THE ARCHITECTS' JOURNAL

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The Editor will be glad to receive MS. articles and also illustrations of current architecture in this country and abroad with a view to publication. Though every care will be taken, the Editor cannot hold himself responsible for material sent him.

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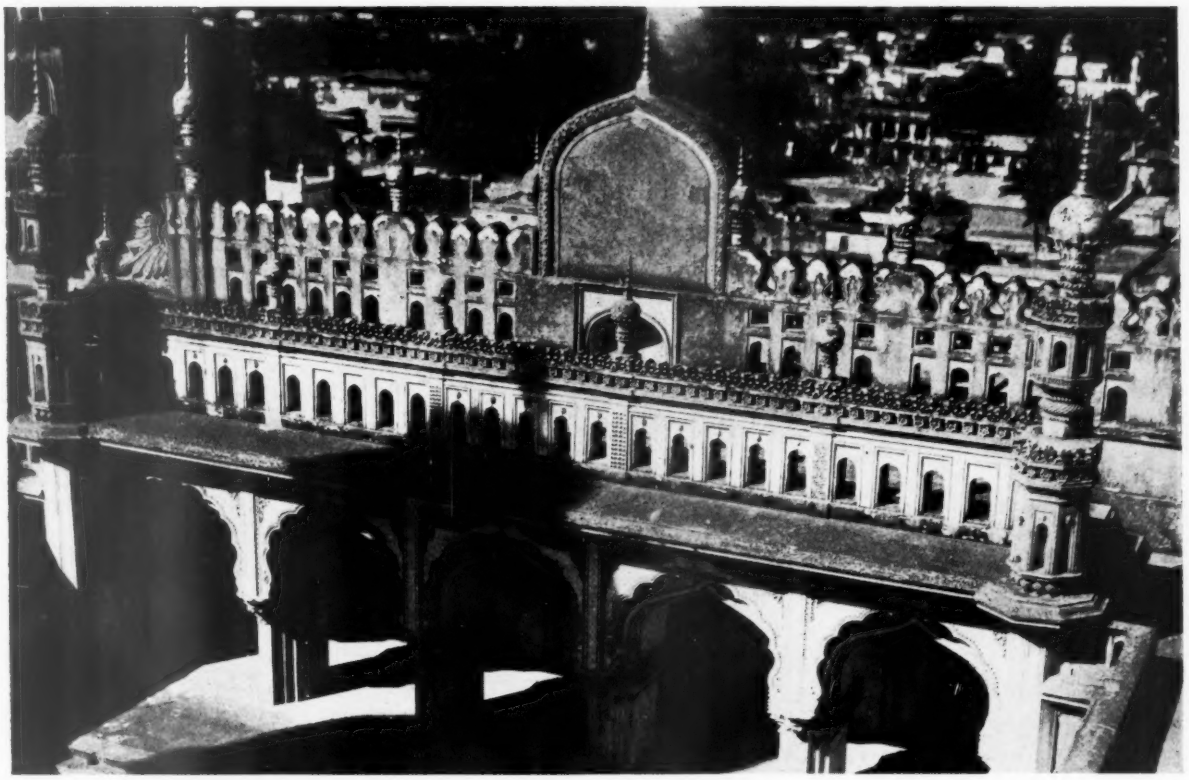
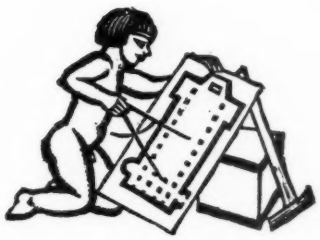


MOGUL ARCHITECTURE

Cloister and screen walls surmounting the mosque at Secunderabad, India.

AUTOMOBILE CLUB

The headquarters of the Royal Norwegian Automobile Club. Architect, Magnus Poulson. The building has a blue-grey stucco rendering with a green-grey stucco base and window mullions. Windows are of wood and the balcony rails wrought iron.



SHELTER POLICY—1

WITH the beginning, on September 7, of the intensive bombing of London there began also the first large-scale trial of shelters and of the Government's general policy for air-raid protection in urban areas. And it was inevitable that the loss of life during repeated raids should be followed by a new demand for the provision of deep or "bomb-proof" shelters in all densely populated districts.

Everyone who has passed the last eighteen days in London will agree that a durable and successful shelter policy is a fundamental of successful Civil Defence, that present policy should be closely examined in the light of the London raids and that, if changes are found necessary, immediate and determined action should be taken to carry them out. But it is also necessary that the failures and successes of present policy should be examined from the standpoint of our whole war effort and that large changes should only be made to meet a form of attack which is likely to continue for a considerable period.

At a time when at least some enemy bombers are over London for most of the night and part of the day, it is very difficult to see anything except the advantages of deep shelters for everyone in crowded districts. To see this question in right perspective it is necessary to go back to the controversy which centred on it two years ago, and test the arguments which each side then put forward against what has actually happened in London.

The advocates of deep shelters then maintained that they were the only effective method of protection in densely populated areas (of which the poorer London boroughs are typical). They suggested that these large shelters should hold between 1,000 and 10,000 persons each and be placed at distances not exceeding seven minutes' walk from the houses or other buildings which they served.

The suggestion was turned down by the Government of the day on many grounds, of which the following were the most important: (1) A ten-minute warning period could not be guaranteed; (2) the hurried movement of a large number of undisciplined persons towards one place, particularly in a blackout, is extremely likely to engender panic—and disastrous panic if the warning period proves insufficient; (3) the concentration in one place of a large number of persons during an air raid would be attended by serious psychological and hygienic risks and ensure the maximum publicity for every case of individual distress; (4) timid persons would tend to stay in or near the shelters during safe periods and thus possibly impose a disastrous strain on the community's morale at times of great stress; for bad behaviour is more infectious than good.

For these reasons the Government rejected the deep, large shelter in favour of very widely dispersed shelters —one for each family where possible—which gave moderate protection, avoided movement through streets and minimized the period for which normal activities had to be interrupted.

When these two theories of protection are examined against the forms of bombing which have actually taken place in London, each reveals important weaknesses. The deep shelter policy (which was not carried out) contains fundamental weaknesses in that it has not proved possible to give warnings of all raids before bombs were dropped and—much more important—every London borough must have had ten warnings when bombs were not dropped in that borough for every one when they were. There can be little doubt that had deep shelters been available in all crowded London districts, the interruption of work and movement caused by daytime raids would have been much greater.

Against this, the dispersed shelter policy which has been carried out, though not to the extent necessary in the most crowded areas, has also revealed two weaknesses. It failed to foresee continuous small-scale night raids lasting for five to nine hours, and hence the necessity of "protected" sleeping accommodation. And it failed to take proper account of the special conditions prevailing in the most densely populated areas. This second failing is the one which really matters. It should be remedied with all possible speed.

The most densely populated areas lie in many cases around and between important military objectives. They are extremely vulnerable to air attack, not only physically but psychologically. This last is a point which is too easily overlooked by those who are drafting a policy for general application. If a garden shelter at Hampstead or a basement shelter in Kensington suffers a direct hit few people know of it except the immediate neighbours and they do not often know the victims personally. When a similar incident occurs near the docks—where it inevitably happens more frequently—the inhabitants of several streets know the victims personally, several parishes know every detail of the occurrence and very few people in the neighbourhood know that there are few shelters anywhere in Britain which can stand up to a direct hit. The result tends to be exaggeration of calamity and increase of nervous strain. And those who suggest that the West End have much better shelters are never entirely lacking.

It thus seems necessary that the first change in existing Civil Defence policy should be to give special attention to crowded areas. This attention may be in part a campaign of reassurance and simple explanation and an increase in social services of a special kind: it may include an evacuation scheme. But it must also include the provision of strong shelters in which it is possible to sleep.

Next week the JOURNAL will consider the ways in which such shelters could be provided with the least expenditure of labour and materials.

The Architects' Journal
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NOTES & TOPICS

NINETEEN DAYS

BEFORE the war, and during its first year, we heard a great deal about the Germans' elaborate study of war psychology—of how their army and air force were intended to be held back until propaganda and Fifth Columns had sown distrust, terror, division and so forth in the intended victim. The last nineteen days seem to have shown that this nicely systematized stage-by-stage aggression has proved woefully inapplicable to Britain—or else that the War Psychology Department is disastrously out of step with the Luftwaffe.

*

No one, of course, imagined that our enemies would rely on weakening our resistance by radio propaganda and internal treachery. But one would have thought that in the bombing of the London area any potential weaknesses in our unanimity would have been exploited to the full. For instance, the Luftwaffe might have concentrated their attention exclusively on the poorest and most vulnerable districts and spread the story that the rich had wonderful shelters (not worth bombing) in the West End.

*

Or they might have bombed the West End only and tried to pose as deliverers of the oppressed. Neither of these red-herrings, one fancies, would have had much success ; yet, after three years' mumbo-jumbo about a War of Nerves, one would have expected the inventors of that witch-word to prod for what nerves they thought most sensitive. That they have not done so, that they have adopted the method most calculated to increase British solidarity, shows a lack of intelligence or lack of ability. Either is encouraging.

IN LONDON

The past week in London has repeated the lessons of the previous ten days—that daylight raids are very costly to the Nazis and cause very little disturbance to usual doings, but that night raids can be a great nuisance for which a sleeping shelter and a really noisy barrage are the best antidotes. It has also impressed upon me two other points about bombs and bombing.

First. Home Office advice about glass protection has been proved correct. I made a tour of about twenty damaged buildings with an expert on this question, and it was very plain that only a solid or stout network barrier gave any guarantee of protection from splinters. Wire-netting, wire in plastic and leaded lights stood up well. Cellulose film, firmly glued in several thicknesses, had given way and hung outwards but had not flown. Methods which did not employ a solid or net barrier over the whole surface of the glass stayed put or flew for miles with intriguing but somewhat unsettling open-mindedness. We saw no examples of surgical tape, wired glass, copper glazing or textile netting. Paper strips were no good.

*

Note for shopkeepers and their architects. Plate glass windows which are merely butted and clipped at the junction between two sheets are much more vulnerable than those separately framed.

*

Second. Bomb explosions appear to sound very much nearer, produce all the effects of being very much nearer, in a suburb than in Central London.

*

To many Londoners this may by now be a platitude. I confess that I had expected just the opposite—that earth, trees and discontinuity of roads and buildings would absorb the shock. They apparently do not.

*

One evening last week a severe explosion shook a suburban house at which I was staying. In the pause which followed glass and tiles were heard to fall near at hand, and none of the five persons present (all experienced and tolerably calm-nerved) put the scene of the explosion at much over 150 yards distance. A rescue party was organized. On the doorstep falling dust made visibility poor, and there was a pronounced smell of explosive. In the next twenty minutes, together with local wardens and police, we examined streets for about 300 yards round the house and found nothing.

*

Next morning the murder was out : they were two not very big bombs and their distance from the house, as near as can be calculated, was 650 yards in a straight line.

ST. PAUL'S

Since I last wrote about my friend who is one of the Night Watch at St. Paul's, the war for him has begun in grim earnest : no longer are playful practices in mastering the intricacies of the Cathedral's behind-the-scenes planning his nightly occupation, followed by a comfortable bed in the crypt ; instead, there are continuous patrols of the roofs, watching the city's bonfires and dodging any fragments that fall unpleasantly near.

*

When I met him last week he talked of the one-ton time bomb that had just been extracted from near the western portico of the Cathedral by the justly famous Lieut. Davies, Sergt. Wardrobe and the others. My friend described the event as a heroic piece of dentistry.

*

The Night Watch continued their duties while the bomb was there ; but their headquarters, together with the sheltering clergy, had to move to the east end of the building. The sinister aspect of the whole affair, which added to the suspense of waiting and the difficulty of the work, was that, through some freak of sub-soil conditions,

the bomb continuously tended to burrow its way nearer the Cathedral until the removal tackle took its weight. My illustration shows, in the right foreground, the hole near the West Portico from which the bomb was hoisted. No architect, I fancy, can think of Lieut. Davies' lonely drive to Hackney Marshes through cleared streets without wishing to pay him a special tribute.

★

The threat of the time bomb, of course, was only a passive affair for the Night Watch. Their most active night was the previous Monday, when large fires raged in the City from Cheapside to Cannon Street, having been first started by a bomb that fell only 100 ft. or so from the east end of the Cathedral. The Watch spent a busy night on the Cathedral roofs, spraying them with water, and saw the harrowing sight of three of Wren's best churches simultaneously threatened by fire ; but all were eventually saved except for superficial damage. Other City churches, I believe, have suffered.

★

I was told that, lit up by neighbouring blazes, St. Paul's at night achieves indescribable majesty ; even the inside is sometimes lit by a maroon glare reflected on the dome through the windows, a most moving sight. I myself have noticed, too, the extra stature St. Paul's seems to have acquired since these night raids began. I have seen its dome from the heights of north London poised like a black bubble above the smoke and flashes of a raid. It seems magical that it survives.

FUTURE FURNISHING

I have been very impressed during the last few days by a book called *Furnishing Your Home**. Superficially, the book is handicapped by Mrs. Tomrley's assumption that all decisions about houses and furnishing are the woman's business and that a certain perkiness of style is essential to hold Modern Woman's attention. She may be right : but, in any case, these things are soon forgiven. For Mrs. Tomrley *knows* furnishing in a way that few people and very, very few architects know it.

★

She knows the business side of furnishing thoroughly —the faults, limitations, difficulties and motives of manufacturers and furniture shops. But neither this knowledge nor the close contact with the furniture trade which must have been needed to acquire it tempts Mrs. Tomrley to avoid a single difficult point by a generalization. I write this in real admiration : for everything connected with the business side of furnishing is so entangled with the trade's self-protective attempts to reduce all furniture to six styles, and the needs of all customers as *This* or *This* or *That* (but nothing else), that it is exceptional for anyone to emerge clear-headed from prolonged contact with it.

