CEMENT
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JANUARY, 1964

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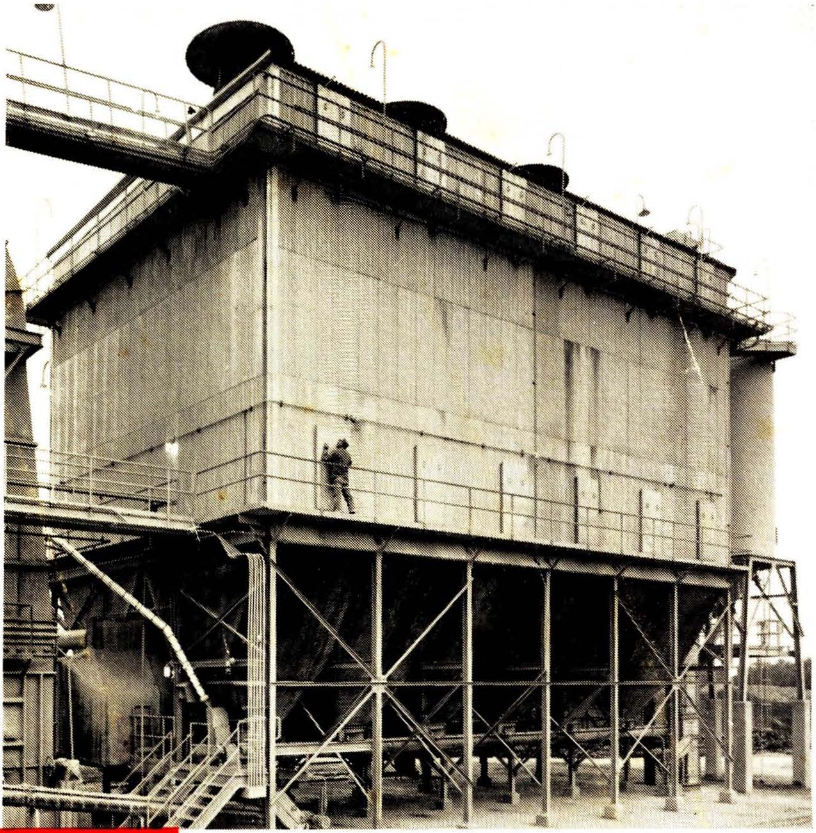

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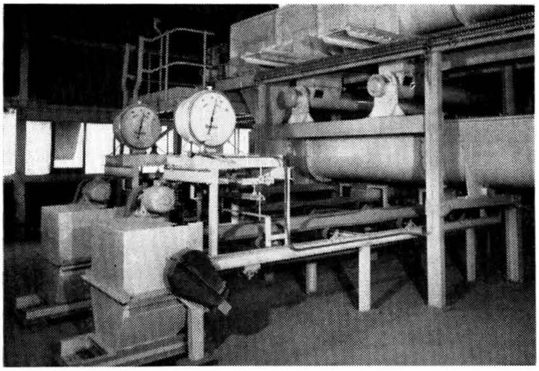

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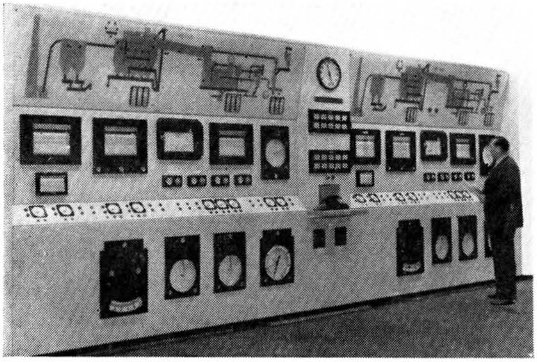

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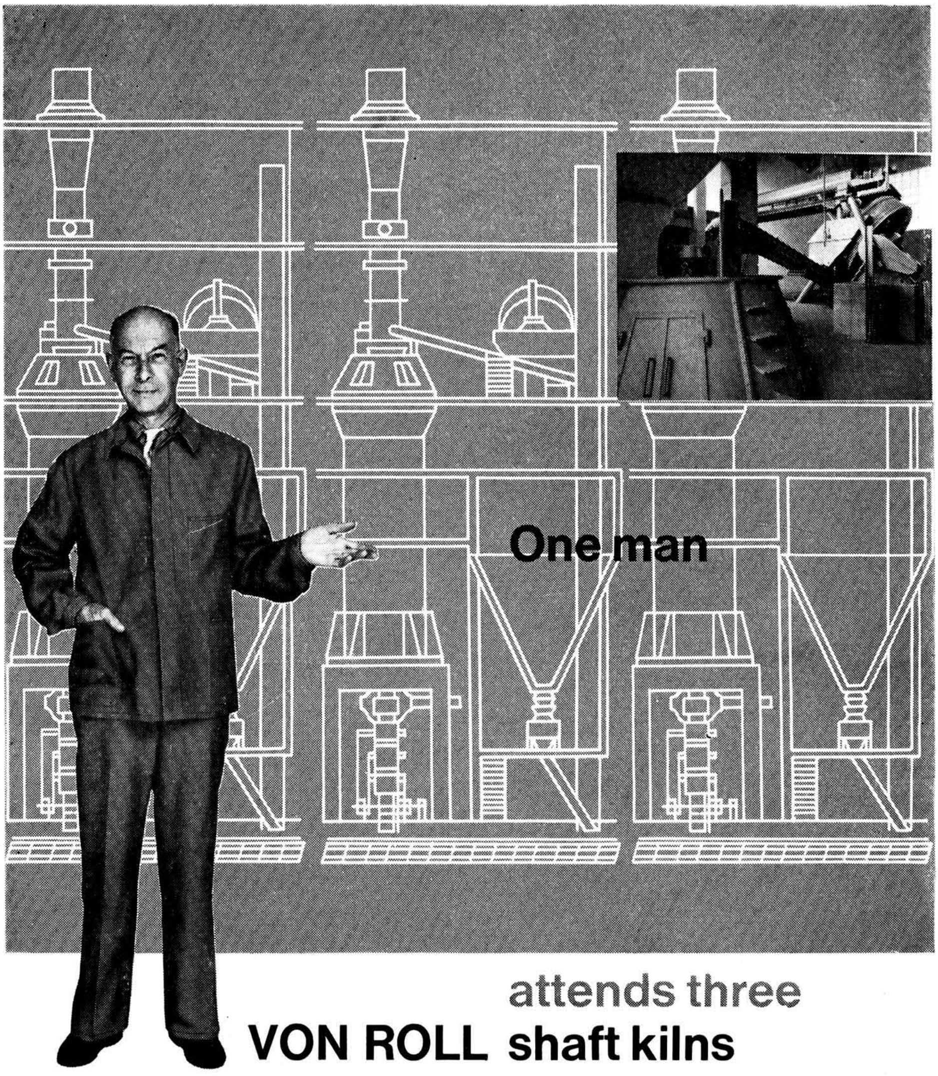
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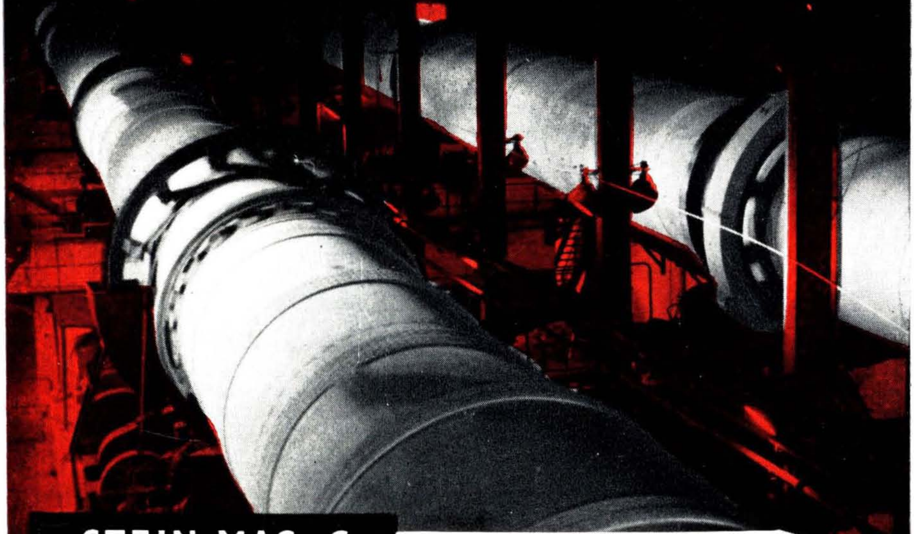


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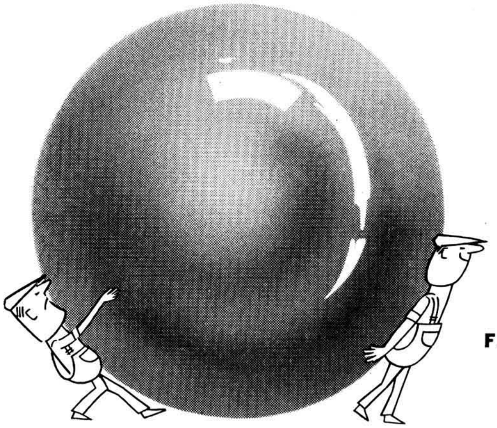

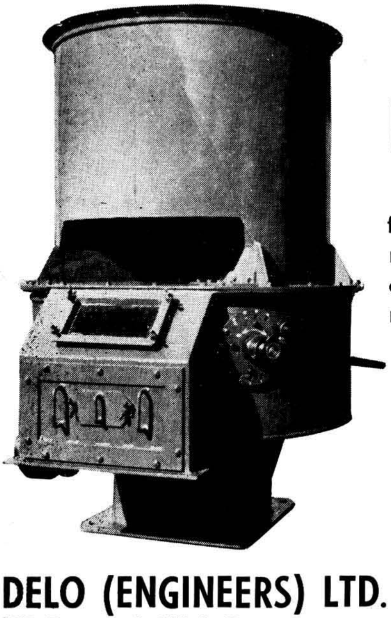

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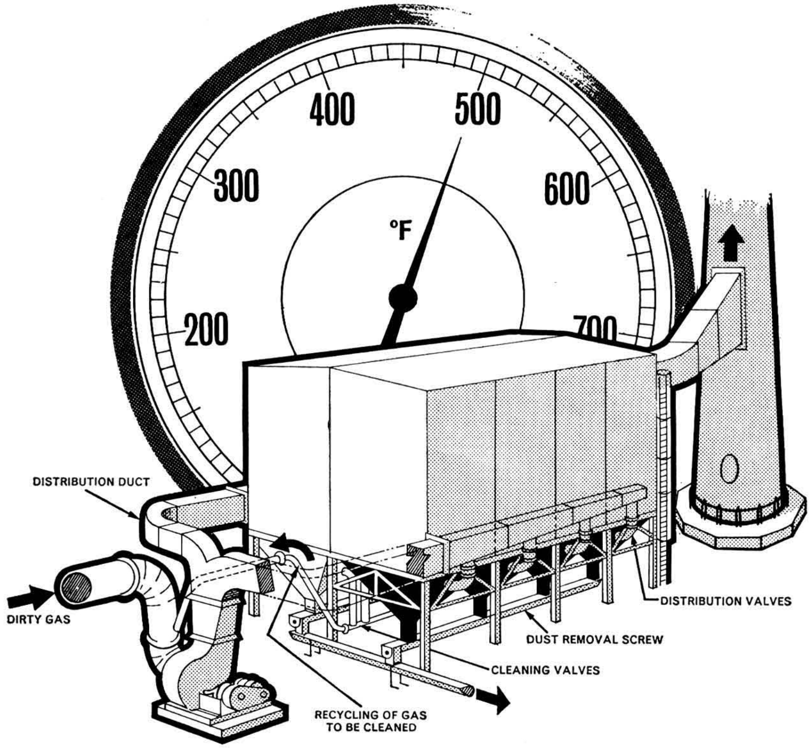
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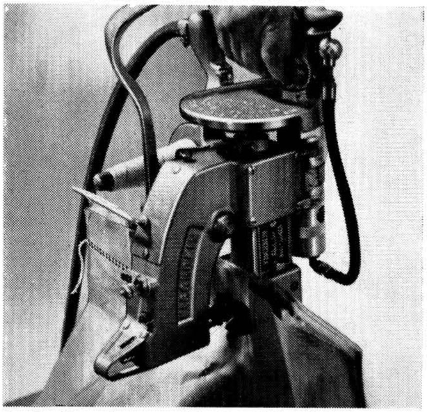

