RUBBER FLOORING

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2, 3 & 4, IDOL LANE,
EASTCHEAP,
LONDON, E.C.3

25th May, 1928.

Dear Sir (or Sirs),

RUBBER FLOORING.

I have pleasure in sending a copy of a recent publication on the subject of Rubber Flooring.

The growing popularity of this material, which is very largely a recent addition to the comfort, utility and beauty of modern buildings, makes it essential that there should be available for architects and the building public generally the fullest information, with regard to the material itself, and the conditions under which it can best be laid.

This Booklet is an attempt to meet this need, and will, it is hoped, make a useful addition to your works of reference.

Yours faithfully,

FRANK G. SMITH.

Secretary.

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FOREWORD

As a flooring material rubber is daily attracting increasing attention, and no apology is therefore needed for submitting to the architectural profession this little booklet which embodies, in a convenient form, such information as is available on a subject which is daily becoming of greater importance to architects and the building public generally. The information contained therein is the result of careful observations of numerous contracts, extending over a considerable period of time, and covering various types of rubber flooring and sub-floors.

In publishing this information it is not intended to lay down hard and fast rules. It is felt, however, to be in the best interests of all those responsible for building that as full a knowledge as possible both of rubber flooring itself and of the conditions under which it can be most successfully applied should be readily available for reference when required. Some of the information contained in the Booklet deals with matters which will no doubt be well known to many readers, but it has been felt desirable to include it for the benefit of those who are not so well versed in the subject.

The average text-book on building construction does not mention rubber flooring, and the few otherwise excellent works on specification writing do not indicate the elementary precautions that experience has taught to be advisable, in order to obtain satisfactory results.

It would seem that in the past the qualities of rubber both in its crude and finished form have been of interest to manufacturers only. On the other hand, it is probable that the manufacturers are not fully informed of the nature and properties of the sub-floors on which they are to lay their rubber.

These are matters which are perhaps inseparable from an industry which is comparatively new. They are matters,

however, which should be carefully considered in order to avoid possible causes of prejudice against what is very largely a modern addition to the comfort, utility, and beauty of our modern buildings.

THE RUBBER GROWERS' ASSOCIATION, INC.
2, 3 & 4, IDOL LANE,
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April, 1928.

Chapter I.

THE MANUFACTURE OF RUBBER FLOORING

THE basis of rubber flooring of any type is the substance rubber itself. As the raw material differs from the final product in many respects, it will be necessary to consider first the production of raw rubber as utilised by the manufacturer, and later to explain how its properties are modified in the manufacture of flooring.

Many trees, shrubs, and even weeds, exude a milky juice or latex consisting of particles suspended in a watery liquid or serum. These particles are usually resinous, but in the case of some trees, which grow in the tropics, consist almost wholly of rubber.

Raw rubber is obtained from the latex of the Hevea Braziliensis and by far the greater part from those in Ceylon, Malaya and the Dutch East Indies. The latex is collected by tapping the trees; a very little dilute acetic acid is then stirred in, with the result that the whole sets to a junket-like mass. This is pressed, rolled in suitable machines, and then dried. The product is the plantation para rubber of commerce.

Raw rubber is a pale to dark brown, translucent substance. Soft and easily pressed between the fingers it soon recovers its original shape when released. It is not very tough as judged by hand tests, the raw rubber as produced by coagulation not being homogeneous and retaining the fine pores of the coagulum. Thin strips may thus be torn or broken if stretched too much. A film or skin obtained by drying down latex in a shallow dish is, however, much stronger.

For the purpose of this booklet, the toughness of raw rubber is not of much importance, since the product undergoes a drastic "working," milling, or mastication as the first process of manufacture. The machinery for this purpose consists of two heavy hollow iron rollers, often 4′ to 5′ long, and 18″ or 20″ in

diameter, and taking anything up to 100 H.P. to drive. The rollers move at different speeds and crush and tear the rubber between them. The heat engendered by the " working " of the rubber is such that the steam is soon turned off and replaced, if necessary, by cold water. After 20 to 30 minutes of this treatment the rubber becomes soft and plastic, in which condition there is mixed with it a variety of compounding ingredients which considerably modify the properties of the final product. These compounding ingredients consist of a few per cent. of sulphur necessary for the final process of vulcanisation, pigments or fillers, mainly mineral substances, in the form of fine powders, and in the case of black rubber, carbonaceous black of some description ; softeners which facilitate the incorporation of fillers and finally accelerators which promote vulcanisation.

The mixing is carried out in similar roller machines to those used for milling and may follow immediately on the former operation. The product, which is still plastic, is now shaped either by passing through the rollers of a calender or by being forced out of a spewing machine. In the latter case the shape will depend on that of the orifice, but in the former a sheet will be obtained. It is not possible to produce a sheet of the thickness of a tile in one operation, as it will be porous. These thick sheets are therefore built up of two or more thinner ones rolled together.

The rubber is now ready for the final process of vulcanisation, which consists of heating to about 120° to 150° C. for periods of a few minutes up to two to three hours, according to conditions. The effect is to convert the soft plastic material into a relatively hard and resistant product, more closely resembling the raw rubber, but with its properties modified by the compounding ingredients introduced into it.

The temperature and period of heating must be exactly adjusted to the particular rubber mixture. If the heating is not carried far enough the product is " undercured " and is still too soft. If, on the other hand, it is carried too far the material becomes hard and brittle or will become so in time. Most of the failures with rubber goods are the result of faulty vulcanisation, which must be carried out in the absence of air. To obtain a sharply defined product, such as a rubber tile with a smooth face, it is necessary for the rubber to be enclosed in a mould, usually constructed of steel machined to the correct dimensions. The provision of these moulds is one of the most expensive items in

CHURCH OF OUR LADY AND ST. JOHN, CHORLTON, MANCHESTER.

SMOKE ROOM, S.S. CATHAY (P. & O. S.S. CO.).

rubber goods manufacture, the slightest alteration in size or shape entailing fresh expenditure on new moulds. This is a matter which should be carefully borne in mind and the sizes of tiles standardised as far as possible.

More recently, however, it has become the practice for large sheets to be vulcanised and subsequently cut to size. Large sheets of relatively thin flooring can be vulcanised in rolls in steam, like rolls of linoleum, but such rubber does not lie so well as tiles which are vulcanised flat.

It has been explained that various colours can be obtained by incorporating powdered pigments with the rubber before vulcanisation. By partially mixing two or more batches of different colours various marbled effects are obtainable. The colours available are, however, limited to the relatively permanent ones, as most of the vegetable and coal-tar colours will not stand up to the action of the heat and sulphur in the vulcanising process.

An important ingredient not previously mentioned is reclaimed or regenerated rubber, obtained by submitting waste vulcanised rubber to chemical and mechanical treatment. The material resembles a raw rubber mixture after the milling and compounding operation is complete. Obviously "reclaim" does not produce such good results as raw rubber, but it is nevertheless a very important constituent of most rubber goods, particularly tiling.

It will be apparent that the quality of rubber goods depends largely on the price that can be paid for them, or roughly speaking, on the proportion of new rubber which the manufacturer can afford to use. There are many cheap rubber articles which contain very little, if any, new rubber, and there are others which have as much new rubber as it is possible to get into them. As an example of the latter may be cited the tread of a first-class make of pneumatic tyre. The cost of the raw materials, particularly the cotton duck, the moulds, and the manufacture generally, are so great that the expense of an extra pound or so of new rubber is a minor consideration. The conditions of wear of a tyre tread are such that the rubber must be as good as it is possible to make it.

On the other hand, rubber flooring is not exposed to such severe conditions. It is usually protected from the weather, and does not as a rule have to stand heavy traffic.

There is no need, therefore, to aim at the highest abrasion resisting quality, although concessions in the nature of colour, texture, and feel may be given more prominence. Nevertheless wearing qualities should take first place.

Vulcanised rubber shows elasticity and resiliency in various degrees. The word elasticity is somewhat misleading, as engineers attach a different meaning to the word to that which it conveys to the general public. It may, however, be said that rubber is unique both as regards the degree to which it can be stretched before breaking and its energy absorbing capacity when in the process of stretching or compressing (deforming). Soft rubber without fillers and adequately vulcanised can be stretched to ten times its original length without rupture, and if ruptured the load required compares not unfavourably with steel of the same cross-sectional area at the moment of rupture.

This type of rubber, although suitable for such articles as elastic bands or webbing, would not be quite suitable for flooring. It is too soft and too easily cut or torn. A considerable degree of compounding is therefore justifiable in the manufacture of tiling, which must feel firm to the tread. It has been found that when suitably compounded the energy absorbing capacity of vulcanised rubber is actually increased. Just as this permits of better cushioning qualities in a tyre tread, it also improves the feel of tiling when walked upon. Tiling should therefore possess a certain degree of hardness and must not give too much under pressure of the foot. Within certain limits this is, however, a matter of opinion or individual comfort. Some prefer a more "springy" flooring, others a harder and firmer one. It is obviously cheaper to make a flooring with a hard dead feeling, and this tendency must therefore be strongly guarded against. If carried to excess there is little or no improvement on rubber substitutes.

Vulcanised rubber, being a product of heating with sulphur and containing a small amount of the latter, is obviously resistant to moulds, bacteria, and micro-organisms generally. It is in fact a most hygienic material. It absorbs moisture very slowly and to a limited extent and can thus be washed down and disinfected without suffering damage.

Vulcanised rubber is also very resistant to chemicals, there being few which attack it with the exception of powerful oxidising agents such as strong nitric acid. The ordinary disinfectants

have little or no effect upon it. As the particles of pigment or colouring matter are embedded in the rubber they are protected from chemicals. Soap and water may frequently be used, and a mild abrasive in obstinate cases.

Raw rubber is not readily inflammable, as sufficient heat must be applied to decompose it before it will ignite. The inflammability is greatly reduced by compounding and vulcanising, considerable heating being required to set fire to a piece of rubber tiling. One would expect therefore that the fire hazard would be less than that involved with wood or linoleum.

As rubber does not wear appreciably it does not produce dust in the same way as many floor coverings. Its texture is such that it may be described as non-slipping, both dry rubber and leather having an excellent grip on rubber itself. It is only, for instance, when coated with a layer of wet mud that rubber loses some of its gripping power, but these conditions do not usually apply to rubber flooring.

As a rubber tile is moulded to shape and fits closely, a homogeneous and substantially seamless flooring is produced by sticking the edges together. Rubber flooring tends to deaden sounds, very little noise is produced by walking on it or when by any chance articles are dropped upon it. Breakages are therefore minimised.

Although somewhat expensive in the first instance, rubber flooring is economical in the long run, there being little or no maintenance costs, provided a good quality rubber flooring is used.

Chapter II.

TYPES OF RUBBER FLOORING

In the previous section reference has been made to the manufacture of rubber flooring and the manner in which its properties can be adjusted by suitable compounding to suit individual requirements. The main advantages of rubber flooring have also been discussed.

In this section it is proposed to deal with the various types of rubber flooring. Before doing so, however, it may be desirable to draw attention to the fact that the material lends itself admirably—perhaps more so than any other flooring material—to individual treatment and design in form, pattern, and colour. This valuable characteristic has not in the past been sufficiently exploited by those responsible for the designing of buildings. Selections of rubber flooring made from a few stock samples have probably been brought to the notice of architects by an enterprising traveller—the actual designing of the floor from the colours selected being subsequently left to the draughtsmen employed by the manufacturers. It is felt, however, that if the best results are to be obtained this might be done by the architect. He alone can visualise beforehand the building or rooms to be treated, and therefore the form, scale, and colours best suited to give effect to his conceptions.

A very wide range of effects can be produced with properly selected rubber flooring. By varying the combination of tones, harmonies, and contrasts of colour obtainable, and the form and scale of the patterns employed, results are obtainable as rich in value as Roman Mosaic, as delicate as finely tinted marbles, or as harmonious and subdued as an old polished oak floor in a mellow panelled room.

The designs of the floors themselves will thus well repay the attention bestowed upon them by the architect. He is not tied down by either stock colourings or stock patterns and, subject

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PRINCE'S CAFE, MANCHESTER.

to the natural limitations of the material, can give free play to his faculties of design.

So far as colour is concerned, the limitations referred to above apply chiefly to tones rather than actual colours. Where, for example, the floor is to be subject to heavy traffic, as in the entrance halls of cinemas and theatres, etc., the colour should be kept to a darker tone. White would show dirt more easily. Raw or crude colours should be avoided in any design both on æsthetic and practical grounds. The raw "primary" colours taken from a set of tempera poster colours would be unsuitable for reproduction in rubber. If, however, the same colours are toned down by the addition of a little neutral tint they will be found to conform more closely to the tones most practicable.

Another point of subsidiary importance in selecting colours is the fact that a marbled variety, *i.e.* one containing streaks of varying colours, does not show the marks of traffic or other stains so readily as a plain or flat coloured rubber. This type of colour or mixture of colours can be made in a great variety of tints to resemble closely the veining of real marble. These veins are present right through the thickness of the material, and there is therefore no danger of the colour or the pattern being worn away as in the case of linoleum or carpets. This is true of all types of rubber flooring.

The plain or flat coloured types give a more decided colour effect, and the colour values may be further enhanced by the introduction of carefully selected lines, borders, or alternate tiles in contrasting shades to the main theme. This, again, calls for the attention of the architect, the subtle variations of tone being best dealt with by the trained artist.

It is equally important that the architect should himself consider the scale of the pattern employed, the size of tiles, etc. It will readily be seen that the proportions of a room may be ruined by the use of too large a pattern in the floor, while one that is too small would be equally wrong in a very large room or hall.

It is important, therefore, to emphasise that the architect may himself design the rubber floors both as to form and colour, and also the scale of pattern to be employed. His design can then be submitted to a reputable firm of manufacturers of rubber flooring, from whom an estimate can be obtained for such a floor laid complete. He should also indicate the thick-

ness and any other particular qualities, such as resistance to heavy or ordinary traffic.

As described in Chapter I., these are qualities that can be varied at will by altering the proportion of fillers and other ingredients used in the manufacture of the floor. Manufacturers rarely carry stocks of rubber flooring, each floor being specially made for a job. It is an easy matter therefore to arrange beforehand for a floor which has to meet special requirements.

Having decided upon the colour, design, and other essentials, it becomes necessary to consider the form and type of flooring required. The three chief types may be described as follows :

1. Rubber flooring in long lengths (in plain or marbled colours).
2. Inlaid flooring, that is a tiled, or any other design, which is made up on a backing, ready to lay in sheet form.
3. Separate tiles (*a*) with the edges cut straight, or (*b*) with the edges moulded. (The latter are generally of the interlocking variety.)

The material under the first heading generally consists of rolls 50′ to 100′ long, $\frac{1}{8}''$ to $\frac{3}{16}''$ in thickness, and 3′ or 4′ wide. For office corridors or poorly lit interiors where appearance is not a first consideration this type is to be recommended, but rubber of at least $\frac{3}{16}''$ thickness should be used ; $\frac{1}{8}''$ is too thin to give complete satisfaction unless the traffic is light and the sub-floor smooth and level and free from faults. If the rubber flooring used is too thin, any irregularities of the sub-floor, such as the joints of the floor boards, will show through in time and detract considerably from its appearance.

This type of flooring looks well if laid with a strip or border of contrasting colour, especially in a corridor or on stairs. Its chief merit is its relative cheapness and the speed and ease with which it can be laid.

The second type (inlaid flooring) is favoured by some manufacturers who claim that it possesses certain advantages, including the following:

(*a*) All the lines of a pattern on a sheet are vulcanised, thus eliminating numerous joints.

(*b*) The pressing of each sheet on to the backing, after it is made up, tends to do away with any slight irregularities of surface in the sub-floor.

(*c*) The tough and stiff backing holds each portion of the design in place.