★

Mrs. Tomrley's head remains perfectly clear, and I believe there is no architect who will not learn a great deal from her analysis of the functions and possibilities of each room in a modern home.

★

What is more, Mrs. Tomrley gives us some hope for the future. Consider these two extracts about controlling factors of furniture design.

★

The first concerns the position up to the war :

> We must bear in mind that mass-production, which aims at cheapening things and bringing them to everyone, is a fairly new thing, and the manufacturers, though they understand perfectly how to make strong and adequate cheap furniture, and some of them make it, do not understand or care about the fundamentals of design . . .
>
> The contemporary architect's design is so simple that its quality rests upon form and proportion and these are fundamentals and cannot be copied like surface features ; they must arise anew for each problem and each solution of it. For this, the manufacturer would have to call in an architect or highly skilled designer who would (*a*) be too expensive, and (*b*) not understand the machines. Or so they think. . . .
>
> The manufacturer's lot is not a happy one. On the one hand he is convinced by sales and all other available evidence that the "planned," the "functional," and even simple, proportionate furniture is not right either for his public or for his standard productions, yet he is bound to admit there is planning in the air, as it were, and that the idea of it exerts . . . influence on contemporary thought.

The second deals with the position after the war :

> Whatever emerges from the present position, there is likely to be a fairly severe change in design, and it is possible that the present break in the continuity of supplies may be a blessing in disguise, though it seems very heartless to say so when ruin faces many of the furniture manufacturers. The fact remains, however, that the makers of quantity-produced furniture have allowed the standard sizes of the panels to which their machines were set to control the design of model after model. The function of the designer was to provide some ornament to disguise the sameness of the fundamental sizes of the repetitive pieces such as dressing-tables, sideboards and wardrobes. The sizes of these never varied from the few standard alternative models sanctioned by custom . . . Now that these stocks will certainly be exhausted, there is no more ground for the argument that a new design means disproportionate expense and disorganizes the production schedule.
>
> If someone does not engage a first-class designer to find a new set of standard sizes which will produce well-proportioned and interesting standard pieces, a great opportunity will have been missed.

ASTRAGAL

* *Furnishing Your Home.* By C. G. Tomrley. George Allen and Unwin. Price 8s. 6d. net.

NEWS

REPAIR OF WAR DAMAGE

The following letter has been addressed by the Ministry of Health to all Housing Authorities in England and Wales :

I am directed by the Minister of Health to refer to Circular 1810 of August 18, 1939, and to state that he has had under review the arrangements for the repair of war damage to houses in the light of the experience gained since the outbreak of war, and more particularly since the recent intensification of enemy air attacks. He has observed with great satisfaction that the arrangements of all but a few local authorities have enabled them to proceed at once with the carrying out of first-aid repairs and it is clear that this prompt action has had a pronounced effect in maintaining public morale.

Where air attacks are sporadic with damage on a relatively small scale, it is frequently possible for local authorities to use methods of immediate repair (such as restoration of tiling and glazing) which under less favourable conditions cannot be adopted without seriously delaying work on other houses awaiting repair. With air attacks on a wider scale and the possibility of bad weather in the autumn and winter, the most important aspect of first-aid repairs is their completion *with the utmost possible speed*, so that the occupants may be spared the necessity of removing to other accommodation and that further damage to the house and contents by exposure to the weather may be avoided. Speedy action will result not only in a saving in expense to the owner in the long run but will reduce the work falling on local authorities and their staffs in connection with billeting, requisitioning, etc., for temporary accommodation.

The continued occupation of a house depends above all on the roof and windows being weatherproof and the aim of the authority should be to see that, before work less immediately urgent is undertaken on any houses, no damaged house is left with roof and windows uncovered. The simplest and quickest method of repair should be adopted. This will be more than ever necessary when the days are shorter.

Where damage is extensive time will not permit of the retiling of roofs, and the use of tarpauling (where obtainable), roofing felt, waterproof building paper, asbestos sheeting, etc., should be regarded as the normal method of repair.

As regards windows, complete re-glazing as a measure of first-aid repair will in many cases be impracticable; the possibility of further damage may, indeed, render this inexpedient even as part of permanent repairs. The local authority should therefore be ready to employ alternative materials when urgency and expediency demand.

In view of the desirability of economy in the use of glass the practice of those authorities whose areas have been raided on several occasions of re-glazing only one quarter or one-third of the window surface is commended. Timber will not be available for the boarding up of windows, but cardboard—or building board painted on the outside—roofing felt, waterproof building paper, butter muslin, can all be used as circumstances direct. Where nothing but an opaque material is used, light can only be obtained by opening the window, and it is therefore better where possible that translucent material such as butter muslin (which admits both light and air), cellulosed cotton fabric or one of the glass substitutes on the market should be used over part of the window.

Much valuable material for repairs will of course be obtainable from houses and other buildings which have to be demolished. Some local authorities have been able to use salvaged glass from damaged shop windows for the re-glazing of houses, and local authorities are reminded that the Government reserve of materials for first-aid repairs is available to be drawn upon when other sources of supply run short.

Local authorities requiring timber for first-aid repairs can obtain a licence immediately (without a certificate to purchase) on application to the Area Officer of the Timber Control. Private owners doing their own repairs may in some cases ask for the local authority's assistance in obtaining timber and it will be of great help to the Timber Control if such applications from private owners are scrutinized and a recommendation to the Area Officer given only in cases of obvious necessity.

On the occurrence of widespread damage a local authority have to ascertain the extent and incidence of the damage and to decide where repairs are required. Neither this task nor the supervision of the repairs can be carried out with the speed which is all-important without an adequate technical staff. Many authorities, by arrangement with local panels of architects, have made certain of obtaining the additional technical services required. Authorities who, for local reasons, would find it difficult to make such arrangements are advised to get into touch in an emergency with the local Society of Architects. It is also strongly recommended that arrangements should be made between neighbouring local authorities for mutual help in the shape of both labour and materials.

As regards labour it is contemplated that it will often be necessary to arrange for men to be taken temporarily off other and less urgent work in order to carry out first-aid repairs which are of the highest degree of priority. Where the local authority cannot obtain necessary labour they should at once get into touch with the local Employment Exchange.

The Minister is aware of the doubts felt by some local authorities as to the legality of the action taken by them in the best interests of the inhabitants of their areas—owners as well as occupiers. He is glad to know that the authorities have not allowed such doubts to deter them from taking immediate action and he hopes shortly to introduce into Parliament an amending Bill designed to regularize past action and to enable future work to be carried out with the same promptness as hitherto.

As local authorities are aware, the repair of factories working for the Supply Departments is being co-ordinated by Local Reconstruction Panels which have been set up in various areas, and that these Panels will be responsible for making repairs and for securing the release of the necessary materials. There will, however, be factories, warehouses, and other commercial buildings for which the Panels will be unable to vouch, and it has been decided that materials will be released in such cases either from the Government Reserve Stores or by the Timber Controller or Steel Controller, or in the case of cement by the suppliers on the recommendation of the surveyor or other authorized officer of the local authority who is in charge of the organization for the first-aid repair of houses. It is not expected that this officer should check the demands in detail but that he should indicate that the amount asked for is *prima facie* reasonable. The Minister would accordingly be glad if the local authority would make arrangements for dealing with such requests as speedily as possible.

H. M. GEORGE

BUILDING CONTROL

At a press conference held on Tuesday last Mr. R. Assheton, M.P., Chairman of the Works and Building Priority Committee, explained the new Order for the control of civil building and constructional operations.

Briefly, the purpose of the Order is to restrict private building in order to conserve both labour and essential materials. Consent will be necessary for all building costing over £500, and consent will be given generally by licence or on special occasions on authorisation from certain departments. Exceptions are:—(1) Operations undertaken by a Government Department; (2) operations paid for in whole or in part by Government; (3) operations costing less than £500; (4) works of maintenance, running repairs or decoration.

The new Regulation will come into force on October 7, but in order to give plenty of time, it is provided that work may be continued, provided that an application is made for a licence before October 21, until the application has been disposed of.

LETTERS

Materials and War Gases

SIR,—The reply to Query 477 in your issue dated August 29 gives some useful information concerning the properties and use of different kinds of lime as mortars. There is still a small amount of desultory internal plastering being done up and down the country. May I suggest that if the alternative materials of gypsum and lime were used for this purpose also, Portland cement would be available for constructional work ?

The reply to Q. 480 in the same issue is also of interest, in which you recommend the treatment of asbestos sheeting and plaster-board with sodium silicate solution. May I respectfully doubt whether such treatment is worth while ?

The resistance of materials to war gases is a complex problem. There is both the problem of chemical decontamination and also the purely physical aspects of resistance. So far as plaster-board is concerned there would be no chemical reaction between the gypsum core and the gases themselves that would de-toxicate the gases, but apart from this, decontamination by bleaching powder solution or chloramine-T (for mustard-gas) or even soapy water has to be considered. Plaster-board, if it gets wet, may buckle ; but if left alone it will eventually dry and regain its former usefulness. There is no physical absorption to be expected in the manner, for example, in which activated carbon absorbs chloro-picrin.

The difficulty in dealing with the resistance of materials to the war gases is that the gases have a wide range of properties, even when penetration alone is of moment. A gas like phosgene, which has been called " non-persistent," diffuses in air quickly and soon loses its toxic concentration, while a more persistent gas such as mustard-gas vaporizes slowly and can remain for a long time. The rate of diffusion of a gas varies inversely with the square root of its density so that taking phosgene and mustard-gas as examples, phosgene, which has a density $3\frac{1}{2}$ times that of air, would diffuse approximately in a quarter of the time that mustard-gas would take, which has a density 7 times that of air. This is quite apart from the rate of evaporation, which depends on the vapour pressure of the gas.

Assuming, therefore, that there is a good supply of gas available for penetrating the material of which an air-lock is made, the problem is to determine the rate of penetration, on which little information is available.

A flask of phosgene which I sealed with a piece of $\frac{3}{8}$-in. plaster-board showed no evidence of penetration at the end of three days.

Plaster-board is a sandwich of gypsum between layers of stout paper. Sometimes the gypsum is interspersed with sawdust to lighten it, or there may be artificially induced air-bubbles, but these do not form a continuous honeycomb.

The plant physiologists, who have studied in great detail the rate of passage of atmospheric gases through the microscopic breathing pores of the leaves of plants, have found that the shape rather than the actual size of the openings controls the rate of passage of a gas through minute openings. That these are important can be seen from the fact that they can actually in a sense stimulate a flow of gas through them.

A section of plaster-board examined under the microscope shows that any spaces that there may exist between the paper fibres become filled with a solid (gypsum, or occasionally a special adhesive) during the manufacture of the board, and this survives even the artificial drying.

It may therefore be safely assumed that plaster-board is practically impervious to gases, as it does not dissolve them in the same way, for example, that mustard-gas is soluble in vegetable and animal oils and fats.

Mustard-gas will penetrate leather and ordinary textile fabrics, but there is little penetration into ordinary brickwork and it does not penetrate glazed bricks. Oil paints protect materials from penetration, though it has been found that unpainted woodwork is soon penetrated, and in a liquid state mustard-gas will even penetrate paper and wax.

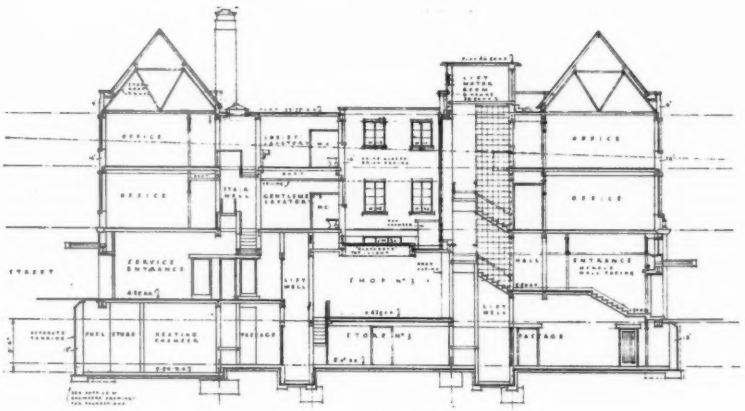
Plaster-board may, however, be expected to offer a reasonable degree of protection, as mustard-gas is more difficult to deal with in some ways than the arsenocresols which are not filtered out by activated carbon.

London G. H. ELLIS

SHOPS AND OFFICES AT NEWCASTLE-UNDER-LYME

General view and (right) entrance to offices.

DESIGNED BY HICKTON AND MADELEY



SECTION A-A

GENERAL—This building is the result of an open competition promoted by the Newcastle-under-Lyme Council in 1936 and assessed by Mr. H. S. Fairhurst. The conditions of the contract laid down that the building should be of fireproof construction and comprise basement stores, shops at street level and two floors of offices with an office entrance facing Market Cross, and was to be provided with a staircase and lift.

