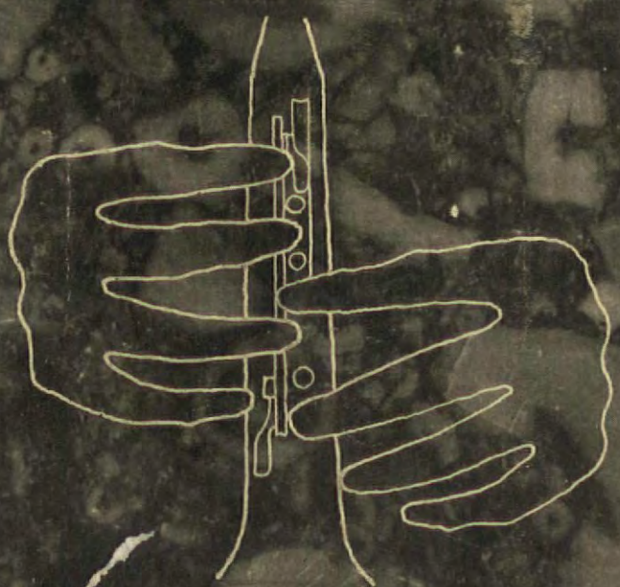
ROYAL FESTIVAL HALL



A SPECIAL NUMBER OF THE ARCHITECTURAL REVIEW
VOL. CIX No. 654 JUNE 1951 PRICE 3/6

Design for a Nursery Schoolroom. From the original Collage by R. Myerscough-Walker

The modern Nursery Schoolroom calls for comfort and colour. The floor must also stand hard wear and constant cleaning. It must be hygienic and waterproof, yet warm and not tiring to young feet. In this unusual design, Marley floor tiles have been used to provide an inexpensive solution to all these problems.

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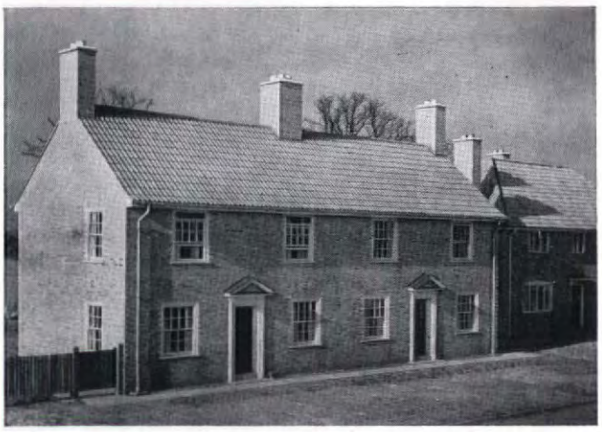

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It pays in the long run to use

Clay Roofing Tiles

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This drawing by Leonard Willcock is the first of a series, "Window Makers at Work" by artists commissioned by Williams & Williams Ltd. It shows the first stage—the cutting and despatch to welders of rolled steel sections for frames.

Window-making begins
with George Dickson. He is the foreman
(with twenty-five years in the trade)
who checks the steel as it comes from the rolling mills
and organizes the cutting and despatch
of the sections to the drillers and welders.
He and his fellow workers use the
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to make good windows. Their aim
is achieved when the Architect sees the windows
in the buildings and tells the
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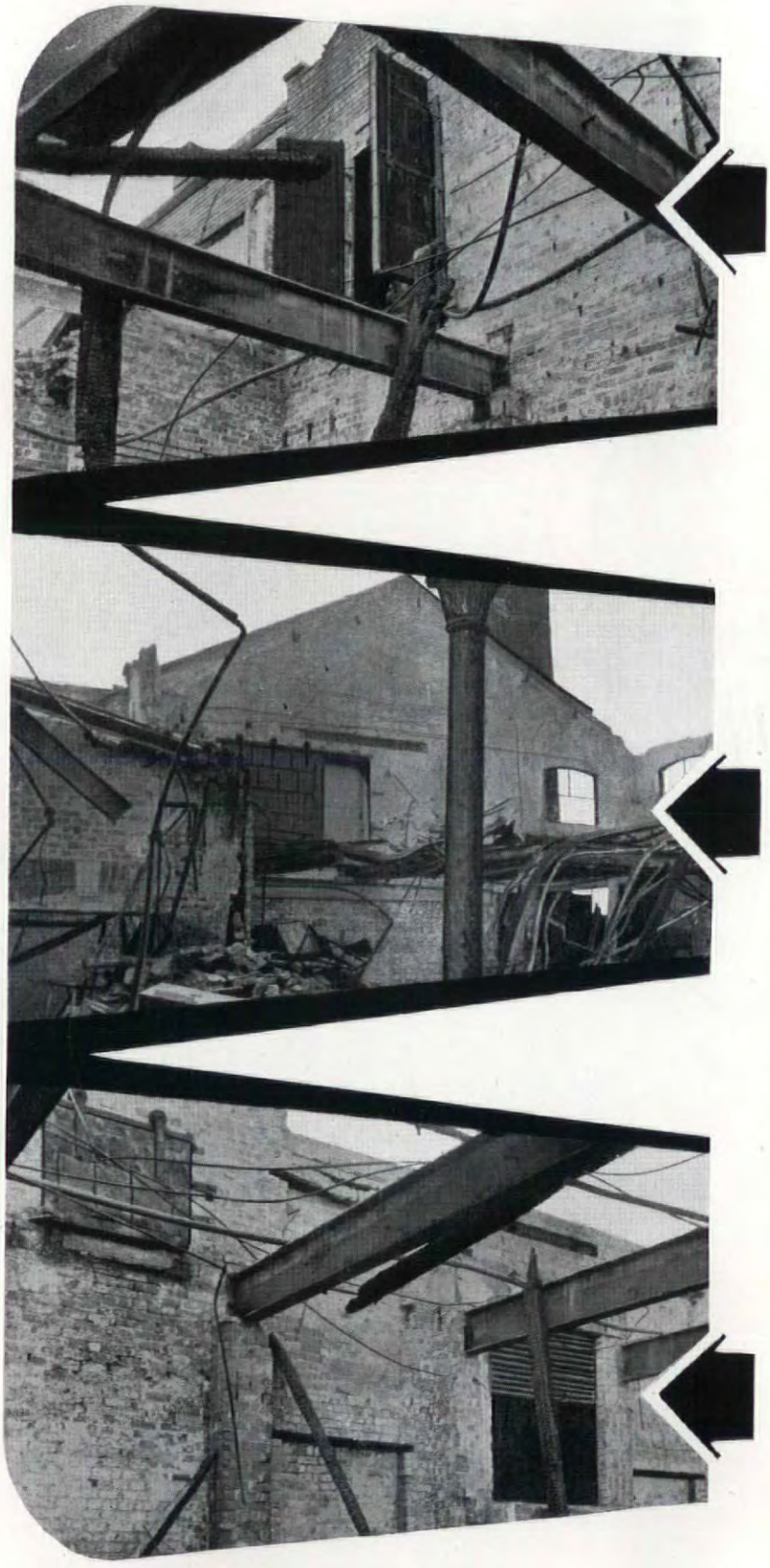

M&P Fire Doors halt blaze

On the night of March 24th, 1950, Mather & Platt Fire Doors checked the spread of fire at premises occupied jointly by a firm of raincoat manufacturers and a firm of food manufacturers. The installation of Fire Doors and one steel rolling shutter built to F.O.C. requirements had been completed only three months previously.

80,000 Coats destroyed in adjoining premises

Press reports say that "Within a few minutes flames had swept the length of the 100 yards by 75 yards building, destroying 80,000 raincoats being made up for Government orders." The party wall which separated the premises of the food manufacturers from those of the raincoat manufacturers was pierced by a series of openings, protected by Mather & Platt Fire Doors and a Steel Rolling Shutter. The Doors and Shutter fulfilled their purpose perfectly. The fire was completely checked at the party wall.

Mather & Platt FOC Shutter guarding a vital stairway

A special problem was presented by a flight of steps leading down from the first floor of the gutted building to the ground floor of the building which remains intact. It was solved by the installation on one side of the wall of a steel rolling shutter built to F.O.C. requirements, and on the other a Fire Resisting Door. The Steel Rolling Shutter held the fire in check at this point.

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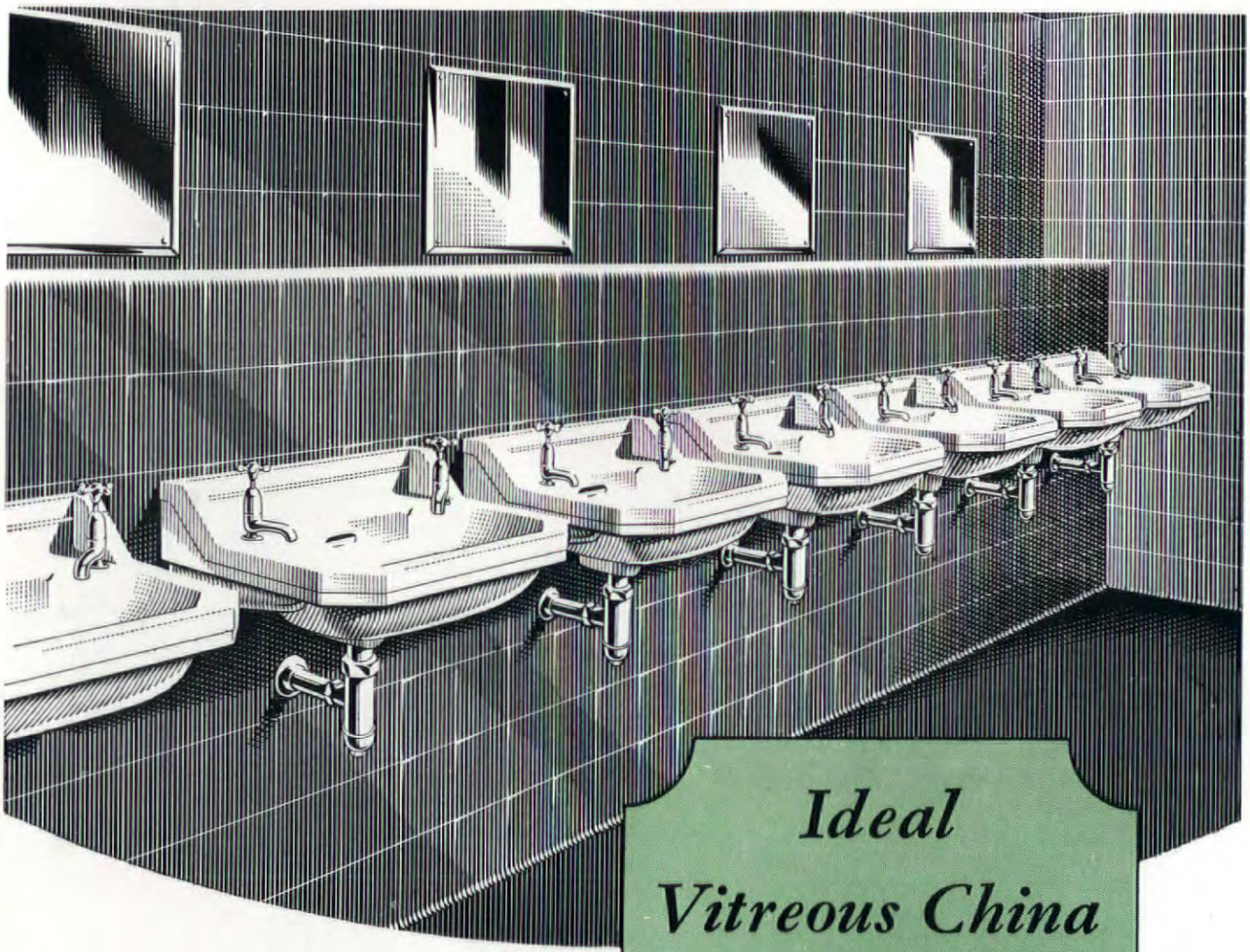

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The illustration shows a range of Devon Lavatories fitted on wall brackets.

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Here is a case in which CARTER TILES have been used in a rather unusual manner to give an atmosphere of dignity and restraint to a building of some historic interest. The black 12″ x 8″ tiles extend from the ground to the top of the third storey. The commemorative panel is in modelled faience.

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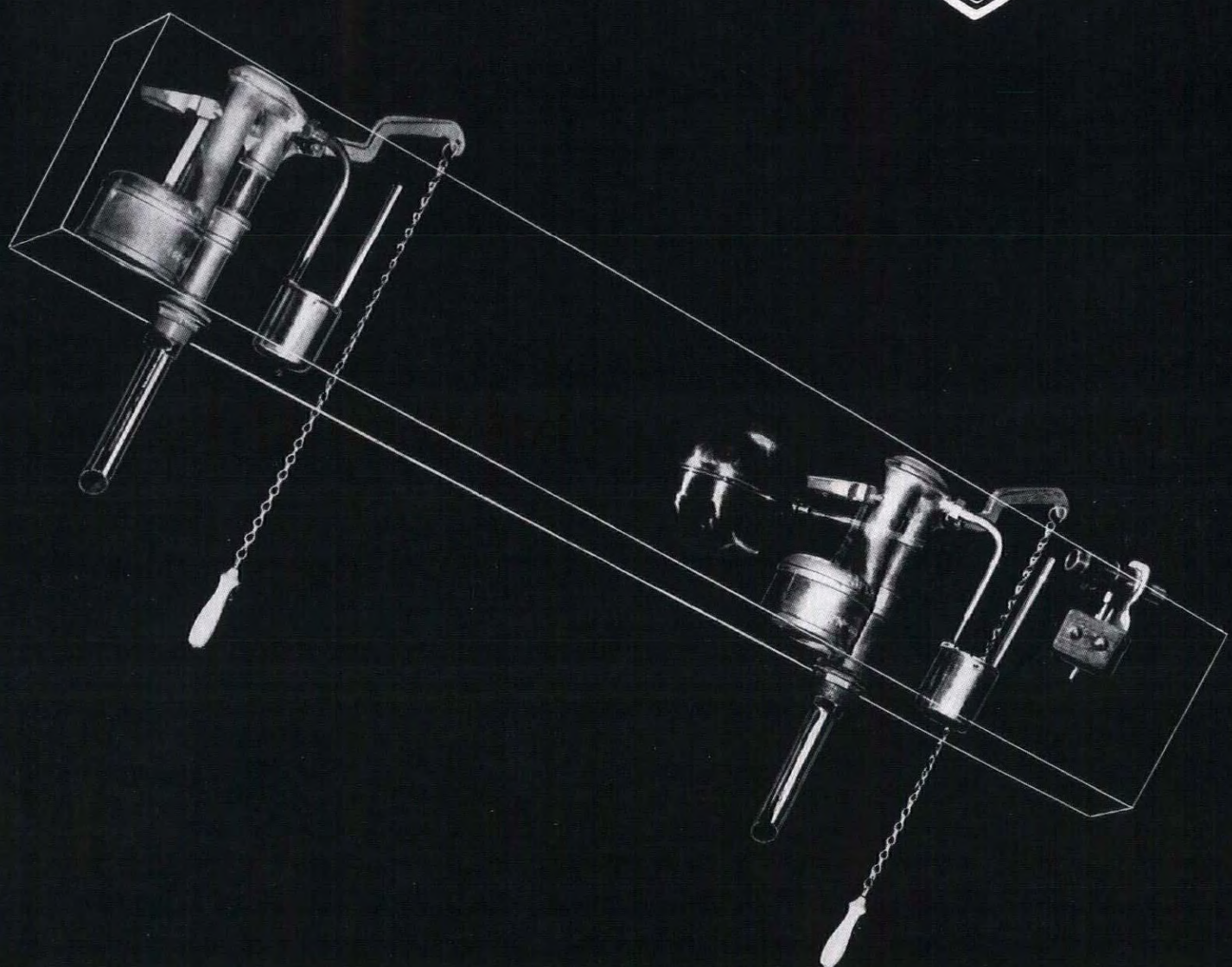

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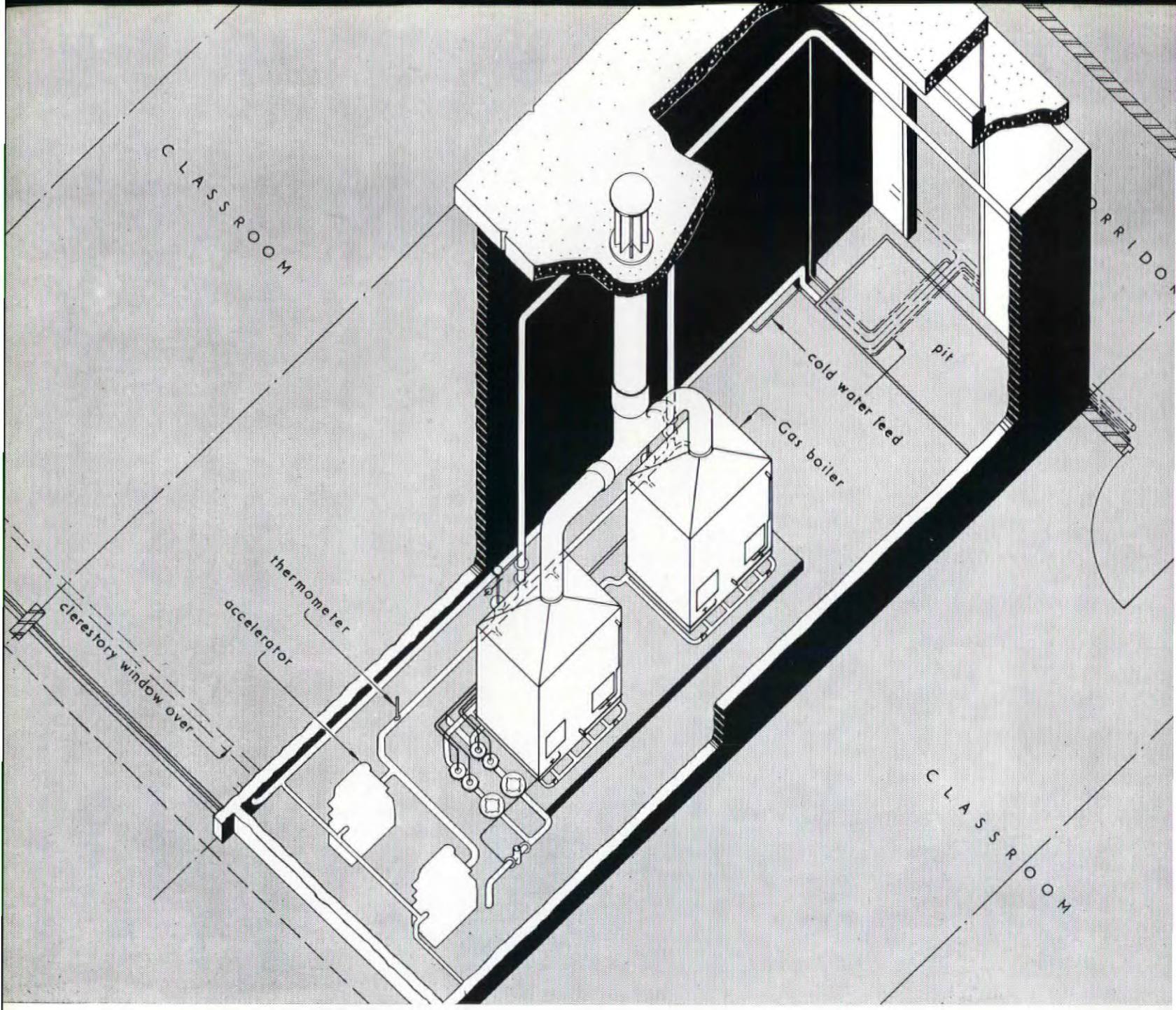

Boiler house for New Classroom Block, Twickenham Technical College. County Architect : C. G. Stillman, F.R.I.B.A.

GAS solved this school heating problem

Gas-fired low pressure central heating is installed in this most recent extension to Twickenham Technical College, opened in 1948.

Factors which influenced the choice of boiler plant were : the distant situation of the new buildings in relation to the main boiler house ; the difficulty of providing fuel storage and access to it ; and the difficulty of providing a suitable chimney that would be unaffected by the proximity of adjacent high buildings.

The new single-storey block contains eight classrooms with cloakroom accommodation. The total catalogue rating of the two automatically controlled boilers is 720,000 B.T.U's per hour.

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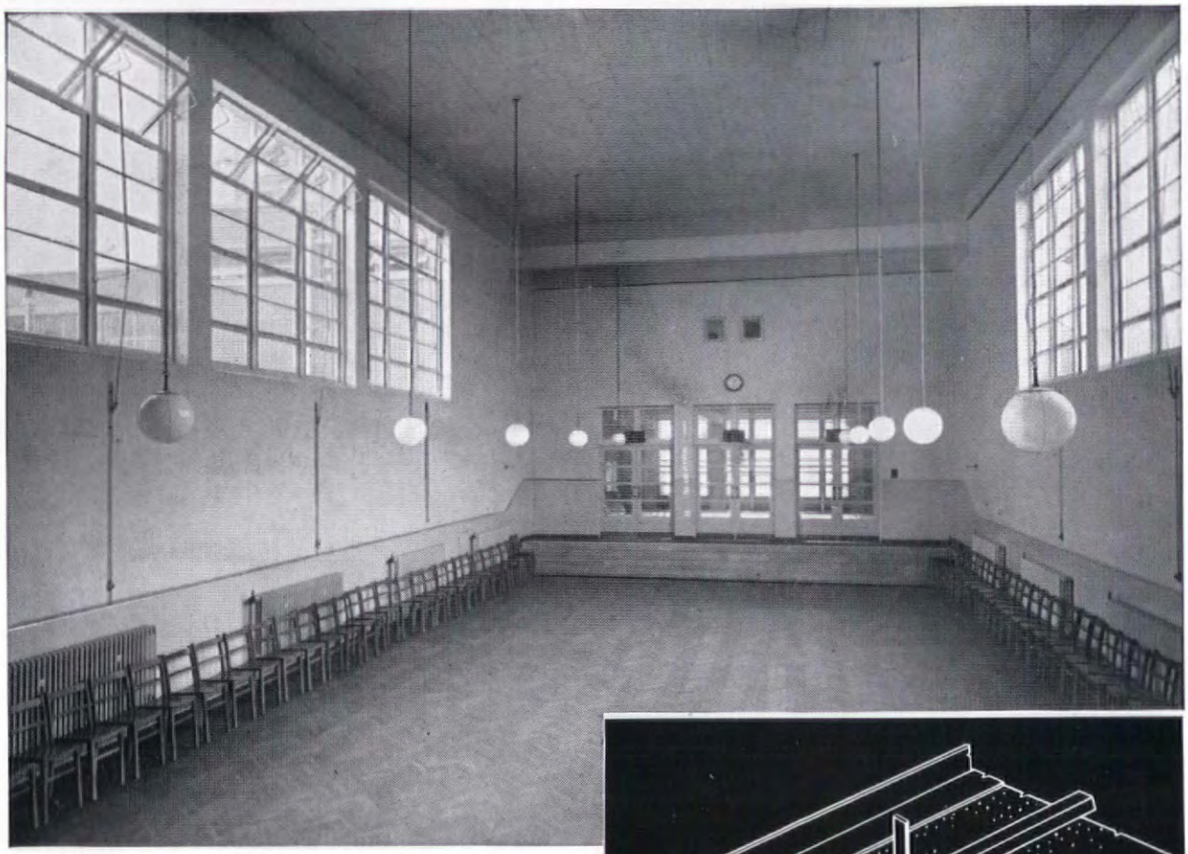
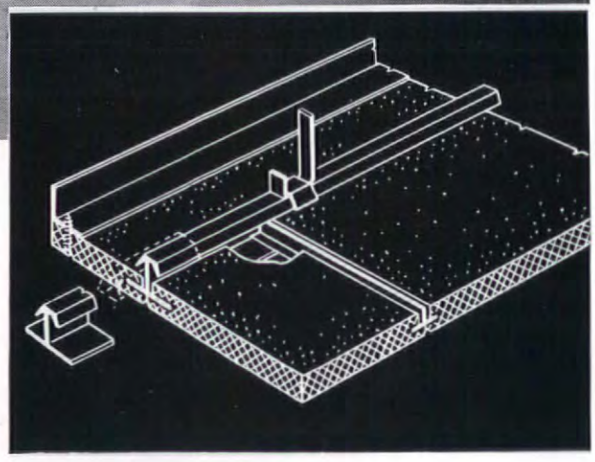


Colmers Farm Secondary Modern School, Birmingham.
Architects: Harrison & Cox.



Look at this ceiling at Colmers Farm Secondary School!

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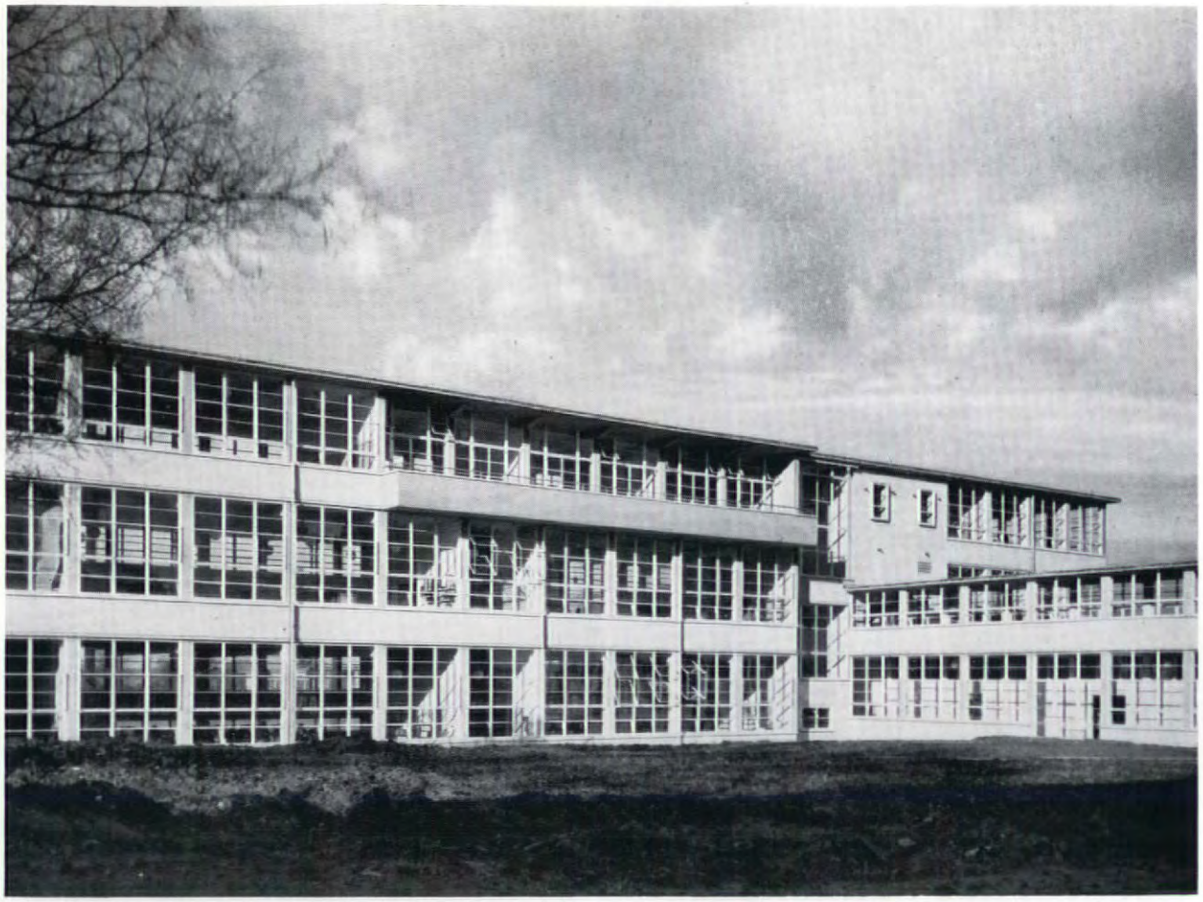

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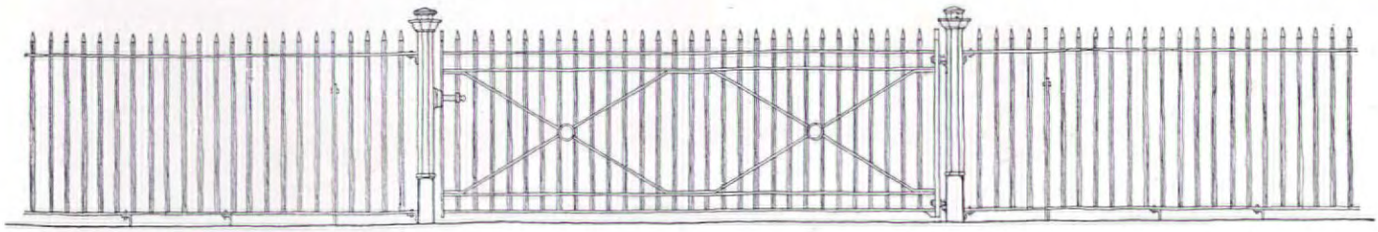

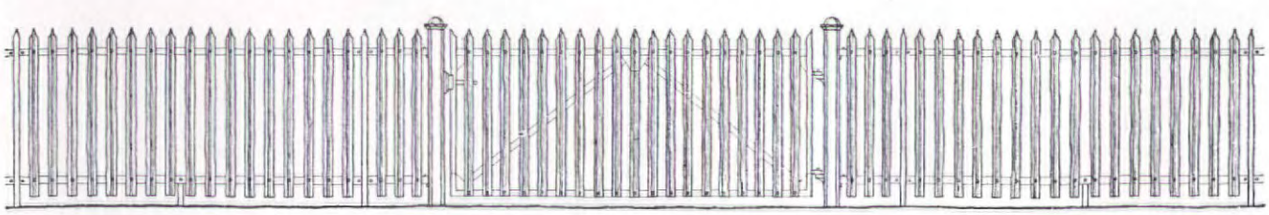

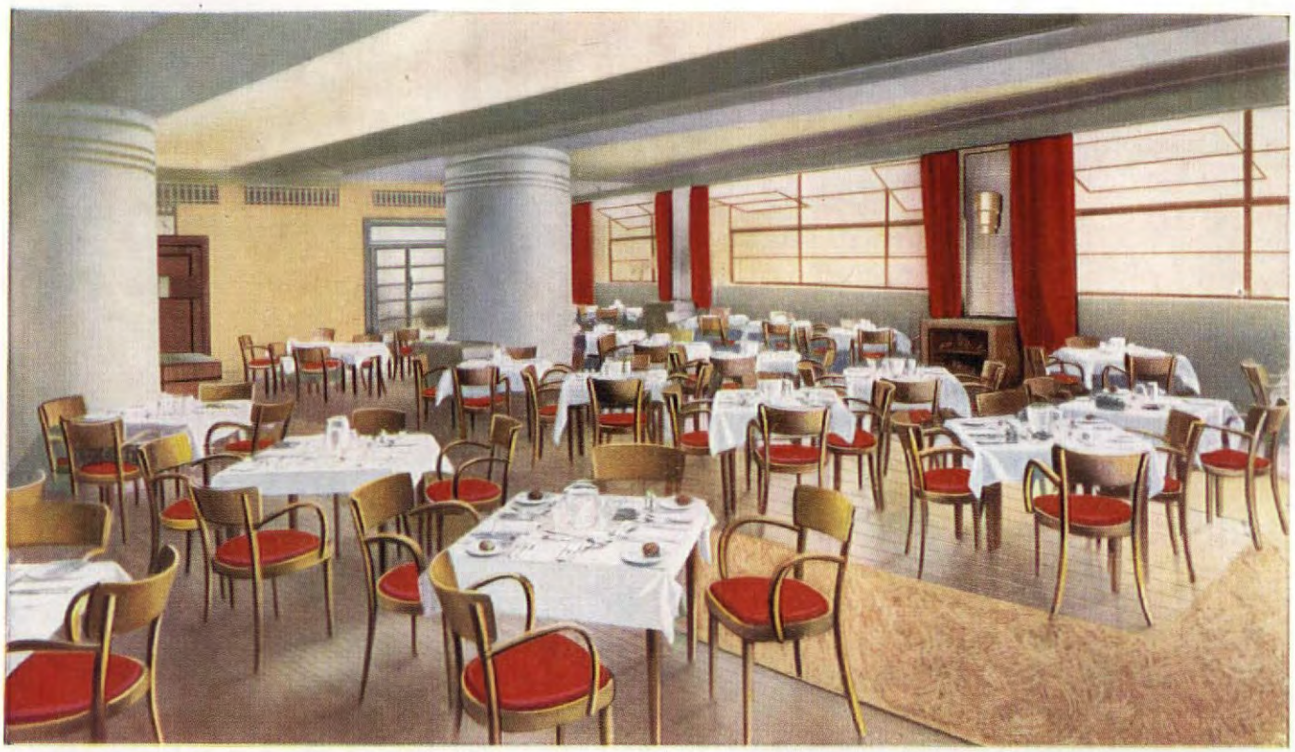

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P7

The ancient Fosse Way, running north from Leicester, existed merely as a drift way up to 1923. About that time the County Council lightly metalled it to provide a hard two-lane carriageway which did service for several years but, since it affords the most direct route from Leicester to Nottingham as well as to Lincoln and the North-East, some modern reconstructional treatment was inevitable. This work was interrupted by the War and from 1943 to 1945 one of the carriageways on a "dual" section of the road was used as a park for military vehicles.

This carriageway began to fail after the War and had to be reconstructed. Owing to the extent of the job and a dearth of labour up-to-date mechanical methods were necessarily employed and included mechanical spreaders and finishers and a travelling mixer.

Curing and protection, as might be expected, was entrusted to SISALKRAFT Concrete Curing Blankets placed directly on the concrete as soon as practicable after the last pass of the finishing machine. The picture is published by kind permission of the local highway authority by whom the project was carried out with direct labour.

The famous 'Comet' airliner

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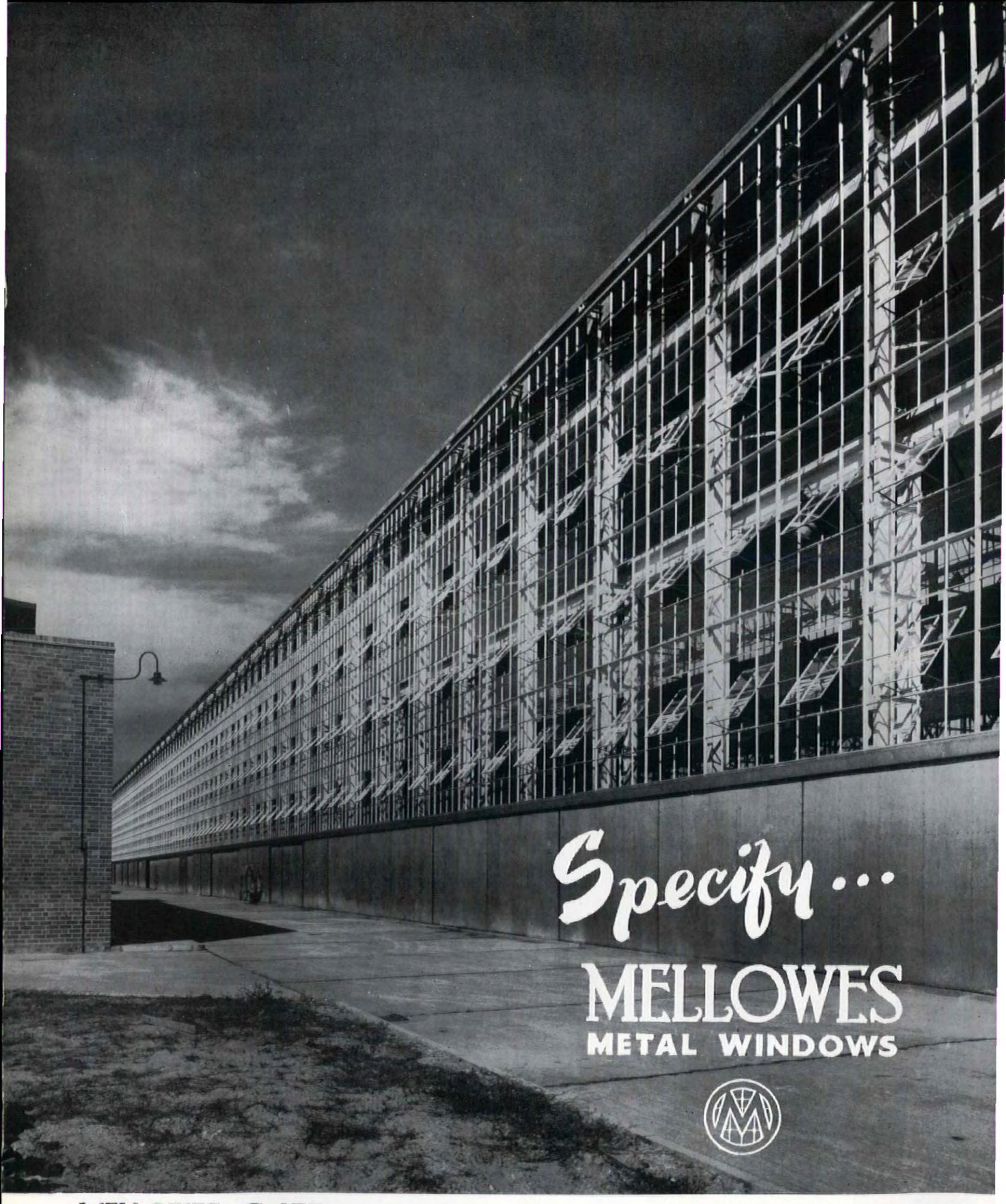

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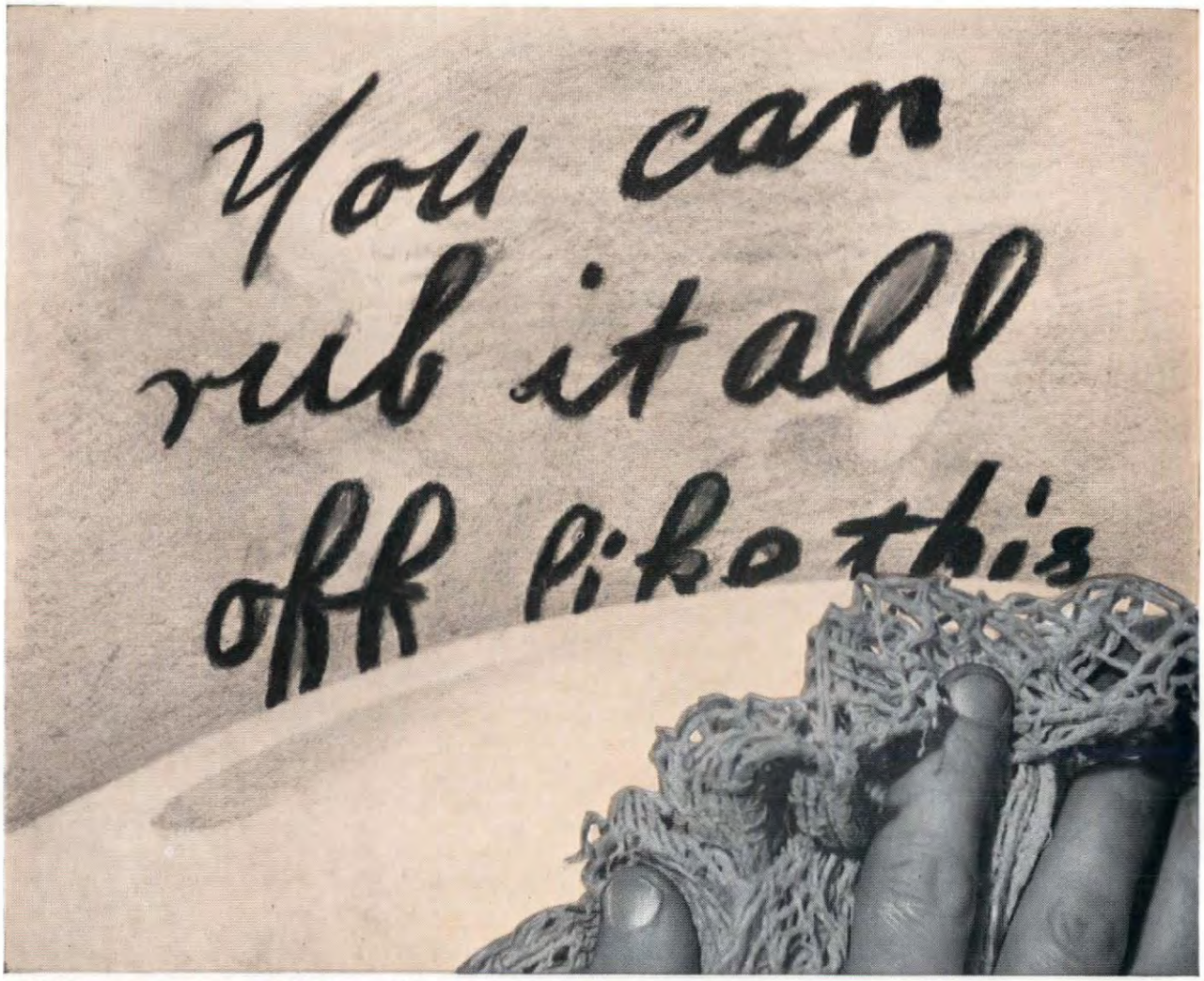

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Traductions Übersetzungen Переводы

THE ARCHITECTURAL REVIEW JUNE 1951

Juin 1951

Le Royal Festival Hall (Hall Royal du Festival), tué sur la rive droite de la Tamise, près de la gare e Waterloo, a été choisi comme le sujet d'un uméro entier de la REVUE pour trois raisons. remièrement, il est important en tant que le remier acompte du redéveloppement permanent e cette zone; deuxièmement, c'est le seul édifice ublic de grande envergure qui ait été construit en ngleterre depuis la guerre; troisièmement, il jouit 'une importance particulière en tant que construction civique dessinée selon un style moderne et ıtransigeant dans un pays où les Conseils Munipaux, quand il s'agit d'architecture, sont notamıent timides et routiniers. Le Conseil Municipal de ondres (LCC) a, depuis bien des années, envisagé n rapprochement plus actif du South Bank (Rive Droite) avec le Centre de Londres, rompant ainsi la arrière psychologique que constitue la rivière.