(*d*) Simplification of laying and subsequent saving of time owing to flooring being laid in sheets.

A point that requires supervision in the use of this type is the difficulty sometimes experienced in getting the design on one sheet to coincide exactly with that on the adjacent one.

Inlaid flooring is usually made in $\frac{3}{16}''$ to $\frac{1}{4}''$ or $\frac{3}{8}''$ in thickness, and with the backing sheet vulcanised to it varies from $\frac{1}{3}''$ to $\frac{1}{2}''$ thickness.

The third class (tiles) refers to all types of tiling which are laid loose, either cut or moulded. The latter includes various types of interlocking tiles which are especially suitable for the slightly moving and sometimes convex surface of the decks of ships. The thickness of the tiling, whether cut or moulded, generally varies from $\frac{3}{16}''$ to $\frac{3}{8}''$ in thickness, according to requirements.

The chief advantage of this type of floor is that as all tiles are laid separately the design or pattern may be worked to with perfect accuracy, there being no danger of the different parts of a pattern not exactly coinciding, as might possibly be the case with inlaid flooring.

The large number of joints might be considered a drawback, but there are compensating advantages. If for any reason it becomes necessary to take up any part of the rubber for repair or replacement, it is easily done by removing perhaps one or two tiles. If inlaid flooring is used it might well mean taking up a whole sheet for repair.

Before concluding this section an important point in regard to the designing of panels might be emphasised. Wherever possible panels should run in straight lines. Rubber has to be cut by hand and the elimination of large curves or intricate circular work will simplify to a very large extent the process of preparing and laying the floor.

Chapter III.

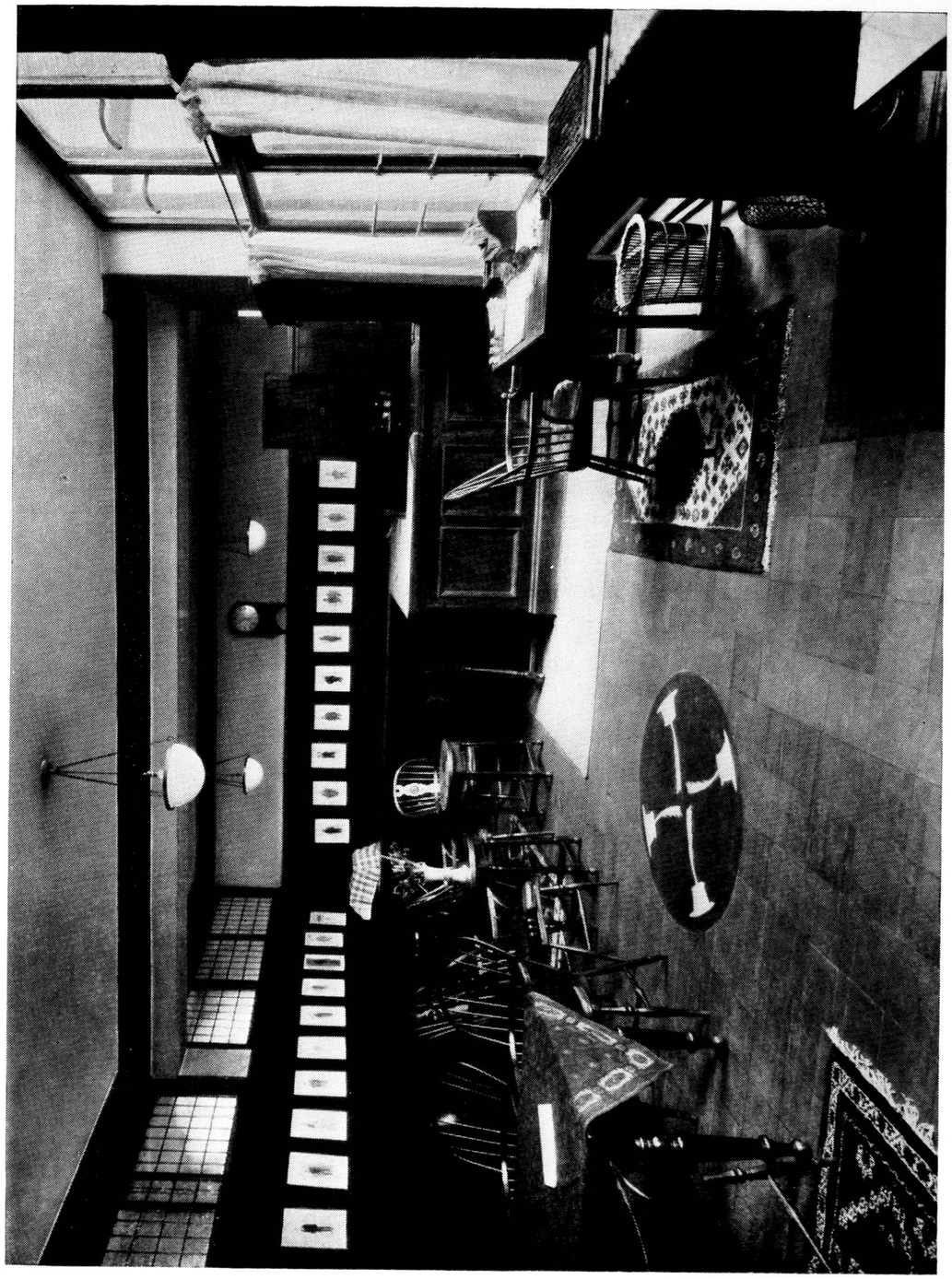
SUB-FLOORS

ALTHOUGH the laying of rubber flooring would appear to be a simple matter, there are several important points to which careful attention must be given. Foremost among these are the nature of the sub-floor and the nature and quality of the adhesive employed, and in this and the following section these two important aspects of the problem will be discussed.

After careful inquiries and observations of a large number of rubber floors which have been laid mainly under the auspices of the Rubber Growers' Association—in some cases as far back as 1903—it has been ascertained that there have been complaints only in respect of about 5 per cent. of the floors. These complaints have never been directed against the wearing quality of the rubber, but on investigation have been found to be due to the failure of the adhesive to keep the rubber down. The weight of evidence has also shown that this is due to various defects in the sub-floor, and is not therefore the fault of either the adhesive or the rubber.

It is with the object of correcting this undesirable state of affairs that attention is called to the defects which have been apparent in various sub-floors, and also the methods which experience has shown to be the most successful in their elimination.

Generally speaking, no trouble need be anticipated with sub-floors, whether of wood or concrete, which have been in existence for some time, are well seasoned and mature, and otherwise in good condition. Given a clean, dry, level, and compact surface, free from irregularities, the rubber floor may be laid with every chance of success, particularly if the precautions outlined in Chapter V. as to the proper finishing at such places as the edges of the rubber, thresholds, and skirting, etc., are taken.



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In classifying the complaints with regard to various floors, it has been noticed that the trouble is chiefly associated with a new sub-floor, more particularly a new concrete sub-floor. It would appear that new Portland cement concrete possesses certain inherent defects which are detrimental to the adhesive qualities of the substances used to secure the rubber to the sub-floor. These defects are (1) the presence of moisture due to the residue of water originally used in the mixing of the concrete, and (2) the slight dusting of the surface of Portland cement mortar caused by the liberation of free limes on the hydration of the cement.

With regard to the first of these, it is an established fact that Portland cement when mixed with the aggregate only requires a certain quantity of water for its chemical action, and any excess of this requirement is got rid of by evaporation after the concrete is laid. This often takes a considerable time and in many cases is not apparent when complete. Concrete floors often appear quite dry on the surface within a few days of setting if the weather is favourable, but they are not necessarily dry underneath. It will thus readily be seen that if an impervious substance such as rubber is affixed to the surface of the concrete by means of an adhesive, the residue of the moisture in the concrete will rise to the surface and destroy the effect of the adhesive.

Rubber flooring therefore should not be laid on a concrete sub-floor until the concrete is thoroughly dried out. This applies equally to the rough concrete and to the surface rendering of $\frac{3}{4}''$ of Portland cement and sand.

Various experiments are employed to test the dampness of a cement floor or any capillary water action through a cement slab, a particularly good one being as follows :

Use a plate of glass at least twelve inches square, or preferably larger. Under this plate place sufficient calcium chloride crystals to cover the space of the floor fairly well. Then carefully seal the glass with putty and leave at least sixty hours If there is any dampness or capillary action, the calcium chloride crystals will dissolve and disappear. Sometimes even water will collect on the glass and on the floor. If the slab is perfectly dry and there is no capillary action, the calcium chloride crystals will remain in their original form and there will be no appearance of water either on the underside of the glass or on the floor itself.

Unless such is the case, under no condition should a floor be laid.

If, as is usually the case, it is imperative to save time by laying a rubber floor as soon as possible after the concrete is laid and rendered with the surface screeding, the use of a rapid hardening cement, in which the setting is accompanied by a high temperature due to a chemical action in the cement itself, enables the concrete to be dry throughout twenty-four hours after laying. An aluminous cement, such as the well-known "Ciment Fondu," will be found to give these results without any loss of strength in the concrete.

There are three steps, therefore, which can be taken to combat original moisture :

1. The use of an aluminous cement.
2. In the case of ordinary Portland cement concrete, to make sure that only sufficient water is used in the mixing of the concrete to ensure complete hydration.
3. To wait for a varying period before attempting to lay the rubber flooring to enable the concrete to dry thoroughly.

The first of these would appear to be the most practical.

It will, of course, be appreciated that the foregoing notes have been written on the assumption that the necessary steps have been taken to obviate all sources of dampness other than the mixing of the concrete, and that the usual precautions, such as efficient damp courses, have been observed to prevent fresh supplies of moisture penetrating the floors, particularly where a concrete floor is laid direct on the ground in damp situations. The question of damp courses has, of course, to be considered whatever finish is desired on the floors, rubber being no exception.

The porosity of concrete is increased by using too much water in the original mixing. This excessive water when evaporated leaves behind innumerable small holes which tend to make it porous. It becomes desirable, therefore, when a rubber floor is contemplated to specify the importance of using only the correct amount of water, which should never be more than 15 per cent. when rubber solutions are used as adhesives. Any difficulty in this connection can, however, be greatly lessened by the use of such compounds as ironite, pudlo, waterex, etc., which tend to reduce the porosity of concrete. The first named only should be used with aluminous cement.

The actual composition of concrete itself will, of course, vary according to the requirements of the floor from a structural point of view and the experience of individual architects. It is, however, necessary to point out the importance of a good clean aggregate. Such materials as coke breeze or burnt ballast are very undesirable, particularly the latter, as the baked clay is readily affected by moisture and will by returning to its original condition make it practically useless. Broken Petersfield brick should also be avoided for much the same reason.

The liberation by Portland cement of free lime in the form of slight dusting of the surface or efflorescence should be removed as far as possible by careful brushing. Rubber flooring will not stick to a dusty concrete any more than a gummed label will adhere to a dusty surface. Any reliable petrifying liquid applied to the surface screeding of Portland cement and sand in two coats and allowed to penetrate the pores of the cement will help to relieve this trouble. One gallon will cover 30 square yards, and has the effect of binding the particles of the screeding together in a dense compact mass. It should then be allowed to dry before the rubber is laid.

An aluminous cement will also be found to be of service in this respect. This cement frees alumina rather than lime, the alumina, being an oxide of aluminium, is less likely to interfere with the action of the adhesive than the alkaline substance lime.

In considering surface screeding a proportion of three of sand to one of cement will be found to give good results, and a slight roughness of texture (but not unevenness) will help the adhesive to function. It should be borne in mind that if too great a proportion of cement is used in the mixing the resultant hard glassy surface makes it extremely difficult for the adhesive to obtain a firm grip. Furthermore, the screeding must be thoroughly dry before the adhesive is applied preparatory to fixing the rubber. It often happens that in order to complete a building by a certain date rubber flooring is laid upon screeding which has been left to the last few days of the contract period before being executed. In such cases it is inevitable that in a very short time the rubber will show signs of coming loose in parts, thus causing trouble which could have been avoided by attention to the surface screeding at the right time.

Manufacturers are often required to lay a rubber floor upon materials other than cement screeded concrete, some of which

are not entirely suitable. A smooth, highly polished terrazzo flooring, for instance, does not provide a good key for the adhesive, and if rubber is required to be laid a fresh surface should be prepared by re-screeding.

Composition flooring, such as the many magnesium compositions now available, *i.e.* "Linolite," "Decolite," etc., will be found eminently suitable for taking rubber, as they do not suffer from the defects found in cement. They are smooth, jointless, dustless, and damp resisting. They are, however, somewhat dearer; but if they can be laid direct to the concrete without the usual $\frac{3}{4}''$ of surface screeding which would be replaced, they would be found economical. It would also be possible to dispense with the colouring matter usually incorporated.

Wooden sub-floors, that is, floor boards laid on wooden joists or, as is sometimes the case, direct to the concrete, may be divided into two classes, *i.e.* new and old. By old floors is meant those that have been in use for such a length of time that there can be no doubt as to their being properly seasoned and free from further movement owing to shrinkage.

When laying rubber flooring on an old well-seasoned wooden floor the nails should be counter-sunk and all irregularities of surface planed off. All spaces between the boards, cracks, etc., should be filled with a suitable putty. If, on the other hand, the boards are considerably worn or warped, with wide spaces or cracks between, excellent results can be obtained by first covering the whole of the floor with plywood, a material which has been considerably improved and is now far superior to the old familiar three-ply. The $\frac{1}{4}''$ type will be found to be suitable for nailing to existing floor boards, it being readily obtainable in large sheets. Oregon pine, for instance, may be procured in sizes up to $7'$ by $3'$, and "B" quality or second grade will meet the requirements. Any one who has seen a thin type of rubber laid on an uneven sub-floor will readily appreciate the advantages of wide flat sheets of plywood.

It is not advisable to lay a rubber floor upon boards which have been laid direct on concrete. If this is done it seals up the wood, prevents ventilation, and in time causes dry rot.

New wooden floors are a source of trouble, owing to the practical impossibility of obtaining in these days wood that is thoroughly seasoned. Consequent shrinking and warping and

the uneven movement, especially near hot water pipes and radiators, are generally fatal to a satisfactory floor.

There is, however, a growing demand for the comfort and utility of rubber flooring in domestic buildings and smaller public buildings where wooden sub-floors are chiefly found. It is necessary, therefore, to consider a means of eliminating these defects, and plywood will be found useful not, as in the case of an old floor, to lay on the floor boards, but to replace the latter altogether.

Plywood is now obtainable in sheets from $\frac{3}{16}''$ up to 2″ in thickness, and in such sizes as 5′ by 15′, 10′ by 5′, etc. The thicker class of boards in these sizes, known as laminated plywood or laminboards, are very suitable for laying direct upon the joists to form a floor. It is very strong, stronger in fact than ordinary floor boards, and gives a good surface on which to lay rubber. There is no risk of expansion and contraction, and there is a considerable saving of both time and labour owing to the large sizes in which the boards are available and the ease with which they can be laid. The actual cost of the material itself will, in the first instance, be higher, but when other factors are taken into consideration it will be found that laminboards can be used economically.

It should be borne in mind that all wooden floors upon which it is desired to lay rubber or any other impervious material should be efficiently ventilated around and between the joists. This is usually done on the ground floor, but is equally necessary on upper floors where the undersides are usually sealed up with a plaster ceiling. The laying of linoleum or any similar material without ventilation is a fruitful source of dry rot. Through ventilation from the outside walls should therefore be provided between the joists, and occasional holes bored in the joists themselves for cross ventilation.

Chapter IV.

ADHESIVES

If a good sub-floor is essential to the success of a rubber floor, a good adhesive is no less important. Nearly all the leading manufacturers of rubber flooring supply adhesives which experience has taught them to be best suited to any particular type of sub-floor. It is advisable, therefore, that a representative of the manufacturers should inspect the sub-floor in order to determine whether any departure from the usual adhesive is necessary.