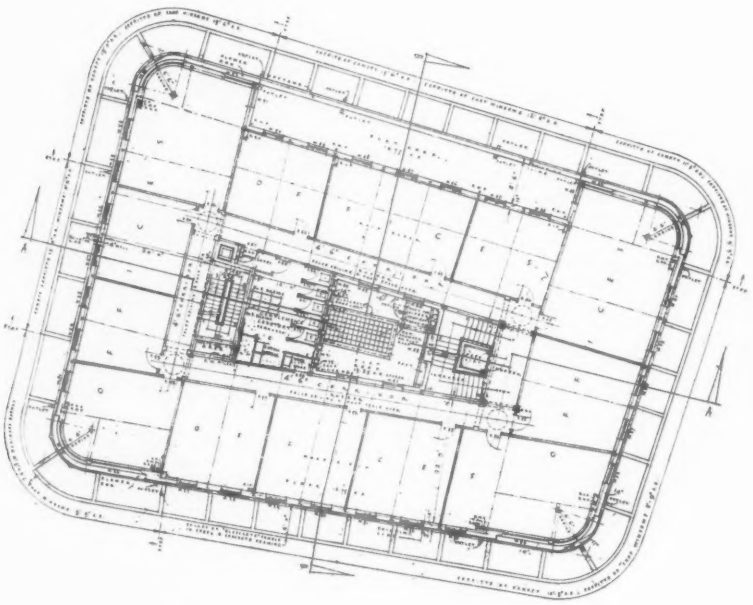
PLAN—The layout of the building has been arranged to provide office space with an approach direct from the street without taking up too much of the shopping area. This has been obtained by planning offices on all four sides enclosing a central area giving light to internal lavatory blocks. The main staircase and automatic lift lead directly to the upper floors and into a hall from which access is obtained to the offices by corridors. The whole of the top floor has now been taken over by the Borough Surveyor's Department, and has been planned to suit his requirements. On the shopping floor twelve self-contained shops are provided to meet a considerable variety of individual requirements. Each shop is planned with a large basement and separate lavatory accommodation, to which there is access by a private stairway from each shop.

CONSTRUCTION AND FINISHES—Steel-framed with 14-in. brick main walls, and floors of hollow-tile and reinforced

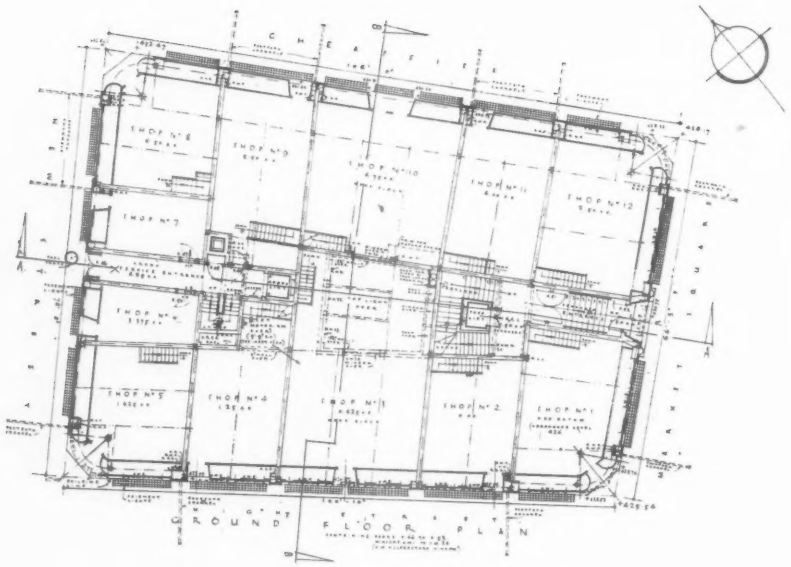
SHOPS AND OFFICES

NEWCASTLE-UNDER-LYME

DESIGNED BY HICKTON AND MADELEY



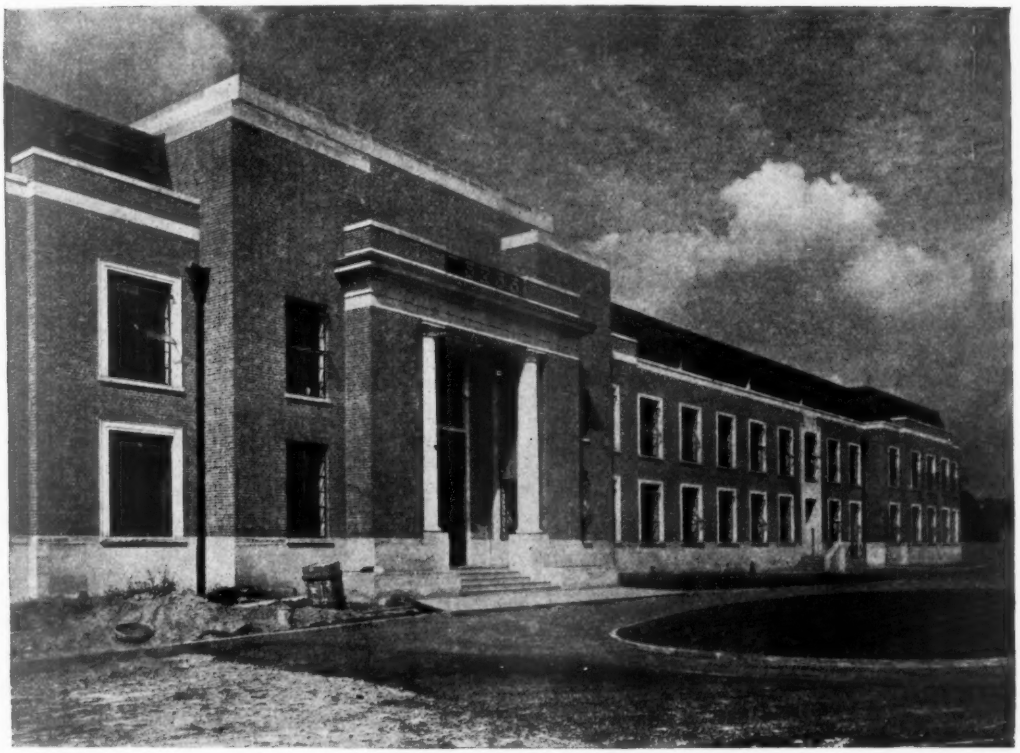
View on flat roof, first floor level.



GROUND AND FIRST FLOOR PLANS

concrete construction. The basement is of solid brick construction and is completely waterproofed with asphalt on the outside. At the time the building was begun there was some difficulty in obtaining steelwork, and the bases for the stanchions carrying the outer walls were therefore placed some distance above the basement floor and carried on blue brick piers. Local materials have been used as far as possible—hand-made facing bricks, white glazed bricks, stonework and roofing tiles. The facing of the shop fronts is of polished cream travertine marble with plinths of green Tinos, and the surround to the main entrance is in golden travertine. Inside, the entrance hall and landings are faced in cream travertine and Napoleon marble. Windows are of rust-proofed steel, and the canopy is of glass lens and reinforced concrete construction, finished on the edge with a bronze fascia. The floors of the shops are of Burmese teak blocks ; offices, oak strip ; corridors, rubber ; and stairs and entrances, terrazzo.

SERVICES—Heating is by accelerated low-pressure hot water, and the boilers are fed by automatic stokers using cheap bituminous fuel, the hoppers needing replenishing only about twice a day. Hot water supply is from a calorifier, except in summer, when a separate small boiler is brought into operation. Mechanical ventilation is provided to all basement lavatories. Lifts are push-button controlled with full safety devices. The lift-well is completely enclosed in a metal and glass screen.



Main front

OFFICES, THAMES DITTON

DESIGNED BY KENNETH LAYTON

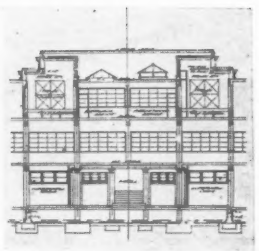
PROBLEM—Head offices of the Milk Marketing Board. Building is designed to facilitate inter-departmental work and also to segregate noisy adding and addressograph machines. A.R.P. shelters for the whole of the staff have been provided outside the building, all partly below ground level, with lavatories and first-aid rooms.

SITE—The site was chosen for the following reasons : proximity to train and bus routes ; no military installation within immediate vicinity ; labour replacements ; good drainage and facilities for recreation ground ; the greater proportion of the staff lived in south-west outer districts of London. The local council's requirements were that the building should be set back approximately 60 feet from the existing roadway for future road widening, and a new wall, surmounted by ornamented iron railings, has been built for the protection of the premises.

CONSTRUCTION—Part steel frame ; structural external walls with piers. Roofs hollow-tile, asphalt on flats. Internal walls, 4½ in. brick. Floors, hollow-tile construction throughout. Partitions : glazed metal screens. The A.R.P. shelters are built in special patent blocks with waterproof concrete for both walls and roofs.

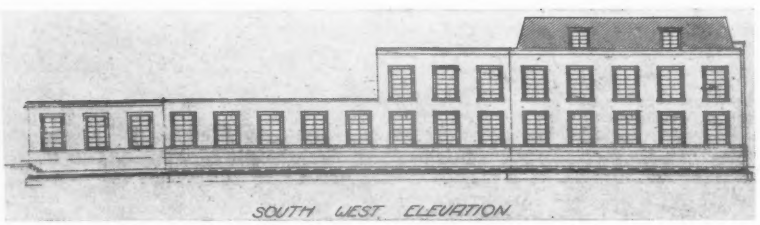
PRINCIPAL ELEVATION

Left, the terrace linking the various building units ; below, a view from the terrace.

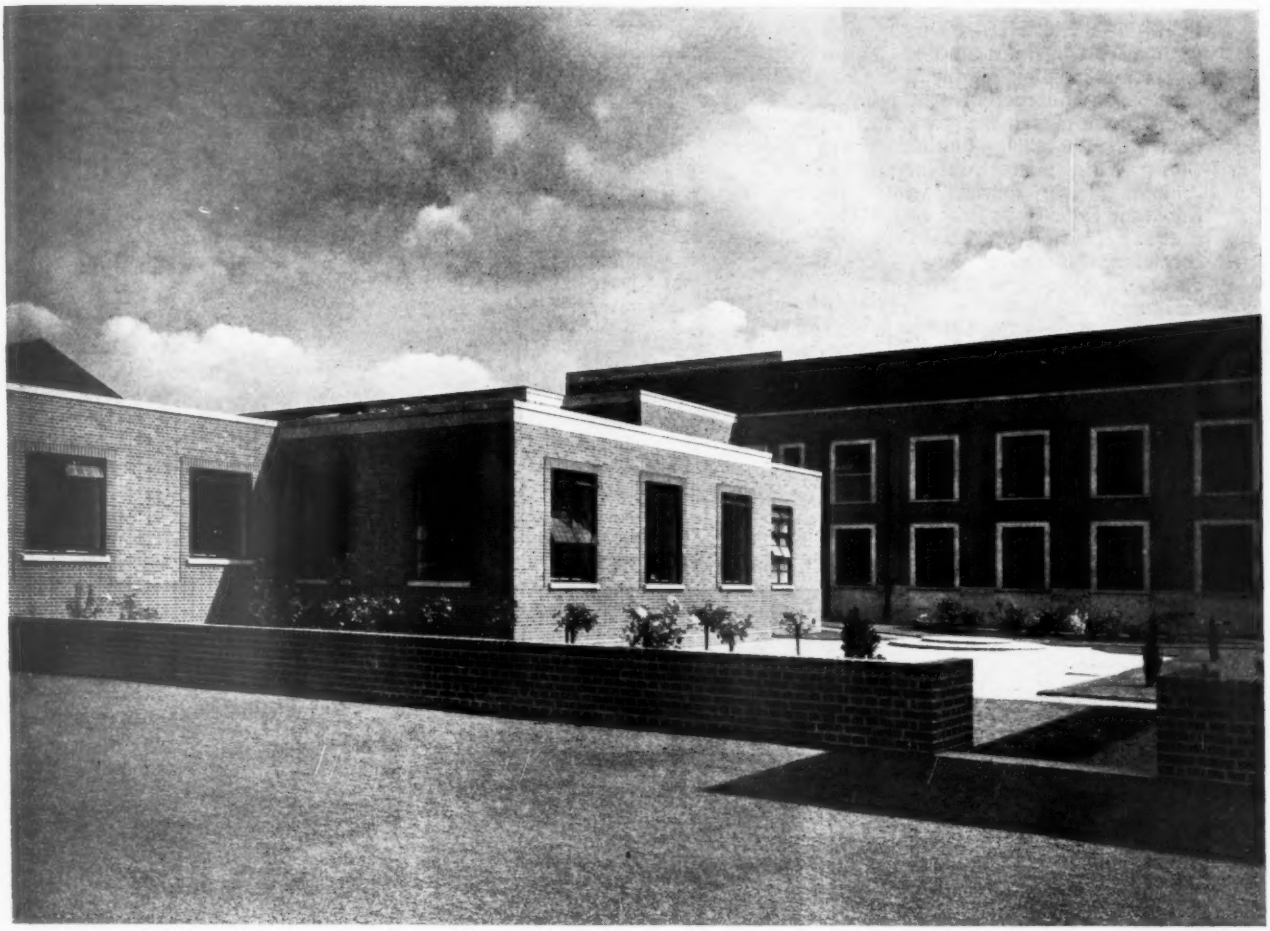


SECTION D-D

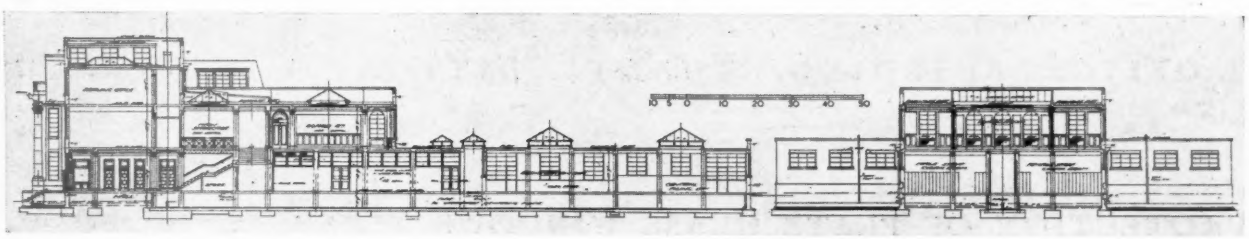
EXTERNAL FINISHES—External walls are faced with sand-faced bricks with Portland stone dressings to windows, doors, copings, etc. Plinth is of Portland stone. Roofs are plain tile and asphalt. Standard metal windows are fitted.



