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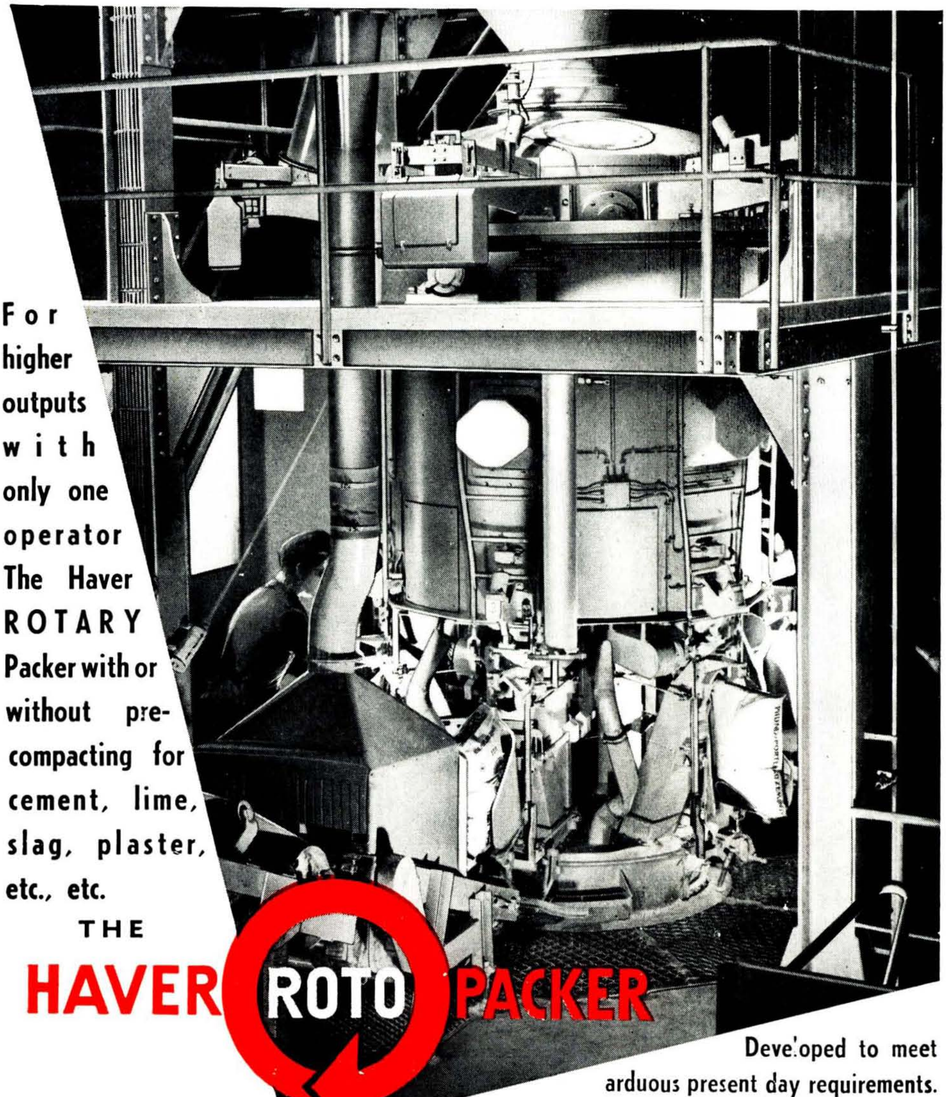