Selon le plan Abercrombie-Forshaw, élaboré endant la guerre, cette zone, qui était alors encore ccupée par des bâtiments industriels désuets ou ıême délabrés et des habitations très anciennes, fut ésignée comme Centre Culturel. Lorsque le ouvernement arrêta son choix sur le South Bank our l'exposition centrale du Festival de la Grande-Bretagne de 1951, le Conseil Municipal de Londres ıt invité à accélérer la construction du Hall des oncerts, l'un des bâtiments envisagés selon le rojet, afin que ce Hall puisse prendre sa part au ivertissement des visiteurs au Festival. Ainsi le oyal Festival Hall, pour lui donner son titre fficiel, se dresse à présent parmi les constructions rovisoires de l'Exposition (qui formera l'objet 'un autre numéro spécial de la REVUE dans deux ois), mais plus tard il fera partie d'un ensemble ui comprendra un théâtre national, un hôtel, lusieurs blocs de bureaux gouvernementaux et 'autres constructions. On peut espérer que ces eux édifices, chacun individuellement et—ce qui st tout aussi important—le plan qui déterminera eur rapport, seront aussi audacieux et imaginatifs ue le Hall des Concerts qui est leur précurseur.

La majeure partie de ce numéro est dédiée à une escription détaillée de l'édifice. L'espace requis tait une grande salle (pouvant contenir au moins ,000 personnes) un Hall plus petit pour la musique e chambre, des récitals et, de temps en temps, de a danse de ballet, ainsi que suffisamment de place our l'orchestre, des foyers et des bars, un grand estaurant, donnant de préférence sur la rivière, des alles de réunion et une galerie d'expositions; ceux-ci evaient être projetés de façon à ce que chaque artie constituante puisse être utilisée séparément u bien en combinaison avec un ou plusieurs des utres éléments. Le petit Hall et la galerie d'exositions n'ont pas encore été construits.

La section descriptive est suivie d'un article sur acoustique et l'exclusion des sons par W. A. Allen t P. H. Parkin, des spécialistes de la 'Building Research Station,' qui furent consultés à ce sujet. 'attention est attirée sur le fait que le Royal 'estival Hall a été construit selon une nouvelle hèse de l'acoustique et il représente un effort vers obtention de la plénitude du ton sans perte de etteté, avec un équilibre exact dans le rendement rchestral à n'importe quel point de la salle. Cet rticle explique les moyens adoptés pour atteindre e but, ainsi que les méthodes utilisées pour inonoriser le Hall des bruits extérieurs des trains et e la circulation et pour empêcher les sons de asser d'une partie de la construction à d'autres arties de celle-ci. La forme générale du Hall a été éterminée par les nécessités acoustiques. Sur un sujet, toutefois, aucune indication ne put être obtenue de la théorie de l'acoustique. Il s'agissait des avantages relatifs des plans comportant soit des côtés parallèles, soit des côtés en entonnoir; on a trouvé, toutefois, que la première solution semblait jouir d'une meilleure réputation en ce qui concerne l'acoustique de la musique. Il semblerait que, pour obtenir des conditions idéales, l'auditoire d'un concert devrait s'asseoir sur la pente d'une grande colline et l'orchestre sur la pente d'une colline plus petite mais plus escarpée et qu'entre les deux, il devrait y avoir un petit lac. Cette idée est celle qui a été appliquée dans la section longitudinale du Festival Hall, dans laquelle chaque auditeur peut voir tous les musiciens. L'estrade comporte un bon nombre de particularités, par exemple une partie du premier gradin est amovible pour former une baie pour piano et la profondeur de la plateforme, de l'avant à l'arrière, a été maintenue dans les limites maxima de 40 pieds (12 m.) admissibles pour que l'orchestre puisse être entendu comme une unité en économisant l'espace par l'utilisation de pupitres à musique montés sur rails, rendant ainsi inutiles les trépieds. Le ciel se trouvant immédiatement au-dessus est arrangé de façon à renvoyer une partie du son sur l'orchestre afin de l'aider à s'entendre lui-même dans son ensemble et en même temps de façon à bifurquer vers le fond de la salle le son montant verticalement. Parmi les absorbants de son employés dans le Hall, le plus intéressant est le lambrissage d'orme des murs; des panneaux avec un espace d'air derrière ont contribué en une grande mesure au succès de bien des halls de concert, mais ici ils ont été conçus scientifiquement, sur la base de résultats fournis par des expériences faites, pour leurs propriétés acoustiques. Parmi d'autres dispositifs absorbants, il y a des plaques de laine de bois dans la partie de la corniche et des résonateurs Helmholtz dans le plafond.

Sous l'en-tête 'insonorisation,' on a trouvé que, malgré la proximité du pont de chemin de fer dit Hungerford Bridge, l'emplacement n'est pas plus bruyant que d'autres emplacements de salles de concert dans les villes. Afin que l'isolement soit aussi parfait que possible, partout où le Hall faisait saillie dans le plein air en dehors de son 'blindage' de salles et foyers dont il est entouré, il a été doué de mur et toit doubles, tandis que des absorbants de son ont été utilisés pour augmenter l'efficacité du 'blindage' lui-même.

L'un des principaux problèmes de l'insonorisation intérieure était d'empêcher la production de bruits dans la petite salle pendant que le grand Hall est employé.

La solution adoptée a été de chemiser les colonnes portant la structure du foyer du petit Hall autour de celles portant le Hall principal, les fondations des colonnes extérieures, reposant sur de l'amiante, posées sur les fondations des colonnes intérieures de façon à obtenir deux systèmes structuraux enchevêtrés mais indépendants.

AVIS AUX PERSONNES DÉSIRANT S'ABONNER À LA REVUE

Le papier n'étant plus rationné en Angleterre les abonnements à THE ARCHITECTURAL REVIEW peuvent être maintenant acceptés pour la France et autres pays étrangers.

Le prix d'abonnement, franco de port, est de £2.0.0 par an, payable d'avance, et les ordres d'abonnement peuvent être envoyés soit directement aux Editeurs, The Architectural Press, 9 Queen Anne's Gate, Londres, S.W.1, soit par l'intermédiaire des principaux dépositaires de journaux et agences d'abonnement français.

Juni 1951

Aus drei Gründen wurde die Royal Festival Hall auf dem Südufer der Themse, in der Nähe des Waterloo-Bahnhofs, als Hauptthema dieser Nummer der ARCHITECTURAL REVIEW gewählt. Erstens ist die Halle von grosser Bedeutung als erster Versuch diesem Stadtteil eine neue Note zu geben; zweitens ist sie das erste grosse öffentliche Gebäude, das in England seit dem Kriege errichtet worden ist; drittens ist sie von besonderer Bedeutung als öffentliches Gebäude, das ohne jeden Kompromiss ein Denkmal des Stiles unserer Zeit ist in einem Lande wo städtische Behörden, sobald Architektur in Frage kommt, notorisch zaghaft und konservativ sind. Der Grafschaftsrat von London ist seit einer Reihe von Jahren bestrebt, einen stärkeren Zusammenhang zwischen Südufer und Zentrum von London zu schaffen und die Schranke zu durchbrechen, die der Fluss gebildet hat. Im Abercrombie-Forshaw Plan, der während des Krieges vorbereitet worden ist, ist dieser Stadtteil, der damals aus veralteten, ja selbst verfallenen Fabrikanlagen und aus Wohnhäusern bestand, die normalen Forderungen nicht mehr entsprachen, als kulturelles Zentrum ausersehen. Als die Regierung das Gelände auf dem Südufer als Mittelpunkt der Ausstellung von 1951 für das Festival of Britain von 1951 wählte, wurde der Grafschaftsrat von London aufgefordert, den Bau der Festhalle die zu den vorgesehenen Gebäuden gehörte, zu beschleunigen, damit sie ihre Aufgabe im geplanten Vergnügungsprogramm erfüllen könne. So bildet die Royal Festival Hall, wie sie genannt wurde, den Mittelpunkt der provisorischen, für die Ausstellung bestimmten Gebäude, über die eine Sondernummer der REVIEW im August vorgesehen ist. Die Halle wird zu einem Komplex gehören, der ein Nationaltheater, ein Hotel, verschiedene Regierungsgebäude und andere Bauten umfassen wird. Hoffentlich werden diese Gebäude—jedes einzelne und was ebenso wichtig ist in ihrer Gesamtwirkung und ihren Beziehungen zu einander—ebenso kühn und phantasiereich sein wie ihr Vorläufer, die Festhalle.

Eine eingehende Beschreibung der Festhalle bildet den Hauptinhalt der vorliegenden Nummer. Die erforderlichen Räumlichkeiten waren ein grosser Saal, in dem mindestens 3000 Zuhörer Platz haben, ein kleinerer Saal für Kammermusik, Vorträge und gelegentliche Ballettaufführungen, die erforderlichen Räume für die Musiker, Foyers und Büfett, ein grosses Restaurant (womöglich mit Ausblick auf die Themse), Versammlungs- und Ausstellungsräume; all diese Räumlichkeiten müssen so angelegt werden, dass sie gesondert oder im Zusammenhang benützt werden können. Der kleinere Saal und die Ausstellungsräume sind noch nicht gebaut.

Der detaillierten Beschreibung folgt ein Aufsatz über Akustik und Schallisolierung von W. A. Allen und P. H. Parkin, Experten des Instituts für Bauforschung. Der Bau der Royal Festival Hall entspricht neuen akustischen Untersuchungen und Prinzipien. Es ist ein Versuch den vollen Ton in seinen zartesten Uebergängen, so dass keine Note des Orchesters verloren geht, von sämtlichen Plätzen hörbar zu machen. Im vorliegenden Aufsatz werden die Mittel beschrieben, die für diesen Zweck notwendig waren, ebenso die Methoden, um die Halle von Geräuschen, die von draussen eindringen, zu isolieren wie vorbeifahrende Eisenbahnzüge, Verkehr und Lärm auf der Strasse und dergleichen mehr. Die äussere Form der Festhalle ist durch akustische Forderungen bedingt. Nur für ein

Problem hatten die Theoretiker keine eindeutige Antwort: die relativen Vorzüge von Räumen mit parallelen und schrägen Seiten; Untersuchungen ergaben jedoch, dass der erstere Typus sich für Musikalische Akustik vermutlich besser eignet. Es wurde gesagt, die ideale Lösung bestände darin, dass die Zuhörer bei einem Konzert am Fusse eines grösseren Hügels sitzen, während das Orchester seinen Platz auf dem steilen Hang eines kleineren Hügels habe, mit einem kleinen See als Zwischenraum. Diese Vorstellung wurde im Längsschnitt der Musikhalle verwirklicht, jeder Hörer kann von jedem Platze aus jeden der aufführenden Musiker sehen. Die Anlage der Plattform enthält eine Reihe besonderer Züge, z.B. ein Teil der Sitzplätze in der ersten Reihe ist auswechselbar; die Tiefe der Plattform von vorn nach hinten beträgt 12 m., das Orchester kann als eine Einheit gehört werden, bei einer Platzersparnis durch Notenständer auf Geleisen, so dass Stative nicht notwendig sind. Die Wölbung darüber ist so konstruiert, dass sie gewisse Töne zurückwirft. Damit hilft sie dem Orchester sich selbst als Einheit zu hören und drängt gleichzeitig nach unten strebende Töne in die Halle zurück. Unter den Lautaufsaugern in der Festhalle ist eine Ulmentäfelung besonders interessant. Panellierungen mit Luftraum dahinter sind von grosser Bedeutung in der Anlage von Konzertsälen; hier sind sie nach wissenschaftlichen Grundsätzen entworfen auf Grund von Experimenten, die auf ihre akustische Eignung hin gemacht wurden. Unter anderen absorbierenden Vorrichtungen sind 5 cm. starke Holzwollplatten in den Architraven und Helmholtz-Resonatoren in der Decke angebracht. Unter dem Schutz von Isolierungen wurde festgestellt, dass der gewählte Platz trotz der Nähe der Hungerford Eisenbahnbrücke keineswegs mehr Lärm ausgesetzt ist als dies bei anderen Konzertsälen der Fall ist. Um die Isolierung so vollkommen wie möglich zu machen, bekam der Hauptsaal an allen Stellen, an denen er nicht durch das 'Gehäuse' umgebender Räume und Foyers geschützt ist, sondern einen Vorstoss in den Freiraum macht, doppelt verstärkte Wände und ein doppelt verstärktes Dach, während Laut-Isolatoren benützt wurden, um die Wirksamkeit dieser 'Gehäuse' zu verstärken. Eines der Hauptprobleme der Isolierung im Innern des Gebäudes bestand darin, Geräusche in dem kleinen Saal zu verhindern, wenn der grosse in Gebrauch ist. Dieses Problem wurde auf die Weise gelöst, dass die Säulen, die die Struktur des Foyers des kleinen Saales tragen, mit einem besonderen Schutz versehen wurden. Die Fundamente der Aussensäulen, die auf Asbest ruhen, liegen über den Fundamenten der Innensäulen, so dass zwei ineinander greifende aber unabhängige Struktursysteme geschaffen wurden.

Июнь 1951 г.

КРАТКОЕ СОДЕРЖАНИЕ СТАТЕЙ

Настоящий выпуск нашего журнала целиком посвящен Королевской Палате Празднеств („Ройял Фестивал Холл") на южном (правом) берегу р. Темзы, недалеко от вокзала Ватерло, постройка которой только что закончена к Выставке (т. н. „Фестивал оф Британ"). Причины этого следующие: Во-первых, здание это является первым выполненным сооружением в фундаментальной перепланировке и перестройке этого района г. Лондона; во-вторых, оно является первой постройкой большого масштаба, общественного назначения, исполненной после войны; в третьих, оно является первой муниципальной постройкой, выполненной в Новом Стиле, безо всяких компромиссов, в стране, где муниципальные власти, там, где это касается зодчества, отличаются пресловутой робостью и консерватизмом. Совет Лондонского Графства (так называется главный муниципальный орган Лондона) подготовлял уже в течении многих лет планы более тесной спайки части города, лежащей на южном берегу Темзы, с центром города, который расположен на северном берегу, так чтобы преодолеть психологический барьер реки. По проекту Аберкромби и Форшоу, разработанному во время войны, район этот, который тогда был почти целиком занят устарелыми, и даже полуразрушенными, промышленными сооружениями и совершенно неудовлетворительными жилищами, предназначался для разбивки нового культурного центра. Когда правительство решило избрать южный берег Темзы для главной выставки в связи с „Фестивал оф Британ 1951 г.", оно обратилось к Совету Лондонского Графства с просьбой ускорить осуществление одного из зданий, входивших в этот план, а именно нового Концертного Зала, для того чтобы использовать это здание для Выставки. Этому-то зданию дано было название „Ройял Фестивал Холл". Пока что оно будет возвышаться среди временных выставочных построек (которым будет посвящен особый выпуск нашего журнала), но в будущем он составит часть целого комплекса зданий, включающего Национальный Театр, гостиницу, несколько больших зданий правительственных учреждений, и ряд других домов. Надо надеяться, что все эти здания будут столь же смело задуманы и проявят то же богатство зодческого воображения, как индивидуально, так и, что еще важнее, в их взаимном плановом соотношении, как их предтеча — Концертный Зал.

Большая часть настоящего выпуска занята подробным описанием этого нового здания. Задание проекта включало большой концертный зал, не менее чем на 3000 слушателей, малый зал для камерной музыки и соло-концертов, в котором можно бы было давать также время от времени небольшие балетные представления, комнаты для артистов, фойе, буфеты, ресторан (предпочтительно выходящий на реку), комнаты для заседаний и галлерею для выставок. Все это требовалось так спланировать, чтобы отдельные части здания можно было использовать не только по отдельности, но и погрупно в различных комбинациях. Малый зал и выставочная галлерея пока еще не выстроены.

За этой описательной частью следует статья В. А. Аллен'а и П. Х. Паркин'а об акустике зданий и, в частности, о методах звуко-изоляции. Оба автора являются научными работниками государственного научно-исследовательского института по строительству („Билдинг Ресерч Стэш'он"), которые являлись в то же время консультантами строителей здания по этому вопросу. Они указывают в этой статье на то, что Ройял Фестивал Холл построен по новому методу строительно-акустической техники, целью которого является получение полноты тона, совместно с точностью воспроизведения и равновесием интенсивности звука от различных частей оркестра, во всех частях аудитории, независимо от их положения по отношению к эстраде. В статье описываются средства для достижения этой цели, которые были здесь применены, равно как и использованные здесь методы изоляции концертного зала от шума поездов и уличного движения, и других звуков доходящих извне, а также методы звукоизоляции различных частей здания друг от друга. Общая форма постройки была обусловлена, главным образом, строительно-акустическими требованиями. На этот счет теория не дает достаточно определенного руководства. В частности, она не дает достаточных данных для определенного выбора между параллельными и расходящимися стенами; было найдено, однако, что первый метод имеет лучшую репутацию по отношению к музыкальной акустике чем второй. Повидимому, наиболее подходящей формой для продольного разреза концертного зала является такая, при которой места для слушателей как бы расположены на склоне большего, но относительно пологого, холма, а места для оркестровых исполнителей лежат на склоне меньшего, но зато более крутого, холма, а между этими двумя „холмами" находится ничем не заполненное углубление. При такой схеме каждый слушатель, где бы он ни сидел, сможет видеть каждого оркестрового исполнителя. Эта-то схема и была здесь применена. Некоторые нововведения применены были также в устройстве оркестровой эстрады. Так, например, три первых ступенчатых ряда могут быть частью сняты, чтобы дать место для рояля, когда это требуется. При этом глубина эстрады не превосходит максимума в сорок футов, соблюдение которого необходимо для того, чтобы оркестр сохранял единство звукового воспроизведения. Требуемая для этого экономия пространства достигнута благодаря устройству пюпитров в промежутках между рядами оркестрантов, вместо обычных треножников, которые занимают много места. Над эстрадой устроено вогнутое перекрытие („балдахин"), имеющее двоякое назначение: во-первых, отразить часть звука обратно к оркестру, так чтобы каждый оркестрант мог его слышать и соответственно приноровить свою собственную игру, а во-вторых, чтобы увеличить силу звука доходящего до задних рядов. Из числа звукопоглотителей, примененных в этом здании, наиболее интересными является вязовые панели на стенах. Панели с воздушными промежутками между ними и стенами применялись и раньше, и им многие концертные залы в значительной мере обязаны высоким качеством своей акустики. В данном случае, однако, конструкция спроектирована на основании предварительных экспериментальных исследований, благодаря которым удалось достичь значительных улучшений. Среди других звукопоглотителей заслуживают внимания плиты из „древесной шерсти" около двух дюймов толщины, уложенные у карнизов и резонаторы Гелмгольца, вделанные в потолки. В отношении звуко-изоляции, было уже найдено, что в новый концертный зал проникает не больше звуков извне чем в другие концертные залы, расположенные в больших городах, несмотря на близость Хангерфордского („Голоднобродского") железнодорожного моста. Для того, чтобы этого достигнуть, все наружные стены концертного зала сделаны двойными. Точно также двойным сделан потолок концертного зала всюду, где он непосредственно лежит под крышей. Наряду с этим широкое применение дано звукопоглотителям для перехватки звуков проникающих извне, как это сделано для предупреждения нежелательного отражения звуков от стен (предупреждения „внутреннего эхо"). Одной из трудных проблем внутренней звуко-изоляции является предупреждение проникновения музыки из большого концертного зала в малый и обратно. Эта задача была решена путем подвески остова фойе малого зала на трубчатых колоннах, надетых на основные колонны, поддерживающие главный концертный зал, и покоющихся на асбестовых прокладках, лежащих на фундаментах этих основных колонн. Этим путем достигнута тесная конструктивная смычка этих остовов, сохраняя, в то же самое время, требуемую для удовлетворительной звукоизоляции степень взаимной независимости относительного их движения.

THE ARCHITECTURAL REVIEW

SPECIAL ISSUE: ROYAL FESTIVAL HALL

Robert H. Matthew and J. L. Martin, Architect and Deputy Architect to the London County Council; Edwin Williams, Senior Architect; Peter Moro, Associate Architect

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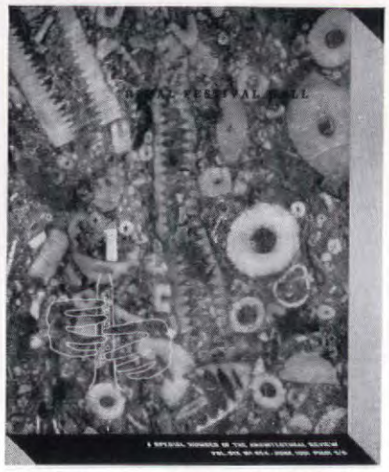

The Cover shows the *genius loci* of the Royal Festival Hall as it manifested itself to Gordon Cullen while he was examining the Derbyshire marble walls of the foyer. This fossiliferous limestone, of a brownish-grey colour, is used to face the outer walls of the auditorium wherever they can be seen inside the building, and externally on the river front.

The Architects ROBERT H. MATTHEW, born 1906, architect and town-planning officer to the London County Council since 1946; previously chief architect and planning officer to Department of Health for Scotland; trained Edinburgh; Pugin Student, 1929; Soane Medallist 1932; Arthur Cates Prizeman, 1932; RIBA Bossom Gold Medallist 1936; member of RIBA Council. J. L. MARTIN, born 1908, deputy architect to the London County Council since 1948; previously deputy architect, LMS railway; trained Manchester University; Soane Medallist, 1930; head of Hull School of Architecture, 1935-40; author (with wife Sadie Speight) of *The Flat Book*; co-editor of *Circle*. **The Authors** W. A. ALLEN, born 1914. Took B.Arch. (Hons.), Manitoba, Canada, 1936. Came to England in 1936; spent a short period with L. de Soissons at Welwyn Garden City, and then joined the Building Research Station, Watford, on acoustical work. Now Acting Head of Architectural Physics Division at Building Research Station. P. H. PARKIN, born 1917. Took degree BSc (Hons.) in electrical engineering at London University. Served at the Admiralty during the war, doing scientific research in counter-measures for under-water mines. Joined the Building Research Station, Watford, in 1946 in charge of the Experimental Acoustics Section of the Architectural Physics Division.

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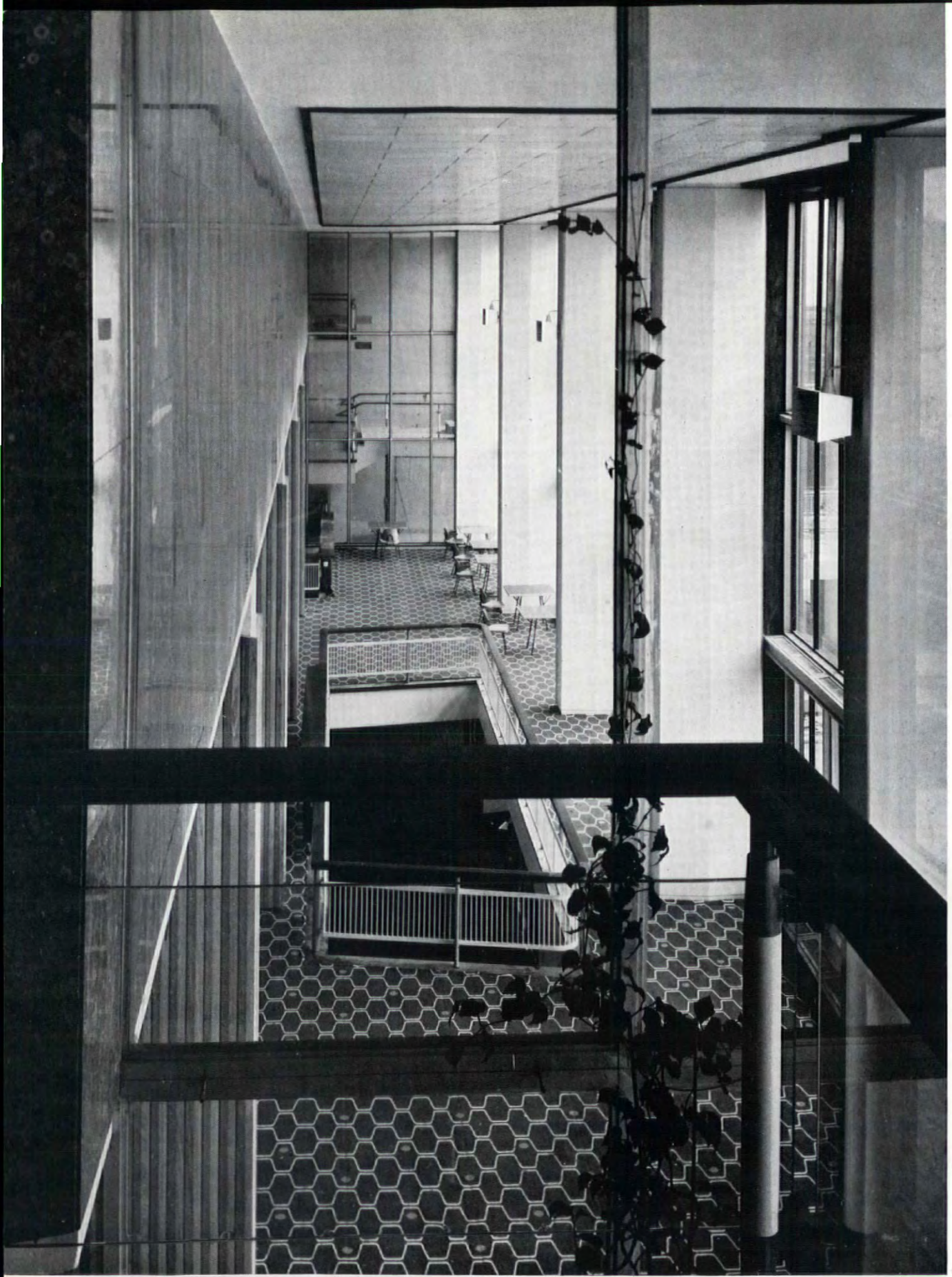
THREE SHILLINGS AND SIXPENCE



The most remarkable quality of the interior of the Royal Festival Hall is the sense of space created by the transparency of the internal subdivisions. This photograph is taken from the half-landing of one of the main staircases, looking down through a glass screen into the upper restaurant. Beneath the well in the centre is the lower restaurant. On the left is the polished marble wall of the main auditorium and on the right, between the piers, are windows looking on to the river, through which the solid bulk of the auditorium can be seen from the outside.

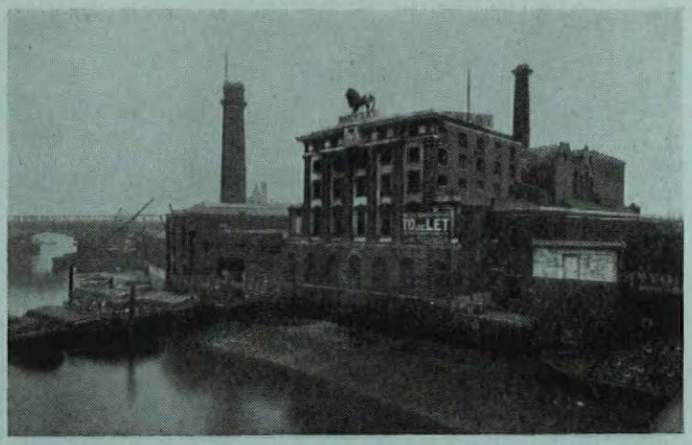
FOREWORD

FOR many years the London County Council have been making plans to bring the South Bank of the Thames into a more active relationship with central London, which it adjoins but in the life of which it has had but little part for at least a couple of centuries. The airview on page 341 shows the situation of this long neglected area on the inside of the curve of the river. Bridges link it equidistantly to Westminster and the eastern end of the Strand, the City is reached nearly as directly and on the south-east is Waterloo Station, one of the biggest London railway termini. Yet in spite of its key position in the London plan the South Bank is unknown territory to most Londoners, to whom the river seems to remain a psychological, though it is nowadays hardly a physical, barrier.

Monogram engraved on the glass of the external doors. Designer, Jesse Collins.

It is one of the responsibilities of the LCC to break down this barrier and, with the aid of good planning and a proper liveliness of architectural character, to lure Londoners over the river into an extension, as it were, of the West End. The Council set themselves this task when they designated the area between Westminster and Waterloo bridges, occupied by obsolete or even derelict industrial buildings and sub-standard housing, as London's future cultural centre—it was marked as such on the Abercrombie-Forshaw plan prepared during the war—and they took an important step towards solving it successfully when they conceived their concert hall (the subject of this issue) as a multi-purpose building suitable for a variety of occasions in addition to—and at the same time as—musical performances, with a restaurant occupying its river front and gardens and terraces overlooking the water on to which the restaurant can extend in summer weather, taking advantage of the magnificent views the site affords.

That is a brave beginning which should contribute much to the gaiety of London. May the rest of the South Bank project be carried out in the same spirit. There are to be, it is known, a national theatre, an hotel, several blocks of government offices and other buildings, and it is of vital importance that these be designed and laid out in such a fashion as to promote that liveliness of character throughout the area without which it cannot effectively perform the role assigned to it in the new plan of London. For example the blocks of government offices must not be the conventional cliffs of Portland

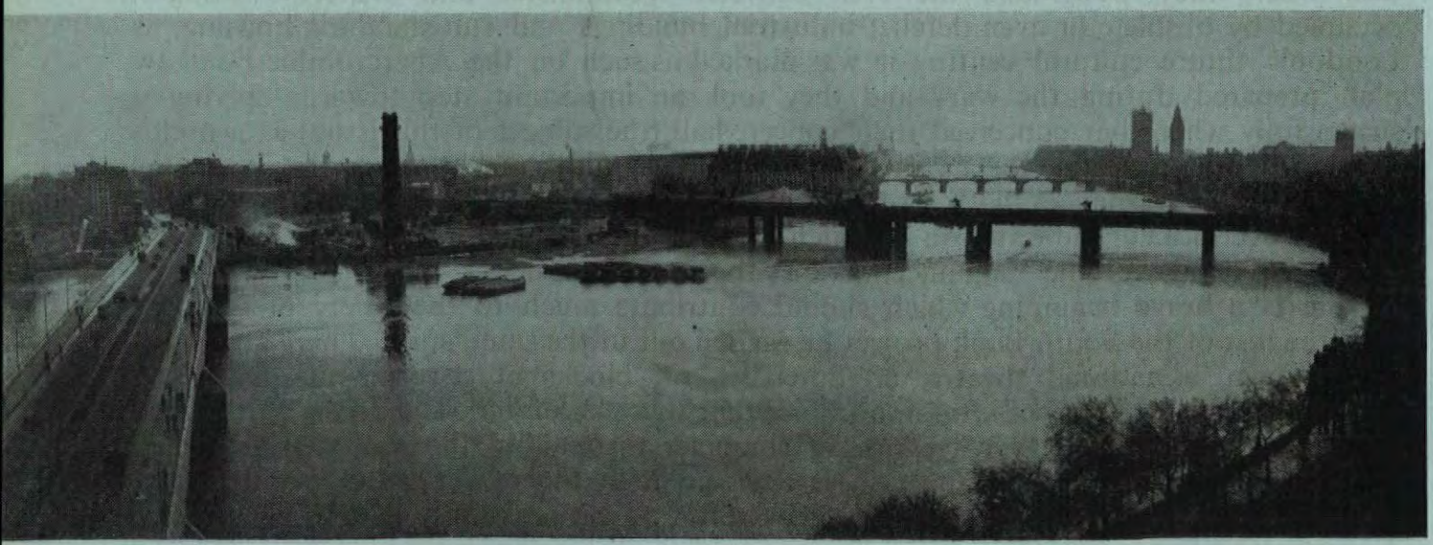


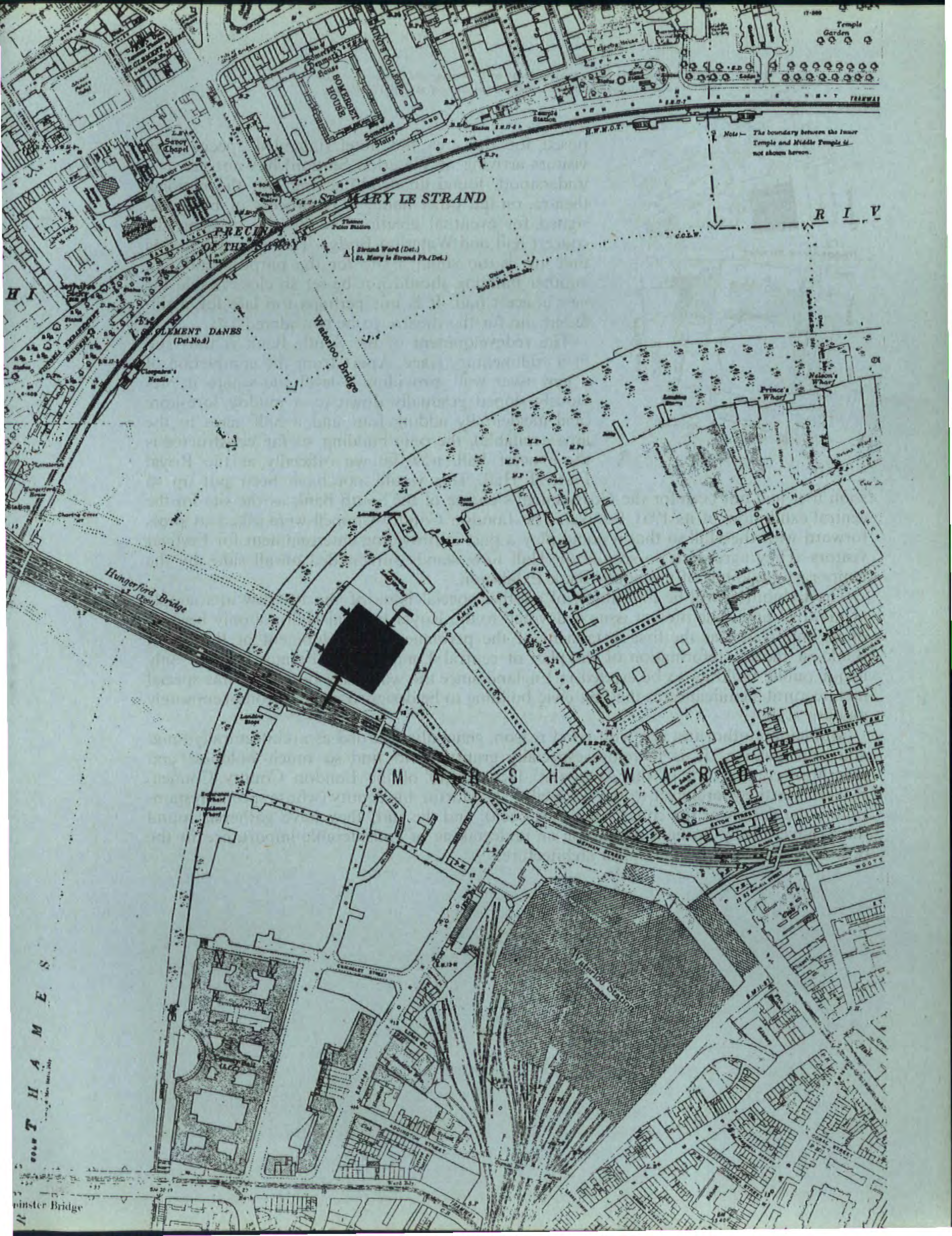
Right, the old Red Lion Brewery, a familiar London landmark, shown before its demolition to make way for the Royal Festival Hall. The lion on top, which is of Coade stone, has been preserved and temporarily re-erected to mark the site of the Festival Hall booking offices in York Road. Beyond the brewery and the other obsolete industrial buildings is the shot tower, now incorporated in the exhibition but doomed to disappear soon since it occupies the site allocated to the national theatre. Foot of page, the South Bank photographed in April 1949, after demolition of the old buildings but before work on the concert hall or the exhibition had started. The site of the concert hall is the flat area between the shot tower and Hungerford railway bridge, the proximity of which posed exceptionally difficult problems of sound exclusion. Facing page, the Royal Festival Hall, with its approaches marked by arrows superimposed on an ordnance map of the South Bank area showing the confusion of narrow streets and derelict factories that previously occupied the site. The black line parallel with the river bank between high and low tide marks shows the position of the new river wall from which the terraces in front of the concert hall are built up, providing London with a new riverside promenade.

stone, silent after six p.m., past whose shuttered windows visitors from the hotel and patrons of the concert hall grope their way towards livelier night-time scenery on the other bank of the Thames. This would cast a blight over the whole South Bank. Life in the streets and lights and gaiety after dark could be ensured by giving over the lower floors of these buildings to shops and cafés—which, as with the concert hall, could spread themselves in summer over the riverside gardens—leaving the civil servants to occupy an appropriately superior position in as many floors of offices as might be needed above.

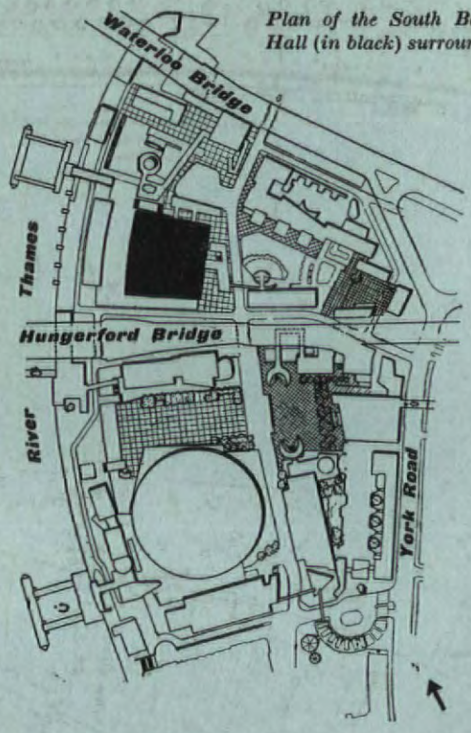
No doubt ideas of this kind will be considered as plans for the development of the area approach finality.* At present these plans are still indeterminate. Immediately after the war a consultant was appointed to design a detailed layout, but his plan has neither been approved nor published and such work as has been carried out is not in accordance with it, so it must be assumed that it has been rejected. The placing of the various buildings in the area and the programme for constructing them are thus still in the melting-pot and are likely to remain so to a great extent until large-scale expenditure of capital is possible and certain vital decisions can be taken, such as those determining the proposed replacement by a new road bridge of the present Charing Cross railway bridge which divides the area into two. Of the buildings definitely pro-

* The planning of the new government offices is in the hands of the Ministry of Works (to whom the LCC has leased the area immediately down-river from County Hall). It is hoped that on this occasion the Ministry will show real enterprise, qualities in respect of which they have a much poorer record than the London County Council.





