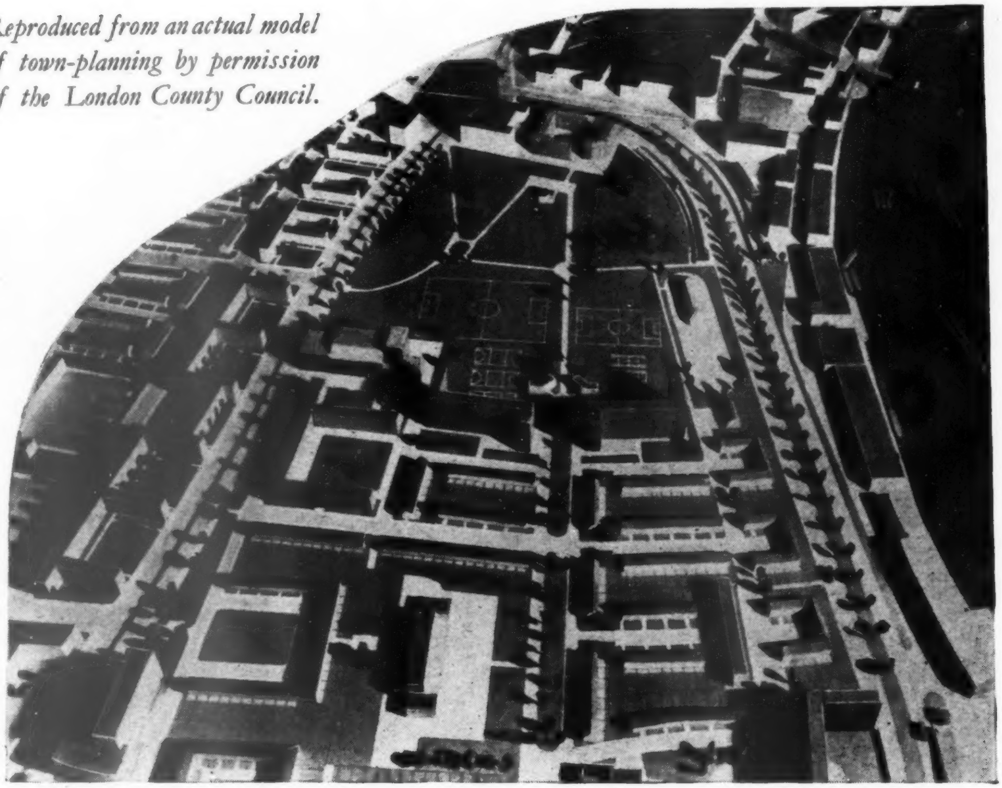
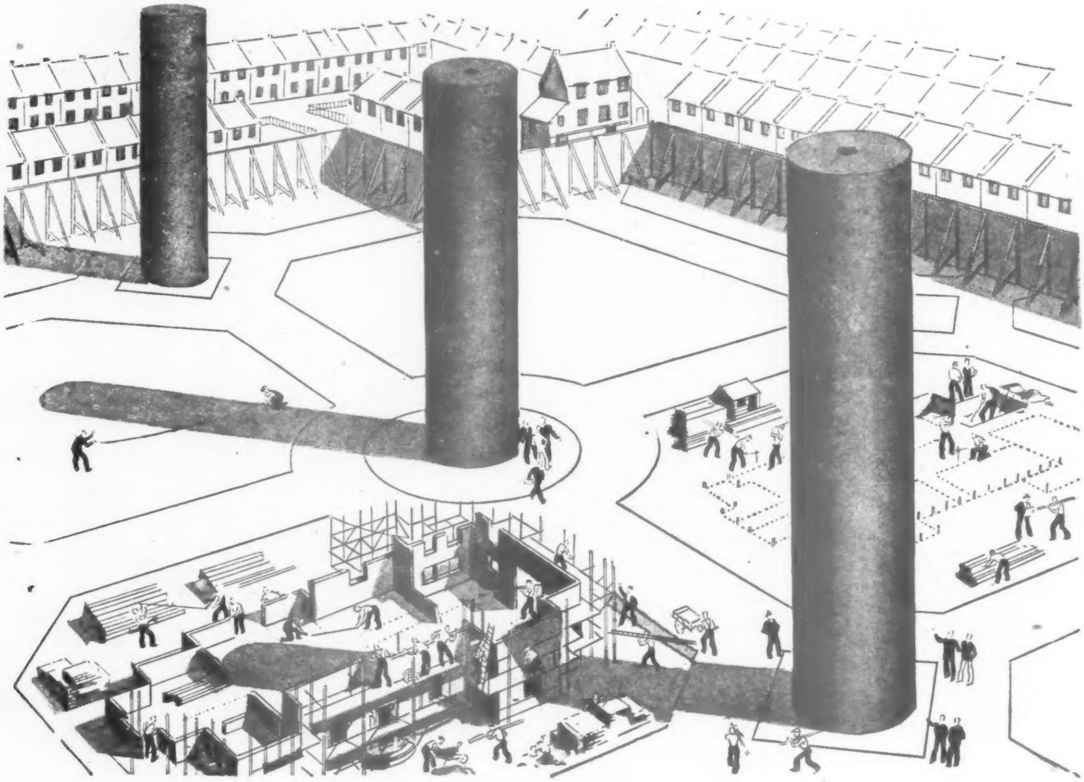
Reproduced from an actual model of town-planning by permission of the London County Council.





PILLARS OF THE POST-WAR WORLD

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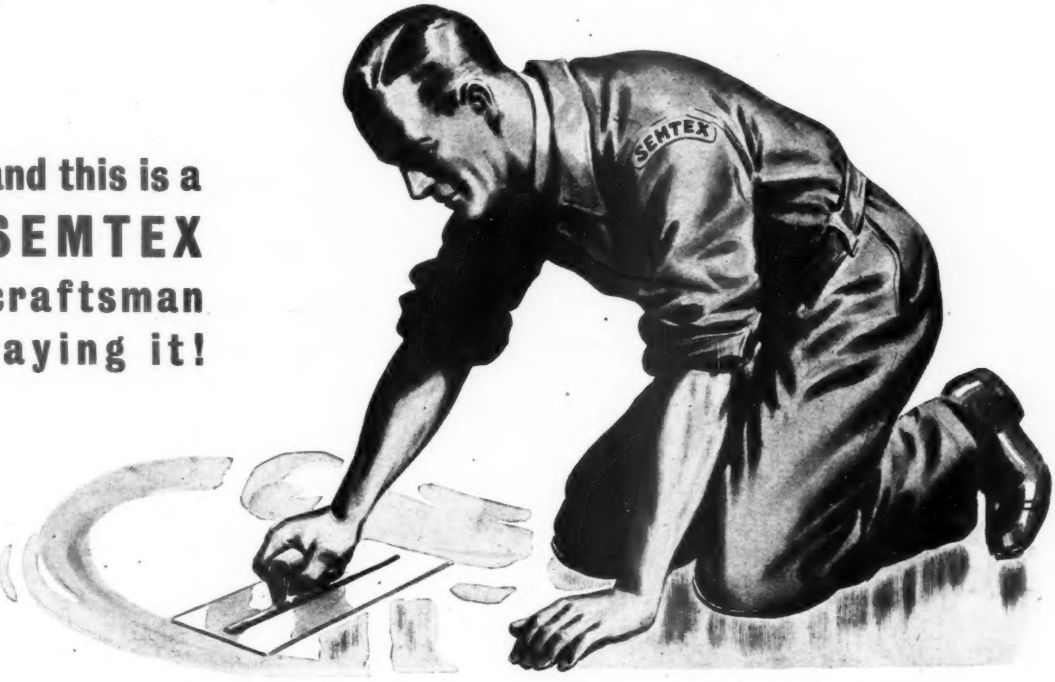

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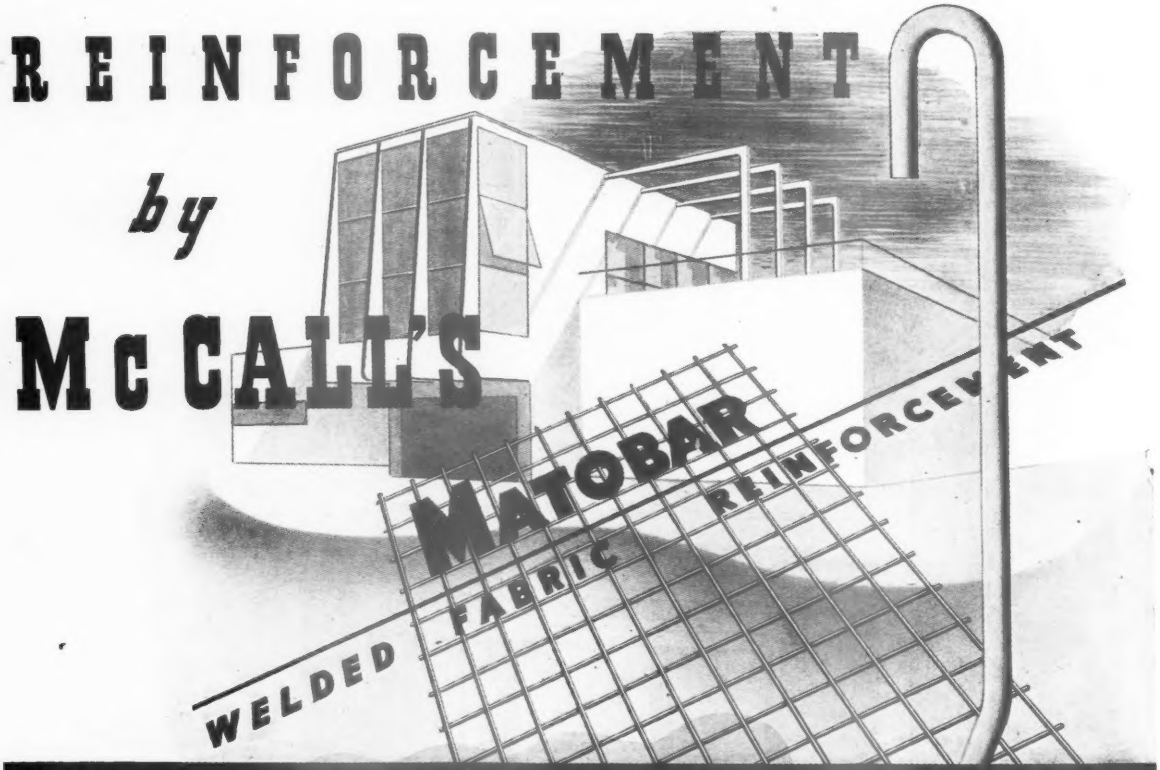

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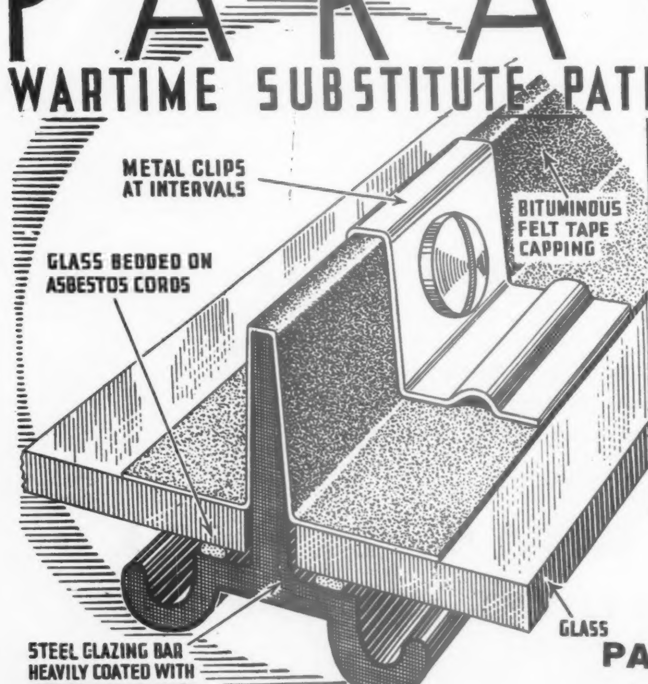

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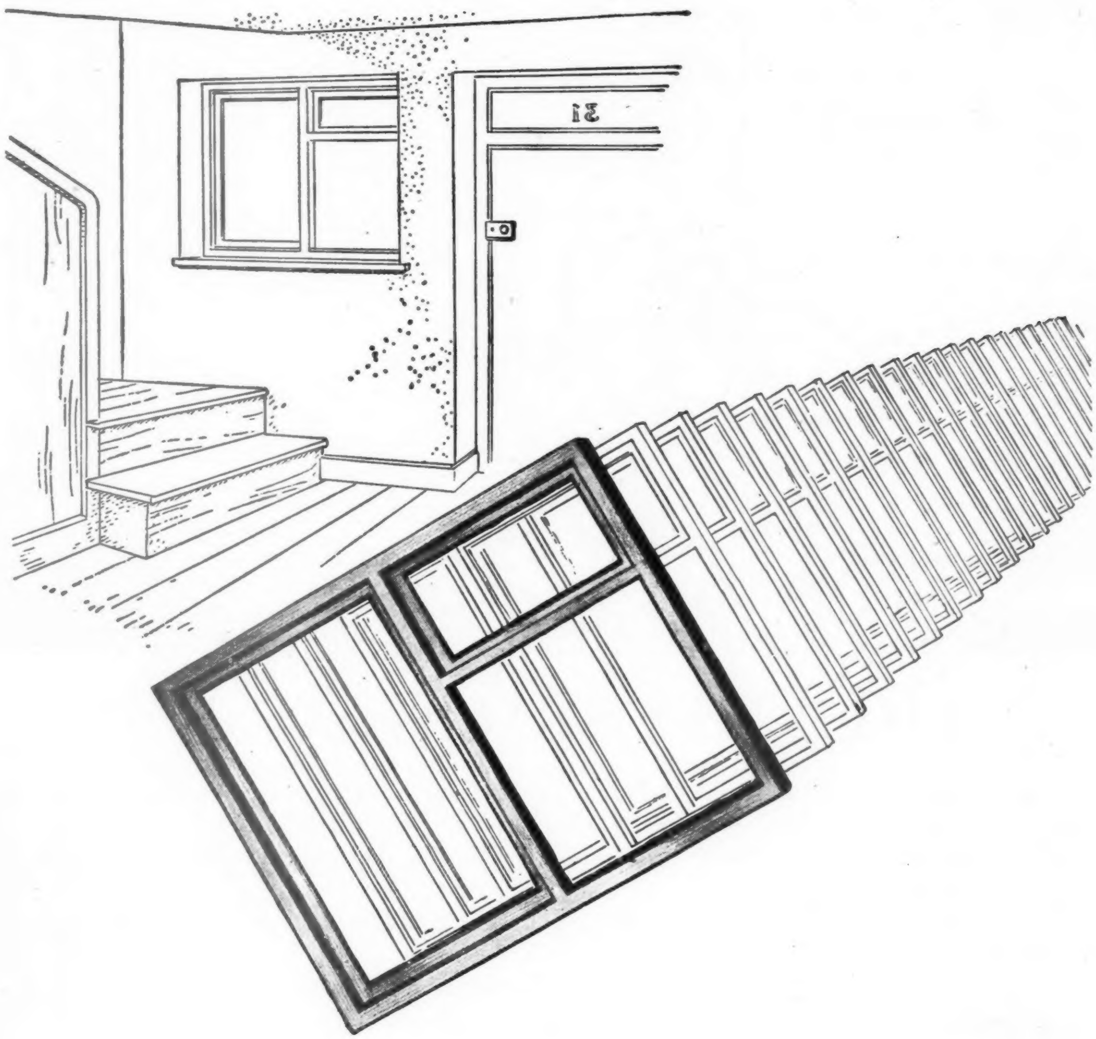

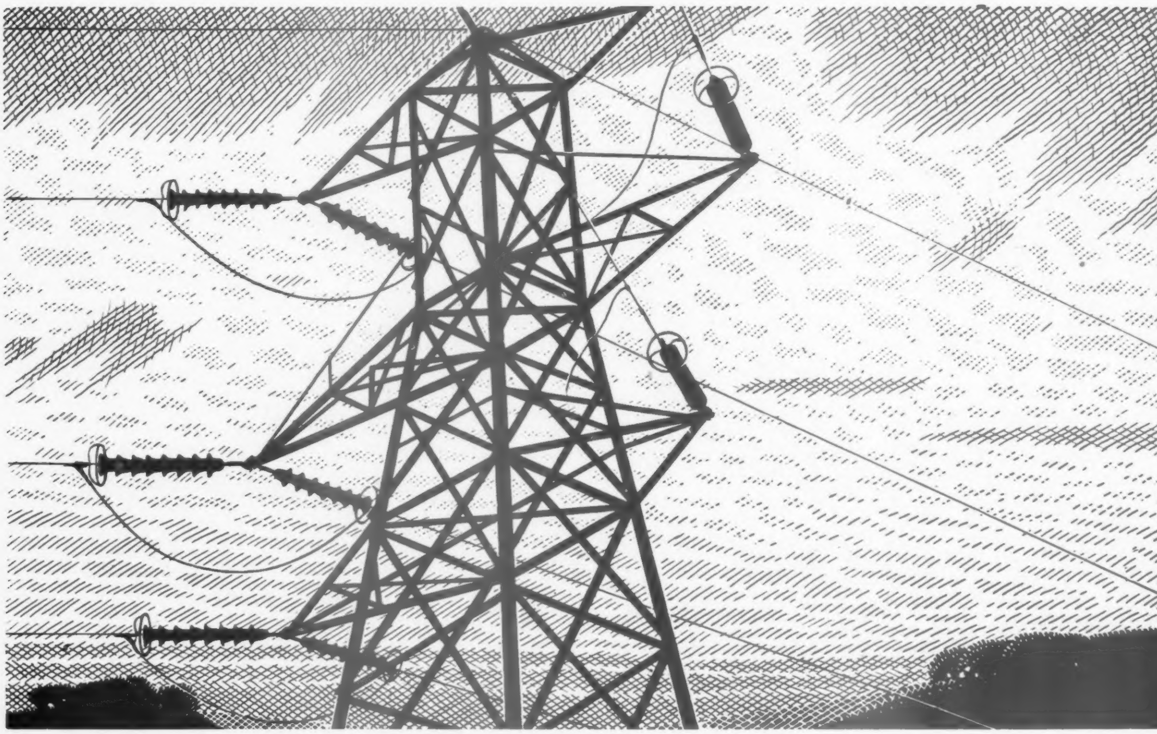

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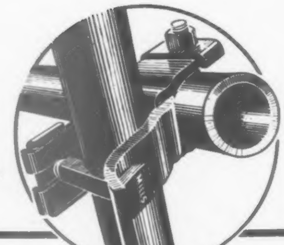

