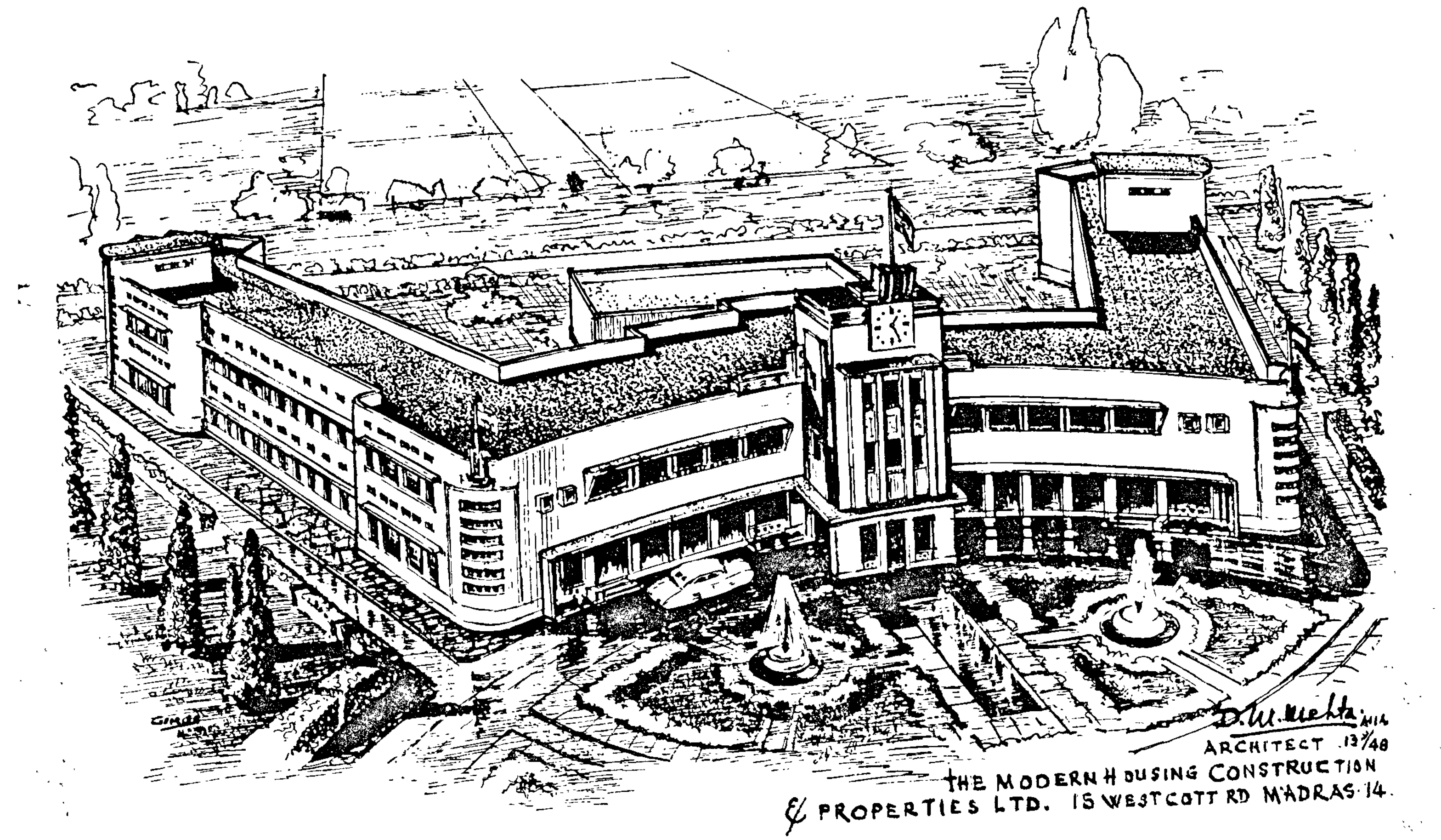
BUILDING GAZETTE

VOLUME 2 | APRIL 15, 1949 | NUMBER 4



H. TUCKER COLLEGE AT PALAMCOTTAH

THE BUILDING GAZETTE

AN INDEPENDENT MONTHLY JOURNAL DEVOTED TO THE INTERESTS OF BUILDING INDUSTRY

VOLUME II — APRIL 15, 1949 — NUMBER 4

Articles, photographs, and drawings with a view to publication will be carefully considered. All such articles and illustration should bear the name and address of the sender, and postage should be sent to cover their return if desired in the event of non-acceptance. All communications on Editorial matters should be addressed to the Editor, and all those pertaining to Advertisements to the Manager, THE BUILDING GAZETTE, 1/11, Mukker Nallamuthu Street, G.T., Madras.

SUBSCRIPTION RATE IN INDIA, PAKISTAN, BURMA & CEYLON IS Rs. 6 PER ANNUM. SINGLE COPIES As. 9 EACH. POST FREE.

THE BUILDING GAZETTE is published on the 15th of each month. Complete copy instructions and Blocks for Advertisements must reach the Office not later than the 31st of the month preceding that in which the advertisement is to appear.

THE BUILDING GAZETTE

1/11, MUKKER NALLAMUTHU STREET

G.T., MADRAS.

EDITED BY T. N. SUBRAMANIAM

Associate, Faculty of Surveyors of England

PRINCIPAL CONTENTS

7 PUBLICITY FOR ENGINEERS
8 NOTES AND TOPICS
10 ALTERNATING OR DIRECT CURRENT?
13 TERRAZZO
14 PLASTICS IN HARDWARE
16 20TH CENTURY TOWN PLANNING
WHAT IS YOUR CIQ?
17 LAW REPORT
20 PLAN OF A BUNGALOW
21 ALCRETE HOUSES
22 WOOD PRESERVATIVES
SOIL MECHANICS
23 NEW METHOD OF WATER CHLORINATION
25 SPECIFICATION
26 CONTRACTS OPEN
RESULTS OF TENDERS
27 PROPOSED NEW WORKS
FOR DISCUSSION
28 EDUCATIONAL
29 BOOKS FOR READING
30 CURRENT WAGES FOR MEASURED WORK

BANKS AND BANKING

INTRODUCED THROUGH THE BUILDING GAZETTE.

Figures indicate the current rates per cent of interest to new investors. Investors are advised to communicate direct with the Bank of their choice so that they may obtain full details of any special advantages which are available.

IN THEIR OWN INTERESTS BANKS ARE REQUESTED TO ENSURE THAT THE JOURNAL IS ADVISED OF ALTERATIONS OF RATES OR CONDITIONS AS AND WHEN THEY OCCUR.

* = *Particulars obtainable only on application to the Bank*
—= *Investments not received or temporarily suspended.*

BHARATHA LAKSHMI BANK: Madras.—RAJAH OF BOBBILI, *Chairman*, 2¾ to 3½.

CALCUTTA NATIONAL BANK: Madras.—S. M. BHATTACHARYA, *Chairman*. 6 months—; 1 year 2½; 2 years—.

EGMORE BENEFIT SOCIETY: Madras.—T. R. VARADARAJA PILLAI, *Secretary*, 1 year 3½.

HINDU BANK: Karur. — K. S. ANANTHA RAO, *Manager*, 6 months 3½; 1 year 4; 2 years 4½.

INDO-COMMERCIAL BANK: Madras.—S. N. N. SANKARALINGA IYER, *Managing Director*, 6 months—; 1 year 2¾; 2 years 3.

KANNIKA BANK, Kodambakkam, Madras.—K. V. MUTHUKRISHNA CHETTIAR, *Managing Director*, 6 months 3½; 1 year 4; 2 years 4¼.

KARUR VYSYA BANK: Karur.—M. LAKSHMINARAYANAN, B.A., B.L., *Secretary*, 6 months 3½ : 1 year 4½ : 2 years 4.

KUMBAKONAM BANK: Kumbakonam.—S. MAHALINGA IYER, B.A., B.L., *Managing Director*, 6 months 3; 1 year 3; 2 years 3¾.

LAKSHMI VILAS BANK: Karur.—V. S. N. Ramalingam Chettiar, *Chairman*, 6 months *; 1 year 4½; 2 years 4½.

MADRAS MUTUAL BENEFIT PERMANENT FUND 69, Big Street, Madras 5. — V. THIRUMALA IYENGAR, *Secretary*, 1 year 4; 2 years 4¼.

MADURA MERCANTILE BANK: Madras.—K. M. S. LAKSHMANIER, *Chairman*, 6 months—; 1 year 3; 2 years 3½.

SOUTH INDIA BANK: Tinnevelly.—6 months 2½; 1 year 2¾; 2 years 3.

TRAVANCORE BANK: Trivandrum.—Dr. LUDWIK ARONSON, *Managing Director*, 6 months*; 1 year*; 2 years—.

BUYERS' GUIDE

FOR	SEE PAGE
ALDROPS	3
ASPHALT MIXERS	2
BANKS	6
BOLTS	3
BOOKS	29
BUILDERS	31
BUILDING TRADES EXHIBITION	Back Cover
CONCRETE MIXERS	2
CONTRACTORS	31
HINGES	3
HOISTS	2
KNOBS	3
KNOCKERS	3
METAL WINDOWS	Inside Front Cover
PAPER	31
PREFABRICATION	1
PRINTING	32
PUMPS	2
PUNCTURE SEALER	32
PLYWOODS	2
RAWL PLUGS	2
ROLLING SHUTTERS	31
ROLLER PAN MIXERS	2
ROOF TRUSSES	1
TILES	Inside Back Cover
TIMBER	2
WINDOW HANDLES	3

PUBLICITY FOR ENGINEERS

There is to-day an increased conviction among several engineers that they could be better used on the national reconstruction schemes.

If this is true, its significance should largely control their future policy—if they really intend to have a policy.

For just as politics may be divided into internal and external affairs so must the activities of a profession. Judged in this wider way engineers make poor showing. It is a dignified and authoritative profession. But it does not touch the public imagination.

To-day, when constructive nation-wide planning is on the anvil, the number of engineers capable of taking part in it is negligible. As is generally known, whenever a specialist is sought after, he is asked not who would do the job best, but who has done most jobs of the same kind.

On the other hand, if we are not yet eager for the best, our grumblings show that we are becoming impatient of the worst, and to all grumblers we wish to make a constructive suggestion.

And that is, senior engineers can do an enormous amount of good to their own profession, vis-a-vis themselves if they secure publication of their designs, construction methods and their project histories for prominent schemes and expose to technical discussion.

Secondly, engineering cannot thrive without a constant supply of ideas, and the most fertile ideas will often be found in the heads of young and unknown men. For that, competition is the only door that can always be kept open to the unknown man who has something to give that the world of engineering needs.

Thus through the former specialists come to lime-light and through the latter new men move to the moon-light.

It is not denied that engineers regarded singly are men with their living to make, but collectively they too may hope to be educators and to some degree reformers.

We are, therefore, convinced that the best approach they can make to reform the profession will be by persuading their comrades to promote common welfare by means of common exertion.

NOTES & TOPICS

The C.P.W.D. News: Contractors' Claims.

The Government of India, it is learnt, have set up a Negotiating Committee in the Central Public Works Department to go into disputed claims of contractors in respect of works carried out during the period December 1941 to March 1946. This step has been taken to avoid litigation in courts. The Committee will consist of three members, namely, Mr. H. P. Sinha (Chairman), Mr. Ranuq Lall, Deputy Accountant-General, and Mr. S. T. Advani (lately an officer of the Sind Judicial Service) who will be the legal member of the Committee. The Committee is required to submit monthly progress reports to Government, and will function for six months or till all the cases referred to it are disposed of, whichever is earlier.

Rural Reconstruction.

The very fact that discussions and experiments on Rural Reconstruction are still going on is evidence that no satisfactory solution has yet been reached. This problem is not yet solved. Further thought and experiment are still needed.

Very many factors are involved. There has so far been little attempt to evaluate the relative importance of the four main groups of these factors, viz.—

1. The social and economic needs of the villagers;

2. the facts of the natural and human geography of the village;

3. the technical, economic and social features of its culture, and

4. its geographical, political and economic relations to other villages.

Calcutta Sample Survey.

In pucca buildings no less than 69.5 per cent of families are in a worse position than those living in bustees from the point of view of congestion, according to a sample survey of Calcutta made by the West Bengal Government's Statistical Bureau.

About 81.65 per cent of the total population—mostly middle class Bengali families—are huddled in three-room tenements in pucca houses at a ratio of 3.87 per room. In tenements of the size in bustees the corresponding figure is 3.79.

The sample survey, done by 28 investigators in 300 man-days after interrogating 5,952 families living in 1,454 holdings, found that 89.63 per cent of the population in pucca buildings paid a rent per room ranging between Rs. 12.4 and Rs. 18.90 per month in tenements of one to four rooms. Over 47 per cent of residents in pucca buildings live in single rooms. Among bustee dwellers 87.80 per cent live in one room per family and on an average 98.11 live in one to four room tenements and pay from Rs. 5.85 to Rs. 10.20 per room.

Competition Results.

The expert committee set up by U.P. Government to judge the various designs received for the standard model quarters for labourers in industrial areas in U.P. have reported that the quality of the plans submitted were not up to their expectations and have recommended, therefore, that the third prize of Rs. 250 and a consolation prize of Rs. 100 only need be awarded. These prizes are accordingly being awarded to Manohar Lal of Meerut and T. S. Soorma of Kanpur, respectively whose designs were judged to be the best among those submitted by the competitors.

Discount on Estimates.

Nowadays it has almost become a practice amongst employers of contractors to ask the latter to reduce *some* amount from a previously-framed and priced estimate so as either to bring the total amount to an anticipated figure or what is called a "discount" on the accepted estimate. When the question of extras occur, this discount is sometimes taken off the estimate as a minus percentage on each and every rate of the estimate. Care should be exercised while giving such discounts to state that it is a special discount without affecting the "extras".

Foreign Education.

The Education Minister, Moulana Azad, indicated in reply to Mr. Mahavir Tyagi in the Union Parliament that foreign education was cheapest in Australia and New Zealand and dearest in the U.S.A. The average estimated expenditure on each scholar calculated on a 2½-year basis, he said, was Rs. 28,000 for the U.S.A., and Rs. 14,000 for Australia and New Zealand. Expenditure in the U.K. was Rs. 19,000.

Liquid Linoleum that Never Cracks.

Laying a linoleum covering to the floor is likely to present, it is learnt, less problems in the future. A London firm has developed a liquid composition, called "Fleximer", which is considered to be even superior to linoleum in some respects. The new method consists of simply pouring "Fleximer", a quarter-of-an inch thick, over the floor and leaving it to dry for 24 hours. It can then be polished and looks just like real linoleum. It has the added advantage that no cracks appear as in the case with strips of ordinary linoleum.

Zinc Spraying for Rust Prevention.

While hot-dip galvanizing has been for many years a recognised method for protecting metal surfaces exposed to weather conditions, zinc spraying is a more recent departure. It is being extensively used for the protection of ship's hulls after cleaning them down by grit-blasting. The zinc spraying pistol follows closely behind the shot-blasting so that the metal is coated before it has time to tarnish. A coating of '004 inch of zinc is usually applied, although in certain circumstances it may be increased to ensure longer life.

The links of the chains of the suspension bridge over the Menai Straits, North Wales, for example, were sprayed in 1939 with two coats of zinc from about '005 inch to '006 inch thick. The links were zinc-sprayed after shot-blasting, and spraying was followed by an under-coating of red-lead paint, after which the links were stored in the open until erected about a year later. At this stage, a further lead priming coat and a finishing-paint coat were applied.

Recently, a party of engineers visited the bridge to inspect the condition of the steelwork after exposure for some nine years to a moist salt-laden atmosphere.

They found that the links though not treated in any way since 1940, not only showed no trace of rust anywhere, but the condition of the original paint was excellent.

While the finishing coat had certainly become thin and "dusty" in many places, the two undercoats appeared to be in perfect condition and firmly adherent on every part of the links. The protection afforded by a zinc-sprayed deposit and the value of such an undercoating in preventing the spread of rust beneath a painted surface are thus clearly demonstrated. As there has been no need for any maintenance work on the links, the original cost of the spraying is considered to have been justified.

Heavy Duty Fixing Device.

One of the latest of fixing devices is the 'H' type Toggle, designed for use where it is necessary to have reinforced bracing at the inaccessible rear of a wall. The method of fixing is simply to drill a hole right through the wall. The toggle is inserted fixed horizontally on a bolt, on reaching the void the toggle drops into a vertical position. When the fixture is tightened up the toggle is drawn against the back of the wall to take the strain.

Cracks in Lloyd Barrage.

The Lloyd barrage at Sukkur completed in 1932 at a cost of Rs. 16 crores has developed cracks in 10 piers out of the total of 65.

The Sind Government is securing the expert advice of Prof. Hellstrom, Dean of the Department of Civil Engineering at the Royal Institute of Technology, Stockholm. Prof. Hellstrom is at present in Pakistan preparing hydro-electric schemes for the Dominion.

Inquiries show that all the work above the water level has been done in fat lime instead of hydraulic lime to effect economy. But the economy of about Rs. 100 lakhs effected then is proving costly now.

Maintenance, however, may have been somewhat at fault. In any case, the present reported damage emphasizes the need to take even greater care in future of this structure.

BULLDOZERS IN LARGE-SCALE TRACK RELAYING

Over two weekends engineers of the London Midland Region of British Railways have laid 3,660 yards of pre-fabricated track in the mile-long Watford Tunnel, between Watford and Kings Langley, Hertfordshire. Eight bulldozers were used for the first time in this type of work. Picture shows gear for relaying the track at Watford going into the tunnel during the weekend.

ALTERNATING OR DIRECT CURRENT?

*J. E. BREWIN, A.M.I.E.E. and JAMES F. DRIVER, M.I.E.E.

A Review explaining the Advantages and Disadvantages of the two systems of Supply

ALTERNATING CURRENT
(J. E. Brewin).

A Brief Recapitulation of Terms.

The Term "Alternating Current" is used with reference to a current the magnitude and direction of which are constantly changing in a periodic manner.

The Generation of an Alternating Electromotive Force takes place in a circuit when the flux linkages vary in a periodic manner. In the alternator, the magnetic poles may be stationary while the armature conductors are rotated beneath them, or, the armature conductors may be embedded in slots on the inner face of a cylindrical stator while the magnetic poles of the rotor are revolved within the stator.

The Frequency of an alternating current is the number of cycles or complete changes in the current

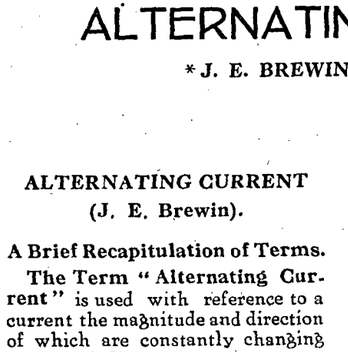


Fig. 1. The R.M.S. value of a sine wave.

recurring per second. The frequency of supply in Britain is now standardised to 50 cycles per second.

The Wave Form is the shape of the graph showing how the instantaneous values of the periodically changing quantity vary with time. The ideal wave form of e.m.f. is a sine wave and this is closely approached in the wave form of modern turbo-alternators.

The Average Value of an A.C. wave taken over one complete cycle is zero, but if the average value be taken over half a cycle it will be found to depend on the wave form. The average value for a sine wave when taken over a half cycle is 0·637 of the maximum value attained, while for non-sinusoidal waves the average will be greater or less than this value quoted according as the wave is less or more peaked than a sine wave.

The Effective or R.M.S. Value.—If the same amount of heat be developed in a given resistor, over a given period of time, by the passage of either A.C. or D.C., then the effective value of the A.C. is of exactly the same value as the D.C. For a sine wave the effective or R.M.S. value is 0.707 of the maximum value (Fig. 1).

Alternating current apparatus having marked advantages over Direct Current include:—

The Transformer.

We have in the transformer a piece of electrical machinery of unique value. It is static, there being no friction losses nor moving parts to maintain. It can remain connected to the supply when the secondary is unloaded, the power consumption on no load being extremely small. Once switched on, it requires little further attention. Large transformers may have efficiencies of 98 per cent or more, representing considerable saving.

A simple transformer comprises two separate coils of insulated copper wire, of negligible resistance, having a magnetic circuit of special steel sheets which is common to both.

The reactance of the primary winding is high, consequently little current and power are taken if the secondary winding is open circuit. The alternating flux due to the primary current induces an e.m.f. in the secondary winding just as it does in the primary winding. These e.m.fs. both lag 90° on the flux, hence the secondary voltage is antiphase to the applied primary voltage. The voltage transformation ratio is the same as the corresponding turns ratio if there is 100 per cent coupling between the windings.

When the transformer supplies a load, the current flowing in the secondary winding sets up a flux in opposition to that due to the primary winding, and the lowering of the primary reactance results in more current being taken from the supply to provide power for the output and the increased losses. If the losses in the transformer, which on full load only amount to a few per cent of the output, are neglected, then the output is equal to the input and the current transformation ratio is the inverse of the voltage transformation ratio. By using suitably designed windings this useful piece of static machinery enables the output voltage to be raised with corresponding reduction in output current or permits greatly increased current output at correspondingly lowered voltage.

The Polyphase System.

The term polyphase is applied to a system or apparatus in which there are two or more alternating voltages which are, usually, but not necessarily, displaced in phase with regard to one another by equal portions of a period.

Three-phase systems are in common use, the voltages in the three separate windings of such machines being mutually displaced by one-third of a cycle.

The adoption of polyphase systems offers such advantages as :—

(1) More efficient use of the active material in machines. The output of polyphase machines being greater than that of single phase machines of the same physical dimensions.

(2) Rotating magnetic fields can be produced by the use of stationary coils and this phenomenon is used in the three-phase induction motor.

(3) In general less conducting material is needed in transmission lines.

The Generation of High Voltage and Transformation to E.H.T. is a Practical Proposition.

The efficient transmission of electrical energy over long distances requires the utilisation of high voltages, since for a given kVA. the use of small currents at high voltages results in less I^2R loss and the consequent employment of less conducting material than would be the case if heavy currents at low voltages were employed. The smaller conductor section represents a saving in initial cost.

The Generation of High Voltage is a practical proposition, the alternator being inherently more suitable than a D.C. machine for this purpose. The rotor of a large alternator comprises the magnetic poles which are continuously excited by current from a D.C. generator, known as an exciter, this auxiliary machine being mechanically coupled to the rotor.

The armature winding is embedded in the stator, so there are no live moving parts connected with the output and consequently the outgoing conductors can be adequately insulated to give ample protection against shock. Output voltages of 6,600 V., three phase, are commonly employed.

Transmission Line Voltages of the order of 132 kV. are quite readily obtained by the employment of step-up transformers at the feeding end, while a return to lower voltages is effected at the receiving points by the use of step-down transformers. A degree of voltage control is obtainable by tap changing. Overhead lines are cheaper than cables and more easily accessible for repair, and can be easily operated at high voltages.

Distribution is facilitated by the Use of Transformers.

The electricity supply to a town may be generated locally at say 6.6 kV. or received from the high tension lines of the Grid and transformed to 6.6 kV. at the main sub-station. A number of transformer sub-stations or kiosks, erected at suitable points in the town, house transformers, the primaries of which are fed from the main sub-station via 6.6 kV. cables, while the low tension secondaries feed three phase, four wire distributors providing three phase 400 V. supplies for motors and 230 V. single phase for service mains to domestic consumers. The heavy currents are confined to the local L.T. mains.

It will be recognised that in the sub-stations of an A.C. supply system, the machinery employed comprises highly efficient transformers having losses of the order of 2 or 3 per cent operating with lower running costs than with motor generator plant which might give losses in the order of 10 to 15 per cent and would need attention. Transformers have no moving parts requiring maintenance and they can be left unattended, hence a further saving in wages. Transformers are almost silent in operation by comparison with, rotating machinery, thus causing a minimum of disturbing noise when used in sub-stations situated in residential districts.

Application of Transformers for Low Voltage Heavy Current Work as in Butt and Spot Welding.

Resistance welding consists of passing an electric current through the joint between two or more pieces of metal and applying mechanical pressure sufficient to join them together when the temperature has reached the value which makes the surfaces in contact become plastic. For example, **spot welding** is employed to join sheet metal strips, wires, etc. It is used as a substitute for rivets, bolts, machine screws, etc. The spot welding process may be carried out using water cooled copper or copper alloy electrodes to pass currents of several thousand amperes, at a few volts, through the joint. Such supplies as 5,000 A—6,000 A at from 2 V. to 16 V. are conveniently obtained by transformer action. Large sets may include 350 kVA. transformers capable of delivering welding currents up to 30,000 A.

Machines for the butt welding or joining pieces of metal end to end and those for the process known as Seam Welding make use of step down transformers capable of giving large output currents at low voltage.

For the production of large currents at low voltages used in the intermittent operation of such plant, there is no machine so adequately suited as the transformer, apart from the fact that a D.C. generator for this purpose might present design problems, etc., the losses both "off load" and "on load" and the maintenance expenses would be considerably greater if a motor generator

* Extracts from lecture to the Nottingham Society of Engineers.

were used instead of apparatus working on the transformer principle. A.C. equipment would be more portable than D.C. plant of similar capacity.

The Characteristics of Alternating Current Motors.

In all A.C. Motors as well as D.C. Motors the torque is produced by the forces resulting from the interaction between current carrying conductors and the magnetic field in which they are situated.

The currents flowing in the rotor windings of an A.C. motor may be actually taken from the supply, or they may be induced therein by transformer action between the stator and rotor windings, in which case the machine is known as an induction motor.

The Squirrel Cage Induction Motor is simple, cheap and robust; it has no commutator, slip rings, or bushes, and consequently requires a minimum of maintenance. The currents in the stator windings of a three-phase induction motor give rise to a magnetic field of almost constant amplitude with an approximate sinusoidal distribution over the pole pitch and which travels round the stator at synchronous speed; that is, it moves through two pole pitches per cycle.

Copper bars embedded in the slots of a laminated rotor and having their ends short circuited by heavy copper rings, from the squirrel cage.

The rotating field of the stator induces e.m.fs. in the rotor bars causing circulating currents to flow therein, and the resulting forces exerted on the rotor conductors cause it to rotate in the direction of rotation of the stator field.

It is obvious that, as the rotor accelerates, the frequency and magnitude of the induced currents fall and the rotor can never run at synchronous speed but must slip or lag behind sufficiently to permit the induction of sufficient e.m.f. to produce the current necessary to provide the driving torque. A small e.m.f. will suffice to circulate full load current in the low resistance rotor, so that the fall in speed between no load and full load is not great, say 5 per cent in a small machine and 2 per cent in a large one, hence the machine exhibits a shunt type of characteristic.

A reversal of rotation is effected by reversing or interchanging the connections of two of the supply leads. Machines may be started by auto transformer or star delta switching. Improved starting conditions are obtained by the use of a double squirrel cage arrangement.

Squirrel cage motors are suitable for small power drives where almost constant speed is required. They are well suited to use in explosive atmospheres since there are no bare moving live parts. Such a motor coupled to a rotary pump can be submerged. Machines of this type can be made up to 300 h.p. Being of simple construction squirrel cage motors are much cheaper than Direct Current motors of equivalent output.

The Slip Ring Induction Motor employs a wound rotor with slip rings enabling the insertion of external resistances in the rotor circuit to improve starting conditions, the resistance being reduced to zero as the machine is run up to speed. The insertion of the resistance on load gives speed control but with poor efficiency. Such machines are suitable for most industrial drives up to high powers say 10,000 h.p., where speed control is unnecessary. They might cost up to 1.5 times that of the squirrel cage type.

Small Single Phase squirrel cage motors are started by one of the methods of phase splitting whereby a form of rotating field is produced by the inclusion of a suitably placed starting winding carrying current in quadrature with that in the running winding.

A Synchronous Motor runs at absolutely constant speed irrespective of the load, provided that the supply frequency is constant. Such machines require D.C. excitation and they must be run up to just a little more than synchronous speed by means of a pony motor and then synchronised to the A.C. supply or they may be provided with special damping windings in the pole face for starting purposes.

Synchronous motors can be made up to 10,000 h.p. and 15 kV., their cost being about twice that of the squirrel cage type of similar rating. Such machines running at constant speed, can withstand up to 100 per cent overload without falling out of step, and have reasonable starting characteristics.

What may be of outstanding importance is that they may operate at unity power factor or at a leading power factor and so help to improve the power factor of a system.

The Synchronous-Induction Motor starts as a slip ring machine and when up to speed D.C. is fed to the rotor making it run as a synchronous machine with the advantages of such. On too great an overload the speed falls, the machine then runs as an induction motor.

There are other forms of A.C. motors, employing commutators in which starting, reversing and speed control are obtained by shifting the brushes.

A.C. Traction.

It is a fundamental fact that the direction of the force acting on a current carrying conductor placed in a magnetic field is unchanged when the direction of both the current and the field are changed simultaneously. It follows that the direction of rotation of a D.C. series motor would be affected by rapid reversals of the polarity of the supply and moreover such a machine would run on A.C. though with reduced efficiency and increased commutation trouble. A.C. series motors have laminated magnetic circuits throughout and

(Continued on page 18)

TERRAZZO

Ordinary terrazzo is a form of concrete in which marble chippings are used as the aggregate, the surface being ground to a smooth finish. The marble chippings vary as to colour and size according to the purpose for which the terrazzo is to be used, the grades being 3/32, 1/8, 1/4, 3/8 and 1/2 inch. The cement may be grey, white or coloured. If the user wishes to mix his own colours, this should be done in a ball or roller mill, as hand mixing tends to give unevenness of tone. Coloured cements can, however, be bought ready mixed by the manufacturer.

Various proportions are used in making terrazzo, according to the grade of chippings chosen. Some suitable proportions are:

Grade 0.—1 part cement, 2½ parts 3/32-inch chippings.

Grades 1 and 2.—1 part cement, 3 parts 1/8-or 1/4-inch chippings.

Grades 3 and 4.—1 part cement, 2½ parts 3/8 or 1/2-inch chippings.

If a mixture of chipping sizes from 1/8 to 1/2 inch is used the proportions should be 1 part of cement to 3 parts of chippings. The mixture should not be richer than 1 to 2½.

Coloured terrazzo may be red, pink in red, white in red, white in black, white, and black speckled, red in brown, black in white, and black in green. These mixtures are obtained by using coloured aggregate, cement and a suitable pigment, such as red oxide for reds and pinks, and black manganese for black.

The mixing of the materials for terrazzo work needs great care as segregation of the coloured aggregate in patches destroys the effect. For this reason mechanical mixing in special machines devised for the purpose, which have blades with a lifting as well as a rotary movement, are to be preferred to mixing by hand. On small-scale work, however, hand mixing is a far more economical proposition. This should be done in a trough or tub, the chippings being well mixed first, then the coloured cement added and the whole mixed dry, care being taken to prevent the materials getting into a heap, as in this case the larger chippings fall to the edge of the heap and the cement works into the centre at the bottom. When thorough dry mixing is completed the water should be added from a hose or watering-can with a fine nozzle, the materials being worked all the time until the requisite consistency is attained; this occurs when the mix is plastic but not wet enough to flow. It has been found that, for instance, a mixture of 28 lbs. of chippings of grades 0 to 4 with 11¼ lbs. of cement requires about 4¾ pints of water.

Certain precautions are to be recommended in the laying of terrazzo work; these being chiefly designed to minimise the risk of contraction cracks. Joints are essential, and should be made to coincide in position with joints in the base, so that movement of the base will not initiate new cracks in the terrazzo topping but merely enlarge the already existing joints. Terrazzo topping should not be allowed to join the walls directly; it has been recommended that strips of untarred roofing felt should be inserted against the walls. Joints should enclose panels of not more than 12 square feet in area.

In the laying of the terrazzo flooring; a layer of 1:3 mortar 3/8 inch thick should be placed on to the base, and the terrazzo mix on to this, the usual thickness of the topping being 3/4 inch. When the terrazzo has been screeded level it is rammed to ensure consolidation, and then trowelled. Rolling, though easier to carry out, is not recommended as it tends to increase the likelihood of cracking by drawing cement to the surface of the mix.

If the floor is to have a border or decorations these should be carried out before the main part of the terrazzo is laid; wooden or metal strips or decorative brass stencils are used for the purpose. The mix for the decoration should be of the same proportions as the main part of the topping, otherwise cracking is likely.

Polishing of terrazzo is easier to carry out the sooner it is done, but the actual time will depend on the materials, the proportions of the mix and the weather, the normal time being 3 days. The mix should never be allowed to get dry between the time of laying and the grinding, and a small amount of the mix should be kept in reserve to make good the small holes which are formed in the surface during grinding, by the tearing out of some of the chippings.

Grinding is preferably done by suitable machinery, but it can be done by hand in small jobs. The first process is carried out with coarse carborundum brick or disc and a good supply of water. The surface is then scrubbed with water to remove all traces of the grinding mud, and small pores and holes are filled, the mix being well pressed in with a trowel, allowed to stand a little above the surface of the floor, and kept damp.

Five days later the second grinding should be carried out. This is done with a disc of finer grain. Unless there are further faulty patches to be repaired no third grinding should be necessary.

After the final grinding, the floor is washed with hot water and pure soft soap, and after it has dried, polished with a little wax. The wax serves to prevent the marble chippings from absorbing dust.—(From 'Builder's Materials' by Bernard H. Knight, D.Sc., Ph.D., M.I.C.E., F.R.I.C.S., M.I. Struct. E. and Rena G. Knight, M.A., M.Sc., D.I.C.).

PLASTICS IN HARDWARE

E. L. MERRITT

TWENTY years ago plastics were but little known generally, and in the hardware trade they were something quite new. (Celluloid and shellac, which are plastics, have been used for a variety of purposes for many years, but they were not known under the term "plastics".) It was, in fact, only a few years before the last war that the word became generally used. Before that, the public and many people actually handling plastics described them all as *Bakelite*, an understandable error because there was not much publicity or advertising, except by the makers of the phenolic moulding material with the word *Bakelite* as a brand name. This name was taken from that of Dr. L. Baekeland, who discovered phenol formaldehyde resin in 1908, and it was this discovery which was the starting point in the history of modern plastics.

The rapid growth of the plastics industry is undoubtedly linked with the growth of the electrical and radio industries, and even today these two great industries are probably the largest users of plastic materials. In the hardware trade plastics have been taken into use quite naturally and without any very spectacular applications, to such an extent that they have been taken for granted. In fact, it is doubtful if the average hardwareman realises just how much of his stock is of plastic material. To give just a few examples there are door handles, door furniture, cupboard knobs and turns, letter plates, lavatory seats, trays, bathroom fittings, locksets, clothes pegs, cabinet handles, ventilators, bathroom cabinets, kitchen utensils, picnic-ware, numerals, w.c. cisterns, hat and coat hooks, sinks, tool handles, draining boards, etc. In addition, it will be noticed that nearly every piece of hollow-ware, most kitchen cabinets, and practically all the grates, ranges and boilers are fitted with plastic knobs and handles.

For the store which also handles electrical goods, the list lengthens considerably, for it is rare to find any switch, plug, socket, lamp-holder or ceiling rose which a not made from plastics; additionally there are lampshades, tables lamps, clock cases, iron handles and vacuum cleaner parts all in plastics. Should there also be a radio department, plastics will be much in evidence in cabinets, speakers, valve holders, control knobs, and in numerous other components.

Generally speaking, where plastics have replaced older materials they have achieved this on their own merits, which can be summarised as follows: A greater scope in design and colour, lighter materials which are warm to the touch, comfortable to handle, possessing excellent insulation against heat and electricity. Plastics are rustproof, rotproof, untarnishable and therefore most suitable where adverse climatic conditions prevail. In common with everything he handles, the enterprising salesman will desire an adequate knowledge of this newest material. It is particularly necessary in this case, since the man in the street will inevitably know little but will nevertheless show considerable interest, and ask elementary questions which will need at least a working knowledge of the subject on the part of the salesman for him to satisfy his client.

The popular conception that plastics are made from milk is correct for one type only, casein, but this is not commonly encountered in the hardware trade. Another conception that plastics are produced from coal, air, water and limestone is nearer the truth, as most plastics, other than casein and cellulose, are derived from them. Behind the production of all plastics is a great deal of chemical research, the chemical industry being responsible for providing the raw materials. The fabrication of the raw materials brings in the engineering industry, including the plant manufacturers, the toolmakers and the moulders themselves, while electrical engineers provide the apparatus for preheating the materials.

There are about 24 distinct types of plastics with literally hundreds of varieties, but generally speaking, all plastics fall into two groups—the thermoplastic group and the thermosetting group. Thermoplastics soften on heating and harden on cooling, and the process of softening by the application of heat can be continually repeated. In other words, thermoplastics undergo only a physical change in the moulding process. Thermoplastic mouldings can also be produced from sheets, first softened by heat and pressed in a heated die, which is then cooled by water. One of the new plastics, methyl methacrylate, more commonly known under the trade name "Perspex", is fabricated in this manner, and the most recent development lies in the use of wooden templates instead of steel dies.

On the other hand, thermosetting plastics first soften under the application of heat and pressure, and then harden and set solid. In other words, a chemical as well as a physical

change takes place in the moulding process, and once moulded they cannot again be made plastic or reduced to their original state. Both groups of materials reach the moulder in the form of powder or small granules, and in each case moulding is carried out in highly polished hardened steel moulds under heat and pressure, but the actual process varies. Generally speaking, the thermoplastics are moulded by the injection method, whereby the raw material is softened under heat and injected under pressure into cold moulds. Cooling is almost instantaneous so that the mouldings can immediately be withdrawn from the moulds and the operation repeated. Production is, therefore, very rapid and the flash or any scrap mouldings can be used up.

Thermosetting Plastics.

The thermosetting plastics are normally produced by compression moulding whereby the raw material is loaded into heated moulds. The moulds are closed and pressure applied causing the material to soften and flow to the shape of the mould. After a given time the material sets hard, the moulds are opened, and the moulding, while still hot, is removed. The time cycle varies according to the size of the mouldings, but it is seldom less than one or two minutes, and may be as long as 15 or 20 minutes. Production is therefore much slower than with thermoplastic materials, and the flash or scrap cannot be re-used.

No finishing is required apart from the removal of flash (or excess material) which always appears at the point where the moulds meet. The degree of polish on the mould surface is directly responsible for the finish of the moulded article, so quite clearly success depends chiefly upon toolroom craftsmanship.

It will be seen that thermoplastics are produced quicker and, therefore, cheaper than thermosetting plastics, but this advantage is offset by the fact that the raw materials are considerably more expensive.

Every type of plastics material has its own special application; in fact, the newer materials are the direct results of efforts to improve other materials to make them suitable for some particular purpose. It will be readily seen that the application of the two main groups differs—for instance, a thermoplastic saucepan handle would soften in use, while spectacle frames made from thermosetting materials would be too brittle.

Although new plastics are continually being discovered and their application extended to new uses almost daily, the original phenol-formaldehyde type mentioned earlier is still the most important when considered on bulk of material used and variety of purposes. In the hardware trade it is certainly more prevalent than any of its fellows, and, apart from the other types, all of which make their own contribution, it has become just as vital a basic material as iron, steel, brass, copper or aluminium.

While the moulded article is best known, there are phenol-formaldehyde extruded sections—rods, tubes and laminated sheets. The latter are produced by moulding together layers of paper or cloth previously impregnated with the synthetic thermosetting resin. They are light, extremely strong, and obtainable in attractive colours and decorative finishes. Laminated plastics are used for table tops, bath panels, meter boards, curtain rails, kicking-plates, and wall panels. They can be cut or machined to shape in a similar manner to wood, with the result that gear wheels, pinions, parts of machinery and electrical equipment can be produced in small quantities for special work without the expense of moulds.