Generally speaking, the basis of the adhesives ordinarily employed is rubber solution made of plantation rubber in a solvent such as petrol, coal tar, or shale naphtha. As water will generally be used for the subsequent washing of the floors, the need for a moisture-resisting solution will be apparent, particularly at such places as the joints in the rubber sheets and tiles.

When the sub-floor is found to be of an unusually porous nature special consideration should be given to the adhesive, as it may be necessary to incorporate some kind of filler in the solution to counteract such porosity. This, however, should not often be necessary, particularly if the sub-floors have been specially specified for rubber covering.

The chief advantage of a rubber solution is the retention of its adhesive properties after it is dry. This obviates the necessity for laying each piece after it is treated, and enables large portions of the sub-floor and the rubber flooring to be coated at one operation. It cannot, however, be said to form a mechanically perfect junction with a cement sub-floor, as it does not mix with the cement but only forms a skin on the surface. The strength of the rubber solution and the grip or key it can get from the slightly rough or sanded texture of the sub-floor is, however, usually sufficient to hold the rubber in position under normal conditions.

If rubber tiling is first vulcanised to a hard solid tile it can be laid on wet Portland or other cement. The finished surface of the floor might, however, present slight irregularities owing to

each tile being laid separately on a mortar surface—a procedure which would depend upon the individual tiler's or bricklayer's workmanship and the exact thickness of the mortar bed. Another undesirable feature would be the restriction to tiled patterns.

Casein water cement is an adhesive which is becoming increasingly popular. It approximates more closely in substance to Portland cement, in that it forms an actual mechanical joint with the sub-floor. It is extremely hard and gives a good grip to the rubber and the sub-floor. As an illustration of its excellent powers of adhesion, it might be pointed out that where used on a wooden sub-floor made of boards of unseasoned wood the rubber would be split or torn by the shrinkage or warping of the boards.

One of the principal drawbacks to this type of cement is the fact that it has to be laid wet. The floor and the back of the rubber are coated with the cement and put down in place immediately at a moment when the cement has no adhesive properties in itself. In consequence, the rubber has to be held down to the sub-floor by means of weights, etc., until the adhesive is set, which takes from four to six hours. This disadvantage is, however, not so great when the thicker types of rubber flooring are used, as they obviously do not curl so easily.

Provided the sub-floor is satisfactory, manufacturers of rubber flooring will usually guarantee that the rubber will remain properly in position if they have laid it themselves and supplied their own adhesive.

Before concluding this section, it might be as well again to remind the reader that the two chief enemies to the powers of an adhesive are moisture and the disintegration or dusting of the surface of the sub-floor. Every precaution should therefore be taken to guard against these contingencies.

In certain situations, where a concrete sub-floor is laid direct to the ground without proper damp courses or other precautions against damp, there is nothing to prevent fresh supplies of moisture finding its way through the porous concrete and freeing the adhesive. Although the sub-floor may appear to be dry it may not necessarily be so, and a rainy season might very well cause trouble. In such cases, nothing short of proper drainage of the sub-soil around the building will give adequate relief, although two coats of a good bituminous paint applied to the sub-floor will help considerably.

NELSON CAFE, NELSON.

Chapter V.

LAYING THE RUBBER

In practice nearly all manufacturers of rubber flooring lay their own material.

The actual methods used in laying the rubber are of such importance that it is always advisable to have the work done by specially trained men with a long experience in laying all types of rubber floors on a variety of sub-floors. The employment of these skilled men is of particular importance where a certain amount of cutting and fitting has to be done in laying a specially designed floor of intricate pattern.

There are, however, certain salient points which it will be found advantageous to observe in order that proper supervision may be exercised by those responsible for the provision of a rubber floor.

When laying rubber on a cement screeded concrete floor, it is of the utmost importance that the cement should be thoroughly dried out and entirely free from dust and loose particles of sand. It should be first well brushed with a stiff bass broom to remove partially loose granules of sand, etc., and then carefully gone over with a soft hair broom to remove all fine dust.

If, as is usually the case, a rubber solution is used as an adhesive it should be spread thinly with a brush over both the floor and the back of the rubber, and allowed to dry before attaching the rubber to the sub-floor. Sometimes two coats may be necessary. The time taken for the adhesive to dry will vary with the atmospheric conditions. A simple test of dryness can, however, be carried out by lightly drawing the fingers over the surface of the adhesive, which should remain in the form of a skin on the sub-floor. On an average the time taken for drying is from two to four hours, care being taken that too much of the adhesive is not applied.

After the rubber is put down the floor may be subjected to slight traffic immediately, but very heavy fittings or furniture should not be moved about on it for at least two days, preferably three. Any neglect of this precaution may cause the rubber to curl up at the edges, which must be cut square and clean with a very sharp knife and the assistance of a straight-edge. Alternatively they may be very slightly bevelled inwards from the top surface downwards, as shown in Fig. 1.

It is important to ensure that the joints are close, and fit together perfectly, as there is a danger that the water used for subsequent washing will find its way underneath and destroy the effect of the adhesive. It is not sufficient just to stick the

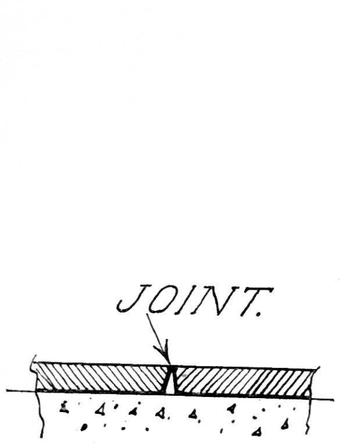


FIG. 1.

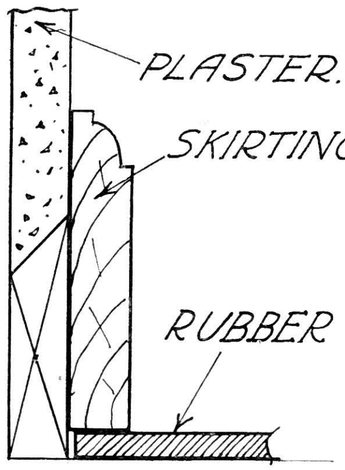


FIG. 2.

edges of a sheet, as one of the objects of using an adhesive is to ensure that there are no spaces left under the rubber for moisture or dirt to collect. The whole sheet must be stuck to the sub-floor and the outside edges protected to prevent their being kicked up, especially at such places as the threshold of doors, etc.

If practicable, the rubber should be laid before the skirtings, if any, are fixed in position, the skirtings being subsequently fixed to cover the edges of the flooring, as in Fig. 2. Where this is not practicable, a similar result may be obtained at small cost by covering the joint next to the skirting with a small hardwood scotia moulding, as in Fig. 3.

Sometimes a coved granolithic skirting is necessary, in

such places as the wards and corridors of hospitals. Where this is the case, the skirting should be so designed that the toe

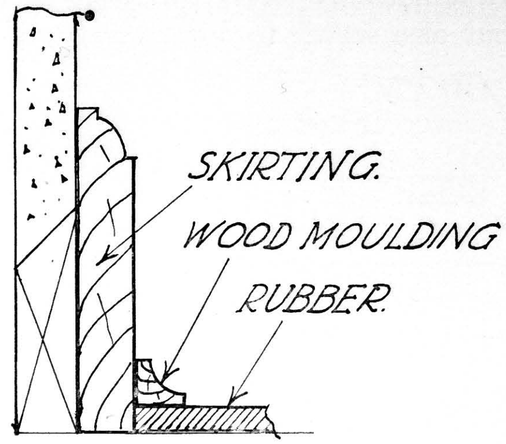


FIG. 3.

(" A " in Fig. 4) will be flush with the top surface of the rubber flooring, no crevice being left for the collection of dust and dirt.

In finishing off the rubber at the threshold of a door a metal

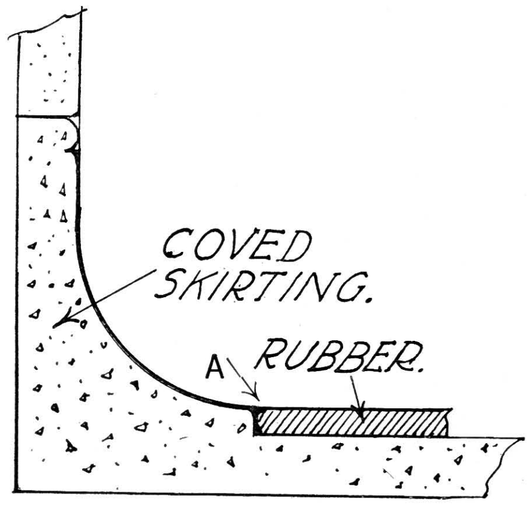


FIG 4.

strip will be found effective and neat in appearance. This is not such an obstacle to the feet as a wooden threshold, and may be secured to the floor with " rawl-plugs " and countersunk screws.

Where it has been necessary to resurface an old floor, and

thus raise it above the general floor level, a splayed hardwood threshold will be found useful. This may take the form shown in Fig. 5, where it not only forms an effective stop to the new floor surface, but also serves to cover the edges of the rubber

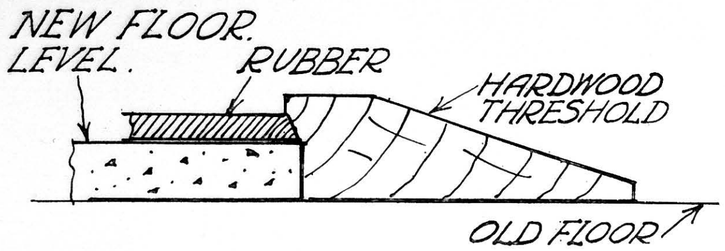


FIG. 5.

and hold it firmly to the sub-floor. The splayed side of the threshold offers the minimum obstruction to the feet.

The comfort, cleanliness, and decorative effects obtainable with rubber stair coverings, coupled with the very important need for non-slipping treads, is making this form of stair covering increasingly popular. A few hints on the methods found to be most useful in covering stairs may not therefore be out of place.

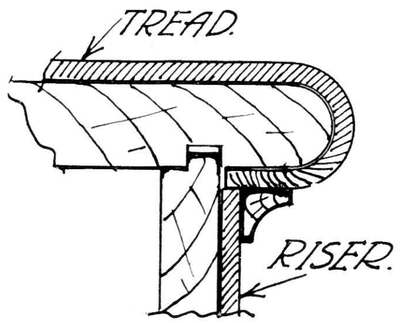


FIG. 6.

Stairs are covered by separate rubber treads and risers which fit more closely to the shape of the stairs, and are consequently more convenient for winders or semicircular flights.

With wooden stairs, the treads and risers may be so designed as to allow room under the nosing for a wooden fillet or beading to hold the rubber treads and risers in position (see Fig. 6).

A concrete stair is best finished with a plain nosing without any moulding underneath. This enables the rubber of the treads and risers to come into contact, as shown in Fig. 7.

No stair rods are necessary if an adhesive is used. The internal angles of treads and risers may be finished, as shown in Fig. 8, but a hardwood fillet will give additional security and prevent dust lodging in the angle.

The following hints on the cleaning and after care of floors have been compiled from the experience of various manufacturers and of the Research Association of British Rubber and Tyre Manufacturers, and are of sufficient interest and importance to justify their inclusion in this book.

Generally speaking, no rubber floors should be washed for

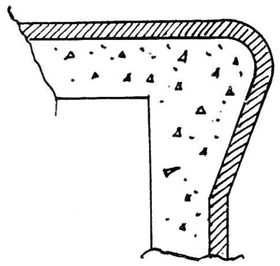


FIG. 7.

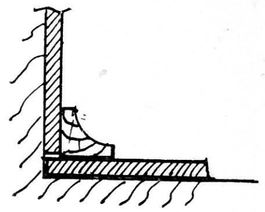


FIG. 8.

at least seven days after laying, although subsequently thorough washing is of prime importance. In any public or other building where the traffic is continuous a rubber floor must be regularly washed to give complete satisfaction. When this is done the finish and brightness of the colours will improve in a surprising manner. Under no circumstances whatever must the floors be flooded, and strong washing powders should not be used. It is not sufficient just to mop over the rubber with a wet cloth, as this will not remove any dirt which may have become ingrained in the surface. It should be well scrubbed with a fairly hard bristle brush and soft soap and hot water. In lieu of the soft soap, some manufacturers state that excellent results may be obtained by using cleaners such as "Marvex," which can be used without harming the rubber in any way. All traces of soap should be washed off with clean water on completion.

If the above methods are not sufficiently drastic for removing stains, a stronger detergent such as "Wyandotte Detergent" has been recommended as proving effective. Dissolve a handful or two of the "Detergent" in a pail of warm water and use a scrubbing mop. If this solution is not sufficiently strong and the stains are hard to remove, a little of the "Detergent" may

be sprinkled on the floor and scrubbed with the heel of the mop. " Wyandotte Detergent " should not, however, be used regularly like the " Marvex " cleaner, but only in cases of necessity.

In smaller rooms of the domestic class or wherever the traffic is not heavy, rubber flooring may be kept polished. This will not remove dirt, and due care should be exercised in selecting a reliable polish. Those containing turpentine should especially be avoided, as they will render the surface initially tacky or sticky, and ultimately result in the perishing of the rubber. Good results can be obtained, however, with well-known and reliable floor polishes. Polish should not be applied to the surface until all the " bloom " has disappeared from the rubber, about a month from the time it is laid. Where it is ultimately desired to keep the floor polished, the rubber should be twice cleaned with naphtha and then periodically scrubbed with " Marvex." A reliable floor polish may subsequently be used as a surface dressing. Every few months the polish should be thoroughly washed off to prevent it from collecting too thickly on the rubber. This will keep the colours clean and bright.

Chapter VI.

THE ADAPTABILITY OF RUBBER FLOORING

THE permanent and artistic qualities of rubber flooring make it particularly suitable for almost every type of building. This quality of permanence is so marked in the thicker types that the material should be placed in a structural as well as a decorative sense, in the same category as marble, mosaic, and other materials of a lasting character. Probably in no other material is it possible to achieve permanent decorative effects in combination with the warmth, comfort, resiliency, and sound deadening properties present in a rubber floor.

In domestic buildings there is no reason why rubber flooring should not be laid throughout, direct to a cement screeded concrete sub-floor. This would eliminate the necessity of using wooden floor boards and joists altogether, and would give the house owner a permanent, artistic flooring, possessing all the advantages already enumerated. In addition, it would substitute dust-harbouring carpets or perishable linoleum and save the expense of subsequent up-keep in time, labour, and money.

If the question of providing rubber floors is considered before building operations are commenced, the elimination of wooden joists and floor boards could be made to pay for the inclusion of the thicker types of rubber flooring in the original specification of the materials to be used in the building of the house. The inlaid variety or the thick tiling will give twenty to twenty-five years of hard wear and probably more in a domestic building.

