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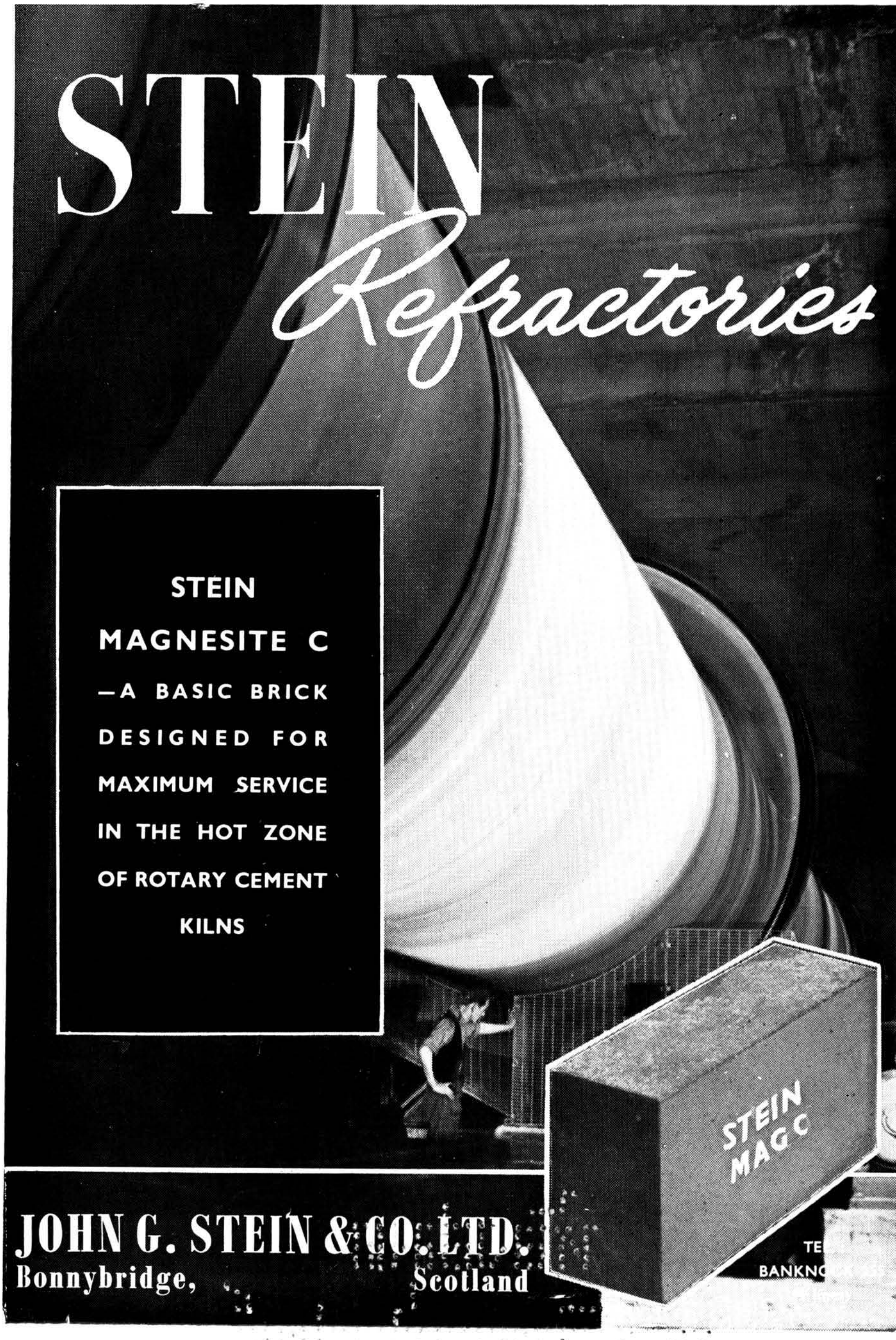
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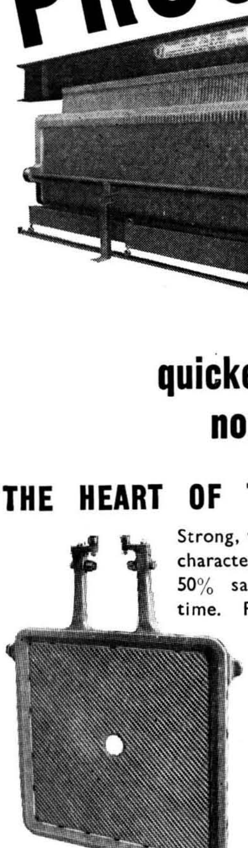

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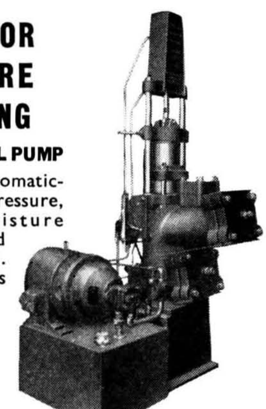

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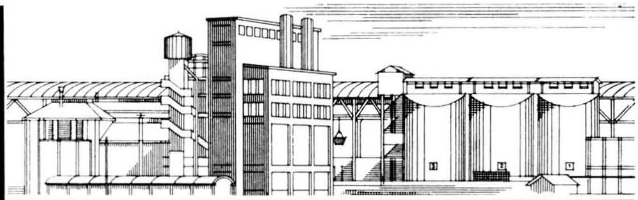

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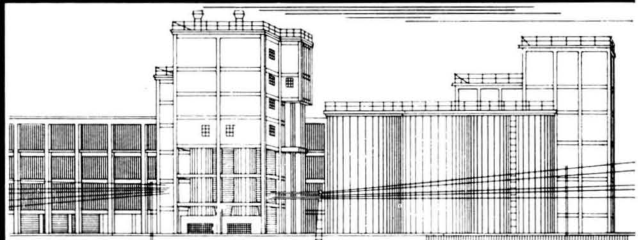