Development in the thermosetting plastics is hampered just now by shortage of raw materials, due to the fact that both phenol and formaldehyde are obtained from coal, but it is safe to forecast that many new and fascinating applications will be evolved in the not so distant future.

Being a young industry, many manufacturers of plastics are comparatively recently established, but this does not mean that they lack experience, or that their products are not of the highest quality. There are of course many old established manufacturers who have taken up plastics because of their suitability for the articles which have long been made in other materials.

At the same time, it should be pointed out that with plastics, as with any other products, it is possible to use inferior materials and/or accelerate production to such a degree that the finished article is of poor quality, which may result in unreliability. Buyers are, therefore, well advised to insist on a branded article, the trade mark being a guarantee that the goods have been fabricated to a sound design from quality materials, and finally subjected to practical tests.

PERSONAL

Mr. M. Andre Coyne.

Mr. M. Andre Coyne, President, International Committee on Large Dams, has agreed to give his advice on the structure of the proposed Kosi and Tungabadra dams.

Dr. S. Kamesam.

Dr. S. Kamesam, Indian Timber Expert, has received an invitation to go to the Philippines and to Japan to demonstrate his technique in timber utilisation.

OBITUARY

Mr. V. R. Subramania Iyer.

We regret to record the death on March 21, of Mr. V. R. Subramania Iyer, Retired District Board Engineer of the Madras Provincial Service.

20TH CENTURY TOWN PLANNING

* **Martin S. Briggs,** F.R.I.B.A.,

In England before 1900, very little attention had been paid to minor dwellings, though a few enlightened employers had laid out model villages for their people: of these the chief examples were Port Sunlight (1888 onwards) for Mr. W. H. Lever, afterwards Lord Leverhulme; and Bournville near Birmingham (1895 onwards) for Messrs. Cadbury Brothers. These settlements were far ahead of anything that had preceded them, in the provision of communal amenities and a tasteful lay-out as well as in the actual design of the houses.

In 1898 an obscure and impecunious Press reporter named Ebenezer Howard published a book, "*Tomorrow*", republished in 1902 as "*Garden Cities of Tomorrow*", in which he lit a torch that is now burning more brightly than ever. His thesis, simply but most convincingly expounded, was that modern cities are far too ugly and far too big, that their inhabitants are divorced from the health-giving country and have to travel excessive distances from home to work. He therefore advocated the 'Garden City', artificially and attractively planned round a civic centre, provided with all amenities, with sufficient industry to employ all the citizens, and surrounded by a 'green belt' of agricultural land owned by the community and capable of supplying them with milk and produce as well as with fresh air. This belt would prevent the outward spread of the urban area, for which Howard suggested, as an ideal, a population of 32,000, i.e., large enough to carry a reasonable load of civic amenities, but small enough to possess the advantages of a country town.

Howard's book very soon bore fruit. The 'First Garden City Ltd.' was established at Letchworth in 1903, designed by Raymond Unwin and Barry Perker. For seventeen years it remained without a rival; and, although a second Garden City was established at Welwyn in 1920, no others have followed. Yet all our Town Planning Experts agree that there is no alternative better than Howard's idea and Unwin's plan. For, this was the first attempt to establish a complete community on scientific and artistic lines, entirely self-contained, with its own industries, its civic amenities, and—above all—its agricultural belt.

In 1909, Unwin, who combined great practical ability and imagination with his ideals of social betterment, produced the first manual of the new subject under the title "*Town Planning in Practice*". Few people realise that, upto 1906, the familiar term 'town planning' had never been used. Since that not very remote date, town planning has created a whole vocabulary of technical jargon, a crop of books, a professional institute holding examinations and granting diplomas, special faculties or schools for its study, and a complete revolution in our social outlook. Both Unwin and Howard richly deserved the knighthoods awarded to them.

Suburban estates soon began to benefit by the increased attention paid to the aesthetics of planning, and in 1907, Unwin laid out the Hamstead Garden Suburb. Admirable as that scheme is, it complies in no way with Howard's conception of a Garden City; but it came to be included in the itinerary of numerous delegations made to England by enthusiasts from abroad who accepted England as *facile princeps* in the new art.

* Architecture by M. S. Briggs, 5s.

WHAT'S YOUR CIQ?

If you get 150, you're a genius. If you are an operative housebuilder, you can find out your CIQ (Construction Intelligence Quotient) with this check list.

Every "Yes" to the following adds 15 points to your CIQ.

1. Do your plans make maximum use of standardized parts and material sizes?

2. Do you precut and preassemble parts from drawings, instead of cutting and fitting on the job as work progresses?

3. Do you list all parts and materials at the start of a job and schedule deliveries so that materials will be available without delay in the sequence needed?

4. Do you assume responsibility for detailed job layout, instead of delegating it to a foreman?

5. Do you set up repetitive labour operations where the job is of sufficient size and duration to permit such organization?

6. Count one for each of these tools you employ: electric hand saw, radial saw, electric sander, electric lock mortizer, electric drill, electric pipe cutter and threader, paint sprayer, masonry saw, mobile concrete mixer, motor-generator (to operate electric tools where power current is not available).

7. If you build 100 or more houses at a time, or multi-story housing, do you use at least three of these: truck-mounted crane bottom-dump bucket for hoisting concrete, portable elevator tower for lifting other materials, motorized wheel-barrow, lift truck for stacking incoming lumber, straddle truck for picking up prepared framing?

8. Are you ordering the modular sizes now available in brick, structural tile, glazed tile, cement masonry units, wood sash and doors, metal windows, wall boards and insulation boards?

9. Have you studied these improved materials for their use to you: ready-mixed concrete (arrives heated in cold weather); high-early-strength cement, structural tile glazed on both sides, pre-finished flooring, plastic-surfaced building board and plastic tile, new thermal and acoustical insulating materials, simplified builder's hardware, more efficient adhesives and paints?

10. Are you making maximum use of these factory assemblies: doors cut to fit with preassembled trim, kitchen and bathroom cabinets, closet or wardrobe units, automatic laundry equipment, plumbing-and-heating units?

The Architectural Forum

LAW REPORT

Nagpur High Court

Before Mr. Justice Bose

King-Emperor *V.* Gulabchand and another (accused and complainant), non-applicants.

Municipalities Act, Central Provinces (C.P. of 1922), sections 103, 167, 199—construction without sanction—Demolition—Notice under section 103—No date fixed—Conviction, legality of—Notice under section 103 not given—Prosecution, legality of.

The fixing of a date in the notice under section 103 of the Central Provinces Municipalities Act, for the demolition of a structure built without the sanction of the Municipal Committee is a matter of substance and not merely of form. There can, therefore, be no breach of the section if no date is fixed in the notice as required by the section and no conviction can be based on section 199 read with section 103 of the Act when that is not done.

When a building is constructed and where the sanction is refused, the only power which the committee has, in the first place, is to issue a notice under section 103 of the Central Provinces Municipalities Act and fix a date for demolition of the building under section 167 of the Act. The right to prosecute only arises on a failure to comply with this notice provided the notice is valid and according to law.

Order: Bose J. observed as follows: The applicant applied for permission to build on his site, his proposed building. The committee gave sanction to build only a portion and refused sanction for the rest.

In spite of this prohibition the applicant started to construct his building on portions of the site for which sanction was not obtained. The construction reached the plinth stage.

On the 20th February 1946 the committee served a notice on the applicant and directed him to demolish the portion which lay outside the sanctioned area. No time was given in the notice for compliance with this. As the applicant took no steps to demolish the offending parts of his building, the committee filed a complaint on the 26th April 1946 for a breach of bye-law No. 20.

It is clear that bye-law No. 20 does not apply. That merely requires in writing to be given of an intention to build. This was done and every requisite which such notice has to contain was present. Therefore, bye-law No. 20 has no application.

It is contended here that the conviction can be sustained under section 199 of the Central Provinces Municipalities Act of 1922 for two reasons: (1) because the applicant failed to obey the notice dated the 20th February 1946 which required him to demolish the offending portions of the structure and (2) because he built in the face of the prohibition.

As to the first point, section 103 empowers the committee to give notice in writing requiring the offending structure to be demolished

"Within such reasonable time as the committee may think fit" and section 167 states that the committee

"shall fix a reasonable time for doing the same."

As no time was fixed, there has been no breach of the provisions of these sections.

It was argued that section 168 (4) validates the notice because the motion to fix a time is only a defect in form. I do not agree. The fixing of a date which is compulsorily required to be fixed under the Act is a matter of substance and not of form. The manner in which it is fixed, that is today, the language employed, the place where the date occurs, whether in a postscript or at the top and so forth, may be a matter of form, but not the fixing of a date. Therefore, no conviction can be based on these sections.

As to the second point, if a building is erected when sanction is refused, the only power the committee has, in the first place, is to issue a notice under section 103 and fix a reasonable time for the demolition under section 167. The right to prosecute only arises on the failure to comply with this notice provided the notice is valid and according to law.

It was argued that the Municipal Committee is given the option to issue a notice or not because section 103 reads

"*may*, by notice to be delivered, etc."

but this, in my opinion, only means that the committee is not bound to require demolition in all such cases. It may in given cases choose to overlook the breach, or it may compound the breach under section 219 and allow the building to stand on payment of the requisite penalty. But if it wishes to prosecute, then the notice must be given. The mandatory language of section 167 would become meaningless were it otherwise. In my opinion, the decision in *Pandurang* V. *The Secretary, Municipal Committee, Chanda*, applies even though this is a case of building where sanction has been refused and that was a case of building without sanction. Section 103 makes no distinction between the two cases.

The reference is accepted. The conviction is set aside and the fine which has been paid will be refunded.

ALTERNATING OR DIRECT CURRENT?

(*Continued from page 12*)

for traction they operate at 16⅔ or 25 cycles per second, thus giving an improved performance.

The A.C. series motor is suited for traction since its load characteristics are somewhat similar to those of a D.C. series motor.

If an electric railway employs D.C. motors then D.C. generating plant or sub-stations housing converting plant are necessary, both of which represent large capital expenditure and entail running and maintenance costs. The actual rolling stock gives satisfactory operation.

If single phase A.C. motors are used the supply, even though of 16⅔ or 25 cycles, can be carried on high voltage lines of small conductor section which is an economical consideration.

The step-down transformer, of high efficiency, used to supply the motors, and having a tapped secondary for speed control, is housed in the locomotive. The transformer requires a minimum of maintenance and attention, whilst its weight improves the drive by giving increased adhesion between the wheels of the locomotive and the track. There seems a good deal about the A.C. single phase system which is commendable.

A.C. traction systems used in countries other than Great Britain, are of the single phase or three phase type. A three phase system used for locomotives, particularly in Northern Italy, has two overhead lines with the bonded rails forming the third conductor. With operating voltages of 3,700 V. the induction motors used have their stators wound for the full line voltage so that transformers are not necessary. The absence of a commutator on the motor is an advantage. The induction motor-speed load characteristic is somewhat like that for a D.C. shunt motor, any speed variation being brought about by a system of pole changing or cascade running of two induction motors or by a combination of both.

The Grid Controlled Mercury Arc Rectifier.

When the conversion of A.C. to D.C. is required either rotating or static apparatus may be used, and of the various forms of plant available, the mercury arc rectifier can be credited with high efficiency, low cost of operation and maintenance, ability to withstand heavy momentary overloads, simplicity of starting and control, and the foundations are inexpensive.

The introduction of the control grid into the mercury arc rectifier increases its field of application as exampled by the following:—

(1) The regulation of output voltage is achieved by variation of grid bias voltage, whereas without grid control, such apparatus as induction regulator or on-load tap changing transformer might be employed.

(2) The inversion of D.C. to A.C. is obtainable.

(3) It provides an efficient means of conversion from one frequency to another.

(4) By the use of grid control the rectifier can be made to act as its own circuit breaker, sufficient negative grid bias voltage preventing re-striking after the arc current passes through zero.

Glass bulb rectifiers are capable of outputs up to 400 kW.; steel tank water-cooled patterns handle outputs of 3,000 kW.

D.C. output voltages of the order of 20,000 V. are attainable so that where very high D.C. voltages are needed it appears that such rectifying plant achieves what is impossible by a D.C. generator which employs a commutator.

Principles of Operation.

An evacuated chamber contains a pool of mercury, the anodes, three or six in number, situated in the upper portion of the chamber, are supplied from the secondary windings of the transformer. The D.C. output is obtained by connecting the load between the mercury pool and the centre tap or neutral by a transformer secondary winding, the latter being the negative terminal.

An ignition electrode causes an arc at the pool, from this hot spot mercury vapour is ejected, while electrons, which are also ejected, form a space charge above the spot. When the positive potential of one anode reaches sufficient magnitude, the electrons attracted by it acquire sufficient velocity to cause them to ionise the mercury vapour molecules, the result is an arc which persists only while the anode is positive. As the potential of the anodes pass through the peak of their positive half cycles in succession, the arc maintained by an anode having passed through its peak value will be transferred to the succeeding anode of rising potential when it reaches a suitable value.

The positive ions of the arc bombard the mercury pool and so maintain the hot spot from which issues electrons and mercury vapour (Fig. 2).

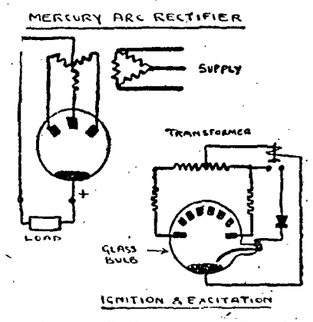


Fig. 2.—The Mercury Arc Rectifier.

The excitation circuit employs auxiliary anodes supplying a small current to dummy loads to maintain ionisation when the load circuit proper is open circuit.

When a control grid between the anode and space charge is used, it can be given sufficient negative potential to prevent operation of the anode. If at any desired moment, during the positive half cycle, the biased grid is given a positive impulse voltage of sufficient magnitude, then the anode may conduct for the remainder of the half cycle only (Fig. 3).

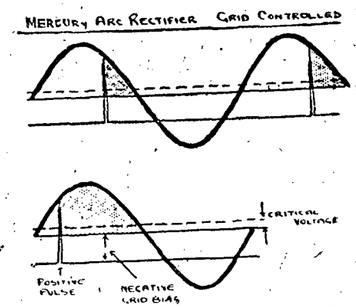


Fig. 3.—Operation of the Grid Controlled Mercury Arc Rectifier

By this or other methods of applying grid voltage control we have a means of controlling the rectifier output. Some applications have already been outlined. Another interesting application is the use of grid controlled rectifiers for the variable speed operation of a large D.C. motor (Fig. 4).

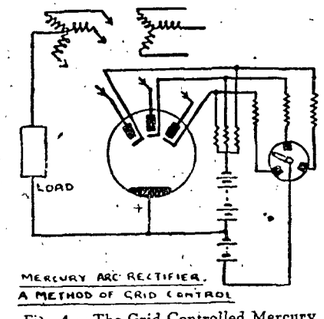


Fig. 4.—The Grid Controlled Mercury Arc Rectifier with simple method of Grid control.

The grid controlled mercury arc rectifier will no doubt be of great practical importance in any high voltage D.C. transmission schemes.

Other Applications of A.C.

Induction Furnace.—The metal or alloy to be melted has high conductivity and is heated by the induced eddy currents set up when A.C. at a frequency of 1,000 cycles per second is passed through a surrounding coil. Contamination of the melt is reduced to a minimum.

High Frequency Heating.—The radio frequency currents employed are obtained from valve oscillators.

The high frequency field from the oscillator coil is used to induce currents into conducting materials within its influence.

The dielectric between two electrodes is strained by the application of a potential difference, a movement of all the dipoles takes place. The high frequency reversal of the forces acting on the molecular structure of the material results in heating within it.

Some examples of the application of H.F. heating are:—

(1) Gettering in the final stage of exhaustion of radio valves.

(2) High speed soldering of suitably shaped metal canisters.

(3) Tempering and hardening (the skin effect is utilised in this case).

(4) Glueing of plastic bonded plywood.

(5) Driving moisture out of wood.

(6) De-hydrating of foods, etc.

Electric Clocks.—These employ a small synchronous motor rotating at a speed dependent on the supply frequency, which, maintained precisely constant at 50 c.p.s., keeps the clock going at the correct rate. Once the clock is correctly set it will continue to indicate the correct time provided that there is a constancy of frequency and no interruption of supply.

Transformer for L.T. Supply to operate door bells is more convenient than batteries, there being negligible maintenance required.

Neon Signs and such discharge tubes used for advertising purposes, operate at several thousand volts which is so readily obtained from a transformer.

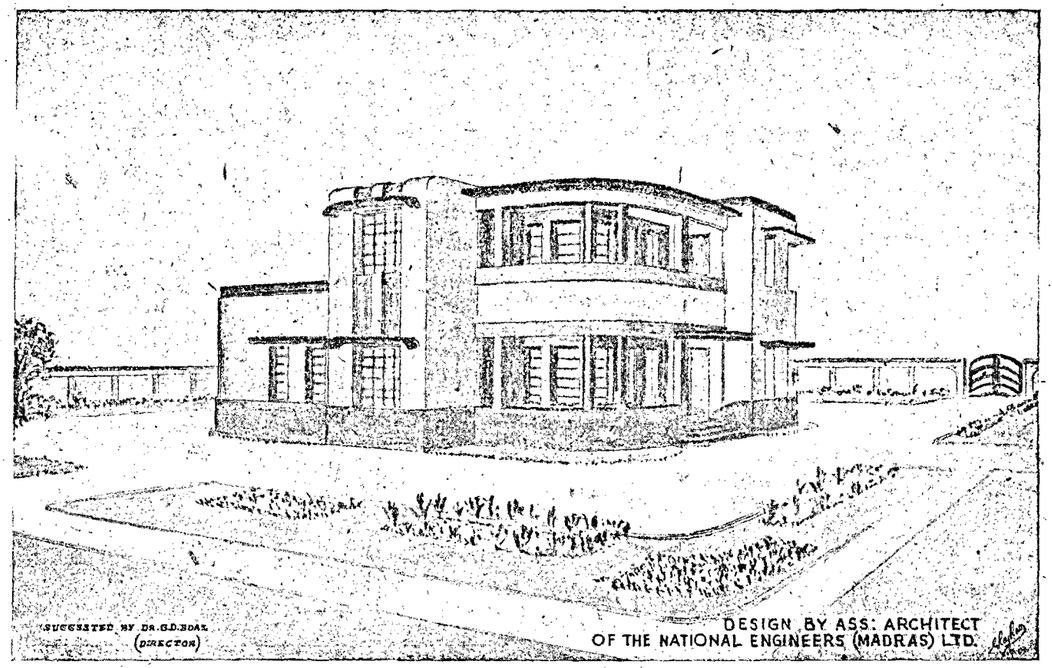
Current Breaking Capacity of Contacts.—It is well known that an arc is struck between current carrying contacts at the instant of their opening, and that the duration of the arc and its detrimental influence on the contact surfaces is dependent on the speed with which they part, the distance they open and the magnitude of the current being interrupted.

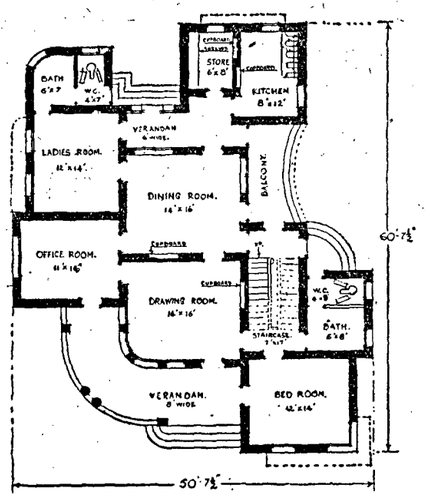
The contacts of small switches, relays and thermostats have a larger current breaking capacity on A.C. than on D.C.; for instance, thermostat contacts rated for 0.1 A. on a 250 V.D.C. supply will satisfactorily interrupt 10 A. in a 250 V. 50 c.p.s. A.C. supply. With A.C. at 50 c.p.s. the current passes through zero 100 times per second—the contacts need only open a minute distance before 250 V. is insufficient to re-strike an arc, the duration of which is limited to a small fraction of a second.

Demagnetisation of such articles as hosiery machine needles, and other small steel products which become magnetised during the processes of manufacture, is readily carried out using A.C. excited demagnetising apparatus.

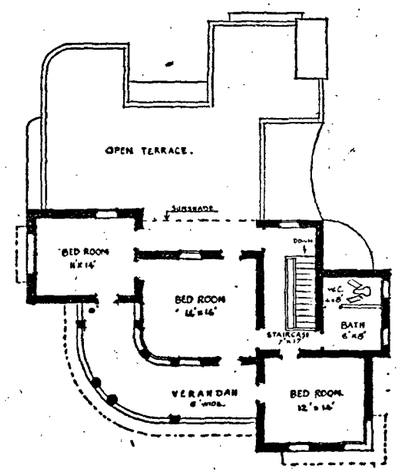
(*To be continued*)

(Review on Direct Current will appear in June issue.)





GROUND FLOOR.



FIRST FLOOR

Plinth Area :—Ground Floor 2090 sq. ft.
First Floor 1240 sq. ft.

ALCRETE HOUSES

P. MATTHEN

(Of the Structural and Mechanical Development Engineers Ltd.)

I have had the pleasure of reading the article entitled " HOUSING PROBLEM IN INDIA " published in your magazine of the 15th March. Mr. G. V. Rao's comments on the Alcrete House in the above article were of particular interest to me, as I am the sole concessionaire in India for the Structural and Mechanical Development Engineers Ltd., who have developed the Alcrete method of prefabrication and mass production of houses. I cannot understand how any engineer can say, that from his study of 'Prefabricated structures' he considers the Alcrete House unsuitable for Indian conditions. The Engineering and structural principles of the Alcrete House, are in no way different from that of any traditional house. In the Alcrete House, as in all traditional structures and practically in all prefabricated houses, except perhaps the Fuller House, the foundation supports the walls which in turn support the roof. There can be nothing inherent in this principle that makes it unsuitable for prefabrication or mass production.

The only method by which one can judge the suitability or otherwise of a factory produced house, is by examining whether the materials used for its manufacture are equal to the demands that are likely to be made on them. Mass production of houses in factories necessitates mobility both for raw materials and the finished products, and mobility demands minimum weight. Consequently traditional materials like brick, mortar, ordinary cement concrete, etc., are unsuitable for the purpose. In the absence of more suitable lightweight raw materials, the pioneers in prefabrication and mass production of building components were forced to use plywood, treated timber, asbestos sheeting, etc. These materials though light in weight are not completely satisfactory from the point of view of durability and weather protection. The fault therefore with most types of prefabricated houses ia that they are made of unsuitable materials. Given an efficient, permanent, light-weight and economical building material there is no reason why a prefabricated house should not be a better and more efficient dwelling than its traditionally built counter part. Most critics like the writer of the above article have not clarified this point. Reading their criticism, one gathers the impression that there is something inherently impracticable in the very idea of mass fabricating building components. On the contrary under present day conditions where the costs of materials and labour are infinitely higher than what they were a few generations ago, the only method of reducing the cost and improving the quality of buildings, is to make them the way that all other articles for mass consumption are made today—namely in factories. It is only on the assembly lines of modern factories, where utmost control is possible over materials and labour, can the necessary economies be effected.

The main raw material of the Alcrete House is foamed concrete. This material as perfected by the Structural and Mechanical Development Engineers Ltd., is made from a mixture of ordinary portland cement, powdered sand and water, aerated chemically and seasoned in autoclaves under high temperature and pressure. The resultant material is extremely light with a specific gravity of 0.6. It has more than the strength required to support all single storey structures without the help of any frame work. It is water-proof and is an ideal material for sound proofing. Its durability cannot of course be questioned as both cement and sand are permanent and imperishable. Its thermal insulation value is exceptionally high. It has been proved that a 4 " thick panel of foamed concrete provides thermal insulation equivalent to an 18" to 20" thick brick and mortar wall, and above all it permits maximum economy in the use of cement. Since the end of the war, nearly 70,000 houses, designed by Structural and Mechanical Development Engineers Ltd., using foamed concrete have been built in the United Kingdom. These were the only fully factory built houses that have been accepted by His Majesty's Government as permanent houses. Furthermore like traditionally built permanent houses, they were passed by the Government for a subsidy of 90% of the value of the house, to be repaid over a period of 60 years. This should convince anyone of the Government's estimation of the life of these houses.

The Alcrete House is based on two or three different sizes of standardized foamed concrete panels. Some are plain wall panels, and others have windows and some others have doors incorporated in them. These standardized panels lend themselves admirably to various architectural designs. Consequently the Alcrete House does not have to be of one monotonous shape and size.

In view of the acute shortage of steel and hard-wood the Government of India have decided to use high tensile aluminium alloys, which are readily available at economical prices, for roof trusses, purlins, doors, windows, etc., and corrugated aluminium sheeting with insulation for roofing. The particular alloy that is going to be used for the purpose is non-corrosive and will not require any maintenance once erected. I am sure if Mr. G. V. Rao were in possession of details and specifi-

cations of the Alcrete House, he would never have described it as a "*Costly experiment*". The Alcrete House is not an experiment and is by no means costly. The Engineers and Architects, who have been responsible for its design, have made thousands of houses for use in the United Kingdom and various parts of the world including Palestine, Egypt, Argentine and South Africa. They are being used by some of the Oil Companies in the Persian Gulf area, where extremely high temperatures are the rule, and found perfectly satisfactory.

I am sure you will agree with me that if a house is weather proof, shock resistant, fire and termite proof, durable and economical at the same time it is a sound proposition.

SOIL MECHANICS

The seasonal shrinkage and swelling of black cotton soil which presented troublesome problems in the foundation design of a large power station in Central India was one of the subjects of research at the Building Research Station of England.

The consulting engineers wished to obtain an estimate of the pressure required to prevent swelling of the black cotton soil when it absorbed water during the monsoon season. It was thought possible that the power station might be lifted if the black cotton soil was left underneath the building. Examination of the soil showed that it is similar to London clay and that the movements are more severe due to the climatic extremes in Central India. The pressure required to prevent swelling when the clay is brought into contact with free water varied from 4 to 20 tons per sq. ft. depending on the initial dryness of the clay. If a certain amount of swelling was permitted, the pressure required to prevent further swelling was much smaller. The average pressure under the building was about 1 ton per sq. ft. and it was clear that considerable uplift and distortion of the building could occur. It was decided to remove the black cotton soil so as to keep it clear of the underside of the building and to support the structure on walls carried down to underlying rock.

WOOD PRESERVATIVES

The following table gives examples of the suitability of the three types of preservatives for different purposes :—

Class of timber or structure	Coal-tar creosote type	Water solution type	Organic solvent type
Wooden farm buildings: timber garages and outhouses: fencing above ground level: pigsties: chicken houses: weather boarding.	Quite suitable and frequently applied to boarding by brush. It is not advisable to admit animals to freshly creosoted structures.	Many of these are quite suitable.	Generally suitable.
Factory roofing timbers: housing timbers: shipbuilding timbers: motor car bodies.	Not as a rule suitable, but sometimes used where objections do not arise.	Generally suitable ...	Generally suitable.
Railway sleepers: transmission poles: marine piling: fence posts: pergola poles: bridge timbers: wood block paving: coal barges.	The most suitable preservative. Best results with pressure impregnation, but open tank process also suitable. An impregnation method is essential.	Some which are fixed in the wood are suitable, but the more leachable are unsuitable.	Expense generally rules out this type.
Timber for horticultural uses such as seed or bulb boxes and glass houses.	Not suitable if timber is in contact with plant.	Generally suitable ...	Generally suitable.

With acknowledgments to T. D. A., London.

NEW METHOD OF WATER CHLORINATION

Metropolitan Water Board Report on Sterilisation

We are glad to publish an expert report on sterilisation which will be of considerable interest to water works engineers in this country.

Introduction of a new method of using chlorine for the terminal sterilisation of the Board's river-derived supplies, is mentioned in a report submitted to the Metropolitan Water Board by Lieut.-Col. E. F. W. Mackenzie, O.B.E., M.C., M.B., Ch.B., D.P.H., Director of Water Examination.

According to *The Contract Journal* the report states :

In the early days of chlorination of the Board's water supplies attempts were made by the then Director of Water Examination, Sir Alexander Houston, to use this process for the sterilisation of river-derived water after filtration, but these had always been abandoned on account of taste which could be avoided only if the chlorine were added before filtration. In the 12th Annual Report (1918), however, Houston wrote:—"No taste, unless perhaps the original taste, has ever been observed after gross chlorination and dechlorination." No progress appears to have been made in applying gross or superchlorination, as Houston called it, to the Board's river-derived supplies, although there were further references to the subject in his Annual Report for 1919.

In 1918 it had been found in Canada that the addition of ammonia to water before chlorination prevented these tastes. Terminal treatment of the Board's river-derived supplies by ammonia-chlorine, or as it is now termed the chloramine process, was introduced at Kempton Park in 1926 following upon work by Col. Harold before he became Director of Water Examination, and was rapidly extended to the remaining filtration works. Since then it has been the standard method for sterilising the Board's filtered water.

Chloramine More Powerful Than Chlorine.

In India in 1932 and subsequently, the present Director commenced a series of investigations into the relative efficiencies of chlorine and chloramine which have been continued with many variations in the laboratories of the Board up to the present time. Early in these experiments the Director came to the conclusion that the widely expressed belief that chloramine is a more powerful disinfectant than chlorine was erroneous, and that, on the contrary, chlorine in the free state destroys bacteria many times more rapidly than does chloramine. This was not, however, generally accepted at the time. He confirmed Houston's findings to the effect that the addition of chlorine in sufficient quantity was no less effective than ammonia in preventing the formation of tastes, and found also that free chlorine removed many tastes which commonly exist in water, an attribute not shared by chloramine. The amount of chlorine required to produce these effects varied greatly in different waters, and in the same water at different times, and reliable control of the process was difficult unless a great excess of chlorine was added. Because of this and previous failures to use chlorine alone for the Board's filtered waters without the production of objectionable tastes it was considered inadvisable to repeat these experiments on a full works scale. Since 1940 superchlorination has, however, gradually displaced chloramine treatment for the Board's well waters, and so successful has it been that no *Bact. coli* have been detected in 99.92 per cent. of 1,772 samples drawn from wells treated by superchlorination during the past five years; nor has there on any occasion been a complaint of taste in water so treated.

Despite the controversy which has been mentioned, the present Director's early work on chlorine and chloramine and work by other investigators pointing to the same conclusions has now been amply confirmed. More recently, the effect of chlorination on waters containing ammonia has been investigated in the United States of America, and these investigations have led to the introduction of what has been termed in that country "breakpoint" chlorination. While this process bears little relation to that now used for the Board's waters, to which it would not be applicable, the elucidation of the ammonia breakpoint has contributed to an understanding of the process, and has provided the explanation of certain anomalies in the behaviour of chlorine in the presence of ammonia.

This understanding has been greatly assisted by the recent introduction, also in the United States, of tests which distinguish free chlorine from chloramine which could not previously be done. These tests have enabled the dose of chlorine to be maintained at that required to effect sterilisation and to prevent the production of tastes in river-derived filtered water with an exactitude previously impossible.

Treatment on Works Scale.

As a result of these advances it was decided in 1947 to introduce superchlorination treatment of river water on a works scale. The Barnes works were selected for this experiment because a period of about half an hour elapses after treatment, at the end of

which the quality of the water can be ascertained before it passes into supply. After certain minor difficulties had been overcome the change to superchlorination was completely successful. As a result of this experiment the use of the process was slowly extended, and it has now been introduced at all the Board's filtration works.

Since the change took place there has been a marked improvement in the bacterial quality of the water supplied, the percentage purity having increased from 96.8 to 99.8. Moreover, of the five samples containing *Bact. coli* during this period, four occurred at a time when superchlorination could not be maintained in the absence of contact tanks owing to an increase in the natural ammonia content of the water which resulted in the formation of chloramine. The fifth bad sample was probably due to particular difficulties in chlorination treatment which have always been encountered at the works concerned.

So successful did superchlorination prove that the belief that prechlorination of the water could be discontinued without any deterioration in the quality of the finished water was justified. The following experiment was, therefore, devised. Prechlorination was stopped at a works where the quality of the filtered water is particularly dependent upon this process. As a result the filtered water became extremely bad, containing on one occasion 90 *Bact. coli* per 100 ml., yet the water pumped into supply after treatment by superchlorination has been of good physical quality and the bacterial purity has been 100 per cent. It is unlikely that filtered water of worse bacterial quality will be encountered at any of the Board's works.

Cold Retards Chlorine Action.

Extreme cold retards the action of chlorine, and it may be that results will not be so good when such conditions prevail, but the completion of contact tanks already in course of construction at several of the Board's works will enable these difficulties to be surmounted, as also the difficulties experienced when the natural ammonia in the water increases.

In the light of the experiment outlined above it was felt that the expenditure of large quantities of chlorine on prechlorination could hardly be justified at times when the natural ammonia in the filtered water was sufficiently low to enable superchlorination to be used for terminal sterilisation. Prechlorination has, therefore, been stopped at all Thames valley works. Moreover, the period of contact for which provision is now being made at these works may now be reduced to one hour instead of two hours previously required for chloramine.

The administration of chlorine at the works has also been rearranged in such a manner that a breakdown of a chlorinating instrument will be attended by less risk to the purity of the supply than would previously have been the case.

There are two directions other than bacterial purity in which superchlorination seems to have led to marked improvement in the quality of the water. Firstly, the colour has shown a reduction of 23 per cent. Secondly, there has been a complete cessation of complaints of chlorinous tastes from consumers, and there is certainly no reason to believe that other tastes have been any more frequent than hitherto.

The economic aspect of the changes recorded above is, perhaps, worthy of mention.

Contact Tanks.—The increased speed with which superchlorination destroys bacteria permits of a reduction in the size of contact tanks in the Thames valley to one half of that previously required. This reduction alone constitutes a large saving in capital costs. Any reduction would be inadvisable in works treating River Lee water where special difficulties exist.

Pretreatment Basins.—Before the introduction of superchlorination the only means for reducing tastes and colour was the provision of pretreatment basins. Experience is as yet insufficient to speak with certainty, but the indications are that the majority of tastes can be removed by superchlorination, and it seems unlikely that any additional improvement which might be effected would be sufficient to justify the great capital expenditure required for the provision of pretreatment basins on these grounds alone.

No estimate has been made of these savings in capital expenditure, but it can be said with certainty that production of water by any other known methods of a physical and bacteriological quality equal to that now being produced by superchlorination would have necessitated the expenditure of several millions of pounds in capital works alone with consequently high annual running costs.

Chemicals.—The full effect of the new method upon consumption of chemicals for water treatment has been felt only since Jan. 1, 1949, when all prechlorination in the Thames valley was stopped. The savings shown in the following table have, therefore, been calculated over a relatively short period:

Average weekly cost of chemicals at filtration works.

(July to December, 1947, and January, 1949.)

	July–December 1947.	January 1949.	Weekly saving.
	£	£	£
Chlorine ...	363	221	142
Sulphur dioxide ...	47	Nil	47
Ammonia gas ...	121	Nil	121
Ammonium sulphate ...	34	Nil	34
Totals ..	565	221	344

This constitutes a saving at the rate of £17,888 per annum.

Circumstances will arise at times which will necessitate an increase in the present rate of consumption of chemicals; at other times there may be a reduction, but on the whole the period has, if anything, favoured a low consumption. Nevertheless, at a most conservative estimate the annual saving should exceed £10,000 and it may be as high as that recorded up to the present.

APPROACH TO PLANNING

It is consistent with the record of progress of British planners, which for decades has kept Britain in advance in the field of Town and Country Planning, that five years before the outbreak of war there was founded in London the School of Planning and Research for Regional Development. In 1940, side by side with the School, grew up the Association for Planning and Regional Reconstruction (APRR) with the complementary functions of research and survey. Then, the Battle of Britain having been fought and won over Southern England, in London and in other cities ravaged in the blitz of those first years of war, town planning leaped into public interest as a major issue of the peace that was to come. In the Autumn of 1943 the War Office, looking ahead to post-war reconstruction, asked the School to elaborate a course in planning to be made available by correspondence to members of the Armed Forces in all theatres. This was set in motion and in the latter part of the war many hundreds of service men and women in Britain and Overseas took up this specially planned course. Following its success, and to cope with the urgent demand for qualified planners for re-development schemes up and down the land, the School instituted a series of intensive courses. The School of Planning is a recognised school of the Town Planning Institute in Great Britain, and its Diploma Course, and also, in order to extend similar opportunities for study in planning to those unable to join a recognised course, the School has designed a new Correspondence Course, based on the war-time one, and covering in detail the subject matter of the Town Planning Institute's syllabus.

The address of the School is: 34-35, Gordon Square, London, W.C. 1.

SPECIFICATION

PLYWOOD FOR BUILDING AND GENERAL PURPOSES

This British Standard (B.S. 1455: 1948) has been prepared with the intention of defining the grades and qualities of plywood suitable for building and general purposes regardless of the species of timber which may be used. It does not, however, include plywood graded for stress requirements nor plywood faced with decorative veneers.

It is emphasized that this British Standard applies only to plywood manufactured in U.K.

In addition to general requirements regarding the manufacture of the plywood the grading is based on a dual classification, firstly in relation to the performance of the adhesive used and secondly according to the appearance on one or both sides of the finished boards. An appendix describes the method of testing the plywood for adhesion between the veneers, a test which is carried out by endeavouring to separate the veneers by the forcible application of a tool and comparing the force required to effect separation and the nature of the resulting damage. The specification provides a means of assessing the suitability of plywood for various purposes.

Copies of this British Standard may be obtained from the British Standard Institution, Sales Department, 24, Victoria Street, London, S.W.1. Price 3/6, post free.

BOOK REVIEW

BRICKS & MODERN RESEARCH:—By B. Butterwoth. (Crosby Lockwood & Son Ltd., 39, Thurloe Street, London, S.W. 7. Pp. 155. Price 10 sh. 6d.)

This book is written by a research chemist who has specialised in the study of clay building materials. It provides a convenient summary of the scientific knowledge of bricks and is so useful that it can be added to any engineering library in this country.

LETTER TO THE EDITOR

A. R. I. C. S.

Sir,

With reference to the letter of Mr. M. Venkatraman, A.M.I.E., and the footnote published in *The Building Gazette* for January 1949, examinations of the Royal Institution of Chartered Surveyors taken in India are *not* confined to officers of the M.E.S.

Yours faithfully,

Col. K. B. RAI, B.Sc., A.M.I.E., Chief Surveyor of Works.

E-in-C.'s Branch, Army H.Q., New Delhi.

CONTRACTS OPEN

The dates at head of paragraphs are those for the submission of Tenders. Application for forms and particulars should be made to the address given at the end.

AHMEDABAD : Aerodrome.

April 18.—Construction of a major Aerodrome Terminal Building at civil aerodrome at Ahmedabad. Approximate cost Rs. 5,92,087. The Executive Engineer, Bombay Aviation Division II, Exchange Building, Ballard Estate, Bombay.

VIZAGAPATAM : Roads.

April 18.—Cement Concreting Anakapalli-Madugole Road, miles 0/7 to 7/5. The Divisional Engineer, Highways, Vizagapatam South, Maharanipet.

CHEMBUR : Staff Quarters.

April 19.—Construction of quarters for the staff for the Receiving Centre at Chembur. Estimated cost Rs. 81,927. The Executive Engineer, South Thana Division, Thana.

NEW DELHI : Quarters.

April 19.—Constructing Residential Accommodation at I.A.R.I., New Delhi. Estimated cost Rs. 1,94,366. The Executive Engineer, Construction Division No. I, C.P.W.D., American Barracks, Queensway, New Delhi.

MIHIJAM : Filter House.

April 19.—Construction of the main Filter House for Loco Building Works Project at Mihijam. The Engineer-in-Chief, Loco Building Works Project, Chittaranjan, Mihijam.