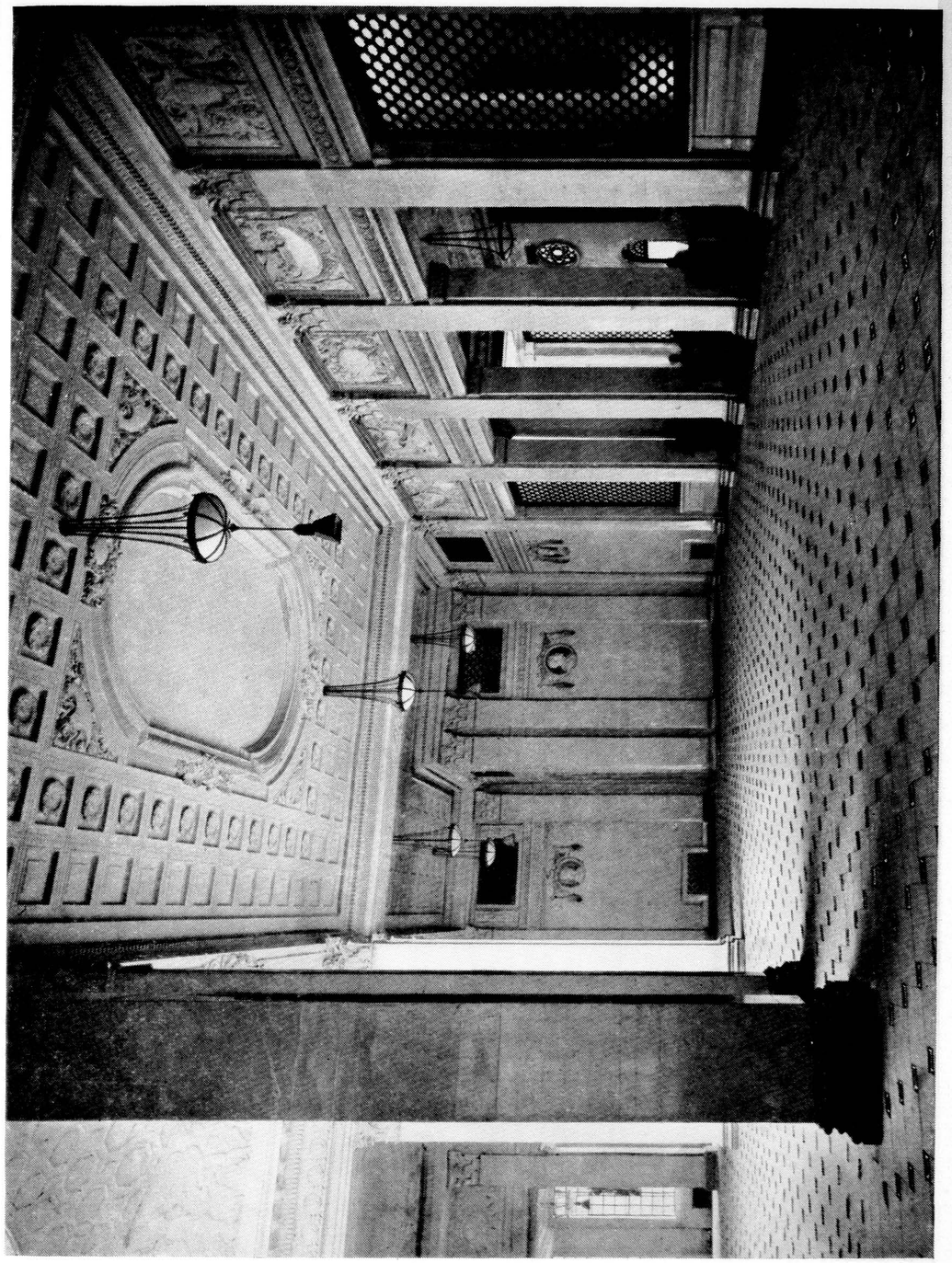
It will be readily conceded that rubber is an eminently desirable floor covering in almost every room of the average house, with the exception perhaps of such places as working sculleries, wash-houses, or coals, where the concrete could be very well left screeded with cement and sand, as is in fact usual. In other

rooms, such as bathrooms and children's nurseries, it has certain very definite utilitarian claims to consideration.

In a bathroom it may, for instance, be used not only on the floor but also on the walls up to dado height. The panelling may be attached with the greatest ease and the juncture of floor and wall covered with a rubber cove or skirting. Any one who has seen the spectacle of splashed plaster and paint in a bathroom will readily perceive the advantages of rubber. These remarks apply in equal measure to nurseries, especially to a children's play room, where hygiene has to be studied as well as comfort. The dustless qualities of rubber are particularly desirable, and make it the ideal floor for this purpose.

In public buildings, such as council chambers, public libraries, schools, churches, etc., a monumental effect can readily be produced with this material. This fact, coupled with the silence of footsteps due to the softness of the tread, conduces to that dignified atmosphere which one expects in buildings of this character. Fourteen years ago the old Lloyd's Building over the Royal Exchange was laid with $\frac{3}{8}$" rubber tiling. It shows very little signs of wear, and has had practically nothing done to it during the whole period. The selection of rubber flooring for the new Lloyd's seems to suggest that this type of flooring has demonstrated its superiority over all others for buildings where silence, durability, and cleanliness combined with appearance are essential.

Rubber flooring also possesses certain acoustic properties which, although outside the scope of this booklet, are of sufficient interest to deserve mention. If, for the purpose of experiment, one speaks loudly in an empty church the echo of the voice reverberates in a hollow sounding manner, usually terminating in a long-drawn-out, and confused murmur, which make the words very indistinct and difficult to understand. This effect is due to a multiplicity of hard reflecting surfaces—churches being generally stone throughout—which reflect sound waves backwards and forwards until lost in a confusion of sound. This is considerably minimised by the presence of a congregation, but much can be done to eliminate this trouble altogether by covering the usual hard floor with rubber. The results obtained are equally gratifying to preacher, organist, choir, and congregation. The acoustic properties of council chambers may also be improved in this way.



RUBBER FLOOR IN THE NEW LLOYD'S BUILDING.

In hospitals, scientific laboratories, X-ray rooms, etc., rubber will be found to meet all requirements in a very marked degree. Its many advantages are more fully dealt with in the report at the end of this booklet, which deals chiefly with hospitals and allied services. The quietness obtained is especially valuable in the wards, where nurses and doctors may walk about without unduly disturbing the patients. The covering of corridors with rubber will also add considerably to the comfort of the patients and staff, while in operating theatres and sterilising rooms the hygienic properties of the material deserve careful consideration.

In clinical and other scientific laboratories, where various delicate recording apparatus may be in use, a thick type of rubber flooring is almost a necessity—the vibrations caused by walking on an ordinary flooring, however minute, being sometimes sufficient to upset the correct working of the instruments. In an X-ray room, or any electro-therapeutic treatment room, the non-conducting properties of rubber are very valuable.

As rubber is also sound deadening and sound resisting to a very marked degree, it can be used with advantage in music schools, orchestra rehearsal rooms, individual practice rooms, etc., in various ways. In addition to its use as a floor covering to deaden the sound in rooms below, doors also may be made very largely sound-proof by being partly constructed of rubber as follows :

An ordinary one-panel door can be made with stiles, top and bottom rails of wood, and the panel filled in with rough boarding. On both sides of this $\frac{1}{4}''$ rubber sheeting may be secured in one piece and the edges covered all round with a small wooden moulding. The rubber may be of any colour, as it will serve as the finished surface of the door. If the walls of a room are constructed with, say, two thicknesses of 3″ breeze blocks, with a cavity between, the insertion of sheets of sponge rubber in the cavity will form an efficient insulation against sound.

In buildings devoted to recreation and pleasure, such as theatres and cinemas, the ease and cheapness with which it can be cleaned after large audiences have passed over it, its hard wearing qualities, together with its luxurious appearance and feel and the manner in which it lends itself to dignified and monumental design, make of rubber not only an economical floor covering, well repaying its first cost, but also a floor of

considerable beauty, which is retained under the severest wearing conditions.

Rubber flooring is perhaps the only material in existence which fulfils all the requirements of gymnasiums, whether school or medical orthopædic. The stamping and jumping soon raise clouds of dust from a badly constructed floor, and it is therefore of the greatest importance that a gymnasium floor should be so constructed as to leave no places for dust to lodge, as, for instance, in the joints of ordinary floor boards. Gymnasium floors should also be resilient and possess a surface that will eliminate the possibility of slipping when running, walking, vaulting, etc. Rubber fulfils all these conditions, and will be found especially suitable for a medical gymnasium, where patients undergoing treatment may not be too sure on their feet.

A solid concrete floor is usually required to enable apparatus to be fixed firmly in position, and the rubber flooring may be fixed direct to this.

Much more might be said of the many uses and advantages of this material. It is not, however, the object of this booklet to give more than a general survey of the subject, and if it serves to stimulate interest and thought on the many problems connected with flooring materials, it will have achieved its purpose.

Chapter VII.

RUBBER FLOORING IN STEAMSHIPS

MODERN standards of comfort and luxury necessitate much greater attention than hitherto to the furnishing, decoration, and fitting out of steamships. Various trades and crafts, previously not confronted with shipbuilding problems, have now been compelled to study and understand various constructional points connected with sea-going and other vessels.

Consideration of these points as they affect rubber flooring might therefore be of interest not only to shipbuilders but also to architects whose services are sometimes required for this class of work. The stresses due to the motion and vibration of a ship when under way and the action of possible seas are perhaps the most important matters to which attention should be directed in this booklet.

As all parts of a ship may be said to be in continuous movement, any rigid type of floor or deck covering, such as ceramic tiles, cement composition flooring, etc., have very serious drawbacks. This is particularly so with regard to any composition floor containing magnesium chloride, which, as is well known, has a strong corrosive effect on the steel with which a modern ship is chiefly constructed.

For purely structural purposes the decks are made with either steel plates, or deck planking (usually yellow pine), or both, bolted athwart the ship to steel beams, which are in turn supported by flanged brackets riveted to the steel frame of the hull. This floor would obviously not meet those standards of comfort required in state rooms, dining saloons, smoke rooms, and lounges, etc., where a luxurious form of floor covering is demanded. Carpets and rugs soon become worn and discoloured, and in addition might be ruined by possible deluging with sea water in rough weather.

Rubber flooring, besides possessing the necessary qualities of elasticity and flexibility required for structural reasons, is also warm, comfortable, and clean in appearance, and cannot be damaged by sea water. Further, its waterproofing features aid in the important task of protecting the steel members under the decks from the effects of rust and corrosion. A rubber floor laid on a deck will also increase its water-tight properties and lessen the danger of a loss of buoyancy due to an inrush of water caused by possible damage to the outer shell plating of a vessel.

Overhanging promenade decks, and shade decks of passenger vessels, owing to their comparatively slender construction and elevated position on the hull, are specially liable to develop swaying and moving tendencies. This is a source of trouble in the caulking of the deck planks, which might allow water to leak below. Rubber flooring would be a distinct asset in such circumstances.

Little need be added to the information already given in regard to the selection and laying of a rubber floor on board ship. Attention might perhaps be drawn to the fact that large sheets of the inlaid variety present obvious advantages from the point of view of water-tightness, owing to the scarcity of joints. For this reason also special care will be necessary with the finish at the edges of the rubber round the skirtings, companion ways, stanchions, etc.

With regard to the adhesive, it would seem that marine glue is best. In good class shipbuilding this is used for the caulking of deck planks. It consists of pure plantation rubber and shellac in a solution of naphtha, is strongly adhesive, impervious to water, and does not become sticky.

In conclusion, it is only necessary to refer to the large and growing number of ships in which rubber flooring is laid to appreciate its ability to meet not only the structural but also the decorative and other requirements of all classes of vessels.

REPORT ON VARIOUS RUBBER FLOORS LAID IN LONDON AND DISTRICT UNDER THE AUSPICES OF THE RUBBER GROWERS' ASSOCIATION

GENERAL REMARKS

THE following general points would appear to be well established by the evidence collected at the various buildings referred to. It seems that in no case is the wearing quality of rubber flooring in doubt, except perhaps where too thin a variety is obviously used. Nearly all the defects noted are due to failure of the adhesive to keep the rubber down, and the weight of evidence also invariably shows that this is due to various defects in the sub-floors and not necessarily the fault of the adhesive. Speaking generally, all old sub-floors, whether of wood or concrete, are usually successful if certain other precautions are taken, such as a proper finish at the edges of the rubber at such places as skirtings, thresholds, and at the edges of tiles or sheet rubber. A reference to the report on Cases Nos. 6 and 7 shows two failures due to lack of a proper finish in this respect. In nearly every building where these precautions are taken in conjunction with an old concrete sub-floor, or an old well-seasoned and level wood floor, there are no faults to find.

On the other hand, in one case of a new concrete floor in a new building there was a more or less complete failure. It is difficult to see how this sort of thing can be guarded against unless an ideal specification for a cement screeded finish can be found. It is also suggested that perhaps the manufacturers of rubber flooring might experiment further with their adhesive in an effort to overcome these faults.

One other thing which ought to be guarded against is the moving of heavy pieces of furniture, fittings, or other impediment too soon on a newly laid floor, as this might quite conceivably start the adhesive to give.

RUBBER FLOORING

The report on Case No. 2 raises an interesting point on the subject of acoustics in an auditorium when rubber flooring might be used with advantage.

Case No. 1 (Hospital).

(*a*) *Ward.*—Laid in 1914, this floor is of $\frac{1}{4}''$ tiling laid on an old concrete floor which was first screeded with new cement. It is still in excellent condition and shows only slight signs of wear, which has taken the form of very slight pitting of the surface in occasional spots about the size of a sixpence. This, of course, in no way impairs the efficiency of the floor, which is still good for some years' wear and is in all respects satisfactory.

(*b*) *"X" Department.*—The floors in this department are of sheeting laid on concrete in 1921. It is in excellent condition and there are no faults. This was again an old concrete floor when the rubber was laid.

(*c*) *"Y" Room.*—This is also a sheet rubber floor laid in 1921 on old concrete and is in excellent condition and shows no signs of wear. The rubber is particularly appreciated in this room, owing to its non-slipping surface.

(*d*) *"Z" Room.*—This is of $\frac{1}{4}''$ tiling laid in 1914 and is in excellent condition and shows no faults whatever.

In making the above examination the writer had the assistance of the resident works foreman, who was present when the floors were laid.

Case No. 2 (Church).

This floor is of $\frac{1}{4}''$ tiling laid in 1914 on a cement sub-floor. This floor is generally in a good condition, has worn well and appears good for some years' further wear. It has required attention in places owing to a few tiles buckling; this appears to be due to some dampness in the sub-floor, as the same patch (a small one) has given trouble before.

An interesting point about this floor is the great improvement in the acoustic properties of the church as an auditorium for the preacher since the rubber was laid. The rubber surface apparently eliminates the confusion of sound which is sometimes set up by too many hard reflecting surfaces for the sound waves.

The improvement in the church from this point of view was at once noticed by the Vicar, who is naturally pleased with the result.

Case No. 3 (Hospital).

Four Rooms.—These four rooms are of $\frac{3}{8}''$ tiles, green, white, and black in colour, laid diagonally in 1914. Considering the time these floors have been laid they are by far the most satisfactory floors inspected. They are laid on a cement screeded concrete floor which was thoroughly dried out before laying the tiles; they are closely finished off at the edges by a covered granolithic skirting, which serves excellently to keep out the wet when floors are scrubbed, which is done every day, as they are subjected to considerable traffic, some hundreds of out patients receiving attention every day. In spite of this the floors show very little signs of wear.

