THE ARCHITECTS' JOURNAL

No. 2602] [VOL. 100

THE ARCHITECTURAL PRESS

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★ The war has both multiplied the number of Official Departments and encouraged Societies and Committees of all kinds to become more vocal. The result is a growing output of official and group propaganda. A glossary of abbreviations is now provided below, together with the full address and telephone number of the organizations concerned. In all cases where the town is not mentioned the word LONDON is implicit in the address.

AA	Architectural Association. 34/6, Bedford Square, W.C.1.	Museum 0974
ABT	Association of Building Technicians. 5, Ashley Place, S.W.1.	Victoria 0447-8
APRR	Association for Planning and Regional Reconstruction. 34, Gordon Square, W.C.1.	Euston 2158-9
ARCUK	Architects' Registration Council. 68, Portland Place, W.1.	Welbeck 9738
ASB	Architectural Science Board of the Royal Institute of British Architects. 66, Portland Place, W.1.	Welbeck 5721
BC	Building Centre. 23, Maddox Street, W.1.	Mayfair 2128
BCIRA	British Cast Iron Research Association. Alvechurch, Birmingham.	Redditch 716
BDA	British Door Association. Shobnall Road, Burton-on-Trent.	Burton-on-Trent 3350
BIA	British Ironfounder's Association. 145, Vincent Street, Glasgow, C.2.	Glasgow Central 2891
BIAE	British Institute of Adult Education. 29, Tavistock Square, W.C.1.	Euston 5385
BINC	Building Industries National Council. 11, Weymouth Street, W.1.	Langham 2785
BOT	Board of Trade. Millbank, S.W.1.	Whitehall 5140
BRS	Building Research Station. Bucknalls Lane, Watford.	Garston 2246
BSA	British Steelwork Association. 11, Tothill Street, S.W.1.	Whitehall 5073
BSI.	British Standards Institution. 28, Victoria Street, S.W.1.	Abbey 3333
CCA	Cement and Concrete Association. 52, Grosvehor Gardens, S.W.1.	Sloane 5255
CEMA	Council for the Encouragement of Music and the Arts. 9, Belgrave Square, S.W.1.	Sloane 0421
CPRE	Council for the Preservation of Rural England. 4, Hobart Place, S.W.	Sloane 4280
CSI	Chartered Surveyors' Institution. 12, Great George Street, S.W.1.	Whitehall 5322
DIA	Design and Industries Association. Central Institute of Art and Design, National Gallery, W.C.2.	Whitehall 2415
DOT	Department of Overseas Trade. Dolphin Square, S.W.1.	Victoria 4477
EJMA	English Joinery Manufacturers Association (Incorporated). Sackville House, 40, Piccadilly, W.1.	Regent 4448
FAS	Faculty of Architects and Surveyors. 8, Buckingham Palace Gdns., S.W.1.	Sloane 2837
FMB	Federation of Master Builders. 23, Compton Terrace, Upper Street, N.1.	Canonbury 2041
FS (Eng.)	Faculty of Surveyors of England. 8, Buckingham Palace Gdns., S.W.1.	Sloane 2837
GG	Georgian Group. 55, Great Ormond Street, W.C.1.	Holborn 2664
HC	Housing Centre. 13, Suffolk Street, Pall Mall, S.W.1.	Whitehall 2881
IAAS	Incorporated Association of Architects and Surveyors. 75, Eaton Place, S.W.1.	Sloane 3158
ICE	Institution of Civil Engineers. Great George Street, S.W.1.	Whitehall 4577
IEE	Institution of Electrical Engineers. Savoy Place, W.C.2.	Temple Bar 7676
IOB	Institute of Builders. 48, Bedford Square, W.C.1.	Museum 7197
IRA	Institute of Registered Architects. 47, Victoria Street, S.W.1.	Abbey 6172
ISE	Institution of Structural Engineers. 11, Upper Belgrave Street, S.W.1.	Sloane 7128-29
LIDC	Lead Industries Development Council. Eagle House, Jermyn Street, S.W.1.	Whitehall 7264
LMBA	London Master Builders' Association. 47, Bedford Square, W.C.1.	Museum 3767
MARS	Modern Architectural Research. 46, Sheffield Terrace, W.8.	Park 7678
MOA	Ministry of Agriculture and Fisheries. 55, Whitehall, S.W.1.	Whitehall 3400
MOE	Ministry of Education. Belgrave Square, S.W.1.	Sloane 4522
MOH	Ministry of Health. Whitehall, S.W.1.	Whitehall 4300
MOI	Ministry of Information. Malet Street, W.C.1.	Euston 4321
MOLNS	Ministry of Labour and National Service, St. James's Square, S.W.1.	Whitehall 6200
MOS	Ministry of Supply. Shell Mex House, Victoria Embankment, W.C.	Gerrard 6933
MOT	Ministry of Transport. Berkeley Square House, Berkeley Square, W.1.	Abbey 7711
MOTCP	Ministry of Town and Country Planning. 32-33, St. James's Square, S.W.1.	Whitehall 8411
MOW	Ministry of Works. Lambeth Bridge House, S.E.1.	Reliance 7611
NAMMC	Natural Asphalte Mine-Owners and Manufacturers Council. 94, Petty France, S.W.1.	Abbey 1010
NBR	National Buildings Record. 66, Portland Place, W.1.	Welbeck 1881
	All Souls' College, Oxford.	Oxford 48809
NFBTE	National Federation of Building Trades Employers. 82, New Cavendish Street, W.1.	Langham 4041
NFBTO	National Federation of Building Trades Operatives. 9, Rugby Chambers, Rugby Street, W.C.1.	Holborn 2770
NFHS	National Federation of Housing Societies. 13, Suffolk St., S.W.1.	Whitehall 2881/2/3
NT	National Trust for Places of Historic Interest or Natural Beauty. 7, Buckingham Palace Gardens, S.W.1.	Sloane 5808
PEP	Political and Economic Planning. 16, Queen Anne's Gate, S.W.1.	Whitehall 7245
PWB	Post War Building, Directorate of. Ministry of Works, Lambeth Bridge House, S.E.1.	Reliance 7611
RCA	Reinforced Concrete Association. 91, Petty France, S.W.1.	Whitehall 9936
RIBA	Royal Institute of British Architects. 66, Portland Place, W.1.	Welbeck 5721
RS	Royal Society. Burlington House, Piccadilly, W.1.	Regent 3335
RSA	Royal Society of Arts. 6, John Adam Street, W.C.2.	Temple Bar 8274
SFMA	School Furniture Manufacturers' Association. 13, New Square, Lincoln's Inn, W.C.	Chancery 5313
SPAB	Society for the Protection of Ancient Buildings. 55, Great Ormond Street, W.C.1.	Holborn 2646
TCPA	Town and Country Planning Association 28, King Street, Covent Garden, W.C.2.	Temple Bar 5006
TDA	Timber Development Association. 75, Cannon Street, E.C.4.	City 6147
TPI	Town Planning Institute 18, Ashley Place, S.W.1.	Victoria 8815

ER

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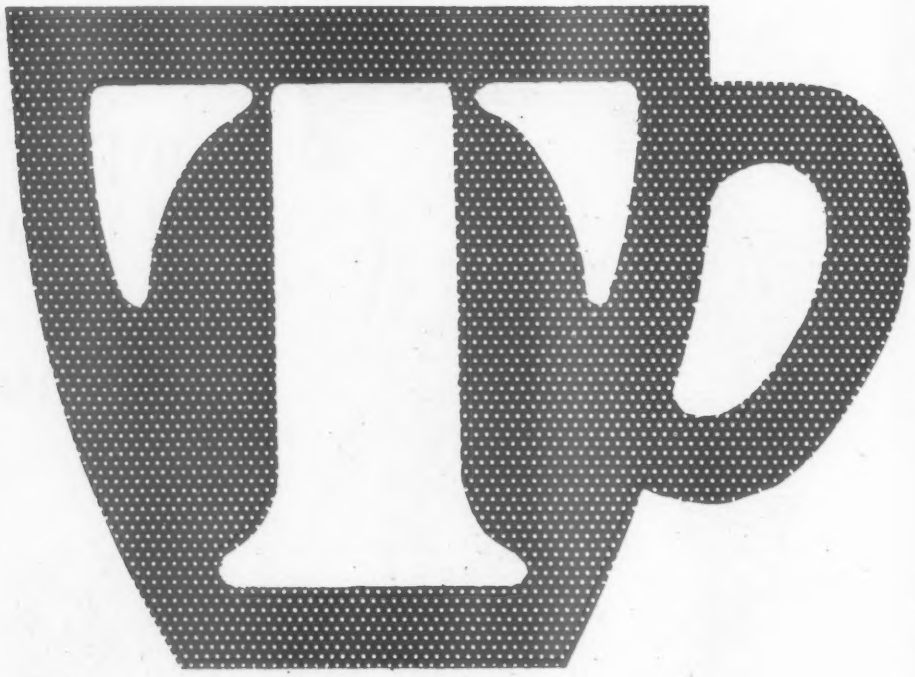
A



TO ARCHITECTS and others concerned with the rebuilding of Britain:

Whether they are designing community centres, shops, factories, office buildings, holiday camps, railway stations, schools or health centres, they can be certain that sooner or later those using their buildings will be 'dying for a cup of tea'.

The Empire Tea Bureau welcomes discussion with architects on all problems to do with tea drinking. Its files, plans, specifications are freely at their disposal.

The Empire Tea Bureau is a service organisation set up by all Empire tea growers to ensure that good tea is available to all. The Bureau is concerned solely with encouraging those who desire to make or drink the National Beverage in ideal conditions.

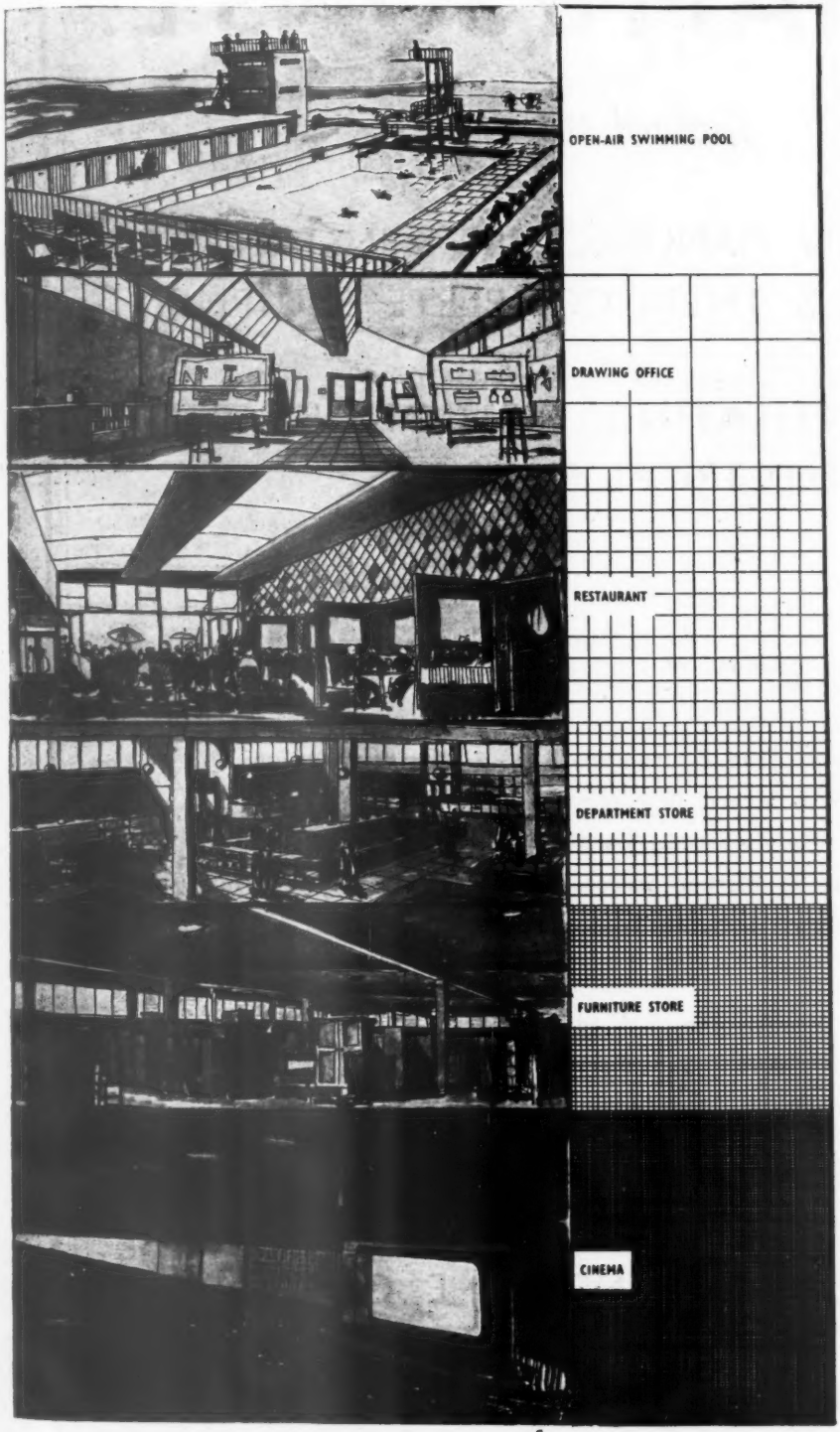
The Empire Tea Bureau has carried out very wide research and experiments during the war. Large factory canteens have been run, new and better equipment designed. Facts, figures, blue prints, findings both financial and technical, are at the architect's disposal in the public interest.

tea

PLEASE ADDRESS ALL ENQUIRIES TO: THE EMPIRE TEA BUREAU
REGENT HOUSE
KINGSWAY LONDON WC2
CHANCERY 6601

BUILDING FOR DAYLIGHT

No. I FACTS ABOUT GLASS FOR ARCHITECTURAL STUDENTS



Daylight is a constituent part of building: it is universally and freely distributed, and should be considered in relation to the function and planning of all structures above ground level. Each type of building has its own particular daylighting problem, and the quantity of daylight used should correspond with functional needs. A graduated scale of the daylighting required by different buildings is shown here, ranging from the open-air swimming pool, which needs 100% daylight, to the cinema theatre, which needs none.

Good natural lighting depends upon:

1. The amount of daylight available.

2. The size and position of the openings which admit daylight into a building.

3. The use of appropriate transparent or translucent material for filling these openings to admit and distribute daylight and to satisfy such requirements as resistance to weather and heat and sound insulation.

These problems will be examined in greater detail in this new series of sheets, prepared for the information of architectural students.

* * *

This is published by Pilkington Brothers Limited, of St. Helens, Lancashire, whose Technical Department is always available for consultation regarding the properties and uses of glass in architecture.

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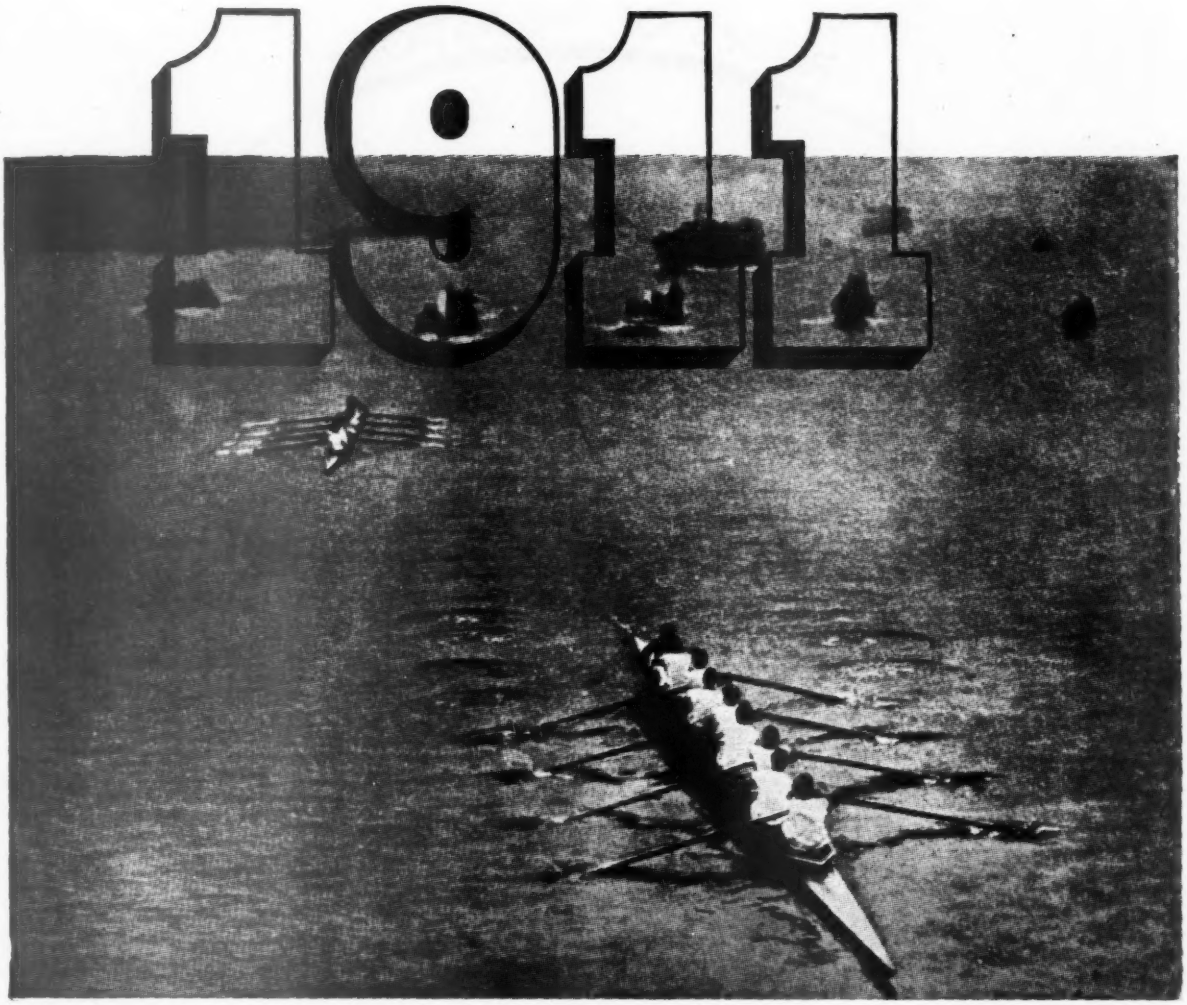
where architectural students may get advice and information on all questions relating to the properties of glass and its use in building.



Oxford wins the University Boat Race by 2¾ lengths in record time (to date) of 18 minutes, 29 seconds. April 18, 1911.

WHEN WE WERE YOUNG

Most photographs of the event show that the spectators were more interested in an aeroplane flying over the course for the first time, than in the race itself. No doubt there were many who deprecated the intrusion of the new-fangled contraption ('if it had been intended that we should fly, we would have wings'), and there could have been few who foresaw the mighty future in the air, that is common understanding now. No public notice was focused on another event of 1911 — the foundation of the firm Cellon, but, amongst other matters, our eyes were fixed on the aeroplane with more than casual interest. The progress of Cellon has been parallel to the progress of aviation and we can look back on thirty odd years of effort with justifiable satisfaction.

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A hunting they will go...

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The Prestcold model suggested below is presented as an ideal all-purpose model for homes of moderate size. It would hold sufficient perishable food for four people and be arranged for fitting at waist height to avoid backaching stooping.

From war-gained experience in making the most economical use of vital materials Prestcold engineers will hope to produce this model at a surprisingly low price in view of the following special advantages it offers:—

Storage capacity of approximately 4½ cubic feet, which will hold all the perishable foodstuffs for a family of four.

Larder space rendered unnecessary. Dry goods and non-perishable foodstuffs would be kept in kitchen cupboards.

Waist-high refrigerator door, allowing access to interior without stooping.

Height adaptable by varying position of supporting frames.

Refrigerator can be built into kitchen fitments with cupboard space above and below it.

Design provides for adequate ventilation of mechanism without the necessity for special air-bricks or ducting.

Ice making and "cold cooking" facilities.

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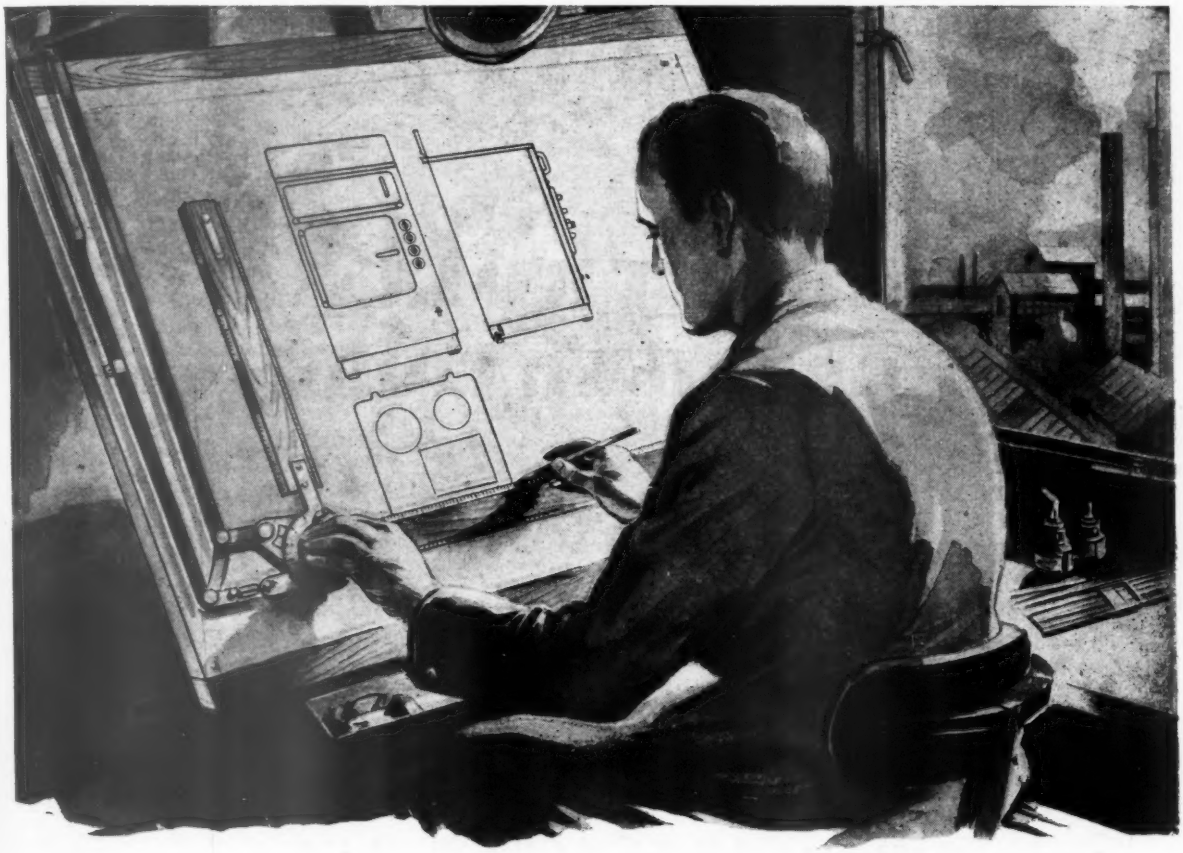

English Electric

DOMESTIC·APPLIANCE·DEPARTMENT

Message for December

PRIOR to the war, 'English Electric' were large manufacturers of domestic appliances. But these activities have been largely restricted since 1940 and the Company's resources have been devoted to the manufacture of electrical equipment for works' canteens and British Restaurants. The added experience thus gained is now being utilised in the development of new types of appliances for the homes of post-war Britain. This equipment includes Cookers, Heaters, Hot Water Systems, Washing Machines and other units of advanced design.

Whilst your plans are still fluid it will be an advantage to discuss them with one of our Development Engineers. In the first instance, you are invited to write to the Domestic Appliance Dept., Queen's House, Kingsway, W.C.2.

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B

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He hopes she can read it . . . how's the garden — and Bill? He's thinking of home. He'll have a home one day . . . and lashings of light — yes, in his own home . . . when . . . For this man — and a million like him — new homes are in the planning. Homes to whose modern amenities Edgar's are ready to lend a long experienced hand . . . in installations for lighting, cooking and heating.