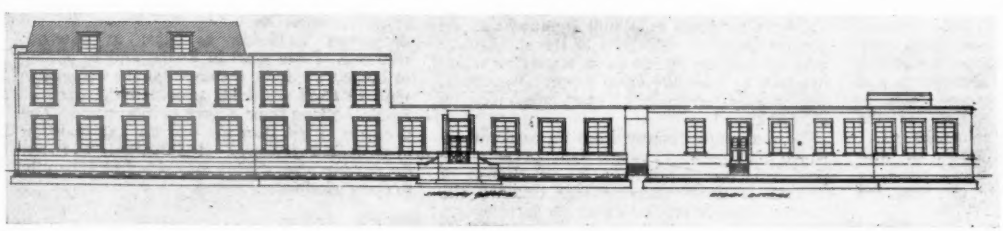
OFFICE BUILDING, THAMES DITTON



Another view from the terrace



SECTION B-B SECTION C-C



NORTH-EAST ELEVATION

DESIGNED BY KENNETH LAYTON

INTERNAL FINISHES—Main entrance hall : rubber flooring with marble margins ; walls, beige marble lining, neapolitan to columns; ceiling, plaster finished white with fibrous plaster cornices and fluorescent lighting fittings. Corridors : rubber flooring with cork margins ; metal partitions, cream, with brown dado ; ceilings, finished white. Offices : flooring, cork tiles ; walls, plaster distempered buff with brown dado ; ceilings, plaster finished white with small cove. Board Room and Executive's Suite : wood block flooring; oak panelled dadoes ; plastic-paint treatment to walls ; fibrous plaster cornices. Cafeteria : wood block flooring ; oak panelled dadoes ; plastic paint treatment to walls and columns ; large octagonal laylight with coloured glass insets. Fibrous plaster cornices. Efflorescent lighting in octagonal laylight.

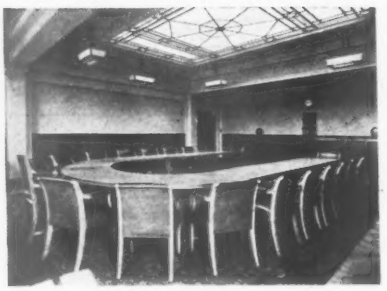
SERVICES—Heating : gravity feed boilers, burning coke. Ventilation : natural ventilation throughout except in case of exhaust in kitchens. Hot water : gravity feed domestic boiler. Cleaning : Provision made for vacuum cleaning throughout. Telephones : G.P.O. installation — 16 outgoing lines — 95 internal lines. Internal telephones throughout — 150 phones.

COST—£150,000. Cost per ft. cube, 1s. 4½d.

Staircase landing

Entrance hall

Cafeteria



Board room

OFFICE BUILDING, THAMES DITTON • DESIGNED

PROTECTION OF PLATE GLASS WINDOWS

Bulletins Nos. C.9, C.10 and B.6 have just been issued by the Research and Experiments Department of the Ministry of Home Security. The Bulletins, which are printed on this and following pages, deal with the protection of plate glass windows (C.9), flexible substitutes for glass (C.10) and bracing systems for large sheets of glass (B.6).

BULLETIN C.9

This Bulletin is concerned with vertical windows, fixed or made to open, fitted with plate glass $\frac{1}{8}$-in. thick or more. Such windows are common in shop fronts, restaurants and hotels, in internal display cabinets inside or outside buildings. The protection of the interior, lit by the window, is also considered.

Shop windows are prone to damage by blast because of their large areas. Small panes of plate glass are relatively strong but may fail by the frame breaking.

The weakest form of fixing for plate glass is to fasten the edges of panes by means of clips and bolts through the glass. Stout steel or bronze frames are generally better than wooden ones, though much depends on the dimensions of frame sections in relation to pane size.

When a bomb explodes the direct blast pressure may force in the window, or the suction following the pressure pulse may pull it outwards. At greater distances reflections of the shock-wave may start strong vibrations in a window which happens to have the same natural frequency. Such a window may break when others close by are unharmed.

The minimum distance from an explosion at which plate glass will escape damage cannot be predicted, but within 200 ft. its chance of survival is small. Beyond that distance the chance depends on factors which include size and thickness of pane, frame fixing, size of bomb and method of detonation and, in particular, the reflection of the blast wave from adjacent buildings. The last factor is chiefly responsible for the apparently freakish fracture of windows. Panes facing the ends of streets leading towards the explosion often break where adjacent windows escape. Where blast travels along a street, the side panes (at shop entrances, etc.) may be broken and the larger front panes escape ; elsewhere the reverse may happen.

When a pane breaks under severe blast, pieces may be scattered violently. It is not possible to foretell whether the pieces will fly inwards or outwards. When a pane breaks under distant blast, pieces generally fall inside and outside within a few feet.

Plate glass in internal partitions, show cases, etc., is almost as liable to fracture and to dangerous scattering as glass in external windows. Plate glass in doors, and in sliding or hinged windows, is somewhat less vulnerable than in fixed windows, provided the door or window allows some degree of movement. The decrease in risk does not warrant the omission of protective measures. It is desirable to fasten doors wide open during air raids and generally to open windows.

Resisting Fracture.

There is no method of preventing the fracture of glass under blast except by complete closing of the window opening as described in A.R.P. Memorandum No. 12, "Protection of Windows in Commercial and Industrial Buildings";

Above, typical typing office. Left, director's room

General contractors were W. H. Gaze & Sons, Ltd.; for list of sub-contractors see page xx

BY KENNETH LAYTON

nor has any method yet been discovered of materially increasing the resistance of glass to blast while retaining its transparency.

Various forms of bracing and damping devices have been investigated but none has been found which can be relied on to strengthen the resistance of the glass. In certain circumstances a bracing device may increase the liability of the pane to fracture. The behaviour of braced windows in air raids has confirmed the investigations. An important objection to such devices is that it may give the building occupier a false sense of security, blinding him to the need for providing against the danger of flying glass. This danger is in no way eliminated by any bracing device.

The possibility of increasing the resistance of large sheets of plate glass is being investigated. Research, however, does not at present indicate more than that it is useful to provide a flexible setting for the glass.

Minimizing the Results of Fracture.

Since it is not practicable to prevent the fracture of plate glass windows, while retaining their transparency, efforts should be directed towards minimizing the results of breakage. Such results include injury from flying glass, damage to stock or other contents of the building from flying glass and from exposure to weather and, in shops, pilfering of stock and loss of trade.

The following methods are available :—

(1) *Boarding up external display windows.*—Windows may be covered externally with boarding on stout framing, securely fixed, and provided with hinged shutters over openings exhibiting the display space. (See A.R.P. Memorandum No. 12, pages 18, 32 and 33.) Such boarding only gives a slight degree of protection. Under severe blast the boarding may be dislodged bodily, but is likely to be replaceable with minor repairs. Shortage of timber discounts this method.

The advantage of boarding over the methods described below is that it gives some protection against weather and pilfering to the display space and to the stock. Since boarding gives little protection against the scattering of glass fragments internally, it is desirable to add such protection as described below (paragraphs (4), (5) and (6)).

Rolling shutters of steel or wood give less protection than boarding. Under severe blast they may be dislodged from their guides. Open mesh shutters of " portcullis " type often escape damage by blast, but protect only against pilfering. The obsolescent sectional wooden sliding shutter gives protection similar to light boarding.

(2) *Bricking up the display space.*—Internal damage can be much reduced if a solid brick wall is built at the back of the display space. If this wall, which should extend to the ceiling, is 12½ in. thick, the shop interior will be given lateral protection on the street side like that afforded by an air raid shelter. Even with a 9-in. wall, protection is appreciable. It is desirable that entrance to the display space should be at the side and not through the protecting wall. This method has the serious disadvantage that it is a major structural work and may necessitate a special support for the wall. A brick wall gives the maximum obtainable protection to shop interiors.

(3) *Improving panelling behind display spaces.*—Where display spaces in shop fronts are backed by wooden panelling, if this is substantial, well braced and extends to the top level of the glass, it provides useful protection to the interior. Where panelling is low, wire netting of ½ in. mesh should be securely fixed between the panelling and the ceiling.

(4) *Wire netting.*—Wire netting of ½ in. mesh will stop all but the smallest fragments of

broken glass: these, except under very severe blast, are not likely to fly far. There is no need to use two layers of netting. Expanded metal of similar sized mesh gives equal protection but less transparency. The netting must be securely fixed, that is by firm stapling, or strongly-nailed battens. In order to allow cleaning of the glass, the netting is best attached to removable wooden frames. These should not be flimsy. The frames should be securely fixed to the structure, e.g. by bolts rather than by turn-buttons. It has been found in practice that the fixing and framing are the weakest parts of protective netting systems.

The netting should be as close to the glass as possible, preferably touching it. Netting of larger mesh than ½ in. has much less effect in arresting flying glass fragments. A mesh larger than 1 in. may pass dangerous fragments of glass.

Some local authorities have asked shop owners to fix wire mesh outside plate glass windows lest glass lying in streets should immobilize Civil Defence vehicles, such as fire engines and ambulances, by damaging the rubber tyres. Research and practical experience show that this risk has been exaggerated.

(5) *Blinds and curtains.*—Blinds and curtains, particularly if heavy and thick, give a moderate degree of protection against flying glass fragments, except under intense blast.

(6) *Adhesive treatments.*—An adhesive treatment does not make the breakage of glass less likely but, if appropriate to the weight and size of glass, it affords a useful measure of protection against the scattering of fragments. The following "anti-scatter" adhesive treatment is suitable for plate glass $\frac{3}{16}$ in. or ¼ in. thick, though it reduces the transparency. A full coat of varnish is brushed on the glass and when it has become tacky a sheet of fabric or strong textile netting is pressed into the varnish so that the whole glass area is covered. When the material is thoroughly set a full coat of varnish is brushed over the whole.

Where considerable transparency is required (e.g. in display windows) textile strips can be used, though this treatment is not so efficient as a close mesh netting all over the glass. Interspaces between strips should not be more than 6 in. each way. The stronger the textile and adhesive, the better the result.

Transparent film of "cellophane" type pressed into and afterwards coated with varnish is a useful alternative to the fabric or textile netting treatment.

The above adhesive treatments cannot be used on obscured glass, unless the surface is smooth enough for the material to adhere firmly. Where adhesion is likely to be poor, internal wire mesh screens should be used, or the glass removed.

Liquid coatings and paper strip are not recommended for plate glass.

Removal of Glass and Repairs.

The safest plan is to remove plate glass, if necessary substituting translucent or opaque materials. Much glass in interior partitions, show cases, fanlights over doors, etc., can be dispensed with, at least in wartime.

The use of substitutes for glass should be considered in undertaking repairs. Materials having a transparency approaching that of glass are difficult to obtain owing to the demands of aircraft production. Moreover, they are not made in sizes suitable for average shop-window openings, unless the latter are subdivided. Where, in undertaking repairs, it is desired to retain the use of the display space, a reduction in size of pane should be considered. If the opening is bricked up, or otherwise closed, leaving a glazed aperture about 4 ft. by 2 ft., this will usually allow inspection of the display space from the street, or will at least indicate that the shop is open. The aperture may be glazed with a transparent glass substitute (if obtainable) or by plate glass, protected inside with wire mesh.

Information on glass substitutes is available in Bulletin C.10.

FLEXIBLE SUBSTITUTES FOR GLASS

BULLETIN C.10

Glass damage from a bomb explosion is always much more widespread than its other effects. The breaking of glass and the violent scattering of its fragments under the blast of high explosive bombs cause a fair proportion of air raid casualties, and serious inconvenience from exposure to weather. Several "anti-scatter" treatments to prevent the flying of glass fragments have been recommended in Ministry of Home Security publications,* but though such treatments may hold fractured panes together, they neither reduce the risk of breakage nor prevent the pane being wholly dislodged if the blast is violent enough. Extensive air raids are likely to cause, through destruction of glass alone, delays in production, discomfort and casualties.

It appears unwise to replace broken glass with new glass, in view of the risk of repeated attack and because new glass would in turn require protective treatment. Further, supplies of materials for protective treatments can be expected to serve only a fraction of the glass at present in use. The utility of a flexible substitute for glass, that can be harmlessly dislodged by blast and readily replaced, is therefore obvious.

The Ministry of Home Security has arranged for an investigation into materials suggested as glass substitutes in general. This Memorandum (C10) gives available information which it is hoped will be considerably amplified in the near future.

Materials.

Flexible substitutes may be either translucent or, where permanent obscuration is required, opaque. Most translucent substitutes are at present made of synthetic resins or cellulose substances reinforced with metal or textile mesh.

Alternatively, cotton or linen textiles may be used; these are not ordinarily windproof or rainproof but may be obtained suitably treated with cellulose lacquer or with boiled linseed oil, or alternatively, may be treated in position at the window opening.

Translucent Glass Substitutes.

Qualities: The desirable qualities in translucent glass substitutes are:—

(1) *Reasonable translucency:* Materials having a transparency and light-transmission approaching that of glass are expensive and difficult to obtain owing to their use in aircraft. The majority of the cheaper translucent materials transmit less light than glass and interfere in some degree with clear vision.

(2) *Weatherproofness:* The material should not be porous (as is untreated cotton sheeting) or it will become soaked with rain and is also likely to admit wind enough to make interiors uncomfortable in cold weather. Attention should be paid where necessary to the sealing of the edges of the material.

(3) *Life:* The material should not lose its light-transmission value, suffer from crazing or become brittle too readily.

(4) *Resistance:* The material, while standing up to wind pressures, should be capable of being dislodged by blast so that it can be readily replaced. In this, the method of fixing is important (see below). The weaker materials should not be used in large unsupported areas. On such areas a stiffer material is desirable, or the opening should be subdivided by wooden bars.