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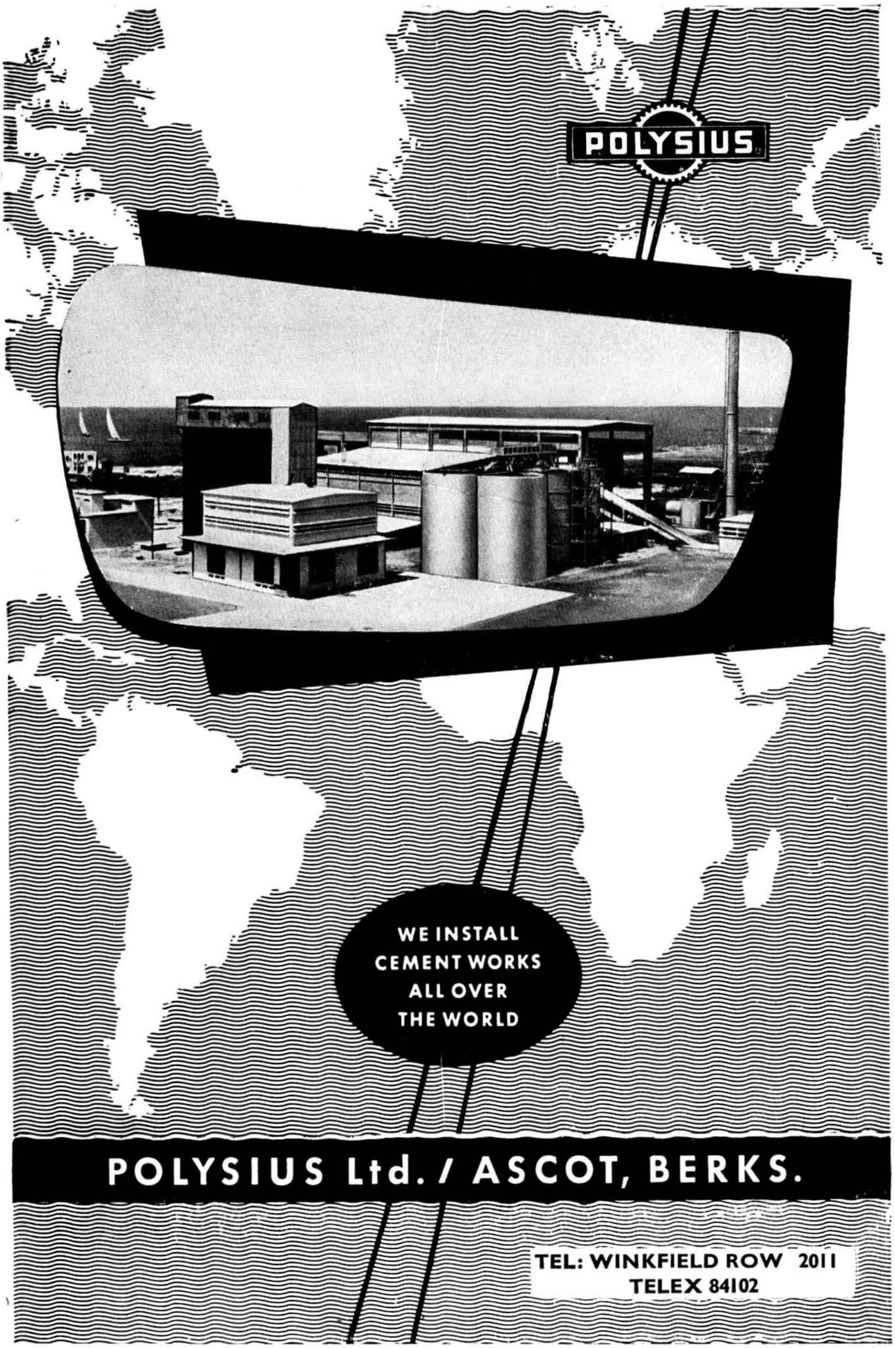

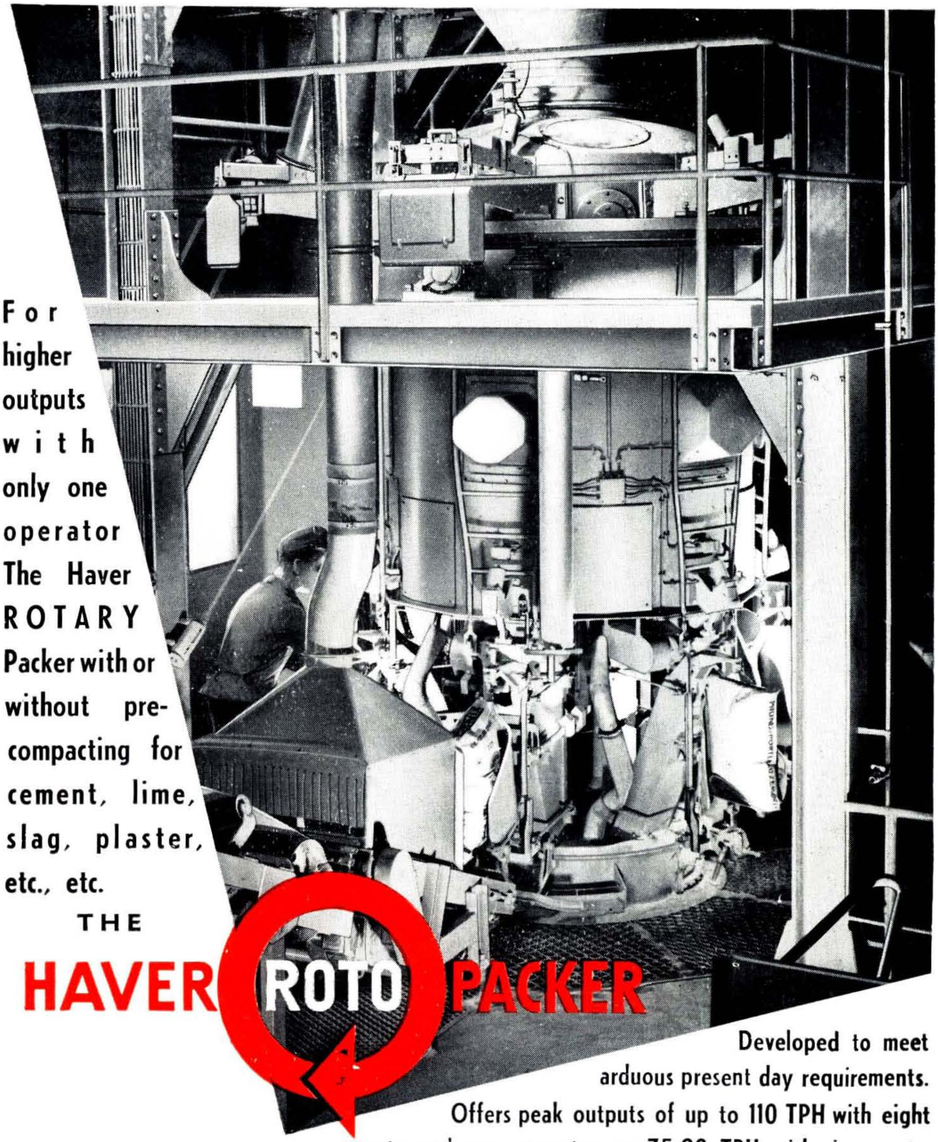

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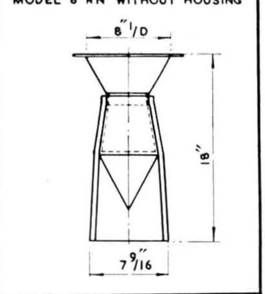

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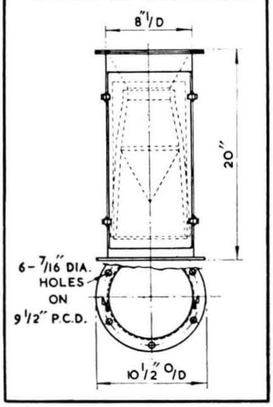

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A New Portland Cement Works in Scotland.

The new cement works built by the Associated Portland Cement Manufacturers Ltd., at Dunbar in East Lothian, is the only works in Scotland making Portland cement. The works, which was officially opened in September last, is situated about 2½ miles east of Dunbar and has connection to the main railway line from London to Edinburgh and direct connection to the Great North Road. Great care has been taken to ensure that the works obtrudes as little as possible on the countryside and, to assist this object, the planting of extensive belts of forest trees is planned. A general view of the works is shown in *Fig.* 22 on page 18.

The works will have an annual output of 400,000 tons of cement from two Lepol kilns operating on the semi-dry process and each of which has a daily productive capacity of 600 tons of clinker. A plan of the works is shown in *Fig.* 1 and a flow chart of the process in *Fig.* 3.

Working of the Quarry.

The quarry is adjacent to, and at the eastern end of, the works. The formation and thickness of the beds are approximately as follows: top soil; glacial drift up to 30 ft.; upper shale in some areas; upper limestone 16 ft.; sandstone and siltstone 30 ft.; lower shale 6 ft. to 9 ft.; and lower limestone 22 ft. The materials used in the works include a limited amount of the upper shale, all the lower shale and all the upper and lower limestone. The top soil, glacial drift, sandstone and siltstone are discarded, but it is a condition of operating the quarry that these beds be replaced in their appropriate order to restore the surface as agricultural land. The operation of the quarry is therefore somewhat different from common practice in cement works quarries. *Fig.* 5 shows the various working faces.

The top soil is removed by a Caterpillar D8 tractor and scraper, and is being dumped while the quarry is being opened; eventually it will be deposited on the top of the replaced drift by the scraper and levelled by a D9 bulldozer. The

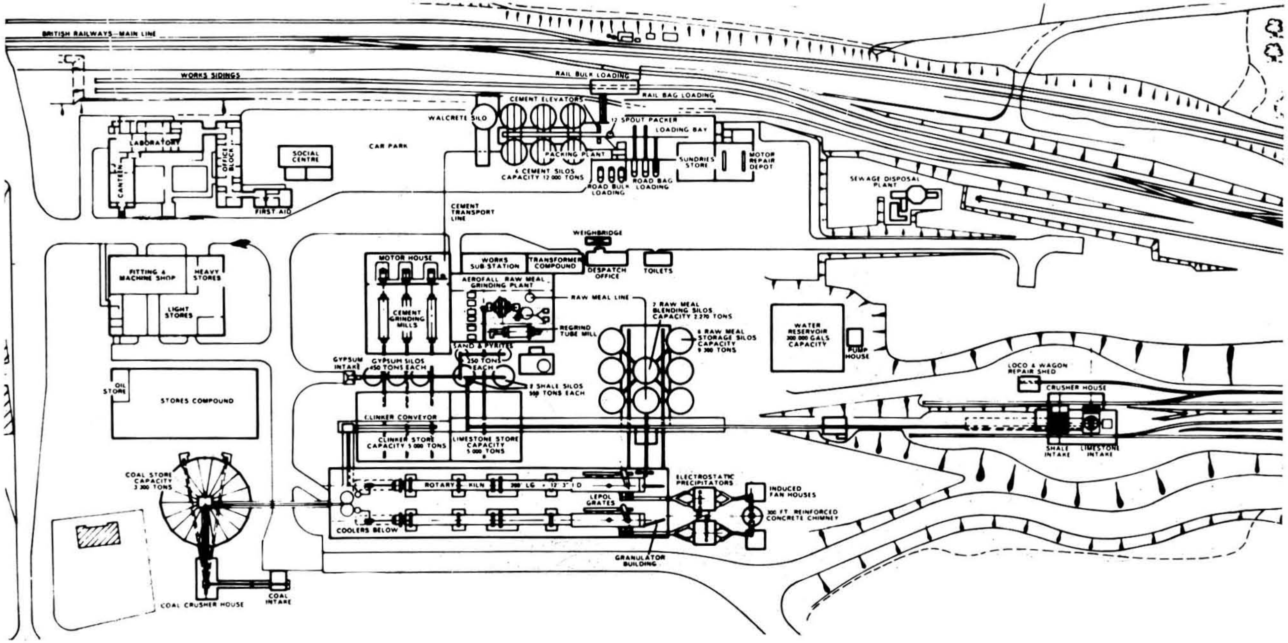

Fig. 1.—Lay-out of Dunbar Cement Works.