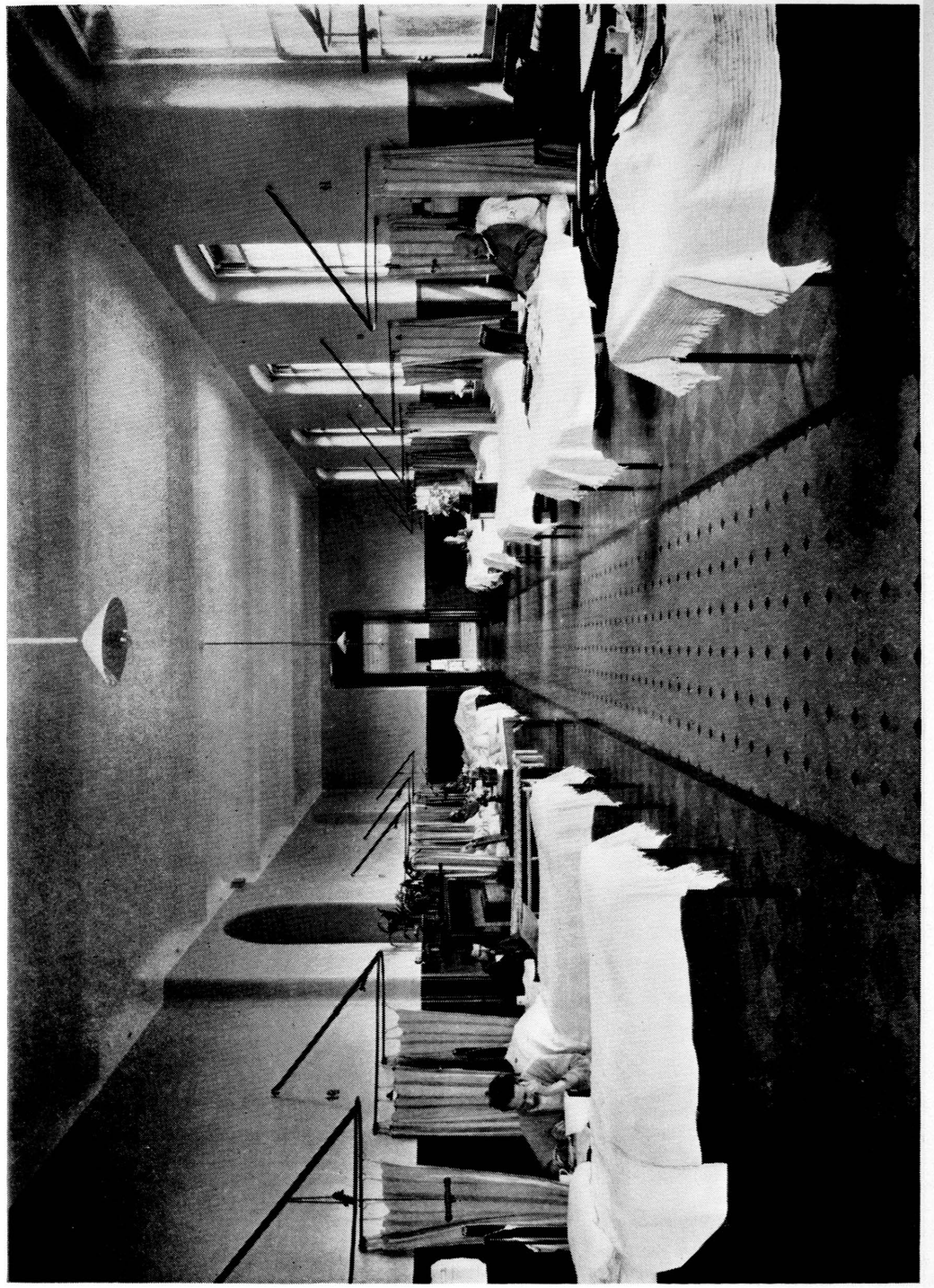
The top surface of the white tiles seems to have very slightly perished, as minute surface cracks are visible on these only; the green and black tiles do not seem to be affected.

In the middle of one room slight blisters have appeared, caused, in my opinion, by failure of the adhesive due to penetration of wet when the floors are scrubbed. These small defects, however, are put right by the hospital works foreman, who takes up the tile or tiles affected, cleans the edges and underside and relays with ordinary rubber solution. With the care and supervision this floor receives, it is still good for some years' wear. It would appear that the extra thick tiles, viz. $\frac{3}{8}''$, amply repay the extra first cost.

Case No. 4 (Hospital).

(*a*) *Offices.*—This is a $\frac{1}{8}''$ sheeting laid on a boarded floor in 1921. In the offices this is showing some signs of wear, owing to the traffic being confined by the office furniture to very narrow alleyways between desks. The joints of the floor boards show through. This floor is perhaps of too thin a variety for the work it does, and a thicker kind would have been advisable; but the general condition is good, and it will stand more wear yet. The floor is kept polished and does not curl up or "blister."

(*b*) *Wards.*—These are similar to the above; the traffic is not so heavy and is more diffused. It is laid on a boarded subfloor and is in very good condition, and is much appreciated by the nursing staff.



STEPHEN WARD, GUY'S HOSPITAL

Case No. 5 (Clinic).

This is a small room laid with $\frac{1}{8}$″ sheeting in 1922. It is laid loose on a wooden sub-floor, it is wearing well, but is inclined to curl slightly at the edges, as no adhesive has been used. It is of a dark grey colour, which is not very pleasing to the eye, but is in good condition, although again perhaps of too thin a variety, as it also shows the joints of the wooden sub-floor under.

Case No. 6 (Homes). The Hospital Corridors.

(*a*) *Ground Floor Corridors.*—These are of $\frac{1}{8}$″ sheeting laid in 1922 on an old cement sub-floor. The rubber sheeting does not take up the full width of the corridors, the adhesive has disappeared, and in consequence (there being no proper finish to the edges) dust and dirt collect underneath, and the rubber strips have to be rolled up periodically by the staff for the corridors to be cleaned, and the rubber has been broken and cracked in places due to this.

In spite of these defects the rubber is much appreciated by the matron and doctors for its sound-deadening qualities on what would otherwise be a noisy corridor.

(*b*) On the *First Floor Corridors* and landing it is laid on wood and is in excellent condition. It is kept polished on this floor and looks much better.

Case No. 7 (Hospital).

Three Wards.—These three wards (situated together) were laid with $\frac{1}{8}$″ sheeting in 1922. The rubber sheeting is laid on an old cement screeded concrete floor which is thoroughly dry but not an especially good surface to take rubber. The top surface of the cement has become disintegrated in the form of a fine layer of cement dust, and this has come away together with the adhesive and rubber flooring. In this case, therefore, it is obviously not the fault of the rubber but of the composition of the cement.

Near the entrance to the "X" Ward the adhesive has completely failed. The maximum traffic is encountered at this point, and another source of trouble is the stone corridor outside the wards. This is swilled down with apparently large quantities of water, and, owing to the absence of efficient thresholds at the entrances of the wards, water has got under the rubber sheets

and worked its way along the joints and destroyed the adhesive.

It would appear that when thin rubber sheeting is used special care should be taken with the finish at such points as skirtings, thresholds, and joints; these precautions do not appear to have been taken in this instance with the consequent failure of the flooring.

Case No. 8 (Hospital).

X-ray Room.—This room was laid with $\frac{1}{4}$″ tiling in (according to information supplied) 1922. They are laid on a cement screeded concrete floor, and are in excellent condition and show not the slightest signs of wear. Two tiles only were slightly buckled, possibly due to a slight dampness in the sub-floor. The secretary of the hospital and the radiographer were very enthusiastic as to the utility of this type of floor for an X-ray room, the only apparent drawback, so far as the radiographer was concerned, being due to the fact that he could not conceal the insulated cables of the apparatus in use beneath the floor covering. This might very well have been done by wiring the floor with armoured and insulated cables let into the concrete before the rubber was put down.

The alternate cream and blue of the tiles used in this case is of a very pleasing appearance.

Corridors and Entrance—Hall.—These are of $\frac{3}{16}$″ sheeting laid on a wooden sub-floor. Here again the floor is a complete success. There are no defects anywhere. In my opinion the factors contributing to this desirable result are, in this case, that the wooden sub-floor had been down a considerable time before the rubber was laid, and was therefore thoroughly well seasoned, no subsequent shrinkages, warping, or other movement taking place to disturb the rubber. Also that all irregularities were carefully planed off and the floor generally well prepared for the reception of the rubber.

The corridors especially are subjected to very heavy traffic; possibly no other material would have worn so well, certainly not with the other desirable qualities of rubber.

Case No. 9 (Hospital).

Operating Theatre and Adjoining Rooms.—These floors were laid in 1923, and are of $\frac{3}{16}$″ sheeting laid on a wooden sub-floor.

That in the operating theatre is in excellent condition and gives no trouble, except that the nursing staff find that the white colour is very difficult to keep free from stains and marks, etc.

In the corridor and adjoining rooms a thinner variety seems to have been used. Here, owing to irregularities in the wooden sub-floor, there are signs of wear and the lines of the floor boards show through.

Case No. 10 (Hospital).

Laboratories and Corridors.—These floors, put down in 1924, are in excellent condition. That in the laboratories is giving special satisfaction, as the quietness is much appreciated by doctors and students working therein. The floors show no signs of wear or other defects, and the vari-coloured marbled pattern used is very suitable for a laboratory, as it does not show acid stains, etc.

One portion laid on a hard smooth, almost a polished, terazzo floor came up; this type of sub-floor is obviously unsuited. This portion was taken up and relaid in a new position on a cement floor, where it is giving every satisfaction.

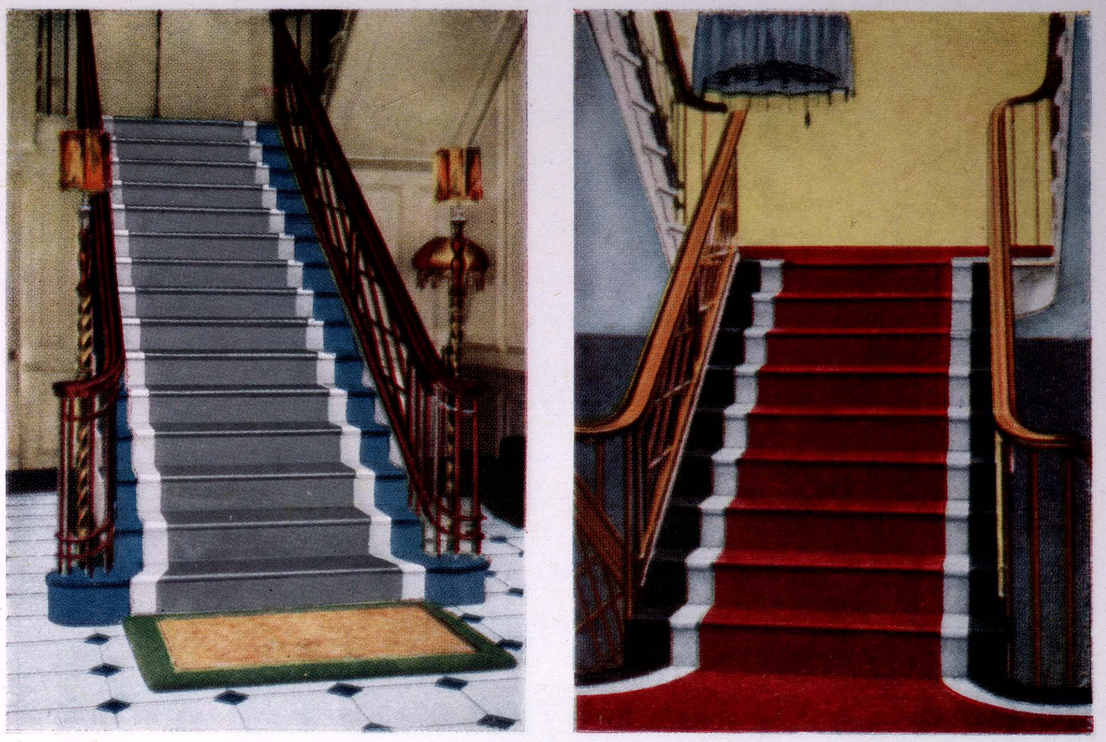
Another part laid on slightly uneven wood flooring was of too thin a variety, $\frac{1}{8}''$, showing the joints of the boards through. It would appear that $\frac{3}{16}''$ is the best thickness that should be put down on this type of sub-floor, especially where the traffic is likely to be heavy, such as corridors, etc.

Case No. 11 (Hospital).

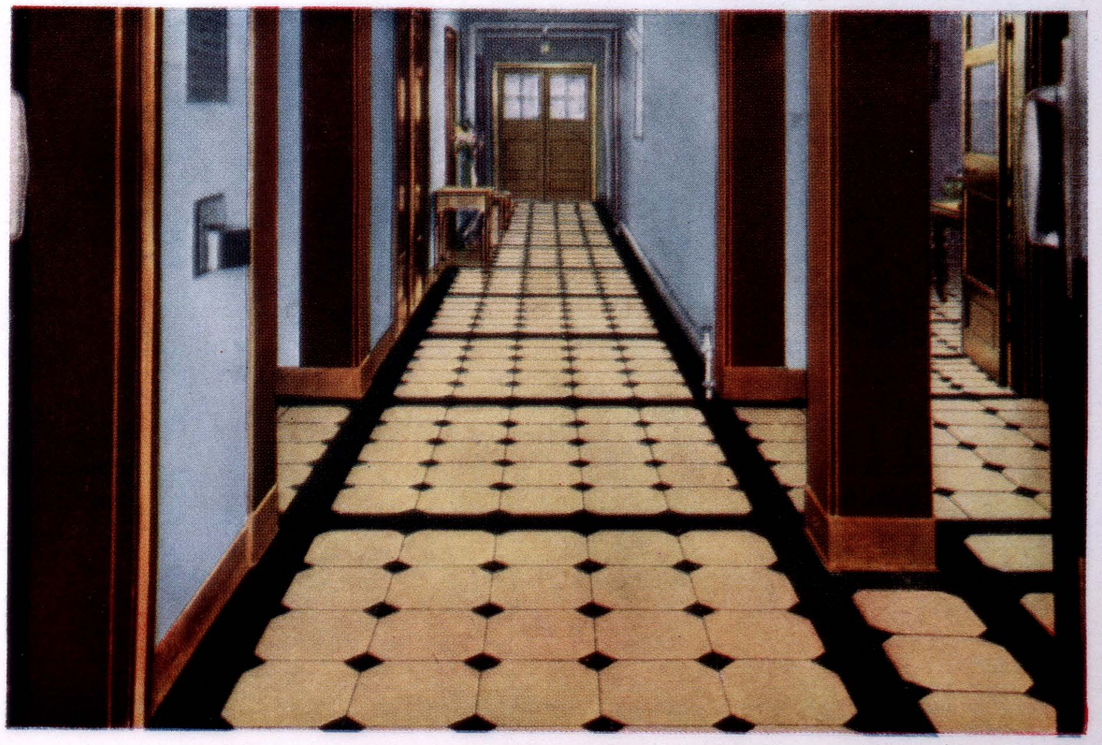
Wards.—These two wards are of sheeting laid on wood in 1925. They are in excellent condition and there are no faults with the laying. The only places that are wearing badly are at the nosings of the step up to each of the wards. This edge requires covering with a metal strip or other suitable nosing.

Case No. 12 (Welfare Centre).

This floor, laid in 1925, is of $\frac{3}{16}''$ sheeting laid on a composition sub-floor. It is in excellent condition, has stuck down perfectly. It is subjected to fairly heavy usage every day. It is used as a lecture room also, with separate movable chairs for seating accommodation, and in spite of this shows no signs of wear.



STAIRCASES, GAS LIGHT AND COKE CO.'S OFFICES, RETFORD.



RETFORD HOSPITAL, RETFORD.

A SOLICITOR'S OFFICE.

Case No. 13 (College).

Light Treatment Room.—This floor is of $\frac{3}{16}''$ sheeting laid on concrete in 1925. It is subjected to daily and continuous use, but is in perfect condition, has stuck down well, and shows no signs of wear. Perhaps the light colour is hardly suitable for the amount of cleaning this floor requires, and a darker variety would have been better.

Case No. 14 (Hospital).

New Wards and Extensions.—These floors were laid with $\frac{3}{16}''$ sheeting on a concrete sub-floor in 1925. They are in excellent condition, give no trouble, and show no signs of wear. They are kept polished instead of scrubbed. The concrete sub-floor was down a considerable time before the rubber was laid, so that no sweating or moisture disturbed the adhesive.