(5) *Inflammability:* Most glass substitutes are combustible. In the majority of buildings a slow-burning material would not be very dangerous.

Roof Glazing: Only the stiffer materials, i.e. those reinforced with metal mesh, are likely to be suitable for use in roof glazing bars. They should probably be supported below at 2 ft. intervals as recommended for roof glass in R. & E. Department Bulletin C.7. No tests have yet been carried out.

Fixing in Vertical Glazing: Preliminary blast tests show that if flexible glass substitutes are fixed with nails or staples, the material when displaced is usually torn at the edges. Also, where edge fixing is too strong, the material may be burst in the centre. The following methods of fixing are accordingly being tested:

(1) In steel windows a soft non-setting putty or mastic, preferably one that can be scraped off and re-used.

(2) In steel and wood windows, fastening of the edges with adhesive tape.

(3) In wood windows, fixing by ordinary wood glazing beads in the glass rebates, care being taken that the material is not bent round the beads.

(4) In wood windows, fixing on the face of the frame by plasterer's lath or similar wood strip, care being taken that the nails or tacks used to secure the laths do not perforate the edge of the material.

(5) In steel and wood windows holding of the edges of the material in strip rubber channelling (similar to that used on car windscreens), the rubber strip being either tacked to the wood frame or bedded in hard-setting putty to either wood or steel frames.

Opaque Glass Substitutes.

Where permanent obscuration is required the following materials can be used:

(1) *Roof Glazing:* Galvanized flat sheet steel, composite sheets of asbestos and steel, hard wallboards. These will stand up to blast pressures considerably greater than those that fracture roof glass. When displaced, they can usually be replaced undamaged. They can be fixed in the same way as roof glass.

Thinner and more flexible opaque materials such as combinations of wire mesh and bituminous sheeting, soft wallboards, etc., probably require support beneath as recommended in R. & E. Department Bulletin C.7.

Experiments have shown that flat asbestos-cement sheeting, including the newer "flexible" type, is readily fractured by blast; there is, therefore, little to be gained by using it as a glass substitute in roof glazing bars, since it is likely to be fractured before it is displaced though, when fractured, it is not so dangerous as glass.

Wallboards require painting or impregnation with preservative to give protection against weather.

(2) *Vertical Glazing:* The materials described as suitable for roof glazing can also be used in windows. In addition, bituminous sheeting, plywood and plasterboard can be used. The two latter should be painted on the face and on the edges to prevent the soaking in of moisture. A plasterboard faced with bituminous sheet is obtainable.

As with translucent materials, firm fixing, as for instance by nailing, is undesirable. Similar fixings to those recommended for translucent materials are suggested.

The use of existing internal lightweight screens, as recommended in A.R.P. Memorandum No. 12, should not be overlooked. If these are painted on the face and edges, reasonable weather protection will be obtained, though there may be some collection of rainwater at cill level.

Burglary Risks.

Where there is risk of burglary, the fixings of glass substitutes may have to be strong, and materials used that cannot readily be cut with a knife.

Substitute Materials.

There are many substitute materials on the market, and the provisional list which follows

* A.R.P. Memorandum No. 12, "The Protection of Windows in Commercial and Industrial Buildings." H.M. Stationery Office, price 4d.
"Your Home as an Air Raid Shelter." H.M. Stationery Office, price 3d.
R. and E. Bulletin C.4, "The Protection of Glass in Hospitals."
R. and E. Bulletin C. 7, "The Protection of Factory Glazing."

gives some of their names. The list, however, does not aim at being comprehensive, and simply includes the names of those which are known to the Department to be on the market. The inclusion of a name in the list neither gives nor implies any guarantee by the Ministry of Home Security of the reliability at any time of the price or quality or of the availability of the materials. The materials are placed in alphabetical order.

TRANSLUCENT MATERIALS

"Armourbex." Cellulose-acetate sheet reinforced with wire mesh. Thickness 22/1000 in. Sheets 55 in. by 24 in. Price approx. 10s. per sq. yd. British Xylonite Co., Ltd., Hale End, London, E.4.

"Celiglas." Moisture proofed viscose film reinforced with textile fabric. Price 1s. 6d. per sq. yd. British Celilynd, Ltd., Burwell Works, Lea Bridge, Leyton, London, E.10.

"Cellofabric." Cellulose-acetate film reinforced with textile fabric. Prices, 18 in. wide, thickness 5/1000, 13s. per sq. yd.; 3/1000, 7s.; 2/1000, 4s. 6d. Cellofabrics, Ltd., 11 Gillingham Street, London, S.W.1.

"Del Beta." Cellulose-acetate film reinforced with textile fabric. Prices, 18 in. wide, G.R.3, 4s. per sq. yd.; G.R.4, 5s.; G.R.5, 10s. Dobsons and M. Browne, Ltd., Del Beta House, Nottingham.

"Dufaynet." Cellulose-acetate film reinforced with textile fabric. Price 22 in. wide, 2s. 9d. per sq. yd. Dufay-Chromex, Ltd., P. & O. House, 14/16 Cockspur Street, London, S.W.1.

"Ferrophane." An expanded metal mesh coated with a film of ethyl-cellulose. Sheets, 54 in. by 24 in. Price 8s. 3d. per sq. yd. Ferrophane, Ltd., 52 West Ham Lane, London, E.15.

"Marvol." 36 and 48 in. wide. Saville Marvel & Co., Ltd., Port Street Works, Manchester, 1.

"Nuart." Cellulose film reinforced by filet net. Two qualities of net. 40 in. wide. A. & F. H. Parkes (Nottm.), Ltd., Anglo-Scotian Mills, Beeston, Notts.

"Rexine." A cotton fabric, impregnated with cellulose acetate. Price, 40 in. wide, 2s. 9d. per sq. yd. I.C.I. Rexine, Ltd., Imperial Chemical House, Millbank, London, S.W.1.

"Steadoglass." A cotton fabric, impregnated with linseed oil. Price, 36 and 50 in. wide, 3s. 3d. per sq. yd. Also "Super Quality" 27 in. wide. Storeys, Ltd., Lancaster.

"Sunralite." A fine wire mesh coated with a film of cellulose acetate. Price, 36 in. wide, 4s. 6d. per sq. yd. Sunralite, Ltd., 84 Chestnut Road, London, N.17.

"Textuff." A cotton fabric, impregnated with viscose. Three thicknesses. Price, 37 in. wide, 11d. to 1s. 2d. per sq. yd. Textuff, Ltd., c/o Capt. Kilner, Tree Tops, Dollis Avenue, London, N.3.

"Windolite." A fine wire mesh coated with a film of cellulose acetate. Price, 36 in. wide, 4s. 6d. per sq. yd. Windolite, Ltd., Harlow, Essex.

Unnamed substitutes:

Fabrics impregnated with special lacquer. Jenson and Nicholson, Ltd., Jenson House, Stratford, London, E.15.

Impregnated cotton fabric. Morton Sundour Fabrics, Ltd., 15/19 Cavendish Place, London, W.1.

Impregnated fabric. Winterbottom Book Cloth Co., Ltd., 60 Wilson Street, Finsbury, E.C.2.

Impregnated fabric. Three qualities, all 36 in. wide. Prices: 1s. 1d., 1s. 5d., 1s. 8d. per sq. yd. M. Barr & Co., Ltd., 28 Miller Street Glasgow, C.1.

Impregnated fabric. Price 37 in. wide, 1s. 1d. per sq. yd. Horrockses Crewdson & Co., Ltd., Yard Works, Preston.

Oil cotton fabric. Four qualities, 36 in. wide. Edward Macbean & Co., Ltd., Wellington Mills, Port Dundas, Glasgow, C.4.

Plastic reinforced with glass silk. James Clark & Eaton, Scoresby House, Glasshill Street, London, S.E.1.

OPAQUE MATERIALS

"Bennieflex." A combination of wire mesh and bituminous sheeting. Flexible. Price, 36 and 72 in. wide, 3s. per sq. yd. Bennie Lifts, Ltd., 2 Tinworth Street, Albert Embankment, London, S.E.11.

"Durasteel." Flat or corrugated asbestos-cement and metal reinforcement. Prices, flat, sheets 30 in. wide, 6 and 8 ft. long, $\frac{3}{16}$ in., $\frac{1}{4}$ in., $\frac{5}{8}$ in. thick, 9s. to 16s. per sq. yd. Corrugated: 27 in. wide in lengths up to 8 ft., 6s. 9d. per sq. yd. Durasteel Roofs, Ltd., Oldfield Lane, Greenford, Middlesex.

"Kimoloboard." Fire-resisting board of asbestos and diatomaceous earth. Prices, $\frac{1}{4}$ in. thick, 2s. 7d. to 2s. 10d. per sq. yd., according to quantity. Cellactite and British Uralite, Ltd., Higham, Kent.

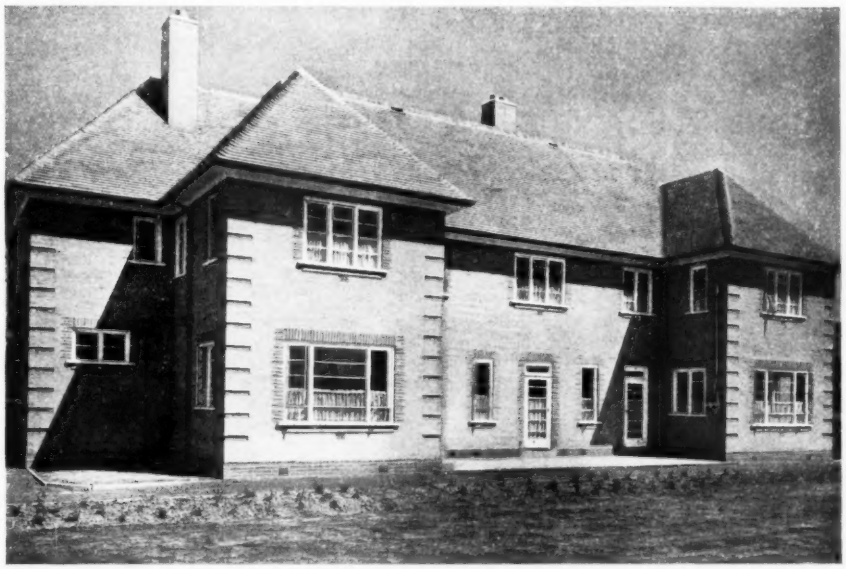
"Sisalkraft." A 6-ply fibre and bituminous building sheet. Price 4d. per sq. yd. J. H. Sankey and Son, Ltd., Aldwych House, Aldwych, London, W.C.2.

"Steelbestos." A combination of steel and asbestos. Rather flexible. Price, 30 in. wide, 6 ft. and 8 ft. long, 6s. per sq. yd. Asbestos Developments, Ltd., Grove Works, Grove Lane, Smethwick, Staffs.

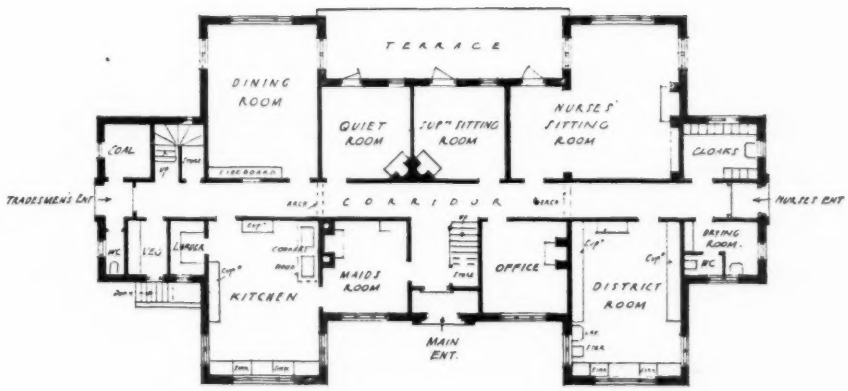
"Turnall" Asbestos Wood. Fire-resisting board. Prices: $\frac{1}{16}$ in. thick, 2s. 11d. per sq. yd. $\frac{1}{4}$ in. thick, 3s. 8d. per sq. yd. Turners Asbestos Cement Co., Ltd., Trafford Park, Manchester, 17.

NURSES' HOME, SHEFFIELD

DESIGNED BY J. MANSELL JENKINSON



View from south-west



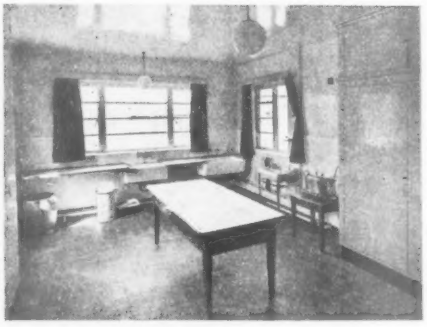
GENERAL.—This home for district nurses has been erected on one of the new Corporation housing estates in Sheffield.

NURSES' HOME, SHEFFIELD

View from north-east

Dining room

Sitting room



Kitchen

PLAN—The new home contains entrance hall, office, matron's sitting-room, nurses' sitting-room and bedrooms, study, dining-room, kitchen, maids' sitting-room, drying room, cloak room and district room. The latter contains storage cupboards for nursing appliances, medicine chests, facilities for storing and washing mackintosh sheets, etc. A sitting-out terrace is provided on the south front overlooking the garden, access to which is obtained from the french windows in the sitting-rooms. The upper floor is devoted to bedrooms for the nurses and staff and each room is fitted with wardrobe, dressing chest and wash-bowl. A service room is provided with shampoo basin and ironing accommodation ; also a room for storing suit cases.

EXTERNAL FINISHES—Walls are faced with stone-coloured rustic bricks with red rustic dressings to all door and window openings and the roof is covered with stone-coloured roofing tiles. Windows have metal casements in wood frames.