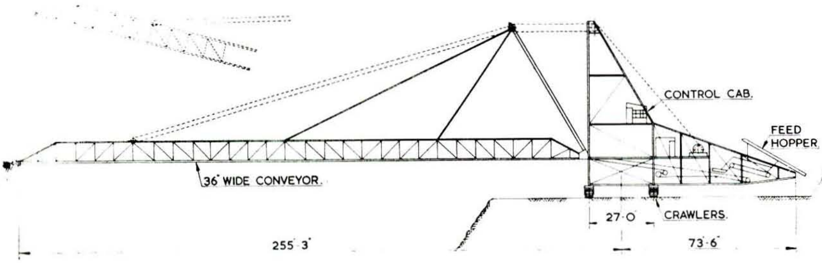

Fig. 2.—Spoil Transporter in Quarry.

glacial drift is dug by an NCK-Rapier 1405 electric face-shovel with a $3\frac{1}{2}$-cu. yd. Hadfield ESCO bucket fitted with instantaneous air-operated tripping. While the quarry is being opened up, this machine loads 18-cu. yd. A.E.C. dumpers which deposit the material in heaps behind the face.

As soon as the quarry has been opened up sufficiently to receive the spoil, a mobile transporter (*Fig.* 2), supplied by Messrs. Keir & Cawder (Engineers) Ltd., and mounted on NCK crawler-tracks, will be installed. This will be the largest of its type in the United Kingdom. The Rapier face-shovel will deposit the spoil in the hopper from which it is transferred, by the conveyor on the 255-ft. boom, to positions behind the workings at the lower faces. In areas where the upper shale occurs, the shale will be excavated by this shovel, but as little as possible of the shale will be used as raw material, since the main requirements will be supplied by the lower shale. Any of the upper shale that is required is loaded into wagons on a rail-track serving the upper limestone bench.

The bed of upper limestone is drilled for blasting by a Simens-Schuckert DUH-7 electric rotary drill. The loosened material is dug by an NCK-1405 electric dragline having a 50-ft. boom and a 4-cu. yd. heavy-duty ESCO bucket; this machine is positioned on the bench dug by the face-shovel. The dragline has a capacity of 120 tons to 160 tons per hour and loads wagons on a 3-ft. 6-in. gauge rail-track laid along the bench.

The bed of sandstone-siltstone is drilled for blasting by a Gardener-Denver rotary percussive drill driven by a diesel engine. A percussive drill is required in order to penetrate, without wandering, a band of hard material in the bed.

The loosened material is dug by a 5-W Ruston Bucyrus walking-dragline, which has a range of booms from 120 to 150 ft. using alternative 5-and $2\frac{1}{2}$-cu. yd. buckets. This dragline works from the top of the sandstone bed, and, when the quarry is opened up sufficiently, it will side-cast the spoil on to the quarry bottom; this deposit will eventually be covered by the glacial-drift material and top soil.

The lower shale, which provides the main supply of argillaceous material for the works, is not at present blasted but is dug by a Caterpillar 977-Traxcavator. This machine loads wagons on another 3-ft. 6-in. rail-track laid along the bench on the lower limestone which is now exposed and which is dug by duplicate

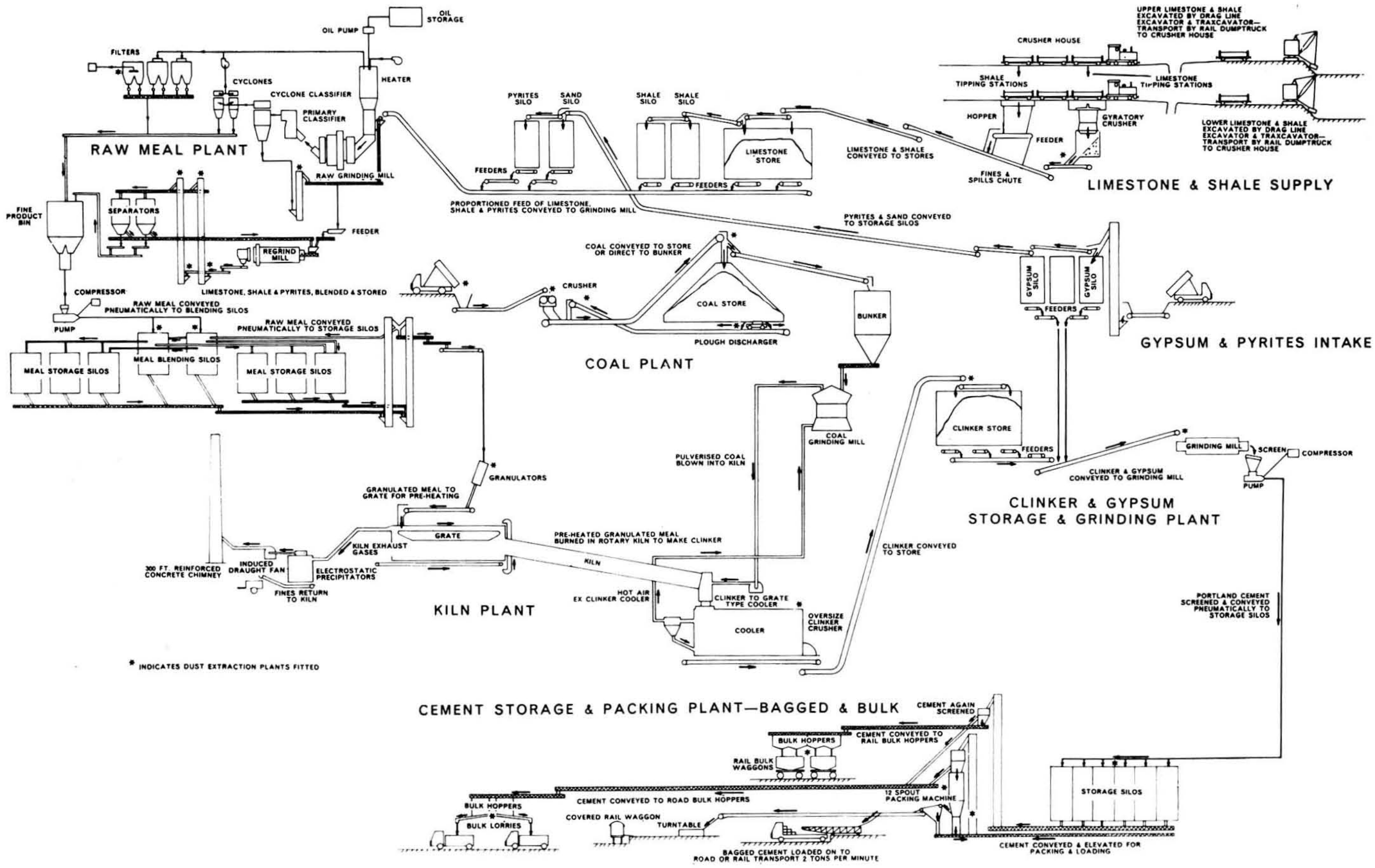

Fig. 3.—Dunbar Cement Works: Flow Chart.

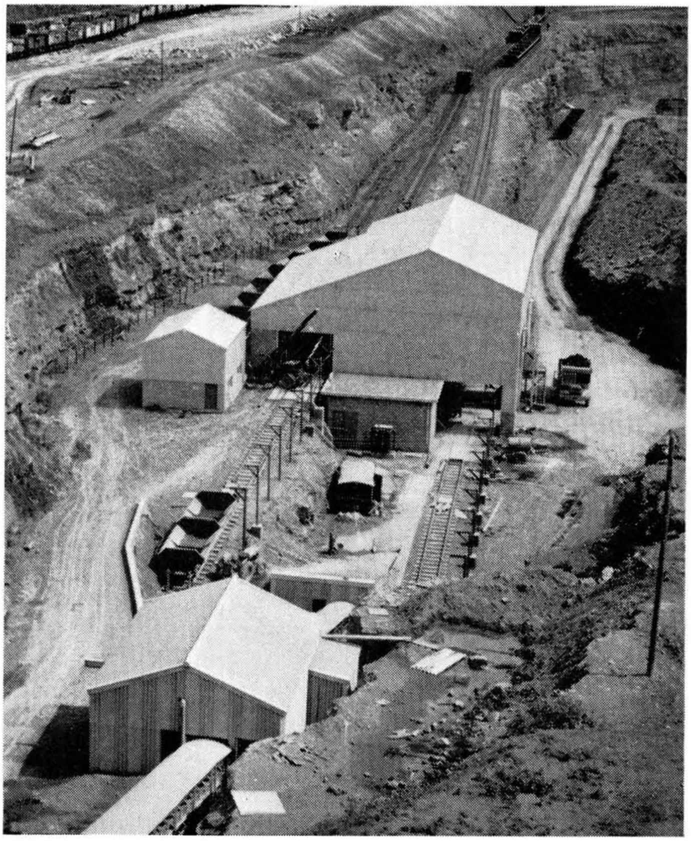

Fig. 4.—Quarry: Tipping Stations for Limestone and Shale, and Crusher House.

equipment in a similar manner to the upper limestone. The lower limestone is loaded into wagons on the same rail-track as the lower shale. The shale and limestone are dug in separate working periods.

Each of the rail-tracks on the two benches are single tracks running separately to the crushing plant at the works, where they arrive at different levels, as seen in *Fig.* 4. On each level there are two intake hoppers, one for the limestone and one for the shale. There is a passing loop in each track just before reaching the hoppers and there is an inclined connection between the two tracks. The materials are transported by two trains on each track. Each train makes one journey in about one hour and consists of a Hibberd 25-ton Planet locomotive which has a 174-h.p. Leyland diesel engine and hydraulic transmission hauling Hudson 15-ton tray-type steel side-tipping wagons. The trains, which are equipped with pneumatic brakes, are shown in *Fig.* 6. The wagons can be tipped to either side by Hudson hydraulic tipping gear installed at each of the four intake hoppers, each tipper being capable of dealing with thirty wagons per hour. In its operating position, the tipping gear projects above the level of the rail. In order that road dumpers can also discharge into the intake hoppers, the tipping gear can be retracted hydraulically below rail-level, leaving a clear platform. There are two hydraulic pumping systems, each capable of operating the retracting, clamping, and tipping rams for the two intakes.

Interconnections allow any of the tipping stations to be operated from either pumping system, but the stations at the upper and lower levels cannot be tipped

Fig. 5.—Working Faces.

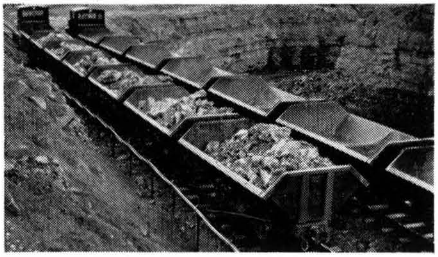

Fig. 6.—Trains with loads of Upper Limestone.