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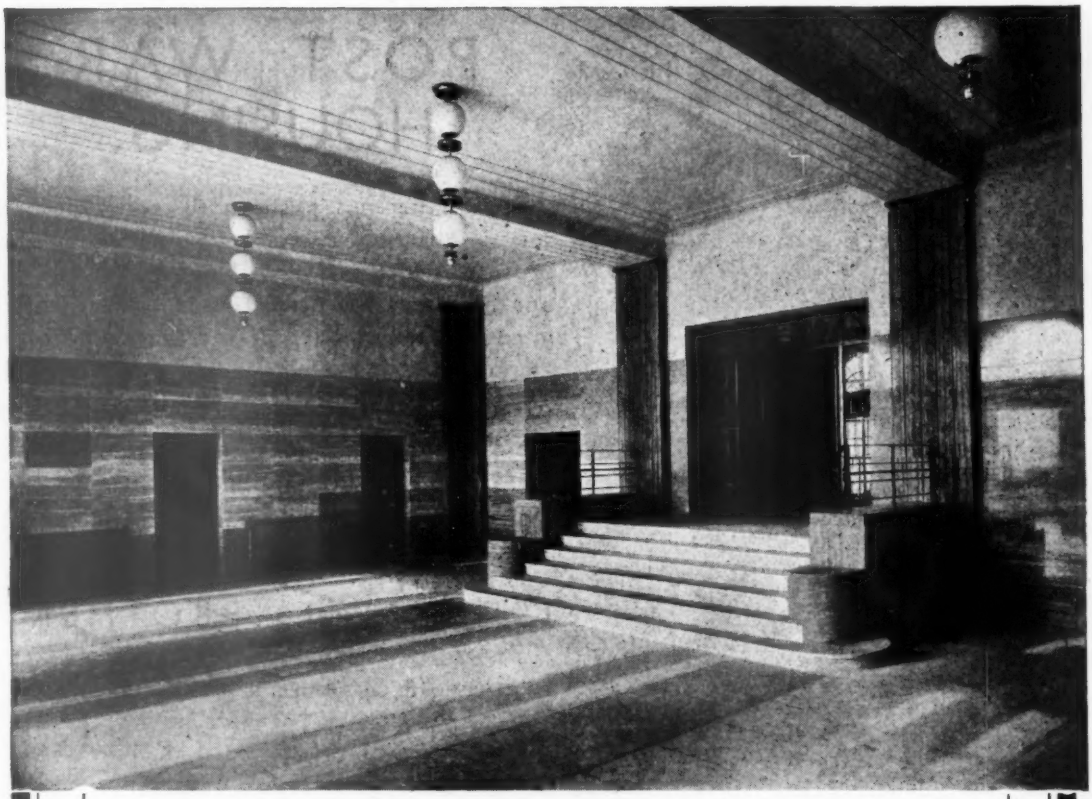

A QUALITY PRODUCT

The illustration above shows the Entrance Hall to the Shire Hall, Chelmsford. County Architect: John Stuart, F.R.I.B.A. The photograph demonstrates the suitability of Truscon Precast Units for incorporation into Buildings of a high Architectural standard.

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PLANNING TOMORROW

Typical Example of Recessed Fire Equipment

The above illustration is just one example of many ways in which accommodation for "Pyrene" Fire Equipment has been effectively provided in the Architect's Plans. We should be glad to co-operate and make suggestions from our wide experience; and thus, if we may, help you to plan fire protection for the buildings of to-morrow, so that they are adequately protected against the ravages of fire.

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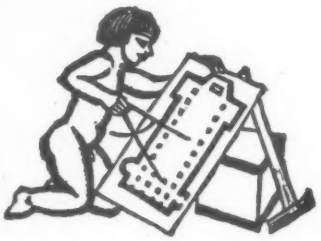

DIARY FOR DECEMBER JANUARY AND FEBRUARY

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.

BERWICK - ON - TWEED. *When We Build Again.* Exhibition and Film. (Sponsor, TCPA, in collaboration with Messrs. Cadbury Bros). The Town and Country Planning Association is holding a conference on the last day of the Exhibition. DEC. 9-16

BRISTOL. *1944 ArchSA Congress.* Symposium. *The Architect's Contribution to Reconstruction.* Exhibition of work from Schools of Architecture in Great Britain. (Sponsor, ArchSA). DEC. 12-15

CROSBY, LIVERPOOL. *The English Town: Its Continuity and Development.* (Sponsor, TCPA). JAN. 17-31

GATESHEAD. *Rebuilding Britain.* Exhibition. At Shipley Art Gallery. (Sponsor, BIAE). DEC. 11-30

LONDON. *Town and Country Planning Association's Annual Conference.* On Problems of Redevelopment, Overspill and Rural Planning. At the Waldorf Hotel, Aldwych, W.C.2. (Sponsor, TCPA). DEC. 8-9

T. P. Bennett. *The Architect and Organization of Post-War Building.* At the RIBA, 66, Portland Place, W.1. (Sponsor, RIBA). 5.30 p.m. DEC. 12

The Insulation of Buildings, Domestic and Industrial. Fifth paper in series on *Thermal Insulation.* At the Institution of Mechanical Engineers, Storeys Gate, S.W.1. 2.30 p.m. DEC. 13

What is Modern Architecture? MARS Group (Modern Architectural Research) discussion, at which the public is invited to take part. At the RIBA, 66, Portland Place, W.1. Chairman: Professor Sir Charles Reilly. Speakers: John Summerson, E. Goldfinger, Prof. William Holford, Anthony M. Chitty, and M. Hartland Thomas. After the introductory speeches, the meeting will be open for general discussion. 6.30 p.m. DEC. 13

J. C. Nicol. *Organization of Industrial Electrical Maintenance.* At Institution of Electrical Engineers, Savoy Place, Victoria Embankment, W.C.2. (Sponsor IEE). 5.30 p.m. DEC. 14

David Cushman Coyle. *The Tennessee Valley Authority.* At 2, Savoy Hill, W.C.2. (Sponsor, TCPA). 1.15 p.m. DEC. 14

Electrical Tools for the Building Industry. Exhibition. At the Connaught Rooms. F. C. Orchard, chief electrical engineer of Hornsey, will give an address on the present day use of small tools in the building industry at the opening ceremony, December 18, 2.15 p.m. (Sponsor, LMBA). Tickets for the exhibition from the LMBA, 47, Bedford Square, W.C.1. DEC. 18

Competition for the best Design for an International Airport for London. Promoters *The Aeroplane,* Bowling Green Lane, London, E.C.1. Assessors: Austin Blomfield, M.A., F.R.I.B.A.; H. Roxbee Cox, B.SC.; Air Vice-Marshal D. C. T. Bennett, C.B.E., D.S.O.; W. R. Verdon Smith; and Dennis H. Handover. Prizes: 1st, £500; 2nd, £100; 3rd, £50. Closing date December 31, 1944. Overseas entries must arrive at the offices of *The Aeroplane* by February 16, 1945. DEC. 31

Discussion. *Lay-out of Road Intersections.* Introducer, A. J. H. Clayton. At the Institution of Civil Engineers, Great George Street, Westminster, S.W.1. (Sponsor, Institution of Civil Engineers). 5.30 p.m. JAN. 9

L. H. Keay. *Post-War Housing.* At 66, Portland Place, W.1. (Sponsor, RIBA). 6 p.m. JAN. 16

Applications of Electricity to Water Supply. Discussion. At the Institution of Electrical Engineers, Savoy Place, Victoria Embankment, W.C.2. (Sponsor, IEE). 5.30 p.m. JAN. 22

S. R. Raffety. *Rural Water Supplies.* At the Institution of Civil Engineers, Great George Street, Westminster, S.W.1. (Sponsor, Institution of Civil Engineers). 5.30 p.m. JAN. 23

National Federation of Building Trades Employers Luncheon. At the Connaught Rooms. Chairman, J. G. Gray, the President. Guest of honour, Ernest Bevin, M.P., Minister of Labour and National Service. JAN. 25

SPALDING, LINCS. *The English Town: Its Continuity and Development.* Exhibition. At the East Elloe Post-War Housing Committee, Holbeach. (Sponsor, TCPA). DEC. 7-16

WORKINGTON. *Town and Country Planning Association Conference.* Speakers, Mrs. Jean Mann and George Bull, Town Clerk, Durham. JAN. 13

The English Town: Its Continuity and Development. Exhibition. (Sponsor, TCPA). JAN. 8-13

NEWS

THURSDAY, DECEMBER 7, 1944
NO. 2602 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.

In the south Devon area which was used for a battle training school for American troops the UNITED STATES ARMY IS TO ERECT A MEMORIAL.

Architects and others are to be invited to submit designs, with a prize of £25. The memorial, a rugged one in granite, 20 ft. high, erected in an exposed position, is to commemorate the fact that 3,000 people cheerfully left their homes to provide this essential training for the invasion of France.

Three ring roads, a green belt for future satellite towns and a ZONING SCHEME FOR MANCHESTER are among the City's post-war plans.

The zoning scheme consists of a series of areas, each having its own identity, and from which all traffic except that on business will be discouraged. Shops, amusements, civic buildings, educational centres, warehouses, commerce and residential areas will each be cut up into precincts. They will thus be rendered quiet for normal occupations, with a reduction in the road accident rate. Three ring roads are proposed—an inner, linking shops, entertainments and railways; an intermediate, for industrial zones; and an outer, for long-distance through traffic, with a green belt beyond on which future satellite towns might be built.

SHOP FRONTS AND INTERIORS. The use and application of new materials, developed during the stress of war, will play an all-important part in the rebuilding of new Britain.

ARCHITECTURAL WOOD AND METAL WORK. The entirely new standards in conception and manipulation which can now be employed will have a marked influence on the trend of new designs and the plans of modern architecture.

SHIP FURNISHINGS. Here, too, the standards already set by Parnalls in the famous trans-Atlantic liners of immediate pre-war years, will be but the basis for post-war design and treatment.

RESEARCH AND EXPERIENCE in all the above subjects are available within the framework of this organisation, and it is not too early to plan at once, having regard to the restricted means which will be available.

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From AN ARCHITECT'S *Commonplace Book*

THE VOCABULARY AND SYNTAX OF STANDARDS. [*From* Our Building Inheritance *by W. H. Godfrey* (*Faber and Faber*)]. All good architecture through the ages has been standardized, that is, its component parts have been uniform and based upon an agreed and accepted pattern. Variation has been found in arrangement and in the enrichment of standard forms. Language is standardized in that we use the same vocabulary and the same grammar but the beauty of both prose and verse is rendered possible by the handling of our words and the syntax. If we can standardize the details of building it will be an enormous gain, for people will gradually learn to know them and by familiarity will possess themselves of a common standpoint. Standardization, moreover, enables good things to be made economically, it can raise the quality and reduce the cost. But let us beware of standardizing the plan, the assembling of the units, their arrangement and disposition, or we shall risk making all men to a pattern, with a loss of individuality and all the joy and colour of life. It is a fault to which Government departments are especially prone, the long gestation of a plan or a formula and its rigid application in and out of season.

★

To extend the grid system the Central Electricity Board aims at providing NINETY MILLION POUNDS WORTH OF NEW PLANT by the winter of 1948.

Part of the programme has already begun. Owners of selected stations supplying the grid have already been directed to instal new turbines, boilers and cooling towers. These will increase their generating capacity by about 900,000 kilowatts by the winter of 1946 and by a further 340,000 kilowatts by the following winter. By the winter of 1947 three new stations will be in operation, the first sections of which will have a total capacity of 270,000 kilowatts The remainder of the extensions are scheduled for 1947 and 1948. These will require further authority from the Government. To avoid delay, the board has already arranged with the stations concerned, including owners of two of the proposed new stations, to begin at once preparing designs and specifications and placing provisional contracts. Central and South-East England will get the three new stations. They are allocated to Meaford, owned by the North-West Midlands Joint Electricity Association, Cliff Quay (Ipswich Corporation) and Kingston (London and Home Counties Joint Electricity Association). Two others, subject at present to further Government release, are planned for Mid-Durham (North-Eastern Electricity Supply Co.) and Croydon (Croydon Corporation).

The uncertainties of the timber position have been CAUSING VERY CONSIDERABLE ANXIETY amongst the many users of timber.

As a result various Timber Consumer Associations have for some time past been consulting together with regard to the whole position. The Consumer Associations concerned, which are listed below, recently decided to set up an Ad Hoc Committee so that the activities of these bodies in this matter could be effectively co-ordinated:—British Furniture Manufacturers' Federated Association; English Joinery Manufacturers' Association (Inc.); National Federation of Box and Packing Case Manufacturers; Railway Carriage and Wagon Builders' Association; School Furniture Manufacturers' Association; Timber Furniture Manufacturers' Association; Timber and General Fencing Contractors' Association. These consumer Associations very much hope that other similar associations will join them. Information can be obtained from the Joint Secretaries to the Committee at St. Paul's House, 61/3, St. Paul's Churchyard, E.C.4. The Joint Secretaries are:—Cuthbert Greig, Secretary of the British Furniture Manufacturers' Federated Association; R. G. Harvey-Greenham, Secretary of the English Joinery Manufacturers' Association (Inc.); G. E. Titley, Secretary of the Timber Building Manufacturers' Association. The Committee has already directed a request to the Minister of Supply asking him to receive a deputation to discuss the timber situation in the period immediately following the cessation of hostilities with Germany.

In India on November 1 *occurred the DEATH OF LIEUT. ROBERT BERNARD VERDON, R.E., B.Arch., A.R.I.B.A., at the age of* 31.

Lt. Verdon, who joined up in the early days of the war, served with the R.A. until last year, when he was drafted with the Royal Engineers to India attached to the York & Lancs Regiment. There he served with the Chindits, and for many months was in Burma behind the enemy lines, cut off from their base except for radio. Recently he returned on leave to India, where he was convalescing in an Army Rest Camp, but he was suddenly taken ill and died. Lt. Verdon studied in Blackpool Grammar School, and then joined the Liverpool School of Architecture, where he graduated in 1936, getting his B.Arch with First Class Honours. He worked in the Architect's Departments of Liverpool, Preston, and Derby.

Lieut. Robert B. Verdon, R.E., B.Arch., A.R.I.B.A., who has died in India on active service. (*See News item above*).

★

In England and Wales NINETY THOUSAND CHURCHILL HOUSES HAVE BEEN ALLOCATED to local authorities by The Ministry of Health.

In Scotland, a further 33,020 have been allocated. London is to have 25,000. Some of the other figures are:—Liverpool, 3,500; Birmingham, 4,500; Bristol, 2,000; Southampton, 2,000; Norwich, 1,000; Coventry, 1,000; Sunderland, 1,000; South Shields, 450; Newcastle, 1,000; Hull, 2,250; Leeds, 1,500; Sheffield, 2,000; Harrogate, 104; Derby, 400; Leicester, 750; Grimsby, 500; Nottingham, 1,000; Luton, 300; Slough, 300; Exeter, 600; Plymouth, 250; Bath, 600; Stoke, 700; Birkenhead, 500; Blackpool, 350; Barrow, 400; Manchester, 3,000; Dover, 400. The Ministry of Works states that the cost of the house delivered and erected with water, drainage, gas and electricity, will come to £600. This does not include the cost of the site.

Mr. Justice Humphreys: Is the architect for this building alive? If he is I should LIKE TO ORDER HIS IMMEDIATE EXECUTION.

Complaining of the acoustics during the Assizes at Maidstone, Mr. Justice Humphreys asked: Is the architect who designed this building alive? Mr. Norman Parkes, prosecuting counsel: I do not know, my lord. The Judge: Because, if he is, I should like to exercise the powers I have of ordering his immediate execution. He added that the witness-box was carefully placed to make it as unlikely as possible that the jury would hear a single word that was said. The Assize Court at Maidstone was built about 100 years ago.

All architects in the Forces are now included in the EMPLOYMENT BUREAU WORK OF THE IAAS, whether members or not.

The Incorporated Association of Architects & Surveyors is extending its normal employment bureau work at its own expense, to include all architects and surveyors and assistants now in the Forces or on war work. These are invited, whether members or not of the Association, to forward essential particulars to the IAAS, 75, Eaton Place. S.W.1. A Register is being compiled, and steps taken to furnish every possible help in securing post-war employment.

Design for Research

This issue of the JOURNAL is devoted mainly to an article on airport design by an expert in the subject. It is significant that the author has both architectural and engineering qualifications, for in no other field of design is the relationship between architect and engineer so intermeshed. The above structure, examples of which are often included in the equipment of airports, is, however, a piece of pure engineering—the fan of a giant Boeing wind tunnel for testing aircraft. It is interesting to architects, not only as an example of that dramatic, yet functional and largely incidental, beauty so often found in modern machines, but also as a symbol of the concentrated and objective technical research applied to engineering, which building so badly needs if it is to keep pace with other branches of technology.

★

Replying in the House of Commons to the Address on the King's Speech on November 29, Mr. Winston Churchill, the Prime Minister, said that HOUSING IS THE MOST THREATENED SECTOR ON THE HOME FRONT.

I have, he said, for some time been disquieted by the situation. During the last four or five months I have been continually referring to it by minute and by personal discussion. He continued: The objective is painfully plain—namely, to provide in the shortest time the largest number of weather-proof dwellings in which our people can live through this winter in reasonable comfort. The subject is divided, like ancient Gaul, into three parts—repair, prefabricated, and permanent, or, using the code names which have become so common in military matters, Rep, Prefab, and Perm. (Laughter.)

At the summit of this problem sits Lord Woolton, and what I will venture to call, somewhat disrespectfully, the Housing Squad, including not only War Cabinet Ministers, but also some who are not ministerial at all. These collect, co-ordinate, and in a great many cases decide, subject to the War Cabinet in the last resort, what is to be done. I have reserved to myself the right to take the chair when and if at any time I think it necessary or desirable. That is the function, the relationship, of Lord Woolton to this general scheme. Lord Woolton has shown a very great deal of energy and grip in trying to meet the difficulties of the past, difficulties which are being continually added to by the fire of the enemy. He has taken a number of steps, but I did not consider that the situation—it was borne in upon me by questions, and answers which I had to give in this House—was such that we did not require to smooth out and make more precise the arrangements for gripping this problem. Naturally, with the war going on, one's mind is drawn to the focusing of executive forces of an emergency character upon the really serious parts of the problem. On a lower level, but of equal practical importance, an importance which outweighs the superior level, is the great field of emergency executive action. I can in a word state the relations between the Minister of Works and the Minister of Health in this field of London repair. The Ministry of Health is the great ambassador department which deals with local authorities, and nothing must be done to hamper that long usage. Therefore the Ministry of Health is the ambassador for the Ministry of Works in respect of the taking over of areas, streets, and so forth that really require more power than any local authority can bring to bear. For the rest, executive power will increasingly rest with the Ministry of Works, which will have to discharge all the task of repair which cannot be undertaken, or is not being effectively undertaken, by the local authorities. We shall have to produce the prefabricated houses which I spoke of at the beginning of the year, but which cannot be produced in the numbers I then mentioned, but still can be produced in very great number and of varying types. Further, they have to make, in the closest liaison with the Board of Trade, the fittings and parts of all kinds which must be made not only for the Reps and for the Prefabs, but also for the Perms, which must get forward as fast as they possibly can under the driving power of the Minister of Health and the Secretary of State for Scotland. I do not want to go more into this now, because we shall very likely have a special debate on the subject.

AIRPORTS IN THE FUTURE

THE importance of civil aviation has now been recognized rather tardily by the Government in the creation of a separate Ministry for it. Of more immediate interest to the profession is the recent publication of two large airport projects, one for London* and the other, more recently, for Blackpool ; and the architectural competition for an International airport for London, promoted by the *Aeroplane*. Regarding the former, the architects† are to be congratulated on establishing the precedent that the architect shall play a leading part in the design of a great modern airport in this country (and not be merely the person called in to design the terminal building). The sponsors of the schemes are also to be congratulated for preparing concrete proposals, on actual sites, in which the far-reaching recommendations of the Department of Civil Aviation have been illustrated and in which their effect on town and country planning, on architecture and on civil aviation can be gauged.

The function of air transport is not always understood. It is supplementary to ground transport, not an alternative to it. The air transport company sells Speed, that is to say it carries traffic which is prepared to pay a higher rate for the saving in time. It therefore follows that the success of air transport depends firstly on keeping the extra cost as low as possible and secondly on maintaining a town-to-town speed which shows a worth-while saving of time over the ground speed for the same journey. These two factors are inter-related. If the town-to-town speed is reduced to 75 m.p.h. by badly sited or badly planned airports, the service will not be much better than the best express train and, if a saving of 30 minutes (by using faster aircraft or a more costly airport site) means an increase of 50 per cent. in costs and rates, only very high priority traffic will be attracted and the service will not pay. The success of a civil airport depends, therefore, on the close co-operation of the aircraft designer, the air-line operator, the town-planner, the architect and the various specialist engineers working under the control and regulation of the Ministry of Civil Aviation. The airport, however, cannot be considered by itself. To maintain the requisite town-to-town speed there must be express road and rail connections between town and airport, as well as telegraph and telephone cables, and the airport must be properly sited as near the town as possible.

So far, only the tactical problems have been considered. The strategic problem is well illustrated by the Blackpool project. The Blackpool Town Council has approved the preliminary design for a Trans-oceanic airport *twice as large as the town itself* with a landing ground of 42 square miles (nearly one-quarter of which would be paved) and a seaplane lagoon of over 12 square miles. This is the largest scheme yet put forward anywhere in the world, yet the landing ground no more than complies with the recommendations of the Department of

* Illustrated in the A.J. of Sept. 30, 1943 & March 23, 1944.
† Messrs. Guy Morgan & Partners.

Civil Aviation. The cost of the project is not given but, comparing it with the smaller London scheme, cannot be less than £30,000,000.

The promoters of the Blackpool project appear to envisage two or more such airports, that at Blackpool serving the north of England but, from what has been said about the function of air transport, it will be clear that it cannot support more than one (if that) £30,000,000 airport in this country. The British Overseas Airways Corporation, who will operate the international lines, appears to prefer a terminal in the London district, and the official view seems to be that such a large undertaking can only be provided by the State.

The provision of air transport is, then, clearly a nation-wide matter and, if time and money is not to be wasted, the new Minister must speedily bring forward a master plan for the air-lines in and from Great Britain, which should itself form part of a comprehensive National Plan.

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

NOTES & TOPICS

ARNHEM SCENE

I have been talking to some of the men back from Arnhem, who described to me the kind of country in which they fought. The town of Arnhem itself is on flat land immediately to the north of the river, but just behind the town the country rises quite steeply, and this broken hilly country runs eastwards alongside the river for some ten miles. It was in this area, to the east of the town, that most of the fighting occurred. The highest point is only about 300 feet, but the contours are steep and the ridge is cut by a number of little valleys and dells. All of it, outside the town, is well wooded.

*

The perimeter which the main body held for over a week was in the eastern suburb of Oosterbeek. Oosterbeek is something of a Spa. The houses are large, solid, and of stone, mostly detached, of two stories, and with an exterior of white-painted stucco. All of them were extremely well kept, distinguished by wide Dutch windows with large horizontal panes in sash windows. Most of them had extensive grounds, full of autumn flowers, tennis courts, orchards and ornamental shrubberies. Their nearest equivalent, in this country, would be found in Leamington Spa or Cheltenham, save for the broken nature of the ground.

*

Further to the east, in the area in which both the paratroops and the glider-borne men landed, the country is not unlike lowland Scotland, small glens lined with pines or with rough pasture in which a kind of broom grows. On the afternoon of the Sunday, September 17, it all looked very elegant and peaceful in the warm, calm sunshine of a day in early autumn.

*

A week later the suburb had been smashed to pieces. Every house had been turned into a fortress, and had been gradually demolished by artillery or mortar bombs, or fired by incendiary grenades. The trees were shattered, the lawns and flower beds torn to pieces by slit trenches, craters, tank tracks and the gun-pits of the artillery. The whole area was littered with the debris of battle.

*

And not a word of complaint from the inhabitants, nothing but help, the sharing of food, the search for water. The Dutch may be a stolid people, but they seem to have both deep convictions and the courage to match them.

TPI EXAMS

On July 27 I complained in these columns about the inadequate arrangements the Town Planning Institute had made for the candidates who sat for its annual examination in London. The doodle bugs were falling and little was done to give that sense of security to the candidates so essential if they were to be able to concentrate calm minds on answering those far from easy and rather vague questions invariably posed by the TPI in its exam papers.

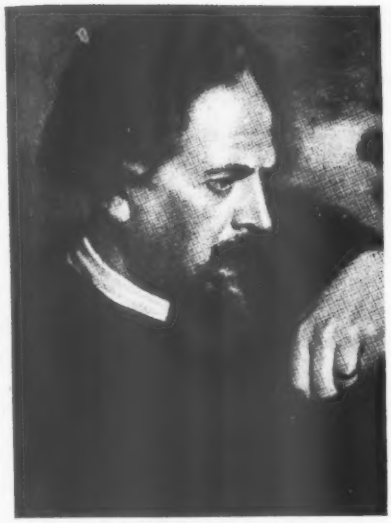
*

Now the results of that exam are out and I have received a letter from one of the candidates, who writes:

"Dear Astragal,—At last the TP final results are out and I—for one—have received the bald statement that I have failed—apparently in all subjects—although it is not mentioned. I wonder how the remainder have fared? I consider myself of average intelligence—with a good memory and about 10 years' Town Planning practice behind me. I swotted soundly for about a year before the exam. You have already mentioned in your column the conditions prevailing at the examination, but you did not mention that during 80 per cent. of the total week we were under fire; the average night's rest was 3 hours and there were up to three immediate danger signals per paper and no extra time allowed. I have since heard that the examination was also held in Scotland—but we were not given the option of sitting there, although Lancs and Yorks candidates were actually nearer to that centre. I may be labouring under a grievance, but the whole question surely calls for a statement from the Board."

MIRACLE AT THE WAR HOUSE

One of the few artists brought into prominence by the war is Abram Games—formerly Sapper, then Sergeant, now Lieutenant, RE. In pre-war days, Games was unknown outside the advertising profession, in which he worked; in recent years his posters have been seen by so many million men that, if only one in a thousand has noticed his name, he must still be among the best-known of contemporary artists.