INTERNAL FINISHES—The decoration scheme has been carried out in light pastel shades to give a bright cheerful effect throughout the building and the walls have been lightly stippled in water paint.

SERVICES—Gas-heated low-pressure hot water system.

The general contractor was E. C. Horton, of Sheffield ; for list of sub-contractors and suppliers, see page xx.

DESIGNED BY J. MANSELL JENKINSON

BULLETIN B. 6

Fitting a central support or brace to a sheet of glass introduces opposing factors affecting its resistance to fracture when exposed to blast in the open, that is to an isolated pulse characterized by a single inward push followed by a single outward pull.

Whether the blast acts as an isolated pulse, or as a succession of pulses as it may in a street, the chance of the brace increasing the resistance of the glass to fracture may be regarded as an unlikely coincidence.

An important objection to a brace is that it may give the owner a false sense of security, blinding him to the need for providing against the danger of flying glass. This danger is in no way eliminated by a central brace.

The static strength of a sheet of glass, assumed to be subjected to a uniformly distributed load over its whole surface, is increased if a brace is fitted which provides a single central rigid support having an area greater than $A_c = 1/16$th length of the sheet $\times$ 1/16th breadth of the sheet.

If the area of the central rigid support is less than A_c, the strength of the pane is decreased, since the more concentrated forces at the support induce high stresses at that point.

If the support is not rigid the strengthening effect is diminished, and so also is the concentration of stress.

2. If the brace restrains movement at the centre of the pane, the glass between the centre and the edges acquires a natural frequency of vibration higher than that of the pane without the brace. Consequently the equivalent static pressure exerted by the blast on the braced pane is increased. It has been calculated that if the natural frequency of the pane, without a brace, is 10 cycles per second, as with a sheet of plate glass ¼-in. thick and 9 ft. square, the effect of fitting a rigid central brace is to increase the equivalent static load exerted by the blast about 3½ times. In practice, the brace will not act as a rigid support but will always allow some movement of the pane, depending on the tension of the stay wires and their inclination to the pane. The fundamental frequency of the unbraced pane will thus not be entirely eliminated by the fitting of the brace though vibration of the pane at this frequency will be greatly restrained.

3. It follows that fitting a more or less rigid support at the centre of a sheet of glass always increases the effective pressure and suction forces exerted by the blast wave, and may or may not increase the strength of the pane. Consequently the effective resistance which the glass can offer to the incident blast wave may or may not be increased. The two effects are opposing and either may predominate, but in no case is the effect likely to be great. In other words, the brace may make the conditions worse or better, but is not likely to have much effect either way.

SOME QUESTIONS ANSWERED THIS WEEK:

★ *WITH lead flashings resting on steel purlins is there any likelihood of accelerated corrosion or deterioration of either metal due to electrolytic action?* - - - - - Q515

★ *ON a building I am carrying out my clients would like the flat roof finished with a green asphalt. Can you give me the names of any firms who carry out this kind of roofing?* - Q518

★ *IN a private shelter we are building our client wants a panel of bullet-proof glass. Which firm can we approach for this?* - - Q524

★ *WE are considering the use of panels of glass bricks in lieu of ordinary factory windows. What approximately would be the price of glass brick construction in this way?* - - - Q525

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Enquirers do not have to wait for an answer until their question is published in the JOURNAL. Answers are sent direct to enquirers by post or telephone 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. Samples and descriptive literature sent to the Information Centre by manufacturers for the use of a particular enquirer are forwarded whenever the Director of the Centre considers them likely to be of use.

Finally, if an answer does not provide all the information needed, the Centre is always glad to amplify any point on which the enquirer wants fuller explanation.

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Q514 ARCHITECTS, LONDON. — *We have been asked to recommend a form of ACID - RESISTING FLOOR FINISH for a chemical laboratory attached to a works. The building to be used has a smooth cement floor and the owners want a material not greater in thickness than about ¼ in. so as to obviate any pronounced change in floor levels between adjoining sections of the building. What materials are capable of fulfilling these conditions?*

In view of the stipulation of ¼ in. thickness, the choice must be between special linoleum, acid-resisting asphalt and one of the proprietary forms of cement-based floors. For the latter two alternatives, hacking of the surface of the existing cement floor will be necessary for keying purposes. Linoleum such as Cellulin (Cellulin Flooring Co., 100 Victoria Street, London, S.W.1) has been used over a period of years in hospital operating theatres where acid contamination is experienced. With operating theatres, of course, cleaning of the floor is done several times a day so that acid solutions do not remain long on the surface. The difficulty about acid-resisting asphalt coatings might lie in obtaining a satisfactory flooring in the thickness permitted, but on this point enquiry should be made to an asphalt

firm experienced in this work, such as Limmer and Trinidad Lake Asphalt Co., Ltd., Berry Hill House, Taplow, Bucks. With the proprietary forms of cement-based floors (such as laid by Prodorite, Ltd., Artillery House, Artillery Row, London, S.W.1 ; or Sealocrete Products, Ltd., Atlantic Works, Macbeth Street, Hammersmith, London, W.6) the question of minimum useful thickness of material and the nature and strength of concentration of acids likely to fall on the floor are points which should be discussed with the manufacturers.

Q515 QUANTITY SURVEYOR, LONDON.—*With LEAD flashings resting ON STEEL purlins is there any likelihood of accelerated corrosion or deterioration of either metal due to ELECTROLYTIC ACTION?*

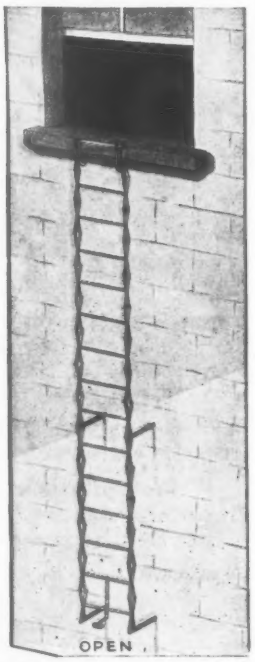
In the order of electrode potentials of metals, iron stands higher than lead, so that with iron and lead in association in an atmosphere containing moisture it would be expected that the presence of the iron would hasten the deterioration of the lead. But when lead corrodes it forms a surface skin of lead carbonate which protects it from further action: the rapidity of the formation of this skin can easily be seen by scraping the surface of a piece of lead to the bright metal, when the surface dulls quickly in ordinary atmosphere. On the other hand, iron in corroding forms no protective skin, but merely iron oxide, and corrosion is continuous. This corrosion, however, is neither brought about or is accelerated by the presence of the lead. The answer is therefore: No.

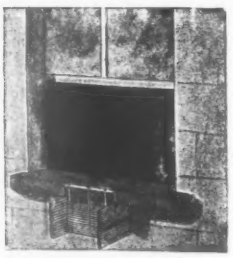
Q516 ARCHITECTS, WEST COUNTRY.—*We should be obliged if you would kindly let us know the AVERAGE RISE IN THE PRICE OF MATERIALS and labour between March, 1939, and August, 1940. We require this information for assessing war damage to property.*

It is impossible to give such a general figure which would have any useful meaning. A figure could be assessed by taking off rough quantities and pricing at March, 1939, and at current, rates. This percentage increase in cost will be found to vary appreciably with the type of building: for example, between single-storey factories, multi-storey warehouses, shop premises and small house property. Quoting from the Prices Survey contained in the August 1 issue of the JOURNAL, the cost of bricks shows an increase of 5·9 per cent. above pre-war, ballast 21¾ per cent., cement 20·7 per cent., and steel 30·8 per cent. It can be seen that the percentage increase in cost of the structure of a small brick-built house will bear no relation to the percentage increase in cost of a steel-framed factory or warehouse building with concrete panel infilling. Complete prices for March, 1939, were published in the September 5 issue of the JOURNAL.

Q517 ARCHITECT, DEVON.—*I believe there is marketed a collapsible FIRE ESCAPE LADDER known as the "Instant," and I should be obliged if you could provide me with the name of the manufacturers. One or two small ladders are required for a 12 ft. drop and a longer one for approximately a 20 ft. drop.*

The manufacturers are Gravity Ladders, Ltd., High Holborn House, 52–54 High Holborn, London, W.C.1,





and the illustration shows the ladder open and shut. The ladder is supplied in lengths up to 20 ft.

Q518 ARCHITECT, LONDON.—*On a building I am carrying out my clients would like the flat roof finished with a GREEN ASPHALT. Can you give me the names of any firms who carry out this kind of roofing?*

It should be possible to have the asphalt undercoats carried out in the standard roofing asphalt and the finishing coat in the green asphalt used normally for flooring purposes. Work of this type in coloured asphalt is done by Limmer and Trinidad Lake Asphalt Co., Ltd., Berry Hill House, Taplow, Bucks ; and Val de Travers Asphalte Paving Co., Ltd., 21–22 Old Bailey, London, E.C.4. Or it would be possible to use as a waterproof membrane a built-up bituminous roof covering, and finish this with a green coloured bituminous macadam of the type used on all-weather tennis courts. For this type of roofing the firms given below* could be approached. If, however, these firms will not undertake the green macadam surfacing, then no doubt the tennis court specialist firms would undertake the surfacing work. Firms to approach are also given at the foot of this column.†

Q519 ENQUIRER, WEST COUNTRY. — *With regard to building materials generally, are the garish bright red and yellow bricks cheaper? Similarly, are roofings of bright pink or green and other offensive colours cheap? They are used by builders of houses so much and in preference to materials which would harmonize with the general surroundings that I wonder whether the use of other materials would penalize those intending to build and make houses much more expensive. My enquiry briefly is, can HARMONIOUS MATERIALS be found which will not mean great expense?*

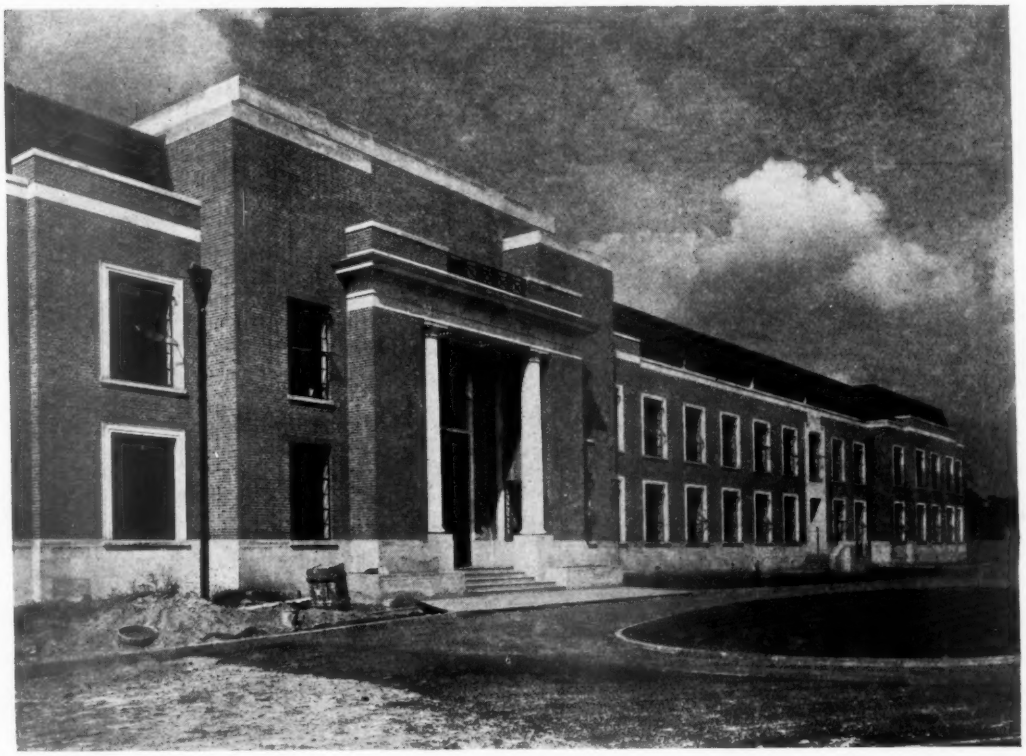
In most districts surface finishes can be found which are in general harmony with local materials without increase of cost. Bricks and roofing materials of garish colour or depressing uniformity are usually, but not always, a little cheaper than materials of better appearance. But some of the worst offenders have such poor protective and lasting qualities that they would not be used by architects for this reason even if their appearance were acceptable.

The answer to this enquirer is therefore a double one. For any

* *BUILT-UP BITUMEN ROOFINGS.—Ruberoid Co., Ltd., Lincoln House, 296 High Holborn, London, W.C.1 ; D. Anderson and Son, Ltd., Roach Road Works, Old Ford, London, E.3 ; William Briggs and Sons, Ltd., 29a Vauxhall Grove, London, S.W.8 ; Geo. M. Callender & Co., Ltd., 25 (South Block), Victoria Street, London, S.W.1.*

† *GREEN MACADAM FINISHES.—En-Tout Gas Co., Ltd., Syston, Leicester ; Ferndon Contractors, Ltd., 130 Regent Street, London, W.1 ; Grassphalte Hard Courts, Ltd., Thames House, Millbank, London, S.W.1.*

OFFICES, MILK MARKETING BOARD



Kenneth Layton, M.Inst.R.A., *Architect* W. H. Gaze & Sons, Ltd., *Contractors*

DAMP-PROOFING UNDER-FLOOR HEATING DUCTS

THE state of absolute dryness, so desirable in ducts that contain heating, and other engineering services, was ensured by the inclusion of 'PUDLO' Brand waterproofing powder in the concrete bottoms, and in the cement mortar renderings applied to their brick sides. Dampness in ducts is a direct cause of deterioration of apparatus and of heat losses, and by preventing these wastages, the cost of the waterproofing is recovered at a very early stage in the life of the building.

