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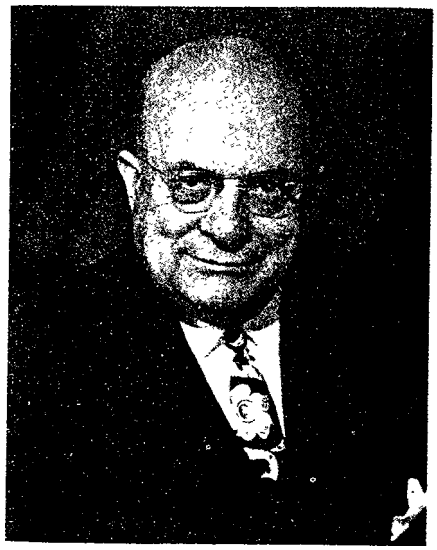
MEN OF THE INDUSTRY—HENRY J. KAISER AS A NONMETALLIC MINERALS PRODUCER

This article, dealing more with the achievements of Henry J. Kaiser and his associates in the nonmetallic minerals industries than with his personal history, presents, we believe for the first time, a complete picture of his truly remarkable record. Having since 1932 written more than a dozen major articles, based on personal visits, on all the more important operations mentioned in this article, we have long felt that this record should be brought to the attention of contemporary producers, most of whom have heard little about it.—The Editor.

another P and Q exclusive

NATIONAL interest currently is focused on Henry J. Kaiser's production of automobiles, housing, aircraft, household appliances and other such consumer items glamorous to a hungry public. Maintaining an uninterrupted growth in the Kaiser industrial structure, however, are the non-metallic minerals industries which helped foster the expansion of Kaiser production management into widely diversified fields.

Now operated in California are sand and gravel plants at Pleasanton, Antioch, Upton and Oroville, and a plant at Seattle, Wash. In addition to these producing units, Kaiser operates three major batching and ready-mixed concrete distributing plants under his own name, and several others in conjunction with building material dealers in Northern California. Several articles describing these concrete plants have been published in PIT AND QUARRY. Further, cement and commercial rock are produced at Permanente, with branch facilities at Redwood City, Calif., and at Honolulu and Seattle. Basic brick, as well as chemicals, are produced at Moss Landing, Calif.; dolomite products and lime at Natividad, Calif.; and gypsum and gypsum products near Los Angeles.



Henry J. Kaiser

Production of aggregates was among the earliest of Henry J. Kaiser's commercial ventures. During the several years' period that the Kaiser Paving Co. was engaged in road construction in Washington and California, several small temporary plants were constructed for the production of essential materials. In 1921, in connection with paving operations in northern California, a semiportable plant was erected on a 17-acre gravel deposit at Black Butte, Calif., which proved capable of supplying a certain commercial demand. This plant was operated for about seven years.

The first gravel plant owned by Mr. Kaiser which was operated primarily as a commercial project was at Livermore, Calif. Production began in 1923, at the time the Kaiser Paving Co. was awarded the con-



Aerial view of the Radum plant at Pleasanton, Calif., operated by the Permanente Cement Co. This plant's annual production exceeds 2,000,000 tons.

tract for the Livermore-Pleasanton highway in California, and remained in operation until 1931, when new gravel deposits were purchased near Pleasanton, five miles distant.

The Radum plant, constructed in 1930 on the site of the Pleasanton gravel deposits, is the largest and most complete of the company's sand and gravel plants. It produces concrete aggregates, crushed rock and asphaltic mixes for the commercial market. From January, 1931, to November of last year, it produced approximately 17,243,000 tons of gravel. In recent years annual production has exceeded 2,000,000 tons. A detailed description of this plant was published in the March 9, 1942, issue of PIT AND QUARRY. In the October, 1945, issue improvements in the pit were described. Several articles describing the Seattle gravel plant, formerly operated by the Glacier Gravel Co., have also been published.