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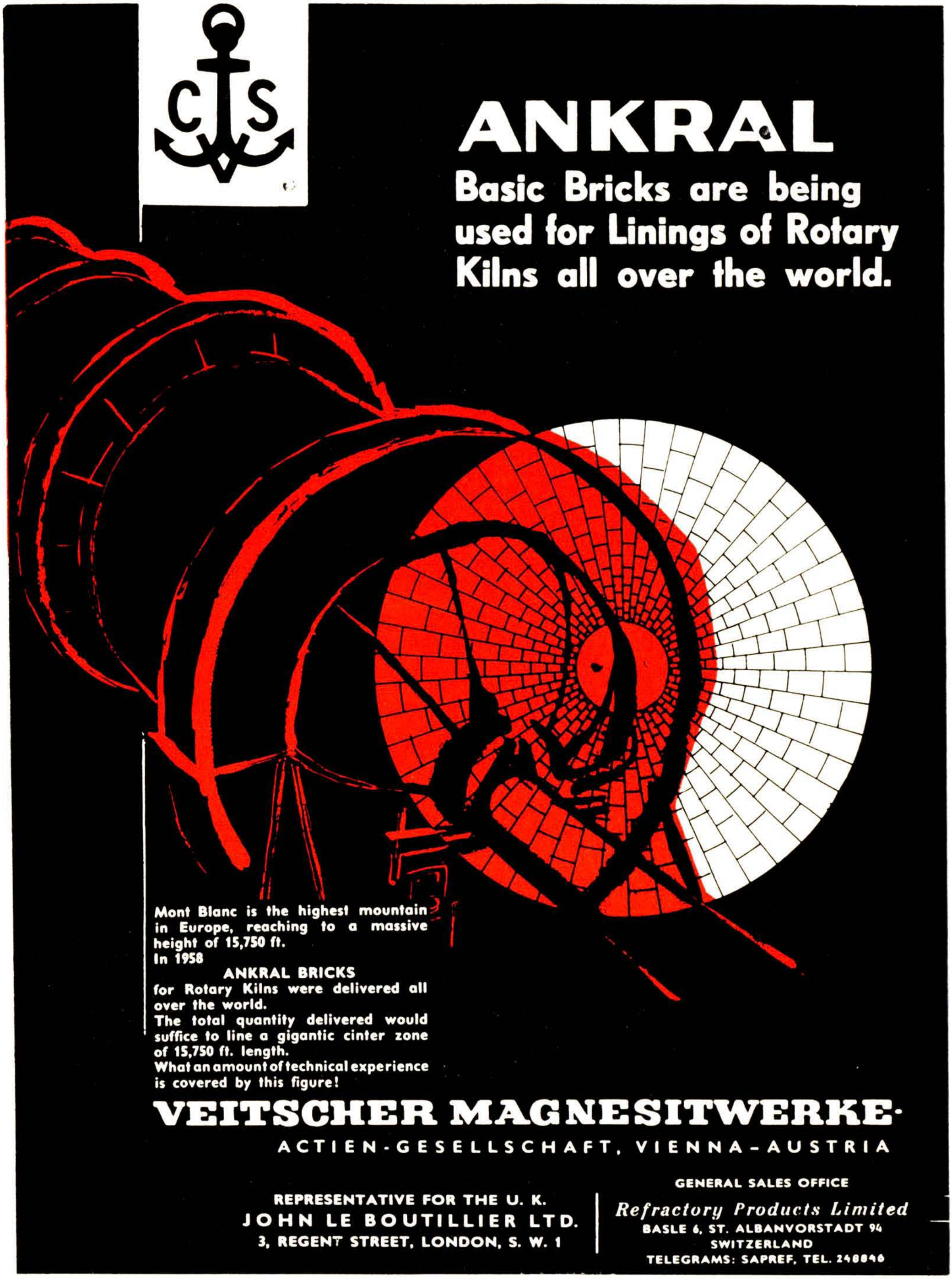
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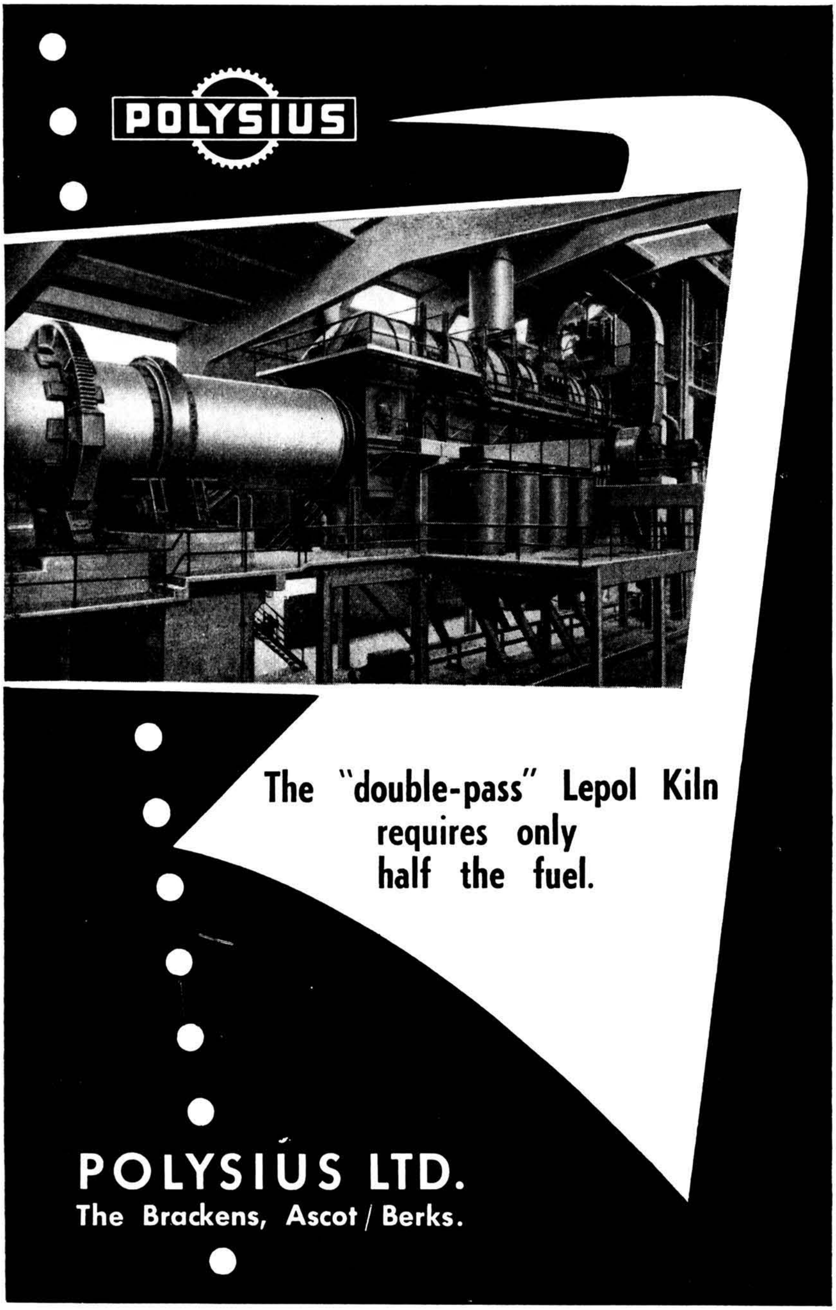
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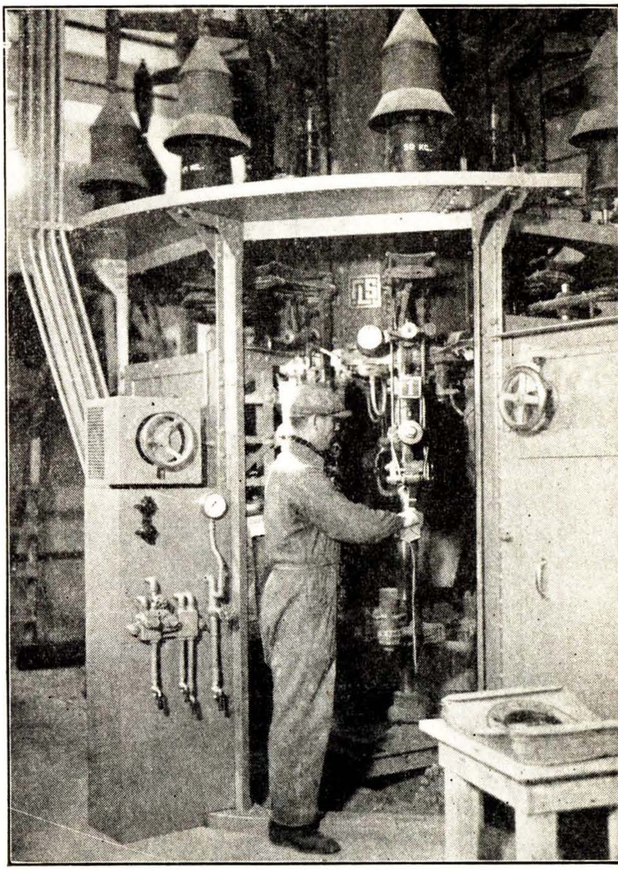

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Developments at a Cement Works in Britain.

THE large building for storing raw materials, clinker and gypsum at the Plymstock works of the Associated Portland Cement Manufacturers, Ltd., is a reinforced concrete structure of unusual design. It is one of several modern structures at these works, the operation of which is described in this article.

The raw materials are high-calcium and low-calcium limestones, and the works operate on the semi-dry process using two shaft-kilns for the production of the clinker.

The New Store.

