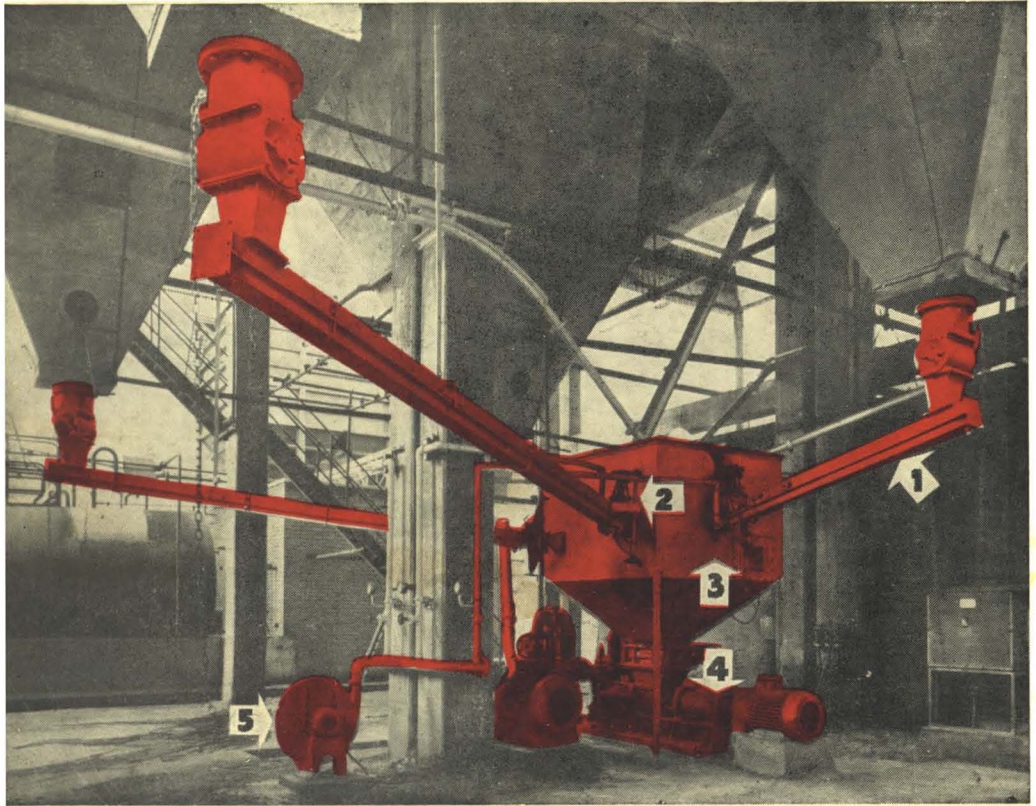


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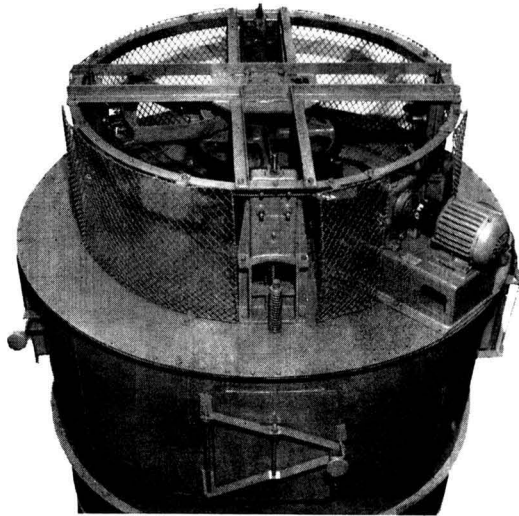
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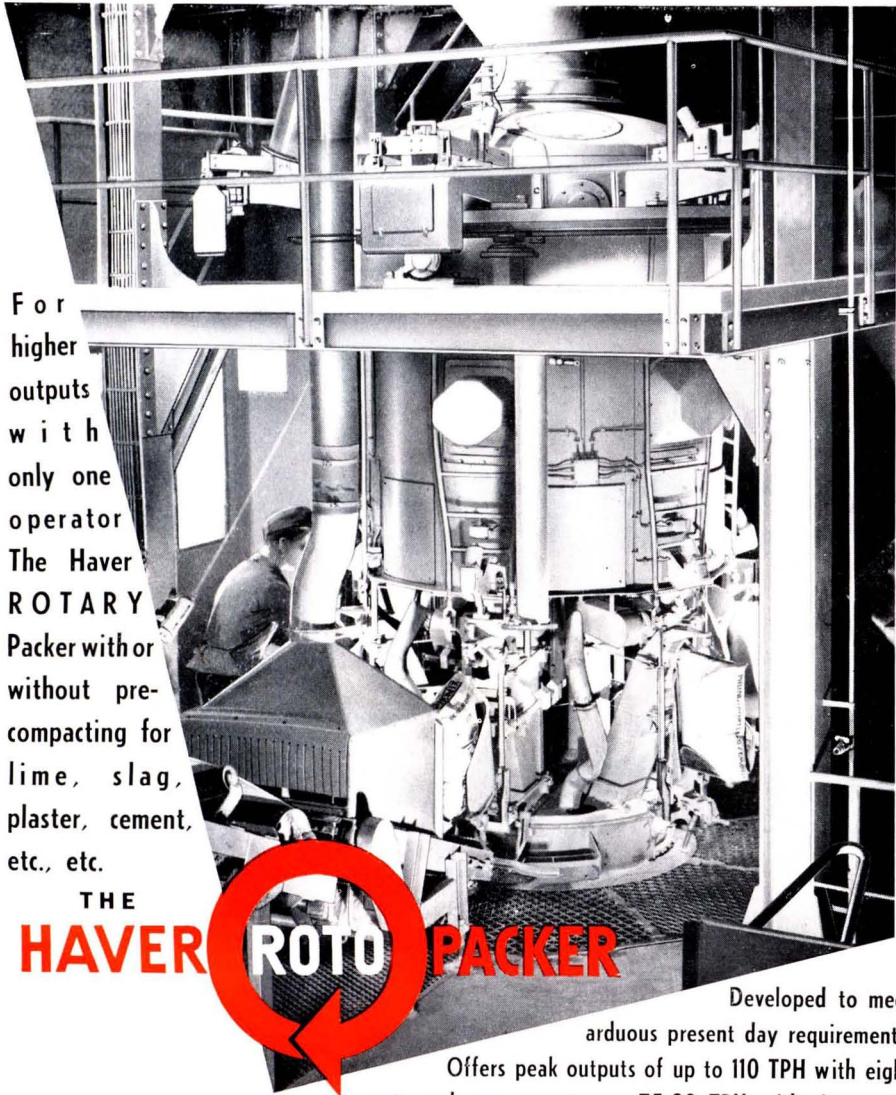
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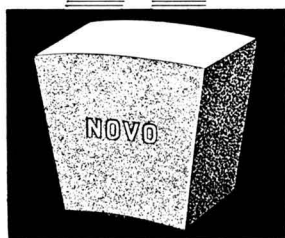
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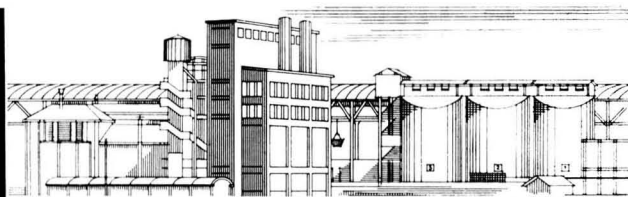