Victor Vesnin, President of the USSR Academy of Architecture.

The neat signature in small capital letters of A. GAMES indicates the work of the Army's poster designer No. 1, and it must be counted as something in the brasshats' favour that they have given this young man plenty of rein, for his technique, compared with the average poster-designer's, is so advanced that they might well have fought shy of it. Indeed, few commercial patrons of the poster have ever given their chosen artists as free a hand as the Army has given Games. His task was difficult; to design posters that would sell not merchandise but ideas.

*

Incidentally, his work is finding its way into other fields of design besides the poster. A soldier's head which was originally the subject of one of Games' posters has now been printed on cambric sheets as the motif of wraps for native women. These are being sent to West Africa to clothe the populace and at the same time do some "reminder advertising" for the Salute the Soldier campaign.

IN RUSSIA NOW

The romantic looking gentleman whose portrait appears above is Mr. Victor Vesnin, the Percy Thomas of the USSR, President of the Academy, and designer of the Dnieper Power Plant, the Palace of Labour, the Government Palace at Kiev, etc. It is reproduced from a recent copy of *Architecture in the USSR*, a technical paper which occasionally reaches this country, but which is published only in Russian, a language which to the uneducated eye looks more as if it had been knitted than printed on the page.

Luckily for those who cannot unravel it, an English language periodical called *Architecture* has now begun to appear from Moscow, and the news it contains is supplemented by Arthur Ling's *Soviet Reconstruction Bulletin.*

*

Architecture in Soviet Russia is evidently humming like a dynamo. The replanning of Stalingrad,—surely the 2.96 acres per 1,000 persons suggested here is very low?—conferences on housing, war damage, and the protection of monuments are among the activities reported as well as such minor matters as the fact that the Portal House is being discussed as keenly in the Donbas as in Westminster; that at Panteleimonovka an enthusiastic, timber-saving local architect is building brick-domed houses with the help of a team of girls; that in Georgia a steel works is in full blast in a district formerly inhabited only by wild boars; that Tudor timber-framed buildings were the most popular item in the recent exhibition of English architecture; and that in Moscow the birth-rate has trebled, and Sir Archibald Clark Kerr's house is being repainted.

*

Every page is studded with statistics which leave the ordinary reader breathless and glassy-eyed, would probably make even an American blink, and are perhaps the cause of Mr. Vesnin's air of weary preoccupation.

*

Together these publications give an interesting account of how our allies are solving their own immense problems of reconstruction even if they make us sigh a little in envy of the speed with which things seem to be accomplished in Soviet Russia.

BEACHCOMBER'S CORNER

Dr. Strabismus (Whom God Preserve), of Utrecht, is experimenting at Waggling Parva with jet-propelled prefabricated houses. The houses are "blown," like glass, into the required shape by gigantic bellows, and are then jet-propelled to the place where they are needed. The first dozen houses blown turned out to be irregular, hexagonal buildings, owing to a flaw in the bellows. They were then jet-propelled in the direction of Weymouth; and landed among the Westmorland fells.—(Beachcomber in the *Daily Express.*)

ASTRAGAL

LETTERS

G. B. J. Athoe
(Secretary, Incorporated Association of Architects and Surveyors)

A. L. Abbott, F.R.I.B.A.

Building Jigsaw

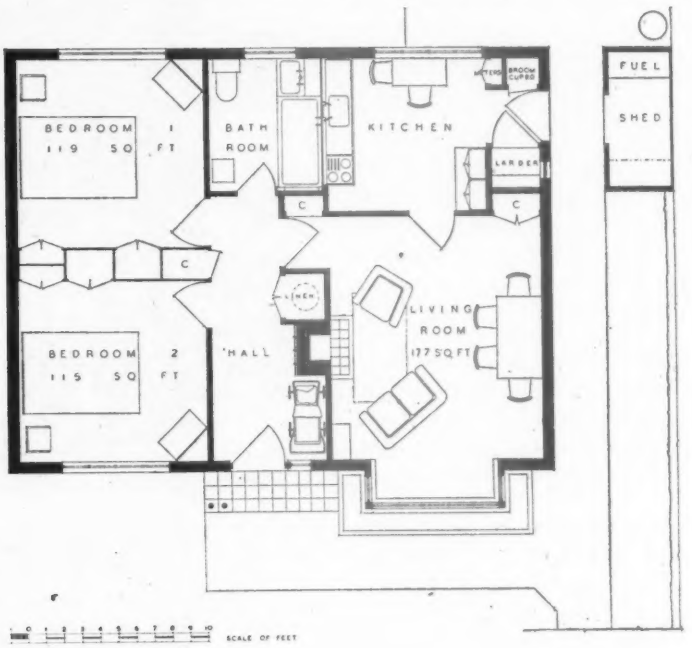
SIR,—As one whose duties have brought him into close touch with the Ministry of Works, I should like to pay a tribute of respect to the retiring Minister, Lord Portal, whose selflessness and conscientious work has, I feel, not received the recognition it should have done. But Lord Portal, like his opposite numbers, the Ministers of Health and of Town and Country Planning, must have suffered laymen's handicap in the sense that they had no connection with the building industry before their respective appointments.

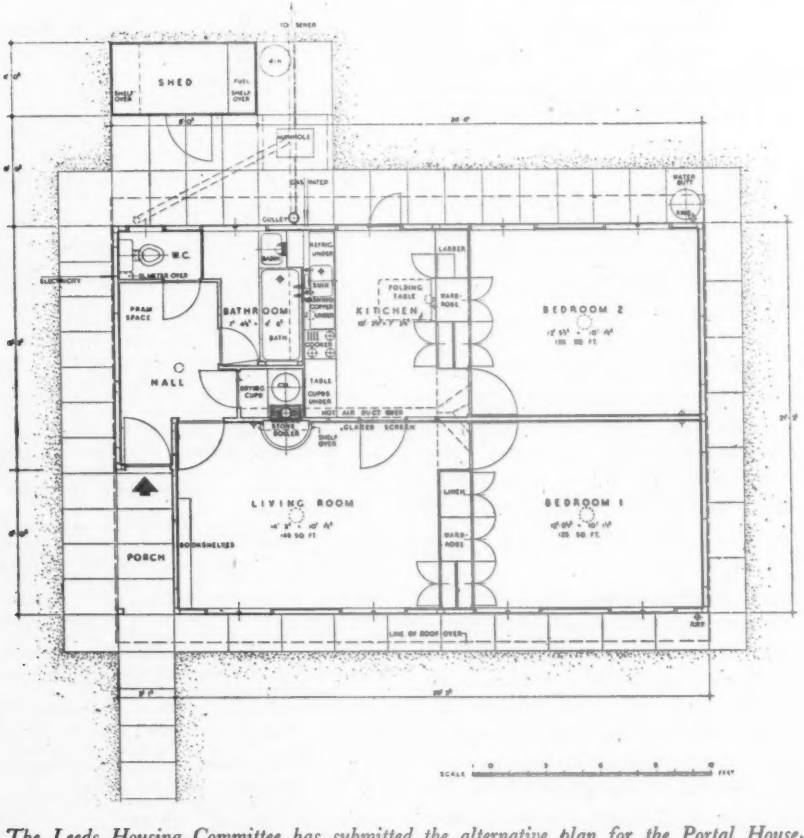
Now that the Prime Minister has appointed his son-in-law, Mr. Sandys, as the new Minister of Works, the public may expect marked progress in the way of housing. But they may be disappointed, for Mr. Sandys is a layman also. Yet there are at least three other members of Parliament who know the building industry from A to Z, and who would have had the confidence of the industry and, ultimately, the public's.

However that may be, it is reasonable to assume that no real progress will be made with housing whilst there is so much divided authority and overlapping between various Ministries. If it is not one Minister's job, it is one Ministry's job.

Take the present muddle—for it is a muddle—in the repair of war damage. Thousands of skilled and unskilled workmen are now engaged in London alone on that work; and complaint is rife in regard to the unlucky waste of man-power. Too frequently, I am afraid, the workmen themselves are unjustly blamed, whereas, undoubtedly, the cause is the lack of proper supervision and direction. Yet there are many practising architects or surveyors (some well-blessed with staffs of qualified assistants) who are idle, or whose profes-

LEEDS PORTAL PLAN





The Leeds Housing Committee has submitted the alternative plan for the Portal House, shown at the top of the page, to the Minister of Health, as being more satisfactory for the North of England, with the request that this plan, incorporating the Portal Fittings, be considered as an allowable alternative. The Committee, in forwarding this resolution, expressed the hope that the door was not yet closed to improvements designed to make the bungalow a more satisfactory dwelling. The total interior floor area of the Leeds Bungalow is 665 *square feet, as against* 623 *square feet in the Portal Plan. The plan has been prepared by Mr. R. A. H. Livett, Housing Director of Leeds. The official Portal Plan is shown below for comparison.*

sional work has been brought to an end by the interference of local authorities or of one or other of the Ministries concerned. Why cannot their services be utilized?

One can cite cases *ad nauseam* in which the building owner has been able to find builders ready to do the work and architects (or surveyors) ready and qualified to supervise, but their efforts are retarded or, more generally, negatived by ill-conceived Orders.

It is true that a few of the more enlightened Metropolitan Boroughs are engaging the services of professional men, but this procedure is rare. Hence the muddle which obtains and must obtain until the helm is taken by someone who, by long experience and training, understands the building industry. For, if these unnecessary delays and muddles occur in the mere work of repair, what will happen in regard to the major and vital matter of rehousing?

At present we are confronted with one gigantic and, as things are, an insoluble jigsaw.

G. B. J. ATHOE,
Secretary,
The Incorporated Association of
Westminster Architects and Surveyors

SIR,—With the change of the Minister of Works, would appear the opportunity for concerted action by the building trade and all professional bodies connected therewith to bring to the notice of the Government the necessity for restricting the activities of the Ministry of Works and the Local Authorities to their legitimate functions instead of allowing them to grow into a vast monopoly controlling the whole of the building industry.

The trades and professions concerned have some of the best brains in the country, and are quite capable of dealing with both bomb damage repairs and the housing shortage if they were allowed to function normally and unfettered, guided by the wishes of Parliament and the people instead of by the Ministries.

The present system of all Ministries "passing the baby" to Local Authorities and making them responsible first for ARP shelters, bomb damage repairs, and now housing both temporary and permanent, must cease. In the majority of cases the Borough Surveyors are Engineers, and neither they nor their staff have been trained or equipped for the work that they are now asked to undertake.

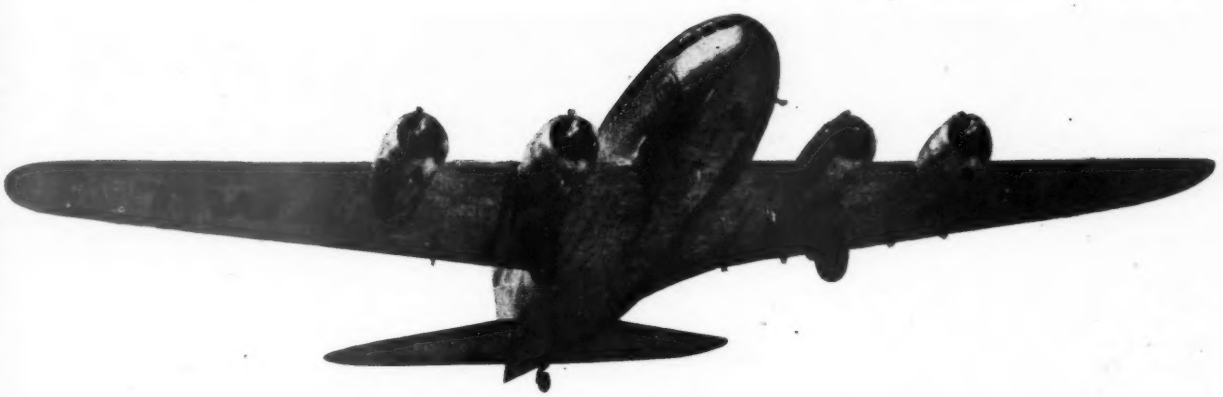
Following the refusal of most Local Authorities of the Royal Institute of British Architects' recent offer that its members should co-operate with them on war damage work, the present chaotic state of house repairs in most districts mainly arising from the total lack of organization, direction and superintendence, is a warning of what will happen when housing and many other forms of building are controlled by Local Authorities through their Borough Surveyors with a few architectural assistants under them.

The need for the speediest completion of the bomb damage repairs is apparent, not only for the sake of the unfortunate people concerned, but because other building cannot start or be planned until this is completed.

The Architectural profession, except for very few members, has had a bad time in this war, and with the £100 and now £10 limit on building, it has become "a depressed profession," but nobody seems to raise a voice in protest.

It would be interesting to hear the views of your readers on this matter.

Westminster A. L. ABBOTT



The author of this article has been associated with airfield design for many years and during the war has constructed RAF airfields in the Far East. Here he records some useful facts on airport design, a field of building which will in the future give wide scope to architects and engineers. He discusses the general problem, defines terms, and deals with the principles governing planning and design of civil airports, including such matters as runways, hangarage, control and administrative buildings, passenger facilities, strip zoning, and drainage.

DESIGN OF AIRPORTS

[By H. T. JACKSON, F.R.I.B.A., A.M.I.Struct.E., Captain R.E.]

A THE GENERAL PROBLEM

While it is generally recognized that, after the war, civil aviation will take a far greater share of internal and international transport, yet there is no civil airport in the British Isles designed to meet the volume and type of air traffic which will be in operation immediately after the war. On the other hand there is, in Great Britain, a concentration of service airfields, unequalled in the world. The first questions are, therefore:

1. Are the Service airfields suitable for civil airports? *Answer*: No.
Reasons:

Civil Airports.	*Service Airfields.*
(i) Must be sited in close proximity to potential centres of traffic, or situated on established routes.	Sited in respect of defence policy or radius of action of aircraft and local protection possibilities.
(ii) Layout of buildings and facilities must be as compact and centralized as possible and located adjoining the landing arms.	Hostile air attacks necessitated the dispersal of the various units and aircraft over a wide area at some distance from the landing arms.
(iii) Aircraft using civil aerodromes are so controlled by the aerodrome staff that the runway may be used to taxi into the "take off" position (in other words—the arm can be used two-way) and, for this reason, the arm is usually 50% wider to ensure greater freedom for ground operation.	Traffic is intensive, necessitating the arm in use being continuously clear for landing and taking off (in other words—the arm can only be used one-way but is much narrower for economy and camouflage).
(iv) The location must be as distinct as possible from the surrounding country so that pilots in flight are attracted to the spot from the the greatest distance in all weathers and at all times.	Landing grounds and buildings are concealed in the greatest possible degree.

2. Can Service airfields be converted to civil airports? *Answer*: Service airfields can, and undoubtedly will, be used for airports, as a temporary expedient, but the loss in efficiency, higher recurring expenses and loss of "speed from door to door" (the air operating company's greatest asset) will make them an unsatisfactory expedient.

When the site of a Service airfield is suitable for, and selected for, a civil airport, the designer will be advised to consider the airfield as a "site" and only to use existing buildings and facilities where they coincide with, and are, suitable for the most efficient plan, rather than to be tempted to try to adapt them for the different purpose.

Aerodromes built for pre-war requirements are now completely out of date and inadequate. An airport built then to the Air Ministry's highest classification would now fail to comply with the lowest requirements.

It therefore follows that, within a short period after the war, civil airports must be provided within a commercially strategic framework.

B DEFINITIONS OF TERMS

Aerodrome. An area of land or water (including any buildings, installations and equipment thereon) intended to be used for the landing and departure of aircraft. The term may be qualified by prefixing Land or Water to indicate suitability for landplanes and seaplanes.

Airfield. The term aerodrome is no longer used to describe Air Force Stations—the term Airfield is used instead.

Airport. An aerodrome used wholly or mainly for the embarking, disembarking and transfer of air transport.

Airline. An established system of air transport or the company operating it.

Air Traffic Control. The regulation and control of the movement of aircraft both in the air and on the aerodrome, in order to ensure the safety and efficiency of air traffic.

Zoning. The delimitation of areas within which obstructions to flight are forbidden.

Unobstructed Area. A long rectangle of land, down which the aircraft moves when taking-off or landing, in which there are no harmful obstructions to it.

Strip. A long, narrow, rectangular area of land (co-axial with the *Unobstructed Area*) which has been cleared and graded but not prepared for landing.

Prepared Strip. A strip prepared by the consolidation of soil to permit an aircraft to "roll" (taxi) and rest upon it without damage.

Runway. A paved landing and take-off path (co-axial with the Strip), fit for use in all weathers.

Flightway. A funnel-shaped air space of defined dimensions, extending beyond the ends of the Strip, to allow for approach and take-off. Within it, must be no obstructions to flight, but the ground below is not specially prepared for landings.

Flightway Floor. An inclined plane, formerly the lower boundary of a flightway.

Obstruction Angle. The angle between the horizontal and a plane above which all obstruction to flight are prohibited.

D

Over-run. The central portion of the Flightway, in prolongation of the runway, which was kept from severe humps and depressions and fit for taxying, in case of premature landing or of over-running the end of the runway. With the longer runways recommended by the Department of Civil Aviation, this is not necessary.

Taxying. The movement of an aircraft on the ground, under its own power, other than when taking off or landing.

Taxiway. A paved track prepared for taxying in all weathers.

Apron. Paved areas adjacent to hangars, terminal buildings and taxiways, designed to take the weight of standing aircraft in all weathers. Also called *Hard Standings.*

Aircraft Park. Hard standings on which aircraft in transit are placed during their stay at the aerodrome.

Terminal Area. The paved area on which aircraft take on or unload passengers and freight. Also called *Embarkation Area.*

Terminal Building. The building at an aerodrome for the control, reception and despatch of aircraft, passengers and cargo. It usually accommodates the administrative staff and other services.

Saucer. An almost invisible valley drain devised to give no danger to taxying or landing aircraft. Cheap and efficient.

French Drain. A duct drain with porous cover. Deservedly popular on civil aerodromes of the past, with their light aircraft.

Approach Lights. Distinctive lights indicating the alignment of a runway and the line of approach from the air.

Contact Lights. Distinctive lights along a runway to indicate the direction for taking-off and landing and the limits of the run available.

Obstruction Lights. Lights on high structures which are liable to prove a danger to aircraft flying at night.

Air Beacon. A "lighthouse" constructed to give pilots their course at night.

Radio Beacons. Short-wave radio beam transmitters used to guide pilots approaching and landing in conditions of low visibility.

Q.B.I. The Air Ministry radio signal code signifying that controlled zone regulations are in force in the vicinity of the airport because of conditions of low visibility.

S.B.A. Standard Beam Approach.

Wind Rose. A vector diagram of wind frequency, on which the wind frequency and direction is recorded. "All winds" and "winds over 17 m.p.h." are plotted separately. It is prepared to determine the orientation of strips and runways.

C PRINCIPLES GOVERNING PLANNING AND DESIGN OF CIVIL AIRPORTS

1. Close proximity to potential centres of traffic. Even before the war, £150,000 might be necessary to establish a fully equipped airport, the running cost of which might be £5,000 a year, and the *construction costs may be* 100 *times greater for the airport of the post-war period.* Although it is realized that the running cost is not likely to be covered by the annual income during the first few years, civil aviation, like other forms of transport, must pay its way within a reasonable time.

2. Situation on established route. The airport must not only be a collecting point for air traffic, but must also be a point on the main flow line of traffic.

3. Facilities for supplies.

4. Speed of travel from "door to door." The air transport company "sells speed": that is to say, it carries traffic which is prepared to pay more, for the "Saving of Time." Loss of speed between "door" and Airport and between Airport and "door," therefore, decreases, and may even destroy, the "Saving of Time." On long distance Empire routes this factor may not be of major importance, but to the internal air routes of a small country the access to the airports may make all the difference between success and failure.

(i) A traveller could go from the centre of London to the centre of Birmingham, before the war, practically as quickly by express train as by plane, owing to the loss of speed and time between the centre of these cities and their respective landing grounds.

(ii) Quick access is not necessarily a question of distance. The Gatwick airport, being on the main London-Brighton electrified line, can be reached from London in the same time as Croydon, though more than twice as far away.

5. Reduction of recurring, running and maintenance expenses, and

6. Possibilities of gradual development with conservative finance. Experience has shown that there is a very considerable time-lag between the provision of air transport facilities and their full utilization and the cost of the facilities and of their maintenance have already been mentioned.

The design must, therefore, allow for the extension and development of aviation over a protracted period of years; at the same time contending with the stringent limitations of finance.

7. Scope. The airport must take all classes of aircraft and the "main-line" airports must be prepared to take the largest aircraft visualized for International air services, while still allowing for the smaller aircraft operating Internal and Local lines. The "main line" airport should also include a seaplane lagoon for use by flying-boats of the largest size.

8. Situation relative to cities of industrial centres. The airport should not be to leeward, in terms of the prevailing wind, of large towns or industrial centres, since dust, smoke and smoke-laden fogs create conditions of extremely poor visibility, most unfavourable to the operation of the port. Since, in Great Britain, the prevailing wind blows from the south-west, a site should be selected on that side, but, since aircraft approaching or leaving the airport will generally fly in that direction, the site must be staggered so that the traffic will not have to fly low over densely populated areas.

9. Avoidance of unfavourable natural features. Land liable to flood is obviously unsuitable. Boggy and swampy land involves excessive expenditure for drainage. Low lying land subject to frequent ground mists or very high ground frequently covered by low cloud should be avoided. Desirable characteristics include soil of a sandy-clay or chalky nature and a slightly domed configuration of the landing area, to promote natural drainage.

Hills, near the airport, not only provide serious obstacles, but may give rise to turbulent air conditions. The close proximity of hills may prove dangerous, especially during periods of bad visibility—as a guide it has been ruled that hills 500 ft. above the site should not come within a radius of 5 miles, but hills of even lower altitude in close proximity to a site may prove dangerous to aircraft landing, taking-off or operating at low altitude in the vicinity.

High hills or mountains may prove obstructions even outside the 5-mile limit. Certain aircraft has a low angle of climb, varying with air speed and load and combined with a high rate of travel over the ground. Pilots flying on instruments in conditions of negligible visibility or at night normally keep course after taking-off until good height or clear visibility is obtained.

If saddles in the hills are available slight changes in the alignments of the arms may be made to give aircraft, on take-off or landing course, adequate clearance below and on either side.

Such factors will be examined by experts, who will calculate the rate-of-climb/ground-speed ratio for the most adverse type of aircraft under calm wind conditions (when fog is more prevalent and the ground speed is at its maximum) and who will advise the promoters.

10. Complete and immediate control of all ground activity, and correct sequence of facilities. The buildings of a civil aerodrome need to be designed and located to ensure efficient and immediate control of all activities on the ground, and there must be short approach on to any point of the landing arms from the control buildings, hangars and workshops.

The facilities for the control staff, crews, agents, passengers, mail and freight must also be distributed in the correct sequence. The lay-out is, therefore, to be as compact as possible, centralized and located adjacent to the landing arms.

11. Control of air operation in the vicinity of the airport. It must be possible to so control, from the airport control tower, all aircraft operating on or in the vicinity of the airport that both the strip and/or runway in action, according to the wind direction, may be used by aircraft to taxi into

An elevated walkway at the terminal building of La Guardia Field, New York.

the "take-off" position. In other words, the arms of a civil aerodrome can be used "two-way" and, for this purpose, a minimum width of 300 yds. for each arm is desirable to ensure greater freedom for operation.

12. Easy identification from the air. The airport should be so constructed that its location is as distinct as possible from the surrounding country, so that pilots, in the air, are attracted to the spot from the farthest distance and in the greatest range of times and weather conditions.

In this respect, it should be borne in mind that simple geometrical forms and circles, squares and triangles catch the eye before more complicated shapes, and that surfaces which reflect the light are more visible than matt. Gatwick airport building is a good example of these.

13. Proximity to other landing grounds, The site must not be in close proximity to other aerodromes or landing grounds, otherwise danger of collision would arise through circuits overlapping or long approaches and take-offs being executed in periods of bad visibility. Landing grounds should not be nearer than 5 miles, and considerably farther than this if their main runways lie along their common axis.

14. Purpose. The purpose of an airport is the quick, efficient and safe embarking, disembarking and transfer of air transport by day or night or in bad weather. In the author's opinion, flying clubs, training schools for pilots (amateur or professional), air pageants and public swimming baths at an airport are as out-of-place as their counterpart would be at a London railway terminus. These air facilities require separate aerodromes, and it is suggested that "airport" be restricted to air transport and "aerodrome," to landing grounds used for training, sporting and recreational purposes.

D CONSTITUENTS OF AN AIRPORT

1. Landing and Take-off. The primary purpose of an airport is to provide suitable places where aircraft can land and take-off; the first unit of airport development is therefore *Landing and Take-off*. This consists of:

(i) (*a*) *The Principal Runway*, oriented to the prevailing wind.

(*b*) *Subsidiary Runways*, sufficient to allow for a reasonable annual distribution of operation in all directions of wind.

