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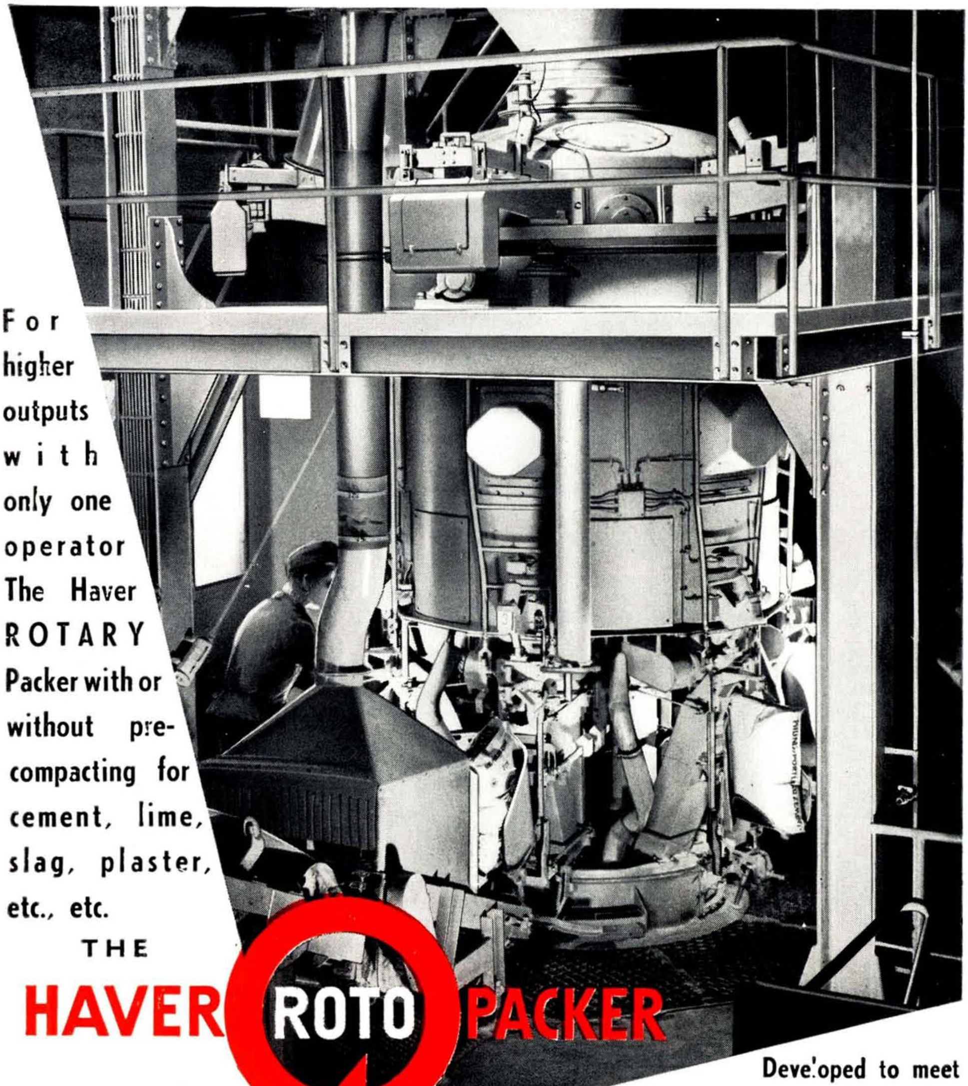

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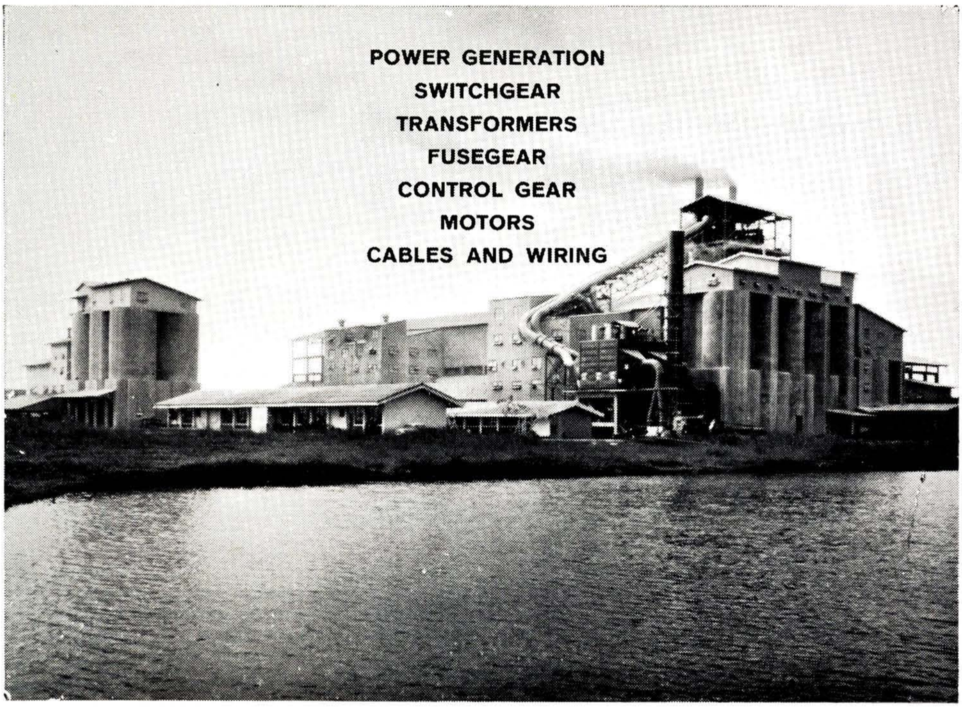

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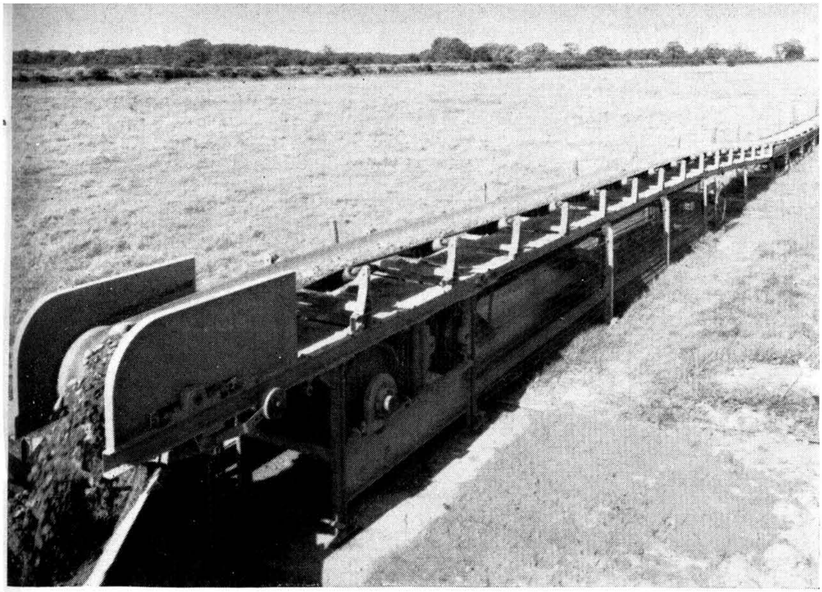

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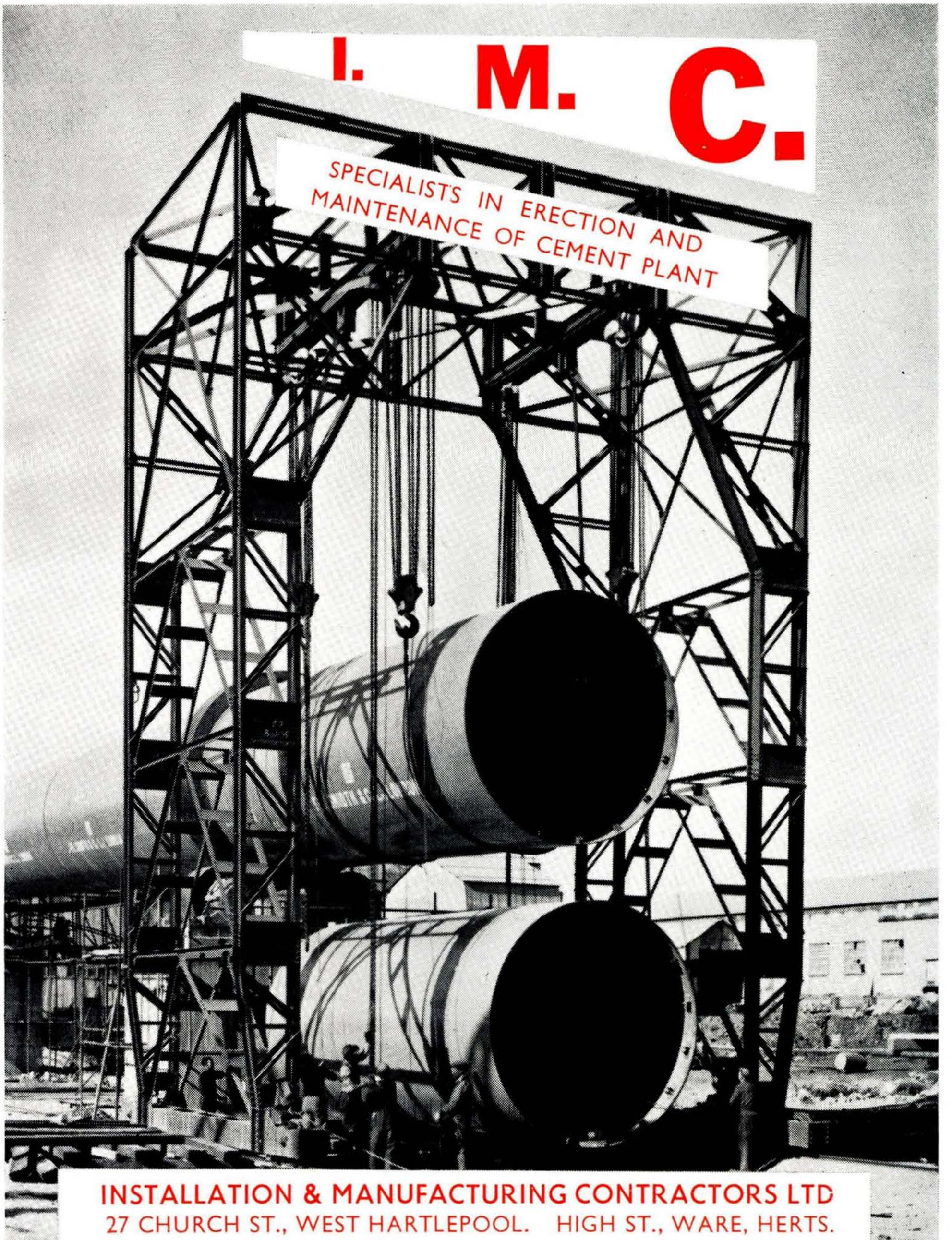
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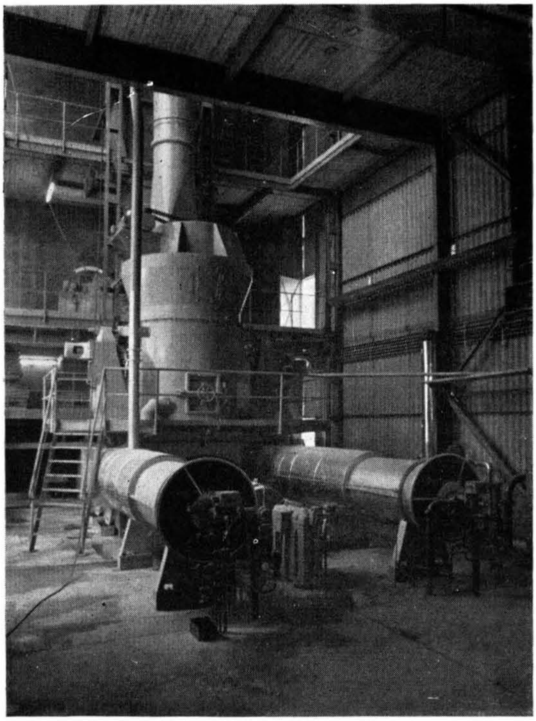