JHANSI : Mitra Quarters.

April 20.—Construction of 100 units Mitra 'A' Type Quarters; and 20 units Mitra 'B' Type Quarters at Jhansi. The Executive Engineer, G. I. P. Railway, Jhansi.

SATARA : Irrigation Works.

April 25.—Work of constructing a Tank at Ranand, Taluka Man, District Satara, estimated to cost Rs. 14,43,831. The Executive Engineer, Satara Division, Satara.

BHUBANESWAR : Quarters.

April 25.—Construction of Staff Quarters and Bungalows at a cost of approximately two crores of rupees in the new capital area at Bhubaneswar. The Superintending Engineer, Central Circle, Bhubaneswar, Puri District.

DHARWAR : Water Scheme.

April 25.—Constructing Purification Works at Kanvihonnapur District Dharwar, in connection with the Neersagar Water Supply Scheme for Dharwar and Hubli. Estimated cost Rs. 4,69,000. The Executive Engineer, Karnatak, Sanitary Division, Dharwar.

SINDRI : Pump House.

April 25.—Construction of Clear and Process Water Pump House with appurtenant works at Sindri. The Construction Engineer, Public Health Division No. II, Sindri.

SINDRI : Plant Building..

April 25.—Construction of Purification Plant Building with appurtenant works at Sindri. The Construction Engineer, Public Health Divisian No. II, Sindri.

NANGUNERI : Bridge

April 27.—Construction of Bridge across Nambiar at 4/8 of Nanguneri-Tirukarangudy Road. The Divisional Engineer, Highways, Palamcottah,

NAGPUR : Electrification.

May 28.—Electrification of six Wards of the New Medical College at Nagpur, the work involving wiring of about 2000 points in concealed conduit. The Superintending Engineer, Thermo Electric Circle, Govt. Electric Dept., Seminary Hills, Nagpur.

HYDERABAD : Pumps.

May 31.—Supply and erection of 10 units of electric driven pumps complete with motors and necessary accessories each capable of delivering 225 c. ft. per second at a gross head of 65 feet, The Superintending Engineer, P. W. D., Investigating Circle, Barkatpura, Hyderabad (Dn.).

MIHIJAM, Sewerage.

June 1.—Design and Installation of a Sewage Disposal Plant according to Dic-Aeration Process, including sludge digestion arrangements, to serve the new town of Chittaranjan near Mihijam (West Bengal), with an initial population of 40,000. The Engineer-in-Chief, Loco Building Works Project, Chittaranjan. Mihijam.

RESULTS OF TENDERS

Adoni.

Closed December 1.—Constructing two Aqueducts of Low Level Canal at Adoni :—*Gannon Dunkerley & Co. Ltd., Madras, were the only tenderers and their two tenders have been accepted.*

Kuppam.

Closed December 20.—Construction of type Quarters at Kuppam :—*Awarded to Hindustan Fertilizers and Bone Factories Ltd., Kuppam.*

Jubbulpore.

Closed December 28.—Construction of Administration Block of the Government Engineering College at Jubbulpore :—*Tender of Deo Narayan Trivedi, Jubbulpore at 9½ per cent above current schedule of rates has been accepted on 11-2-1949.*

New Delhi.

Closed December 20.—Sanitary Installations to the National Physical Laboratory Building at New Delhi :—*Tender of John Tinson & Co., New Delhi, was accepted for Rs. 1,67,000. Estimated cost was Rs. 80,000.*

Thana.

Closed January 17.—Construction of Factory Buildings, etc. for the National Machinery Manufacturers Ltd., at Thana :—*Tenders from the following were received :*

1. M. V. Nayak.
2. Indian National Construction Co.
3. Fabricated Steel & Construction Co. Ltd.
4. Concrete Construction & Engineering Co. Ltd.
5. Shapoorji Pallonji & Co. Ltd.
6. Motichand Co.

Tender of Shapoorji Pallonji & Co. Ltd. was accepted.

HOW WAS MAY 1948

For Building

A rainy day is one in which 10 cents or more rain is recorded. The following figures show the average number of rainy days in the month of May based on data up to 1940 :—

Agra	1.1
Ahmedabad	0.7
Allahabad	1.2
Ambala	1.5
Asansol	4.4
Aurangabad	1.3
Bangalore	6.6
Bellary	3.3
Bhopal	1.2
Bhuj	0.3
Bombay	0.8
Calcutta	6.9
Cawnpore	1.0
Chittagong	10'8
Cochin	12.3
Colombo	14.1
Dacca	11 0
Gaya	1.7
Hyderabad Dn.	2.3
Jamshedpur	5.1
Jhansi	1.0
Jiwani	...
Jodhpur	1.1
Jubbulpore	1.4
Lahore	1.3
Madras	1.1
Mangalore	6.7
Marmagoa	2.0
Masulipatam	2.0
Nagpur	2.0
New Delhi	1.6
Patna	2.3
Peshawar	2.0
Poona	1.7
Puri	3.2
Quetta	1.1
Rawalpindi	2.5
Sambalpur	2.3
Srinagar	5.4
Trichinopoly	4.1
Trincomalee	3.4
Trivandrum	10.1
Vizagapatam	2.7

FOR DISCUSSION

There is no culture in the hearts of a people until the very utensils in the kitchen are beautiful as well as useful—W. B. Yeats.

A staff strength equivalent to 36 executive engineers was normally used in the U.S.A. for jobs of the size of the Boulder or the Shasta dam for "design and research".

In England 97·5 per cent of bricks used in building construction during pre-war period was of clay or shale, 1.9 per cent of sand-lime, and only 0.6 per cent of concrete.

Associations are varied and various that at the moment "*An Association for Planning*" is the crying need. Every man and woman capable of contributing a rupee a year may be its members. Its primary aim should be to ascertain, compile and present facts affecting planning in any planned programme.

Three things are necessary for really good planning—the right men, the right methods, and the right materials.

There are some who even think of starting a little society of angry engineers.

Designing is best learnt by means of designing, and that, once a student has learnt to draw, he should be making some design or other all the time.

Local authorities should fix up a D-day now to spring clean their own institutions in order to achieve greater efficiency for Free India.

The first requirement for speedy industrialisation is business integrity and honesty.

PROPOSED NEW WORKS

Bombay: The foundation stone of a new township at Pewai, a suburb about 20 miles from Bombay, which is expected to house about 10,000 people, was laid by the Home Minister of Bombay recently. The town construction has been undertaken by the Gopal Housing and Plantation Society.

A scheme for the reconstruction of the Princes' and Victoria Docks, damaged during the explosion in April 1944, and for the modernisation of Bombay Port is under the consideration of the Bombay Port Trustees.

Coimbatore: The Government of Madras has a proposal to put up temporary structures estimated to cost Rs. 3 lakhs in the Agricultural College Estate, Coimbatore.

Garhwal: The Plan to construct an 800-foot dam at Marora on the river Nayar in Garhwal, U.P., has now been finally approved, it is learnt.

Mr. J. L. Savage, American dam expert, and M. Andre Coyne and M. Jean Gognel, French experts recently visited the site at Marora. They are said to have expressed the view that the place is suitable for the construction of a dam.

The inaugural ceremony for starting construction will be held at Marora on May 5 next when Sardar Patel is likely to visit the place.

Madras: The City Improvement Trust, Madras, has sanctioned Ayodhyakuppam Improvement Scheme and the Esplanade Hostel Scheme.

Mysore: The Government of Mysore is considering the question of having another power project near the Mahatma Gandhi Hydro-electric (Jog) Works. It is proposed to put up a reservoir at a place called Honemaradu. This project, it is expected, would generate about 500,000 k.w. of power and the estimated cost of the project is rupees ten crores.

Nagpur: The C.P. Government has approved bridging of the Mahanadi river, between Sarangad and Raigarh, at a cost of Rs. 25 lakhs.

EDUCATIONAL

THE MADRAS ENGINEERING LICENTIATES ASSOCIATION

The Third Annual Provincial Conference of the Association was held recently at the Central Polytechnic, Madras.

Mr. Justice A. S. P. Iyer, I.C.S., who opened the conference traced the history of engineering, past and future. The four classes who guided the destinies of men were the priests, the doctors, the lawyers and the engineers. Whereas all the former three attended to the soul, body and mind of men the engineers neither deal with the body nor soul nor mind. They dealt with the nature outside the man. The irrigation works in the Indus Valley Civilisation were the best known in the world. One bad quality with Indians was that they neglected petty repairs and spent on major repairs. That was true with regard to not only to building, cars, etc., but even to their body. The cause of failures of engineering work in India, he found out to be due to lack of adequate supervision and perhaps to a little extent corruption.

Indians had got inner cleanliness but not external cleanliness. In Western countries it was quite opposite. If epidemics were to be avoided here, sanitary engineering was very essential. Further they were allowing millions of rupees worth of nitrogenous manure go to waste. The scope of engineering was very high here and if all the manure was properly cured they could raise the food production. He found from extensive tour of the world that Indians were not backward to any nation in intelligence. The capacity was there but it should be put to use. They were planning many new projects and any engineer who accomplished the Ramapadasagar Project will be the pride of India.

Advising the Licentiates the speaker told them not to enter into any competitive spirit with other professions. Each profession has its own use. The Engineer should not dabble in other professions. They should not agitate for salary. This salary is accidental. They should work in a spirit of service with a creative joy. He asked them to remember that they were not degenerating. India was entering into a glorious period and they should exert with the feeling that they shall make India a heaven on earth and if they do that they would have fulfilled their duty.

Mr. K. P. Subramanyam, the retiring President, addressing the conference said that they should confess that though the headquarters was located in Madras the mofussil centres did much better.

Dealing with the pay of a Licentiate he deplored the scale of pay prevailing at present. Some of the Licentiates even took up jobs as clerks, typists or salesmen. Although many more Polytechnics were started in the province, he wished to say that a good many of the men turned out were unemployed or under-employed. The employers judging them on a par with their employees who had practical knowledge offered low pay. That was the fundamental reason. All the technical institutions should do everything in their power to see that students were not allowed to waste their times. If this aspect of the problem is properly tackled we should neither have unemployment nor under-employment.

CURRENT WAGES FOR MEASURED WORK

- **Prices shown below are for sub-contract work, Labour only, for an average job in Madras.**
- **Labour includes use of craftsmen's and artisan's tools only.**

	Rs.	A.	P.
EXCAVATOR			
Excavating trenches for foundation per 1000 c. ft.	20	0	0
CONCRETOR			
Mass cement concrete any position laid and rammed per 100 c. ft.	20	0	0
R.C.C. band-course over plinth 4" thick any position and watering per 100 sq. ft.	15	0	0
R.C.C. slab 6" thick laid any position and watering per 100 sq. ft.	15	0	0
R.C.C. lintel cast *in situ* average size per R. ft.	0	6	0
R.C.C. sunshade 3" thick any position and watering per 100 sq. ft.	10	0	0
Granolithic floor 1½" thick laid and finished smooth per 100 sq. ft.	10	0	0
Brick-jelly concrete 4½" thick laid and rammed per 100 sq. ft.	8	0	0
BRICKLAYER			
Ground-floor superstructure 9" wall per 100 c. ft.	17	0	0
Do. 13½" wall per 100 c. ft.	16	0	0
First-floor superstructure 9" wall per 100 c. ft.	17	0	0
Do. 13½" wall per 100 c. ft.	18	0	0
Brick nogging in cement mortar per 100 sq. ft.	6	0	0
Half-brick wall in cement mortar per 100 sq. ft.	8	0	0
Floor rendering ½" thick in cement mortar per 100 sq. ft.	6	0	0
Do. but finished in coloured cement per 100 sq. ft.	10	0	0
Grinding lime mortar or pounding same per 100 c. ft.	10	0	0
Open terrace levelling course in brick jelly lime concrete and rawing per 100 sq. ft.	10	0	0
Open terrace flat tiles two courses per 100 sq. ft.	10	0	0
Open terrace flat tiles pointing per 100 sq. ft.	4	0	0
CARPENTER			
Panelled doors including housing shutters per sq. ft.	1	2	0
Glazed doors do. per sq. ft.	0	15	0
Panelled windows do. and cutting and fixing guard bars per sq. ft.	1	6	0
Glazed windows do. per sq. ft.	1	3	0
Glazed shutters only per sq. ft.	0	15	0
Fixing only door or window frames per each	1	0	0
Centering to R.C.C. slabs per 100 sq. ft.	13	0	0
Do. to R.C.C. stairs per 100 sq. ft.	16	0	0
Do. to R.C.C. sunshades per 100 sq. ft.	15	0	0
Wood work in scantlings per c. ft.	3	0	0
IRONWORKER			
Bending and fixing M.S. Reinforcements for R.C.C. work per cwt.	6	8	0
PLASTERER			
Wall-plastering in cement per 100 sq. ft.	6	0	0
Ceiling—plastering per 100 sq. ft.	6	8	0
Sunshade—plastering per 100 sq. ft.	7	0	0
Rounding internal or external angles per R. ft.	0	1	0
Moulding not exceeding 9" girth per R. ft.	0	8	0
White or colour washing 1st coat per 100 sq. ft.	0	10	0
Do. 2nd coat per 100 sq. ft.	0	8	0
Do. 3rd coat per 100 sq. ft.	0	7	0
GLAZIER			
Fixing only glass panes in window sashes per sq. ft.	0	2	0
Do. if cutting is necessary per sq. ft.	0	2	9
PAINTER			
Painting on wood or iron 1st coat per 100 sq. ft.	1	0	0
Do. 2nd coat per 100 sq. ft.	0	14	0
Do. 3rd coat per 100 sq. ft.	0	12	0
Do. if in narrow widths add 16 % extra.			
Tarring to door or window frames per 100 sq. ft.	0	8	0
SUNDRIES			
Fixing only round rain water pipes per R. ft.	0	4	0
Casting and fixing R.C.C. slabs for shelfs per sq. ft.	0	6	0
Fixing welded fabrics including cutting per sq. ft.	0	10	0

Note:—1. Water to be supplied at spot.
2. Scaffolding extra.
3. Setting-outs and making good extra.

CLASSIFIED ADVERTISEMENTS

Professional.

Membership and Associate Membership of the International Corporation of Engineers Inc. U.S.A. open to Scientists and Engineers in responsible position. Apply to Secretary, I.C.E., Dhanaula Nabha, E.P.

Situations Vacant.

Wanted a B.E. Civil to join a firm of consulting engineers in Madras. Remuneration according to merit. Reply with copies of testimonials and proof of pay last drawn to Box M c/o 'The Building Gazette.'

Wanted a Draftsman on Rs. 75 per month in Madras. Neat workmanship essential. Higher starting will be considered. Apply stating qualifications and experience to Box N, c/o 'The Building Gazette'.

Message

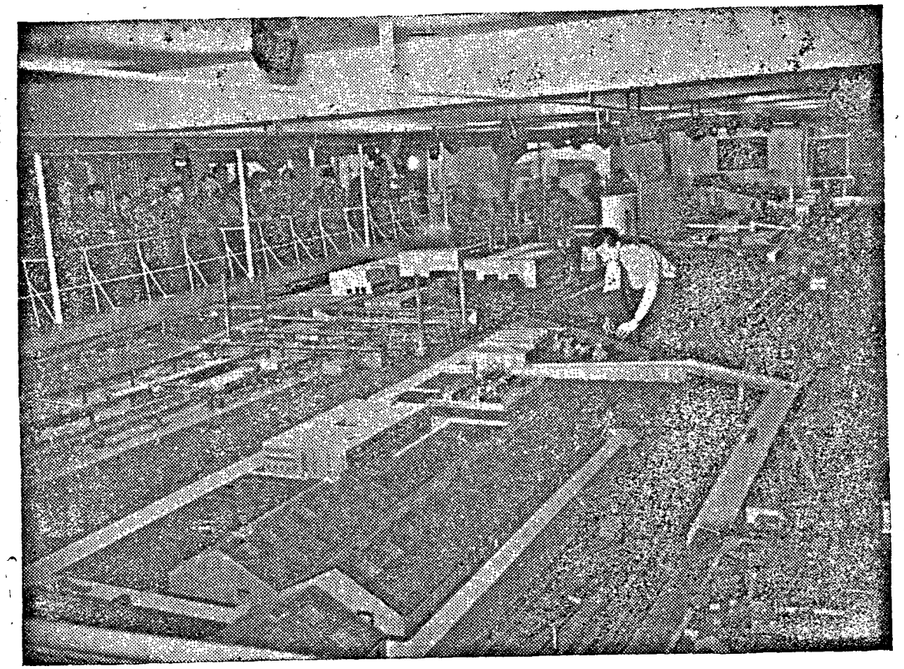
from

The Hon'ble
Mr. M. BHAKTAVATSALAM,

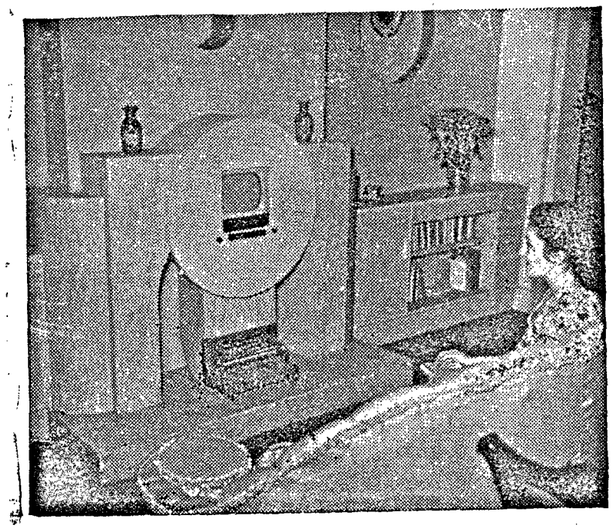
Minister for Works,
Government of Madras.

"I have seen your Journal which is very instructive. In view of the concentrated attention that is to be paid to the building problem, your Journal, I have no doubt, will prove very useful to the Engineers and also to the members of the general public. I wish your endeavours all success."

EXHIBIT NUMBER TWO



THE IDEAL HOME EXHIBITION



A general view of the Steelworks Model at the Exhibition. Nearly as big as a tennis court and believed to be the biggest model ever made, a complete modern steelworks with every activity alive and alight is on view. Every thing is perfect to a scale of 72 inches to one. Express trains race through it, main line freight trains discharge homeland ores, coal, limestone and scrap. A ship at the quayside discharges its foreign ore, a tug fusses about the harbour, blast-furnaces are in action, glowing ingots of iron travelling on to the open-hearth furnaces to become steel and thence to rolling mills and cogging mills to be shaped, sheared and turned out as ship's plates, are also seen. The coke-oven, gas-plants and by-products plants are all in action. There are 30 locomotives and 1,500 wagons on the 30 miles of track and sidings represented here. There are strange technical vehicles—transporters, grabs, tipplers, ladle-cars and cranes, all at work. A tramway service runs from the Ideal Village of the workers to the homes.

Television is so new that no one quite knows where to put the receiver. Here a solution is offered by making it the new central point in the lounge so that viewers sit round it instead of the fire. Picture shows the new television fireplace as exhibited by the British Electrical Development Association.

Registered No. M. 5257.

EDITED BY T. N. SUBRAMANIAM, A.F.S. (ENGLAND), PRINTED BY K. M. KURIAN AT THE GORDON PRESS, MADRAS-5
AND PUBLISHED BY T. RAJARAM FOR THE ASSOCIATED BROTHERS LIMITED, MADRAS.

BUILDING GAZETTE

563/2nd

EXHIBITION NUMBER

MAY, 1949.

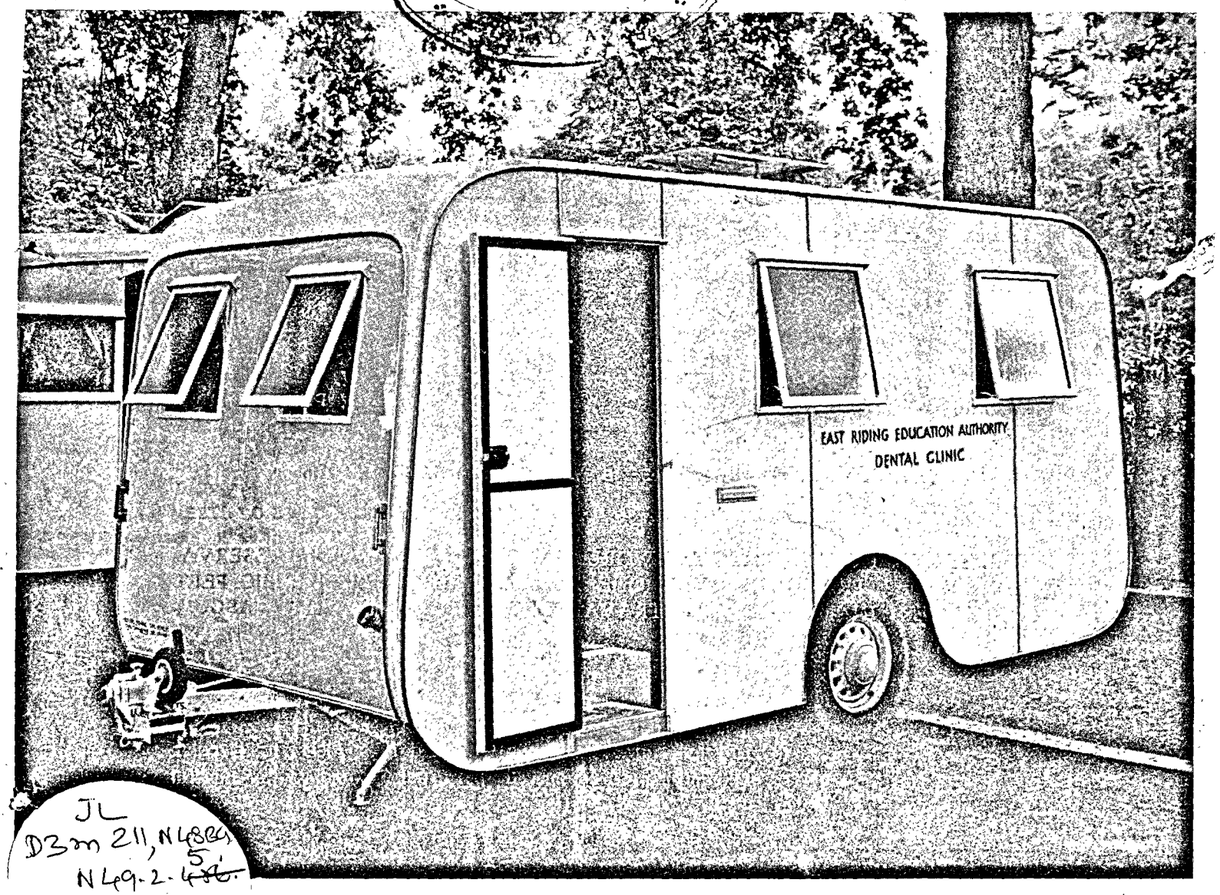
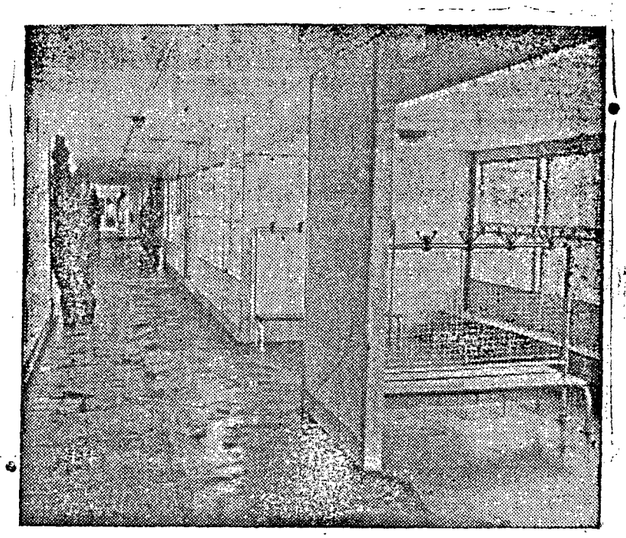


EXHIBIT NUMBER THREE

The first of several to be erected in Britain, an aluminium school, the New Mundella County Primary School, is being built at Park Farm Road, Folkestone, Kent. Others are to be erected at Maidstone, Sidcup, Erith and Dartford. In this picture, workmen are seen fixing guttering to one of the classroom blocks.

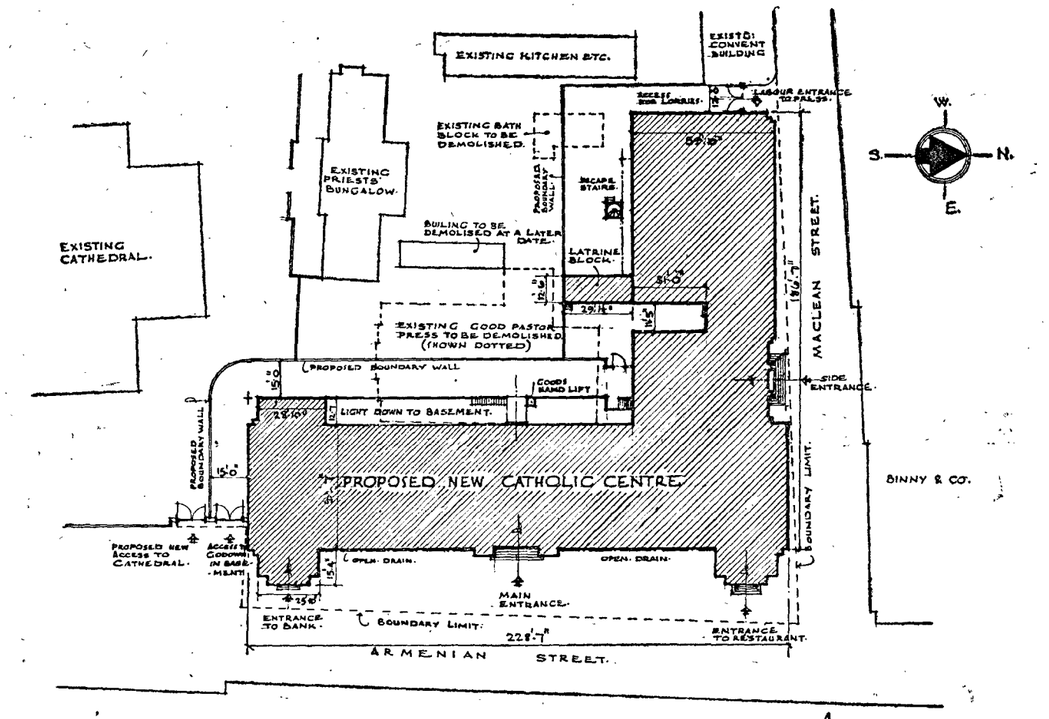
AN ALUMINIUM SCHOOL



Constructed from prefabricated units made by the Bristol Aeroplane Company, the Lockleaze Primary School, Bristol, is the first permanent prefabricated School to be erected in Britain. This picture shows a view along one of the corridors showing the cloakroom recess on the right of the picture.

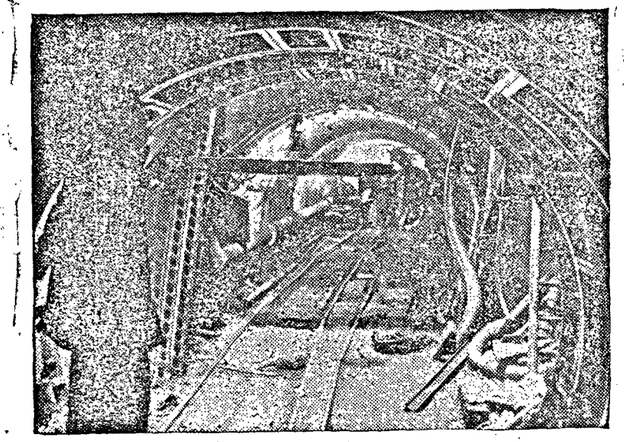
EXHIBIT NUMBER FIVE

PROPOSED CATHOLIC CENTRE IN MADRAS



JOB.NO. 140 DRAWG: NO. 33	SITE PLAN. PROPOSED NEW CATHOLIC CENTRE GEORGE TOWN, MADRAS.	4.4.1949. SCALE 32 FT = 1 INCH.	PRYNNE, ABBOTT & DAVIS ARCHITECTS 13 COLLEGE RD, NUNGAMBAKAM.

ARCHITECTS:
Prynne, Abbott and Davis

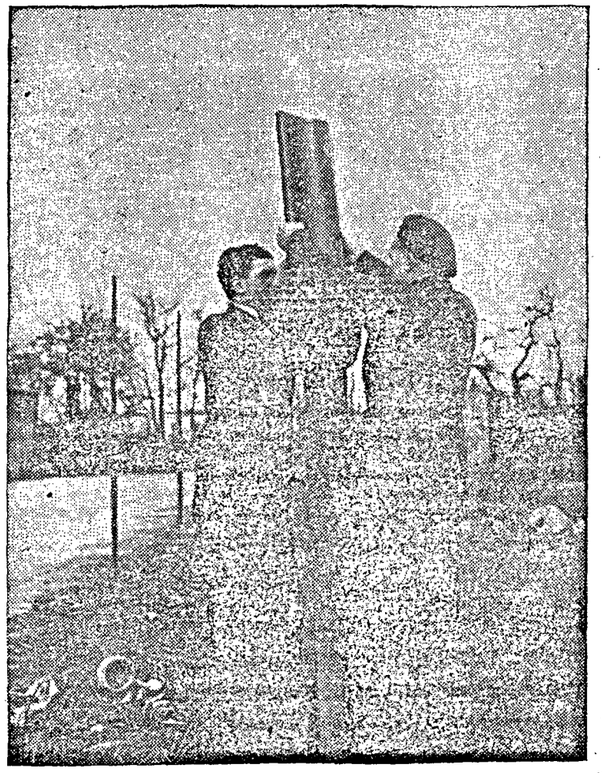


New Tunnel Under the Thames

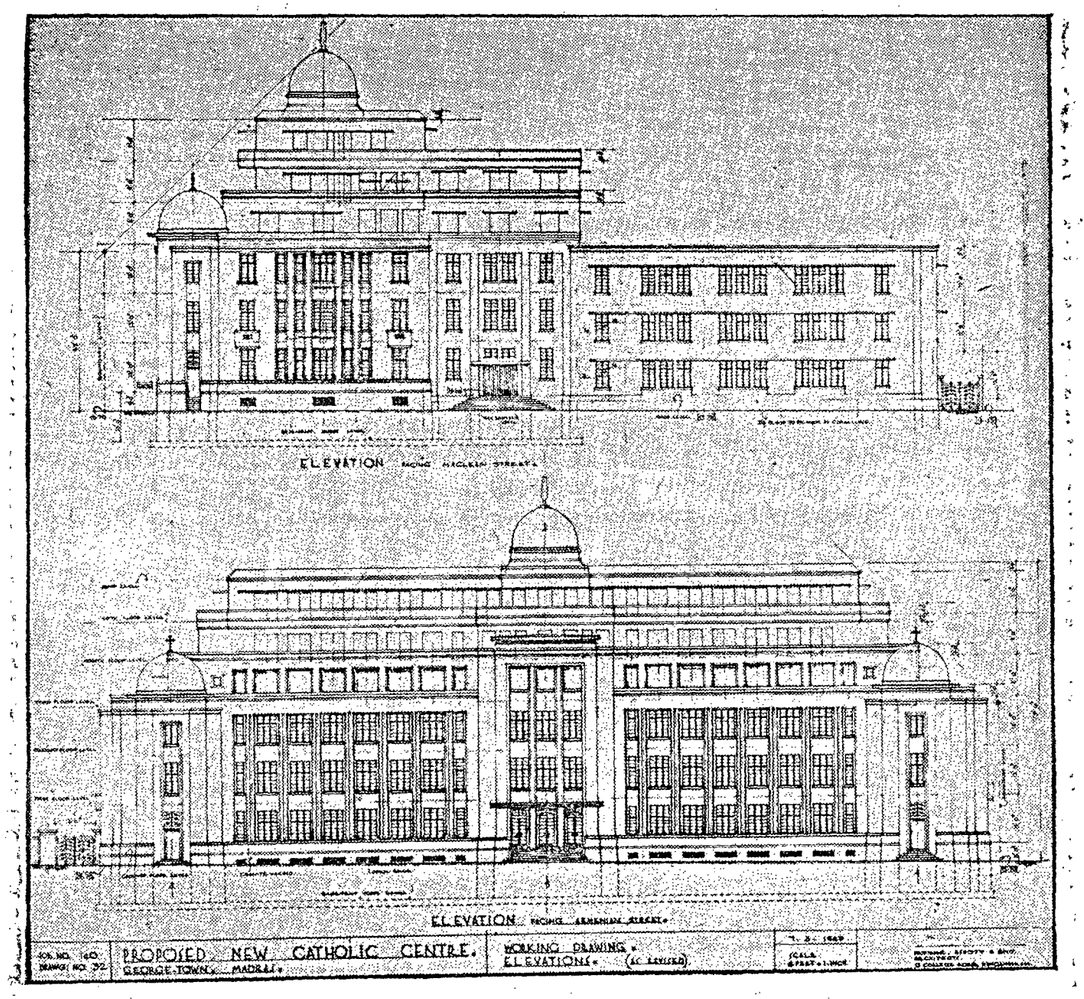
A new tunnel, under the river Thames from Battersea Power Station to Chelsea, will carry cables between the power station and a new sub-station in north-west London. The 2,500 ft. tunnel—one of the most remarkable engineering feats in London—takes two 500-ft. radius bends to miss the piers of the Victoria Railway Bridge, but in spite of this it was only 3 inch out when it connected with the pit dug at the Chelsea end. Continuous shifts working day and night since last September have averaged 60 feet per week, and pressurised air had to be used to keep the engineers going. At one point the tunnel air pressure of 10 lbs. per square inch had to be increased to 28 lbs. to stop the water from bursting through. The internal diameter of the tunnel is eight feet, and it is being lined with 1,900 tons of cast iron lining. It is 76 ft. below ground level on the south bank, and is 16 ft. under the river bed at the highest point. The picture shows the bottom of the shaft on the south river front. Note the patch of daylight on the floor of the tunnel.

New Labour-Saving Tools

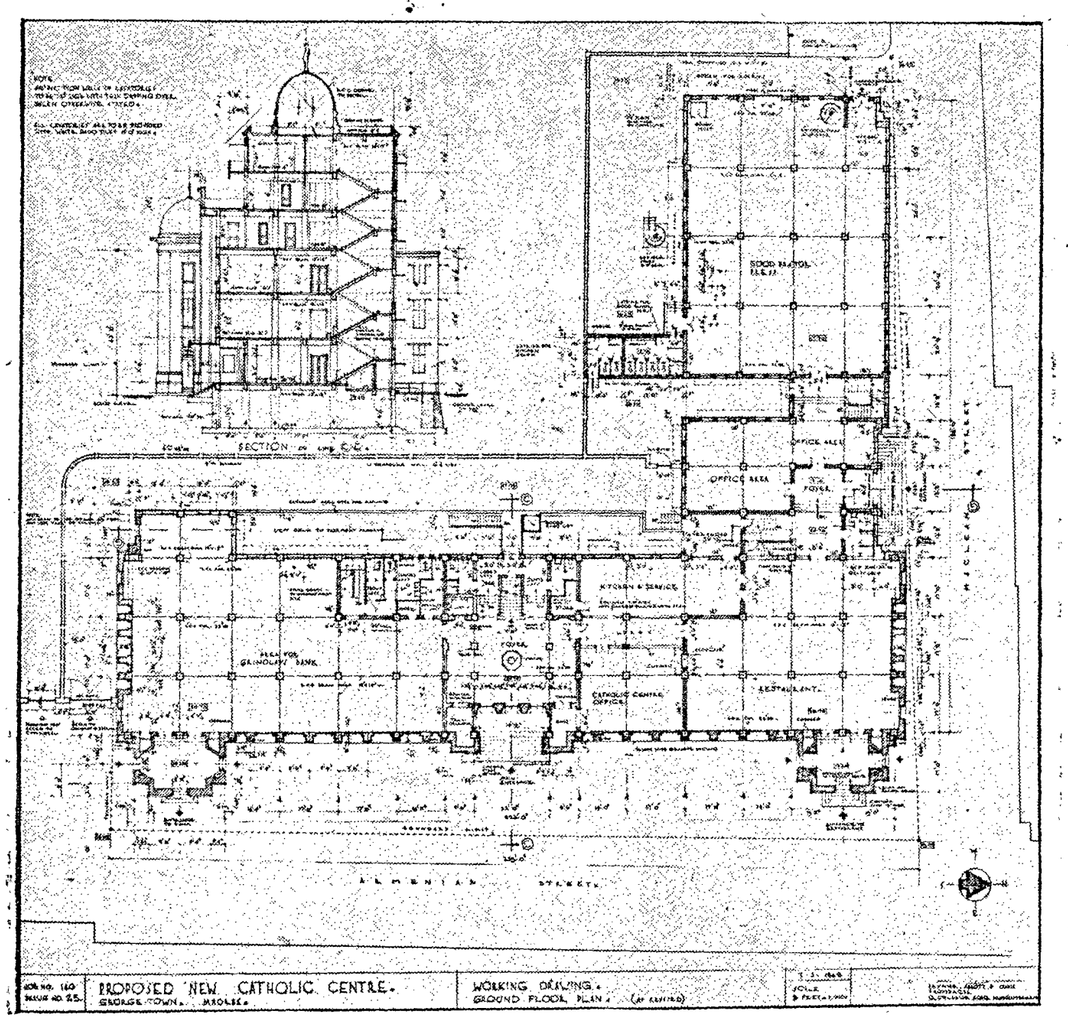
Driving stakes into the ground, lifting stakes out of the ground and breaking up really hard surfaces are among the back breaking jobs of practically every agricultural worker, army sapper and estate labourer. Three new, and very simple tools have been developed by a British firm which have made these operations easy. Two men make light work of driving in stakes with the use of one of the new tools, the "Drivall." In five minutes they can put in more stakes than in an hour with a spade and rammer.



PROPOSED CATHOLIC CENTRE IN MADRAS



PROPOSED CATHOLIC CENTRE IN MADRAS



THE BUILDING GAZETTE

AN INDEPENDENT MONTHLY JOURNAL DEVOTED TO THE INTERESTS OF BUILDING INDUSTRY

VOLUME II — MAY 15, 1949 — NUMBER 5

Articles, photographs, and drawings with a view to publication will be carefully considered. All such articles and illustration should bear the name and address of the sender, and postage should be sent to cover their return if desired in the event of non-acceptance. All communications on Editorial matters should be addressed to the Editor, and all those pertaining to Advertisements to the Manager, THE BUILDING GAZETTE, 1/11, Mukker Nallamuthu Street, G.T., Madras.

SUBSCRIPTION RATE IN INDIA, PAKISTAN, BURMA & CEYLON IS Rs. 6 PER ANNUM. SINGLE COPIES As. 9 EACH. POST FREE.

THE BUILDING GAZETTE is published on the 15th of each month. Complete copy instructions and Blocks for Advertisements must reach the Office not later than the 31st of the month preceding that in which the advertisement is to appear.

THE BUILDING GAZETTE
I/II, MUKKER NALLAMUTHU STREET
G.T., MADRAS.