Temple Garden
SOMERSET HOUSE
KING'S COLLEGE
Somerset Stairs
Temple Station
Savoy Chapel
Note— The boundary between the Inner Temple and Middle Temple is not shown hereon.
ST. MARY LE STRAND
PRECINCT OF THE SAVOY
Thames Police Station
Strand Ward (Det.)
St. Mary le Strand Ph.(Det.)
R I V
ST. CLEMENT DANES
(Det.No.8)
Cleopatra's Needle
Waterloo Bridge
Prince's Wharf
Nelson's Wharf
Charing Cross
Hungerford Bridge
U P P E R G R O U N D
M A R S H W A R D
T H A M E S



Plan of the South Bank redevelopment area showing the Royal Festival Hall (in black) surrounded by the temporary buildings of the 1951 exhibition.

posed for the area the hotel (intended specially for visitors arriving at Waterloo Station) has not yet, it is understood, found financial backing, but the national theatre, on the other hand, is in process of being designed for eventual erection on the site between the concert hall and Waterloo Bridge. There is some feeling that this is too small a site for the purpose and that another building should not be set so close beside the new concert hall. It is not perhaps too late for a different site for the theatre to be considered.

The redevelopment of the South Bank is thus still in a rudimentary stage. Apart from the completion of a new river wall, providing a level site where it previously sloped gradually down to a muddy foreshore (and incidentally adding four and a half acres to the area available), the only building so far constructed is the concert hall, now known officially as the Royal Festival Hall. This would not have been put up so soon if it had not been for the Government's choice of the South Bank as the site for the central exhibition of its 1951 Festival. The London County Council were asked to press forward with the Hall so that it could play a part in providing entertainment for Festival visitors. They agreed to do so and the Hall now stands surrounded on all sides by the temporary buildings of the South Bank Exhibition.

The Exhibition will be the subject of another special issue of the REVIEW in a couple of months' time. The present issue is devoted to the Royal Festival Hall not only because of its importance as the first instalment of the permanent redevelopment of the South Bank—a radical reformation of the plan of central London—but because it is the only major public building to be erected in England since the war; also because it has special architectural significance as the first civic building to be designed in an uncompromisingly modern style.

Municipal authorities are, with good reason, generally regarded as architecturally timid and conservative. It is therefore especially gratifying to find so much boldness and enterprise coming out of the Architects' Department of the London County Council. Robert Matthew, architect to the Council, J. L. Martin, his deputy (whose special responsibility the design of the concert hall has been), and the staff they have gathered round them, have jointly brought to fruition an undertaking of considerable importance in the post-war development of English architecture.

1, air view of the South Bank, taken from the direction of Westminster during the final stages of constructing the exhibition buildings by which the Royal Festival Hall is temporarily surrounded. In the foreground, Westminster Bridge and County Hall; in the centre, Hungerford railway bridge and Waterloo Bridge (the concert hall is between the two); to the right, Waterloo Station; in the background, the City, punctuated by the spires of Wren churches and the dome of St. Paul's, and merging in the hazy distance into the East End of London. The concert hall and exhibition are thus linked with the main centres of London—visually and topographically—by the River Thames, London's ancient highway.

2

2, looking up at the Hungerford Bridge side of the building. On the left are the glass lens windows, in a frame of Portland stone, that light the side promenades and bars at mid-stalls and upper stalls level. On the right are the small windows of the rear staircases. The wall surface is of pale blue and white tiles.

ROYAL FESTIVAL HALL

From all sides of the building there are dramatic views up and down the Thames, which have been fully exploited in planning the foyers and promenades. Below is the panorama of London, as seen from balcony level. 3, from the roof-garden, looking across the Hungerford railway viaduct towards Whitehall Court on the far side of the river. 4, from the promenade which links the two balcony foyers across the river front of the building. 5, from the roof-garden on the City side, looking past the shot tower to Waterloo Bridge.

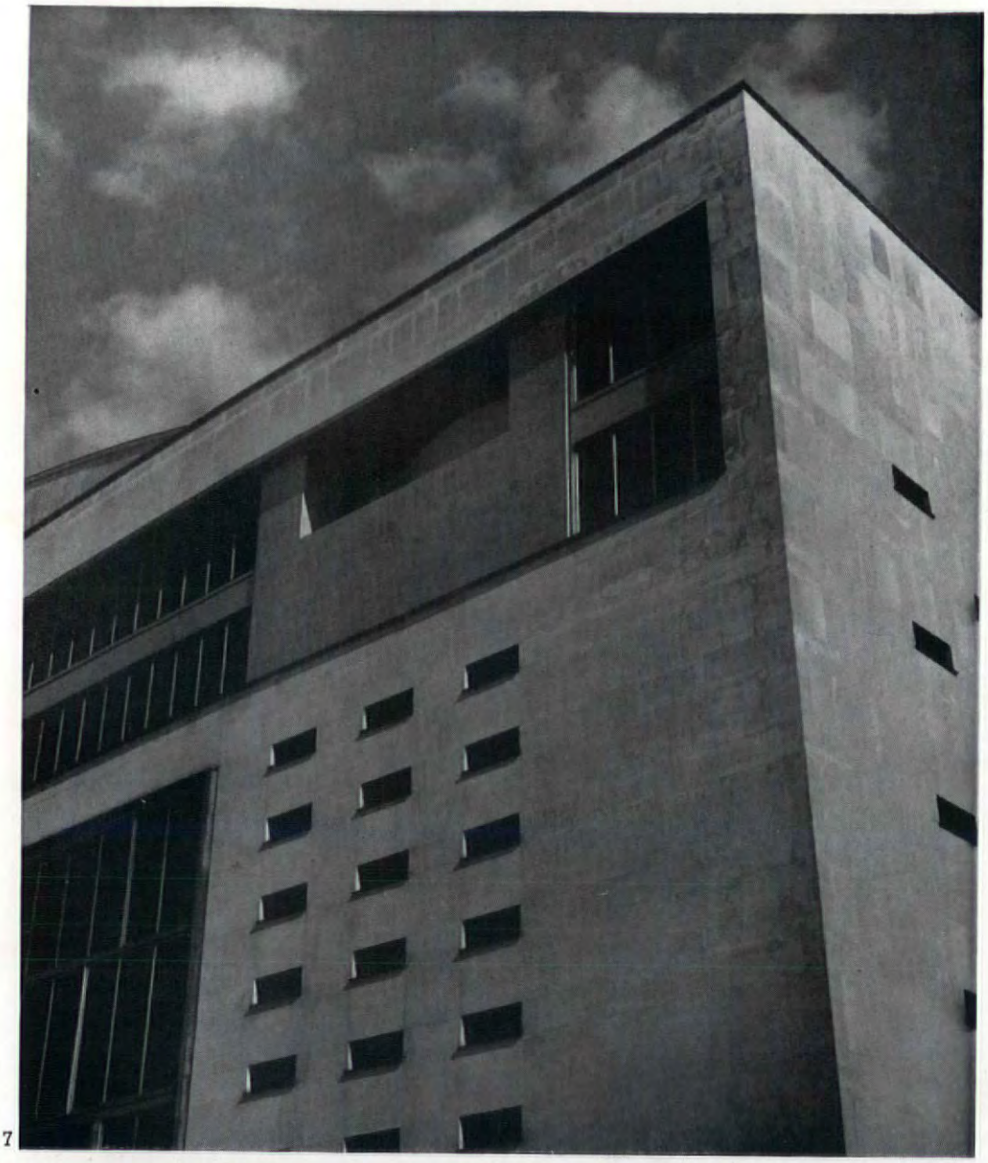
3

4

6

6, the river front from Hungerford Bridge. On the left is the shot tower and in the foreground the new river wall surmounted by some of the temporary structures, still unfinished when the photograph was taken, of the South Bank Exhibition. The large central window lights the upper restaurant and main staircases; above are the long windows of the upper stalls and balcony promenades (from which the views below are taken) and above these the curved roof and marble-faced gable-end of the main auditorium.

5



7

9

10

Two views looking up at the centre of the river front. 9 is taken in the daytime and 10 at night, to show the effect of the internal lighting of the upper restaurant. Floodlights illuminate the marble-faced wall of the auditorium which forms the back of the restaurant.

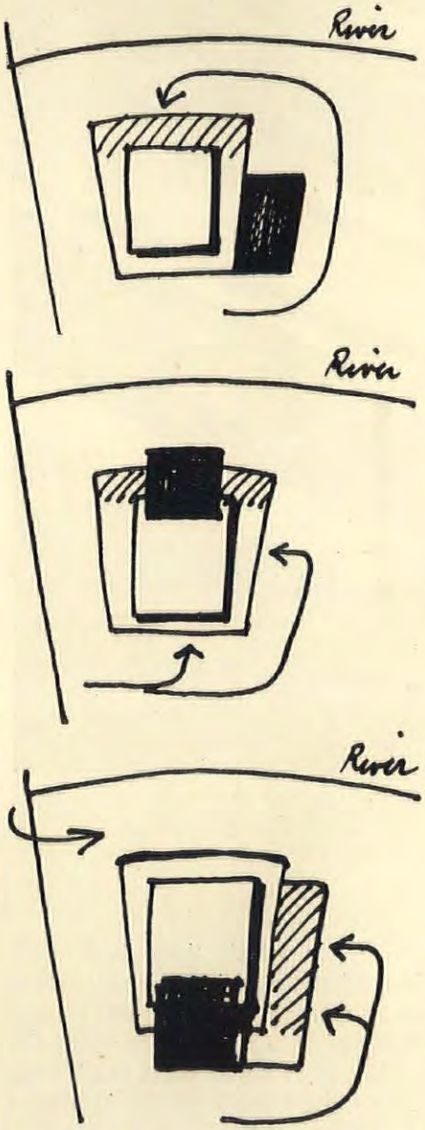
8

7, the corner of the building looking upwards from the Hungerford Bridge end of the riverside terrace. On the left are the windows of the upper restaurant and main staircases; above are those of the upper stalls and balcony promenades. The small windows light the escape staircases. The wall surface is Portland stone. The recessed panel at the head of the escape stairs is faced with reddish brown tiles. 8, looking up the external approach stairs leading from ground level to the terrace at main foyer level on the Hungerford Bridge side of the building. In the distance is the flagstaff on the riverside terrace; on the right is the foyer entrance.

accommodation The accommodation that the architects of the Royal Festival Hall were asked to provide by the London County Council consisted of a large auditorium (to be used primarily for orchestras and choirs and to hold at least 3,000 people), a smaller hall for chamber music and recitals (and occasionally for amateur theatrical performances and ballet), the necessary musicians' accommodation, foyers and refreshment bars to go with the two halls, a large restaurant (preferably facing the river), meeting rooms and an exhibition gallery. These had to be planned in such a way that each element could be used separately or in combination with one or more of the others; therefore each had to have its own independent access. The small hall and exhibition gallery have yet to be built.

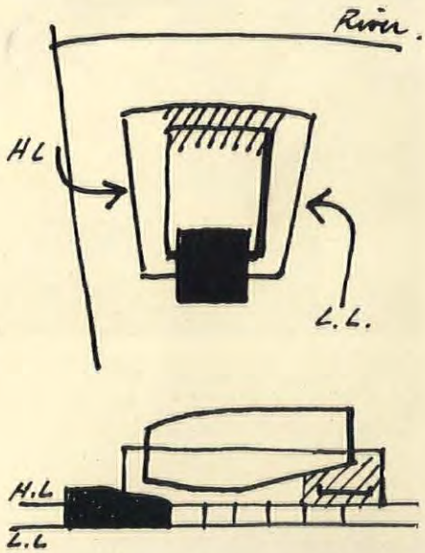
planning and circulation The site is not large, and the method the architects have used to obtain plenty of circulation space is to spread the main foyer over almost the whole area of the building, raising the main auditorium above it. Several of the many alternative methods of solving this problem that were considered and discarded are shown in the series of diagrams alongside. The method chosen has the added advantage that simultaneous access to both sides of the auditorium can be provided from a number of staircases rising from the same foyer, thus simplifying the distribution of an audience to their proper seats, and that by surrounding a central auditorium with a series of promenades and subsidiary foyers extra protection is given against the intrusion of noise from outside.

The level of the main foyer, running beneath the auditorium, is the same as that of the terrace which has been built up along the river front, following the construction of the new river wall. This enables the foyer to open straight into the restaurant, which occupies the whole river front of the building, and the restaurant in turn to open on to the terrace, a portion of which is partially screened off by planting, to serve as an outdoor restaurant. The restaurant can thus form one unit with the main foyer, when the latter is used for receptions and the like. The foyer is, however, provided with its own bar. There is a second restaurant over the first, which is similarly linked to the foyers and promenades at the level of the lower stalls entrance to the auditorium. The two restaurants are linked together by an internal staircase, and the upper restaurant can also be entered directly from an outside staircase rising from the riverside terrace.

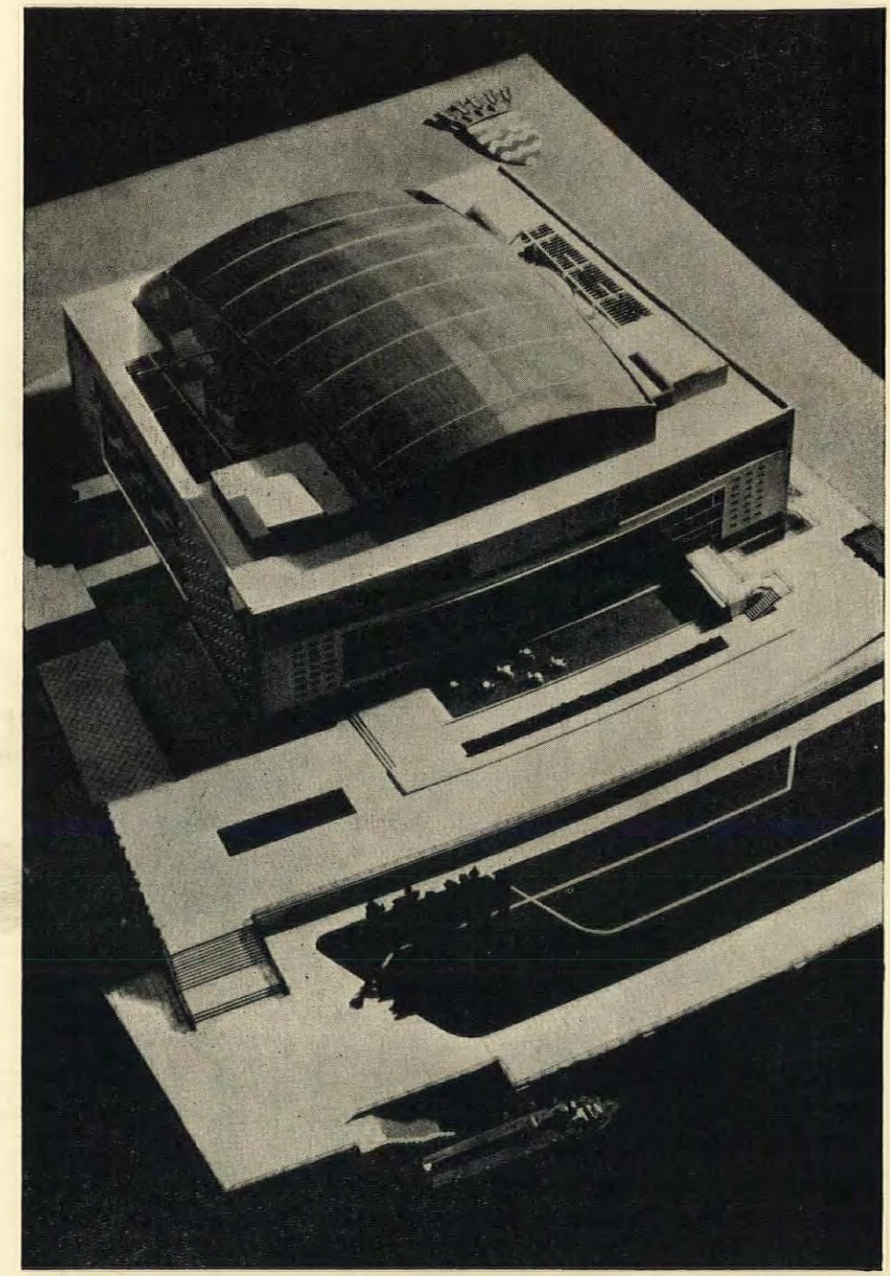


Three rejected arrangements. Top: two halls side by side on one level. Difficulties arising are site coverage, small foyer, problems of escape stairs and access for theatre scenery. Centre: two - level arrangement with one hall above the other. Convenient access to large hall from road at rear and to small hall from side. Difficulty of blocking view at terrace level by theatre stage and of access to this for scenery, etc. High level restaurant. Bottom: two-level arrangement of halls as above, with side access foyer and restaurant over. Asymmetrical arrangement; some site advantages but unsuited to internal planning where escapes and access are essentially balanced.

The future small hall and exhibition gallery are planned at the rear, the hall being placed beneath the orchestra platform of the main auditorium, and the gallery across the top of the building with a rehearsal room (reproducing exactly the lay-out of the orchestra plat-



The selected arrangement, with halls above and below a common foyer, gives convenient high level and low level access to centre of accommodation. Restaurant and promenades have uninterrupted views of river and a balanced circulation is ensured. The section shows how in this arrangement halls and foyer are related. Immediately below the main auditorium is the foyer, with the restaurant on two levels on the right and the small hall at a lower level on the left.



A model of the building, illustrating the essential basis of the design: a centrally placed auditorium surrounded by foyers and galleries to give all-round access and at the same time protect the auditorium from external noise. This model shows an early version of the design, indicating how the same basic conception was present in the architects' minds almost from the first.

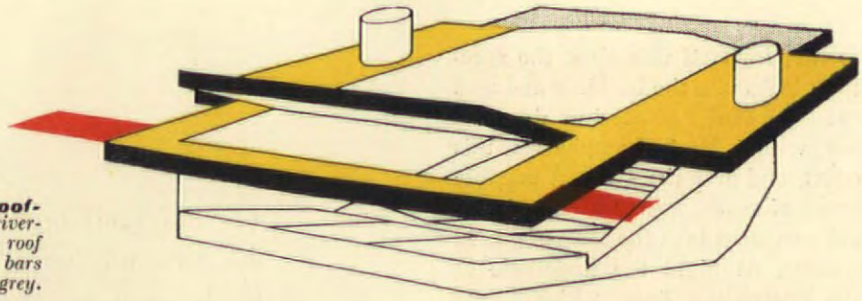
The diagrams opposite illustrate the multiple uses for which the Royal Festival Hall is planned. Each represents one horizontal plane of the building, and the colours show how general circulation and the use of the whole interior as one—for instance when a musical festival takes place—is combined with the possibility of each element—the auditorium, the foyers, the meeting rooms, the restaurants and so on—being used independently.

form) and additional musicians' accommodation between. It is hoped to begin work on these as soon as the South Bank exhibition is over. Meanwhile the building is finished at the rear by a temporary wall, and additional musicians' accommodation is temporarily provided by partitioning off part of the upper foyers.

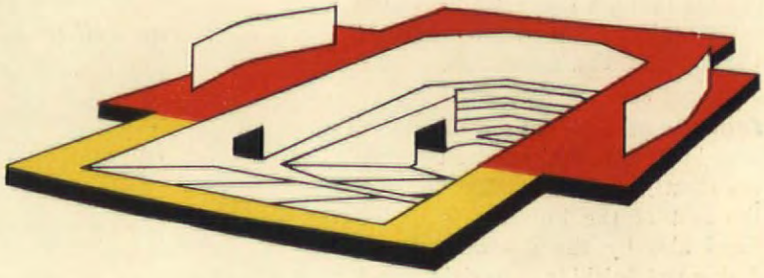
access to auditorium The main auditorium is entered at four different levels, each of which has its own system of foyers, promenades and bars: lower stalls level, at which the two side access foyers are linked by a gallery, with a coffee bar, from which there is a view down into the main foyer; mid-stalls level, from which access is also obtained to the side galleries of the auditorium; upper stalls level, with access also to the lower tier of boxes; and balcony level, with access to the upper tier of boxes. At both upper stalls and balcony level the side access foyers are linked across the river front of the building by a promenade above the restaurant, the balcony promenade having its own bars.

At upper stalls level also are placed the meeting rooms, linked at one end with the foyers already mentioned and at the other with staircases for use when they are employed independently. The meeting rooms will eventually link up also with the exhibition gallery which will run across the rear of the building. Above the meeting rooms, at balcony level, are roof gardens forming an extension of the balcony foyers.

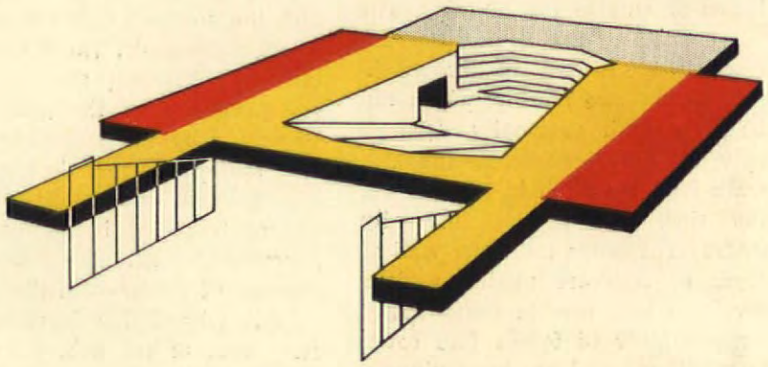
stairs and entrances All these levels are reached from the main staircases rising from the main foyer, which flank the restaurant at either side. Alongside these are the batteries of escape stairs. Planned within a solid-walled tower, as the fire regulations require, these form a solid corner at either end of the river front. The staircase towers also contain lavatories at each foyer level. There is a lift in each tower, and a special lift for musical instruments, which can also be used by invalids in wheeled chairs. Musicians' and service entrances are at the side of the building beneath a terrace which gives direct access to the main foyer from Hungerford Bridge. In the corresponding position at the other side is the main entrance for people arriving by car. A car park beneath the riverside terrace has space for fifty cars. Schemes have been worked out for



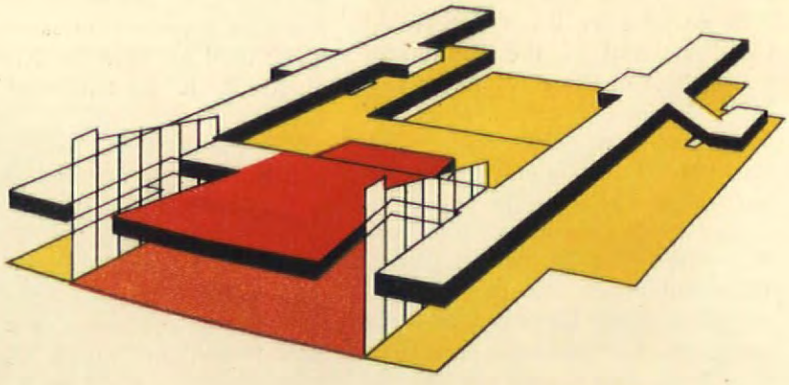
balcony and roof-garden level: *river-front promenade and roof gardens in yellow; bars in red; service area in grey.*



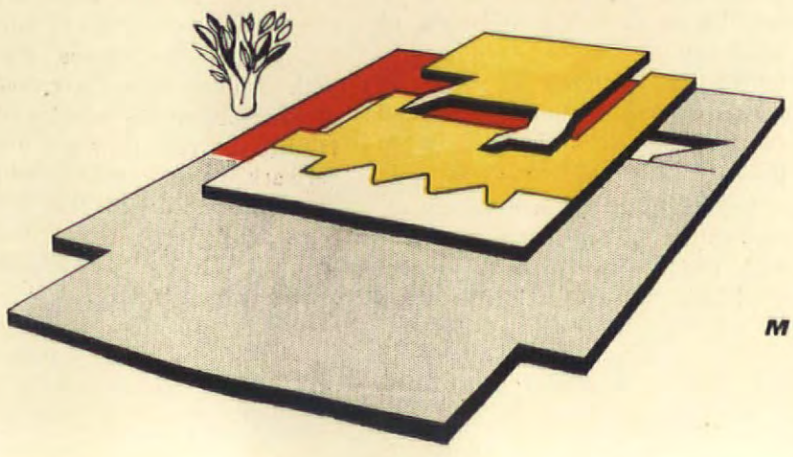
back stalls and meeting-room level: *circulation (river-front promenade) in yellow; meeting-rooms and future exhibition gallery in red. The latter are accessible either from the promenade or from a special entrance at the rear of the building and can therefore be used separately even when the auditorium is in use.*



middle stalls level: *circulation areas in yellow; bars in red; musicians' accommodation in grey.*



main foyer and front stalls level: *foyer (shown yellow) serves dual purpose of circulation and assembly space for audience, and of hall for receptions, etc. When used for receptions it can be linked with upper restaurant (shown in red), while lower restaurant (red on yellow) operates independently, and half landings can provide space for dancing. Alternatively two restaurant levels can be closed off from foyer (which has its own bar) and linked by internal staircase. Upper restaurant can also be related to circulation from front stalls of auditorium.*

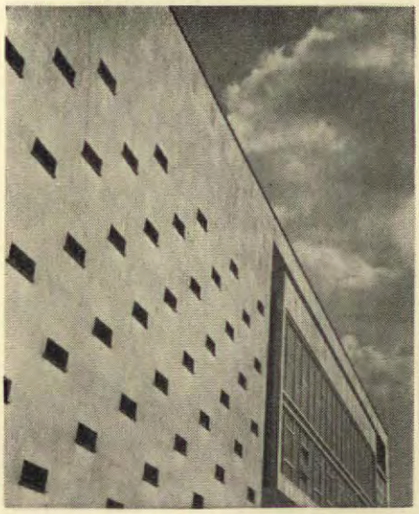


lower foyer level: *main entrance vestibule (and entrance to future small auditorium) in red; cloakroom space and half-landing (access to main auditorium) in yellow.*

increasing the parking accommodation after the Festival.

From the main entrance a large vestibule (off which are the concert booking offices) leads to a lower foyer with cloakrooms. Thence a short flight of stairs leads to the main foyer from which access to all parts of the building is obtained in the manner already described and illustrated in the set of diagrams on page 347. The set of diagrams on the facing page shows how the various elements in the plan can be used in combination or independently.

construction and materials Almost the whole structure of the building is reinforced concrete (see notes on the construction on page 389), the auditorium being carried on a series of circular reinforced concrete columns round which the main foyer with its staircases and bar and the approaches to the lower restaurant are planned. The walls and the slightly curved roof of the auditorium are of two skins of concrete with an air space between. The outer skin has an absorbent lining to prevent the transmission of noise from outside (see the special article on the acoustic treatment of the building beginning on page 377). This concrete roof is carried on transverse steel girders.



Looking upwards from the corner of the building, showing the solid wall enclosing the main stairs, pierced by small windows. Beyond are the large windows of the upper foyers and meeting rooms.

In contrast to the solidity of the central mass, the surrounding structures have been made comparatively light and as transparent as possible, so that from all directions the spectator looks into the building and sees the mass of the auditorium descending within it. To emphasize this effect, and give the greatest possible sense of space, nearly all the internal partitions take the form of glazed screens. At night the underside of the auditorium floor, which forms the ceiling of the main foyer, is illuminated, and can be seen from outside through the windows of the restaurant and the glazed screen at the back of the restaurant.

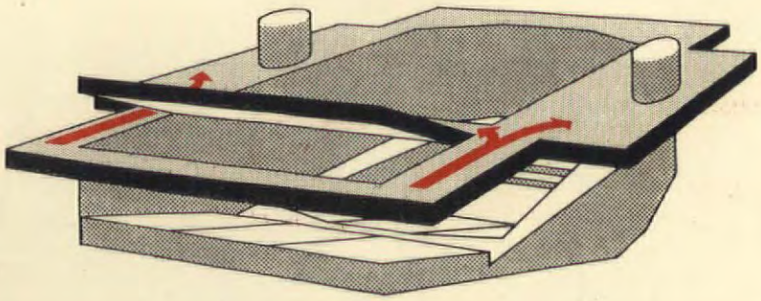
facings and finishes The difference in structural character between the stoutly enclosed auditorium and the rest of the building is underlined also by the use of different facing and finishing materials, which are in general applied consistently irrespective of whether they appear inside or outside the building. The outer walls of the auditorium, for example, are faced with a brownish-grey Derbyshire marble, which can be seen both externally (though only on the river front—the side walls have been left in concrete for the time being) and internally wherever it forms the inner wall of foyer or staircase at the various levels. It is a marble containing a large number of fossils (see cover to this issue) and has been given a high polish to bring out their decorative texture.

In contrast to the dense, dark-toned material of the auditorium walls, those of the surrounding galleries, foyers and staircases are finished with clear, bright colours, the actual structure—columns, staircases and the piers between the wide windows—being generally white and the curtain walls of coloured plaster. The main foyer beneath the auditorium is nearly all white, in order to lighten the effect of this large area with a relatively low ceiling, the circular columns being finished in a kind of scagliola giving a grey speckled surface. The windows, of teak and aluminium, are uncurtained, and richness of detail is mostly concentrated on the bars and counters where various kinds of polished wood are employed.

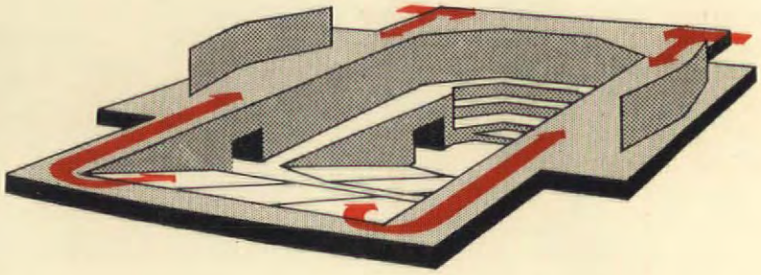
Another contrast is between the cool colours of the foyers and staircase and the warm dark colours used inside the auditorium, expressing the total enclosure of the latter and the former's relative openness to the outside air. The difference in character between the centre and the perimeter of the plan is also expressed by the treatment of the floor surface at the main foyer level. The portion underneath the auditorium is paved in stone—with a geometrical pattern formed by changes of colour—and the portions outside (those, that is to say, that form part of the subsidiary structure) are given a lighter character by enclosing wood panels in stone surrounds. At the upper levels the floors are carpeted, the same pattern being used all over the building to give unity to the public circulation space.

For the external facing of the building various materials are used to emphasize, once again, differences of structural character. The river façade, and the return walls with their pattern of staircase windows, are of Portland stone, certain recessed portions within the main framework are faced with coloured tiles and the bay windows of the lower restaurant, where the richly furnished interior breaks out, as it were, on to the terrace, are faced with strips of teak. On either flank of the building, the panel walls containing the rear staircase windows, set back within a stone-faced framework, are faced with tiles in a geometrical pattern of pale blue and white. The crowning auditorium roof is sheathed in copper.

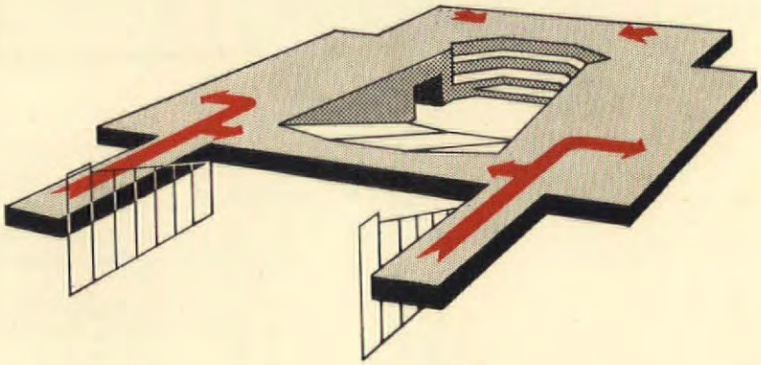
The diagrams opposite illustrate the main circulation at each level. This is designed to give separate access to each part of the building which it may be wished to use independently, as well as to provide rapid means of reaching and leaving the various levels of the auditorium and free promenading space during intervals.



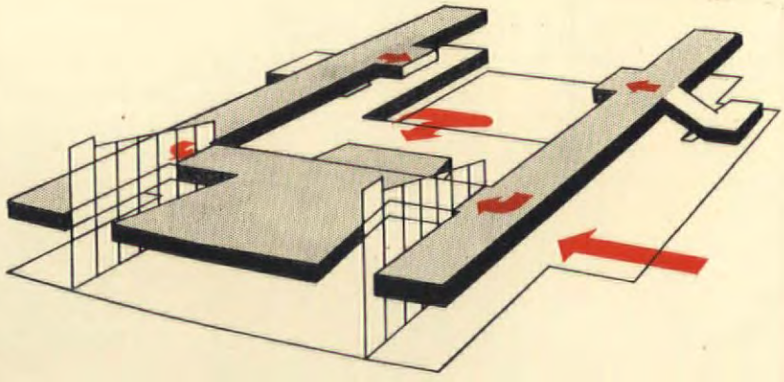
balcony and roof-garden level: *arrows show access from main stairs at either side, linked by river-front promenade.*



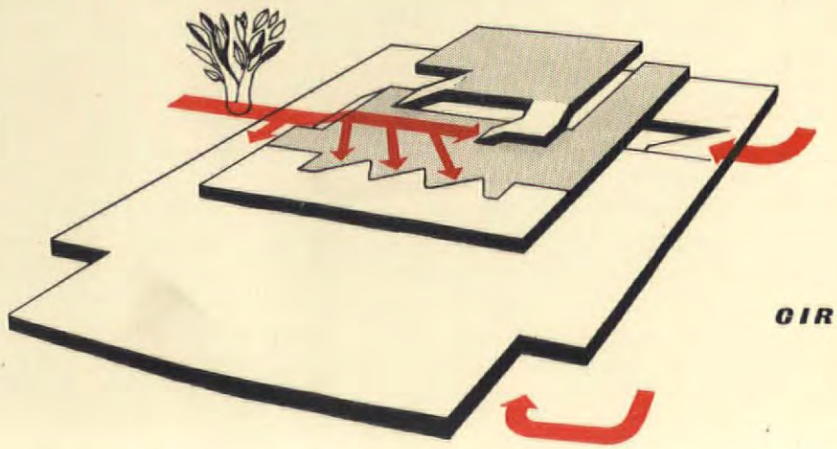
back stalls and meeting-room level: *long arrows show circulation between back stalls and meeting-rooms; short arrows show separate access at rear of building to meeting-rooms and future exhibition gallery.*



middle stalls level: *long arrows show approach from staircases to middle stalls and circulation to bars; short arrows show choir access—orchestra access is below.*



main foyer and front stalls level: *large central arrow shows approach from lower (car-access) entrance; arrow on right shows approach at upper terrace level from Hungerford footbridge (eventual main entrance if railway bridge replaced by Charing Cross road bridge)—public using either of these entrances arrive at common foyer, whence distribution of ticket holders to auditorium entrances at various levels takes place. Small arrows show access at main foyer level to promenade and restaurant (front arrows) and front stalls of auditorium (rear arrows).*



lower foyer level: *branching arrow shows public entrance from car approach and thence to cloaks before ascending to main foyer; upper arrow (right) shows musicians' entrance; lower arrow (right) shows service entrance to kitchens, etc.*

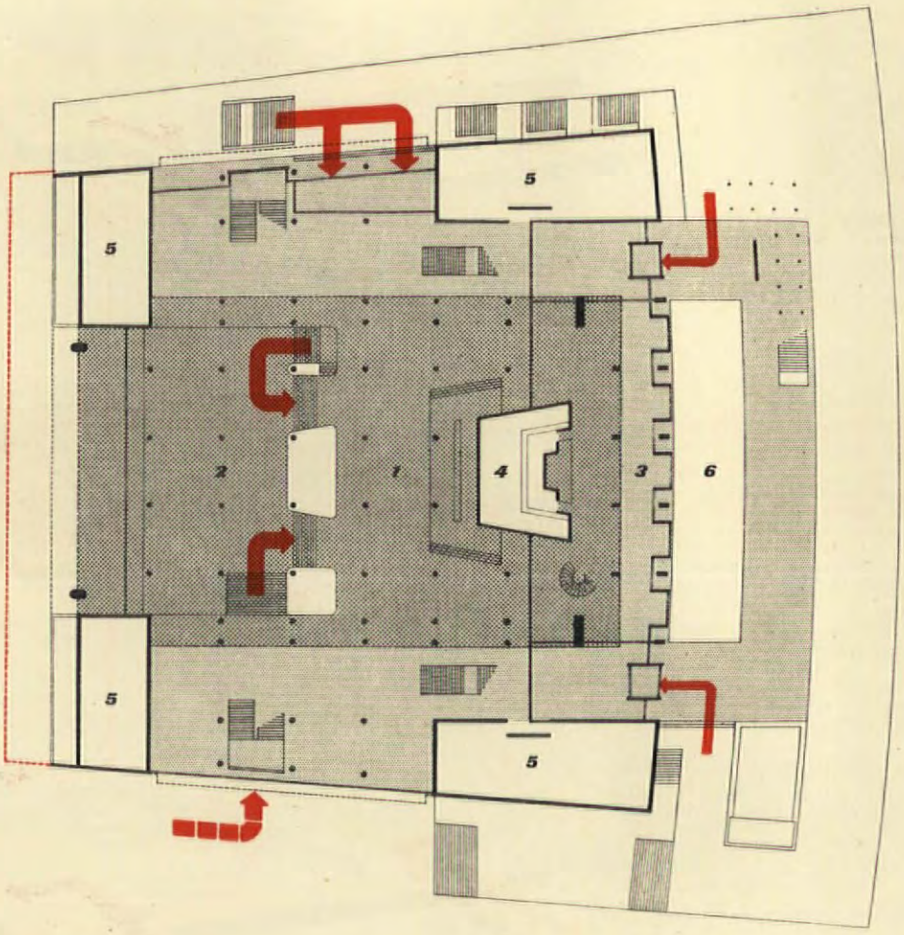
The tone on each plan covers the circulation areas.

The darker tone on the main foyer level plan (right) shows the circulation area underneath the auditorium.

The red arrows show the entrances and main public circulation.

The red lines show the future outline of the building when the portions not yet built (including the small hall and exhibition gallery) have been added.