The new store (*Fig.* 1) can contain about 2,000 tons of crushed stone as well as the clinker and gypsum; the latter material is imported from France. The feed-

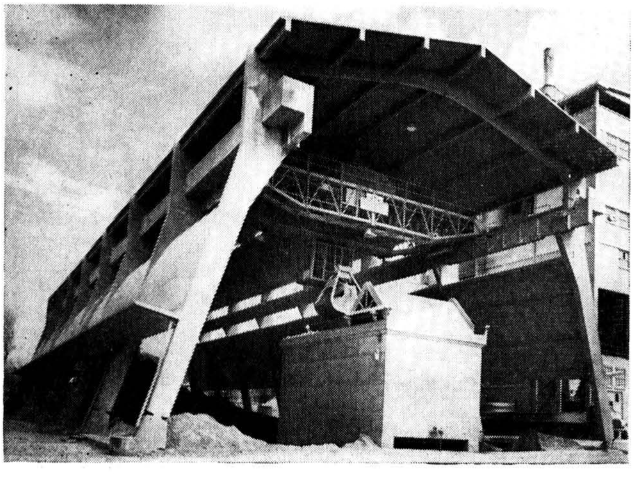


Fig. 1.

bunkers for the raw grinding mills and clinker mill are also incorporated in the building. The materials are handled by a 7-ton Butters overhead electric travelling crane having a 3-cu. yd. grab (*Fig.* 2), the heaped capacity of which is 110 cu. ft. The hoppers for the clinker and gypsum are shown in *Fig* 1. The stock of crushed limestone is shown in the foreground of *Fig.* 2; the blending hoppers are shown in the centre of this illustration.

The structure, which is 240 ft. long and 76 ft. wide, comprises eight main transverse two-hinge frames (*Fig.* 3) at 32 ft. centres. The frames carry the sloping beam-and-slab roof, the walls, glazing, and crane-rail beams; the span of the crane is about 53 ft. The structure was designed by Mr. H. Spanning and constructed by Messrs. Richard Costain, Ltd.

The walls do not extend down to the level of the ground so that vehicles can obtain access into the store. Two expansion joints are provided in the walls. The natural level of the ground sloped transversely across the site of the store. Advantage was taken of this configuration by excavating on one side and filling up on the other, and excavating a wide central trench in which the base of the heap of stored material is accommodated. Therefore no pressure is imposed on the

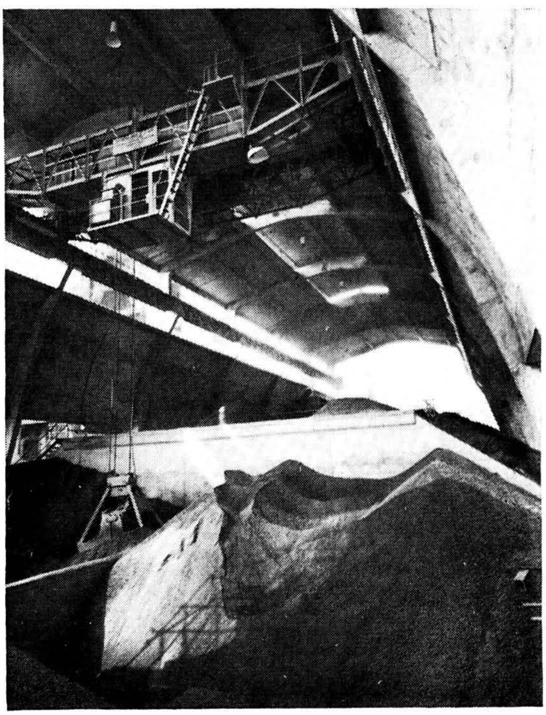


Fig. 2.

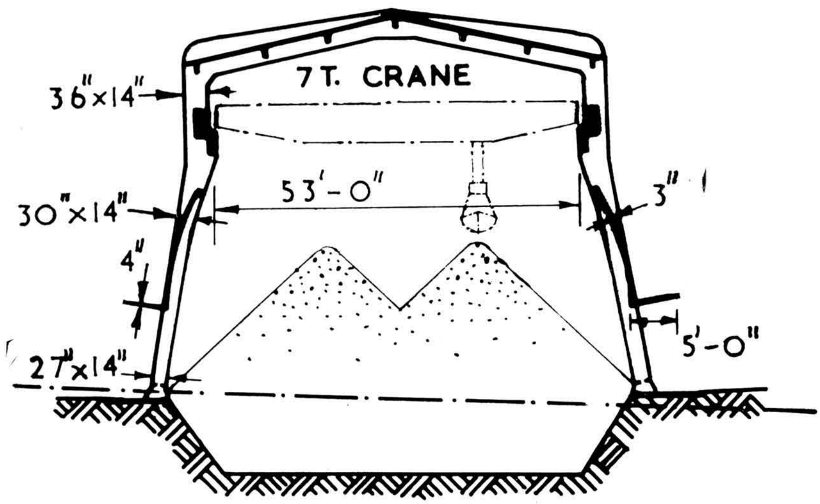


Fig. 3.

sides of the structure. A canopy projecting 5 ft. from the walls is provided on each side of the building.

Connection between the store and the primary screen house is by means of an inclined reinforced concrete conveyor gantry 7 ft. 6 in. wide and suspended from two arches spanning about 89 ft., as seen in *Fig.* 4.

Preparation of Raw Materials.

The works are adjacent to the quarry which yields a hard limestone having a calcium-carbonate content of more than 90 per cent., and a lower-calcium limestone with a content of about 50 per cent. There is little overburden. The stone is quarried in the usual manner, using Halco-Stenuick drills and blasting. Two diesel-driven excavators are employed. The stone is transported by a Foden dumper a distance of about 200 yd. to a Hazemag impact crusher which deals with pieces of rock up to 1 cu. yd. in size, and reduces the stone to pieces not exceeding $\frac{5}{8}$ in. in size. Screening and oversize-return equipment is provided. The crusher, which has an hourly output of 60 tons of the harder limestone, is driven by a 175-h.p. motor, the rotor of which weighs 9 tons and revolves at 400 r.p.m. The crushed stone is then transferred to the store on a belt-conveyor.

A small amount of silica sand and ferric-oxide is added to the crushed stone during proportioning.

After proportioning, the stone is ground by a Lopulco mill to a size such that the residue on a 170-mesh sieve is about 13 per cent. The mill deals with about 12 tons per hour. Two Rema ring-roll mills also assist in raw-meal grinding. Oil-fired furnaces produce the hot air necessary for drying the stone in the mills; the stone usually has a moisture content of 2 to 3 per cent.

The raw meal is fed into eight silos each of 60 tons capacity. Simultaneous extraction from these silos and homogenizing in an aerated paddle-mixer produce kiln-feed material of constant composition. At this stage the raw-meal is batch-weighed with coke breeze (not greater than $\frac{3}{8}$ in. in size), mixed and dampened, and passed to an inclined pan nodulizer of 10 ft. 8 in. diameter.

Although the physical properties of the raw meal are not ideal, it has been found possible to produce nodules with satisfactory physical characteristics and ranging in size between $\frac{3}{16}$ in. and $\frac{3}{4}$ in. by the addition of 12 per cent. of water. The coke is added on the basis of its calorific value and the heat requirement of the kilns, which is between 1000 and 1100 K-cals. per kilogramme of clinker, and amounts to about 13 per cent. by weight of the raw meal.

The nodules are conveyed by a flat belt to rotating chutes which distribute the nodules around the tops of the kilns.

Shaft Kilns.