Opened in 1932 to supply plaster and concrete sand, the Antioch plant had produced by November, 1945, about 1,044,000 tons. At the Felton plant, from 1937 to November, 1945, 987,000 tons of sand were processed for use in asphaltic mixes. This plant was completely described in the August, 1938, issue. From the Upton plant, near Oakland, 883,700 tons of crushed rock have been taken from the quarry since 1938. Since 1929, the Oroville plant has produced 4,211,413 tons of ballast and commercial rock.

Sponsored and managed by the Kaiser interests, the Columbia Construction Co. erected a plant at Redding, Calif., early in 1940, to supply aggregates for the Shasta Dam. Until requirements had been filled in June, 1945, approximately 12,775,000 tons of sand and gravel were delivered for the dam project. A complete description of this plant was published in the March, 1941, issue of PIT AND QUARRY, following a progress story in the November, 1939, issue.

As in all Mr. Kaiser's operations, his production of aggregates has been notable for advancements in method which have become, with him, habitual. Many features in the Kaiser approach to gravel production were innovations in the industry more than 15 years ago. At that time, for example, Kaiser's largest plant at Pleasanton is believed to have been the first to introduce such features as (1) final screening and washing of material before shipment, (2) blending of no material except in the car for shipment, (3) stocking and reclaiming material in a period of manufacture rather than as a finished product, thus allowing stockpiled material to be screened again, washed and blended before shipment, (4) screening accomplished by flat, vibrating screens, (5) control of all power units being centralized, thus eliminating signals and time losses, promoting immediate decisions with proper corrections, (6) clean-up facilities where all waste flows by gravity to a central point where it is collected and returned to the system, (7) all gravel washed and de-watered three times in its manufacture, (8) all sand rewashed and segregated in its various sizes, then mixed for shipment, thus allowing a closer grading and blending than then customary and (9) unit plant construction whereby its capacity might be increased 50 to



Aerial view of the Permanente Cement Co. plant near San Francisco.

100 per cent., with the minimum expense and no loss of production.

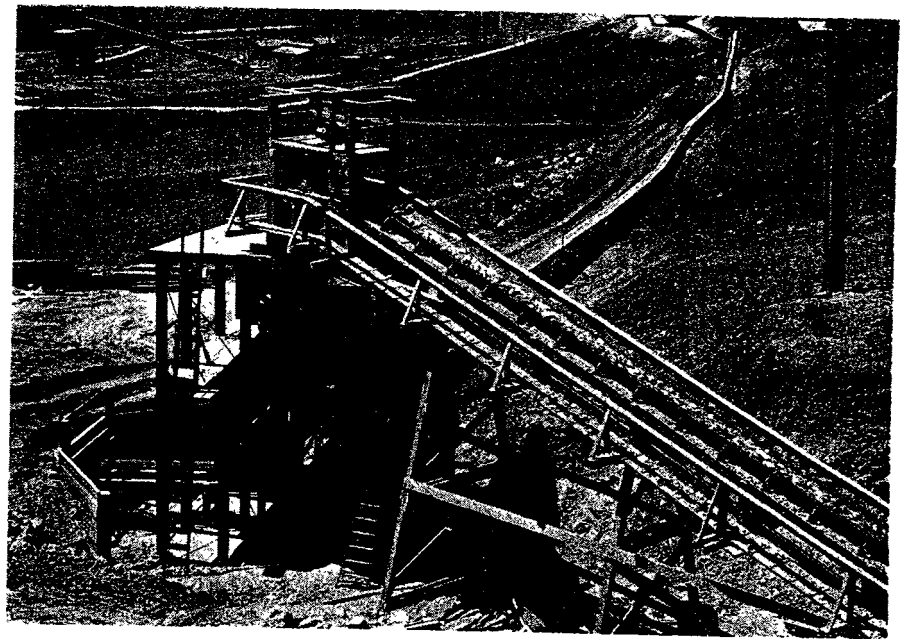
Utilization of a 9.6-mile-long conveyor belt set a record in economical transportation of aggregates in the Shasta Dam operation from 1940 to 1945. From the banks of the Sacramento River at Redding, Calif., where the Kaiser-directed washing and screening plant was built, timber trestles supported a yard-wide duck and rubber belt-line which delivered the finished product at a calculated speed of 1,100 tons per hour. Two walking draglines at Redding dug the raw material and delivered it to 42-inch pendulum belt conveyors supplying a 16- by 42-inch jaw crusher, from which the product went to the raw storage pile. Successive lifting by gravity-flow belts through the several processing machines finally delivered the finished product to stockpiles. From these, belts in reclaiming tunnels led to the 9.6-mile conveyor system which transported the aggregates to the hopper at Coram, the specified point of delivery.