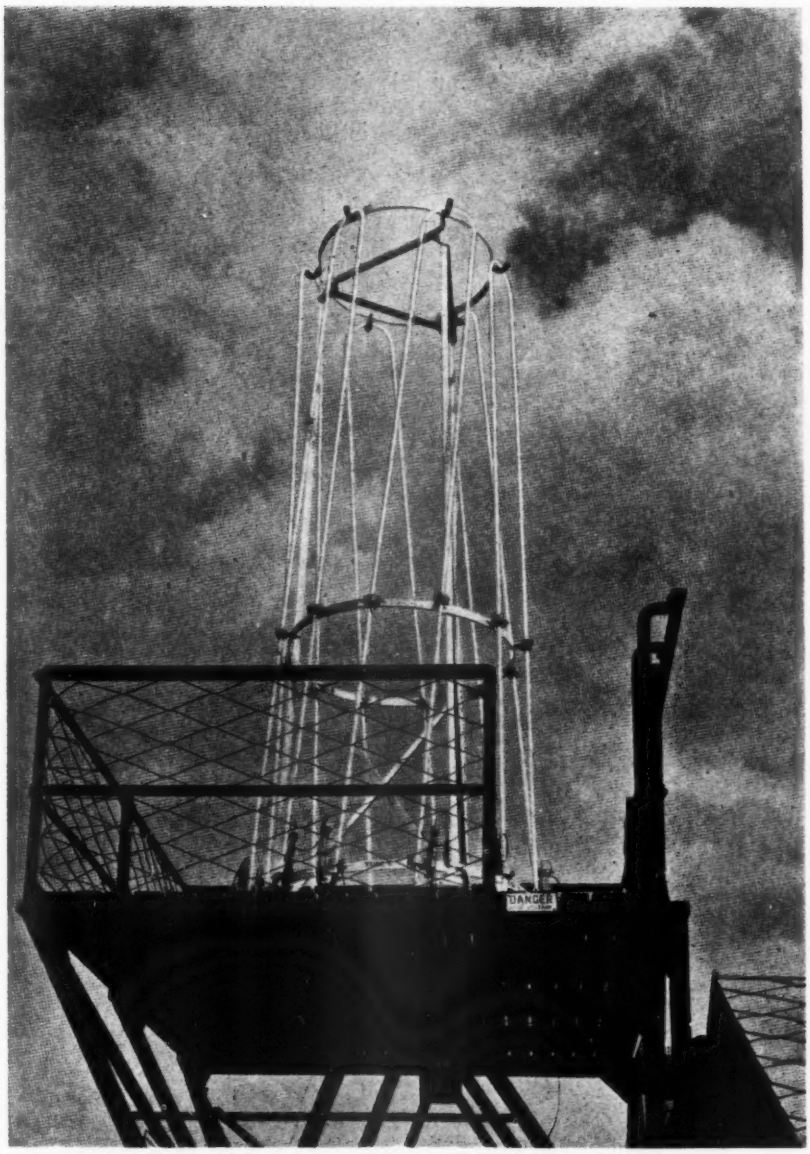
Runways may be *single* or *multiple* according to the low or high frequency of aircraft movements.

(*c*) The runway passed down the centre of a wider belt, the *strip* which, in turn, is enclosed in the *unobstructed area* (see section K).

(ii) At the ends of the runways are the turning circles (in the case of the wider runways these are included in the runway), and, beyond these, the *flightways*. (See section M.)

(iii) For blind flying under difficult conditions (so often found in Britain), the *Standard Beam Approach System* is used at one end of the principal strip. This requires a "beam approach strip" 2,000 yds. long and 400 yds. wide, but the calculations for runways and flightways include for this.

(iv) Connecting the ends and intermediate points of the runways with the terminal area are the *taxiways* (see section P), which should be carefully designed to reduce (i) initial cost, and (ii) surface transit time.



An airport identification beacon of neon tube for night flying.

(v) *Seaplane Lagoon* (see section F) with *loading bays and slipways*.

(vi) *The Terminal Area* (see section O), adjacent to the *landing area* and *lagoon* where aircraft take on passengers and cargo.

(vii) *The Aircraft Park* (see section O), for aircraft in transit and awaiting departure.

(viii) *Helicopter Park*. (See section S).

2. Control and Communications. The pilot relies on the airport for safety, instructions, and, in low visibility or night flying, for direction. The airport must control all aircraft operating in its vicinity, and may also control the scheduled movements of all aircraft within a much larger area. An aeroplane in flight may require an instruction, a bearing (called a "fix"), or an urgent weather report and assistance to land safely at night or in bad weather. The second unit of development is thus *control* and *communications*.

The *Control Room* is the action-centre of the airport, corresponding in many ways to the bridge of a liner. Wireless facilities must be in the closest touch with "control" since a second's delay must be avoided. Activities in the airport are controlled by telephone and public-address system, and land lines and teleprinters are used to connect with other ground stations. The *Look-out* who should be in close and constant touch with the *Control Officer*, must be able to see all round the horizon. The *Look-out*, *Control Room* and *Wireless and Meteorological Service Room* are, therefore, normally housed in a tower or on the roof high above the roof of the hangars and other considerable obstructions.

Below, and closely connected, is a *Rest Room, Toilets*, a small *Record Room*, and a *Telephone Exchange*. The *Aerodrome Lighting* is operated from the control room by the aid of a charted panel with tell-tale lights.

3. Administration. The third unit is *Administration*, which controls the personnel, the accounting and the maintenance of the airport. It is very similar to the administration of other commercial undertakings with *Offices* for *Manager, Assistant*

Top, two control towers; left, La Guardia Field, New York; right, a USA military airport. Centre, interior of the control tower at Wayne County, USA. Bottom, typical control desk for lighting equipment at Ford Airport.

Manager, Secretary, Cashier, Pay Office, and *Clerical Staff,* and the usual *Toilets* for both sexes. (*Liverpool Airport* allows for baths.)

A *Board* or *Committee Room* may be required, and the *Telephone Exchange,* if not situated with the control unit, may be included here. A view of the landing area is not essential to this unit.

4. Operation. This is a large and important unit providing offices and facilities for all officials operating the *Terminal Building.* It can be divided into 3 groups:

(i) Operation by Government Departments.

(*a*) *Customs Examination Hall, Custom Office,* and *Landing Staff and Freight Customs Offices* (the last adjacent to the inwards goods shed). *Toilet Accommodation.*

(*b*) *Immigration* and *CID Examination Hall, CID and IO Offices. Toilet Accommodation* for staff.

(*c*) *MO's Office, Dressing Rooms* and *Toilet Accommodation.*

(*d*) *Post Office, Postal Sorting Office, Staff Room,* with *Toilet Accommodation.*

(ii) Operation by Airport Staff.

(*a*) *Duty Office, Watch or Air Guard Room.*

(*b*) *Traffic Office,* responsible for the circulation of air traffic.

(*c*) *Inward and Outward Goods Sheds. Transit Shed with Bonded Store. Repacking Station* (freight sent by surface transport often requires to be securely crated for protection, but this is not necessary with air transport. Repacking can reduce weight of freight by as much as 35 per cent., greatly reducing freight costs).

(iii) Operation by Allied Companies.

(*a*) *Booking Hall. Airline Companies Offices* and *Offices for Road* and *Rail Transport Companies,* with facilities for booking and weighing passengers, baggage and freight. (Only airline companies need to weigh passengers.)

(*b*) *Toilet Accommodation* for the staff of these offices.

5. Hangarage. The fifth unit of development is the *Hangarage* blocks. The word "hangar" is French, and means a shed. In aviation, a *Hangar* is the building in which aircraft are garaged for protection, repairs and maintenance. The *Workshop Hangars* at an airport will therefore require *Workshops, Paint Shop, Stores* (with a locked *Quarantine Bay* serving workshops and hangars), a *Technical Administration Block* and the necessary *Lavatory* accommodation.

The *Hangar* will require an overhead runway for the removal of heavy aero engines and reasonable heating. An *Engine Test Bed,* insulated for sound, may be required.

The growth both in size and number of air lines, demanding more and larger hangars, presents an engineering and financial problem of ever greater magnitude. The hangar at *Speke Airport,* Liverpool, built before the war at a cost of some £44,000, would hold only 3 post-war main line transport planes, and Lord Brabazon estimates that *British Overseas Airways Corporation* will require 600 machines "at the least."

Against this, it should be borne in mind that air-transport planes are no longer light and flimsy, but strongly built, and, in the planes now projected, weighing up to 100 tons each. The war has shown that aircraft can be kept in the open air, and, before many years, it may seem as absurd to keep an air-liner in a covered hangar as it would to keep a sea-liner in a covered harbour. When this occurs, aircraft would be taken into the hangar only when repairs and overhauls are required, as a ship is taken into dock; but, since an aeroplane is by its design, susceptible to air currents, it may still be necessary to protect it from gales by parking it in a *Pen*—a hard standing bounded on three sides by walls 12-18 ft. high.

6. Aircraft operational facilities. On the ground, the aircraft requires facilities for:

(i) *Refuelling.* Underground storage of petrol is essential, the fuel being taken to the planes by *mobile tankers* which require *housing.* Oil will also have to be stored.

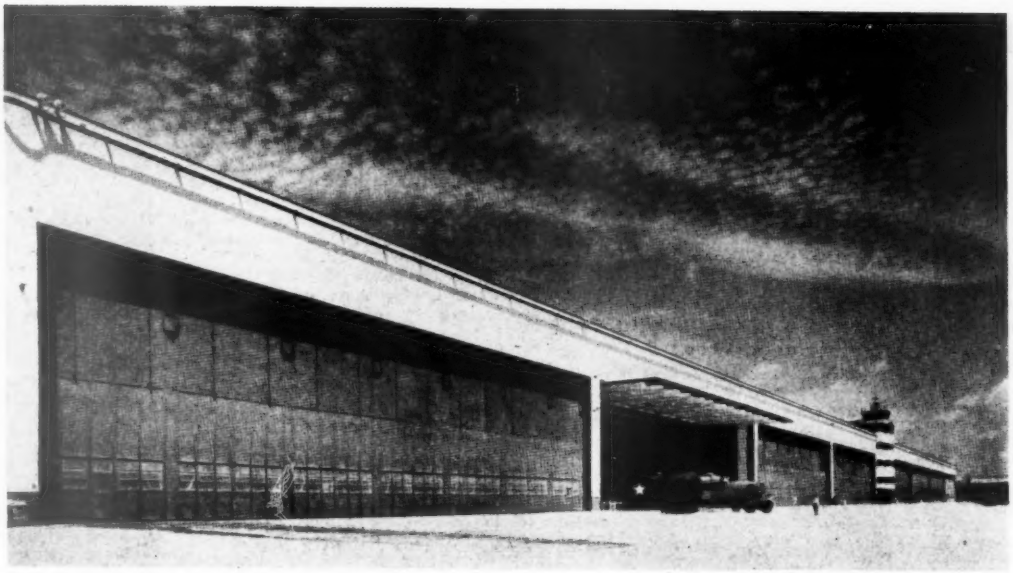
(ii) *Revictualling.* This will probably be done direct from vans, but the airline companies may require stores.

(iii) *Loading and unloading* in the shortest possible time.

In the air it requires, from the landing area, facilities for protection and direction as:

(i) *Boundary markers and lights.*

(ii) *Circle and name.* The white circle, having an overall diameter of 100 ft., is marked approximately in the centre of



Three hangars. Right, the hangar building at a bomber plant, Ypsilanti, Mich. (Albert Kahn, Inc.), one of the world's largest industrial units under one roof, has the canopy type doors which, electrically operated, are 150 feet wide and 40 feet high. Centre, hangar at Hagerstown, Md., USA (Albert Kahn). These doors, of laminated- and plywood, are of the horizontal sliding type. Bottom, US naval hangar of shell concrete with exterior arch ribs of 294 feet span and 84 feet rise (J. H. Lupish, and Roberts and Shaefer).

the landing area, and the name of the airport, in white letters 20 ft. high, is placed 100 ft. due south of the circle. These, required by the Air Ministry, were essential when a landing ground was a grass field, but, in these days of concrete runways, the circle might well be omitted.

(iii) *Landing Tee*, mounted in a concrete base, and working on a weather-vane principle, supplements the wind-sock to give the pilot wind-direction.

(iv) *Take-off Line*, stretching down the centre of the principal runway, assists the pilot to keep direction in fog and ground mist.

(v) *Aerodrome Beacons and Floodlights* for night flying.

(vi) *Radio Beacons*, for blind flying.

(vii) *Radio Mast*, sited to prevent collisions in low visibility and connected to the control room by a landline.

(viii) A small isolated *Store* is necessary to house pyro-technics (rockets and signal lights).

(ix) *Obstruction Lights* on every prominent object within 1,000 yards of the airport perimeter.

(x) *Approach and Contact Lights* (see section B).

7. Landing area maintenance. This group includes:

(i) *Fences*, to keep trespassers and stray livestock from the flying strips. They should be clearly visible from the air.

(ii) *Garages* for airport maintenance vehicles—lorries, mowers and rollers.

(iii) *Silos* may be required to take the cut grass.

(iv) *Canteen* and *Lavatories* for outdoor ground staff.

8. Emergency services. This unit includes:

(i) *Garages* for *Fire Tender* and *Ambulance* with facilities for keeping their engines warm in winter.

(ii) *First Aid Room*, preferably adjacent to ambulance garage.

(iii) *Matron's Room* adjoining First Aid Room.

9. Passenger facilities. The ninth unit consists of amenities for passengers. These include:

(i) *Covered ways* from rail and road to terminal building.

(ii) *Covered loading* between terminal building and aircraft. This was formerly done by means of telescopic or portable canopies, as at *Burbank*, *Croydon*, and *Gatwick*, but these narrow tunnels are cramped and passengers and baggage could not be loaded at the same time. The later solution is to provide cantilevered canopies, wide enough to shelter the aircraft, except for the outer wing, and long enough to take as many aircraft as may load at the same time.

(iii) *Main Concourse.*

(iv) *Waiting Room. Toilets.*

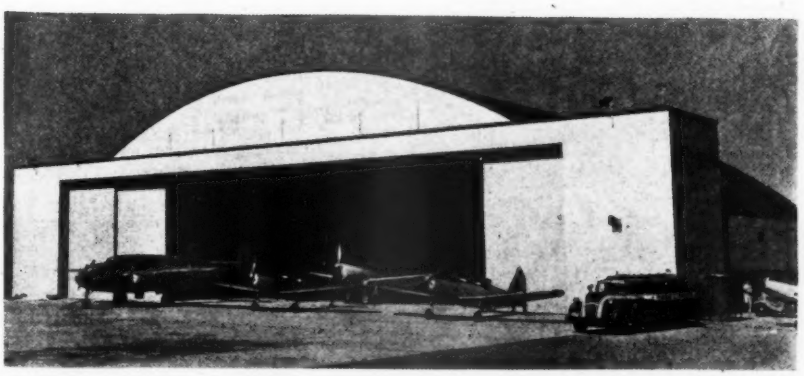
(v) *Post Office.* (See also para. 4 (iv) *Shops, Bank.*

(vi) *Public Bar and Buffet* with *Store.*

(vii) *Porter's Room.*

(viii) *Hotel.* A small modern hotel is necessary for passengers changing aircraft or detained by weather or mechanical defects. This would follow the usual lines—*Manager's and Clerk's Offices, Lounges* (one large and one small), *Restaurant, Wine Store, Bar, Servery, Kitchen, Larder, Cold Store, Beer Store, Pantry, Staff Room, Guests' Bedrooms, Bathrooms, and Toilets, Staff Bedrooms, Bathrooms and Toilets, Service and Cleaners' Rooms* and *Lifts.*

(ix) *Car and Public Vehicles Parks* and *Refuelling Point.*

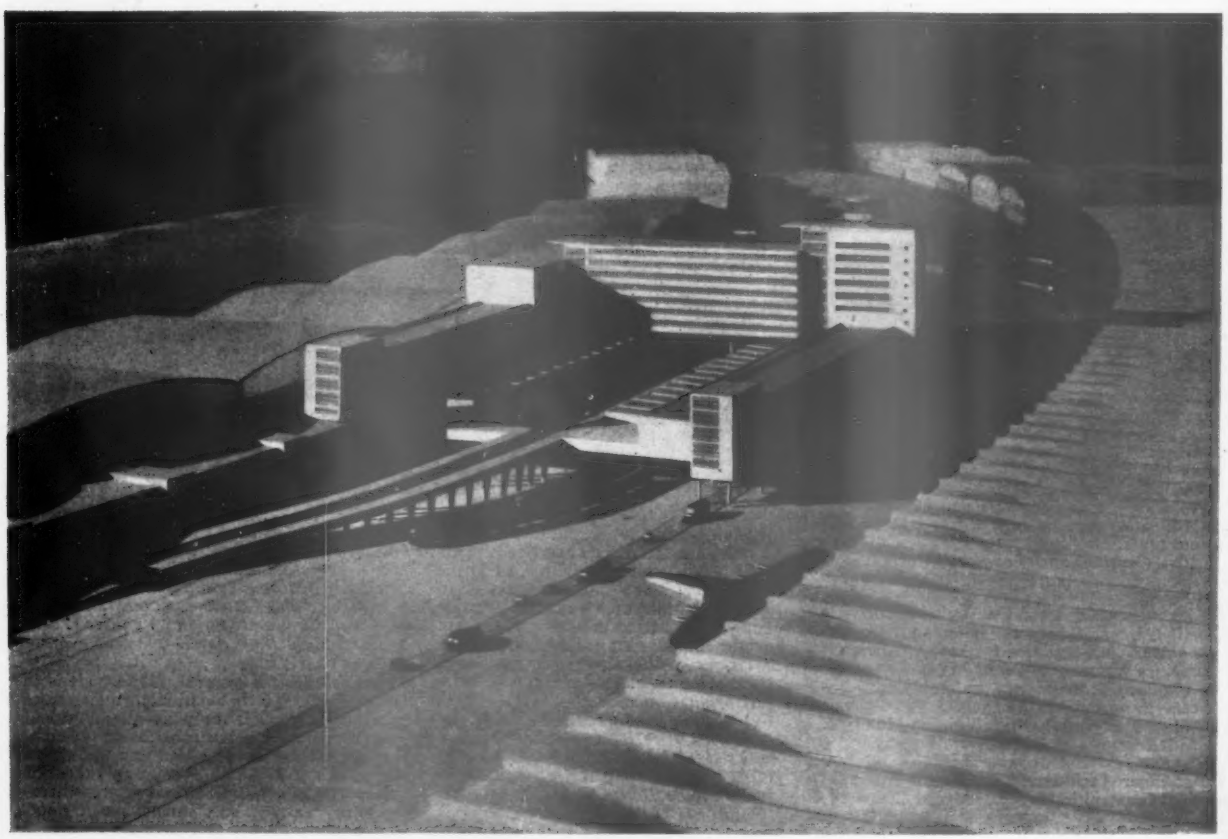


10. Facilities for general public. It is in the interest of civil aviation to interest the general public, not only as an additional source of revenue, but also that, by watching aircraft movements, they may come to accept air travel as a normal mode of transport. *Public Enclosures* are therefore provided. These must have a good view of the runways and terminal area, and should be provided with restaurant and other amenities. These may be sited on the upper floor or roof. They must be kept entirely clear of passenger circulation, with separate approaches.

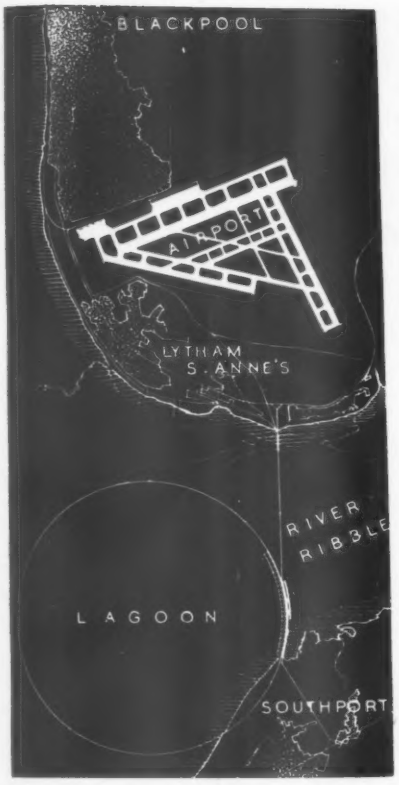
E OVERALL DIMENSIONS, WEIGHT, TAKE-OFF, LANDING AND WHEEL TRACK OF MODERN TYPES OF AIRCRAFT, GOVERNING THE DESIGN OF MODERN AIRPORTS

Before the design of runways, hangars and covered loading can be prepared, it is necessary to have data of the aircraft which will use them. In the table below are included 3 pre-war types, although they are obsolete, so that, by comparing the past with the present, the trend of progress can be perceived.

Type.	Span.	Length.	Height.	Max. Weight.	Take-off.	Landings.	Wheel Track.	Max. Tyre Pressure.	Remarks.
1. Aircraft of 1930-1940.	ft.	ft. in.	ft. in.				ft. in.		
Hefacles	130	86 6	27 3	30,000 lb.	—	—	—	—	The largest aircraft in the world employed in civil air transport.
Atalanta	90	71 6	14 0	—	—	—	—	—	
Bremen	—	—	—	—	—	600 yds.	—	—	From concrete runway.
						1,583 yds.			From rolled cinder runway.
D.C.4	135	95 0	—	50,000 lb.	—	—	—	—	This type was projected in America before the War.
2 Aircraft of 1940-1945.									
(i) Bombers which will be converted or re-designed for use as transport planes in the immediate post-war period									
Lancaster	102	69 4	20 0	55,000 lb.	1,400 yds.	—	—	Assumed 90 lb./sq. in. for design of runway	Summarizing the overall requirements of the War period; it will be seen that these are :—
Halifax II	99	70 2	21 7	55,000 lb.	1,350 yds.	—	—		
Stirling	99	87 3	22 10	62,000 lb.	1,350 yds.	—	—		
Wellington II ..	86⅓	61 0	17 6	29,500 lb.	1,180 yds.	—	20 4		
Whitley V	84	70 6	17 0	26,500 lb.	1,100 yds.	530 yds.	18 10		
Fortress II	103¾	73 9	19 1	45,470 lb. (Fortress I)	1,200 yds.	1,200 yds.	—		Widest wing span, 110 ft. (Liberator).
Liberator	110	63 10	18 2	—	1,200 yds.	—	—		Greatest length, 87½ ft. (Stirling).
Kurier II	108	78 0	18 0	—	—	—	—		Greatest height, 22⅝ ft. (Stirling).
(ii) Air liner, and transport planes easily convertible to first-class civil aircraft.									Heaviest plane, 62,000 lb. (Stirling).
D.C.3	95	64 6	17 6	24,800 lb.	—	—	—	Ditto.	Greatest projection of wing beyond wheel, 43 ft. (Liberator).
Junkers JU52 ..	96	62 0	14 10	—	—	—	—	—	
„ JU290 ..	Over 100	—	—	—	—	—	—	—	
3. Aircraft of 1945-1955.									
Brabazon	—	—	—	100 tons	—	—	—	—	Intended to fly New York—London. According to Lord Brabazon, will not be ready until 1949. The comparable American machine is scheduled for 1945.
Trans-ocean ..	300	240 0	70 0	360,000 lb.	—	—	100 0	120 lb./sq. in.	Estimate prepared by the Department of Civil Aviation (Air Ministry).
Inter-continental ..	220	175 0	55 0	180,000 lb.	—	—	70 0	100 „	
Trans-continental ..	170	135 0	40 0	90,000 lb.*	—	—	55 0	85 „	*Aircraft of this type may be employed on Continental routes where there is very heavy traffic.
Continental	125	100 0	30 0	45,000 lb.	—	—	30 0	85 „	
Local	110	80 0	25 0	30,000 lb.	—	—	25 0	60 „	



Model of the terminal buildings for an airport project, both for land- and seaplanes, showing hangars, and the main building housing traffic station for road and rail, administrative and control buildings, control tower, passenger facilities, etc. Ramps help to segregate traffic and improve circulation. This is a photograph of the model of the London "Cliffe" project illustrated in the Journal for September 30, 1943. (Guy Morgan and Partners.)



Outline for a super trans-Oceanic airport terminal at Blackpool for land- and seaplanes. The airport is linked to the landing lagoon by a road and rail tunnel under the River Ribble. The lagoon is 4 miles in diameter. The airport is illustrated again on page 426. (Consultants: Guy Morgan and Partners with Brian H. Colquhoun.)

F SEAPLANE DATA

1. Governing factor of modern types.

Type.	Span.	Length	Height.	Max. Weight.	Take-off.
	ft. in.	ft. in.	ft. in.	lb.	seconds
Sunderland	112 9	85 7	32 10	53,500	52
Catalina ..	104 0	65 1	18 6	—	—
D.O. 26 ..	98 6	80 6	20 6	—	—

2. Possibilities of further development. As far back as 1935, Mr. A. Gouge (then General Manager of Short Brothers) in a paper read to the North-East Coast Institution of Shipbuilders and Engineers, demonstrated the possibilities of flying boats of 135 tons. On the other hand, there are authorities who hold the view that the flying boat will be very largely superseded by land-based planes. In designing airports, allowance should be for seaplanes of 100 tons.