Case No. 15 (Hospital).

Corridors.—These corridors were laid with $\frac{3}{6}''$ tiling on a cement screeded concrete floor in 1925. The corridor takes the form of a cloister around a courtyard, and is open at the side to the weather and the varying temperature and exposure this entails. In spite of this, it is in excellent condition, and is sticking down well, and, of course, so far shows no signs of wear. It is well finished at the skirtings and joints, etc., and looks extremely well and is giving every satisfaction. It should be interesting to note this floor in future to see how it is affected by exposure to the weather.

Case No. 16 (Hospital).

Corridors.—These are of $\frac{3}{16}''$ sheeting laid in 1925 on a wooden sub-floor. The floor is subjected to heavy traffic, as it is a central corridor serving all the wards. It is in excellent condition and shows no signs of wear. The joints of the boarded sub-floor show through very slightly, but it is much superior from this point of view than the $\frac{1}{8}''$ variety. The only defect was a slight crack, which appears to have been due to the presence of an unseasoned board in close proximity to a hot-water pipe, which has caused the board to shrink and split the rubber. It would perhaps be advisable if the manufacturers were to point out anything like this in a similar case, with a view, if possible, to having matters rectified before laying the rubber.

Case No. 17 (Hospital).

Annex Operating Theatre and Adjoining Room.—This is of $\frac{1}{4}''$ tiling re-laid in 1926 on a wooden sub-floor. It is in excellent condition, has stuck down well and shows no signs of wear, and being of a darker marbled variety does not show the stains usually found in an operating theatre.

Case No. 18 (Institute and Hospital).

This floor was laid in 1925 with $\frac{3}{16}''$ sheeting on a wooden sub-floor. It is in excellent condition and shows no signs of wear, and has stuck down excellently. A small crack has appeared in one place only, probably due to shrinkage of a defective board

Case No. 19 (Offices).

This was laid in 1925 with $\frac{3}{16}''$ sheeting. It has stuck down perfectly, shows no signs of wear or any other defects. The wooden sub-floor was an old well-seasoned floor, and fairly level. The variegated marble pattern helps to conceal the very slight marks of the joints in the wood sub-floor.

Case No. 20 (Hospital).

A small portion only of this hospital's corridors was laid in 1922. The position selected was subjected to the heaviest traffic in the hospital, heavy hand trolleys, etc., being constantly run over it.

The tiles curled up and were soon damaged, and the floor was taken up as unsatisfactory, so that there is no rubber flooring in any part of this hospital.

The secretary of the hospital agreed that it was not a good test, and both he and the chief physician were very anxious to obtain a rubber floor for their new clinical laboratory which was being built.

In some of the rooms, such as that containing the delicate cardiograph instruments, rubber would seem to be a necessity.

Case No. 21 (College).

Two Rooms.—These two floors were laid in 1922. In one room, which is $\frac{3}{16}''$ sheeting laid on a boarded floor, the appearance is bad. The joints of the boards show distinctly, the colour appears to have worn. It appears to have been polished with some material that has collected and given a very dirty and

patchy appearance to the floor, which generally is not a good advertisement for rubber flooring.

In the other room a more satisfactory pattern of rubber has been selected of a green marbled variety. This floor looks much better. It is worn slightly at the threshold, and also at an uneven patch in the sub-floor. It is subjected to heavy traffic, as this room is virtually a refreshment bar for all students, and on the whole except for the isolated points mentioned is in a very good condition. In one or two instances it has been noted that the marbled variety seems to stand up to wear better than the plain coloured sorts; or at all events does not show defects so easily.

Case No. 22 (Club).

Staircase and Entrance Hall.—These portions, put down in 1925, are laid on old wooden treads and landings which presumably, therefore, are thoroughly well seasoned. This staircase is the only means of access to the club premises, which are open 22 hours in the 24 and in use most of the time. They show no signs of wear, and with the exception of slight buckling of one or two tiles on the landing show no other defects. The buckling of these tiles appears to be due to overmuch swabbing with water.

The edges next the existing skirting appear to be the weak points, and in similar cases a small hard wood fillet put down on top of the rubber to fit into the angle should meet the case and keep any moisture of this nature out.

Case No. 23 (Training Ship).

Lavatories and Shower Bath.—This was put down in 1924, and is, of course, laid on a wooden sub-floor. There are in fact three layers of boarding laid lengthwise and athwart the ship. It is of $\frac{1}{4}''$ sheeting, and the strips are divided by hard wood fillets screwed to the deck, which also hold the rubbers down. This floor is in excellent condition and shows no signs of wear. It is continuously and thoroughly wet by the overhead showers, the deck slopes to the scuppers and carries the water off; the rubber does not seem to be affected in the slightest degree by these unusual conditions.

The captain commanding the ship is very pleased with this and knows of no other material which he could have used with such satisfactory results. A rigid material would have been useless, owing to the constant movement of the ship's timbers.

TYPES OF WORK

The following list, which is by no means complete, gives an indication of the types of buildings in which rubber floors have been laid.

THEATRES AND CINEMAS

Ashton-in-Makerfield Picture House
Barnsley . Alhambra Picture House
Barnsley . Globe Picture House
Belfast . . Imperial Picture House
Beverley . Picture House
Birkenhead. Argyle Theatre
Birmingham Alexandra Theatre
Birmingham Aston Hippodrome
Birmingham Dudley Road Picture House
Birmingham Elite Theatre
Birmingham Empire Theatre
Birmingham Futurist Theatre
Birmingham Grand Theatre
Birmingham Gravelly Hill Picture House
Birmingham Villa Cross Picture House
Birmingham West End Cinema, and others in neighbourhood
Bishop Auckland Hippodrome Theatre
Blackburn . Olympia Theatre
Blackburn . Victoria Hall
Blackpool . Blackpool Tower Co.
Blackpool . Clifton Palace
Blackpool . Hippodrome
Blackpool . New Palladium Picture House
Blackpool . Waterloo Picture House
Blackpool . Winter Gardens
Bolton . . Rialto Cinema
Bradford . Alhambra Theatre
Bradford . Princes Theatre
Brighouse, Nr. Leeds Albert Hall Theatre
Brighouse, Yorks. . Savoy Picture House
Bristol . . Empire Theatre
Bristol . . Hippodrome Theatre
Burnley . Empire Theatre
Burnley . The Palace
Burnley . Palace Hippodrome
Burnley . Pentridge Cinema
Burnley . Savoy Theatre
Burnley . Victoria Opera House
Burton-on-Trent . Picturedrome
Castleford . Picture House and Cafe
Chiswick . Empire Theatre
Church . . Queen's Hall Cinema
Colne, Lancs. Savoy Cinema
Colne, Lancs. The Hippodrome
Coventry . Alexandra Theatre
Coventry . The Hippodrome
Coventry . La Scala Theatre
Colwyn Bay, Wales . Princess Theatre
Crewe . . Empire Theatre
Croydon . Scala Theatre
Doncaster . Carcroft Picture House
Dublin . . La Scala
Dukinfield . Princess Picture Palace
Dundee . . New Royalty Cinema
Dundee . . Picture House
Dublin . . Royal Theatre
Eastleigh, Hants. . Variety Theatre
Edinburgh . Cinema House
Edinburgh . Palace Picture House
Falkirk . . Picture House
Glasgow . Coliseum Theatre
Glasgow . Empire Theatre
Glasgow . Grand Central Theatre
Glasgow . La Scala
Glasgow . Lorne Picture House
Glasgow . Meadowpark Picture House
Glasgow . Mosspark Picture House
Glasgow . Pavilion Theatre, Maryhill
Glasgow . Star Palace
Gourock . Gourock Picture House
Grimsby . Prince of Wales Theatre
Halifax . . Grand Theatre
Halifax . . Palace Theatre
Halifax . . The Palladium
Hampstead. Hampstead Picture Playhouse
Harrogate . St. James Picture House
Harrogate . St. James Theatre
Hoylake . Kingsway Picture House
Huddersfield Palace Theatre
Hull . . East Hull Picture House
Hull . . Hull Palace
Islington . Islington Empire, High St.
Islington and Highbury Blue Hall Cinema
Lancaster . County Cinema
Lancaster . Kingsway Cinema
Leeds . . Briggate Picture Theatre
Leeds . . Capitol Cinema
Leeds . . City Palace of Varieties
Leeds . . Empire Theatre
Leeds . . Picture House and Cafe, Meanwood
Leeds . . Pavilion Theatre, Morley
Leeds . . Picture House, Morley
Leeds . . Rialto Theatre
Leeds . . Scala Theatre
Leicester . Olympia Picture House
Lisbon, Spain . Tivoli Cinema
Liscard . . Liscard Electric Palace
Liverpool . Empire Theatre
Liverpool . Hippodrome Theatre
Liverpool . Majestic Picture House
Liverpool . New Premier Picture House
Liverpool . Olympia Theatre
Liverpool . Rotunda Theatre
London . . Adelphi Theatre
London . . Balham Hippodrome
London . . Battersea Palace
London . . Bedford Theatre
London . . Biograph Theatre
London . . Bruce Grove Cinema
London . . Capitol Theatre, Haymarket
London . . Drury Lane Theatre
London . . Empire Theatre
London . . Fortune Theatre, Drury Lane, W.C.
London . . Hippodrome Theatre
London . . Holborn Empire, W.C.
London . . New Cross Empire, New Cross, S.E.
London . . Shepherds Bush Empire
London . . Standard Cinema
London . . The Tivoli, Strand, W.C.

London . . Tivoli Palace
London . . Wandsworth Picture Palace
Longton, Staffs. . Empire Theatre
Manchester Ardwick Empire
Manchester Hippodrome Theatre
Manchester Palace of Varieties
Manchester The Picture House
Manchester Oxford Street Picture House
Manchester Piccadilly Theatre
Manchester Shaftesbury Cinema
Manchester Victoria Cinema
Maryport . Empire Theatre
Mexborough Empire Theatre
Middlesbrough . La Scala
Minehead . Queen's Theatre
Morley . . New Pavilion
Morley . . Picture House
Musselburgh Central Picture House
Nelson, Lancs. . Queen's Cinema
New Brighton Tivoli Theatre
New Brighton Brighton Picture House
Newcastle . The Cinema House
Newcastle . Regent Picture House
Northfleet, Kent . . The Cinema
Nottingham Elite Picture House
Oldham . Grosvenor Picture House
Oldham . Victory Cinema de Luxe
Paisley . . Plaza
Portobello . Central Picture House
Retford . Majestic Theatre
Retford . Picture House and Cafe
Rotherham Empire Theatre
Rotherham Rotherham Theatre
Rotherham Theatre Royal
Sheffield . Attercliffe (Theatre Royal)
Sheffield . Balby Cinema
Sheffield . Scala Theatre
Shipley . . Prince's Hall
Southampton Palace Theatre
Southampton Picture House
Southport . Nevill Picture House
South Shields . Royal Theatre
Stockton-on-Tees . Globe Theatre
Stratford . Broadway Cinema
Stratford . Empire Theatre
Sunderland Millfield Picture House
Sunninghill Sunninghill and Ascot Picture House
Tipton . . Regent Picture House
Wakefield . Opera House
Wakefield . The Playhouse
Warrington. Hippodrome (Circle Stairs and Landing)
West Bromwich Imperial Picture House
Wigan . . Empire Picture House
Winsford . Picture House
Worthing . Winter Gardens
York . . Castlegate Picture House
York . . York Picture House
Vienna . . Vienna Concert House

OFFICES

Bedminster. Messrs. W. D. & H. O. Wills, Ltd.
Birmingham J. C. Abbott & Co., New St.
Birmingham Paton & Baldwins, Ltd.
Birmingham Exchange Buildings
Birmingham Fysche & Horton, Ltd.
Birmingham Messrs. Martin, Winn & Co., Ltd., Darlaston
Birmingham Mitchells & Butlers, Ltd.
Birmingham West Bromwich Building Soc.
Blackburn . Blackburn Co-op.
Blackpool . Burnley Building Society
Bolton . . Hick, Hargreaves & Co.
Bradford . Halifax Equitable Building Society
Bradford . Phœnix Dynamo Offices Co., Ltd.
Bramley, Leeds . Overseers' Offices
Brierfield . Nelson Gas Co.
Bristol . . Bristol College
Bristol . . Messrs. J .S. Fry & Son, Ltd.
Bromley, Kent . . U. D. C. Offices
Burnley . Building Society
Burnley . Artindale Buildings
Clacton . . Halifax Permanent Building Society, Station Road
Denton . . J. Moores & Sons
Derby . . Leys Offices
Dostill, Staffs. . Stoneware, Ltd.
Dublin . . Messrs. Newells, Ltd.
Dudley . . Harper Bean Motor Co.
Earlstown . Co-operative Wholesale Society
Glasgow . Anchor Line Offices
Glasgow . Arthur & Co., Ltd.
Glasgow . Britannia House
Glasgow . Campbells & Stewart & MacDonald, Ltd.
Glasgow . Henderson Line (New Offices
Glasgow . London Liverpool Globe Insurance Co.
Glasgow . Moore, Carson & Watsons (Offices)
Guiseley . F. A. Parkinson
Halesowen . Stewarts & Lloyds, Ltd., Coombs Wood
Halesowen . H. Vincent, Ltd., Hunnington
Halifax . . Bowling Dyke Dye Works
Halifax . . Patons & Baldwins, Ltd.
Haslingden Haslingden Co-op. Soc. (Offices)
Huddersfield Messrs. Hopkinson
Huddersfield Messrs. R. Ramsden & Co.
Keighley . Joseph King
Leeds . . Messrs. Geo. Bray & Co., Ltd.
Leyland. . Leyland Motors, Ltd.
Leyland. . J. E. Stanning & Co.
Liverpool . African Assurance.
Liverpool . C. P. R. (Offices)
Liverpool . E. A. Clark, Ltd.
Liverpool . Cunard Buildings
Liverpool . Dock Board Offices
Liverpool . Donaldson Line (Offices)
Liverpool . Messrs. Harris & Hobson
Liverpool . India Building
Liverpool . Liverpool "Daily Post & Echo" Offices
Liverpool . The Maritime Insurance Co.
Liverpool . Pacific Steam Navigation Co.
Liverpool . The Union Marine Insurance
Liverpool . Messrs. Geo. Wall Co.
Liverpool . White Star Offices
Liverpool . Messrs. J. S. Willways & Sons, Ltd.
London . . Africa House
London . . Alexandra House
London . . Allen Liversidge, Ltd.
London . . Alliance Assurance Co., Ltd., The, Capel Court, E.C.2
London . . Alliance Assurance Co., Ltd., 88, St. James's St., S.W.1