EDITED BY T. N. SUBRAMANIAM
Associate, Faculty of Surveyors of England

PRINCIPAL CONTENTS

1 MESSAGE
3 THE IDEAL HOME EXHIBITION
5 AN ALUMINIUM SCHOOL
9 PROPOSED CATHOLIC CENTRE IN MADRAS
17 BUILDING TRADES EXHIBITION
18 NOTES AND TOPICS
19 HOW TO LOOK AT MUSLIM ARCHITECTURE
21 BRITISH INDUSTRIES FAIR
22 DESIGN AND PERFORMANCE OF STRUCTURES
24 LATEST BUILDING MATERIALS AND METHODS
28 LIGHT WEIGHT CONCRETES
30 INDIA'S TEAK IMPORTS
32 WATERPROOFING OF CONCRETE
34 ALCRETE HOUSES
35 DOMESTIC ARCHITECTURE IN MADRAS
36 SPECIFICATION
39 RESULTS OF TENDERS
40 CONTRACTS OPEN
41 PROPOSED NEW WORKS FOR DISCUSSION
42 EDUCATIONAL
43 BOOKS FOR READING

BUYERS' GUIDE

FOR	SEE PAGE
ASPHALT MIXERS	6
ASBESTOS CEMENT SHEETS	12
ASPHALT ROAD MACHINERY	44
ANTI CORROSIVE PAINT	Back Cover
BUILDING CONTRACTORS	2, 8, 10
BUILDERS PLANT	2
BRASS FITTINGS	12
BOOKS	43, 44
BASINS	12
BLOCK MAKING	44
CONCRETE MIXERS	6, 44
CONCRETE BLOCK MAKERS	8, 44
COLLAPSIBLE GATES	12
C. I. PIPES	12
CLOSETS	12
CABINET MAKERS	16
COLOUR CEMENT	4
ELECTRICAL ACCESSORIES	10
EXPANDED METAL	12
ELECTRIC WATER HEATER	14 & 16
ELECTRICAL PLANTS	14
FANS	14
FURNITURE	14
FRENCH POLISH	Back Cover
GLASS TILES	12
HARDWARE	12
HAND PUMPS	14 & 44
IRON GOODS	12
LUBRICATION	2
LAMP HOLDERS	10
MANGO PLANKS	12
MARBLES	12
OIL ENGINES	14
PREFABRICATION	Inside Front Cover
PRINTING	44
PUMPS	6
PAINTS	Back Cover and 12
PLYWOOD	6 & 12
ROOF TRUSSES	Inside Front Cover
RAWL PLUGS	6
RICE MILL	14
STRUCTURAL ENGINEERS	8 & 10
SWITCHES	10
STEEL ROLLING SHUTTERS	12
SANITARY INSTALLATION	12
S. W. PIPES	12
SEALER	Back Cover
TIMBER	6 & 12
TUBE WELLS	12
TROLLY TRACK RAILS	44
TIPPING WAGONS	44
TILES	Inside Back Cover
TOGGLEBOLTS	6
WATERPROOF CEMENT	4
WATERPROOF CONCRETING PAPER	12
WATERPROOF ROOFING MATERIAL	12
WOOD PRESERVATIVE	Inside Front and Back Cover
VARNISH	12 and Back Cover

BUILDING TRADES EXHIBITION

Building industry, as a national key industry, radiates its activity over many subsidiary trades; or, in the words of Sir Arthur Salter, "Housing is by general consent a key industry in the economic process. It involves an exceptional proportion of direct and immediate employment. It has, to an exceptional degree, a quickly radiating effect upon other industries."

Housing is also an instance of an appetite growing on what it feeds and hence once a minimum standard is definitely established and overcrowding checked in the lower ranges of accommodation it would not be surprising if the urge towards better housing spreads gradually upwards to other ranges of accommodation. Further the circumstances of the future, with its promise of greater leisure and increased wages for the worker, are in fact likely to increase the workers' preference for his own house and garden rather than the reverse.

Looking more broadly than is hitherto usual, the U.N. estimates that there is today an acute shortage of 10 to 12 crores family dwellings—to say nothing of the need for many crores of additional homes necessary to replace obsolete and sub-standard dwellings that should be torn down.

Achievements, there are, varied and various, successful and capable of emulation; but to bring home all such and thus stimulate interest could be attempted only by co-operative endeavour of several enterprises.

We have no doubt received valuable co-operation in bringing out this exhibition number and take this opportunity to acknowledge one and all who have enabled us to present this "mobile exhibition" to our readers.

The idea behind this Number is not so much to demonstrate the publicity value of good architecture or engineering but only to show the range of activities affecting building industry. This is in no way a complete picture but we hope this is only a beginning for a noble purpose.

To visualise the part played by the building industry as a whole, we must also trust that before the end of this year a real unity of building contractors on an All-India basis may well prove the first step to a unified building industry.

NOTES & TOPICS

City Improvements and Roads.

There arises good deal of discussion, to no great profit, whenever road accidents occur, as to whether it is the roads or the road users that are responsible for the casualties. The answer is that both are to blame. The roads were not designed, nor are they fitted, for modern traffic conditions; but, the roads being at this moment what they are, proportionate care ought to be exercised by road users. As such care is *not* exercised, and as it becomes quite clear that we shall not alter human nature, we must alter the roads. So 'Roads' ought to be the special field of "City Improvement Trusts".

Architectural Advice.

It is, unfortunately, a fact that the majority of our buildings erected every year in this country are without any architectural advice. The idea seems to be prevalent that such advice is a superfluous luxury. Such misconception for which architectural organization in this country must bear a fair share of blame, has not only done much harm to the advancement of architectural education, but—much more important—has contributed heavily to the mass of ill-designed buildings that deface so many of our streets.

Professional Meetings.

It has become altogether a practice with many of our Engineers while presiding over meetings to talk about 'inferiority complex' and connect greatness instead of discussing about more important problems and arriving at technical conclusions. It would be a step forward if in such meetings actually current problems are discussed and conclusions arrived at. It is to be remembered that no other profession is talking in terms of 'inferiority complex' at their professional meetings.

Rat-trap Bond.

The use of "rat-trap bond," details of which appeared in *The Building Gazette* of January Issue, is a possible means of economising in bricks and the opinion of the Building Research Station of England on the characteristics of 9" walls built of this bond is as follows:—

(*a*) For strength, satisfactory for ordinary one or two-storey houses.

(*b*) For resistance to rain penetration, satisfactory if suitably rendered externally.

(*c*) For thermal insulation, intermediate in value between 9 in. solid and 11 in. cavity work.

(*d*) For sound insulation (in party walls), slightly inferior to 9 in. solid work.

Madras Harbour Expansion.

Considering the importance of Madras City in relation to the existence of this harbour the justification of expansion cannot be discussed at low level. In general the public should certainly assert itself against any official encroachment on its amenities. But in this case the City Corporation has given only a step-motherly treatment to the High Court Beach hitherto; it will therefore be prudent if the Corporation pursues its Commissioner's recent recommendations to:—(1) Flushing the Cooum efficiently and making it a pleasant and attractive tidal river; (2) establishing direct communication for the country-craft traffic between the Buckingham Canal and the Port and thereby, improving the facilities for free movement of goods traffic to and from the Harbour; and (3) reclaiming the low-lying Island Grounds and filling up the northern arm of the Cooum, if possible, between the Stanley viaduct and the Napier bridge.

Jadavpur College.

The Government of India have authorized a capital grant of Rs. 39,51,000 and a recurring grant of about Rs. 6 lakhs a year, to the College of Engineering and Technology, Jadavpur, Bengal.

The authorities of the institution do not propose to utilize this money by adding new branches of engineering study to the existing courses. They intend to raise the standard of training in the mechanical, electrical and chemical engineering departments by acquiring up-to-date equipment and adequate staff in order to obviate the necessity of Indian students going abroad for undergraduate and post-graduate studies.

Founded in 1906, the Jadavpur College has grown to be an institution of all-India importance. More than 30 per cent of the students are from provinces outside West Bengal, and many come from countries like Indonesia, Malaya, China and Ceylon.

Howrah Bridge Lighting.

A demonstration of fluorescent lighting on the New Howrah Bridge was given recently when the switch controlling six street lanterns equipped with daylight fluorescent lamps was turned on.

The Commissioners for the New Howrah Bridge, it is understood, intend to implement a scheme drawn up by their consulting engineers for the lighting of carriage ways, foot-paths and approaches to the bridge and it is thought that fluorescent lighting may be the best answer for this important link connecting Calcutta with Howrah.

If the new method of lighting be adopted, about 130 fluorescent lanterns will be installed covering the whole area between the two tramway goomties on either side of the river. The scheme will cost Rs. 10 lakhs and will probably be the first attempt at such street lighting in Asia.

The advantage of fluorescent lighting over the ordinary tungsten filament lighting is that it ensures good road and footway surface reflection and freedom from glare.

HOW TO LOOK AT MUSLIM ARCHITECTURE

Mrs. C. R. MANGAT-RAI, Ph.D.

Introduction.

To all of us who live in Delhi a unique opportunity is given to see and study a panorama of eight centuries of architecture spread out through seven major cities and consisting of some of the finest examples of Muslim buildings in India. But also to most of us, our first reaction on seeing the variety and scope of these ruins, is one of bewilderment as well as awe; of questioning as well as admiration. I am not going to attempt to act as your guide either historically or geographically, but I would like to suggest three ways of looking at Muslim architecture—three approaches that may prove helpful in furthering our understanding of this difficult subject.

The three approaches briefly are as follows: (1) Why man builds—principles of use, (2) How man builds—principles of structure, and (3) How well man builds—principles of design. In each of these I pose a question—and suggest an answer. I will discuss briefly each of these problems and illustrate them with examples from the architecture of Delhi.

1. Why Man builds—Principles of use.

If we ask ourselves why man ever started to build at all, we can only answer—because conditions forced him to. He needed shelter from the elements, so he erected a hut or house or palace. He needed protection from the enemy and so he built a fort. He built temples or mosques or churches to glorify God and to worship in. Thus architecture was born—springing from the basic, human, universal needs of persons and societies.

Thus man builds for use, and we find that the use or function of a building to a large extent dictates the form it is to take. A college or library or hospital fulfils a need of society, and has quite a different form from that of, say, a house which fulfils a personal need. Many factors enter into the utilitarian aspect of architecture—such as geographical position, climate, religion, a changing political or social or economic environment. All of these considerations help us to understand why man builds as he does.

Of these factors climate is one of the most important. Here in Delhi it is hot for most of the year. Man's aim here is to make homes as cool as possible. Whereas the moderns are doing this by means of electric fans and air-conditioning, the Moghuls used marble pavilions and cooled these by means of running water and a free circulation of air through an absence of doors, and a garden setting. Religion is another important factor in why man builds as he does. Islam is a congregational type of worship and requires a large enclosed space for meeting. Hence the form of the mosque with its central courtyard. It is also an austere religion and the architecture reflects this spirit in its purity of line and simplicity of form and restraint of decoration. One could multiply these examples indefinitely but I will confine myself to one further example—the part geography plays on architectural materials. Here in Delhi sandstone is readily available and hence most building is of stone, a factor that in turn influences the style of the building. In the Punjab there is very little stone to be had, and hence there arose a distinctive style of brick architecture.

Let us take a few examples:

Tughlaqabad Fort Wall.—This is the fortress wall of Tughlaqabad built in the 14th century by the warrior sultan Ghiyas-ud-din Tughlaq. The impression it gives us is one of massive strength and power. We can understand these qualities if we understand the unsettled political conditions prevailing at this time. This fort was built to withstand the attacks of both Rajputs and invading Mongols.

Red Fort—Let us look at the view of the Red Fort as a contrast to Tughlaqabad. This was built by Shah Jehan in the 17th century—about 300 years later. Here also we see a fort whose purpose is ostensibly for defence but the form it takes is less stern and uncompromising. Here we see pleasure palaces surmounting the outer walls and their soft and graceful forms reflect an age of peace and security just as their richness of material reflects an era of great wealth and prosperity.

Diwan-i-khas.—This is a building from this fort—the diwan-i-khas or hall of private audience. It is admirably suited to its purpose and to the climatic conditions and to the age of luxury and delicate grace in which it was built.

In summing up this section I would say that the first way to look at architecture is from the practical point of view. If we understand some of the conditions that dictated a certain type of

* A lecture delivered at the Delhi University

building we will understand why man built as he did. Architecture is for use—and the purpose or function of a building is expressed in its form and style.

2. How Man Builds—Principles of Structure.

From this more general way of looking at architecture we are led to particular aspects of building. From the "why" we proceed to the "how". How does the architect embody in actual form the aims of his patron? In every building he is faced with certain problems of plan and structure and engineering that he had to solve in order to carry out the purposes for which it was intended. Let us put ourselves in his place and first analyze his problems and then find out how he solved them. If we, moreover, concentrate our attention on one type of building, the mosque, and take our examples chronologically we will see how different generations solved the same problems differently; a later period often giving the answer to a problem posed by an earlier one. This is the method of the art historian.

Now, how should we go about it? For convenience sake we can consider the elements of architecture under three main divisions: (1) plan, (2) elevation—structure, and (3) decoration. In all of these three certain problems are encountered and certain solutions offered.

Mosque Plan—Now what problems are involved in the plan of the mosque: What are the essential parts of a mosque according to the Islamic creed? Actually no building is necessary, but human nature demanded an enclosed space for congregational worship. This was further elaborated to include cloisters (liwan), gateways, a sanctuary with mihrab and pulpit (mimber), and screen (maqsura), and minarettes. Orientation is to the west in India (i.e. toward Mecca), and therefore the main gate is facing east.

Plan of the Qutb area.—Here we see the first mosque in Delhi—the Quwwat-ul-Islam—begun by Qutb-ud-din Aibek at the end of the twelfth century. This is an early experimental work and does not have all the elements of the developed plan. There is no real sanctuary but only shallow bays within the cloister. There is no tank, no large entrance gates, no minarettes. All of this is partly explained by the fact that Qutb built on the foundations of a Hindu temple and mostly out of the demolished parts of other temples. Even the maqsura screen was added later to offset some of the shortcomings of the mosque. Another interesting thing about this plan of the Qutb is the way in which it grew. Plans are organic; they do not remain static but often spread out in greater and greater complexity through the years. And this is especially true of mosques which *must not* be destroyed by Islamic law. So here Altamish, son-in-law of Qutb-ud-din, enclosed the first courtyard by a second series of cloisters and added a second screen to right and left of the central one. And finally Ala-ud-din Khalji nearly one hundred years later planned an even more grandiose scheme to include the two former ones. Thus plans grow.

Types of Arches (diagram).—But enough of plans,—let us consider a basic problem in structure—the problem of the arch. This, in more general terms, is the problem of how to roof your building—how to meet and counteract the downward thrust of gravity by an equal and opposite upward thrust. There are two principal ways of doing this—the first typical of Hindu architecture, the second of Muslim. The first is called trabeate, using beams of post —and—lintel construction; the second is called arcuate, or using arches. Trabeate is where the downward thrust of the roof supported on a beam is in a vertical direction and is counteracted by a simple upward thrust of pillars or piers. In arches the thrust of the weight is lateral or sidewise as well as vertical and this lateral thrust is carried from one stone to another until the arch is locked by a key-stone.

In this illustration we see different types of arches—the two principle being the false, or corbelled arch, and the true or key-stone arch. The first works on the same principle as trabeate architecture. Its level courses press evenly downward upon each other.

In the true arch the lateral thrust is carried by the voussoirs using the principle of compression. The parts of the arch support each other by mutual pressure. An arch can span large areas with brick or concrete which would break if applied in the trabeate system.

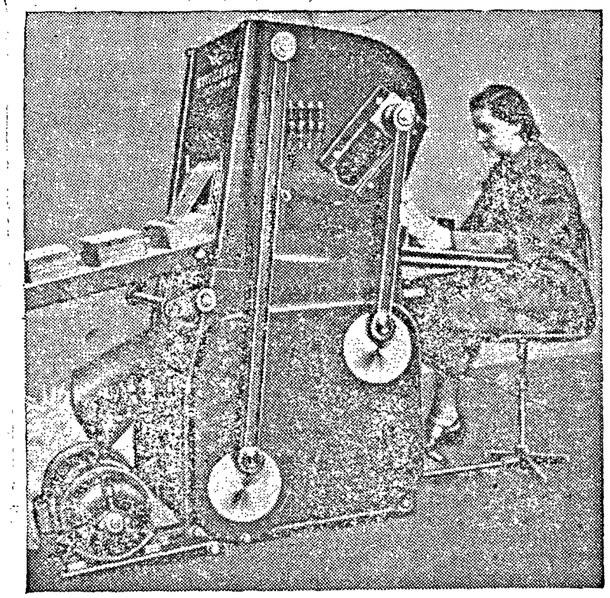
To speak a little more generally —the arch is spoken of as organic and living because it is always working to counteract gravity and exert sidewise pressure. "The arch never sleeps" is a common statement. With arches in a building there is an "harmonious opposition of forces in equilibrium." The post and beam type of architecture is called dead or inorganic because there is nothing to counteract the dead weight of the roof except an equally blind upward thrust of the column.

Cloisters in the Qutb.—This is an example of the trabeate form of building. This is the oldest part of the Qutb and was stolen from Hindu temples. In fact the use of this style of building indicates Hindu workmanship. However, it is not true to say that Indian architects did not know the principle of the true arch before the coming of the Muslims. This is a popular fallacy which was refuted by the great Indian scholar Dr. A. K. Coomaraswamy in his book "History of Indiana and Indonesian Art." In this the author discusses the question at some length and gives many references to isolated occurrences in pre-Muhammadan India. It *is* true to say that the arch was never of primary structural importance until Islamic buildings.

Qutb Screen of Arches.—Here we see what is left of Qutb's maqsura screen. This is a most

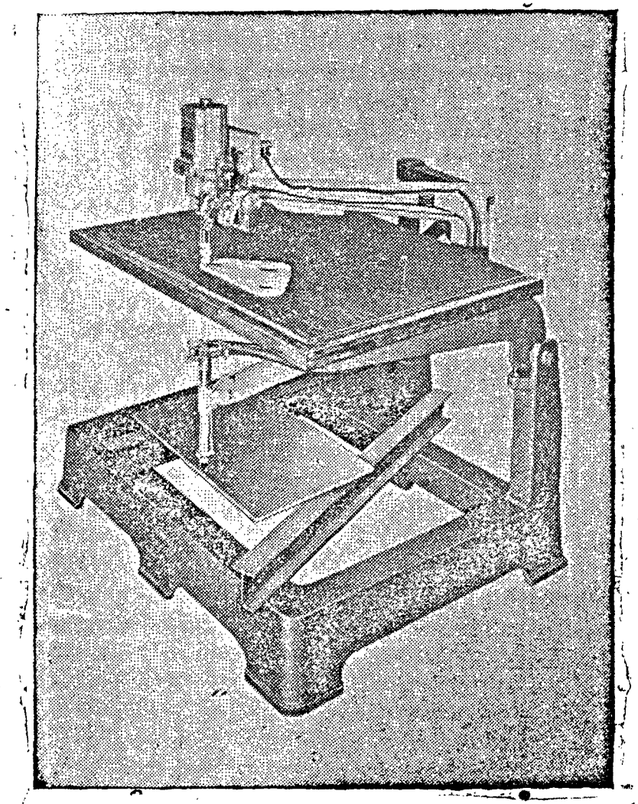
(*Continued on page 37*)

EXHIBIT NUMBER EIGHT



The Johne Continuous Three Knife Trimmer is now manufactured in Great Britain by the Victory-Kidder Printing Machine Company Ltd. of London and Birkenhead. The machine cuts three sides of a pile of books in one operational cycle and delivers them automatically on to a conveyor track.

BRITISH INDUSTRIES FAIR



One example of an oxygen cutting machine made by Hancock & Co. (Engineers) Ltd., Croydon, England. The tracer head follows a guide, template or drawing on the top table and the cutting flame from the nozzle beneath the *table is caused to* follow the *same* path and cut the shape from the steel plate. This type of machine is made in four sizes for cutting plate up to 8 ins. (203 mm.) thick but other machines cope with thicker material. Steel plate 1 in. (25 mm.) thick can be cut at rates of 12 ins. (305 mm.) or more per minute to an accuracy of 1/16 in. (1.6 mm.) or less.

DESIGN AND PERFORMANCE OF STRUCTURES

HIGHWAY BRIDGES

Investigations on Bridge Deck Systems.

A FUNDAMENTAL investigation was carried out at the Building Research Station, England, to study the behaviour under load of composite bridge deck systems. The tests carried out have been confined, for the most part, to those on a one-third scale model bridge deck, consisting of a reinforced concrete slab deck supported on a series of parallel and equally spaced steel beams. The main objects of the tests have been to determine

(i) the distribution of bending moment between individual beams,

(ii) the distribution of bending moment between the beams and the slab and

(iii) the maximum bending moment produced in the slab.

Many readings of deflection and strain have been taken under various conditions of loading, both for the slab in the uncracked and in the cracked condition. In the former case, with the slab in the uncracked condition, it has been found that when the load is applied to the slab, midway between two beams, about 40 per cent of the total bending moment in the beams is taken by each of these beams and about 10 per cent by each of those next adjacent. When the load is applied immediately above one of the beams, 50 per cent of the total bending moment is taken by that beam and about 20 per cent by each of the adjacent ones. The corresponding figures for the cracked slab are approximately 44 per cent and 6 per cent with the load midway between two beams; and 62 per cent and 19 per cent with the load immediately over a beam. These figures do not, however, apply when the load is applied to the outer panels of the slab, or when it is applied immediately above the outer beams.

In addition to the experimental work on the model, mathematical analyses have also been undertaken. The system has for this purpose been considered as a flat rectangular slab of elastic material, supported on parallel, equally spaced elastic beams, the outer one coinciding with the edge of the slab. Both beams and slab, as in the model, have been taken as simply supported and the beams have been considered to offer no torsional resistance. Distributions of deflections, bending moments, and shearing forces over the slab and in the beams for different positions of a point load have been calculated. The effect of the following factors on the behaviour of the system has also been considered :—

(i) Panel ratio, i.e., the ratio of length between supports to the distance between adjacent beams,

(ii) Relative stiffness of beam to slab,

(iii) Position of the load, and

(iv) Number of beams.

The investigations are being continued.

Dynamic Effects in Bridges.

An investigation to study the impact effects in bridges produced by heavy vehicular traffic shows that although there is a wide range of impact factors, the most frequently occurring values lie within the range 0.96 to 0.98, and that although higher values than unity do occur they do so infrequently.

LETTER TO THE EDITOR

Ramapadasagar Project

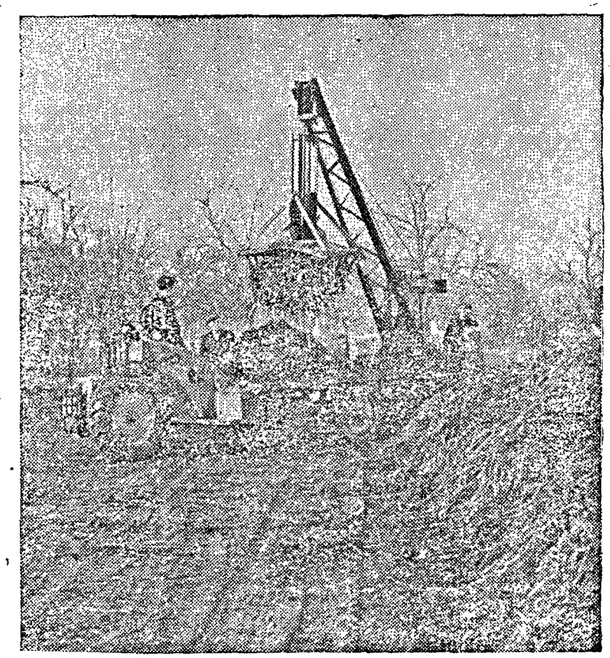
Sir,—The conquest of nature has always been the motive behind the man's activities and it is surprising that the Ramapadasagar project has been postponed by the Government giving more emphasis to 'ifs' and 'buts' and because a parallel could not be found anywhere in the world. It would be interesting to note whether the Americans thought of a parallel when they decided to launch on the Grand Coulee Dam which is the world's biggest man-made structure. The Consulting Engineers to the project have remarked that the Project is "unquestionably possible" and even after such an opinion is expressed by a group of eminent men it is strange why the Government should think of other possibilities and difficulties.

Evidently the Madras Government and for that matter the Government of India seem to forget one important fact. The Americans had no foreign experts to back them up or to undertake construction of their Grand Coulee Dam with the aid of knowledge gained somewhere else. Fortunately we have available for use the experience and methods employed by Americans for the construction of the Ramapadasagar Project if only their services are sought. The considerations

(*Continued on page 26*)

New Compost Shredder Mixer

The Pneulec-Royer compost shredder mixer has the ability to shred, mix and aerate loam, leaf mould, manure, sewage sludge, peat and other compost materials. Compost is produced with particles of proper size to absorb and hold moisture and release nutritive elements as required. Wet or dry materials can be handled with equal success. Steam is instantly released and the sterilized loam quickly cooled down and delivered in a heap. No screens, paddles or knives to wear or clog. Here the mixer is seen breaking up turf into soil for compost, showing the fine soil in front of the machine.



Shifting Dung the Giant's Way

A Ransome's crane loading dung on to a lorry at a farm in Kent. The crane can remove several hundredweights of dung from the heap on to a vehicle in a matter of seconds.

LATEST BUILDING MATERIALS AND METHODS

Scientists Solve Many Problems with Ingenious Tests

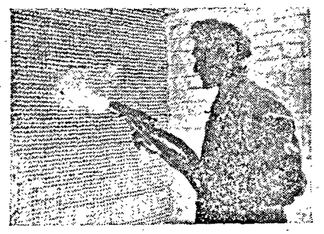
MICHAEL GRANT

FEW industrialists, even in the post-war world, have been called upon to show such ingenuity as builders in overcoming shortages of materials and manpower. The development of new materials and methods and their assimilation into the traditional structure of the building industry has made it essential to study building scientifically with the object of adapting its traditions to modern needs. The potential demand for building materials has become so large that the industry offers an attractive field for the exploitation of newly discovered materials and a prospective outlet for industrial by-products.

Actively supported by Britain's Department of Scientific and Industrial Research, scientists have succeeded in solving many of the building industry's problems by devising ingenious methods to test new materials and ways of employing them to the best advantage, such as making walls resistant to fire, applying the methods of sound insulation to walls, and floors, assessing the amount of daylight entering through the windows, studying photometrically artificial lighting, and testing heating appliances scientifically.

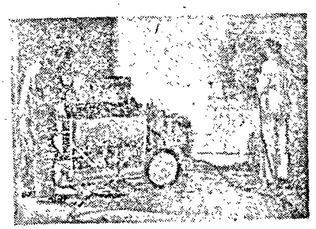
The combination of a new building material called "Pyrok" with wire mesh may well mean new shapes for our homes with their main shells completed at a fraction of the present-day cost. The new material is made from Portland cement, lime and vermiculite—the latter being a type of mica found abundantly within the British Commonwealth, particularly in the Union of South Africa and Kenya. In colour it looks much the same as ordinary plaster, and it can be sprayed on the wire mesh with a spray gun up to eight inches thick. It sets within 50 minutes and there is no need to wait for one coat to dry before adding the next, which reduces the time necessary to attain the desired thickness.

The material has also been applied to such surfaces as steel, iron, asbestos-cement sheeting, galvanised sheeting, brickwork, concrete, timber, clay blocks, wood and cork. The final



Technique of building a Pyrok wall Two sheets of wire mesh with an air space between, are sprayed with the material to the necessary thickness—up to eight inches where required.

smooth finish is achieved by the use of a vibrating finishing tool. Owing to the resilient action of the vermiculite, "Pyrok" does not crack like the normal plaster, it takes nails or screws and can be



Combined mixer and air-compressor for spraying Pyrok. The lime, cement, and vermiculite are mixed in the tank (operator is holding the lid open) by a special pedal-action which avoids breaking the vermiculite granules.

cut with on ordinary saw. It is waterproof and absorbent and there is no difficulty in applying the usual paints and distempers to a "Pyrok" wall. The new material is also fire-resisting to a high degree.

Increasing Use of Aluminium.

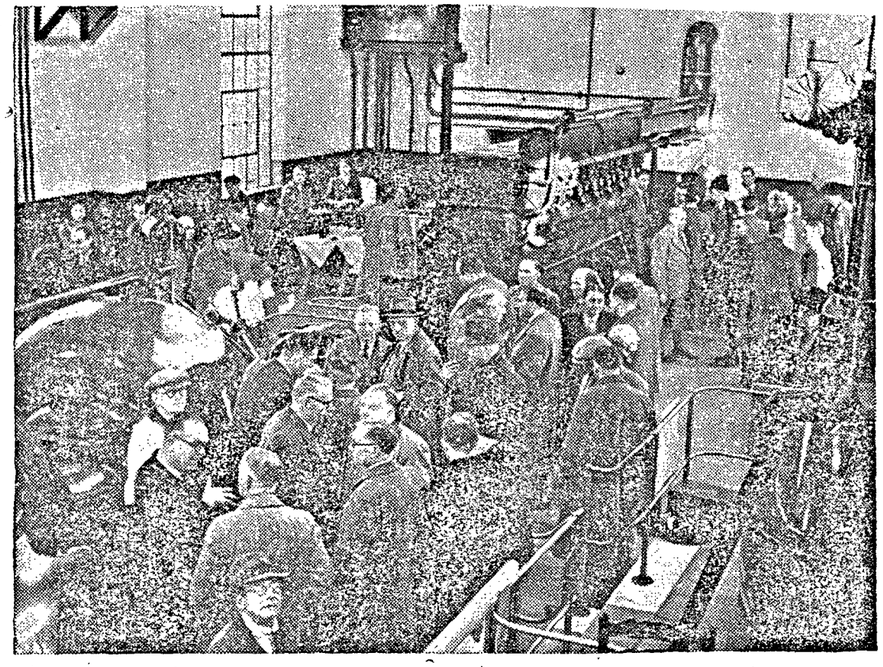
Aluminium and its alloys are coming increasingly into their own as new building materials. The strength of new aluminium alloys, recently developed in Britain, compares favourably with that of mild steel. Their lower elasticity can be compensated by an appropriate increase in the dimensions of structural members without

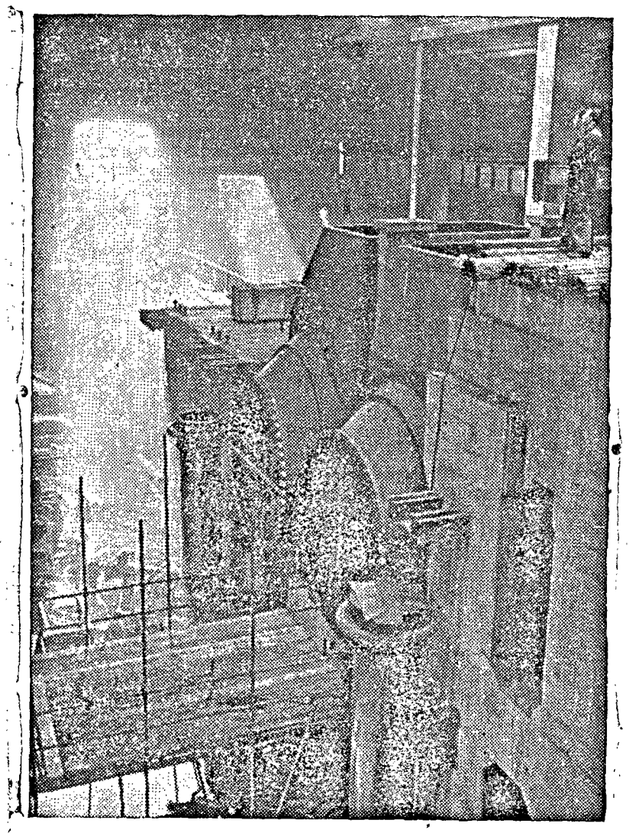
A wood-built model house one half of which was sprayed inside and out with 1/16th inch thickness of Pyrok. The model furniture of wood and fabric was replaced in the room after spraying.

undue increase in weight. Provided with a thicker covering for insulation and fire protection, the performance of aluminium is comparable with that of steel. In combination with foamed-concrete insulation the use of aluminium has been extended, with some improvements, to provide not only temporary buildings but also permanent houses, schools and factories. Transportable buildings made in Britain of aluminium alloy, are in great demand all over the world. Enormous hangars made of aluminium alloy and designed for use in connection with the East African groundnuts.

(Continued on page 26)

EXHIBIT NUMBER TEN





Draining the Fens

Erected at a cost of £65,000 (Rs. 8,61,250), the new Welches Dam Pumping Station, the largest of its kind, was recently opened by Mr. George Brown, Parliamentary Secretary to Britain's Ministry of Agriculture. Fitted with two 72-inch discharge pipes capable of throwing out 750 tons of water a minute, it will help to keep 20,000 acres of peat land in the Fen County free from floods. Visitors who attended the opening ceremony inspecting the machinery.

Battersea Power Station Extensions

The extensions that are now being prepared at Battersea Power Station, London, will add 66,000 kilowatts to the present output of 343,000 kw. A view of the new turbine hall showing foundations, and condensers for No. 5 turbine in position.

LATEST BUILDING MATERIALS AND METHODS

(*Continued from page 24*)

project, can be extended to 400 feet or even longer, and, after transport in sectional sets, can be erected on the spot by six men in two days.

In view of the shortage of timber and steel, a new continuous technique to the production of reinforced concrete joists is being applied by building engineers at Westhoughton, Lancashire. Joists of any required length can be made with the help of a new mould invented by the application of foundry technique. By the application of another new process, cellular concrete can be made in a number of different ways with a density of 20 pounds per cubic foot upwards. Blocks made of such low-density materials can be used for load bearing.

Messrs George Wimpey and Co., Ltd., 27, Hammersmith Grove, London, W. 6, have succeeded in developing a new lightweight concrete called "Situfoam", and have evolved a technique of pouring the shells of houses *in situ* with this material. Compared with traditional methods, the new process saves 25 per cent cost and 50 per cent time and labour.

Another interesting development is a substance which enables concrete to be poured in frosty weather without danger.

Sound-Proof Material.

Woodwool is being increasingly used, especially for temporary buildings. Eleven transitional schools in London, constructed of woodwool covered with patent cement, will last several years until materials are available for permanent buildings. The first of these schools was opened recently. Thermacoust Ltd. have erected a new factory at Bentley Works, Doncaster, Yorkshire, for the production of building boards or blocks composed of cement and woodwool. The material is sound proof, providing temperature insulation. "Thermagard" is another new building material developed by the same company in combination with Gardner Son and Co., of Bristol, Gloucestershire, England. "Thermagard" is made of steel and woodwool.

Lighter timber roof structures with improved fixings have been devised by the Timber Development Association Ltd., 75, Cannon Street, London, E.C. 4, where the traditional carpenter's rule of thumb methods have been replaced by the scientific calculation of timber sizes and spacings. Lighter roof structures have brought with them lighter coverings and the increased use of copper sheeting, bituminous-felt covered steel decking and cedar shingles. A new lightweight, easily transported and erected roof construction, known as the "Arcon" has recently been introduced by a number of firms in Britain. The new roof, meeting chiefly the requirements of engineers concerned with colonial development, is distributed by Taylor Woodrow Construction Ltd., 25, Wilton Road, London, S.W. 1. A 3-bay structure, 30 feet by 30 feet and weighing approximately five tons can be erected by unskilled labour in about 50 man hours.

There are great improvements in the insulation of walls and ceilings with consequent fuel economies. Vermiculite tiles for roofs and ceilings are easily fitted and provide first-class sound and heat insulation for halls, hospitals, theatres and offices. When mixed with plaster and cement, vermiculite gives a wide range of materials for roof and floor concretes, tiles, insulating felts, and materials for wall construction. Ashdowns, Ltd., of St. Helens, Lancashire, England, have developed a fireproof synthetic insulating material made by bonding glass cloth and silicon resins. Fibreglass Ltd., 10, Princes Street, London, S.W. 1, have developed a bitumen-bonded fibreglass material for attic insulation.

The advent of synthetic, waterproof glues has increased the potentialities of plywood and of glued construction in timber, and has led to the development of new kinds of building board made from wood-waste or other by-products. Plastics enter into the composition of a variety of flooring materials.

PERSONAL

Mr. C. W. Fowler.

Mr. C. W. Fowler, Managing Director of the Associated Cement Companies Limited, has left for England prior to retirement after an association of nearly 30 years with the Indian Cement Industry.

Miss Rutty Daver.

Miss Rutty Daver, India's first woman welding engineer, has returned to join her firm in Bombay after 14 months study in the U.K.

Mr. B. D. Mhatre.

Mr. Baburao D. Mhatre, F.I.I.A., has been appointed a member of the Bombay Housing Board. With his knowledge as a practising architect, he will prove an asset to the Board.

Mr. N. B. Shroff.

Mr. Nariman Bejonji Shroff, F.R.I.B.A., F.I.I.A., formerly Consulting Architect and Town Planner to Government, East Punjab, has taken up an appointment with the Ministry of Railways, as Architect to the East Indian and Bengal-Nagpur Railways.

LETTER TO THE EDITOR

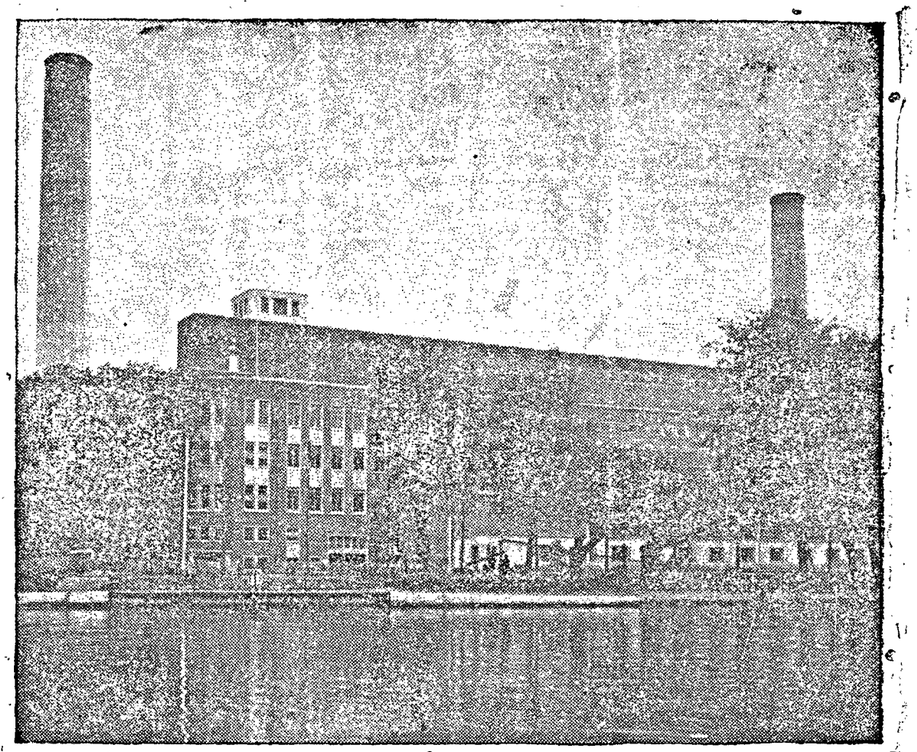
(*Continued from page 22*)

standing in the way are said to be the huge finance and the large quantity of constuction materials required. I do not feel that these are insuperable problems as to require the postponement of the project. If the whole scheme is worked on a planned basis with the necessary backing of men and money and material the project could be the greatest achievement of man.

As to the effects produced on inflation one fact should not be forgotten: that the construction period is spread over to 17 years and the total expenditure would not be spent in a lump. Can the Government tell that the umpteen other projects taken on hand for execution will not produce its effects on inflation? I feel that a determination and a will to do only will lead to success.