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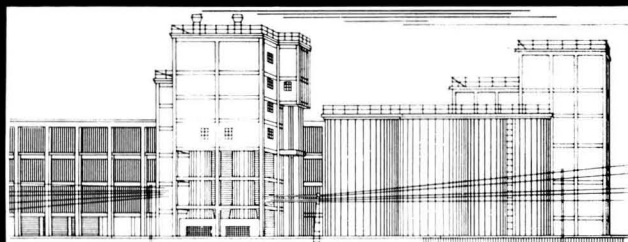
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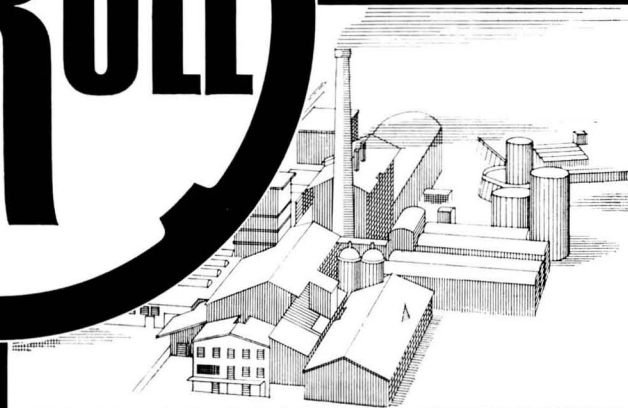


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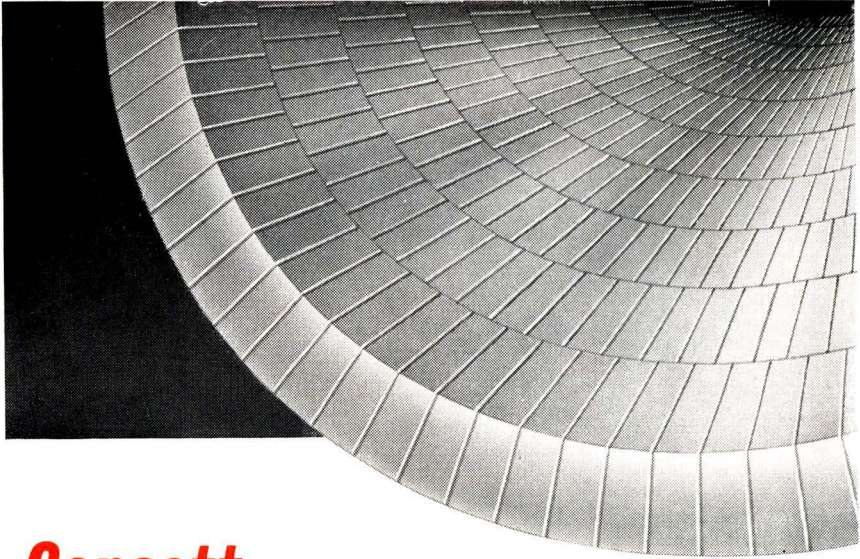
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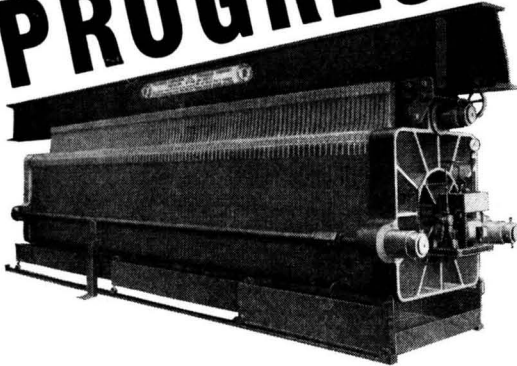
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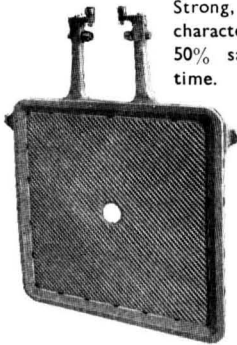
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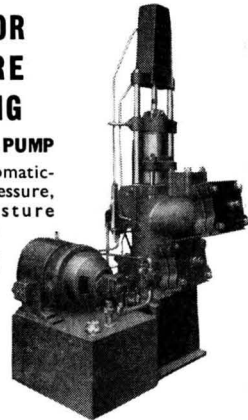
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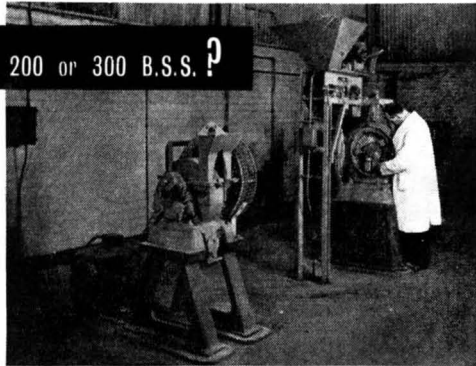
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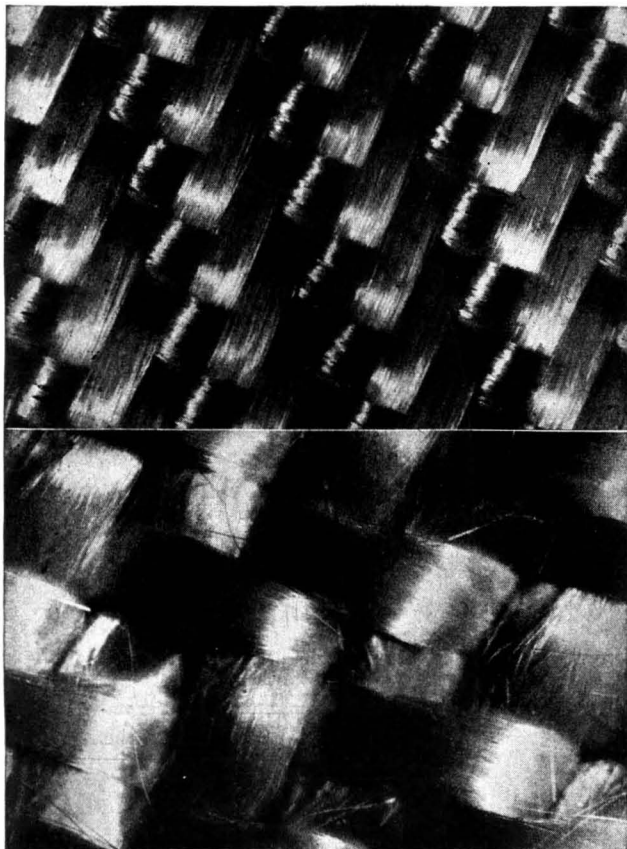
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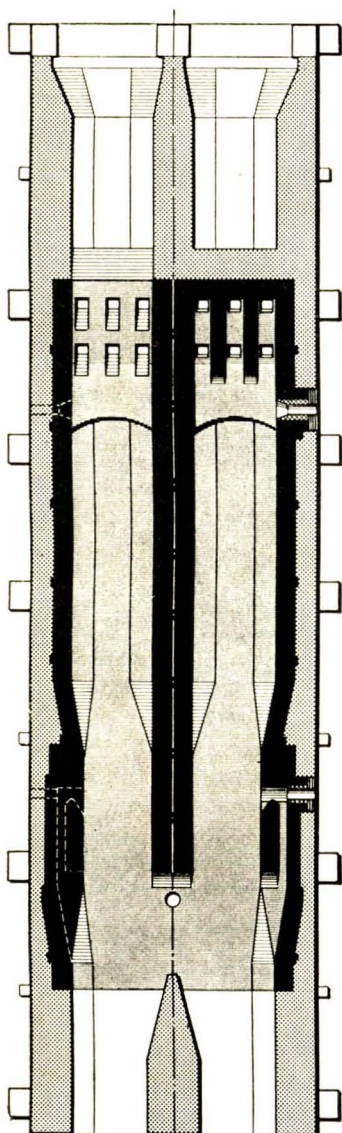
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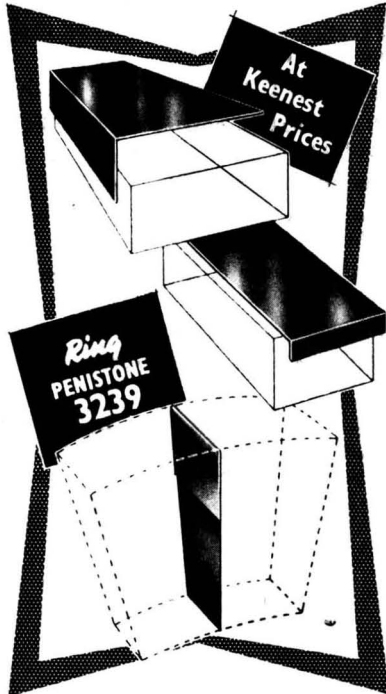
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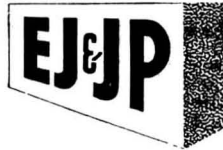
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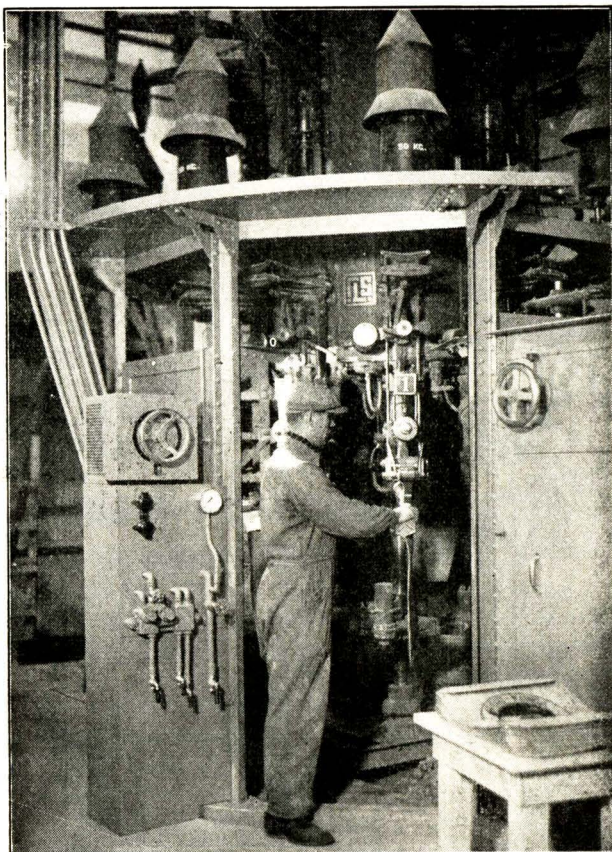
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VOLUME XXXIV. NUMBER 1.