3. Seaplane Lagoon. Flying boats require, for take-offs and landings, a large protected sheet of water, referred to as a lagoon, not less than 3 miles or more than 4 miles long. The lagoon may be circular, but can be reduced to an oval, the minor axis of which is 20 per cent. shorter than the major axis; the major axis being oriented to the prevailing wind. A depth of 2½ fathoms is required. A slipway 260 ft. long by 150 ft. wide, inclined at an angle of 1 in 15, would take a seaplane of 100 tons.

G DESIGN LOAD FOR POST-WAR FREIGHTERS ON RUNWAYS

A decade ago, the Air Ministry required a resistance of surface to 2½ tons/sq. ft., and that any bridge or culvert should stand an impact load of 5 tons/sq. ft.

Now, with much heavier loading, the limiting factor is tyre-pressure. In designing for the heaviest planes of the present day, it is assumed, for bearing capacity problems, that 7 tons/sq. ft. (or 108.5 lbs./sq. in.) is applied uniformly from an elliptic wheel-impress. Thus, a wheel-impress 45 in. by 20 in., having a ratio of major to minor axis of wheel-impress ellipse of 2.25 to 1 and an area of 4.91 sq. ft., gives a total single wheel load of 34.41 tons.

In view of the higher maximum tyre pressures anticipated by the Department of Civil Aviation for aircraft of the Trans-ocean and Inter-continental types, the bearing capacity of runways for these types must be increased to 9 tons/sq. ft. (140 lbs./sq. in.). On the other hand, runways for local type aircraft need only have a bearing capacity of 4½ tons/sq. ft.

As future aircraft design is problematic, it is necessary to state the reasons for the choice of these values. They are:

(i) It is not thought likely that the tyre pressures of present-day aircraft will exceed 90 lbs./sq. in. The Department's of Civil Aviation estimate of the highest figures that tyre pressures may attain during the next 10 years is given in Section E.

(ii) Static load is found to be the worst, in considering the bearing capacity of the runway. The reasons for this include:

(*a*) Cushioning effect during a bad landing, of pneumatic tyres and hydraulic buffer struts.

(*b*) Great Inertia of the volume of runway, combined with high speed (say 100 ft./sec.) of plane during bumping period—the effect being like skating rapidly over thin ice.

(iii) The standing tyre pressure on runways is fairly uniform and, in estimating surface reaction, 15 per cent. should be added to these pressures to allow for the stiffness of the side walls of the tyres.

(iv) It is considered that tyre breadth will not increase much, but that overall tyre diameter will increase. The Stirling uses 68½ in. diameter tyres, and some USA planes use 96 in. diameter tyres.

(v) The ratio of major axis to minor axis of wheel-impress for medium tyres is found by measurement to be about 1.7 to 1, and for larger tyres 2.25 to 1. The latter is safer in design.

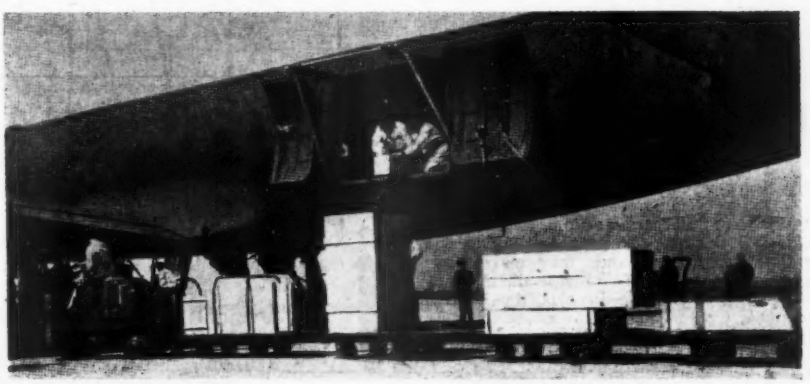
(vi) Apart from the increase of overall tyre diameters, the intensity of applied stress can be reduced by increasing the number of wheels to the aircraft. The number of undercarriage wheels cannot always be estimated, so, to cover all eventualities, it may be assumed that there are two main wheels bearing between them 9/10th of the weight of the aircraft.

H STRESSES ON LANDING GROUNDS ANALYSED

The function of the runway is to spread the pressure until the intensity of stress on the subsoil is no more than it can safely stand.

If the runway is flexible (not like concrete), it is assumed that the load spreads at 45 deg. and remains uniform.

Methods of loading the aerial mammoths of the future will condition the design of airport buildings. Top, a passenger gang plank. Bottom above, nose-loading of cargo. Below, cargo being hoisted into a freight plane by side-loading.



Simple concrete runways of uniform thickness are weakest at their joints, so the same rate of spread is assumed for concrete as for a flexible material, to allow for the joints.

If slab edges are thickened or if the joints between slabs are designed so that the load is spread from one slab to its neighbours, then 1½:1 spread can be assumed, and slab interior and edges are designed separately. For the slab edge design, the effect of a wheel standing on a slab corner is considered. If the concrete is placed directly on a pliable sub-grade, it will require reinforcement to prevent failure by tension. Strengthening slab edges by increasing the soling under them is easier and more practical than thickening the concrete.

Bearing capacity of soils. Generally, the pressure that any soil will stand depends on:

(i) The "surfacing," *i.e.*, the weight of the soil and runway, above the plane of application of the active load.

(ii) The lesser dimensions of the loaded area of soil (breadth of wheel impress + spread of pressure due to concrete).

In very clayey soils these two factors have little influence, but in soils containing sand their effect is great, therefore the uncorrected use of small-scale test, or tables of bearing capacity, may lead to serious error.

The graph in Fig. 2, which shows the bearing capacity of different soils against runway thickness, makes allowance for these factors. The lines sloping down from left to right (some almost vertically) give the bearing capacity, under various thickness of "surfacing," for the soils specified against each.

It will be seen that:

(i) The bearing capacity of an incohesive soil with a high angle of internal friction, such as pure sand, is rather less than proportional to the loads breadth, and is greatly increased by the superimposed runway.

(ii) The bearing capacity of a cohesive soil without internal friction, such as sloppy clay, is practically unaffected by load breadth or runway thickness.

(iii) A soil is unlikely to be suitable unless it has a bearing capacity of more than 3 tons/sq. ft.

Although the use of Fig. 2 is an advance of the older tables of bearing capacity, it still leaves a large degree of vagueness, *e.g.*, a difference of opinion whether a soil is "fairly stiff" or half way between "fairly stiff" and "soft" can make 3-4 in. difference in runway thickness. As 1 in. of thickness on one large runway can mean 45,000 *tons of materials, bearing capacity tests must be made.*

Soil mechanics. Fig. 1 shows how a soil fails under the pressure of the aircraft wheel. The arrows represent the uniform load of the breadth of tyre impress, applied to the ground surface CC. Failure occurs by slipping along the line ABC—*not* by crushing.

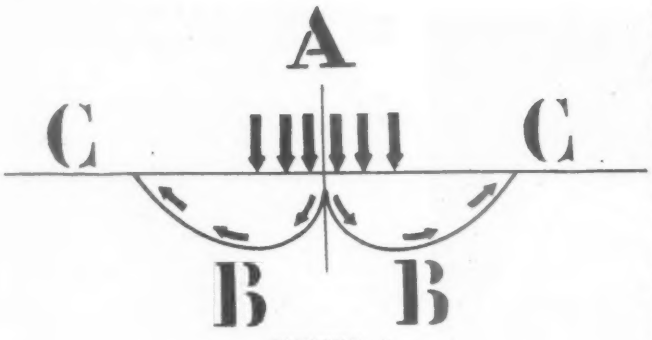


FIGURE 1

Figure 1 shows how soil fails under the pressure of an aircraft wheel. Figure 2 is a graph to show: (i) Pressure intensity on subgrade for any runway thickness. (ii) Suitable runway thickness for different soils. Spread through runway taken at 45 deg.

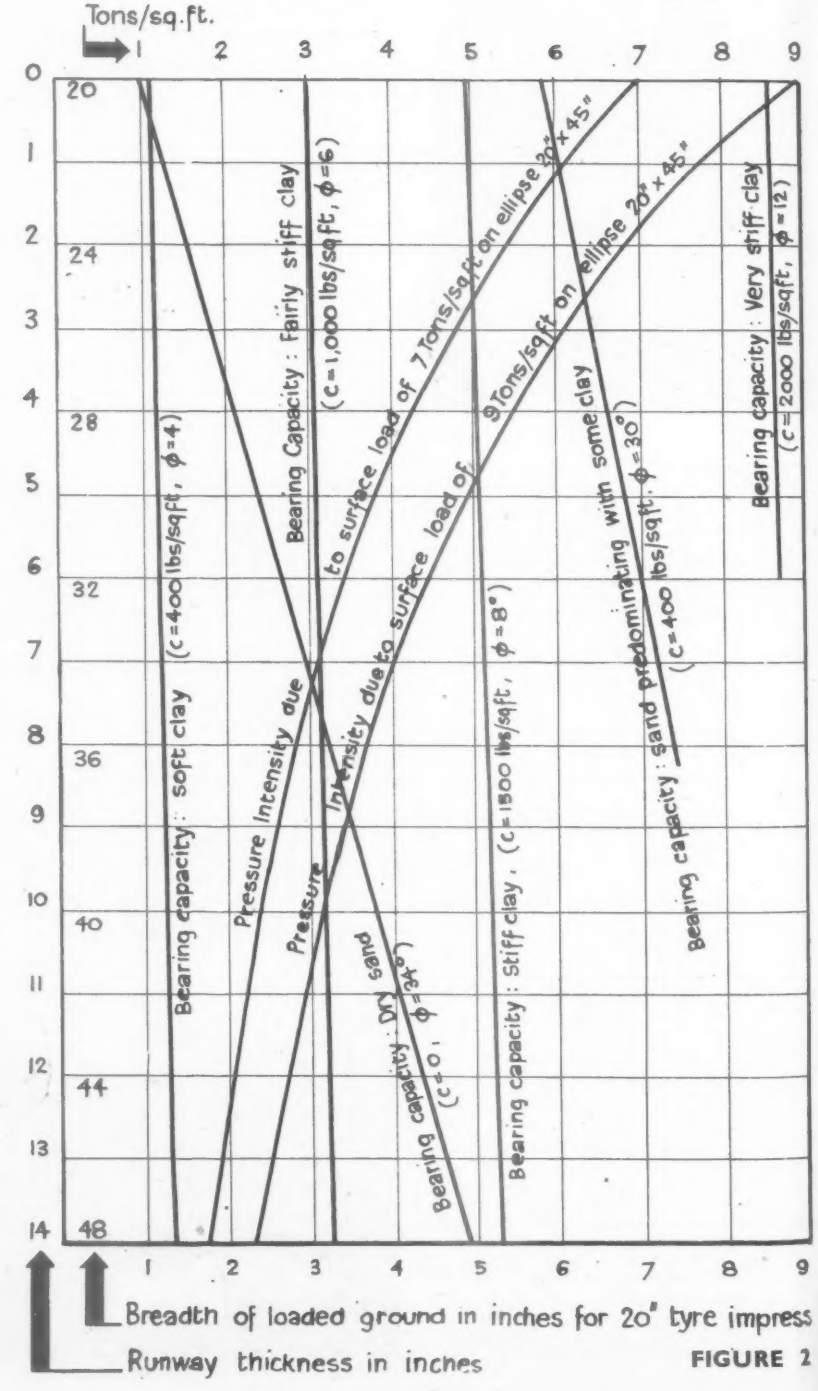
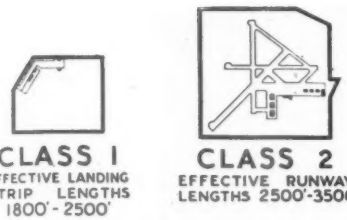


FIGURE 2

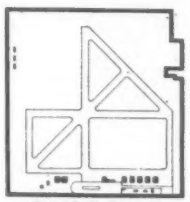
I CLASSIFICATION OF AIRPORTS

The dimensions of an airport are governed by the types and volume of traffic which are to be accommodated. Some types of traffic require larger aerodromes than others, and it is necessary to group air services in relation to the demands they make upon aerodrome design. To assist in the planning of the most efficient airports, the Department of Civil Aviation has grouped future aircraft into five main classes, in so far it is possible to forecast their characteristics, based on their demand on airport design.

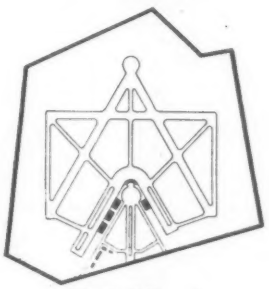


CLASS 1
EFFECTIVE LANDING STRIP LENGTHS 1800'-2500'

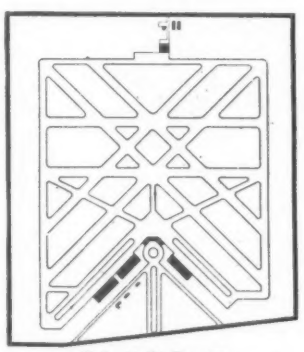
CLASS 2
EFFECTIVE RUNWAY LENGTHS 2500'-3500'



CLASS 3
EFFECTIVE RUNWAY LENGTHS 3500'-4500'



CLASS 4
EFFECTIVE RUNWAY LENGTHS 4500'-5500'



CLASS 5
EFFECTIVE RUNWAY LENGHTS 5500'-6500'

Above, diagrams giving sizes of runways for typical classes of airports with lay-outs in accordance with prevailing winds as laid down by the USA Civil Aeronautics Authority. Right, another diagram based on the proposals of the same authority showing take-off distances required to clear 50-foot obstacles. SG is distance from start to point of take-off. SA is distance from start to clear 50 feet—all engines operating. SB is distance from start to clear 50 feet—one engine inoperative at point G.

These classes are:

(i) Trans-ocean.
(ii) Inter-continental.
(iii) Trans-continental.
(iv) Continental.
(v) Local.

The Department's estimate of the characteristics of each class of aircraft, based on a period of 10 years, is given in Section E. The class of airport, therefore, takes its name from the class of the aircraft which makes the greatest individual demand upon it, although one airport may accommodate several classes of aircraft.

J NUMBER AND ORIENTATION OF RUNWAYS

Eight years ago, when a landing area was a smooth and level field, the Air Ministry's requirements for a Class A aerodrome licence (the highest classification) was "effective runs of 800 yds. in any direction."

With the increased weight of aircraft, necessitating concrete runways, and the increasing length of the strip or runway, coupled with the improved design of aircraft undercarriage, it was found necessary to confine the runs to certain definite directions. These, in civil aerodromes, were four strips oriented at 45 deg. to each other, so that an aircraft was not required to take-off or land more than 22½ deg. out of wind. Civil aviation experience showed that landing on a 200 yds. grass strip or a 50 yds. runway was not difficult with cross winds up to 10 miles per hour, and, at 22½ deg. deviation, the wind to give a 10 miles per hour cross component is a wind of 24 miles per hour. The grass strips, being 200 yds. wide, also gave the pilot further choice of direction.

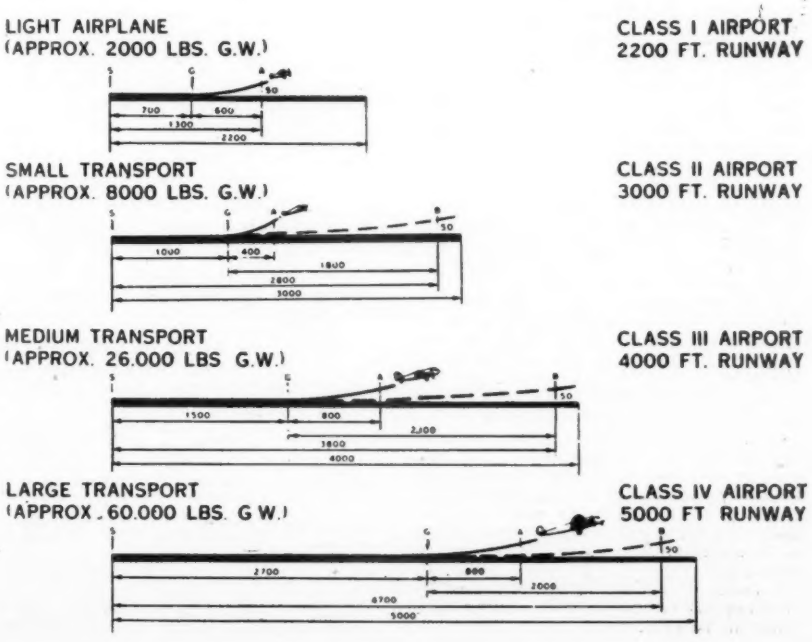
During the war there has been further improvements in aircraft design, and aircraft equipped with tail-wheels can now be taken-off and landed with a cross-wind component of 15 m.p.h. This is the component of a wind of 39 m.p.h. from a direction of 22½ deg. deviation, the maximum deviation (a wind of 39 m.p.h. is a Gale, Beaufort Scale 8). Aircraft equipped with nose-wheels can be safely handled with higher cross-wind, amounting in some cases to 30 m.p.h.

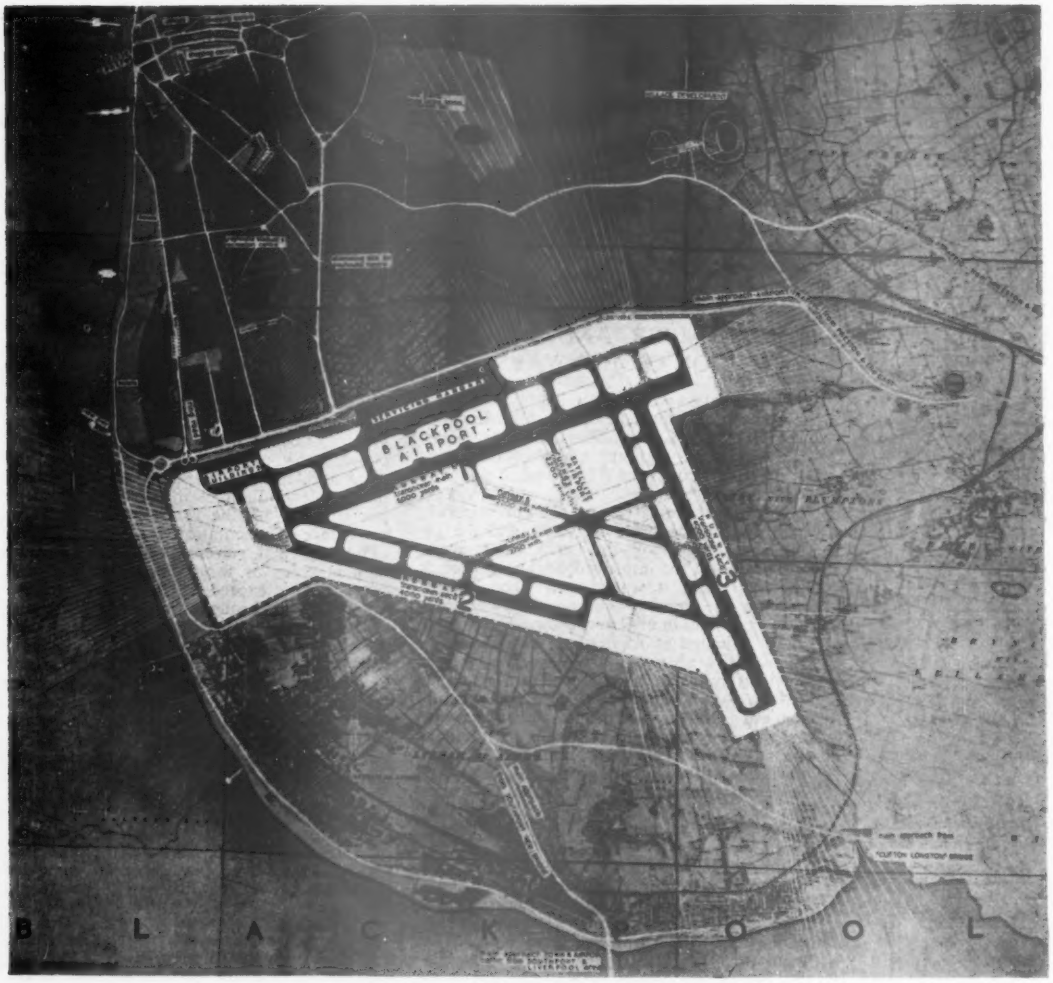
If it is not certain that an aerodrome will be used only by aircraft with nose-wheels, the number and arrangement of runways should permit arrivals and departures to be made with cross-wind component not exceeding 15 m.p.h. If, however, the aerodrome will be limited to nose-wheel aircraft, then this figure can be increased to 20 m.p.h., the cross component of a wind of 38 m.p.h. from a direction of 30 deg. deviation.

The principal runway is usually oriented to the prevailing wind. It is longer than the subsidiary runways, as it will be used when there is little or no wind and the take-offs and landings are longest. It should also be so oriented that it can be used in conditions of low visibility (fog or mist). These usually occur in conditions of little or no wind. Other causes of low visibility—low cloud, snow or sleet—are accompanied by wind and, if these causes are frequent and the usual wind direction is not that of the prevailing wind, the former should receive preference of orientation.

The principal runway will, therefore, be used in calm or wind until the cross-wind component is exceeded. Then another runway will be brought into use. As the subsidiary runways will only be used when the cross-wind component on the principal runway exceed a certain force, they need not be so long, since the take-off and landing runs will be reduced by the force of the wind. The length of the subsidiary runways is governed by the wind rose (see definitions) and by the angle they make with the main runway. They will be from 10 per cent. to 30 per cent. shorter than the principal runway, and all the subsidiary runways on one airport will not necessarily be the same length. Where the climatological data is not available, it may be assumed that they will be 20 per cent. shorter than the principal runway.

Number of runways. It will be seen that an airport with four strips at 45 deg. angular spacing (or an airport, for nose-





Plan of the preliminary design for the proposed Blackpool Airport (see also diagram on page 423) to be constructed by the Blackpool Corporation to the designs of Guy Morgan and Partners, and Brian H. Colquhoun. This will be the biggest and most ambitious air transport terminal in the world. Accommodation has been provided for the landing and take-off of aircraft over 100 per cent. larger and heavier than our biggest bombers and transport planes of to-day, and will be able to handle over 50,000 passengers a day, inward and outward from and to all parts of the globe. Both freight and passenger traffic will be handled and full passenger amenities, including hotel accommodation will be provided. The main runway is 3 miles long and 200 yards wide, capable of extension to 4½ miles. There will be two secondary runways two miles long and 150 feet wide, and provision for a fourth runway, if required. Trans-oceanic and inter-continental traffic will link up here. An important feature of the design is the lay-out of runways in such a way that time loss due to taxy-ing and disembarkation is reduced to a minimum. Up-to-date equipment is being provided to ensure that the time saved in travelling thousands of miles by aircraft is not lost in trans-shipment to other transport services to complete the journey.

wheel aircraft only, with three strips at 60 deg. angular spacing) can operate uninterruptedly until the wind exceeds a gale of 39 m.p.h. from a direction bisecting the angle between any two runways.

As the wind does not blow with the same frequency and force from every point of the compass, a study of the wind rose will suggest adjustments in the orientation of the subsidiary runways to reduce the frequency with which the limiting condition in the last paragraph is likely to occur.

At many places the wind prevails from a definite quarter so consistently that the number of runways may be reduced. In the south-western part of Great Britain two or three are sufficient, in most parts of India two arms will suffice and, in places in Burma and Ceylon, one runway only is necessary.

A tolerance of some 3 deg. is allowed in the siting of runways to enable siting difficulties to be overcome.

K STRING ZONING — UNOBSTRUCTED AREAS

The following area round each runway must be kept free from obstructions harmful to an aircraft:

Type of Airport.	Type of Runway.	Width of Zone from C/L of Runway.	Width of Zone from End of Runway.
		yards.	yards.
Trans-ocean ..	Principal ..	500	1,000
	Subsidiary	300	500
Inter-continental	Principal ..	350	1,000
	Subsidiary	250	500
Trans-continental	Principal ..	300	500
	Subsidiary	200	Merges into flightway.
Continental and Local ..	Principal ..	250	Merges with flightway
	Subsidiary	150	

L STRIPS AND RUNWAYS

1. The Strip is a long narrow area of ground, which has been cleared and graded, provided for the protection of aircraft taking-off and landing. *The maximum permissible gradient on it is* 1 *in* 66.

2. Down the centre of the Strip is superimposed the paved *Runway*. The runway is necessary because:

(i) A paved surface is the only one that will withstand the loading imposed by very large aircraft with high-pressure tyres.

(ii) An earth surface, even if consolidated, is inadequate to resist the wear of the heavy and frequent traffic, particularly in bad weather.

(iii) Aircraft take-off quicker from a paved surface, thus reducing the length of the strip.

(iv) It offers a more efficient braking surface in wet weather than grass.

3. Maximum gradients on Runways.

Type of Airport.	Type of Runway.	Max. Longitudinal Gradient. Between any 2 Points.	Max. Transverse Gradient.
Trans-ocean	Principal	1 in 100	1 in 80
Inter-continental	Subsidiary	1 in 80	1 in 80
Trans-continental			
Continental ..	Principal ..	1 in 80	1 in 80
" ..	Subsidiary	1 in 75	1 in 75
Local	Principal and Subsidiary	1 in 75	1 in 75

The changes in gradient should be gradual and must never exceed 1 in 200 in any 100 ft. interval.