Construction of the belt-line, through a period of heavy rainfall and floods, took more than five months. A parallel road, patrolled by inspection trucks equipped with radio communication, facilitated maintenance of the gigantic conveyor in operation.

Mr. Kaiser's part in the production of aggregates and concrete for, and the construction of the Boulder, Bonneville, and Coulee dams was also recorded in detail in these pages.

A part of the distribution fleet at the Kaiser ready-mixed-concrete plant in Oakland, Calif. This plant services the San Francisco Bay area.



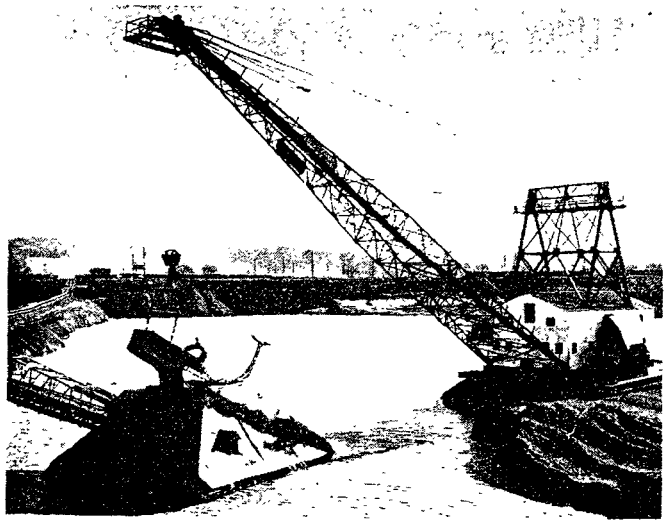


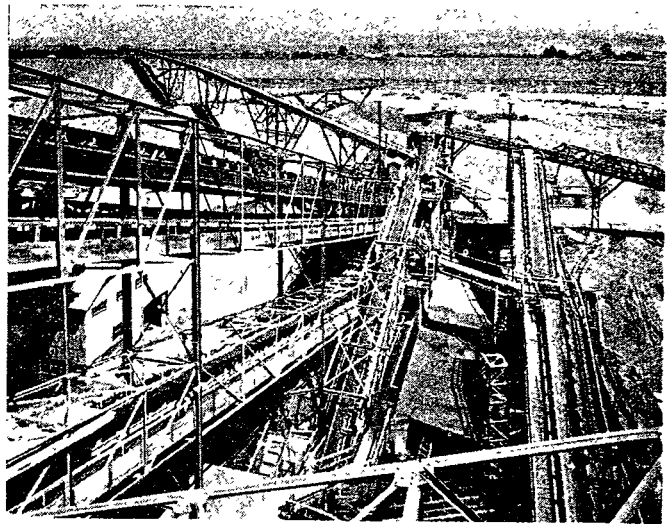
The Natividad plant of the Permanente Metals Corp., showing the main conveyor belt from the dolomite quarry. The main calcining plant (center) delivers the finished product by conveyor to the storage bins (left of center).

What is said to be the largest single cement-producing plant in the world (capacity, 5,000,000 barrels annually) is operated at Permanente, Calif., near San Francisco, by the Kaiser-operated Permanente Cement Co. Construction of this plant was begun in June, 1939. Seven months later the plant went into initial production, first producing the cement requirements (approximately 6,800,000 barrels) for the Shasta Dam. Its second major accomplishment was during wartime in producing the cement requirements for the Pacific war theatre and a $250,000 contract for the Panama Canal Zone. Today the Permanente cement plant is an example of modern advancement in the industry. A progress story on this plant appeared in the November, 1939, issue of PIT AND QUARRY and a detailed description of the completed plant in December, 1940. Later articles described improvements and expansions of this plant.