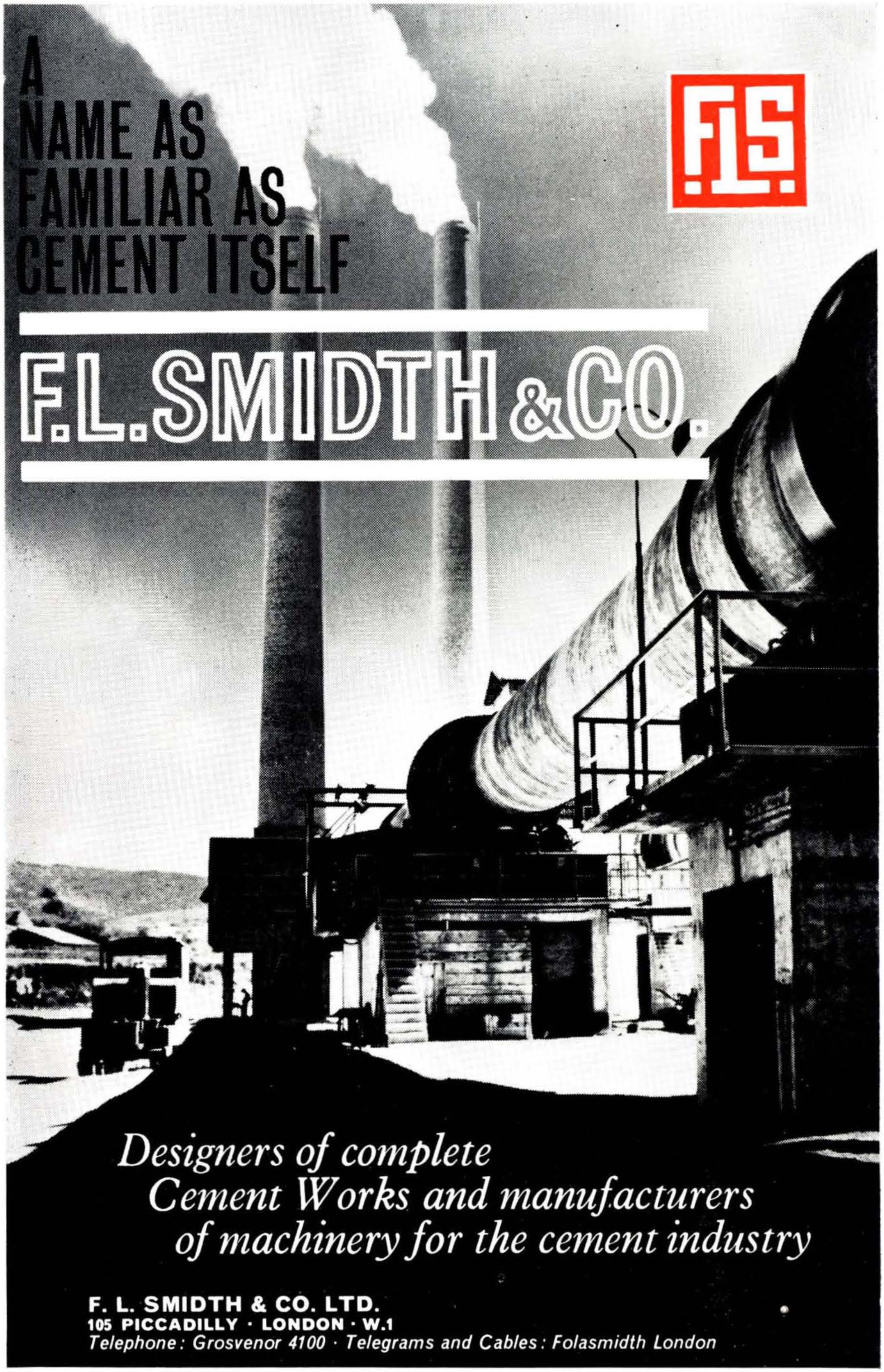
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The New Cement Works at Westbury.—I

PRODUCTION commenced in September last at the new cement works (*Fig.* 1) built by The Associated Portland Cement Manufacturers Ltd., at Westbury, Wiltshire. Cement is being produced by the wet process in a single coal-fired rotary kiln having a capacity of 800 tons of clinker per day; a flow-diagram of the installation is given in *Fig.* 2. The works, which has an annual capacity of 300,000 tons of cement, is situated to the east of the main road from Westbury to Trowbridge, and connected therewith by a new concrete road, and is on the north side of the Western Region main railway line to which sidings connect.

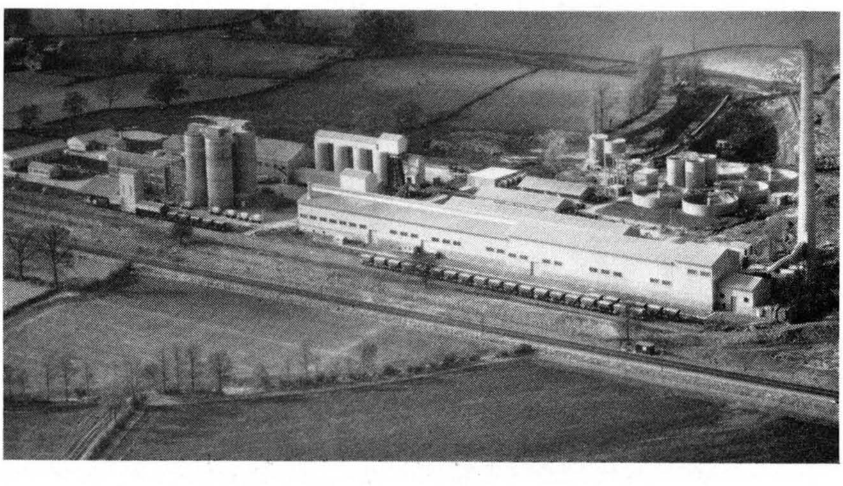


Fig. 1—Aerial View of New Cement Works at Westbury.

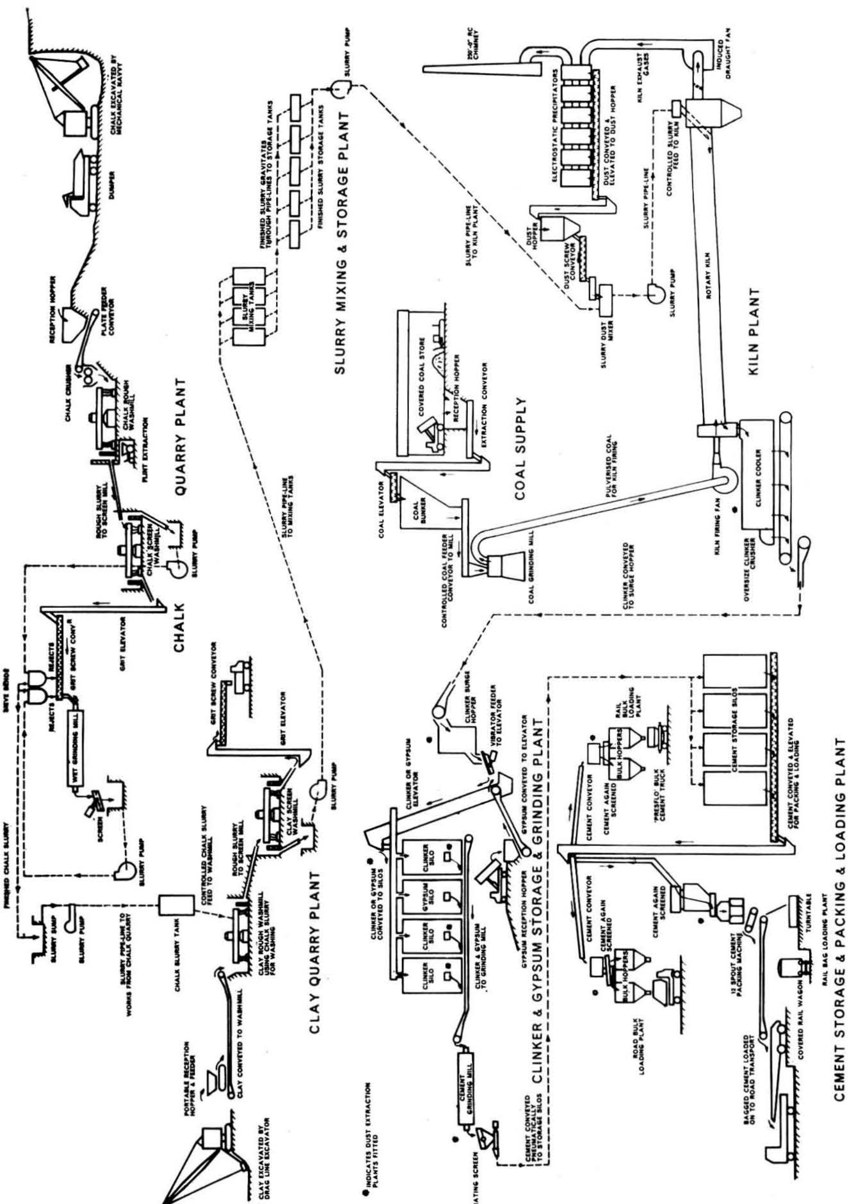


Fig. 2.—Flow-chart of New Cement Works at Westbury.

Fig. 3.—Loading in Chalk Quarry.

Preparation of Raw Materials

The chalk quarry is on the top of the White Horse escarpment $1\frac{1}{4}$ miles south of the works. It is sunk so that no buildings or machinery are visible above the skyline. The chalk is dug by a $2\frac{1}{2}$-cu. yd. 54-RB excavator, operating at 3·3 Kv, which loads the material into 15-ton Foden diesel-driven six-wheel dumpers (*Fig.* 3) in which the chalk is transported to the washmills (*Fig.* 4) in the quarry.

