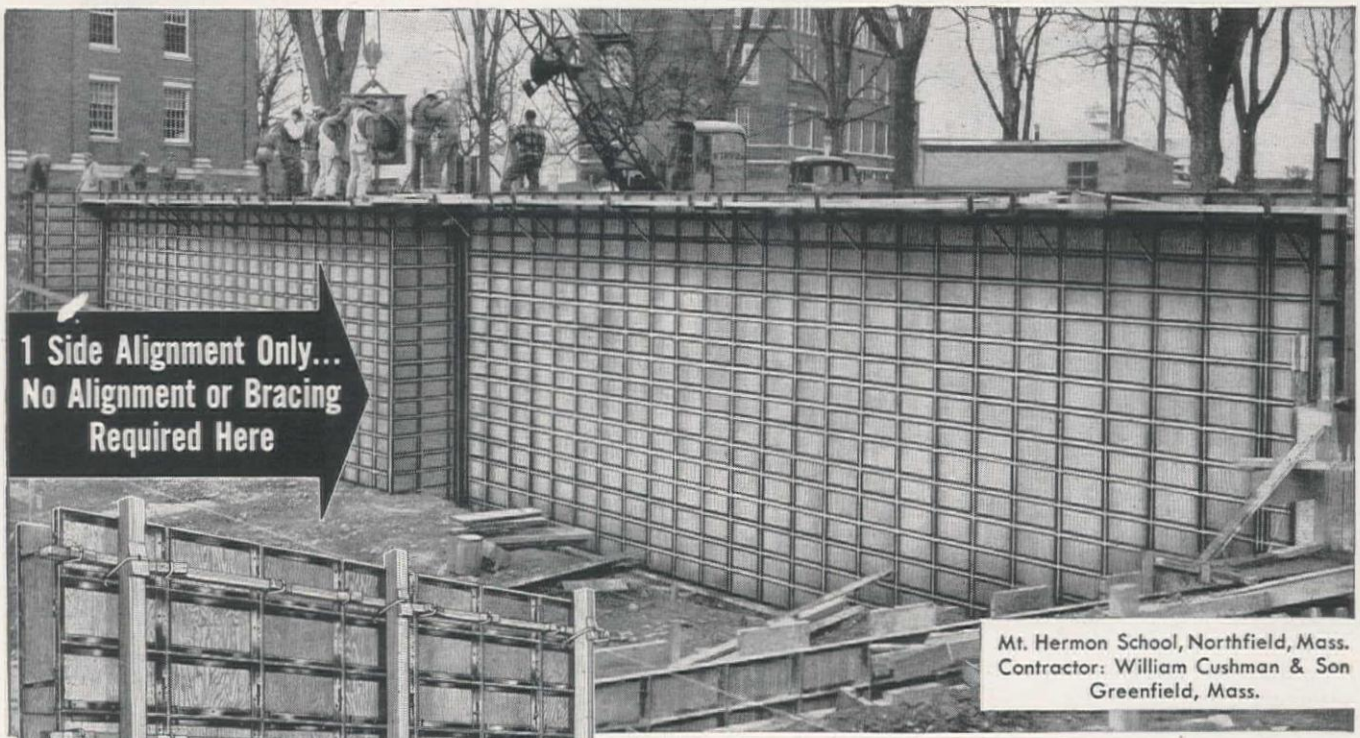
18-ton dump truck lends a hand with stripping and quarry operations

Featured in this new dumper is a planetary-drive type rear axle equipped with the Sterling-White Super-Traction differential. A Sterling-White development, this special differ-

ential divides the power delivered to each rear wheel according to the grip dictated by road and load condition. Other features include Tri-Pinion drive, which permits using larger and huskier gears within the available space. In addition the power is applied at a greater radius from the wheel center. Operating on a short 161-in. wheelbase, this dumper gets added flexibility and ease in maneuvering. The dumper has a wood-lined frame and bolted construction. The dumper is made by the **Sterling Division of The White Motor Co.**

UNI-FORMS..."TOPS" in CONCRETE FORMING

SAVED 73% ON ALIGNMENT AND BRACING HERE!



Mt. Hermon School, Northfield, Mass.
Contractor: William Cushman & Son
Greenfield, Mass.

Let us prove how UNI-FORMS can save material and labor on *your* next job. Here's a typical example:

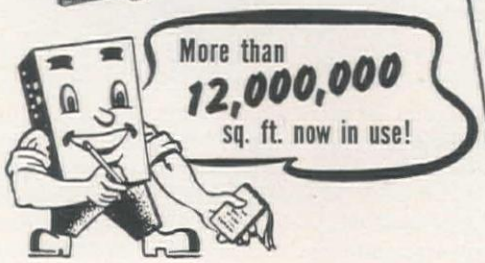
ALIGNMENT AND BRACING LUMBER REQUIRED TO FORM 4000Φ OF CONCRETE ON THIS JOB

METHOD	LUMBER REQ'D	AVERAGE RE-USAGE	LUMBER EXPENDED PER USE
Conventional Forms	2400 bd. ft.	6 times	400 bd. ft.
UNI-FORMS	1080 bd. ft.	10 times*	108 bd. ft.

LUMBER SAVED PER USE . . . 292 bd. ft.
% OF SAVING . . . 73%

**Standard lumber lengths always used with UNI-FORMS—no cutting—no waste.*

IMPORTANT: Less material to be handled and placed means LESS LABOR . . . even greater savings for you.
Write for complete information and your copy of the UNI-FORM Catalog.