The Permanente plant is not only reportedly the world's largest; it also employs revolutionary production methods made possible by varied equipment of special design. A closed-circuit method of raw grinding in the mill building assures accurate control of fineness and increased production. This raw grinding circuit produces raw slurry with a fineness value of 95 per cent. passing through a 200-mesh sieve, and it is impossible for oversize particles to pass through this circuit. Efficient and thorough burning of cement clinker is absolutely essential in the manufacture of good cement, and Permanente's four kilns constitute another unusual feature of the plant. The kilns are 12 feet in diameter by 463 feet long. The finish mills are also closed circuited, with air separators which reduce the clinker to uniform fineness and produce a cement with very high surface area.

Naturally available to the Permanente plant are vast, diversified deposits of limestone, shale and clays. The chemical composition of these raw materials enables Permanente to produce a cement having a high percentage of combined silicates, a low alumina content, and a slight alkali content, which make it resistant to sea water and to high-alkali soils and permissible for use with all types of aggregates.





Above, left: Scene at the Radum plant: a dragline with a 10-cu.-ft. bucket charging a floating hopper. Right: A portion of the Radum plant, viewed from the control tower at the top of the main plant. Note the typical Kaiser use of conveyors.

Novel in operation of the Permanente plant is the 48-inch conveyor belt which moves the rock from the quarry to the processing plant more than a mile away. The plant has more than five miles of conveyor running throughout; and after the induction motors start the conveyors, generators driven by gravity flow supply enough electricity to operate the 5-cubic-yard shovel in the quarry! Another sample of Kaiser efficiency is the use of reject gas from the nearby Permanente Metals Corp. magnesium plant as fuel for the cement kilns.

Branch facilities of the Permanente Cement Co. include bulk loading facilities at the port of Redwood City, 18 miles from the plant proper on San Francisco Bay, and packhouse and silo storage facilities at Honolulu and Seattle, where construction is being completed. Bulk trucks deliver cement to the Redwood City silos, where huge pumps can load a ship with 40,000 barrels in about 18 hours. The plant had a wartime record of having never missed a convoy. Permanente supplied all bulk cement for military fortifications in the Pacific until July, 1945, and filled major government war contracts totaling more than $25,000,000. The Redwood City plant was described in March, 1943.

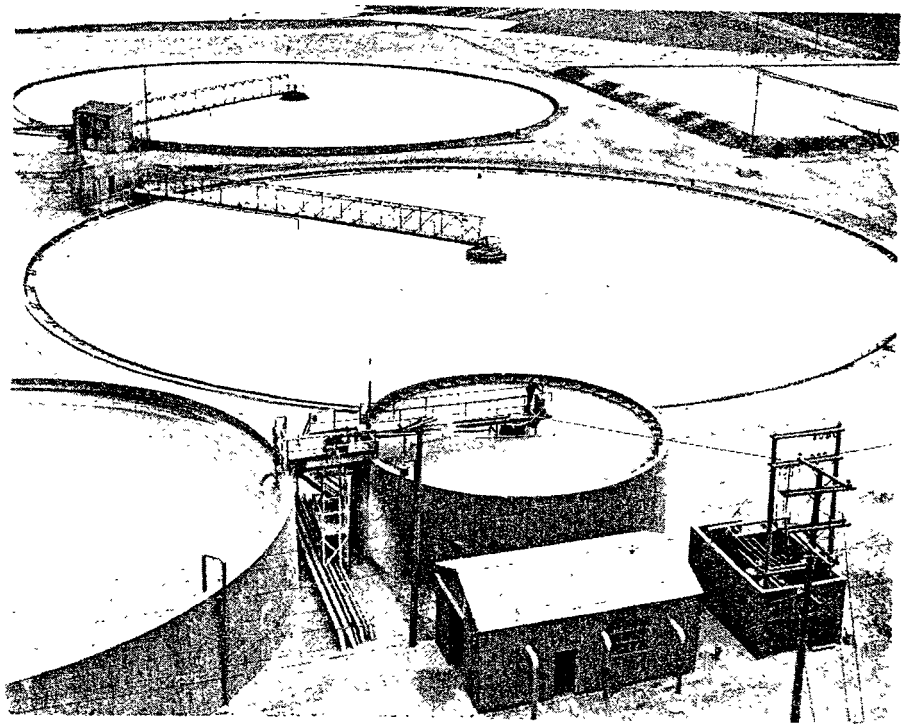
Permanente's facilities also include a 1,500-ton-daily commercial rock plant for production of concrete aggregates, railroad ballast, highway paving material, etc. A plant by-product is a high-grade limestone known as "sugar rock" by reason of its use in the process of refining beet sugar. (Two major sugar companies are the principal users of the sugar rock.)