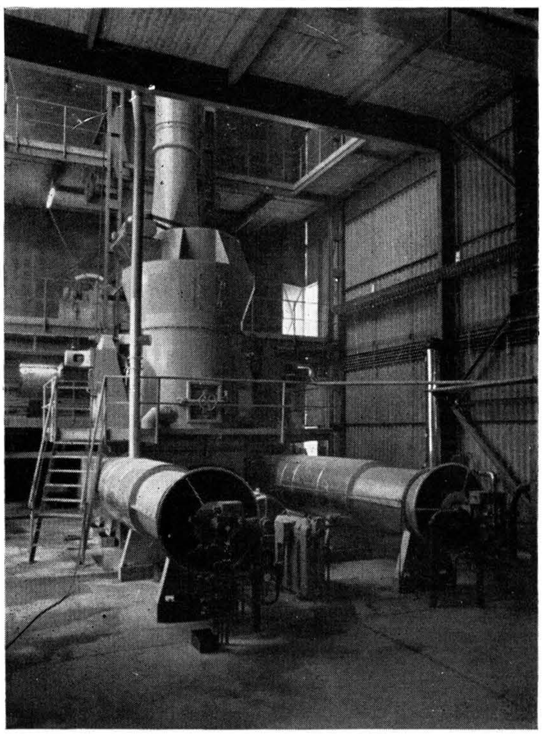

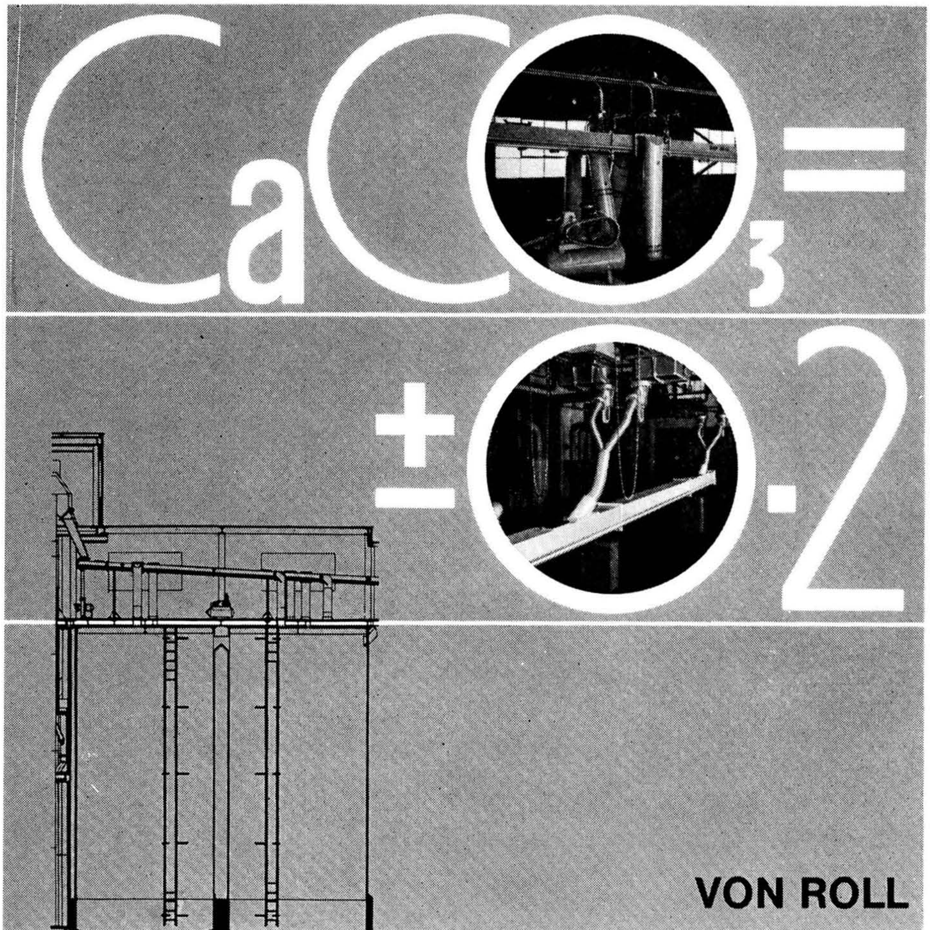

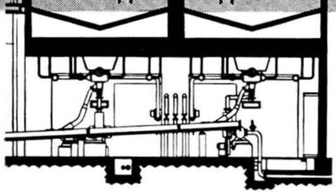

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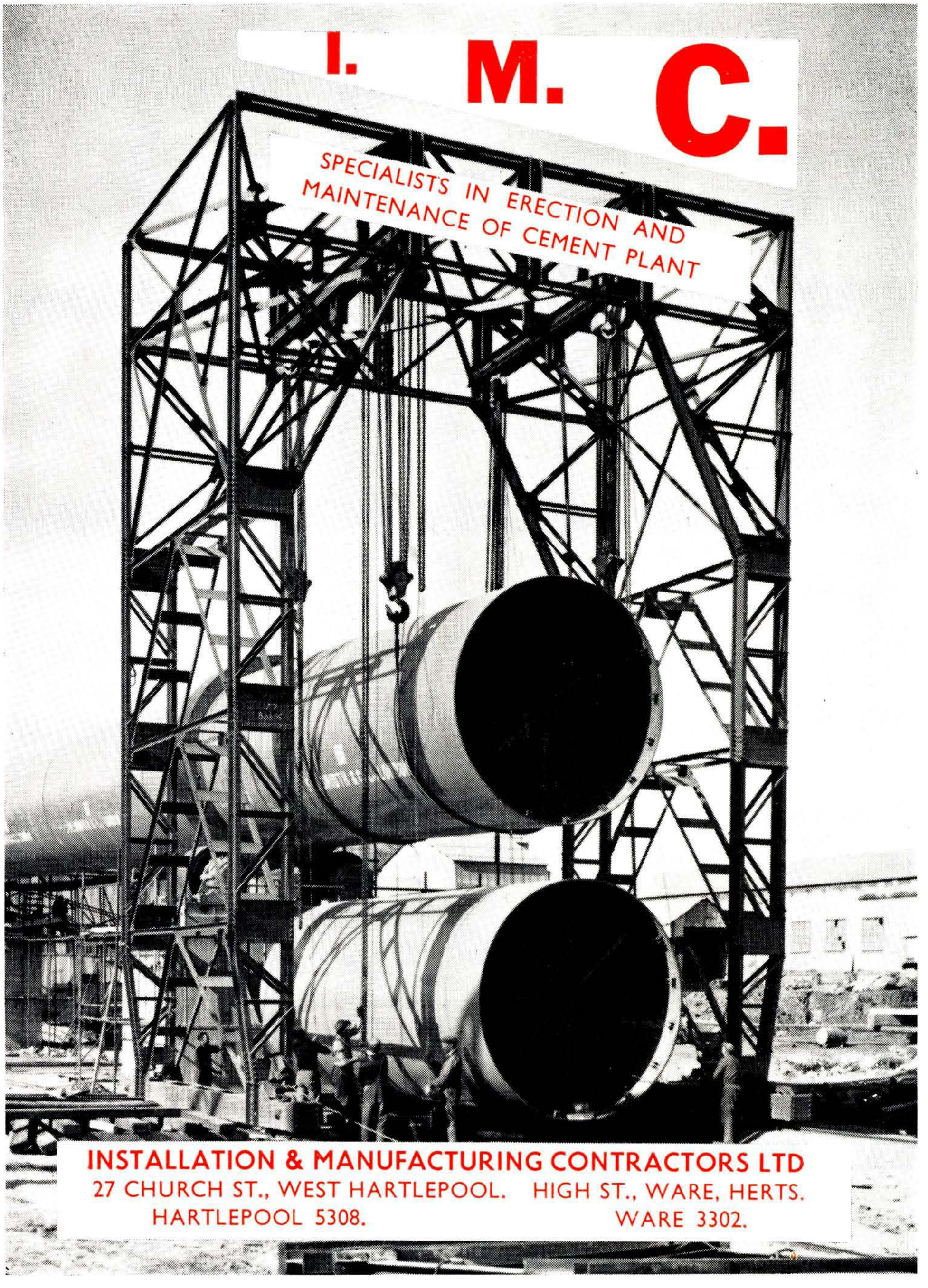
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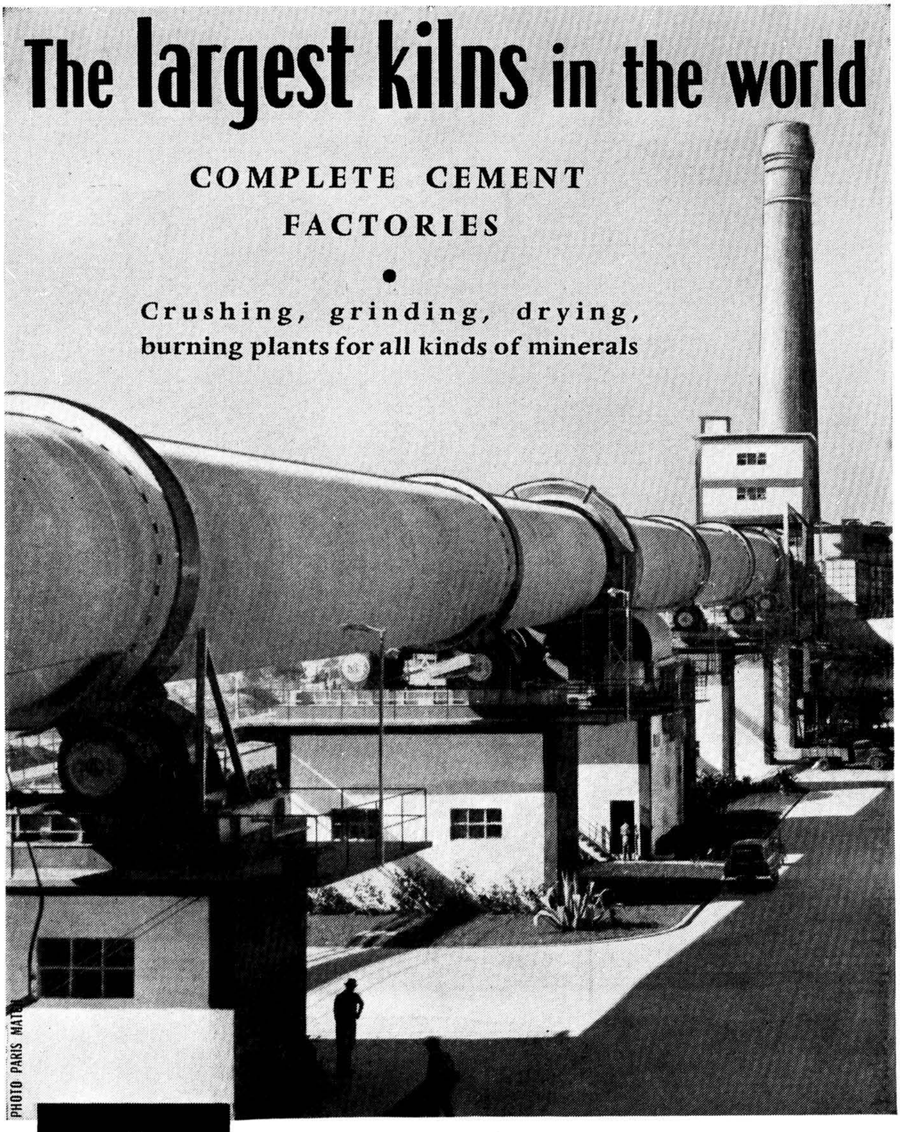

Alhandra cement factory (Portugal). View of the kiln (167.5 m x 4.8/5.3 m - 1600 T/day)

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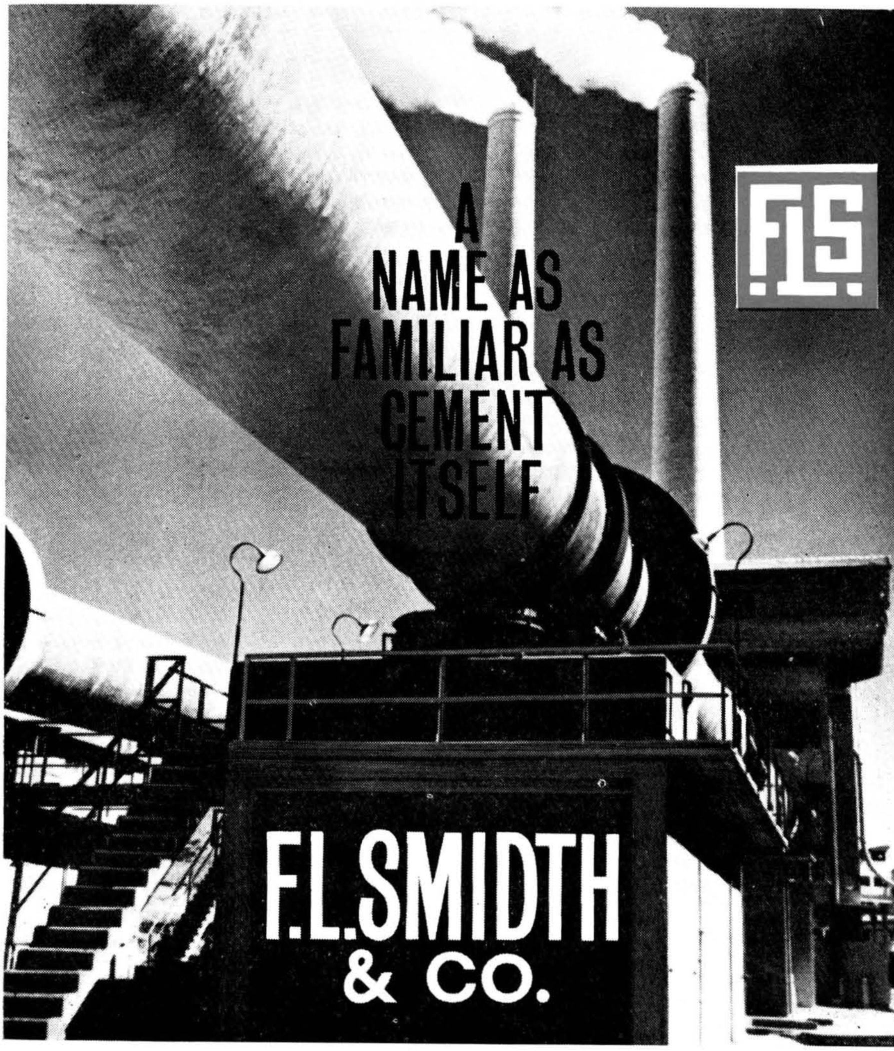