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536

Rubber-tired trenchliner offers mobility for utility excavations

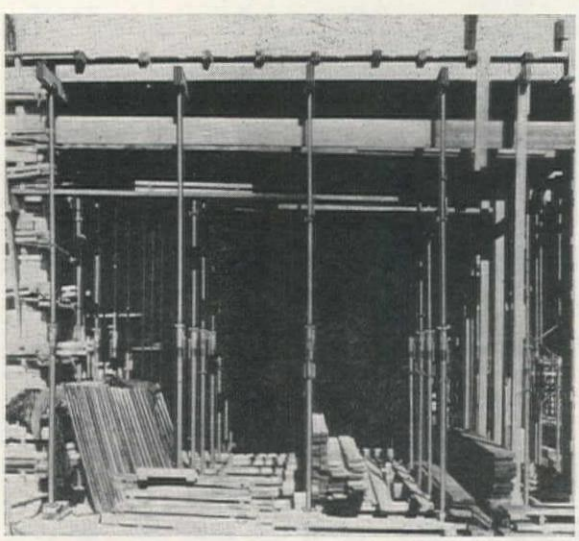
This Model 88 Trenchmobile digs to a maximum depth of 5 ft. and widths of 8 to 12 in. It is powered by a 43.6-hp. gasoline engine, and is a heavy-duty unit constructed on an

all-welded arch type frame. Variable speed selections are provided for operating the bucket line, conveyor belt, travel and digging traction. The Trenchmobile has road speeds up to 12.65 mph. for self-powered moves between jobs. Pneumatic tire mounting plus low ground pressure permits working and traveling over sidewalks, lawns, without surface damage. **Parsons Co.**, a subsidiary of **Koehring Co.**, is the manufacturer.

537

Self-contained telescoping steel shore one man can handle

This steel shore, highly adjustable, can be used effectively in supporting forms for concrete slabs, beams, columns, walls, tunnels and other shoring work. It is self-contained and can be handled by one man. There is a 5-ft. range of



adjustment, and only three sizes cover a range all the way from 6 ft. to 15½ ft. above the mounting surface. The three sizes of Safway shores have height ranges for 6-11 ft., 8-13 ft., and 10½-15½ ft., respectively. The special sleeve nut design makes possible heavier load-carrying capacities to as high as 9,900 lb., with adequate safety factor. No jacking devices or other separate accessories are required. For rough adjustment the upper telescopic member is easily raised to the approximate height and held by inserting a pin through one of the holes in the tube. Holes are located every 6 in. The pin is attached by a chain and ring to prevent loss. Final adjustment is then obtained by rotating a threaded sleeve nut, thus elevating the head to the exact height required. A fine adjustment range of 6 in. is available at a rate of ¼ in. per turn. **Safway Steel Products, Inc.**, is the manufacturer.

538

Aggregate storage and load bins ideal for storing and handling

Three new aggregate storage and load-out bins, designed for storing and handling any dry material, are now available from **Noble Co.** All three are built for drive-through operation. The models are shipped knocked down complete with legs, bolts, nuts and bracing for quick erection. They come in 150, 100 and 60 sizes. The large size has 3 compartments, 3-beam scale with over-and-under indicator, 3 double clamshell batch gates and a 2-yd. weigh hopper. The 100-ton size has the same scale and batch gates with 1½-yd. weight hopper, and the third has a single compartment, one double clamshell gate, but no weigh hopper. All are manually operated.

539

Scraper ups earthmoving production when used with "Cat" D8 tractor power

Struck capacity of this new Caterpillar No. 90 scraper is 21.2 cu. yd., and this capacity can be increased to 25.5 cu. yd. with the addition of top extensions or sideboards. This "Cat" scraper moves dirt with the aid of a hard surfaced, reversible

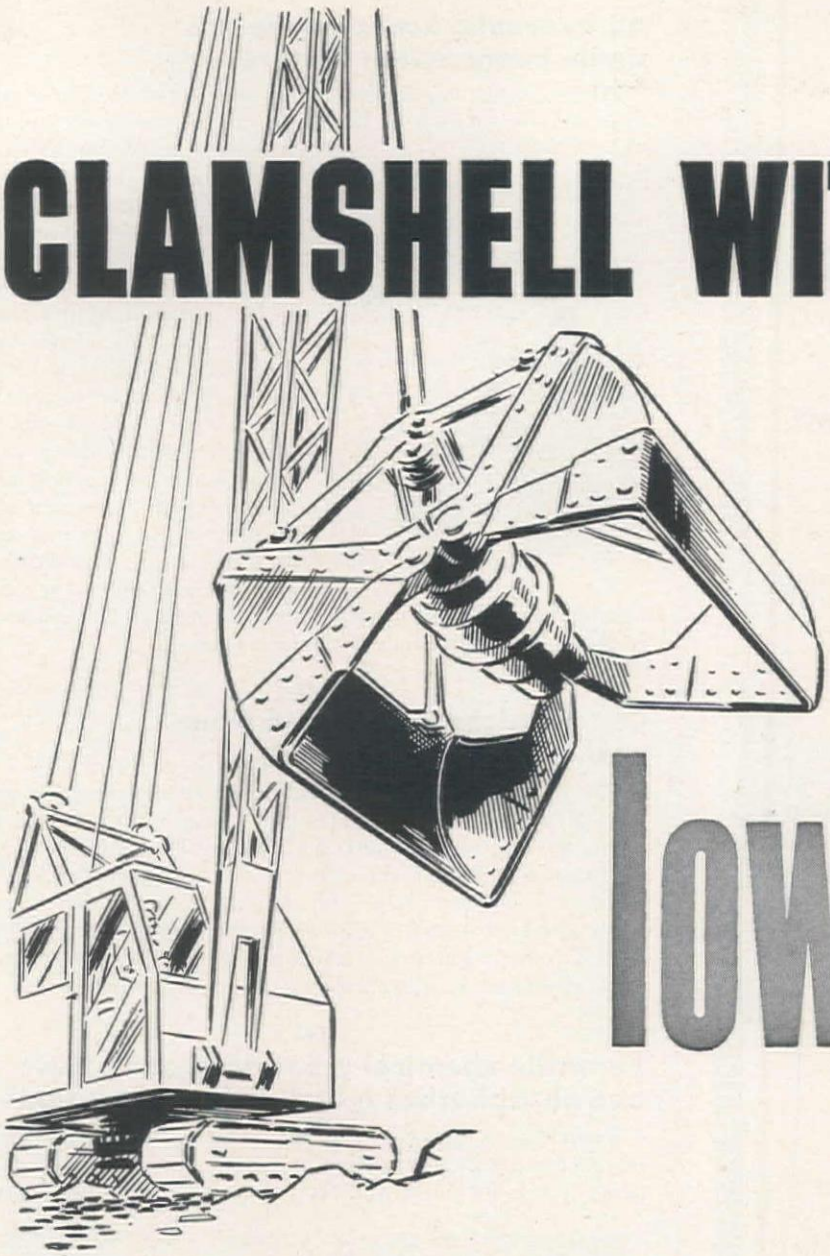
cutting edge. Material is carried in a flat, double-bottom bowl of high tensile steel. Operation is by means of a "Cat" Cable Control unit, which can be mounted on the rear of the tractor to provide positive loading and ejection. Tapered roller bearings are installed at each axle. The scraper uses two 24.00-29 front tires and two 27.00-33 rear tires, all four of 24-ply rating. When loaded, the scraper distributes 60% of the weight on the rear tires. **Caterpillar Tractor Co.** is the manufacturer.