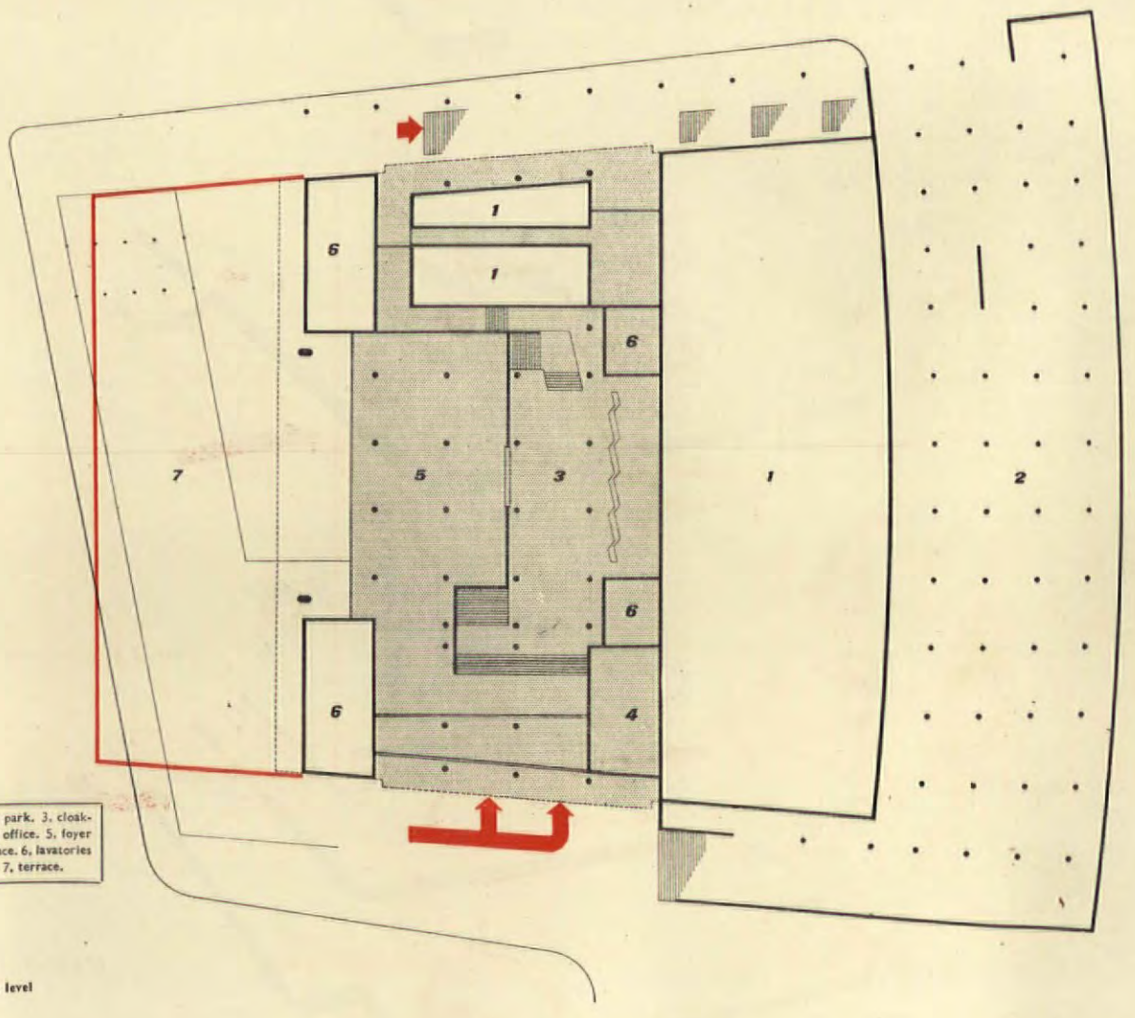
The scale of the plans is 1/64 in. to 1 ft.



key

1, foyer. 2, lower foyer. 3, restaurant. 4, servery. 5, lavatories and escape stairs. 6, terrace.

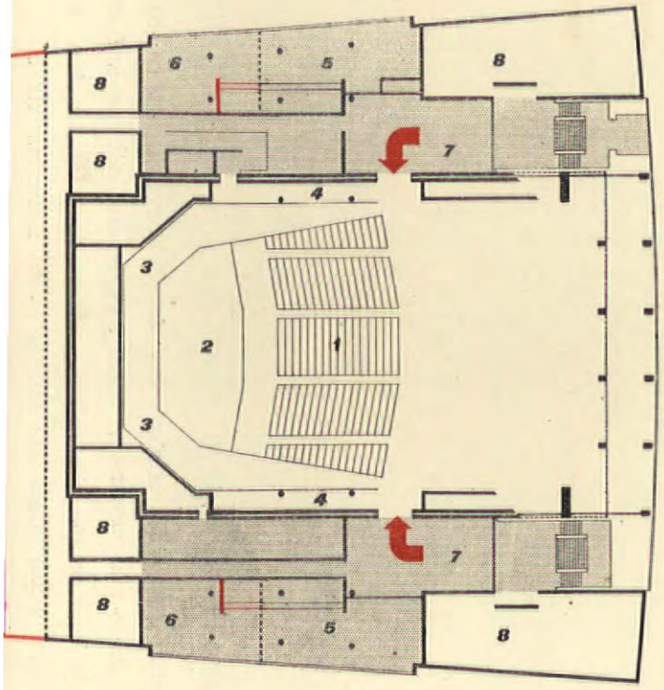
plan at main foyer level



key

1, service. 2, car park. 3, cloakroom. 4, booking office. 5, foyer and exhibition space. 6, lavatories and escape stairs. 7, terrace.

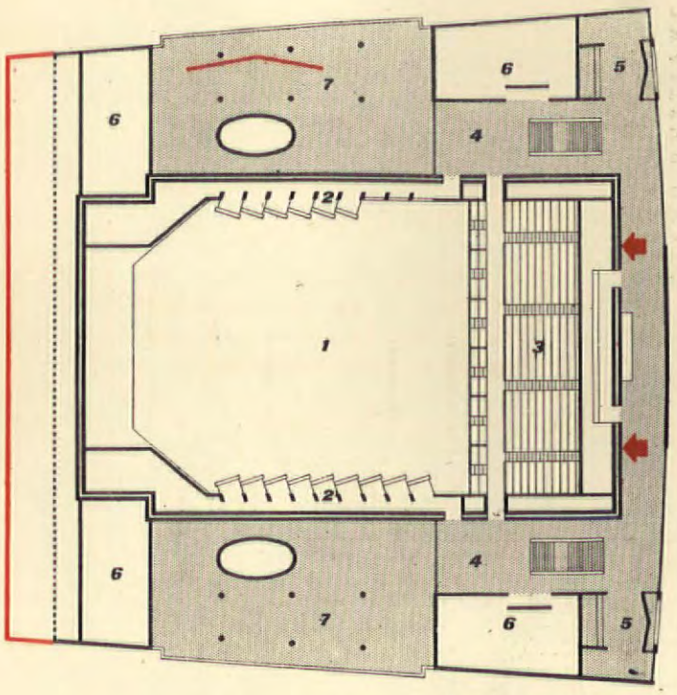
plan at basement level



plan at mid-stalls level

key

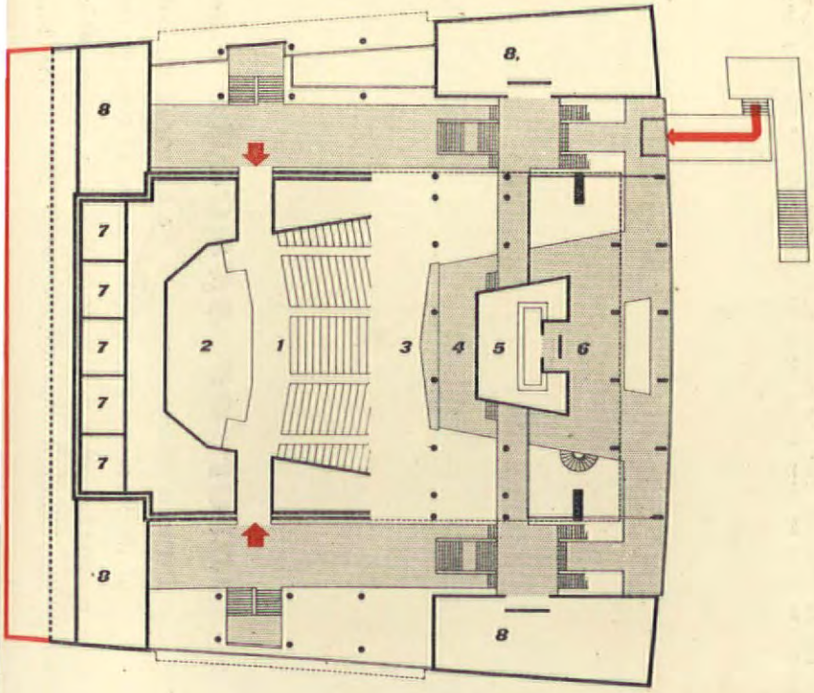
1, auditorium. 2, platform. 3, choir seating. 4, promenade or side stalls. 5, bar. 6, musicians' temporary changing rooms. 7, upper foyer. 8, lavatories and escape stairs.



plan at balcony level

key

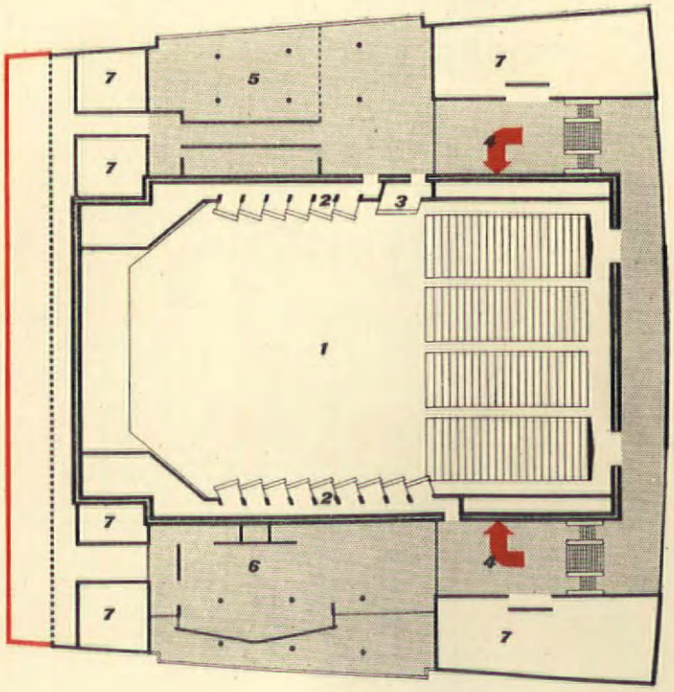
1, auditorium. 2, boxes. 3, balcony. 4, foyer. 5, bar. 6, lavatories and escape stairs. 7, roof terrace.



plan at front stalls level

key

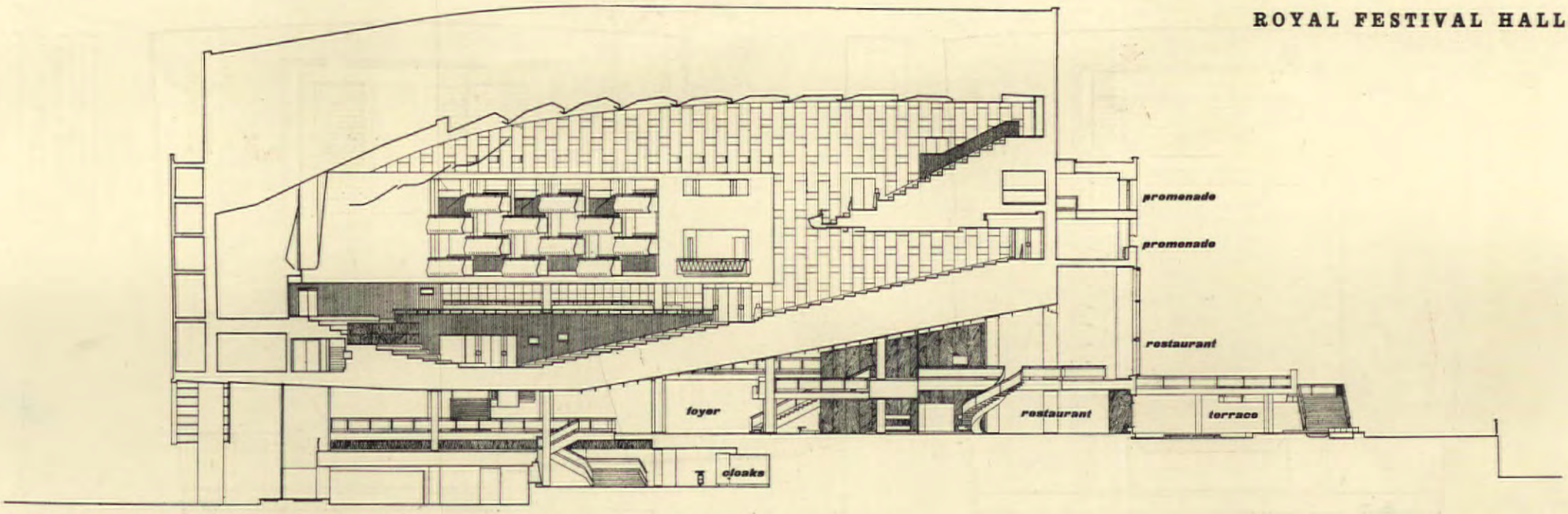
1, auditorium. 2, platform. 3, upper part of foyer. 4, balcony buffet. 5, restaurant service. 6, upper restaurant. 7, practice rooms. 8, lavatories and escape stairs.



plan at back stalls level

key

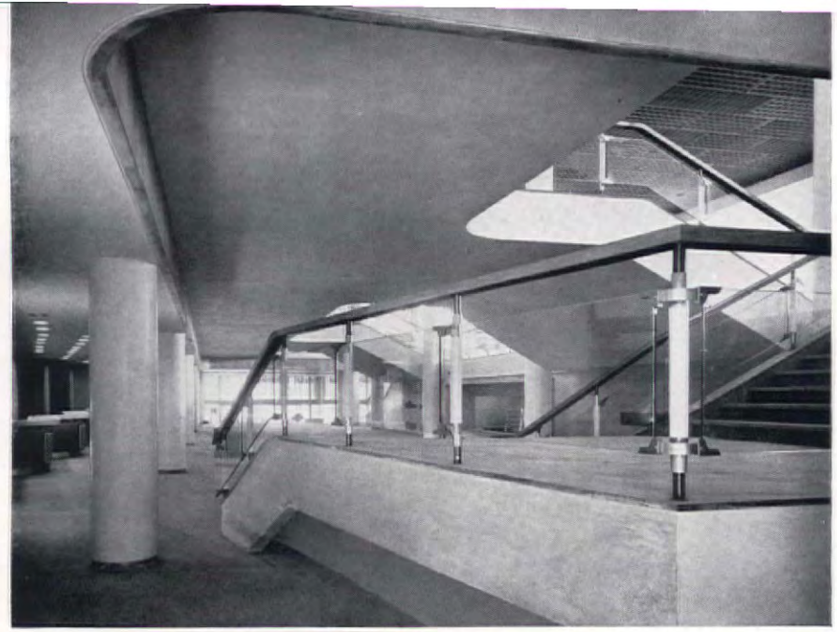
1, auditorium. 2, boxes. 3, royal box. 4, foyer. 5, musicians' temporary changing room. 6, meeting room. 7, escape stairs and lavatories.



The longitudinal section through the building shows how the auditorium is suspended above the main foyer, to which its raking floor gives a sloping ceiling. This ceiling is illuminated at night, when the structure of the building can be clearly read from outside. The main foyer level continues into the restaurant and thence on to the riverside terrace. The access foyers at the sides are linked at lower stalls level by a gallery across the back of the upper restaurant, from which a view down into the main foyer can be obtained. The two promenades, shown above the restaurants in the section, continue round the sides to form access foyers at upper stalls and balcony levels.

interior spaces: a progress through the main foyer

The most striking attribute of the interior of the building is the handling of the foyer space to provide a series of vistas up and down the constantly changing levels and through the glass screens which divide one section from another. The pictures below and on the following page show, in sequence, the series of views that unfold before the visitor who enters at the lower-level cloakroom foyer, ascends the staircase and crosses the main foyer to the side gallery, pausing again at the foot of the next staircase which would take him up to the auditorium stalls.



11, at lower foyer level (cloakrooms on the left) looking towards the main entrance. Stairs on right lead up to main foyer.

12, a right-angle turn, without moving, gives a view up the stairs to the half-landing; beyond, the rear window of building.

13, from half-way up the steps shown in 12; to the left the return of the same staircase is seen reaching main foyer level.

14, from the half-landing (top of steps seen in 12); approaching main foyer (bar straight in front) with back to rear window.

15, a turn to right at top of steps shown in 14 gives a view across the main foyer to side gallery windows; bar now on left.

16, a few steps forward, then another turn to the right gives a view across the half-landing seen in 12, back to the rear window.

17, a little further in the same direction, then another right turn and a view across foyer and staircase-well in reverse direction from 15; bar on right; on extreme left, foot of stairs leading to lower stalls entrance of auditorium.

18, a final turn to the right and a few steps back gives a view along the side gallery of the main foyer beneath the staircase shown at left in 17; just off the far left of the picture are the restaurant and the foot of the main stairs.

J. M. Richards

CRITICISM

The other pages of this issue contain an objective analysis of the design of the Royal Festival Hall, together with a technical description and a pictorial record of its several parts. In accordance with the REVIEW'S recently announced policy these are supplemented by the following critical article, which appraises the building as a finished work of architecture.

Dr. Martin and his colleagues have achieved something without precedent in this country and with very little precedent elsewhere: a modern building—modern in the sense of owing allegiance to no other age but ours—which is also monumental. Hitherto modern architecture has had little chance to aim at a monumental character, for two reasons. The first is that the kind of building programmes that should produce the architectural monuments of our time—programmes for city halls, public libraries and the like—are generally in the hands of municipal or Government authorities, who in this country are notorious for their conservative and sentimental attitude to architecture. They provide us with memorials to an old culture rather than milestones on the road that leads to the birth of a new one—notice the difference in Scandinavia, where official architecture is not afraid to set a lead. The other reason, arising out of the first, is that the categories of building which (apart from domestic buildings where monumentality is not called for) have till now been modern architecture's principal field of operations in Britain are industrial and educational; and these require, on account of their continually changing needs, a flexibility of layout and a somewhat informal and even insubstantial character, which are not in keeping with the monumental idea.

A monumental building has a fixed and a more permanent form. As architecture it is more solid—not necessarily in its structure but in the idiom it employs, which must express its symbolic as well as its functional purpose. At the moment we have no ready-made idiom of this kind which we can call our own, and modern architects cannot be expected to evolve one unless they are given a free hand when an opportunity of creating monumental architecture arises. Too often, as in the case of the House of Commons, refuge is taken in some kind of pastiche of the past on the plea that a monumental programme calls for respect for tradition. But tradition dies unless it is constantly revitalized by work derived from the present not the past. The London County Council, when planning their concert hall, fortunately showed themselves more enterprising than the general run of municipal anthorities. They gave their own architects the chance of demonstrating that the architecture of the present as well as that of the past is capable of combining functional and symbolic roles effectively.

There is a long-standing tradition that monumental buildings are symmetrical, but in the case of the Royal Festival Hall a near-symmetry arises almost inevitably from the nature of the programme, which provides for one dominant element, the great auditorium; the other elements—foyers, promenades and staircases—being both smaller in scale and dependent on the large one. They group themselves naturally round it in symmetrical fashion, because exits and crowd-space are required equally on either side. The only other largish element—the restaurant—extends across the whole front in order to take full advantage of the riverside site, and thus further strengthens the logic of a symmetrical facade. Finally, the character of a concert auditorium, planned to focus attention on one central point, the conductor's rostrum, is naturally most clearly expressed in a strongly axial design. Thus whereas many symmetrical buildings are made so by forcing diverse elements into a formal pattern, this is a rare instance of a building in which divergence from symmetry would have been the first evidence of artifice.

The great bulk of the auditorium is raised high above the ground, allowing the main foyer to flow underneath it, providing ample foyer-space on a somewhat restricted site and at the same time facilitating access from the foyer to all sides of the auditorium. The suspended auditorium is the key to the essential nature of the building, which is clearly discernible from the outside, especially when it is looked at from above. A substantial egg-like structure is suspended, as it were, in a nest of subsidiary structures. The egg-like structure is opaque and heavy-looking, a logical expression

of the great thickness of wall required to exclude noise. The subsidiary structures, in contrast, are fairly light and transparent so that the lower part of the auditorium can be seen descending within them. This effect is enhanced by the fact that its underside is sloping, following the rake of its floor. This sloping surface, forming the ceiling of the foyer, is illuminated at night and can be seen from across the river, gleaming through the glass facade. The satisfyingly simple conception of the building—that of the solid egg in a transparent box—is, however, somewhat contradicted by the complex and highly stylized modelling of the river front. The facade is treated as a frontal screen—as an elaborately worked out piece of architecture in its own right—and the eye is led, at least in the daytime, to explore its surface laterally rather than to penetrate beyond it and apprehend the significance of the three-dimensional conception.

The slightly curved river facade is in fact, in the writer's view, the least satisfactory part of a boldly conceived and interesting design, whose merits are the more remarkable considering the short time that was available for studying it in all its aspects. Much of the designing actually had to be done while building operations were already going on. There are a number of critical points to be made about the exterior, but first something more must be said of the basic conception of the building—the egg in a box idea—this time in relation to the interior. Here the architects have achieved a notable success, exploiting the spatial potentialities of the idea to the utmost. From the main foyer running underneath the auditorium, broad flights of stairs sink down to the level of the entrance hall and rise to the level of the upper foyers through which the auditorium is approached. The various levels are visible one from the other; and also visible through glass screens is the two-level restaurant that runs across the river front. Beyond, the broad windows of the outer walls give views in several directions—on to the riverside terraces, up-river to the spires of Westminster and down-river to the dome of St. Paul's. The total effect is of a complex system of imaginatively related spaces, where changes of level add interest to every vista, where low-ceilinged areas open up dramatically into spaces where the ceiling appears to rise out of sight, where sudden contrasts of light and dark bring variety into the vast interior.

A notable feature of the design is the daring and deliberate use of relatively low ceiling-heights. It might have been expected that the low ceilings of the upper foyers and main promenades, especially when contrasted with their large floor areas, would seem oppressive. They would certainly do so if the spaces were visually closed in,and there are one or two places, notably at the foot of the stairs at the main foyer level, where the structural concrete mass does seem uncomfortably close above one's head. But on the whole, since each space opens out in practice, in almost any direction that the eye cares to travel, into another space with higher ceiling or lower floor level, or into the open air, the sense of openness beyond reconciles the spectator with the small amount of space above his head, and indeed gives added value to the human scale of the enclosed space in which he is standing.

The spatial organization of these interiors is an architectural *tour de force* suffering from only one defect, which is perhaps the inevitable accompaniment of their particular virtue. The sequence of spaces, from the point of view of circulation, is not visually well defined, with the result that the planning seems to be—though it is not—indeterminate. Standing within the main foyer one has an intriguing sense of spaces opening out in all directions, but very little of that sense of being guided to move in one direction more than another, which one obtains from the classical or renaissance plan. In the classical plan, by means of the clear articulation of each element, one is shepherded in the right direction unawares. In the main foyers of the concert hall the very freedom of plan that the light, transparent structure has made possible results in almost too much freedom to move in any direction, which may prove bewildering to those unaccustomed to so much architectural emancipation.

Another notable feature of the interior—exemplifying once again the architects' insistence on the essentially simple idea on which their complex design is founded—is the consistent use of changes of material to define the nature and underline the logic of the design. The polished Derbyshire marble used on the face of the upper foyer walls is confined to those walls that form part of the central bulk of the auditorium, and the material is unchanged as the auditorium rises through the several levels of the surrounding galleries. On the other hand the columns and structural wall surfaces that belong only to the surrounding galleries are finished in white plaster. The structural parts of the building, its beams, posts, staircase spandrels and sound-proof central core are thus clearly articulated, and the non-structural walls that fill the spaces between, when they are not glazed, are equally clearly differentiated by the use of strong colours. With similar logic the floors beneath the heavy bulk of the auditorium are paved in stone, and where they emerge, as it were from its shelter, and form part of the surrounding lighter structures, they change to less weighty materials like wood or carpeting.

In the foyers, promenades, bars and restaurants, colour and materials are not only used logically to underline, as it were, the structural theme of the building, but are used imaginatively to lighten the massiveness of the enclosed auditorium suspended above and between them. The light colours used throughout these interiors, moreover, contrast with the dark rich colours used in the auditorium itself, emphasizing its essentially enclosed, protected nature. The general effect of the main foyer is at first glance somewhat chilly, with so much dead whiteness predominating, but it is saved from aridity by the use of bright colour and by the robust detailing of certain features—like bars and counters—on which richness of finish is concentrated; also by the agreeable use of indoor plants. The craftsmanship is first-rate, though the form of some of the detail is open to criticism as being rather heavy. Above the main bar and elsewhere, it has a somewhat Germanic abruptness, yet in the event variations in the style and sensitiveness of the detail seem to count for very little against the airy geometry of the whole flowing interior.

In parts of the main auditorium, too, certain details may be thought rather mannered, though the vast interior is in its way most impressive. It is of course too early to give a verdict on its acoustic qualities, which will emerge in time. At the moment of writing the acoustic trials are still taking place and the tuning period not yet over, but it is already clear that acoustically the auditorium is free from major error. Critical opinion seems confident that it will prove fully worthy of the place it is expected to occupy in the musical life of London. The elaborate measures taken to ensure this and to exclude external noises are fully described in another article.

The feature of the auditorium likely to come in for most criticism is the boxes. Placed high up on either side wall, they take the form of a series of balcony fronts cantilevered out at an angle and staggered in plan. It is an interesting architectural conception, ingeniously economical in space and serving the additional purpose of breaking up sound reflections from the side walls. From certain places—for instance the back of the gallery—the effect is quite dramatic. From others the abruptly protruding shapes are confusing and appear uncomfortably crowded together. The contour of the balcony fronts, which are of fibrous plaster, is also a little heavy, as though they were an external feature rather than part of the furniture of an otherwise elegantly detailed interior. The fluency of this architectural idea, moreover—that of a dramatic alternation of projections and recesses carved out of the smooth walls of the auditorium—is spoilt by their being contained within a flat band of walnut veneer. This band runs like a picture frame round the whole group of boxes and cuts them off sharply from the wall to whose surface they are thereby made to appear much more arbitrarily related than is in fact the case.

The 'knuckle-bone' panelling of vertical strips of wood, moulded for acoustic reasons, which covers the lower wall surface of the auditorium, and the flat elm panelling above, are admirable in effect and much better in scale. Another piece of design that has come off is the undulating sycamore reflector over the orchestra stage. Freely suspended beneath the main ceiling it is pleasant in form and colour yet not such as to distract the eye unduly. The treatment of the area behind the orchestra platform cannot yet be criticized because the organ has still to be built.

If some of the details appear insufficiently studied, this can be attributed to the rapidity with which a fine basic conception had to be translated into reality, and one can therefore still congratulate the architects on their courage in going for the bold idea even where it has not come off. In any case the detailed wall treatment of a concert auditorium is unimportant compared with the atmosphere created by the interior as a whole. A concert hall stands or falls by its atmosphere or personality. In this respect the Royal Festival Hall is a triumphant success. Immediately on entering one is conscious of an air of expectancy. Whether this is attained by proportion, by colour, by the admirably contrived lighting or not by the architecture at all is impossible to say. Atmosphere, like musical quality, can neither be measured nor rationally explained.

The exterior of the building clearly presented the architects with a very difficult problem. To give a building of this kind sufficient robustness of modelling and richness of architecture to produce an effect of monumentality is extremely difficult in view of the absence of a recognized modern decorative idiom; an attempt to contrive such an idiom is liable to appear mannered and is soon dated. The general modelling of the exterior of the Royal Festival Hall is both logical and stately, with each structural element, as is the contemporary fashion, clearly articulated and the structure differentiated from infilling by changes of material and colour. It is therefore unfortunate that the most important distinction of all—that between the solid shape of the auditorium and the lightness of the lower surrounding structures—should be spoilt by the fact that only on the river front is the main mass of the auditorium faced externally with the dark-coloured marble used elsewhere. The surface of the adjacent side walls is painted concrete, and the change of material gives the front wall the effect of a thin skin, destroying the essential solidity of the great central mass. Elsewhere the use of the facing materials frankly as a protective or decorative veneer is most successful in bringing out the character of the building as a monolithic structure.

On the side walls of the surrounding foyers blue and white tiles are agreeably used externally in a geometrical pattern. On the front elevation tiles are also used in recessed panels, in the fashion already described, to emphasize the underlying structural idea and give strength to the modelling of the facade. But it is difficult to understand why a chestnut brown colour has been used, which is not only unattractive in itself but is almost the same as the colour of the teak facing to the piers between the restaurant windows in the centre of the same facade.

Finally, there is the most unorthodox feature of the curving river front, the rectangular stone panel that hangs, as it were, from the centre of the upper parapet. It may be regarded as a reminder that this is a stone-faced not a stone-walled building, and it serves the useful purpose of masking some of the ventilation machinery. But neither of these is the real reason for its existence. It has clearly been put there because the architects wanted to stress the nature of the front wall of the building: that of a mere skin, through which holes are pierced to give the required transparency, standing in front of the more solid structure of the auditorium. If the windows occupy too much of the area the surrounding wall ceases to read as a skin and looks like a structural frame. The hanging panel has therefore been designed to extend the area of plain wall surface sufficiently to restore its proper character.

These, however, are arguments of the mind which do not necessarily influence the judgment of the eye. The eye finds the effect of this feature on the scale of the building disturbing, and it questions the rightness —though in doing so it may only be revealing its own preoccupation with canons of criticism that no longer apply—of so large a mass of masonry apparently poised over the centre of a wide window opening.

The rather unsatisfactory conflict between the sculptural character of the initial idea and the surface

interest of the elaborately modelled elevations, produced by too many consciously contrived changes of form and material on the latter, has already been mentioned. In a distant view, the sculptural form of the building reads better, though the contour of the main auditorium roof, a straight line at its highest point descending in a flattened curve, is not altogether happy. Perhaps it is this, or the somewhat formalistic modelling of the facade, which makes the whole building look rather lumpy, an effect which is accentuated by its present situation surrounded by relatively flimsy, temporary exhibition structures. For the time being it must inevitably look like a leviathan among sea-horses, but eventually it must be judged in relation to the scale it is desirable to set for the permanent South Bank development.

The foregoing critical comments are concerned with the visual qualities of the building rather than with the planning, and this article must not conclude without some special words of praise for the latter, which can be described, without exaggeration, as masterly. It is the outcome of what must have been an unusually difficult process of reconciling various and often conflicting demands: those of circulation and access, those of acoustics and sound exclusion, those of fire safety, those of traffic access and car-parking; above all those arising from the multiple purpose of the building. A simple concert auditorium, with its necessary foyers and approaches, would have been a relatively easy problem, but the architects were also called upon to provide riverside restaurants, an exhibition gallery, offices and rehearsal rooms, meeting rooms on the upper floor and (in the portion still to be built) a small theatre, each of which required its own independent foyer space and means of access, yet had to be so planned that on certain grand occasions the whole building could function as one, and the different departments amalgamate, as it were, to form a single integrated interior.

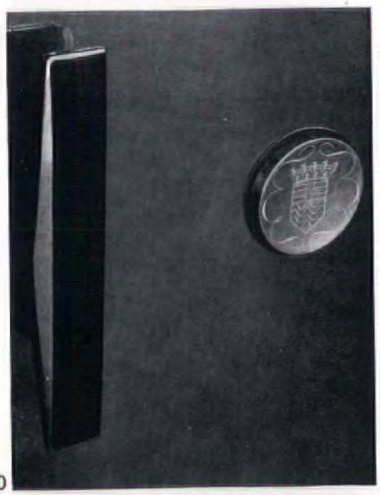
The sense of well-organized spaces that is the special virtue of the interior æsthetically, is evidence in addition that all this has been accomplished skilfully and without allowing the maximum development of one idea to be compromised by the rival demands of another. A more practical test of the planning will come with the crowds that will have to be organized, separated and reunited as need be when the building is in full use. There is every sign that this test will be passed with dignity as well as efficiency.

The circulation problems, moreover, have been handled by the architects not only with skill but with considerable imagination. This is apparent both in the inspiring sense of controlled spatial relationships already referred to, and in the drama that has been extracted—in a deceptively casual way—from the building's unique site: in the changing river views from the different restaurant levels; in the sudden glimpse down into restaurant and foyer from a turn in the main staircase as one ascends to the auditorium; in the unexpected views of trains on Hungerford Bridge sliding silently past the promenade windows, of the towers of Westminster framed in one group of windows and the City and St. Paul's in the opposite group. The familiar London landscape takes on a magical quality when seen from these airy platforms of glass and metal and polished wood and Derbyshire marble.

ROYAL FESTIVAL HALL: Robert H. Matthew, Architect to the London County Council; J. L. Martin, Deputy Architect; Edwin Williams, Senior Architect; Peter Moro, Associated Architect

main entrance

19



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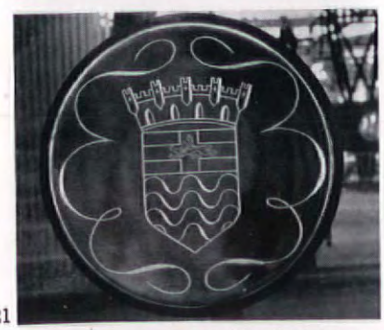
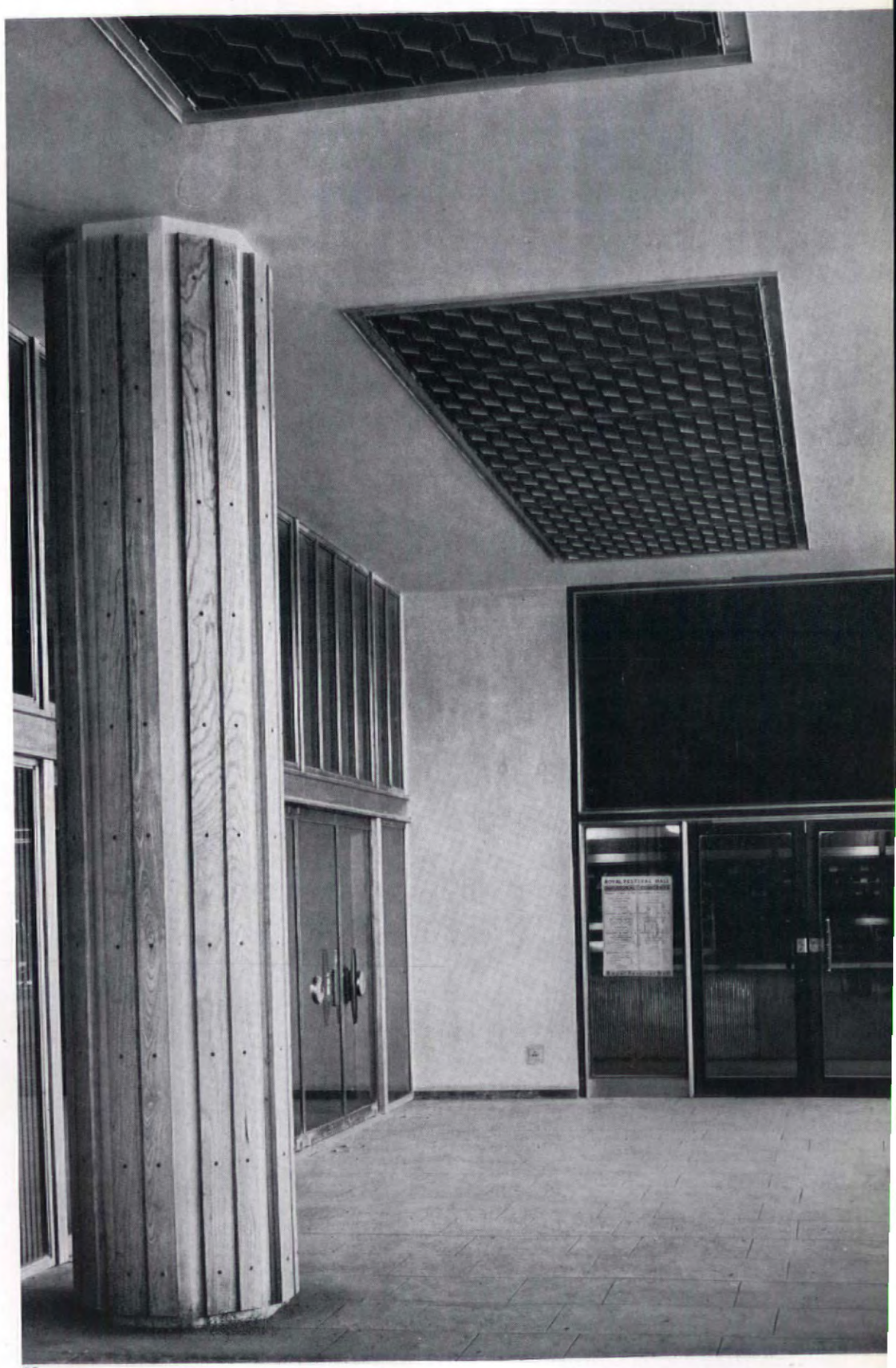
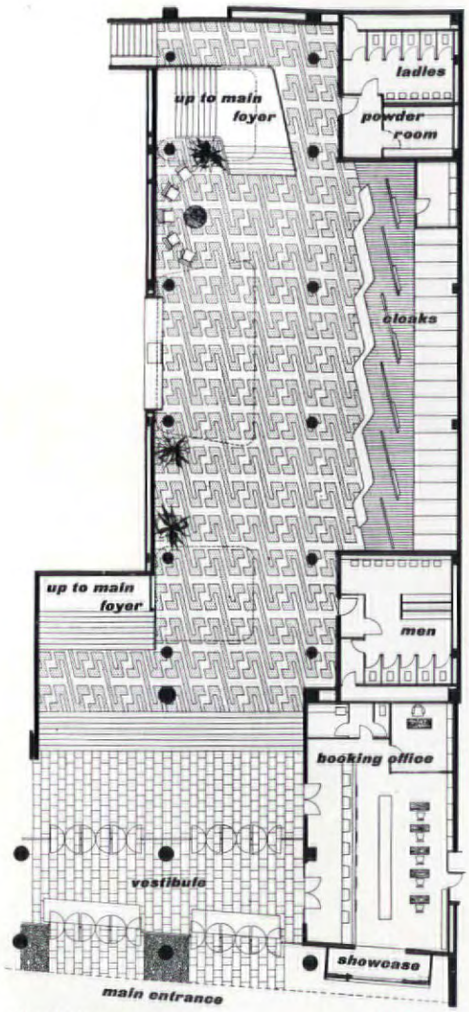


21

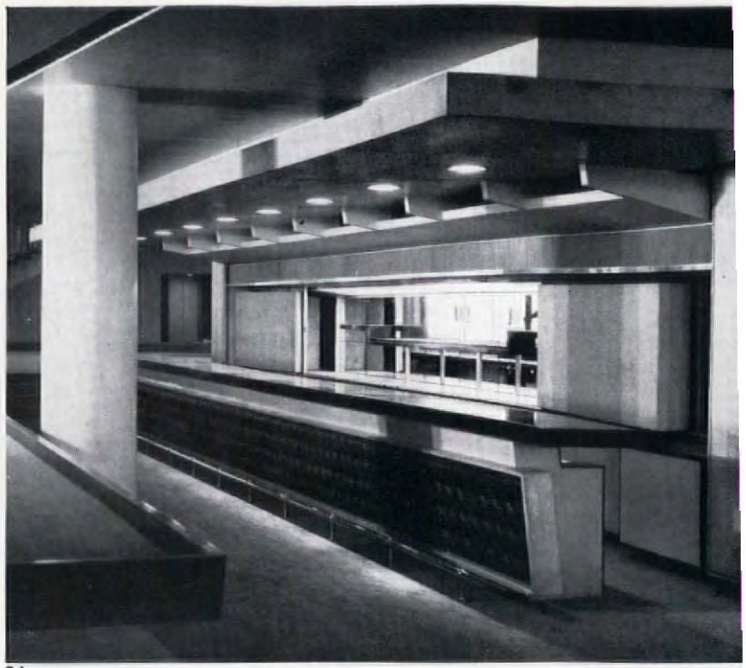
The main entrance has a large vestibule between rows of plate-glass doors. Door-handles are bronze with a grooved ebony inset. The outer doors, 19, have bronze push-plates, within which is a round window with an etched monogram. The inner doors, 20, have bronze plaques (shown close-to in 21) bearing an engraved coat of arms filled with white enamel. This and the monogram were designed by Jesse Collins. 22, looking across the vestibule towards the booking office. The inner doors are on the left. Since the glass is self-supporting they have very thin bronze frames. The columns, like those in the side gallery of the foyer above, are faced with ash. The lights in the ceiling panels are screened by aluminium grilles. The panel over the booking office entrance is of black glass.



22



plan of entrance foyer scale 1/32 in. = 1 ft.