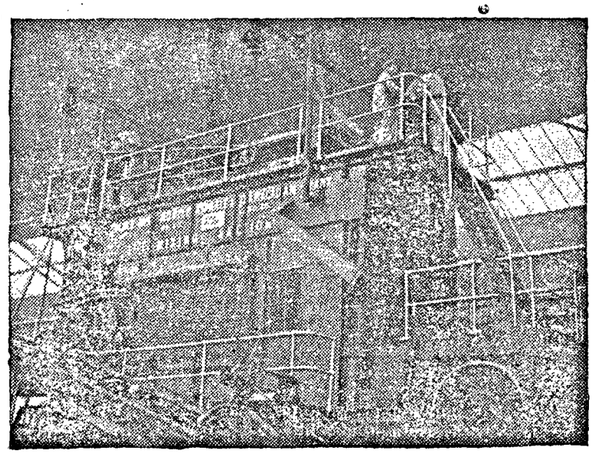
Yours faithfully,
Cocanada. S. NAGENDRA RAO.

EXHIBIT NUMBER ELEVEN



New Thames-Side Power Station.

One of the four in the £20,000,000 (Rs. 26,50,00,000) scheme designed to meet the ever increasing demand for electrical power in Britain, and capable of producing 120,000 kilowatts, this new riverside power station at Kingston, Surrey, was opened recently by Their Majesties the King and Queen.



Giant Road-building Machine

This ninety-foot long, 50-ton, mobile asphalt and tarmacadam plant which can turn out 20 to 25 tons of road material per hour, and can be operated by one man from a control panel, was the largest machine on show at the Public Health and Municipal Engineering Exhibition held recently at Olympia, London.

LIGHT-WEIGHT CONCRETES

ANTHONY POTT, A.R.I.B.A.

THE following is an extract of a paper read at the Royal Institution of Chartered Surveyors by Mr. Anthony Pott, A.R.I.B.A. of the Building Research Station (U.K.'s Department of Scientific and Industrial Research).

Light-weight concretes are not "new" materials but except in the common and much distrusted clinker concrete (partition) block they have not been widely used. This is not so in countries such as Sweden and the U.S.A. where they are well-established building materials and are used in large quantities. Broadly speaking any concrete weighing less than 120 lb./c. ft. can be described as light-weight, but the usual range is between 50 and 90 lb./c. ft. They fall into two classes: those made from aggregates which are themselves light and those consisting of a cement mortar of a cellular structure which is obtained by chemical or physical means during manufacture. The light-weight aggregates are either natural materials by-products of other processes or manufactured aggregates. In England the best-known examples of these types are pumice, furnace clinker and foamed slag respectively. The properties of light-weight concretes vary with the materials and processes used; and considerable variation is also found within any single type depending on the density of the material which is largely determined by the mix used. Thus, with foamed slag concrete the compressive strength (at 28 days) may range from about 4,500 lb./sq. in. with a 1 : 1: 2 mix (density 114 lb./c. ft.) to about 250 lb./sq. in. with a 1 : 6 : 12 mix (density 70 lb./c. ft.); and the thermal conductivity from 1.0 B.Th.U./hr./sq.ft./in./°F. at 41 lb./c. ft. to 2 . 2 B.Th.U./hr./sq. ft./in./°F., at about 80 lb./c. ft. The advantageous properties of light-weight concrete are relatively low thermal conductivity (that is, they are good heat insulators) that they are easily cut, they can be nailed into, they are a good base for plastering and their behaviour in fire is slightly better than that of dense concrete. Against these advantages light-weight concretes have two disadvantages: lower strengths and rather larger moisture movements than, say, dense concrete. But there are many purposes for which great strength is not necessary, and it is in application to these that light-weight concretes can be used with the benefit of their other properties. For instance, the most economical method of improving the insulation of the walls of the ordinary small house is by replacing the brick inner skin of an 11" cavity wall with one of light-weight concrete chosen for its combination of adequate strength with low thermal conductivity. Strength is of still less significance in the design of panel infilling for framed buildings. and here the lightness of the material is itself an advantage in reducing dead load. In a recent number of an American paper there was reported the extensive use of light-weight concretes (of the light aggregate type) in two large office buildings: and it was stated that in each of these the very large reduction in the dead loads had resulted in a saving of over 1,000 tons of steel.

In these office buildings the steel frames were encased in vermiculite plaster, 2" thick, gunned on to expanded metal fixed to the steelwork. This one feature contributed a substantial saving in deadweight, and is a good example of how a relatively new material and advances in knowledge—of fire-hazard in this case—may combine to produce new kinds of construction. Vermiculite is a mica-like mineral which is found mainly in the U.S.A. and in South Africa. It has the characteristic of exfoliating when heated to produce a very light material weighing only a few pounds a cubic foot. In the U.S.A., it has been used as an aggregate for light-weight concrete, as loose insulation and in special acoustic plasters: so far as I know, the last of these is the only application to which it has been put in England in the past, but recent notices in the technical Press suggest that developments which are going on at present may lead to its wider use in the future. There is little, if any, experience of vermiculite as an aggregate for concrete in England, but it is clear from American sources that very light-weight concrete can be produced (from 20—60 lb./c. ft.). with good thermal insulating properties (conductivity about 1.0 B.Th.U., etc.). It seems probable that the behaviour of vermiculite concrete in fire-resistance tests would be at least as good as that of other light-weight concretes. The apparent disadvantages are the low strength, which may well restrict its use to non-load-bearing elements, and the high cost of the aggregate; and there are a number of important properties, such as moisture movement and permeability, on which more information is necessary before a complete assessment can be made.

The main function of the vermiculite plaster encasement to the steel members in these American buildings is, of course, to increase the fire-resistance of the elements of the structure. Here I would like to draw attention to the work on Fire Grading of Buildings of the Joint Committee of the Building Research Board and the Fire Offices' Committee. Part I of the committee's report has been published as No. 20 in the Post-War Building Studies. It deals with

(*Continued on page 32*)

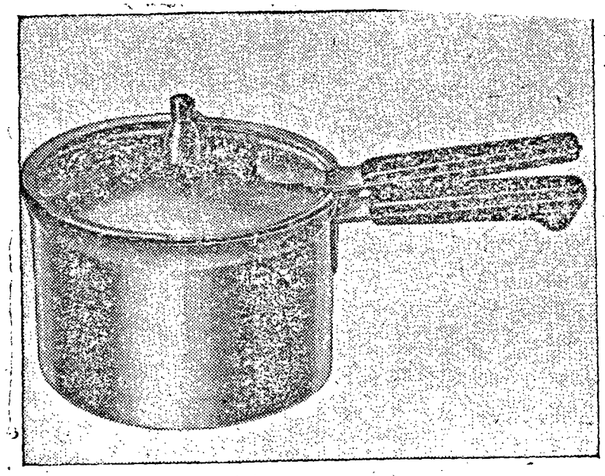
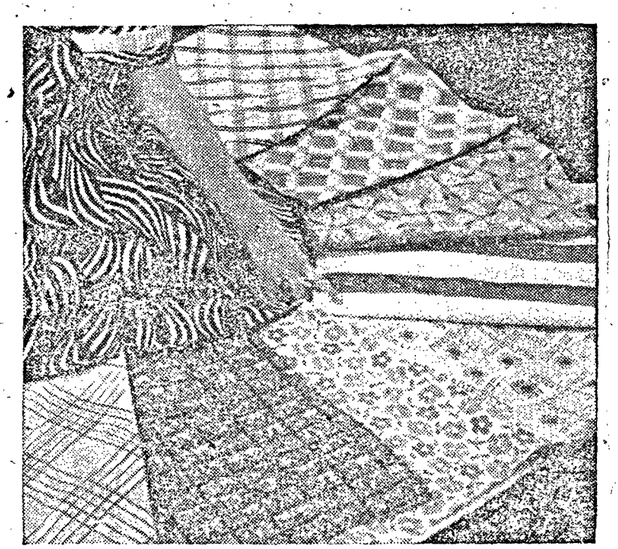
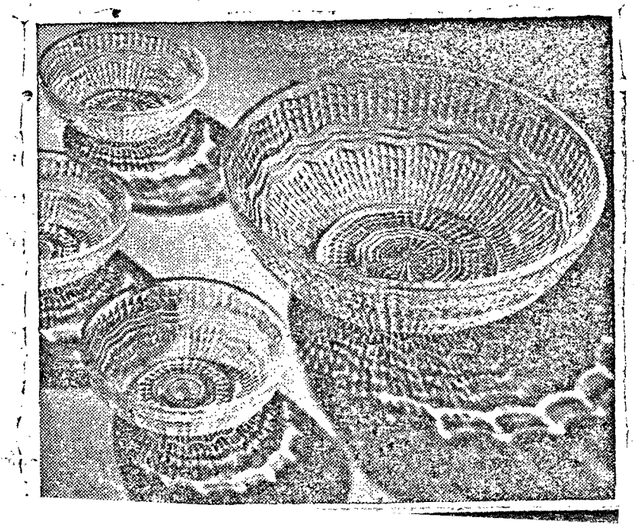


EXHIBIT NUMBER TWELVE

First stainless steel pressure cooker produced in Britain. Made by Andrews Bros. (Bristol) Ltd. is guaranteed for 25 years, on view in the Hardware Section of the 1949 B.I.F.



A survey of some of the new 1949 cottons being produced by Southwell Fabrics (of Manchester and London). shown in the Textile Section of the B.I.F. (Earls Court). From LEFT to RIGHT: an attractive double check with a dark and lighter stripe on a medium ground; an amusing caricature design; stylised flowers on a pale ground; combination of flower and broken Greek key design; bold black stripe and spot combination; tartan bow motifs on a ground broken by dots; the linked bow motif; and a fancy tartan design. The plain weave cotton frock worn by the girl pointing to the materials is bold wavy design in white and dark blue on a dark blue ground.



The "Waverley" Fruit Set, on view in the Glassware Section of the B.I.F. 1949, is the latest pattern in Chance Domestic Glassware made by Chance Brothers, Smethwick, Birmingham: a brilliant new design in three sizes 3½", 4½" and 9½".

INDIA'S TEAK IMPORTS

A Plea for the Abolition of Import Duty on Non-Burman Teak.

L. S. KRISHNAN, M.A. (Hons.)

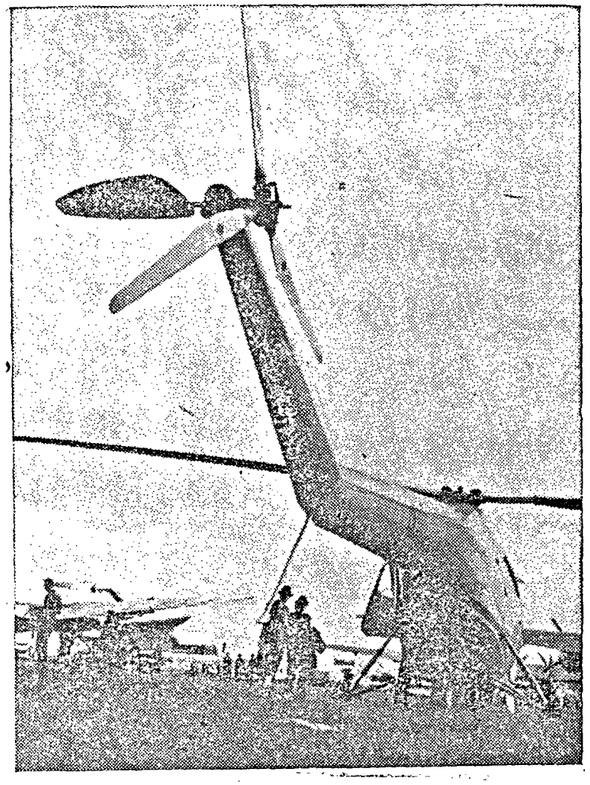
RECENTLY I had occasion to impress on the public and the Government the absolute necessity for conserving our teak resources, both indigenous and imported. The timber trade in this country has been accustomed to think that teak was synonymous with "Burma Teak". This is erroneous, because practically the whole of South-East Asia right up to the Philippines is a natural teak zone. For a considerable time now regular imports of teak from countries east of Burma has been subjected to a serious handicap by way of an *ad valorem* import duty of as high as 30%. The main excuse for the levy of this duty was that it was a PROTECTIVE DUTY, and since Burma was a province of India (I am referring to the old days prior to separation) the Burman resources should be protected against foreign competition. As a matter of fact the sole object of this import duty was to protect European vested interests exploiting the teak in Burma and nothing more. This is confirmed when I say that this duty was continued even after Burma was separated from India in 1934. The European teak lessees in Burma had a good innings till, in the first instance the Japs entered Burma, and subsequently, during the short interval between the return of the Britisher and the declaration of Burma as an independent republic followed by the nationalisation of the teak industry. It will be interesting to mention here the present position of teak trade in Burma.

Immediately after the Japs quit the country in 1946 a sort of partnership was entered into between the Governor of Burma and a body called the "Consortium", the latter made up of the European teak interests, by which the Government of Burma undertook to finance the Consortium for the further exploitation of the Burman teak. The profits were divided in the ratio of 60% for the Government and 40% for the Consortium. The individual firms who were formerly engaged in the teak trade formed themselves into a Burma Teak Exporters' Association and their former agents in India in their turn formed themselves into a Burma Teak Importers' Association. In fact a carefully planned monopoly was created between these bodies in their respective spheres, the interests of the nationals of Burma and India being completely ignored. The Consortium used to buy f.o.b. from the seller and sell c.i.f. to the buyer in India and in so doing managed to create a difference in price after meeting freight and insurance charges, amounting to an average of Rs. 200 per ton of 50 c. ft. or Rs. 4 per c. ft.! This difference was divided between the Government and the Consortium in the above ratio of 60 per cent and 40 per cent. In fact, this was nothing more than an export duty on teak which the Government of Burma were debarred from levying under the Indo-Burma Trade Agreement of 1941. But who cares? The extra money which the Indian importer has to pay as a result of the devious methods adopted by the Burman Government to increase their revenues is something considerable. Because, when the Timber Project Board, constituted by the Britisher immediately after the war, and their successors, the State Timber Board formed after the nationalisation of the industry buys f.o.b. from the seller, the latter sees to it that he makes his margin of profits from the Board and the extra 40 per cent he gets subsequently from the Board is only additional profit.

There is a deep rooted impression in the Government of Burma that India is helplessly dependent on Burma for her rice and teak. Even if this is a fact, which in the case of teak at least it is not, they fail to see that we are responsible for consuming no less than 75 per cent of the normal export of 450,000 tons of teak exported annually from Burma and 67 per cent of the total money value which goes into Burma. That being the case it is obvious the Burman will be in a parlous position if we find it worth our while to import our teak from non-Burman sources. The same applies to his rice. One may thrive on loans and borrowings for some time but the real solvency of a country depends on her capacity to create a favourable trade balance. Therefore, the stage has arrived when the Central Government will have to find a solution to this "friendly exploitation" of the needs of our country by our Burman neighbour. The first solution that suggests itself to me is the immediate abolition of this iniquitous import duty of 30 per cent on non-Burman teak and the use of Indian bottoms to carry the teak cargoes from the countries in South-East Asia.

Our present supine policy of favouring Burma against the rest of Asia and allow ourselves to be exploited by the Burman as a consequence is suicidal to the interests of India. Burma is now to us just in the same position as Siam, Indo-China, or the East Indies. We are suffering from a serious shortage of teak just now

(*Continued on page 32*)

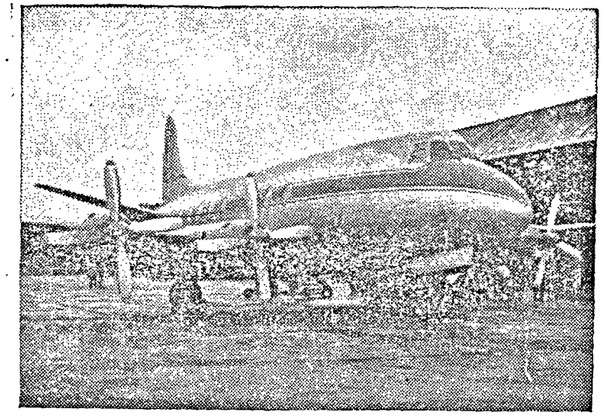


Machine with a Strange Fuselage

This strange looking contraption is the Bristol Type 171 Mark II Helicopter, and was on show at the British Aircraft Constructors' Display held recently at Farnborough, Hampshire.

First Turbine Air Liner Demonstration

The Vickers Armstrong Viscount—the first propellor turbine air liner in the world, recently had its first public demonstration at Weybridge, Surrey. The 'Viscount' is fitted with four Rolls-Royce "Dart" propellor turbine engines, and is the first air liner in the world to be equipped with propellor turbine engines. The 'Viscount' at Weybridge, before the trial flight.



LIGHT-WEIGHT CONCRETES

(*Continued from page 28*)

general principles and structural precautions, and is to be followed by parts dealing with fire-fighting equipment in buildings, means of escape and chimneys and flues. The problems of the protection of buildings and their occupants against fire are very complex and can be approached in many ways. Until recently the way has been a rough-and-ready one; as is shown by the fact that building regulations have tended to lay down a single standard of fire-resistance in the form of a minimum thickness for walls or encasement, and so on, applicable to a wide range of buildings irrespective of the varying fire hazards involved. This is not unexpected if you are told, as I was recently by a man who is an expert in the subject, that the bye-laws concerned with structural fire precautions were based on the London Building Act of 1666 up to 1936. It seems to me that the Fire Grading Committee's work is of great value because it has put the whole problem on a rational basis. For example, the committee suggests the grading of occupancies according to what is termed the "damage hazard," as measured by the fire load, and the grading of building constructions according to the fire-resistance of their elements. These two, the fire load and the fire-resistance can be inter-related to determine the type of construction which is appropriate to a particular building in a way analogous to that in which loads and the properties of materials form the basis of a structural design. This analogy must not be taken too exactly, for at present the quantitative data on the severity of fires in buildings is limited and the fire-resistance of elements of structures has only been methodically studied for ten or fifteen years. Moreover, other factors, such as the size of the building and its sub-division, enter into even this single aspect of fire hazard. But I think that this example typifies a new approach to the whole problem of fire-precaution in buildings which, in the future, will have a big effect on many forms of building.

INDIA'S TEAK IMPORTS

(*Continued from page 30*)

and commonsense dictates that we should not spare any pains to secure it from every source available to us. We went on a pilgrimage right up to far off Brazil for our rice. Why not go up to Java and Borneo which are much nearer home and get rid of this monopoly of Burma? With regard to quality let me assure all concerned that dame Nature ignores political boundaries, that the teak in Asia in the various countries are children of the same mother and brought up under identical conditions of soil, climate, rainfall and altitude and that technically they are identical and can be put to the same use by us. The Burma teak was boosted in the past as superior to the rest, but that is due to entirely different reasons. Therefore, let us first get rid of this un-wanted incubus of an import duty on non-Burman teak, and send out directions to our Trade Commissioners in the South-East Asia countries to launch an all-out drive to export teak from these countries and remind Burma that she has breached the Indo-Burma Trade Agreement of 1941 by levying an export duty on her teak no doubt under another name. If my proposals are accepted I feel that it will result in our being very much better off with regard to our teak supplies than we are now. I hope the Central Government will now at least open its eyes if it has not already done so.

OBITUARY

Rao Bahadur N. J. Joseph.

We regret to record the death of Rao Bahadur N. J. Joseph, Additional Chief Engineer, Irrigation, P.W.D., Madras, who was on long leave at his residence in Trichur on April 29. He was 52. The Journal has received much support in its pre-publication days and take this opportunity to acknowledge his valuable advice and support.

WATER-PROOFING OF CONCRETE

The following suggestions are made for the production of water-proofed concrete:

1. The cement should be of good quality and finely ground.

2. The aggregate should be clean, sound, and well graded and should not be unduly porous.

3. A fairly rich mix, say a 1 : 1½ : 3, is more satisfactory than a lean one.

4. The water used should be the minimum amount consistent with suitable workability.

5. The mixing period should be at least 2 minutes.

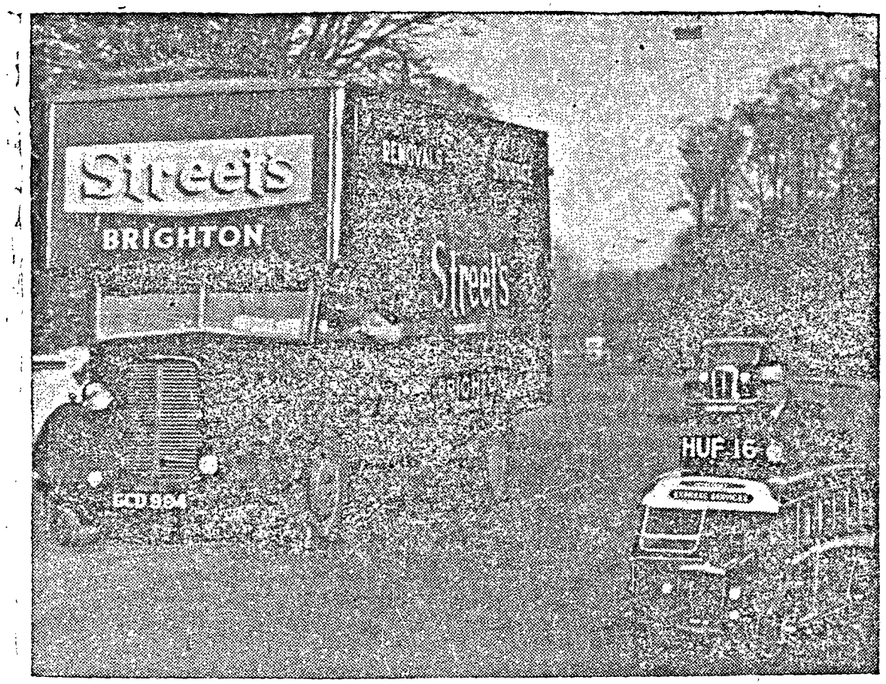
6. The concrete should be placed in approximately horizontal layers not exceeding 12 inches thick, honey combing must be avoided and the concrete should be well spaded against the forms.

7. Constructional joints should be avoided. If this is not possible, all laitance should be removed and proper precautions be taken to ensure a good bond.

8. The concrete should be cured by being kept in warm moist conditions.

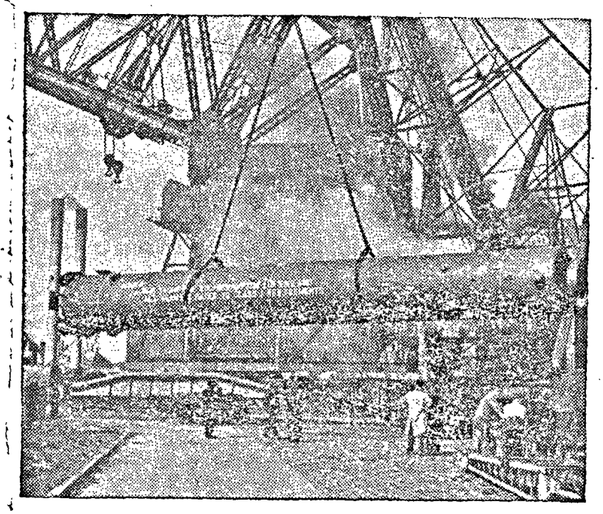
Aluminous cement concrete is much more impervious to water than ordinary cement concrete.

The opinion of research workers, not engaged in the manufacture of materials sold for water-proofing concrete is that admixtures are not effective and that concrete made according to the recommendations above are likely to be quite as efficacious as concrete with expensive admixtures.



The One Horse-Power Bus

Mr. Ernest Johnstone, a former bus driver, who in his spare time used to make small models of the buses which he drove, has now made a career of the hobby. The models, slightly redesigned, are now fitted with engines, instead of the original pedals, to supply power. After much experimenting with various types of engines he has found the Villiers one horse-power motor unit the best. These little buses, capable of carrying three adults do 100 miles to the gallon and can attain a speed of 30 miles per hour. An ordinary lorry and the little bus on the road.



A Record Load

A huge container weighing 68 tons, nine feet in diameter and 70 feet long was recently shipped to India from Birkenhead, England. To cope with its giant size special arrangements had to be made and a special route taken to the docks to avoid bridges. The container, en route to Sindri *via* Calcutta, being manoeuvred into position for shipment at Birkenhead.

On arrival at Calcutta there was no rail waggon capable of bearing such a load. So a special platform to be fixed on two 50-ton railway bogies was made.

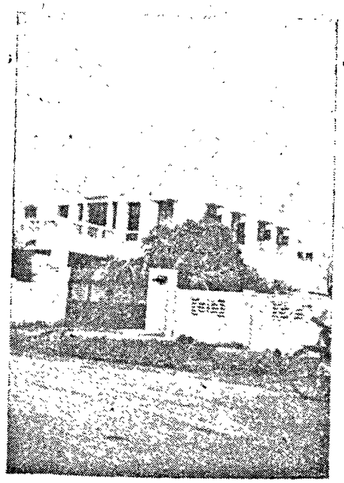
ALCRETE HOUSES

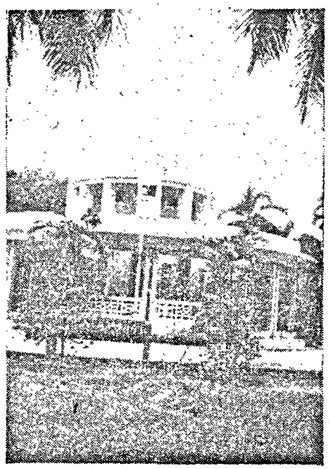
Dr. S. Kamesam, Hon. D.Sc., B.E., M.I.E. (Ind.), F.A.Sc., M.E. (Hons.)

I HAVE read in your April issue the remarks of Mr. P. Matthen, of the Structural and Mechanical Development Engineers Ltd., of London. Although no reference to my remarks on Alcrete published in your February issue has been made by Mr. Matthen, as he refers to Mr. G. V. Rao endorsing my opinion on Alcrete houses, I am making a few comments. Neither Mr. G. V. Rao nor myself condemned Alcrete houses because they are prefabricated structures, and we are both aware of the great advantages of standardisation and prefabrication. There is no divergence of opinion on the question of prefabrication *per se*. We would like Mr. Matthen to throw more light on convincing engineers in India that Alcrete houses (the special features of which seem to be small rooms with aluminium roof trusses, purlins, doors and windows, and also roofing sheets, and walls of "alcrete," a kind of foamed concrete) are one of the most suitable and most economical for Indian conditions.

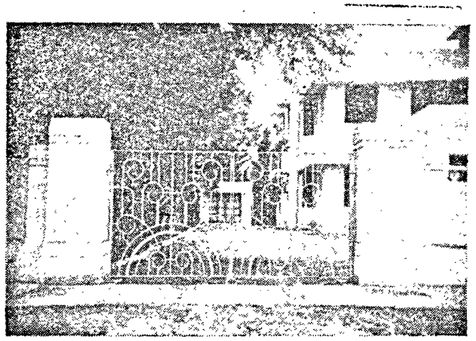
The main points at issue are, firstly, whether prefabricated houses using imported aluminium, doors, windows, roof trusses, and roofing sheets--which means further exhaustion of our precious foreign exchange resources, which are already at a low ebb—is called for, and even necessary. It is a tremendous responsibility that the Government Adviser has taken on himself to recommend this extreme step of importing aluminium building components, deciding that the corresponding Indian substitutes are not suitable or as not available. Secondly, what is the patent taken for Alcrete houses for which the Government of India have been asked, and are now committed to pay royalties? There seems to be nothing *per se*, as regards the *design* of Alcrete houses for a patent. If the patent is for the type of foamed concrete which is called Alcrete, used only for the walls of these houses, the question is whether it is necessary for India to pay heavy royalties for using this process and whether foamed concrete, especially that requiring seasoning under high pressures and temperatures in autoclaves, requiring very expensive plant, is necessary when concrete hollow blocks, made with Indian-made inexpensive machinery, can do the job, as far as insulation is concerned. It is reported that the Government of India are obliged to pay Rs. 50 per house as royalty, subject also to a minimum payment for 25,000 houses, or a sum of Rs. 12,50,000. I shall be glad if Mr. Matthen will correct me if this report, which is widely current, is correct. There are many other excellent "foamed concrete", hot or cold, processes patented abroad, like the Siporix process in Sweden, which have not been protected by patents in India. The question is whether the Director of Housing to the Government of India has considered these other foamed concrete processes for using which no royalty need be paid, and whether he can justify, Government of India committing themselves to a payment of royalty of several lakhs of rupees on account of the undoubted superiority of Alcrete process over *all* others which are well known, and for which no royalties need be paid. That is the point. Personally, I have not seen Alcrete described in any of the several books that have been recently published on prefabricated housing. It seems to be little known. Thirdly, as far as walls "with locally available materials" are concerned the Director of Housing wrote to the undersigned last October that they did not present much difficulty, and engineers would agree with him. If so, why did he commit Government to the payment of heavy royalties and an investment of several lakhs of rupees for Alcrete foamed concrete walls? He also wrote that the main problem was concerning "roof construction". The Alcrete house does not solve this difficulty at all, as it is to be of aluminium sheets with a lining of insulation. Aluminium sheets are highly prone to rapid corrosion due to bimetallic contacts or dirt and are much less durable than cement asbestos sheets. This may prove to be "a costly experiment". Mr. Matthen and the Director of Housing should be able to convince engineers giving them full details, that the less expensive Indian-produced cement asbestos sheets are not suitable enough for roofing, and that India has to import, heavily sacrificing foreign exchange, aluminium roofing sheets from the U.S.A. or England. This is most important. Will Mr. Matthen state from where these aluminium building components will be imported? Fourthly, Mr. Matthen has to convince engineers in India that treated hardwood or coniferous wood is not available in India to the extent of corresponding aluminium building components that are to be imported for Alcrete houses which are only about 21½ ft. x 21½ ft. To import high tensile aluminium roof trusses and purlins for roofing about 10 ft. wide and for a very light roof is, in the opinion of engineers in India, nothing short of a tragic waste of our foreign exchange resources. I shall be glad to see Mr. Matthen convince engineers that there is such an acute shortage of wood in India to justify Govt. of India deciding to import high tensile aluminium alloys for even doors and windows. If the Government are to import these aluminium building components from the U.S.A, and if there is a legal

(*Continued on page 39*)





DOMESTIC ARCHITECTURE IN MADRAS



SPECIFICATION

Indian Standards Institution (ISI) Draft Indian Standard

The Draft Indian Standard Specification for Coniferous Sawn Timber intended for further conversion has been prepared by the Timber Products Sectional Committee of the Indian Standards Institution to cover the various requirements of the trade and, in particular, those of the purchasing departments of the Central, Provincial and State Governments.

All species of coniferous timber have been classified into four grades, namely, Special, Grade I, Grade II and Culls. In addition to the definition of a number of terms used in the trade, requirements of the first three grades in regard to species of timber, dimensions, permissible defects, and estimated percentage of recovery of useful material are specified in detail in the standard.

In accordance with the procedure of the Indian Standards Institution, every draft specification or code prepared by a Sectional Committee or Sub-committee, after its approval by the Sectional Committee, is to be issued in proof form for a period to be determined by the Committee but not less than three months, and widely circulated amongst those likely to be interested, for the purpose of securing critical review and suggestions for improvement. Comments received from all quarters shall be given due consideration by the Sectional Committee; and the revised final draft will then be put up to the Engineering Division Council for endorsement. Before being finally accepted as an Indian Standard it must be approved by the Executive Committee and the General Council of the Institution.

This draft standard is being circulated among timber interests for purposes of comment and suggestions. The Director, Indian Standards Institution will be pleased to receive comments on this standard up to June 30 1949.

British Standard for Schedule of Fixing Accessories for Building Purposes (B.S.No. 1494: 1948)

The requirements in respect of materials and dimensions of the following fixing accessories are given:—

Hook bolts and nuts
Drive screws
Washers for roofing sheets
Roofing bolts and nuts
Cone and mushroom head gutter screws
Screwed and lugged pipe brackets
Pipe clips
Pipe hooks
Round and rectangular back plates
Single and double pipe rings
Rag or lewis bolts
Coach screws
Handrail screws
Dowel screws
Cup hooks, ruler hooks and Square eyes square hooks
Gate and shutter hooks and eyes
Wire staples
Screw cups
Wall hooks
Holdfasts
Brass head nails
Escutcheon pins

General requirements in respect of materials and workmanship are stated in Part One. Tables of dimensions and specific requirements are included in Part Two which is divided into three sections, viz:—

Schedule A—Fixings for corrugated roofing sheets.

Schedule B—Fixings for pipes.

Schedule C—Sundry fixings.

Copies of this British Standard can be obtained from the Sales Department, British Standards Institution, 24, Victoria Street, London S.W.1., price 5/- post free.

BOOK REVIEW

R.C.C. Designs:—By S. Raman, B.E., A.M.Am.Soc. C. A.M.I.E. (Ind.). Price Rs. 5-4-0.

Problems in Strength Materials (Elementary):—S. Rajaraman. Price Rs. 2-4-0.

Practical Plane Geometry: By S. Rajaraman. Price Rs. 2-8

Building Materials:—I S. Rajaraman. Price Rs. 4-8-0.

Geology for Engineers:—B S. Rajaraman. Price Rs. 4-8-0.

Problems in Hydraulics:—B D. L. Deshpande, M.Sc., M.I.I (Ind.), and S. Rajaraman B.E A.M.I.E. (Ind.) Price Rs. 3-8-0.

Practical Solid Geometry:—By D. L. Deshpande and S. Rajaraman. Price Rs. 6.

This series is commended to the attention of students at the colleges. Next to Roorkee series, there are no suitable text books for engineering students to suit their particular needs. Prof. S. Rajaraman has done a service by bringing out the above series. The authors would do well if in further reprints they will add an introduction to R.C.C. Designs; Strength of Materials; and Problems on Hydraulics

Copies are available from the author at the College of Engineering, Trivandrum.

Stylish Homes:—By G. V. S. Mani (Mani Putthaka Salai, Swamimalai. Price Rs. 5-0-0).

Modern Cottages:—By G.V.S. Mani. (Mani Putthaka Salai, Swamimalai. Price Rs. 5).

"Stylish Homes" contains 80 designs of bungalows, plinth areas ranging from 900—1,500 sq. ft. Ground Floor and Elevation are shown. "Modern Cottages" contains 80 designs of also bungalows though listed as cottages with plinth areas ranging from 600—2,500 sq. ft. Ground floor and Elevation are shown.

The average tendency of the prospective house builder in this country is to seek type-designs and these two publications answer such a need very well.

HOW TO LOOK AT MUSLIM ARCHITECTURE

(*Continued from page 20*)

interesting monument for it shows our various problems in a formative aspect. Here it seems that we have abandoned the trabeate Hindu system in favour of the Islamic arcuate. At least the shape is arch-shaped but, on closer examination, we find that they are not "true" arches—only make-believe. They are not true arches in that they do not embody the physical structural principles of the arch. There is no lateral thrust and no key-stone. The thrust is straight down as in our last example. This effect is reached by means of what is called "corbelling"—that is where each successive layer of stone projects out further from the side until they meet at the apex. The inner edge is finished to look like an arch. This shows a transitional stage between the purely trabeate Hindu work and the true arch system of the Muslims.

Now what else does this screen show? Let us take a nearer view of it.

Qutb Screen of Arches—Detail.—We have looked at the mosque from the point of view of plan and of structure. Now let us examine its decorative scheme. First we must note the shape of the corbelled arches. It comes to a sharp point with two reversed curves and is called an "ogee" arch. Again this is typical of Indian design and goes back originally to the Buddhist churches. Another sign of Indian influence in this screen is the floral decoration to the right. This sensuous and naturalistic type of ornament is in sharp contrast to the geometric and formal designs on the left. The Islamic faith does not allow the representation of living forms in art and later works do not show such a mixture of styles.

Alai Darwaza—General view.—This is the alai darwaza or gateway built by Ala-ud-din Khalji nearly one hundred years later. It was the only part of his grandiose scheme for the enlargement of the Qutb mosque which was finished. Here we see the answers to the problems posed one hundred years earlier. The arches here are true and not corbelled arches. The decoration is strictly Islamic—geometric and caligraphic with no floral or other living forms. Here also we find appearing for the first time a new decorative element—the spear-head lining of the arches—later to become so popular.

Tomb of Altamish—.There is another structural problem beside that of the arch that faced the early Islamic builders. This problem is called the "phase of transition" and means simply the way in which a round dome can be put upon a square base. They obviously won't fit together unless there is a transitional portion between them. This illustration shows a corner of the 13th century tomb of Altamish, and, although the dome is missing, the "phase of transition" is there all ready for it. The tomb is square and, by cutting the corners, it is made into an octagon. The arches that so cut the corners are called "squinch" arches.

Mosque at Khairpur—Pendentives—.Here we see a later and more successful example of the phase of transition. This late 15th century mosque does not use squinch arches to cut the corners, but rather a devise called pendentives. Percy Brown in his authoritative book on Indian architecture defines a pendentive as the "triangular surface by which a dome is supported on a square compartment". This system of tiny corbelled niches makes a much more elegant phase of transition than does the squinch arches.

Purana Qila—Sher Shah's Mosque (*Qila-i-Kuhna*).—This illustration shows us the same type of pendentives as we saw in the Khairpur mosque—but even more successfully accomplished.

Jami Masjid.—I would like to conclude this second section on the plan and structure of architecture by showing a later example of the mosque in Delhi—the Jami Masjid built by Shah Jehan in the 17th century. In many ways this monument is a complete working out of the problems that have gone before. The plan is complete with cloisters around a courtyard, great eastern gateway, sanctuary with its domes and minarettes. There is no longer any fumbling over the true arch or phase of transition in the domes. The decorative system has likewise developed in grace and power. The shape of the arches and the multiplicity of such decorative features as the little domes and kiosks on the roof all show a later phase of building that those which we have been considering.

This then completes the second section of how man builds—or principles of structure. In it we have discussed the plan and elevation of the mosque and some of its principal structural problems such as the arch, the dome, and the "phase of transition". Now I would like to suggest a third and last way of looking at buildings—the critical way. Instead of merely analyzing the elements of a building and how it was put together, let us look at it critically, and ask ourselves if we like it, and why do we like it. This section I have called.

3. How Well Man Builds—Principles of Design.

This section is necessary because architecture is much more than mere building for use, however practical and structurally correct it may be. Good architecture is based on certain principles of design and harmony. I will certainly not attempt to set up a criterion of good architecture or to cover all its elements, but would merely like to suggest a few points that may be helpful.

(1) For a first basic rule of good architecture we must return to the principle of use or function in building. The design of a building should suggest its function. This seems almost too obvious a rule to be considered—but how often it has been violated! For example, in the west, we often find a bank building masquerading as a Greek temple. Thus the design should be **truthful.**

(2) A second rule simply carries further this principle of truth in design. As a building should truthfully express its function in its design, so also should it express its plan and structure in its design. Thus the facade must show through its divisions the structure of the interior and must not be merely a screen set up to mislead.

(3) This emphasis on truth in design leads to another corollary—that of economy and simplicity of means. If the purity of the structure is the main element in good design, then this natural beauty should not be overlaid and hidden by too much ornament. Decoration should always be subsidiary to basic design.

(4) A further corollary arising from the principle of truth is honesty in the treatment of materials. Every material has a beauty of its own and a natural method of use which should not be violated. This rule applies to other arts than architecture, of course. We in the west are too prone to make this mistake—we make steel look like wood, and paint stone to imitate marble, and treat card-board to look like leather! One should let the material "speak for itself". All true craftsmen have a feeling for the honest treatment of their materials which our manufacturing age has lost. But enough of this digression . . .

(5) A fifth principle of architecture is proportion. All buildings are made up of mass and space and the penetration of the one by the other. Buildings are nothing more than enclosed space. The relative proportions of mass and space are thus at the basis of good architecture.

(6) A final principle of architectural design is rhythm. Proportion deals with mass and space in static repose. Rhythm is the flow of one part into another —fluidity of line—repetition of elements—the use of ornament and colour and the textural contrasts of materials to enrich a building and give it vitality.

These then are a few of the principles of design that may be considered in looking at architecture from the critical or aesthetic point of view. Let us take a few examples.