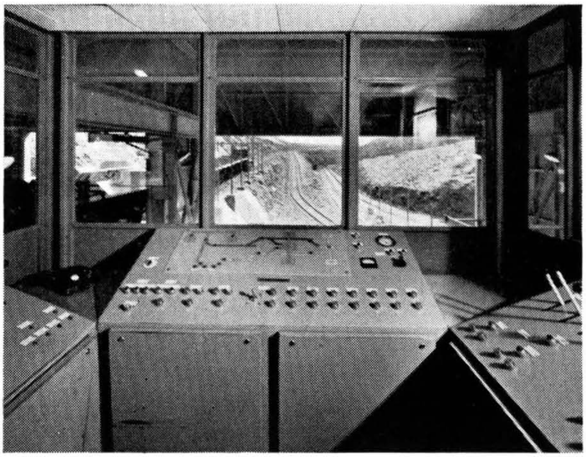

Fig. 7.—Control Panel for Unloading, Crushing and Conveying Systems.

Dunbar Cement Works: Views of the Plant at the Quarry.

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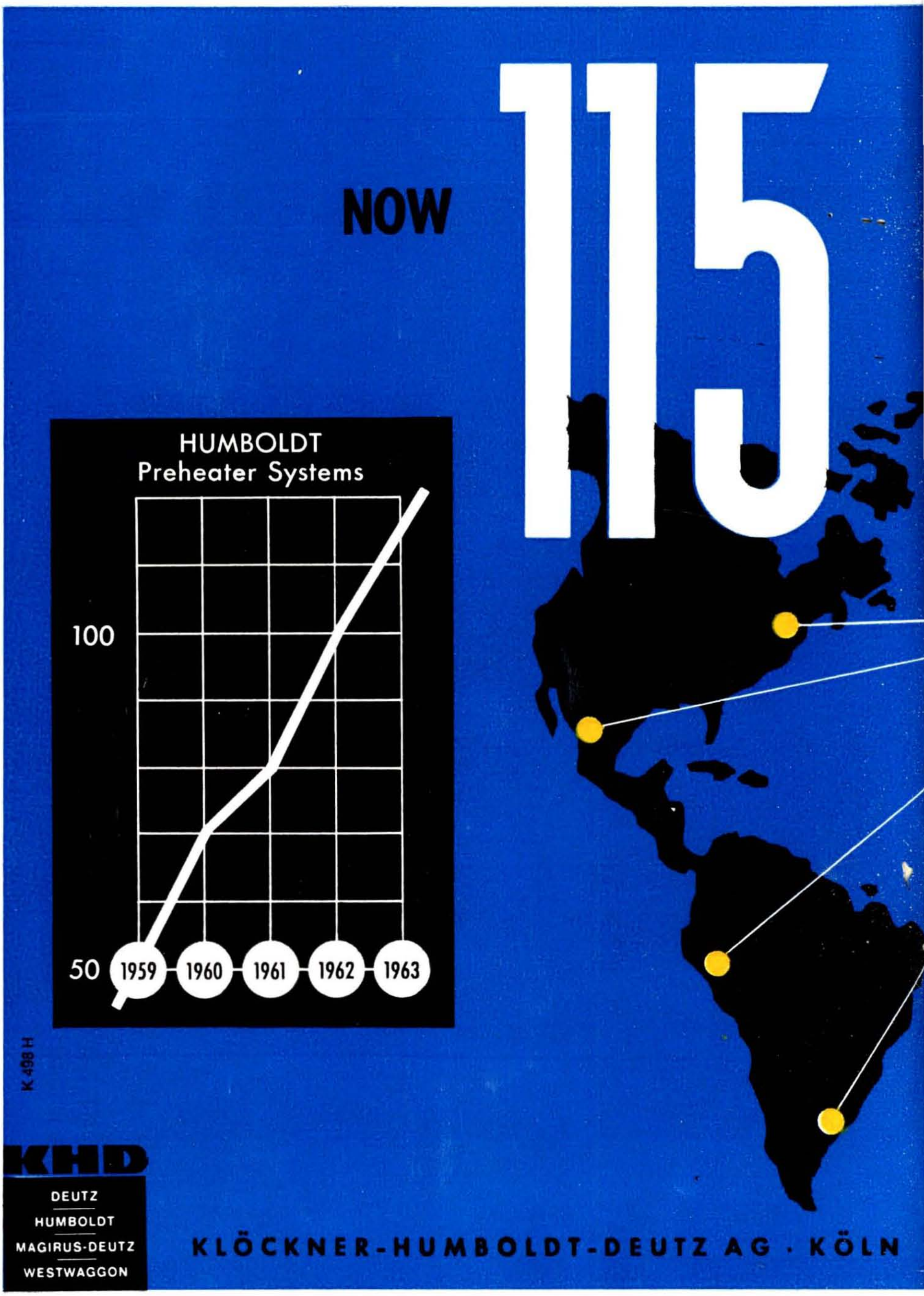
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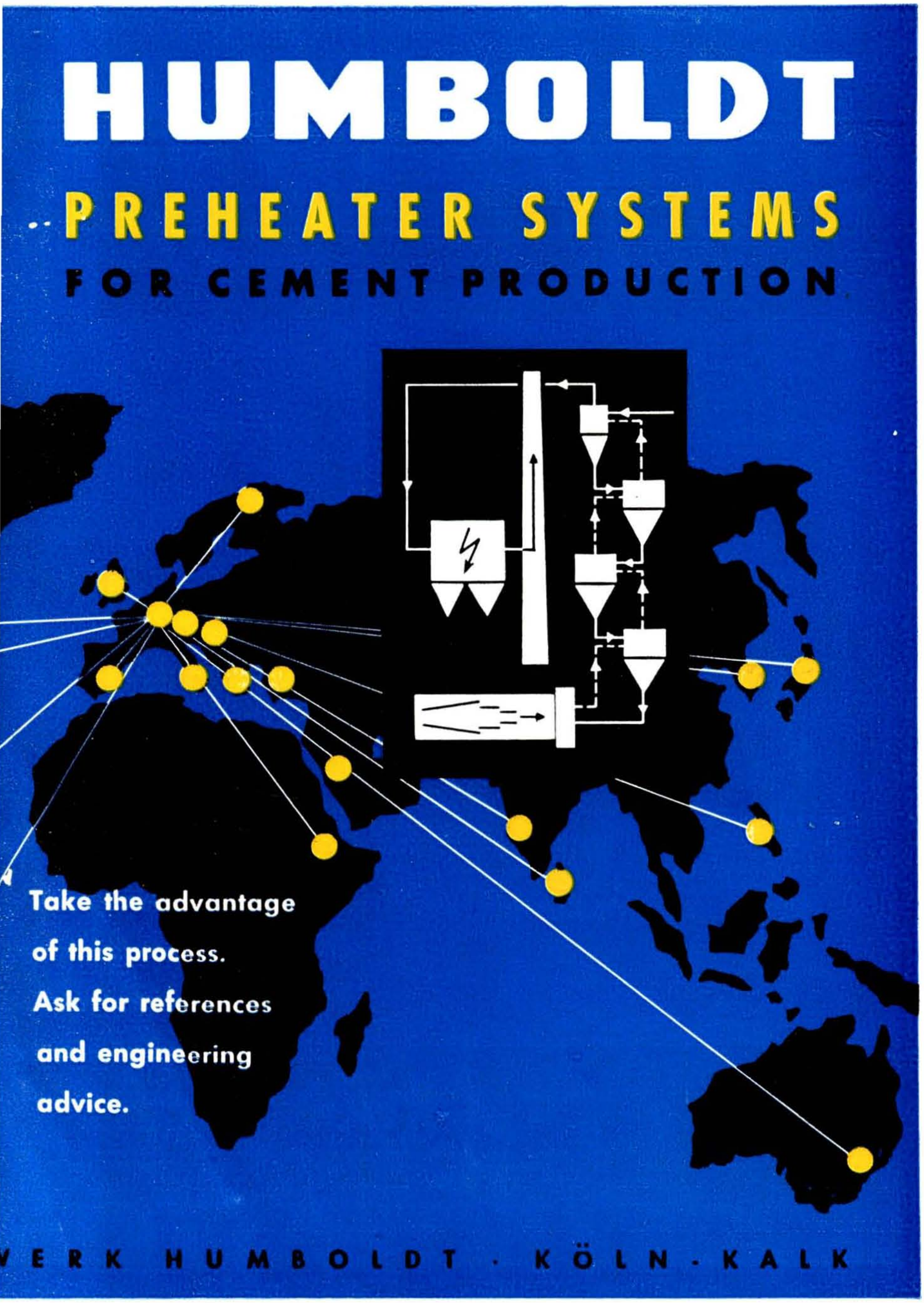


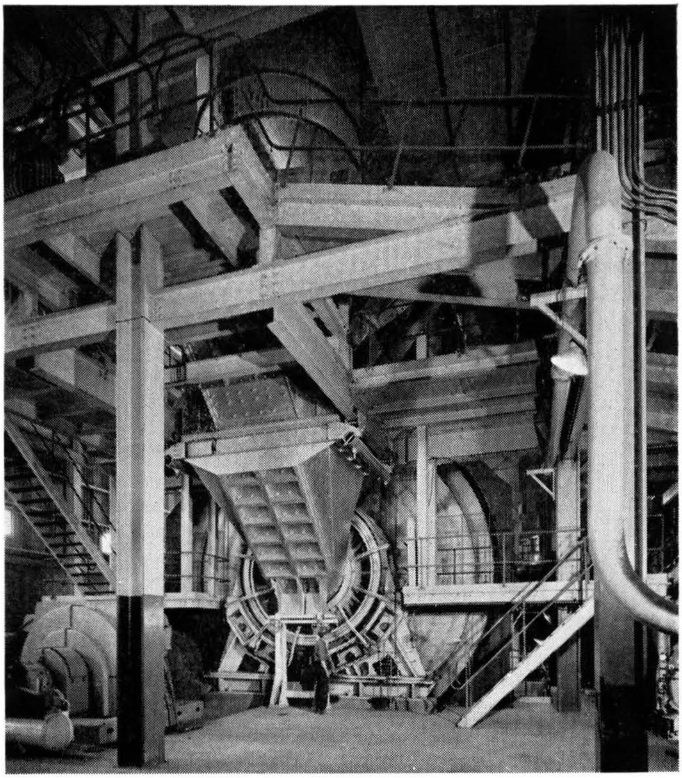


Fig. 8.—Aerofall Mill (Viewed from Feed End.)

simultaneously. The operating valves are interlocked to ensure a correct sequence and lights indicate that the various motions are correctly completed.

Preparation of the Raw Meal.

Below the two limestone intake hoppers there is a coarse-set 42-in. Nordberg crusher having a capacity of 500 tons per hour, which works without a feeder on choke feed. The product is all below 14-in. ring size and is taken by a 42-in. inclined belt-conveyor and discharged on to a 5,000-ton covered stockpile. The shale is also taken by this conveyor, when it is not being used for limestone, and distributed by other conveyors to two 550-ton hoppers adjacent to the limestone stockpile.

The controls for the tipping of the wagons, for the crusher and conveying system are located in a central control cabin (*Fig.* 7) overlooking the crusher. Closed circuit television is also installed so that the operator in the control cabin can observe all the transfer points in the conveying system.