London . . Anchor Line Buildings
London . . Anglo-Mexican Petroleum Co., Ltd.
London . . Anglo-Persian Oil Co., Ltd., Britannic House
London . . Asiatic Petroleum Co.
London . . Atlas Assurance Co., Ltd., 92, Cheapside, E.C.2
London . . Australian Mutual Prov. Soc.
London . . Baburizza & Co.
London . . Balfour, Williamson & Co.
London . . Borneo Co., Ltd., 28, Fenchurch St., E.C.3
London . . Britannia Assurance Co.
London . . British Consolidated Investment Co.
London . . British Law Insurance Co., Ltd., 31–32, King St., E.C.2
London . . British North Borneo (Chartered) Co.
London . . British Trade Corporation
London . . Buckingham Palace Mansions
London . . Cathedral House, Westminster
London . . Chartered Institute of Secretaries, London Wall
London . . Chatwood Safe Co., Ltd., 3, Laurence Pountney Hill, E.C.4
London . . City Mutual Insurance Co., King St., E.C.2
London . . Clan Line (Offices)
London . . Colemans
London . . Cossor, A. & Co., Ltd., Cossor House, Highbury Grove, N.5
London . . County Fire Offices, Piccadilly
London . . Cunard Offices, Leadenhall St.
London . . "Daily Mail" Offices, Fleet St., E.C.
London . . Deloitte, Plender & Griffiths, Ltd.
London . . Dodgson, H., Ltd., 1, Cheapside, E.C.2
London . . Dotteridge Bros., 2, Devonshire Square
London . . Eagle Star & British Dominions Ins. Co., Ltd., 30–32, Moorgate St., E.C.2
London . . Eastern Telegraph Co., Ltd., Strand, W.C.
London . . Eastern Telegraph Co., Ltd., Parliament St., S.W.
London . . Elder Dempster & Co.
London . . Equitable Trust Co. of New York
London . . Exchange Telegraph Co., Ltd., The, 14–15, Panton St., S.W.1
London . . Exchange Telegraph Co., Ltd., The, 64, Cannon St. E.C.4
London . . Ferguson, Jas. & Sons, Ltd., Merton Abbey
London . . Glen Line
London . . Guardian Assurance Offices, King William St., E.C.
London . . Guinness, Mahon & Co.
London . . Harrisons & Crosfield, Ltd., 1–4, Gt. Tower St., E.C.3
London . . Houlder Bros.
London . . Hudson Bay Co.
London . . Humbers, Ltd., 94, New Bond St., W.1
London . . Kellys
London . . Kleinwort, Sons & Co., 20, Fenchurch St., E.C.3
London . . Knighton & Cutts, Ltd., 4–7, Red Lion Court, E.C.4
London . . Kodak Ltd., Kingsway
London . . Law Fire Insurance Co., Ltd.
London . . Lazard Bros. & Co., Ltd., 11, Old Broad St., E.C2.
London . . Legal & General Assur. Society
London . . Lloyd's (Underwriters' Room)
London . . London Life Assurance, Ltd.
London . . London Metal Exchange
London . . Lorden & Sons, Egyptian House
London . . Maggs Bros.
London . . Malay States Information Bureau
London . . Malcolm & Co., W.
London . . Marconi's Wireless Telegraph Co., Ltd., Radio House, Wilson St., E.C.2
London . . McMahon, Knocker & Co.
London . . Muller, W. H. & Co., Ltd.
London . . Nobel Industries
London . . North British & Mercantile Assurance Offices
London . . Ocean Accident & Guarantee Corporation
London . . Pearl Assur. Offices, Holborn
London . . Peck's Offices
London . . Dorothy Perkins, Ltd.
London . . Price & Pierce
London . . Ridgmount Garden Flats
London . . Robertson, Bois & Co., 12, Fenchurch St., E.C.3
London . . R. M. S. P. Offices
London . . Stevens & Sons, Thos.
London . . Sun Insurance Offices
London . . The Luxfer Co., Hill St., E.C.
London . . Union Insur. Soc. of Canton
London . . Union Assur. Soc., Ltd., 35, Baker St., W1.
London . . Union Marine Assur. Co., Ltd., 124, Old Broad, St. E.C.2
London . . Walton, Isaac
London . . Westminster Public Library
London . . Williams, Howell J., Ltd.
Manchester Affleck & Brown
Manchester Anjarut, Jacob & Co.
Manchester Bannermans, Ltd., Messrs.
Manchester Craston & Sons, Messrs., Oldham St.
Manchester Haletts
Manchester Kippax, J. & Co.
Manchester Manchester Liners
Manchester Marshall & Aston
Manchester Stewart, J. & Co., Ltd., 3, Brunswick St.
Middleton Junction Lees, J. W.
North Shields . Smiths Dock Co., Ltd., Messrs., Coronation St.
Preston . . Bank Top Mills
Preston . . Bleasdale, Mr.
Preston . . Preston Corp. Tramways Dept.
Preston . . "Lancashire Daily Post"
Rotherham British Westfalite, Ltd., Nr. Denaby
Sheffield . Davy Bros.
Sheffield . Gem Assurance Co., Fargate
Sheffield . Walker & Hall, Ltd., Electro Works
Sheffield . "Sheffield Weekly Telegraph" Ltd.
Southampton Phœnix Assur. Co., Above Bar
Southport . "Northern Daily Telegraph"
South Shields "Daily News" Offices
Stafford . Lotus, Ltd.
Surrey . . Kennards
Wellington, Somerset . Fox Bros. & Co., Ltd.
West Bromwich . . Kenrick & Jefferson

PUBLIC BUILDINGS

Belfast . . Masonic Hall, Arthur St.
Birmingham City of Birmingham Old Council Offices
Birkenhead Masonic Temple
Bishops Stortford. Bishops Stortford College
Bristol . . Bristol University
Cambridge . Engineers' Laboratory, Cambridge University
Cardiff . . Post Office, Bute Docks
Glasgow . Corporation of Glasgow
Glasgow . Municipal Buildings
Glasgow . Whiteinch Library (for Glasgow Corp.)
Ilkley, Yorks. . Town Hall
Lanarkshire Education Authority Special School
Liverpool . Britannia Rooms
Liverpool . Cotton Exchange
Liverpool . Peel Buildings
Liverpool . Philharmonic Hall
London . . New Auction Mart
London . . School of Economics
London . . College of Estate Management
London . . Metropolitan Borough of Hackney Electricity Station
London . . L. M. & S. Rly. Co., Euston Station
London . . Regent St. Arcade
London . . Shoreditch Welfare Centre
London . . Underground Rly.
London . . Wandsworth Town Hall
London . . Westminster Public Library
London . . New Aquarium, Zoological Gdns.
Malvern. . Malvern College
Manchester Manchester Union Institute
Manchester Ship Canal House
Newcastle-on-Tyne . Dalgleish's Offices & Corridors, Blue Line Offices
Newcastle-on-Tyne . Oxford Gallery
Oxford . . Radcliffe Camera
Oxford . . School of Pathology
Purley . . Warehousemen & Clerks' School
Sheffield . Telegraph Offices
Sheffield . Warnecliffe Chambers
Southwell . Rural District Council Offices
Stockton-on-Tees . Stockton Co-operative Society Jubillee Hall
Surrey . . Russell Schools [Girls
Weybridge . Royal Masonic Institute for
Woolwich . R. A. Barracks

RESTAURANTS

Birmingham Central Restaurant
Birmingham Kardomah Cafe
Birmingham Kunzle's Cafe, Midland Arcade
Birmingham Kunzle's Cafe, Paradise Street
Birmingham Kunzle's Cafe, Union Street
Birmingham Pattison's Cafe
Birmingham Wimbushe's Cafe
Blackpool . Globe Cafe
Blackpool . Imperial Cafe
Blackpool . Palace Restaurant
Blackpool . Rendezvous Cafe
Blackpool . The Savoy Cafe
Blackpool . Tower Cafe
Bolton . . Collinson's Cafe
Brighton . Sherrys, Ltd., West St.
Bristol . . Hort's Restaurant
Bristol . . Dunlop, Mackie & Co.
Burnley . B. S. K. Cafe
Doncaster . Parkinson's, Ltd. (Cafe)
Edinburgh . Cafe Royal
Glasgow . James Craig's Tea Rooms
Glasgow . Fairfield Building Co. Dining Room
Glasgow . Fuller's Cafe
Glasgow . Royal Restaurant
Glasgow . Smith's Restaurant
Gourock . T. McKay & Sons
Huddersfield Field's Cafe
Leeds . . White House Restaurant
Leicester . Kunzle's Cafe
Liverpool . Albany Restaurant
Liverpool . Bank Cafe
Liverpool . Cunard Building Restaurant
Liverpool . Edinburgh Cafe
Liverpool . Kardomah Cafe, Castle Street
Liverpool . Kardomah Cafe, Church Street
Liverpool . Kardomah Cafe, Dale Street
Liverpool . King's Cafe
Liverpool . L. M. & S. Rly.'s Restaurant
Liverpool . Ye Mecca Cafe
Liverpool . New Cafe
Liverpool . Ridgeway's Cafe
Liverpool . Robert's Cafe
Liverpool . Sisson's Cafe
London . . Aerated Bread Co., Ltd., 324/6, Regent Street, W.1
London . . The Karsino, Hampton Court
London . . J. P. Restaurant (many branches)
London . . Kardomah Cafe
London . . J. Lyons & Co., Ltd., 2, Bridge St., S.W.1; Corner House, Coventry St., W.1; Victoria Station.
London . . Ye Mecca Cafe, 16, Tokenhouse Yard, E.C.2
London . . Slater's Restaurant (many branches)
London . . The Trocadero Restaurant, Piccadilly Circus, W.1
London . . Mecca Cafe (several branches)
Manchester Friendship Inn
Manchester Kardomah Cafe, Market Street
Manchester Kardomah Cafe, St. Ann's Sq.
Manchester Princes' Cafe, Oxford Road
Manchester Lyons' Cafe
Manchester St. James's Cafe
Manchester Sisson's Cafe
Manchester Wardorf Cafe
Matlock . Rockside Hydro
Oldham . Irlam's Restaurant
Preston . . Robert's Cafe
Rochdale . Todd Lane Restaurant
Southport . L. M. & S. Rly. Restaurant
Southport . Palais de Danse
West Kilbride . . Seamall Hydro

CHURCHES

Addington . Ballard's Chapel
Belfast . . St. Philip's Church
Birmingham Jewish Synagogue
Birmingham Zoar United Methodist Church
Blackburn . St. Anne's Church
Clifton, Bristol . Christchurch Parish Church
Dewsbury . Roman Catholic Church
Ealing . . Wesleyan Church
Glasgow . Notre Dame
Glasgow . St. John's Church
Halifax . . St. Marie's Church
London . . Golder's Green Crematorium
Harrow . . Harrow School Chapel

London . . St. Mary Abbotts Church, Kensington
London . . St. Michael's Church, Cornhill
London . . London Spiritual Mission
Manchester "Our Lady and St. John," Chorlton-cum-Hardy
Oldham . Westwood Moravian Church
Preston . . Lune St. Wesleyan Church
Preston . . St. Mary's Church
Preston . . St. Wilfred's Church
Sheffield . St. Catherine's Catholic Church
Sunninghill St. Michael and All Angels Church

CLUBS

Anglesey . Golf Club
Bath . . City Club
Blackpool . Philharmonic Club
Chesterfield. Rechabite Club (Entrance Hall)
Chorley . . Police Club
Leyland. . Conservative Club
London . . Cavendish Club, Piccadilly
London . . Conservative Club
London . . The Constitutional Club
London . . Junior Carlton Club
London . . Royal Automobile Club
Newmarket. Calcutta Turf Club
Oldham . Union Club
Preston . . Conservative Club
Preston . . Reform Club
Romford, Essex . Golf Club
St. Anne's . St. Anne's Golf Club
Teddington. Lensbury Club
Walsall . . Walsall Club
Wanstead, Essex . Golf Club

HOSPITALS AND INFIRMARIES

Aldershot . Louise Margaret Hospital
Alton, Hants. Inwood Cottage Hospital
Beckenham, Kent . . Memorial Hospital
Birmingham Infirmary, Erdington
Blackburn . Sanatorium, Queen's Park
Bolton . . The Royal Infirmary
Bourne-mouth . Royal National Sanatorium
Bramshot, Hants . Sanatorium
Bristol . . Eye Hospital
Bristol . . Homeopathic Hospital
Burnley . Maternity Home
Burnley . Victoria Hospital
Brentwood . Cottage Hospital
Brentwood, Essex . District Hospital
Croydon . General Hospital
Glasgow . Essex County Hospital
Glasgow . Glasgow Hospital for Women
Glasgow . Royal Infirmary
Glasgow . St. Margaret's Nursing Home
Glasgow . Western Infirmary
Glasgow . Woodside Nursing Home
Halstead, Essex . . Cottage Hospital
Hampstead Queen Mary's Hospital
Hampstead Royal Soldiers Daughters' Home
Ilkley . . Coronation Hospital
Kirkham . Moss Side Isolation Hospital
Lesmahagow Birkwood Institute
Liverpool . Leasowe Hospital
Liverpool . Walton Institute
London . . Allen & Hanburys, Ltd., Bethnal Green
London . . Battersea Anti-Vivisection Hospital
London . . Cancer Hospital
London . . Charing Cross Hospital
London . . Children's Hospital, Gt. Ormond St., W.C.1
London . . General Lying-in Hospital
London . . Greenwich and Deptford Hospital
London . . Greenwich Union
London . . Guy's Hospital (Stephen Ward)
London . . Guy's Hospital
London . . Highgate New Town Clinic
London . . King Edward Memorial Hospital, Ealing
London . . Labour Theatre, St. George's Hospital
London . . Light Clinic, Pimlico
London . . London Hospital
London . . National Orthopædic Hospital
London . . Queen Mary's Hospital
London . . Ross Institute
London . . Royal Waterloo Hospital
London . . St. Bartholomew's Hospital
London . . St. George's Hospital
London . . Middlesex Hospital
Preston . . The Royal Infirmary
Preston . . St. Joseph's Hospital
Retford . New Hospital
Richmond . Star and Garter Hospital
Rochdale . Memorial Home for Crippled Children
Southampton Grove House Nursling
Southsea . Stepney Towers Nursing Home
Stroud, Gloucester Hospital
Suffolk, East East Suffolk Hospital
Tavistock, Devon . Hospital
Wallingford, Berks. . Boys' Home
Wantage . Hospital
Weybridge . Hospital
Wigan . . Infirmary
Windsor . King Edward VII Hospital
Woolwich . Memorial Hospital (Radioscope Room)
Woolwich . Miller Hospital (General)

BANKS

Aarhuas, Denmark. Private Bank
Accrington . Lloyds Bank
Antwerp . Grand National Banque de Belgique
Barnsley . Yorkshire Penny Bank
Bath . . Lloyds Bank
Bedminster. Lloyds Bank
Belfast . . Bank of Ireland
Bideford . Lloyds Bank
Birkenhead. Bank of Manchester
Birkenhead. National Provincial Bank
Birmingham Barclays Bank
Birmingham Municipal Bank
Bishops Stortford. Nat. Prov. Bank, Ltd.
Blackpool . Yorkshire Penny Bank
Blundell-sands . Liverpool Bank
Bourne-mouth . Lloyds Bank
Bridgwater Barclays Bank