JANUARY, 1961

The Hydration of Quicklime and the Plastic Properties of Hydrated Lime.

IN "Zement-Kalk-Gips" for October 1959, J. WUHRER, G. RADERMACHER and ZAGAR describe the first part of a comprehensive investigation of hydrated lime. The work includes a study of the changes in electrical conductivity during the process of isothermal wet-slaking of quicklime with grains of different sizes and burned at different temperatures. The pastes were examined by means of optical and electronic microscopes, and their plasticities measured by Emley's method. The following is a summary of the article.

The composition of the limestone used for the experiments was as follows: Loss on ignition, 43.69 per cent.; SiO_2 , 0.20 per cent.; Fe_2O_3 , 0.14 per cent.; Al_2O_3 , 0.16 per cent.; CaO , 55.60 per cent.; CaCO_3 , 99.25 per cent.; MgO , trace; SO_3 , 0.08 per cent.; K_2O and Na_2O , 0.08 per cent. Deviations from this analysis were small. The stone consisted mainly of crystals of sizes in the range 2 to 10μ , with some interspersed coarse crystalline portions.

The stone was reduced to grains 3 to 8 mm. in diameter and then burned in a muffle-furnace at the required temperature in an atmosphere of carbon dioxide for 15 hours. The lime was removed from the furnace before cooling to below 900 deg. C. and put into a closed metal container before cooling to room temperature; this procedure was to avoid recarbonation. Some of this quicklime was used directly in the slaking experiments and some was used after comminution, sieving and elutriation into fractions of different sizes. The chemical composition of the different fractions showed very little deviation. Since the electrical conductivity of solutions of lime varies considerably with temperature, conditions of slaking were chosen so that the rise of temperature was insignificant.

The apparatus for slaking consisted of a small vessel with a jacket for water circulating from a thermostat. The contents of the vessel were stirred by a

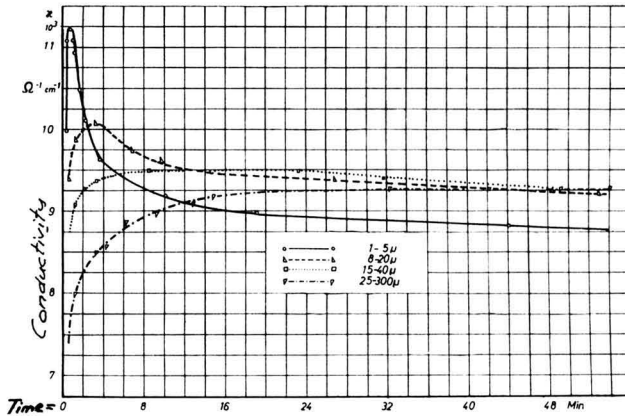


Fig. 1.—Change of Conductivity with Time for Particles of Four Ranges of Sizes. (Hard-burned Lime.)

magnetic stirrer. A thermometer and the electrodes of a conductivity bridge (using an oscillating circuit) were immersed in the slaking system. Conductivity water was fed from a plastic dispenser protected from ingress of carbon dioxide. The experiments were carried out at 20 deg. C., with a mixture of 7.5 gr. of quicklime to 1 l. of water.

Change of Electrical Conductivity.

The diagram in Fig. 1 shows the change of conductivity with time during the slaking of four ranges of particle size of a hard-burned lime, namely 1 to 5 μ ,

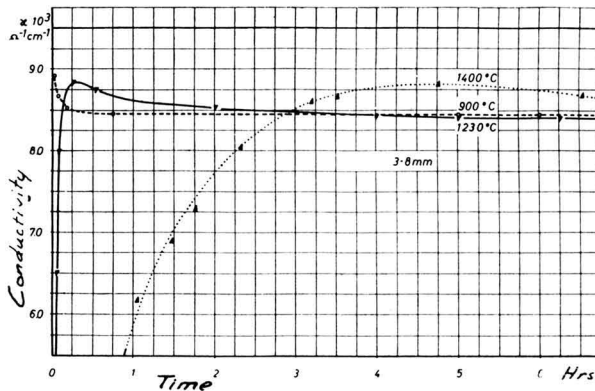


Fig. 2.—Change of Conductivity with Time for Limes Burned at Three Different Temperatures. (Sizes of Particles 3 to 8 mm.)

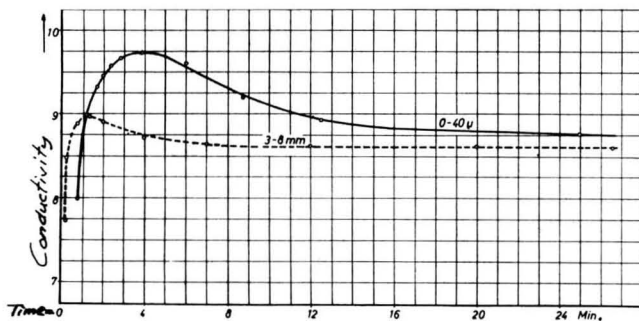


Fig. 3.—Change of Conductivity with Time for Fine and Coarse Grains of Soft-burned Lime (900 deg. C.).

8 to 20 μ , 15 to 40 μ and 25 to 300 μ . Increasing the size of the particles of quicklime resulted in a reduction in the rate of slaking and a lowering of the hump in the conductivity curve representing the maximum degree of supersaturation.