The two automatic shaft kilns at the Plymstock works are almost the only kilns of this type producing Portland-cement clinker in this country. The kilns are 9 ft. 3 in. in diameter and 28 ft. high, and have an hourly output of about 4 tons

Fig. 4.

of clinker. The upper 6 ft. or so of the kiln is cone-shaped, the larger diameter being at the top. The reason for the upper cone is the considerable shrinking of the raw material during the burning process resulting in excessive quantities of air escaping around the walls of the kiln. Material in the cone helps to seal this gap, and a better air distribution through the contents of the kiln is attained; thus a shorter kiln is required. If equilibrium between feed, burning and discharge is not achieved, sintering may take place too high in the cone and a clinker ring can then form which will not drop through the narrower part of the kiln until it is broken. The burning zone of a shaft kiln cannot, of course, be observed in the same way as that in a rotary kiln, but gauges and other instruments are provided which enable the burner to exercise the necessary control. The relation between the volume and pressure of the combustion-air shown on a recorder must be correlated and indicates the general state of porosity in the kiln. The reversible and variable-speed rotating-grate must break up the clinker at the bottom of the kiln at a rate similar to that of feed and sintering. The temperatures of the waste gases and the extracted clinker give information regarding the position of the sintering zone, which can also be checked by thin steel rods inserted into the fire from above and examined after a few minutes.

It takes the material about eight hours to pass through the kiln before being discharged as clinker through a system of air locks, which prevent the combustion-air being exhausted with the discharge of the clinker. The combustion-air is delivered by Rootes blowers and is about 3,000 cu. ft. per minute at a pressure of 45-in. water-gauge. The clinker, which is now up to 5 in. in size, is transferred by a Schenck vibrating conveyor to a jaw crusher which ensures that a material of reasonable size is fed into the cement grinding mill. The clinker is then conveyed to the main materials store on a belt-conveyor before being extracted for grinding.

The cement mill is a 600-h.p. Vickers Armstrong mill 40 ft. long and 6 ft. 6 in. in diameter. It produces 12 to 13 tons per hour of ordinary Portland cement which is conveyed by a 4-in. Fuller-Kinyon pump pipe-line to the silos. There is one 48-ft. diameter silo 60 ft. high, which holds over 2,500 tons of cement, and four 500-ton silos.

The packing plant comprises a Haver and Boecker three-spout machine and a Bates two-spout machine. There are two loading bays for transporting loose cement in bulk.

The Production of Slag Cement in India.

It is reported in the " Indian Concrete Journal " for November 1959 that the Associated Cement Companies, Ltd., intend to manufacture Portland-blastfurnace cement at their works at Chaibasa. Production is expected to start in April 1960 and to attain an annual production of 370,000 tons in about a year. This will be the first time that this type of cement has been manufactured in India. The blastfurnace slag will be obtained from the works of the Tata Iron & Steel Co., at Jamshedpur, where a slag-granulating plant is being erected.

Standards for Slag Cements.

Revision of French Standards.

THE French standards published in 1959 relate to five types of Portland-blastfurnace-slag cements and six non-Portland cements, namely,

No. P15-302: CPAL (160-250) and CPAL (250-315).—Ciment Portland ordinaire au laitier.

HRIL (315-400).—Ciment Portland à haute resistance initiale au laitier.

No. P15-303: CPF (160-250) and CPF (250-315).—Ciment Portland de fer.

No. P15-304: CHF (160-250) and CHF (250-315).—Ciment de haut fourneau.

No. P15-305: CLK (160-250) and CLK (250-315).—Ciment de laitier au clinker.

No. P15-311: CMM (160-250) and CMM (250-315).—Ciment métallurgique mixte.

Slag cements CHF (100 to 160) and CLK (100 to 160) are now excluded. The requirements of the remaining standards differ from those of the previous corresponding standards in respect to the following only. The maximum SO_3-content permissible in all the foregoing cements is increased from 3 to $3\frac{1}{2}$ per cent., except that the content permissible in the two CLK-cements remains at 5 per cent. There is now no test required for fineness. The cold-water storage test is also omitted. The minimum content of slag in rapid-hardening Portland-blastfurnace cements (HRIL) is now 5 per cent. instead of nil. The slag-content of the two CMM-cements is now 45 to 55 per cent. instead of 50 per cent.

Slag-Content According to Various Standards.

In the following are given the slag contents required in accordance with the standards of various countries.

Country	*Type of Cement*	*Slag (per cent.)*
Great Britain (B.S. No. 146)	Portland-blastfurnace	65 maximum
France (1959 standards)	CPAL (160-250) and CPAL (250-315)	10 to 20
	HRIL (315-400)	5 to 10
	CPF (160-250) and CPF (250-315)	25 to 35
	CMM (160-250) and CMM (250-315)	45 to 55
	CHF (160-250) and CHF (250-315)	65 to 75
	CLK (160-250) and CLK (250-315)	80 minimum
India [I.S. No. 455 (1953)]	Portland-blastfurnace	25 to 65
Germany	Eisenportlandzement	30 maximum
	Hochofenzement	31 to 85
Belgium	Ciment de fer	30 maximum
	Ciment de haut fourneau	30 to 70
	Ciment permétallurgique	70 minimum

In practice Belgian "ciment de haut fourneau" contains 60 to 70 per cent. of slag, and "ciment métallurgique" may contain 80 to 85 per cent.

The Use of Radioactive Isotopes in the Cement Industry.

THE radioactivity emanating from radioactive-isotopes is applied in industry as gauges and other instruments, or as tracers, or as aids to chemical analysis. The United Kingdom Atomic Energy Authority, through its Isotope Research Division and Industrial Liaison Group, is endeavouring to bring to the attention of industry the available instruments and processes some of which are applicable to the cement industry.

Radioactive Materials as Tracers.

Some examples of the use of radio-isotopes as tracers are as follows.

In Sweden small quantities of a radio-isotope were added to a batch of cement and the distribution of this batch in storage silos was traced by means of a detector. In this way it was possible to determine the time required for each batch of cement

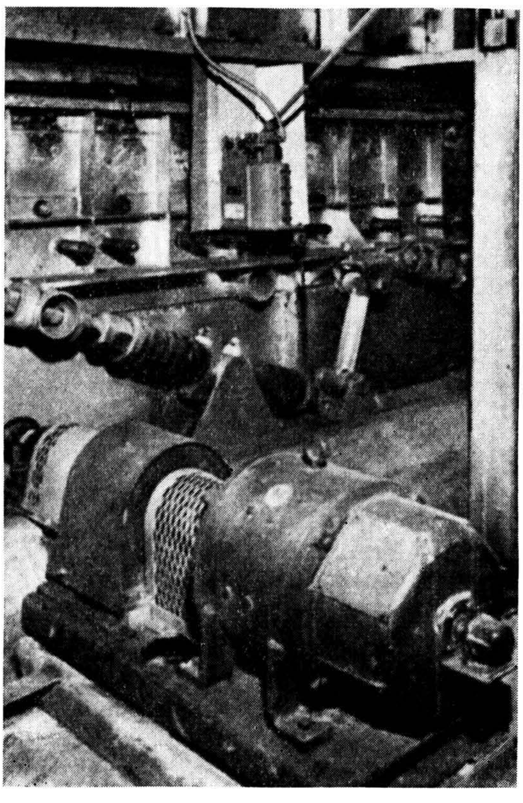


Fig. 1.

to pass completely through the silo and the location of those parts of the silo where cement became lodged. Similar methods have been used to determine the efficiency of mixing of the raw materials. If a radio-isotope is added to an ingredient of a mixture and becomes uniformly distributed throughout the mixture it is an indication that the material to which it was added is also uniformly distributed.

In the chemical industry in America a radioactive tracer with a short half-life was added to the material delivered to a kiln. Since radioactivity is unaffected by heat, it was possible to trace the progress of the material through the kiln and determine where the material was delayed, the length of time required for the material to pass through the kiln, and the amount of material at any part of the kiln. This method is suitable for use in cement kilns.