Purana Qila—Sher Shah's Mosque—Here the five entrances in the facade echo the interior plan with its five bays separated by lateral arches. The proportions are pleasing and the composition as a whole has variety and rhythm and builds up to a focal point at the central arch and dome. It shows one particular trick in solving a problem in design. This is the problem of how to give heroic proportion to a man-sized entrance. This is done by repeating the doorway and rectangular frontage on a larger scale and giving it prominence in the centre of the facade. This is a problem of scale often encountered in architecture.

Alai Darwaza.—We look again at the Alai Darwaza of Ala-ud-din but this time from the point of view of its total effect rather than as a landmark in the history of art. This exemplifies to perfection the use of ornament and color and textural contrasts of materials to give vitality to a design without in any way detracting from the force of the basic structural composition. I quote from Percy Brown "So skilfully balanced is the coloured plastic scheme that although all the surfaces are most intricately carved, some in low relief, others deeply incised, the appearance is not cloying or fatiguing to the eye."

Humayun's Tomb.—This is the first of the great Moghul masterpieces, and it represents a fusion of the Persian and Indian traditions. The Persian elements were introduced by Humayun who spent the long years of his exile in that country. It shows a new shape of the dome, new interior exterior elevation with great plan, new alcoved doorway. Design is logically related to structure and structure to plan; the mass of the great central dome is relieved by the kiosks clustering around it; richness of surface texture is lent by the play of red sandstone and white marble. One new element which first makes its appearance in this monument is the so-called "double-dome". The dome is not one but two, with a space between. This is done so that from the exterior view the dome can soar to an imposing height, while, if this same height were not broken in the interior, it would be too high for the proportions of the hall. This is an example where truth of structure is *not* entirely realized in the design—but only a purist would quarrel with the means to gain such an end.

Moti Masjid.—I am using this example of the Moti Masjid in the Delhi Fort to illustrate my point as to the influence of material upon style. At the time of Shah Jehan and later there was a general shift from the use of stone to that of marble, and with it a marked shift in style. Marble cannot be plastically carved since so rich in itself. Likewise marble is a softer and more fluid medium than the harsher sandstone. It lends itself to sensuous curves, delicacy and femininity, and inlay patterns in coloured stones. The arches become foliated or cusped, the domes are bulbous with constricted neck, the squares and rectangles of the preceeding style have disappeared.

Safdar Jung's Tomb—done in the middle of the 18th century. One can learn a lot from looking at bad art. In this example one is struck by three main faults in design: (1) the proportions are bad; the building is too high and narrow, (2) the effect is over-garish; there is too great a multiplicity of incidental parts and colours, and (3) the whole effect is disjointed; there is no real harmony between the parts.

Taj Mahal.—As a final example I have chosen this one monument from outside Delhi and to serve as a contrast to the tomb of Safdar Jung. The Taj is comparatively simple in plan and elevation, and was strongly influenced by Humayun's tomb in Delhi. But it is the simplicity of perfection. Its proportions are likewise simple—the width is equal to the height—187 feet high and 186 feet per square side, and the height of the facade in the centre is the same height as the dome, in other words, the top of the parapet above the large alcove is the middle point in the whole elevation. It builds up to a logical pyramid, in design and, finally, the whole effect is enhanced by the perfect beauty of the material.

Conclusion

In this paper I have suggested three different ways of looking at Muslim architecture—one functional, looking at man's aims and purposes in the utility of a building, and taking into consideration the whole environment from which it sprang. The second structural, dealing with the actual problems of building, and the third aesthetic, touching upon the principles of design.

When considered in this way art comes alive to us, and the monuments of past ages disclose their hidden meaning through their form and structure, their design and their colour.

ALCRETE HOUSES

(Continued from page 34)

commitment to import these according to an agreement with the Structural & Mechanical Development Engineers Ltd., all that I can say is that Government have been very wrongly advised, and the Government should ask the technical expert who advised them to explain his action which has exposed Government to severe criticisms. I might add that besides hard woods, any soft wood like pine which is available in lakhs of c. ft. in the U.P. and Punjab, could be used with much greater economy, for the small cottages, and without, most important, consuming our foreign exchange resources. I have used such woods for even highway bridges and spans of 150 feet. The Government should institute an inquiry into the facts and circumstances which impelled the Director of Housing, who after a special trip to Europe for this job, to take the responsibility of advising Government to adopt this unnecessarily expensive (initially for plant, etc., and recurring on royalties) and uncalled for scheme based on aluminium building components and which depends on the consumption of so much of our precious foreign exchange.

I have still not been able to get the literature on the technical details of Alcrete houses. I was a little surprised to hear from the Director of Housing on 28th October 1948, after questions had been asked on this type of housing in the Constituent Assembly—that "technical information" on the houses "could not be made public" at that stage, although it was perfectly open to the Assembly members to ask Government for such information a few weeks before. In spite of three letters to the Director of Housing since then, I have not received any reply concerning the technical details, and so I welcome Mr. Matthen's contribution to your April issue. I may add that the Chairman of the Madras City Improvement Trust and some Chief Engineers who know about Alcrete, share the opinion I have expressed above, and Mr. Matthen should, I feel, convince engineers at any of the Institution of Engineering Centres, say at Bangalore, honest doubts which they entertain regarding the wisdom of the Govt. of India's decision to adopt Alcrete and spend over Rs. 60 lakhs. If foamed concrete is not used for these houses or some kind other than Alcrete or hollow blocks are used it will be Alcrete house without Alcrete.

RESULTS OF TENDERS

Agra.

Closed January 31.—Agra Drainage, Khatgar and Dholikar Sewers:—*Tenders decided in favour of Om Prakash, Tilak Dwar, Mathura. Tenders for laying of Rising and Distributing Mains for Agra Water-supply have not yet been finally decided.*

Calicut.

Closed February 25.—Cement concreting Madras-Calicut Road within Calicut Municipality:—*Tender of M. K. Sankaran has been accepted.*

Cudappah.

Closed January 25.—Cement Concreting Chittur-Kurnool Road:—*Tender of P. Rami Reddy was accepted. The work is under execution.*

Gorakhpur.

Closed February 28.—Erection of 57 miles of 11 kv main line, Basti - Gorakhpur - Charichaura:—*The work will be done departmentally.*

Jullunder.

Closed March 7.—Supply of 13,000 nos. 11/33 kv Insulators:—*No decision has yet been made.*

Kanara.

Closed January 28.—Constructing Dispensaries in heavy forest tracts at Kadra, Kumbharwada and Ramangulli:— *3 Tenders for Kadra, one for Kumbharwada and five for Ramangulli were received:—That of B. S. Redkar and V. S. Redkar & Co. accepted for Kadra and Kumbharwada and of A. R. Patwardhan for Ramangulli.*

(Continued from page 44)

CONTRACTS OPEN

The dates at head of paragraphs are those for the submission of Tenders. Application for forms and particulars should be made to the address given at the end.

MORADABAD: Hospital.

May 19.—Construction of Women's Hospital at Moradabad. Estimated cost Rs. 4 lakhs. The District Engineer, P.W.D., B/R., Moradabad.

SINDRI: Fertiliser Factory.

May 20.—Providing Storm Water drains in the Fertiliser Factory and Floor drainage of Ammonia Building at Sindri. Estimated cost Rs. 1,41,000. The Executive Engineer, Festiliser Factory Division, No 1, C.P.W.D., Sindri.

HAZARIBAGH: Quarters.

May 20.—Construction of 19 Blocks "A" Type Quarters at Karhali Colliery. The Superintendent of Collieries, Karhali P.O., Bokaro., Dist. Hazaribagh.

ADONI: Quarters.

May 23.—Construction of Type Quarters with road, water-supply, and drainage at Adoni sub-station under the Ceded Districts Scheme. The Superintending Engineer General Construction Circle, 157, Mount Road, Madras.

POONA: Workshop.

May 25.—Constructing Workshops—two units—in connection with the construction of a Central Workshop at Poona for the State Transport. Estimated cost Rs. 3,60,000. The Executive Engineer, Building Projects Division, Poona.

DEOLALI: M.E.S.

May 26.—Provision of Married Accommodation by additions and alterations to existing buildings for R.I.A. Centre at Nasik Camp, Deolali. Estimated cost Rs. 5,82,000. The Chief Engineer, Southern Command, Poona.

POONA: Workshop.

May 26.—Constructing Administrative Block, Hot Shop, and a Store in connection with the construction of a Central Workshop at Poona for the State Transport. Estimated cost Rs. 2,80,000. The Executive Engineer, Building Projects Division, Poona.

POONA: Workshop.

May 27.—Asphalting Roads, and Parking Areas and Water-supply and Sanitary arrangements in connection with the construction of a Central Workshop at Poona for the State Transport. Estimated cost Rs. 1,60,000. The Executive Engineer, Building Projects Division, Poona.

NAGPUR: Electrification.

May 28.—Electrification of six wards of the New Medical College at Nagpur, the work involving wiring of about 2,000 points in concealed conduit. The Superintending Engineer, Thermo Electric Circle, Government Electricity Department, Seminary Hills, Nagpur.

BANKURA: Bridge.

May 31.—Construction of a Reinforced Concrete Bridge over the River Darakeswar near the tower of Bankura. Estimated cost Rs. 12,25,000. The Superintending Engineer, Road Construction Circle, No. 1, Anderson House, Alipore, Calcutta.

MIHIJAM: Sewerage.

June 1.—Design and Installation of a Sewage Disposal Plant according to Dio-Aeration Process, including sludge digestion arrangements, to serve the new town of Chittaranjan near Mihijam with an initial population of 40,000. The Engineer-in-Chief, Loco Building Works Project, Chittaranjan, Mihijam.

BOMBAY: Wireless Station.

June 2.—Provision of a Wireless Transmitting Station Buildings, etc., at Juhu, Bombay. Estimated cost Rs. 3.5 lakhs. The Chief Engineer, Southern Command, Poona.

Damodar Valley Corporation

August 2.—Supply and erection of 132 kv out-door sub-station equipments and indoor control accessories for Ramgarh, Jamshedpur, Loyabad, Sindri, Maithon and Raniganj sub-stations of the Damodar Valey Grid. The Chairman, Central Electricity Commission, Simla.

Proposed New Works

(*Continued from page 41*)

the first stage in the development of the Godavari irrigation and hydro-electric power, is designed to bring 1,250,000 acres of land under cultivation. The development of the Godavari area will ultimately cost about Rs. 75 crores.

Jodhpur.

A multi-purpose irrigation scheme estimated to cost Rs. 1.50 crores and scheduled to be completed by 1952, has been undertaken by the Jodhpur Government. The scheme envisages the construction of a dam across the river Jawai, 15 miles from its source in the Aravalli Hills, near the Erinpura railway station on the Ajmer-Ahmedabad line on the B.B. & C.I. Railway. A reservoir calculated to impound 7,000 million cubic feet of water is also being constructed. The whole scheme is designed to irrigate 110,000 acres of 'barani' land and generate power from a catchment area of 304 square miles.

HOW WAS JUNE

For Building

A rainy day is one in which 10 cents or more rain is recorded. The following figures show the average rainfall in inches and the average number of rainy days in the month of June based on data up to 1940 :—

	Rainfall in Inches	*Number of Rainy Days*
Agra	2.4	3.8
Ahmedabad	3.7	4.7
Allahabad	5.0	4.3
Ambala	3.0	4.4
Asansol	9.5	11.7
Aurangabad	5.4	7.7
Bangalore	2.9	5.9
Bellary	1.7	3.3
Bhopal	6.8	9.4
Bhuj	1.4	1.9
Bombay	19.1	14.6
Calcutta	11.7	13.2
Cawnpore	3.2	4.5
Chittagong	21.0	16.7
Cochin	28.5	24.3
Colombo	8.4	14.0
Dacca	12.4	14.5
Gaya	6.5	7.5
Hyderabad (Dn.)	4.4	6.5
Jamshedpur	7.5	10.7
Jhansi	4.2	5.5
Jiwani	0	0
Jodhpur	1.4	2.1
Jubbulpore	7.0	8.8
Lahore	1.6	2.8
Madras	1.9	3.7
Mangalore	37.1	24.6
Marmagoa	32.1	23.0
Masulipatam	4.2	6.2
Nagpur	8.8	10.2
New Delhi	3.0	4.2
Patna	7.1	8.0
Peshawar	0.3	0.9
Poona	4.5	7.3
Puri	7.5	8.1
Quetta	0.2	0.4
Rawalpindi	2 5	2.3
Sambalpur	10.1	10.7
Srinagar	1.4	3.4
Trichinopoly	1.6	2.4
Trincomalee	0.9	1.6
Trivandrum	13.2	17.1
Vizagapatam	4.1	6.5

FOR DISCUSSION

An engineer said recently "We don't know how to build a wall"; meaning, that we know so many ways of building walls that there is no agreement on the best way of building a wall for a particular purpose.

* *

Tradition is crystallised reasoning, which may or may not still be logical.

* *

Much of the present labour-management conflict would vanish if fair wages and a fair volume of work are established by the scientific application of motion and time study, coupled with the job-rating technique.

* *

Some of the published data on the thermal conductivity of dense concrete are contradictory.

* *

The time of curing concrete to a given strength is approximately inversely proportional to the temperature, unless a cement/aggregate cementing reaction is taking place.

* *

We cannot wait for better conditions, but must go on making the best of the existing conditions.

* *

Many of us refuse to use a pedestal closet (as if it is un-Indian) more due to prejudice than practice. Those who have used and found it to be inconvenient might have treated it exactly as the Squatting Pan?

* *

Due to lack of interest shown by local bodies, the Government of Bombay is preparing legislation to compel Municipalities to prepare compost from town waste!

PROPOSED NEW WORKS

Ajmer.

The Government of India have approved a Rs. 30 lakhs drainage and sewage disposal scheme for Ajmer Municipality. The scheme will be financed by the Government of India on a half-grant and loan basis.

Bombay.

It is understood that a decision that the Bombay Government should immediately begin investigation on the Koyna Power Project and undertake the preparation of a report by March, 1950, was taken at a recent high-level discussion at New Delhi. Special staff will be appointed for the purpose by the Bombay Government.

The Koyna scheme envisages the construction of a dam of about 300 feet high across the Koyna river which is about 150 miles south of Bombay. The dam will store about 3 million cubic feet of water for power and irrigation and generate 3-lakh killowatts of power. When fully developed, the Koyna power station will be one of the biggest in the country. The estimated cost of the whole project is about Rs. 30 crores.

Chittagong.

Tenders from reputable firms all over the world will be invited, it is learnt, within a few months for the development of Chittagong Port in East Bengal. The planning had been entrusted to a group of two British and one Swedish engineering firms, known as "M.R.V.", whose reports are now under preparation.

Hyderabad.

The Hyderabad Government have sanctioned the Godavari North Canal Project for pumping water from the river at an estimated cost of Rs. 9.28 crores. The project includes the construction of a dam over the Koddam river, a tributary of the Godavari, and a 79-mile-long canal as well as pumping installations. The project, which is only

(*Continued on page 40*)

EDUCATIONAL

THE TOWN PLANNING INSTITUTE

THE Town Planning Institute is the technical body responsible for the practice of the profession of town and country planning. Its objects are as follows: To advance the study of town planning, civic design and kindred subjects, and of the arts and sciences as applied to these subjects; to promote the artistic and scientific development of town and cities; to secure the association, and to promote the general interests of those engaged or interested in the practice of town planning.

The Membership consists of the technical classes of Members and Associate Members and the Law Classes of Legal Members and Legal Associate Members. Entrance is by examination plus a period of practical experience. There are also Honorary Members, Honorary Associates and Honorary Corresponding Members. Suitable qualified persons who intend to proceed with the examinations may be enrolled as students. Membership is not restricted to British subjects.

The work and importance of the Institute has steadily increased and since the setting up of the Ministry of Town and Country Planning the volume of inquiries received indicate the realisation of the importance of town and country planning in its relation to physical reconstruction throughout the world.

The Final Examination is conducted by the Town Planning Joint Examination Board which comprises representatives of the Institute, the Royal Institute of British Architects, the Royal Institution of Chartered Surveyors and the Institution of Municipal Engineers. The Board is also the examining body for the Town Planning Diploma or equivalent examination of these constituent institutions. A uniform standard of qualification for those practising the profession is therefore secured. A new syllabus for the Examination has recently been approved by the Board to include training in the use of the further data required in Planning Surveys, and the Intermediate Examination is now under revision.

The Institute has also established a Special Committee to consider the whole question of town planning education and what adaptations or developments are appropriate to present professional trends.

There are Diploma courses in Town and Country Planning **recognised by the Institute** at several universities and schools in U. K. and a five-year degree course has now been initiated at Durham University. Students who hold the Town Planning Degree are exempt from the Institute examinations and are eligible for Associate Membership subject to satisfying the Council on their practical town planning experience, in the same way as those who pass the final examination. The pre-war arrangement for a Visiting Board to pay periodical visits to the recognised schools is being re-established this year.

The Research Committee of the Institute have recently submitted Memoranda to the Ordnance Survey Department on their post-war programme and the design for a new 6-inch series, and to the Registrar-General on Population Statistics. A memorandum is being prepared on Road-side Rests.

The address of the Institute is 18, Ashley Place, London, S.W1.

CLASSIFIED ADVERTISEMENT

RESULTS OF TENDERS

(*Continued from page 39*)

Lonavla

Closed February 17.— Renovations at "H.M.I.S. Shivji" at Lonavla :—Supply of Trusses and doors : *Tender of Ratilal Bhagwandas & Co. for Rs. 283,802-7-0 accepted. Roof work : Tender of Ram Singh & Co., for Rs. 108,109-5-0 accepted.*

Madras.

Closed February 23.—Supply of Chlorinating Plant to City Corporation :—*Tenders are under consideration by the Standing Committee of the Corporation.*

Mokameh.

Closed February 24.—Constructing 200 units of Temporary Quarters at Mokameh Jn. :—*Tenders subsequently cancelled.*

Ramnad.

Closed January 24.—Cement concreting Karaikudi-Devacottai Road :—*Tender of S. Michael Udayar accepted and the work is in progress.*

Salem.

Closed February 25.—Cement concreting Salem-Cuddalore Road and Sankari-Tiruchengode Road :—*Works entrusted to A. C. Abdul Salam, Karipatti and S. M. Haneef, Krishnagiri, respectively. The works are in progress.*

Surat,

Closed February 21.—Cooling Tower for the Steam Power House near Surat :—*Tenders have not been finalised so far.*

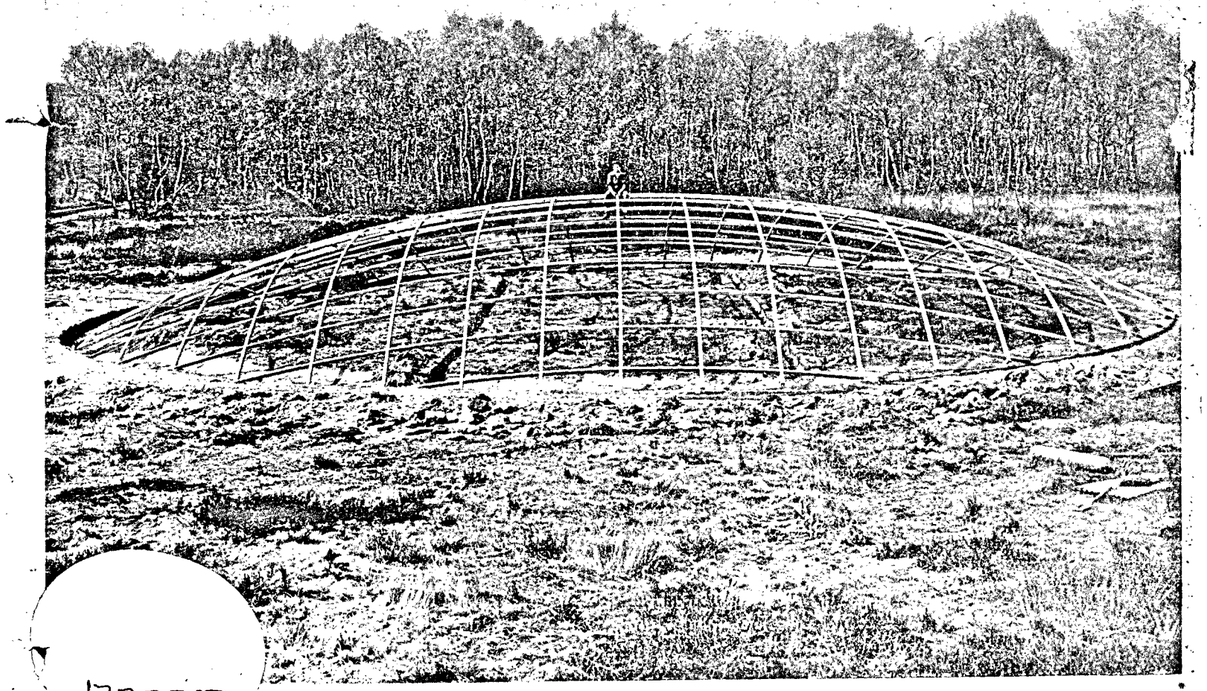
Registered No. M. 5257.

EDITED BY T. N. SUBRAMANIAM, A.F.S. (ENGLAND), PRINTED BY K. M. KURIAN AT THE GORDON PRESS, MADRAS-5
AND PUBLISHED BY T. RAJARAM FOR THE ASSOCIATED BROTHERS LIMITED, MADRAS.

17

THE BUILDING GAZETTE

VOLUME 2 | JUNE 15, 1949 | NUMBER 6



NEW ALUMINIUM ROOF

See Page 25

THE BUILDING GAZETTE

AN INDEPENDENT MONTHLY JOURNAL DEVOTED TO THE INTERESTS OF BUILDING INDUSTRY

VOLUME II | JUNE 15, 1949 | NUMBER 6

Articles, photographs, and drawings with a view to publication will be carefully considered. All such articles and illustration should bear the name and address of the sender, and postage should be sent to cover their return if desired in the event of non-acceptance. All communications on Editorial matters should be addressed to the Editor, and all those pertaining to Advertisements to the Manager, THE BUILDING GAZETTE, 1/11, Mukker Nallamuthu Street, G.T., Madras.

SUBSCRIPTION RATE IN INDIA, PAKISTAN, BURMA & CEYLON IS Rs. 6 PER ANNUM. SINGLE COPIES As. 9 EACH. POST FREE.

THE BUILDING GAZETTE is published on the 15th of each month. Complete copy instructions and Blocks for Advertisements must reach the Office not later than the 31st of the month preceding that in which the advertisement is to appear.

THE BUILDING GAZETTE
I/II, MUKKER NALLAMUTHU STREET
G.T., MADRAS.

EDITED BY T. N. SUBRAMANIAM
Associate, Faculty of Surveyors of England

PRINCIPAL CONTENTS

7 CEMENT TODAY
8 NOTES AND TOPICS
10 GOVERNOR AND COUNCIL
11 HOUSE FOUNDATIONS ON SHRINKABLE CLAYS
15 ALTERNATING OR DIRECT CURRENT ?
19 CEMENT MANUFACTURE AND PLANTS
23 AGRICULTURE AND THE SANITARY ENGINEER
25 NEW ALUMINIUM ROOF
26 EDUCATIONAL
27 LAW REPORT
28 CONTRACTS OPEN
RESULTS OF TENDERS
29 FOR DISCUSSION
PROPOSED NEW WORKS
30 CURRENT MARKET PRICES OF MATERIALS
31 BOOKS FOR READING

BANKS AND BANKING

INTRODUCED THROUGH THE BUILDING GAZETTE

Figures indicate the current rates per cent of interest to new investors. Investors are advised to communicate direct with the Bank of their choice so that they may obtain full details of any special advantages which are available.

IN THEIR OWN INTERESTS BANKS ARE REQUESTED TO ENSURE THAT THE JOURNAL IS ADVISED OF ALTERATIONS OF RATES OR CONDITIONS AS AND WHEN THEY OCCUR.

* = *Particulars obtainable only on application to the Bank*
— = *Investments not received or temporarily suspended.*

BHARATHA LAKSHMI BANK: Madras.—RAJAH OF BOBBILI, *Chairman*, 2⅞ to 3½.

CALCUTTA NATIONAL BANK: Madras.—S. M. BHATTACHARYA, *Chairman*. 6 months—; 1 year 2½; 2 years—.

EGMORE BENEFIT SOCIETY: Madras.—T. R. VARADARAJA PILLAI, *Secretary*, 1 year 3½.

HINDU BANK: Karur. — K. S. ANANTHA RAO, *Manager*, 6 months 3½; 1 year 4; 2 years 4½.

INDO-COMMERCIAL BANK: Madras.—S. N. N. SANKARALINGA IYER, *Managing Director*, 6 months—; 1 year 2½; 2 years 3.

KANNIKA BANK, Kodambakkam, Madras.—K. V. MUTHUKRISHNA CHETTIAR, *Managing Director*, 6 months 3½; 1 year 4; 2 years 4½.

KARUR VYSYA BANK: Karur.—M. LAKSHMINARAYANAN, B.A., B.L., *Secretary*, 6 months 3½; 1 year 4½; 2 years 4.

KUMBAKONAM BANK: Kumbakonam.—S. MAHALINGA IYER, B.A., B.L., *Managing Director*, 6 months 3; 1 year 3; 2 years 3½.

LAKSHMI VILAS BANK: Karur.—V. S. N. Ramalingam Chettiar, *Chairman*, 6 months *; 1 year 4½; 2 years 4½.

MADRAS MUTUAL BENEFIT PERMANENT FUND 69, Big Street, Madras 5. — V. THIRUMALA IYENGAR, *Secretary*, 1 year 4; 2 years 4½.

MADURA MERCANTILE BANK: Madras.—K. M. S. LAKSHMANIER, *Chairman*, 6 months—; 1 year 3; 2 years 3½.

SOUTH INDIA BANK: Tinnevelly.—6 months 2½; 1 year 2¾; 2 years 3.

TRAVANCORE BANK: Trivandrum.—Dr. LUDWIK ARONSON, *Managing Director*, 6 months*; 1 year*; 2 years—.

BUYERS' GUIDE

FOR	SEE PAGE
ASPHALT MIXERS	1
BOOKS	26 & 31
BLOCK MAKING	32
CAULKING COMPOUND	Back Cover
CONTRACTORS	2
CONCRETE MIXERS	1
DESIGNERS	2
ELECTRICAL ACCESSORIES	1
HANGARS	Inside Front Cover
HOISTS	1
HOUSE	26
INSURANCE	32
LIME	32
LITHOGRAPHERS	3
LAMPHOLDERS	1
PREFABRICATION	Inside Front Cover
PUMPS	1
PLYWOODS	1
PENCILS	3
PRINTERS	3 & 32
PAINTS	32 and Back Cover
PLASTIC WOOD	Back Cover
ROOF TRUSSES	Inside Front Cover
RAWLBOLTS	2
REMOVER	Back Cover
STATIONERS	3
SWITCHES	1
TIMBER	1
TILES	4
VARNISH	32 and Back Cover

CEMENT TO-DAY

Members of the building industry will have noted with particular interest the increasing cost of imported cement, the present position and future development of the cement industry in this country. During 1945 and after, the Central Government has sanctioned installation of cement making machinery to the extent of an annual production of 33 lakh tons.

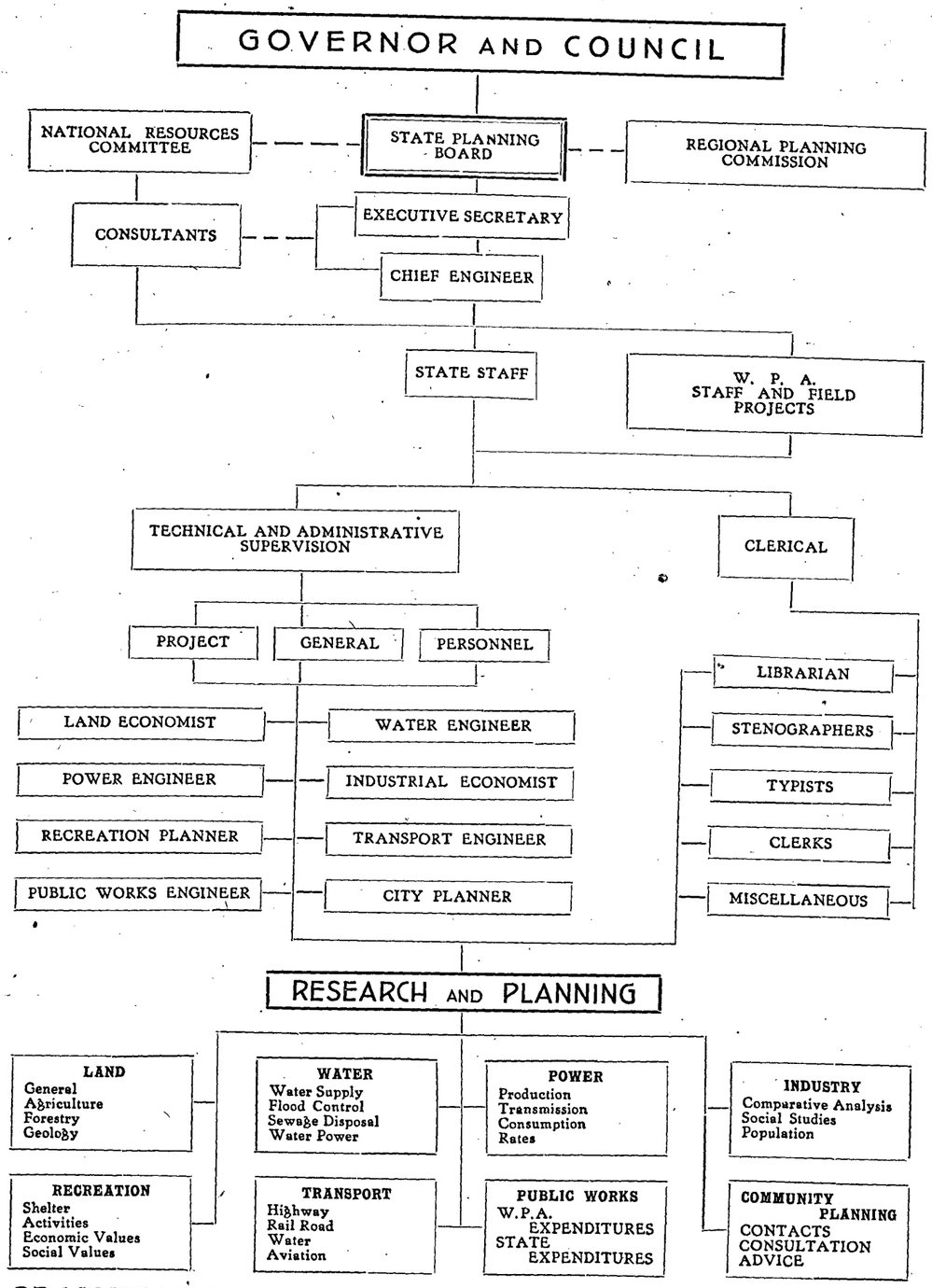
The building industry has to complain of the slow progress of these factories not maturing chiefly due to lack of funds, limitation of dividends and the high cost of wages. The shortage of cement is still acute and it has undoubtedly exercised a hampering effect upon building progress.

Cement is a basic industry, on which depend many developments of the country. The Government should, therefore, seriously consider giving as much assistance as possible to the production of indigenous cement by way of reduction in taxation or otherwise to enable it to make bigger savings to plough back more in the industry, as well as to finance the installation of the new cement manufacturing plants.

Recently it has been reported that the U.P. Government would be receiving about 60,000 tons of imported cement at about Rs. 150 per ton. If that Government really consider using this amount of 60,000 x 150—Rs. 90 lakhs as an investment it could produce the same quantity of cement every year, thus not only providing added employment but also helping in reducing the adverse trade balance.

An essential pre-requisite is the determination from time to time of the capacity of production to be aimed at, and for this a survey of proposed construction should be undertaken at once and subsequently maintained. The machinery is already available, in the records of the local authorities of plans submitted. Those records only require extension to enable the Government to be able to estimate with fair accuracy the potential demand.

The building industry, as one largely affected by ample supply, or otherwise, of cement, owes it to the country not less than to itself to press for the establishment of permanent machinery to enable its demands to be forecast and met.



ORGANIZATION OF MASSACHUSETTS STATE PLANNING

(From City Planning Why and How by Harold Maclean Lewis: Price Rs. 9-14)

HOUSE FOUNDATIONS ON SHRINKABLE CLAYS

The following are abstracts of notes received from the Building Research Station of England.*

Introduction

The traditional brick or masonry (stone or precast block) house is fairly sensitive to stuctural damage arising from differential settlement of the soil beneath the foundations and it is therefore important to keep such movements as small as possible. In the past emphasis has been laid on spreading the load and keeping foundation pressures low, but, apart from some special cases noted later, excessive pressure is a comparatively uncommon cause of cracking. In this country cracking and damage to dwelling houses occur most frequently in areas of shrinkable clay where movements are caused by the clay shrinking beneath the foundations in dry summer weather and subsequently swelling in the rainy winter season. The movements associated with these seasonal changes are greatest at the surface and decrease with depth until at about 5-6 ft. below the surface they are very small. To avoid detrimental differential movements it is recommended that foundations on such clays should be placed at a depth of at least 3 ft. below ground level. In the vicinity of fast growing trees the drying effect of the roots causes increased shrinkage and affects the clay to much greater depths (down to 10 ft.) and consequently presents a more serious problem as regards house foundations.

The present note discusses the problem of foundations on shrinkable clays in some detail; it indicates the extent of the ground movement involved, points out the effect on buildings with shallow foundations and outlines suitable remedial measures.

Clays which are sufficiently firm to bear the loads imposed by houses on normal footings without undue settlement, but which, on the other hand, are subject to appreciable seasonal movements due to changes in water content, are here called firm shrinkable clays.

Extent of Ground Movement and its Effect on Houses with Shallow Foundations

In open grass-covered ground the amount of water contained in the clay varies seasonably down to a depth of 5 to 6 ft. and corresponding changes occur in the volume of the clay; the changes are greatest at the surface and gradually become smaller with depth. The volume changes cause both vertical and horizontal movements of the ground, the vertical movements being generally the more important. It is essential that the possible effects of both movements are considered in the design of all structures, small and large, founded within the moving zone.

The vertical movement may be illustrated by the movement of a series of plates buried 1, 2, 3 and 4 ft. below the grass-covered surface on a site of shrinkable boulder clay at Garston. The movements given in Fig. 1 were obtained during the dry summer of 1947.

The shelter which a house affords to the ground immediately beneath it protects the clay from the effects of climatic changes. This is not the case with the clay outside the periphery of the house, which is subject to pronounced volume changes, and hence there is a tendency for differential

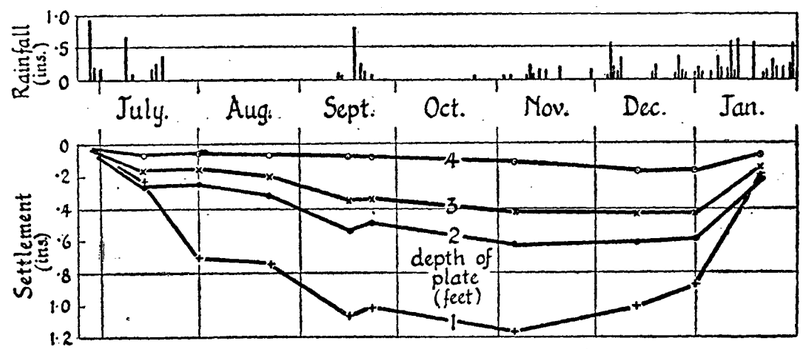


Fig. 1. Vertical movements of buried plates at Garston, 1947.

NOTES & TOPICS

Building Research Station :

Building Research Station of England through whose kind courtesy 'Results of Research' are published in *The Building Gazette*, has on its staff 343 members of which 162 are scientists, 33 Laboratory Assistants, 2 Artificers, 55 Drawing Office Assistants, and 90 Industrial Staff.

Development of Ports : French Experts Conduct Survey

Three French Naval Experts are now in India conducting a survey of major coastal ports locating new ship-building yards. They are expected to submit their recommendations to the Government shortly.

Engineering Association : Proposed Steel Plant

Mr. N. N. Rakshit, Chairman of the Re-Rolling Mills Association, speaking at a meeting of the Engineering Association of India in Calcutta recently, criticised the report of the consulting engineers engaged by the Government of India suggesting sites in the C.P. and Orissa for the establishment of two new steel-works plant.

He said that the engineers had not taken into consideration the question of supply of semi-finished material, such as steel billets, for re-rolling mills. Most of these mills were in the Calcutta area and used about 280,000 tons of steel yearly while the requirements of Bombay and Cawnpore were about 80,000 tons and 82,000 tons respectively. These centres would be placed at great disadvantage if the proposed works were set up at the sites recommended by the Consultants.

Mr. Rakshit added that if the Government had decided to accept the report of the consultants, it should set up an additional plant at Durgapur near Asansol, as suggested by the Government of West Bengal.

Rail Construction Work : Preference to Displaced Contractors

The Railway Board have issued instructions to all railway administrations suggesting that preference should be given to displaced contractors in allotting contracts for railway construction work. G.I.P. Railway, B.B. and C I. Railway, E.I. Railway and E.P. Railway have already decided to give preference to displaced contractors in their future programmes. The Railway Board have also suggested to the railway administrations to split up contract as far as practicable and desirable, so that the largest possible number of displaced contractors could be accommodated.

A Castle in the air

Plans for a 440-storey building to house 400,000 people have been deposited with the San Francisco City authorities by Mr. A. M. Mc Sweeny, an architect (says an U.P.I. report). They provide for 300 lifts, 20 churches, 50 night clubs, 10 hospitals, 1,000 shops, and parking facilities for 80,000 cars. The only time a man need go out would be when he is buried, for the plan makes no mention of an interior cemetery.

Chartered Surveyors' Examination : 1949 Results

Mr. K. V. Rajagopalachari attached to the Office of the Superintending Engineer, N.E.F.A., Shillong, Assam, is the only candidate from India, who has been successful in the 1949 Preliminary Examination of the Royal Institution of Chartered Surveyors.

Damodar Valley Project : Bokaro Power House

A 135 million dollar contract has been signed between the Damodar Valley Corporation and the International General Electric Co. (India) Ltd. for the designing and supplying of equipments for the proposed power house at Bokaro.

This is stated to be one of the biggest contracts that has been signed in this country for a power house which will use three 50,000 k.w. turbines—the biggest units that have been used in this country so far.

A.M.I.E. (India)

The Government of Madras have directed that the A.M.I.E. (India) to be awarded after November 1, 1949, in accordance with the revised syllabus prescribed by the Institute of Engineers, India, be recognised as equivalent to the B.E. degree of a University in the Province of Madras.

Export Students or Import Professors ?

Travel, it is true, is part of education. The idea of exporting students is being revived and the reports received by us show that those students, who after expensive training have returned, have not adequately equipped themselves to show this country anything new. That suggests the necessity for examining the prospects of importing professors who will impart knowledge to more number of students in this country at a lower cost.

Govt. To Acquire Princes' Palaces

The Government of India, it is understood, propose to acquire 20 princes' palaces in New Delhi, and preliminary work in this connection is to be undertaken shortly. The Ministry of Works has asked the Chief Engineer, C.P.W.D., to make a valuation of the 20 princes' houses in the capital. The houses belong to the States of Hyderabad, Kashmir, Baroda, Jaipur, Patiala, Udaipur, Nabha, Dholpur, Kapurthala, Travancore, Cochin, Jaisalmer, Tehri-Garhwal Bikaner, Kotah, Bhavanagar, Pataudi, Mandi, Bahawalpur and Jind.