Beneath the limestone stockpile and leading to the grinding plant, there is a

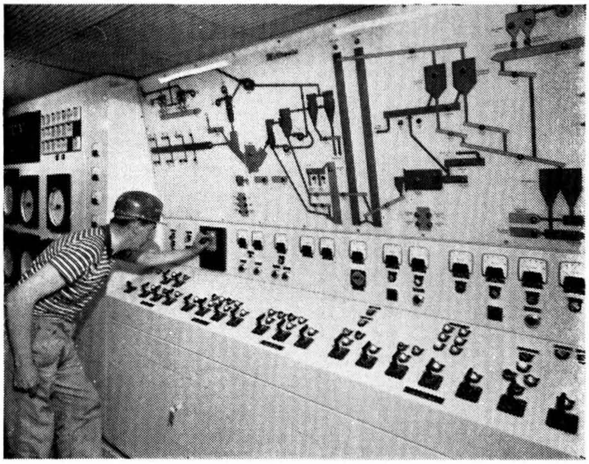


Fig. 9. Control Panel for Raw Meal and Grinding Plant.

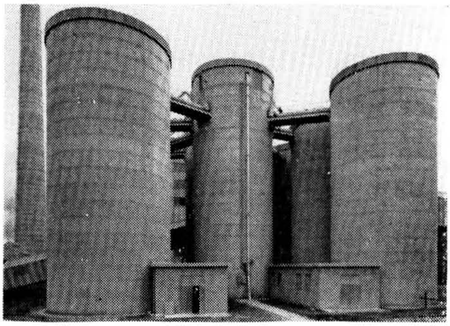


Fig. 10.—Silos in Connection with Continuous-blending Plant.

42-in. belt-conveyor fed by four pan-feeders, which extract the limestone from the pile. Beneath each of the 550-ton shale hoppers a pan-feeder also feeds on to this 42-in. belt via a Richardson weigher. Two 250-ton hoppers are installed above this conveyor. One hopper is for sand and the other for pyrites, either of which materials may be needed upon occasion to rectify the composition of the raw materials. The sand and pyrites are delivered to the works by road and are received and handled by same intake system as the gypsum. They are extracted and fed on to the 42-in. conveyor by a belt-extractor under each hopper.

The 42-in. conveyor to the grinding mill also has a Richardson weigher incorporated. The four limestone and the two shale pan-feeders and the 42-in. conveyor are driven by Lawrence-Scott commutator motors, which are linked to the Richardson weighers by ASMAG controllers, so that the correct limestone-shale ratio is maintained. They are also linked to the weight and sonic controllers of a mill which the conveyor feeds in the next stage of the production of the raw meal. This stage comprises an Aerofall autogenous grinding mill working in conjunction with a " regrind " tube mill to produce the finished raw meal, thus combining the functions of secondary crushing, drying and fine grinding. Together with similar equipment at another of the works of The Associated Portland Cement Manufacturers Ltd., these are the first occasions on which this process has been used in the cement industry.

The mill (*Fig.* 8) is 23 ft. in diameter and 6 ft. long and is driven at 13½ r.p.m. by a girth-gear and pinion connected to an 1,800-h.p. English Electric motor running at 200 r.p.m. The girth-gear is 27 ft. in diameter and is said to be the largest in Europe. With this limestone, the action is not entirely autogenous and a charge of 20 to 30 tons of forged steel balls of up to 5¼ in. in diameter is used in the mill. The mill works on closed circuit and is swept by a circulation of about 160,000 cu. ft. of air per minute. The airstream, carrying the whole of the mill output, is passed through first-stage and second-stage classifiers and a cyclone. A purge of about 50,000 cu. ft. per minute is then vented to atmosphere through an Andrews-Weatherfoil Dynaclone filter with preheated scavenging air. The main circulating air is returned to the mill inlet, where heated make-up air is introduced from a furnace fired with Bunker C fuel oil by Stein-Atkinson-Stordy burner equipment; by this means the raw material which has a moisture content of 3 to 4 per cent. is dried. The furnace can be seen above the mill in *Fig.* 8. The main circulation of air is created by a fan driven by a 500-h.p. motor. There are also fans for providing small reflux circulations in the first-stage and second-stage classifiers for regulating the fineness and for the hot make-up air and purge. The flows in all these fans are regulated by power-operated dampers connected to a central instrument panel (*Fig.* 9) from which the whole operation is controlled.

Since the operation of an autogenous mill depends upon a correct charge of stone being maintained in the mill, a highly sensitive response for the feed control is required, and is achieved by a controller operating from the sound of the mill which actuates an over-riding control of the speed of the 42-in. conveyor, and immediately changes the rate of feed without awaiting changes in the deliveries from the pan-feeders to take effect.

The Aerofall mill reduces the material to about 50 per cent. residue on 170-mesh. The finishing grinding is done in a Head Wrightson single-chamber tube mill, 10 ft. 8 in. in diameter and 25 ft. long. This mill, which operates on closed circuit with two Sturtevant 18-ft. diameter classifiers, is driven by a double helical girth-gear and pinion connected through a double reduction Turbine-Gear gear-box to a 1,200-h.p. Crompton Parkinson motor. It is fed with the rejects from the first-stage classifier of the Aerofall system by a screw-conveyor. Should the mill be overfed, a sonic controller operates a Syntron vibrator incorporated in the bottom of this screw-conveyor to divert some of the feed back to the inlet of the Aerofall mill.

The product from the tube mill is elevated to the inlets of the Sturtevant classifiers where it is joined by the rejects from the second-stage classifiers. The rejects from the Sturtevant classifiers are returned to the " regrind " mill feed, and the fines go forward to join the material caught by the cyclones and filters of the Aerofall system. The mill is ventilated by about 10,000 cu. ft. of air per

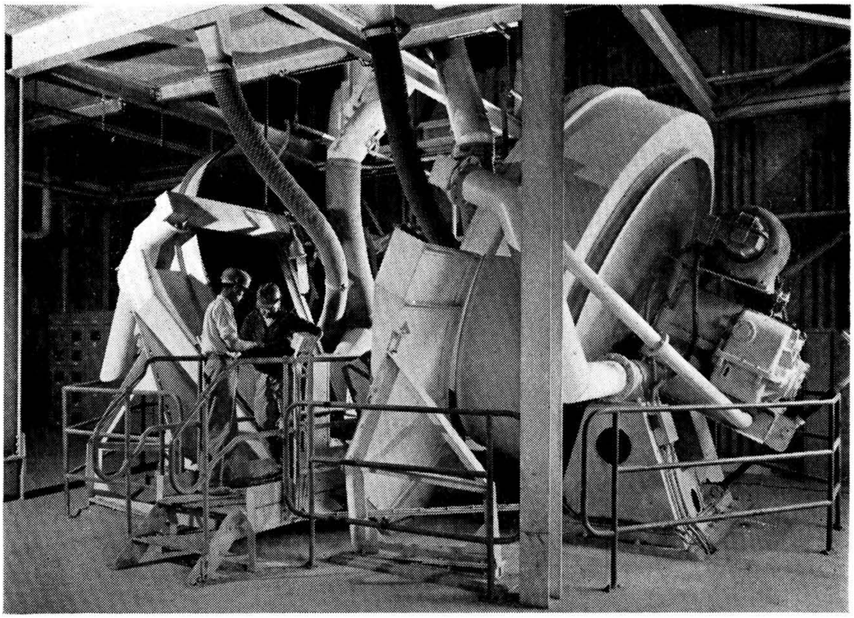


Fig. 11.—Pair of Nodulisers for Feeding One Kiln.

minute which, together with air from all the dust collection points in the raw meal milling system, is passed through a 25,000-cu. ft. per min. Dynaclone filter. The air for the tube mill can, if necessary, be heated in a Todd oil-fired furnace when starting the mill from cold. At other times the heat generated in the mill suffices for the drying that is required in this regrinding section. The product is conveyed between the various units of the system by screw-conveyors for the coarse material and Air-Slides for the fines.

The whole of the product from the milling system is taken by Air-Slides to a 25-ton hopper feeding an 11-in. Fuller-Kinyon pump which pumps it to the blending plant (*Fig.* 10), in which the Fuller Air-Merge continuous system is used. It consists of two concrete blending tanks each with a capacity of 1,135 tons. The raw meal is pumped into the first, from which it overflows into the second, which in turn overflows through Air-Slides into any of six concrete storage silos, each having a capacity of 1,565 tons of raw meal.

The raw meal is extracted by three Air-Slides at the bottom of each silo and these discharge into two screw-conveyors, each of which feeds a bucket-elevator in which the raw meal is taken to the granulators preparing the feed for the kilns. Each line of conveyor and elevator is large enough to handle the feed for two kilns. The quantity of raw meal conveyed and elevated exceeds the actual feed requirements, the excess being returned by gravity to the elevator boots.

Fig. 12.—Nodules being formed in Noduliser Pan.

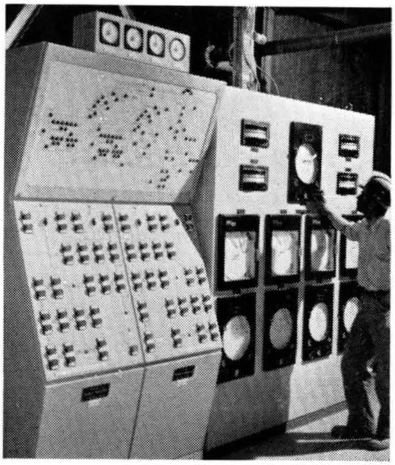


Fig. 13.—Control Panel for Raw-meal Feed and Nodulisers.

Nodulising, Burning and Cooling.

There are two pairs of nodulisers (*Fig.* 11), each 12 ft. in diameter, in which nodules (*Fig.* 12) are made from the raw meal by the addition of 12 to 14 per cent. of water. The product from each pair feeds one of the two Lepol grates and rotary kilns. The elevators delivering the raw meal to the plant discharge into a screw-conveyor which keeps filled four small boxes placed beneath it. Each box discharges into a feed-screw driven by commutator motor, and each feed-screw discharges, via a Richardson weigher, into a noduliser. The nodules from each pair of nodulisers fall down chutes on to a swinging conveyor that spreads them evenly across the width of the grate feed-hopper. The level of the material in this hopper is kept constant by the noduliser attendant by regulating the raw meal feed. The feed is maintained at the rate set by the attendant by the Richardson weighers coupled to Honeywell pneumatic controllers regulating the commutator motors driving the feed screws. These controllers are also linked by ratio controllers to Fischer and Porter water-flow controls to ensure a constant moisture content in the nodules. The control panel is shown in *Fig.* 13.

Each Lepol preheating grate is 71 ft. long and 12 ft. 10 in. wide and is driven by a 17-h.p. variable-speed motor. The grates are arranged for double-pass operation. The hot gases are passed down through the preheating end of the grate, are cleaned in a set of cyclones, passed through an intermediate induced-

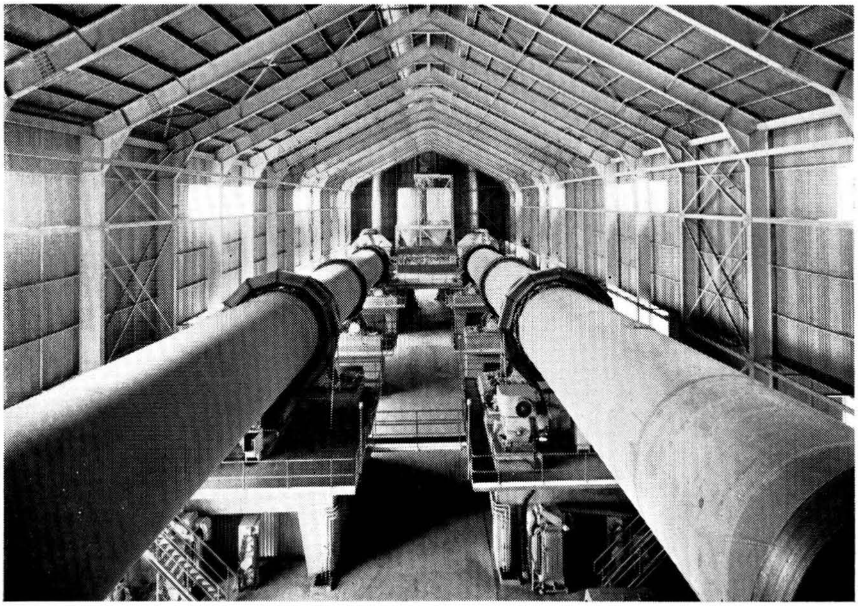


Fig. 14.—The Kilns viewed from Feed End.

draught fan and, by means of a main induced-draught fan, down again through the grate to dry the incoming nodules. The hot nodules are discharged down a chute into one of the kilns.