Some of the chalk is rather hard and, after washing, leaves a residue which has to be passed through a tube-mill to be ground to the fineness required in the finished slurry. The chalk is tipped from the dumpers into a hopper from which a plate-feeder delivers it at the rate of 120 to 150 tons per hour into an Edgar-Allen double-roll kibbler, driven by a 75-h.p. motor. From the kibbler, the material is discharged directly into a rough washmill of 35-ft. diameter, driven by a 350-h.p. motor. The chalk contains flints, for the removal of which provision is made in the bottom of the rough washmill. The product from the washmill flows by gravity to two screening mills, each of 24-ft. diameter, driven through a common shaft by a 170-h.p. motor. The screened product then flows

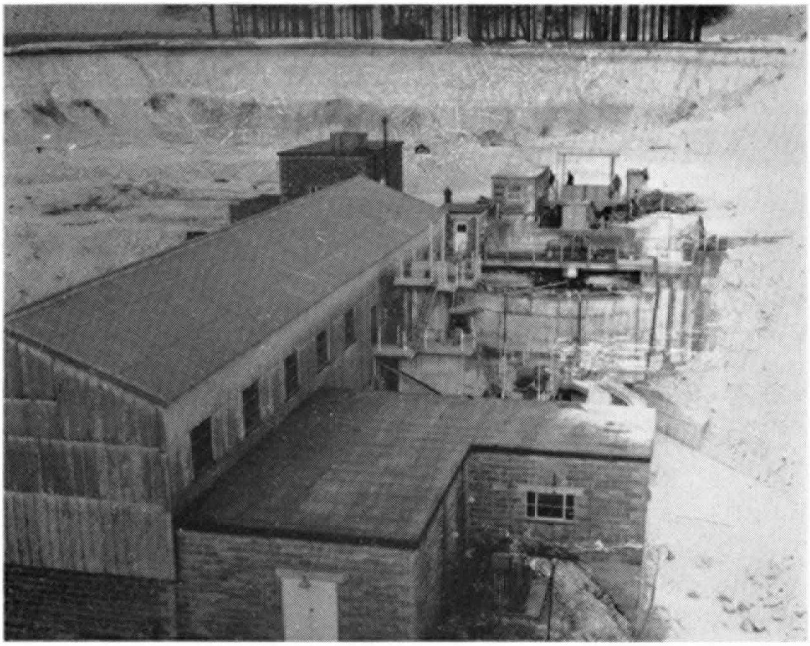


Fig. 4.—Chalk Washmills and Mill House.

to a sump from which it is pumped by an Allis-Chalmers 5-in./4-in. centrifugal slurry pump to a Dorr-Oliver Sieve-bend, where the product is further screened, and from which the fine material flows to another sump ready for pumping to the works. The washmills are shown on the right in *Fig.* 4.

The grit from the screening process is transported by a screw-conveyor which feeds the material into a wet-grinding mill. Some part of the chalk is highly resistant to washing and, to prevent excessive accumulation of this material in the screening mills, a proportion of it is bled continuously from the bulk in the screening mills and taken by a grit elevator and screw-conveyor to the wet-grinding mill where it joins the coarse material from the Sieve-bend. The mill house is seen on the left in *Fig.* 4. The wet-grinding mill is a single-chamber Vickers mill, 45 ft. long by 8 ft. $4\frac{1}{2}$ in. in diameter. It is driven by a 1,200-h.p. Crompton-Parkinson 3·3 Kv. auto-synchronous motor through an A.E.I. double-reduction gear box and torsion shaft which is connected centrally to the trunnion of the mill discharge. The gear train is of balanced split construction and enables the mill and motor to be in line. The speed is reduced from 750 to 20·5 r.p.m. The mill operates on closed circuit. The discharge flows through a Niagra screen to remove extraneous material, and is then pumped by a 4-in./3-in. Allis-Chalmers centrifugal pump to another Sieve-bend, from which the coarse material is taken

Fig. 5.—Drag-line and Conveyor in Clay Pit.

by a screw-conveyor back to the mill feed, while the fine material flows to the sump for pumping to the works.

The chalk slurry is pumped from this sump by an Oil Well Engineering two-cylinder horizontal slush-pump, driven by a 150-h.p. motor, and is passed through about $1\frac{1}{4}$ miles of 6-in. pipe to a concrete storage tank at the works; the tank has a diameter of 22 ft. and a capacity of 400 tons of chalk slurry.

The clay pit (*Fig.* 5) is at the northern side of the works. The clay is dug by a 38-RB diesel drag-line which has an 80-ft. jib and 1-cu. yd. bucket and can dig to a depth of 60 ft. The excavated material is discharged into a portable hopper provided with a 54-in. belt driven through a Kopp variable-speed gear. This belt feeds the clay on to a 42-in. Meco field belt-conveyor, with spring suspended idlers, on which it is transported to the clay washmill at the works. Such a wide belt is necessary to carry, without spilling, the large lumps of clay which are seen on the conveyor in *Fig.* 5. There is no practical way of breaking down these lumps until they reach the washmill.

Preparation of Slurry

The clay washmill consists of a 35-ft. rough and two 24-ft. screening mills, which are duplicates of those in the chalk washmill but operate on open circuit. The field belt-conveyor discharges the clay directly into the roughing mill, into

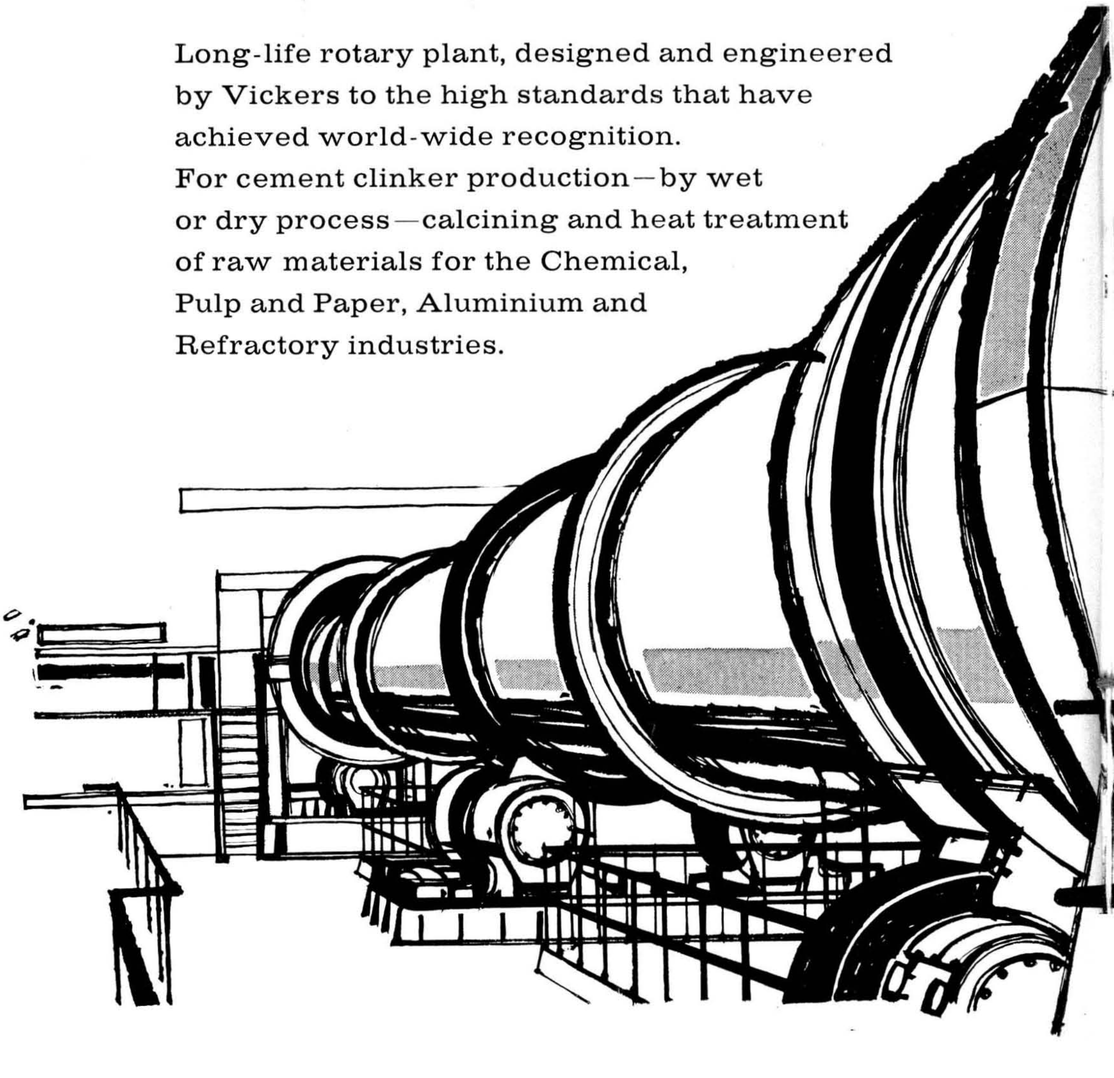
Fig. 6.—Slurry Doctor and Storage Tanks.

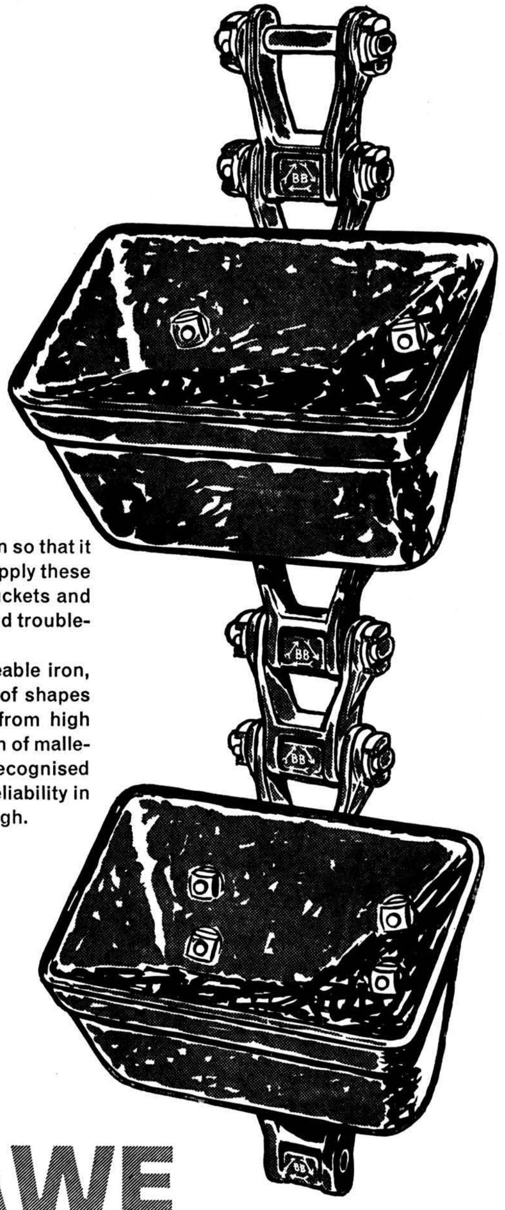
which chalk slurry from the storage tank, and water are fed in the proportions required to give a combined slurry of the correct composition.