Kanpur Development Board

The Budget estimates of the Kanpur Development Board for 1949-50 reveal a total income of Rs. 2,49,60,229, including an opening balance of Rs. 4,18,913, and a total expenditure of Rs. 2,47,51,478, with a closing balance of Rs. 2,08,751.

The summary of both General and Water Supply Capital and Revenue Accounts is as follows :—

	Income	Expenditure
General—	(in lakhs of rupees)	
Capital	2,04,77	2,08
Revenue	24,21	21
Water Supply—		
Capital	2,96	4
Revenue	14,20	14

In the General Capital Account the estimated expenditure exceeds income by Rs. 3,36,252. The shortage is proposed to be met out of the savings under General Revenue Account. As regards Water Supply Capital Account, the total expenditure of Rs. 4,83,228 includes Rs. 1,87,200 expenditure on capital works, Rs. 74,528 repayment of loan and Rs. 2,21,500 as cost of stores which is a *contra* item. The first will be met out of the unspent balance of loan money and the second by transfer from Water Supply Revenue Account.

Items of Income

The main item of income is Rs. 20,71,000 from sale proceeds of land and premia on leases. This includes Rs. 15,93,300 from new sales of land in different schemes. The other items excluding *contra* items are sale proceeds of buildings which include Rs. 6,00,000 from disposal of refugee houses; and contribution from Municipal Board Rs. 1,55,376 for drainage and Rs. 12,09,160 for municipal roads. Under loans from Government the provision of Rs. 106 lakhs includes Rs. 100 lakhs for construction of workers' houses and Rs. 6 lakhs being the last unpaid instalment of loan of Rs. 24 lakhs for refugee houses already under construction.

Under expenditure the capital works proposed to be carried out are, briefly, Rs. 24,03,336 for schemes, Rs. 1,08,92,960 for houses and other buildings, and Rs. 11,34,536 for drainage and city roads.

Indian Standards Institution : Legislation likely to legalize decisions

The possibility of the Government of India enacting legislation to give legal sanction to standards prepared by the Indian Standards Institution was mentioned by Dr. Shyama Prasad Mookerjee, Minister for Industry and Supply, presiding at a meeting of the General Council of the Indian Standards Institution held in New Delhi recently.

Dr. Mookerjee called upon the Institution to produce quick results in respect of some of the investigations now under way. While he conceded that the field of work of the Institution was very wide, he stressed the urgency of finalizing standards, particularly of some of the important commodities exported by India.

He said it was the Government's desire to see that Indian goods compared in quality with the best produced anywhere in the world. If this was not borne in mind, he warned, there was danger of losing valuable markets abroad as well as loss of custom within the country.

While regretting that it had not been possible to raise the Central contribution to the funds of the Institution, he was happy that there had been a good response from some of the provinces and he hoped the industries would also increase their contribution.

The Council elected Dr. K. S. Krishnan and Dr. L. C. Jariwala to be Vice-Presidents for the next year.

The Council approved the first lot of standards prepared by the Institution, including standards relating to fireclay refractories; make-up of periodicals; test for shrinkage of woven cotton cloth in laundering and colours for ready-mixed paints.

NEW FIRE-DETECTOR

The "Minerva" electronic smoke detector is the latest development in the war which is constantly being waged against fire. Manufactured by a British firm, the "Minerva" smoke detector takes the form of a small cylindrical unit about three inches in diameter and six inches long, which houses the ionisation chamber and the electronic relay. The number of detectors used in an installation depends upon particular circumstances, but as a rough guide, a single detector unit will protect from 20 to 50 square yards of floor space. Safety devices in the unit indicate the failure of any particular circuit and a special time delay arrangement prevents false alarms from random puffs of smoke. The "Minerva" smoke detector, making use of basic principles in atomic physics, is far ahead of any comparable unit of smoke detection which has yet been devised. Testing the "Minerva" smoke detector by blowing cigarette smoke into the ionisation chamber, thus setting off the alarm.

movement between the clay on the inside and that on the outside of the external walls. Moreover the ground will dry most where it receives the greatest radiation from the sun and, other things being equal, the differential movements will be greatest under corners and walls facing South and least in the shade on the North side.

If the foundations of the house are located within the zone where seasonal movements of the soil occur, then distortion of the structure will result. *The shallower the foundations the greater will be the distortion, and cracks in the structure up to 1 in. wide may be formed.* The distortion of the house usually begins late in the summer with South corners and walls settling and tilting outwards and fracturing away from the rest of the house. The tilting of the outer walls frequently causes the first floor and the roof also to be drawn outwards. Hence cracking inside the house, originating from the movements of external walls alone, may be extensive. Sometimes when a flexible damp-proof course is used only the brickwork below this moves and in these cases the horizontal movement caused by shrinkage may be more noticeable than the vertical movement. In the course of the winter the clay will swell and cause the cracks to close partially. This movement associated with swelling and shrinking of the clay beneath the foundation level will continue every year with a definite tendency of the fractured portion of the house to settle more each year and the cracks to become wider.

Drying shrinkage considerably greater than that already described occurs in the vicinity of the root systems of trees and shrubs. This is not unexpected, since a large tree may transpire 12,000 gallons of water each year from the ground. The root systems of isolated trees generally spread to a radius greater than the height of the tree and in Southern England they have been observed to cause significant drying to a depth of 10 ft. within the area of root spread. Differential movements of 4 inches or more have been measured in houses 80 ft. from a row of black poplars and movements of 1 to 2 inches are quite common.

The problem arises broadly in two ways :—

1. When soon after construction young fast growing trees, e.g., poplar, elm and willow are planted in suburban gardens. Within 5 or 6 years the roots extend a distance of 50 ft. or so, and dry out the clay abnormally below the foundations of the nearest part of the house. The drying appears to be more than a purely seasonal effect, and a permanent depression of the ground surface is produced during the early period of rapid growth.

2. When a house is constructed over part of the root system of a mature slower growing tree, the sheltering effect of the house on the already established root system prevents the replenishment of the water removed by the roots and the clay thus suffers significant shrinkage. The damage arising from this set of conditions does not appear to be as common as that mentioned under (1), but examples of damage have been encountered within 30 ft. of mature oak trees.

When an abnormal dry spell occurs drying goes down to greater depths in the ground, the resulting movements are larger and trouble becomes more widespread, so bringing the problem into prominence. Drought conditions have even more serious effects when trees and shrubs are present. During dry weather the clay not only receives less rainfall, but the increased radiation on the trees in full leaf causes the transpiration to increase and the root system to spread. During the 4-year period 1942 to 1945 the total rainfall in the S.E. of England was about 25 per cent below normal, while again in 1947 only just over one inch of rain fell between the end of July and the beginning of November. In these years the damage became very extensive and serious.

Seasonal movements caused by normal climatic drying are considerably reduced in paved urban areas, and damage will generally be found only in suburban and rural areas. On the other hand the drying effects of tree roots are generally increased under paved areas, and where fast-growing trees develop in urban areas the house movements are particularly noticeable.

The extent of the cracking, which arises in the ways already described, may appear rather alarming, but generally speaking the house is quite safe to live in and no cases of accidents have been reported to the Building Research Station. There is certainly no need to pull the house down even though complete repair is not economical. The following portions of the structure may become unstable and particular attention should be paid to them :—

1. Brick and masonry arches (rare in modern house).

2. Portions of the outer skin of 11 in. cavity walls may become detached from the inner skin, particularly above doors.

3. Roof trusses not tied at wall level (rare in modern houses).

Method of determining whether Movements are due to Shrinkage of Clay

In order to determine whether the house movements are due to the shrinkage of clay a close examination of the building movements should be made and the following information obtained :—

1. Whether the soil below foundation level is shrinkable. Ground which is shrinkable will exhibit large cracks in the surface in dry weather and become very sticky in the winter. The shrinkable nature of the soil may be estimated directly by measuring the change in length of a sample when it is allowed to dry out.

2. The depth of the bottom of the foundation below adjacent

ground level. It is unwise to rely on drawings or verbal information in this connection.

3. The positions and magnitude of cracks, both on the outside and inside the building. Levels of the damp-proof course should be taken with a dumpy level.

4. The history of the site and of the house, and the history of the movements. This usually requires careful cross-examination to establish the facts.

5. The positions and species of all trees and shrubs which are closer to the building than 1½ times the height of the tree or shrub.

If it can be established that the cracks occurred, or that they open and widen, during dry weather in late summer and that they partially close in the winter, and that windows and doors which jam in late summer become easier to move in the winter, then the distortion can be attributed with little doubt to shrinkage of the clay beneath the foundations. If, in addition, cracks of ¼ in. or 1 in. are associated with foundations 24 ins. or 12 ins. deep respectively, then the movements are likely to be due to direct climatic shrinkage only.

If fast-growing trees, like poplar, elm, willow, are within 100 ft. of the property or there are vigorous shrubs, creepers, etc., within 5 ft., then the drying action of the roots is likely to be significant and windows and doors may remain tightly jammed even in the winter. Vertical movements of internal walls near the centre of the building, and cracks anywhere greater than 1 in. wide are generally associated with shrinkage arising from root action. Such trouble may result even when the shrinkable clay is covered by several feet of non-shrinkable soil such as sand and gravel and it is generally necessary to determine the nature of the soil down to a depth of about 10 ft.

Remedial Measures

Remedial measures are difficult and generally expensive in relation to the value of the property. Each case should be considered individually on its own merits in relation to the extent of existing damage and the likely extent of further movement and damage. If movements are detected in the early stages, further damage can sometimes be prevented at little cost, but experience shows that very often most of the possible damage has occurred before the owner decides to take remedial action.

Repairs will be considered under two headings as follows :—

1. *Movements associated with direct climatic drying in the absence of the tree root drying.*

Differential movements may be eliminated by underpinning all the external walls to a depth of at least 3 ft. It is necessary to emphasise that this work requires close supervision by a qualified person experienced in underpinning. It is unwise simply to underpin a fractured corner only, since this will usually accentuate relative movements of the rest of the house which is still founded less deeply. It is generally necessary to underpin regularly the whole of the external walls, either by continuous underpinning placed in alternating sections or by separate blocks of underpinning placed in relation to the window and door openings so as to take full advantage of the strength of the existing brick walls. The building should be strutted and propped during the underpinning process. When the pit has been prepared a bed of concrete about 12 ins. thick should be cast in the bottom and brick piers constructed under the full width of the existing foundations to within a few inches of their lower surface. After setting, the piers should be tightly wedged against the existing foundation by folding metal wedges and finally grouted up. Careful records should be kept of the depth and extent of all underpinning.

Underpinning of the foundations may prove uneconomical and often too costly, especially if the damage is not severe. In such cases it may suffice to reduce further movements by surrounding the house with a relatively impervious path of precast concrete or stone slabs to a width of 5 ft. After laying this path the ground should be left to saturate for a winter before the cracks in the house are repaired. The path tends to reduce the loss of water from the ground in summer and the same object can be achieved by regularly watering the clay next to the house during summer. This latter practice is, however, very tedious and is liable to lapse during absence or change of occupier.

2. Movements associated primarily with the drying action of tree roots.

The treatment of houses affected by trees is generally more difficult than those affected by seasonal movements alone.

If the offending trees have not reached maturity it is wise to cut them down and kill the stump. When this has been done the ground under the fractured part of the house will slowly swell up during wet weather and tend to lift that part of the house upwards and close the cracks partially. It is therefore desirable to delay filling the cracks for at least one wet season to enable this movement to take place. If the cracks are filled earlier, further cracks may develop in other places after the trees have been removed.

If the trees have reached maturity and the house is fairly old, it is unlikely that further movements will occur, except in unusual spells of dry weather. In this case it may be more satisfactory and economical to leave the trees in position and only fill up the cracks. Even small alterations in the conditions, such as an increase in the paved surface between the house and the trees, may, however, lead to further damage and their possible effect should therefore be considered.

It is not usually economical to carry out underpinning of houses

badly affected by trees, since it is generally necessary to underpin to a depth of about 10 ft. and the cost of this work may be greater than the value of the property.

When repairing cracks to brickwork and similar walling materials, the horizontal gaps should be first wedged tight by driving in pieces of slate at intervals so as to support the upper parts of the structure adequately. The outside of the cracks may then be filled up as far as possible with mortar and pointed. Plaster cracks should be cut back to a fair width and filled up with a gypsum plaster gauged with lime, the amount of lime being varied to produce a plaster of similar hardness and suction to the existing work.

Foundations for New Houses

Two types of foundation may be used :—

1. Strip footings.
2. Piles and beams.

Strip Footings

On the firm shrinkable clays in the region previously mentioned the width of the footings need not exceed 15 ins. for two-storey dwellings, but a machine is required to cut such narrow trenches and digging by hand will necessitate approximately double this width for the external wall footings. The depth of all external wall footings should be not less than 3 ft. on flat sites and 3 ft. 6 ins. on sloping sites with a good runoff. Where the natural ground within the external walls is covered with 6 ins. or more of concrete, either as site concrete below a suspended floor or as a ground floor slab, the internal walls may be founded directly on this concrete. Where bare ground is left exposed to ventilation under suspended ground floors the width and depth of the concrete footings under all internal walls should not be less than 15 ins. and 24 ins. respectively. Party walls of two-storey dwellings should have footings of these dimensions when either solid or suspended floors are used.

Care should be taken to avoid the footing trenches being exposed to either wet or very dry weather and the clay should be covered with concrete as soon as it is excavated to the correct level, any softened clay or water being removed before placing the concrete. It may be more economical to fill the trench completely up to ground level than to lay bricks below ground. The concrete does no more than replace a shrinkable by a non-shrinkable material and a concrete richer than a 1 : 3 : 6 mix is not necessary.

3-in. layer of ashes, coarse sand or gravel improves working conditions in wet weather and aids heat insulation, but larger thicknesses of filling under the ground floor slab should be avoided as far as possible. The finished floor level should be chosen so as to avoid excessive filling and on sloping sites shallow bulk excavation by means of scrapers following the soil stripping operation should be considered.

Pile and Beam Foundations

The comparatively large quantities of materials involved in providing adequate strip footings for houses on shrinkable clays have suggested that it may prove more economical to use short bored piles and beam foundations to support the external walls. Experimental work on these lines is in progress at the Station and the results appear to be promising. The pile holes may be bored very easily, provided the clay does not contain many stones, by means of a hand posthole auger about 12 ins. diameter. The average spacing of the piles is about 8 ft., the exact locations being determined by the positions of door and window openings. A lightly reinforced concrete beam about 12 ins. wide and 6 ins. deep spans between and is anchored to the piles. This beam, which may be cast *in situ* at ground level, supports the external wall. The internal walls may be founded on the solid concrete ground floor which may be cast independently of the pile beams. Heavy internal chimney stacks may be founded in the usual way on an independent pad foundation 2 ft. deep.

PERSONAL

Mr. P. C. Bahl

Mr. P. C. Bahl, Chief Administrative Officer, Eastern Punjab Railway, has been appointed as General Manager, Bengal-Nagpur Railway, since May 21.

Born in 1901, Mr. Bahl graduated from Thomason Civil Engineering College, Roorkee, and joined the North-Western Railway as an apprentice engineer in October 1923.

Dr. Lal C. Verman

Dr. Lal C. Verman, Director, Indian Standards Institution, will represent India at a number of conferences to be held by the International Organization for Standardization in Paris from June 25 to July 11.

Dr. J. J. Rudra

Dr. J. J. Rudra has been appointed Principal of the new Engineering College which is expected to start functioning from 1950, at Sindri in the Jharia Coal-field area.

GRANITE INDUSTRY IN SCOTLAND

In Scotland a Joint Apprenticeship Council, representing the Granite Manufacturers' Association and the Sculptors, Association on the one hand, and the Union of Building Trades Operatives on the other, apply the recruitment and training scheme through local apprenticeship committees. Apprentices normally begin between 14 and 18 years of age. Stone polishers serve 4 years and stone cutters and toolsmiths serve 5 years. There are the usual provisions for part-time education, and generally it is the duty of Local Committees to ensure that apprentices obtain experience in all classes of work for which they are indentured and to satisfy themselves that the lads are being properly trained.

ALTERNATING OR DIRECT CURRENT?

*J. E. BREWIN, A.M.I.E.E. and JAMES F. DRIVER, M.I.E.E.

A Review explaining the Advantages and Disadvantages of the two systems of Supply

DIRECT CURRENT
(James F. Driver)

In considering the objections to alternating current we must remember that in Alternating Current supply the current flows in the circuit in one direction, dies down to zero, rises to a maximum value in the opposite direction, and again dies down to zero, during each complete period.

In the A.C. system supply delivered by the British grid there are 50 such periods per second. But for many purposes, for example, electrostatic heating and wireless, current is generated with periodicities up to many millions per second.

When dealing with Direct Current the magnitude of the current is measured in amperes and it is necessary for suppliers and consumers to know what value of Alternating Current is equivalent to a certain value of Direct Current. Obviously we cannot take the maximum value of the Alternating Current wave and instinctively we might consider the average value. But what we really require to find is the value which is equivalent to Direct Current and the average value will not do because the heating effect of the current varies as the square of the current. We therefore ascertain the height of an infinite number of ordinates and from these we ascertain the mean value of these ordinates. We then take the square root of this mean ordinance to obtain the Root Mean Square to give us the virtual value. The value of the virtual ampere depends upon the shape of tha current wave, and it is general practice to assume that this is a sine wave in which case

$$\text{the R.M.S. value} = \frac{\text{max.}}{\sqrt{2}}$$

Then if the R.M.S. value is 100 the maximum value is 141 approximately.

Similar arguments apply to the voltage wave and therefore with a 230 volt Direct Current supply the maximum value for the equivalent Alternating Current voltage is 325 volts. So we have the anomaly that though our voltmeter reads 230 volts the electric shock voltage is over 300, and it is this peak voltage which kills and therefore it will be seen that the danger of electrocution is considerably greater with an Alternating Current domestic supply than with Direct Current. In this respect it might have been wiser to adopt a lower figure such as 110 volts for domestic electricity supplies. But this is not all. In many cases harmonics exist as ripples on the fundamental wave, and these may send the peak value of the voltage much higher than would be the case with a pure sine wave. Under these circumstances the danger of shock is still further magnified.

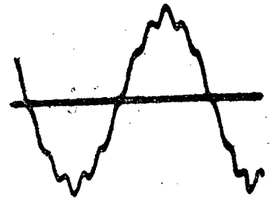


Fig. 5. Wave form of an Alternator with harmonics superimposed on the fundamental sine wave.

Capacity Currents

Consideration will show that every pair of conductors taking an electric supply to any piece of apparatus is really a capacitor (condenser), the two cables being the plates and the insulation being the dielectric between the plates. If therefore an alternating current is switched on to these conductors a current will flow into and out of the conductors whether a load is connected or not. Furthermore it will often be found that the voltage at the end of an unloaded line is higher than that of the generator.

Any electric circuit which contains self induction and capacitance has, as every wireless enthusiast knows, a natural period of its own and, if the resistance does not exceed a certain limit, electric oscillations may be produced in such a circuit if the periodic time happens to coincide with the periodicity of the alternator or one of its harmonics. Such oscillations may be violent and are limited only by the apparent resistance of the circuit. In the case of a long unloaded line switched on to an alternator the capacity is that of the cable and the inductance is mainly that of the alternator itself. In his paper on Pressure Rises* Duddell quotes the case of a 6,600 volt generator connected to two feeders where the maximum voltage rose to 14,000 or 2.33 times the R.M.S. value.

Another cause of serious pressure rises occurs when the load is switched off at the end of a long feeder, as, for example, by the opening of a circuit breaker. In such cases pressure rises between two and three times the R.M.S. voltage are not unknown. It

* Extracts from lecture to the Nottingham Society of Engineers.

* I.E.E. Journal, Vol. 52, page 3, 1913.

should be realised that any pressure rises of the nature indicated not only seriously endanger the insulation of the system but increase the risk of shock.

The losses peculiar to Alternating Current supply include:—

Eddy Currents

When a current flows in a conductor a magnetic field is set up around the conductor and if the current varies, as is the case with Alternating Current, the field varies and this field sets up eddy currents in nearby metals which heats these metals and power is wasted. This is of course the basis of Induction Heating.

The Skin Effect

The magnetic field set up when the current flows in a conductor is not only external to the conductor but is also within it. When the value of the current varies an e.m.f. of self induction is induced, which tends to stop the change and the net result is that the current tends to crowd to the outer surface of the conductor so that its apparent resistance is increased with corresponding increased losses.

Dielectric Losses

When a capacitor is charged and discharged, current flows into and out of the plates and, with a perfect capacitor, as the current leads 90° no power is lost. Unfortunately, however, we know of no perfect dielectric, some power is lost and the dielectric is heated. The higher the frequency the greater the losses and this is the basis of high frequency dielectric heating. At normal power frequencies the losses, though by no means negligible, can be tolerated but at radio frequencies they become of serious importance and many well-known insulating materials cannot be used because the losses at such frequencies render them impossible.

Power Factor

In the case of direct current the power in a circuit is measured in watts and is obtained by multiplying the current in the circuit at any instant by the voltage across the terminals of the circuit at the same instant. With alternating current, however, the maximum value of the current is rarely in phase with the maximum value of the voltage producing the current and, dealing with the quantities vactorially, the current lags or leads by some angle ϕ between the voltage and the current and it can be shown that the power in watts $=E.I. \cos\phi$ where ϕ is the angle of lag or lead and $\cos\phi$ is known as the Power Factor.

If the angle ϕ is large it is possible to have heavy currents with only little power. For example, given a perfect condenser the current will lead 90° in front of the voltage producing it and as $\cos 90° = 0$, no power will be developed. Similarly, given a perfect inductance, the current will lag 90° and again no power is developed.

In the case of the average alternating current motor the power factor is about 0.85. This means that larger mains are required and for a given sized motor, the efficiency is lower, the losses in the generators, transformers and cables are increased and it can be shown that in a system working at 0.7 power factor the losses will be twice as great as they would be on the same system operating at unity power factor.

Direct Current apparatus having advantages over Alternating Current apparatus includes:

Direct Current Motors

Though the A.C. Squirrel Cage Induction Motor is simple and robust it suffers from the problem of power factor and what is often worse, the fact that it has a low starting torque. If we switch such a motor direct on to the line it will take from five to seven times full load current and will only develop little more than full load torque, whilst the less said about power factor the better! We can of course insert rotor resistance or better still adopt star-delta starting, but then the motor will only develop 40% full load torque with a starting current of about 1½ times the full load value and if the motor will not start on star and we switch to delta to obtain full load torque the current immediately rises to about five times full load value. We can of course introduce windings, slip rings and starters to obtain a better starting torque, but we then throw away the simplicity which is the feature of the induction motor. Further more, unless we are prepared to adopt a heavy, expensive and complicated motor it is difficult to obtain a wide range of speeds. The induction motor depends for its operation on the fact that a rotating field is developed which drags the rotor round. There must be some slip between the speed of the field runs at the speed of the field, and this depends upon the number of poles developed by the particular stator winding. With a 50 period supply possible speeds are 3,000, 1,500, 1,200, 1,000 r.p.m. and so on.

By pole changing it is possible to have a limited number of speed changes but we cannot exceed 3,000 r.p.m. Higher speeds are often demanded for woodworking machines, power drills for coal mines and so on and for these it is necessary to employ an additional alternator, generating at a higher frequency. We drive this with a separate motor and dignify it with the name of Frequency Changer but the cost of running it inevitably comes on the electricity bill! With Direct Current motors, on the other hand, we have full load torque with full load current and motors can be designed for almost any speed and it is easily possible by means of suitable control gear for a motor to run at any speed from 0 to 6 times full load speed in either direction, whilst it is claimed that adjustable speed motors may be designed to operate over a speed range as high as thirty to one. Furthermore a D.C. motor can be made to run at absolutely constant speed for all loads whilst control panels are now on the market provided with a control knob calibrated in revolutions per minute. The dial can be set to any desired speed and when the starting button is pressed the

motor will run up to, and hold that speed constant, irrespective of the load. Dynamic braking makes quick reversals possible all by push-button control.

Electric Traction

The Direct Current series motor with its very high starting torque and increasing speed at low loads is outstandingly superior for electric traction, cranes and similar applications. Whilst it is true that single phase low periodicity A.C. traction is possible the upkeep is higher and the efficiency is lower than D.C.

The Storage of Electrical Energy

Using Direct Current, electrical energy can be stored in secondary cells and though the efficiency is not as good as we should like, storage batteries are being increasingly used, and for nearly a century electrical engineers have looked forward to the evolution of a high capacity, low weight and high efficiency storage battery.

Even the batteries we now use are capable of giving efficient service in our battery vehicles, shipping buoys and the like.

Consider now a small Generating Station, for example a station generating power for use in a works, preferably a works requiring heat for process work and uses its exhaust steam or waste heat from the exhaust. If alternating current is generated no matter how low the load, an alternator must be kept running to supply the current whereas if Direct Current is generated the station battery can take over at any time and in the case of a small station can even assist during periods of overload. Charging can be done on periods of light load and so improve the load factor of the station.

When we have a number of super stations linked by a grid the problem is different because one station can take the load and feed to all districts but who dares to work out the cost per unit under such circumstances?

Electric Clocks

Theoretically the A.C. Electric Clock with its single phase synchronous motor is ideal if the alternators run at a suitable and constant speed but during those times when there are cuts such clocks cease to function. There are two patterns available, the clock which must be mechanically started and the self-starter. It is probable that the former is to be preferred because when current is cut off the clock stops, whereas with the latter a cut of a quarter of an hour means the clock stops and becomes a quarter of an hour slow without giving any indication of the fact.

An electrically wound clock is a far better proposition. In these the clock is spring driven but provided with a battery which re-winds the spring at regular intervals. Such clocks keep remarkable time because the tension on the spring varies only slightly. Whilst A.C. clocks operating on a similar principle can be made, the absence of trailing flexible leads makes the battery-driven clock portable and more desirable in every way.

The Long Distance Transmission of Electric Energy

It is necessary on transmission schemes to provide conductors of sufficient cross section to ensure that the current density is relatively low in order to keep the I^2R losses within permissible limits. The choice of material lies between copper or aluminium and as both are costly it is necessary to step up the voltage to reduce the current and therefore the cross section, if economical transmission is to be achieved. In other words, insulation is less costly than copper or aluminium. For this reason the British grid transmits at 132,000 volts, whilst in Sweden, for example, current is supplied at 220,000 volts. This appears to be the economic limit with Alternating Current as at higher voltages corona losses become seriously important. Corona appears when the electrostatic stress in the atmosphere exceeds a certain value and the air is electrically broken down and is ionised. Not only does corona give rise to losses, but it facilitates the formation of nitric acid which leads to corrosion. Corona may be reduced by increasing the diameter of the conductors and this has been done on the 287,000 volt Boulder Dam line in America by using what is practically a stranded copper tube which is far more costly than the simple stranded conductor used on the British grid and also has serious disadvantages with regard to windage and snow. Other losses increase rapidly whilst voltage rises due to capacitance introduce serious problems. If, however, we are prepared to adopt Direct Current we do not have to multiply the voltage by 1,414 to determine the peak value and it has been shown that, using the same insulators, conductors and spacing a double circuit three phase transmission line designed for 132,000 volts, Alternating Current with earthed neutral can be used as a triple circuit Direct Current transmission line with earthed neutral operating at well over 300,000 volts between the positive and negative and as there are no losses due to eddy currents, skin effect, capacity currents or dielectric losses, it is possible to transmit the same amount of power with a line loss of less than half of that occurring with Alternating Current.* This places the Direct Current transmission of electrical energy over long distances well ahead of Alternating Current transmission, whilst power factor problems do not arise.

Some years before the war the Germans devised a scheme for a European grid in which a million kilowatts of high voltage current was to be distributed from hydro-electric stations in Norway. The scheme was outlined by W. Gosebruch and various proposals were compared. These included:

(1) A.C. distribution,

(2) A.C. generation followed by rectification to D.C. for D.C. distribution and afterwards inversion to A.C. for local distribution.

* Rissik, I.E.E. Journal, Vol. 75, No. 451—1934, suggests that the D.C. losses would be one-sixth those with A.C.

(3) D.C. generation on the Thury system with D.C. distribution.

It was concluded that the cheapest scheme would be the second, namely, A.C. generation followed by rectification to 400,000 volts for Direct Current distribution and followed by inversion to Alternating Current for local distribution. The scheme as outlined involved only 24 miles of sea crossings and the line was to extend to Rome in the South, Portugal in the West, and Rostov on the Black Sea in the East. It has been asserted that cables manufactured for a certain A.C. voltage can operate at between two and three times the A.C. voltage (R.M.S.) and as the Electricity Board already have a 33,000 volt A.C. cable across from the Mainland to the Isle of Wight, whilst a short length of 132,000 volt cable is or soon will be laid across the River Orwell near Ipswhich, so that it would appear that the manufacture of a cable suitable for 400,000 volts D.C. should present no difficulties.

A glance at the map gives a hint as to the strategic importance of Norway and the adjoining countries and suggests yet another reason for the occupation of these countries during the war. There is little doubt that had the Germans won the war this high voltage D.C. grid would have been built by slave labour.

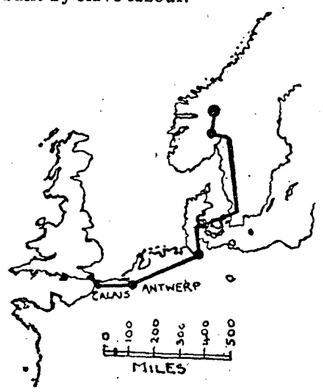


Fig. 6. Suggested route for electric supply from Norway to Britain.

Electricity from Norway to Great Britain

If a scheme for the transmission of electricity from one end of Europe to the other can seriously be contemplated it is a simple matter to consider the transmission of electrical energy from Norway to Great Britain. All that is necessary is to follow a similar route to that already planned through Denmark, then to pass along to Calais and finally cross the Straits of Dover to England, as shown in Fig. 6.

Naturally the question of cost is involved and though this is considerable, it must be remembered that the supply from Norwegian hydro-electric stations is inexhaustable, whereas our steam stations depend upon coal which is ever increasing in price. If we examine the cost per unit for electricity generated in 1937 against that for 1945 we find that whilst the labour charges have increased, the overall cost for the generation of electricity has remained practically constant due to more efficient plant. On the other hand the cost of coal has risen nearly two and a half times, and in the 18th annual report of the Central Electricity Board for 1945 a curve showing the rise in the cost of coal from 1937 to 1945 shows no indication of this diminishing.

According to Gosebruch the estimated cost for supply on the Germany-Norway scheme was:

Generation—

0·155 pence per kW. hour.

Transmission and Distribution—

0·086 pence per kW. hour.

Making a total of—

0·241 pence per kW. hour.

Compared with this the total overall charge, including general transmission and distribution for the British grid was, in 1945, 1·2 pence per kW. hour, so that even though we treble the estimated German figures, it would still appear an economic proposition to purchase current from Norway.

We have discussed the question of cables and have seen that the laying of Direct Current cables across the Straits of Dover appears to be a practical proposition.

But there is another point which is worthy of consideration.

Many years ago the suggestion was made for a Channel Tunnel. This was turned down mainly for reasons of military defence. But in the last 40 years new weapons and new methods of attack have completely altered the situation. When Bleriot crossed the Channel 40 years ago, Great Britain, as Lord Northcliffe prophetically pointed out, "ceased to be an Island," and there appears to be no military reasons why a Channel Tunnel should not now be constructed. A point of interest to us is that, given our Channel Tunnel, the cables for our Norway to Britain transmission line could pass through the Tunnel so that the problems of a submarine cable would vanish.

(Review on Alternating Current appeared in April Issue of The Building Gazette.)

ARCHITECTURAL EXHIBITION PLANNED IN LONDON

An architectural exhibition of a kind never before seen is to be held in London as part of the Festival of Britain. This big national Festival will take place in 1951 and will show the world Britain's contribution to civilisation—past, present and future,

The exhibition will be sited in the centre of London and will take the form of a cross-section of a typical residential neighbourhood. This will be shown as in the course of construction and will comprise not only houses and flats but other features which go to make up a properly balanced development.

When the Festival is over, the buildings will be completed for normal occupation. It will then form a permanent part of the London scene.

CEMENT MANUFACTURE AND PLANTS

Major J. SIM, A.I.Mech.E.

The inventor of "Portland" Cement was a certain Joseph Aspdin, a Yorkshire Bricklayer in 1824, and from this a very large industry has sprung up all over the world. Britain produces ten million tons a year, the United States produces 40 million tons, and India's expanding Cement Industry has already reached the two million tons mark and with her long-term dam projects she will need considerably more.

The manufacture of Portland Cement has changed very little since the days of Joseph Aspdin. The main difference being that where Aspdin used a stationary kiln (some of his kilns are still in existence in Northfleet, England), the modern cement maker makes his clinker in a Rotary Kiln using pulverised coal or oil as his fuel.

Basic Principles: The principles of cement manufacture are illustrated in Figure 1 and a typical layout in Figure 2, from which you will see that chalk and clay (or limestone) are quarried and fed into a washmill, from which they go to a mixer. The resultant "slurry" is fed into the Rotary Kiln. The slurry is burnt by pulverised coal or oil, and the resultant "clinker" goes through a cooler into the "clinker" store.

Then 5% Gypsum is mixed with it and it is ground to a powder in a circular ball mill. The resultant cement is then pumped into Cement Storage Silos and from there it is pumped to the despatching plant from whence it leaves the Factory either in bags or in bulk.

Wet or Dry Process: There are actually two methods of making

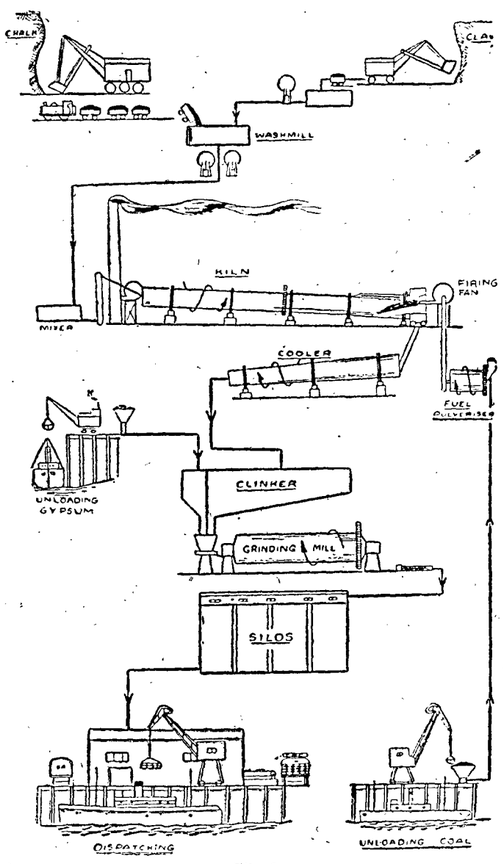


Fig. 1.

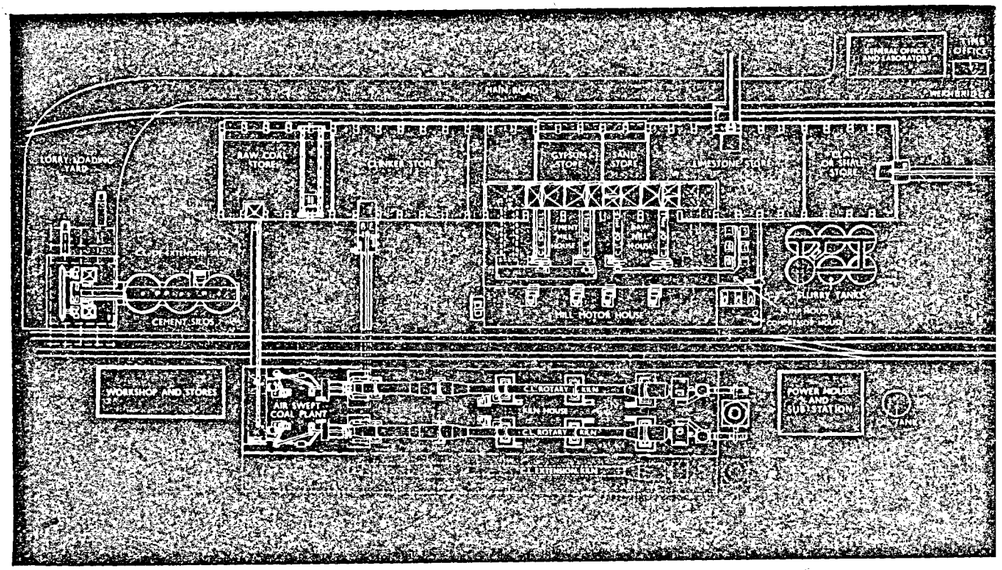


Fig. 2.

cement, the "Wet" and the "Dry" process, and consulting engineers are available to advise you which is the best system. This can be worked out from the raw materials. In fact to operate most economically each factory should be individually engineered.

Generally the "Wet" process which has already been described is the most usual, but if the raw materials are very hard limestones or marbles and the initial grinding is considerable, it pays to put down a "Dry" process plant to grind your raw materials to a sufficient fineness and store them in "Raw Meal" silos. The raw meal goes into the kiln dry. A further advantage of the "Dry" process is that the excess moisture in the slurry is not present in the "Raw Meal" which is fed into the Rotary Kiln dry and the fuel consumption per ton of cement made is reduced.

Such a factory with an output of 100,000 tons per annum is at present being erected at Kankasenturai by the Ceylon Government, the machinery being by Vickers-Armstrongs Ltd. A factory of this type is illustrated in Figure 3.

Detailed Design: It is impossible to include in an article of this nature all the detailed designs and developments in Cement Plants, and especially all the arguments for and against them, but I have listed some particular items which may be of interest to readers.

Layout: The main item in layout to be considered is the kilns in relation to the stores building with the object of keeping material movement to a minimum. As a general principle it is preferable for smaller factories where the addition of many kilns is not foreseen, to have the kilns parallel with the main stores building.

In U. P., however, where the new Cement Factory is being built by Vickers-Armstrongs Ltd. with an initial output of 700 tons per day that can be increased to an output of 1,400 tons per day, the kilns are at right angles to the Stores Building to obtain minimum movement.

Quarrying: As transport is one of the major expenses in cement production, serious consideration must be given to quarrying and the plant must be as near as possible to the raw materials. Few of India's cement plants have highly mechanised quarries but with high mechanisation, selection of suitable stone is difficult and with large overburdens and mixed stones, quarrying by hand may prove cheaper in spite of rising labour costs.

Grinding: Both raw material grinding and clinker grinding is carried out in Ball Mills. A view of a mill house is shown in Figure 4. In past times Cement Mill Houses were dark and dusty places, but attention to detail and dust collection makes this unnecessary in modern factories.