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Cement Works in Jordan.

There is only one cement works in Jordan, and this is the works (*Fig.* 1) of the Jordan Cement Factories Co., at Fuheis some twelve miles from Amman. This works was founded a few years ago and has since been expanded to a daily average productive capacity of 1,000 tons. There are at present three kilns in operation, the latest being put into operation in February 1963. They are all oil-fired Polysius rotary dry-process kilns. Both water and coal are scarce in Jordan. Electric power for the works is generated by eight Siemens generators driven by M.A.N. slow-speed diesel engines, and each has an output of 1,000 kw.

The annual productive capacity of the first kiln installed was 85,000 tons, but the capacity of the works was increased to 220,000 tons when the second kiln was installed in about 1960, and is 350,000 tons now that the latest kiln is in operation.

The raw materials are obtained mostly from local limestone quarries and clay pits, and are brought to the works in motor lorries. The mixture of the raw material is tested every ½ hour for carbonate content and is maintained within ± 1 per cent. of the required chemical composition.

The accompanying illustrations show some of the plant at these works, the entrance to which is shown in *Fig.* 2. As seen in *Fig.* 1, the materials store runs down the centre of the works and divides the older from the more recent installa-

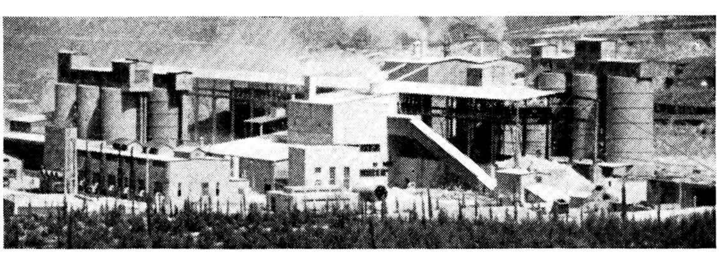

Fig. 1.—Cement Works, Jordan.

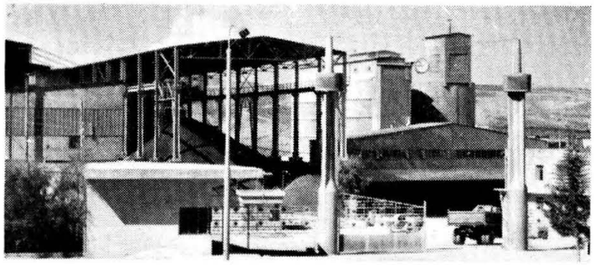

Fig. 2.—Entrance to Works.

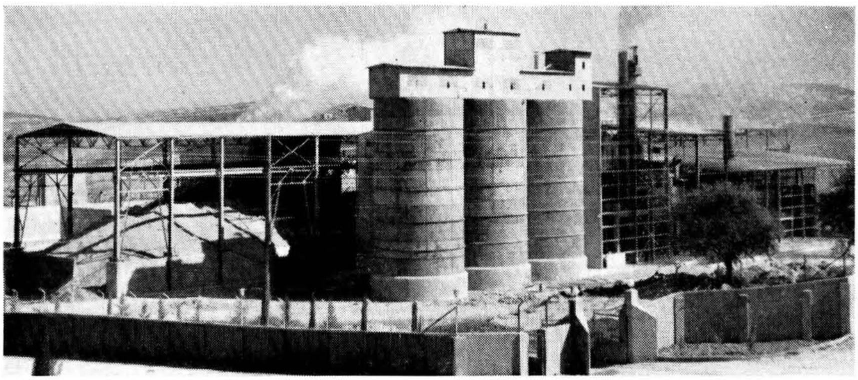

Fig. 3.—Extensions in Progress.

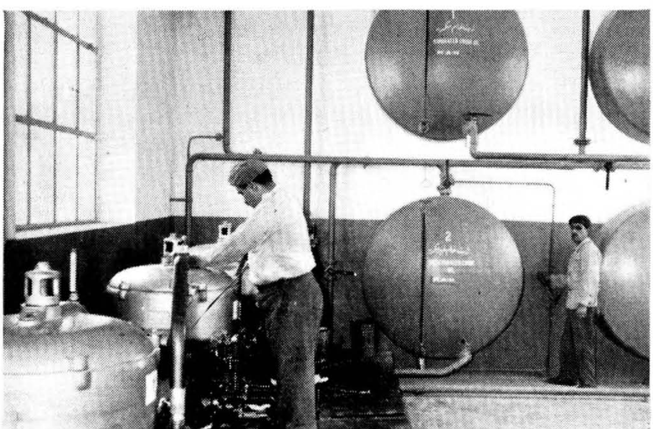

Fig. 4.—Fuel-oil Store.

Cement Works, Jordan.

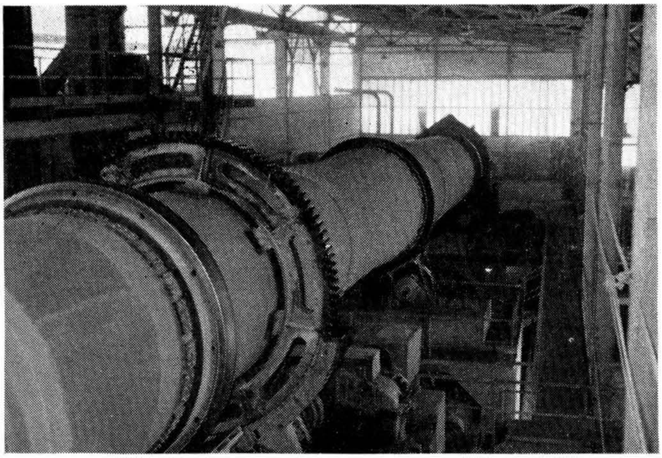

Fig. 5.—Cement Works, Jordan: One of the Kilns.

tions. A view of the new plant being installed is shown on the right-hand side in *Fig.* 3, in the centre of which are seen the three new silos; on the left-hand side is the extension to the materials store. The storage tanks and pumps for the oil for firing the kilns are shown in *Fig.* 4, one of the three Polysius kilns, which are entirely covered by the kiln-house buildings, being seen in *Fig.* 5. The interior

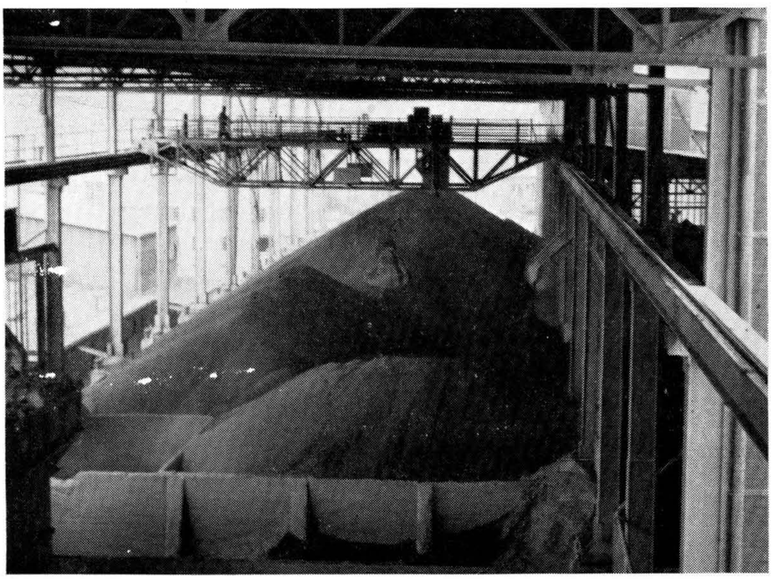

Fig. 6.—Cement Works, Jordan: Clinker Store.