The radio-isotope of sodium (^{24}Na) which has a half-life of fifteen hours was used in a similar way to determine the efficiency of the crushing and grading plant at a cement works.

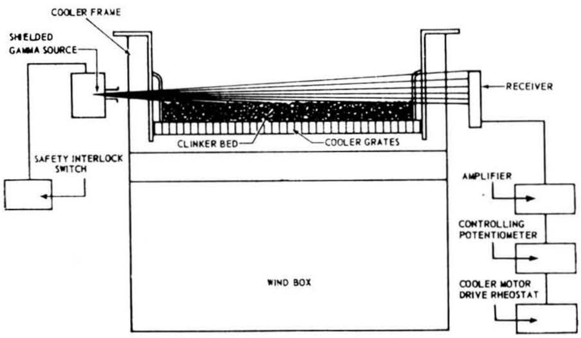


Fig. 2.

The time required for over-size material to be returned to the crusher and positions in the system where there were areas of inactivity, could be determined. A modified form of the tracing method has been used to measure the wear of moving parts of machinery. In one instance, a part of the bearing surface of a machine was made radioactive and replaced in the machine. As the surface was worn radioactive particles were carried away in the lubricant and provided a means of measuring the wear of the bearing.

In chemical analysis the method of activation analysis makes it possible to detect very small quantities of a wide range of elements, and in certain favourable cases direct measurement by means of special instruments may be made of the amount of an element present in a compound.

Radioactive Materials in Gauges.

A useful application of radio-isotopes in the cement industry is in gauges for the measurement of thickness, density, water content, composition, and other properties of materials. Generally such instruments depend on the emission of radiation through or against the material to be tested and the measurement by a suitable

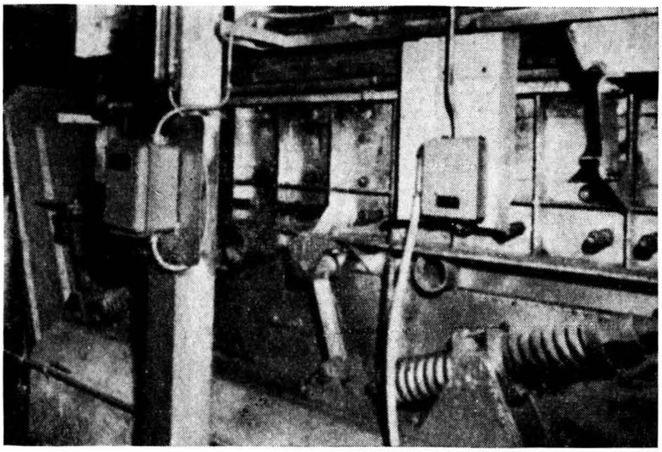


Fig. 3.

meter of the resulting attenuated radiation. One use of such instruments is as a level indicator. A source of radiation mounted on one side of a container radiates a beam to a detector on the other side. When enough material is in the container to obscure the beam an alarm can be operated or the supply of material stopped automatically. This type of instrument is useful for materials which do not form a level surface when stored since the instrument can be arranged to operate when the beam of radiation is reduced to a particular strength by the interposition of the required thickness of the heaped material. These instruments also have the advantage that they can be fixed to the outside of the container without apertures in the wall.

Radioactive Control of Clinker Cooler.

A recent application of such an instrument at a cement plant in the U.S.A. is described by D. H. Gieskieng in " Rock Products " for February 1960, The depth of clinker in a cooler is controlled by means of a radio-isotope. Gamma radiation, emitted from a source mounted outside and near the entry to the cooler (*Fig.* 1) passes through the near wall of the cooler, across the oscillating grate (*Fig.* 2) and through the far wall to a Geiger-Müller receiver (*Fig.* 3). As clinker travels along the grate the beam of radiation is attenuated to a greater or lesser extent depending on the depth of the bed of clinker.

The small voltage produced in the receiver varies and is amplified and used to control the speed of the cooler. As the depth of clinker on the grate increases the speed of the cooler is increased automatically and the layer of clinker becomes thinner. The instrument has the advantage that when it is mounted close to the entrance of the cooler a quicker control is obtained than by depending on the pressure of air beneath the grate.

Visual and audible alarms are provided which signal stopping of the cooler motor and continue to operate until the shield around the radio-isotope is closed by means of a remote control. The radio-isotope is amply shielded and the amount of radiation near the source and receiver are within acceptable limits.

Safety.

The protection of operators against radiation and the safety precautions to be taken are the subjects of many reports and recommendations. The aim of all preventive measures is to ensure that a person receives the least amount of radiation and that this amount never exceeds the maximum permissible dose, which is defined by the International Commission on Radiological Protection as " the dose of ionising radiation that in the light of present knowledge is not expected to cause appreciable body injury to a person at any time during his lifetime."

Publications dealing with recommendations and regulations in Great Britain concerning the protection of persons employed near radioactive materials include the second preliminary draft regulations for the Factories Acts, " Factories (Ionising Radiations) Special Regulations," " Code of Practice for the Protection of Persons Exposed to Ionising Radiations," and a report presented to Parliament in June 1956 by the Medical Research Council, " The Hazards to Man of Nuclear and Allied Radiations." The documents are published by Her Majesty's Stationery Office. The latest statistics compiled by the Royal Society for the Prevention of Accidents show that there have been no fatalities in Great Britain caused by radiation in atomic energy radio-isotope development work.

Accidents in the Cement Industry.

THE Annual Accident Prevention Report of the Blue Circle Group of Cement Companies for 1959 states that the total number of accidents, involving loss of time was 145 for 1959 compared with 150 for the previous year. This reduction represents an improvement of the frequency rate for 1958 of 0·07 thus reducing the rate to 0·82; the frequency rate for 1958 was reduced for the first time to less than unity. Twenty-eight works competed in the safety competition for 1959 and of these, six completed the year without an accident incurring loss of time, and three had only one such accident each. The Midland area achieved the greatest reduction. Of the seven works in this area, four reported no accidents resulting in loss of time. The reduction was from twelve accidents in 1958 to seven in 1959.

The Report for 1959 of the Accident Prevention Advisory Committee of the Cement Makers Federation covers forty-four cement works in which the total number of accidents increased from 254 in 1958 to 266 in 1959; there was, however, an increase of more than 1,000,000 man-hours. The accident frequency rate was 1·01, which is the same as in 1958. The main causes of accidents in 1959 were persons falling or handling goods (about equal numbers for each of these causes); objects falling, stepping on and striking against an object or being caught between two objects were the causes next in descending order of frequency.

Revisions to U.S.A. Standards for Cement.

Numerous minor revisions were made in 1959 to the standards for cement issued by the American Society for Testing Materials. Particulars of the revisions are given in " 1959 Supplement to the Book of A.S.T.M. Standards. Part 4.—Cement, Concrete, Mortars, Road Materials, Waterproofing, Soils." (Obtainable from the Society, price 4 dollars.) Some of the more important changes are given in the following. Revisions made prior to 1959 were given in this journal for May and July 1959.

Content of Sulphur-trioxide.

When the content of $3CaO.Al_2O_3$ in rapid-hardening Portland cement (Type III Standard No. C150-1959) exceeds 8 per cent., the maximum content of sulphur-trioxide (SO_3) is increased from 3 to 4 per cent. The same increase applies to rapid-hardening air-entraining Portland cement (Type IIIA. Standard No. C175-1959).

Methods of Tests.

The following standard or tentative methods of tests have been revised in sufficient detail to warrant publishing in full in " 1959 Supplement.": Standard No. C151-1959 (Autoclave Expansion of Portland Cement); Standard No. C349-1959T (Compression Strength of Hydraulic Cement Mortars using Portions of Prisms broken in Flexure); Standard No. 305-1959T (Mechanical Mixing of Hydraulic Cement Pastes and Mortars of Plastic Consistency); and Standard No. C190-1959 (Tensile Strength of Hydraulic Cement Mortars).