This slurry is pumped by two Allis-Chalmers centrifugal pumps to four concrete doctor tanks, each of 400-tons capacity and equipped with time-controlled air-agitation. Their contents are discharged by gravity into five storage tanks of 66-ft. diameter, in which the slurry is air-agitated by blowers carried on the arm of a rotating bridge. The doctor and storage tanks are shown in the course of construction in *Fig.* 6 and the washmill is to the left rear. The slurry is pumped therefrom by two Allis-Chalmers pumps to two steel tanks near the back end of the kiln, the pumps being controlled by floats in the tanks. In these tanks, which are of 14-ft. diameter and 7-ft. deep, flue dust from the kiln which has been caught by electrostatic precipitation, is mixed with the slurry by air-agitation. From these tanks, two Allis-Chalmers centrifugal pumps deliver the slurry to a small constant-level feed tank above the back-end chamber of the kiln, at a rate greater than the kiln feed, the surplus not used for the kiln feed being returned by gravity to the mixing tanks.

Burning and Cooling

The Vickers rotary kiln (*Figs.* 7 and 8) is 450-ft. long and 13-ft. 6-in. internal diameter, with a burning zone of 14 ft. 6 in. internal diameter and a nose-ring is 12-ft. 6-in. in diameter. The kiln is equipped with a system of curtain and festoon chains. The burning zone is lined with magnesite-chrome blocks. The hood (*Fig.* 9) at the firing end of the kiln being very heavy and to reduce the height of the kiln above the cooler to a minimum, the hood is not retractable but is fixed permanently in position. Doors, large enough to pass a small tractor or dumper through, give access for maintenance. The nose-ring is cooled by air blast.





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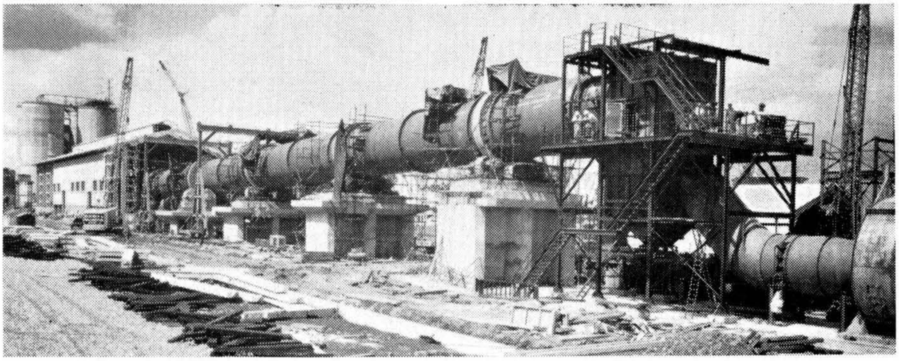


Fig. 7.—The Kiln during Installation.

The kiln is fired on the direct system with pulverised coal. Centrifuged washed Midland smalls containing up to 11 per cent. of moisture are delivered to the works by road. The receiving station is a covered floor, where 2,000 tons of coal can be stored, with an outlet hopper below ground. The lorries tip the coal either directly into the hopper or on to the floor where it is shifted to the hopper, when required, by a bulldozer. It is extracted from the hopper by a 13-in. Redler conveyor, elevated and distributed by an open-bottom 18-in. screw conveyor, into a 100-ton bunker above the coal mill. The coal is extracted from the bunker

Fig. 8.—The Kiln viewed from Driving Bed.

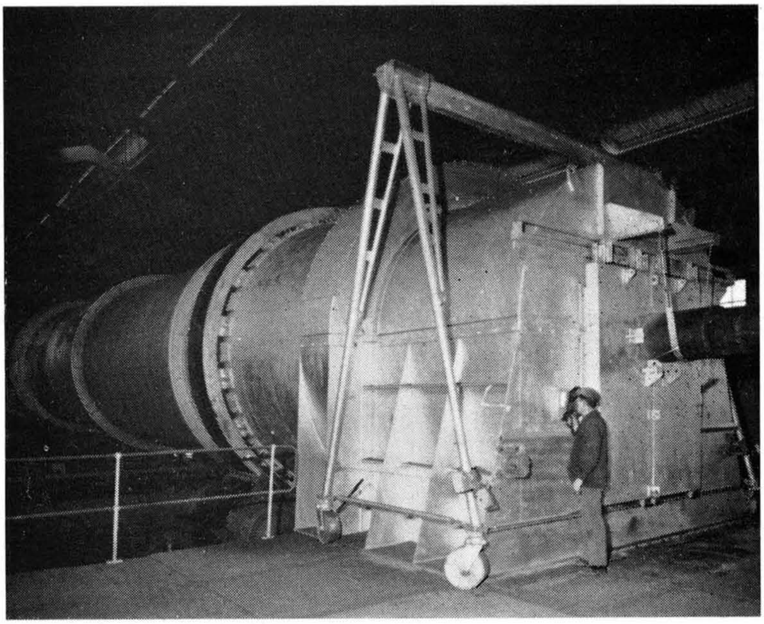


Fig. 9.—Kiln Hood.

by a Besta feeder chain and fed into a 112 M.P.S. mill (*Fig.* 10), which is driven by a 150-h.p. motor. The mill is swept by hot air, drawn through it by the firing fan, from the clinker cooler, the coal being dried while being ground. Before passing into the mill, the hot air passes through a collector so as to remove clinker dust. This supply constitutes all the primary air for combustion and is passed to the burner pipe by a heavy-duty Alldays & Onions fan specially designed to have high resistance to wear and to be easily maintained. The fan runs at 1,472 r.p.m. and is directly coupled to a 200-h.p. motor.

The kiln, the shell of which is of welded construction throughout, is carried on seven supporting beds. On beds Nos. 3, 4, 5 and 6, there are hydraulically-loaded thrust rollers. The hydraulic system gives the kiln a slow oscillating axial movement of 2-in. amplitude. The drive is by two 180-h.p. Lawrence-Scott drip-proof commutator motors arranged for pipe ventilation and having a range of speed from 750 to 250 r.p.m. One of the motors, together with the hydraulic control panel, is seen in *Fig.* 8. Each motor is coupled to a triple-reduction Turbine-Gears gearbox operating a pinion which engages with a single girth gear.

The back-end chamber provides a straight through flow to a cylindrical flue which, through easy bends, is brought into the eye of an induced-draught Keith-Blackman 125-in. 14 EK high-efficiency backward-blade fan. The fan is driven through vee-ropes by a 375-h.p. fixed-speed motor. The draught is controlled

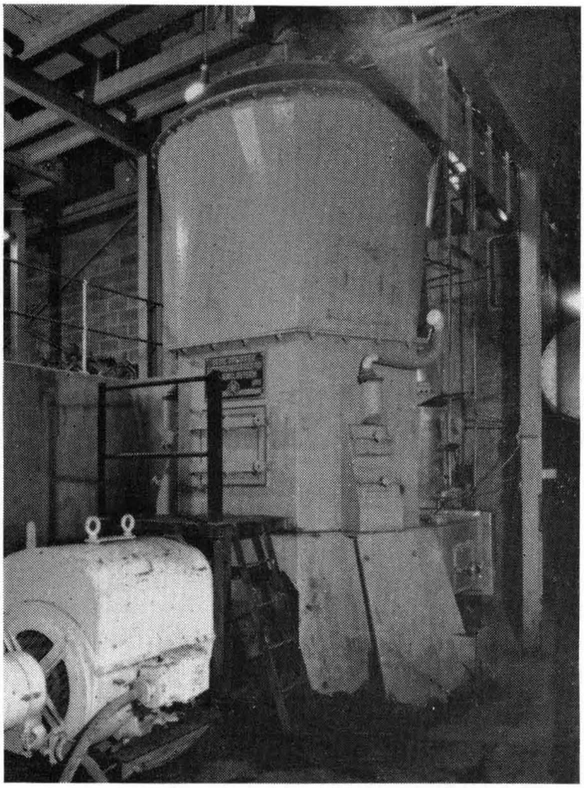


Fig. 10.—The Coal Mill.

by a louvre damper which is in the inlet flue and which is operated by power from the central kiln control. This equipment is seen on the right-hand side in *Fig.* 7, which also shows, before completion of the erection of the kiln house, the arrangement at the back end of the kiln.

There are two outlets in the bottom of the back-end chamber to segregate from deposits of dry dust, any slurry carried over. Large doors in the side of the chamber provide easy access for maintenance. The slurry flows by gravity from the constant-level slurry tank into the kiln through an Altoflux flowmeter which measures the rate of flow and, by means of a Honeywell controller, causes a pneumatically-operated Elliott-Fisher valve to give a constant flow at the rate required.

The flue-gas is discharged by the induced-draught fan into a group of electrostatic precipitators comprising six separate units arranged three on each side of the flue, in the connections to which are dampers to give equal distribution to each unit. The system of vertical collector tubes, each with a central electrode,

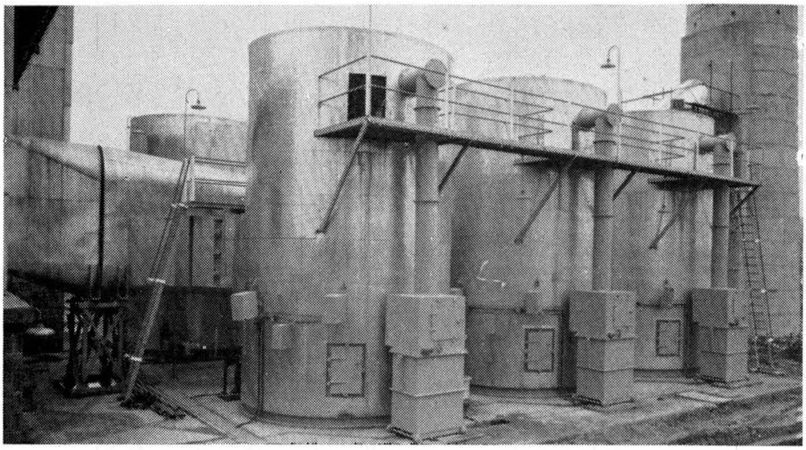


Fig. 11.—Electrostatic Precipitators.

is used. Each unit is housed in a cylindrical steel chamber lagged on the outside. The installation has sufficient capacity to run at full efficiency on only five of the six units, so that units can be isolated and taken out of service one at a time for routine cleaning and maintenance. Thus a high standard of efficiency is maintained. The precipitators, which are shown in *Fig.* 11, were designed by The Associated Portland Cement Manufacturers Ltd. The dust collected in this plant is taken by screw-conveyors and an elevator to a storage hopper from which it is extracted by two screws, each of which feeds into a paddle-mixer where water is added, before discharging the contents into the mixing tanks in the slurry-feed system already described.

The cleaned flue gas from the precipitator is discharged into a reinforced concrete chimney 250 ft. high; the topmost 15 ft. of the shaft is of bricks.

The clinker is cooled in a Fuller 850 horizontal grate cooler and is discharged at about 50 deg. C. Part of the excess air from the first pass through the cooler is used in the coal mill, as described in the foregoing, and the remainder is discharged to the atmosphere through a Prat-Daniels multiple-cyclone dust collector.

(*To be concluded*)

Determination of the Composition of Clinker.

RESEARCH workers and others throughout the world continue to develop practical means of determining quantitatively the mineralogical composition of cement clinker. Three such developments are described in the following.

Charts for Bogue's Formula.

Determination Based on Composition of Raw Materials.