The diagram in Fig. 2 relates to the slaking of limes with grains 3 to 8 mm. in size burned at three different temperatures. The maximum degrees of supersaturation in all cases were almost equal, but they occurred at greatly differing times, namely after about one minute with the soft-burned lime. Fifteen minutes with the lime burned at 1230 deg. C., and 270 minutes with the hard-burned lime.

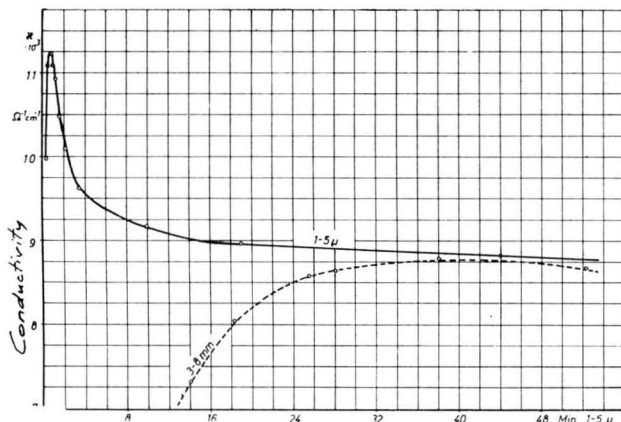


Fig. 4.—Change of Conductivity with Time for Fine and Coarse Particles of Hard-burned Lime, (1400 deg. C.)

The diagram in *Fig. 3* shows the softest degree of burning (900 deg. C.) with large particles (3 to 8 mm.) and small particles (0 to 40 μ). The finer fraction showed a kind of inertia which was attributed to agglomeration after initial dispersion.

The diagram in *Fig. 4* refers to hard-burned lime (1400 deg. C.) with large particles (3 to 8 mm.) and very small particles (0 to 5 μ). The small particles produced a sharp, high maximum within a minute, and the large grains reached a maximum from five to six hours later.

Effect of Burning at Different Temperatures.

Pastes formed by slaking limes burned at different temperatures with grains of 3 to 8 mm. in size were examined with the optical microscope. The maximum sizes of particles of paste formed by slaking limes burnt at the different temperatures were as follows. 900 deg. C., 2 μ ; 1000 deg. C., 3 μ ; 1100 deg. C., 6 μ ; 1400 deg. C., 50 μ , as shown in *Fig. 5*. The majority of the particles, the shapes of which were discernible, consisted of more or less hexagonal platelets, but some deviated considerably from this form.

The electronic microscope showed recognisable hexagonal platelets of 0.5 μ in size, with the majority of particles under 0.05 μ , and with the smaller particles occurring frequently as agglomerates. The highest magnification showed that even the smallest particles were of hexagonal form (*Figs. 6 and 7*).

A determination of the proportion of particles below 1 μ in size was made by shaking a known quantity of slaked lime in a cylinder and allowing it to stand

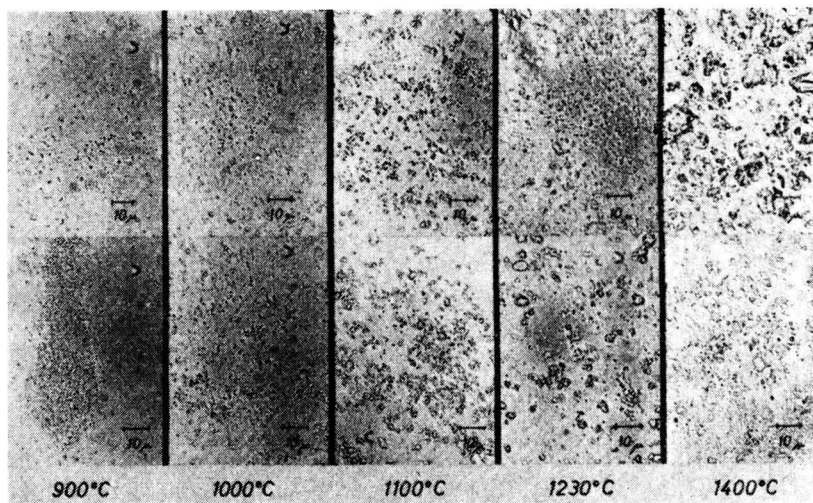


Fig. 5.

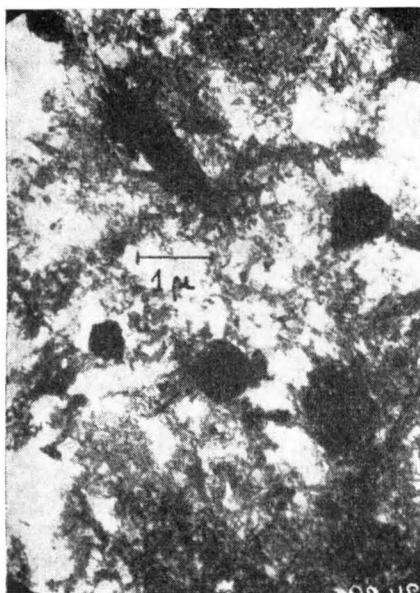


Fig. 6.

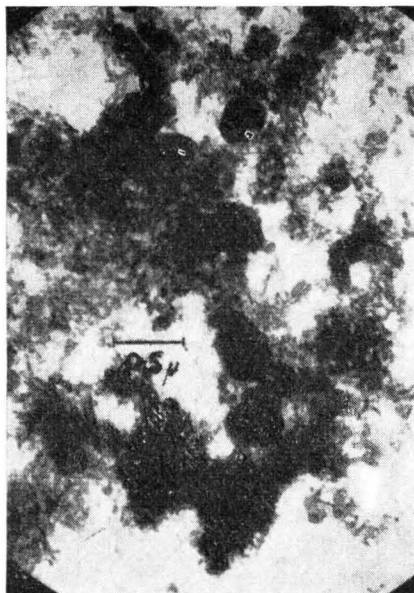


Fig. 7

until all particles above 1μ in size were seen through the microscope to have passed a given line. The liquid above the line contained all particles finer than this. The sediment below the line was shaken with saturated lime-water and the process repeated until the layer above the line remained clear. The approximate values for the proportion of particles less than 1μ in size for limes burned at the respective temperatures were as follows. 900 deg. C., 95 per cent.; 1000 deg. C., 80 per cent.; 1100 deg. C., 50 per cent.; 1230 deg. C., 25 per cent.; and 1400 deg. C., 20 per cent.

Plasticity.

Measurements of the plasticity of pastes of the hydrated lime were made by Emley's method, taking in each instance the mean of three determinations. The Emley values were determined for five pastes from limes, with grains 3 to 8 mm. in size and of different degrees of burning, slaked at 20 deg. C. and at 85 deg. C. (Fig. 8). With limes slaked at 20 deg. C., the plasticity value showed a small increase with degree of burning, but in general they all gave excellent plasticity. Slaking at 85 deg. C. gave poor plasticity, becoming worse as the degree of burning was increased.

Emley values were then determined for different sizes of grains for limes burned at 900 deg. C. and 1400 deg. C., and a soft-burned shaft-kiln lime. These samples were all slaked at 20 deg. C. (Fig. 9). For each type of lime, the finest fractions gave the worst plasticity and fractions between 0.5 mm. and 8 mm.

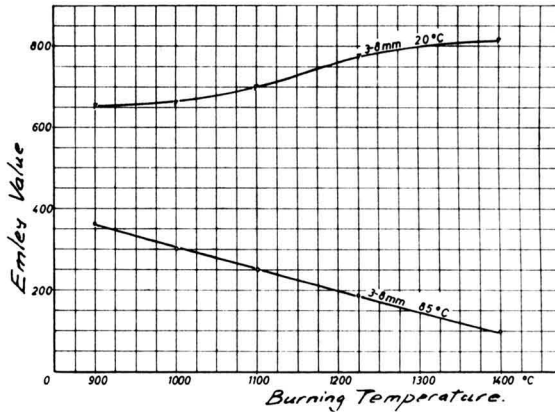


Fig. 8.—Change of Plasticity with Burning Temperature for Different Temperatures of Slaking. (Particles 3 to 8 mm.)

gave the best plasticity. In the range 0 to 0.04 mm., the plasticity with the soft-burned lime was better than with the hard-burned. The best paste was given by the hard-burned lime from 3 to 8 mm. In all cases fractions above 8 mm. caused deterioration in plasticity.