24

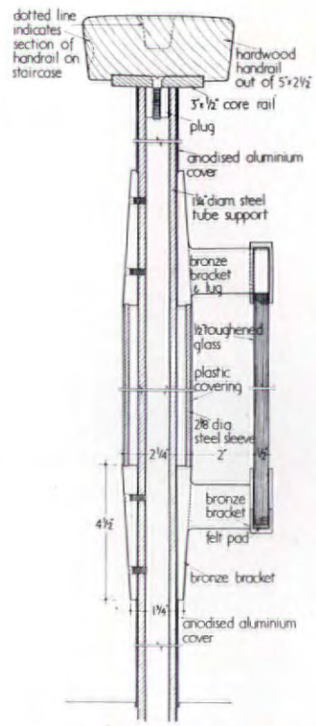
entrance foyer

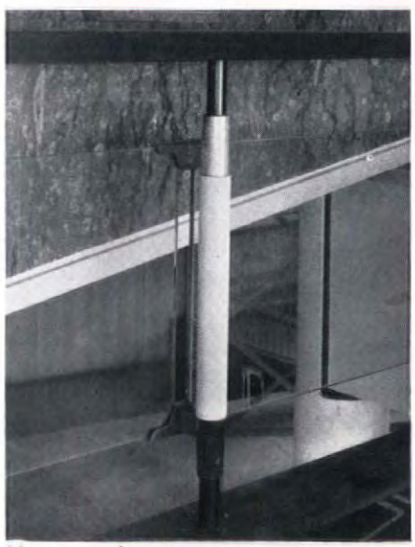
Left, plan at lower foyer level, showing entrance vestibule at foot. The stairs at top are those illustrated in the series of consecutive view-points on pages 353-354. The pattern shown on the floor is formed of two kinds of Derbyshire stone, from different beds of the same quarry. On the right of the plan is the main cloakroom, seen in 23 below. The counter front is veneered in walnut with protective steel panels painted grey. The counter top is beech with linoleum insets, and the screens behind, containing louvred heating units, is in walnut veneer.

The main foyer (see also pages 353-354) has its own bar, 24, backing on to the restaurant servery. Sliding doors allow the back portion (containing the bottles) to be closed off when the front is to be used as a buffet. The counter front is of scarlet padded leather. 25 (facing page), the main foyer from the approach stairs. The side panels of the balcony over it are painted nigger-brown, the central recessed panels yellow. The aluminium grille forming the ceiling over the front portion is removable for access to lighting. The columns are finished in greyish-white stucco-marble. On the staircase shown, and throughout the building, is a standard balustrade treatment shown in detail in 26 and in the drawing above. Armourplate glass panels are held by bronze castings and brackets; centre of baluster is white cellulose; handrail is sapele mahogany.

23

main

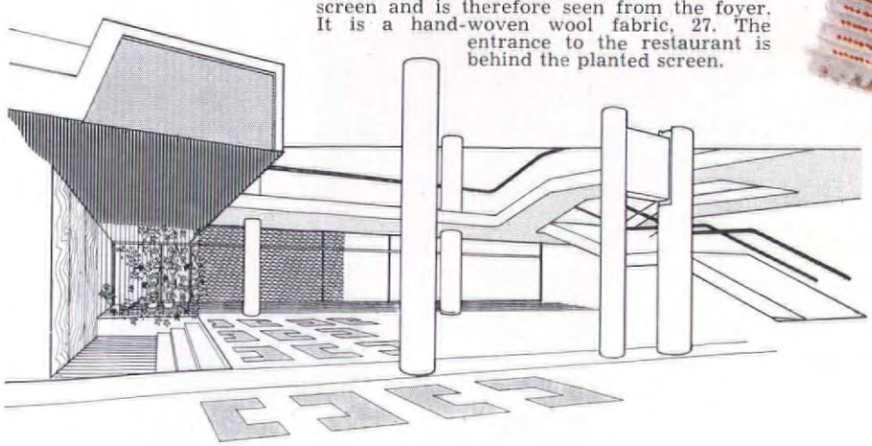


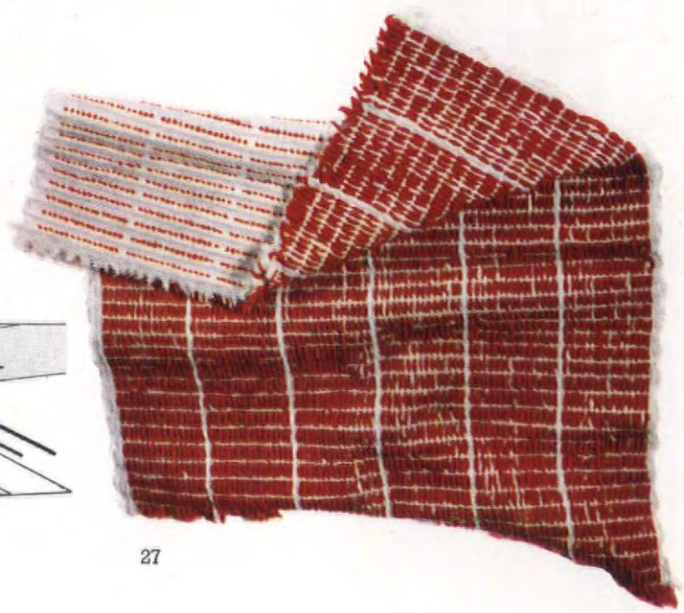


26

foyer

Below, diagrammatic perspective of one of the side wings of the main foyer, looking beyond the bar (at left) through a glass screen into the restaurant. A red curtain (dark tone in drawing) runs behind this screen and is therefore seen from the foyer. It is a hand-woven wool fabric, 27. The entrance to the restaurant is behind the planted screen.

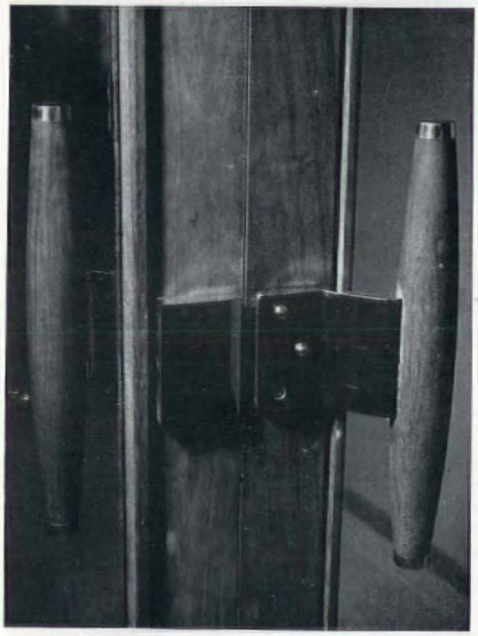




27

foyer details

28



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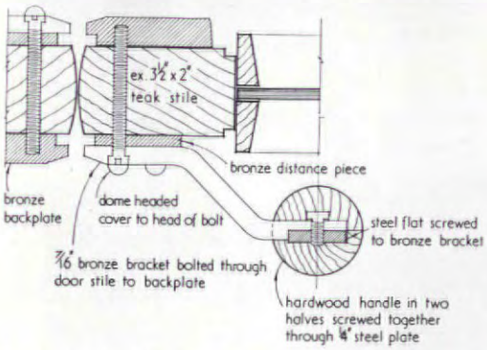
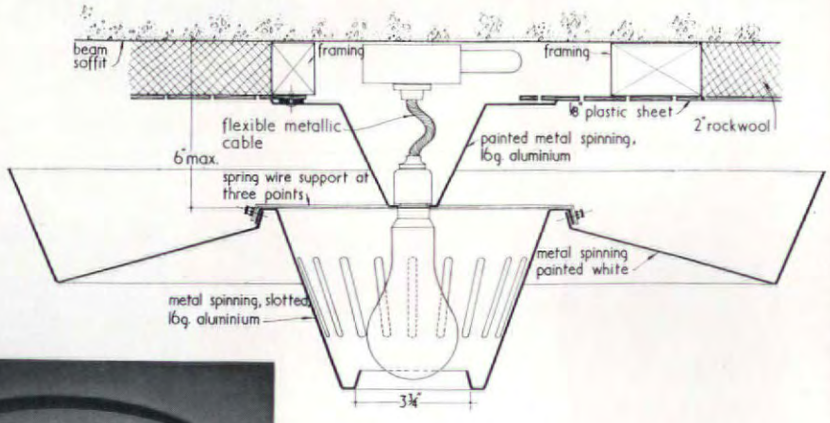
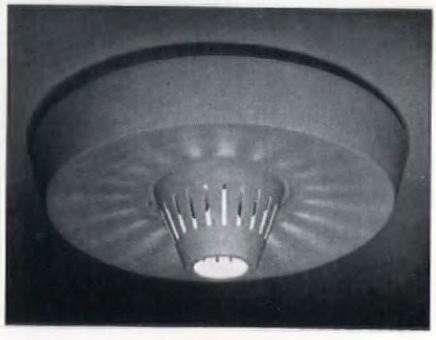


Two standard types of door-handle are used throughout the building: 28, lever handle in bronze and ebony; 29 and drawing above, handle for glazed doors.

30

30, the side gallery and promenade at lower stalls level, showing the stairs leading down to main foyer and standard glazed balustrade (see previous page). The columns, like those in the vestibule below, are faced with ash strips. The recessed portions are painted dark red. 31, detail of ceiling light fitting. The drawing shows its construction. Another type of light fitting, placed below gallery floor level, on the link between the gallery face and the column, can just be seen at bottom right in 30. It is shown in detail in 32 (facing page) and consists of a brass cup with a perforated steel hood painted white. 33, standard lift door, in grey cellulose. The wall alongside is faced with sound-absorbing mahogany slats.





31

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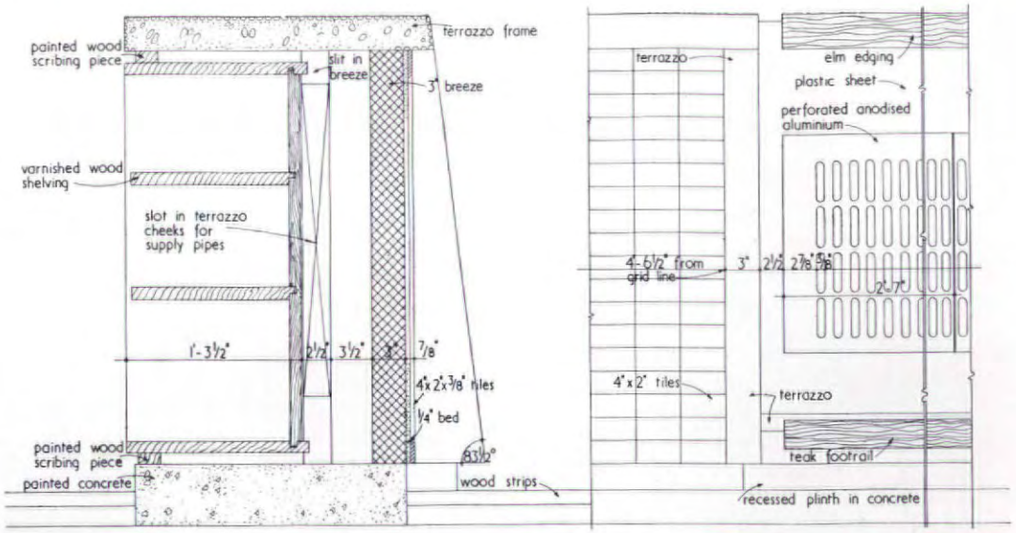
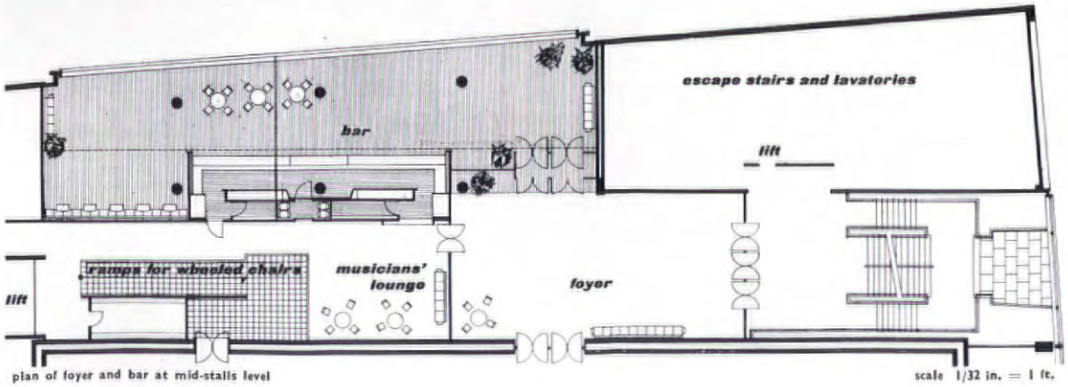
33

34



stalls level foyer



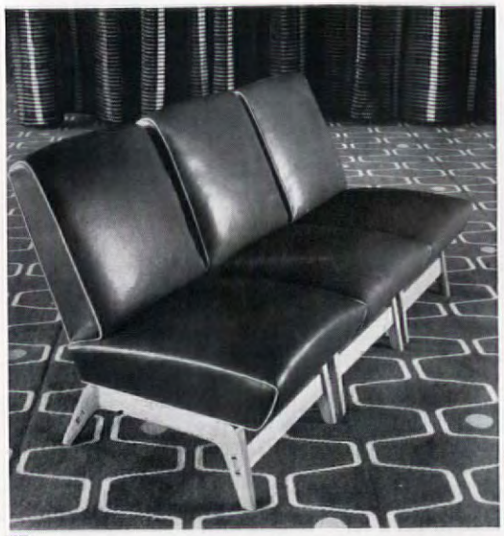
plan of foyer and bar at mid-stalls level

scale 1/32 in. = 1 ft.

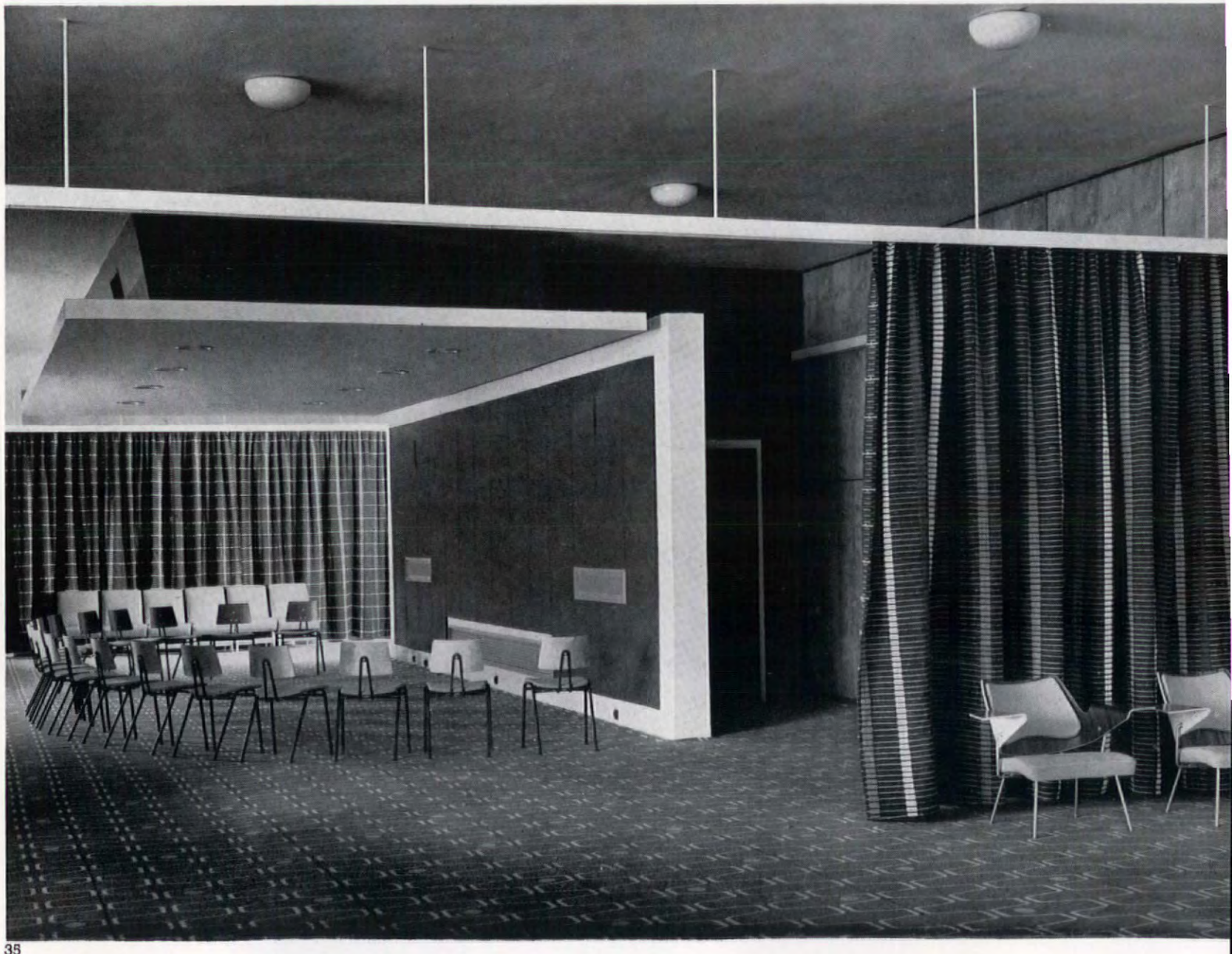
At mid-stalls level the foyer opens on to a large bar—see plan, at the foot of which is the double-skin wall of the auditorium. The bar has wide windows giving a view across Hungerford railway viaduct towards Westminster. The bar counter, 34, has a perforated steel sheet front cellulosed lime yellow and a black terrazzo step. Construction details are given in the drawing at the top of the page. The far wall in 34 is temporary; behind it are musicians' quarters which will be moved when the second portion of the building is completed. The bar will then be extended.

meeting-room

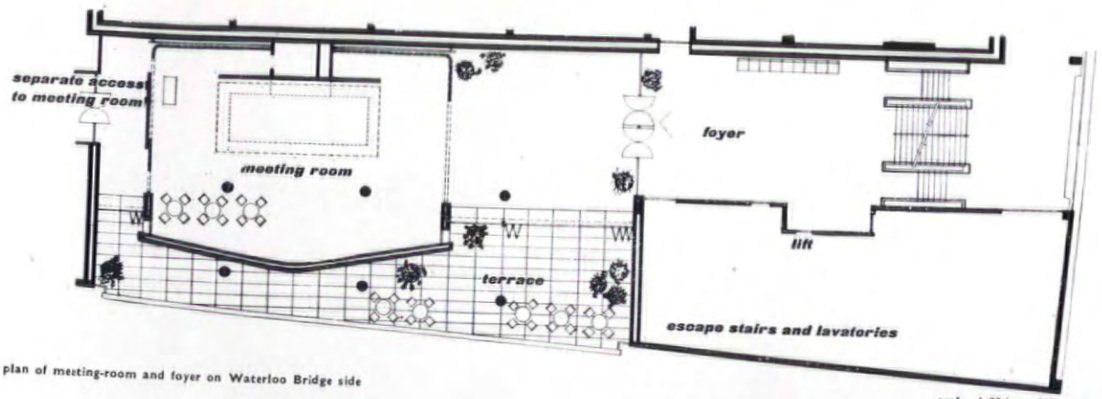
Meeting-rooms are planned on either side of the auditorium at rear stalls level. They open out of the foyers (see plan on facing page) but also have independent staircases. The meeting-room area on the Hungerford Bridge side temporarily houses the choir changing rooms, until the second stage of the building has been completed. The meeting-room on the Waterloo Bridge side, 35 (below), has its own open terrace balcony. At the top of the plan is the double-skin wall of the auditorium and on the right-hand side the main stairs and the windows overlooking the river. The hood seen in 35 masks some of the ventilating ducts and covers the area occupied by a movable speakers' platform. Curtains on a suspended track (top of picture) subdivide the room when required. They have been designed to be seen from either side—see details on facing page. The picture shows the pattern of the greyish-green, close-fitting carpet which is used throughout the building above main foyer level ; also the specially designed meeting-room furniture—again see facing page. 36, settee unit, used in the meeting-rooms and in foyers, etc., throughout the building. Three units are here placed together but the number can be varied as required. The wooden base is of birch ; the upholstery red leather.



36



35



plan of meeting-room and foyer on Waterloo Bridge side

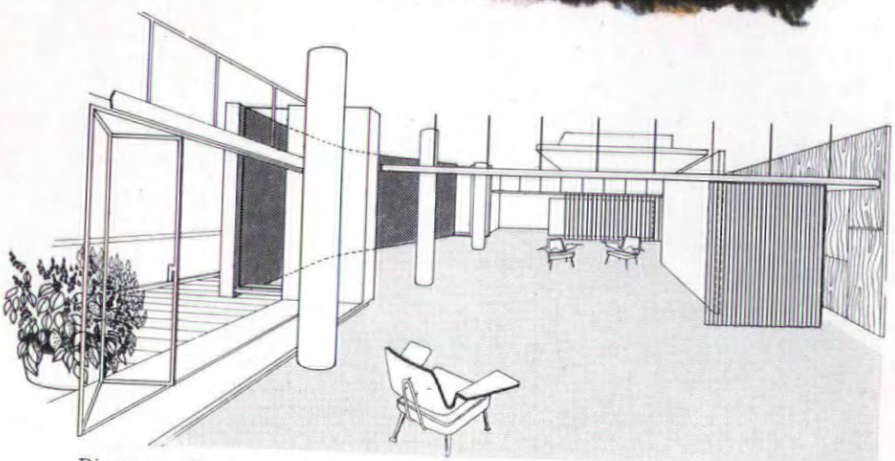
scale 1/32 in. = 1 ft.

Meeting-room furniture designed by Robin Day. 37, stacking chair (also used in the auditorium for the orchestra): legs of steel rod; back of formed plywood with sapele mahogany veneer; seat covered in woven nylon fabric. 38, bent plywood armchair: rosewood veneer; padded back removable for cleaning; metal frame with copper finish; seat covered in lemon yellow fabric.

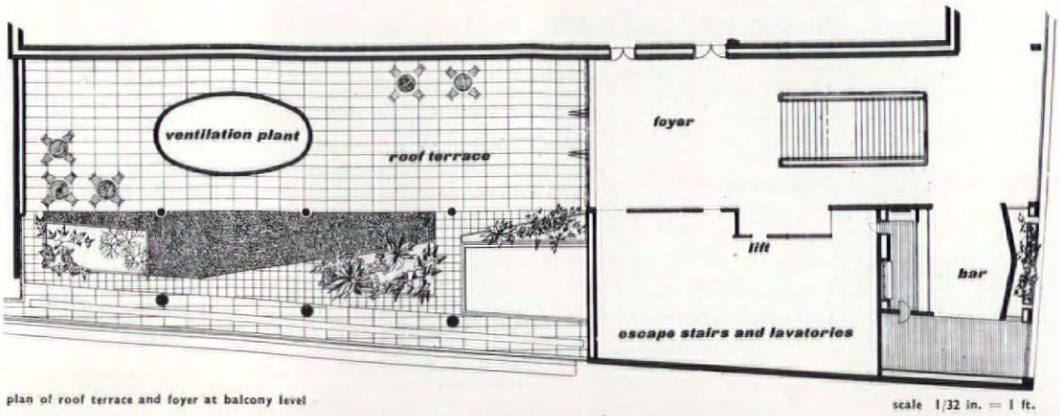
37

38

39



Diagrammatic perspective of meeting-room showing glass doors to terrace on left and arrangement of movable curtains (vertically striped areas on right). 39, the curtain fabric in colour. It is a handwoven woollen fabric designed to be seen from either side—see photograph on facing page—but to show a slightly different pattern on each.



plan of roof terrace and foyer at balcony level

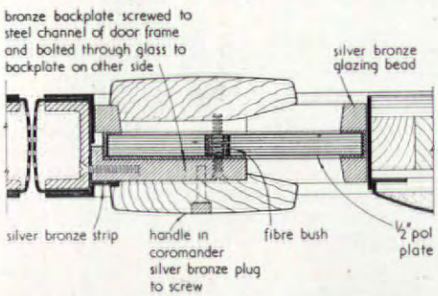
scale 1/32 in. = 1 ft.

balcony foyer

There are foyers at balcony level either side of the auditorium—see plan above, which has the double-skin wall of the auditorium at the top. 41 and 42, the bar at this level, in the extreme corner of the building at the end of the promenade which links the two balcony foyers across the river front. The counter front is of corrugated aluminium cellulosed, the top of linoleum with an edge of ash, the fitting behind veneered in olive ash. For the balcony-level roof-terraces see page 386.

41

40, doors leading from the balcony-level foyer into the auditorium. They are in walnut veneer with a silver bronze frame. The drawing is a detail of the centre panel; note the absorbent treatment of the edges to stop sound coming through the crack.

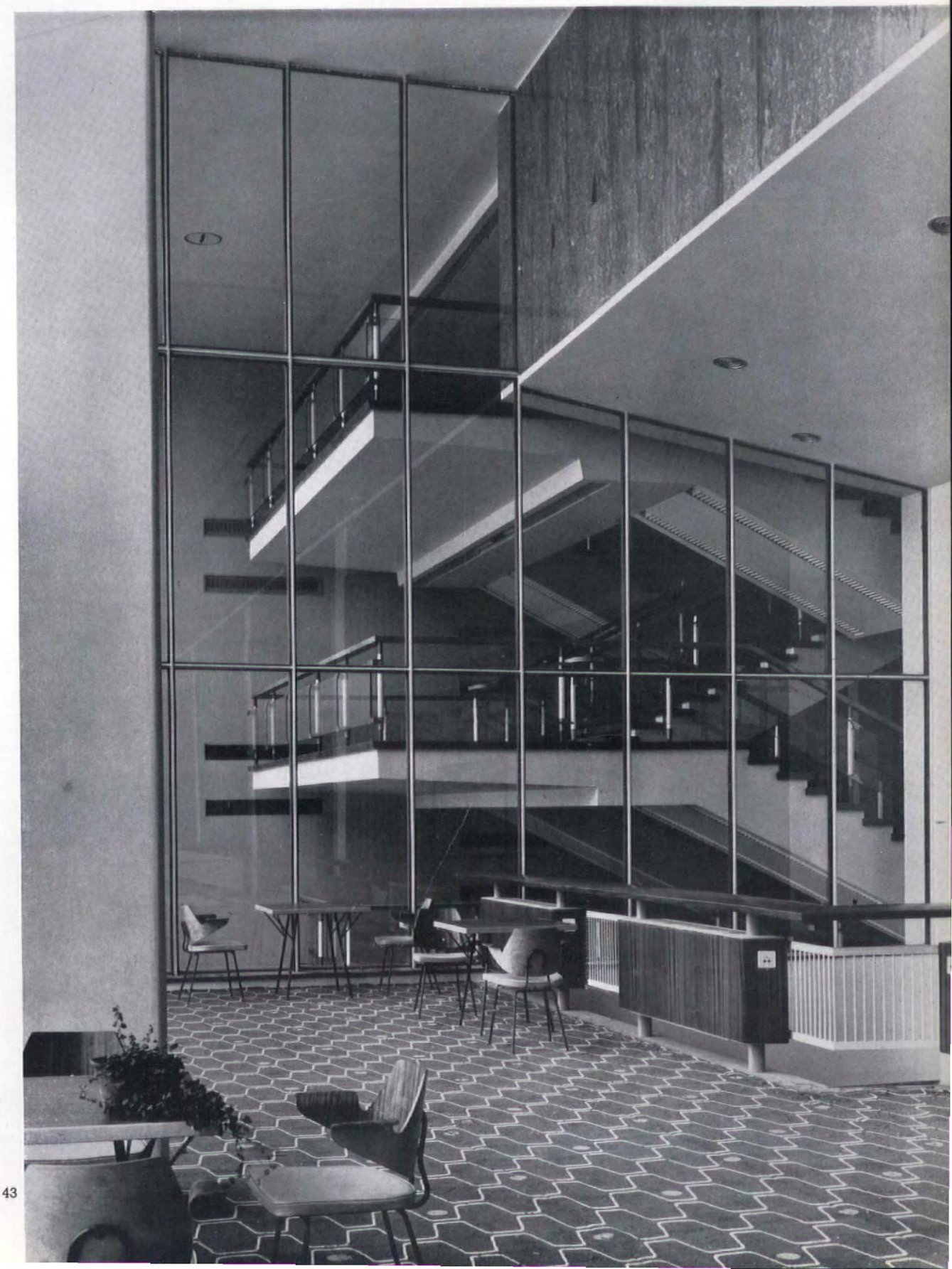


40

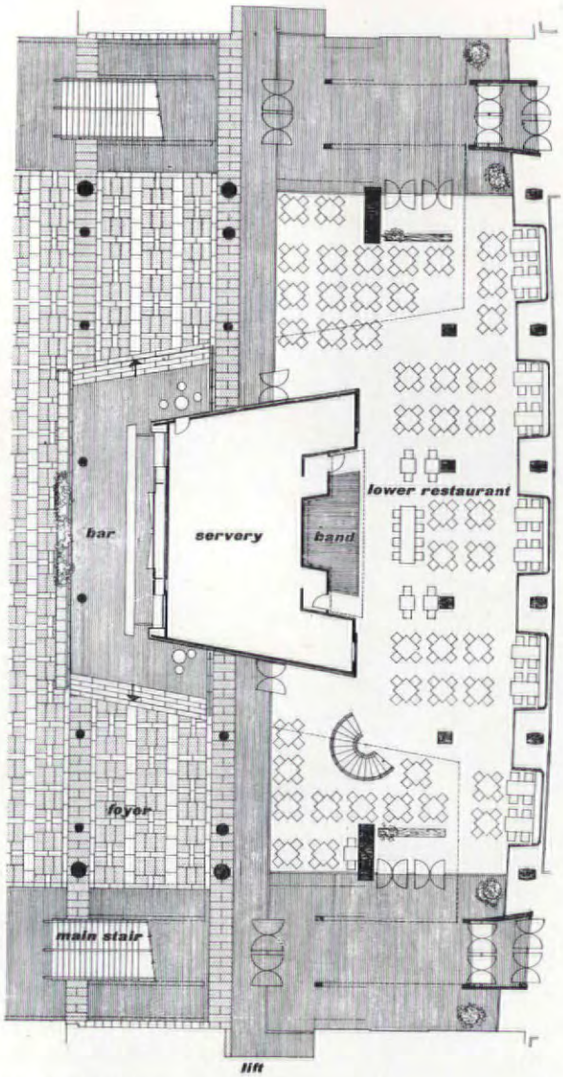
42

restaurants

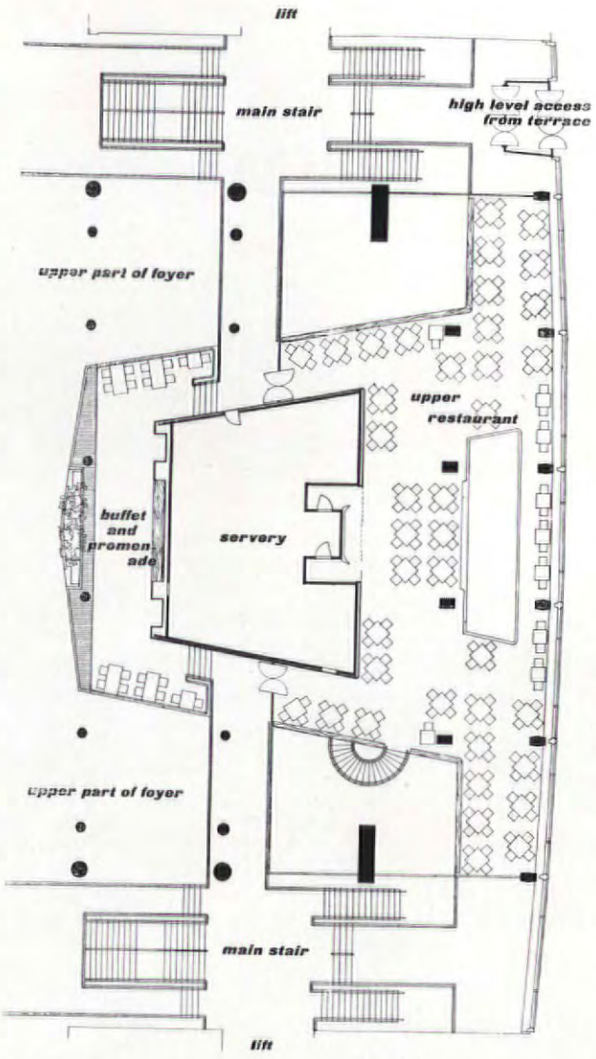
There are two restaurants, one above the other, on the river front of the building. 43, looking towards the end wall of the upper restaurant, which is a glass screen through which can be seen one of the main staircases. The wall surface at top right, faced with polished marble, is the outer wall of the auditorium and the sloping ceiling beneath it the underside of the floor of the stalls. The richly fossilized marble comes from Derbyshire.



43



plan of lower restaurant



plan of upper restaurant

scale 1/32 in. = 1 ft

46

44, the upper restaurant looking along the river front. At the top of each pier are floodlights to illuminate the external wall of the auditorium which descends (top right) into the upper part of the restaurant. The lower restaurant is beneath the well in the centre. 45, the upper restaurant looking in the opposite direction. The photograph is taken from the half-landing of the main staircase between mid-stalls and lower stalls levels. A similar view, but taken from one floor higher, appears on page 336. On the left of 45 is the entrance to the servery; at bottom left the well of the spiral stair connecting the two restaurants. 46, this stair from the lower restaurant. The precast terrazzo treads are cantilevered from a central reinforced concrete backbone (see also page 390). The balustrade is sheet aluminium, painted.

44

45

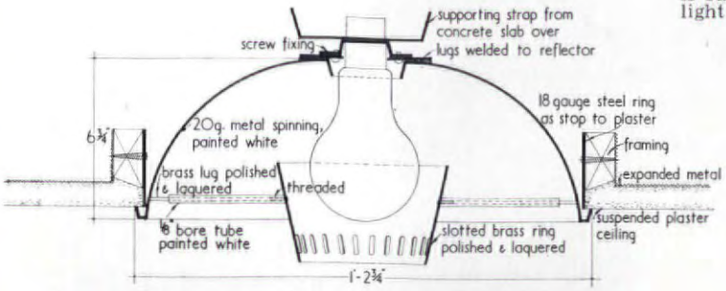
47

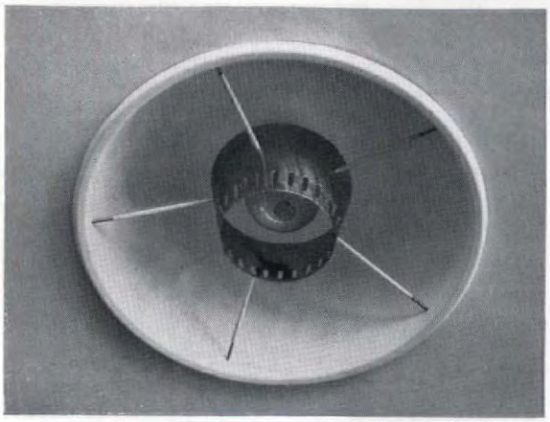
48

49

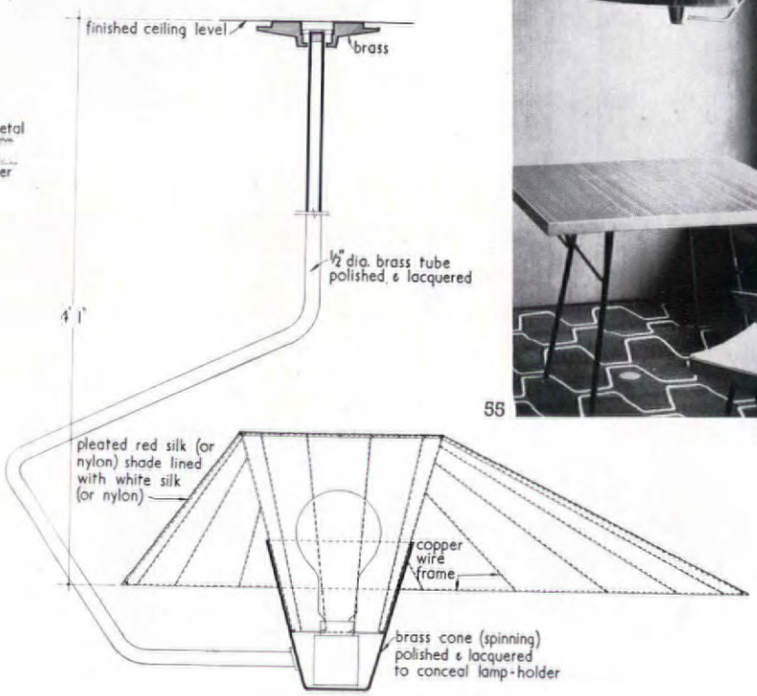
47, looking out through the windows of the upper restaurant, showing the panoramic view of the river, the North Bank and Waterloo Bridge. 48, from the lower restaurant, looking up through the well into the upper restaurant. The white painted balustrade is attached to grey enamelled steel supports carrying a sapele mahogany handrail. The louvres beneath the balustrade are for air intake. 49, a detail of the top of the columns showing also the marble faced wall of the auditorium. The timber facing is ash.

54, the light fitting let into the ceiling of the lower restaurant, with detailed section through the fitting above. 55, corner of one of the bays into which the window wall of the lower restaurant is subdivided. Below is a detailed drawing of the light fitting suspended above each table.





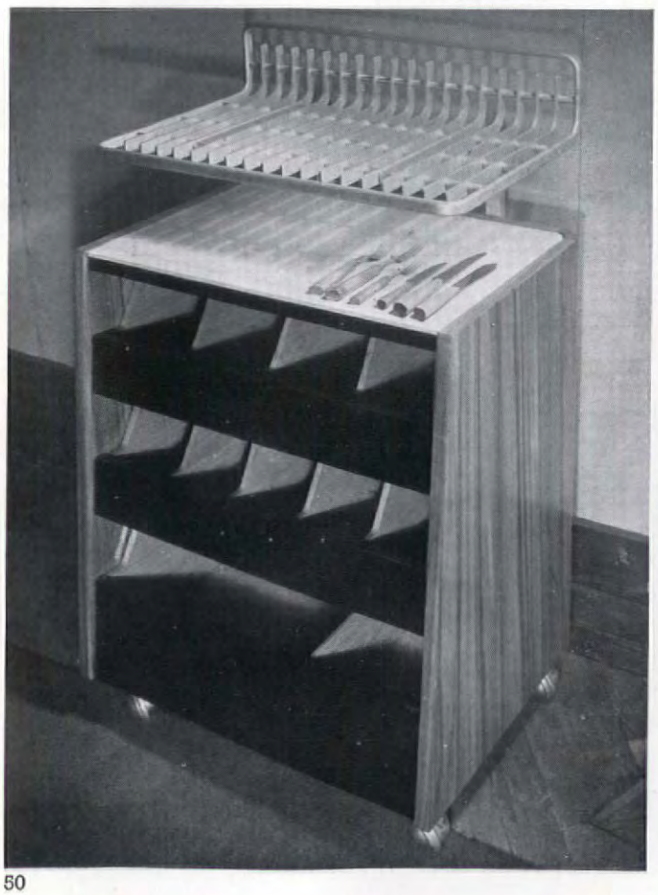
54



55

restaurants

Restaurant furniture designed by Robin Day. 50, dumb-waiter designed to stand against wall or columns, veneered in sapele mahogany with tray shelf in anodized aluminium. 51 and 52, table with walnut veneer top, birch edge; chair with formed ply back, veneered walnut inside, birch out; legs of steel rod cellulosed grey; cushion of putty-coloured leather. 53, cutlery and silver selected by the architects.