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Unless waterproofing work is completely successful, all the money spent upon it is wasted. The cost of the 'PUDLO' Brand waterproofer is only a fraction of the total expense, and is a very small premium to pay for the assurance of a satisfactory result.

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structure in which the owner is prepared to pay for reasonable permanence and sound workmanship, pleasing materials can always be obtained for no greater cost than unpleasing. In other structures—garages, sheds, seaside bungalows—standardized mass production in large numbers with poor workmanship will always achieve a lower cost per unit than is possible when one unit is being specially built. But even with these standardized buildings there is no reason why the general appearance of their surfaces should not be much better without any increase in cost. The fault is that the "average client" for whom such buildings are designed either likes things garish, or doesn't mind whether they are or not.

Q520 BUILDERS, LONDON.—*This week some of our men were working at the blacking out of factory rooflights and lost from AIR-RAID WARNINGS some 30 hours' time. Is there any form of standard agreement between builders AND operatives as to the payment for this LOST TIME? Also the work we were doing was not subject to any particular form of contract, but was just an estimate given in the ordinary way of business. Is there any way in which the additional cost from stoppages of work during air-raid warnings can be passed on to the clients?*

On the question of payment of workmen there was a Decision of the National Joint Council for the Building Industry regarding Time Lost through Air-raid Warnings or Air Raids, published in September, 1939. The text of this is as follows :—

(1) When, due to air-raid warnings or to air raids, operatives are prevented from working during the normal daily hours as prescribed by the National Joint Council Agreement (i.e. the daily hours corresponding to weekly hours of 46½, 44 or 41½ according to the locality or the time of the year), then it shall be the duty of the employer, so far as possible and practicable, to provide facilities to enable the operatives to make up the time lost, by working (in that week or in the following week if still in the same employment) during hours before and after the normal starting and finishing times as prescribed by the Agreement.

(2) Any such extra time worked before or after the normal starting and finishing time for the purpose of making up time lost shall be paid for at the appropriate overtime rates.

(3) The object of these provisions is that, under the present war-time conditions, the operative shall be enabled, so far as possible, to work the full normal number of hours per week (as prescribed and as above referred to).

(4) If, owing to air-raid warnings or air raids it has been found impossible to work the total normal number of hours (as prescribed under the Agreement) in any full working week, then the employer shall pay (at the hourly rate applying to the district under the Agreement) for 50 per cent. of the time by which the total time actually worked falls short of the time which could have been worked within the prescribed working hours under the National Joint Agreement (as set out in (1) above), subject to the following provisos :—

(i) that payments due under this clause shall not exceed a (50 per cent.) payment for 8 hours in any one full working week as above referred to (i.e. the maximum actual payment would be 4 hours' pay).

(ii) that, in order to qualify for such payments, the operative must have reported for work by attending at the job each day during the normal working hours.

(5) The employment of any operative shall not be prejudiced by reason only of his arriving late to work in consequence of an air-raid warning provided that his arrival is within a reasonable time after the "all clear" signal, having regard to traffic conditions and travelling distance.

(6) In the event of successive air raids or warnings during any day, of such a character that an operative considers it prudent not to journey to his work and elects to absent himself accordingly, then, upon reporting for work on the following day, such operative shall be enabled to resume work without any question arising due to such absence.

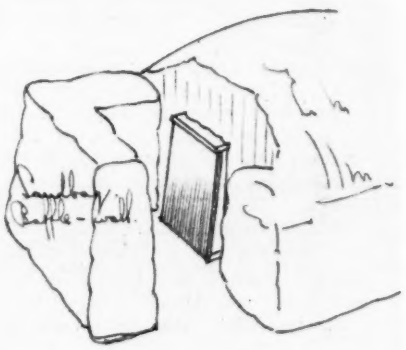
(7) It is agreed that if, over a considerable area of the country, work is interrupted by air-raid warnings and/or air raids for a period exceeding 8 hours in any one week, and if it has not been possible to make up such time under (1) and (2) of the foregoing, then further consideration shall be given to the position by the National Joint Council within 7 days after such happening.

If there is no proviso in the contract between yourself and client to cover this point, the passing on of this extra cost can only be a matter of private agreement between the parties.

Q521 ARCHITECT, WARWICKSHIRE.—*In your issue dated June 27, 1940, you stated, in reply to question No. 394, that "ARCHITECTS ENGAGED IN A.R.P. work are RESERVED AT 30 if they are in the full time employment of local authorities." Is this still true?*

In the Schedule of Reserved Occupations (Revision May, 1940) by the Ministry of Labour and National Service and obtainable from His Majesty's Stationery Office, York House, Kingsway, W.C.2, price 1s. net, it is stated that for a Whole-Time Officer of a Local Authority, not specifically reserved at a lower age by reason of the occupation in which he is employed, the age of reservation is 30. It is further defined that the terms "local authority" and "officer" are to be interpreted within the meaning of the Local Government Superannuation Act, 1937, and the Local Government Superannuation (Scotland) Act, 1937, except that local authority does not include a Parish Council in England and Wales, or a District Council in Scotland. The chief consequence of this interpretation is that, to qualify as a Local Authority Officer, a person must either hold a permanent appointment or have been in the temporary employment of one or more local authorities for a total period of two years. It should be mentioned that amendments in the Schedule may be made from time to time, and the enquirer should consult the Local Office of the Ministry of Labour as to any changes as yet unpublished which will affect his position.

Q522 ARCHITECT, LINCS.—*I have recently fitted a DEAL DOOR TO THE ENTRANCE OPENING of an ANDERSON SHELTER in the manner shown in the accompanying sketch (the door being of 1¼-in. battens*



screwed to ledges and hung on the face of a wood frame bolted through shelter front, having cill piece and projecting hood, etc.), and shall be pleased to have your opinion as to whether such a door, fixed in the position indicated, is likely to prove advantageous or otherwise in the presence of moderate or severe blast. A reference to any standard work dealing with the effect of blast in similar confined spaces will be appreciated.

The Home Office A.R.P. pamphlet entitled "Directions for the Erection and Sinking of Galvanized Corrugated Steel Shelters" (His Majesty's Stationery Office, York House, Kingsway, W.C.2, price 2d. net) illustrates various approved positions for Anderson shelters in relation to buildings existing and illustrates also forms of screen wall provisions for entrances to shelters that are isolated and consequently are not protected in any way by proximity of buildings. The degree of protection against blast and splinters provided by the sandbag screen wall shown in the inquirer's sketch would be greater than that provided by the alternative arrangements illustrated in this official publication providing the sandbag wall is 30 in. thick. The door would give

some additional protection against blast, but not a great deal.

Q523 CONSULTING ENGINEERS, LONDON, S.W.1.—*Before the war there used to be available forms of saw-tooth-edged circular rings used as TIMBER CONNECTORS in heavy carcassing work. They were of North European origin. Are these connectors still available in this country?*

The "Alligator" connectors sold by Wood Specialists, Ltd., 329 High Holborn, London, W.C.1, are still available. The 5¼-in. diameter connector is being made in this country and smaller sizes are still available from stocks held. Similarly with the "Bulldog" connectors marketed by the Palnut Company, 26 Holborn Viaduct, London, E.C.1, all types are still available either from stocks held or from types now made in this country. Originally both the Alligator and Bulldog connectors came from Norway. The "Teco," American made, split ring connectors can still be imported where Government sanction is given, but the marketing firm, Messrs. MacAndrew and Forbes, Ltd., Bush House, Aldwych, London, W.C.2, have just completed arrangements to have these "Teco" connectors manufactured in this country.

Q524 ARCHITECTS, LONDON.—*In a private shelter we are building our client wants a panel of BULLET - PROOF GLASS. Which firm can we approach for this?*

The so-called "bullet-proof" glass is the thicker varieties of "Armourplate" glass as produced by Messrs. Pilkington Bros., Ltd., of St. Helens, Lancs, and 63 Piccadilly, London, W.1. But in the use of the material in shelter construction another factor, that of blast resistance, will arise, and in approaching the firm the use and position of the glass should be stated and their recommendations followed.

Q525 ARCHITECTS, LONDON.—*We are considering the use of panels of glass bricks in lieu of ordinary factory windows. What approximately would be the price of GLASS BRICK CONSTRUCTION in this way?*

It is possible for glass bricks to be built by ordinary building labour as part of the normal bricklaying operations. The design should be so arranged that the glass bricks are built in as a panel in a prepared opening left in the structure, and each panel of bricks must form a non-load bearing unit. The prices of the glass bricks as supplied by the manufacturers — Messrs. Pilkington Bros., Ltd., St. Helens, Lancs—are as follows :—

Model PB 3 size	$7\frac{3}{4}'' \times 7\frac{3}{4}''$	.. 2s. 6d.
,, PB 2 ,,	$5\frac{3}{4}'' \times 5\frac{3}{4}''$	.. 1s. 8d.
,, PB 1 ,,	$8'' \times 4\frac{7}{8}''$	.. 2s. 0d.

each delivered on site.

The bricks are $3\frac{7}{8}$ in. on bed. The actual price of the work as built will vary, being dependent on the type of brick and total quantity, but the following prices could be taken as a rough guide. For quantities of 100 square feet and upwards the price will be from 8s. per square foot in London area to 10s. per square foot in parts of the provinces.

Q526 BOROUGH COUNCIL, ARCHITECTS' DEPARTMENT.—*Throughout our specification for public shelters to be built on soil we had adopted as standard construction for the floor 4-in. hardcore with 3 in. of concrete on top. With the idea of conserving our supplies of cement we asked all contractors engaged in this work to give a price for 1½-in. thickness of fine tar macadam over the hardcore in lieu of the 3-in. concrete. The contractors quote this 1½ in. tar macadam as costing more than the 3-in. concrete originally specified, one contractor claiming an extra of £90 for an area of 400 square yards. Is an extra cost justified? Can you suggest a floor finish which would be comparable in cost with the 3 in. thickness of concrete specified originally?*

The specification of 1½ in. thickness of fine tar macadam is wasteful and would certainly cost more than 3 in. of concrete. A coarse underlayer and fine top-coating would seem all that is called for. It would appear possible for tar paving to be secured at the same price as 3-in. concrete providing subcontractors are employed and that 200 sq. yds. is available for laying at one time, though not necessarily in one area. In these conditions a suitable specification would be :—

2-in. tar paving, laid in two layers, the bottom layer 1½ in. thickness of 1½ in. material and the top layer ½ in. thick of ⅜ in. material laid on top of hardcore already provided, and well rolled and consolidated.

If such an area cannot be made available, a cheaper specification would have to be devised. For instance :—

Over hardcore already provided, lay 2 in. finished thickness of good binding gravel and well watered and rolled and on this apply a heavy mop coating of "Colas" or other approved bituminous binding agent and ¼ in. shingle dressing.

The work could be undertaken by the general contractor, so each shelter could be done separately, or if a series of shelters were available at any one time specialist firms could be invited to tender.

ASPHALT IN RESERVOIR CONSTRUCTION

Following notes have been supplied by the Limmer and Trinidad Lake Asphalt Company.

The uses of water in modern civilization are many and varied, it being essential for such services as disposal of waste, industry, irrigation, water power, navigation and recreation, but, above all, for domestic supply. In these days when whole communities are transferred to remote districts, many authorities are confronted with the immediate necessity of providing an adequate supply of water for domestic consumption. The problem of procuring such a supply differs in nearly every case, and depends upon local conditions ; below, it is intended to discuss in brief detail the several uses of asphalt as a water-proofing material in the construction of reservoirs, which structures must form an integral part of any scheme, in order to provide storage to meet hourly and daily fluctuations in demand.

In the case of underground reservoirs, it is necessary to incorporate in the design an adequate and efficient system of drainage, both under the concrete floor and behind the walls, in order to prevent the accumulation of subsoil water outside the structure. If the proper precautions are taken and contraction joints are provided in the concrete walls, the success of an asphalt lining in maintaining watertightness is assured. On the other hand, failure to provide for the disposal of ground water will, when the reservoir is empty, inevitably result in the "blowing" and ultimate failure of the asphalt due to external water pressure. If contraction joints are omitted, there is a risk that the concrete will crack at unexpected and perhaps awkward places, and in so doing rupture the asphalt lining.

Whilst the primary object of water-proofing a reservoir with asphalt is to preclude the possibility of leakage therefrom, it will be obvious that if water can escape from a reservoir, it is equally easy for polluted water to enter, either through a crack or through porous materials, when the reservoir is empty or greatly drawn down. When dealing with water for human consumption, not a single risk should be taken. Asphalt, when properly applied, ensures absolute safety.

It is beyond the scope here to deal with the main features of the design of a reservoir; in fact, by virtue of the Reservoirs (Safety Provisions) Act, 1930, all reservoirs of a capacity exceeding 5,000,000 gallons may only be designed and constructed under the supervision of a qualified engineer selected from a panel of engineers appointed by the Home Office.

Although there is some divergence of opinion amongst engineers specializing in reservoir construction as to the necessity or desirability of providing contraction joints in walls, most engineers specify their use, particularly in large structures. The joints should be spaced at intervals not exceeding 50 ft. ; if placed further apart they will not give the desired immunity against cracking. In the construction of these joints, it is a common practice to make use of bitumen compounds or asphalt mixed with a larger proportion of bitumen, either alone, or in conjunction with a strip of copper or steel, crimped at the centre (Fig. 1).

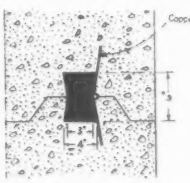


FIG 1
CONTRACTION JOINT IN WALL

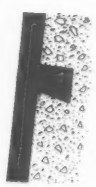


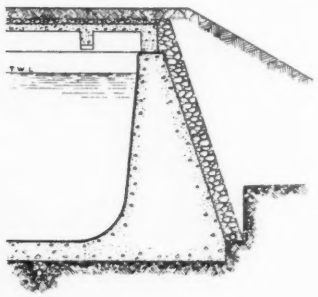
FIG 2
DETAIL OF GROOVE FOR FIXING ASPHALT TO WALL

The adhesion of the jointing material and the concrete is of fundamental importance, and the application of a bituminous solution on the exposed concrete face of the wall section is recommended.