Two fractions, 0 to 0.04 mm. and 3 to 8 mm. of the lime burned at 900 deg. C., and 1 to 5 μ and 3 to 8 mm. of the lime burned at 1400 deg. C., were slaked isothermally at different temperatures and the Emley values of the pastes determined (Fig. 10). With both limes increase in temperature of slaking improved the plasticity of the fine fractions but decreased the plasticity of the coarse fractions.

From the results it can be seen that a lime burned at 900 deg. C. with grains

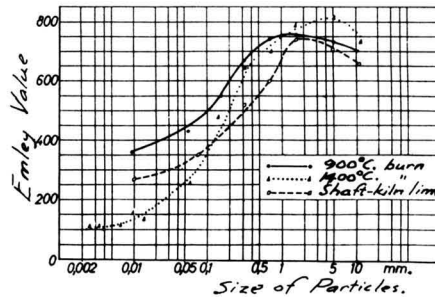


Fig. 9.—Change of Plasticity with Size of Particles. (Temperature of Slaking 20 deg. C.)

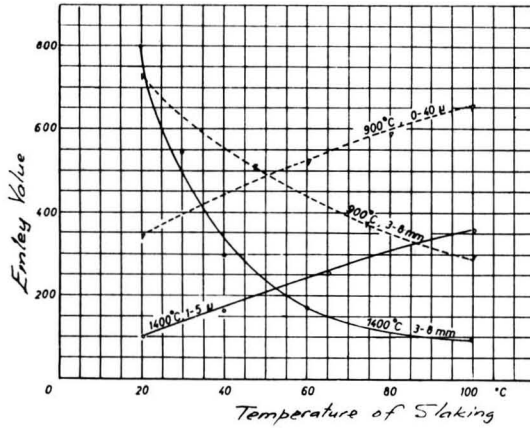


Fig. 10.—Change of Plasticity with Temperature of Slaking for Limes Burnt at Different Temperatures and with Different Sizes of Particles.

of 3 to 8 mm. slaked at 20 deg. C. gave a paste of hydrated lime in which 95 per cent. of the particles are smaller than 1μ and the Emley value of the paste is 750. A mixture of 30 per cent. of this paste with a paste of Emley value of 100 gave a value of 570.

Effect of the Size of Particles on the Strength of Portland Cement.

IN "Zement-Kalk-Gips," September 1960, Mr. B. Beke describes experiments in which fractions of particles of certain sizes were removed from Portland cement and replaced by similar fractions of powdered glass. Mixes made with the resulting material were tested for development of strength. The presence of particles of sizes in the range 0 to 3μ was essential for the development of early strength, but the final strength developed by this fraction was low. Particles larger than 60μ had little influence on the development of strength.

A New Cement Works in Scotland.

The Secretary of State for Scotland has stated that the limestone quarrying and cement works in East Lothian proposed by the Associated Portland Cement Manufacturers Ltd. shall be permitted. A public enquiry was held last year. It is expected that the works will produce about 400,000 tons of cement annually over a long period of years. Permission has been granted for the use of 500 acres of land on the south side of the main railway line. The limestone will be quarried after stripping topsoil and subsoil, but there will be systematic restoration of the land for agricultural purposes and some trees will be planted. East Lothian County Council and Dunbar Town Council welcomed the project, which will give employment to the local population.

International Congress on Cement in Lisbon.

AN International Congress on Cement was held in Lisbon last summer. The papers presented at the Congress include the following.

"Composition of Cements used in Marine Works in the Port of Lisbon." By D. J. L. Ferreira Cardoso (Portugal).

"The Cement Industry in relation to the Requirements of Modern Construction." By H. Lafuma (France).

"Practical Aspects of Grinding of Cement." By J. Rocha E. Mello (Portugal).

"Observations on Testing Concrete." By F. S. Fulton (South Africa).

"The Ferric-anhydrate Phases and the Hydration of Portland Cement." By C. Gorla (Italy).

"Non-shrinking Cement and its general Use." By Fabio Ferrari (Italy).

"The Economic Situation of the North-American Cement Industry especially in respect to the Cement Industries of other Atlantic Nations." By C. B. Baker (U.S.A.).

"The Contribution of the Iberian Cement Industry to the Progress of European Industry." By P. Palomar Collado (Spain).

"The Industrial Perspective in Europe." By A. Iveroth (Sweden).

"High-alumina Cements as Refractories." By P. L'Hopitalier (France).

"Study of Pozzolanas and their Activities." By F. Guye. (Switzerland).

"Metallurgical Cements in relation to the Evolution of the Italian Cement Industry." By G. Malquori (Italy).

"The Possibility of a European Standard for Cements." By P. Palomar Llovet (Spain).

"A Proposal for a European Classification of Cement." By E. Plassmann (Germany).

"A Short Note on the Alite." By G. Haegermann (Germany).

"Scientific and Technological Concepts of Cement." By A. Sarabia Gonzalez. (Spain).

"Correlation of the Resistances to Rupture of Portland Cement Mortars and Concrete." By F. F. Guedes Soares (Portugal).

"White Portland Cement: History, Properties, and Applications." By A. Virella Bloda (Spain).

"The Application of Modern Physical-chemical Techniques to the Rapid Analysis of Cement." By M. do R. Cravo and A. V. De Seabra (Portugal).

"Setting Time of Cement: Critical Examination of some Methods of Determination." By J. M. Tobia (Spain).

"Reinforced Concrete in Sea-water." By F. M. Lea (Great Britain).

"Methods of determining the Heat of Hydration." By L. Santarelli (Italy).

Summaries of the foregoing papers, details of other communications presented at the Congress, and particulars of visits made to cement works, laboratories, and civil engineering works are given (in the Spanish language) in "Cemento Hormigon," No. 320, November 1960.

An Application of Dahl's Equation for Control by Lime Requirement of Cement.

THE following notes on the application, in a modified form, of Dahl's equation to the rectification of the CaCO₃ content of the kiln feed by relating this content to the compound composition of the clinker are contributed by MR. A. D. KILPADIKAR (of Kymore Cement Works, India).

When a slight change in the composition of the raw mixture or coal ash is made or suspected, the desired content of C₃S or C₂S in the clinker can be obtained by correcting the amount of carbonate in the raw mixture in the following manner.

Dahl's equation for the control of the potential C₃S is

$$P = p + 0.07 (A - a),$$

and for the control of the potential C₂S is

$$P = p + 0.074 (b - B),$$

in which *P* is the carbonate required, *p* is the carbonate content of a sample of the mixture, *A* is the desired amount of C₃S in the clinker, *a* is the potential C₃S in the clinker, *B* is the desired amount of C₂S in the clinker, and *b* is the potential C₂S in the clinker.

Two series of tests were carried out, the results of which are tabulated in *Table I* in which the results of actual tests are given.

TEST NO. I.—Column (1) for test No. I shows that the percentage of carbonate in sample A of the kiln feed was 77.1 and that even with this amount, which is slightly higher than normal for the slurry (76.7 per cent.), clinker with a small lime content and consequently lower C₃S was obtained as shown in columns (2) and (7), and would result in lower strengths. This discrepancy was corrected, as a change in the oxide composition was rightly suspected, by utilising Dahl's equation.