As an adverse gradient of even 1 in 100 may increase the take-off of an aircraft by some 10 per cent., it is important that these gradients are not exceeded. Transverse gradients tend to swing the aircraft to one side when taking-off or landing.

4. Treatment of Strips.

(i) *For Trans-ocean and Inter-continental airports,* the *strips* will be cleared and graded, but need not be prepared for landing.

Reason: The weight of the larger aircraft using these airports will be such that a prepared earth surface could not withstand their weight. The aircraft's tendency to swing can normally be controlled by the pilot (and, as the heavier types of aircraft will generally have nose-wheels, there should be little tendency to swing), but a burst tyre or a binding brake may cause the aircraft to leave the runway, and the strip is needed to prevent the accident from becoming a catastrophe. Smaller aircraft using these airports will be protected by the greater width of the paved runways provided.

(ii) *For the 3 lower classes of airports,* the *strips* will be cleared, graded and prepared.

Reason: On a good bearing soil, a prepared earth surface will support aircraft with a gross weight up to 90,000 lbs. providing the tyre pressure does not exceed 70 lbs./sq. in., and the provision of a prepared strip, on each side of the runway, enables the width of the paved runway to be reduced.

5. Runway Specification.

(i) *Requirements of a runway:*

A runway must provide:

(*a*) Bearing capacity.

(*b*) Resistance to the effect of horizontal shear caused by braking.

(ii) *Specification*:

2 in. tough stone (or blast furnace slag) hardcore, and concrete of 1 cement to 6 volumes mixed aggregate (coarse sand and hard stone aggregate). (Thicknesses of concrete are given in Fig. 2.) Expansion joints to be provided in the concrete.

(iii) *Alternative specifications*:

(*a*) 10 in. (according to loading) tough stone or blast furnace slag, 2½ in. tarmacadam.

(*b*) In India, relatively soft stone has been used with success. In concrete it stands the abrasion from tyres, and in macadam, beneath the wearing coat, it showed no attrition under the runway. It is not suitable for roads.

(iv) *Runway edges:*

Runway edges are weaker than the interior. *Reasons*:

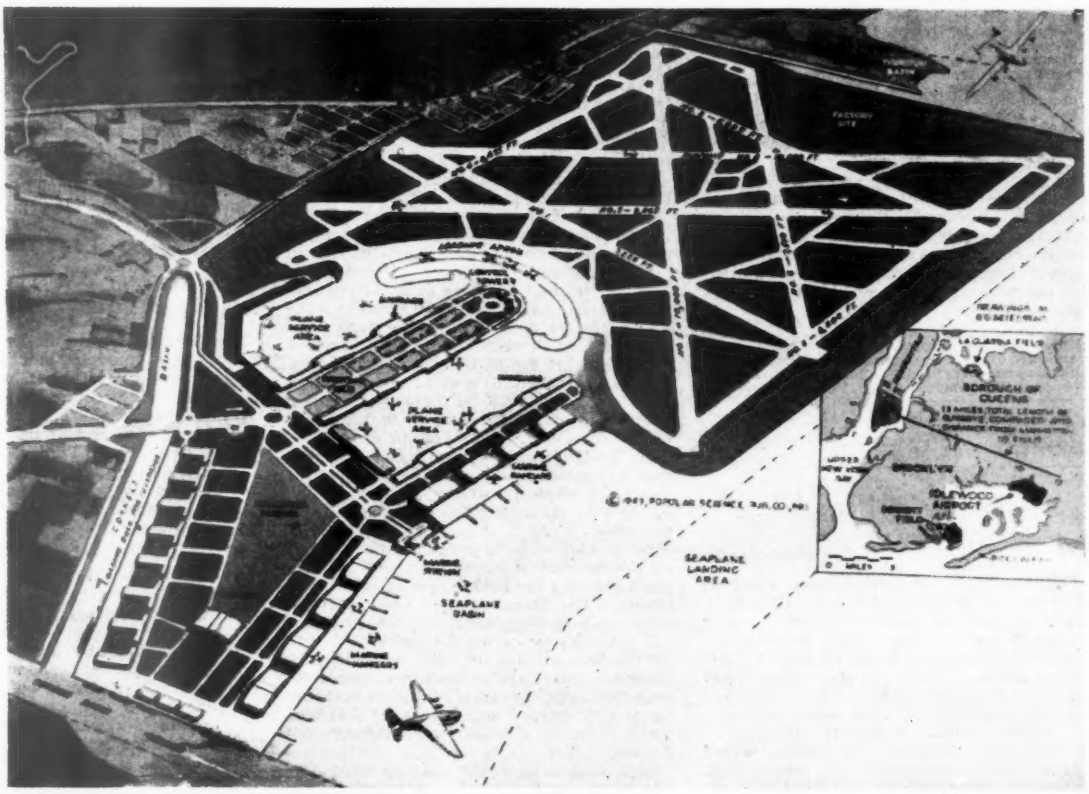
(*a*) "Surfacing" from soil is only 2/3rd that of runway.

(*b*) Rain lowers the bearing capacity of the soil under the edge, for a distance determined by capillarity.

Treatment. Thickness of the concrete runway will be increased by 4 in. along the edges, the breadth of the thickening being sufficient to take the spread of the wheel load at the base of the the thickening.

Alternative and better treatment. A dropwall with foundations below "the wedge of extrusion" (about 3½ ft.). The foundations of the wall must rest on good soil or else be at a depth where variations of moisture content are too slight to cause swelling. This type is particularly suitable for soils which suck in water rapidly and swell. If a drain is required along the runway edge, the drop-wall will provide one side for it. The drop-wall is best constructed, after the runway has been made, of well rammed concrete in a vertical-cut trench.

Apron. An apron, to prevent rainwater soaking beneath the runway edge, is excellent in theory, but most dangerous in practice as aircraft often taxi along runway edges, and the pilot expects any paved surface to have runway strength.



Preliminary proposals for the new Idlewild Airport on Long Island, New York City, to deal with trans-continental and trans-oceanic travel, provides 13 miles of runways, some 10,000 feet long and 200 feet wide. Access to the central buildings is by tunnel under the runways. A recent proposal suggests another lay-out of tangential pattern; terminal buildings and ramps would form the hub, and tangential runways would form the spokes. It is claimed that taxi distance would thus be much reduced, more traffic would be dealt with per hour, and acreage much reduced.

6. Design Graph for Runway Thickness. Figure 2 gives the *minimum runway thickness* for a given soil to stand pressure intensities of 7 tons/sq. ft. and 9 tons/sq. ft. respectively on an ellipse 20 in. x 45 in. It it plotted from the theory of Appendix I of Paper 5297, Journal of ICE, March, 1942, for circular loading after its extreme results had been verified in practice.

The vertical axis gives runway thickness and also the breadth to which the standard 20 in. wide wheel impress spreads at 45°. The horizontal axis shows tons/sq. ft.

To find the runway thickness for a given soil take the intersection of the appropriate pressure curve and bearing capacity one. Safety should be given by taking the worst condition of soil likely to occur.

7. Length and breadth of runways and strips. The length of the runways of an airport must be sufficient to enable a public transport aircraft to land again and come to rest should engine failure occur before it has attained the speed at which flight can be continued with one engine inoperative.

The following table of strip and runway lengths and breadths, providing for the above safety requirement under the most adverse circumstances and adjusted for atmospheric conditions at sea level in the United Kingdom, has been prepared by the Department of Civil Aviation. It is estimated to allow for future requirements as far as they can be forecast. The fourth column shows the reduction to the length of strips and runways in similar conditions but where icing is not likely to occur.

Type of Airport.	Type of Runway.	Length of Strip and Runway.	Reduce Length for No Icing Condition.	Width of Strip	Width of Runway.
		yds.	yds.	yds.	yds.
Trans-ocean	Principal	5,000	1,000	600	200
	Subsidiary	4,000	800	400	150
Inter-continental	Principal	3,750	750	450	150
	Subsidiary	3,000	600	300	110
Trans-continental	Principal	3,350	650	300	120
	Subsidiary	2,700	500	200	90
Continental	Principal	2,750	550	200	66
	Subsidiary	2,200	400	150	50
Local ..	Principal	1,900	400	150	50
	Subsidiary	1,500	300	100	40

Allowance for altitude. The length of strips and runways will be increased by 7 per cent. per 1,000 ft. of altitude.

Allowance for tropical regions. Strip and runway lengths will require to be adjusted for decrease in both density and performance as follows:—

Highest Average Temperature experienced over 10 Years, expressed (in Degrees above Standard) air Temperature.		Percentage Increase in Length of Strips and Runways.
°C.	°F.	Per cent.
10	18	6%
20	36	12%
30	54	18%

M FLIGHTWAYS

Flightways are fan-shaped zoned areas, at each end of the *Strip* and co-axial with it, required for the protection of aircraft taking-off and landing. They may be regarded as having two diverging side " walls " and a sloping " floor," within which there must be no obstruction. They constitute the only exacting restriction upon the height of objects around an airport. (Previously it had been necessary to impose severe height restrictions upon the whole area around an aerodrome.)

Ruling Dimensions. Where the narrow end of the flightway joins the strip, it is the same width as the strip. The side " walls " of the flightway splay outwards horizontally in ratio of 1 in 2½ (1 in 5 on each side). The angle which the " floor " of the flightway makes with the horizontal must be less than the smallest angle at which an aircraft will climb or descend. The " gradient of the floor," or obstruction angle, is measured as follows:

Type of Airport.	Type of Runway.	Obstruction Angle.	Measured from:
Trans-ocean and Inter-continental	All Runways	1 in 50	Ends of Unobstructed Area.
Trans-continental ..	Principal Runway		
Trans-continental	Subsidiary Runways	1 in 50	Ends of Strip.
Continental ..	Principal Runway		
Continental ..	Subsidiary Runways	1 in 40	
Local	Principal Runway		
Local	Subsidiary Runways	1 in 30	

Over-run, formerly allowed in the centre of the flightway, is not now required, it being allowed for in the length of the runway.

N TURNING CIRCLES

Turning circles are 100 yds. diameter and of similar construction to the runways. They will be required at the ends of all runways on local and continental airports and at the ends of subsidiary runways on trans-continental airports.

O TERMINAL AND PARKING AREAS

The **Terminal Area** is the apron, between the landing area and the terminal building, used for loading and unloading. The term can also be used to include the terminal building, in which case the apron is called the *Embarkation Area.*

The **Aircraft Park,** for aircraft in transit or awaiting departure, is sited close to the *Terminal Area* with ready access to the *Refuelling and Servicing Park.*

The siting of the *Terminal Area* is governed by the following factors:

(i) It shall be related to the flow of traffic on the landing area, so that the time (and cost) of taxying is reduced to a minimum.

(ii) It shall give the quickest possible access to main roads and railways leading to the centres of traffic served.

Aircraft should only be allowed to remain at the **Loading Points** for the minimum time necessary for them to embark and discharge their loads (to reduce the number of loading points to a minimum). At other times they will be stationed in the *Aircraft Park.*

The loading points should be of sufficient size to accommodate the largest aircraft using the airport, and the aircraft should be able to manœuvre freely to and from the point.

The number of points required will depend on the number of aircraft arriving and departing during the peak hours of the busiest season. The Department of Civil Aviation estimates that the number of points required will generally be between 4 and 8.

If the lines of flow of traffic are efficiently designed, delays are reduced to a minimum, and the traffic capacity of the airport increased. Figures 3 and 4 show, in diagrammatic form the flow of traffic through the *Terminal Area.*

Some designers consider that the smoothest flow is obtained when the embarkation area is convex in plan. It certainly reduces the distance that the passengers have to walk.

Apron. The design of the *Apron* will be as for taxiways (see section P), with edges protected as for runways (section L, 5 [iv]).

P TAXIWAYS

1. Width and lateral clearance. The width of the *taxiway* is calculated on the basis of approximately 2½ times the track of the widest undercarriage in each category of aircraft. Generous lateral clearance has to be allowed on each side of the *taxiway* for the overhang of the aircraft's wings.

Type of Airport.	Width of Taxiway.	Lateral Clearance from C/L of Taxiway.
Trans-ocean ..	250 ft.	375 ft.
Inter-continental ..	175 ft.	290 ft.
Trans-continenta l ..	150 ft.	245 ft.
Continental ..	80 ft.	190 ft.
Local	60 ft.	125 ft.

2. Gradient. The maximum permissible gradient is 1 in 66, and the maximum rate of change should not exceed 1 in 100.

3. Tangential radius of turn. The airport can only handle its full capacity of traffic, and the time of air journeys can be reduced, if aircraft are able to taxi at fairly high speed. To enable them to do so without strain on the undercarriage (or undue wear on the brakes) turns must be kept flat. The radius of turn, measured on the centre line, should not be less than 450 feet, but a radius of 600 feet is preferable.

4. Runway Exits.

(i) The ends of each runway will be connected to the embarkation area by taxiways.

(ii) An aircraft must have left the runway by a safe distance before the next movement can take place. The rate of movement will be raised if exits from the runway are provided at convenient intervals, since it is not possible to foretell at what point on the runway the aircraft will come to rest. The maximum distance between exits should not exceed 500 yards.

(iii) A perimeter taxiway, joining the ends of the runways, saves construction costs, but involves excessive taxying.

5. Construction. *Taxiways* will be designed for the same static load as runways, but, as they are not subjected to the transverse forces arising from non-rotating wheels landing at high speed and from emergency braking, they may be of lighter specification.

Q ROAD AND VEHICLE PARKS

Roads and **Vehicle Parks** generally will follow good modern practice, but a perimeter road, at least 12 ft. wide, joining all runways, is required for aerodrome servicing vehicles. This, and the approach road to the airport, must be capable of taking a Recovery Trailer of 60 ft. wheel base. No hump-backed bridges should be allowed on these roads, and the curves should be adequate.

R DRAINAGE

1. Runway drainage. This is necessary to:

(i) *Remove surface water. Reason:* A runway with an inadequate slope collects puddles which are most dangerous to aircraft landing at high speed. The water shoots up in a sheet that blinds the windscreen and can tear off flaps.

(ii) *Maintain and raise the soil's bearing capacity. Reason:* The runway thickness depends on soil bearing capacity, and this falls rapidly when moisture exceeds a certain amount. Drainage is therefore important and, in the case of clayey soils, vital. By referring to Fig. 4 it will be seen that,

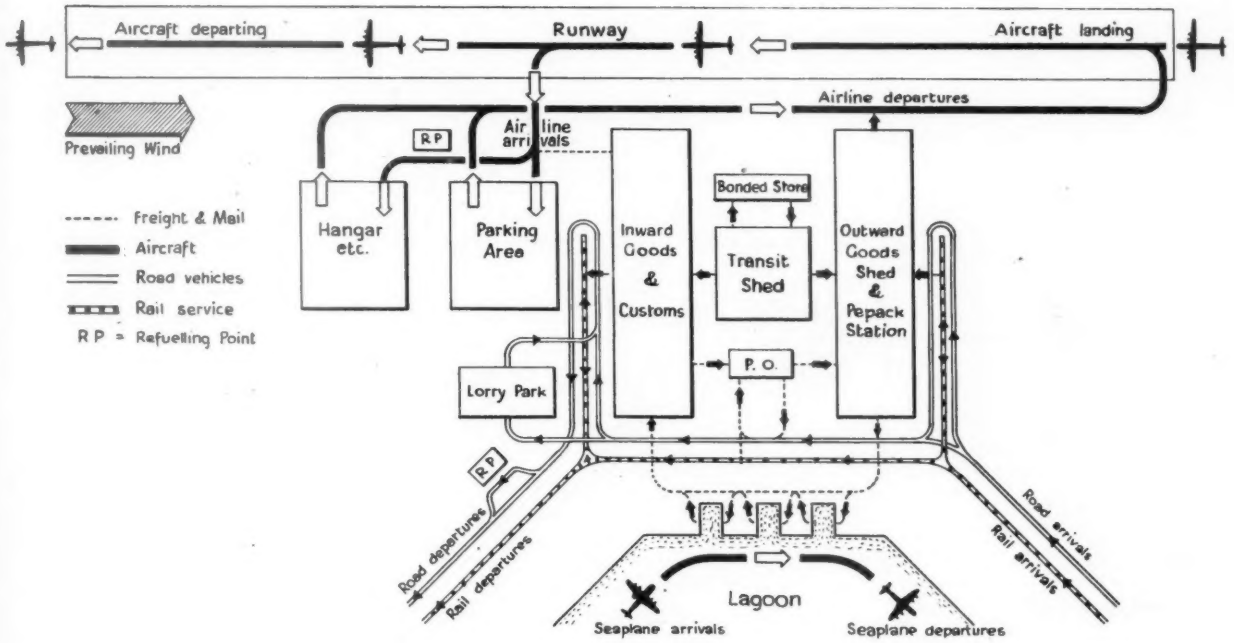


FIGURE 3

Traffic diagram for freight and parcel mail.

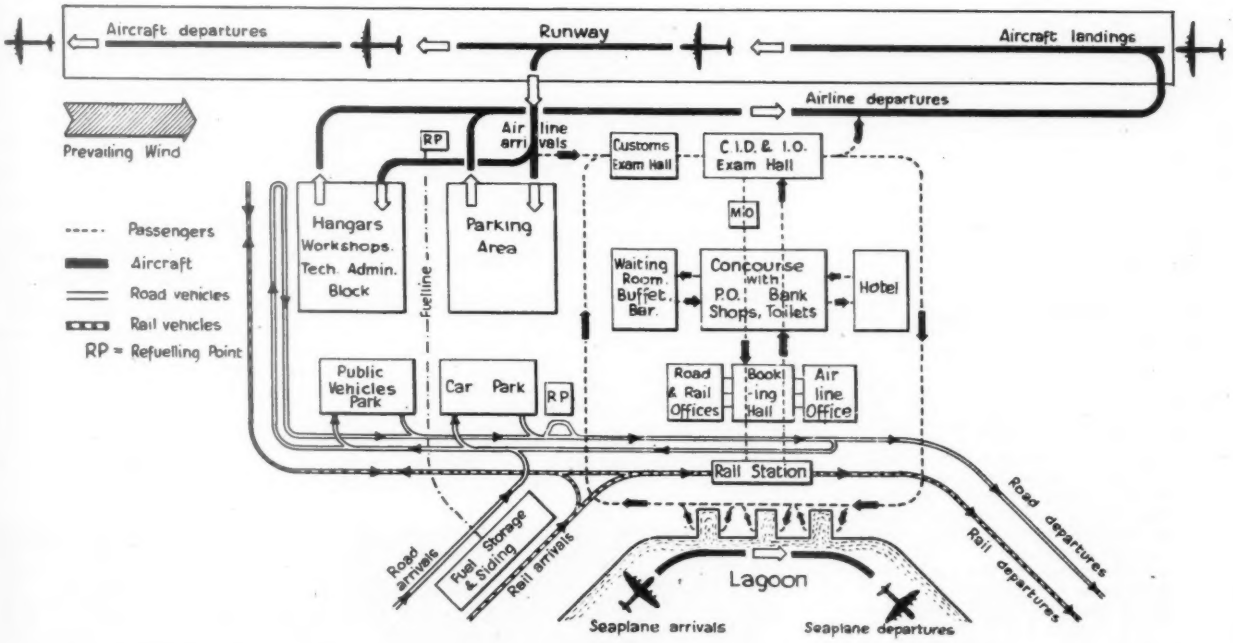


FIGURE 4

Traffic diagram for aircraft, passengers and letter mail.

by drainage, a runway thickness could be reduced from 16 to 7 in.

(iii) *To reduce the extent of heaving action due to frosts.*

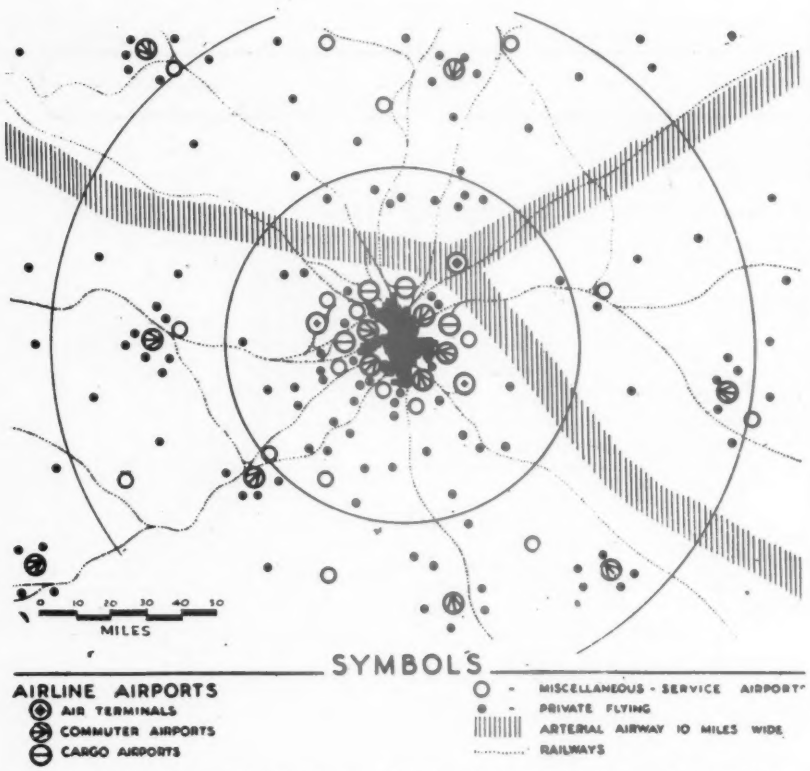
2. The removal of surface water. The permissible gradients for runways, strips and taxiways have already been given. The runway may slope to each side by the provision of a crown, but this crown must be given by two planes meeting in a ridge, not as a camber. Alternatively, if the ground has appreciable cross slope, not more than 1 in 80, the runway may be given the same slope. The nature of the slope may change, within permissible limits, in the length of a runway to conform with the ground. To prevent the flow of water from outside, across the runway, the uphill strip edge will require *saucer* or other drainage.

The run-off factors of various types of surfaces are as follows:

Concrete, 80 per cent.
Asphalt, 75 per cent.
Tarmacadam, 70 per cent.
Turf (well drained), 5 per cent.

The drains must allow for the removal, within 3 hours of the beginning of the storm, of one hour's rainfall of maximum intensity.

3. Saucer Drains. These are the most useful, the cheapest and the most efficient drains for removing storm-water, and should be considered before any other type. They are constructed by first digging gently-sloping ditches to the least depth required for the flow of water, and then grading their sides back to a slope of 1 in



A chart showing the possible distribution of various types of airports round a metropolitan centre of 1,000,000 *population. Terminals and cargo airports are close in; commuter airports are both outlying and close-in; private fields are interspersed between.* (*From* New Pencil Points.)

200. In this form they are invisible, and do not form an obstruction to taxying. They are, in fact, nothing more than the provision of self-drainage.

4. The prevention of access of water beneath runway. Access of water may be by seepage or by the water-table rising between the runway. The most practical way of preventing this is by seepage drains along the runway edge, with surface measures as described below.

(i) *Seepage Drain.* The most advantageous type, if properly used, is the *French Drain.* One side of this drain will be an 18 in. concrete drop-wall, as specified in Section L (5[iv]), on a 6 in. concrete foundation. The "piping" will be two dry-brick channels, and these will be covered by a 2 in. to 2½ in. ungraded porous material sealed with a 2 in. to 3 in. porous bituminized wearing coat. Between this material and the soil side, to a depth of 18 in., is deposited ballast, 1 in. on top and 2 in. at the bottom. This type is a combined seepage and storm water drain.

(ii) *Surface measures.* When the water table is high, every means is necessary to prevent rain-water from reaching the water-table. This can be done by:

(*a*) The provision of saucer drains.

(*b*) Planting the strip with a gross-feeding plant like lucerne. A 50 ft. strip of lucerne, regularly cut, is as good as an ordinary farm drain; it transpires water during periods when the drain does not work.

S ACCOMMODATION FOR HELICOPTERS AND JET-PROPELLED AIRCRAFT

1. Helicopters. The development of rotating-wing aircraft has not yet reached the stage where it is possible to foresee whether it will be of practical use for rapid transport between city and airport. For one thing, they are expensive to operate in terms both of first cost/pay load and of tons/miles/gallons of fuel. A site should, if possible, be reserved as a *Helicopter Park*, and the best position for it is on one side of an *Unobstructed Area*, near the *Terminal Building*, and at least ½ mile from any flight-way.

2. Jet-propelled aircraft. Jet-propelled aircraft may one day double the speed of flight, but there are indications that they may require longer runways for take-off than convention aircraft, and runways up to five miles in length can be envisaged. On the other hand, runways have certainly "runaway" with themselves, and runways 3-5 miles long not only create planning and economic problems of great magnitude, but must make even the birds laugh. It is felt, therefore, that other developments may produce a reduction in take-off, so that these developments will tend to cancel each other and to leave runway lengths unaffected.