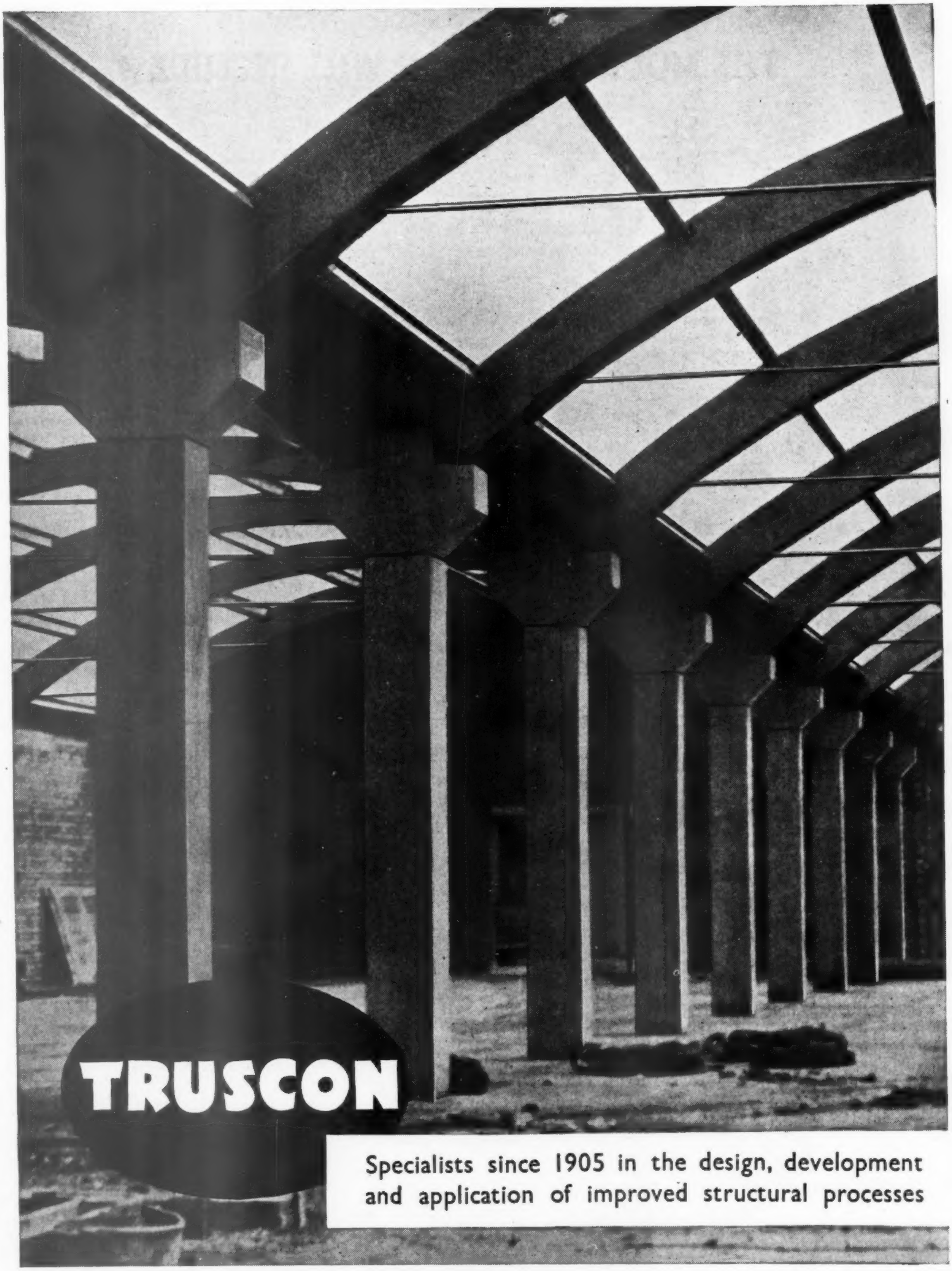
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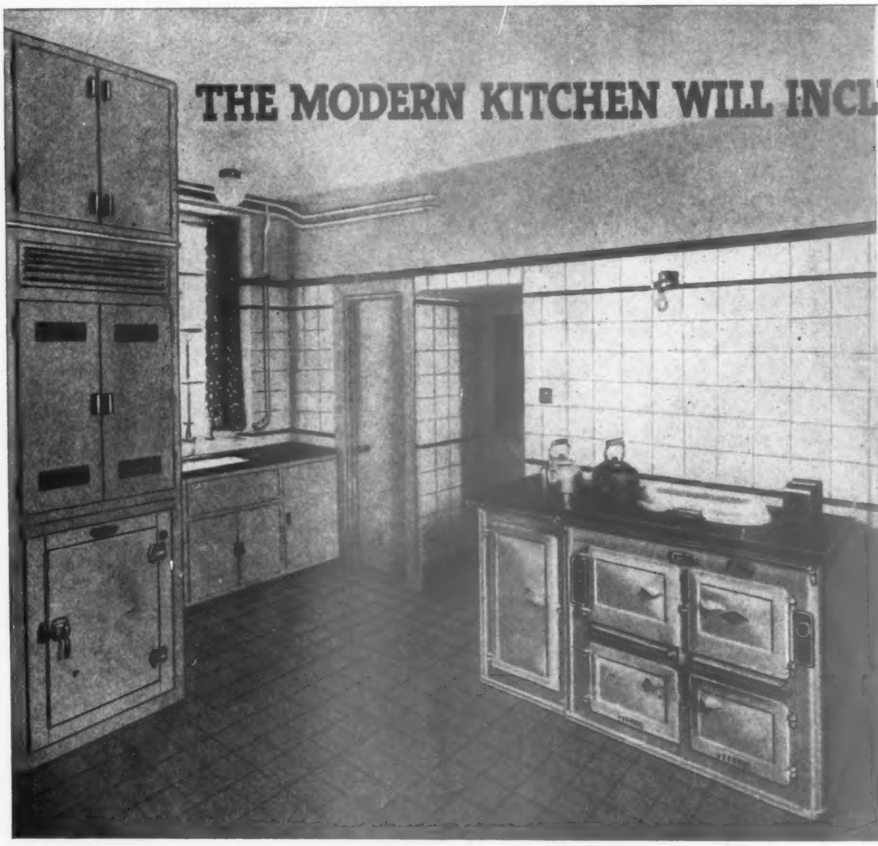
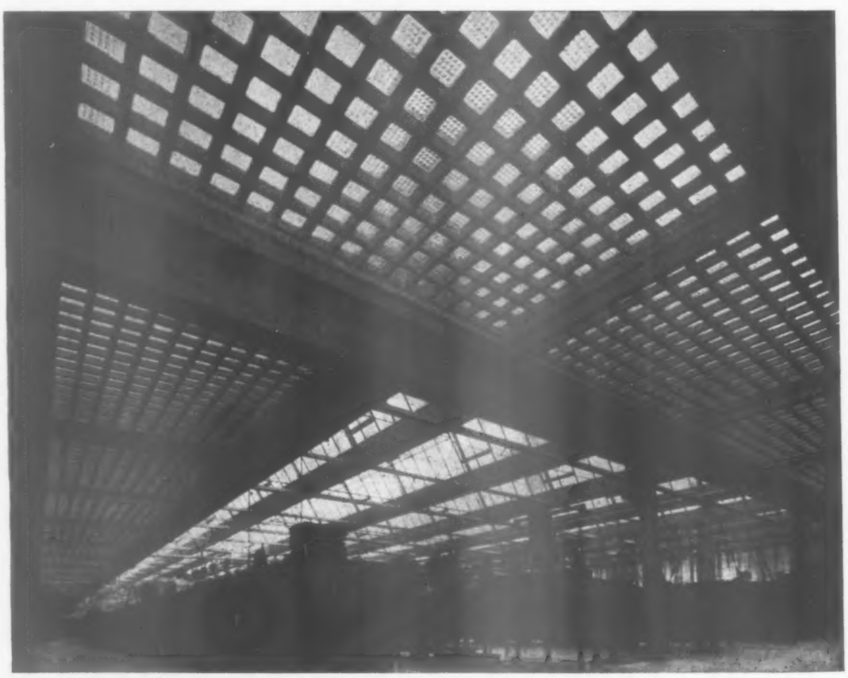
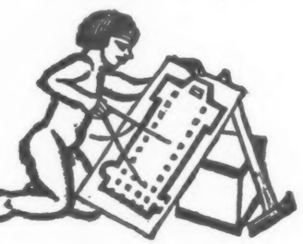




In common with every other periodical this JOURNAL *is rationed to a small part of its peace-time needs of paper. Thus a balance has to be struck between circulation and number of pages. We regret that unless a reader is a subscriber we cannot guarantee that he will get a copy of the* JOURNAL. *Newsagents now cannot supply the* JOURNAL *except to a "firm order." Subscription rates: by post in the U.K. or abroad, £1 15s. od. per annum. Single copies, 9d.; post free, 11d. Special numbers are included in subscription; single copies, 1s. 6d.; post free, 1s. 9d. Back numbers more than 12 months old (when available), double price. Volumes can be bound complete with index, in cloth cases, for 15s. each; carriage 1s. extra. Goods advertised in the* JOURNAL *and made of raw materials now in short supply, are not necessarily available for export.*



DIARY FOR SEPTEMBER OCTOBER AND NOVEMBER

Titles of exhibitions, lectures and papers are printed in italics. In the case of papers and lectures the authors' names come first. Sponsors are represented by their initials as given in the glossary of abbreviations on the front cover.

BUXTON. *When We Build Again.* Exhibition and Film. (Sponsor, TCPA, in collaboration with Messrs. Cadbury Bros.) OCT. 14-21

CARDIFF. *When We Build Again.* Exhibition and film. (Sponsor, TCPA, in collaboration with Messrs. Cadbury Bros.) SEPT. 21-23

DONCASTER. *Homes to Live In.* Exhibition. At the School of Art. (Sponsor, BIAE). SEPT. 21-OCT. 8

DURHAM. *The English Town: Its Continuity and Development.* Exhibition. (Sponsor, TCPA). OCT. 5-18

When We Build Again. Exhibition and film. (Sponsor, TCPA, in collaboration with Messrs. Cadbury Bros.) NOV. 11-18

ELLESMERE PORT. *Homes to Live In.* Exhibition. At Woolworth Stores. (Sponsor, BIAE). SEPT. 21-23

HERTFORD. *Homes to Live In.* Exhibition. Land Army Tour. (Sponsor, BIAE). SEPT.-NOV.

LONDON. John Charrington. *The Place of Solid Fuel in Town and Country Planning.* At 2, Savoy Hill, W.C.2. (Sponsor, TCPA.) 1.15 p.m. SEPT. 21

Presentation to W. J. Rudderham. In recognition of his completion of 25 years of service as Secretary of the London Master Builders' Association, Mr. W. J. Rudderham is to be the guest of honour of the Council of the Association at a luncheon in the Dorchester Hotel before its September meeting, on September 21. A presentation is to be made to him by members of the Council. SEPT. 21

Housing Centre Touring Exhibition. At 13, Suffolk Street, S.W.1. (Sponsor, HC). 9.30 a.m. to 5.30 p.m. Saturdays, 9.30 a.m. to 12 noon. SEPT. 25-29

Six-Day Course on Housing and Planning. A course for Discussion Group Leaders at the Housing Centre, 13, Suffolk Street, S.W.1. (Sponsor, HC). SEPT. 25-30

Miss J. G. Ledeboer. *Building* (Discussion 3 in *Education for Householding* Series). At 13, Suffolk Street, S.W.1. (Sponsor, HC). 1.15 p.m. SEPT. 26

Kensington To-day and To-morrow. An Exhibition prepared by the Housing Centre for the Kensington Borough Council. At 13, Suffolk Street, S.W.1. (Sponsor, HC). 9.30 a.m. to 5.30 p.m. Saturdays, 9.30 a.m. to 12 noon. OCT. 2-14

F. L. Barow. *Plumbing.* At 13, Suffolk Street, S.W.1. (Sponsor, HC). 1.15 p.m. OCT. 3

Presentation to Sir Ian and Lady MacAlister. At the RIBA, 66, Portland Place, W.1. All those who have contributed to the presentation fund are invited by the RIBA to attend. The proceedings will be informal, and it is anticipated that they will not last more than 45 minutes to an hour. 2.15 p.m. OCT. 18

Presentation of Sir William J. Larke Medal. Presidential address to the Institute of Welding by Mr. W. W. Watt and presentation of the Sir William J. Larke Medal to Mr. H. W. Clark, the winner of the competition for 1944. At the Institution of Civil Engineers, Great George Street, S.W.1. 6 p.m. SEPT. 27

Sir Albert Howard. *Fresh Food and Town Planning.* At 2, Savoy Hill, W.C.2. Chairman, Lord Portsmouth. (Sponsor, TCPA.) 1.15 p.m. OCT. 19

A. W. Kenyon, Chairman of the RIBA Central Planning Advisory Committee. *The National Plan.* At the RIBA, 66, Portland Place, W.1. (Sponsor, RIBA). 6 p.m. NOV. 14

T. P. Bennett. *The Architect and Organization of Post-War Building.* At the RIBA, 66, Portland Place, W.1. (Sponsor, RIBA). 6 p.m. DEC. 12

NANTWICH. *Homes to Live In.* Exhibition. At the Gas Showrooms. (Sponsor, BIAE). SEPT. 26-OCT. 1

NORFOLK. *Your Inheritance.* Exhibition. (Sponsor, HC). SEPT. 21-30

STRETFORD, MANCHESTER. *When We Build Again.* Exhibition and film. (Sponsor, TCPA, in collaboration with Messrs. Cadbury Bros.) SEPT. 30-OCT. 7

SUDBURY, SUFFOLK. *The English Town: Its Continuity and Development.* Exhibition. (Sponsor, TCPA.) SEPT. 21-30

SWADLINCOTE. *The English Town: Its Continuity and Development.* Exhibition. (Sponsor, TCPA.) OCT. 24-NOV. 8

N E W S

THURSDAY, SEPTEMBER 21, 1944
No. 2591. VOL. 100

Though no feature in the JOURNAL *is without value for someone, there are often good reasons why certain news calls for special emphasis. The* JOURNAL'S *starring system is designed to give this emphasis, but without prejudice to the unstarred items which are often no less important.*

★ *means spare a second for this, it will probably be worth it.*

★★ *means important news, for reasons which may or may not be obvious.*

Any feature marked with more than two stars is very big building news indeed.

★

The RIBA has decided not to proceed further at present with the general revision of the RIBA SCALE OF PROFESSIONAL CHARGES and the charging of architects' fees upon quantity surveyors' charges.

Announcing this decision, the RIBA states: The Practice Committee has given considerable time and thought to the question of the revision of the Scale of Charges but, having regard to the views expressed by many of the Allied Societies, the Council has adopted the recommendation of the Practice Committee not to proceed further with the general revision of the scale at the present time. It has, however, been necessary for the Council to deal especially with one particular point which has been raised repeatedly in recent years, and that is the question of whether or not the amount of the quantity surveyor's charges should be included in the total upon which the architect bases his percentage fee. The point seldom arises where the quantity surveyor is paid direct by the client but only where he is paid through the contractor. After careful consideration of the whole matter the Council at its meeting on June 27, 1944, resolved, to inform members that, while not wishing to interfere with existing practices in different parts of the country, it is unable to support the practice of charging fees upon the amount of the quantity surveyor's charges.

From AN ARCHITECT'S *Commonplace Book*

ART FOR FUN'S SAKE. [*From* The Pre-Raphaelite Tragedy *by William Gaunt (Jonathan Cape)*]. It is characteristic that Morris's definition of art concerned what the artist should get from it ; not what an audience or " a public " of any kind would get from it. Hunt, for example, in a lecture at Oxford, explained that the work of an artist was a comfort, a solace, to the world at large. He took it for granted that the process of appreciating, when the work was done, was a serious and separate occupation. This, Morris did not comprehend. All the fun was in doing the job, for the chap who did it. To obtain more fun you started another job. This involved the disappearance of " Art " altogether, as a conscious activity. Very well. That too was what he wanted. The abolition of class privilege entailed also the abolition of geniuses as a class. A " genius " was as bad an anachronism as a lord.

★

On October 4, a public inquiry is to be held by The Electricity Commissioners into the proposed erection of THE POWER STATION AT LINCOLN.

The inquiry is to be held in consequence of protests made against the proposal to erect two cooling towers, each 220 ft. high, as part of extensions to St. Swithin's generating station, because, it is claimed, the towers will mar the view over the city from the south-east. It is possible, so great is the opposition, says *The Times*, that the inquiry will last two or even three days. Both the corporation and the opposition (led by the Bishop of Lincoln) are briefing counsel to conduct their case. The first suggestion that an inquiry into the proposal should be held was made in a letter to *The Times* from the Bishop of Lincoln and the Dean on July 25, after the announcement by the Minister of Town and Country Planning that he would not grant the application of the North Eastern Electric Supply Company to construct an electric power station near Durham Cathedral without a local inquiry being held. The Friends of Lincoln Cathedral, at their annual meeting, approved the suggestion contained in the letter, and last week a meeting was held in Lincoln at which an opposition committee —as yet unnamed—was set up with the Bishop of Lincoln as chairman and Councillor J. W. F. Hill, chairman of Lincoln Corporation finance and post-war reconstruction committees, as secretary *pro tem.*

★

A former student of the Liverpool School of Architecture, Mr. Philip Hirst, has been APPOINTED ARCHITECT TO THE GOVERNMENT OF IRAK.

He is now engaged in preparing a town-planning scheme for Bagdad, and has also been entrusted with the designing of railway stations for several towns in Irak. Mr. Hirst was a student of the Liverpool school, from which he graduated with first-class honours in 1935. During his course he gained, among other distinctions, the Ravenhead, Holt, and Lord Waring travelling scholarships, as well as the John Lewis, Brickbuilder, and John Rankin prizes. While pursuing post-graduate studies in the school's Department of Civic Design he won the Honan Scholarship offered by the Liverpool Architectural Society, and in the same year, 1936, he was awarded the Rome Scholarship in Architecture. On the completion of his studies in the British School at Rome he returned to England shortly before the outbreak of war. His military service since 1939 has been spent chiefly in the Near East. Before his temporary release from the Army to undertake the special work for the Irak Government on which he is now engaged, he held the rank of major, R.A. As a General Staff officer at G.H.Q., Paiforce, his particular province was camouflage.

★

With Lord Nuffield's approval the trustees of the Nuffield Foundation have decided to allocate £10,000 a year for a period of 10 years for a CHAIR OF CHILD HEALTH IN THE UNIVERSITY OF LONDON.

The offer of the trustees has been gratefully accepted by the University. The financial assistance provided by the foundation will enable a post-graduate Institute of Child Health to be created for teaching and research on all aspects of child health. It is proposed that the institute should be associated with the Hospital for Sick Children, Great Ormond Street, and the Obstetric Department of the British Post-Graduate Medical School at the Hammersmith (LCC) Hospital. A suitable site and the necessary buildings may involve anything up to £250,000.

The gas industry should be publicly owned. The dual system now in operation is A PERMANENT BARRIER TO CO-OPERATION.

These are two of the points made by the sub-committee of the Association of Municipal Corporations. The sub-committee states: Any attempt to reorganize the industry by a process of voluntary evolution resulting in the perpetuation of gas companies and holding company interests in the industry will fail to bring about any substantial improvement. The existence of the dual system of public and private ownership as a permanent feature of the industry will always be a barrier standing in the way of voluntary rationalization and co-operation. The sub-committee envisage, in some localities, the joint ownership of gas undertakings by several local authorities formed into a Joint Gas Board. It is stated that, pending the fulfilment of a long-term policy, holding companies should be placed under strict statutory control. In a short-term policy much could be done to remove the present defects in the industry by well planned and controlled integration and co-operation. If the recommendations are adopted the committee state that some of the company undertakings would be transferred to local authorities or gas boards within a comparatively short period.

Eye Town Council, Suffolk. is inviting local HOUSEWIVES TO HELP PLAN A MODEL HOUSE.

The Council is going to build the walls and roof of a post-war house and invite local housewives to make suggestions as to how the job should be finished. The women will be asked to make an inspection, with tape measures and notebooks, and there is to be a guarantee that every suggestion will be considered. When they have decided what shall go inside the four walls, 40 of the houses will be built in an oval lay-out with a village green in the middle. This will be Eye's housing programme.

Staple Inn "Fayrest of Inne of Chancerie" in the words of a chronicler of James I's time was considerably DAMAGED BY A FLYING BOMB.

The bomb fell in the old garden, wrecking the western end of the inn, blast damaged the eastern end. The fountain was destroyed, the two trees which gave shade to Dr. Johnson, when he lived there, were obliterated. The old Hall, with all its Tudor woodwork, was smashed to pieces. The chambers on either side are completely ruined. The Patent Office, a more modern building comprising the fourth side of the square, is badly damaged. The row of mediæval half-timbered houses facing High Holborn, also caught the blast and windows were blown out. These houses were built about 1546, and were completely renovated in 1938. Dr. Johnson lived at No. 2, moving from Gough Square in 1759, and is said to have written his *Rasselas* there. Dickens placed a great part of the action of *Edwin Drood* in Staple Inn.

An explanatory pamphlet has been issued by the War Damage Commission to help those concerned with the REPAIR OF WAR DAMAGE for which a cost of works payment may be claimed.