540

One-man hard masonry drilling quickly without binding

Thunder-Core carbide tipped drill bits easily cut through materials such as concrete with bluestone or granite aggregate and even solid granite. The bit is designed for drilling holes ¾ in. to 5 in. in diameter in hard masonry and has been thoroughly field tested. **New England Carbide Tool Co.** is the manufacturer.

CLAMSHELL WITH stiff lower lips



Rock-picking packs a tough wallop for a pair of bucket lips. Whether the load is sludge or tight-grained granite, abrasion alone is enough to wear thin the toughest steel . . .

. . . But — when you throw in the almost continuous impact when the clam is in the hands of a high-grade operator — bucket lips are sure to curl back and quit . . .

. . . Unless you have taken the precaution to protect the life of your buckets — up to twice as long as the unprotected type — with one of the many Airco Hardfacing Alloys available to extend the life of all your equipment.

'Face' it. There are more than twenty Airco Hardfacing Alloys for you to choose from. Any Airco representative will be glad to give you complete information. Contact your nearest Airco Office today.

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541

All-hydraulic Scoopmobile has single boom action feature

Fifteen years of development went into the new all-hydraulic Scoopmobile, Model H. It has been christened "the one-armed bandit" due to its unique single boom operation. It comes equipped with ¾-yd. scoop, has a rated capacity of 4,000 lb., and a standard discharge height of 8 ft. Maneuverability and power in this front-end loader are provided by Vickers hydraulic steering, combined with Mixermobile planetary drive. Many uses are possible for this machine as a handler of bulk materials, and for leveling and back-filling. It is claimed that an efficient operator can handle up to 120 yd. of bulk material per hour. The product is made by **Mixermobile Manufacturers.**

542

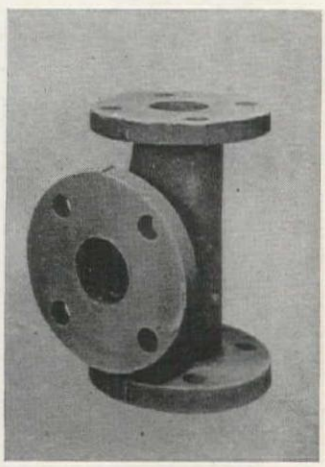
Critical nickel eliminated from new electrode for cast iron

The increased use of welding in the maintenance, repair and salvage of cast iron parts plus the critical shortage of nickel have prompted **Eutectic Welding Alloys Corp.** to introduce a new nickel-free electrode for cast iron. While this new rod does not replace nickel-bearing electrodes on all applications, it is said to offer an extremely high-tensile weld with a uniform amount of carbon so that the deposited material is similar to a high-tensile, high carbon steel.

543

Versatile chemical treatment beats rust and phosphatizes metals in one operation

Rustclean is the name of this new chemical treatment which removes rust, tarnish and light oil, chemically prepares metals for paint, and retards corrosion. By destroying

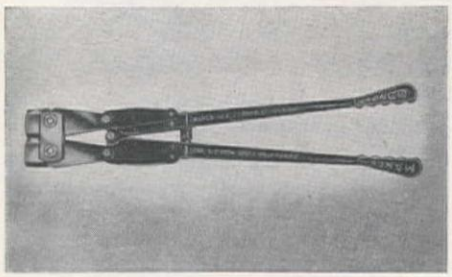


rust and rust-promoting surface contaminants, this compound retards corrosion. It cleans the surface of steel, iron, aluminum, zinc and cadmium and forms a phosphate coating to serve as a base for organic finishes. Also removes tarnish from copper and its alloys. Can be used on storage tanks, machinery, steel partitions and pipelines also. Types available are: Rustclean 12 for wipe-on process and Rustclean 15, more concentrated, for immersion process use. **Octagon Process Inc.** is the manufacturer.

544

Mill-type bolt cutter has reversible jaws

Double blade life is claimed for this Model 30-MCC Mill Type Bolt Cutter. Prime feature is an innovation in design which permits the cutting blades to be

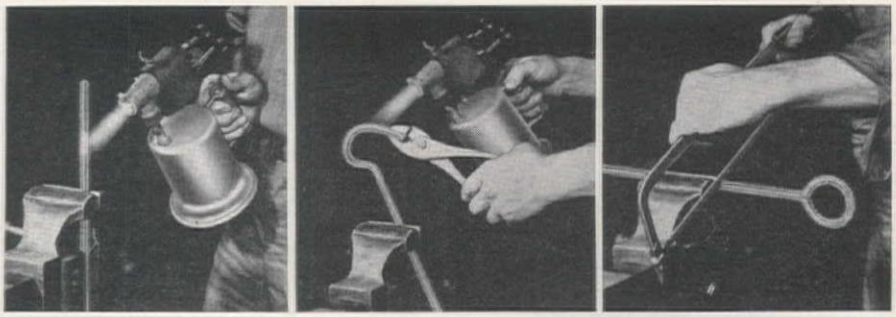


reversed—the blades themselves being roughly similar to a double-edge safety razor blade. Blades may be readily resharpened when necessary, and the drop forge steel handles are guaranteed against breakage. Capacity is ½-in. diameter bolts or ⅜-in. diameter steel rods. **The Manco Manufacturing Co.** produces the product.