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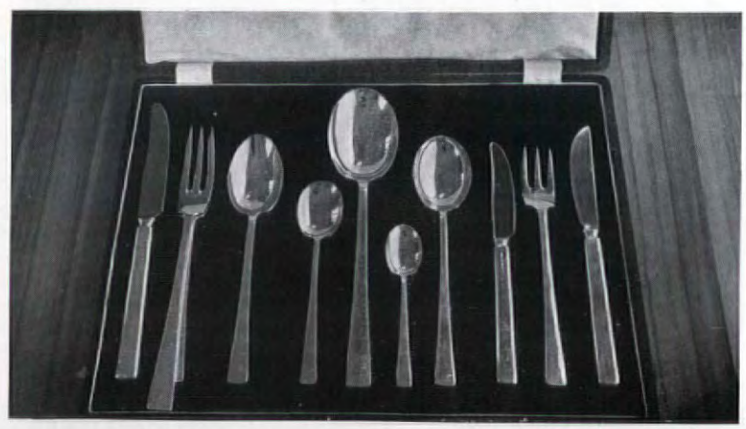
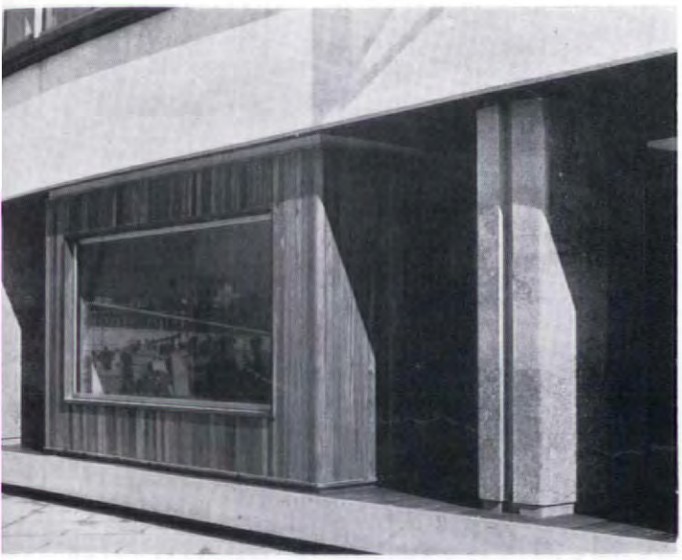


53

51

52



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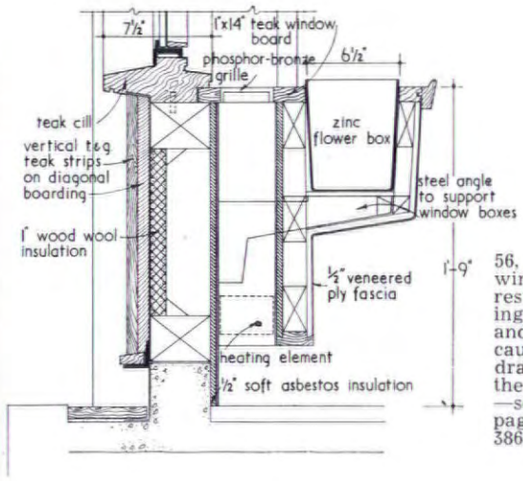
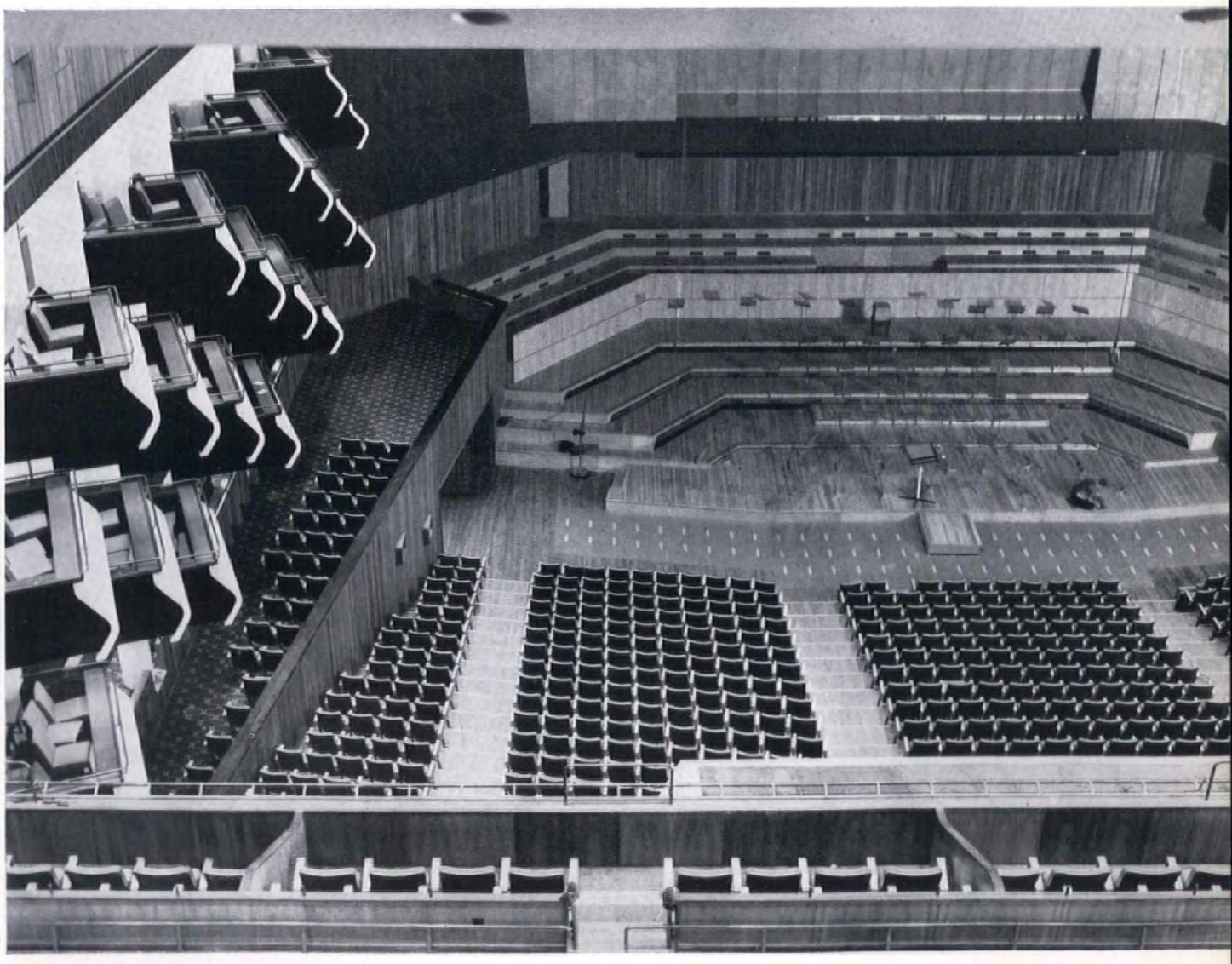


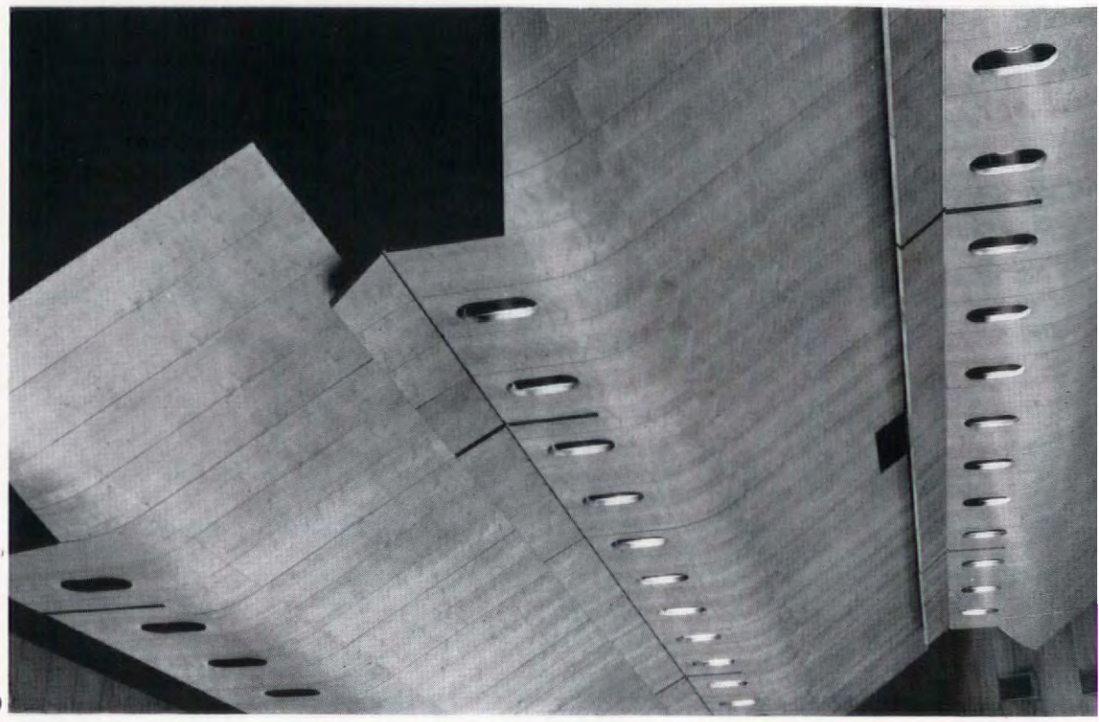
56, one of the bay windows of the lower restaurant overlooking the terrace. Step and soffit are of caulked teak. The drawing shows also the flower box inside —see 55 on facing page. Also see pages 386-387.

auditorium

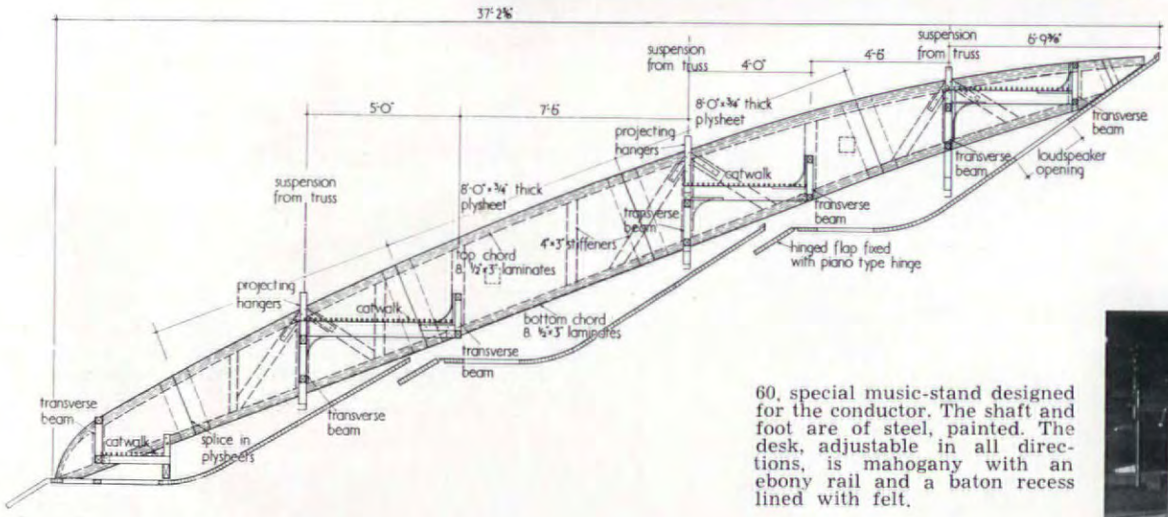
57, looking down into the auditorium from the projection box at the back. In the foreground is the front row of balcony seats, on the left are the quadruple tiers of boxes and below them the side galleries. Between the front stalls and the orchestra platform can be seen the area of slate paving which acts as a reflector.



57

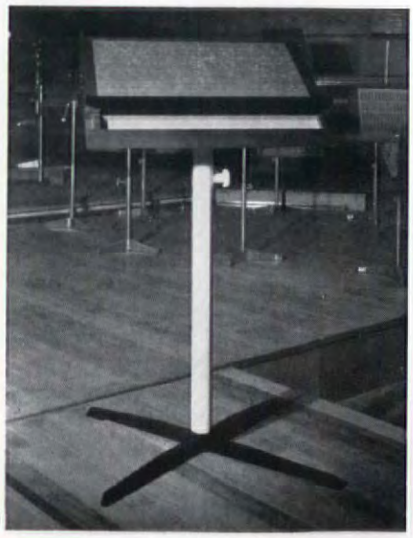


59

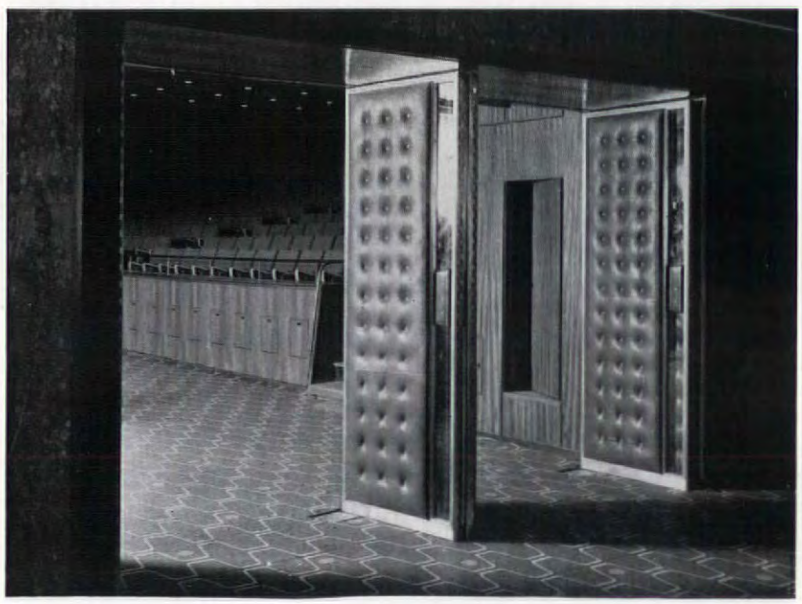


59, close-up of the sycamore canopy over the orchestra platform. The sloping surfaces throw sound to the back of the hall and the flat surfaces return some of it to the orchestra so that it can hear itself as a body. The slots are for lighting — see pages 392-393. Left, construction of the canopy

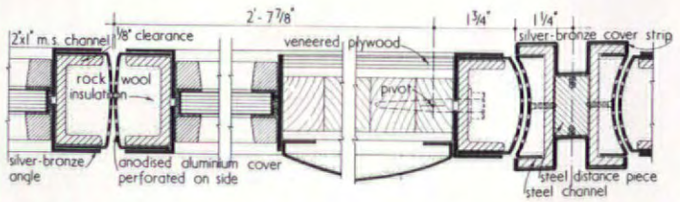
60, special music-stand designed for the conductor. The shaft and foot are of steel, painted. The desk, adjustable in all directions, is mahogany with an ebony rail and a baton recess lined with felt.



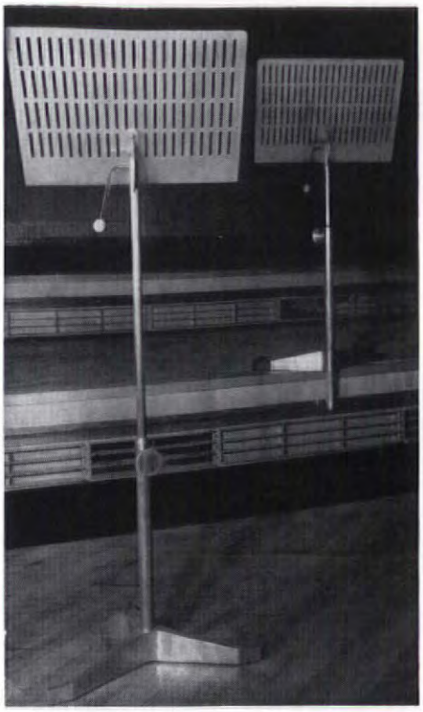
60



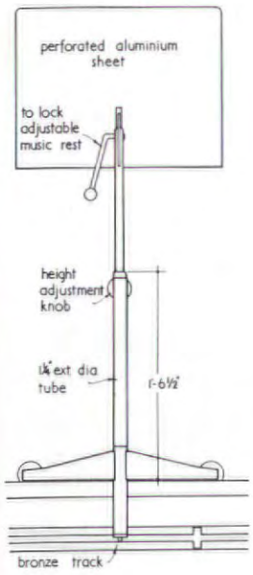
58

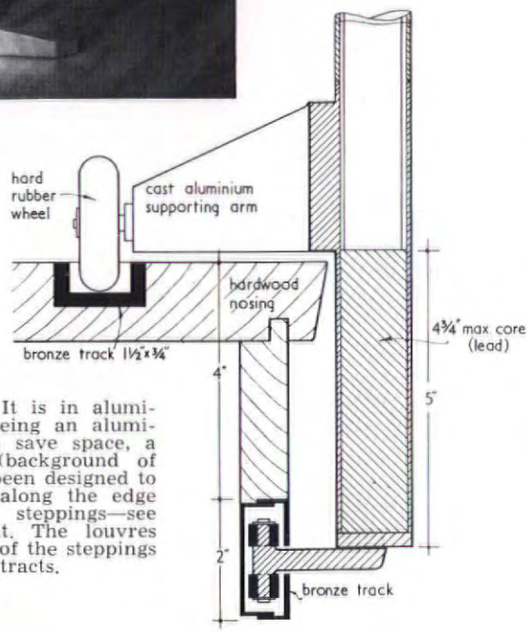


58, looking into the auditorium from the entrance at mid-stalls level, showing the padded leather doors. The drawing above also shows the absorbent treatment of the edge of each door to prevent sound passing through the crack when they are closed.



61





61, music stand. It is in aluminium, the foot being an aluminium casting. To save space, a special model (background of photograph) has been designed to run on a track along the edge of the platform steppings—see drawing on right. The louvres seen in the front of the steppings are ventilation extracts.

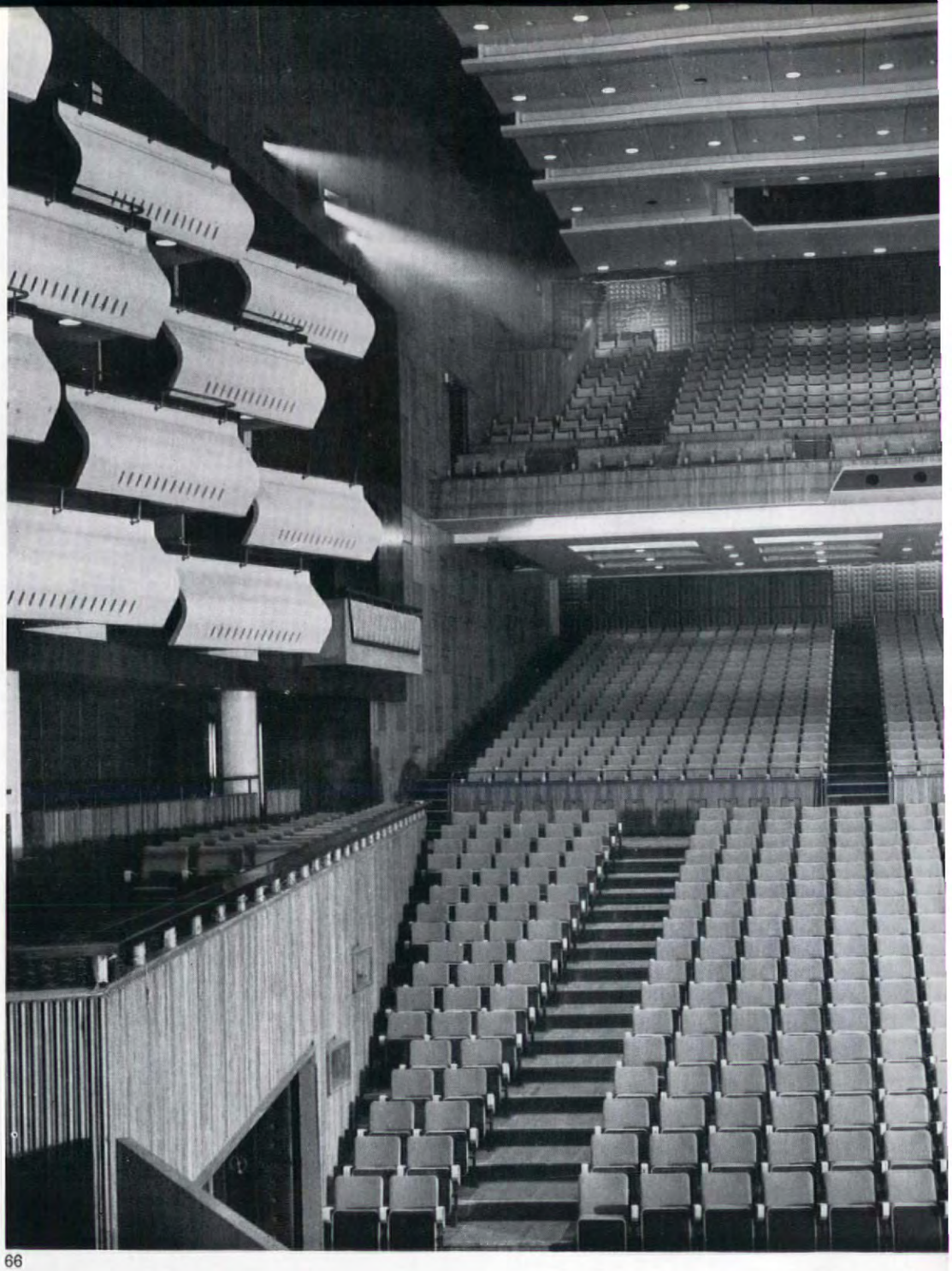
64

65

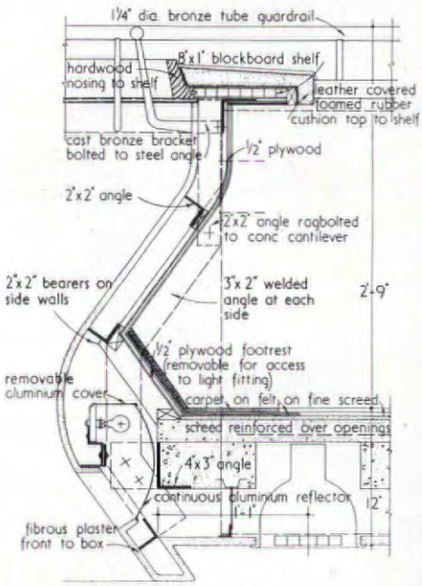
62 and 63, the auditorium seats, lowered and raised, the latter showing the absorbent treatment of the underside. Upholstery is ribbed moquette of a greyish yellow colour. Supports are elliptical steel tubes and the seat a steel pressing with rubber inset. The arms are leather covered. At the back is a preformed ply panel with mahogany veneer. 64, looking upwards from the lower stalls entrance. The floor is teak with beech nosings to show up in semi-darkness. Beneath the seats it is cork for quietness. 65, at mid-stalls entrance level. The gangway has an elm front with tip-up seats for attendants.

62

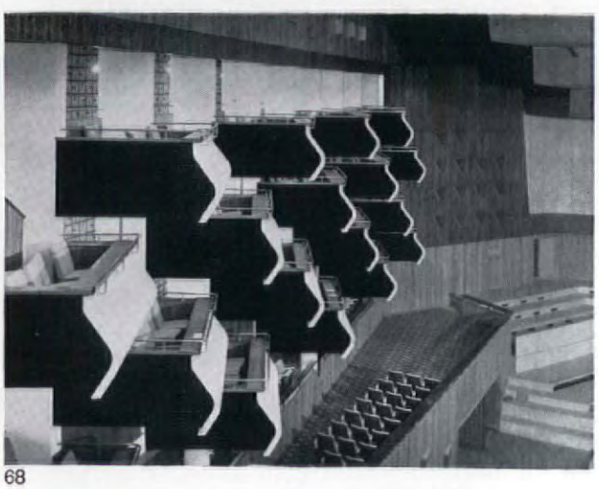
63



66



67

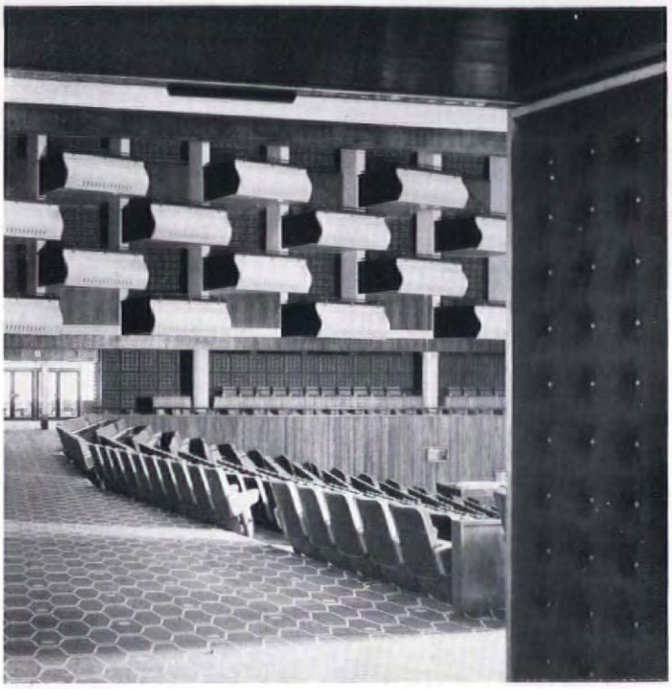


68

66, looking towards the back of the hall from the choir seating behind the orchestra platform. On the left are the boxes in the form of projecting balconies of fibrous plaster. The drawing alongside shows their construction and finish in detail. 67, looking up at the boxes from the lower stalls. 68, the boxes seen from the side of the balcony. Their sides are faced with dark blue flock paper. 69 (facing page), a detail of the elm balustrade to the rear part of one of the side galleries seen in the lower part of 67. The back wall is padded with red leather.

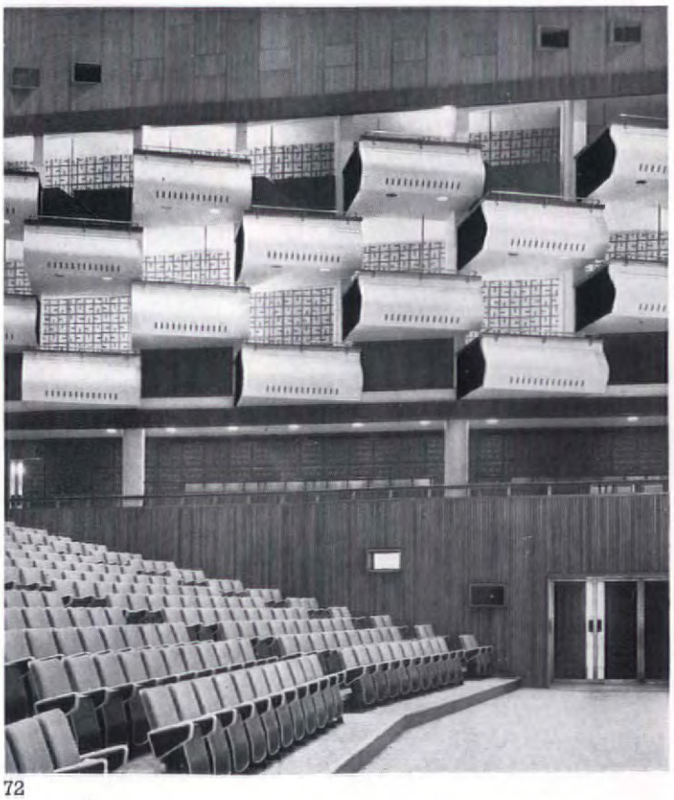
70

The walls behind the boxes, as shown in the photographs on the right, are hung with fabric partly as decoration and partly for its absorbent value. 70, a detail of the design of the fabric which is of scarlet wool with a white pattern applied to it in candlewick.



71

71, looking along one of the main transverse gangways from mid-stalls entrance. The corresponding entrance can be seen at the far side of the auditorium, with the foyer windows beyond. Below the boxes the wall surface is red padded leather. 72, a similar view one stage lower: looking across to the lower stalls entrance showing the paved reflector of slate between the front row of seats and the orchestra platform. The walls of the side galleries are faced with Copenhagen ribbing in elm (see acoustics article, pages 377-384). The small windows in this wall are for BBC commentators. The balconies of the boxes are of fibrous plaster, with their sides faced with dark blue flock paper.



72

73

73, looking over the stalls from one of the boxes to the four tiers of boxes on the other side of the hall. On the left is the end of an adjoining box. The group of boxes is surrounded by a walnut frame. The general side wall panelling is elm. At top right can be seen a corner of the sycamore canopy over the orchestra platform —see page 372.

74

74, from the rear stalls looking in the opposite direction from 73 and showing in the centre the royal box. It has a walnut surround, a padded leather front and internal panelling of walnut.

W. A. Allen and P. H. Parkin

ACOUSTICS AND SOUND EXCLUSION

A concert hall must stand or fall by the quality of its acoustics, and to a very large extent the planning, structure and finishing materials of the Royal Festival Hall have been determined by acoustical considerations. The finished building is probably the best example in existence of the practical application of up-to-date acoustical science. The following article, on the research and knowledge that accompanied the design of the building and the methods of applying it in practice, is contributed by W. A. Allen and P. H. Parkin of the Building Research Station who, together with Hope Bagenal, acoustical consultant, advised the architects on this aspect of their problems. They deal both with the internal acoustics of the auditorium and with the means taken to exclude sound from outside, of great importance in view of the noisy site.

The Royal Festival Hall has much acoustical interest because it embodies modern acoustical knowledge to an entirely unusual degree. The architects and their acoustical consultants have enjoyed exceptionally close and harmonious collaboration, and the building as it stands is an almost complete statement of present acoustical theory.

For this reason it is desirable to record exactly the arrangements for acoustical advice. The Consultant was Mr. Hope Bagenal, and he and the London County Council have been advised throughout by the Building Research Station of the Government Department of Scientific and Industrial Research, who also conducted all experimental studies required. Professor R. H. Bolt of the Massachusetts Institute of Technology, and Dr. Fritz Ingerslev of the Academy for Technical Sciences in Copenhagen have also been in touch with the development of the design and were able to give opinions at an important stage. This has ensured that both American and European experience could be taken fully into account.

The acoustical problems of a large concert hall cover a wider field than the acoustical characteristics of the auditorium alone. There are in addition a considerable number of sound insulation and noise reduction problems, and these will be included in this description.

acoustical objectives

The question 'What are good musical acoustics?' is a matter for musical rather than scientific decisions. Only musical criteria matter in a hall for music, and the function of physical studies is to provide so far as possible a factual basis for the prediction of desired musical attributes.

This approach is rather different from the pre-war outlook based on the pioneer work of W. C. Sabine, which gave reverberation time a prominence due not so much to any priority of importance it possessed as to the fact that few other matters were so easily measured. Unfortunately musical criteria themselves are still difficult to establish, largely because musical views have seldom been linked to scientific studies, but the following can now be seen to be significant:—

> FOR THE PERFORMERS: *The players and singers must be able to hear one another well in order to play in good ensemble and intonation.*
>
> FOR THE AUDIENCE: *The output of all departments of the orchestra should be heard in all parts of the house in the balance intended by the conductor. Definition should be clear. Tone should be 'full' and have a 'singing' quality.*

Musicians have been consulted about these matters at various times in the past two years and so far as can be discovered, tone is regarded in this country as the paramount consideration, with definition next, and balance third. But no one is certain about the measures to take to secure these musical objectives. Tone is the most difficult because it is still ill-defined as an acoustical attribute, but it seems mostly to depend on a fairly long reverberation time in general, and on a certain relation between the reverberation times at low, middle and high pitches. Definition undoubtedly depends on how effectively the high frequency sounds from each instrument can be heard, and balance depends on hearing all departments equally well. 'Ensemble' conditions for the orchestra obviously require suitable nearby surfaces to reflect sounds back to the players quickly. Not all of these matters were as clear at the outset of the work as they are now; balance, especially, was not fully grasped as an objective. But 'tone' and 'definition' were fully discussed and the firm decision was taken to design the hall for long reverberation, and to offset any risk of reduced definition that this might entail by raking both the orchestra and audience seating steeply enough to ensure so far as possible unimpeded paths between all listeners and all instruments.

shape of the auditorium

The general shape of the Royal Festival Hall was for the most part a logical development from the acoustical requirements, with one exception, which was the choice of a plan with parallel sides rather than splays. No decisive guidance on this point could be obtained from acoustical theory, and it was decided therefore to fall back upon tradition. The evidence even so was necessarily slim, but it seemed to point towards halls with parallel sides as having generally better reputations for musical acoustics than 'fan' or 'horse-shoe' plans. The parallel-sided plan may well have the

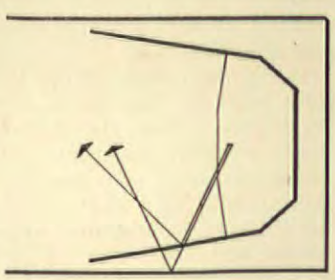
virtue mentioned, and it enjoys some relative simplicity in construction, but it has at least one major acoustical difficulty, for in a hall to seat 3,000 people the overall width must be considerable (if length is not to be excessive), and yet the region around the platform must be 'gathered in' to avoid cross-reflections of such length that they will cause echoes in the way shown in *fig. a*. This is the origin of the interesting arrangement of promenades splaying inward at the sides of the hall which tip the reflections towards the rear of the hall so that the risk of a long-delayed echo is minimized. The front part of the splays was made absorbent to reduce risk still further by reducing the strength of the reflected sounds.

The long section is acoustically the most significant part of the design and is perhaps unique among concert halls because of the way the orchestra and audience seating rakes upward from the floor area which separates them. Bagenal has said that ideally the audience should sit on the slope of a large hill, and the orchestra on the steeper slope of a smaller hill, and that they should be separated by 'a little lake.' The Festival Hall applies this idea (see *fig. b*, in which its section is compared with those of other well-known concert halls).

the orchestra platform

The purpose has been mentioned briefly as being to ensure good definition. To be more explicit, the output of many orchestral instruments and of all singers is strongly directional, especially for the higher frequencies which give instruments and voices their unique, individual qualities, and if the sources cannot be seen properly by listeners, they are unlikely to be heard properly. High frequencies are easily shadowed and absorbed by other players. Thus, in view of the long reverberation time, it was felt that a good 'aural view' of the instruments should be guaranteed.

Balance as a musical factor was not fully appreciated when design began, but by the time the details of the platform came up for consideration it was more clearly understood, and the arrangement of the orchestra on a fully raked platform was seen to be probably a factor of importance. In many conventional halls with flat fore-stages and flat or nearly flat audience areas listeners complain that strings are hard to hear and that brass is all-powerful, while the nearest listeners add that the sound all seems to go 'over their heads.' It is expected that the rake of the platform and the main seating in the Festival Hall will enable the whole of the audience to receive a well-balanced sound picture. In many halls this is enjoyed only by those in balconies.



a, *echoes can be caused by reflection across the front of a hall. The splayed sides of the Royal Festival Hall tip the echoes harmlessly towards the back.*

Other points about the platform design should be noted. Pianos, up to four in number, have to be accommodated. If they are on the same level as strings and wood wind, which is usual, they may easily screen a number of players and their instruments rather badly. In the Festival Hall this has been avoided by making part of the first tier of the platform removable, as a piano bay (*figs. e–f*). Another point, never previously taken into account, is the distance from front to back of the platform. If this is greater than about forty feet, sounds from the rear players will reach many listeners so long after the sounds from the front players that they will appear to lag, and even with very good time-keeping in the orchestra and choir there will tend to be an impression of blurring or of ponderous performance, and sometimes of bad synchronization.

To some extent there is a similar problem with the width of the orchestra, because listeners seated near either side will again notice blurring and raggedness due to the large path differences across the orchestra, sometimes 60-80 feet or more, but this affects a far smaller number of seats than the path differences from front to back, and is correspondingly less important.

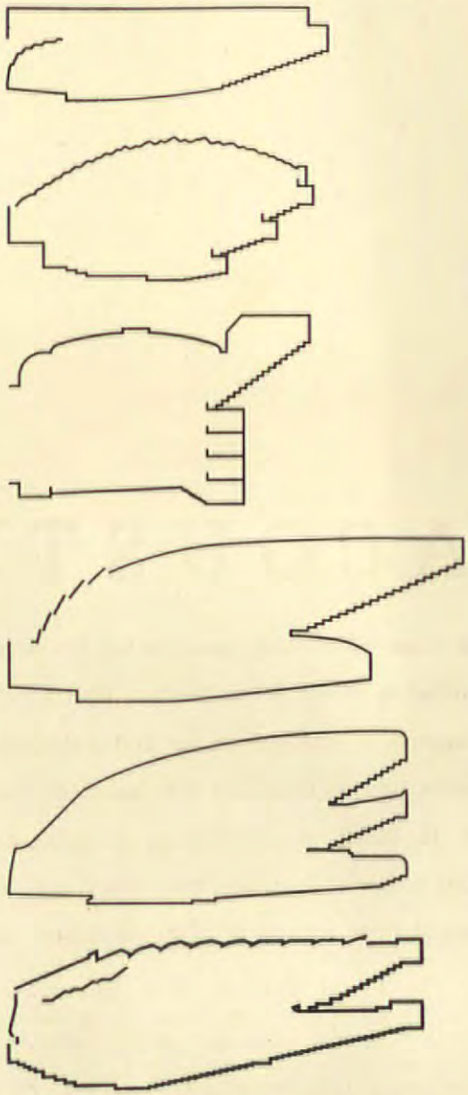
These arguments combine to emphasize the necessity of compressing the orchestra and choir into the smallest space consonant with the needs of individual players. This helps definition and makes rapid passages easier for the conductor to manage; it contributes also to good ensemble. Forty feet should probably be the maximum depth from front to back, including space for singers. In the Festival Hall space for orchestral players is economized by having music stands on tracks, so that tripod bases are not needed (*fig. d*).

The detailed configuration of the ceiling in inverted waves was not intended to have acoustical significance and was worked out principally for illumination. The main line of the ceiling is naturally intended to assist hearing towards the rear of the balcony, and with a general curvature of this kind the individual 'waves' avoid any concentration of reflections.

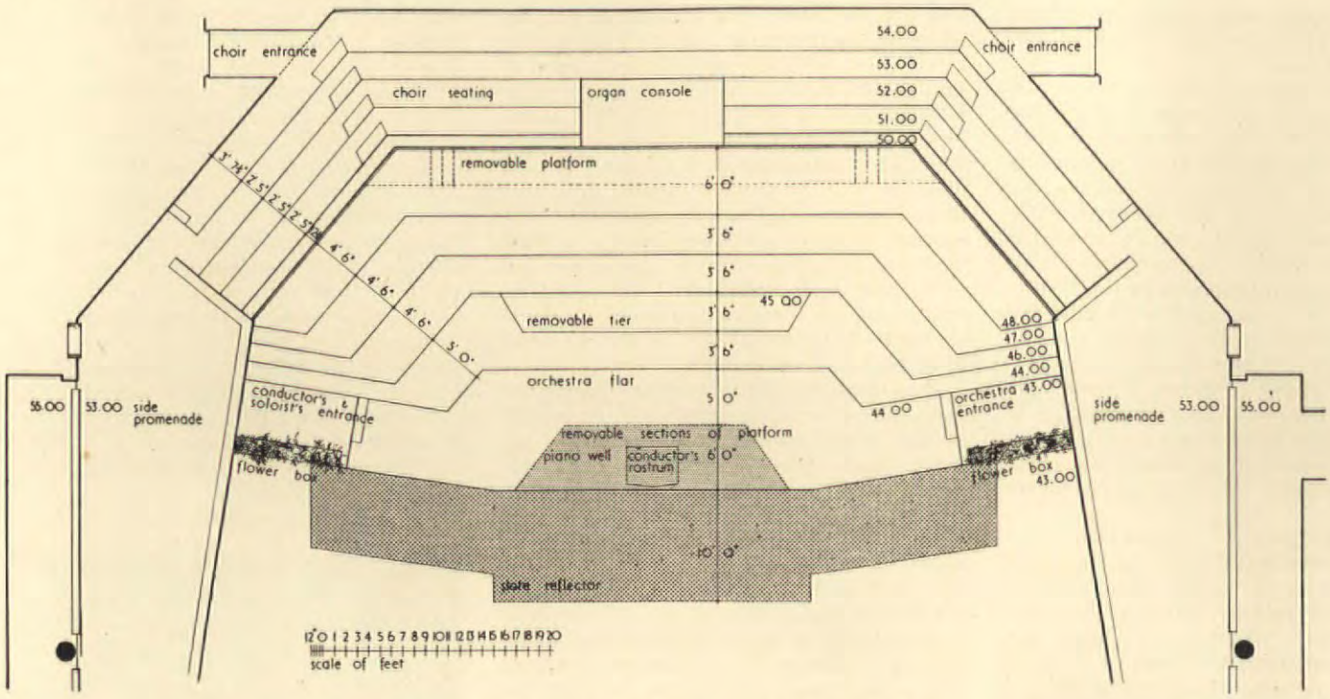
Over the orchestra the graceful canopy finished in pale sycamore on a body of 2 in. thickness is designed for a dual purpose: the return of some sound to assist the orchestra in hearing itself as a body, and the somewhat diffuse redirection of upward moving sound towards the rear of the hall. It had been hoped to use it to reflect sound towards the rear seats beneath the balcony, but arguments have been advanced by the organ-consultant that lowering the canopy to a point where this would be effectively attained would interfere with the output of organ tone from the opening behind the orchestra.