In a recent number of "Revue des Materiaux," M. P. TERRIER gave two charts which are useful aids for the rapid determination of potential compositions of clinker based on Bogue's formulæ. Examples of the use of the charts are given in the following.

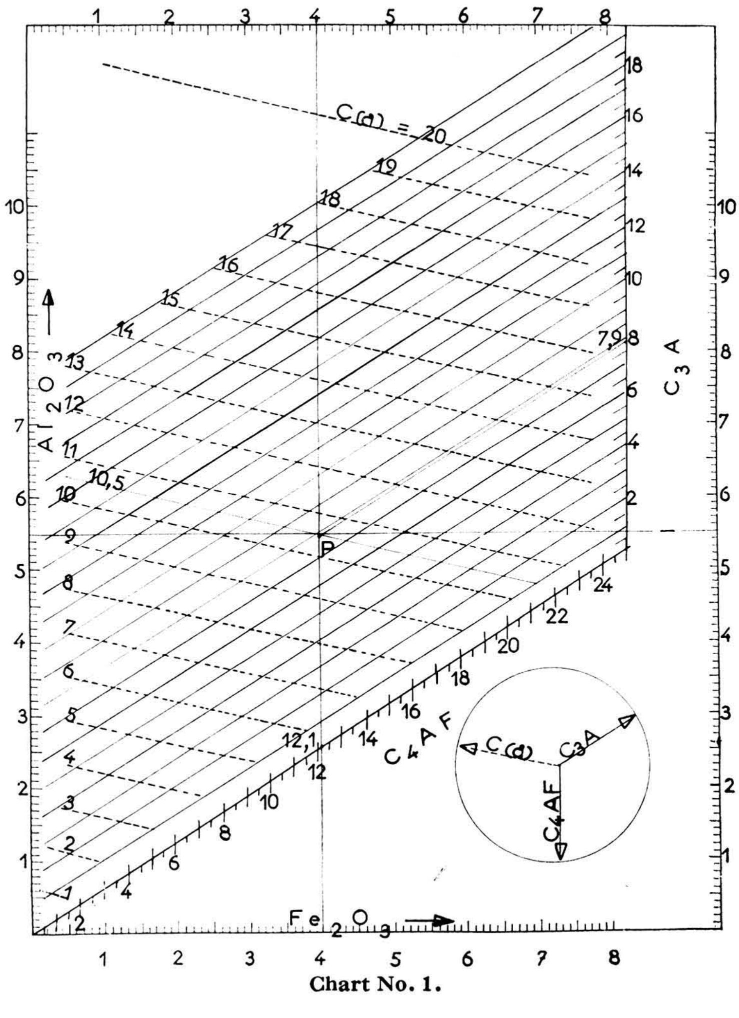


Chart No. 1.

CHART NO. 1.—In the example, Al_2O_3 = 5·5 per cent. and Fe_2O_3 = 4 per cent. This determines the point P. Following the parallel lines to the scale for C_3A, the value of C_3A = 7·9 per cent. is read.

Following the broken lines to the scale for $C_{(a)}$, which is the percentage of lime combined with alumina, the value of 10·5 per cent. is read.

The vertical line downward from P intersects the scale for C_4AF at 12·1 per cent. and at this point the ordinate on the scale for Al_2O_3, in this case 2·55 per cent., represents the alumina combined in the form of C_4AF.

CHART NO. 2.—In the example, SiO_2 = 22·6 per cent., Al_2O_3 = 5·5 per cent., Fe_2O_3 = 4·0 per cent., and CaO = 67·9 per cent.

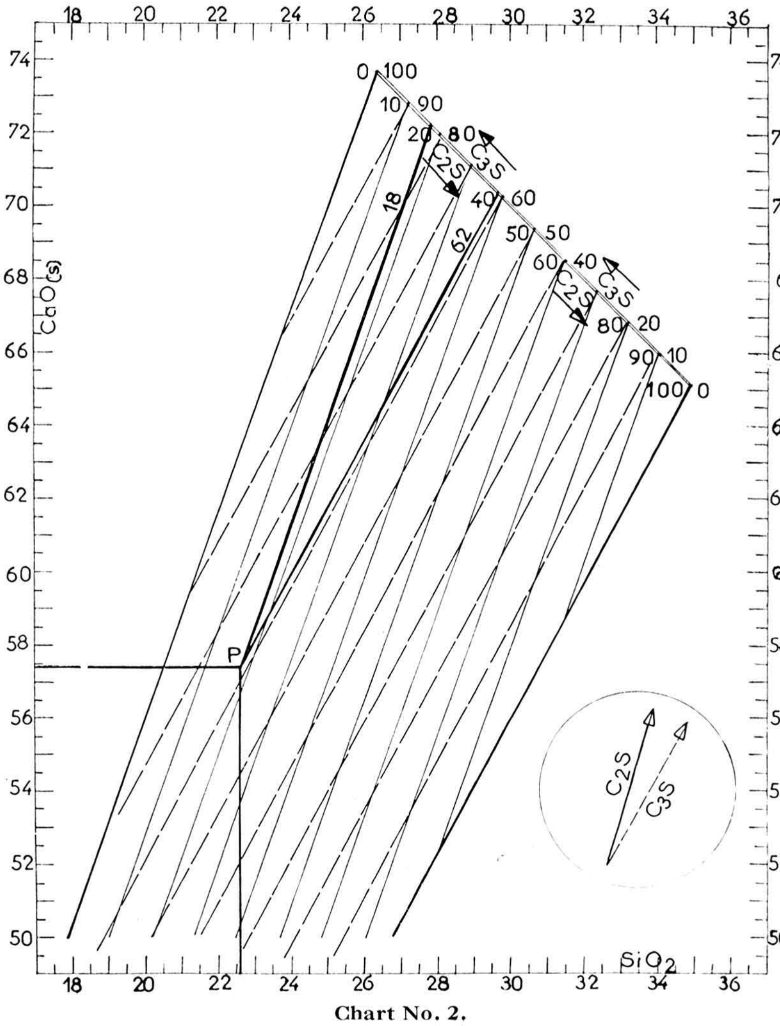


Chart No. 2.

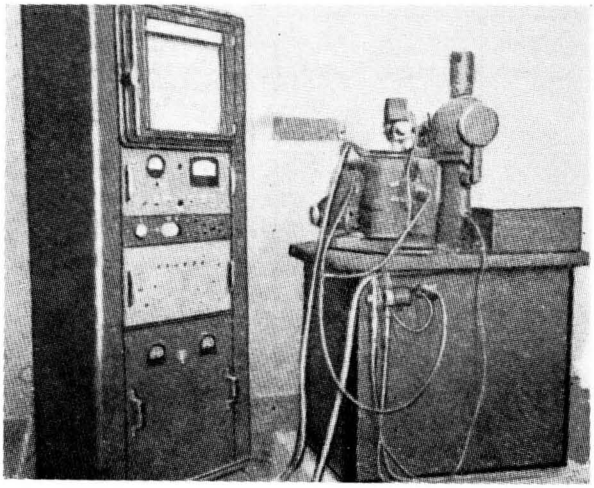


Fig. 1.—Russian X-ray Diffractometer.

From Chart No. 1 it is already known that C_3A = 7·9 per cent., C_4AF = 12·1 per cent. and $C_{(a)}$ = 10·5 per cent. On Chart No. 2, the percentage of lime combined with silica $C_{(s)} = C\text{-}C_{(a)}$ = 67·9-10·5 = 57·4 which, with SiO_2 = 22·6, gives the point P. From the point P, parallels are drawn to the scales for C_3S and C_2S, giving the values C_3S = 62 per cent. and C_2S = 18 per cent.

Russian Development of X-ray Diffractometry Methods.

In a recent number of " Tsement," YU. S. MALININ, V. P. RYAZIN and O. S. VOLKOV describe means of chemically analysing clinker by X-ray by recently developed ionisation methods of recording crystal diffraction patterns. Some bibliographical references are given at the end of this section.

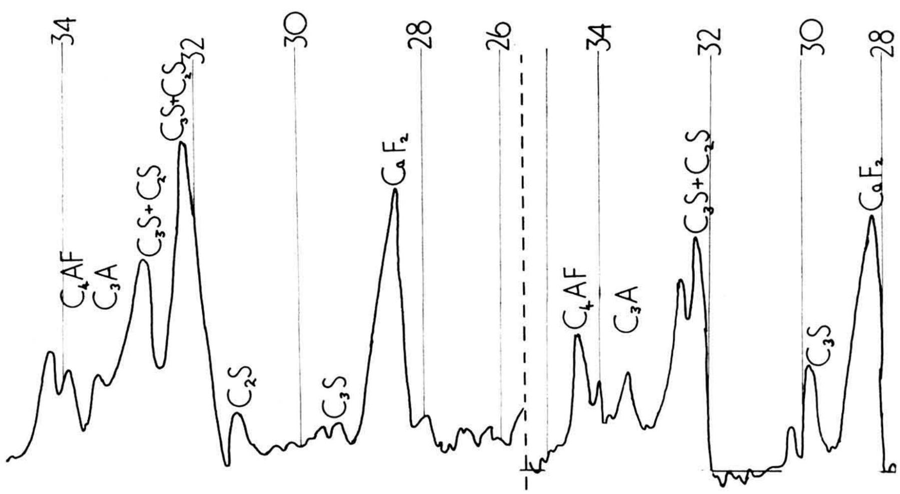
X-ray diffractometry makes it possible to analyse simply the clinker phases quantitatively and this problem has been studied at the Scientific Research Institute for Cement using the Russian diffractometer URS-50 I (*Fig.* 1).

Analysis with X-rays depends on the determination of the inter-planar spacings d by measuring the angular position θ of reflections from crystals bombarded with the X-rays.

$$d = \frac{\lambda}{2 \sin \theta}$$

where λ is the wavelength of the X-rays. The intensity of a reflection is a characteristic of the amount of the phase causing it and is used for the quantitative analysis.

Sensitivity depends on the minimum amount of a phase in a sample which can make a record which is distinguishable from the background fluctuations and is increased by increasing the intensity of the X-ray beam and the time fixed



(a) Mechanical Mixture of Clinker Materials and CaF_2

(b) Clinker mixed with CaF_2.

Fig. 2.

for counting, and by lowering the relative background level. Increasing the intensity of the X-rays is limited by the capacity of the tube. A significant increase in the time constant for counting, with a consequent increase in the time taken for the measurement, is not feasible. To reduce the background level and so increase sensitivity and accuracy, a focusing crystal monochromator device was used. In practice it lowered the background by cutting out some of the components, improving both the sensitivity and the resolution.

Fluorite CaF_2 was used as an internal standard for the quantitative analyses. The strong line, 3·16 Å, ($2\theta = 28$ deg. 10 min.), for this compound is found in the same region as the strongest lines for the clinker minerals. The analytical lines for the minerals which were selected were: for tricalcium aluminate, 2·70 Å ($2\theta = 33$ deg. 04 min.); for tetracalcium aluminoferrite, 2·63 Å ($2\theta = 33$ deg. 56 min.) and for tricalcium silicate, 3·01 Å ($2\theta = 29$ deg. 28 min.), a line with a strength of 7 on a scale of 10. It is more difficult to select a line for dicalcium silicate as the majority of the C_2S-lines are covered by lines from other clinker minerals. Consequently the method is relatively insensitive for C_2S.