Each rotary kin (*Fig.* 14) has a shell consisting of a parallel section 198 ft. 6 in. long with an internal diameter of 12 ft. 3 in., and tapered inlet and outlet sections giving an overall length of 206 ft. 8 in. The shells have fusion-welded joints. The plates are 1$\frac{3}{16}$ in. thick in the sintering zone and 1$\frac{3}{8}$ in. thick under the tyres and girth-gear. They are carried on four splined tyres having an outside diameter of 15 ft. and a face 1 ft. 9$\frac{1}{4}$ in. wide. Hydraulic thrust-gear on Nos. 3 and 4 beds of each kiln imparts a slow axial oscillatory movement to the kiln. Each kiln is driven by a 110/44-h.p. Lawrence-Scott totally-enclosed commutator motor, having a speed range of 3 : 1, through a triple-reduction Turbine-Gears gear-box and pinion and girth-gear. To prevent risk of distortion of the shell in the event of a power failure, barring gears, each driven by 12$\frac{1}{2}$-h.p. diesel engine, are provided. During construction they were used to rotate the kilns while the circumferential site joints of the shell were being welded.

The clinker is cooled in Fuller-744 horizontal grate-coolers incorporating the usual equipment of clinker breaker, drag-link conveyor and Prat-Daniel multi-tube dust collector, in which the excess air discharged to atmosphere from the cold pass of the cooler is cleaned.

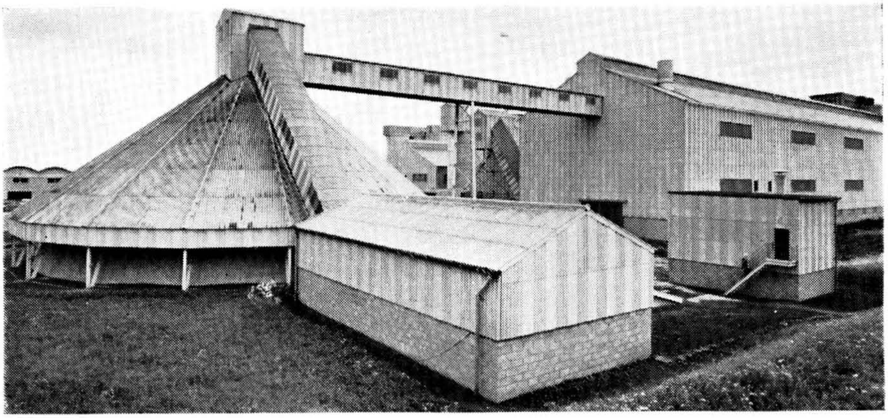


Fig. 15.—Covered Stockpile for Coal.

The kilns are fired by pulverised coal on the direct system. From the intake hopper the coal, which has a moisture content of about 8 per cent., is taken by an extractor-conveyor to a Sheepbridge roll crusher which discharges on to a Wharton conveyor, inclined at 40 deg. This discharges either on to a conveyor leading to two 35-ton coal-hoppers in the kiln house or on to a conical stock-pile 3,300 tons capacity roofed with a conical cover (*Fig.* 15).

Beneath the stock-pile of coal there are two tunnels, each with a plough discharger and belt-conveyor that discharge into the boot of the elevator to convey the coal to the two hoppers in the kiln house. Coal is fed from each of these hoppers by a Besta feeder to an M.P.S.-90 coal mill having a capacity of 4·8 tons per hour and driven by a 100-h.p. motor. Each mill serves one kiln. Primary air is drawn from the cooler through each mill by a Keith Blackman firing fan driven, at 2,450 r.p.m., through V-belts by a 100-h.p. motor.

The intermediate fans on each Lepol grate and the main induced-draught fans are Keith Blackman 80-in. high-efficiency backward-bladed fans driven at constant speed by 80-h.p. motors. The draught is controlled by power-operated louvre-dampers. The dampers in the intermediate fan ducts are controlled automatically to maintain nearly equal pressure in the two chambers over the grate. The dampers for the main induced draught fans are regulated automatically from the kiln control panel to maintain a constant pressure in the firing hoods. Each main fan draws the flue gas from the grate outlet through an electrostatic precipitator (*Fig.* 16) supplied by the Western Precipitation Division of Joy-Sullivan and discharges it to a single reinforced concrete chimney 300 ft. high. Each precipitator consists of two stages, each in parallel half-sections, either of which can carry the full output of the kiln. The internal equipment is made of stainless steel to obviate corrosion at the flue-gas temperature of about 200 deg. F.

Kiln Instrumentation and Automatic Control.

The automatic control of the Lepol Kiln is more complicated than that of a wet process kiln. The principle adopted is to control at predetermined levels some of the more important process variables. This coupled with the weight control of the nodule input tends to even out some of the factors disturbing the equilibrium of the burning process. In addition to the instrumentation for control, instruments are provided for recording the same variables and a number of other temperatures and pressures throughout the system.

The instruments and electrical controls are situated on a common panel (*Fig.* 18) on the firing platform; on the panel there are also mimic diagrams for each kiln and alarms to inform the burner of any fault which may upset the operation of the kilns.

Clinker Grinding.

The drag-chain conveyors from each of the two coolers discharge on to either of two Clarke-Chapman steel-trough catenary-conveyors which convey hori-

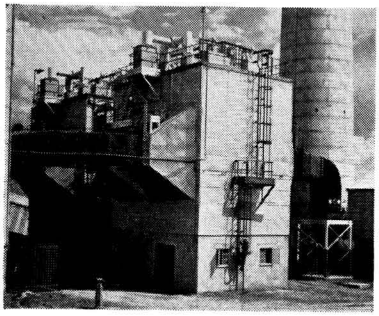


Fig. 16.—Electrostatic Precipitators.

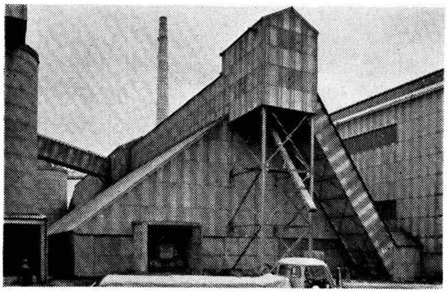


Fig. 17.—Clinker Store and Clinker Elevator.

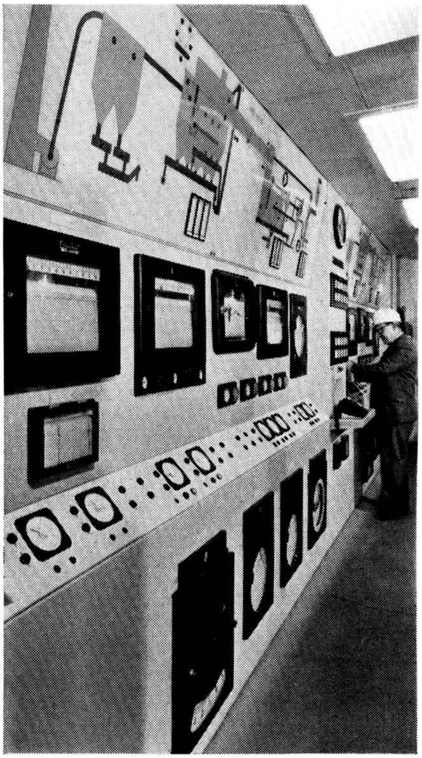


Fig. 18.—Control Panel for Kilns.

zontally for 85 ft. and then elevate the clinker for 75 ft. at an angle of 55 deg. to the top of a 5,000-ton stockpile. Here two Redler conveyors distribute the clinker over the stocking area. The stockpile is protected by a cover of design similar to those over the limestone and coal stockpiles. *Fig.* 17 shows the steeply inclined conveyor and the clinker store. Beneath the clinker stockpile, there are three tunnels, each of which houses the extraction, conveying and feed-control equipment for one of the three grinding mills. There are three extractor feeders in each tunnel and the conveyor belt passes over a Richardson belt-weigher before discharging on to an inclined conveyor leading to a drum feeder on the mill inlet. The extractors are set to give the desired feed which is then kept constant by the belt-weigher through Honeywell controllers.

Above the inclined conveyors are the gypsum hoppers which have a total capacity of 900 tons. Beneath the hoppers there are three Richardson extractors and constant-weight feeders, each of which discharges on to one of the inclined clinker conveyors. The feeders are linked by Honeywell controllers to their respective clinker belt-weighers to give a constant ratio of gypsum to clinker.

The gypsum is delivered to the works by road, the lorries discharging into an intake hopper at ground level from which the gypsum is elevated and taken to the hoppers by belt-conveyors. These conveyors also extend to the hoppers for the sand and pyrites, the same intake hopper and elevator being used for all three materials.

The three mills for grinding the clinker are 1200-h.p. Vickers compound mills, 45 ft. long and 8 ft. 4½ in. in diameter, centrally driven, through A.E.I. double-reduction divided-drive locked-train gear-boxes, by Crompton-Parkinson 3.3-KV auto-synchronous motors. The mills are of the same design as those at the Westbury works of A.P.C.M. Ltd. (as described and illustrated in the number of this journal for July 1963) One mill is arranged with four chambers and two with three chambers. Each mill discharges through a Hummer screen to a 7-in. Fuller-Kinyon pump, which delivers the cement to the silos. Each mill is equipped with two Visco automatic bag filters, one, by which the mill reek is purged, with pre-heated scavenging air. The other, with cold scavenging air, deals with dust collected from the clinker and gypsum extracting and conveying system.

Storage, Packing and Loading.

There are six reinforced concrete 2,000-ton cement silos arranged three on each side of two 24-in. screw-conveyors which are installed at ground level. Each conveyor has a capacity of 125 tons per hour and takes the cement from the silos to the packing and loading plant. Extraction is by three air-permeable conveyors in the base of each silo. The extraction rate is controlled by devices in the screw-conveyors that regulate the supply of air to the permeable conveyors. The air from the Fuller-Kinyon pumps and from the conveyors is exhausted through Pnujet filters, situated on top of the silos.

Each of the screw-conveyors from the silos discharges into a vertical bucket-elevator which in turn discharges through a rotary screen into a surge-

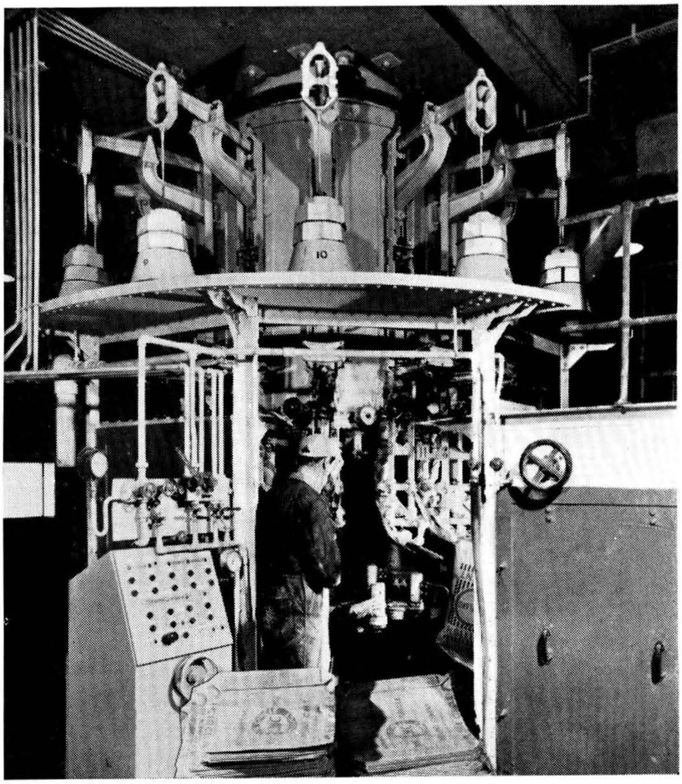


Fig. 19.—Twelve-spout Packing Machine.

hopper. The cement is conveyed from these hoppers by air-conveyors and screw-conveyors to three loading plants. The low-pressure air for the air-conveyors is supplied by a number of Keith Blackman blowers having a capacity of 250-cu. ft. per minute at 28-in. water-gauge, located adjacent to their respective conveyors.