In manufacturing basic refractories, Permanente is moving its operations to a new plant, nearly completed, at Moss Landing, Calif., which is also its source of raw materials. Here Permanente obtains a magnesia natural oxide produced from high-grade dolomite and sea water. This material, with silica added and extremely hard-burned, becomes periclase, the principal ingredient of Permanente basic refractories. With the most modern equipment, the periclase is mixed with Permanente's specially-developed bonding material, the grains of which are microscopically small and penetrate all voids between the grains of periclase. Brick aggregates of either straight periclase or chrome-periclase are fed to a modern high-pressure automatic press for forming into brick of high density and uniform weight. Bricks are then treated in an autoclave to develop full green strength and are ready for shipment to supply the demand for a better refractory in open hearth furnaces, kilns and electric furnaces.

As The Permanente Metals Corporation, Henry J. Kaiser and associates operate several outlying plants in connection with their magnesium operation. These include a silica quarry at Le Grande, Calif., a quarry and a dolomite calcining plant at Natividad, Calif., and a seawater magnesia plant at Moss Landing. These units are now operating

(*Continued on page* 75)

Thickener tanks at the Moss Landing plant of the Permanente Metals Corp. Here calcined dolomite and sea water are mixed and burned to form magnesia oxide, periclase, chemicals and other products.



ing rings and girth gears will oftentimes get quite warm through conduction. A lubricant having a fairly high liquefying point should therefore be used. It must also of course, resist the cutting and drying action of the inevitable dust. Lubricants suitable for the dryers should prove satisfactory upon the corresponding parts of the clinker coolers.

CONVEYING THE MATERIALS

Cement materials are handled to or from the various crushing devices, dryers and kilns by a screw, apron, pan or flight conveyor; by elevators, or by a suitable pressure pumping system.

Lubrication a Factor

In operating such equipment, every consideration should be given to the fact that high temperatures, and frequently considerable thrust pressure may be involved. Lubrication therefore, must not be neglected. Dust also presents a problem. In the pan or apron conveyor, for example, the roll bearings may be exposed to a sufficient extent to permit of entry of enough abrasive foreign matter to cause considerable wear. The builders have made special effort to counteract this by oil-tight and dust-tight design.

The lubricant must be chosen according to the design of the conveyor. Certain types of rollers, for example, will require oil, a suitable wick being used as a distributor. There a straight mineral oil of from 300 to 500 seconds Saybolt Universal Viscosity at 100° F. will be satisfactory. In general, such an oil also will be adaptable for the lubrication of the driving motor bearings of either ring oiled or anti-friction type, provided the housing will retain oil and abnormal temperatures do not develop.

There are other types of conveyor rollers which are designed for grease lubrication. They are usually equipped either with compression cups or pressure grease fittings. Grease serves as an effective seal at the rims of the bearings to prevent entry of dirt or dust.

Screw conveyors very often are not lubricated due to constant contact with the material being handled. In such installations shafts of tool steel running on dry cast iron bearings are favored. It is less costly to renew bearings than to try to maintain lubrication.