New tentative standards include Standard No. C430-1959T (Fineness of Hydraulic Cement by the No. 325 Sieve).

A standard that was previously tentative but is now adopted is Standard No. C185-1959 (Air Content of Hydraulic Cement Mortar).

Masonry Cement.

The proportions of the mortar for tests of masonry cement (Standard No. C91-1959) are now specified as follows.

Mortar for the compressive-strength test shall be proportioned to contain the weight of cement (in grams) equal to six times the printed-bag weight in pounds and 1,440 g. of sand. The sand shall consist of 720 g. of graded Ottawa sand and 720 g. of 20 to 30 Ottawa sand. The quantity of water, measured in millilitres, shall be such as to produce a flow of 110 ± 5 as determined by the flow table. Mortars for the water-retention and air-entrainment tests are prepared in exactly the same way as the mortar for the compressive-strength test. If the printed-bag weight (in pounds) is 70, the mortar shall contain 420 g. of cement. The specified proportions of mortar are approximately 1 : 3 nominal by volume as indicated in the following calculation.

If a bag of masonry cement contains 1 cu. ft. of cement, and 1 cu. ft. of loose damp sand contains 80 lb. of dry sand, $C = \frac{1,440}{240} \times$ weight per bag in pounds $= 6 \times$ weight per bag in pounds, in which C is the number of grammes of cement to be used in the mortar with 1,440 g. of sand, and 240 is the weight in pounds of dry sand in 3 cu. ft. of loose damp sand.

Associated Portland Cement Manufacturers Ltd.

IN the Annual Report for 1959 of the Associated Portland Cement Manufacturers Ltd., the Chairman, Mr. J. A. E. Reiss, announced that deliveries of cement in 1960 may be up to 10 per cent. greater than in 1959. The production of cement is increasing all over the world and in this connection the Chairman outlined expansion schemes, which will take three years to carry out and will represent an addition to the Company's capacity of nearly 1,000,000 tons per annum and which will be the largest building programme in Great Britain the Company has undertaken. Record sales of 2,262,000 tons were achieved in 1959 by the overseas companies of the group. Production of clinker by the home group in 1959 was approximately 2 per cent. greater than in 1958. Deliveries of Portland cement in the United Kingdom were up by about 6 per cent. Deliveries oversea decreased by about 3 per cent.

The means taken to expand production in Great Britain include the second kiln at Cauldon Works which is expected to be in operation this year. Work has started on the rebuilding of the Plymouth Works which will result in the capacity being more than doubled. (An article describing these works is given on page 49). A suitable location for a works has been found in Scotland and negotiations are proceeding for its acquisition with the object of building a plant having a capacity of 400,000 tons a year. A site at Westbury, Wiltshire, has been acquired for the erection of a works capable of producing 200,000 tons a year.

The Commonwealth Portland Cement Co. in Australia surpassed its previous record and during the year 1959 took steps to acquire Metropolitan Portland Cement Ltd., which owns a works with a rated capacity of 100,000 tons per annum at Maldon in New South Wales. The new 200,000-ton kiln of The Golden Bay Cement Co., Ltd., at Tarakohe, New Zealand, commenced production in October 1959.

Both kilns at the works in Malaya have been converted from coal to oil firing. Demand continues to increase and while competition from Far Eastern imports remains keen, Malayan Cement Ltd., continues to sell its full output.

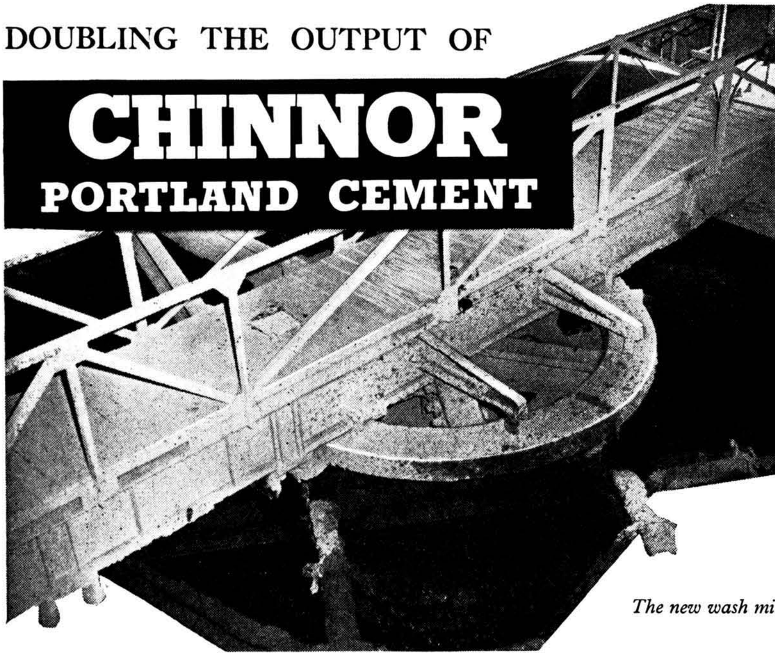
In Canada, the Province of British Columbia is still slow in recovering from the setback of 1958, and the demand for cement remains below the productive capacity. During this slack period the opportunity is being taken to increase the efficiency of the cement works at Bamberton, which is in the process of being converted from coal to oil firing.

Although trading conditions in Mexico generally reflected the recession in the U.S.A., sales of cement showed little change from those of the previous year. There has recently been a marked increase in demand. During periods of reduced demand the opportunity was taken to carry out considerable repairs to the plant of the Mixcoac works which, in common with the other works at Tolteca, is now operating at full capacity. The new plant at Atotonilco, which will produce 300,000 tons per annum, is expected to come into production about the end of this year.

DOUBLING THE OUTPUT OF

CHINNOR

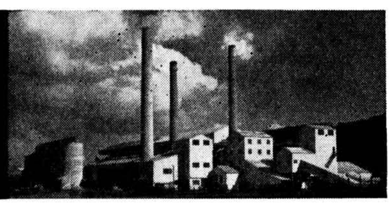
PORTLAND CEMENT



The new wash mill

Extensive modernisation of the Chinnor Cement plant in the Chiltern Hills has increased its annual capacity from 100,000 to 220,000 tons. As main contractors Vickers-Armstrongs undertook the design and engineering work. They manufactured the new kiln and cement mill, and through their associated companies they also supplied all the steel-framed buildings, plate work and the majority of the conveying equipment. The whole contract was completed without interruption to existing production.

The new cement mill



General view of the new plant

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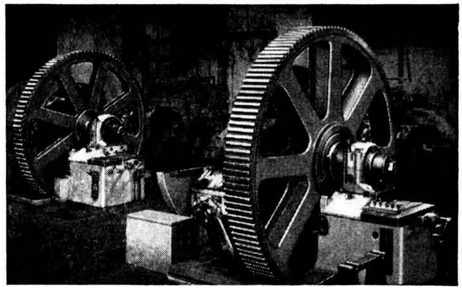


In South Africa there was a reduction in building activity and consequently a lower demand for cement. White's South African Portland Cement Co., Ltd., more than maintained its position relative to other cement makers. The works at Lichtenburg, Transvaal, operated at full production. The plant at the older works in the Orange Free State is being modernised. The East African Portland Cement Co., Ltd., Kenya, had a successful year's trading. In Southern Rhodesia there was a general reduction in building activity and, with the completion of the Kariba Dam, the demand for cement was appreciably less, but the affairs of the Salisbury Portland Cement Co., Ltd., are very satisfactory. In Western Nigeria it is expected that the new 200,000-tons works now under construction will be in operation towards the end of 1960. The demand for cement in Nigeria continues to grow. Elsewhere oversea, exploratory work in Pakistan, Ghana, Northern Nigeria, and in the State of Victoria, Australia has been undertaken.