The use of a canopy in halls of this kind is not unusual but it deserves a little explanation, seeing that the main ceiling of the hall could conceivably be shaped to serve the same function. Its chief merit is that it enables the main ceiling to be kept at a high level without there being a danger of echoes from it. A large volume is needed in a hall to ensure long reverberation, and the high ceiling helps; but without the canopy this would lead to echoes.

The presence of the organ behind the platform necessitates an opening for it to speak into the hall, and the organ consultant's view was that the instrument should be as freely exposed as possible. The opening therefore is large, and removes the reflecting surfaces normally immediately behind the orchestra and choir



b, *comparison to the same scale of the long sections through several well-known concert halls and the Royal Festival Hall. Reading from top to bottom they are: Helsingfors Concert Hall; Copenhagen Radiohus; Covent Garden Opera House, London; Kleinhans Music Hall, Buffalo; Salle Pleyel, Paris; Royal Festival Hall. The unique part of the Festival Hall is the low platform and the steep rake of the audience seating immediately in front of the orchestra, the two being separated by a hard reflector. The purpose is to get a balanced aural view of the orchestra for all the listeners in the main seating area.*



c, *the orchestra platform. The light tint shows the removable piano bay; the darker tint shows the slate reflecting area.* d (*right*), *the specially designed music stands, which are on tracks to avoid the waste of space by tripod legs, permitting closer spacing of the players and therefore improving unity of sound.*

d

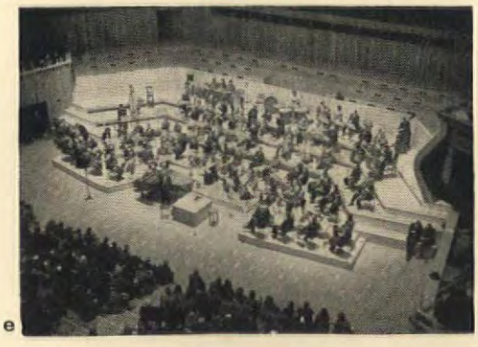
to a distance so great that they may cause an echo unless the sounds are suitably redirected. The organ is not to be installed for a year or two, and meanwhile a temporary screen largely avoids the difficulty, and the matter will be given further study. There is no doubt that the installation of a large organ in a concert hall presents serious problems in design to meet effectively its acoustical needs as well as those of the orchestra and choir. The need for good reflectors around the orchestra is very great, and a large organ opening just behind it is undoubtedly a disadvantage.

The cross-section of the hall presents only two acoustical features worth noting. The 'cornice' region, where walls and ceiling meet, may easily return sound as an echo. The reflection from a right-angle is parallel to the path for the arrival of the sound, and consequently exceptionally long delays of reflected sound can occur from a source on one side of the platform to listeners on the same side, via the 'cornice' diagonally opposite. In this case the treatment employed was to make this region highly absorbent at the point where echoes were most to be feared, using 2 in. wood-wool slabs with an air space behind.

The other feature to be noted is the deep pattern of boxes. These naturally were not introduced for acoustic reasons, but they have acoustical usefulness in causing diffuse reflection of sound. There is a risk that in a hall lined only with large plane surfaces the reflections from them will be so obvious and simple that the decay of sound in the place will seem irregular; broken surfaces help to avoid this. So much, then, for the shape of the hall in general. The main objectives in design were to ensure a good aural 'view' of the orchestra from all seat positions, and to form a large volume without echoes.

musical tone

Fullness of tone was the other desired musical attribute and it is said to be more important than balance or definition. No one knows for certain what 'fullness' of tone means in physical terms, which is bound to make treatment a little uncertain, but there is at least not much doubt that it calls for relatively long



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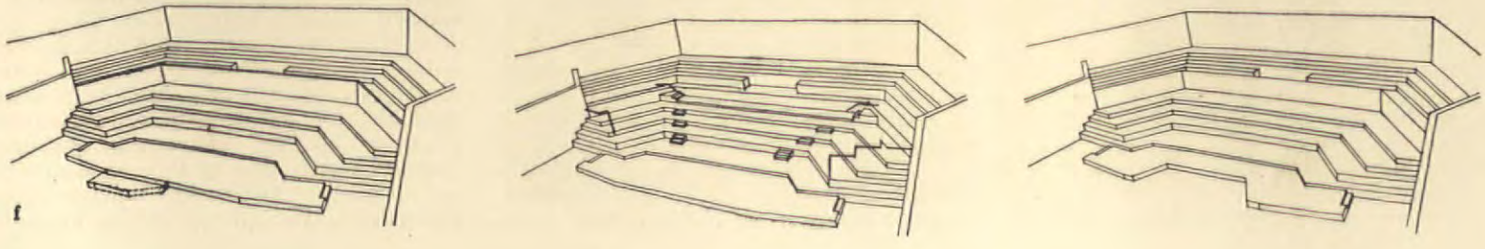
The first music played in the auditorium was at a tuning test which took place on February 14, 1951. e, *the orchestra platform during this test.* f (*below*), *three alternative arrangements of the platform, which is adjustable to suit different orchestral layouts. The arrangement on the right is that shown in the photograph.*



f

reverberation and for a particular balance as between the reverberation at low, middle and high registers.

When reference is made to the reverberation time of a hall without specifying whether it is for low, middle or high frequencies, the assumption is that it means the middle range, around about 500 cycles per second, and there are well-known recommendations as to what the reverberation should be at that frequency, though there are differences in the recommendations. For a hall of the present size (volume 750,000 cu. ft.), Knudsen and Harris in America recommend 1.7 secs. and Bagenal and Wood of Great Britain give 2.2 secs. In practice, contrary perhaps to common expectations, the problem is not to get the reverberation down to these levels, but to get it up even to the lower of the two.

The recommended values at low frequencies (100–200 c.p.s.) and at high (3,000–4,000 c.p.s.) are stated in relation to the value at middle pitch. The low frequency reverberation is not critical, but is generally accepted as being at its best when it is not less than the value for middle pitch, and not more than 50 per cent. greater. High frequencies are recommended to be maintained at the highest levels possible, because it is recognized that air and the audience combined will probably absorb them excessively anyway. In practice it simply means therefore that one tries to keep out of the design any other absorbents which operate at high frequencies.

provision of absorbents

Low frequency reverberation may easily be too long, and in the Festival Hall there was a special risk of this because the sound insulation treatment which had to be used to keep out low frequency traffic and train noise would be effective also in retaining low notes generated inside. Therefore special absorbents, effective mainly in the lower register, were given much attention in the design.

The most interesting of these is the elm panelling on the walls (*fig. g*). Panels with air spaces behind them have played a major part in the success of many halls, without anyone having more than a vague idea that it somehow 'helped acoustical tone.' Conventional panelling was common, and the use of plaster-on-lath, battened out an inch or two from the main structure, served the same acoustical function. Then German and Scandinavian research between 1935 and 1945 showed how panelling worked as an absorbent and how it could be controlled; now it is used deliberately in a great deal of acoustical work.

Panelling absorbs best at one particular frequency depending mainly on the weight of the panel and the depth of the air space, and its efficiency falls off fairly quickly above and below the best point, though for panels like those in the Festival Hall with peak values of 50 per cent. or more at frequencies around about 125 c.p.s., the absorption at 500 c.p.s. is still as much as 5 per cent.

The design of this panelling has an interesting history. It was known that the hall would need absorption at very low frequencies of 100 c.p.s. and lower, and that ordinary acoustic laboratories could not easily give accurate values down at that range because exceptionally large test chambers are needed for reliable measurement. Fortunately it was found that the London County Council had in its own building a large room built below ground partly under the approach to Westminster Bridge, and this was hastily converted for measurements. The Building Research Station's mobile acoustics laboratory sat overhead in the main road and by working at night during lulls in the traffic the necessary data were quickly obtained and the design of the panels went forward. The thickness of the panels was $\frac{3}{8}$ in., and the air spaces behind were of two depths, 3 in. and 4 in., to give a wide enough band of absorption. Two sizes of panel were also used, and bracing was varied on the larger size, again to spread the absorption band. Provision was made for inserting rock-wool in the air space (this increases absorption but does not change the frequency), and the whole of the panelling was made demountable in case tuning trials in the hall suggested the need for alterations.

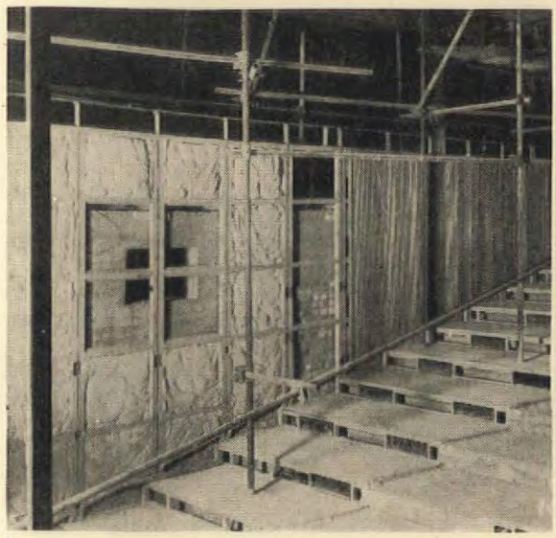
In the preliminary calculations it was assumed that the ceiling, which is of 2 in. thick fibrous plaster, would not be very absorbent at any frequency, and it was thought that most of the low frequency absorption would have to be done by the wall panelling. Early measurements in the hall as it neared completion made it clear that the ceiling is doing far more than was anticipated, and this has interesting technical implications. Obviously all linings of less than, say, 4 in. are going to have to be studied as absorbents.

The ceiling construction provides for an unusual absorbent not yet installed. Experience in a recent continental hall had shown that 'standing waves' sometimes occur which emphasizes one frequency rather unpleasantly, especially for radio listeners. There is a special type of absorber known as a Helmholtz resonator which consists simply of a hollow with an opening on one side (like a bottle), and by choosing an appropriate size absorption can be ensured at any desired frequency. The need for any particular size of resonator cannot be anticipated, and therefore provision in this hall was made for their subsequent insertion in the ceiling by forming plugs which could be withdrawn. *Fig. h* is a view of the ceiling showing the arrangement of the plugged openings (the smallest holes) for the resonators.

h, *the ceiling, showing the plugged holes for Helmholtz resonators to be inserted later if necessary.*

The absorbent treatment with the most arresting appearance is the vertical ribbing which lines the plinths below the promenades and various other positions (*figs. i–k*). This has been called the 'Copenhagen' treatment as a tribute to the Danish designers who devised it, and its distinctive merit, apart from appearance, is its ability to stand up to hard wear, while yet being a reasonably efficient absorber. The treatment is arranged to leave free air-gaps between ribs, but the gaps are overlapped by the asymmetrical cross-section of the ribs so that they are not visible. The energy in the incident

g, *wall panelling at side of auditorium, with panels removed to show rock-wool filling.*



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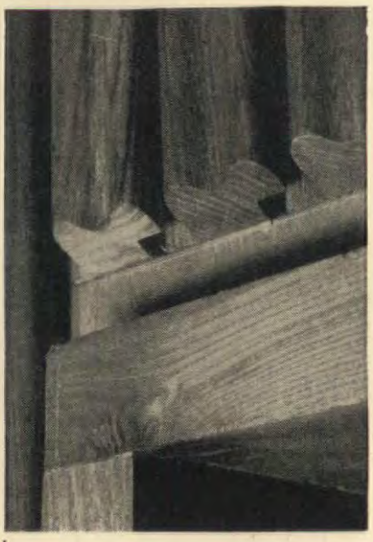

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k

'Copenhagen ribbing,' a type of wood wall-surfacing devised for its absorbent properties. i, *the panelling partly in place, with the rock-wool filling behind.* j, *a detail of Copenhagen ribbing showing the slits between ribs.* k, *the surface texture given by the Copenhagen treatment.* l (*below*), *absorbents at the back of the auditorium take the form of padded leather panelling with air spaces and rock-wool behind.*

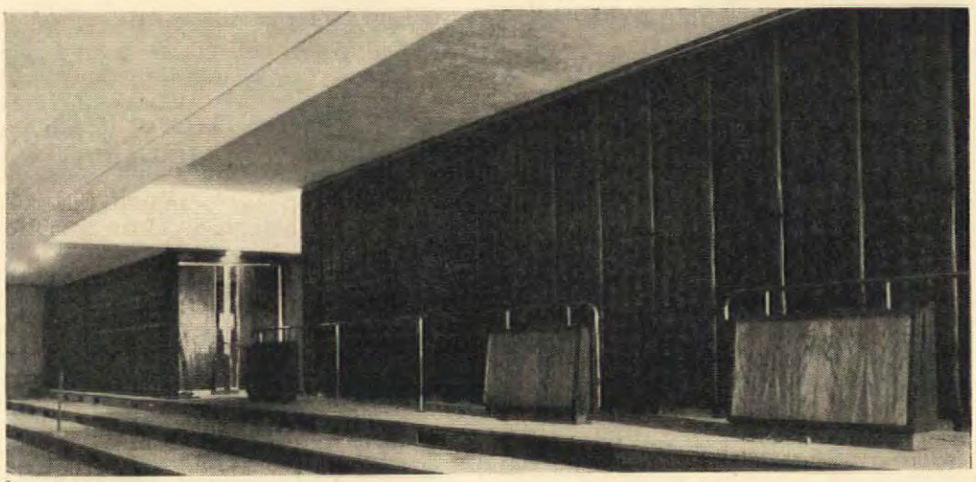
sound can pass through the slits to the air space behind, which can be filled with soft absorbents such as rock-wool or glass-wool. In the hall only the front portion is treated with soft absorbents behind, this being the area from which reflections could occur which might give echo effects.

The 'Copenhagen' treatment in another form is used elsewhere in the building in small areas and is very attractive. In this case the gaps between the ribs are exposed, and the soft absorbent behind is protected by perforated metal. An efficient absorbent has been introduced on the rear-wall surfaces where there is a risk of echoes, and this has been used also behind the promenades at the sides. Padded leather-covered panels (*fig. l*) are fitted in front of rock-wool which in turn has an air space behind it.

Apart from these absorbents, which all have decorative value, there is of course the exposed wood-wool in the cornice region, which has already been mentioned. Carpets and curtains have been kept to a strict minimum. Considering all these treatments as a group, it will be seen that only those intended for echo control are effective at middle or high frequencies, and that they comprise only a small total area. All the remainder are for low frequency absorption. It is an illustration of the extent to which acoustical design has become a matter of preserving energy rather than losing it. *Fig. m* (next page) shows the location of absorbent and reflecting areas.

Partly at least this has come about through the use of more luxuriant seats. These (and the audience which sits in them) constitute the most influential single type of absorbent in the hall, amounting to about half the total at middle pitch. Possibly seats should be made less absorbent, but there is this to be said for making them efficient, that when the hall is used empty for rehearsal it will then have characteristics reasonably close to those when it is full for performance. In this case the seats were perforated on the underside, with a pad of rock-wool behind.

Another absorbent is the ventilation system. The openings are surprisingly large in total area, and must be taken as having a high absorption efficiency. Moreover, they are now distributed over the whole area of audience and platform, and may have appreciable local effects as well as a general effect in reducing reverberation.

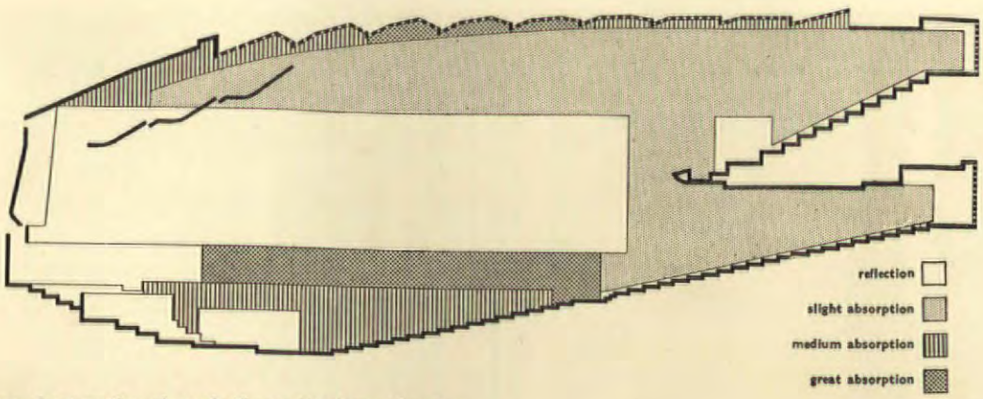


l

the tuning of the hall

This is a hall built to a new acoustical thesis. It is an attempt to attain 'fullness' of tone together with definition, with a true balance of orchestral output for all seat positions. Indications at the time of writing (April, 1951) are that the balance is all that it was hoped to be, so that differences between one seat position and another should not be very evident. The value of this may be difficult to appreciate unless one has experience of sitting in different positions during the same concert, but it is the case that some halls are very different from place to place, and no matter how good some particular position in a hall may be, the hall as a whole cannot be called good if its acoustical quality is highly variable.

Definition and fullness of tone may prove to be slightly conflicting requirements, and it is not known for certain yet whether the two are fully compatible in a hall of this size; or, if they are compatible, what exact balance should be struck between them. For this reason it was decided from the beginning to set out the construction programme so as to allow three full months between virtual completion and the opening date, for the purpose of studying the hall and modifying it if necessary. This tuning period, as it has come to be known, seems a worth-while idea to adopt for many buildings where high functional standards are required, and in this case it is expected to yield a great deal of valuable information besides being beneficial to the hall. Test concerts are being held with special programmes to bring out acoustical and musical factors, and full audiences are being invited, together with special teams accustomed to critical listening. The latter move systematically from place to place in the hall during the programme and are thus able to arrive at an appraisal of increased sensitivity covering the whole hall. There seems to be no full appreciation among designers or critics that the acoustics of a hall vary from place to place,



m, *long section through the auditorium, showing the location of reflecting and absorbing surfaces.*

and that the whole hall must be appraised for a fair judgment. Furthermore, to be 'good' acoustically, a hall must have good attributes in all positions, even though there are variations; thus, for instance, there must always be 'balance,' but it will be better in some positions than in others. The results of the investigations during the tuning period were not available in time for publication with this issue.

insulation and background noise

The Royal Festival Hall lies very near to one end of Hungerford railway bridge, a steel structure which carries across the Thames a dense traffic of electric trains and, like most such bridges, has a powerful low frequency emission when vibrated by a train. Various circumstances made the site unavoidable and the exclusion of the train noise from the hall became an important feature in design from the outset.

At that time not a great deal was known about the insulation requirements of concert halls and various studies had to be made. There had to be measurements on the site to determine the intensity of sounds reaching the hall, and measurements in other halls to discover the level to which quiet passages in music would drop.

This made possible the determination of insulation needs by simple deduction, but it was thought desirable then to check up on them by studying the insulation provided by existing halls and the noise fields around them. It was found, surprisingly, that many sites in cities were virtually as noisy as the Festival Hall site, due to heavy bus traffic, and the site was shown then to seem exceptionally risky merely because there was one outstanding noise in a relatively quiet area. At the same time it was found not only that listeners in many well-known halls had complained of intruding noises, but that unknown to them there was also a high general noise level filtering through which they would not notice because of its uniformity, but which was nevertheless interfering with their hearing of quiet passages. It was concluded therefore that a high standard of insulation should be provided in the Festival Hall, and that standards of the same order were generally desirable in all halls built in busy cities, and were not to be regarded as special to this building.

Of course the sources of noise, the trains on Hungerford Bridge, were considered to see if their noise could be reduced, and another surprising point emerged. Rails get worn, and it was thought that re-laying the rails on the bridge might reduce the amount of vibration. This was done, and a very useful reduction of low frequency noise resulted.

In addition to the busy surface railway, there are some underground lines beneath the hall. Again not much is known about the extent to which underground trains can cause noise in structures of various kinds, but measurements of vibration in the basement of an existing building on the site indicated that the hall was unlikely to suffer any serious harm from this cause; a preliminary assessment of the completed building seems to confirm this forecast.

The tactics of defence against the external surface noise—the noises of London at large and Hungerford Bridge in particular—took the following form. Where the main hall projected into the open air above its surrounding structure of foyers, offices, and so on, a stout double wall and roof were provided. Where the surrounding structure provided some protection, this was further developed for insulation by the use of sound absorbents able to absorb usefully at low frequencies. In other words, each storey and foyer was made into a large flat absorbent-lined duct, through which the sound had to pass to reach the hall itself. The last defences for the hall were the doors, all of which were specially treated to give high resistance. Finally, all openings through the 'armour' from the outer air into the ventilation plant were treated with absorbent splitters, as used for aero-engine test houses, to prevent the entry of low frequencies. *Fig. n* shows the main defences diagrammatically.

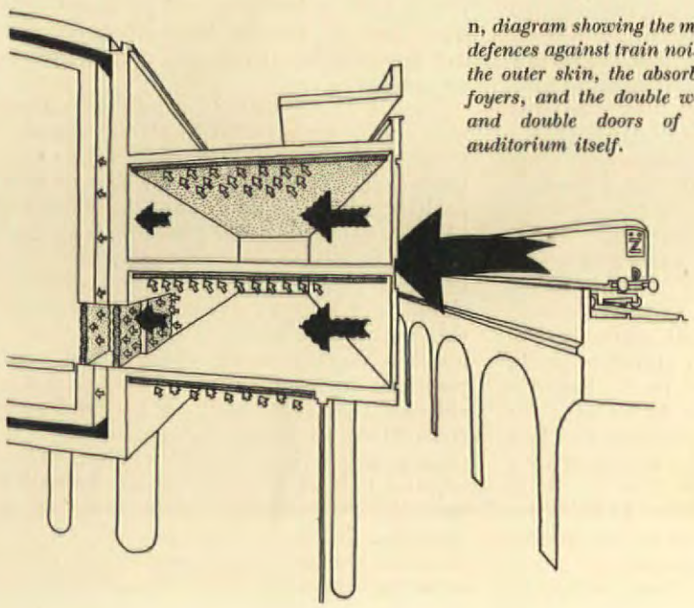
The actual 'armour' for the hall consists of two leaves of about 10 in. thickness of concrete, separated by a cavity of 10 in., lined on one side with 2 in. wood-wool used as permanent shuttering. This runs *unbroken* around the hall and penetrates down between it and the foyers to the base of the hall where the two leaves are allowed to become part of the general structure. This ensures that although the two leaves are not entirely separated at the base, noise reduction is provided by the length of path which the sound energy has to follow to reach the inner face of the hall.

The main defensive element in the roof is the double outer skin, for the ceiling of the hall is too freely perforated to be relied upon for much insulation. The outer skin is 4 in. thick and the inner is 6 in., both being of solid precast concrete screeded over to ensure that no cracks were left open. The gap between them is an average of 2 ft., and the upper leaf is carried by sleeper walls of brickwork resting on the lower leaf, with the upper leaf resting on a blanket of glass-wool. *Fig. o* shows the arrangement under construction. Walls and roof are joined in such a way as to maintain the cavity unbroken and the two elements imperforate.

It was considered necessary to test this construction in advance and as soon as possible a small building was erected on the site having roof and walls of the kind specified above. As a result of these studies the original roof proposals were modified to give the results described.

surrounding absorbents

The treatment of foyers and other surrounding spaces to turn them into



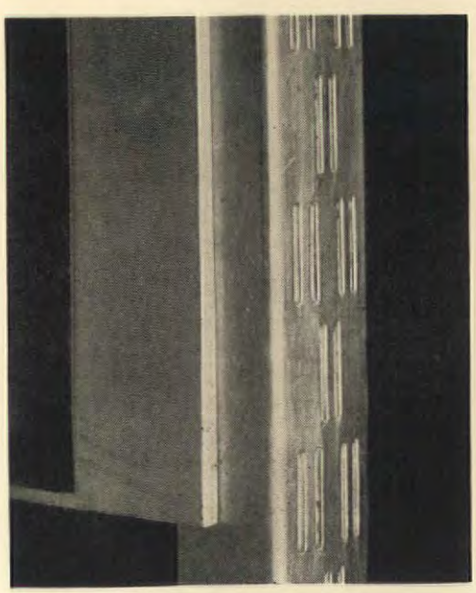
n, *diagram showing the main defences against train noises: the outer skin, the absorbent foyers, and the double walls and double doors of the auditorium itself.*

o, *the roof under construction; the outer concrete skin rests on insulating blankets of glass-wool over sleeper walls carried by the inner skin.*

absorbent insulating zones was mainly carried out by the use of perforated ceiling panels with a mattress of rock-wool above. The panels were a proprietary form of thin perforated plastic sheet with a light-coloured finish applied during manufacture, and their general appearance can be judged from *fig. p.* By being panels they are able to absorb appreciably at low frequencies, and by passing energy through the holes to the air space behind, the rock-wool is made operative at higher frequencies. Absorption treatments of this kind play an increasing part in acoustical work, and can often be relatively cheap in materials such as hardboards and plasterboards.

Areas of this perforated panelling were applied in foyers and other rooms on all sides of the building, but were used most generously on the two sides and corner nearest Hungerford Bridge. The amounts used can be gauged by studying the general views in the building and need not be given here in detail, except perhaps to mention that care was taken to use them over certain stair wells, where there was a free passage for sound movement throughout the building, and where glass screens enabled certain parts of foyers to be turned into absorbent lobbies.

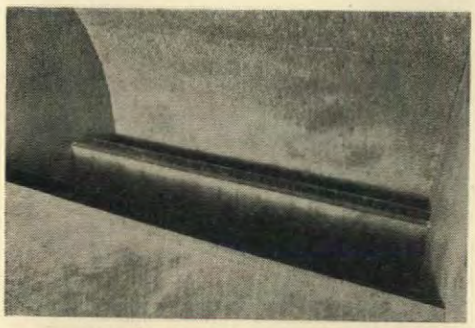
All this was related to the door system giving access to the hall itself through the 'armour.' Thus where the foyer design enabled only one sheet of glass to lie between the outer world and the armour, double doors were provided into the hall, with a highly absorbent lobby between,



p, *perforated plastic panels as used in the ceilings of the foyers, shown surrounding one of the light fittings. Behind the panels is an air space partly filled with rock-wool.* q (*right*), *perforated metal covers for the absorbent around the edges of the doors, to keep noise from going through the cracks.*

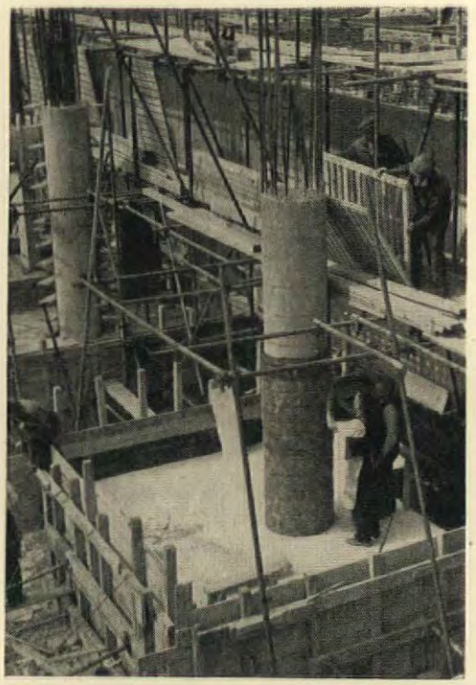
heavily carpeted and having a perforated panel ceiling. Where the foyers were arranged so that two lines of glass were interposed between outer and inner worlds, only single doors were used into the hall. In all cases the edges of doors were lined with a protected sound absorbent helping to prevent noise passing through the gaps between them (*fig. q*: foot of preceding page). This treatment could have been made more effective but it was not thought necessary to do so here. It is another of the useful ideas to come from Danish investigators and designers.

Finally there was the protection of the ventilation plant. This required openings so large that they could easily have negatived much of the value of the armour unless treated, and much care was therefore given to this item. The general nature of it can be seen from *fig. r* to consist of splitters faced with perforated metal and



r, *perforated sheet linings and splitters with rock-wool fillings are provided in the ventilation system to insulate noise passing along ducts.*

containing rock-wool. These run for some 100 ft. length between outer air and fans, and for 30 ft. between fans and openings into the hall, the general location being as shown in the diagrammatic representation of the air-supply system on page 394. It may be that the degree of protection is slightly greater than was actually necessary.



s, *sleeved columns under construction. An outer ring is to carry the foyer of the future small hall and is insulated from the centre column which supports the main hall, in order to prevent transmission of sound. The photograph shows the inner column being sleeved with insulating material.*

Measurements of the overall insulation provided by the system of protection are not yet complete, but preliminary indications are that it is entirely satisfactory in preventing the entry of train noise, the sounds of ships' sirens on the river, the noise of aircraft and the general noise of London.

insulation within the building

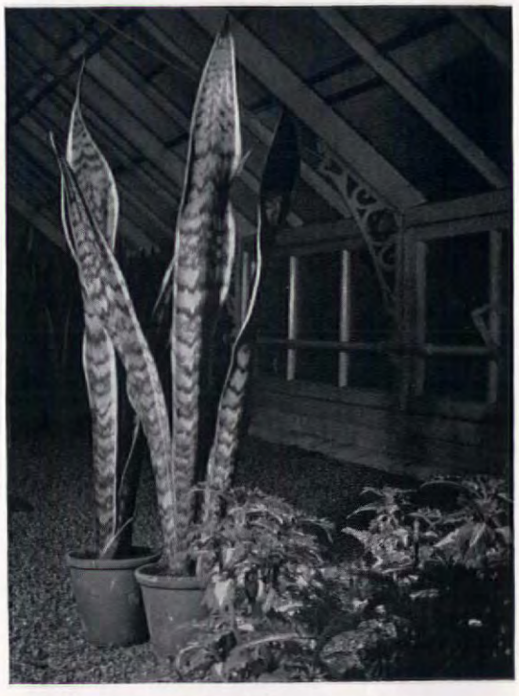
One or two problems of internal insulation required separate attention. The simpler of these was the reduction of noise in passages running from the musicians' lounge and practice rooms beneath the platform to the platform itself, and between kitchens and restaurants and other places. These require no detailed description and it is sufficient merely to say that the use of absorbent lobbies, and sometimes double door systems, has been the main technique employed.

More difficult was the insulation between the main hall and the future smaller hall which is to be tucked beneath the platform end of the former. Although it is the foyer of the smaller hall which actually comes beneath the platform, it was feared that if the structures of the two were actually coupled the organ and orchestra would both be capable of generating noise in the smaller hall which would prevent it being used at the same time as the larger. Yet it was not possible to visualize entirely separate systems of support, and the problem had to be approached by building up concentric columns, one sleeved around the other, with the inner column carrying the main hall and the outer sleeve the foyer structure for the smaller chamber. The sleeving offered no practical difficulty and was carried out by wrapping the inner support with glass-wool and a sheet metal casing, against which the sleeve was cast (*fig. s*). The foundation was more awkward, but study of pre-war measurements of the insulation provided by various materials under heavy load showed that a particular form of asbestos could take the expected loadings and yet retain suitable compliance. This material was laid over the foundation of the central column to receive in turn the foundation of the sleeve, and in this way the entire sleeved system was made separate from the structure for the main auditorium above.

The work described in the foregoing article was carried out, in association with Mr. Hope Bagenal, as part of the research programme of the Building Research Board of the Department of Scientific and Industrial Research and is published by permission of the Director of Building Research.

indoor plants

73
74



75
76

77
78

Indoor plants are freely and effectively used in the Royal Festival Hall. They are distributed throughout the foyers, bars and restaurants and play a specially important part in the furnishing of the main foyer, where there is a large planted area alongside the Hungerford Bridge entrance and a smaller one beside the bar opposite the doors to the lower restaurant. On this page are illustrated a selection of the principal plants used indoors—planting on the outdoor terraces is dealt with in the two following pages.

73, *Dracæna* (dragon plant). It has dark green foliage with silver stripes and comes from tropical Africa. It occurs in the planted area of the main foyer, and is grouped in tubs elsewhere away from direct light and away from doors and vents.

74, *Clivia Miniata*. This is an improved form with dark green foliage and flame - coloured flowers which comes from South Africa. It is used in vases, away from direct light, for both foliage and flower effects.

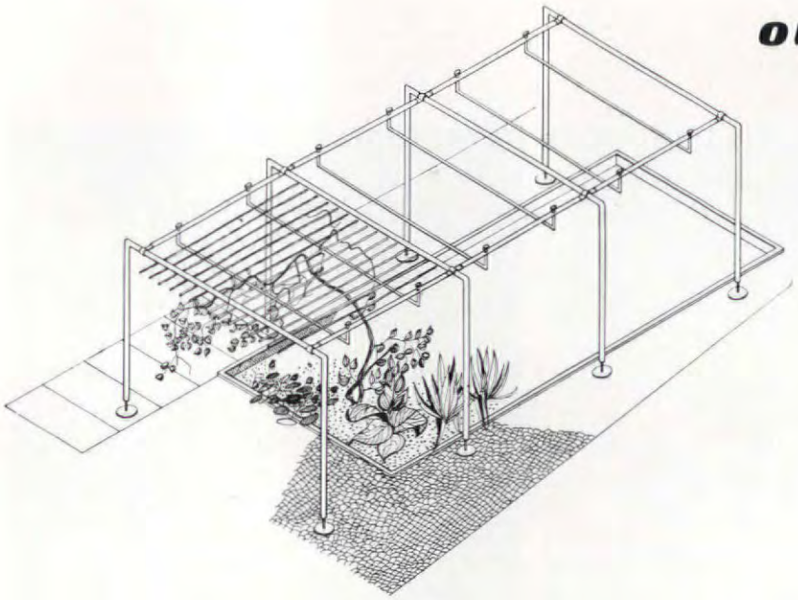
75, *Ficus Elastica* (rubber plant). It has dark green shiny leaves and comes from India. Used away from full light, both in bold groups and as single specimens.

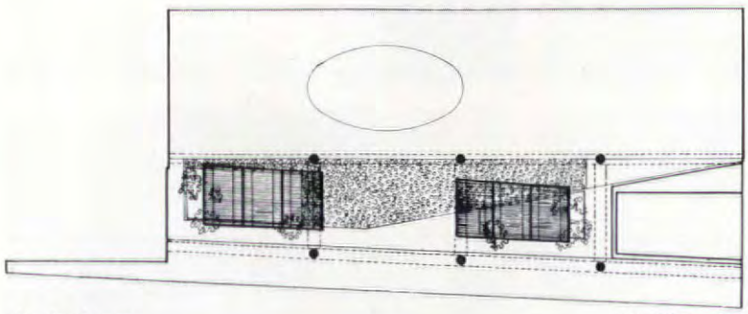
76, *Sanseviera Trifasciata Laurentii* (bow-string hemp). Greenish white, striped a golden yellow, it comes from tropical Africa. It occurs in the auditorium (where it is always fairly warm) and elsewhere in warm positions such as near convectors. In the foreground of the same picture is a *Coleus* (flame nettle or nettle geranium). It has green or red leaves, variegated in silver or gold and comes from Java. Used in dark corners, and in the boxes in front of the main foyer bar.

77, *Aralia Sieboldii Variegata* (fig-leaved palm): green and gold variegation, from Japan. It is used in dark corners away from direct light.

78, *Camelia* (japonica variety), with dark shiny leaves and white flowers flecked with pink. It too is used away from direct light.

outdoor planting





plan of roof terrace

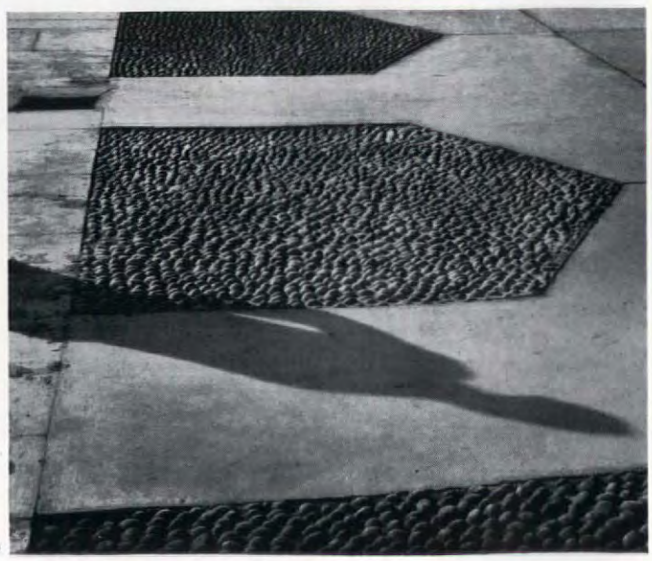
scale 1/32 in. = 1 ft.

81

At balcony level at either side of the building is an open terrace, reached from the foyer (see page 364), laid out as a garden. They are paved with cobblestones and furnished with pergolas for climbing plants. The placing of the pergolas is shown in the plan above and details of their construction in the drawing at top of page. They are designed in removable 7 ft. units, 10 ft. wide and 8 ft. high. The main framework is 2 in. steel tube, and the crosspieces 1¼ in. steel tube. Across them are laid bamboo rods. These roof terraces have extensive views up and down the river. 81 is the view from the Waterloo Bridge side. The shot-tower is on the left and Somerset House across the river beyond the bridge.

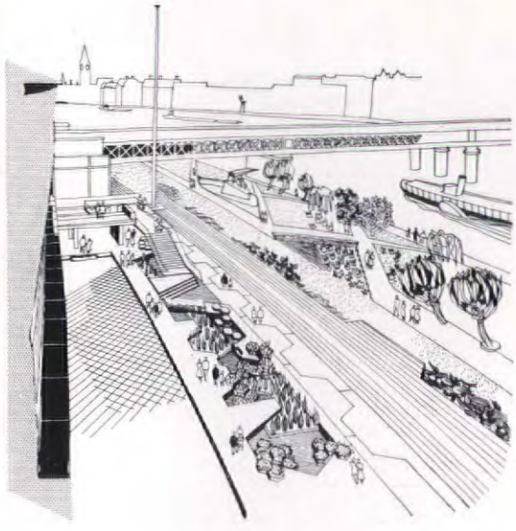
82

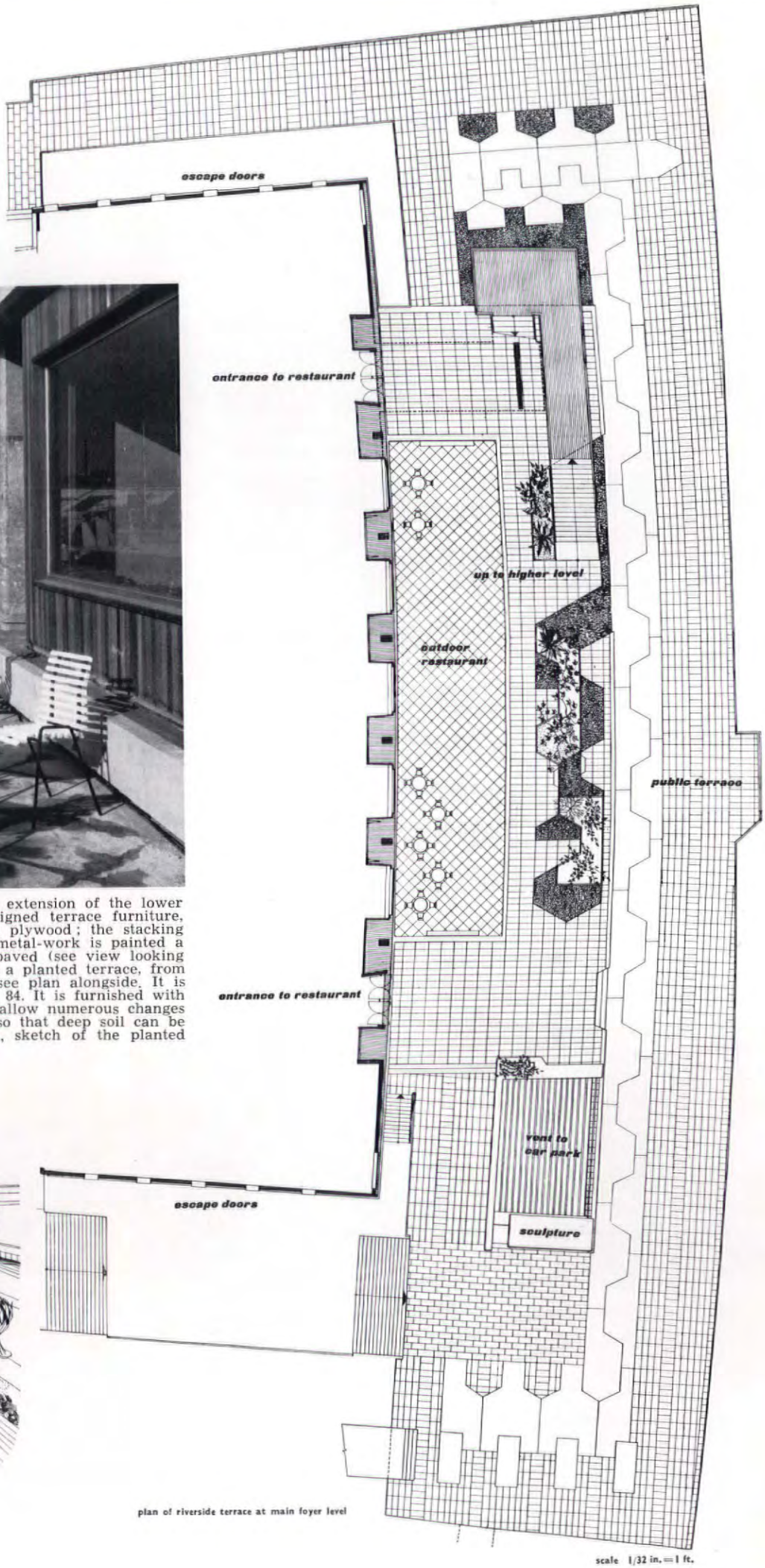
83



84

The centre part of the riverside terrace is an extension of the lower restaurant and is equipped with specially designed terrace furniture, 82 (facing page). The table-tops are varnished plywood; the stacking chairs have seats of beech, cellulosed white; metal-work is painted a matt black. This part of the terrace is stone paved (see view looking towards Waterloo Bridge, 85). In front of it is a planted terrace, from which a stair leads to the upper restaurant—see plan alongside. It is stone paved with inset panels of cobble-stones, 84. It is furnished with hexagonal concrete plant pots, 83, designed to allow numerous changes of pattern. The pots have removable bottoms so that deep soil can be provided when they are superimposed. Below, sketch of the planted terrace.