Samples weighing 2 g. were prepared by mixing various proportions of synthetic clinker minerals. In all, ten samples were prepared and 0·5 g. of fluorite was mixed into each. The powder was then transferred to a clear plastic holder with a well 20 mm. in diameter and 1 mm. in depth. The surface was levelled with a knife and the sample then mounted on a device which allowed it to rotate in a plane. Exposures were repeated four times, on each occasion the powder was retamped into the holder. The range covered was 26 deg. to 36 deg. at a speed of 0·5 deg. per minute and a time constant of 8 seconds on the counter.

Forty X-ray curves like the one shown on the left-hand side of *Fig.* 2 were obtained. The intensities of the lines were measured relative to the background. From the results calibration curves (*Fig.* 3) for C_3S, C_3A, C_4AF and C_2S were drawn. The relative strengths of the analytical-line and the fluorite-line are the abscissa, and the percentage of the mineral in the standard mixture is the ordinate. Using these curves, analyses of a number of clinkers were carried out, the same procedure as before being followed with 2 g. samples mixed with 0·5 g. of fluorite. A typical result is shown on the right-hand side of *Fig.* 2.

The results are presented in *Table I* together with data from petrographic and computational analyses. In general there is good agreement between contents of C_3S and C_2S as determined by the X-ray method and petrographically, although marked differences do occur in some cases; the reasons for these discrepancies are being investigated. The large discrepancies found when comparing the C_4AF-content as determined by the X-ray method and by calculation is explained by the unsatisfactory nature of the latter method. It is assumed that the alumino-ferrite is present as C_4AF, whereas there is a possibility that solid solutions of various compositions are formed. The relative error in the measurement is 3 per cent. A disadvantage of the X-ray method at the present stage of research is its insensitivity when determining C_3A (5 per cent.), aluminoferrite (5 per cent.)

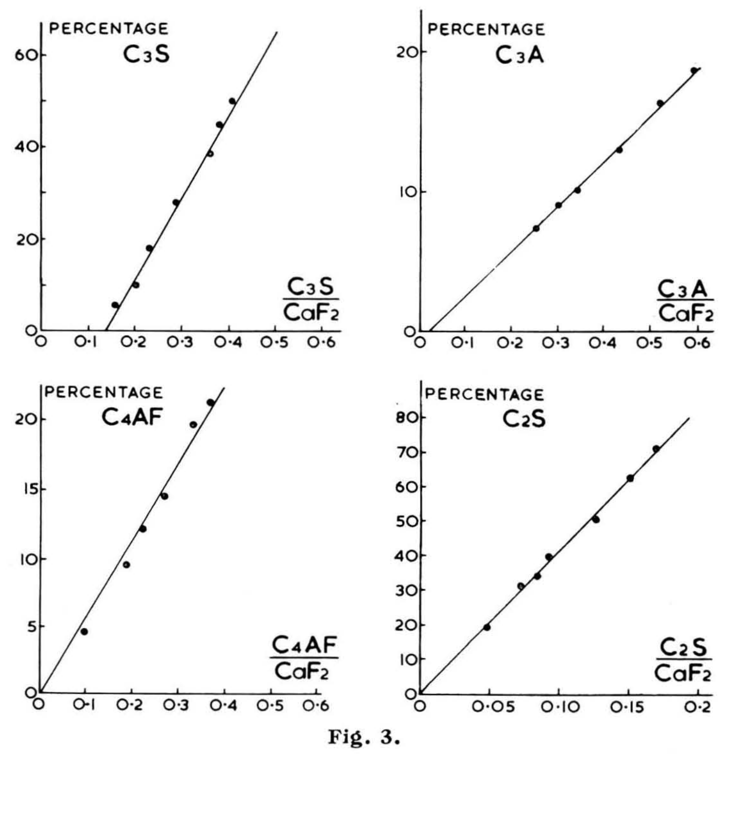


Fig. 3.

TABLE I.—COMPARISON OF RESULTS (PERCENTAGES) BY DIFFERENT METHODS OF ANALYSIS.

Clinker	C_3S			C_3A			C_4AF		
	X-ray	Calculation	Petrographic	X-ray	Calculation	Petrographic	X-ray	Calculation	Petrographic
A	56	53	45–50	8·5	9	8–9	12	12	—
B	63	57	51–55	8	8	8–9	11	13	—
C	51	44	45	7	7	6	14	16	—
D	55	46	50	4·5	12	6–7	11	13	—
E	62	63	55	5	6·5	5	12	15	—
F	52	46	55	12	12·5	7–8	10	10·5	—
G	56	55	—	9	9	—	16	22	—
H	52	60	55–60	<5	1	—	19	26	—
I	57	61	60	<5	1·5	—	23	27	—
J	43	49	50	<5	7	—	17	15	—
K	24	35	30–35	<5	7	—	13·5	14·5	—
L	44	35	50	<5	12	—	17·5	16·5	—

and especially C_2S, which can only be determined in amounts exceeding 15 per cent. However, no doubt these limitations may be overcome later.

The advantages of this method include the unbiassed nature of the analytical procedure, the possibility of determining aluminoferrite directly, and the feasibility of carrying out phase analysis of cement.

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2. D. M. KHEIKER et al.—'Increasing the Sensitivity and Accuracy of Quantitative Phase Analysis with the URS-50/I X-ray Diffractometer.' Asbestos-cement Scientific Research Institute, Proceedings, No. 8, 1958.
3. D. M. KHEIKER.—'Phase Analysis with the X-ray Diffractometer.' Zav. Laboratoriya, 1958, No. 9.

A Graphical Method.

In Bulgaria, according to an article by KHR. B'CHVAROV and N. TABAKOVA in "Stroitelni Materiali," No. 5, 1962, it is common practice to use the formulæ developed by the Russian, V. A. Kind, for calculating the mineralogical composition of clinker.

As a first step the coefficient of lime saturation (LS) or the basicity of the clinker is computed from the chemical analysis by the formula

$$LS = \frac{C - (C\,\text{free} + C_A + C_F + C_{SO_3})}{2{\cdot}8SiO_2}$$

where C_A is the CaO combined with the Al_2O_3 (that is 1·65 Al_2O_3),

C_F is the CaO combined with the Fe_2O_3 (that is 0.35 Fe_2O_3),

C_{SO_3} is the CaO combined with the SO_3 (that is 0·7 SO_3), and

C is the total percentage of CaO in the clinker.

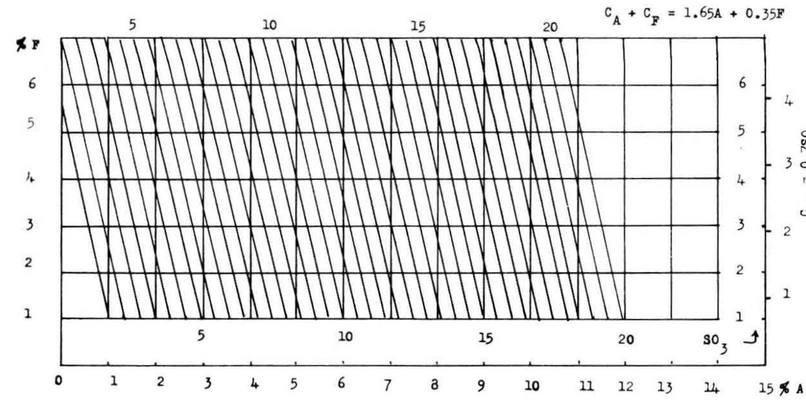

Fig. 4.

For calculating the compounds present in the clinker the following formulæ are used:

$C_2S = 8{\cdot}6S(1 - LS)$; $C_3S = 3{\cdot}8S(3LS - 2)$; $C_3A = 2{\cdot}65A \times 1{\cdot}7F$; and $C_4AF = 3{\cdot}04F$

where C_2S, C_3S, C_3A and C_4AF are the major compounds, S, A and F representing the oxides SiO_2, Al_2O_3 and Fe_2O_3.

The time taken to make the calculations can be greatly reduced by using nomograms giving a graphical representation of the mathematical relations between two or more of the values involved.

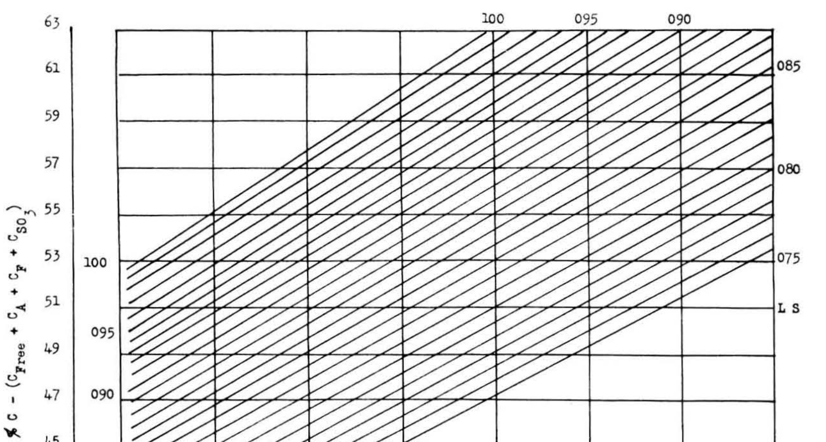

Fig. 5.

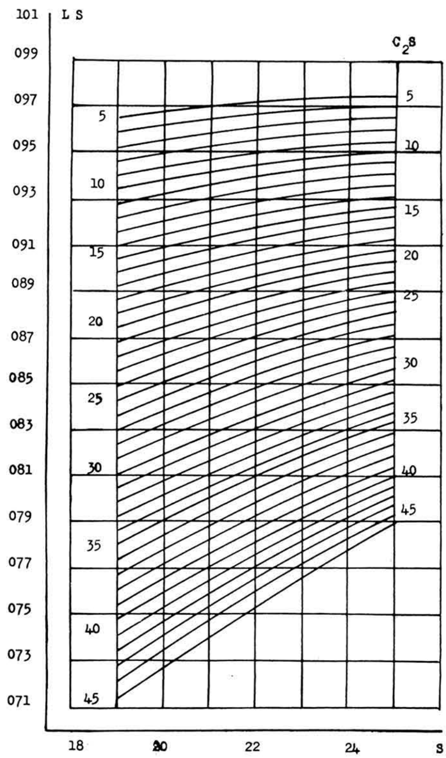

Fig. 6.

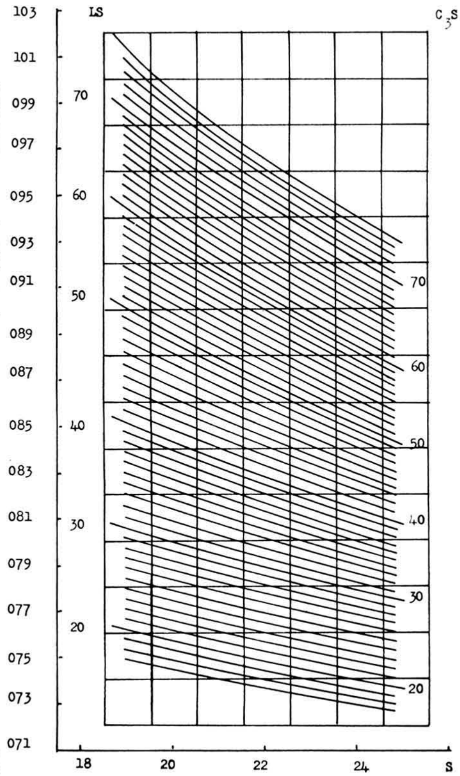

Fig. 7.