545

Pipe and bolt threading machine reduces costs and saves time

There is a new type of self-contained die head in this "500" pipe and bolt threading machine. It is instantly adjustable to thread 1-in. to 2-in. pipe, including over and under size, regardless of position of quick-opening lever and without removing dies or die head from machine. The new improved Dualtype Die Heads, one for ¼-in. and ⅜-in., and one for ½-in. and ¾-in., offer this same instant size change right in the machine. Monotype Die Heads, ⅛-in. to 2-in., and bolt die heads ¼-in. to 2-in., adjust to over and under size in the machine. **The Ridge Tool Co.** is the manufacturer.



546

New threaded steel rod is on the market

This threaded steel rod for industrial repair, installation and construction work is designed to save shopmen time and money on jobs requiring long bolts or rods, or bolts of special shape. Known as Redi-Bolt, the rod comes in straight 36-in. lengths and in six diameters—¼, 5/16, ⅜, ½, ⅝ and ¾ in.—precision-threaded the full length. The rod is made of cold-drawn steel—20% stronger than ordinary steel. A special coating protects the rod against rust. Long straight bolts and adjusting rods can be made in seconds by simply hacksawing Redi-Bolt to size, and fitting with standard nuts. Many other applications are possible. Many other applications are possible, as U-bolts, L-bolts, Eye-bolts, etc.

547

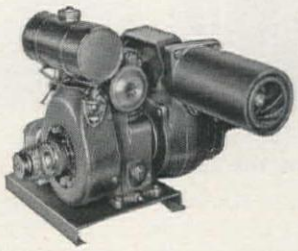
Acid safety goggle with built-in comfort features

Practical and comfortable, this new acid safety goggle features a bright yellow vinyl frame, the American Standard Association color code for acids. Light weight is assured through the use of soft vinyl frames and vinyl optical plastic lens. The bright yellow frame is soft enough to mold in a tight seal to facial contours and has a maximum resistance to acids and alkali. Metal hoods over screen vents offer safe, adequate ventilation. The lens will not stain, or discolor and is easily replaceable. It meets federal specifications for impact resistance. The goggle weighs only one ounce, and it is a product of the **United States Safety Service Co.**

548

Gas-driven oil burner with 0.8 to 2.5-gph. capacity range

This new oil burner unit operates without outside electric current supply. The gasoline engine drives the fuel pump and fan. The engine-driven magneto



generator, which is assembled as part of the unit supplies the power needed for ignition. It has a 1.5-hp. gasoline engine. Capacity range of 0.8 to 2.5 gph. **Wayne Home Equipment Co., Inc.,** is the manufacturer.

549

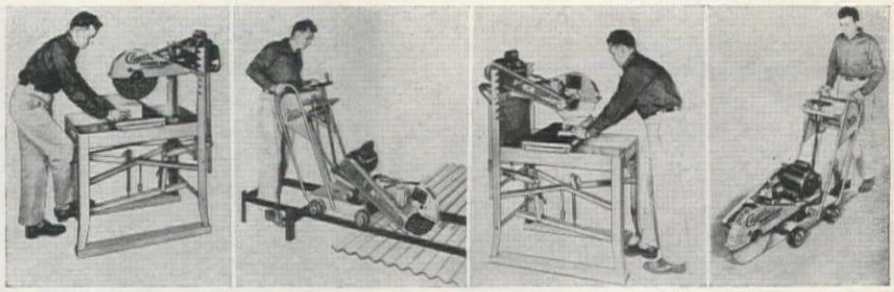
20 to 150-ft. holes drilled by this set of tools

These tools, for use with standard percussion type rock drills, are designed for drilling long holes varying in depth from 20 to 150 ft. Tru-Seal shank, adapters, couplings, extension rod, Rok-Bit tungtsen carbide bits are included in the tool set. The tools are for use in drilling grout holes, test holes, sub-level bench stoping holes or blast holes of standard diameters. Couplings and adapters are self-cooling. Designs keep the hole in alignment and eliminate excessive vibration at maximum depth. **Rock Bit Sales and Service Co.** is the manufacturer.

551

New centrifugal pumps give up to 40,000-gph. capacity

Three new self-priming centrifugal pumps, the 20-M, 30-M and 40-M are announced by **Rice Pump & Machine Co.** They are powered by air-cooled gasoline engines. Design features include: cartridge type shaft seals, open type non-clogging impellers, hardened steel wearing plates, built-in check valves, and straight line flow of water through the suction openings to the impeller. The new sizes are available mounted on skids, on two pneumatic-tired wheels, or on steel wheels. Trailer hitches are standard equipment on the 30M and 40M models. Seven sizes of Rice AGC-rated pumps now provide capacities from 4,000 to 40,000 gph.



550

Masonry saw convertible to concrete saw and track saw

The "Convertible" Model HD Masonry Saw, which is both a wet and a dry saw, can now be converted to both a concrete and track saw. At any time the cutting head of the Model HD Masonry Saw can be placed on the convertible (4-wheeled) cart. The equipment is then ready for sawing concrete or asphalt patches, etc. Through this conversion, it is possible to switch from sawing glazed tile, concrete block, etc., to sewer, water or gas lines and floor patches in a few minutes. When placing the model on tracks, stone slabs, transite sheets, pre-cast stone, etc., can be placed under the elevated tracks and sawed with this convenient track saw. Manufactured by **Clipper Manufacturing Co.**

552

Concrete water repellent is easily applied in liquid state

Crete-Driseal is the name given this development of the Dow Chemical Co. designed to supply the missing water repellency of mineral silicates in masonry. It is easily applied over the surface in a colorless liquid state. Now in wide use in the building and construction industries, it has proved to be a very successful water repellent under varying conditions. **Williams Form Engineering Corp.** is the distributor.

553

13-cu. yd. Heiliner is now available to civilians

Manufactured exclusively for the Corps of Engineers during the past two years, the 2C500 Heiliner is now available in commercial models. The unit is

equipped with a 13-cu. yd. scraper for contractors, and others who require such a machine for maintenance, stockpiling, etc. The model has the exclusive Hydro-Steer, unobstructed visibility, big, safe, heavy-duty 2-shoe air brakes synchronized on both the tractor wheels and the trailing unit wheels, and speeds up to 25 mph., even when loaded. A 165-hp. Model HRB600 Cummins diesel engine powers the 500 Heiliner (pictured above). **The Heil Co.** is the manufacturer.