There is a packing plant for filling and loading paper bags for transport by road or rail, and a bulk-loading plant for despatch by road and rail. Each of these plants has a capacity of 120 tons per hour. Paper bags are filled by a twelve-spout Fluxo packer (*Fig.* 19) and are transferred by retractable conveyors to three lorry-loading bays (*Fig.* 20) or, via a turntable and barrows, to rail vans (*Fig.* 21). The bags are vacuum-cleaned before loading. The dust collecting system for the packing plant is connected to a Darnley Taylor filter having a capacity of 8,000 cu. ft. per minute.

The hoppers for road and rail bulk-loading have air-permeable conveyors to enable the cement to be loaded at high speed into the vehicles below. The railway wagons actually stand on the weigh-bridges while being loaded. The railway wagons, two of which can be loaded at a time, are either 20-ton " Presflo " vehicles or special 27-ton light-alloy wagons. The latter vehicles, which were designed and are owned by The Associated Portland Cement Manufacturers Ltd., are exceptional in that the useful load is equal to three times the tare weight, and they can be emptied in eight minutes. Much of the output of the works is despatched in bulk in block trains of these light-alloy wagons to distribution and packing depots at various key points in Scotland. These trains and other railway traffic are handled by a 170-h.p. Hibberd Planet shunting locomotive to and from the assembly sidings.

All loading points are fitted with dust collecting equipment vented through Spencer-Halstead filters.

Services.

Water for the manufacturing process and for cooling is obtained from two boreholes which have a combined capacity of 10,000 gallons per hour. Drinking water for the canteen, laboratories and the like is supplied by the local water authority. Complete soil drainage and sewage treatment plants are installed.

The electricity supply is taken from the South of Scotland Electricity Board's substation adjacent to the works at 11 kv. and is transformed at the works substation in two 6-mva. 11/3·3-kv. London-Transformer transformers. Distribution is through oil-immersed Ellison switchgear to the various 3·3-kv. motors in the works and to a small substation at the crushing plant, from which also are fed two 3·3-kv. skid-mounted portable substations to supply the mobile plant in the quarry. The low-voltage supply for the works is provided by A.E.I. outdoor-

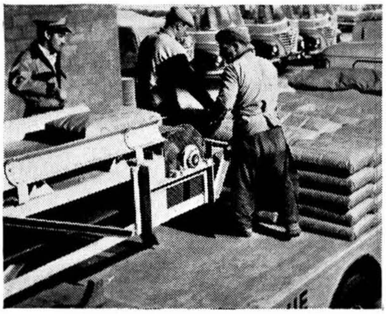


Fig. 20.—Loading a Lorry by means of a Retractable Conveyor.

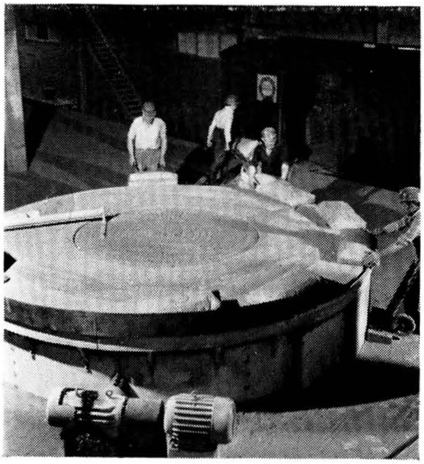


Fig. 21.—Turntable for Loading Railway Vans.

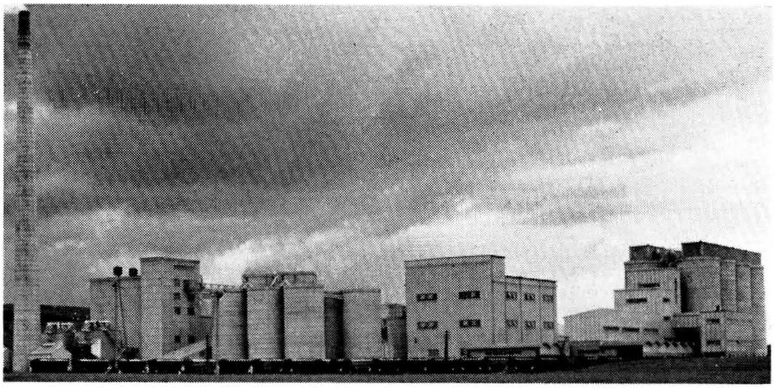


Fig. 22.—General View of Dunbar Cement Works.

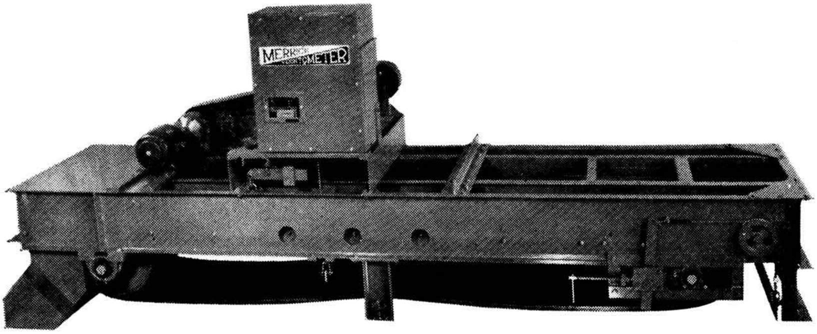
type 3·3-kv./433-v. transformers at the works substation and in various sections of the plant. The low-voltage supply for the quarry is provided by a skid-mounted 300-kva. transformer feeding an outdoor type skid-mounted switch-fuse unit.

The works were designed by The Associated Portland Cement Manufacturers Ltd. The consulting civil engineers were Messrs. Oscar Faber & Partners. The general civil engineering contractors were Messrs. Duncan Logan (Contractors) Ltd., but the civil engineering work for the kiln plant and chimney was carried out by Messrs. Bierrum & Partners Ltd. The main contractors for the administrative buildings were Messrs. John Best (Contractors) Ltd.

The main contractor for the installation of the kilns was Polysius Ltd., but the remaining plant was erected by The Associated Portland Cement Manufacturers Ltd., and the various suppliers of the plant as stated in the foregoing article. The electrical work was installed by Messrs. H. J. Couzens Ltd., and Messrs. W. T. Glover & Co., Ltd.

Particle-size Analysis.

THE second regional meeting and exhibition on " Particle-size Analysis," arranged by the Whiting and Industrial Powders Research Council, was held in October last at Sheffield. [A report of the first meeting, which was held in Hatfield in April last, was given in the issue of this journal for September, 1963.] Lectures were given by five speakers, namely Mr. R. L. Brown of the British Coal Utilisation Research Council, Mr. J. C. Williams of Bradford Institute of Technology, Dr. L. Cohen of Simon-Carves Ltd., Dr. V. Timbrell of the Medical Research Council and Mr. B. H. Kaye of the Whiting and Industrial Powders Research Council.


MERRICK WEIGHTOMETER

The Cement Industry in Europe.

THE annual publication, by the Organisation for Economic Co-Operation and Development, of " The Cement Industry," in which are given statistics for 1962 and the trend for 1963, was issued in September 1963.

The European member countries of O.E.C.D. produced 112,400,000 metric tons of cement in 1962; this is an increase of nearly 7,000,000 tons compared with 1961. After the recovery in 1961, a rate of increase of 6·5 per cent. was attained in 1962, this rate being rather below the average of about 7 per cent. for the period from 1954 to 1961. Output increased in 1962 in all countries except Austria and the United Kingdom, but in neither of these countries was the reduction appreciable. The rate of growth in the other European countries was not uniform. Marked progress was made by Italy (an increase of 12·2 per cent.). Several smaller producers, including Norway, Spain, Portugal, Turkey, Ireland and Iceland, registered increases ranging from 10 per cent. to nearly 30 per cent.

For the second successive year European productive capacity increased by between 8,000,000 and 9,000,000 tons to 127,200,000 tons in 1962 compared with 118,400,000 tons in 1961. The greatest increase was in Germany, followed by Italy, France, and the United Kingdom, in that order.

The effect of more extensive mechanisation and rationalisation in the cement industry was again apparent in 1962 since the increase in European output was achieved by a virtually stable labour force. The trend towards a reduction in the number of workers employed was, however, reversed in 1962. The whole of the increase in the labour force is accounted for by an increase in the number of operatives, the industry employing about the same number of administrative, technical and clerical staff as in 1961.

Information from other sources regarding the cement industry in European countries is given in the following.

Poland.—It is expected that exports of cement from Poland in 1963 will be 1,500,000 tons compared with 710,000 tons in 1961 and 1,300,000 tons in 1962. Poland now claims to be second in the world in the export of cement; Japan claims to be the first. Polish cement is exported to more than 20 countries, mainly the developing countries of Nigeria, Ghana, Togoland, Sierra Leone, Liberia, Kuwait and Saudi Arabia, Pakistan and Indonesia. The exporting agency is the Minex foreign trade organisation of Warsaw, now said to be the largest single concern exporting cement in the world.

Cement for export is packed in six-ply paper bags impregnated with urea resin, and each having a valve which closes automatically when the bag is full. This prevents the cement from getting damp during transportation by sea. A number of empty bags, to the extent of 3 per cent., is added to each consignment to replace bags which may get damaged during transportation.

Polish Portland cement complies with the requirements of the British Standard B.S.12 (1958), the American ASTM C.150/56, the Soviet GOST, the German DIN 1164 and the French CPA 250/315, as well as others.

In addition to ordinary Portland cement and clinker, exports include rapid-hardening Portland cement, cement having low contraction characteristics for construction of roads, and low-heat cement for dams. Preparations are being made to produce white cement.

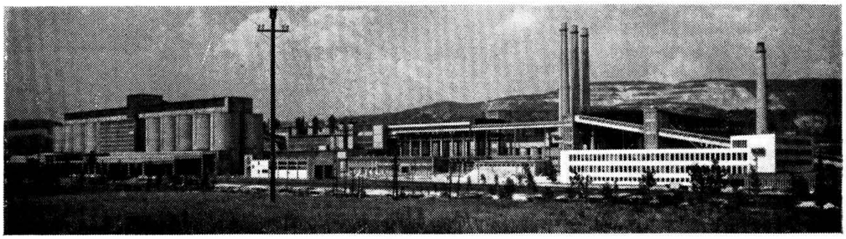
One of Poland's largest industrial undertakings, a cement works at Dzialoszyn, near Lodz, is nearing completion. Production, which ultimately will be about 1,000,000 tons annually, will start this year and, when full output has been reached, it will include 700,000 tons of Portland cement annually. The plant is of Polish manufacture.

The first reloading centre for cement commenced operation recently in the port of Gdynia. The installation comprises twelve silos, and the annual capacity amounts to more than 100,000 tons. Other cement reloading centres are being built in Bydgoszcz, Elblag and Szczecin. As many as thirty reloading centres of this type are to be built. Losses of cement during transportation, which previously were about 5 per cent., are expected to be reduced to 1 per cent.

Iceland.—Cement in Iceland is made from shells pumped up from the sea bed and processed. Until recently, cement was exported, but local demand makes exports no longer possible.