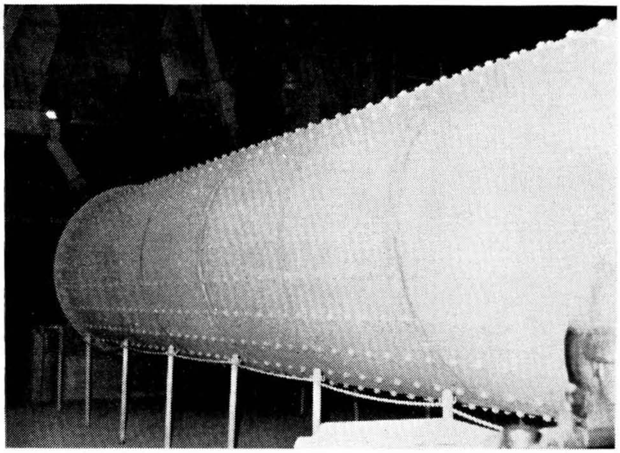

Fig. 7.—Cement Works, Jordan: Cement Mill.

of the clinker store is shown in *Fig.* 6, and one of the three cement mills in *Fig.* 7.

Two types of cement are made, namely ordinary Portland cement and " Petra," which is in effect a form of pozzolanic cement containing about 15 to 20 per cent. by weight of pozzolana. The pozzolana is obtained from deposits at Carietan near the Iraq border. At present the output of the works is in the proportion of one of " Petra " cement to two of ordinary Portland cement. It is expected that the manufacture of the former type of cement will cease in the near future, and a low-heat Portland cement, which is required for the construction of new dams in Jordan, will be made.

The standard crushing test, on 4-cm. cubes made from 1 part of Portland cement, 2 parts of coarse sand, and 1 part of fine sand gives a strength, at twenty-eight days, of not less than 275 kg. per sq. cm.; the standard bending test gives strengths of not less than 50 kg. per sq. cm. Random tests, made on the occasion of a recent visit, gave the following results:

" Petra " cement.— Crushing strength: 414 and 389 kg. per sq. cm.
Bending strength: 69 kg. per sq. cm.

Portland cement.— Crushing strength: 475 and 495 kg. per sq. cm.
Bending strength: 75 kg. per sq. cm.

The tests and specification of the cement produced at these works are in accordance with the German Standard DIN 1164.

Publication Received.

" Reasons for More Brands of Cement to Meet Diversified Requirements." By S. Gottlieb. Reprinted from the Proceedings of the First Conference of the Australian Road Research Board, 1962. Vol. 1.

The Effects of Sulphate Solutions on Cement.

MUCH intensive research has been conducted and continues at the laboratories, at Ramat Aviv, of the Standards Institution of Israel. The principal subject being studied is the effect of sulphate solutions on cement since this aspect is of considerable importance in view of the highly saline nature of the soils and water in parts of this territory and adjacent countries. Some of the results of this research, which is being carried out under the auspices of the Ford Foundation Projects, have already been published or otherwise made available.

Early Tests.

Some of the early tests are described in an unpublished report (dated 1960) by L. HELLER and M. BEN-YAIR entitled "The Effect of Sulphate Solutions on Cement."

Bars of dilute pastes of ordinary and sulphate-resistant Portland cements were immersed in closed vessels containing distilled water and Na_2SO_4 and $MgSO_4$ solutions of various concentrations, Mediterranean sea-water, artificial sea-water solutions of (Na_2SO_4 + NaCl) and (Na_2SO_4 + NaOH) respectively, and water from the Dead Sea. The products, after different reaction times, were identified by X-ray powder methods, and simultaneously the expansion of the bars was measured. Differential thermal curves and chemical analyses were used to supplement the X-ray data.

Ettringite ($3CaO . Al_2O_3 . 3CaSO_4 . 31H_2O$) occurred in all the samples investigated. In general strongly expanded bars were rich in ettringite but a quantitative correlation between expansion and the quantity of ettringite actually present did not obtain. It was concluded that ettringite is unstable and undergoes further reaction. The low-sulphate form occurred in very small quantities in many of the samples and a solid solution of the type $3CaO . (Al_2O_3, Fe_2O_3) Ca(OH)_2 (SO_4) (SiO_3)$ in the outer crust of some of the bars exposed to 2 and 10 per cent. $MgSO_4$ solution. Neither could be regarded as a decomposition product of ettringite in bulk samples of cement. It was inferred, that under the conditions of the experiments, ettringite passes into a gel phase.

The formation of ettringite is still regarded as the primary cause of expansion; subsequent volume changes, however, depend both on the continued formation of ettringite and gypsum and on moisture movement of the gel phase. The rate of formation of ettringite is determined by the rate of hydration of the aluminate phase. Free lime is always present.

The compound $3CaO . Al_2O_3 . CaCl_2 . 10H_2O$ was formed in all samples exposed to solutions containing Cl-ions. It accumulates with increasing time of attack.

Some results of these investigations had also been published by the same authors in "Nature" (Vol. 191, July 29, 1961) under the heading "Formation of Calcium Chloraluminate by Interaction of Portland Cement with Sea-water and Chloride Solutions." Earlier investigators had reported in 1948 and 1952 that the addition of chloride ions to solutions containing sulphate reduced or inhibited the expansion of concrete and mortar bars, and attributed this effect to the ncreased solubility of gypsum and calcium sulphoaluminate in chloride solutions Contrary to the earlier observations addition of chloride ions to solutions containing sulphate was found to increase expansion of cement and mortar bars in all the Israeli experiments. Expansion in sodium-chloride solution only slightly exceeded that in distilled water. A considerable increase of volume was observed in magnesium-chloride solution but can probably be attributed to the accelerated hydration caused by the reaction of magnesium ions with calcium hydroxide and hydrated calcium silicates of the cement.

Failure of previous investigators to detect chloraluminate in the course of their many studies of the attack on cement by sea-water may perhaps be attributed to the lack of X-ray data in relevant cases.

Subsequent Tests.

In a later unpublished report (1962) by M. BEN-YAIR on "Studies on Portland Cement," the subject is dealt with further under the headings "The Prevention of Sulphate Attack on Cement and Concrete" and "The Nature of Calcium-Sulphoaluminate and Calcium-Chloraluminate."

The nature of synthetic calcium-sulphoaluminate and calcium-chloraluminate was studied by microscopic, X-ray and D.T.A. methods. The stability of these compounds in different chemical media was investigated. Three modifications of calcium-chloraluminate were synthesized which crystalise as short needles, hexagons and long needles respectively. The composition of the first two forms is

$$\text{Low C . Cl . A.} = 3\,CaO \,.\, Al_2O_3 \,.\, CaCl_2 \,.\, 10H_2O.$$

The longest spacing of their X-ray powder patterns is at 7·86 A and 7·92 A respectively. The third form probably corresponds to

$$\text{High C.Cl.A.} = 3CaO \,.\, Al_2O_3 \,.\, 3CaCl_2 \,.\, 30H_2O.$$

Its powder pattern is characterised by a strong spacing at 9·6A.

The possibility of preventing sulphate attack was studied on bars of dilute pastes and mortars of ordinary Portland cement. The bars were immersed in sodium-sulphate and magnesium-sulphate solutions with and without alkali, in Mediterranean sea-water and in chloride solutions. Some positive results were obtained by the addition of alkali to the attacking solutions and of barium salts to cement pastes that were immersed in 10 per cent. sodium-sulphate solutions.

Effect of Dead Sea Water.

The effect of Dead Sea water on pastes and mortars of normal and sulphate-resisting Portland cement are described in the foregoing report but are elaborated in a paper entitled "Effect of Dead Sea Water on Portland Cement," which was published in "The Journal of Applied Chemistry" (1962, Vol. 12, pp. 481-485) by the same authors as the earlier report. The principal reaction products include magnesium hydroxychloride, calcium chloraluminate and hydrated magnesium silicate. The use of Dead Sea water as mixing water in the preparation of the test samples appears to enhance their stability.