The Lime Industry in U.S.A.

A Large Lime Kiln.

A NEW lime kiln, which is said to be the largest in the world, is being installed at Ludington, Michigan, by the Dow Chemical Co. The daily productive capacity of the kiln will be nearly 600 tons. The kiln is an Allis-Chalmers-Lellep type grate-kiln and is thought to be the first of this type used for the production of lime in the U.S.A. The kiln is 160 ft. long and 11 ft. 6 in. wide.

New Lime Works.

IT is announced in "Rock Products," October 1959, that three new lime works are to be established in the U.S.A. One of the plants is being installed beside the gypsum products works of U.S. Gypsum Co., at New Orleans. It is intended to produce quicklime of high purity and hydrated lime products from shells obtained nearby, and will supply the paper, oil, sugar, petro-chemicals and aluminium industries.

Another new plant in Louisiana which will also use crushed shell as a raw material is expected to cost about £450,000 and will be built at Morgan City by Southern Industries, Inc.

The Utah Lime & Stone Co., is building a lime works at Dolomite, near Salt Lake City. The " Miracle " process of Messrs. G. & W. H. Corson, Inc., is to be adopted. The works are expected to cost about £350,000.

New and Revised U.S.A. Standards For Lime.

STANDARD No. C5, " Quicklime for Structural Purposes," which was last issued in 1926 by the American Society for Testing Materials, has now been revised and reissued as Standard No. C5-1959.

Two new tentative standards were issued in 1959, namely Standard No. C433-1959T (Quicklime and Hydrated Lime for Hypochlorite Bleach Manufacture) and Standard No. C432-1959T (Pozzolannas for Use with Lime).

The standards in the foregoing are given in full in " 1959 Supplement to Book of A.S.T.M. Standards including Tentatives. Part 4.—Cement, Concrete, Mortars, Road Materials, Waterproofing, Soils." (Obtainable from the Society, price 4 dollars.) Revisions to U.S.A. standards for lime made prior to 1959 are given in this journal for September, 1959.

The Cement Industry Abroad.

Australasia.

Tasmania.—A factory is to be opened shortly at Spreyton for the manufacture of multiple-wall paper bags. The site is close to the Goliath Portland Cement Co., Ltd. Automatic production will be installed so that twenty-five employees working one shift daily are expected to produce 5,000,000 bags annually.

North America.

Canada.—The new works of Lafarge Cement of North America, Ltd., at Lulu Island, Richmond, Vancouver, commenced operation recently. The initial productive capacity is 250,000 tons per year.

U.S.A.—The two new kilns at the works of the Dundee (Mich.) Cement Co., are expected to be in production shortly and will have an annual capacity of about 830,000 tons.

A fourth kiln is being installed in the works of the Giant Portland Cement Co., at Harleyville, South Carolina, and when in production the annual capacity of this works will increase from 483,000 tons to 667,000 tons.

Asia.

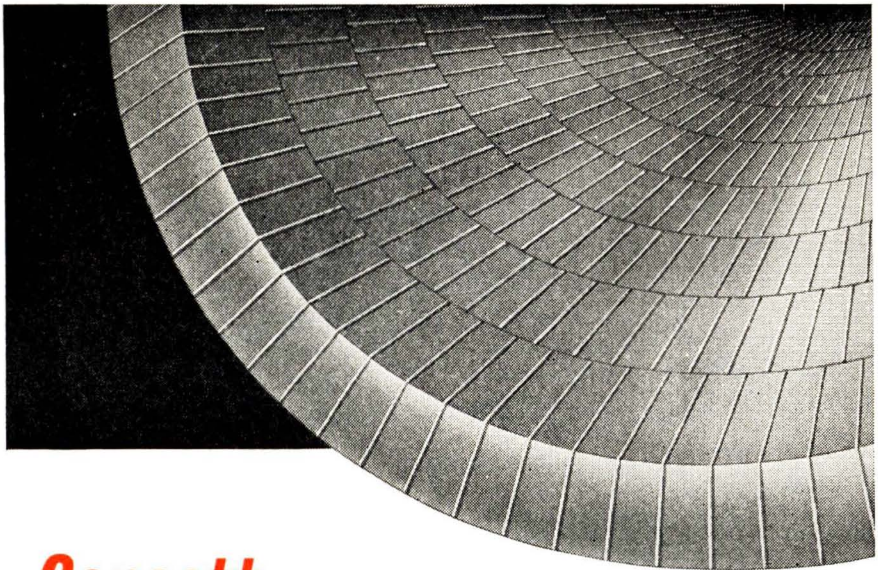
Turkey.—Cement production in Turkey is now nearly 2,000,000 tons annually, due to the construction of seventeen new works or extensions. This production is nearly five times that of 1950, and additional plant now in course of construction is expected to increase the capacity to more than 2,750,000 tons. According to a report in " Pit and Quarry," Turkey has imported no cement since 1953 and exported about 100,000 tons last year.

Pakistan.—There are seven cement works in Pakistan having an annual capacity of about 1,050,000 tons. Four new works are contemplated and the government proposes to raise the annual output to about 2,500,000 tons in the next two years.

India.—The number of cement works in India in 1947 was eighteen, and in 1959 this had increased to thirty-two. It is expected that by 1961 the number will be forty-four, when the capacity aimed at is about 16,000,000 tons, although it is reported in a recent number of " Rock Products " that the capacity may then be about 10,000,000 tons compared with the present capacity of 7,740,000 tons.

The new cement works at Ammasandra, Mysore, now under construction for Mysore Cements, Ltd., was designed and is being installed by Kaiser Engineers Overseas Corporation and, according to a report in " Rock Products " is expected to be completed in 1961. The annual capacity will be 100,000 tons. In addition to the main plant, the works include quarry development, road and rail facilities, raw-material stores, cement silos, a laboratory and administration buildings.

Russia.—In accordance with the present seven-year plan, the annual production of cement in the U.S.S.R. is expected to be 73,500,000 tons by 1965. The growth of the industry since 1945, when the production was only 1,360,000 tons, is

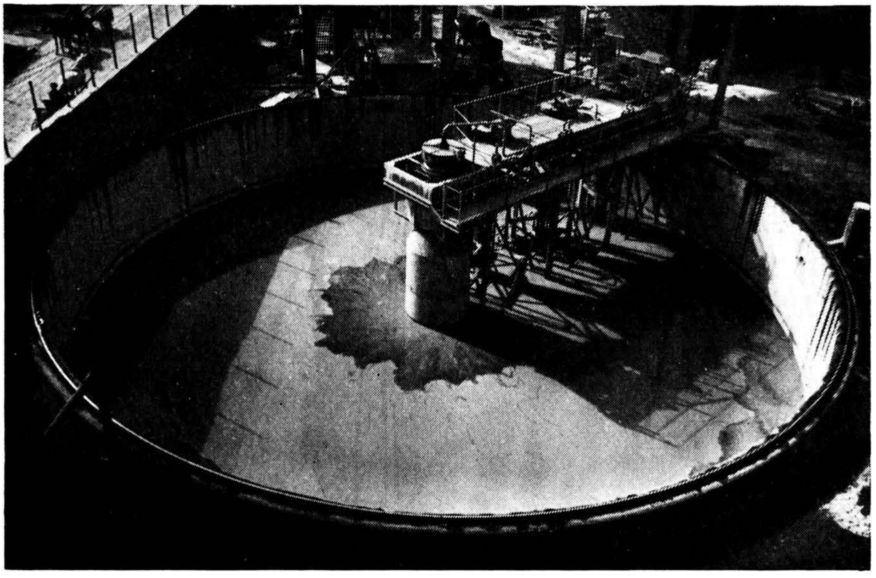


remarkable. Production attained 10,000,000 tons in 1950, when fifty-five works were in operation, and subsequently has increased by about 16½ per cent. annually. In 1959, the production was about 38,000,000 tons. [A description of the present state of the cement industry in Russia is given by Bo Nikander (of Pargas Cement Works, Finland) in "Rock Products," June 1960.]