T BULK STORAGE OF PETROL

1. Quantity. The minimum quantity of petrol required to be stored at an airport is 60,000 gallons. Storage will be in *Tanks.*

2. Site. The best position for the *Storage Tanks* is at a railway siding, about 20 ft. from the permanent way, and within easy access (within 2 miles) of the *Aircraft Servicing Park.*

The normal method of transferring aviation spirit from railway tanker to storage tank is by gravity. Spirit is transferred from tank to tank and tank to plane by means of mobile tankers.

U AIRPORT CAPACITY

At Croydon before the war, the peak of scheduled aircraft movements was 12 movements per hour. With improved technique and improved methods of landing in low visibility, it may be possible to increase the number to 20 movements. To attempt to exceed this number, where bad visibility is of frequent occurrence, would only lead to congestion and delays.

Air traffic has seasonal peaks, summer traffic being generally twice as heavy as winter traffic. There are also daily peak periods. The peak hour of a pre-war summer's day at Croydon accounted for 11.23 per cent. of the day's scheduled movements, and 12 per cent. has been quoted as a typical figure. It is therefore estimated that the annual estimate of an airport with one runway in use at a time, and a summer peak hour of 20 movements, would be 39,000 movements.

Twenty passengers per plane may be taken as a fair average.

It has only been possible, within the limitation of this article, to give a brief reference to technical equipment used on an airport, but in these matters the architect will expect to receive expert advice.

Model of Santos Remart's Demoiselle *of* 1908 *at the South Kensington Science Museum.*

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

1700 **Russian Villages**

THE PRESENTATION OF TECHNICAL ROADS. *V. Semenov-Prozorovschi.* (*Architectura No.* 1: 1942.) Many Russian villages straddled main traffic routes. Have been more bombed than others. Proposals made for rebuilding on new lines.

These villages must be re-built on and near their present sites partly because of their historic connections and partly because during winter and spring mud confines transport to the arterial (metalled) roads.

The traditional lay-out, lining both sides of the main road, is no longer practicable. The life of the village inconveniences the through traffic and causes it to reduce speed, and the existence of through traffic disturbs the village and causes danger, dust and noise.

Three of the suggested lay-outs are reproduced below.

STRUCTURE

1701 **Electric Clocks**

MEMORANDUM ON THE SYNCHRONOUS ELECTRIC CLOCK. (*Submitted by the British Synchronous Clock Conference*). A brief review of synchronous electric clock types and installations for all principal uses.

This memorandum has not been circulated elsewhere, and this note therefore attempts to abstract all main points.

The objective of the memorandum is to indicate the types of clock likely to be available after the war, their uses, and where to place them. Some interesting psychological points about time and time-keeping are made.

The clock types and uses mentioned can be itemized.

Exterior Clocks.—It is suggested that the local planning authority should install a network of public external clocks of suitable design.

Factories.—An external clock is recommended, and also internal clocks in all departments. Dial should be clear, and in diameter an allowance of one inch should be made for each foot of height.

Offices.—Flush-fitting clocks

Banks, etc.—As for offices, and additionally a clock in the vestibule.

Shops.—No definite recommendations, but reference is made to two psychological points. People usually think the time is passing quickly and are apt to leave the shop before necessary unless they know the hour; and accurate clocks well displayed give confidence of efficiency for purchasers.

Hotels.—All rooms should have a clock with synchronous automatic alarm adjustable for waking time and with a press-button silencer.

Cinemas and Music Halls.—Clocks softly illuminated.

Theatres.—Clock to become visible when the curtain is lowered.

Public Houses.—Suggestion for a warning bell 5 min. before "time."

Houses (*Living Rooms*).—A clock outlet at the centre of the mantel, and 2 in. above it, unless otherwise required by owner. *Kitchen.*—Wall clock (possibly flush fitting, with wall chaplets), 6 ft. above floor and near the cooker. Steam, etc., need not affect electrical mechanism. *Hall.*—Filling suggested over door, so that adequate size can be accommodated without fouling the paint. *Bedrooms.*—One outlet over the mantel and one by the side of the bed. The bedside clock should be luminous and have an alarm. *Bathroom.*—Wall clock visible from bath.

Emphasis is laid on the desirability of wiring for clock outlets in each main room. Clock outlets should be independently fused.

The memorandum gives the impression that points for clocks should be nearly as prevalent as those for lights—a conception which represents a technological advance.

1702 **Technical Writing**

THE PRESENTATION OF TECHNICAL LITERATURE. *G. E. Williams.* (*Journal of the Institution of Electrical Engineers, May,* 1944, *Part I, p.* 199.) Technique of technical writing. Method of presentation, choice of words, organization, psychological principles.

Along with the development of science as a way of thinking there has arisen a style of writing about technical matters which itself is new, and in principle scientific. Technical people everywhere write in that way because they recognize its fundamental suitability for their purpose. At the same time they acquire their technique very much as a craft; that is to say, they read a great deal of such literature, and slip themselves into the manner of it without any very careful thought about it. The present writer has apparently sensed that this is not too satisfactory, and has undertaken to set out the principles and technique in detail.

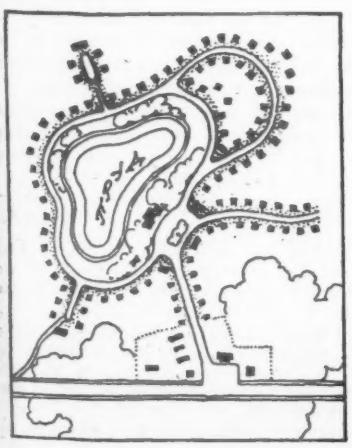
His discussion is split into four main parts: *The Method of Presentation, The Choice of Words, Organization* and *Psychological Principles.*

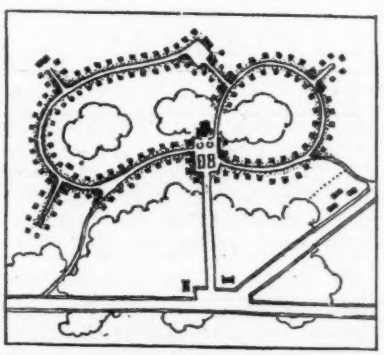
The presentation, he says, should proceed in a logical manner—from outline to details, from simple to complex, from known to unknown in order of importance. The sequence will often best be temporal, but almost never historical; the latter should be kept to the introduction. If mechanical or structural matters are discussed, they should be handled in ascending order of complexity; of two that are equally complex, the more important one should be described first and in greater detail. The proper place for generalization is almost always at the end. Important relationships developed mathematically should always be expressed in words as well as symbols. (This is a point so frequently overlooked that it accounts for a great deal of apathy towards technical material.)

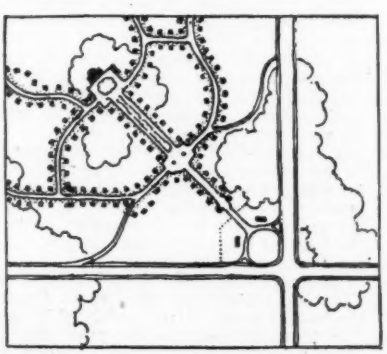
His references to diagrams are fundamentally those of art composition. They should not present "several topics of equal value all clamouring for attention at once." As a rule, he says, no more than three topics to a diagram. It is surprising how frequently one offends such simple rules.

For the choice of words he depends principally on other writers, such as Fowler and Quiller-Couch. There is a nice touch in his quotation that the verb "to involve" is "the foggy mind's best friend."

Organization is one of the best sections. Not only is the reader made aware of many simple subtleties of writing, but he is given







Three proposals for the lay-out of a reconstructed Russian village, lying along a main road and destroyed by bombs. (No. 1700.)

convenient and useful quantitative guidance, *e.g.*, 300 words as the upper limit for a paragraph, and 900 words for a section. The main title should be exact, brief, and euphonious, and if it contains more than seven stressed syllables, it should be divided. Sub-titles should contain less than 15 words. These are useful tips.

The section on psychological principles is less definitive than the others, despite the author's awareness that factors in sustained attention are "variety, repetition (short of monotony), intensity, and definiteness." Nevertheless there is good guidance for the use of associated ideas and suggestion.

Architectural literature has been tardy in acquiring a distinguishable technical subdivision. But the development is coming, and architects who are now working to increase their competence with building science will find in this paper excellent advice on how to present technical ideas.

1703 **Trimetric Projection**

TRIMETRIC PROJECTION. *H. Fowcett.* (*Metropolitan - Vickers Gazette, January*, 1944, *p.* 264.) Simplified drawing office technique for making trimetric projections.

The technique consists of an ingenious scale, in the form of a multi-sided set-square, by which trimetric projections can be made from any of twelve different viewpoints. It is said to have helped greatly in the production of easily understood assembly drawings of all types, prepared by untrained assistants, and it seems quite likely that it could be useful to architects. The scale is illustrated.

1704 **Timber Aircraft Hangar**

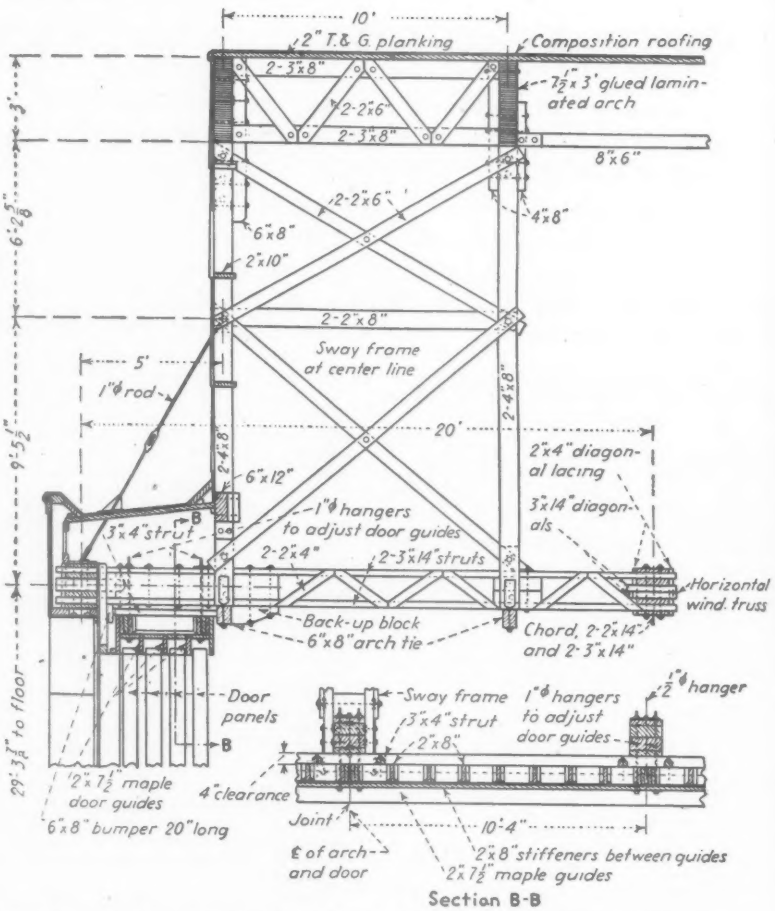
LONG SPAN LAMINATED TIMBER ARCHES FOR AN AIRCRAFT HANGAR. *Alfred Zweig.* (*Engineering News-Record, September* 21, 1944, *pp.* 347-349.) Three hinged laminated arch ribs of $7\frac{1}{2} \times 36$ in. cross section and 171 ft. span serve as principal framing for timber aircraft hangar. Arches prefabricated.

An aircraft hangar of timber construction at Hagerstown, Md., USA, claims attention because of the long span of arch ribs and some remarkable features of design. The hangar is 171 ft. wide, 120 ft. long, and 48 ft. high inside. Wooden doors rolling back into pylons at the sides provide a 27 × 135 ft. clear opening at the front end. The arches are spaced at 10 ft. centres; they were designed for 75 per cent. of the normal snow load of 30 lb./sq. ft.; the permissible stress was close to 2,000 lb./sq. in. The two front arches of the hangar, carrying a horizontal wind truss and the door guides, were designed for almost twice the loading of the typical arch. Instead of using arches of greater cross-section to accommodate the increased load, a horizontal 6 × 8 in. wood tie about 29 ft. above floor level was provided in the vertical plane of each of these two members. By means of these ties it was possible to use the typical arches throughout.

Of interest is the fact that the moments in the arches are all negative, making the bottom and not the top of the arch in compression for its entire length. In order to prevent buckling it was necessary to brace the bottoms laterally at spacings not exceeding 28 ft.

The arches were prefabricated at Wisconsin.

The horizontal wind truss at the front of the hangar spans 171 ft. and is 20 ft. deep. The centre of one chord is projected 5 ft. outside the centre line of the first arch, and the centre of the other chord is located between the second and the third arch. This arrangement enables the chords to pass to the outside supports without interfering with the arches. At nine intermediate points the horizontal truss is hung by swayframes from the first and second arches. The verticals of the truss form the bottom of the sway frames and support the top guides of the sliding doors. The guides are suspended on hangar rods in which turnbuckles are provided so that it will be possible to adjust the guides by turning the nuts, in case the roof sags slightly due to shrinkage of the wood or from other reasons.



Section through the end arch and door lintol of the aircraft hangar at Hagerstown, USA, of laminated timber arches. The sliding door leaves are suspended from the horizontal wind truss which projects about 6 feet beyond the end arch rib. If necessary, because of shrinkage of timber or for other reasons, the bolts supporting the guides can be tightened to provide more space above doors. A photograph of the building is shown on page 421 (centre). (*No.* 1704.)

MATERIALS

1705 **Lead**

MILLED LEAD SHEET AND STRIP FOR BUILDING PURPOSES. *British Standard* 1178:1944. (*British Standards Institution*, 1*s.* 0*d.*) Soft milled lead sheet and strip for roofs, weatherings, damp proof courses and other work.

1706 **Softwood**

SIZES OF STRESS-GRADED SOFTWOOD TIMBER. *British Standard* 1175:1944. (*British Standards Institution*, 2*s.* 0*d.*) Standard sizes of beams, columns and struts, members of small cross section. Shrinkage. Variation in rough sawn timbers. Reduction due to surfacing. Determination of moisture content.

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.*

1707 **Silver Fish**

Q *How can one get rid of Silver Fish? I believe they are able to fly as well as crawl, and only come out at night. Are they harmful in any way?*

A Silver fish are not able to fly, but they run very fast when disturbed. As you suggest, they come out chiefly at night. They are not considered as important pests in this country.

Silver fish eat crumbs, etc., which is why

L. E. Walker, Photo.

CASTLEACRE PRIORY,
The S.W. Tower

THE Norman builders made great use of lime concrete, chiefly as a filling behind the facings of finely cut stone, but they had lost the knowledge, possessed by the Romans, of the enormous increase of strength given to feeble lime by a small addition of volcanic ash. But for this lack, Norman buildings would be as strong as they look, and many a sturdy pillar which, long since, has crumbled to a heap of loose stones, would still be standing. A small addition of 'PUDLO' Brand waterproofer to Portland cement concrete, and renderings, makes them completely waterproof, and immune against the disintegrating effects of rain and frost.

they are attracted to kitchens and larders. They prefer starchy foods and may even go for the paste off the back of wallpaper where it has become detached.

Poison is the best method of control. Either of the two mentioned below can be sprinkled where the insects are normally found and, if possible, blown into cracks and crevices.

(1) 6 parts by bulk Sodium Fluoride.
2 parts by bulk Pyrethrum Powder.
2 parts by bulk Corn Starch.

(2) 6 parts by bulk Sodium Fluoride.
6 parts by bulk Flour.

Both of the mixtures (which should be well mixed) are poison to humans and animals and stringent precautions must be taken.

Spraying with domestic insecticides containing Pyrethrum is often effective, but fires and naked lights must be put out before spraying is started.

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.

ISE

B. H. Colquhoun

November 23, at 11, Upper Belgrave Street, S.W.1. Paper read to the Institution of Structural Engineers on THE DESIGN AND PLANNING OF AIRFIELDS AND AIRPORTS, by Brian M. Colquhoun, B.SC., M.INST.C.E., M.I.STRUCT.E., former Director-General of Factories for the Ministry of Aircraft Production.

B. H. Colquhoun: If Great Britain is to maintain its position in the world it must hold a position of at least equality with other nations in civil aviation. Although there are many aspects of civil aviation which have not yet been determined either nationally or internationally, it is essential that there should be a number of major air terminals. One at least of these should be in this country, and if it is to be ready when it is needed, design and construction should be commenced at once.

In deciding the location and design of major airports consideration must first be given to the controversial problem of seaplanes versus landplanes. For various reasons it is probable that after the war seaplanes will develop more rapidly for civilian flying, particularly for the larger size of aircraft and for the longer distances. Consequently, therefore, any major airport should have facilities both for landplanes and seaplanes. The location of a major airport must therefore be chosen having regard to the suitability for the construction of a seaplane lagoon; but in addition to this the site must be so selected that the meteorological conditions are suitable, the topography is satisfactory up to a distance as much as 30 miles from the airport, it is as near as possible to centres of industry and population, it must have good trunk communications, it must have first-class local amenities in close proximity, and the availability of land should be such that there should not be too much demolition of existing housing or industry, nor be in an area where future town planning may restrict future development of the airport.

These qualifications greatly limit the numbers of suitable locations in this country for a major air terminal.

When a location complying with as many of these conditions as possible has been found, consideration must be given to the technical aspect of design. The runways and paved areas should be designed to accommodate the heaviest aircraft which can be envisaged for some years to come, and it is suggested that this figure may be as high as 500,000 lbs. The design of runways and paved areas will be affected, as far as aircraft are concerned, not only by the weight of air aircraft, but by the number of undercarriages, tyre pressures, undercarriage spacing, wheel spacing and impact loading. It is considered that restriction should not be placed upon the aircraft designers by these points, but that the runways and paved areas should be so designed as to allow a free hand to the aircraft designers.

Geology, sub-soil conditions and drainage in the district must then be investigated before the engineering design can be settled, but it is felt that runways and paved areas for major airports may be of reinforced concrete design on a suitably prepared sub-base, and it is stressed that particular attention must be given to drainage, not only of the paved areas and immediate vicinity, but also the surrounding areas. Many runways have failed in this and other countries through lack of proper drainage.

In connection with airfield design, ample and early consideration must be given to suitable control buildings and the installation of airport and runway lighting, telecommunications, Radar and other airport electrical equipment which forms a part of flying control on any large airport.

With regard to the number, length and width of runways, this is still a matter of much discussion and controversy, but as a basis for design much credit should be given to the recent pamphlet, *Technical Characteristics of Aerodromes*, issued by the Department of Civil Aviation at the Air Ministry laying down suggested data for airports, divided into five different categories. In designing a major airport consideration must be given also to the advisability of providing a secondary or subsidiary land airfield for the use of feeder services and taxi aircraft.

The design of a major airport must cover also all the usual buildings required, including special emplaning and disemplaning buildings, a combination for Customs, Excise, Immigration, etc., airport offices, restaurants and bars, shops, and probably also cinemas and other entertainment areas. It must cover also repair and storage hangars large enough to deal with aircraft of at least 300-ft. wing span, quarters for pilots and airport staff, and possibly also an hotel.

Many of these buildings will be of normal ordinary design, but special consideration must be given to the hangars which will have to be large enough to accommodate the largest aircraft envisaged for some years to come, and to the emplaning and disemplaning buildings, both for seaplanes and for landplanes. Up to the present time buildings on airports for this purpose have not received much consideration, and much delay is caused at airports by inefficient emplaning and disemplaning. At a future major air terminal the handling of a seaplane after it alights and the loading and unloading of passengers and freight both from and to seaplanes and landplanes is a matter which requires careful research and investigation.

Illustrations of the design of modern air terminals are the new Idlewild Airport at New York, the Cliffe Airport which has been designed as a suggestion for London's air terminal, and the proposed new Blackpool Airport. The Idlewild Airport at New York is under construction and is an indication, in view of the existence already of the La Guardia Airport, that the Americans fully appreciate the necessity for large airports of the future and the urgency of their construction. The Cliffe Airport, designed by Messrs. Guy Morgan and Partners over two years ago, and the new proposed Blackpool Airport are still only in the realms of possibility—an indication of how backward and unprepared we are at the present time for the future of civilian air travel. It is strongly recommended that a new great air terminal, combining both a landplane and a seaplane base, and to act as one of the centres of world air travel, should be constructed in this country without further delay.

ICE

A. S. Maclaren

November 28, at Great George Street, S.W.1. Lecture to the Institution of Civil Engineers on THE DESIGN OF LAND AIRPORTS FOR MEDIUM AND LONG-DISTANCE CIVIL AIR TRANSPORT, by A. Shaw Maclaren, M.A., A.M.INST.C.E., A.R.AE.S., Civil Engineer to the British Overseas Airways Corporation.

A. S. Maclaren: Although modifications to buildings and equipment enable military aerodromes to carry out to a certain extent the tasks imposed on them when used as civil airports, adaptations of this kind are not best suited to civil airline work, which has to be conducted commercially with the maximum of economy, regularity, comfort and safety while, at the same time, offering to the public amenities of the highest quality.

Aircraft Characteristics.

The characteristics of aircraft which principally affect the design of an airport are the wing loading and power loading, the all-up operating weight, the number and arrangements of wheels, including the load distribution, wheel track, and tyre pressures, the wing span, the overall length and maximum height from ground and the number of passengers and/or volume of mail and cargo which can be carried.

Relation to Runway Length.

The product of wing loading and power loading, or WXP, is a guide to the take-off

run required in still air under standard atmospheric conditions, and, in the opinion of responsible British operators, 650 represents the upper limit of WXP for safe and economic commercial operations. Accordingly, there appears to be a coming limit to the length of runway required for British civil transport according to the principle that there shall be no undue risk even if one engine fails before the critical speed has been attained at take-off or under the most unfavourable conditions of braking surface. In that connection, the universal adoption of reversible propellers to be used as air brakes will considerably reduce the lengths required.

Future Size of Aircraft.

The largest British transport at present under design has a wing span of 230 ft., overall length 170 ft., tail span 75 ft., overheight 47 ft. 4 in. Independently prepared British estimates of the largest commercial aircraft expected to be built within the next 10 or 20 years give figures of 360,000 lb. and 400,000 lb. operating weight respectively with a 300-ft. wing span. These figures agree with indications from America.

The general trend of wheel arrangement and loading is less clear, but British designers appear to favour dividing up the load of heavyweight machines between several widely-spaced pairs or groups of wheels. That considerably reduces the loading on pavements and is of importance in economic design in view of the fact that the British machine of the size referred to above will have an all-up weight of approximately 250,000 lb. It is very desirable that there should be widespread recognition among engineers both aeronautical and civil of the importance of linking the question of the wheel layout of heavy aircraft with runway constructional design and cost.

Tyre pressures are also on the increase, and may vary from 45 lb. to 70 lb. per sq. in. for an aircraft of 30,000 to 100,000 lb. weight to 80 to 120 lb. per sq. in. for 150,000 to 400,000 lb. weight.

New Types and Effect on Choice of Site.

In choosing a site, the object should be to allow for space which will accommodate a master-plan providing for the maximum of development which can reasonably be foreseen, consistent with good service to transport needs, and so to plan its development as to provide, in stages both as larger aircraft need to use it and as the volume of traffic grows, the necessary facilities.

At the same time, consideration must be given to the possibility of variations in aircraft, such as all-wing or tailless types, jet propulsion, track-laying undercarriages, swivelling undercarriages and helicopters. Jet propelled machines will almost certainly be used for fast transportation within the next 2 or 3 years, and the take-off of that type of aircraft to-day is no different from normal aircraft as regards the length of runway required. If the experiments in the United States on replacing landing wheels with a small track-laying gear prove successful, the distributed loads imposed on paving will be materially reduced. The Maclaren, or swivelling-wheel, undercarriage enables a machine to be taken off and landed crabwise in winds whose component across the runway would otherwise be too great. So far that system has been successfully applied to small nose-wheel aircraft, and if it can be applied to large aircraft it will have a considerable effect on the number of runway directions required. However, no new development will affect economies in airports until it becomes universal.

Helicopters do not at present seem likely to oust winged aircraft from the medium- and long-distance transport field although they may come into considerable use for short-distance work and as privately-owned vehicles, air-taxis and air-buses.

The Airfield.

Temporary pavings of military type will serve in some cases as a stop-gap measure for civil transport after the war, but more durable surfaces, less " rough " for light aircraft, and less liable to damage tyres are required for permanent work; bituminous mix and concrete surfaces seem likely to displace all others. Paving should be designed for economical maintenance on a regular basis, with adequate foundation courses and surface- and sub-soil drainage.

Private, club, military, and training flying, being generally of a non-scheduled character, should be excluded from transport airports handling frequent services if the transport is to be run at an efficient level. Express, mail, and freight pick-up services, together with helicopter operations, can also be permitted only during the " free " hours of an airport handling an occasional normal service. At other periods, they will have to be relegated to a satellite airport.

Length and Number of Runways.

Much thought will have to be given to the number, length and direction of runways so as to ensure that the traffic can be handled at all times and under all conditions of wind, etc. That is a scientific matter. For a WXP of 650, it is estimated that a primary runway should be 10,000 ft. in basic length. Estimates for basic primary runway lengths required for immediate post-European-war operations are, however, at present only 6,000 ft. for Class A airports serving routes involving flight stages averaging about 2,000 miles between landings, and 5,200 ft. for Class B airports serving stages up to about 1,000 miles. All factors will have to be taken into consideration, including the density altitude of the site which necessitates an addition to the basic runway length. Even in the vicinity of London during the hot summer months, an addition of 10 per cent. to the basic length will be necessary.