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Long Conveyor at a U.S.A. Cement Works.

What is probably the longest permanent cross-country belt-conveyor system in the world was recently put into operation to carry 1,000 tons an hour of either limestone or shale to Ideal Cement Co.'s new works (*Fig.* 1) at Ada, Oklahoma. The installation, which comprises a series of seven conveyors (and part of which is shown in the accompanying illustration), extends 5½ miles from a quarry at Lawrence, to the works. The longest conveyor in this system, which was designed and erected by Link-Belt Co., is 11,766 ft. in length and runs at a speed of 500 ft. per minute; the belt, which is 4½ miles long, makes only ten round trips in an eight-hour day. The shortest conveyor is 550 ft. long. The line of conveyors changes direction six times. The gradient averages about 6 per cent., the steepest being about 14 per cent. All the belts are 36 in. wide.

The conveyors are supported on inverted precast channels of lightweight concrete which span 50 ft. and also provide a cover over the entire length of the belt. The main supporting structures are of prestressed concrete. The con-

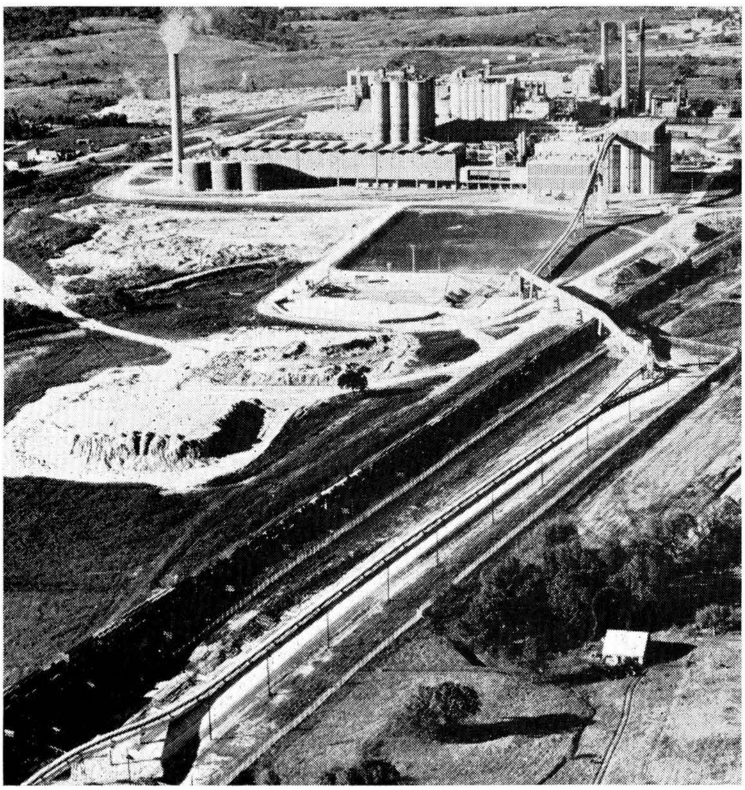


Fig. 1.

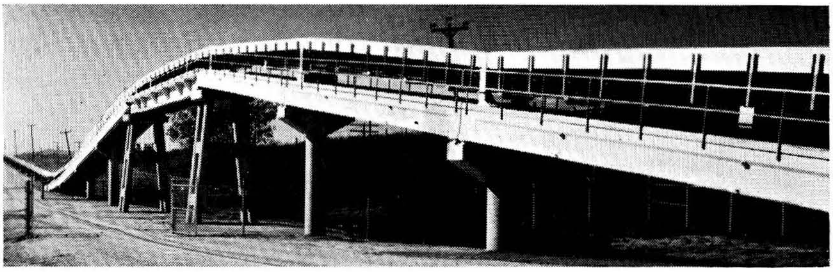


Fig. 2.

veyors generally follow the undulations of the terrain, but hollows are filled and high ground is excavated to give a smooth rolling grade. They cross two roads, a main railway line and a branch line (*Fig* 2), and at six points there are farm crossings. The system is on a strip of land the average width of which is 150 ft., and which is fenced on both sides. The strip contains a 40-ft. earth road with its drainage, an electrical power transmission line from the works to the quarry, the belt-conveyor and its supporting structures, and a 16-ft. stone-surfaced road.

The entire system is operated by a single push-button control in the cement-mill control room, the belts being started automatically in sequence, beginning with the last belt. Each belt starts moving when the preceding belt attains about half speed. To stop the conveyors, this cycle is reversed. In the event of a power failure or any stopping of the system while it is fully loaded, each belt in sequence can coast for successively longer distances to prevent material piling up at the transfer points. Protective devices, including metal detectors, head-and-tail drift switches, belt-slip switches, and take-up overtravel switches, stop the system in an emergency and flash a signal to the operator in the control room.

The conveyors operate eight hours a day for five days a week, and carry crushed limestone on four days of the week and shale on the remaining day. The limestone is crushed to a $\frac{3}{4}$-in. size at the quarry. The shale is crushed to 6-in. size in the primary crusher, and thence proceeds directly to the conveyors. Since it takes nearly an hour for material to travel from the quarry to the works, the system is stopped at night fully loaded. At the works, shale is deposited into a soaking basin, and the limestone is distributed by an inclined belt-conveyor into one of six storage silos.

Particle-size Analysis.

A MEETING having the title "Problems of Particle-size Analysis" was held by the Whiting & Industrial Powders Research Council at Hatfield College of Technology in April last. One of the four official speakers, Dr. H. Heywood, emphasised the need for acceptable standard methods of analysis which should be specificed under the auspices of the British Standards Institution, and then dealt with the fundamentals of particle-size analysis. It is important to examine a powder under the conditions in which it is to be used in practice, and a distinction must be made between those methods suitable for routine control and those for research. Attention was drawn to the classification of methods which had been prepared by a committee of the Society for Analytical Chemistry and published in "The Analyst," March 1963.

Another speaker, Dr. V. T. Crowl, was concerned with the meaning and correlation of the numerical results of different methods of sizing particles. He was mainly concerned with pigments, the particles of which are largely in the submicron range, and compared the various methods most frequently used, namely surface area determinations by B.E.T. gas adsorption, the Perkin-Elmer method, and gas permeability. The last named is reported as recording only about 70 per cent. of the surface area obtained by the first. Direct measurement by an electron microscope, apparently the most foolproof method, seems to involve an operator error by which oversize particles tend to be neglected. Flying spot counting measured optically separable aggregates as single particles. Each of the other methods mentioned, such as sedimentation, centrifugal methods, and the Coulter counter, had advantages and disadvantages. In the discussion, which followed, problems such as the erratic effects of moisture, the difficulties and uncertainties of dispersion, and the unusual aggregating tendencies of magnetic particles like iron oxide pigments were considered.

Mr. J. F. Hinsley, the next speaker, developed an equation for following the effect of a continuous progressive grinding process. He pointed out the importance of particle-size analysis in the control of the efficiency of industrial operations of grinding and classifying. The equation related the fineness of the feed and product of a ballmill to the time of grinding.

Lastly, Dr. B. H. Kaye emphasised the need for not multiplying unduly the analyst's efforts. The accuracy of bulk sampling, sample reduction, analysis and data handling must be seen as a whole so that the work at the later stages should not be more complex than is warranted by the results of the earlier stages. A number of time-saving devices which had been developed by the speaker, for routine calculations, were described. One problem which had been successfully solved was the mixing effect experienced in centrifugal analysis every time the centrifuge was stopped and started. The solution, which was demonstrated by means of a model, was to introduce the sample into the apparatus while the centrifuge was running steadily. The device, which gave reproducible results of sufficient accuracy for routine analysis, was a simplified version of a disk centrifuge.

Contributors to the discussion made reference to the difficulties in selecting the appropriate method of particle-size analysis and to discrepancies in the results of various firms using the same method. The fact was stressed that no method measured the actual sizes of the irregular lumps of matter called particles, but rather one property or another which could be more or less closely related to the idealised sizes of such lumps; this explained why no two or more methods necessarily gave concordant results.

Standard Methods of Determining Particle-size of Powders.