The best results are definitely obtained by the application

of three coats of asphalt both to the vertical sides of the structure and to the floors, the vertical asphalt being ⅜-in. thick and the horizontal 1¼ in. thick, all fillets to be in two coats. In dealing with large areas of vertically applied asphalt, such as are found in reservoirs, it is advisable that special precautions should be taken to ensure that the weight of asphalt does not tend to sag when the reservoir is emptied, particularly in hot weather if the reservoir is open, and this can be achieved by the formation of continuous horizontal grooves, approximately ⅜-in. square in section, and spaced between 2-3 ft. apart, formed at the time of construction (Fig. 2). It is also necessary to ensure that there is perfect adhesion between the asphalt and the vertical concrete by roughening the exposed concrete, which should be dry, and by removing all laitence and loose material before the asphalt is applied.

Cracks occasionally develop in the walls and floor of a reservoir for various reasons, notwithstanding the provision of contraction joints, but if they are small, and the reservoir is lined with asphalt, the lining may be relied upon to take up the stresses and to maintain complete watertightness of the structure.



TYPICAL CROSS SECTION THROUGH RESERVOIR WALL SHEWING WALL & FLOOR DRAINAGE AND ASPHALT LINING.

In the case of unlined reservoirs, provided the walls and floor are otherwise watertight, small cracks may be repaired by cutting out a chase of sufficient size to cover the crack, treating the surface with an emulsified bitumen, and filling the crack with mastic asphalt. Where the cracks in the vertical concrete are of considerable size, it is sometimes found necessary to provide expanded metal, plugged into the walls with rawlplugs, using bronze screws and washers, to form a substantial and secure surface for the subsequent application of the mastic asphalt.

On the question of specification, it must be remembered that mastic asphalt is available in many grades and qualities, and in respect of a suitable specification attention is necessary in order to guard against failure to specify materials of proven quality. Trinidad Lake asphalt, from the fact that it is a natural product, can be guaranteed to stand up to constant and direct contact with water, without the necessity of facing bricks; it is therefore advisable that Trinidad Lake asphalt should be specified as the matrix or bonding medium.

In conclusion, whilst emphasizing the important part played by asphalt in the construction of reservoirs, we would add that this material is also used in connection with many other liquid-retaining structures such as :—

The lining and flooring of brine pits in connection with refrigeration and cold storage processes. Tanks where high temperatures and strong liquors prevail. For whey tanks and other processes in dairying.

Standardised grades of asphalt are manufactured which will stand up to :—Inorganic acids of high concentration and temperature. Alkalies solid and liquid, organic acids, sugars, brewing liquors, cider, etc. Complex liquors such as are met with in precious metal refining and chemical processes.

In all these processes, as in reservoir work, no additional protectional lining is called for; the asphalt itself, standardized as we have stated to meet many diverse conditions, provides the required protection to the structure to which it is applied.

THE BUILDINGS ILLUSTRATED

NEW HEAD OFFICES, MILK MARKETING BOARD, THAMES DITTON (pages 255-259). Architect : Kenneth Layton. General contractors were W. H. Gaze and Sons, Ltd. Sub-contractors and suppliers included : Neuchatel Asphalte Co., Ltd., asphalt ; Obo Construction Co., Ltd., concrete blocks ; Proctor and Lavender, special bricks ; Wills and Packham, Ltd., bricks ; Bath and Portland Stone Firms, Ltd., stone ; Empire Stone Co., Ltd., artificial stone ; H. Young & Co., Ltd., structural steel ; Kleine Co., Ltd., fireproof construction ; Decorative Tile Co., Ltd., tiles (internal work) ; Universal Asbestos Manufacturing Co., Ltd., slates ; Stirling and Johnson, special roofings ; Celotex, Ltd., roofing insulation ; Sankey-Sheldon, Ltd., partitions ; Farmiloe and Sons, Ltd., glass ; Haywards, Ltd., rooflights ; Williams and Williams, Ltd., patent glazing ; Acme Flooring and Paving Co., Ltd., woodblock flooring; Figg Floorings, Ltd., flooring (cork rubber) ; Sorbo, Ltd., patent flooring ; Kerner-Greenwood & Co., Ltd., Pudlo waterproofer ; J. Jeffreys & Co., Ltd., central heating and boilers and cafeteria ventilation ; Horseley Bridge and Thos. Piggott, grates ; Wandsworth and District Gas Co., cafeteria cooking equipment and gas-fitting ; J. E. Swann & Co., Ltd., electric wiring ; General Electric Co., Ltd., electric light fixtures ; Arthur Scull and Son, Ltd., plumbing ; Shanks & Co., Ltd., sanitary fittings ; Yannedis & Co., Ltd., door furniture ; Crittall Manufacturing Co., Ltd., casements and window furniture ; Reliance Telephone Co., Ltd., internal telephones ; G.P.O., external telephones ; Garton and Thorne, Ltd., folding gates ; Dennison, Kett & Co., Ltd., rolling shutters ; Mather and Platt, Ltd., sprinkler installation ; F. A. Norris & Co., Ltd., iron staircases ; Bentalls, Ltd., sun blinds ; G. Jackson and Sons, Ltd., fibrous plaster ; Jaconello, Ltd., stonework ; Diespeker & Co., Ltd., terrazzo to partitions, floors and walls ; J. Burley and Sons, Ltd., shrubs and trees ; Roneo, Ltd., steel shelving and cabinets ; Lamson Engineering Co., Ltd., letter lift ; Duke and Ockenden, Ltd., water supply (well) ; Metropolitan Water Board, water supply (mains) ; Permutit Co., Ltd., water (softening plant).

NURSES' HOME, SOUTHEY HILL, SHEFFIELD (pages 261-262). Architect : J. Mansell Jenkinson. General contractor was E. C. Horton. Sub-contractors and suppliers included : W. Proctor and Sons, Ltd., roof tiling ; Henry Hope and Sons, Ltd., casements ; W. Stiles, plasterer ; J. Newman and Son, plumber ; A. Grindrod & Co., heating ; John Norton and Son, sanitary goods ; Gabbitas and Woods, decorating ; Alfred Shaw & Co., gates ; John Hadfield and Sons, Ltd., rock asphalting ; Silver Hill Nurseries, Ltd., garden work.

CLASSIFIED ADVERTISEMENTS

Advertisements should be addressed to the Advt. Manager, "The Architects' Journal," 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," 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

CAMBRIDGESHIRE COUNTY COUNCIL

COUNTY ARCHITECT'S DEPARTMENT

Applications are invited for the appointment of Quantity Surveyor and Assistant to the County Architect in the County Architect's Department.

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

The salary will be at the rate of £400 per annum, rising by annual increments of £20 subject to the satisfactory discharge of duties to a maximum of £500.

The appointment may be terminated by three months' notice on either side.

Candidates must be trained and be qualified as Quantity Surveyors and Architects, and must be experienced in preparing quantities (standard method of measurement) and specifications and supervising works for all classes of building works, estimates and adjusting contract sums. Experience with a public authority is desirable.

Applications, stating age, training, qualifications, details of experience, together with copies of three recent testimonials, to be delivered to the undersigned not later than Saturday, the 5th October, 1940.

ASHLEY TABRUM,
Clerk of the County Council.

Shire Hall,
Castle Hill, Cambridge.
16th September, 1940. 15

EASINGTON RURAL DISTRICT COUNCIL

TEMPORARY ARCHITECTURAL ASSISTANT

Applications are invited for the post of Temporary Architectural Assistant in the Department of the Engineer and Surveyor to the Council.

Applicants must be exempt from military service.

The salary will be at the rate of £4 10s. per week and war bonus, and the appointment will be subject to one month's notice on either side.

Application forms may be obtained from the Clerk to the Council, Council Offices, Easington, and must be returned to him not later than Monday, 14th October, together with copies of two recent testimonials. The envelope must be endorsed "Temporary Architectural Assistant."

J. J. WARING,
Clerk to the Council.

Council Offices,
Easington, Co. Durham.
18th September, 1940. 13

ALTON RURAL DISTRICT COUNCIL

CIVIL DEFENCE ACT
ERECTION OF DOMESTIC SHELTERS

Applications are invited for the following temporary appointments in connection with the provision of domestic shelters :—

(a) Suitable qualified technical officer, preferably with previous experience, to take full charge of the work at a salary of £6 6s. per week.

(b) Three Assistants to carry out the necessary preparatory survey of the areas concerned at salaries of between £5 5s. and £7 7s. per week, according to qualifications and experience.

(c) Clerk to assist in the office work. Applicants for this appointment must also be capable draughtsmen, able to prepare plans from survey notes. Salary at the rate of £4 per week.

Appointments for (a) and (c) will be for the whole period of providing shelters for a population of over 2,000 and applicants for (a) should be capable of supervising contractors, etc.

Applications to be addressed in sealed envelopes endorsed "Shelter Staff" and followed by the designating letter (a), (b) or (c) to the undersigned so as to reach him not later than Monday, the 30th September, 1940.

Canvassing will be a disqualification.

V. J. GADBAN,
Clerk of the Council.

46 High Street,
Alton, Hants.
September, 1940. 16

Architectural Appointments Vacant

Advertisements from Architects requiring Assistants or Draughtsmen, and from Assistants and Draughtsmen seeking positions in Architects' offices will be printed in "The Architects' Journal" free of charge until further notice. Other "Appointments Vacant" and "Wanted" will be found under later headings, and are subject to the charges given under each heading.

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.

LADY DRAUGHTSMAN required for large multiple firm. Must be conversant with full routine of architect's office, including ¼-in. scale in working of drawings, surveys, inspection of work in progress, builders' accounts, etc. Write, stating full details, to Box No.12.

Architectural Appointments Wanted

ARCHITECTURAL ASSISTANT (22), A.R.I.B.A., Cert. in Town Planning, exempt from Military service, seeks situation anywhere in England or Wales in architect's or town planner's office; R.I.B.A. Soane Medallion Finalist 1939-40 and Polytechnic Bronze Medallist 1939; six months' with factory designers; two years' experience in schools and clinics with well-known London architect; at present disengaged; salary by arrangement. Reply A.R.I.B.A., 210 Torbay Road, Harrow, Middlesex. 123

Classified Advertisements continued on page xxiv.

Classified Advertisements continued from page xxii.

ARCHITECTURAL ASSISTANT (20) classed grade 3 at medical examination; intermediate standard; five years' experience in architects' and surveyors' office, including four years articles, general office work, preparation of ¼ scale drawings, from sketch plans to full size details; surveying and levelling; setting out on site and general supervision; general domestic work for houses, £650-£1,500 and specifications for same; road surveys, alteration work to public houses, etc.; experience with showrooms, offices and hotels. Box 113.

CLERK-OF-WORKS AND BUILDING SURVEYOR seeks re-engagement; disengaged owing to the War; over 25 years' extensive, varied experience of all classes of Buildings, in first class work; recently completed £212,500 contract; testimonials from architects and surveyors, municipal engineers and surveyors, etc.; over military age; rendered War Service during 1914-18 Great War; salary to mutual arrangement. Box 114.

ARCHITECT AND SURVEYOR offers services as required in London, Surrey, or own office, one to three days. Specifications, quantities, dilapidations, A.R.P., factories, layouts, surveys, details, etc. Box 118.

ARCHITECT AND STRUCTURAL ENGINEER, 40. Specialist in Warehouse, Factory and Industrial design. Used to control of large staffs in office and field. Extensive experience all types structures including steel framed and R.C. buildings, roads, bridges, sewage disposal, long scale developments and conversion of property, L.C.C. and Provinces. Desires position of responsibility. Box 120.

JUNIOR ARCHITECTURAL ASSISTANT, 19 years of age, keen and accurate draughtsman; 2 years Yorkshire architect's office experience; knowledge of general design and surveying; attended evening and part-time classes at a school of architecture; studying design and building construction; good secondary school education; school certificate standard. Box 121.

ARCHITECT'S ASSISTANT (24) urgently requires position; will go anywhere; experience in all types architectural and A.R.P. work. Write R. P., 26 Hartley Avenue, Leeds 6. 122

Other Appointments Wanted

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

ADVERTISEMENT MANAGER, 18 years with well-known firm of lighting engineers, 11 years as sales representative and 7 years in charge of advertising and publicity, now owing to the war seeks new position. Thorough knowledge of sales promotion and some experience of journalism both for trade and general press. Box 78.

To Let

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

QUEEN ANNE'S GATE. Two adjoining houses in Queen Anne's Gate to be let. Opening between the houses has been made at all floor levels, so that the two houses form one office. Accommodation comprises about 24 rooms. Full particulars from Box 43.

A FINE SUITE of well-decorated modern offices on the third floor of building in Manchester Square, W.1. Lift, central heating and constant hot water. Four rooms, approximately 1,000 sq. ft., but would subdivide if required. View any time by appointment. Box 964.

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.

SPECIFICATIONS AND BILLS OF QUANTITIES, etc., expeditiously and accurately typed or duplicated. Translations and Facsimile Typewriting. All work treated confidentially. Miss G. Saunders, Typewriting Bureau, 17 Dacre Street, Westminster, S.W.1. Telephone: Whitehall 2605. 200a

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

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Part-time Day and Evening Courses for pupils and both Junior and Senior Assistants in offices lead to the Examinations of the Royal Institute of British Architects.

Other Courses include Industrial Camouflage, Landscape Architecture, Interior Design.

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Free entrance, continuation and senior art scholarships; chool prizes and travelling scholarships.

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W. O. LESTER SMITH,
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