Europe.

Sweden.—Cement production in Sweden in 1959 was 2,820,000 tons compared with 2,490,000 tons in 1958. Deliveries of loose cement amounted to nearly 60 per cent. of the total used in the country. Exports went up by 25 per cent. and were 225,000 tons, but most of the increase was due to a non-recurring delivery to Poland. The bulk of the remaining exports was despatched to the Middle East.

Reconstruction of a Cement Works in Hungary.



RECONSTRUCTION of the Lábatlán Cement Works in northern Hungary commenced in 1952 and is expected to be completed in 1961 or 1962. The total cost of the reconstruction is about £9,000,000 (300,000,000 forints) according to an Hungarian news service. The output during 1960 is expected to be double that of 1952. The accompanying illustration shows one of two slurry mixing tanks which were brought into use in 1959.

The Cost of Research in the Cement Industry

PARTICULARS of the expenditure on research by British industries are given in " Industrial Research and Development Expenditure, 1958 " (published on behalf of the Department of Scientific and Industrial Research by H.M.S.O.; price 1s. 3*d*.). The total amount so expended in 1958 was about £300,000,000.

Data relating to the cement industry are not given separately but are incorporated in those of the ceramic and glass industries. The total expenditure in this group of industries was about £3,200,000, about 6 per cent. of which was expended outside the industry; the bulk of this expenditure was spent in the research departments and on other activities in the industries. This proportion is more or less the same as in other industries.

The survey on which the data is based covered almost completely the cement, ceramic and glass industries, but was less complete in other industries, especially engineering.

The response to the questionnaires relating to the man-power enquiry conducted by the Ministry of Labour was about 80 per cent. The survey was concerned only with workers classified as " fully qualified " and participating in research and development. The cost of each qualified worker, excluding those in the aircraft industry, was on the average just under £8,000 and, discounting the increases in the cost of living, the expenditure per qualified worker has risen 27 per cent. since the previous survey in 1955. In the cement, ceramic and glass industries the cost per qualified worker was £8,727.

International Congress.

THE Thirty-second International Congress of the Chemical Industry is to be held in Barcelona from October 23 to 30, 1960.

International Symposium.

THE Fourth International Symposium on the Chemistry of Cement is to be held in Washington D.C. (U.S.A.) from October 2 to 7, 1960. The following are among the papers to be presented.

HANSEN, W. C.—" False Set in Portland Cement."

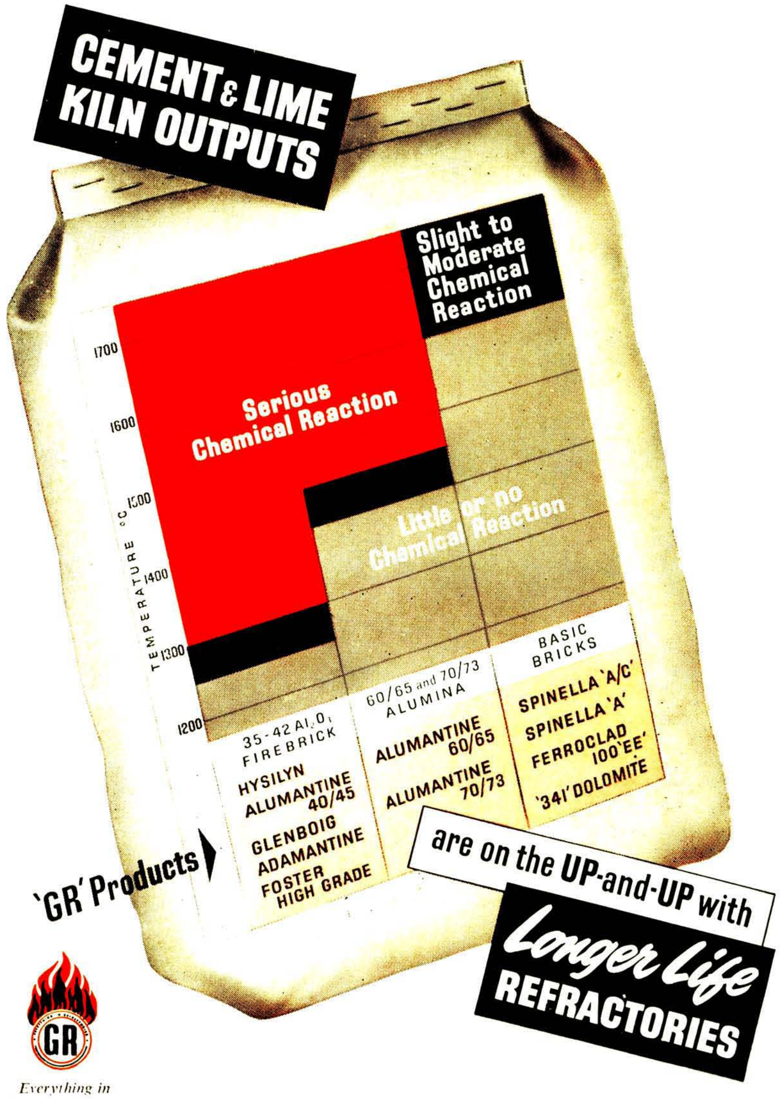
VIVIAN, H. E.—" Some Chemical Additions and Admixtures in Cement Paste and Concrete."

BRUNAUER, S. and GREENBERG, S. A.—"The Hydration of Tricalcium-silicate and β—dicalcium-silicate at Room Temperature."

TAYLOR, H. F. W.—"Hydrothermal Reactions in the System CaO-SiO_2-H_2O and the Steam Curing of Cement and Cement-silica Products."

Patent Application for a Water-repellent Cement

Cement is made water-repellent during storage by the addition immediately before, during or after the grinding stage of its manufacture, of a minor proportion of the order of 0·25 per cent. by weight of an additive consisting of a fatty acid or a mixture of a fatty acid and commercial cetyl alcohol, e.g. stearine in powdered or liquid form, or a mixture of stearine or whale acid oil with 2 to 20 per cent. of commercial cetyl alcohol.—No. 830,861. Aspada, Ltd., March 27, 1958.



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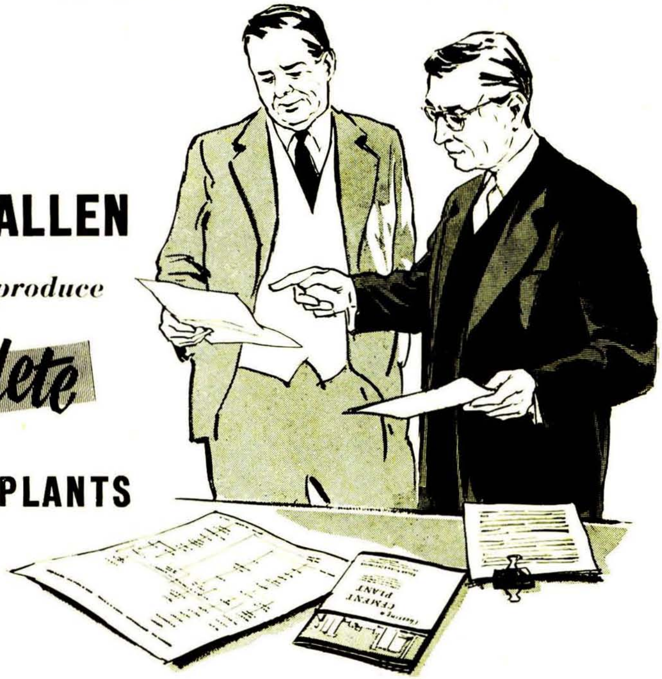

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