The pamphlet has been issued in agreement with the National Federation of Building Trades Employers. In a foreword, Sir Malcolm Trustram Eve, chairman of the Commission, explains that for some time past the commission has been urged both to provide a procedure for the assistance of claimants who propose to execute works for the repair of war damage in respect of which they will be entitled to claim a payment of cost of works, and also to give

Shell Concrete Domes

Domes over the trickling filters of a US sewage treatment plant built with the remarkable Zeiss-Dywidag system of shell concrete construction. By this method, which involves reinforcing in such a way that the whole structure acts as a homogeneous load-bearing member, almost any curved form with clear spans up to 300 feet can be obtained with an average shell thickness of about 3¼ inches. A thickness of even less than 3 inches would be possible if this approximate minimum were not conditioned by the need for at least three layers of reinforcement. The pioneers of the Zeiss-Dywidag system, also known as the Z-D or Chisarc system, were Carl Zeiss, of Jena, and Messrs. Dyckerhoff and Widmann, who based their theories on the principles which underlie the strength and rigidity of the sea-shell. Though the system is not new, the present emergency has considerably stimulated its development, especially in the USA, for it is the most economical and flexible method of covering large areas without intermediate supports. As this week's leading article points out, it should have many post-war possibilities. A special article in this issue describes the system and many of its past applications.

as much guidance as possible about its practice in assessing the proper cost of such works. Discussions with the National Federation of Building Trades Employers produced comprehensive proposals for a national basis for "proper cost." Much help was also obtained from the deputy commissioners and from consultation with the RIBA, the Chartered Surveyors' Institution, and the Auctioneers' and Estate Agents' Institute. The results are embodied in the pamphlet.

A planned road system should consist of FOUR CATEGORIES OF ROADS — motorways reserved for motor traffic, trunk roads, classified roads, and unclassified roads. This suggestion is made in a memorandum on national planning and new road construction and the improvement of existing roads issued by the Standing Joint Committee of the Royal Automobile Club, the Automobile Association, and the Royal Scottish Automobile Club. The memorandum says: Preliminary investigations and surveys should be started without delay under the ægis of the Ministry of War Transport. Certain major works on bridge and tunnel construction should also be proceeded with, including tunnels under the Lower Thames at Dartford and Blackwall, and high-level bridges across the Lower

Severn, Forth, Humber, Thames (at Woolwich), and Tyne. Among the many recommendations for removing the defects of the present road system are the construction of pedestrian footpaths with a properly made surface in all roads in urban areas, pedestrian subways at congested intersections, road surfaces to be more uniform and non-skid, the position of schools in relation to main roads to be reviewed, improvement in the lay-out of roundabouts, street lighting standardized and subject to Ministerial control, the number of parking places in urban areas greatly increased, camber reduced to the minimum, the provision of cycle tracks extended, and many rights of way, bridle paths, and disused roads converted into cycle tracks.

★

Mr. Anthony Minoprio, M.A. A.R.I.B.A., A.M.T.P.I., has been appointed by the Chelmsford Area Planning Group to direct a CIVIC SURVEY OF CHELMSFORD Borough and Rural District, and to prepare suggestions for the future development of the area.

For the best work in the City and Guilds Final Examination the London Master Builders' Association's PRIZES GO TO BRADFORD and London.

Winners of the prizes presented by the London Master Builders' Association for the best work done in the City and Guilds of London Final Examination in Painters' and Decorators' Work, go this year to Bradford College of Art and the LCC School of Building. Gilbert Woodcock Dowling, of Bradford, wins the first prize of 3 guineas, and George Hughesman, of London, the second prize of 2 guineas.

Wallasey, Cheshire, Housing Committee has decided to BAN PORTAL HOUSES.

The Committee has instructed the borough surveyor, Mr. L. St. G. Wilkinson, to inspect and report on other factory-made houses, among them types designed by a Hull firm, others designed by the Birmingham authorities, and the Glasgow foam-slag house. Mr. Wilkinson told a *Daily Mail* reporter: "After seeing the Portal exhibition house in London, we are satisfied that this type of house will not suit our particular requirements." Another official said: Our main need is for a type of house suitable for large families. At the moment most bombed-out families are either evacuated or are split up, living with relatives and friends. When the war is over it will be necessary for us to have houses, even of a temporary nature, suitable for them.

Perth Housing Committee recommends that application be made to the Department of Health for Scotland for the ALLOCATION OF 500 CHURCHILL HOUSES to the city.

SHELL CONCRETE

THE most striking characteristic of the architecture of any age is probably its method of covering roofs of large span. Roman vaults, Gothic arches, Renaissance domes are the landmarks of architectural history. In the 19th century steel began to take the place of the older materials, stone and timber ; and though their use for large spans had been developed to high perfection, already in Antiquity and the Middle Ages, structural steel opened up the possibility of covering much larger spans without intermediate supports than had hitherto been possible. As always in the past, the material partially conditioned the style.

The invention of reinforced concrete did not seriously affect the position for over half a century. The weight of a reinforced concrete structure of the usual type increases very rapidly with an increasing span, so that it has not been economic to cover very large spans in this way. In recent years, however, two developments have tended to challenge the predominance of steel. On the one hand, timber construction has progressed beyond all earlier expectations. The hangars recently built to house the barrage balloons of the US Navy, give impressive evidence of the possibilities of timber in covering spans as large as 246 ft.* On the other hand, a relatively new and daring form of reinforced concrete construction has been discovered and in this issue we publish an article describing this remarkable system.

This ingenious method, by which space is enclosed by a shell relatively much thinner than an eggshell, is truly characteristic of reinforced concrete construction. Whereas in both steel and timber roofs the main structure and the cladding are separate, and stresses are transmitted by any one member in one direction only, a reinforced concrete shell acts as both load-bearing member and cladding at the same time. Stresses are transmitted in any direction in the thickness of the shell, and a large span shell construction weighs only a fraction of an ordinary reinforced concrete roof of the same span.

What influence may we expect this type of construction to have on the style of our buildings? The number and variety of buildings which need the covering of large areas are increasing, not only for industrial requirements, but, as the community comes to demand more and more public amenities, for other types as well. To churches and occasional monumental buildings, on which ingenuity in the construction of large spans was formerly expended, have been added railway stations, factories and garages, and, more recently, swimming pools, public libraries, market halls, and so on. It is obvious that after the war, the need for such buildings to which shell construction should be especially applicable will be accelerated. The reinforced concrete shell gives great flexibility, especially in lay-out, in the arrangement of natural lighting, space distribution and so forth. Even more

* See the ARCHITECTS' JOURNAL, March 9, 1944, pp. 182-184, 196-198.

important, perhaps, are the architectural potentialities of this new method. The strength, homogeneity, and adaptability of concrete, which make unusual forms possible, eliminate the need to build straight up and straight over. When the concrete is applied freely and fully to the problem of enclosing space, circular, elliptical and polygonal-shaped structures, or combinations of any or all of these shapes, become feasible. Very little has yet been done. There were very few examples of concrete shell construction in this country before the war, though greater progress was made on the Continent and the USA. The war, however, has given a great stimulus to shell concrete construction, both here and abroad. Many examples exist which for security reasons cannot at present be published, but it is hoped that the examples given in this issue are, at any rate, sufficient to convince the reader of the importance of this new development.

The Architects' Journal
War Address: 45, The Avenue, Cheam, Surrey
Telephone: Vigilant 0087-9

N O T E S & T O P I C S

THIRTY YEARS OF DOUBT

From time to time my faith in the essential sanity of the law receives support even from lawyers themselves. A recent piece of confirmatory evidence is the decision in *Vickery* v. *Martin*, a case in which the Court of Appeal held that a boarding house is a dwelling house within the meaning of the Rent Restriction Acts. That is not a point on which a layman would have thought that controversy could arise, but it did, and a County Court Judge held that it was not.

*

I have encountered boarding houses which could be described as not very good dwelling houses, but, even in the worst, I should have said that the difference between them and normal dwelling houses was one of degree and not of kind. But there it is. Thirty years after the first Rent Restriction Act was passed, the Court of Appeal has settled a point that, to some lawyers at least, seems to have been one of worry and uncertainty. If anyone had cause to be uncertain on this point, it should surely be an architect rather than a lawyer.

*

Incidentally, I hope some day to see in one of the better placed niches outside the Law Society's Hall a statue to the original inventor of the Rent Restriction Acts. Apart from Workmen's Compensation, there is no other subject which has, in such a comparatively short time, brought more grist to the legal mill. Thirty years of happy doubt. What more could any lawyer ask from any Act of Parliament?

MIES VAN DER ROHE'S SCHOOL

In an article by Howard Dearstyne in *Liturgical Arts*, an immaculate American quarterly devoted to the arts of the Catholic Church, news comes of the didactic activities of Ludwig Mies van der Rohe. The article is of special interest in that Mies van der Rohe was not only the last head of the now defunct Bauhaus, but has achieved world renown with those two or three buildings of his which are generally acknowledged to be milestones in architectural evolution, especially, of course, the famous Haus Tugendhat at Brünn.

*

He is now head of the Department of Architecture of the Illinois Institute of Technology in Chicago, a job he took on shortly before the war. He brought with him from Germany two close associates, who worked with him at the Bauhaus, Ludwig Hilbersheimer and Walter Peterhaus. The former has a wide reputation as a city planner (his latest work, *The New Elements of City Planning*, is now in the press), while the latter "has achieved in his work and in his thinking an integration of the three ostensibly disparate fields of mathematics, philosophy, and art." These three colleagues, writes Mr. Dearstyne, have developed at the Illinois Institute a course of architectural study whose effect upon the teaching and practice of architecture in the USA promises to be profound.

*

The course at the Illinois Institute is a four year one, in which everything accidental or non-essential to the fixed goal has been eliminated. The curriculum includes all those subjects taught in architectural schools elsewhere, but "the superiority of this school over the others lies in the aim of the teaching and in the manner in which the courses are taught." The course begins under Mr. Peterhaus with Visual Training in which the æsthetic relationship of form, space, colour and texture is studied in the abstract. This is followed by Architectural Design under Mr. van der Rohe, who bases his teaching on the study of (*a*) functional planning, (*b*) the character of materials, and (*c*) the structural principles derived from the characteristics of these materials from load-bearing brickwork to the frame and panel of reinforced concrete.

*

The course concludes with a study of City and Regional Planning under Mr. Hilberseimer. The core of the principles taught seems to be anti-megalopolitan and pro-neighbourhood-unit, for "the city structure is broken down into independent settlement units which are limited in size and contain all the elements necessary to the city, segregated according to their functions. . . The different groups are connected with each other by a simplified traffic system. The open spaces between the different groups can be used for gardening and farming, and these, together with the adjoining agricultural area, enveloping and penetrating into the city, bring about the integration of the latter with the countryside."

*

It is pleasing to know that there exists at least one architectural school in the world which, (*a*) has clearly formulated principles, (*b*) includes town-planning as part of the course and not merely as a post-graduate study, and (*c*) teaches that though honesty of form and structure are essential to beauty, beauty does not arise automatically from fitness for purpose.

*

There is a tendency, particularly amongst engineers, to believe that something which functions well is automatically beautiful, and thus to regard the architect, with what is believed to be his senseless æsthetic snobbery, as a useless parasite. The answer to this is given particularly clearly in the results of a subject recently set by Mies van der Rohe to his advanced students. The problem was the design of a simple, three-storey building of rectangular plan using successively two different structural systems, steel frame and reinforced concrete skeleton.

*

All the one hundred solutions were designed to reveal and express the structure. Although they were related in fundamental character, no two solutions were the same, and van der Rohe maintains that his students by no means exhausted the possibilities. The moral is obvious, for the variety achieved was not the arbitrary difference resulting from the use of forms for forms' sake alone, but the result of human and personal selection and creation based upon a mechanical constant of function and structure.

INDECENCY AND A HELICOPTER

Anything that Raymond Loewy designs has a style that you soon come to recognize as unmistakably Loewy's. In one of the popular magazines I saw illustrated a model of a Sikorsky helicopter which made me think Igor Sikorsky had been strongly influenced by Loewy's style. Later I came across the same picture in *The Aeroplane*, with a more detailed caption which explained that the machine had been designed by Sikorsky and Loewy in collaboration.

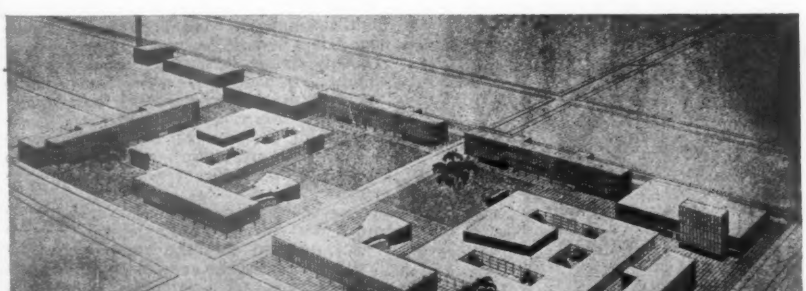
*

I hear that Loewy took plans of this helicopter to Washington for inspection by one of the Government departments; was ushered into an office where a committee was already sitting. Suggestive, Improper, Indecent, Salacious, the committee-members said. Loewy could not believe these words applied to helicopter design—his own or anyone else's. And they didn't. In error, he had been brought before a committee that was discussing some drawings in a contemporary magazine.

BEACHCOMBER'S CORNER

" A report of the first indoor flight of a helicopter will be good news for millions of householders who are sick of the unprogressive drudgery of walking from one room to another. I understand that scientists are now at work on a machine that will fit on a man like an overcoat. He will live in it and even sleep in it, and it will do his eating for him, to save time. This seems to be what everyone has been waiting for—provided that it makes a great deal of noise and gives off a stink of petrol."—(Beachcomber in the *Daily Express*.)

ASTRAGAL



Design by Mies van der Rohe for the campus for Illinois Institute of Technology. The first building, a materials-testing laboratory, was completed last year; a second laboratory is under construction. See Astragal's note.

LETTERS

Ove Arup

Victor Krasilnikov
(Soviet Scientists Anti-Fascist Committee)

The Churchill House

SIR,—Out of the twilight of my solitary confinement, I raise a feeble hand in salute to Astragal, who " almost alone of plan-improvers, has provided an interior artfully landscaped . . . an interesting internal *vista free of passages* . . . etc., etc."

In my humble opinion Astragal's plan is the best of the alternatives published in the JOURNAL, *because* he refuses to let himself be cramped by requirements which are not absolutely essential—such as the combination of the living room stove with the kitchen and bathroom equipment—and prefers to concern himself with the *main* business of an architect, *i.e.*, to provide an " Interior Landscape," as Astragal puts it.

For if this were *not*—in the present instance—the *main* business of the architect, as if the achievement of this aim were not worth £5 or £10 extra cost, what, pray, are architects for? What is there—in most of the official and other housing plans—which could not as well have been sweated out by a mere engineer?

And *if it is* the main business of an architect to create an Internal Landscape or a spacial " set up " which gives psychological satisfaction, why is it that so few architects seem to be aware of it? Why is it that so many of the younger architects—not including the old-fashioned facade mongers—truckle down to the engineer and neglect their own important, difficult and inspiring job?

This, coming from an engineer, is " sauce," and I expect I shall suffer for it in due course. At the moment I am above such matters. But I am led to another sad reflection.

Does Astragal, or any of the other contributors to the Churchill House discussion, seriously believe that their proposals, however excellent, will have the slightest effect on the final outcome, or will even be considered by those in authority?

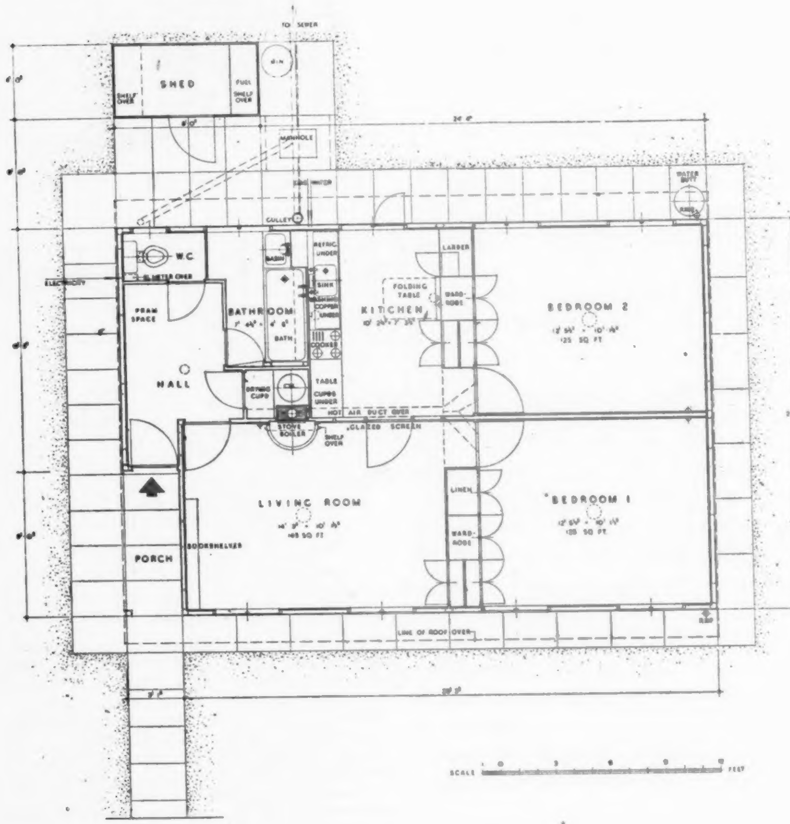
Probably not. It is too late now; the discussion must be considered as a purely academic exercise. But does it not show that many people are willing to give of their time, and come forward with their ideas to contribute to a problem of social importance—in spite of the fact that they can hardly hope now to influence events. (It is beside the point that their motives for doing so may not be exclusively, or even dominantly, altruistic—that is not at all necessary.)

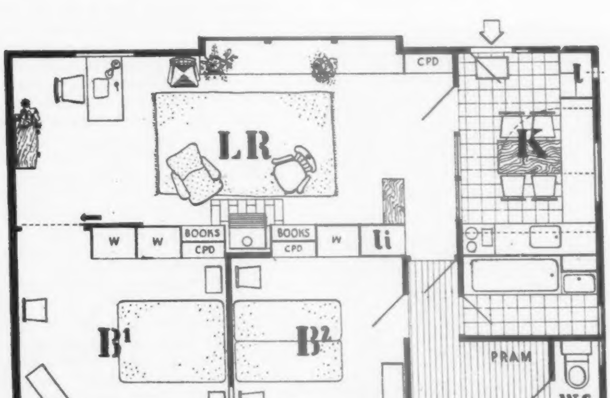
We see the same thing over and over again—but why must the picture always be one of futility and frustration?

I must stop now—Doctor's orders. Otherwise I would have liked to discuss the possibility ,of exploiting these untapped resources of ingenuity and knowledge for the public weal, but introducing a spot of Democracy—closer collaboration between governors and governed—abandoning some of the excessive secrecy, born of fear of criticism, and therefore public discussion which is characteristic of the civil service. Perhaps it is just as well. Thinking of the fact that architects who have become civil servants are not even allowed to talk or write in public might easily raise my temperature—or something.

Unless we somehow manage to combine planning with Democracy, we shall be in danger of losing both.

Middlesex Hospital, London. OVE ARUP





The Churchill House. Top, the revised plan by the Ministry of Works; bottom, suggested plan by Astragal.

Cablegram from Russia

[The following cablegram has been sent to us from Moscow by Victor Krasilnikov, of the Soviet Scientists Anti-fascist Committee.]

Academy of Architecture USSR was founded in Moscow November, 1922, in connection with large scale building that was launched in the country during period second five-year plan. There are twenty-one members and fifty corresponding members in Soviet Academy Architecture. Among academicians are such prominent architects as Victor Vesnin, Alexei E. Schusyev, Karo Alabyan, George Goltz, Ivan Zholstovsky, Boris Iofan, Nikolai Killi, Arkadi Mordvinov, Lev Rudnev. Members of academy sciences USSR working in sphere of architecture such as Boris Vedenyev, Boris Galerkin, Boris Grekov, and Joseph Orbeli are also on membership of Academy Architecture. Victor Vesnin, one of Russia's most venerable architects, is president Academy Architecture. The vice-presidents are Karo Alabyan, and Arkadi Mordvinov.

Four scientific Research Institutes and Institute of Mass Building engaged in designing dwellings, schools, child institutions, bathhouses, laundries, etc.; Institute of Architecture public and industrial structures, elaborating projects factories, theatres, cinema houses, garages, institute, building, towns, and inhabited places. The Institute of Scientific Building's chief function is to introduce latest scientific discoveries in building practice, and promote rational construction. At present time Fifth Scientific Institute is being founded. This institute will be concerned with problems accommodation and interior decorations dwellings. Two laboratories where experiments on ornaments and ceramics are conducted. Special department for study of theory and history or architecture, museums, architecture; special publishing house and library, all function in academy.

Great changes taken place in academy since beginning war. Its institutes and laboratories now engaged on problems speeding up building factories, one-storey standard houses east of country, and utilization local building materials.