Bristol . . Lloyds Bank, Corn St.
Bristol . . Lloyds Bank, Horfield
Bristol . . Lloyds Bank
Carlisle . . Westminster Bank
Chesterfield. Yorkshire Penny Bank
Colchester . Lloyds Bank, Ltd.
Criccieth & other branches London Joint City & Mid. Bank
Dawlish . Lloyds Bank
Deptford . Lloyds Bank
Dublin . . Bank of Ireland
Farnworth . Manchester & County Bank
Fording-bridge . Lloyds Bank
Glasgow . Union Bank of Scotland, Ltd.
Gosport . Lloyds Bank
Holsworthy Lloyds Bank
Ilfracombe . Lloyds Bank
Ipswich . Barclays Bank, Ltd.
Leeds . . Barclays Bank, Headingley
Leeds . . Barclays Bank, City Square
Leeds . . Barclays Bank, Vicar Lane
Leeds . . Becketts Bank, Ltd.
Leeds . . Becketts Bank (Addition)
Leeds . . Yorkshire Penny Bank
Liverpool . Colonial Bank
Liverpool . Liverpool Bank
Liverpool . Westminster Bank
London . . Bank of Australia
London . . Banca Commerciale Italiana
London . . Barclays Bank, Ltd., Brompton Road
London . . Barclays Bank, 230/2 Kentish Town Road
London . . Barclays Bank, 2, Mandeville Place
London . . Barclays Bank, Lombard St.
London . . Barclays Bank, 47/9, Newington Butts, S.E.
London . . Barclays Bank, Ltd., Pall Mall East
London . . Barclays Bank, Ltd., Victoria St.
London . . Baring Bros.
London . . Bank of British West Africa, 37 Gracechurch St., E.C.3
London . . Bank of England
London . . English, Scottish & Australian Bank, 5, Gracechurch St.
London . . Imperial Bank of Persia
London . . Ionian Bank
London . . Lloyds Bank, Ltd., 16, St. James St., S.W.
London . . Lloyds Bank, 62/8, Brook St.
London . . Lloyds Bank, Ltd., Camberwell Green
London . . Lloyds Bank (late Shury's), Covent Garden
London . . Lloyds Bank, Edgware, N.W.1
London . . Lloyds Bank, 45, New Oxford St.
London . . Lloyds Bank, 61–63, King William St., E.C.
London . . Lloyds Bank, Ltd., St. James St.
London . . Lloyds Bank, Temple Fortune, N.W.
London . . Lloyds Bank, Warwick Sq., S.W.1
London . . Lloyds Bank, Waterloo Place
London . . Lloyds Bank, 27, Whitechapel High St., E.1
London . . Midland Bank (var. branches)
London . . National Bank of South Africa
London . . National City Bank of New York
London . . North British & Mercantile Assurance
London . . Schroder's Bank
London . . Standard Bank of South Africa, 63, London Wall, E.C.2
London . . Sumitamo Bank, 67, Bishopsgate, E.C.
London . . Westminster Bank, Ltd., Westbourne Grove
Longridge . Longridge Bank
Lyme Regis Lloyds Bank
Lymington . Lloyds Bank
Lynton . . Lloyds Bank
Manchester Barclays Bank
Manchester Bank of British West Africa
Manchester National Bank, Moseley St.
Manchester New Union Bank
Manchester Bank of Liverpool & Martins
Manchester Union Bank of Manchester
Newcastle-on-Tyne . Barclays Bank, Ltd.
Newcastle . Lloyds Bank
Newcastle-on-Tyne . London Joint City & Midland Bank
Newport, I. of W. . Lloyds Bank
Northampton Lloyds Bank
Norway . Trondhjems Sparebank
Norwich . Union Bank of Manchester
Paris . . Banque Francaise et Italienne
Parkgate . Yorkshire Penny Bank
Plymouth . Lloyds Bank
Reading . Barclays Bank
Retford . Savings Bank
St. Leonards-on-Sea . Lloyds Bank
Salisbury . Lloyds Bank
Scarborough Yorkshire Penny Bank
Sheffield . Barclays Bank, Pinstone St.
Sheffield . Sheffield Bank, George St.
Southend . Lloyds Bank, Ltd.
Southsea . Lloyds Bank
Sunderland Lloyds Bank
Surbiton . Lloyds Bank
Ti erton . Lloyds Bank
Torrington . Lloyds Bank
Wa efield . Yorkshire Penny Bank
Warminster Lloyds Bank
Weybridge . Barclays Bank, Ltd.
Winchester Lloyds Bank
York . . Becketts Bank
York . . County Savings Bank
York . . Yorkshire Penny Bank

HOTELS

Aintree . . Sefton Arms Hotel
Bucks . . Bayliss House Hotel
Birmingham Midland Hotel
Birmingham Queen's Hotel
Blackpool . Belle Vue Hotel
Blackpool . Clifton Hotel
Blackpool . County & Lane Ends Hotel
Blackpool . Grosvenor Hotel
Blackpool . Prince of Wales Hotel
Blackpool . Princess Hotel
Blackpool . Railway Hotel
Blackpool . Talbot Hotel
Blackpool . Windsor Hotel
Bootle . . Linacre Hotel
Bury . . Newmarket Hotel
Bury . . Raven Hotel
Cambridge . University Arms Hotel
Nr. Croydon The Selsdon Park Hotel
Derby . . The St. James's Hotel
Doncaster . Danum Hotel
Doncaster . Old Thatched House Hotel
Dublin . . Gresham Hotel
Dublin . . Morin's Hotel
Fleetwood . Haslam Bros.

Fleetwood	.	Strawberry Gardens Hotel
Grange	.	Golf Hotel
Grimsby	.	Oberon Hotel
Halifax	.	Junction Hotel
Halifax	.	Victory Hotel, Lounge, etc.
Halifax	.	White Swan Hotel
Harrogate	.	Grand Hotel
Hastings	.	Queen's Hotel
Hebden Bridge	.	White House Hotel
Leeds	.	Griffin Hotel
Lichfield	.	George Hotel
Limerick	.	Royal George Hotel
Liverpool	.	Exchange Hotel
Liverpool	.	Haymarket Hotel
Liverpool	.	Lime Street Hotel
Liverpool	.	Royal Ferry Hotel
Liverpool	.	Washington Hotel
Liverpool	.	Wellington Hotel
Llandudno	.	The Grand Hotel
London	.	Almond's Hotel, Clifford St.
London	.	The Grosvenor Hotel, Buckingham Palace Road, S.W.1
London	.	Kingsley Hotel
London	.	Langham Hotel, Langham [Place
London	.	Metropole Hotel
London	.	The Hotel Metropole, Northumberland Avenue, W.C.2
London	.	Norfolk Arms Hotel
London	.	Hotel Rembrandt, Thurlow Place
London	.	The Hotel Victoria, Northumberland Avenue, W.C.2
London	.	York Hotel
Manchester		Crown & Anchor Hotel
Manchester		Deansgate Hotel
Manchester		Grand Hotel
Manchester		Greyhound Hotel
Manchester		Midland Hotel
Manchester		Mitre Hotel
Manchester		Polygon Hotel
Manchester		Queen's Hotel
Manchester		Royal Oak Hotel, Chorlton-cum-Hardy
Manchester		The Victoria Hotel
Nottingham		Black Boy Hotel
Patricroft	.	Barton Inn
Penrith	.	Ullswater Hotel
Preston	.	Bull & Royal Hotel
Preston	.	Carter's Arms
Preston	.	King's Arms Hotel
Preston	.	New Fleece Inn
Preston	.	Victoria & Station Hotel
Rochdale	.	Old Clock Face Hotel
Rotherham		True Briton Hotel
Salop	.	Ash Hall Hotel, Wellington
Sheffield	.	Angel Hotel
Southampton		South Western Hotel
Stoke-on-Trent	.	North Stafford Hotel
Sunderland		Grand Hotel
Wemyss Bay		Wemyss Bay Hydro
Wigan	.	Legs of Man Hotel
Wigan	.	Tap Lock Inn, New Spring
Woking	.	Albion Hotel

SHIPS

Aberdeen Line : Marathon.
Anchor Line : California, Athenia, Cameronia, Tuscania, Caledonia, Transylvania.
Australian Commonwealth Line : Esperance Bay.
Bergenske, Ltd. : Leda.
Blue Star Line : Avelona, Avila.
British India Steam Navigation Co. : Domala.
G. & J. Burns, Ltd. : Woodcock, Partridge, Pointer, Hound, Viper, Moorfowl, Puma, Magpie, Ermine, Redbreast.
Canadian Pacific Railway Co. : Princess Irene, Calgarian, Scandinavian, Grampian, Marloch, Montlaurier, Marvale, Marburn, Montreal, Montclare, Montrose, Montcalm, Metagama, Empress of Britain, Empress of France, Empress of Canada, Empress of Asia, Empress of Russia, Empress of Australia, Scotian, Melita, Misanabie, Minnedosa, Beaverford, Princess Elaine.
Cia. National de Nav. Costiera : Itaguna, Itapuna, Asturiano, Argantino, Itacuera, Itadinca, Itacusse, Itagiba, Itape, Itaquice, Itanage.
Clyde Shipping Co. : Formby, Goodwin.
Cunard S.S. Co. : Aquitania, Mauretania, Berengaria, Scythia, Albania, Coronia, Franconia, Laconia, Samaria, Ansonia, Andania, Aurania, Servia, Saxonia, Tyrrhenia, Lotharingia, Antonia, Lancastria, Carintha.
Dundee, London & Perth Shipping Co.: London.
Elder, Dempster Line : M.S. Accra, M.V. Apappa.
Elders & Fyffes, Ltd. : Bayano, Camito, Patia, Cavina.
Ellerman Lines, Ltd. : City of Exeter, City of London, City of Glasgow.
King Fuad's Yacht : Khassed-Kheir.
For The Great Eastern Rly. Co. : S.S. Copenhagen, Glasgow; S.S. Munich, Earles Hall; S.S. Vienna, Earles Hall.
Gt. Western Rly. : S.S. St. Andrew, S.S. St. David, S.S. St. Patrick.
Henderson Line : Burma, Pegu, Chindwin, Kenimendine, Henzada, Sagaing, Bhamo.
H.M.S. Arethusa.
H.M.S. Australia, Clydebank, Glasgow.
H.M.S. New Zealand, Clydebank, Glasgow.
Holland Mail Line : Hull (for Earles, Ltd), S.S. St. George.
Koninlijke Hollandsche Lloyd : Gelria.
Lloyd Sabuado Genoa : Conte Uerde.
L.N.E. Rly. Co. : Toward.
S.S. Merdock, Glasgow : (For) Murray & Murdock, Ltd.)
New Zealand Shipping Co. : Aorangi.
Nippon Yusen Kaisha : Haruna Maru Kashima Maru, Hakow Maru, Hakozak Maru, Hakosan Maru.
Orient Line : Oransy, Ormonde, Oronsay, Ormama, Orford.
Pastores S.S. Corporation : Pastores.
P. & O. Line : Ranchi, Ranpura, Chitral.
Pinillos Izquierds : Infanta Isabel de Borbon.
R.M.S.P. Co. : Araguaya.
Sir Dixon Raylton & Co., Middlesbrough : Forvette.
Royal Hollandsche, Lloyd : S.S. Frisia, S.S. Zeelandia, Tubantia.
S.S. Princess.
Southern Rly. Co. : Princess Margaret.
Swann, Hunter & Co., Wallsend : S.S. Crete, S.S. Kason.
S.S. Flora : Wallsend.
S.S. Kemuera : Wallsend.
S.S. Saga : Wallsend (For Swann, Hunter & Co., Ltd.).
F. W. Sykes, Esq., Lindley, Huddersfield : M.Y. Karen.
Tivives Steamship Corporation : Tivives.
Turkish Battleship Sultan Osma III : Walker-on-Tyne.
Union Castle Line : Grantully Castle, Gaika Castle, Garth Castle, Goorka Castle, Guildford Castle, Edinburgh Castle,

Gloucester Castle, Windsor Castle, Llanstephan Castle, Llandovery Castle, Walmer Castle, Dunluce Castle, Armadale Castle, Kinfauns Castle, Carnarvon Castle, Arundel Castle, Durham Castle, Llandaff Castle, Kenilworth Castle.
Union Steamship Co. of New Zealand : S.S. Niagara.
U.S. Steel Products Co., Crofton Hill.
United Baltic Corporation : S.S. Baltrigger.
Walker-on-Tyne : S.S. Malines.
Duke of Westminster : M.Y. Flying Cloud, M.Y. Nyria.
White Star Line : Laurentic, Majestic, Olympic, Homeric.

STORES AND SHOPS

Accrington	.	Taylor & Wilson, Ltd.
Altrincham		Co-op. Branch
Birmingham		Ciro Pearls, Ltd.
Birmingham		Coventry Lever Co., Ltd.
Birmingham		Grey's Premises
Birmingham		Geo. Heath & Co., Ltd., Colmore Row
Birmingham		Geo. Heath & Co., Ltd., Lower Temple Street
Birmingham		Lewis's, Ltd.
Birmingham		Manfield & Sons, Ltd., Corporation St.
Birmingham		Routledge
Birmingham		"Stanley's" Arcade
Birmingham		Toolbys, Ltd.
Bolton	.	Constantine
Bradford	.	J. Morkey & Sons
Chorley	.	G. Waring, Esq.
Colne	.	Colne Co-operative Stores
Doncaster	.	Doncaster Colliery Co.
Farnworth & Kearsley		Co-operative Society Offices
Fishergate	.	Preston Drug Co.
Garstang	.	Preston Co-operative Society
Glasgow	.	Ceylon Tea Rooms
Glasgow	.	Ciro Pearls, Ltd.
Glasgow	.	Kodak, Ltd.
Glasgow	.	McLaren & Sons, Ltd.
Halifax	.	Corporation Show Rooms
Halifax	.	Corporation Electricity Show Rooms
Halifax	.	Halifax Permanent Building Society Offices
Harrogate	.	Walker & Co.
Harrogate	.	Waring & Gillow
Haslingden		Haslingden Co-operative Soc.
Hebden Bridge	.	Wrigley & Sons
Hitchin	.	The Arcade
Huddersfield		Hobson's
Huddersfield		Jenkyn House, Shepley
Hull	.	Asbestos & Rubber Co.
Hull	.	British Gas Light Co.
Lancaster	.	W. Atkinson & Sons
Leeds	.	T. Batty & Son
Leeds	.	Cubb & Naton
Leeds	.	Madame Henry
Leicester	.	Messrs. Jacksons, Ltd., London Road
Levenshulme		Levenshulme Co-op.
Lincoln	.	Boots, Ltd.
Liverpool	.	Finnegan's
Liverpool	.	Lewis's, Ltd.
Liverpool	.	Pierce Williams
Liverpool	.	Dela Rubber Shoe Co., Ltd.
London	.	Army & Navy Stores
London	.	Boots, Ltd., Piccadilly
London	.	Boots, Ltd., Regent St.
London	.	Bourne & Hollingsworth, Ltd., Oxford St., W.
London	.	C. S. S. A., Strand
London	.	Ciro Pearls, Ltd.
London	.	D. H. Evans, Ltd., Oxford St., W.
London	.	Galleries Lafayette
London	.	Gamages, Ltd.
London	.	Gas Light & Coke Co. (various showrooms)
London	.	Gooch's, Ltd., Brompton Road
London	.	Hanan's, Ltd.
London	.	Harrods, Ltd. (Lifts)
London	.	Houndsditch Warehouse Co.
London	.	Kodak, Ltd., Victoria Street
London	.	Lennards (Costumiers), Wood Green
London	.	Leon & Co.
London	.	Selfridges (Lifts)
London	.	South Metropolitan Gas Co. (various showrooms)
London	.	Taylor & Walker (Brewers)
London	.	The Silk Shop, Oxford St., W.
London	.	Twinings
London	.	Waring & Gillow, Ltd.
Manchester		Afleck & Brown
Manchester		Barlow & Jones
Manchester		Boots Cash Chemists
Manchester		English Leather Co.
Manchester		Henry's Stores, Yorkshire House, Cross St.
Manchester		Lewis's, Ltd.
Manchester		Olivant Botsford
Manchester		Prestwich Industrial Co-op. Society, Prestwich
Nottingham		Nottingham Furnishing Co.
Oldham	.	J. & J. Thompson
		Red Star Shipping Office (for Waring & Gillow)
Preston	.	Bennett & Johnson
Preston	.	Mrs. Brierly
Preston	.	Marsdens
Retford	.	Palace Theatre
Retford	.	Smith & Foster
Retford	.	Vickers
Ripon	.	Paint Works
Rishton	.	Rishton Co-operative Stores
Scotland	.	R. S. MacColl's Shops (various towns)
Shaw	.	Shaw Co-operative Society
Sheffield	.	Cocker Bros., Ltd.
Sheffield	.	J. Curtis & Sons
Sheffield	.	Water House
Southport	.	Alexandra Stores
St. Annes	.	Mr. Fernie
St. Annes	.	Walmsley
Stoke Newington	.	William Cullen, 216, High St.
Stretford, Manchester		Stretford Branch Co-operative
Wakefield	.	W. H. Nicholson & Sons
Warrington	.	C. W. S.
Worcester	.	Worcester Co-operative Society

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