554

From bricks to bulk in 90 seconds

This new bulk materials attachment is easily installed in 90 seconds on the Brik-Toter. It instantly converts this masonry materials conveyor into an excellent handler of sand, gravel and other bulk materials. The hopper and side guards assure no spillage and no overloading. In many cases the upper end of the Brik-Toter may be placed directly over the truck, eliminating the second raising from ground level to truck. Countless other uses for this new development have been found around construction jobs. **Mar-Rail Conveyor Co.** is the manufacturer.

555

New lead lubricant resurfaces worn parts

Containing an extremely high amount of metallic lead in the form of a pulverized dust, this new lubricant, Lead-Lube will form self-lubricating surfaces over all the wearing parts of gears and

bearings. The lead is kept in permanent suspension by the Knapp process. In the case of older equipment, the metallic lead will re-surface pits and scores, and thus restore a degree of efficiency comparable to that which existed before wear. **Knapp Mills, Inc.**, is the manufacturer.

556

New water repellent for exterior masonry surfaces

Dam-Tite is silicone-base water repellent for exterior masonry surfaces. It is a completely colorless liquid which penetrates masonry surfaces up to ⅜ in., waterproofing the pore walls without plugging them or preventing air passage. It can be applied by spraying or brushing. Moisture is prevented from reaching interior walls by the substance and exterior chipping, cracking and frost damage are also prevented. Dam-Tite is manufactured by **Speco, Inc.**

557

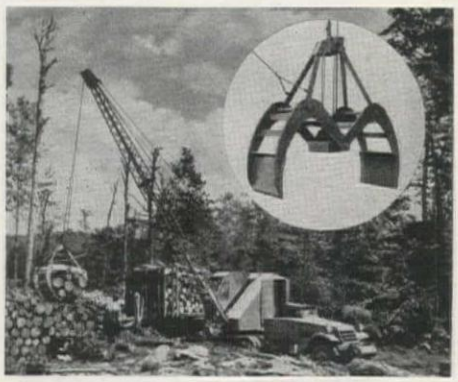
Corporation forms to produce square base traffic cones

Safety Traffic Cones Corp. is a new company formed to produce a cone standing approximately 18 in. high, weighing 2¾ lb., and with a square, 10½-in. base. Red, yellow and black are the colors used in the new cones to make them visible from a long distance. A luminescent cone is produced for use at night. These highway markers are designed to mark traffic hazards and direct the motorist through construction zones and detours. They are made of hard rubber for durability yet light weight, can be put into position by one man. Cost: $1.95 each.

558

New grapple speeds loading of railroad ties, pulpwood, etc.

Featuring a 5-ton capacity truck-mounted Bantam crane and rated at ¼-cord capacity (100-in. wood), the new



Bantam grapple has a tong opening of 5 ft., 3 in., with a gross weight of just 1,155 lb. Overall length of the tong blade is 2 ft., 8 in., while overall grapple height is 5 ft., 2 in. The grapple is constructed of cold-rolled steel shafting and angle irons, with easily lubricated zerk fittings and bronze bushings in sheaves. It combines light weight and excellent balance with unusually rugged strength and fast, easy operation. Tests indicate a production rate of approximately 60 to 70 cords of pulp wood per day, loading partially frozen sticks from small roadside tiers to trucks, with the Bantam crane operator and one man on the ground. **Schield Bantam Co.** is the manufacturer.

559

One tool which drills and saws in any direction

This Drilsaw has a gimlet tip and can do some jobs easier and quicker than a brace, bit and keyhole saw combined. Hard-to-get-at places are where it is especially convenient. It drills its own hole and then will saw any shape in any direction. Piercing range is up to 12-in. plaster walls. Will recess and do small routing jobs with ease and speed. Available in four diameters from ¼ in. to ½ in., and lengths from 7 in. to 15 in. **Drilsaw Co.**, is the manufacturer.

560

One-unit bogie wheel for crawler tractors

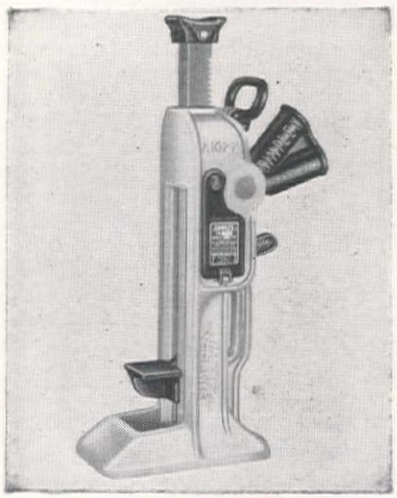
Made of sturdy casting that assures uniform hardness, this new roller comes completely assembled including bearing adjustment and lubrication. An exclusive positive seal keeps out all foreign material. Timken bearings for long, friction-free operation are included, assuring 1,500 hours of continuous operation before additional lubrication is needed. In addition, an exclusive Sterling locking device gives perfect bearing adjustment and alignment at all times. The

bogie wheel (roller) is easily dismantled for quick, simple repairs and maintenance. **Steel Casting Co.** is the manufacturer.

561

Aluminum housing on ratchet lowering lever jack

This model is known as the Simplex A1022. It has a capacity of ten tons, but weighs only 42 lb. It is designed to satis-

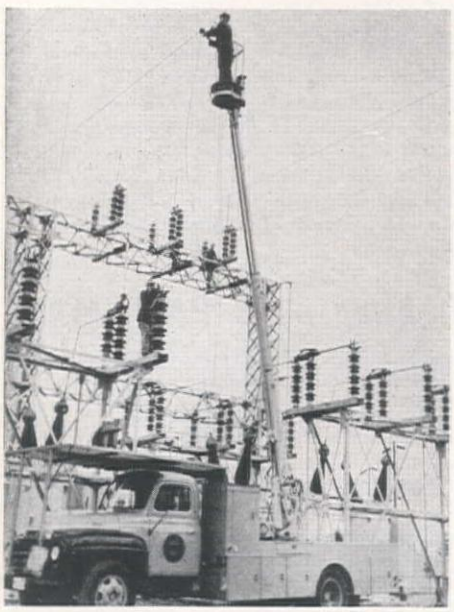


fy demands for light weight versatility in a wide range of general purpose uses. Minimum height: 20½ in., a 12-in. lift and broad toe lift with a minimum height of 2 in. The toe lifts the full rated capacity of the jack. **Templeton, Kenly & Co.** is the manufacturer.