At outset of war special study for projecting camouflage and training camouflage experts was set up at academy. Special department for drawing up catalogues, building materials and architectural reference department were organized at academy during war. First series eighteen volumes *Architects' Handbook* have come out; some booklets are *Town Construction, Housing Construction, Plastering Technique, House Painter's Craft.* Department of study and restoration monuments may be credited with significant war-time achievements.

To accelerate restoration Nazi-wrecked towns and villages, Member's Academy began setting up special experimental workshops 1942. Thus Karo Alabyan has, together with academician Alexei Shusyev, worked out plan for rebuilding Stalingrad. Boris Iofan is busy on projects for rebuilding Novorossiisk; George Goltz—Smolensk; Nikolai Killi—Kalinin; Lev Rudnev—Voronezh; Alexei Schusyev—Istra Etnovgorod. Joint Commission Academy Sciences USSR and Academy Architecture has been established.

Ukrainian Branch of Academy Architecture was organized in liberated Kiev 1944.

VICTOR KRASILNIKOV,
SOVIET SCIENTISTS
ANTI-FASCIST COMMITTEE

Moscow.

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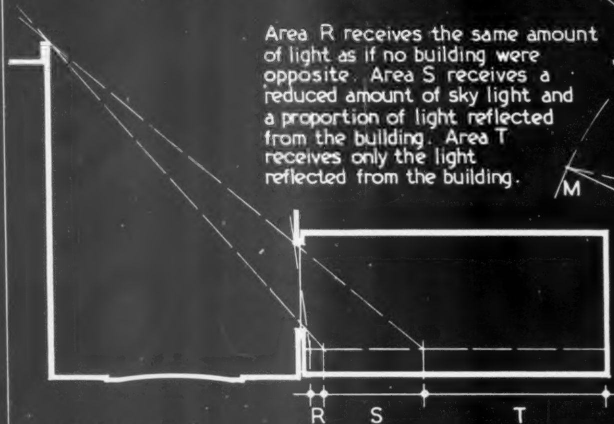
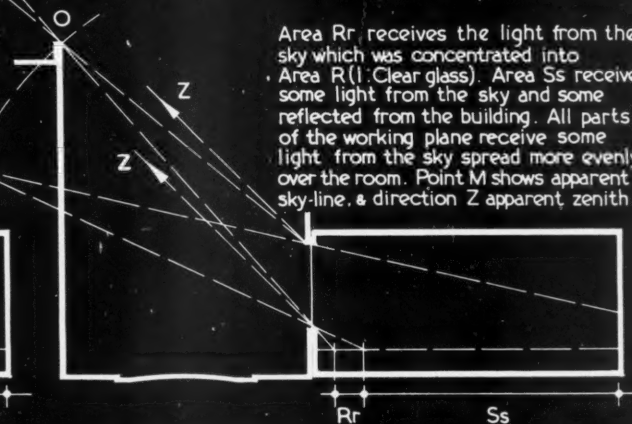
THE ARCHITECTS' JOURNAL LIBRARY OF PLANNED INFORMATION

ROLLED GLASSES : MAXIMUM DAYLIGHT ·A· AND ·BD·



Area R receives the same amount of light as if no building were opposite. Area S receives a reduced amount of sky light and a proportion of light reflected from the building. Area T receives only the light reflected from the building.

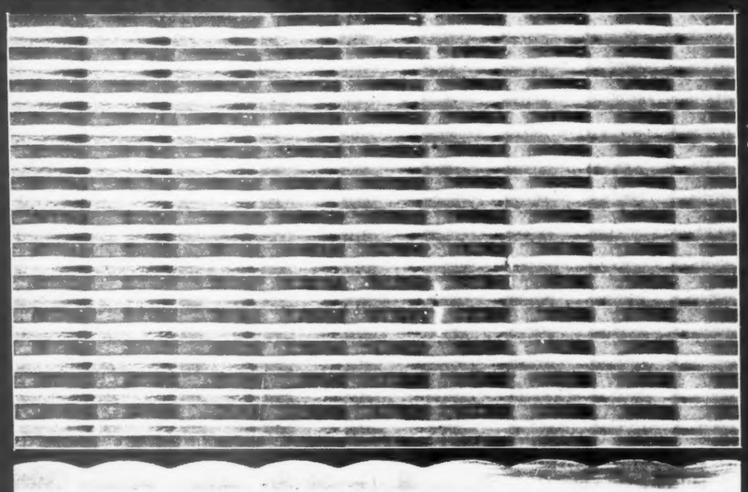
1. Clear glass.



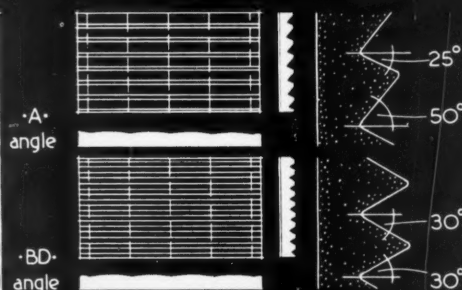
Area Rr receives the light from the sky which was concentrated into Area R (1. Clear glass). Area Ss receives some light from the sky and some reflected from the building. All parts of the working plane receive some light from the sky spread more evenly over the room. Point M shows apparent sky-line, & direction Z apparent zenith.

2. Maximum Daylight glass.

COMPARATIVE DISTRIBUTION OF DAYLIGHT WITHIN A ROOM.



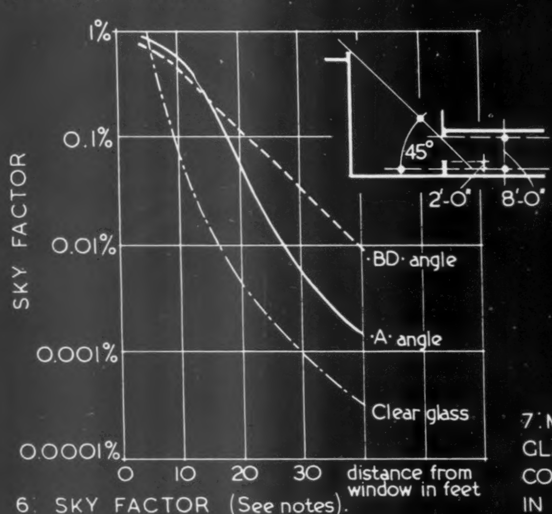
3. FULL-SIZE PHOTOGRAPH OF SECTION AND ELEVATION OF MAXIMUM DAYLIGHT GLASS ·A· ANGLE.



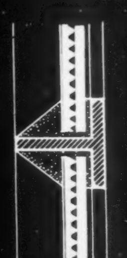
4. TYPES OF MAXIMUM DAYLIGHT GLASS.

Angular elevation of actual sky-line	Angular elevation of apparent sky-line	
Clear glass	·A· angle	·BD· angle
20°	−5°	−
30°	7°	−
40°	17°	0°
50°	25°	11°
60°	32°	20°
70°	−	26°
Zenith	45°	32°

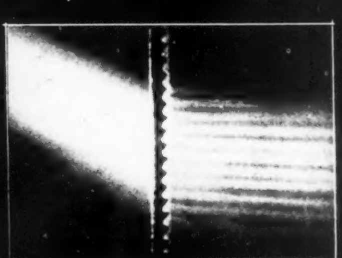
5. (See notes).



6. SKY FACTOR (See notes).



7. MAXIMUM DAYLIGHT GLASS WITH SHEET COVER GLASS AS FITTED IN GLAZING BAR.



8. PHOTOGRAPH SHOWING LIGHT PASSING THROUGH MAXIMUM DAYLIGHT GLASS.

Information from Chance Brothers Ltd.

INFORMATION SHEET : GLASS 15 : TYPES OF GLASS 7.

Sir John Burnet Tait and Lorne Architects One Montague Place Bedford Square London W C I

THE ARCHITECTS' JOURNAL
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INFORMATION SHEET • 948 •

GLASS : No. 15

Subject : Maximum Daylight Window Glass.

General :

This Sheet is the fifteenth of the series dealing with glass and glass products, and the seventh of the section on types of glass.

Standard Forms, Sizes, Thicknesses, etc. :

Light transmission : 65 to 70%

Maximum standard sizes : 100 by 40 in., or 40 by 100 in. (When ordering, the height should be stated first, followed by the width.)

Nominal thickness and weight : $\frac{3}{16}$ in., $2\frac{1}{4}/2\frac{1}{2}$ lb. per sq. ft.

Quality : Made in one quality only.

Colour : White only.

Standard variations :
- A-angle for use where the angle of obstruction is approx. 30°.
- BD-angle for use where the angle of obstruction is 40° or more.

Packing : Packed in crates containing 250 to 300 sq. ft.

Properties :

A rolled glass with a pattern of prisms on one side and lenses on the other, designed for use in windows which are partially obscured by external obstructions. The combined effect of the prisms and lenses is to re-direct the light towards the back of the room and thus increase the natural illumination in the useful area. The glass does not increase the amount of light, but re-distributes it to better advantage.

Optical Design :

Outer face : vertical lens-flutes, $\frac{1}{4}$ in. wide, distributing the light across the width of a room where the external obstructions have pronounced vertical boundaries which might otherwise cause shadows.

Inner face : horizontal prisms which refract the light coming down at a steep angle from the sky and re-direct it horizontally. See smoke-chamber photograph on face of this Sheet, Diag. 8.

Two designs available : A-angle pattern with refracting prisms adapted to be used with external obstructions between 20° and 40° above the horizontal. BD-angle pattern to be used with external obstructions between 40° and 60° above the horizontal. A-angle pattern must be mounted the right way up ; BD-angle pattern may be mounted either way up. See Diag. 4.

Illumination and Sky Factor :

The increased light distribution of the glass is shown diagrammatically by Diag. 1, with clear glass ; and Diag. 2 with Maximum Daylight glass. The area "R," which receives direct light from the sky, is small in Diag. 1, whereas with Maximum Daylight glass in Diag. 2, the same amount of light is distributed over the wider area R_T. In Diag. 1, only a small area S receives a proportion of skylight, and the *majority* of the room, Area T, receives no light from the sky, whereas in Diag. 2, all the back of the room, Area S_B, receives a proportion of light from the sky. Hence there is no point at which the working plane is illuminated only by scattered light reflected from the walls of the external obstruction.

The above description is typical, and more precise data can be given in terms of "Sky Factor" (see Information Sheet, Glass, No. 6). A simple way of computing the Sky Factor with Maximum Daylight glass is to apply the convention illustrated in Diag. 2 where the sky line at O appears to have been swung downwards to the point M by the refractive effect of the prisms and the effective zenith is in the direction of Z. Diag. 5 gives tabulated data for the angles involved, the first column being the angular elevation of the actual sky line, and the second and third columns being the angular elevation of the apparent sky line through A-angle glass and BD-angle glass, respectively. The last line of the table gives the limiting apparent elevation, corresponding to the zenith. Thus a room lit by the open sky above an external obstruction at 50° elevation from the sill, would receive light from 50° to nearly 90° with clear glass ; from 25° to 45° with A-angle Maximum Daylight glass ; and from 11° to 32° with BD-angle Maximum Daylight glass. The effect of the more nearly horizontal lighting given by Maximum Daylight glass is to throw the apparent no-sky line (i.e., the line on the working plane from which the brightness of the open sky is just not visible) much further into the room.

In making a calculation of Sky Factor by this convention, it is usual to take 50% for the transmission factor to allow for the cover glass and for the effect of dust and grime on the outer surface.

The quantitative effect in a long, badly-lit room is shown in Diag. 6. The chain-dot line shows the distribution of Sky Factor obtained with clear glass, where the 0·2% Sky Factor is at 8 ft. The solid line shows the distribution obtained with A-angle Maximum Daylight glass, giving 0·2% Sky Factor at 15 ft. The dashed line shows the distribution obtained with BD-angle Maximum Daylight glass, giving 0·2% Sky Factor at 16 ft. from the window, and also giving greatly increased illumination at greater distances, amounting to a 20 : 1 increase at 40 ft. from the window. It is under such extreme conditions as this that Maximum Daylight glass is of greatest benefit.

Performance in Service :

Compared with clear sheet glass, in rooms with external obstructions of about 30° elevation, the use of A-angle glass will give 2 to 4 times the illumination in the useful area ; in rooms with external obstructions of about 45°, the use of BD-angle glass will give 2 to 3 times the useful illumination.

Some glare may be caused to workers in a room glazed with Maximum Daylight glass if direct sunlight falls on the window from a low elevation (20° to 30° for A, and 35° to 40° for BD), when the sun's rays will be refracted into the room in an approximately horizontal direction.

Dirt :

Maximum Daylight glass is, like other prismatic glasses, criticized on the grounds of dirt. Although dust may collect on the top, this does not materially reduce the light transmitted since the useful light emerges from the under surfaces of the prisms.

Complete protection may be provided by a cover glass over the prisms, as shown in Diag. 7. No trouble with condensation in the interspace need be anticipated.

Methods of Mounting :

A-angle and BD-angle glass are supplied in $\frac{1}{4}$-in. over-all thickness ; a glazing thickness of $\frac{3}{8}$ in. should be allowed. Glazing should be carried out with the lens flutes running vertically externally, and the prisms running horizontally internally. The glass is always supplied with a label indicating the top edge. The cover glass goes over the prismatic surface, to the inside of the room.

Miscellaneous :

The glass is not in general to be recommended for use in windows where the external obstruction is at less than 20° angular elevation from the sill.

The glass is completely obscuring and may be used for internal partitions and borrowed lights.

Where the glass is used for decorative panels, either silvered or lit from the edges, its brilliant prismatic pattern is shown to advantage.

Previous Sheets :

Previous Sheets of this series on glass are Nos. 914, 917, 919, 922, 925, 927, 929, 932, 937, 938, 940, 945, 946 and 947.

Issued by : Chance Brothers Limited
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Telegrams : Chance, Smethwick

The Zeiss-Dywidag system of shell concrete construction is a landmark in structural evolution in that it allows spans of unprecedented width without intermediate supports to be covered at low cost. This article describes the system both in theory and practice. The first part deals with barrel vaults and the second with domes. The author had much practical experience of the system in Germany before the war and was closely connected with the construction of the Frankfurt Market Hall, one of the buildings illustrated here.

SHELL CONCRETE CONSTRUCTION

[*BY DR. K. HAJNAL-KÓNYI, M.I.Struct.E.*]

Part I. Barrel Vaults

1. INTRODUCTION.

The characteristics of shell construction* can best be appreciated by comparing them with those of the usual forms of construction in traditional materials and with the gradual development of new forms in reinforced concrete. The traditional building materials, such as timber, stone, brickwork and steel, have the common feature that they transmit loads substantially *in one direction only*, e.g. the typical form of a roof construction, both in timber and steel, is a combination of (1) main girders or trusses spanning across the building; (2) purlins, spanning between the trusses; (3) rafters, spanning between the purlins; (4) covering material or sheathing between the rafters.

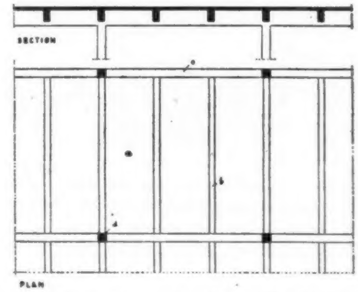
The introduction of reinforced concrete made possible a fundamental change of principle. A concrete slab, if reinforced in a suitable way can transmit loads *in any direction in its plane*. It took some time before this essential feature of reinforced concrete was realized in practice. In the early years of its application only slabs spanning in one direction were used. An example is shown in Fig. 1. A continuous slab (*a*) is spanned between secondary beams (*b*) which in turn are supported on main beams (*c*). These transmit the load to the columns (*d*). Fig. 2 shows a simplification in the layout of the beams. The slab (*a*) is spanned in two directions. There are no secondary and main beams, all beams (*b*) support the slabs directly and are supported directly on the columns. A further development is illustrated in Fig. 3. Here the beams are omitted entirely and the slab is supported directly on the columns, which have properly shaped heads or caps. Whereas the arrangement in Fig. 1 may be carried out in any traditional building material, that in Figs. 2 and 3 is characteristic of reinforced concrete. The advantages from the architect's point of view of the possibilities of Fig. 2 as against Fig. 1, and those of Fig. 3 against both Figs. 1 and 2 are obvious.

The Zeiss-Dywidag shell system is a somewhat similar development of the vault. Fig. 4 shows a cylindrical roof where the slab is supported on purlins which transfer the load to the main trusses. The similarity with Fig. 1 is obvious, the difference being that the slab is curved. Mathematical investigations have proved that owing to the curvature of the slab the actual behaviour of such a system is quite different from what it would appear to be compared with slab construction. The load transmitted by the purlins is only a negligible fraction of the total load and, if certain provisions are made, the purlins are not necessary at all.

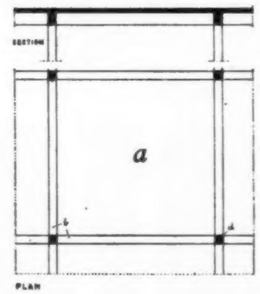
The usual arch in stone or brick transmits loads only in the direction of its curvature but cannot carry loads in the direction of the generating line. A concrete barrel vault shell, if properly reinforced, also transmits loads in the direction of the generating line and acts as a beam in this direction. Distributed forces, such as dead weight, snow and wind, do not produce bending moments in the shell. The equilibrium is maintained by so-called membrane stresses. Fig. 5 shows part of a shell with the three components of forces acting in it. In the usual arch only forces T_2 occur; in a barrel vault shell there are also forces T_1, (both tension and compression) and shear forces S.

The condition for developing such stresses is the maintenance of the shape of the shell, which is achieved by rigid frames. These frames are connected by members at the springings or edge beams which act as ties (Fig. 6). The whole barrel vault, consisting of the shell, the frames and the edge beams, may be considered as one building unit which is particularly suitable for large span roofs. In the traditional construction the dead weight of main girders, carrying the secondary members and sheathing, increases rapidly with the span. The main advantage of shell construction is the smallness of the increase in dead weight required for an increased span, as the roof shell itself acts as load bearing member.

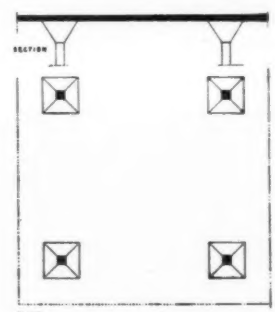
*Data about the Zeiss-Dywidag system of shell construction were published in Information Sheets Nos. 815, 817, 820.