The ideal potential compound composition being about (45 to 48 per cent.) C₃S + (26 to 30 per cent.) C₂S, the carbonate content required to bring about a change in the compound composition which would agree more or less with the ideal or desired percentage was calculated as follows.

$$P = p + 0.07 (A - a) = 77.1 + 0.07 (48 - 39.3) = 77.7 \text{ per cent.}$$

TABLE I

Column	1	2							3	4	5	6	7				8	
Test	Sample	Feed CaCO ₃ per cent.	Chemical Analysis of Clinker							Silica Modulus	A/F Ratio	L.S.F. Ratio	Free lime per cent.	Percentage Calculated Compound Composition				Burnability Index
			SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	CaO	MgO	Loss					C ₃ S	C ₂ S	C ₃ A	C ₄ AF		
I	A	77.1	22.48	5.36	3.80	63.0	4.80	0.40	2.45	1.41	0.88	1.16	39.3	35.6	7.8	11.6	2.03	
	B	77.7	22.04	5.10	3.80	63.9	4.50	0.51	2.48	1.34	0.90	1.30	47.5	27.4	7.1	11.5	2.60	
II	A	76.5	23.46	5.44	2.80	63.5	4.45	0.40	2.85	1.94	0.86	1.29	35.1	40.7	9.7	8.5	1.97	
	B	77.5	22.40	5.22	2.70	64.8	4.35	0.36	2.82	1.93	0.91	2.07	46.1	29.5	9.3	8.2	2.63	

Having determined this holding point, maintenance of control was attempted and the results checked. For sample B, it is shown in Column (1) that the carbonate in the kiln-feed was maintained at 77.7 per cent. and the analysis of the corresponding clinker was as shown in Column (2). The results for A and B in Columns (7) show that with the change of the kiln-feed, the desired compound composition was achieved keeping the silica-modulus, and the A : F and L.S.F. ratios within the desired limits, as shown in Columns (3), (4), (5) and (6). The "burnability index" in Column (8), which relates to the clinkering process most suitable for the kiln and burning system available, the suitability of the clinker for grinding, and the resulting physical characteristics of the final product, was also favourably controlled.

TEST No. II.—To achieve the desired compound composition more closely to the theoretical value, the carbonate content of the blended slurry should be within a very narrow range, as seen from the results of test No. II which are given in *Table I*. The difference between the two kiln-feeds in this test was 1 per cent., as seen in Column (1), which should result in an increase of 14 per cent. of C_3S in the clinker of sample B; but it is shown in Column (7) that the difference in C_3S obtained was only 11.0 per cent. This divergence from the theoretical value could not be explained at first but on closer examination it was found that the carbonate content of the slurry used for blending in order to maintain the kiln feed at 77.5 per cent. varied from 70 to 82 per cent. which range is very wide, resulting from an incompletely homogenous mixture.

The two investigations have interesting features. The results in test No. I show a closer agreement between the results obtained and the required results as obtained from the Dahl's equation. The results of test No. II show a slight deviation from the results required, but the cause of the digression is determined.

Estimated Demand for Cement in 1961.

AN estimate of the amount of construction work and materials likely to be required in Great Britain in 1961 has been made by the National Federation of Building Trades Employers. It is estimated that the amount of cement required will vary from 950,000 tons monthly in the first quarter of the year to 1,100,000 tons monthly in the third quarter, the average monthly requirement being 1,025,000 tons. These amounts compare with a monthly average of 995,000 tons in 1960.

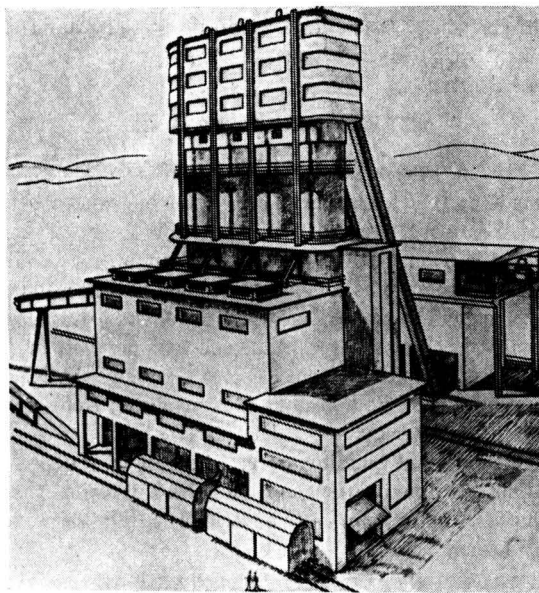
In preparing the estimates, it is stated that "use has been made of recognised mathematical forecasting techniques," but some practical considerations have been taken into account; for example, it is assumed that the amount of construction work will increase by 2 to 3 per cent., and, in the case of cement, the probable increased demand for road construction has been taken into account.

Hungarian Lime Plants in Czechoslovakia.

Two lime plants manufactured in Hungary are now in operation at Zirani and Tisovec in Czechoslovakia. (Five similar kilns have also been supplied to Yugoslavia.) The accompanying illustration shows the general arrangement of the works.

There are four bins, each having a capacity of about 200 cu. m. (262 cu. yd.), for the storage of the limestone and provide a stock sufficient for two days' working. The limestone, which is mainly in large pieces, is fed into the bins by means of external conveyors. Cylindrical feeders are connected to the outlets of the bins, from which the limestone is passed to a screen where material of less than 50 mm. (2 in.) in size and unsuitable for burning is separated. The material remaining on the screen is then passed to a twin-rope skip-elevator. The skip has a capacity of $1\frac{1}{2}$ tons and, when elevated, discharges into an automatic hydraulically-operated bell-shaped cover of a kiln.

A feeder of 8-cu. m. (10.4 cu. yd.) capacity is provided below the bell and is integral with the body of the kiln. There are four shaft-kilns, which are oval in cross-section, and each has a sheet-steel sheath. The principal dimensions of the kilns are 3.3 m. by 5.5 m. (10ft. 10in. by 18ft.) and about 21 m. (69ft.) in height; the working capacity is about 140 cu. m. (183 cu. yd.). Within the sheath, the lining of refractory brickwork extends the full height of the kiln. The burning gases, which are supplied from special generators, are injected through four rows of burners from three ring-ducts. The kiln has a remote-controlled flue-gas louvre



which, with the flue-gas fan, ensures the control of the heating. The preheating of the primary air is carried out by means of the hot lime below the burners, and this ensures that the burnt lime is suitably cooled. Efficient recuperation results in very low heat consumption. The burnt lime is removed continuously from the kiln. The output from each of the four sectors of the kiln can be regulated separately.

The kilns and other equipment are housed in buildings that are partly of reinforced concrete and partly of steelwork. The raw-material bins are connected to the kilns by a steel bridge.

The average production of the four kilns given in the following refers to limestone of larger size in the range from 80 mm. to 150 mm. (about 3in. to 6in.). The total output is 280 tons in twenty-four hours, and is about 90,000 tons per year. The amount of limestone required is 480 tons per day, or about 153,000 tons per year. The limestone has a minimum carbonate content ($\text{CaCO}_3 + \text{MgCO}_3$) of 95 per cent. It is of sufficient strength, exhibits a conchoidal fracture, and is resistant to crumbling during burning. The amount of coal, having a calorific value of 3000 to 4000 k.cal per kg., required is from 136 to 170 tons per day, or from about 40,800 to 51,000 tons per year. The gas-generators require coal of 20 mm. to 40 mm. (about $\frac{3}{4}$ in. to $1\frac{1}{2}$ in.) or 40 mm. to 60 mm. (about $1\frac{1}{2}$ in. to $2\frac{3}{8}$ in.) in size; the permissible maximum moisture content is from 18 to 22 per cent., and the maximum ash content is from 20 to 25 per cent. The coal must not pulverise during the burning process. The heat consumption is from 1000 to 1200 k. cal. per kilogramme (4,000,000 to 4,750,000 B.t.u. per ton) of burnt lime. The electrical power consumption for generators, auxiliary plant and conveyors is about 28 k.W.h. per ton of burnt lime. Total requirements of water are about 8.5 cu. m. per hour (1870 gallons per hour), of which 3.5 cu. m. per hour (770 gallons per hour) has to be softened.