562

Have a high time with this industrial monkey

Climbing spurs, ladders and scaffolding on many applications are no longer needed with the introduction of this Industrial Monkey by **Donwill Company.**



The "monkey" (see cut) consists of a hydraulically operated telescoping boom with a self-leveling cage that takes a workman directly to the spot where he must do his high work. In operation, the

telescoping boom has a 270-deg. turning radius, and a horizontal-to-vertical working span. The operator positions the cage at any desired spot through the use of six insulated foot controls, thus freeing both hands. Cage is located on heavy-duty insulators and has a Micarta platform for protection against more than 24,000 volts. Guard rail around cage is waist-high. The Industrial Monkey can be mounted on any 2-ton or heavier truck with 102 in. from rear of cab to center line of rear axle. The boom and cage retracts into a compact traveling position with a clearance of 10 ft., 6 in.

563

Earth moving truck for even the worst operating conditions

Fresh from rigorous field testing is the new heavy-duty end-dump Earth-Mover, Model 801, from **Kenworth Motor Truck Corp.** (see picture). It features a pay-load capacity of 30,000 lb., and it is over-tired for safety, flotation and high tire life. The truck's body capacity, struck measure, is 9.9 cu. yd., with heaped load at 11.9 cu. yd. It features a full anti-friction bearing-mounted power-assisted steering gear, simplified controls, minimum turning radius and wide axle track to insure ease of handling, maximum maneuverability and high stability. Good visibility for the operator is assured in cab design.

564

Compact new engine introduced for high horsepower needs

Model K90 engine, introduced by **Kohler Co.**, is a rugged power plant with a 3.6-hp. rating at 3,600 rpm. The engine is easy to start and easy to transport since it weighs only 44 lb. It features anti-friction ball bearings at both ends of the crankshaft, easily accessible breaker points which are dustproof and moistureproof and externally mounted for speedy servicing. The ignition system operates from a high voltage crankshaft magneto which insures instant starting.

565

Pipe this pipe tape—durable and economical

The 10-mil Dressertape has an insulation resistance of 100,000 megohms and dielectric strength of 10,000 volts. It features high adhesive firmness, extra strength, sunlight resistance and excellent aging qualities. It provides effective protection against water, salt water, acids, alkalis, etc. Dressertape conforms readily to irregular surfaces, making it especially adaptable for the protection of fittings on service lines. It is applied cold. **Dresser Industries, Inc.**, is the manufacturer.

566

Light weight plastic tubing for salt-water piping, irrigation, etc.

Increased manufacture of thermosetting plastic and fibreglas-reinforced tubing in commercial quantities provides design engineers with a high strength substitute for short supply materials in salt water piping, sanitary piping, electrical conduits, irrigation lines, etc. The tubing is available in standard sizes from 4 to 10 in. O.D., with wall thicknesses ranging from .030 in. Sizes up to 36 in. O.D. are available to order. The tubing has a tensile strength up to 35,000 psi., and a flexural strength up to 65,000 psi. Burst pressures range up to 3,000 psi., varying with diameter and reinforcement. **Reflin Co.** is the manufacturer.

567

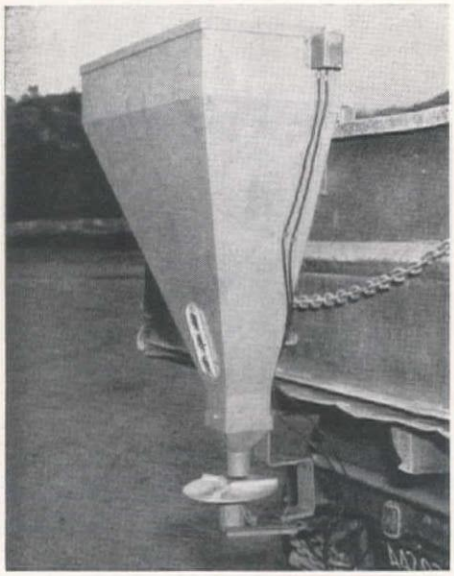
Flexible traffic lane markers are now available

Durability and low maintenance cost are the prime features of the new Dur-O-Lane traffic lane markers announced by **Traffic Safety Supply Co.** The shock resistant qualities of these new plastic markers and their non-breakable characteristics make them ideal for places where there is a constant vehicular flow

of traffic. Like the rigid type Dur-O-Lane markers, this new flexible variety is available in both yellow and white. The new markers can be easily applied to concrete, wood or asphalt surfaces.

568

Salt spreader hits snow before it packs down



The Spin-Zit salt spreader tosses salt in any pattern your job requires. The speed of the disc determines the distance, while the adjustable position of the disc governs the direction of the salt thrown. The Spin-Zit has a weather-proofed motor operating from the truck battery. A butterfly valve controls the amount of salt fed to the disc, and a resistor switch in convenient position for the operator, governs speed of the disc. One man can position and hook-up the unit in three minutes, and the unit can be operated from the side of the truck. *Spin-Zit Salt Spreader Co.* is the manufacturer.

569

30-ton hydraulic ram weighs only 23 lb.

The new 30-ton Power-Twin hydraulic ram is similar in design to the popular 17½-ton ram produced by **Owatonna Tool Co.**, but it has almost twice the power. It weighs only 23 lb., works in any position, is fully adjustable, eliminates torque and takes the hard work out of pulling and installing operations. It is 6¾ in. high, 7½ in. wide, 3 in. thick and has a 2½-in. ram travel.