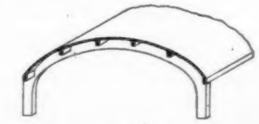
1 *Reinforced concrete slab spanning in one direction between beams.*



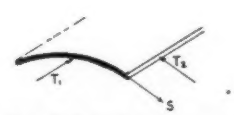
2 *The same with a simpler layout of beams.*



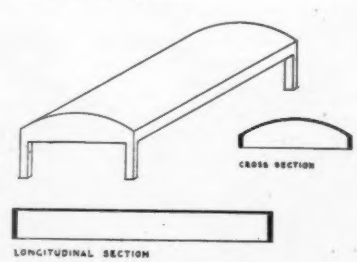
3 *Reinforced concrete slabs supported directly on columns.*



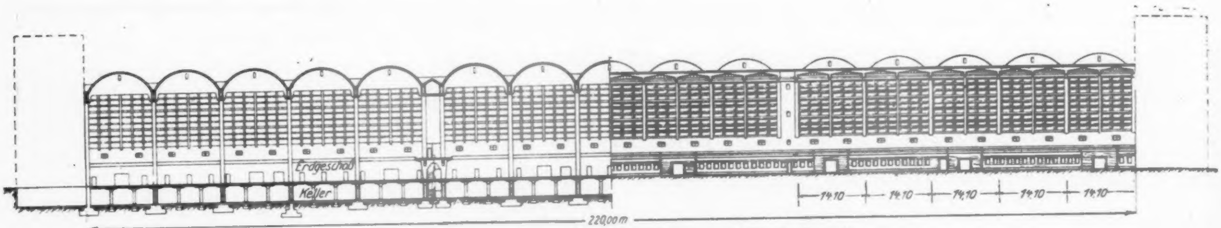
4 *A vault based on the same system as Fig. 1.*



5 *Part of a shell vault showing the three components of forces.*

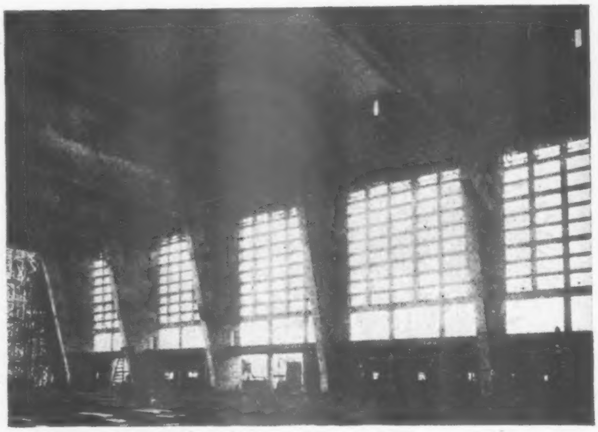


6 *The shell barrel vault with rigid framing ties forming one load-bearing unit.*

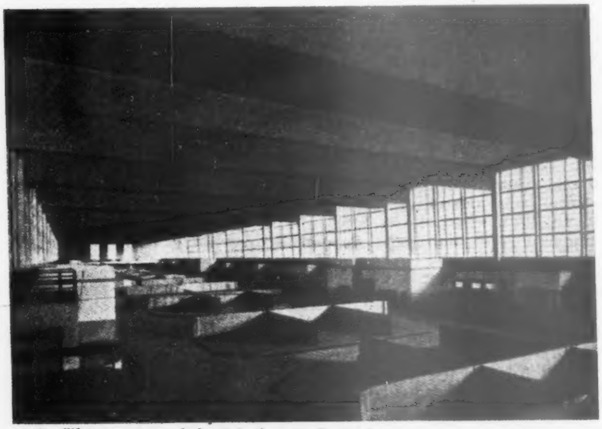


7 *Part section and part elevation of the Market Hall, Frankfurt, which has 15 units of elliptical vaults.*

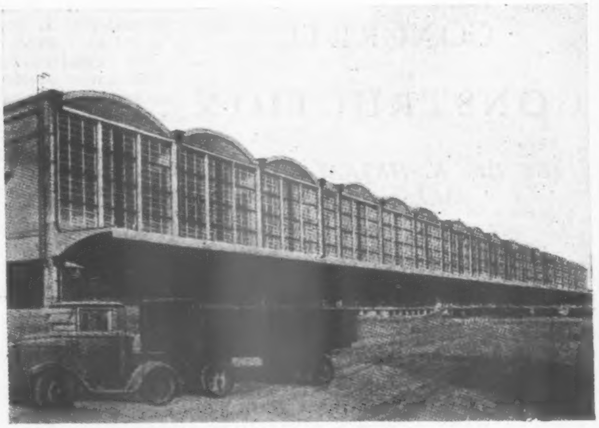
8 *Preliminary test model of the Market Hall, Frankfurt, to a 1 : 3 scale.*



9 *The interior of the Market Hall, Frankfurt.*



10 *The interior of the Market Hall, Budapest.*



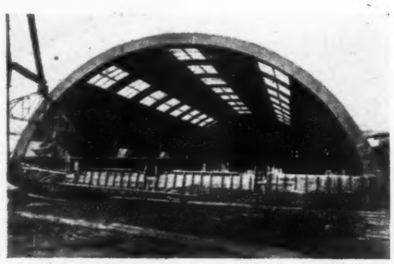
11 *The exterior of the Market Hall, Budapest.*

12 *A shell roof in Hamburg under construction, showing the reinforcing rods of one of the barrel vaults.*

13 *Interior of an aircraft hangar, Turin. An example with roof lights.*

14 *An aircraft hangar in Germany with an asymmetrical arch.*

15 *An aircraft hangar at Doncaster Municipal Airport. Each arch spans 30 ft. The length of the barrels is 90 ft. The thickness of the shell is $2\frac{1}{2}$ in., which encloses three layers of steel rods.*



16 *A store for salt at Tertre, Belgium. An example of wide span with short length, the span being 144 ft., radius 78 ft. The shell is supported on rigid frames at 30 ft. 6 in. centres, and is only $2\frac{3}{8}$ in. thick.*

17 *A bus garage at Nürnberg. One column carries a roof area of about 240 sq. yds. Pumice concrete was used here to improve the thermal insulation.*

2. EXAMPLES

The first application of this system on a large scale was the Market Hall at Frankfurt-on-Main (1927), a hall of 720 ft. length, 141 ft. clear span and 75 ft. height. The roof consists of 15 units of barrel vaults of elliptical shape and is subdivided by two expansion joints into three parts of five barrel vaults each (Fig. 7). The span of the vaults is 46 ft. 3 in., the clear span of the barrels 121 ft. and the thickness of the shells in the intermediate spans is $2\frac{3}{4}$ in. which is $\frac{1}{527}$ of the span. (The shells in the end spans are $3\frac{1}{8}$ in.) Before the authorities approved the system for such a huge building they asked for a model test. The scale of the model, which was used later as a cycle shed, was 1 : 3 (Fig. 8). The description of the main results of this test gives an idea of the extraordinary strength and stiffness of the system. It should particularly be noted that the thickness of the model shell was $1\frac{1}{16}$ in. The design load was applied nine days after completion and the behaviour of the structure was so favourable that another 50 per cent. of the live load was added on the same day. The maximum deflection in midspan was .054 in. at the edge beam and .133 in. at the crown. The span of the vault was increased by .002 in. The load was removed after ten days and the greater part of the deflection disappeared. At a second test the load was applied on one side only, being increased to 62 lb./sq. ft. of horizontal area. The deformations were in line with those at the first test. The usual type of arch construction would have collapsed under such loading on one side only, and this test is perhaps the most convincing evidence of the totally different behaviour of a barrel vault.

In the last test the load was applied symmetrically until the first fine cracks appeared in the edge beam. This happened at a loading of 197 lb./sq. ft., which is 65 per cent. more than the total design load. At this stage the deflection of the edge beam was $\frac{1}{3500}$, that of the crown $\frac{1}{2200}$ of the span (Fig. 8).

Fig. 9 shows part of the inside of the completed building.

A further development of this type of building is the Market Hall in Budapest (1931). This has a length of 767 ft. 8 in. and the span of the barrels is 134 ft. 6 in. The roof is formed by 18 units. The thickness of the shell was reduced to $2\frac{3}{8}$ in. This is only $\frac{1}{683}$ of the span. The vault is much flatter than in Frankfurt, which increased the danger of buckling. Further tests were carried out which proved a factor of safety of four for the total load. Since the greater part of the total load is dead load, this factor of safety means that buckling would occur if the assumed load due to snow and wind were increased eleven times. Fig. 10 shows the inside, Fig. 11 the outside of the building. On the latter an application of cantilevered shell construction can be seen which was also tested. The projection of the cantilever from the face of the building is 20 ft.

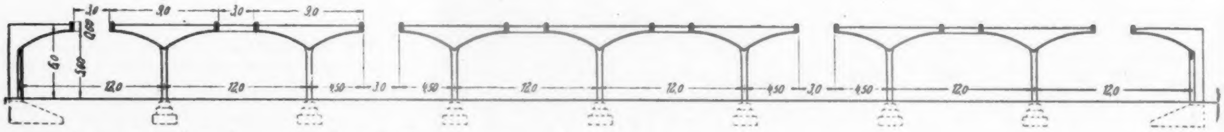
Fig. 12 shows a similar type of roof in Hamburg in course of erection. The arrangement of the reinforcement which follows the trajectories of principal stresses may be seen. The roof light should be noted.

A good example for roof lights is the aircraft hangar at Turin (Fig. 13).

The system is particularly suitable for hangars. A great number have been built in Germany. A specimen with an asymmetrical arch may be seen in Fig. 14. The hangar at the municipal airport at Doncaster (Fig. 15), built in 1936, is a British example.

The previous examples were all of the type where the span of the arch is small in comparison with the length of the barrel. In Fig. 16 the relation is reversed. The span of the arch here is 144 ft., its radius is 78 ft. The shell is supported on rigid frames at 30 ft. 6 in. spacings, its thickness is only $2\frac{3}{8}$ in. Here again the roof lights are an important feature of the design.

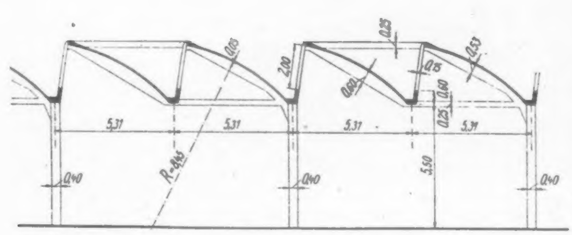
The shell system is well suited for cantilever roofs. An example is shown in Fig. 11. Fig. 17 shows a bus garage at Nürnberg built in this system. The structural arrangement of the building can be seen in Fig. 18. The edge



18 *Section through the bus garage shown in Fig. 17.*

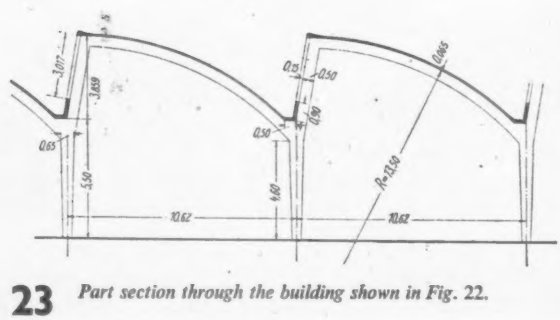
19 *Malden Manor Station, on the Southern Railway, is an example of a cantilevered roof in shell construction.*

20 *A textile factory in Buenos Aires, with roof lights.*

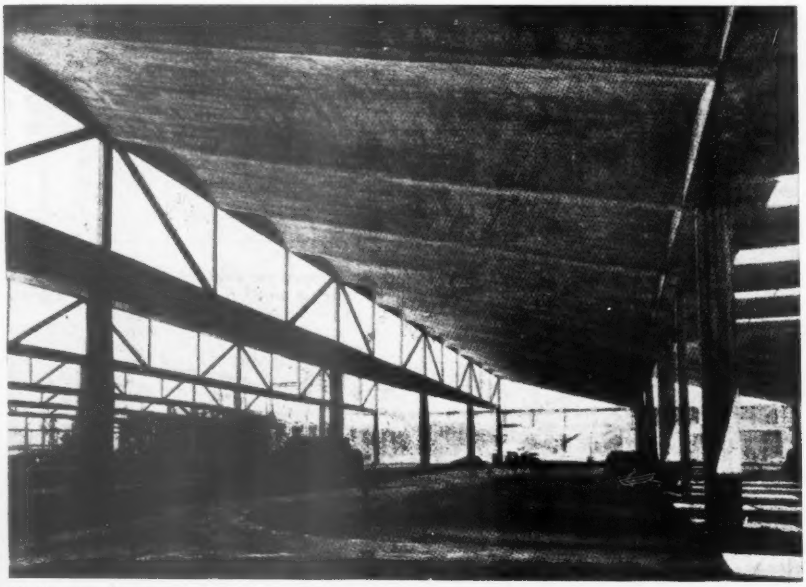


21 *Part section through the building shown in Fig. 20. The thickness of the shell is 2 in.*

22 *A later extension of the factory shown in Figs. 20 and 21. The spacing of the columns was doubled here and the window area reduced by 25 per cent.*

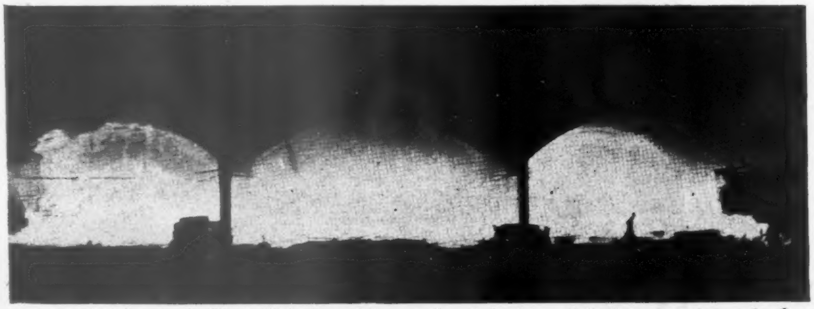


23 *Part section through the building shown in Fig. 22.*



24 *Another form of shell construction in a similar building in Buenos Aires. The rise of the shell is only 2 ft. on a span of 46 ft. 5 in., its thickness being 2⅜ in.*

25 *The ice-rink at Haverford, Pennsylvania, of shell roof construction with glazing.*



26 *A building in the USA which showed the excellent behaviour of shell construction under fire.*

beam which, as is pointed out (p.211) is an essential component of the system, is here on top of the shell, projecting upwards to avoid interference with the light. One column carries a roof area of about 240 sq. yds. Pumice concrete of a density of 93 lb. per cu. ft. was used in this structure in order to improve the thermal insulation of the roof and avoid the application of a separate insulating layer. Torsion tests on hollow cylinders had been made before this material was approved.

Good use of cantilever roofs can be made over railway platforms. Fig 19 is an example.

Factories where a uniform daylight factor is essential provide an important field for the application of shell roofs. Fig. 20 shows a textile factory in Buenos Aires, erected in 1932. The dimensions of the frame work and the spacing of the columns are shown in Fig. 21. The thickness of the shell is only 2 in. The area covered is 20,000 sq. yds.

The fire resistance of this shell had a severe test. Eighty tons of cotton which were stored on an area of about 500 sq. yds. caught fire, but the damage to the roof was insignificant and was caused mainly by the water used in fighting the fire. Any other roof construction but reinforced concrete would have collapsed under the influence of heat.

The arrangement of two rows of windows in each panel followed that of an existing factory. The light in the new building was better than had been expected. The reflection from the slightly curved roof surface, if this has a bright colour, increases the intensity of light in the room and makes its distribution more uniform.

In a later extension of the factory the spacing of the windows was doubled and their area reduced by 25 per cent. (Figs. 22 and 23).

Fig. 24 shows another form of shell construction in a similar building in Buenos Aires. The overall depth of the shell is only 2 ft. on a span of 46 ft. 5 in., its thickness is 2⅜ in. An interesting feature of this building is the longitudinal girder which transfers the weight of the barrels to the columns.

A great number of barrel vaults have been carried out in USA. One famous example is an ice-rink in Haverford (Penn.), accommodating 10,000 visitors (Fig. 25). During the last few years, especially since the war, the system has been used in many factories. Its application in probably the largest building ever built, covering an area of 82 acres, was described in Information Centre No. 1232 (JOURNAL for September 16, 1943, pp. 205-6).

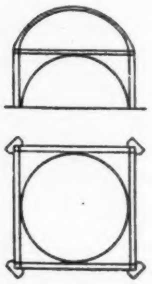
The excellent behaviour of shell construction under fire was also experienced at a military establishment in USA when partly cured concrete shells were subjected to extreme heat and sudden load changes as the supporting formwork burned away (Fig. 26). The shell roof was supported by concrete columns 50 ft. apart longitudinally and 60 ft. transversally. The barrels had a thickness of 3½ in. The fire was intense for about one-and-a-half hours and complete loss of at least part of the building was anticipated. Examination showed, however, that the damage was confined to light spalling and minor cracking, which could easily be repaired. About a month after the fire, and before any repairs had been made on the structure, a full-size loading test was performed on one of the damaged roof panels. Under a uniformly distributed load of about 40 lb./sq. ft. the maximum deflection of the barrel was $\frac{1}{6000}$ of the span. After removing the load on the second day, a very satisfactory recovery of the shell was observed, proving that the structural soundness had not been impaired by fire.

During the war the system has been used in a number of important buildings in this country. These cannot, however, be described for security reasons.

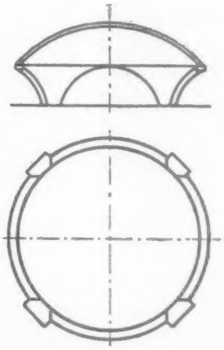
Part II. Domes

1. INTRODUCTION

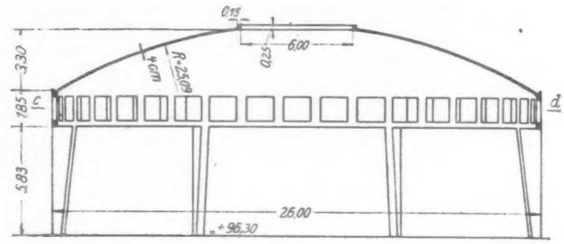
The application of shell construction revolutionized the building of domes as much as that of vaulted roof construction. The building of domes is one of the oldest problems of architecture. The earliest domes were of



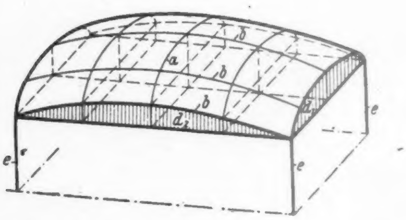
27 *The Byzantine cupola.*



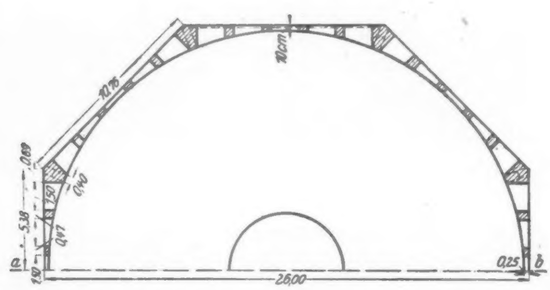
28 *The dome of 213 ft. span at Breslau.*



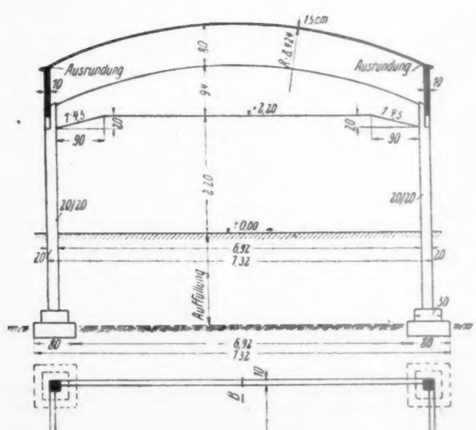
29 *Section through the dome of the electricity works at Frankfurt which has an 11 ft. rise on an 85 ft. span with a shell 1 $\frac{9}{16}$ in. thick.*



31 *Diagram showing the principle of covering a rectangular area with a shell roof curved in both directions.*

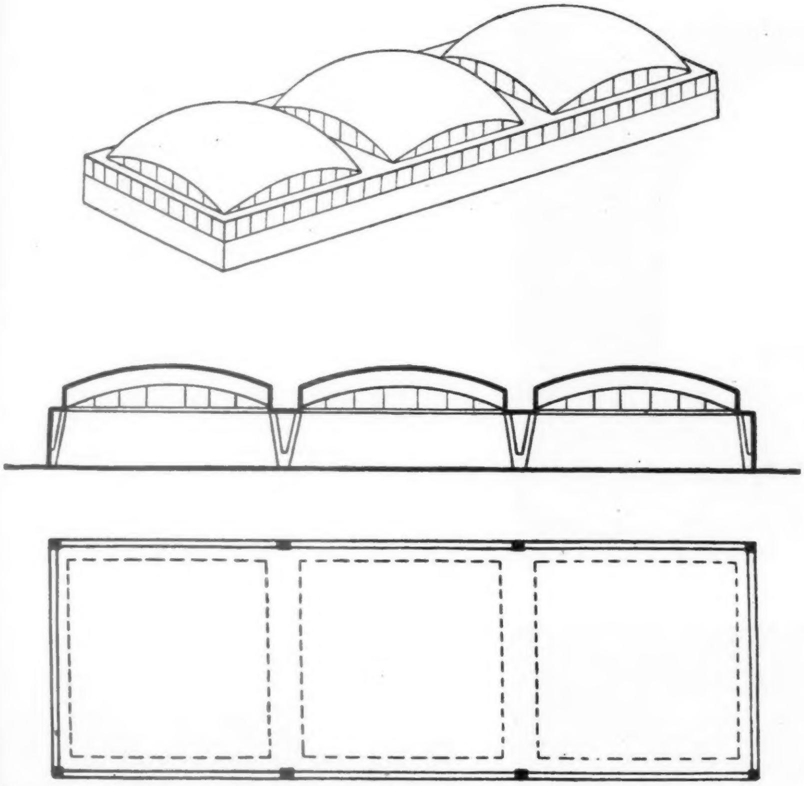


30 *Half-plan of the building shown in Fig. 29. (Section c—d)*

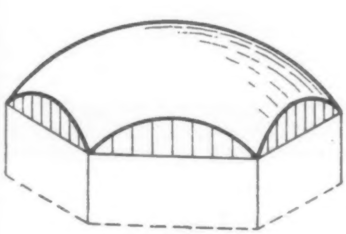


32 *Plan and section of a model illustrating the principle shown in Fig. 31. The area covered is 24 ft. by 24 ft. with a shell $\frac{19}{32}$ in. thick increased to 1 in. at the edges.*

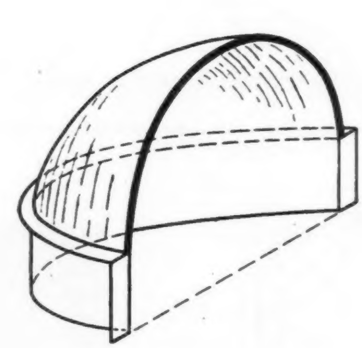
33 *The actual model shown in Fig. 32. Fifty people are standing on the shell.*

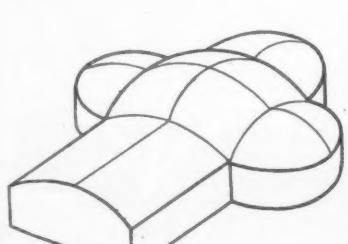


34 *Diagram in plan, elevation and isometric of the type of dome structure possible in shell concrete.*



35, 36, 37 *Three further examples in diagrammatic form.*





the shape of surfaces of revolution. They may be regarded as ancestors of the modern shell construction, since they transmit load in three dimensions. They are, however, not "shells" in the modern sense, because their thickness is very great in relation to their span.