Five graphs, which are shown in *Figs.* 4 to 8, enable the composition of a wide range of clinkers to be computed. As an example, consider a clinker having the following analysis:

S	21·0	per cent.
A	6·0	,,
F	3·0	,,
C	66·5	,,
SO_3	0·5	,,
Total	97·0	,,
C free	0·5	,,

then,

1. From *Fig.* 4, CA + CF = 10·9 and CSO_3 = 0·35.
2. The remaining lime is 65·5 — (0·5 + 10·9 + 0·35) = 54·75.
3. From *Fig.* 5, LS = 0·931.
4. From *Fig.* 6, C_2S = 12·3 per cent.

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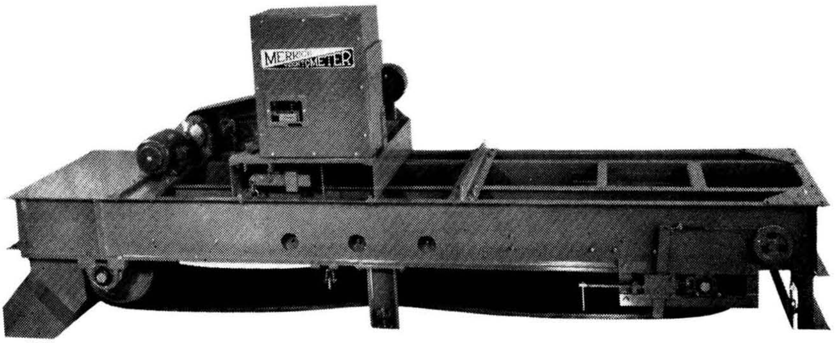

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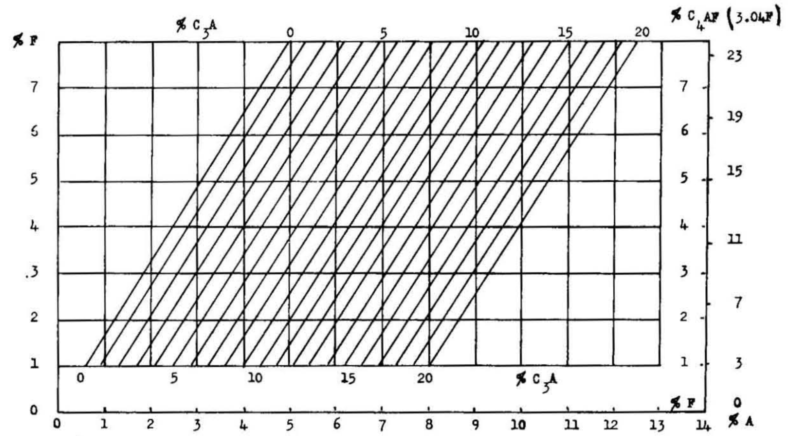


Fig. 8.

5. From *Fig.* 7, C_3S = 63·5 per cent.
6. From *Fig.* 8, C_3A = 11.0 per cent. and C_4AF = 9·0 per cent.

These results compare favorably with those obtained by calculations as is seen in the following:

	From the graphs	By calculation
Lime saturation (LS)	0·931	0·930
C_2S	12·3 per cent.	12.6 per cent.
C_3S	63·5 ,,	63·04 ,,
C_3A	11·0 ,,	10·81 ,,
C_4AF	9·0 ,,	9·12 ,,
Free lime	0·5 ,,	0·5 ,,
$CaSO_4$	0·85 ,,	0·85 ,,

Cement Plant from Poland.

THE exhibit by the Polish Chamber of Foreign Trade at the London International Engineering Exhibition, which was held in London this month, emphasised the large amount of industrial plant which has been exported from Poland. This plant includes equipment for four cement works.

The production of cement in Poland has increased from 1,719,000 tons in 1938 to 7,540,000 tons in 1962.

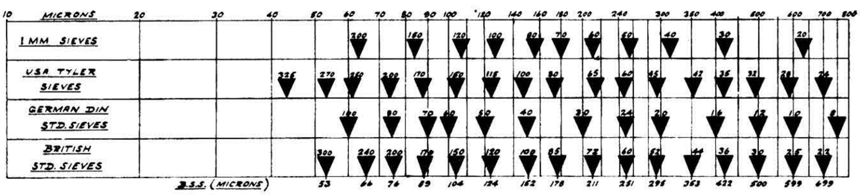
Revised Standard Test Sieves.

As a result of revised international standards for test sieves, which have been prepared by a Technical Committee of the International Organisation for Standardisation (ISO), B.S. 410, 'Test Sieves,' has been revised. Further revisions will be made when the final result of the Organisation's work on standardisation of sieves is known. Agreement has already been reached on a series of sizes of apertures for sieves with square holes; for practical purposes, this series is common to national standards based on a fourth-root-of-two geometric progression of apertures (Rittinger series), and on the Renard preferred number series. The preferred international sizes of apertures in the fine-mesh series are included in the present revision. Emphasis is placed on the internationally-proposed system of designating sieves in millimetres. Other alterations to B.S. 410 include the omission of the wire gauges from the tables since in practice the diameter of the wire before weaving is greater than the diameter in the finished sieve. The tolerance of the sizes of apertures of fine-mesh sieves are given in metric sizes only. The percentage deviation of maximum tolerance from the nominal sizes of apertures, previously given in the main tables, is now given in an appendix.

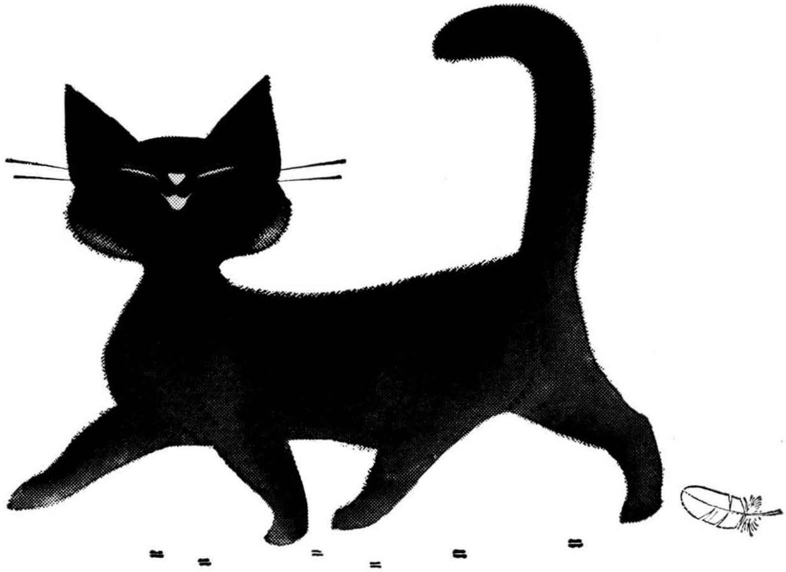
The Standard is in three parts, the first of which gives the woven fine-mesh sieves having widths of apertures in Rittinger series from 3·35 to 0·045 mm. (45 microns), and a range of woven-wire medium-mesh sieves having widths of apertures from ½ in. (12·7 mm.) to $\frac{1}{32}$ in. (0·79 mm.). Part 2 gives a range of perforated-plate coarse sieves with square apertures of widths from 4 in. (101·6 mm.), to $\frac{3}{16}$ in. (4·76 mm.). A range of coarse heavy-duty perforated-plate sieves and single-hole gauges with square apertures of widths from 8 in. (203·2 mm.) to ⅛ in. (3·18 mm.) is given in Part 3; since these are for blastfurnace coke their use for other purposes is not recommended. Summaries of American, German and French standard sieves are also given.

Copies of B.S. 410 (1963) may be obtained from the British Standards Institution, 2 Park Street, London, W.1 (price 8*s*. 6*d*.).

Comparative Sizes of Standard Sieves.



THE accompanying reference chart gives comparatively the nominal sizes in microns (1 micron = 0·001 mm.) of the openings in sieves of four standard series. It is taken from a leaflet issued by Buell Ltd., describing this firm's range of Buell van Tongeren powder classifiers.



The Cement and Lime Works at Vác, Hungary.

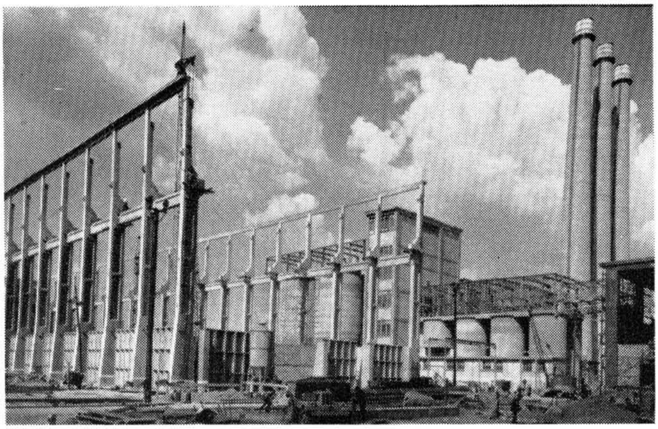


Fig. 1.

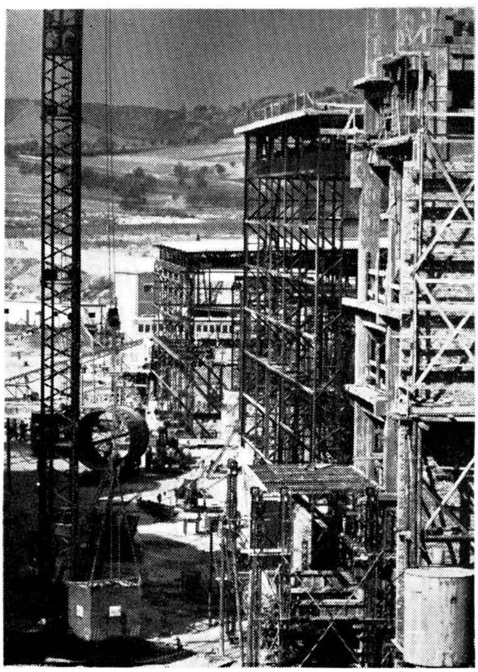


Fig. 2.

THE Danube Cement & Lime Works now in the course of construction at Vác, twenty-five miles north of Budapest will be the largest cement works in Hungary. It is designed to produce upwards of 1,000,000 tons of cement annually and will be almost fully automated. Construction began early in 1960 (see this journal for July 1962). By the end of last year, the cement silos, raw material stores, and the raw grinding mill had been completed, and the installation of the first kiln was in hand; now the first kiln is operating. Some of the completed works are seen in *Fig.* 1, and others in course of construction are shown in *Fig.* 2. By the end of 1963, it is expected that a third of the works will be in production and full production is expected in 1965. The installation is based on Lepol plant. The oil-fired kilns are about 200 ft. long and about 16 ft. in diameter.

Production of Cement in Hungary.