570

Submersible floatless sump and all-purpose pump

This sump and all-purpose pump is called the Lancaster Drain-Pak. It is a small ⅓-hp. unit. Its floatless quality and the fact that it requires no lubrication makes it practically a maintenance-free investment. It weighs 31 lb., can be lowered to depths of 15 ft., and has a maximum capacity of 3,300 gph. Can be used for emptying sumps, but also as a general utility pump for pumping out ditches, pits, elevator shafts, construction excavations, etc. **The Lancaster Pump and Manufacturing Co.** is the manufacturer.

NEWS of DISTRIBUTORS AND FACTORY BRANCHES

Byers Co. sends field service engineer to L. A.

E. J. Leonard, formerly field service engineer in the Chicago office of A. M. Byers Co., transfers to the Los Angeles, Calif., office where he will serve in the same capacity. New address of the firm in Los Angeles is 416 W. 8th St. Leonard will headquarter at this office, but his territory consists of So. Calif., and Arizona.

Goodrich plans expansion of L. A. tire plant

Plans for a $2,000,000 expansion program for the Los Angeles, Calif., plant of B. F. Goodrich Co.'s tire and tubes, are ready to move ahead. NPA authorization of the project has been granted the plan which includes new machinery and production facilities which will increase present tire production by more than 20%, including a more efficient curing room, relocation and modernization of the tube manufacturing department, machine shop, etc. Approximately 175,000 sq. ft. of floor space will be added to give the plant a total area of 803,748 sq. ft. A 100,000 sq. ft. goods warehouse was completed last year.

Chicago Pneumatic Tool Co. branches visited

D. G. Reeder, manager of the Construction Equipment Division of Chicago Pneumatic Tool Co., visited the West Coast recently. Reeder visited branch offices in Seattle, Wash.; Portland, Ore.; San Francisco and Los Angeles, Calif.

SKILSAW SAN FRANCISCO HOME

View of the new Skilsaw, Inc., building at 285 Van Ness Ave., San Francisco, Calif. It contains 4,000 sq. ft. of floor space plus a parking lot for patrons.

Riddell appoints new sales and service representative

Lund Machinery Co., Salt Lake City, Utah, is a new dealer in sales and servicing for WARCO motor graders, manufactured by W. A. Riddell Corp., Bucyrus, O. This is part of Riddell's expansion program to intensify sales and service coverage.

"Cat" makes new Western Division appointment

W. A. Spitzer is now Western Division engineer sales representative for Caterpillar Tractor Co. He will headquarter in San Leandro, Calif., and work with "Cat" distributors in the West.

Spitzer

Coonan

"Cat" district representative

Donald F. Coonan becomes district representative for Caterpillar Tractor Co. in the Western sales division. He will work with Caterpillar dealers in Northern California cities, replacing Frank McNamara, who was promoted to the position of assistant sales manager of the Western division.

Cleco distributor in Grand Junction, Colo.

S. & M. Supply Co., 761 South Seventh St., Grand Junction, Colo., is now distributor for the Cleco Division, Reed Roller Bit Co., Houston, Tex.

Western visitor

C. H. Rieman, sales manager, Rock Drill Division, Gardner-Denver Co., was a recent visitor to the West Coast.

White Motor Co. appoints San Fernando, Calif., outlet

George Cooper Co., Burbank, Calif., is the new distributor of White Motor Co.'s trucks, busses and Freightliners in the San Fernando, Calif., area. Wilford Johnson is the Cooper Co.'s service manager.

Universal Form Clamp names Northwest distributors

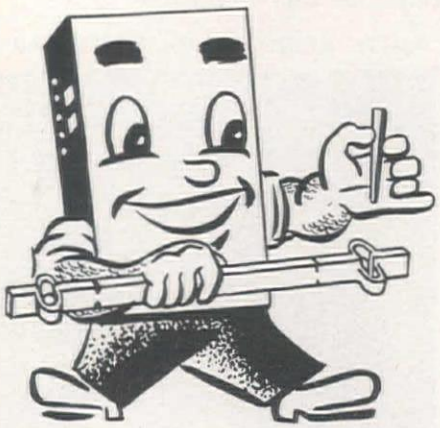
The following firms are distributors of Universal Form Clamp Co. of Chicago products in the Northwest: McCraken-Ripley Co., 2221 No. Albina Ave., Portland, Ore.; Construction Equipment Co., W. 1118 Ide Ave., Spokane, Wash.; Bow Lake Equipment Co., 300 Michigan St., Seattle and Tacoma, Wash. Universal's Pacific Coast office and warehouse is in San Leandro, Calif.

Black & Decker buys land for new warehouse

The Black & Decker Mfg. Co. recently purchased acreage in Richmond, Calif., where a new 30,000 sq. ft. warehouse will be built to serve the West Coast. A. S. Boehm, branch manager of the firm's

San Francisco office announces that sales and services will be expanded to occupy the former warehouse facilities.

MR. UNI-FORM



The jaunty fellow pictured above has a new place in Universal Form Clamp Co.'s organization. He is the official trade mark.

Republic Supply names Mojave agent

Matt Everhardy is the new agent for Republic Supply Co. in the Mojave Desert and Owens Valley areas.

Independent Pneumatic Tool makes staff, division changes

Creation of two divisions within the engineering department of the Los Angeles, Calif., plant of Independent Pneumatic Tool Co., providing separate supervision over tools in production and the design of new tools, prompted personnel changes. H. A. Gillerstrom is appointed chief engineer of product engineering and George Fuehrer is chief engineer of the new development work.

Fuehrer *Gillerstrom*

Allied Equipment Co. has Insley franchise

The Allied Equipment Co. takes over distribution of Insley draglines, cranes and clamshells in Fresno, Madera, Tulare, Merced, Mariposa and Kings counties, California. The firm will also handle the sales in Merced and Mariposa counties of J. D. Adams motor graders.

Euclid appointments

John E. Ehlert, formerly service and parts manager for Euclid Road Machinery Co., Cleveland, O., is now assistant domestic sales manager. He was at one time district manager in the Southern California territory. G. M. Perry replaces Ehlert as service manager.