The spans of some of the old domes are surprisingly large. The Pantheon in Rome, erected in the first century A.D., has a clear span of 140 ft. In 1800 years it has required only a few minor repairs, and the building which it covers still serves as the burying place of the kings of Italy. The span of the Pantheon was not reached in any of the later domes, built in solid material, until the introduction of reinforced concrete. Only in our century has this span been exceeded. Shortly before the last war a dome of 213 ft. span in reinforced concrete was completed at Breslau.

In the middle ages the ribbed dome was developed. In this the loads from the "shell" are transmitted to the ribs which transfer them to the supports. Most of the big domes of later date (e.g. Florence, St. Peter's in Rome, St. Paul's, Breslau) are of this type.

Such domes are suitable for churches, monuments and the like. For industrial buildings, with rectangular plan, they are of no importance. It is, of course, possible to transfer the load from a surface of revolution to a square, e.g. in the way of a Byzantine cupola (Fig. 27). This is done by four main arches over the sides of the square to which the weight of the dome is transferred, but the dome is supported directly at four points only, i.e. at the crowns of the four arches, and all the rest has to be transferred by pendentives, which are very heavy and complicated.

The shape of building adopted at Breslau (Fig. 28) is also confined to monuments. The four main arches are not plane ; they are in the surface of a vertical cylinder of the same diameter as the ring of the dome. The dome is continuously supported on its whole perimeter and the pendentives are omitted, but the main arches must be supported laterally. At Breslau this was done by four apsides.

The following examples illustrate the advantages of the Zeiss-Dywidag system of construction over the traditional forms.

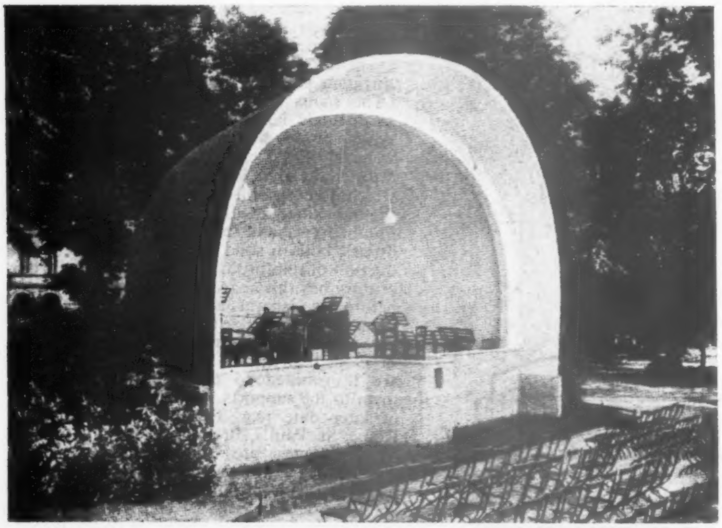
2. EXAMPLES

The simplest form of reinforced concrete dome is a spherical shell. The dome shown in Fig. 29 was built in Frankfurt-on-Main in 1928. It is remarkable for its flatness. Its rise is only 11 ft. on a span of 85 ft. The shell is only $1\frac{9}{16}$ in. thick, i.e. $\frac{1}{650}$ of the span and $\frac{1}{825}$ of the radius of curvature. Its factor of safety against buckling has been determined by testing a model ; it is 8.8 when the dome is fully loaded. The shell is comparatively thinner than an egg shell. The dome is supported on a Vierendeel* girder which rests on eight columns. The inner face of this girder is circular, the outer face is octagonal, its width is minimum in the centres of the spans, maximum at the supports (Fig. 30). This is a very favourable form of a Vierendeel girder, because the shear stresses are reduced at the critical sections.

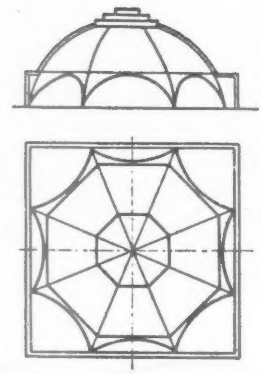
The problem of covering areas of rectangular shape can be solved in reinforced concrete shell construction by a surface curved in both directions, formed by a generating curve, which is moved along another curve (Fig. 31). Fig. 32 shows a model of this type. The area covered by the model is 24 ft. by 24 ft. and the thickness of the shell is only $\frac{19}{32}$ in., which is increased to 1 in. at the edges. This model was loaded with 61 lb./sq. ft. (*a*) over the whole area ; (*b*) on one-half only. When the whole area was loaded the maximum deflection at the crown was less than $\frac{1}{32}$ in. No cracks occurred under this load. The behaviour of the model when the load was applied on one side only was equally favourable. In Fig. 33, 50 people are seen standing on the model. Figs. 34 to 37 show a few possibilities of this type of structure, Fig. 38 a practical application of the form of Fig. 36.

Another line of development is that of

*Belgian system with panels without diagonal bracing.

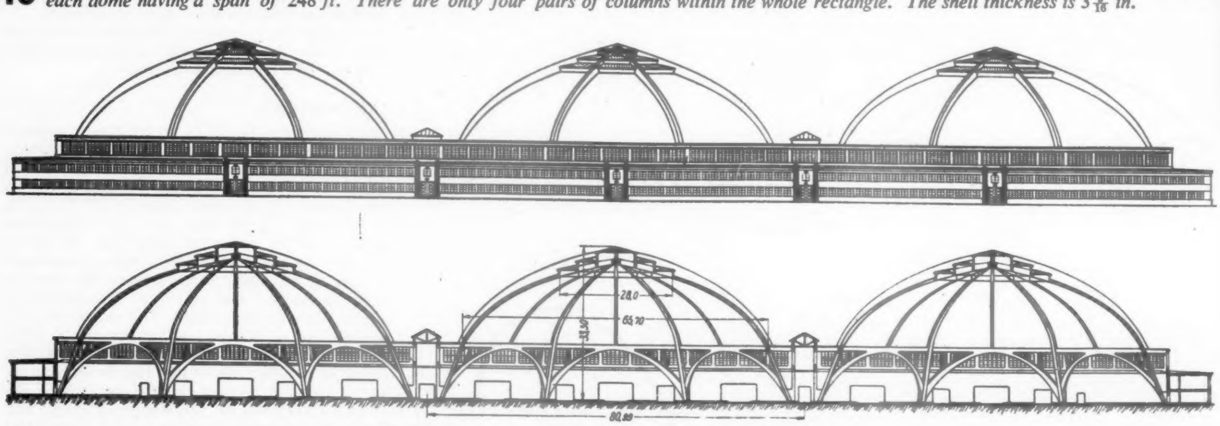


38 *A bandstand at Bad Homburg in shell concrete, of a type shown in diagrammatic form in Fig. 36.*



39 *Diagram showing another development in shell concrete of a polygonal dome formed by the intersection of cylindrical shells which covers a square.*

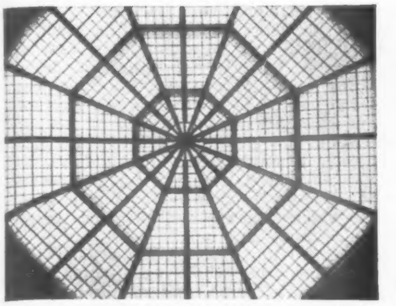
40 *Model and view of the exterior of the Market Hall, Leipzig, with its three octagonal domes. The building covers an area of 21,500 sq. yds., each dome having a span of 248 ft. There are only four pairs of columns within the whole rectangle. The shell thickness is 3 $\frac{9}{16}$ in.*



41 *Elevation and section of the Market Hall, Leipzig.*

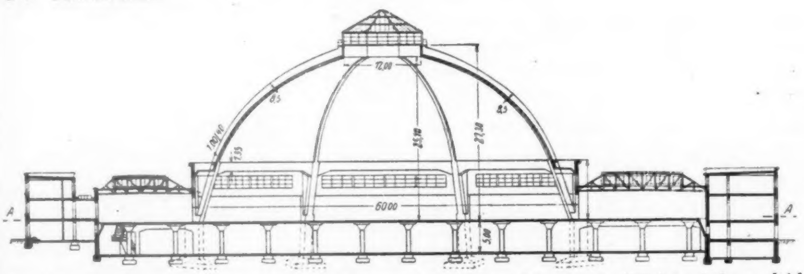
42 *A plan of one of the domes at the Market Hall, Leipzig, looking up.*

43 *An interior view of the Market Hall, Leipzig.*

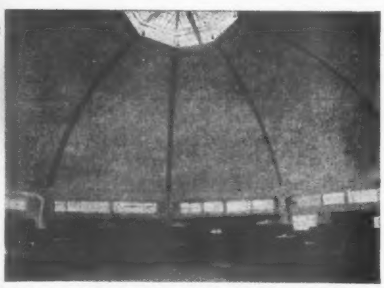


44 *One of the lantern lights at Leipzig Market Hall.*

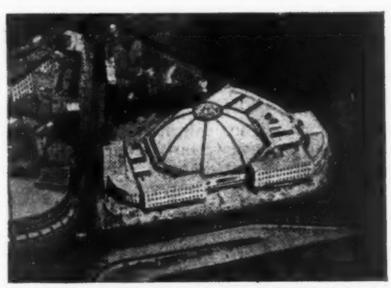
45 *Another interior view at Leipzig.*



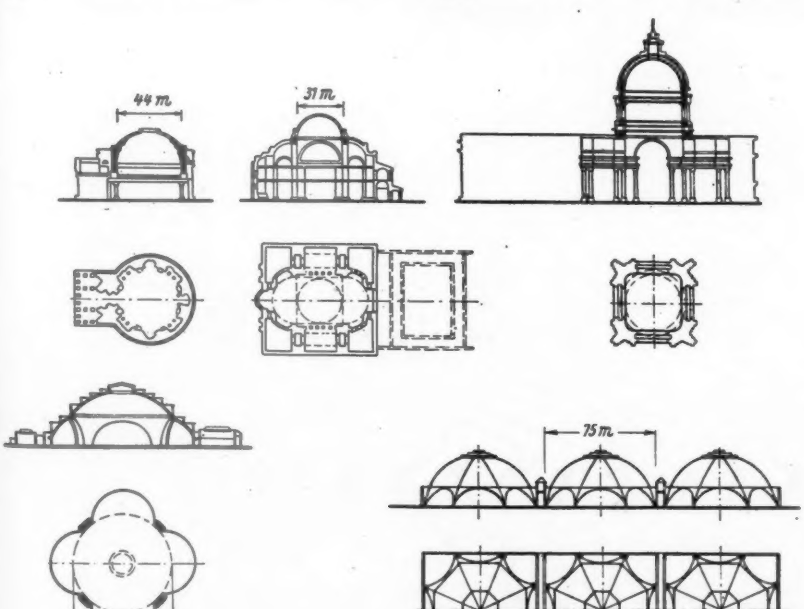
46 *Section through the cupola of the Market Hall, Basle. Diameter is 197 ft. and the cycloid shell is $3\frac{3}{8}$ in. thick.*



47 *An interior view of the Market Hall, Basle.*



48 *An aerial view of the Market Hall, Basle.*



49 *A scale comparison of a few famous examples of domes throughout the ages shows the significance of shell concrete construction. Top, left, the Pantheon. Top, centre, St. Sophia (A.D. 532-537). Top, right, St. Peter's, Rome (A.D. 1506-1626). Bottom, left, the Festhalle, Breslau. Bottom, right, the Market Hall, Leipzig.*

polygonal domes formed by the intersection of cylindrical shells. For covering a square, an octagonal dome, obtained from four cylindrical shells, is particularly suitable (Fig. 39). Two columns are arranged on each side of the square, and it is a simple matter to cover the remaining areas at the four corners by a flat roof. The whole area of the square remains free of columns.

The ridges, formed by the intersection of the shells, replace the rigid frames in barrel vaults. In the case of barrel vaults substantial bending moments are developed in the frames, whereas in symmetrical polygonal domes these bending moments are eliminated by horizontal forces acting in " ring " tension.

From the static point of view, this type of dome structure is a combination of two systems, the cylindrical shells acting as girders, and a system of horizontal forces similar to the " ring " tension in a dome of traditional shape. The excess of the horizontal forces in this structure over those occurring in the traditional design increases as the number of columns decreases. The remarkable feature of the system is the absence of bending moments in the ridges, not only for symmetrical loading (dead weight and snow) but even for wind.

The largest example of octagonal domes is the Market Hall at Leipzig (1929, Figs. 40 to 45). The building covers an area of 783 ft. by 248 ft., i.e. 21,500 sq. yds. This area is roofed by three domes of 248 ft. span, with only four pairs of columns within the whole rectangle. Each dome has a roof light of 92 ft. diameter (Fig. 44). Further roof lights are arranged across the building between the domes and in the corners covered by flat roofs. The cylindrical shells forming the domes are of elliptical shape, the radius of curvature at the crown is 150 ft., and in the direction of the ridges 177 ft. This is the maximum radius of curvature of any dome ever carried out in steel or concrete. The span in the direction of the ridges is 267 ft., the thickness of the shell only $3\frac{5}{16}$ in.

In order to increase the safety of the shell against buckling, a rib, which is not visible at the outside, has been arranged to project on the inside of the shell in the middle of each panel. Although it would have been possible to transfer the whole load by the shell directly to the columns, without supporting arches, such arches, supporting the flat roofs, have been provided for architectural reasons. Fig. 45 shows the inside after completion.

Another notable example is the Market Hall at Basle (Fig. 46). Its diameter is 197 ft., and it is remarkable for the omission of the supporting arches (Fig. 47). This omission governed the shape of the shell which is a cycloid. Its thickness is $3\frac{3}{8}$ in. No stiffening rib on the inside was necessary. Fig. 48 is an aerial view of the building.

The significance of shell construction for domes may perhaps be best realized by comparison of various famous examples. Fig. 49 shows the sections and plans of five large domes, to the same scale. The weights of three of them are as follows:

	Diameter. ft.	Weight. tons.
St. Peter's, Rome ..	131	10,000
Breslau	213	6,340
Leipzig	248	2,160

Thus the total weight of the three domes at Leipzig is approximately the same as that of the dome at Breslau, and less than two-thirds of the dome of St. Peter's in Rome.

Many of the buildings described in this article are in areas which have been exposed to heavy bombing. Information about their behaviour which will be available after the war should shed interesting light on the resistance of such structures to shock, blast and the like.

The limits of space do not allow the reproduction of more examples of the Zeiss-Dywidag shell system. It is hoped, however that the information given in this article will enable architects to realize the possibilities of this system. It has opened a new chapter in the history of architecture.

INFORMATION CENTRE

The function of this feature is to supply an index and a digest of all current developments in planning and building technique throughout the world as recorded in technical publications, and statements of every kind whether official, private or commercial. Items are written by specialists of the highest authority who are not on the permanent staff of the Journal and views expressed are disinterested and objective. The Editors welcome information on all developments from any source, including manufacturers and contractors.

PHYSICAL PLANNING

1601 *City Government*

CITY GOVERNMENT. *K. Hall Gardner.* (*South African Architectural Record, Feb.*, 1944). Critical Study of Capetown Municipal Administration. Plea that Capetown Education should teach principles of City Government.

MATERIALS

1602 *Aluminium Alloys*

SOME POSSIBLE APPLICATIONS OF ALUMINIUM ALLOYS IN BUILDING. *Lecture by Dr. E. G. West at IAAS on June* 14, 1944. (*The Architects' Journal, July* 6, 1944, *pp.* 16-18, xxx). Possible applications of aluminium in roofs, gutters, partitions, doors, glazing bars and windows, canopies, kitchens and bathrooms, insulation, lights, escalators, wall facings.

1603 *Quantity Surveying*

AN EXAMPLE IN QUANTITY SURVEYING. *Arthur J. Willis, F.S.I.* (Distributed by Crosby Lockwood, 25s.) Useful book bridging gap between theory and practice. Four separate documents, comprising drawings for pair of cottages, set of dimensions for these, abstract showing how job should be worked-up, finally a complete Bill.

In his new book Mr. Willis has succeeded in being original and in producing for students and others a work of very considerable value.

It is unlike all other books; in fact, it is hardly correct to call it a book at all. It is, as the title clearly states, only *an example*—but an example which bridges the gap which has always existed between orthodox textbooks and practice.

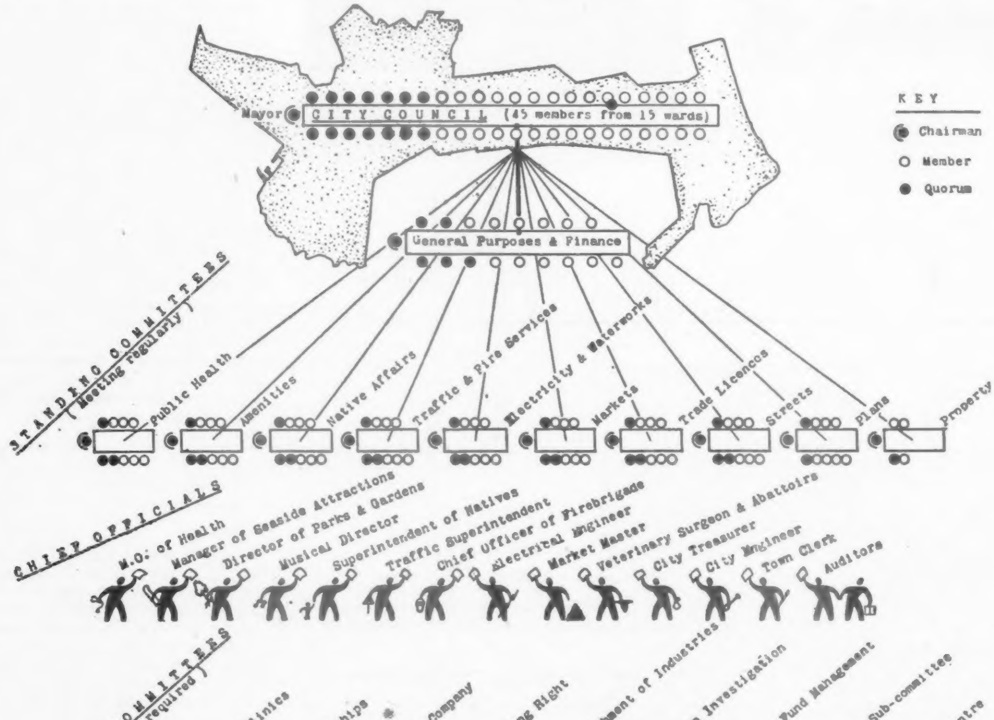
Briefly, the work consists of four separate documents, housed in a convenient case to resemble a book. First, a set of drawings for a pair of cottages—loose, so that they can be spread in front of the taker-off in a practical manner. Then, a set of dimensions in booklet form, showing the complete dimensions for the buildings, as they would be taken-off by a competent surveyor, with a commentary facing each page, which appears to anticipate every possible doubt and query.