A Large Cement Works in Hungary.

MENTION was made in this journal for July 1960 of the reconstruction of the LÁbatlán Cement Works in Hungary. It was originally intended that the extension of the works, which is twenty-five miles north of Budapest, would be completed in 1962 but more workers have been engaged and completion is expected this year. The new works, which will be one of the largest in central Europe, will increase the production of cement in Hungary from 1,200,000 tons per year to about 2,200,000 tons. The plant is being obtained from Eastern Germany (D.D.R.) and includes three Lepol oil-fired kilns. The limestone is transported from the quarries by a telfer on an overhead ropeway.

The civil engineering and building works, the cost of which represents about half of the total cost of about £9,000,000, includes a riverside port to deal with materials transported to and from a steel works at Sztalinvaros, railways, and a pipe-line 50 miles long.

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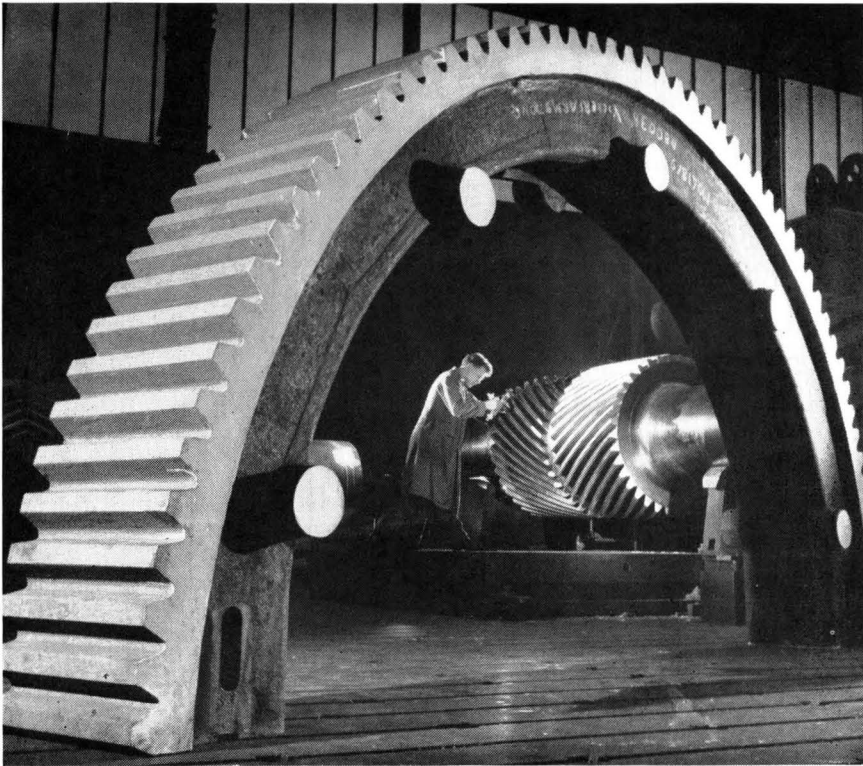
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Equipment for Handling and Transporting Cement and Lime.

Bags of Cement on Pallets.

A MACHINE (*Fig. 1*) for automatically loading bags of cement on to pallets is in use at the works of the Riverside Cement Co., California, and operates in conjunction with new packing and conveying equipment which is described in "Rock Products," September 1960. The Company states that the previous system of packing and loading was expensive and caused delays in fulfilling orders. The cost of loading pallets by hand originally discouraged the Company, but a preference by cement users for bags of cement to be delivered in this way led to the installation of the automatic plant.

The automatic pallet loader can deal with 25 bags a minute. The bags are arranged in tiers of five to eight bags to a pallet according to the capacity of the customer's fork-lift truck. The pallets, which are returnable, are of wood which material is favoured because of its suitability for use with the loader, and because wooden pallets are inexpensive and require no extra charge to be



Fig. 1.

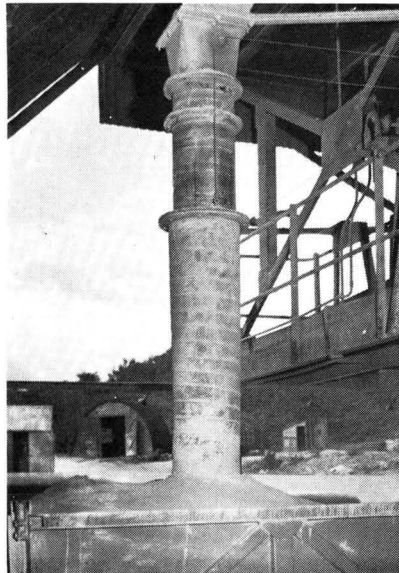


Fig. 2.

made to the customer. The customer claims that with this system time is saved in collecting loads and again when unloading. By stacking the loaded pallets in tiers full advantage can be taken of storage space without the bags being inaccessible to fork-lift trucks. Broken bags are also less frequent. If there is the same number of bags on each pallet, time is saved when checking stocks.

The new packing plant at the Riverside works has a capacity of 48 bags per minute which is achieved by using two automatic packers capable of filling 24 bags; it is hoped to raise the rate of filling to 30 bags by installing automatic valve equipment. An attempt was made to make the operation as simple and clean as possible and to obtain a more accurate control of weight. When filled, the bags are automatically transferred to the conveyors, and by setting the direction of each conveyor, bags can be despatched to any two of the four loading bays in the works. Bags intended to go to the automatic pallet loader pass through a machine which shapes, squares and flattens the bag, which prevents the pallet being loaded unevenly. Correcting points in the conveyor system ensure that all bags arrive at the loading bay with the printed-side uppermost. At the loading bay, fork-lift trucks pick up the pallets and carry them from the automatic loader to lorries which are driven into the warehouse and are loaded from either side. If not required for immediate despatch, the bags of cement are carried by the fork-lift truck direct to the warehouse for storage. If bags of cement are not required to be delivered on pallets, the bags bypass the pallet loader and are carried by an overhead conveyor to the loading bay. The conveyor is installed at such a height as to permit the bags to be dropped on to the lorries. For loading into railway trucks, the bags are despatched to an adjustable conveyor which can be turned through 90 deg. so that the bags



Fig. 3.

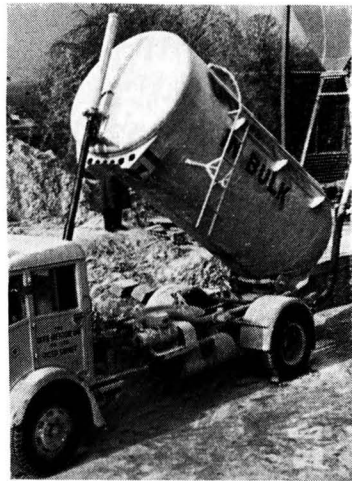
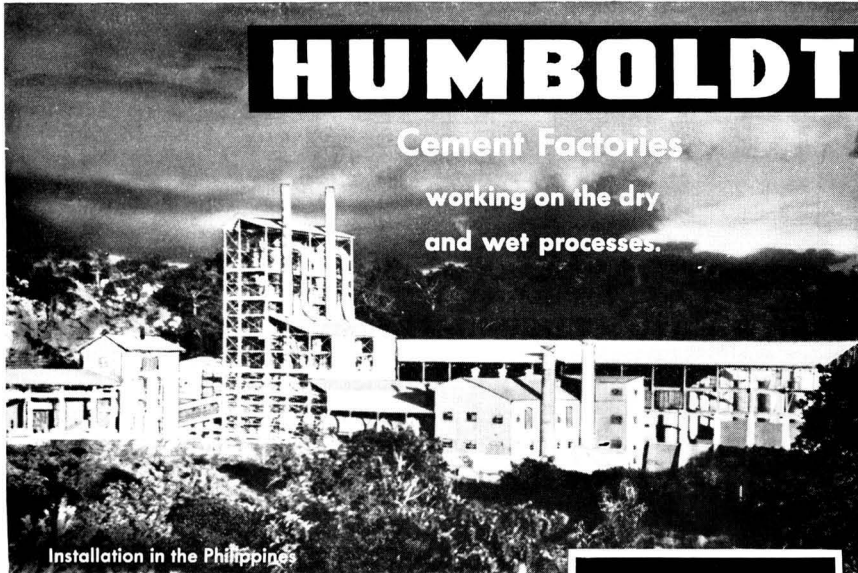