NEWS of MANUFACTURERS

Worthington promotions

C. K. Hood, formerly manager of Worthington Pump and Machinery Corp.'s New York District sales office, gets a vice presidency in the firm. He will be responsible for the direction of the activities of the public works, steam power, deaerating, water treatment and steam turbine divisions.

Moore retires as v. p. from USS subsidiary

Arthur C. Moore, district vice president of the Intermountain Sales district of Columbia-Geneva Steel Division, U. S. Steel Co., is retiring after 42 years of service with the firm. Loring S. Brock replaces Moore.

Allis-Chalmers sales meet

Western representatives of the industrial sales organization, Tractor Division, Allis-Chalmers Manufacturing Co., met with others from the U. S. and Canada at the Springfield, Ill., works recently for discussion of the firm's sales, engineering and manufacturing plans for 1952. Among those attending were L. W. Davis, branch manager and S. C. Skiman, industrial sales manager, Oakland, Calif., branch; L. D. Benedict, branch manager and F. L. Bryson, industrial service manager, Los Angeles branch; A. E. Mills, branch manager and W. H. Appel and W. N. Bryant, sales managers, Portland branch; J. W. Duddleson, Seattle, industrial district manager; G. W. Schierman, branch manager and N. A. Nelson, sales manager, Pocatello branch; J. E. Begley, branch manager and F. J. Crawford, special representative, Billings branch.

American Brake Shoe Co. buys steel facilities

The plant and property formerly owned by the Jumbo Steel Co., Azusa, Calif., is now owned by American Brake Shoe Co. The American Forge Division of Brake Shoe will use the plant and five acres of land to start a West Coast steel forging operation. Machinery for upset and press forgings will be installed, and it is expected operations will start about the middle of the year.

Seattle Chain changes name

Seattle Chain & Manufacturing Co. changes its name to Round Seattle Chain Corp. The firm's name was changed to bring it into closer identification with the main firm, according to William J. McElroy, president of All Round Chain Companies on the West Coast.

Chain Belt staff changes

Several organization changes at Chain Belt Co. of Milwaukee are announced.

B. F. Devine, vice president and manager of the Construction Machinery Division, will become a staff officer of the firm and serve it in an advisory and consulting capacity. A. K. Thomas is now manager, Construction Machinery Division. W. A. Clayton is now sales manager of the division. J. W. Lendved becomes the division's director of engineering. W. J. Sparling is appointed to the newly created position of vice president and manager of Milwaukee operations. M. G. Jewett is the new manager of the Chain and Power Transmission Division.

Austin-Western promotes two sales staff members

Don J. Phillips, who has been a district manager for Austin-Western with headquarters in Portland, Ore., and also

Phillips *Fitzenz*

chief district manager, is promoted to the position of sales manager. J. Arthur Fitzenz will assist Phillips.

Rees of Standard Steel takes added duties with firm

C. N. Rees, sales manager of Standard Steel Corp., Los Angeles, Calif., is promoted to vice president in charge of manufacturing in addition to his other duties. K. G. Thies is a member of the board of directors and the newly appointed secretary. This is the 50th anniversary year of the firm.

Gradall sales manager

Irwin T. White is the new sales manager of the Gradall Division of the Warner & Swasey Co. He has been sales engineer in the Detroit office since 1946. White's old position will be taken over by Robert L. Groves, presently sales engineer in Grand Rapids.

White *Franz*

CF&I elects new president

Alwin F. Franz is the new president of The Colorado Fuel and Iron Corp. Carl W. Meyers, former president, becomes vice chairman of the board of directors. Franz has been executive vice president of the firm since 1949. He has held the position of vice president in charge of operations and managed the corporation's two largest plants.

WHITE REGIONAL HEADQUARTERS

***Wilson D. Patterson*, Pacific Coast regional manager for *The White Motor Co.* (right), presents a check to *C. E. Needham*, president of Van Arsdale-Harris Lumber Co., San Francisco (left), for property for White's new regional headquarters. Standing in back from left to right are: *James C. Needham*, Van Arsdale-Harris; *C. N. Gufstason* of Norris, Beggs & Simpson, realty firm; and *George Cruden*, White's San Francisco branch manager.**

Fairbanks-Morse sales manager

J. A. Cuneo, formerly manager of the Chicago Branch takes over a new position as general sales manager.

Space is sold as advertisers' inches. All advertisements in this section are ⅛ 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.

Chain Belt prizewinner

John Knudsen, president of the Knudsen Concrete Products Co., Dwight, Ill., won any two Rex machinery models of his choice by winning the contest to name two new sizes of Rex Moto-Mixers. Knudsen suggested the name "Adjusta-Wate."

Barber-Greene names Heacock as chief engineer

Roy C. Heacock takes over new duties as chief engineer in charge of development and engineering phases of the Barber-Greene activities. He was formerly executive engineer in engineering development.

Blaw-Knox appoints Levison vice pres. and general mgr.

Arthur A. Levison is the new vice president and general sales manager of the Blaw-Knox Division of Blaw-Knox Co. He will administer the sales and engineering functions for all departments of this division.

Huston is new vice pres. at Fuller Mfg.

Robert A. Huston is now vice president in charge of industrial relations for Fuller Manufacturing Co., Kalamazoo. This is a newly created position.

Newkirk is general sales mgr. for Shunk Manufacturing Co.

J. D. Newkirk is now general sales manager of the Shunk Manufacturing Co., Bucyrus, Ohio. He has been with the firm for three years in a direct sales capacity. Newkirk replaces J. Austin Carrington, who resigned in January to become affiliated with a family-owned enterprise in Indianapolis.

Mangan gets nat'l sales post with Wilson-Albrecht

National Sales Manager is the new title of Frank X. Mangan at Wilson-Albrecht Co., Inc. He will coordinate the sales activities of Waco's 40 national distributors, supervise general sales programs for the firm and assist in the development of new distributor outlets.

Ackley of McKiernan-Terry dies at 78

Charles S. Ackley, secretary of the McKiernan-Terry Corp., died at the age of 78 after a brief illness. Ackley had been associated with the heavy machinery firm and its predecessor for 43 years.

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