After this comes the Abstract showing exactly how the whole job would, or should, be worked-up, and finally there is the complete Bill, with Preliminaries, Summary, and a separate Form of Tender—the final documents ready to be sent off to the Contractors tendering.

There must be very few surveyors who forget the peculiar difficulties of progressing from theory to practice. How difficult it was, in the early stages, to visualize the process as a whole, and later, how different it was to have to take-off, concisely, windows instead of *a* window, or drainage instead of *a* manhole. In the past, students frequently borrowed jobs from their office in an attempt to bridge this gap between theory and practice, but few actual jobs are perfect examples, and none is accompanied by the explanatory notes which a student really needs. This book has been too long in coming, and now that it is here, every student of Quantity Surveying would be advised to secure a copy.

1604 *Fireproofing Timber*

THE FIREPROOFING OF TIMBER. (*Timber Development Association, May,* 1944). Booklet on treatment of wood to increase its resistance to fire.



The organisation of the Capetown Council. See No. 1601

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Impregnation and surface treatment. Testing of Fire-Resistance.

The booklet has been prepared to give practical information on modern methods of treating timber to increase its resistance to fire, and to dispel the popular belief that timber (if properly treated) will not withstand the action of fire reasonably well.

Of the two general methods of treating timber to increase its fire resistance, impregnation under pressure with fire-retarding chemicals is far more effective than the use of surface coatings.

Appendices V and VI contain the chief fire-retardants and processes and the manufacturing firms, Appendices I-III descriptions of fire-resistance tests and methods. Appendix IV a classification of timbers according to general property of fire resistance. This list, however, is purely qualitative, and it is not stated what is meant by "very high fire resistance," "high fire resistance," etc. The user of wood would like to have exact figures regarding how, if he uses a given wood treated with a given chemical, his structure will stand up to fire in terms of Grades A, B, etc., according to B.S.S. No. 476 (Appendix I).

LIGHTING

1605 *Public Buildings*

THE LIGHTING OF PUBLIC BUILDINGS. (*Illuminating Engineering Society, London,* 1944.) Pamphlet on general points about the lighting of buildings used by public at large.

This is one of a series of pamphlets published currently by the Illuminating Engineering Society.

It seems to have as its main purpose the pointing of this moral, that as the public has often to use public buildings as a matter of necessity rather than choice, it is entitled to expect therein good light, as it would expect and normally obtain good water, pure air, and proper sanitation. For the remainder, the pamphlet is mildly instructive, rather as if addressed to such people as local authorities and administrative Boards. Technicalities are avoided. The following building types are discussed: public halls, schools, galleries and museums, libraries, recreation buildings and hospitals. There is a touch of optimism here and there, as for instance when it says that the lighting of art galleries can only be done when buildings are specially designed; there is a good deal of doubt that it can be done very well even then at present. But the pamphlet is well printed and illustrated.

1606 *Schools*

THE LIGHTING OF SCHOOLS. (*Illuminating Engineering Society, London,* 1944). Pamphlet setting out general principles and standards of lighting for schools.

This is the first of a series of Lighting Reconstruction Pamphlets prepared by the IES. It deals briefly with natural lighting and at more length with artificial lighting, and includes notes of desirable values of illumination, decoration, maintenance and the positioning of lighting equipment.

Its principal recommendations can be summarized as follows:—

1. The daylight factor should be not less than 2 per cent., and preferably 4 per cent.
2. Rooms should be at least 13 ft. high.
3. Ceilings should be white and the walls light. Blinds should also be light, and shiny surfaces are undesirable.
4. Supplementary artificial light should be of daylight colour, arranged to turn on automatically at certain minimum intensities.
5. Values of artificial light to be those of the IES Code.
6. There should be at least four fittings, giving a minimum illumination not less than three-quarters of the maximum. Details of fittings to reduce glare are stated.
7. All lamps and equipment should be overhauled monthly, and room redecoration re-done at least every five years. Light values should be checked monthly.

The pamphlet is excellently produced for eye comfort, with outstanding illustrations. But the material is not as clearly set out as one could wish. In particular the Society seems not to have been sure to whom it is addressed. Nevertheless it provides useful information for architects and should be acquired by them if they have to deal with Schools.

1607 *Brightness*

BRIGHTNESS ENGINEERING. *M. Luckiesh.* (*Transactions of the Illuminating Engineers' Society of America, February,* 1944, *p.* 75.) Problems of brightness in lighting design. Brightness contrast and ratios. Glare and specular reflection.

This article covers the following main types:—

1. Brightness contrast and ratio in the visual field.
2. Brightness ratios commonly experienced.
3. Specific problems of glare and specular reflection.

The discussion is in the semi-popular sales-style of the author, but contains, as usual some interesting items of design material.

For instance, he describes very clearly what parts of the visual field are affected by glare and brightness contrast. First, there is a central field of about 1° where we do our accurate seeing, and then, secondly, there is a field of 60° or so which forms the "surroundings" of the central field. (A solid angle of 60° is the equivalent of a 2-ft. circle viewed from 21 in. distance.)

A peripheral field extends beyond this to cover a full angle of 140° or so.

The 60° field which constitutes the "surroundings" is the region where glare and improper brightnesses can have most effect on the accuracy of vision. Where the surroundings are of about equal or slightly less brightness than the central field, efficiency is highest. When the surroundings are brighter than the central field there is an exceedingly rapid drop in efficiency, often to danger point, and the sensation is one of glare. All this has, of course, been known to scientists many years. But it never seems to reach designers effectively, perhaps because illuminating engineers, like other professional people, say what they have to say in journals written for themselves.

In speaking of the influence on design of such information, Mr. Luckiesh chooses a number of pertinent and homely examples, of which one is the desk top. A dark painted desk, he says, is an unsatisfactory background for ordinary work because the ratio of brightness between white paper and the desk top is too great. The reflection factors in common office furniture are commonly between 5 and 10 per cent., whereas he believes the desk top should have at least 25 per cent.

Another case of interest to architects is the cinema, which Mr. Luckiesh describes as being still "a victim of the illusion that you can see the picture better amid very dark surroundings." He goes on to say: "If looking at a motion-picture were really a task of critical seeing—which it is not—we would be more conscious of the abominably high brightness ratios of one to 1,000 and higher. Even so, the condition is a trying one, and it is easy to supply some light to the immediate surroundings without appreciably diluting the desirable contrasts in the picture itself."

The same applies to television, and obviously to a great many other things with which the architect is concerned. It is to be hoped that some day soon someone who understands both sides can be persuaded to set down this material clearly and concisely for designers' use.

1608 *Plant Safety*

DATA RELATING LIGHTING AND PLANT SAFETY. (*Transactions of the Illuminating Engineers' Society of America, February,* 1944, *p.* 120.) Collection of data on accident rates and lighting.

It has been asked frequently what effect lighting has on safety. Obviously intensities alone do not represent good lighting, but generally, to-day, in re-lighting big factories, lighting designers are employed and reasonable comfort conditions are achieved, as well as much higher intensities. Now a systematic survey has been completed of several representative renovated American installations in plants where accident rates are also available, and the data shows that consistently good results are being obtained.

In plants examined, the original light intensities were of the order of 2-10 foot candles, and the order of increase in lighting was to 20, 30 or 40 foot candles. The accident rates are available in many cases for periods of a year or more, and show decided decreases with the better illumination. For instance, in one case when the lighting was increased from 2.5 to 24 foot candles, the accident rate dropped from 31 to 15 per million man-hours, and in another case where the increase was only from 13 up to 25 foot candles, the accident rate decreased 18.8 per cent. Fourteen cases are reported.

The report seems to be entirely fair and well authenticated, and may be assumed to conclude any argument on the value of adequate illumination in places where there is a danger of accidents. Perhaps it is even reasonable to suggest that where the eyes are obviously able to function for higher safety by these intensities, they are also functioning better in respect of general health, a question which has long exercised the minds of people who are concerned with such problems as the effect of lighting on children's eyesight. School classrooms are often considered adequately lighted at 10 foot candles.

1609 *Night Vision*

THE BASIS OF NIGHT VISION. *G. L. Walls.* (*Transactions of the Illuminating Engineers' Society of America, February* 1944, *p.* 93.) Functioning of the eye in darkened conditions. Basis of dark adaptation described. Coloured light in blackout.

An extremely interesting and clear account of how our eyes work, with excellent illustrations. The functioning of the familiar rods and cones of the retina are elaborately discussed, and the reasons emerge for differences between nocturnal and diurnal creatures. One discovers also how we see accurately and why the accuracy drops at twilight, as well as the nature of colour vision. The basis of dark adaptation is described and also night blindness.

The material is not important to architects, but makes most attractive reading in a related field of knowledge. One interesting practical point concerns the use of coloured light in the blackout. We are familiar with blue, but Mr. Walls points out that blue light of sufficient intensity to be useful in reading signs, etc., is very visible to the fully dark-adapted eye of an enemy aviator overhead, whereas red of equally useful intensity cannot be seen. Also blue light causes us to be short-sighted and helps to cause accident. Apparently blue became popular for blackout entirely by accident in the last war.

QUESTIONS and Answers

THE Information Centre answers any question about architecture, building, or the professions and trades within the building industry. It does so free of charge, and its help is available to any member of the industry. Answers are sent direct to enquirers as soon as they have been prepared. The service is confidential, and in no case is the identity of an enquirer disclosed to a third party. Questions should be sent to: THE ARCHITECTS' JOURNAL, *45, The Avenue, Cheam, Surrey.*

1610 *Refractories*

Q *Can you recommend a book, preferably technical, on Refractories (i.e., refractory blocks, bricks, and cements)?*

A The following technical books should meet your requirements:—

Refractory Materials, by A. B. Searle (Charles Griffin & Co., Ltd. 45s. 0d.)

Refractories, by F. H. Norton (McGraw Hill Publishing Co., Ltd. 52s. 6d.).

You may also be interested to know of *The Refractories Journal*, published at 8, Adam Street, London, W.C.2.

1611 *RIBA Exams*

Q *I am an articled pupil and a Probationer of the RIBA studying for the May, 1945, Intermediate Examination.*

Can you supply me with the following information relating to the examination:

(i) *The publishers and prices of the text books whose titles and authors are set down upon the enclosed list.*

(ii) *The first Testimony of Study is a sheet of Freehand Drawing. The RIBA suggests that this may consist of sketches. Do you think that the examiners would accept sketches showing various parts of the interior of the house for which working and full-size details have to be prepared in further sheets?*

A 1. The names of publishers and prices of the books are:

Mechanics for Builders, 2 vols., Bates & Charlesworth (Longmans Technical Handcraft Series; 5s.).

Constructional Steelwork Simply Explained, Oscar Faber (Oxford University Press; 6s.).

Structural Steelwork for Building and Architectural Students, Reynolds & Kent (English Universities Press; 12s. 6d.).

Structural Steelwork for Buildings, H. P. Smith (Crosby Lockwood; 3s. 6d.).

Applied Building Mechanics, A. D. Turner (Pitman; 8s. 6d.).

Principles of Structural Mechanics, P. J. Waldram (Batsford; 12s. 6d.).

Structural Design in Steel and Frame Buildings, P. J. Waldram (B. T. Batsford; 12s. 6d.).

2. The RIBA inform us that the examiners would accept sketches showing the various parts of the interior of the house for which working and full-size details have to be prepared on further sheets, if the sketches reach the required standard. If you have any further enquiries of this nature, you cannot do better than communicate with the RIBA direct.

SOCIETIES AND INSTITUTIONS

Speeches and lectures delivered before societies, as well as reports of their activities, are dealt with under this title, which includes trade associations, Government departments, Parliament and professional societies. To economize space the bodies concerned are represented by their initials, but a glossary of abbreviations will be found on the front cover. Except where inverted commas are used, the reports are summaries, and not verbatim.

TCPA

R. L. Reiss

August 17, at The Planning Centre, 28, King Street, W.C.2. Talk to the Town and Country Planning Association on THE DISTRIBUTION OF INDUSTRY AND POPULATION, by R. L. Reiss, Vice-Chairman, Welwyn Garden City. Chairman, Councillor F. A. F. Keay, J.P., Mayor of Tottenham.

R. L. Reiss: Between the wars there were considerable migrations of population. These were mainly due to industrial and economic changes. During most of the period the heavy industries and certain other basic industries such as cotton and agriculture were very depressed. On the other hand, there were large developments of light industries, such as radio, and of assembly industries, such as motor and aircraft manufacture.

The depression of the industries in North and South Wales led to large scale movements of population to the south, and particularly to the Greater London area, where the newer light industries were settling.

If the newer industries had been located in the smaller towns in the south rather than being for the most part congregated in Greater London itself, this movement would not necessarily have been a bad thing. Unfortunately, however, the movement was mainly to the Metropolitan Police District. This led to the continuous spread of the suburbs, caused all kinds of Local Government difficulties, and involved the divorce of large sections of the people from the open countryside and even from reasonably large parks and open spaces.

Between 1921 and 1939 the population of Greater London rose from under 7½ million to 8¾ million. The situation thus created was considered in all its bearings by the Barlow Commission on the distribution of the industrial population. In their Report, the Commission stated that the growth of Greater London and the concentration of so large a population and so much industry in this one area, constituted a national menace, both from the economic and strategic point of view. How right they were about the strategic danger has been underlined by our recent experiences. As the Prime Minister stated in the House of Commons—the area of Greater London, 30 miles by 20 miles, was the largest target in the world.

The movement of population from other areas to Greater London was coupled with a movement from the London County Council area outwards. The population of the London County declined between the wars by nearly half a million. But this movements outwards extended to several of the areas immediately outside the County, particularly between 1921 and 1939. In those eight years West Ham, East Ham, Leyton, Walthamstow, Acton and Brentford, for example, all increased in population. Tottenham, whose population had been increasing before then, declined by 15,000.

One of the principal issues which will arise in connection with post-war planning, will be whether there should be a further re-distribution of industry and population, and if so, in what direction?

The first proposition which I wish to suggest is that the preservation of a green belt around the existing Greater London should be a prime object in planning the London region. A start had already been made with this by the LCC and the neighbouring County Councils before the war.

My second proposition is that the continuous spread of the suburbs should be stopped. But this can only be done if additional industry is prevented from coming into Greater London.

My third proposition is that there should be a concerted effort, both by the National Government, the LCC and the Local Authorities in Greater London to decentralize a portion of the existing population, not into the suburbs, but into small towns outside the green belt and in certain cases to new towns.

These propositions were all recommended by the Barlow Commission and the LCC in their Plan have also accepted the necessity for decentralization. Under the Plan, it is proposed that half a million people should be moved outside the County, together with the appropriate quantity of industry. My only quarrel with this proposal is that the proposed transference is not great enough. Under their Plan even then, the amount of open space would be too small, and they would be forced to re-house most people in flats and with high densities of population to the acre. West Ham also proposes that there should be a substantial reduction in its population—in fact a larger proportionate reduction than in the case of the LCC, and other Local Authorities just outside the County are thinking along the same lines.

I suggest that Tottenham should seriously consider whether a plan for really satisfactory living can be prepared for its pre-war population of nearly 150,000 on its area of 3,000 acres.

If you and Boroughs similarly situated accept this proposition, how is the necessary decentralization to be effected? The answer is that it can only be really achieved if there is a national planning policy, and the development of existing small towns is actively encouraged by the

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sanctioning of Housing Schemes there, and by directing industry away from the over-crowded areas. This does not mean that any particular industry would be forced to go to any particular place. The manufacturer would have his choice of many areas and he would receive assistance in removal.

Publications Received

Housing Yearbook, 1943. H. R. Pomeroy and E. H. Hoben. (National Association of Housing Officials, USA, 3 dollars).

Sculpture To-day in Great Britain. A. Broadbent. (J. Tiranti, 5s. 0d.).

Elementary Principles of Brickwork Construction. J. G. Proudman. (Chapman and Hall, 7s. 6d.).

Report of the West Indian Conference. (HMSO, 6d.).

The Natural Lighting of Houses and Flats, with Graded Daylight Factor Tables. T. Smith and E. D. Brown. (DSIR, HMSO, 4d.).

Must We Starve. J. James. (F. Muller, 5s. 0d.).

An Example in Quantity Surveying. A. J. Willis. (Crosby Lockwood, 25s. 0d.).

A Village in Piccadilly. Robert Henrey. (J. M. Dent, 12s. 6d.).

War Damage Commission: Cost of Work. Sir M. Trustram Eve (HMSO).

Charter for the Soil. J. Drummond. (Faber & Faber, 10s. 6d.).

Road, Rail and River in London. RA Planning Committee. (Country Life, 2s. 6d.).

St. Martins-in-the-Fields, New and Old. K. A. Esdaile. (Society for Promoting Christian Knowledge, 5s. 0d.).

Ninety-Nine Per Cent. John Gloag. (Cassell, 7s. 6d.).

Private Enterprise Housing. Ministry of Health. (HMSO, 1s. 0d.).

Design of Dwellings. Ministry of Health. (HMSO, 1s. 0d.).

Three Lectures on Architecture. Eric Mendelsohn. (University of California Press, 2.50 dollars).

Provision of Artificial Light. Draft, British Standard Code of Practice, Chapter VII (*a*). (British Standards Institution, 2s. 0d.).

Non-Ferrous Metals. Post-War Building Studies, No. 13. (HMSO, 1s. 0d.).

Mechanical Installations. Post-War Building Studies, No. 9. (HMSO, 2s. 0d.).

The Painting of Buildings, Post-War Building Studies, No. 5. (HMSO, 1s. 0d.)

Plumbing. Post-War Building Studies, No. 4. (HMSO, 1s. 0d.)

Greek Revival Architecture in America. Talbot Hamlin. (Oxford University Press, 42s. 0d.)

Choose Your Kitchen. A. Ballantyne. Faber & Faber, 5s. 0d.)

Daily Mail Book of Britain's Post-War Homes. M. Pleydell-Bouverie. (Associated Newspapers, 3s. 6d.)

The Place of Glass in Building. John Gloag. (Allen and Unwin, 2nd edition, 5s. 0d.)

Building To-Day. Martin S. Briggs. (Oxford University Press, 5s. 0d.)

Roads and Road Transport. (Report by the British Road Federation, 1s. 0d.)

The Welsh House. I. C. Peate. (Hugh Evans, 10s. 6d.)

The Building Industries Survey (*Vol. VIII, No.* 3, *July,* 1944). (Building Industries National Council.)

Tideless Thames in Future London. J. H. O. Bunge. (F. Muller, 10s. 6d.)

Building Regulation in New York City. J. D. McGoldruk, S. Graubard, R. J. Horowitz. (The Commonwealth Fund, 4.50 dollars.)

Gravity Die-Casting Technique. G. W. Lowe. (Hutchinson, 9s. 6d.)

Housing. (RIBA Report, 1s. 0d.)

Location of Employment. Planning, No. 224. (PEP, 1s. 0d.)

Building Societies Year Book, 1944. Edited by G. E. Franey. (Franey, 12s. 6d.)

The Practical Builder. Edited by R. Greenhalgh. (Odhams, 9s. 6d.)

Outline of Studies in Town Planning. H. V. Lanchester. (RIBA, 1s. 0d.)

Programme and Progress. A Pamphlet dealing with the Preparation of Charts for Civil Engineering and Building Contracts. Ministry of Works. (HMSO, 9d.)

A Short Dictionary of Architecture. Dora Ware and Betty Beatty. (Allen and Unwin, 6s. 0d.)

British Woodland Trees. H. L. Edwin. (Batsford, 12s. 6d.)

The Honeywood Settlement. H. O. Cresswell. (Faber, 7s. 6d.)

Bath. R. A. L. Smith. Batsford, 12s. 6d.)

Conversion Factors and Tables. (British Standards Institution, 3s. 6d.)

Common Wealth Policy, 1944-5. (C.W. Publishing Co., 3s. 6d.)

Government Policy for the Rebuilding of Urban Areas: The Town and Country Planning Bill. H. Molson and P. Thorneycroft. (Tory Reform Committee.)