Norway.—A new kiln having a daily productive capacity of 700 tons has been installed by the Christiana Portland Cementfabrik, near Oslo, to replace two smaller kilns, each of about 500 tons daily capacity, which are being taken out of operation.

Hungary.



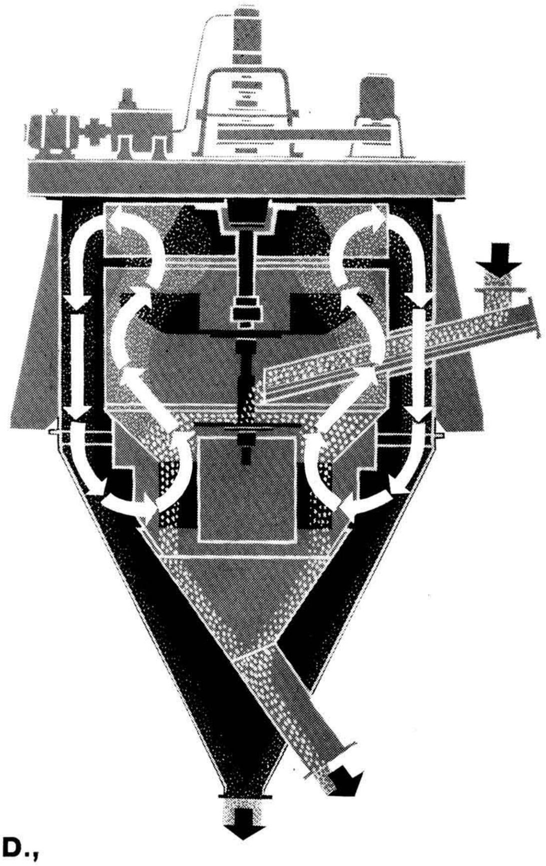
The illustration is of the Danube Cement & Lime Works at Vac in northern Hungary. This works went into full production in November 1963.

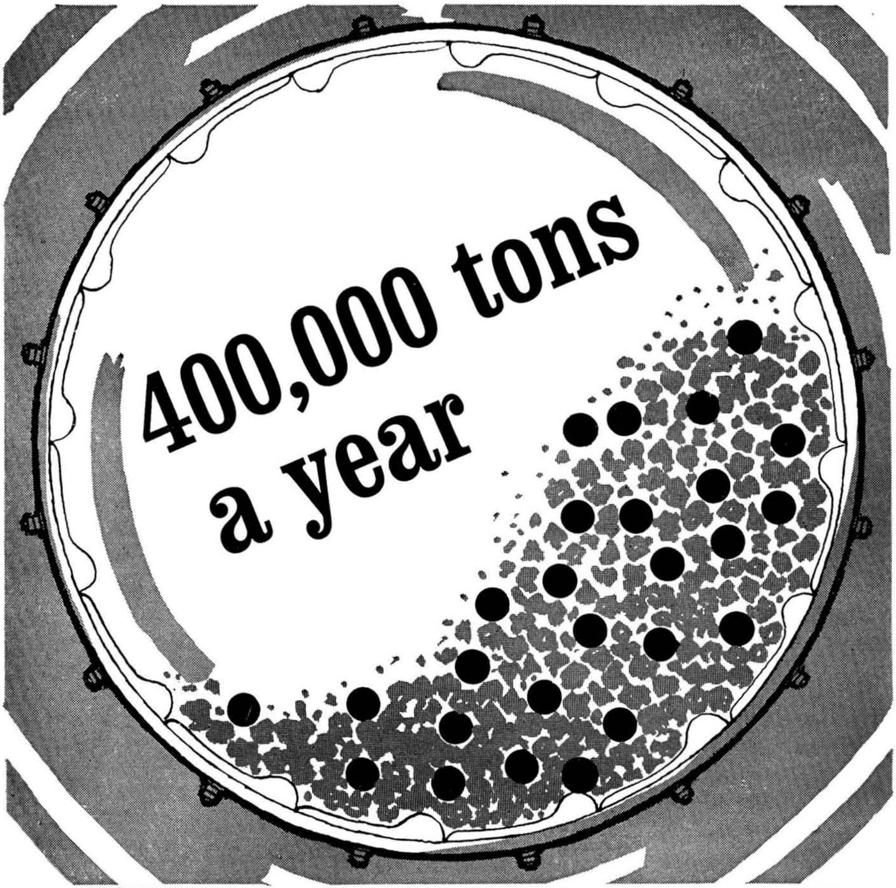
Publications Received.

REPRINTS prepared for the Commonwealth Scientific and Industrial Research Organisation of Australia.

" Importance of Mixing Sequence when using Set-Retarding Agents with Portland Cement." By G. M. Bruere. (Reprinted from " Nature," July 6, 1963.).

" Bubble Characteristics in Air-entrained Cement Pastes Containing Various Mixtures of Surface-Active Agents." By G. M. Bruere. (Reprinted from the " Australian Journal of Applied Science," September 1963).




400,000 tons
a year

Equipment for a Grate-kiln in Mexico.

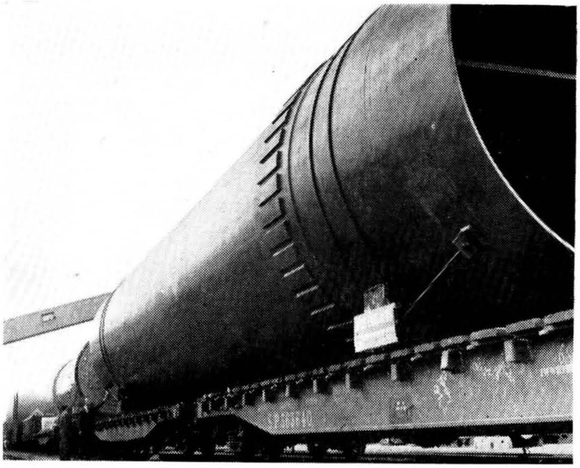


Fig. 1.

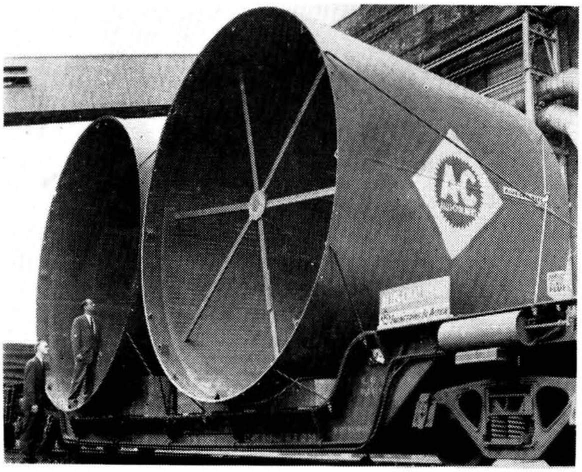


Fig. 2.

The accompanying illustrations show two sections of the 213-ft. grate-kiln installed by Allis-Chalmers, West Allis, Wisconsin, in the works of Cemetos de Mixcoac, Mexico. (Some brief particulars of this plant were given in the number of this journal for July 1963.) The travelling grate is 84 ft. long, and there are two pan pelletisers, each 12 ft. in diameter. The daily productive capacity of the new plant is 700 metric tons.

Fig. 1 shows the riding section of the kiln; this section is 79 ft. long. Two smaller sections of the kiln are shown in *Fig.* 2 ready for transportation by rail from Texas to Mexico.

The Price of Cement.

SINCE January 1 of this year, alterations have been made to the prices of cement in England and Wales.

Since the formation of the Cement Makers' Federation in 1934, the prices of cement have generally been the price to the nearest railway station, the prices having been determined on a system of circles at various distances around each cement works. As many railway stations are being closed and most deliveries are made to sites by road, it has been necessary to alter these pricing arrangements.

The system of fixing prices by distance-circles around cement works, which has been approved by the Restrictive Practices Court, will continue unchanged but, instead of a railway station being the determinant, there will be a common price for deliveries within the boundaries of every borough, urban district and, in rural districts, every parish. Consequently some prices are increased, some are reduced and others are unchanged.

The basic prices at a Sussex works and one works in Lancashire are reduced, with the result that the prices in delivery areas based on these works may also be reduced. On the other hand, the basic price at a South Wales works has been increased.

Certain changes have been made in the extra charges for cement in consignments of less than two tons. The variation in the charges for consignments of not less than two tons are as follows:

Rapid-hardening Portland cement, 10*s*. 6*d*. per ton above the basic price for ordinary Portland cement delivered in bags in full loads.

Ordinary Portland cement delivered in bulk containers, 8*s*. 6*d*. per ton less than the price of bagged cement, or 7*s*. per ton less if delivered in pressurised bulk containers.

Research on Lime.

THE Chalk Lime and Allied Industries Research Association held Open Days last October at their laboratories at Welwyn, Herts. Much work is being done on the analysis and properties of lime. Among new methods of analysis which have been developed recently is that for the separation of cations by electrophoresis and chromatography. Another is for determining the presence of calcium sulphato-aluminate in lime. With regard to the latter, analyses of hydrated limes have shown that the sulphate present is insoluble in water. Microscopic examination of these samples revealed the presence of crystals of calcium sulphato-aluminate. Photomicrographs of the crystals found are compared with samples of calcium sulphato-aluminates prepared in the laboratory. The practical importance of this work is that, if in limes used for building work there are any sulphates present in this form, they are insoluble and harmless.

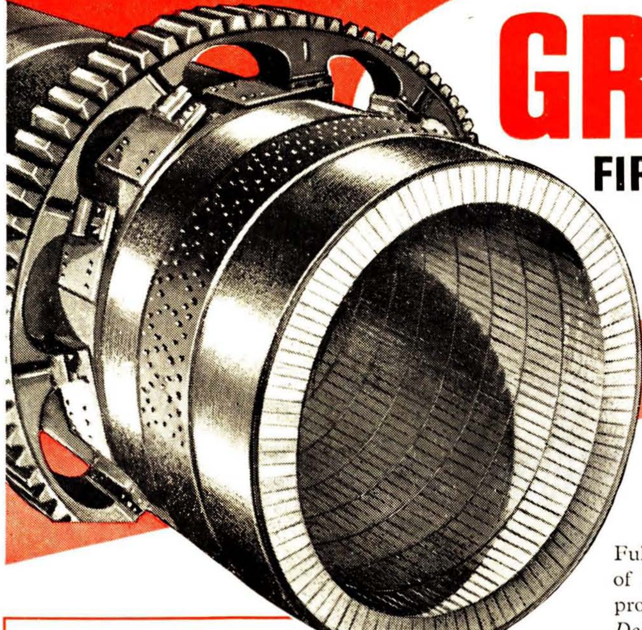
Gas chromatography is being applied to a study of the structure of hydrated inorganic compounds. A sample is heated in a temperature-programmed furnace, and, as the sample is decomposed, the gases evolved are separated and analysed.

New Approach to Hot Zone Linings

FIRED DOLOMITE BRICK LININGS PROVED SUCCESSFUL

GR '341'

FIRED DOLOMITE BRICKS



BASIC FACTS ON A BASIC BRICK

Full scale trials in the hot zones of Portland Cement Kilns have proved the success of *GR '341' Dolomite* bricks. Equivalent life to magnesia based bricks has been established. These bricks quickly develop and retain a protective clinker coating. Lower thermal conductivity values give a reduction in shell temperatures, and as a result the heat losses of linings made from these new bricks are much lower than with magnesite. Greater thermal efficiency, promoted by lower conductivity, makes GR '341' a more economical proposition.

HOT FACE: 1500 C

	C COOL FACE (THEORETICAL)			
	GR '341'		MAGNESITE	
Lining Thickness	Uncoated	Coated	Uncoated	Coated
6″	365	265	395	295
7″	355	255	380	280
9″	330	230	375	275

We shall be pleased to provide specialist advice and supervision of the installation of linings if required.

Consult

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