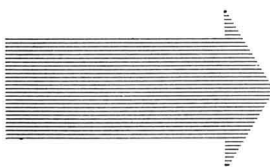
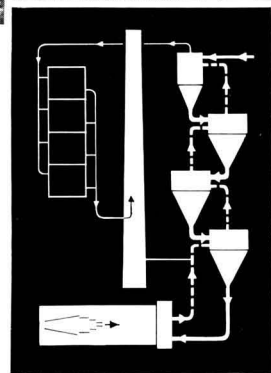
Fig. 4.



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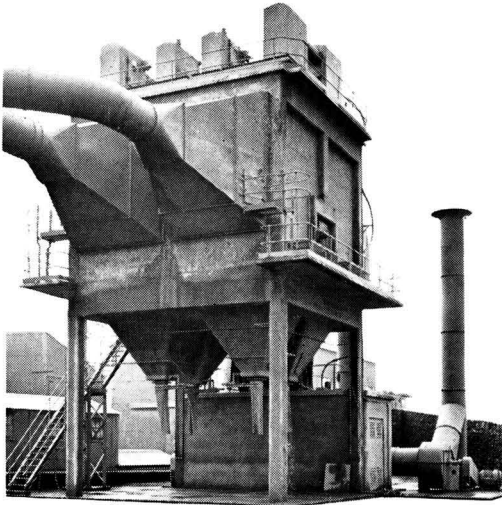
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can be deposited in any part of the truck. It is hoped that eventually the pallet-loading system will be utilized for deliveries by rail.

From July 1959, when the new equipment began operation, to the middle of 1960, the despatch of bags of cement on pallets has increased from 5 to about 40 per cent. of all bags of cement despatched.

A Feed-chute for Loading Open Lorries.

A new type of retractable feed-chute, the life of which is said to be ten times longer than the conventional type, is being used by Ridge Limestone, Ltd., Much Wenlock, for loading lime into open lorries. The chute (*Fig. 2, page 13*) is in two parts, the top section being of mild steel and the bottom section being of a hard-wearing rubber resin $\frac{3}{8}$ -in. thick and reinforced with a helix of impregnated canvas. A rubber washer connecting the two sections minimises leakage. The new chutes replaced others of concertina construction in rubber-proofed canvas, which had an average life of only three to four weeks. The new chutes were installed in January 1960, and are said to be still in a satisfactory condition. The new chutes are called "Fortiflex" and are supplied by the Dunlop Rubber Co., Ltd.

Multiple-compartment Bulk Transporter.

Hitherto, vehicles for the transportation and high-level discharge against gravity of dry powders in bulk, such as cement and pulverised fuel, have had only a single compartment. The Amalgamated Limestone Corporation have now produced a bulk transporter divided into two or more self-contained compartments. The vehicle in *Fig. 3 (page 14)* has two compartments and a total capacity of 425 cu. ft. and is discharging cement into a silo at a ready-mixed concrete plant. With more than one compartment it is not necessary to carry a single large load in order to obtain the advantages of bulk distribution since, not only can different materials be carried, but different customers can be supplied on one journey, provided that the loads are discharged in rotation from the rear of the tank. Efficient discharge is secured with an air pressure of 6 to 10 lb. per square inch.

Transporting Lime.

Lime is now being carried in bulk by The Oxted Greystone Lime Co., Ltd., in the converted vehicle in *Fig. 4 (page 14)*. The equipment comprises a steel tank of frameless construction having a capacity of about 370 cu. ft. The payload is 8 tons of ground burned lime or 5 tons of hydrated lime. Supported at the front by a cradle secured to the chassis the tank is hinged at the rear on a rubber bush. Hydraulic tipping-gear is mounted behind the cab, and a compressor provides the air necessary for discharging the load. The outlet valve and aeration pad are at the rear end. The pressure for discharging the lime and conveying the material to a height of more than 100 ft. is 14 lb. per square inch. The basic vehicle is ten years old and was supplied by Leyland Motors, Ltd. The conversion being made by Interconsult (London), Ltd.

Cement Industry Abroad.

Europe.

Italy.—The production of cement increased from 6,600,000 tons in first six months of 1959 to 7,300,000 tons in the first six months of 1960. The price of cement is officially set by the government and is said to be one of the lowest in Europe.

Hungary.—The production of cement in Hungary in the first half of 1960 was 742,000 tons which is 10 per cent. greater than the output in the first half of 1959.

France.—During the first six months of 1960, cement production in France was 6,959,000 tons, which is 113,000 tons more than in the corresponding six months of 1959.

Greece.—Included in a five-year development plan are two cement works. A new cement works, which will be erected shortly near Salonica, will have an annual capacity of 150,000 tons, and will employ about five hundred workers.

Norway.—A syndicate of three Norwegian cement manufacturers, namely Christiania, Dalen and Nordland, intend to build a new cement works at Molde, West Norway, where there are abundant deposits of limestone.

Africa.

Nigeria.—A new cement works erected by the West African Portland Cement Co., Ltd., at Ewekoro, near Lagos, is the biggest industrial project to be undertaken in Nigeria. The equipment includes a 500-h.p. hammer with a crushing capacity of 200 tons of limestone per hour and a 200-ft. oil-fired kiln. The three partners in the scheme are The Associated Portland Cement Manufacturers Ltd., Western Nigeria Development Corporation, and the United Africa Co., Ltd.

Angola.—The capacity of the cement works at Luanda is now increased to 200,000 tons per annum.

Mozambique.—It is intended to construct a large cement works at Nacala. This will be the third works in this territory.

Ethiopia.—A Yugoslavian contractor is to construct a new cement works near Addis Ababa.

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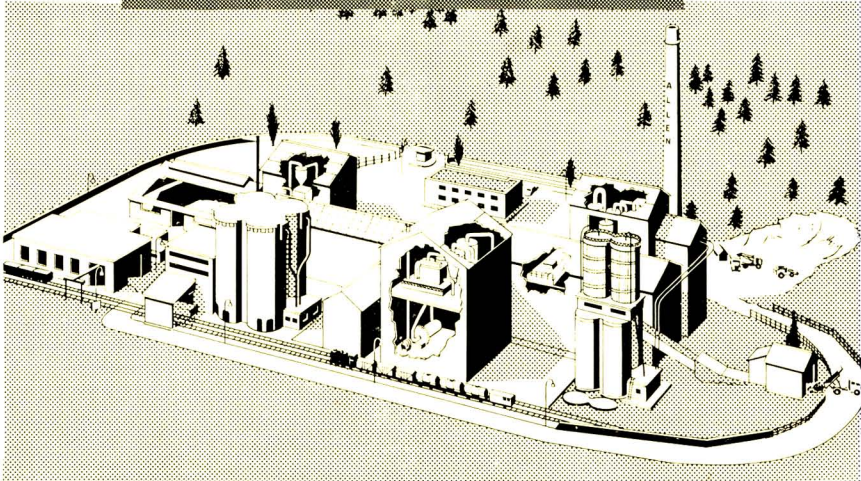
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