The group of Standards published as parts of B.S. 3406 " Methods for the Determination of Particle Size of Powders " is the outcome of one of the projects decided at a conference convened by the British Standards Institution in 1952. The recently published Part 3 (1963), " Air or Gas Elutriation Methods," is the latest in the series describing methods of determining the size distribution of particles in those fractions of powders which pass through a 75-micron British Standard test sieve. (Other Standards are expected to be published shortly covering the liquid-sedimentation and optical-microscope methods, and more Standards will be prepared as necessary.) Elutriation methods, the principles of which are described fully in the introduction, are based on the measurement of the proportion of a powder which is carried off by an upward flow of gas in a vertical column at a known velocity. The largest size of particle elutriated by a given gas velocity is calculated from Stoke's law. Three methods are described: the Gonell method, the Roller (modified A.S.T.M.) method, and the miniature elutriator. Methods of evaluating a size-analysis instrument and of correlating the results between different methods of analysis are described in the appendices.

Copies of B.S. 3406 Part 3 (1963) are obtainable from the British Standards Institution, 2 Park St., London, W.1. (Price 7*s.* 6*d.* each.)

Waterproofing Agent for Cement.

A NEW waterproofing agent (British Patent No. 890,721) for cement is claimed to give complete and permanent protection to concrete structures against the ingress of water. Although numerous waterproofing agents for cement already exist, none, it is stated, is entirely successful and all leave a short period of permeability after the drying out of the concrete. The new agent comprises a basic mixture of alkali aluminate and soap, together with alkali hydroxide and calcium chloride, and may be mixed in with freshly prepared concrete or applied like paint to the surface of concrete. This material causes the particles of cement to expand, and subsequently to congeal and harden in this swollen condition. Consequently, the concrete is claimed to be rendered permanently waterproof and more resistant to acid.

The mixture adheres strongly to freshly set and to old concrete. Prepared as a thin aqueous mixture containing glycerine, it penetrates deeply into concrete, and a single coat is claimed to be sufficient to effect waterproofing.

Extension of a Cement Works in South Wales.

THE expansion scheme, valued at £1,500,000, undertaken at the works at Rhoose, South Wales, by Aberthaw & Bristol Channel Portland Cement Co., Ltd., is expected to be completed shortly. The works will be capable of producing 200,000 tons of cement annually. Work began on the site early in April 1962 but there was some delay due to the severe winter of 1963.

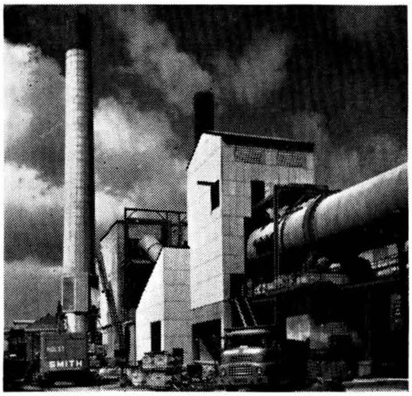


Fig. 1.

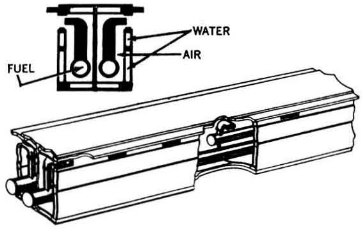
The excavations for the various structures are in limestone, and a large part of the deeper excavations is in the quarry. Much of the rock excavated was taken into the existing plant for processing into cement. The structures in the quarry include the main crushing plant, raw mill, and crushed stone bunkers. The crushing plant consists of receiving hoppers for the stone as quarried, a primary crusher, conveyors, and a secondary crusher. In the raw mill there is a 1,500-tons reinforced concrete bunker comprising two compartments having capacities of 1,000 tons and 500 tons respectively.

In the area of the main works, a new slurry basin of 85 ft. diameter and having a capacity of 720,000 gallons, and a pumphouse have been constructed. The 200-ft. reinforced concrete chimney (*Fig.* 1) has a twin-flue entry allowing provision for later extension of the works. Adjoining the chimney are two precipitators built to the requirements of Messrs. Lodge Cottrell Ltd. The columns and beams of the sub-structure are isolated from the main casings by a system of roller bearings to allow for expansion. The reinforced concrete casings are 62 ft. high and are clad externally with insulating blocks 8 in. thick, and internally with acid-resisting bricks.

The new rotary kiln is 450 ft. long. The kiln foundations vary from 9 ft. to 20 ft. in height. A slurry-feed structure is provided at one end of the kiln and, at the other end, there are the burners platform and the automated control gear. The new cement mill is inside an existing building, and in connection therewith there is a 900-tons reinforced concrete bunker.

The consulting engineers for the plant are Messrs. F. L. Smidth & Co., Ltd. The reinforced concrete design and construction was carried out by Messrs. Holst & Co., Ltd., the cost of their part of the project being about £250,000.

Improved Burners For Lime Kilns.



IMPROVEMENTS in the design and operation of vertical lime kilns have been developed in recent years by Union Carbide Metals Co., Division of Union Carbide Corporation, at their works at Ashtabula, Ohio. Successive improvements have, according to a report in " Pit and Quarry," increased the capacity of each kiln fivefold from the original capacity of 100 tons per day. The basic improvement is the introduction of a patented burner, which comprises water-cooled H-beams housing the burner pipes as shown in the accompanying diagram. The beams are arranged in staggered tiers in each kiln, there being three beams in the top tier and two in the bottom tier. Each beam is divided into four chambers that contain the ports through which the air and cleaned gas mixture are introduced into the kilns. The ports are fed from separately metered pipelines which permit maximum control of combustion. The fuel may be natural gas, furnace gas, or a mixture of these two, or fuel oil. At Ashtabula, the fuel is natural gas combined with a by-product gas from the ferro-alloy and calcium-carbide furnaces.

Revised and New British Standards for Cement.

A NUMBER of the Committees of the British Standards Institution are at present active in the preparation of revised and new Standards for cement. Some of the work completed and some that is in hand is reported by the Reinforced Concrete Association as follows.

An amendment was published in 1962 in respect to the clause in British Standards No. 12, 146, 1370 and 915 relating to " Composition and Manufacture "; the revision concerned metallic iron from the grinding process.

It is proposed to proceed with a new specification for " Ground or Granulated Blastfurnace Slag Powder " for blending with Portland cement.

Matters dealt with in connection with the testing of cement included definitions, terminology and classification of cements in relation to the International Standards Organisation. A sub-committee is investigating laboratory testing temperatures in respect of concrete tests control.

The first draft of a specification for low-heat slag cement has been discussed.

Various laboratories attempted to correlate test results for the determination of alumina of sulphate-resisting cement. If an acceptable method of quantitative determination can be agreed, drafting of the specification should be able to proceed.

The Durability of Concrete.

IN view of the complexity of the problems related to the durability of concrete, and the difficulty and cost of research on this subject, an International Symposium on the Durability of Concrete was held by RILEM in Prague in 1961. The papers presented at this meeting and the contributions to the consequent discussions are given in full in English or French in a two-volume publication.* The first volume gives the Preliminary Report of the Symposium and includes a total of twenty-eight papers, of which twenty-two are in English, the remainder being in French. The second volume gives the General Reports on each section of the Symposium and sixty-five papers, forty-four of which are in English and the remainder in French, and includes the contributions to the discussions.

Although the papers do not solve all the problems, the purpose of the general reports is to give as complete a survey of practice and research and an analysis of the subject as possible, and to point out the principal lines to be followed by future research. The results of numerous tests, comparative experiments and analyses accompanied by tables, charts and many illustrations and an extensive bibliography are given.

The subject is divided into five sections, the principal contents of each being as given in the following, in which is also given the titles of those papers of most interest to the cement industry.

Theoretical Problems.

The subjects included in this section include: the durability of the hardened cement paste; the effects of the composition of the cement, admixtures, water-cement ratio, and conditions of hardening; the durability of aggregates, and the effects of texture, mineralogical composition, and mechanical, physical and chemical properties; the bond of cement and various aggregates, its nature and durability, and its effect on the durability of concrete. The five papers in this section in Volume I include:

'The Durability of Hydrotechnical Concretes made with some Polish Cements.' By W. Gaca (Poland).

'Durability of Concrete made with Hydraulic Admixtures and/or Artificial Aggregates.' By K. Szepesi (Hungary).

'The Significance of the Aggregate-Cement Bond for the Durability of Concrete.' By O. Valenta (Czechoslovakia).