THE production of cement in Hungary increased by 8·2 per cent. (compared with 1961) in 1962, the total being 1,700,000 tons.

The Cement Industry in Africa.

South Africa.—A cement works is to be installed at Coedmore, near Durban by Durban Cement Products Ltd., a firm formed by Pretoria Portland Cement Co., Ltd., White's South Africa Portland Cement Co., Ltd., Anglo-Alpha Cement Co., Ltd., and Cape Lime Holdings. Production of Portland blast-furnace cement is expected to begin next year. Slag will be obtained from the iron works of African Metals Corporation Ltd., at Newcastle, South Africa.

Kenya.—It is reported from Nairobi, that production of cement at the two cement works at Bamburi and Athi River in Kenya was 33,637 tons in July 1962 compared with 20,995 tons in July 1961. Exports in July 1962 amounted to 23,793 tons compared with 10,921 tons in July 1961. The increase in production is due to larger exports to territories including Aden, Mauritius and territories in the Persian Gulf.

Ghana.—The Polish foreign trade enterprise, CEKOP, is to design and erect the first cement works in Ghana. This is to be at Nauli in the Western Region. It is expected that the works will be in operation in 1965 and will have an annual capacity of 200,000 tons.

Tanganyika.—Negotiations have been concluded between the Government of Tanganyika and the Tanganyika Portland Cement Co., Ltd., for the installation of a cement works at Wazo Hill north of Dar-es-Salaam. The works, which should be able to supply all of the cement required in the country, will cost about £1,250,000 and is expected to be in operation late in 1965 or early 1966.

Libya.—It is reported that in the past most of the imports of cement have been from Greece and Yugoslavia, but lately cement has been imported from Russia and a trial order was placed recently with Bulgaria.

The Government has invited tenders for the establishment of a cement works in Cyrenaica and another in Tripolitania.

A Large Hammermill for an Australian Cement Works.

A LARGE hammermill to be installed in the works of the Victoria Portland Cement Co., Ltd., now being constructed by Australasian Civil Engineering Pty., Ltd., at Waurn Ponds, will be used to crush, in one pass, run-of-quarry limestone from a maximum size of 42 in. down to $1\frac{1}{4}$ in. square at the rate of 700 tons per hour. Because of the sticky nature of the material, which may include clay, the hammermill will be fitted with a moving back-plate in addition to the normal moving breaker-plate. The machine will be driven by a 950-h.p. slip-ring induction motor operating through a flexible coupling at 600 r.p.m., but separate 15-h.p. motors will be provided to drive the breaker-plate and back-plate. The machine, which is a Dixie Non-clog hammermill, is to be designed at, and some of the parts will be supplied from, the Fraser & Chalmers Engineering Works of G.E.C. (Engineering) Ltd., at Erith, Kent; the remaining parts will be manufactured in Australia.

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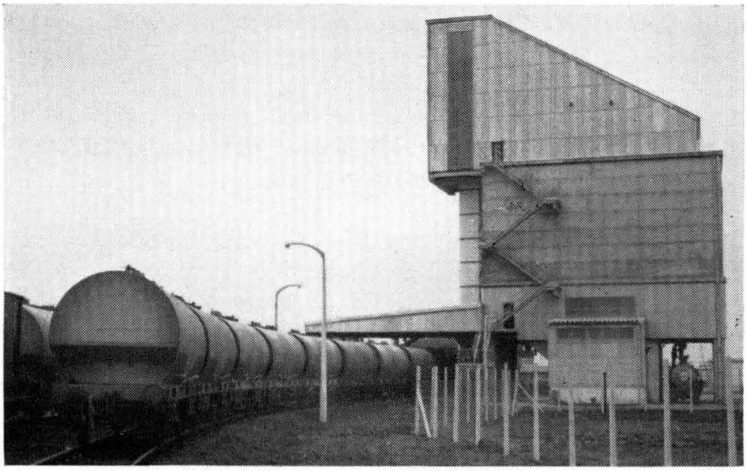

Fig. 1.

CEMENT for the new distribution depot and packing plant of the Cement Marketing Co., Ltd., at Grangemouth, Scotland, is being brought a distance of 460 miles by special express trains from one of the Associated Portland Cement Manufacturers Co.'s works at Cliff Hoo, Kent. The depot will be supplied from works in Kent until the new works near Dunbar is in operation. The latter works is expected to start production this year, when special trains will travel from there to Grangemouth.

Nearly 350,000 tons from Kent works are being supplied to the new reception depot at Uddingston, Scotland, and this supply will continue; in its first year, this depot has already dealt with 330 trains, each carrying an average of 800 tons.

The trains (*Fig.* 1) are made up of special bulk wagons which are owned by the Cement Marketing Co., and have lightweight alloy bodies. Each wagon carries 26 tons and costs £2,600. They are fitted with vacuum brakes which permit travelling at high speeds. Discharge is at the rate of 1000 tons per hour.

New Publications.

"A Apliçacao das Modernas Técnicas Físico-Químicas À Análise Rápida dos Cemontos. Complexometria." By A. V. de Seabra and Maria do Rosario Cravo.—In Portuguese with a summary in English. Published by the Laboratorio Nacional de Engenoria Civil, Lisbon.

"The Temperature Dependence of the Hydration Rate of Portland Cement Paste." By J. H. Taplin.—Reprinted from the "Australian Journal of Applied Science" for the Commonwealth Scientific and Industrial Research Association.

"Ketton Cement."—A booklet published by the Ketton Portland Cement Co., Ltd., on the occasion of their fifth kiln going into operation.

"Soluble Silicates."—A chart giving the properties and applications of soluble silicates in various industries including the cement industry. (Published by Joseph Crosfield & Sons, Ltd.)

"Recommended Practice for Troughed Belt Conveyors." The Mechanical Handling Engineers' Association, London (1962. Price 21*s*.).—A manual containing data relating to use and operation of troughed belt conveyors.

"Rearrangement of Bubble Sizes in Air-Entrained Cement Pastes During Setting." By G. M. Bruere.—Reprinted from "Australian Journal of Applied Science." (September, 1962. No price stated.)

"Reasons for More Brands of Cements to Meet Diversified Requirements." By S. Gottlieb.—Reprint of a paper presented to the Australian Road Research Board First Biennial Conference, 1962. (Distributed by Gippsland Cement Ltd., Melbourne.)

"Centrifugal Pumps." By H. H. Anderson. (Trade & Technical Press Ltd., Morden, Surrey. 1962. Price 55*s*. 6*d*.)

THE author has dealt with the subject of pumps from the practical rather than the academic point of view, and presents the results of an extensive experience co-ordinated with scientific analysis. The reader is supplied with sufficient basic information on matters influencing the construction, operation, design and use of centrifugal pumps. The description of the methods successfully used by the author should be valuable as should also the summarised records of numerous tests. The contents include the theory of centrifugal pumps, the correlation of size and duty, efficiency and speed, the design of pumps, losses in centrifugal pumps, constructional materials, critical speeds, shaft sealing, the characteristics of pumps and pipe systems, erection, starting, testing, and examples of design. Submersible pumps, multi-stage cellular pumps, heavy-duty pumps, boiler-feed pumps and large single-entry pumps are dealt with in subsequent chapters. Then follow six chapters devoted to cone flow and axial flow, mine pumps, oil pumps, power-station pumps, and pumps for other specific applications. Prime movers and their application, and data for the design and application of centrifugal pumps occupy the concluding three chapters.

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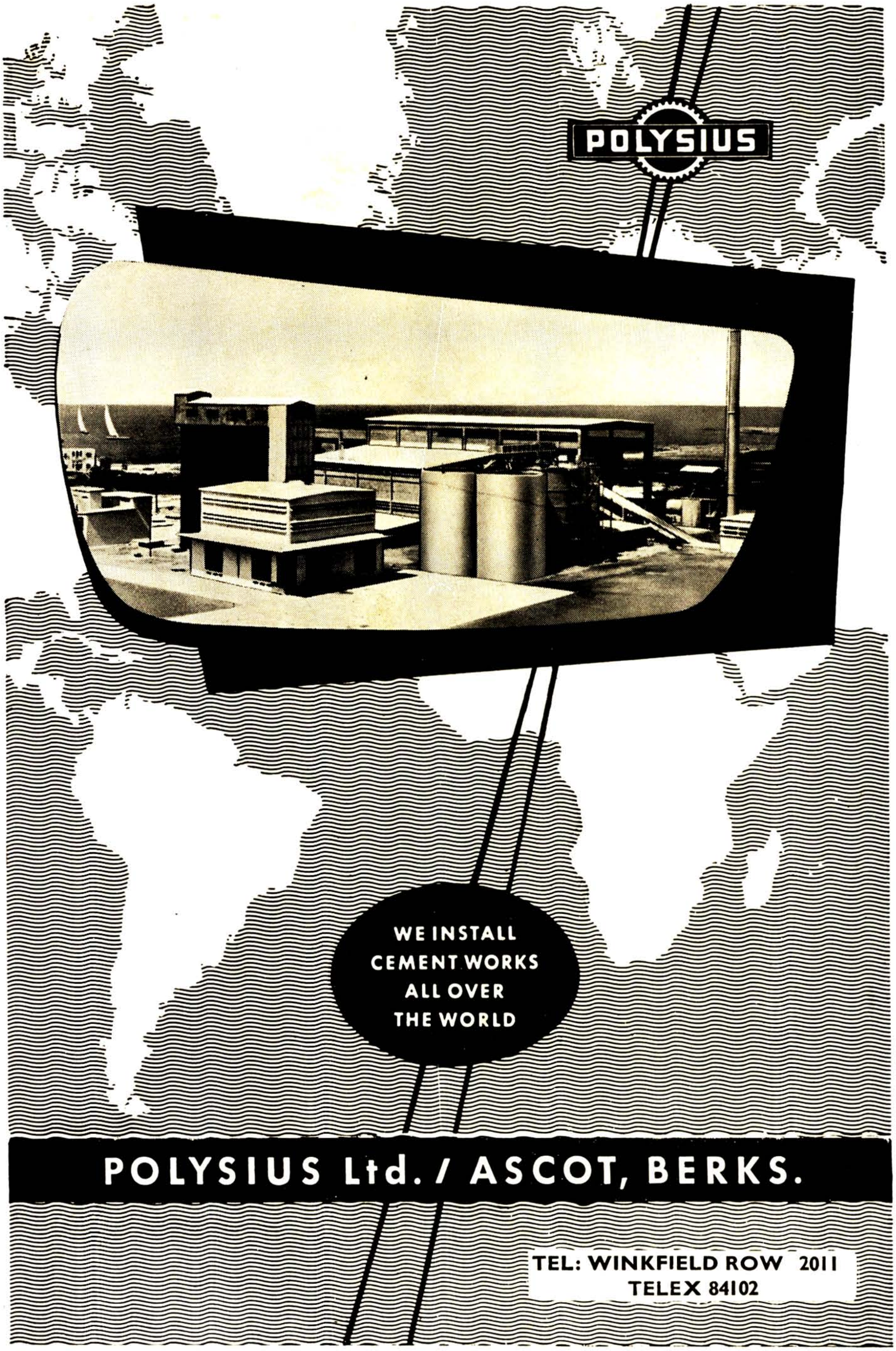

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