It is perhaps safe to say that a single runway will in clear weather be able to handle about 50 aircraft movements—arrivals or departures or a mixture of both—per hour, and something between 20 and 50 movements per hour under instrument-landing conditions.

Runway Layouts.

The location of the airport building has a considerable influence on the capacity of multiple runway systems and, when the airport building is suitably located, it will not be necessary for aircraft using one runway to reduce traffic on adjacent runways. The question whether parallel runways can be spaced relatively close together or have to be wide apart depends on whether instrument-approach as distinct from instrument-landing will be necessary.

The number, orientation, length and spacing having been determined, the lateral position of runways in a layout is determined by:—

(*a*) the shape of the site;

(*b*) the presence of immovable obstructions beyond the airport boundary;

(*c*) the other clearances required for aircraft;

(*d*) economy of construction;

(*e*) providing optimum arrangements for circulation and control of aircraft on the ground;

(*f*) providing an airport building site and layout which would ensure both minimum taxying distances and good surface transport communications with the airport;

(*g*) providing convenient sites for maintenance hangars, fuelling points and dispersal parks.

A perimeter track for access by aircraft to and from runways is not favoured for civil transport as the taxying of aircraft is costly in both time and money, and taxiways should be provided. A perimeter roadway joining the ends of runways is nevertheless a convenient means of providing for surface vehicles to reach them under normal conditions of aircraft operation.

Zoning.

All buildings and prominent objects in the vicinity of an airport should be subject to zoning regulations. Heights of 100 ft. above airport level within half a mile of its perimeter increasing uniformly thereafter to 500 ft. at 5 miles from the perimeter are thought to be permissible except within the flightways.

Equipment.

The equipment of an airfield falls under the three general heads of radio, lighting and daylight marking, and mobile. Wartime developments in radio navigational aids, details of which are secret, may radically improve present systems, but they will still be relatively small items of equipment and normally make no special demands on the designer. The fact that visual observation is preferable to instrument guidance makes fixed lighting installations a necessity for permanent airports of a developed character. As regards refuelling, evidence at present appears to point to fixed underground installations superseding mobile tank waggons as the most economical method when either:—

(*a*) a large number of small aircraft have to be handled with great frequency, or

(*b*) the uptake of a single aircraft exceeds 2,000 gallons.

Mobile oil-supply trucks will probably continue to be most economical for as long as each engine of an aircraft is provided with individual oil tanks requiring only a small supply to each.

Loading Bays and Airport Buildings.

The design of airport buildings to satisfy the complex requirements which they present is a difficult problem. Certain considerations can be mentioned, such as:

(1) In order to limit taxying distances, the buildings should be located as much as possible towards the centre of the airfield;

(2) for intense traffic, the building frontage required will be governed by the number and size of the aircraft to be accommodated alongside it rather than by internal layout;

(3) certain clearly defined stages of building development correspond to the peak traffic capacities of single, double and triple runway systems respectively, and less clearly marked stages of growth will depend on increases in the size and, therefore, in the passenger and freight capacities of the aircraft using the airport.

Consideration of these factors points to a system of building development based on a number of self-contained but interconnecting units, and enhances the desirability of restricting the time spent by aircraft at loading bays to the minimum.

Hangars and Workshops.

Hangars giving complete coverage for large machines are likely to be necessary only at or near the terminal points of the routes, intermediate repairs being carried out if necessary in hangars giving only protection over the nose and engines. Long-distance aircraft are thus tending to become more like ships, living most of their life in the open.

Conclusion.

In the design of civil airports there is a wide field for co-operation between engineers, aeronautical, mechanical, electrical, and civil, architects and specialists in many different subjects. Such co-operation, international as well as national, can only be for the benefit of air transport, which connects nations.

Aluminium and Unit Construction

SUGGESTION FOR AN EXPANDING HOUSE

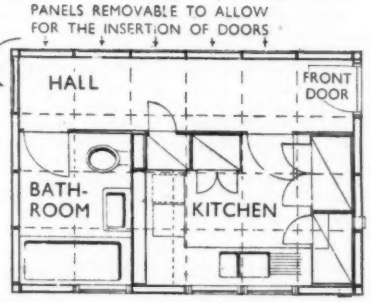
(1) The house is so designed that it can be made up from a number of basic cells each forming one or two complete rooms. The minimum house contains two such cells, one forming a bed-sitting-room, the other a kitchen, bathroom, and hall.

(2) These cells are designed in unit dimensions so that they may be erected in the factory from a number of standard panels. The complete cell can be sent to the site, thus avoiding site work. It is only necessary to construct foundations and to lay drains.

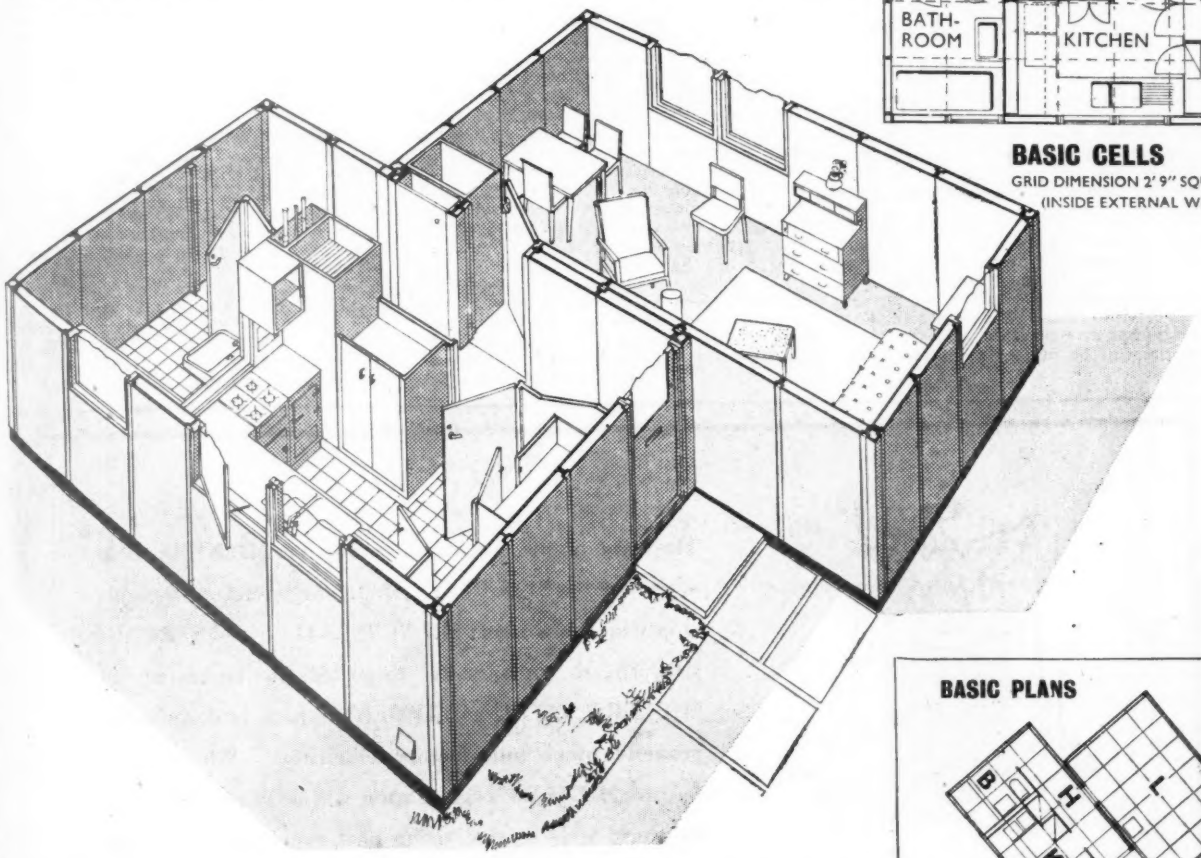
(3) The size of the cell enables it to provide all the rooms normally needed in a small house and by adding to the basic unit of two cells (the living-room with kitchen and bathroom) considerable variation in accommodation is possible.

By varying the arrangement of the panels, when building up the cells, the following rooms can be formed:—

(*a*) living-room (*b*) kitchen and bathroom
(*c*) large bedroom (*d*) two small bedrooms
(*e*) medium bedroom with dressing-room



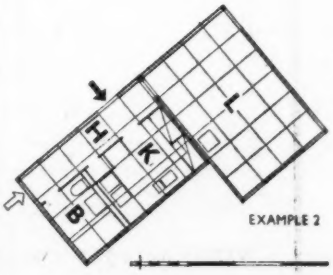
BASIC CELLS
GRID DIMENSION 2' 9" SQUARE (INSIDE EXTERNAL WALLS)



(4) The panels are constructed from an extruded light alloy frame with a covering of light alloy sheeting. Panels of the standard size with door and window openings are used for the walls and also for the roof and floor decks. As the complete cell is assembled in the factory, site jointing is avoided and complete control over the construction is attained.

(5) Flexibility to suit the requirements of orientation and access is obtained by varying the placing of the cells. Some are shown here, but further variations are possible. We illustrate two possible arrangements of the basic cells, to form minimum houses. These houses could be enlarged in a number of different ways to form bungalows or two-storey houses with two or three bedrooms.

BASIC PLANS



ANNOUNCEMENTS

Mr. W. M. Watson has been elected a Director of Messrs. Hebert Morris, Ltd., of Loughborough.

Miss Jane B. Drew, F.R.I.B.A., has moved her office to 12, Bedford Square, W.C.1. Telephone: Museum 4797.

The R.W.A. School of Architecture has returned to its original headquarters at 25, Great George Street, Bristol, 1. Telephone 23767. Fifty students are attending the present session, which began on October 4.

The Technical Information Bureau of the Lead Industries Development Council has reopened at 34, Ebury Street, London, S.W.1, where it will be pleased to answer inquiries on questions concerning the use of lead sheet and pipe in building work. When information sheets or technical bulletins only are required application can be made either to the Bureau or direct to the Council at Eagle House, Jermyn Street, London, S.W.1. Recently the Bureau has been concerned primarily with urgent problems of wartime building. Now it is to resume its pre-war rôle.

Mr. Gordon W. Jackson, F.R.I.B.A., resumed his practice on October 2 at Hinton Buildings, Hinton Road, Bournemouth, on being released from the Army. At this address his firm, Messrs. Jackson and Greenen, chartered architects, will be glad to receive new catalogues published since 1941.

Messrs. Eric Lyons & G. Paulson Townsend, chartered architects and design consultants, have resumed partnership. Mr. Lyons is practising on behalf of the partnership at Mill House, Bridge Road, East Molesey, Surrey (telephone Molesey 2815), where he will be pleased to receive trade catalogues.

SOUND TRANSMISSION IN BUILDINGS.—PRACTICAL NOTES FOR ARCHITECTS AND BUILDERS, by R. Fitzmaurice and W. Allen of the Building Research Station of the Department of Scientific and Industrial Research, which had been out of print for some time, has been reprinted. The report deals with the way sound is transmitted from one part of a building to another, with the conditions relating to different types of occupancy, and with the new structural technique developed as a result of the joint research carried out for some years by the National Physical Laboratory and the Building Research Station. The technique is described and worked out in the form of examples for the design of flats and semi-detached houses. Problems of hospitals, office buildings and other dwelling houses are also considered. Copies of the report may be obtained from H.M. Stationery Office, price 4*s*. (by post, 4*s*. 6*d*.).

TRADE NOTES

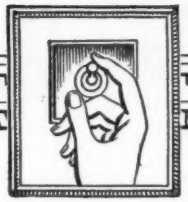
Sixty Years of Engineering

Sixty years ago a modest little factory settled down to manufacture light steel constructions. Ten years later the factory might have disappeared from business had not a partnership been concluded with a young man, who had just completed a five years' apprenticeship with an engineering firm, followed by a course of marine engineering at Liverpool, and who had built two remarkable models of engines. Such were the beginnings of Messrs. Rubery Owen & Company, and the name of the young engineer was Mr. A. E. Owen. In 1893, when he became a partner of Mr. J. T. Rubery, the works consisted of a smith's shop, the roof of which blew off and was lost, and a template shop with a roof so low that one had to stoop to work on the platform. There were twenty-nine employees and an office staff of three, including the partners. At the end of 1929, when Mr. Owen died, he had created a business organization with 1,600 employees: an organization unique in character, in that it consisted in reality of a number of contiguous but separate factories, each producing for the most part its own particular class of goods. Early in the next year, when Mr. A. G. B. Owen, with the help of his brother, Mr. E. W. B. Owen, took over the reins, they determined to continue and accelerate their father's work. The success they achieved is proved by the fact that the vast and progressive concern now employs its thousands. This is the outline of the thrilling story told in 1884-1944—Sixty Years of Engineering, just published by the firm.

OBITUARY

Mr. S. E. Cole, a director of J. H. Sankey & Son, Ltd., and British Sisalkraft, Ltd., died suddenly in hospital on October 31, aged 54. He joined Messrs. Sankey & Son 25 years ago, and did much to make it well known in the building trade in connection with reinforced waterproof building paper, hollow blocks, etc. Mr. Cole came to this country during the last war with the New Zealand Forces, and served in Gallipoli and Greece.

Sir Thomas Miller-Jones, chairman of Thomas Hill-Jones, Ltd., and Frazzi, Ltd. Born on April 26, 1874, and knighted in 1937, Sir Thomas was a man of many interests. Through Frazzi, Ltd., he was closely concerned with the building industry, but his life work was in the chemical manufacturing business of Thomas Hill-Jones, Ltd. He was also a member of the London Hospital House Committee and of the Grand Council of the Federation of British Industries. His son, Lieut.-Colonel T. W. Miller-Jones, is at present overseas. He also leaves a daughter.



On Active Service

Electricity, the essence of war industry,

will enter the service of peace with a great new skill and adaptability. In the homes of the future Electricity will be required not only for cooking, heating, water-heating, and refrigeration, but also for a multitude of minor uses calling for clean, cheap, *flexible* power.

Architects and builders concerned with the planning of new services in premises to be built or rebuilt are invited to make the fullest use of the advisory service offered by the British Electrical Development Association.

The Electrical Section at the Building Centre, Maddox Street, London, W.1, provides an interesting illustration of electrical applications in domestic and industrial premises.

EDA

CLASSIFIED ADVERTISEMENTS

Advertisements should be addressed to the Advt. Manager, "The Architects' Journal." War Address: 45 The Avenue, Cheam, Surrey, and should reach there by first post on Monday morning for inclusion in the following week's paper.

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

SWADLINCOTE DISTRICT URBAN DISTRICT COUNCIL.

APPOINTMENT OF ARCHITECTURAL ASSISTANT.

Applications are invited for the position of Architectural Assistant at a commencing salary of £300 per annum, rising (subject to satisfactory service) by three annual increments to £350 per annum, plus cost of living bonus at present £49 8s. per annum. Preference will be given to candidates who are A.R.I.B.A. or who hold an equivalent qualification.

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

Application forms, which may be obtained from the Council Offices, should be returned, accompanied by copies of three recent testimonials, to the undersigned not later than noon on Saturday, 30th December, 1944, endorsed "Architectural Assistant."

Canvassing, directly or indirectly, will be a disqualification.

GEOFFREY S. BAKER,
Engineer and Surveyor.

Council Offices, Swadlincote.
24th November, 1944. 899

COUNTY BOROUGH OF DARLINGTON.

TOWN PLANNING ASSISTANTS.

Applications are invited for the appointment of two Town Planning Assistants to assist in the preparation of maps, plans, etc., for the formulation of the Town Planning Scheme. The appointments will be temporary in the first place, and the salary will be from £360 to £400 per annum, according to the selected candidate's qualifications and experience.

Preference will be given to applicants who are members by examination of the Institution of Municipal and County Engineers, the Royal Institution of British Architects, or the Chartered Surveyors' Institution, and possession of the Town Planning Diploma of one of these Institutions will be considered by the Corporation as an advantage.

Applications, endorsed "Town Planning Assistant," giving the names of three references, and stating when the candidate could commence his duties if appointed, should be delivered at my Office on or before the 16th December, 1944.

H. HOPKINS,
Town Clerk.

Town Clerk's Office, 11, Houndgate,
Darlington. 901

BOROUGH OF ILKESTON.

ARCHITECTURAL ASSISTANT, temporary, required by the Borough of Ilkeston.

Candidates must have been born before 1923 and be A.R.I.B.A. or hold equivalent qualification, with practical experience in housing and general municipal works.

Salary £400 p.a., plus cost of living bonus and payment for extended working hours, amounting in all to £522 p.a. The appointment is subject to the provisions of the Local Government Superannuation Act, 1937, the selected candidate being required to pass a medical examination.

Applicants should write, quoting EA. 1035XA. to the Ministry of Labour and National Service, Central Register, Room 5/17, Sardinia Street, Kingsway, London, W.C.2, for the necessary forms, which should be returned completed on or before 12th December, 1944. 905

BOROUGH OF MAIDENHEAD.

TEMPORARY ARCHITECTURAL ASSISTANT.

Applications are invited for the appointment of a Temporary Architectural Assistant at a salary of £450 per annum.

Applicants must be registered Architects, and preference will be given to those holding a recognised professional qualification. The person appointed will be engaged on the general architectural work of the Department, but for the time being principally on the Council's Housing Schemes.

Applications on forms to be obtained from the Borough Engineer and Surveyor, Guildhall, Maidenhead, and accompanied by copies of two recent testimonials, must reach the undersigned not later than 15th December, 1944.

Canvassing directly or indirectly will be a disqualification.

JAMES A. BAIRD,
Town Clerk.

Guildhall, Maidenhead,
23rd November, 1944. 902

DERBYSHIRE COUNTY COUNCIL.

COUNTY ARCHITECT'S DEPARTMENT.

Applications are invited for the appointment of Senior Assistant Architect.

Candidates must be well trained, fully qualified, and of some years' good experience, not necessarily with a Local Authority.

Salary £600 per annum, rising by annual increments of £25 to £700, plus cost of living bonus, at present £49 8s. per annum.

The successful applicant will be liable to the provisions of the Local Government Superannuation Acts.

The appointment is subject to the approval of the Ministry of Labour, and terminable by one month's notice on either side.

Applications to be sent to the undersigned, with copies of three testimonials, by 14th December, 1944.

J. HARRISON,
County Architect.

County Offices, Derby.
30th November, 1944. 907

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.

LONDON OFFICE.—Architectural Assistant required for permanent position. State age, qualifications, experience, and salary. Box 906.

MANCHESTER Architects, with varied and busy practice, require Assistants. Reply, stating age, experience, and salary required. Box 886.

ARCHITECTS' DRAUGHTSMAN required for London firm temporarily evacuated to Maidenhead; good salary and prospects to suitable applicant. Apply, stating age, qualifications, experience, and salary required to Box 836.

REQUIRED, immediately, two experienced Architectural Assistants; must be first-class draughtsmen and well trained, for important large scale work. Apply, stating age, salary and experience, Herbert J. Rowse, F.R.I.B.A., Martins Bank Building, Liverpool, 2. 900

DRAUGHTSMAN, for Architectural and Decorative Metal-work; accustomed to preparation of detailed working drawings; progressive permanent position in London to the right applicant. Box 909.

ARCHITECT'S ASSISTANTS wanted immediately; good draughtsmen, with general experience, required for important work; good salary and prospects. Full particulars, including position under National Service Regulations, to Company Architect, Fort Dunlop, Erdington, Birmingham, 24. 904

ARCHITECTURAL DRAUGHTSMAN. — Senior Assistant required; with good pre-war experience of factory, commercial and hospital work, construction and details; permanency considered for right applicant; state age and qualifications. H. S. Fairhurst & Son, Chancery Chambers, 55, Brown Street, Manchester, 2. 876

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. offers spare time assistance in London area on surveys, schemes, and perspectives; evenings and week-ends. Box 399.

A.R.I.B.A. (33), free January 1, 1945, to take Senior post; experienced civil engineering and housing; salary £550. Box 402.

PERSPECTIVES in any medium, any style; also Modern Architectural and Furniture and Decoration Schemes prepared. Box 406.

CHARTERED ARCHITECT, A.R.I.B.A., A.M.T.P.I., aged 27, requires responsible position with Architect in London; 8 years' office experience; salary £500 p.a. Box 401.

ASSISTANT, 7 years' experience; domestic, commercial structures and prefabrication; willing to undertake part time work at home. Write BM/EWGY, London, W.C.1. 404

JUNIOR, aged 18, studying for R.I.B.A. exams., requires position in an Architect's Office in North London area; tracing, colouring, etc.; exempt military service; salary by arrangement. Box 398.

YOUTH (16), previous general office experience, attending Architectural classes, desires appointment with Architect and Surveyor; Birmingham district. Apply to R. E. Roberts, 90, Clent Road, Quinton, Birmingham. 405

ASSISTANT ARCHITECT (Licentiate) requires responsible position in Provinces; experience schools, hospitals, commercial buildings, housing, schedules, delaps. perspectives; energetic and reliable. Box 397.

ARCHITECT (31), disengaged, requires temporary or permanent post; good experience estate layout, roads, sewers, surveys, alterations; 5 years with contractor; salary about £8. E. G. W., "Vellacott," Towstock, Barnstaple. 396

QUANTITY SURVEYOR, requiring post on or near South Coast, would like to get in touch with Architect or Civil Engineer with reference to employment; aged 49; have had over 25 years' experience in building and civil engineering. Please write Box 403.

A.R.I.B.A. (37), specialist, experience in commercial and industrial buildings, including structural design, planning and installation of electrical, heating and other services, requires responsible post as Senior Assistant; London area, if possible. Box 898.

ARCHITECT'S ASSISTANT (35), R.A., desires progressive post; site surveys, sketch plans, working drawings, details, supervision; licensed premises, domestic work, shops, works canteens, factory alterations and maintenance; theoretical knowledge of cinema and theatre work; possess own car; West Midlands preferred. Box 400.

QUALIFIED SURVEYOR, 10 years as a Midland Building Contractors, with extenment Service, and a specialist in the preparation of housing schemes, estate development, town planning, sewerage schemes, etc., offers services, in which his technical and practical experience would be of use. Replies Box 888.

Other Appointments Vacant

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

BUILDER MANAGER.—Old-established West Lancs firm of House Builders requires for engagement, on post-war building when general house building is released, an experienced, energetic, and capable Manager to take charge of house building schemes; permanent position for right man; applicants must be competent to supervise all trades, including layouts, preparation of roads and sewers and building sites, and effectively organize and control; preference given to applicants with suitable professional qualifications, combined with other requirements referred to. Apply, in first instance, stating age, qualifications, experience, and salary required, to Box 897.

Planning

As originators of the Auto-Recorder System of Machine Milking, we have had extensive experience of planning layouts to accommodate the new technique. The Ministry of Agriculture's Clean Milk Bill, when passed, will mean a large increase in the number of new or modified farm buildings required. The position will be affected also by the findings of the English and Scottish Commissions on this important subject. The service of our Technical Department is available to any Architect who may be consulted in these matters. Write in confidence to: Gascoignes (Reading), Ltd., Berkeley Avenue, Reading.

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.

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

MONOMARK Service. Permanent London address. Letters redirected immediately. Confidential, 5s. p.a. Royal Patronage. Key tags 3 for 1s. 3d. Write BM/MONO5R, W.C.1. 44

AUTHORS are invited to submit MSS of all types for book publication—particularly Stories for Children, Poems and Fiction. Stockwell, Ltd., Elms Court, Ilfracombe. 908

J. O. SHEPPARD, late of 21, Bedford Row, W.C.1 (and the Granwood Flooring Co., Ltd.), now at 1, East Road, Chadwell Heath, Essex, and on war work, thanks Architects for past cordiality, and looks forward to meeting them again when his new office opens. 800

Educational Announcements

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

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.

EDINBURGH COLLEGE OF ART.

ANDREW GRANT SCHOLARSHIPS.

The Board of Management may award in March, 1945, four Scholarships of £45 to £80 per annum for three to five years for admission in October, 1945. Candidates must be under the age of 19 on 1st October, 1945, and must show evidence of exceptional artistic ability. One Scholarship of £120 per annum for two or three years may also be awarded to a student who has already reached an advanced stage of training and is under the age of 22 on 1st October, 1945. The College incorporates Schools of Architecture and Town Planning, Design, Painting and Sculpture, and is well endowed with Travelling Scholarships and Fellowships.

Application Forms and further particulars may be obtained from the Registrar, College of Art, Lauriston Place, Edinburgh, 3.

The last date for receiving applications is 31st January, 1945. 903

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THERE'S PRACTICALLY NO END TO THE KIND OF JOB MILLS CAN DO WITH STEEL SCAFFOLDING

Repairing aeroplanes in flight—well, perhaps not quite. But, with these Mills Mobile Scaffold Towers, you feel that you can follow the job anywhere. Rapidly erected, safe at any level, they can be wheeled easily and rapidly from place to place. As 'Bert says: "A bit of a stretch—if you ask me." But then, it would need quite a stretch of imagination to cover all the jobs that MILLS have done with STEEL SCAFFOLDING

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