ANNOUNCEMENT

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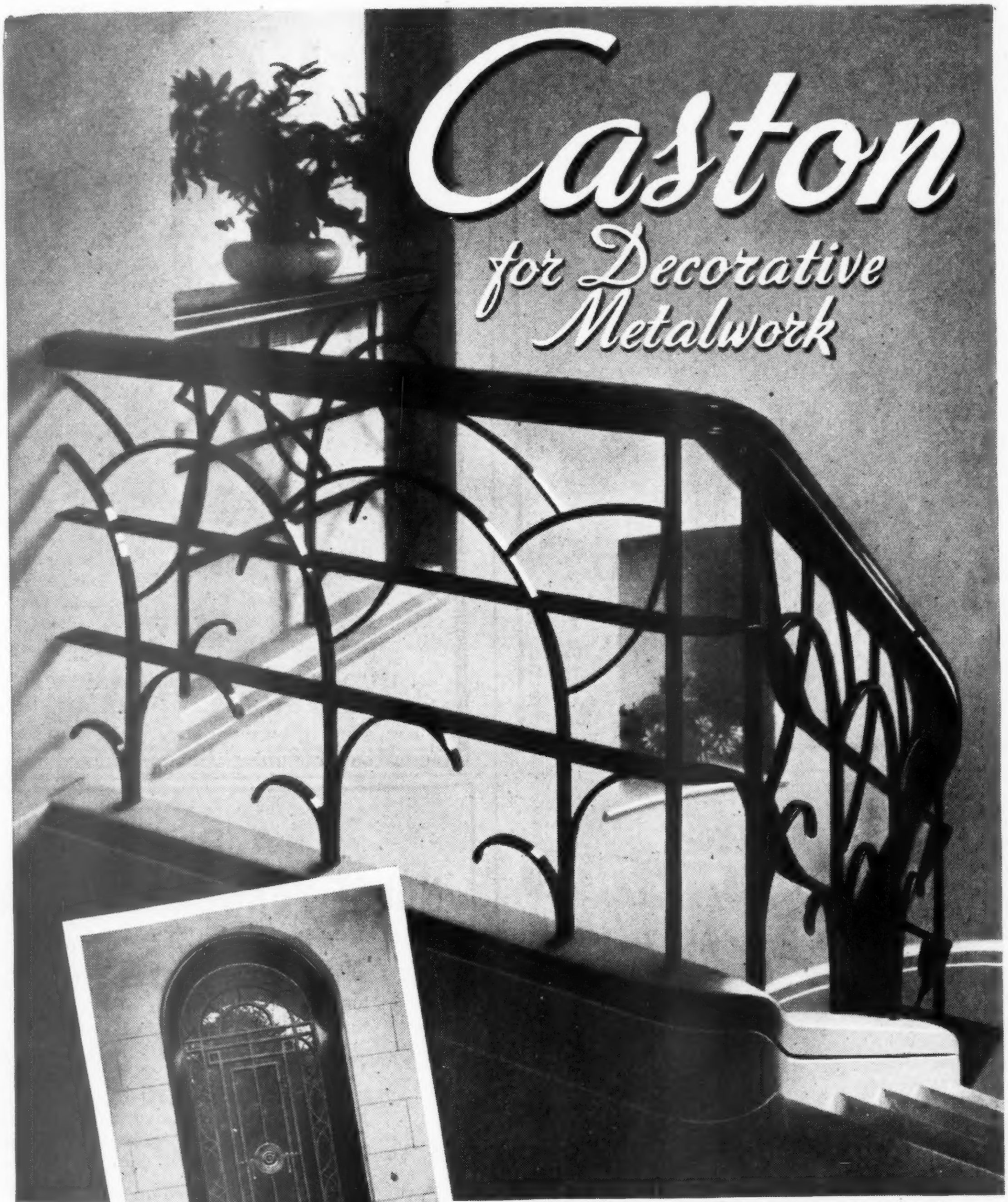

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Replies to Box Numbers should be addressed care of "The Architects' Journal." War Address: 45 The Avenue, Cheam, Surrey.

Public and Official Announcements

Six lines or under, 8s.; each additional line, 1s.

THE INCORPORATED ASSOCIATION OF ARCHITECTS AND SURVEYORS maintains a register of qualified architects and surveyors (including assistants) requiring posts, and invites applications from public authorities and private practitioners having staff vacancies. ADDRESS: 75 EATON PLACE, LONDON, S.W.1. TEL.: SLOANE 5615. 991

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Applications are invited for the post of PLANNING OFFICER, at a salary ranging from £700 to £900 per annum, by increments of £50, plus war bonus and travelling allowance.

Applicants should be members or associate members of the Town Planning Institute, and qualifications in engineering and/or architecture will also be an advantage.

The appointment will be subject to the provisions of the Local Government Superannuation Act, 1937, and the successful candidate will be required to pass a medical examination.

The appointment will be subject to one month's notice on either side.

Applications, stating age, qualifications and experience, together with copies of three recent testimonials, must be received by the undersigned not later than the 3rd October, 1944.

ALLAN JANES,
Clerk to the Committee.

Planning Office, 100, Easton Street,
High Wycombe, Bucks. 774

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Applications are invited for the appointment of PLANNING OFFICER, at a salary of £550, rising to £650 per annum by annual increments of £25, plus war bonus in accordance with the Whitley Council Scale, and car allowance.

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Applicants must be Corporate Members of the Town Planning Institute, and preference will be given to applicants with the Corporate Membership of either the Royal Institute of British Architects, the Institution of Civil Engineers, the Chartered Surveyors' Institute, or the Institute of Municipal and County Engineers.

Applications, stating age, qualifications and experience, accompanied by copies of three recent testimonials, must be sent to reach the undersigned not later than 30th September, 1944.

A. E. GILFILLAN,
Clerk.

Town Clerk's Office, Town Hall,
Barnsley.
9th September, 1944. 780

WEST RIDING (EASTERN DISTRICTS) JOINT TOWN PLANNING COMMITTEE

(Comprising the Boroughs of Goole and Pontefract, the Urban Districts of Castleford, Featherstone, Garforth, Knottingley and Selby, the Rural Districts of Goole, Osgoldcross, Selby and Tadcaster, in the West Riding of the County of York).

Applications are invited for the appointment of PLANNING OFFICER, at a salary of £550, rising to £650 per annum by annual increments of £25, plus war bonus in accordance with the Whitley Council Scale, and car allowance.

The appointment will be whole time and subject to the Local Government Superannuation Act, 1937. Office accommodation in Pontefract, and staff, will be provided by the Joint Committee.

Applicants must be Corporate Members of the Town Planning Institute, and preference will be given to applicants with the Corporate Membership of either the Royal Institute of British Architects, the Institution of Civil Engineers, the Chartered Surveyors' Institute, or the Institute of Municipal and County Engineers.

Applications, stating age, qualifications and experience, accompanied by copies of three recent testimonials, must be sent to reach the undersigned not later than 30th September, 1944.

G. WILKINSON,
Clerk to the Committee.

Municipal Offices, Pontefract. 777

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BOROUGH OF NEWTOWNARDS.

APPOINTMENT OF ARCHITECT.

The Council of the above-named Borough requires the temporary services of an Architect to prepare a Town Planning, Housing and Boundary Extension Scheme in consultation with the Borough Surveyor. Provided the Council is satisfied with the services given, the appointment will be for a period of twelve months in the first instance. The salary will be at the rate of £500 per annum, payable monthly. The appointment will be subject to the approval of the Ministry of Health and Local Government for Northern Ireland, and may be terminated on one month's notice, with the like approval.

Applicants must be Registered Architects, and should hold the final examination Certificate of the Town Planning Institute.

Applications, stating qualifications, age, and experience, and accompanied by copies of two testimonials, should be delivered to the undersigned not later than 12 o'clock (noon) on the 30th day of September, 1944.

Dated this 11th day of September, 1944.

WILLIAM HARVEY,
Town Clerk.

Town Hall, Newtownards,
North Ireland. 785

STAFFORDSHIRE COUNTY COUNCIL.

TOWN AND COUNTRY PLANNING.

COUNTY PLANNING DEPARTMENT.

Applications are invited from persons not liable for military service or who are exempt therefrom, for the following appointments, in the Office of the County Planning Officer engaged on the preparation of a County Advisory Plan and Statutory Planning Schemes within the County:—

1.—TWO SENIOR (GRADE E) PLANNING ASSISTANTS.

(a) One with Architectural Qualifications.
(b) One with Civil or Municipal Engineering Qualifications.

Applicants for both appointments must be Corporate Members of the Town Planning Institute, preferably with experience in a Regional Planning Office. The commencing salary for both appointments will be £450 per annum, rising to £500 by two annual increments of £20 and one of £10.

2.—ONE (GRADE D) PLANNING ASSISTANT.

Who must be an able Draughtsman and Surveyor, preferably with Town Planning Institute Intermediate Qualifications. Commencing salary will be £300 per annum, rising to £375 by annual increments of £15.

3.—TWO JUNIOR (GRADE B) PLANNING ASSISTANTS.

Commencing salary will be £160 per annum, rising to £220 by annual increments of £12 10s.

In every case the salaries stated are at present subject to an additional allowance in respect of war bonus. The appointments will be subject to the Local Government Superannuation Acts, 1937 and 1939, and the successful applicants will be required to pass a medical examination. The appointments will be determinable by one calendar month's notice on either side.

Applications in writing, stating age, qualifications, experience and position with regard to Military Service, accompanied by copies of three recent testimonials, must reach the undersigned not later than the 14th October, 1944.

Canvassing directly or indirectly will be a disqualification. Applicants must state in their applications whether they are related to any member of the County Council.

T. H. EVANS,
Clerk of the County Council.

County Buildings, Stafford.
12th September, 1944. 781

Architectural Appointments Vacant

Four lines or under, 4s.; each additional line, 1s.

Wherever possible prospective employers are urged to give in their advertisement full information about the duty and responsibilities involved, the location of the office, and the salary offered. The inclusion of the Advertiser's name in lieu of a box number is welcomed.

WEST END Architects and Surveyors require competent Assistant. Apply, stating age, experience, N.S. position and salary required. Box 768.

ARCHITECTURAL ASSISTANT required immediately in S.E. Kent. Apply, stating age, experience, references and salary required. Box 767.

JUNIOR ARCHITECTURAL ASSISTANT, with knowledge of industrial design or capable of preparing working drawings, required by progressive firm. Apply, stating age, experience or training, and salary.—Box 773.

PROGRESSIVE DAIRY FIRM requires Qualified Assistants, architect's department; good prospects; applicants between 30/40 years. Write full particulars, experience, salary required. Box 4, Smith's Library, Guildford, Surrey. 772

JUNIOR ASSISTANT required, Student or Associate RIBA, for Industrial and Domestic Work and Town Planning. State age, experience, salary required, and if exempt from National Service. Ronald Vallis, F.R.I.B.A., Frome, Somerset. 782

ARCHITECTURAL and Surveying Assistant, with good knowledge of specifications and quantities required; salary up to £400 per annum, according to experience. Reply with full details to Box 765.

ARCHITECTURAL ASSISTANT required in Eastern Counties in connection with post-war Building Schemes. Applicants must be capable of preparing working drawings from sketches. Apply, giving full particulars and salary required, Box 776.

WANTED.—Capable experienced Architectural Draughtsman for work on design and construction new type pre-fabricated houses. Interesting work, central London. Fine post-war prospects. Write fully, stating age, experience, salary required, and when free. Box 758.

Architectural Appointments Wanted

Architectural Assistants and Students seeking positions in Architects' offices will be printed in "The Architects' Journal" free of charge until further notice.

A.R.I.B.A., with good all-round experience, desires spare time work. Box 345

ARCHITECT, experienced in carrying through works complete; London and provinces. Box 346.

JUNIOR seeks position, Architect's office, Birmingham district; school certificate. Box 356.

ARCHITECT'S ASSISTANT JUNIOR requires a situation in an Architect's Office, preferably London area. Box 362.

JUNIOR ARCHITECTURAL ASSISTANT requires post in Architect's or Local Government Office; exempt military service; South London or Surrey. Box 348.

YOUNG Art Student, 17, very keen to make a start, at living wage, as Assistant in Architect's Drawing Office. "L. G.," 353, Gillott Road, Edgbaston, Birmingham, 16. 349

HIGHLY qualified and experienced Civil Engineer, aged 31 (University graduate) desires appointment with Architect, with view to future partnership. For further particulars apply Box 361.

YOUTH, aged 16½, seeks post in London Architect's Office; 3 years' student of Brixton School of Building; will be studying for R.I.B.A. exams. Reply Box 360.

STUDENT, R.I.B.A. (exempt), with 2 years' full-time training at a London school of architecture, desires position in progressive Architect's Office; London preferable. Box 357.

A.R.I.B.A., 26 (exempt), with good all-round practical experience, desires permanent, responsible position in Office which can offer sound post-war prospects; salary required £520; please give some details. Box 352.

B.A. (Arch.), A.R.I.B.A., Dip. T.P., aged 24 (exempt Forces), varied experience, including town planning, desires post with good prospects; Bristol or South of England preferred. Box 359.

SENIOR QUALIFIED ARCHITECT, long experience in all classes of housing, offers services to private firm or small L.A. in South Midlands; housing and reconstruction only (no bureaucracies or big business). S. G. Wilson, 3, Greenhill Street, Stratford-on-Avon. 347

ARCHITECTURAL ASSISTANT (25); R.I.B.A. intermediate standard; experienced in preparing working drawings, and details of housing schemes, schools, shops, factories, etc., and also surveying and levelling, specifications and quantities; neat and fast draughtsman; Belfast or Dublin preferred. Box 353.

ARCHITECTURAL ASSISTANT, aged 26; 6 years' office experience, with part-time school training; varied experience includes hospitals, schools, churches, cathedrals, etc.; working drawings and details; can carry out theodolite, dumphy and general surveys; R.I.B.A. intermediate standard; salary £5 approx.; references. Box 354.

CONTINENTAL Architect, with many years' experience in planning and designing of all kinds of buildings, public and private; competent in every branch of profession; 5 years in this country; 3 years in London office; good British references; working permit; available at once; London area; terms by arrangement. Box 355.

YOUNG Architectural and Surveying Assistant, aged 22 years, intermediate standard, desires contact Professional Firm or Consultants in Birmingham, Coventry or London districts regarding position with same immediately after cessation of hostilities; at present engaged on factory work; would prefer similar or domestic and commercial design. Full particulars on request to Box 358.

ARCHITECT and SURVEYOR, L.R.I.B.A. (registered), desires responsible position; age 39; Quantity Surveying; 10 years' experience designing licensed houses and hotels for Midland breweries; ⅛th scale working drawings, details, specifications, hospitals, factories, housing estates, general supervision of works, checking accounts, measuring war damage and preparing schedules of repairs; permanent position with good prospects; salary by arrangement.—Box 350.

Other Appointments Vacant

Four lines or under 4s.; each additional line, 1s.

YOUNG SURVEYOR, with architectural experience, required by Limited Company engaged on General Building, Contracting and Estate Development in London area. Write, giving full details of experience, age, references, and salary rquired. Box 282, Reid Walker, Field House, London, E.C.4. 775

Other Appointments Wanted

Four lines or under, 2s. 6d.; each additional line, 6d.

GROUP of Three CHARTERED ENGINEERS (B.Sc., A.M.I.Mech.E., A.M.I.E.E., etc.) offer spare time services; specialists in design of engineering layouts for hospitals and laundries. Write to Group Consultants, 234, Alexandra Avenue, South Harrow, Middlesex. 786

Planning

As originators of the Auto-Recorder System of Machine Milking we have had extensive experience of planning lay-outs to accommodate the new technique. The service of our Technical Department is available to any Architect planning or modifying farm buildings for this purpose. Write in confidence to:—The Planning Dept., Gascoignes (Reading) Ltd., Gascoigne House, Berkeley Avenue, Reading. 603

Miscellaneous

Four lines or under, 4s.; each additional line, 1s.

A. J. BINNS, LTD., specialists in the supply and fixing of all types of fencing, tubular guard rail, factory partitions and gates. 53, Great Marlborough Street, W.1. Gerrard 4223-4224-4225.

PLAN CHEST required and Draughts' Stool; state price. Box 784.

WANTED.—*The Architects' Journal* for August, 1943, to August, 1944. Box 766.

FENCING AND GATES of every type, supplied and erected. Specialists in chain link. Boulton & Paul, Limited, Norwich. 662

QUALIFIED STRUCTURAL ENGINEER offers services for spart time Preparation of Design and Detail Drawings, R.C. and Steelwork etc. Box 779.

GENTLEMAN, now Army officer, having large Architectural connection, would like to invest £5,000 in Company allied to the Building Trade (preferably paint) with a view to working directorship.—Box 756.

For Sale

Four lines or under, 4s.; each additional line, 1s.

"TURNER Architectural Practice," 17s. 6d.; "Macey Specification in Detail," 40s.; "Faber Heating and Air Conditioning," 45s.; "Yorke Specification, 1944," 15s.; "Willis Elements of Quantity Surveying," 17s. 6d.; "Cresswell Honeywood File," 7s. 6d.; "Chesterman" 66-ft. Steel Tape." All new and unused; post additional. Box 778.

Educational Announcements

Four lines or under, 4s.; each additional line, 1s.

R.I.B.A. AND T.P. INST. EXAMS. Private Courses of tuition by correspondence arranged by Mr. L. Stuart Stanley, M.A., F.R.I.B.A., M.T.P.I. Tutor, 161, West Heath Road, N.W.3. 231

R.I.B.A. QUALIFYING EXAMINATIONS.
Mr. C. W. Box, F.R.I.B.A., M.R.San.I.
Courses by Correspondence and Personal in Studio.
115, Gower St., London, W.C.1.
TELEPHONE: EUSTON 3305 and 3906.

MANCHESTER MUNICIPAL SCHOOL OF ART.

CAVENDISH STREET, ALL SAINTS, MANCHESTER, 15.
'Phone: Ardwick 3480.

Principal: JOHN M. HOLMES, Dip. Fine Art., Lond., N.R.D., F.R.S.A.

ARCHITECTURE, INDUSTRIAL DESIGN, AND DRAWING AND PAINTING.

SCHOOL OF ARCHITECTURE.

Head of School: A. DOUGLAS JONES, A.R.I.B.A., Dip. Arch. (Liverpool), Athens Burser.

COURSE—*Intermediate.*—Three years' full-time (inclusive of Probationer Year), leading to the Studentship of the Royal Institute of British Architects.

Final.—Five years' full-time (including Probationer and Intermediate years), leading to the School Diploma (D.A. Manc.), to the examination for the Associateship of the Royal Institute of British Architects (A.R.I.B.A.), and for Registration under the Act.

Part-time Day and Evening Courses for pupils and junior and senior assistants in offices lead to the examinations of the Royal Institute of British Architects.

FEES: £12 12s. for one year's full-time day attendance. Part-time day and evening courses, fees according to scale.

SCHOLARSHIPS, PRIZES, ETC.—Free Entrance, Continuation, and Senior Art Scholarships; School Prizes; Travelling Scholarships.

SESSION BEGINS SEPTEMBER 25th.

Prospectus from the Registrar. 762

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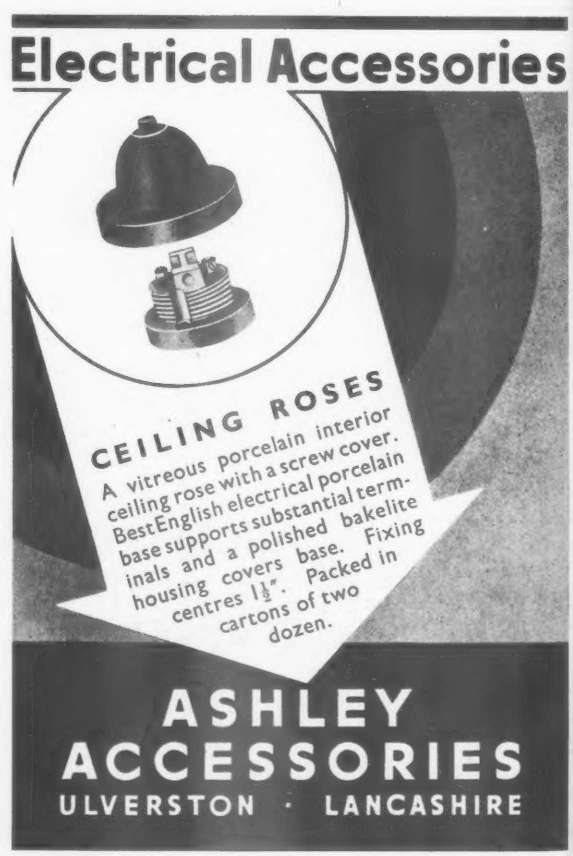

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