In Volume II there are, in this section, a General Report by L. Palotás (Hungary), six Communications, and six contributions to the Discussion. The three additional papers include:

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* 'Durability of Concrete' (Durabilité des Bétons). Published in the edition 'Symposia CSAV' by the Publishing House of the Czechoslovakian Academy of Sciences, Prague. Vol. 1 (1961) 394 pages. Vol. 2 (1962) 624 pages.

Both volumes, which are sold separately, are obtainable from Concrete Publications Ltd. Vol. 1: price 42*s*. (10 dollars). Vol. 2: price 63*s*. (15 dollars). These prices include postage. •The dollar prices apply in Canada and U.S.A.

'Resistance of Cement Mixtures to Corrosion.' By G. Babatchev and P. St. Pentchev (Bulgaria).

'Durability of High-Alumina Cement.' By J. Talabér (Hungary).

Mechanism of the Disintegration of Concrete.

The subjects dealt with in this section include: the origin of cracks in the concrete; the effects of the composition and fineness of cement, the water-cement ratio, admixtures, heat of hydration, and curing; external agents acting adversely on the concrete; the effect of the concrete constituents, proportions, making, placing, finishing and curing. The nine papers in this section in Volume I include:

'Tests on the Resistance of Mortar and Concrete to Sea Water (1934-1964).' By F. Campus (Belgium).

'Alkali-silica Reactions in Concrete.' By J. Jessing, A. Kjaer, G. Larsen and E. Trudsø (Denmark).

'The Influence of Type of Cement and Curing Conditions on Cracking Tendency.' By Minoru Kondo (Japan).

'Deterioration of Concrete by the Conjugated Action of Water containing Sodium Sulphate and Particular Climatic Conditions.' By P. Lhopitallier, J. Rives and P. Stiglitz (France).

'Durability of Concrete in Sea-Water.' By Inge Lyse (Norway).

In Volume II there are, in this section, a General Report by F. Campus (Belgium), nine Communications, three contributions to the Discussion. The seven additional papers include:

'Principles of Selecting Surface-active Agents as Air-entraining Admixtures to Concrete.' By J. Mlodecki (Poland).

'Corrosion and Protection of Reinforced Concrete.' By V. M. Moskvin (U.S.S.R.).

'Hypothesis on Frost-Resistance of Concrete.' By B. Warris (Sweden).

Tests and Control of Durability.

The principal subjects dealt with in this section include: laboratory tests of the concrete and its constituents and their relation to actual conditions; accelerated tests and criteria of the durability; standardisation of durability tests. The six papers in this section in Volume I include:

'Studies and Observations on the Behaviour of Concrete and Reinforced Concrete in Sea-Water.' By P. Courcambeck, L. Duhoux and A. Tessier (France).

'Durability of Concrete and Reinforced Concrete and its Relations to the Composition of Cement, Concrete and Construction Methods,' and 'Frost Resistance of Reinforced Concrete Structures.' By S. V. Shestopyorov (U.S.S.R.).

'The Evaluation of the Chemical Capacity of Resistance of Cement and Concrete.' By K. Wesche (Germany).

In Volume II there are, in this section, a General Report by S. V. Shestopyorov (U.S.S.R.), eight Communications, two contributions to the Discussion. The two additional papers include:

'Tests of Chemical Action of Aggressive Waters on Set Cement.' By P. Schimmelwitz (Germany).

Composition and Making of Durable Concrete.

The principal subjects in this section include: the selection of suitable aggregates and cement; the composition of durable concrete; admixtures, conditions of hardening, curing, strength and other mechanical and physical properties; the protection of concrete structures. The five papers in this section in Volume I include:

'Czechoslovakian Experience with Air-entrained Concrete.' By J. Jambor (Czechoslovakia).

'Durability of Hydro-Concrete with Pulverised-Fuel Ash.' By M. Jirsák and A. Kraus (Czechoslovakia).

In Volume II there are, in this section, a General Report by B. Kopyciński (Poland), three Communications, and two contributions to the Discussion. (No additional papers.)

Experience of Concrete Structures.

The principal subjects dealt with in this section include: the durability of structures under various conditions; measurements and controls performed on site; failures of structures; maintenance and repair of structures; economics; economical durability of structures of all kinds. There are two papers in this section in Volume I. In Volume II there are, in this section, a General Report by K. Hruban, three Communications, five contributions to the Discussion. The three additional papers include:

'Durability of Roman Mortars and Concrete for Hydraulic Structures at Caesarea and Tiberias.' By R. Malinowski, A. Slatkine and M. Ben Yair (Israel).

Old-established Cement Works in the U.S.A.

The original works of the Medusa Portland Cement Co., at York, Pennsylvania, was built in 1907, but this plant, which produces white cement, has been almost completely replaced by new equipment and buildings. The new works, the productive capacity of which is almost double that of the original works, was completed in April last.

The works of the Lehigh Portland Cement Co., at Oglesby, Illinois, is to be closed. The works was established in 1898 and was acquired by the present Company in 1917. It was closed temporarily early this year, reopened in April last, and will be permanently closed this year.

The waste-heat boiler plant and thirteen kilns 100 to 120 ft. long at the Crestside works, California, of the Riverside Cement Co., will be rendered obsolete when two new long kilns go into operation next year. The temperature of the exit gas of the new kilns will be 800 to 900 deg. F., and this is insufficient to support operation of the old waste-heat plant which up to now has been supplied with gas from the old kilns at a temperature of 1,700 to 1,800 deg.

Some New Large Rotary Kilns.

Russia.—The first of two rotary kilns being installed at the Balakleya works some 40 miles from Kharkov, Ukraine, is over 600 ft. long and is 20 ft. in diameter. As expected the first part of this works went into operation this summer, and the full productive capacity of 2,400,000 tons per annum is expected to be attained next year. It is claimed that this will be the largest cement works in the world. The works adopts a continuous-flow process from the production of the raw material to the finished product. Slurry is transported from the quarry through a pipe-line 5 miles long, the five pumping stations along the line being capable of supplying the works with 18 tons of raw material per minute. Automatic and electronic devices are installed and the slurry mixture is controlled by computers.

Rotary kilns, also 600 ft. long but 16 ft. in diameter, are to be installed at the Urals cement works in West Kazakhstan. The first section of the plant, which is expected to produce 1,200,000 tons of cement a year, will be built within the next two years. Production will be fully automated and controlled from a single control board. The construction of two similar works is expected to start shortly in the Pavlodar and Kustanai regions of Kazakhstan.

What is claimed to be the largest cement kiln in the world is being designed in the U.S.S.R. The kiln, which will have a daily productive capacity of 3,000 tons of clinker, will be 656 ft. long and 23 ft. in diameter. It will have a low fuel consumption and will be controlled automatically by computers. This is in accordance with the policy of adopting the utmost mechanisation and automation of all production processes from the excavation of raw material to the shipping of the finished product.

Australia.—The largest wet-process kiln in Australia will be at the works of Southern Portland Cement Ltd., at Berrima, New South Wales. The kiln will be of 15 ft. 3 in. internal diameter and 560 ft. long, and is being manufactured by Allis Chalmers Australia Pty., Ltd. It is expected to produce more than 1,000 tons of cement clinker per day.

Poland.—The largest kiln in Poland is to have a capacity of 1,200 tons per day compared with the present largest which has a capacity of 600 tons. The new rotary kiln is to be built by Bydgoszoz Engineering Works.

U.S.A.—The 510-ft. wet-process kiln, having diameters of 15 ft. 6 in. and 17 ft. 6 in., now being installed at the Catskill, New York, works of Alpha Portland Cement Co., is claimed to be the third largest in the U.S.A. Production is expected to commence late in 1964, and the annual productive capacity will be about 500,000 tons.

Japan.—Two rotary kilns to be installed at the Nanyo works of the Tokuyama Soda Co., Ltd., Tokuyama, will each be nearly 650 ft. long and over 17 ft. in diameter. The operation of the kilns is to be completely automated. Production at these works is expected to be 1,200,000 tons per annum.

New Publications.

"High Alumina Cements and Concretes." By T. D. Robson. (London: C. R. Books Ltd. 1962. Price 40s.)

THE author of this book of some 250 pages is well known especially in cement manufacturing circles. As is to be expected he has drawn upon the experience of his own firm and has also called upon that of manufacturers of high-alumina cement in the U.S.A. and France in collating the considerable amount of data for this admirable and comprehensive study of a restricted subject. In view of the comparatively limited use of high-alumina cement, the subject is well endowed with technical literature and the author cites many hundreds of references to books and journals which include works of over 800 named authors in addition to scores of anonymous references.