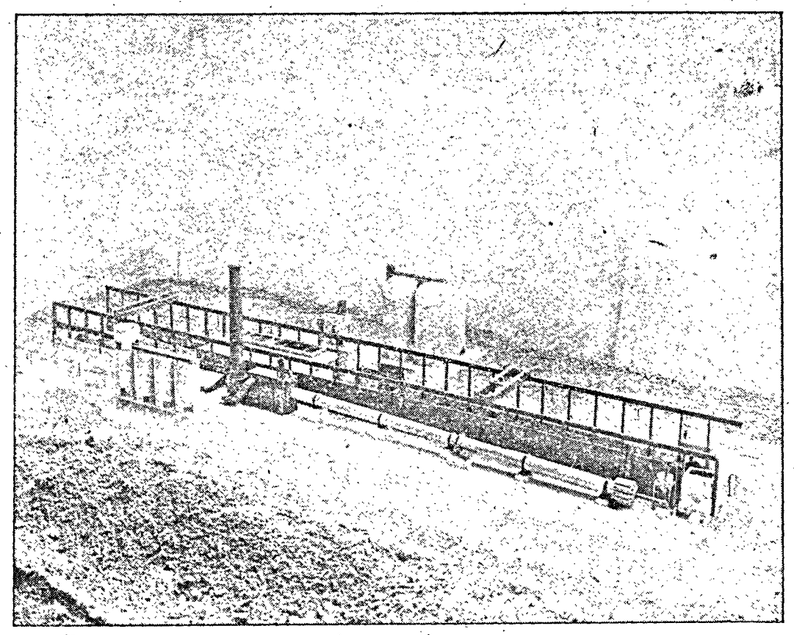


Fig. 3. A Single Kiln Dry Process

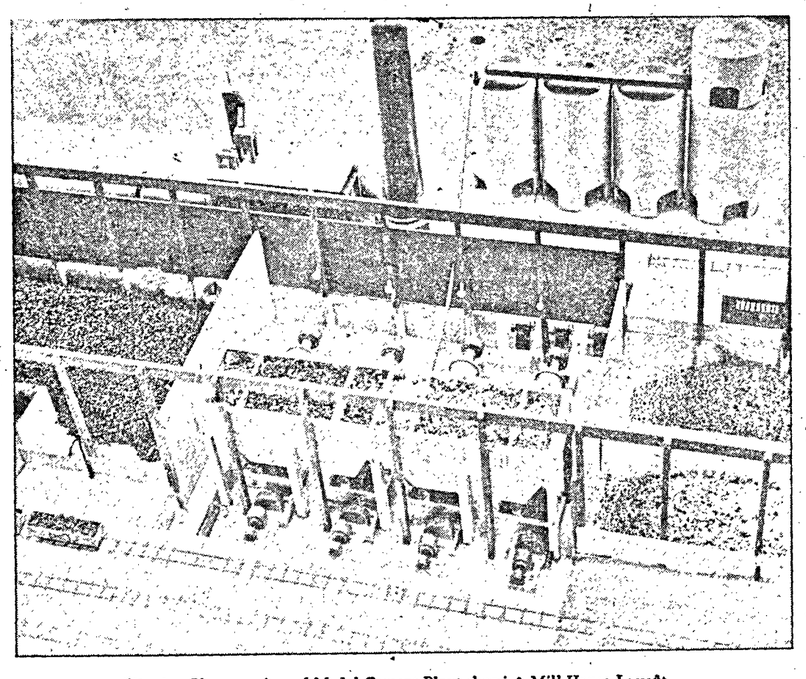


Fig. 4. Close up view of Model Cement Plant showing Mill House Layout

Closed Circuit Grinding: The cost of grinding the raw ingredients is a major item of the total cost of finished cement. A maximum degree of fineness must be reached in order to bring about the desired chemical reaction that is the object of the high temperature of the Kiln. Obviously, if the lime ingredient comes from shells, or marl or a soft rock, the desired fineness will be reached with but little expense for energy (HP) and with but slight wear on the steel liners of the grinding mills and on the steel balls whose rolling crushes the rock as the cylindrical mill revolves.

But if the rock is hard, that is, if it has a low grindability factor (there are methods for determining this factor accurately in advance), the designing engineer must find means to secure the desired fineness and stipulated tonnage throughout, while, at the sametime, keeping his equipment cost and later maintenance charges at an acceptably low figure.

Closed Circuit Grinding was developed in the United States and is being widely used in both North and South America and elsewhere to meet this problem and thus be able to make inexpensive and high quality cement from raw material of whatever type or wherever situated.

In Dorr C.C.G., raw rock is fed to a grinding mill and mill discharge is returned to a Dorr Classifier. Adequately ground material overflows the Classifier and goes on to process, while oversize is recycled back to the mill for further grinding. In open circuit grinding, raw rock is fed to either a single compartment or sectionalized grinding mill. As mill discharge goes directly to process, complete reduction to the desired particle size must be made in one pass through the mill.

Kilns: Considerable attention has been given in recent years to kiln design and kilns vary in length from 100 to 400 ft. The main object of kiln design being to keep the amount of fuel required to make the clinker to a minimum.

Dessicator kilns have been developed to give greater heat efficiency.

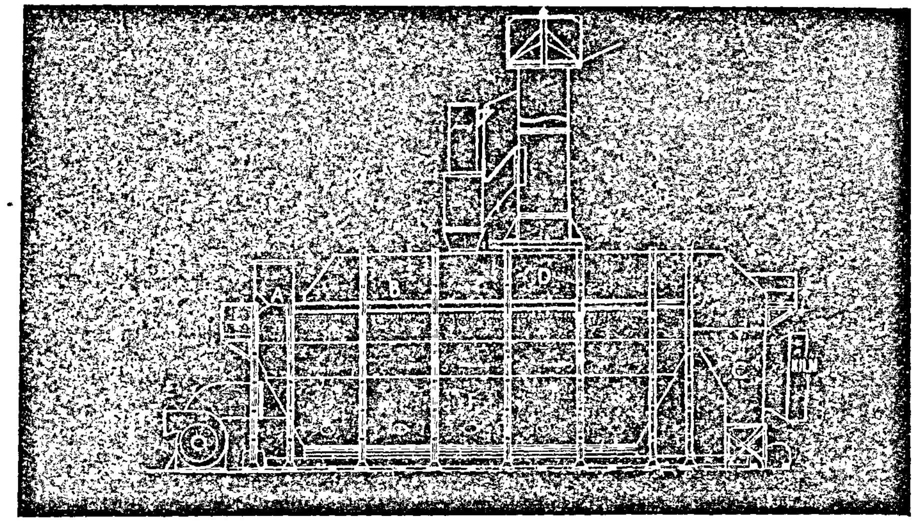


Fig. 5.

The use of pre-heating grates in Dry process plants has also been developed considerably in some countries to obtain low fuel consumption; one big advantage of a "moving grate" kiln being that the length of the kiln is only 100', which give obvious economies.

Figure 5 illustrates the Vickers Moving Grate. The raw material in nodules is fed from the Feed Hopper "A" on to the moving grate "B" by which it is carried forward slowly to the discharge chutes "C" which feed into the short kiln.

The hot gases from the kiln, which are above that required for the dissociation of CO_2 enter the chamber "D" and are drawn downwards through the material by the Fan "E". Dust is precipitated in the Hopper "F" and elevated back to the Feed.

Clinker Cooling: Many developments have been made in this field. Old Factories have the type of cooler shown in the diagram in Figure 1. Later Rotary Coolers were designed integral with the Kiln shell, see Figure 6. These reduced erection costs considerably since Kilns could be mounted much nearer the ground and the cold air passing over the Clinker to cool it becoming heated is fed into the Pulverised Coal Firing Plant, thereby effecting fuel economies.

The latest method of cooling is an inclined Grate Cooler, into which the Kiln feeds directly. This cooler is far cheaper than integral rotary cooling and more economical in fuel and is being installed in new Factories all over the world. The first to work in this part of the world will be at the Government Cement Factory in Ceylon, and they will also be installed in The United Provinces Cement Factory.

In fact with the present high cost of replacing the manganese steel castings in Integral Rotary Coolers, it has been found economical to scrap them and install Grate Coolers in existing Factories.

The writer will be pleased to give more detailed information on any of these points to those interested.

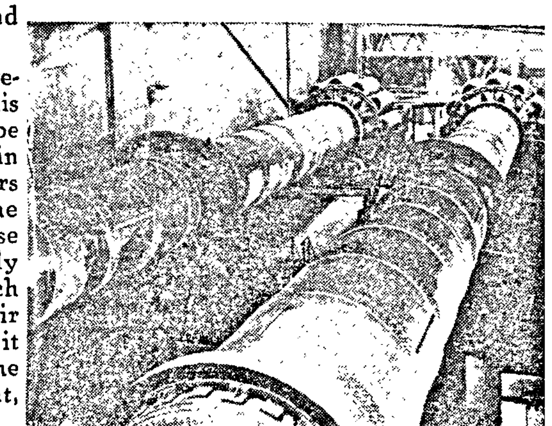


Fig. 6. Rotary Coolers Integral with the Kiln.

AGRICULTURE AND THE SANITARY ENGINEER—FERTILITY FROM SEWAGE

*A. P. I. Cotterell, M.I.C.E., M.Cons.E., F.R.I.C.S., M.I.W.E., F.R.S.I.

The following is an extract of the Valedictory Address by A. P. I. Cotterell, Esq., Past President, Institution of Sanitary Engineers (England) to the South-Western District Centre.

Our task, as Sanitary Engineers, is to see to and improve the hygienic conditions in which we all seek to live. Since life on earth depends on the productiveness of the land I have called my address "Agriculture and the Sanitary Engineer."

From early childhood, but more closely and scientifically of late years, I have been connected with Agriculture. My close connection has shown me that sanitation and agriculture interlock. All of us may be too apt to look upon our own work in human welfare without much thought of the way in which it impinges on that of others. Specialisation, so important in the world economy of today, can be uneconomic if it does not do so. One can bring forward instances but perhaps the most fitting, so far as our profession is concerned, is what my old friend, Gilbert J. Fowler, D.Sc., F.R.I.C., refers to as "the Nitrogen Cycle." In a Presidential Address to the Indian Society of Biological Chemists, Dr. Fowler lays emphasis on the way in which the processes of Nature—of which ours of Sanitary improvement and waste disposal is certainly one—supplement one another. Our work, well or ill done, will have its effect upon the next in the cycle, just as we know too well how an improper "Trade" effluent, if allowed to mix with domestic sewage, has its effect upon our measures for purification.

Turning now to sewage disposal, which is in its way an epic of co-operation between the chemist, the bacteriologist and the engineer, in which all can take pride, let me refer to that part of the treatment pertaining to the sphere of the Sanitary Engineer.

We all know that there are two products from sewage treatment, first a liquid sufficiently purified to be adjudged fit for admission to a stream and second, semi-solid sludge that has to be otherwise disposed of. It is the sludge I am concerned with in this addrees more particularly; although the liquid product is of great importance, since it may become drinking water; as, indeed, it does in the Thames valley, and has done for many years on the Ruhr where some five millions of people have been successfully supplied from a river containing purified sewage effluent; purified, in drought, at least twice over.

The solids from domestic sewage have valuable manurial ingredients. Some trade wastes, but not by any means all, have somewhat similar ingredients or can be purified without harm to the nitrogen cycle, which it is so necessary to preserve. The late Sir Albert Howard claimed, on the ground of a very wide experience, "that the fertility of the soil and the consequent health of humanity may be maintained by the complete utilisation of all (organic) wastes." This is also the view of Dr. Gilbert Fowler, who knew Sir Albert well and had collaborated with him for many years in India; and it certainly applies to sewage sludge.

Sewage sludge has valuable manurial ingredients derived, through digestion in the bodies of men and animals, from food products grown on the land. If such products are not returned to the land, the land is so much the poorer and Nature must recoup herself in some other way. No chemical substitutes can take their place. The early agriculturalists knew this truth perfectly well; hence the injunction given to the ancient Israelite and hence the value placed by the Chinese on faecal matter. Professor Winfield of Cheloo University gave in 1937 the figure put upon human excreta in the Far East at from 2.25 to 7.5 per person per annum.

The fertilising value of sewage sludge is directly dependent on the kind of sewage from which it comes. So long as sewage consists of human and animal wastes (like the Chinese use) it is of the same character the world over. There is no difference in humanity in this respect. But in an organised community it is not long before trade wastes make an appearance, and, although they may be

* By courtesy of the Institution of Sanitary Engineers.

admitted if small in bulk as compared with the sewage proper, or if carefully regulated, they may upset the value of the sludge as a fertilizer.

Local Authorities are now, by law, under obligation to treat trade wastes, subject to terms and ability to do so. It is important to remember that the value of sludge as a fertilizer is dependent upon its phosphoric and nitrogen content, and any ingredient in the sewage that interferes with the normal working of the "nitrogen cycle" will alter such value. Indeed, there already is one loss when sewage is water-carried in a long system of sewers. There should also be a potash content but it seems to disappear, owing probably to potash being soluble in water.

Sewage sludge was the bugbear of sewage disposal not so very long ago. Those farmers who did try it for manure found it best to put it by for a time before spreading it. And their instinct led them rightly: it needed to be "activated" and relieved of its high water content. This has now been partly accomplished at the Sewage Works by air-drying in lagoons, but better still by vacuum filters and rotary driers, thus making it available for further processing. It is also possible, by sludge digestion, to draw off valuable methane gas and to leave a sludge still with fertilising properties.

We have been learning out of all this what our forefathers knew by instinct; that there is an organic fertilising value in sewage, which may be missing ever since sewers, necessary as they are for our crowded conditions, took the place of direct application to land. It may be considered to be a low-grade manure, chemically regarded, but having been produced from life, it may contain other life-giving values, such as hormones, which chemical manures cannot give.

All modern systems of sewage treatment produce sludge. Each are designed to meet their respective problems and one of the latest types is the Activated Sludge process, which I will follow up because by its use of air for purification in the first, or tank stage, it tends to produce sludge of greater manurial value. Its inception is due to Dr. Gilbert Fowler, who was at that time adviser to the Manchester Corporation Sewage Works, and it has been adopted for use in many cities, especially in the New World.

Dr. Fowler, who has been living for many years in India—that great country where land fertility is so vitally urgent—has put it on record in a little booklet, *The Economics of Sludge Utilisation*, that his objective was not only "the purification of sewage but the completion of the nitrogen cycle, by conserving the nitrogen in the sludge for the purpose of making fertilisers for farm lands"; in other words to "help the farmer to grow two blades of grass where it is now only possible to grow one."

Very striking has been the development of the process. Though used chiefly for large installations because of the skilled attention needed, I have successfully installed it for a population of only 2,000 where I could rely on skilled oversight.

It is in the U.S.A. where the greatest developments in the use of sludge have taken place. Many sewage plants make and sell their product—of which some thirty-five use the Activated Sludge process—besides a great number of works that practically give it away more or less prepared for agricultural use. By far the largest producer is Milwaukee, Wisc., where the fertiliser "Milorganite" is made and sold for hundreds of miles around. I have been over these works, as well as those at Chicago, Ill., the second largest producers. At Milwaukee a product is obtained containing at least 6 per cent of nitrogen and 2.25 per cent of available phosphoric acid.

Results have been obtained in Manchester, and at Mogden, Mddx., matching those in the U.S.A. At Manchester their dried activated sludge product has 5 to 7½ per cent of nitrogen and 2 to 4 per cent of phosphate. There are possibilities of even better results from experiments at Harpenden with a more domestic type of sewage.

It is not claimed that a fertiliser from sludge will give so quick a response as a chemical manure, nor does it seem to be so effective with root crops as with grasses; but it is claimed that it possesses life-giving ingredients not as yet perhaps properly understood that the soil must have to retain fertility.

Perhaps there has been a tendency in Sanitary Engineering to regard successful sewerage and sewage disposal, in accordance with certain chemical and biological standards, as an end in themselves. Yet may there not be something more still to be done? Have we considered the value of the sewage in the agricultural economy? Are we neglecting this factor?

The need for Agricultural production is very present in this country in these days and no apology is needed for seeking to press it home. We are faced with the necessity of reducing food imports and growing more at home; there is thus direct need to return to our soil as much as possible of the fertility taken out in crops. Imported fertilizers may not be so readily available; moreover, chemical fertilizers are not quite the same as those of organic origin; an important fact attested, I am told, by some manufacturers themselves who incorporate organic ingredients in their chemical product.

There seems to be dawning on society the realisation that, in the ordering of Providence, modern sewerage is not intended only for the health and comfort of mankind in crowded cities but also for restoring to the land, as far as may be, the fertility they have taken from it, even though some of such fertility comes from far away.

Now how far are we, as Sanitary experts, attempting to fulfil the promise of such a dawn? We are providing better sanitary conditions in rural districts by better housing and, as an obvious sequence, by getting rid of primitive closets and inefficient sink drainage. As a Rural Surveyor for seventeen years, over fifty years ago when building up my practice, I am delighted to see a change of outlook, although let it be admitted there is too much tendency to import the town type of house into the country, which should develop a type of its own. But the fertility from sewage formerly available for the cottager's garden is now to be carried away in the sewerage scheme. Great joint schemes linking up a number of villages have even been formulated with little chance of the nitrogen and phosphates ever getting back to the land again.

Such an outlook points to the return of the sludge values as nearly as possible to the land and before such values are lost by admixture with harmful trade-wastes beyond their capacity of absorption and consequent loss of manurial value. It also points very clearly to utilisation of the sludge and its return as a fertiliser from the city to the country, much as I have described it in some of the cities of the States.

There is no good reason why sewage disposal cannot be efficiently managed in the country without concentration by trunk sewers into big installations. It is really a matter of skilled oversight, and this can be done from a well-equipped central source whence the disposal works are managed for, it may be, half a county. The principles of sewage treatment are now so well understood that skilled oversight can control a number of installations, just as has been done for many years in the Ruhr district of Germany.

As I write, my recollection has been drawn to another farming development to which I would also invite your attention. An apparatus has been designed in Germany for the extraction of methane gas from farm manure, and the use of such gas for cooking, lighting and partly heating the farmhouse. This is perfectly feasible. I saw it fitted up quite fifteen years ago, done for his house by an ingenious manager, at the Bath Sewage Works, by the use of an inverted cistern suspended over the settlement tank and some rubber piping. Farmers in France have, I understand, used the gas collected from their manure pits for some time for the same purpose and, as in the German plant, sufficient gas is also obtained for small power purposes. For years, plant I have designed has been pumping most of the dry-weather flow of Eastleigh, a town of 30,000 population, by sewage gas obtained at the disposal works, and Mogden has since proved what can be done on a still larger scale. And this is when sewage has become mixed with non-organic material. If sewage were dealt with nearer to its source and before mixture with any sterilising trade waste, a much higher percentage of methane might be obtained, and—still more important—a higher fertilising value. The extraction of gas may involve a reduction of nitrogen, but this appears to be made good—to what extent is not yet known—by stirring the sludge. Air seems to have a special attraction to a turbulent liquid. Who has not heard of, or seen, the self-purification of rapidly running streams?

This process of nature, whereby animal waste becomes a fertilising agent, is a very beautiful one. The great Creator determined it. It is the power given to Nature of laying hold of the evil things and turning it into good, the harmful into the helpful, death into life.

Many of the facts that I have set out are probably already well known to you, as well as, possibly, to the farmer. For it is the agriculturist who comes next in the "Nitrogen Cycle," just as he has done from time immemorial.

NEW ALUMINIUM ROOF

Special components and detailed design of a new British patent, an aluminium domed roof having the same strength as a similar steel structure at one-eighth of the weight, was recently on show in Birmingham (illustration on Cover page).

Intended primarily as a roof for oil or chemical storage tanks, to be rendered air-tight if required, an experimental model 83 feet in diameter with a 9 feet rise has been tested to a super load of 27 lbs. to the square foot. This was done by covering the whole of the dome with bricks. Records were kept of the vertical deflections at nine points of the framework but the loading effect was small enough to be masked by temperature effects. Final deflection of the crown under full load was about one inch.

The new-type roof is made of extruded aluminium tubes 2½ x 2½ outside by 2⅛ x 2⅛ inside curved to a radius of 100 feet and forming transverse ribs at intervals of 5 feet. 16-gauge aluminium sheet is rivetted to the structure by 'Linread' aluminium rivets, and the joints can be welded if necessary to render them airtight. Six men can erect all framework and weld all shoes down to the outer support ring in one day.

Manufactured by the Aluminium Construction Company of London, the roof was designed by Mr. W. Hamilton, A.M.I.C.E., and the mathematical work was carried out by Mr. G. P. Manning, M. Eng., M.I.C.E., a well known authority on reinforced concrete structures whose calculations were vindicated in practical test in spite of the fact that the point where a uniform spherical shell becomes unstable under uniform external pressure has never been solved. Roofs of this type in aluminium could be used up to a span of between 5—600 feet, since under symmetrical loading they support themselves by purely tensile and compressive stresses. A deepening of the rib-section with only slight widening is the only necessity for larger structures.

EDUCATIONAL

BRITISH STANDARDS INSTITUTION (B.S.I.)

THE work of the British Standards Institution began in 1901 with the formation of an engineering standards committee. The institution was incorporated by Royal Charter in 1929, and is recognised as "the sole organisation for the issue, in consultation with any Government, professional or industrial bodies concerned, of standards having a national application, other than those for pharmaceutical substances." It is thus a national organisation for the promulgation of British Standard terms, definitions, codes of practice and specifications for materials, articles and methods of tests.

Standards are prepared on the principles that (*a*) they shall be in accordance with the needs of industry and fulfil a generally recognised want; (*b*) the interest of both producer and consumer shall be considered; and (*c*) periodic review shall be undertaken.

The Institution is governed by a General Council. Work is divided into engineering, chemical, building, and textile divisions, administered by Divisional Councils. Industry, as well as the Board of Trade, the Department of Scientific and Industrial Research, National Physical Laboratory, the Federation of British Industries, and the Association of British Chambers of Commerce, are represented on the General Council.

The Institution co-operates with the National Standards bodies in various parts of the Commonwealth, and with the American Standards Association. It also participates in the International Organization for Standardisation, which has the object of promoting the maximum possible co-ordination and unification of standards necessary for the post-war period.

The preparation of each standard is the responsibility of the industry primarily concerned. This is effected by the establishment of separate Industry (Standards) Committees, each being representative of both producer and user interests. In this way the maximum degree of co-operation is achieved. In addition to the industry committees, special committees which do not come within the scope of the Divisional Councils, report directly to the General Council.

Over 1,400 specifications have been issued since the formation of the Institution, which also works on the establishment of agreed terms and definitions, methods of test, standards of performance and codes of practice. A comprehensive range of British Standards has been prepared for building materials, components and appliances, and for general civil engineering work, including roads.

A monthly information sheet is issued to members, giving information on new work started during the month; draft standards ready for circulation; new published standards; and foreign standards received from abroad.

It has been agreed that the work of the Institution will continue to be carried on by the industry committees, each of which is established only with the concurrence of the industrial and professional organizations concerned. Representatives of Government Departments are included wherever appropriate. These committees are the basis of the whole organization and are the points at each standardisation as initiated and carried out. The co-ordination of their work is secured by the Divisional Councils.

The Institution maintains a library and an enquiry bureau and issues publications.

British subjects, and any organization formed or incorporated under the laws of any part of the Commonwealth, are qualified for election as contributing members.

The address of the Institute is 28, Victoria Street, London, S.W. 1.

CLASSIFIED ADVERTISEMENTS

BOOKS

SITUATIONS REQUIRED

SITUATIONS VACANT

HOUSE FOR SALE

LAW REPORT

Bombay High Court

FULL BENCH

Before Mr. Justice Chagla, Mr. Justice Bavdekar and Mr. Justice Gajendragadkar.

The Municipal Borough of Ahmedabad (Original Defendant—Appellant) *v.* Jayantilal Chhotalal Patel (Original Plaintiff—Respondent).

Bombay Municipal Boroughs Act (Bombay Act XVIII of 1925)—S. 206, When applicable—Contract with Municipality to clean streets—Deposit—Forfeiture—Suit to recover deposit six months after act complained of—Whether barred under S. 206.

When a Municipality has obtained powers from a Municipal Act to enter into a contract and that the Municipality is purporting to exercise their power to enforce such contract then an act done in the exercise of their power to enforce the contract is not in pursuance of the Act but it is in pursuance of the contract.

It would not be quite right to demarcate the line of cases falling within the ambit of section 206 of the Act and those not so falling by dividing them into suits on contracts and suits which are not so. The proper test is whether the suit is in respect of a public duty which the local authority has to discharge under the statue or is in respect of a private act or a private obligation on which it owes to a private individual.

Chagla J. observed: The suit from which this reference to a Full Bench arises was filed by the plaintiff against the Municipal Borough of Ahmedabad in respect of a contract which the Municipality had entered into with him for the purpose of cleaning the streets of Ahmedabad. The plaintiff claimed various sums due to him under the contract. The learned trial Judge decreed the plaintiff's claim in part. From that decision an appeal was preferred to this Court and in that appeal the only question that survived was with regard to a sum of Rs. 4,100 which the Municipality purported to forfeit under the terms of the contract. This sum was deposited by the plaintiff when the contract was entered into, and the question that arose with regard to this sum was whether the plaintiff's suit was maintainable having regard to the provisions of S. 206 of the Bombay Municipal Boroughs Act. The appeal came before Mr. Justice Macklin and my learned brother Bavdekar and they referred the following question to a Full Bench:—

When the Municipality has obtained powers from a Municipal Act to enter into a contract, is the exercise of their power to enforce the contract an act done in pursuance of Municipal Act?

A few facts may perhaps be necessary in order to appreciate what the rival contentions of the parties are. The Ahmedabad Municipality passed a resolution on October 29, 1937, forfeiting this deposit. On March 1, 1938, the plaintiff gave notice of his claim, and on August 31, 1938, he filed the suit. Now, under S. 206 of the Bombay Municipal Boroughs Act—"no person shall commence any suit against any Municipality or against any officer or servant of a Municipality or any person acting under the orders of a Municipality for anything done or purporting to have been done in pursuance of this Act, without giving to such Municipality, officer, servant or persons two months' previous notice in writing of the intended suit and of the cause thereof, nor after six months from the date of the act complained of."

Therefore, if the section applied, the plaintiff's claim was clearly out of time. In order to place a proper construction of S. 206 the first thing to bear in mind is that it constitutes a restriction on the ordinary rights of litigants, and, therefore, it must be strictly construed. Only those suits fall within the ambit of the section which are in respect of anything done, or purporting to have been done, by the Municipality in pursuance of the Act. The key words are "in pursuance of the Act" and the whole controversy has arisen as to the true meaning of and effect of that expression. In this case the plaintiff's contention is that the act of the Municipality in forfeiting the deposit is wrongful and it is in respect of that wrongful act of the Municipality that the suit has been brought. Can it be said that forfeiting the deposit is done by the Municipality in pursuance of the Act? It is only if the Municipality has forfeited this deposit purporting to act under a power given to it by the statue that it could be said that the plaintiff's claim comes within the section. It is clear that while a statutory duty is cast upon the Municipality to cleanse the public streets, there is no such duty cast upon it to enter into any contract. It may or may not enter into contract in order to discharge its duty and no individual could require the Municipality to enter into a contract with him. What the plaintiff was seeking to litigate in his suit was his private rights which came into existence as a result of the contract entered into between him and the Municipality. He was not seeking to enforce a public duty cast upon the Municipality by the statue, and even the defence of the Municipality was not that it was forfeiting the deposit in pursuance of the powers given to it under the statue, but that it was doing so in pursuance of a power given to it under the contract.

Apart from any authority it seems to us difficult to hold that a suit to enforce the rights of a private individual under a contract entered into with the Municipality which the Municipality was not under any statutory obligation to enter into can fall within the ambit of the section.

Coming to the question referred to us, if the Municipality is purporting to exercise their powers to enforce the contract, then any act done is not in pursuance of the Act, but it is in pursuance of the contract, and therefore we answer the question in the negative.

CONTRACTS OPEN

The dates at head of paragraphs are those for the submission of tenders. Application for forms and particulars should be made to the address given at the end.

VIZAGAPATAM : Transit Shed.

June 20.—Extension of Transit Shed No 2. in the Dock Area at Vizagapatam Port. The Port Engineer, Vizagapatam.

AVADI : Sheds.

June 20.—Abnormal repairs to existing sheds 3 E.D. R.I.A.F., and U.S.A. Depot, Avadi. Estimated cost Rs. 3 lakhs. The C.R.I.E., Fort St. George, Madras-9.

KUMBAKONAM : Water-supply

June 20.—Kumbakonam Water-supply Scheme II Stage. Laying and jointing Pipes and Specials for the Pumping Main and Distribution Systems. The Superintending Engineer, Tanjore Circle.

BOMBAY : Water Tank.

June 20.—Construction of an underground water storage tank of about 5,000 gallons capacity at peons' chawl, Sewri. The Chief Engineer, Port Trust, Ballard Road, Bombay.

MORADABAD : Railway Quarters.

June 23.—Construction of 36 units 'A' Type Quarters in Harthale and 2 units 'B' Type Quarters at Moradabad. The Divisional Superintendent, E.I.Ry., Moradabad.

AGRA : College.

June 24.—Construction of 2 Boys' Hostel Blocks for the New Agra Medical College. Approximate estimated cost Rs. 7.5 lakhs. The Executive Engineer, Provincial Division, Agra.

AHMEDABAD : Police Quarters.

June 25.—Constructing Constabulary Quarters for Policemen in Ahmedabad City. About 167 blocks, each block consisting of 6 units. Estimated cost Rs. 31,76,000. The Superintending Engineer, North Gujrat Circle, Lal Darwaja, Ahmedabad.

ARKONAM : Sub-station.

June 25.—Construction of 3 blocks of Quarters at Arkonam Sub-station. The Superintending Engineer, General Construction Circle, 157, Mount Road, Madras.

BOMBAY : Dairy Farm.

June 27.—Constructing Dairy FarmUnits Nos. 15 to 24. Estimated cost Rs. 50 lakhs. The Executive Engineer, Milk Plan Construction Division, Bombay.

HUBLI : Concrete Pavements.

June 27.—Cement concreting Goods Shed and Station approach roads at Hubli. Estimated cost Rs. 70,000. The Chief Engineer, M.S.M. Ry., Madras.

POONA : Laboratory.

July 2.—Construction of Central Wing of the National Chemical Laboratory at Poona consisting of Library, Auditorium, Offices and Laboratory rooms for the Council of Scientific and Industrial Research, New Delhi. Approximate cost Rs. 6 lakhs. The Secretary, Council of Scientific and Industrial Research, P-Block, Raisina, New Delhi.

BULANDSHAHR : Quarters.

July 5.—Construction of E/M Engineer's Residence at Bulandshahr. The Executive Engineer, Tube Wells Division, Bulandshahr, U.P.

INDORE : Medical College.

July 15.—Construction of the Superstructure of the Mahatma Gandhi Memorial Medical College. Estimated cost Rs. 12.5 lakhs. The Secretary, Governing Body, Mahatma Gandhi Memorial Medical College, Indore.

POONA : Wireless Station.

July 19.—Provision of Accommodation for a Wireless Transmitting Station for Headquarters, Southern Command, Poona. Estimated cost Rs. 2.2 lakhs. The Chief Engineer, Southern Command, Poona.

BHUBANESWAR : Sewerage Works.

End of July.—Supply and Erection at site of a complete Sewage purification and disposal plant capable of dealing with 20 lakh gallons of raw sewage daily for Bhubaneswar, capital of Orissa Province. The Public Health Engineer, Orissa, Cuttack.

DAMODAR VALLEY CORPORATION.

August 2.—Supply and erection of 132 kv out-door sub-station equipments and indoor control accessories for Ramgarh, Jamshedpur, Loyabad, Sindri, Maithon and Raniganj sub-stations of the Damodar Valley Grid. The Chairman, Central Electricity Commission, Simla.

ALWAR : Water Works.

No date—Applications are invited to undertake installation of water works for Alwar City on lease basis which may extend for a period of 30 years. Estimated cost Rs. 15 lakhs. The President, Municipal Board, Alwar.

BHAVNAGAR : Weir Gates.

No date.—Quotations for 60 automatic gates steel fabricated size 10'x 4' ready to be installed at Waste Weirs. The Agricultural Equipment Co., Post Box 57, Bhavnagar.

RESULTS OF TENDERS

Closed March 25.—Cement Concreting Trichinopoly-Coimbatore Road, Miles 120/0 to 124/5 :—*Still under consideration.*

Closed March 25.—Earthen Dam across river Bambhan :—*Awarded to Dayalji Naranji and Mohanlal Motilal and Co. of Rajkot.*

Closed March 21.—28 Nos. Type C and C-1 Quarters, for Co-operative Housing Society, Adyar, Madras :—*Tenders of Murthy and Sivan, Madras, accepted.*

Closed March 18.—Bridge in Mile 86/1 of Kurnool-Guntur Road :—D.E., Highways :—*Still under consideration.*

Closed March 18.—Dam across river Vaitarna for Bombay Municipality :—*No decision has yet been taken.*

HOW WAS JULY

For Building

A rainy day is one in which 10 cents or more rain is recorded. The following figures show the average rainfall in inches and the average number of rainy days in the month of July based on data up to 1940 :—

	Rainfall in Inches	*Number of Rainy Days*
Agra	8.5	11.0
Ahmedabad	12.2	12.6
Allahabad	12.6	15.2
Ambala	9.6	10.6
Asansol	13.7	17.7
Aurangabad	6.7	11.3
Bangalore	3.9	8.0
Bellary	1.6	3.4
Bhopal	19.7	16.4
Bhuj	6.3	6.0
Bombay	24.3	22.1
Calcutta	12.8	17.5
Cawnpore	10.7	12.5
Chittagong	23.5	18.9
Cochin	23.3	24.2
Colombo	5.0	8.4
Dacca	13.0	17.7
Gaya	13 2	15.8
Hyderabad (Dn.)	6.0	11.1
Jamshedpur	13.2	17.4
Jhansi	11.8	13.8
Jiwani	0.1	0.4
Jodhpur	4.0	5.5
Jubbulpore	19.4	18.1
Lahore	5.5	5.9
Madras	3.6	6.8
Mangalore	38.9	27.5
Marmagoa	32.3	26.6
Masulipatam	6.4	10.7
Nagpur	14.6	16.5
New Delhi	7.0	9.0
Patna	11.6	13.7
Peshawar	1.3	2.0
Poona	6.6	12.7
Puri	10.3	12.0
Quetta	0.5	1.1
Rawalpindi	8.1	8.8
Sambalpur	20.6	19.6
Srinagar	2.3	4.9
Trichinopoly	1.3	2.1
Trincomalee	1.8	2.3
Trivandrum	7.8	14.3
Vizagapatam	4.4	8.5

FOR DISCUSSION

The surest way of accomplishing "master plans" is to have more people sharing in both the forming and carrying out of city plans.

* *

City Improvement Trust should be constituted of engineering, architectural, social, economic, financial, administrative and legal talents.

* *

Planning is still surrounded with a haze, due in some cases to impractical plans, and in other cases to its being tied up with high-sounding terms and theories.

* *

Melbourne Water Authorities are considering, it is learnt, to add Sodium fluoride to the city's water supply with the object of reducing decay in teeth.

* *

City planning is not, and probably never will be, the field of a single profession unless it becomes a separate profession by itself.

* *

Up-to-date experts in city planning have come from various professions, anyone of which can supply the basic technical training which is essential.

* *

Planning pays.

* *

In almost every town, despite congestion, much of the land remains unused.

* *

The first main task that should be delegated to a city improvement trust is the preparation of a "master plan."

PROPOSED NEW WORKS

Ahmedabad.

The Bombay Government have, it is learnt, sanctioned a sum of Rs. 2 crores for the construction of a refugee township at Kubernagar near Ahmedabad. The township will be capable of housing 50,000 people and is part of the Provincial Government's scheme of constructing three refugee townships at Deolali, Kalyan and Kubernagar.

Darjeeling.

A scheme, estimated to cost Rs. 10 lakhs for providing a runway 4,200 ft. by 150 ft. and other ancillaries at the airport of Bagdogra, 12 miles from Siliguri near Darjeeling, is now being considered for execution. Tenders, it is learnt, will be called for shortly.

Hyderabad.

The expansion of Begumpet aerodrome is estimated to cost Rs. 106 lakhs. The scheme provides for the construction of three hangars and a main runway 6,600 feet long and another of 4,800 feet.

Madras.

The Standing Finance Committee of the Madras Cabinet approved recently the execution of the Upper Pennar Project in Anantapur district. The scheme, which will take three years for execution, is estimated to cost Rs. 77.72 lakhs and is expected to irrigate 6,000 acres of virgin land in the district.

Rajpura.

A railway workshop at an estimated cost of Rs. 10 crores would, it is learnt, be set up shortly near the proposed refugee township in Rajpura (Patiala).

———

CURRENT MARKET PRICES OF MATERIALS

1. Prices vary according to quality and quantity ordered.
2. Those given below are average market prices in Madras.
3. Owing to the unsettled state of market most prices are liable to fluctuate.

		Rs.	A.	P.
CONCRETOR				
A.C.C. cement controlled price per bag		4	11	3
Blue metal ½" gauge	per 100 c. ft.	56	0	0
" 1½" "	"	40	0	0
River Sand	per 100 c. ft.	15	0	0
Reinforcement, M.S. rods ⅝" dia.	per cwt.	18	15	0
" ¾" "	"	19	2	0
" ⅞" "	"	20	3	0
" 1¼" "	"	22	11	0
Building wire 16" gauge	per lb.	0	12	0
BRICKLAYER				
Country bricks 2" G.M.	per 1000	26	0	0
Stock bricks 3" T.S.M.	per 1000	45	0	0
Kankar Lime	per 100 c. ft.	68	12	0
ROOFER				
Malabar Tiles	per 1000	225	0	0
Malabar Ridge Tiles	per 100	75	0	0
Terrace bricks	per 1000	14	0	0
Asbestos Corr. Sheets	per sq. ft.	0	5	9
Asbestos Trafford Sheets	"	0	6	3
G.I. Corr. Sheets 24 gauge	"	0	4	3
CARPENTER				
Burma Teak scantlings	per c. ft.	20	0	0
Malabar "	"	15	0	0
Mango planks	"	4	8	0
Insulation boards ½"	per sq. ft.	0	8	0
Asbestos plain sheets ¼"	"	0	6	4
" 5/32"	"	0	4	0
Wire-nails	per lb.	0	9	0
Wood-Screws ¾"	per gross	1	12	0
" 1"	"	2	0	0
" 1½"	"	2	4	0
Butt Hinges cast brass 4"	per pair	2	12	0
" 3"	"	2	8	0
Cast brass cabin hooks 4"	each	1	0	0
" 6"	"	1	4	0
Barrel bolts cast brass	per R ft.	4	8	0
All-drop bolts cast brass	each	11	8	0
GLAZIER				
Sheet glass cut to size, glazing quality 16 oz.	ordinary per sq. ft.	0	10	0
Sheet glass cut to size, glazing quality ⅛"	ordinary per sq. ft.	1	2	0
Plate glass ¼"	"	4	0	0
Figured glass, white	"	0	14	0
" coloured	"	1	6	0
IRONWORKER				
R.S. Js. 4" x 3"	per cwt.	18	14	0
" 5" x 3" to 15" x 6"	"	18	8	0
" 18" x 6" and over	"	18	14	0
Channels, angles and tees	"	19	12	0
M.S. plates	"	20	0	0
Black sheets 20 gauge	"	22	10	0
G.I. plain sheets 24 gauge	"	22	10	0
G.I. barbed wire, 2 ply, 12 gauge	"	39	4	0
Rivets, flat or round head	"	75	0	0
Steel Rolling Shutters (upto 120 sq. ft.)	per sq. ft.	5	4	0
PAVIOR				
White glazed tiles 6" x 6"	per 100	6	8	0
Coloured "	"	8	0	0
White or grey marble tiles ¾" (polished)	per sq. ft.	4	0	0
PLUMBER				
Squatting pans, English 18"	each	54	0	0
Pedestal closets without seat	"	45	0	0
W.W.P. Cisterns 3 gal. (Elephant brand)	each	44	0	0
Sinks 30" x 18" x 10"	"	158	0	0
W.H.B. 25" x 18" with waste and one tap	each	118	0	0
Flat urinals, English	"	56	0	0
PAINTER				
Distemper J. and N.	per lb.	0	11	6
" 'Aquatinta' oil bound	per lb.	1	1	0
'Neurolac' synthetic enamel	per gal.	32	0	0
'Goodlass' wall paints	per lb.	0	10	9
Linseed oil	per gal.	9	10	0
Copal varnish	"	9	8	0
Glue	per lb.	0	15	6
Putty	"	0	12	0
Sand paper	per doz.	1	4	0