Where High Temperatures Prevail

Where high temperature conditions may prevail a relatively high melting point grease should be used of the type applicable to kiln or dryer trunnion bearings. Temperature frequently must be given especial attention in the lubrication of the ball bearings of pumps which are used to force cement materials through pipe lines for a considerable distance under pressure. Wherever the pump bearings are subjected to considerable heat, as for example, where flue dust or hot cement must be handled, the grease should be of adequate melting point and consistency to withstand the thinning down effects which will be promoted by high temperatures.

CONCLUSION

Treatment of the mechanical details of the production machinery used in the manufacture of cement has been briefed, with the thought that those who are particularly interested in lubrication will gain more by studying the details of the accompanying illustrations. Power equipment has not been discussed since other issues of Lubrication and certain booklets are available which are more specific. For additional reference material see the following:

"Air Power and Compressor Lubrication," *Lubrication,* January, 1940; "Electric Motor Bearings," *Lubrication,* April, 1940; "Steam Cylinder Lubrication in Industry," *Lubrication,* April, 1942; "Steam Turbine Lubricating Oils," *Lubrication,* May, 1944; "Industrial Gears," *Lubrication,* September, 1945; also *Diesel Operation* and *Ball and Roller Bearing Lubrication*—booklets published by The Texas Company.

Men of the Industry

(*From page* 72)

at capacity, producing and marketing such products as calcined dolomite, dehydrated and processed lime, magnesium oxide, periclase, chemicals and others.

Mr. Kaiser's entry into the gypsum business came in 1944, with the incorporation of Standard Gypsum Co. of California for the purpose of mining, manufacturing and processing gypsum. This company has assumed complete control and operation of Standard Gypsum Co., Inc., whose existing properties included a leased gypsum deposit (estimated 500,000,000 tons) on San Marcos Island, Mexico; land at Long Beach, Calif., with calcining and plaster plants and a quarry located thereon; and mining claims at Ludwig, Nev. A gypsum plant, plaster mill and other facilities are located on the Nevada property.

Construction of plant facilities at Long Beach are now being rushed to completion. For improvements at Long Beach and elsewhere, a $1,000,000 investment is already projected. Included will be the purchase or construction of rock-handling, grinding and plaster mill facilities. Standard Gypsum will manufacture all types of hardwall and casting plasters and gypsum lath, wallboard and tile, as well as gauging plasters, acoustical, industrial and patching plasters, and agricultural gypsum and pebble gypsum. The service is intended to supply the entire Pacific coast area, as well as export markets.

At the age of 63 years, Henry J. Kaiser is now actively engaged in some 25 major industries, among which his interests in the production of nonmetallic minerals are likely to be minimized in the public eye. The 1,517 combat and cargo ships produced at Kaiser yards, steel production at the Fontana plant, aircraft engineering and munitions for war —all such have bulked large in the public imagination during wartime. With the coming of peace, Mr. Kaiser's entry into the automobile and household-appliance fields, his production of the Kaiser-Hammond family safety plane, and his initiation of a broad Pacific Coast housing program (10,000 homes in 1946) have particularly gripped the public interest.

But although the Kaiser interests now produce more than 140 products, Mr. Kaiser himself still aggressively maintains his activity in the continued development of his early interest, the nonmetallic minerals industries.

$250,000 Dust Collector Sold as Cowell Plant Closes

A $250,000 Cottrell Electrical Dust Precipitator installed ten years ago by the Cowell Portland Cement Company at Cowell, California, was sold to the Santa Cruz Portland Cement Company, according to an announcement from E. D. Barnett, Cowell superintendent. The structure has a 200-foot main collecting flue, which feeds a mass of machinery; it ends in a stack 16 feet in diameter and 235 feet high.

Other installations at Cowell are also being sold to dismantle the plant. The 37-year-old industry closed several months ago because of the lack of accessible limestone rock.

Paraffine Companies, Inc., announced recently through its wholly-owned subsidiary, Plant Rubber & Asbestos Works, that it will erect a $1,000,000 asbestos cement products plant at Redwood City, California. The announcement was made by R. H. Shainwald, executive vice-president, who is president of Plant Rubber & Asbestos Works.