The contents of this book include an account of the manufacture, chemical composition and hydration of high-alumina cement, the physical properties and resistance to chemical attack of this cement, and mortars and concretes made therewith, admixtures, latex-cement compositions, expansive cements, non-refractory and refactory concrete, and thermal insulation. Throughout, comparisons are made with Portland and other cements. Each of the eight chapters is preceded by a detailed list of the contents thereof, but some difficulty is experienced in using the book because of the unusual omission of a general contents giving the titles of all the chapters and the page numbers. The index does not make up fully for this exclusion.

Although the advantages of high-alumina cement are stressed, the author is very fair in his statements of when its use is not so advantageous and, quite properly, gives warning of the special care needed in several respects when using concrete made of this material.

"Cement Industry in India." By V. Podder. (Dalmianagar, Bihar, India. Rohtas Industries Ltd. 1963. Price 40 rupees.)

IN this book of over 400 pages, there are, in addition to tabulated particulars of the cement companies and associations operating in India and a history of the development of the industry in that country, price comparisons with other countries and some fiscal considerations. The requirements of the Indian standard specifications and those of other countries are given and compared, but the summary of world standards applies only up to 1955. The bulk of the book deals, however, with cement manufacture as practised in India. Much useful productive data are given relating to quarrying limestone, the production of sulphuric acid, the flotation process as operated in India and some other countries, the prerequisites for establishing cement works, and fuel and oil consumption. The different types of cement as produced in India and elsewhere are described with a wealth of detail. The plant and other equipment required for the preparation of the raw material, for burning by the wet and dry processes, and for grinding and packing are also dealt with in detail.

In the latter part of the book, heat balances, quality control, optimum performance, labour conditions, productivity, and the manufacture of cement on a small scale are among the variety of subjects considered. Two pages of errata complete this publication, which can be recommended to those wishing to acquire a more than superficial knowledge of the cement industry, not necessarily in India, but in a general manner.

"Heat Transfer in Rotary Kilns with due regard to Cyclic Processes and Phase Formation." By Paul Weber. (Wiesbaden: Bauverlag GMBH. 1963. Price 45s.)
IN this special English edition of "Zement-Kalk-Gips," the subjects considered include past investigations, programme of research, heat balance, heat effects along the kiln axis, material and gas temperatures in a rotary kiln, interchange of matter (evaporation of water) in the drying zones of wet-process kilns, heat transfer and excess air, dimensional analysis of kilns, and limiting values of heat consumption.

More than 70 per cent. of the total energy required in making cement is consumed in burning the clinker. The thermal efficiency attainable in the most up-to-date rotary kiln is, at the best, about 50 per cent. To effect further improvements in the heat economy, it is necessary to realise the theoretical principles of heat transfer in a rotary kiln and also the heat requirements of the kiln charge. The heat consumption and the magnitude of the individual heat losses can indeed be determined by means of ordinary investigations of kilns, but it has hitherto seldom been possible thereby to ascertain the causes of the differences in efficiency between kilns of the same type and even less so between kilns of different types. These important problems are considered comprehensively and indications of some promising ways to achieve economic and technical solutions are given.

"Proceedings of the Sixth Conference on the Silicate Industry." Edited by Béla Beke and Ferenc Tamás. (Budapest: Publishing House of the Hungarian Academy of Sciences. 1963. Price 12 U.S.A. dollars).
SEVENTY-SEVEN papers were presented at the Conference of the Silicates Industry held in Budapest in 1961. Forty-four of these papers are included in this publication; those excluded have been omitted either because they are of local interest only or because of copyright difficulties. All the published papers are in English irrespective of the language in which they were originally written. Several of the papers deal with subjects of interest to the cement and lime industries; a selection of such papers was noticed in this journal for November 1961, and abstracts of five of them were given in this journal for April 1962.

"Lime Hydrating." (London: Sturtevant Engineering Co., Ltd. 1963. Gratis.)
A 24-PAGE brochure describing in detail the process and plant used in the hydration of lime was issued recently. The text is fully illustrated by photographs of plant and equipment supplied by the Sturtevant Engineering Co., Ltd., from which firm copies of the brochure are obtainable free of charge upon application to Sturtevant House, Highgate Hill, London, N.19.

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The Cement Industry in Eastern Countries.

Near East.

Jordan.—Elsewhere in this number, a description is given of the works of the Jordan Cement Factories Co., at Fuheis. A third oil-fired dry-process Polysius rotary kiln commenced operation at this works in February 1963.

Turkey.—Conversion to the dry process of the eleven cement works of the Cement Industry Corporation of Turkey is proceeding.

Saudi Arabia.—The Yamama Saudi Cement Co., Ltd., are to establish a cement works near Riyadh, the capital. The works, which will have an annual capacity of 100,000 tons, will operate on the dry process. Contracts for the principal plant have been placed with Messrs. F. Krupp of Rheinhausen, Germany, and, for the electrical equipment, with Messrs. A.C.E.C. of Charleroi, Belgium. Messrs. Henry Pooley (Consulting Engineers) are the consultants for the entire project.

(A description of the new cement works in the Province of El Hasa was given in this journal for September 1962.)

Middle East.

Pakistan.—A works having an annual capacity of 400,000 tons is to be built at Gharibwal, West Pakistan, as the result of an agreement between financial corporations and Ismail Cement Industries Ltd.

East Pakistan.—The Japan Consulting Institute recently reported favourably on the practicability of building a cement works near the limestone deposits at Takerghat. Enough limestone is available to supply a 500-ton-per-day works for 40 years.

India.—A works, having a daily productive capacity of 700 tons, was completed recently in Churk.

Afghanistan.—A cement plant with a daily capacity of 200 tons is under construction in Pol-i-Khomri.

Ceylon.—Work has begun on the expansion of the works at Kankesanturai and Galle, which will increase the country's present output of 90,000 tons to 300,000 tons per year. It is planned to treble production in 1963 and to be able to supply at least 90 per cent. of the country's requirements of cement by 1964.

(The foregoing reports on the industry in the Near East are from " Pit and Quarry.")

Far East.

Taiwan.—The Taiwan Cement Corporation has built a new cement works at Hwalien in eastern Taiwan. The works has an annual productive capacity of about 60,000 tons. The company's works in Kaohsiung has been increased in productive capacity to about 600,000 tons.

South Korea.—The U.S.A. and South Korea and a private Korean firm are to construct a cement works 100 miles south-east of Seoul.

(The foregoing reports on the industry in the Far East are from " Pit and Quarry.")

c (*Continued on page 102.*)

Taiwan.—It is reported that Ishikawajima-Harima Heavy Industries Co., Ltd. (IHI), of Tokyo, have been awarded a contract to construct a cement mill having a capacity of 100 tons per hour for installation in the Ta-tu factory at Hong Shan-Hsiang in northern Taiwan, for the Asia Cement Co.

Japan.—According to a survey by engineers of the Iwaki Cement Co., of Tokyo (as given in a recent number of " Rock Products ") cement production in Japan increased from 900,000 metric tons immediately after World War II, to 6,500,000 tons in 1951, and reached 25,700,000 tons (including all types of cement) ten years later. The types of kilns in use and percentage of the annual productive capacity of each are as follows:

Dry process	35 per cent
Ditto (calcined lime burning)	13 ,, ,,
Wet process (short with filter)	11 ,, ,,
Ditto (long)	24 ,, ,,
Lepol	15 ,, ,,
Shaft	2 ,, ,,

Australasia.

Australia.—Production at the new works, at Waurn Ponds, of The Victoria Portland Cement Co., Ltd., is expected to commence in October this year.

New Zealand.—The kiln transferred from the Golden Bay Co., to the Tarakohe works of Waitomo Portland Cement Ltd., has been in production now for over a year. It is fitted with a Dracco dust collector. The improved quality of the cement resulting from this installation has led to increased sales in the area.

REVISED OVERSEAS SUBSCRIPTION.

OWING to the recent increase in the rate for overseas postage, the Publishers of this journal regret that, commencing with the number for January 1964, the subscription rate for readers abroad will be increased by 2s. 6d. (40 cents) per annum. The price of the journal remains at 9s. per annum; therefore the total subscription will be as follows:

Subscribers overseas (except Canada and U.S.A.) 11s. 6d. per annum

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