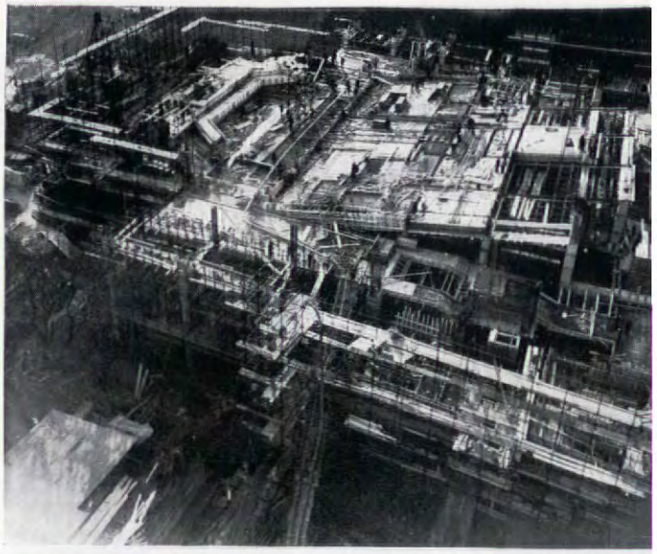




plan of riverside terrace at main foyer level

scale 1/32 in. = 1 ft.

a



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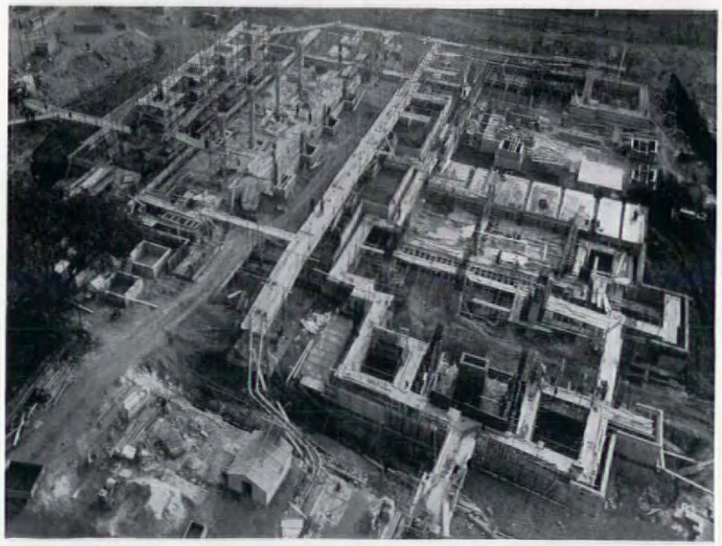
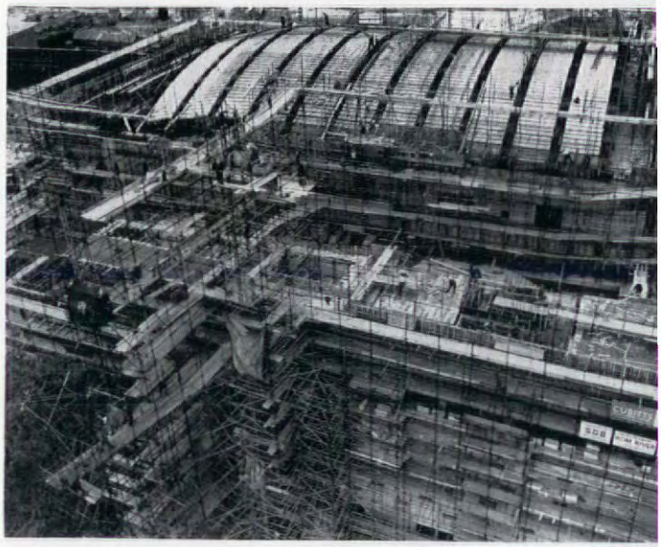


b



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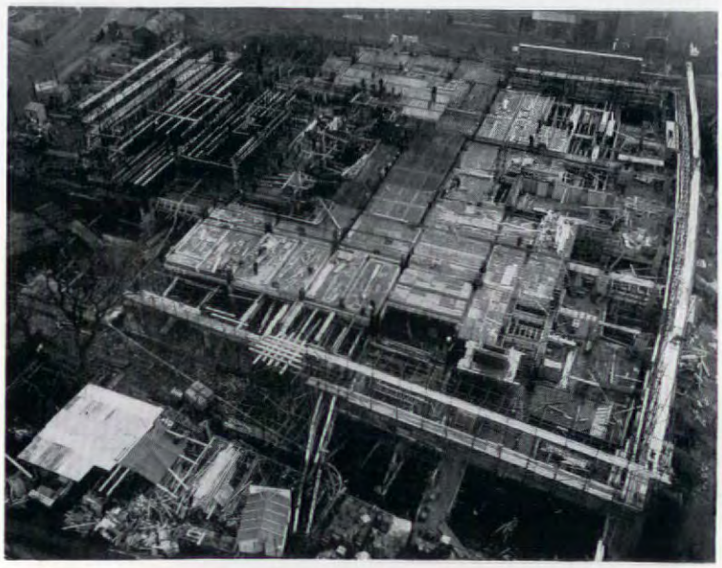


c

f

building progress

The progress of the building, which took the remarkably short time of exactly two years from the day work began on the site to the day of the Royal opening on May 3, 1951, is illustrated by a series of views all taken from the top of the shot tower. a, July 12, 1949: dewatering (see description on facing page) complete; mass excavation in progress; concrete bases started. b, September 27, 1949: basement walls under construction. Notice, running across the site from the centre foreground, the pipe-line through which liquid concrete was pumped to all parts. c, November 22, 1949: shuttering for main foyer floor in position. d, January 17, 1950: formwork being constructed for raking floor of auditorium. e, June 22, 1950: inner skin of auditorium roof being placed in position; reinforced concrete structure of foyers, etc., surrounding auditorium complete. f, January 7, 1951: the structure complete and waterproofed; finishing work proceeding inside. In all these photographs there can be seen in the bottom left-hand corner the one tree—a wych elm—that existed on the site. It was carefully protected, survived all the excavating around it, and is now flourishing.

TECHNICAL

construction The structural engineers, Messrs. Scott and Wilson, were faced with three special problems: to design a structure fulfilling the very complicated acoustical requirements (see article on pages 377-384); to poise the main auditorium, which because of the massive walls resulting from these requirements represents a load of 22,000 tons, on columns, leaving free foyer space beneath; and to devise a system capable of being built in a very short time. Detailed engineering drawings could not be begun until April, 1949, a month before the contractor started work on the site.

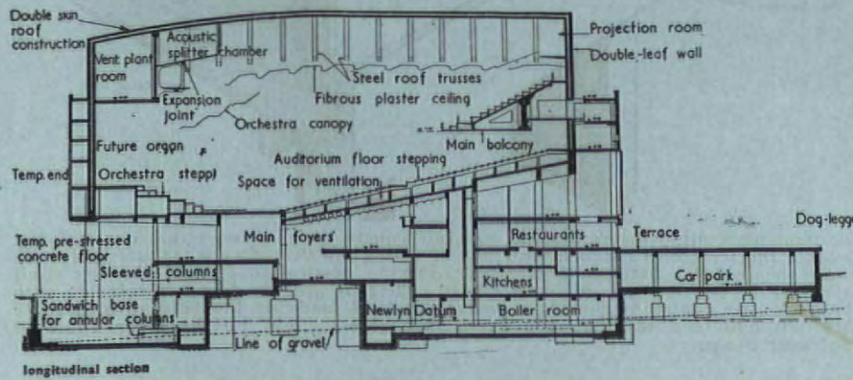
The solution was to use reinforced concrete throughout, except for supporting the curved auditorium roof, which is carried on twelve bow-shaped lattice steel trusses, and to carry the auditorium on a number of reinforced concrete columns of varying sections. An all steel structure might have been quicker to erect, but the limited allocation of steel for the building made this impossible and in any case concrete lent itself well to sound-proof construction. The auditorium, for sound-proofing reasons an almost totally enclosed box, has cavity walls of reinforced concrete. Each leaf is 10 in. thick and the cavity 12 in. The double floor consists of a sloping slab (forming the ceiling of the main foyer) and the stepping for the seating. Throughout this double-skin structure, wherever the inner and outer skins come in contact with each other in walls, floor or roof, there are pads of asbestos felt to reduce the transmission of sound.

The lattice-steel roof-trusses are supported on the inner leaf of the reinforced concrete walls and act as permanent shuttering for the concrete roof, which has the form of an arch, the ties being provided by the lower members of the steel trusses. The roof therefore exerts no outward thrust on the walls. The inner skin of the roof is 6 in. thick and the outer skin 4 in. thick with a 12 in. cavity between. The steel roof-trusses have the additional purpose of supporting the heavy fibrous-plaster ceiling (which is 2½ in. to 3 in. thick and is required for acoustic reasons), the ducts for air conditioning and the lighting equipment. They also made it possible to keep the auditorium relatively free from scaffolding while the concreting was being done, permitting work on the interior to proceed at the same time.

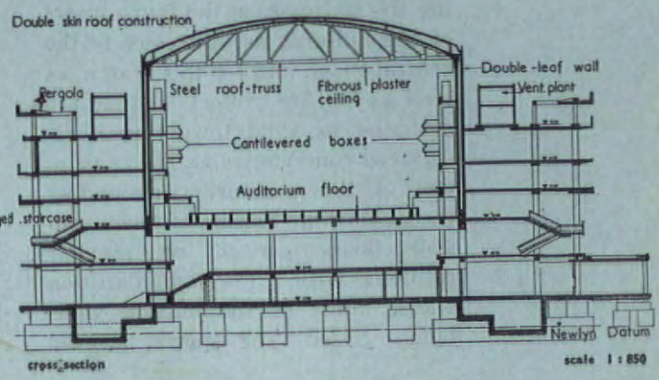
The auditorium balcony has an unusual form of construction. Instead of the traditional transverse girder with cantilevers in front and raking beams anchored into the walls behind, the main supporting member is designed as a torsion tube in reinforced concrete (see diagram on next page) spanning 104 feet between buttresses, with short cantilevered members in front and behind.

Of the reinforced concrete columns carrying the auditorium, the largest is 9 ft. by 3 ft. in cross section and carries just over 2,000 tons. Their load is taken down to foundations, some of mass concrete and some of reinforced concrete, at a level where there is good ballast capable of carrying three tons per square foot. These mass foundations were preferred to piles because of the risk of delay owing to obstructions known to exist on the site (such as the foundations of earlier buildings) and the risk of vibration damaging the approaches to Charing Cross Bridge or the tube railway that runs beneath the site.

The excavation for the foundations and lowest levels of the building involved another departure from traditional methods because the bottom of the excavation was well below Thames high-water mark, and the ballast overlying the London clay is fully charged with water.

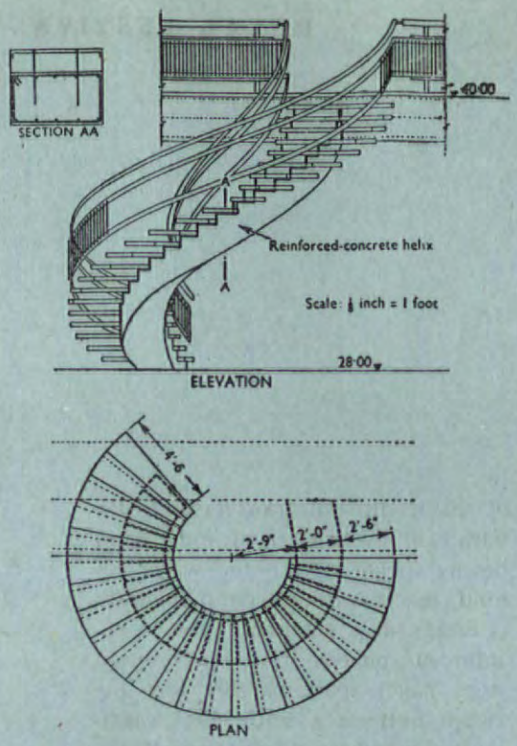


longitudinal section



cross section

scale 1 : 850



The helical stair, with terrazzo treads cantilevered from a central reinforced concrete spine, which links the upper and lower restaurants.

Instead of sheet-piling the perimeter and constructing a series of retaining walls to enclose the base of the building, a 'dewatering' system was used. This consisted of a 'fence' of steel pipes driven into the ground round the perimeter of the site and connected at the top to pumps. The pumps were kept going night and day, and as the pipes were fitted with strainers only water was removed, not silt, and settlement or movement of the subsoil was avoided. The 'dewatering' system lowered the water level by 11 ft. within four days after the pumps had been started, and kept the excavation dry throughout the progress of the work.

For planning reasons the columns supporting the auditorium had to be kept as slender as possible and could not be braced laterally to give rigidity. It was therefore decided to use the staircases at the four corners of the building as buttresses to the central mass, and for this reason, as well as for fire protection, they are designed as solid towers with reinforced concrete walls. The remainder of the structures surrounding the auditorium consist of beam-and-slab floors carried on circular columns, with a few light partition walls, most of the outside walls being glazed. The special sleeved columns, designed to prevent transmission of sound from the stage of the main auditorium to the small auditorium later to be built beneath it, are described and illustrated on page 384.

Two of the internal staircases are of some structural interest: a dog-leg stair rising from the main foyer direct to the lower stalls entrance to the auditorium, and a spiral stair (illustrated on this page) connecting the upper and lower restaurant. The first of these has laminated timber treads cantilevered 3 ft. 5¼ in. out from a central backbone. In the second the backbone is a helix of rectangular cross section measuring 2 ft. by 12½ in., and the treads, of pre-cast terrazzo, project 2 ft. 6 in. on either side.

lighting In the main foyer there is indirect lighting in the form of numerous small parallel troughs in the ceiling, designed to give the ceiling a general effect of all-over illumination when seen through the restaurant from the outside of the building. In the other foyers and the staircases, meeting rooms, restaurants, etc., there are various types of ceiling fitting, some of which are illustrated on the preceding pages.

The lighting installation in the main auditorium can be divided into three categories: the general lighting of the hall and audience; the lighting of the orchestra and choir platform; and the special lighting for occasions when the platform is used for dramatic or ballet performances. The general auditorium lighting is from rows of tungsten lamps set in the coves of the undulating ceiling, the surface of which is lit by fluorescent tubes. This gives a general lighting of the ceiling itself, together with directional lights for reading scores. Each row (of thirty-three lights) and the fluorescent tubes can be dimmed independently, giving a brightness range of all intensities from 600 to 1. Supplementary auditorium lighting is from concealed tungsten lamps in the front of the boxes and inside the access corridors to the boxes.

The lighting of the orchestra and

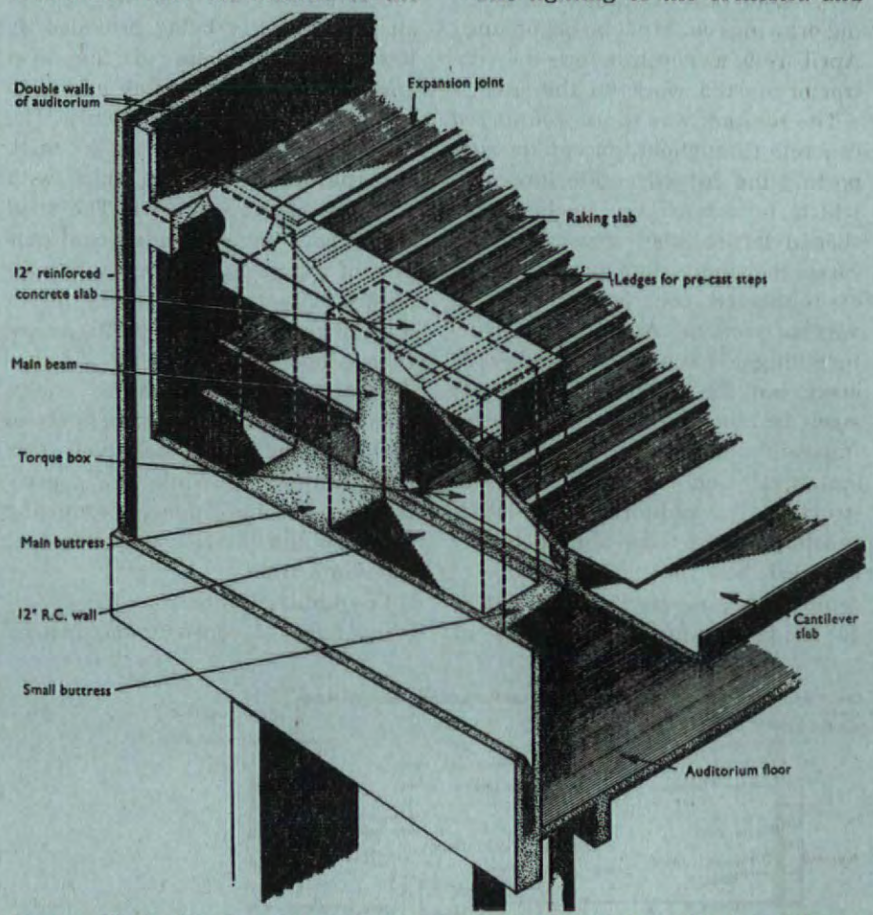
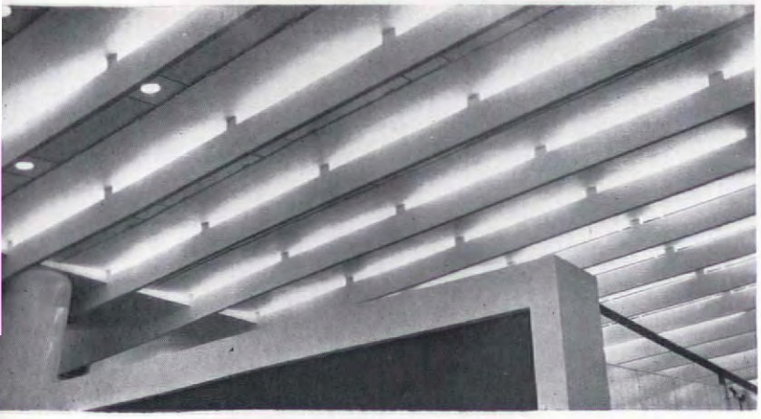


Diagram illustrating the reinforced concrete construction of the auditorium balcony. It takes the form of a quadrilateral box of which the deep face constitutes the main girder (span 104ft. between buttresses) carrying vertical loads, and the box itself takes the torque moment of loads whose centre of gravity does not coincide with the geometric centre of the main girder. Vertical loads on the balcony girder are thus not amplified (as they are in normal construction) by the lever effect of cantilever beams.

lighting

Left, the river front at night, taken from the outside stair leading to the upper restaurant. It shows the transparent treatment of the outer wall, designed to reveal the solid wall of the auditorium descending within it. Below, two views of the main foyer ceiling showing the indirect lighting. This ceiling follows the slope of the auditorium floor and when illuminated can therefore be seen from outside.

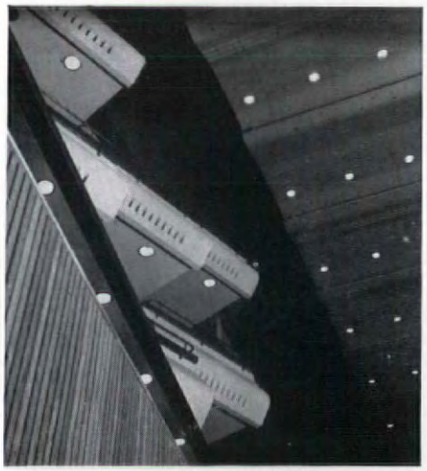


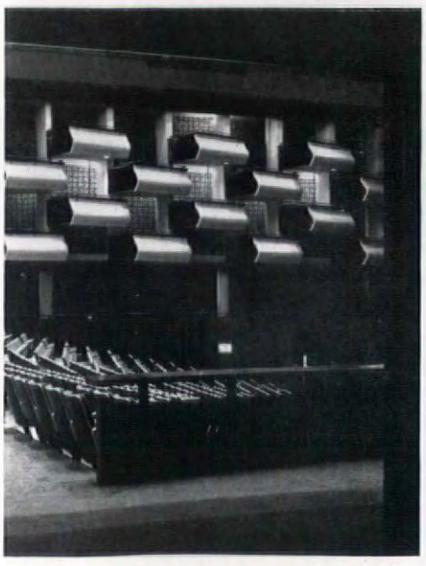
auditorium lighting

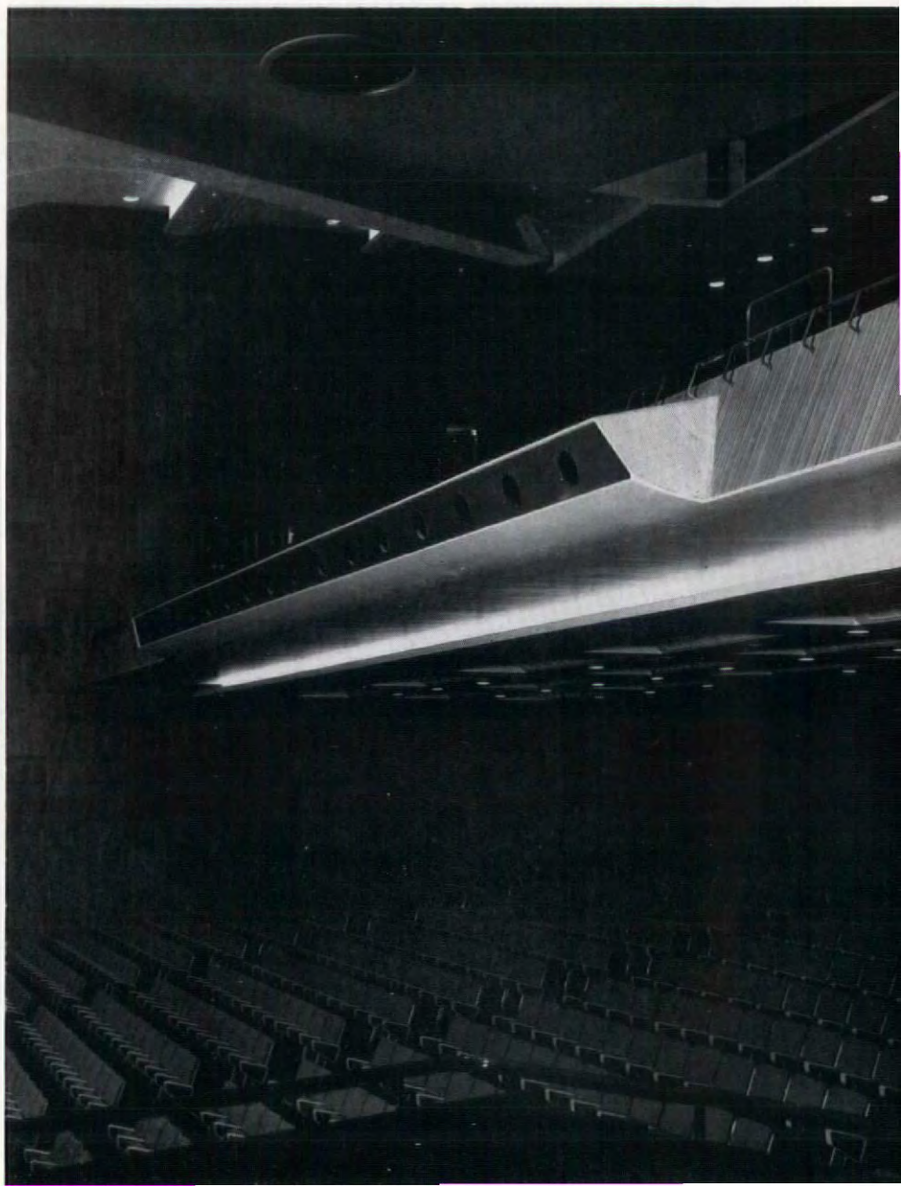
Right, the auditorium photographed at balcony level with normal audience lighting. The principal sources of light are in the ceiling; supplementary lighting comes from the boxes.

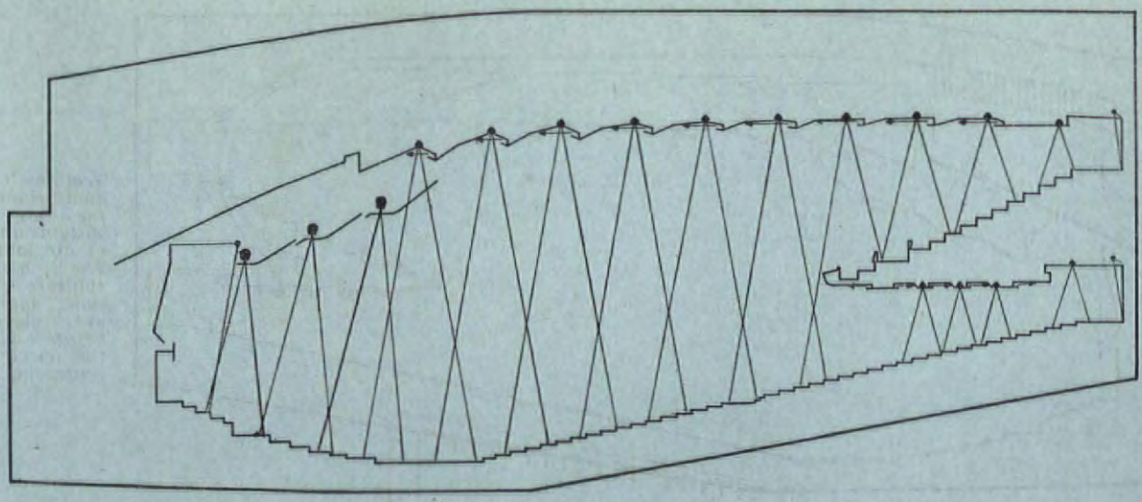
Above, the orchestra platform, illuminated for a performance, showing the even diffusion of light over the area.

Below, the auditorium (boxes, stalls and balcony) showing the effect when the audience lighting is dimmed during a performance. The lights in the ceiling are restricted to directional spotlights designed to be just sufficient for reading a score.

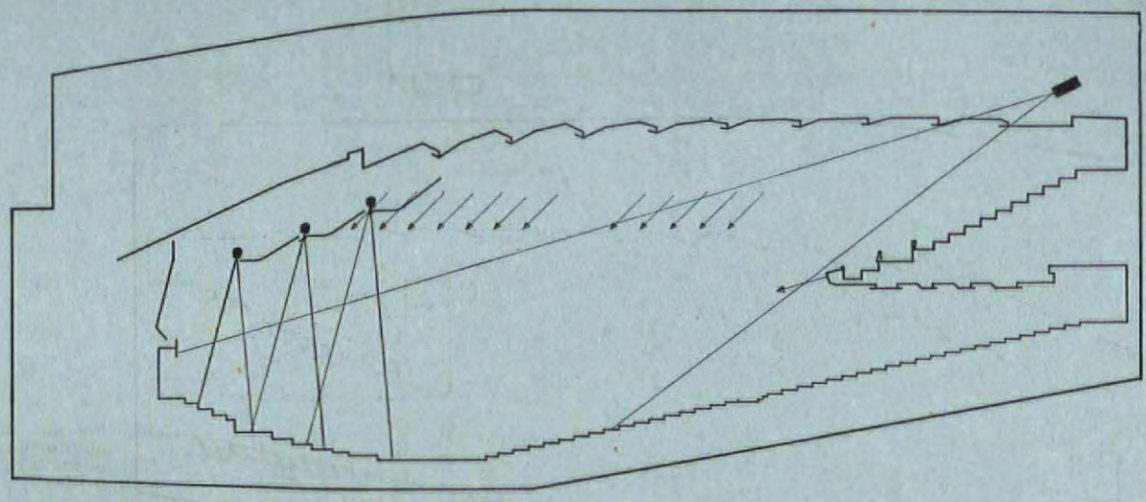








Section through the auditorium showing lighting for concerts. The arrows indicate the direction of the light reflected from the undulating ceiling (general audience lighting). The black spots indicate the tungsten directional lighting for reading scores when the general audience lighting is dimmed during performances.



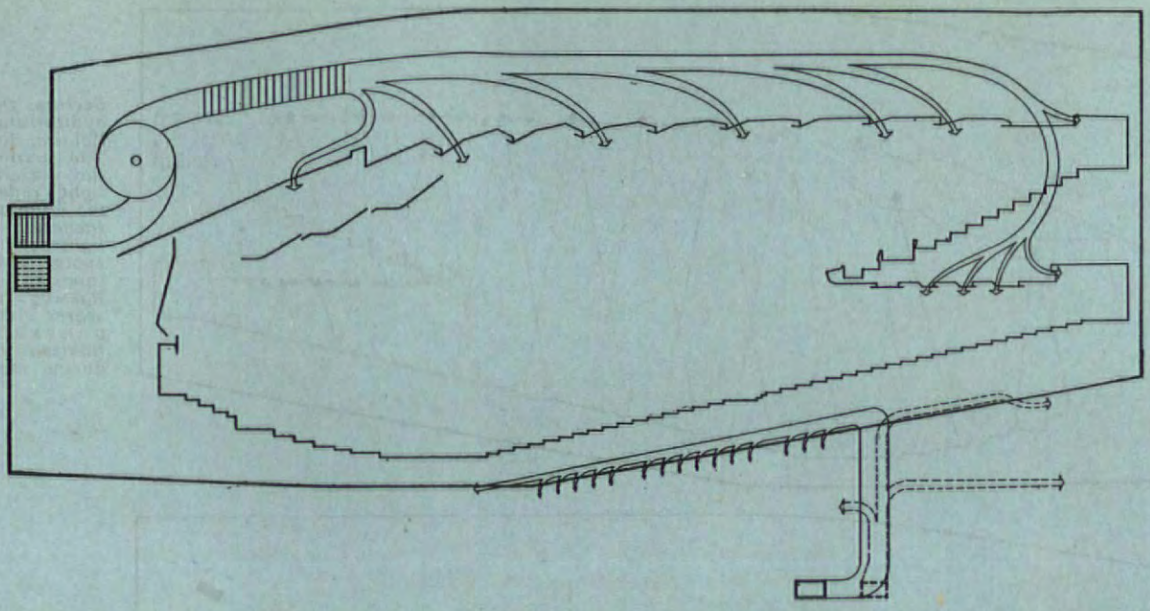
Section through the auditorium showing extra lighting for ballet or dramatic performances. The arrows indicate fixed and movable spotlights, the black spots additional acting area floods and the black rectangle on the right arc-lamps operating from the projecting-box.

choir platform was complicated by the fact that an acoustic sound reflector hangs over the front of the platform. All the lighting is projected downwards through apertures in this reflector. There are thirty-three 1,000-watt floods, separately controlled so that the lighting coverage can be adjusted according to the size of the orchestra and can even be restricted to illuminate a soloist.

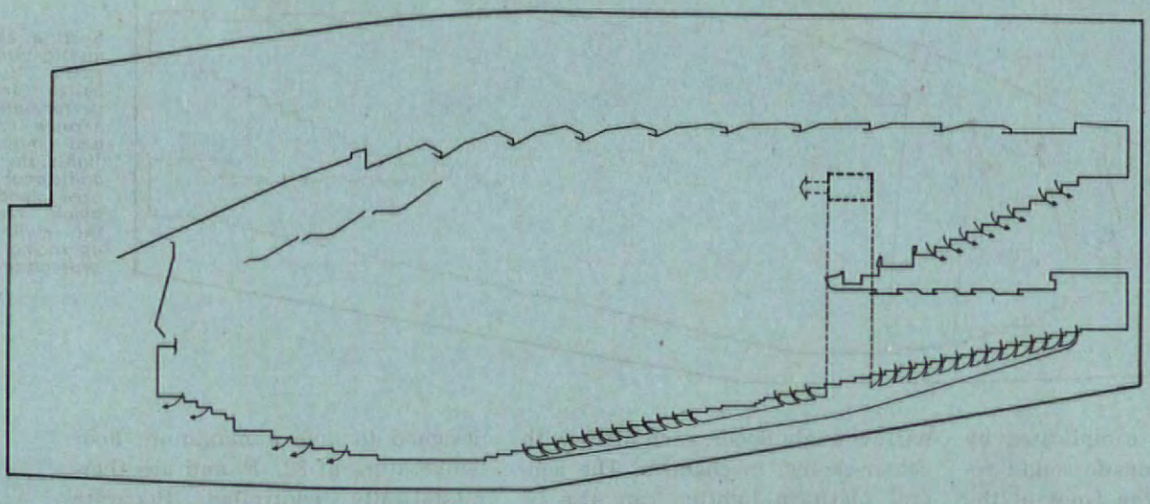
The lighting installation for ballet or dramatic performances includes a certain amount of basic equipment together with permanent wiring and control apparatus for such supplementary equipment as the occasion may require. Additional apertures in the overhead sound reflector can be opened up for this purpose, and there are also eleven apertures in the side walls of the auditorium behind which are concealed lighting galleries. A row of spotlights is built into the front of the balcony, and projection rooms at the back of the hall contain four high intensity arc projectors. The basic equipment includes thirty-two 1,000-watt spotlights and twenty-three 1,000-watt narrow angle floods, each fitted with colour-change mechanism. The general platform lighting can also be fitted with colour filters for use in dramatic performances. The dimmers and colour-change mechanism are controlled from a console in a small cubicle at stalls level with a view of the platform.

heating and ventilating The heating and air-conditioning services have been designed by the Heating Section of the LCC Architects' Department so that, in accordance with the planning requirements, the various parts of the building can be used either separately or together. This sectionalization of ventilation ducting and pipe runs was also highly desirable from the point of view of avoiding sound transmission. In the foyers, meeting rooms, restaurants and so on the heating is by low-pressure hot water, supplied from gas-fired boilers in a central basement boiler room. This low-pressure apparatus feeds convector-type radiators and floor panels. The latter are designed to give a maximum floor temperature of 80° F. and are thermostatically controlled. Separate air-supply plants, incorporating washers and filters, provide an air-supply by a plenum system to all parts of the building except in the main auditorium. General extraction points are provided in the kitchen with exhaust canopies over the cooking equipment. Domestic hot water is supplied to the lavatories and kitchens from central calorifiers with independent boilers.

The auditorium is air-conditioned; there is no direct heating, so that the danger of transmission of sound or vibration through heating pipes is avoided. There are two main air-conditioning plants, provided with speed variation and capable of delivering conditioned air at a rate of 1,250 cubic feet per person per hour under normal conditions. The plant has been designed with a view to incorporating refrigeration at a later date. It will then be possible to increase the total air supply, by recirculation, to 1,875 cubic feet per person per hour. In the meantime it



Section through the auditorium showing the air supply system and position of air intake grilles. The absorbent splitters for insulation against noise are placed just before and just after the circle, which represents the fans.



Section through the auditorium showing position of air extract grilles.

is proposed to take a limited supply of chilled air, for partial summer cooling, from a heat pump, using water from the Thames, which the Ministry of Fuel and Power has installed alongside the concert hall for exhibition purposes.

The conditioned air is introduced into the auditorium through louvres in the main suspended ceiling, and through air-diffusers at the back of the stalls at ceiling level. It is extracted through grilles in the steppings of the balcony and stalls and the orchestra and choir platforms (see the diagrams of the air intake and extract system on this page). Special precautions have had to be taken to prevent noise from outside from entering the auditorium through the ventilating ducts. As described in the article on the acoustics of the building on pages 377-384, the ducts have been specially constructed to absorb sound and incorporate acoustic splitters, the positions of which are shown in the two diagrams.

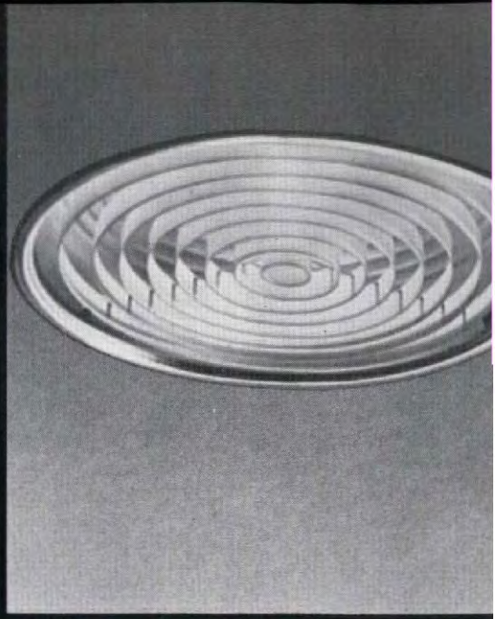
other services The water supply is taken from one main and is pumped, owing to the lack of the necessary head, through a ring main and four risers to four 3,000 gallon tanks at the top of the building. These are placed over each staircase tower. The ring main is of cast iron ; risers and supply pipes are of copper, gas-welded. There are, in addition, two 3,000 gallon soft water tanks, and another tank to serve the fire-prevention sprinkler system.

There was a difficult problem in draining the large auditorium roof, especially as it was decided that rain-water pipes should only be taken down at the corners of the building. Rain-water collecting tanks are therefore sunk in the copper roof at these points and multiple down pipes descend through ducts alongside the lavatory blocks in the staircase towers. A maximum of 2 in. of rainfall per hour was allowed for. The gutters which carry the rainwater to the collecting tanks are not of copper, because of the danger of mechanical damage and excessive movement in the lengths involved. They are of two $\frac{3}{8}$ in. layers of asphalt on screed. Down pipes are of cast iron.

There is a central vacuum cleaning plant for use in cleaning carpets and the upholstery of the auditorium seating. The plant is in the basement and consists of a motor-driven, multi-stage turbo-exhauster linked to two dust-separators each with removable bins. From the plant a piping system serves hose connections set flush in the floor steppings of the auditorium.

F.1200 RECESSED CEILING. Finishes : off-white ; outer ring, satin aluminium. Lamp : 150 watt reflector spot or floodlight, for display.

F.905/F TABLE LAMP. Satin brass and White flashed opal glass. Shade : convex-reeded, off-white grained plastic.



F.922 RECESSED CEILING. Finishes : refl anodised aluminium ; louvres, off-white. L 300/500 watts.

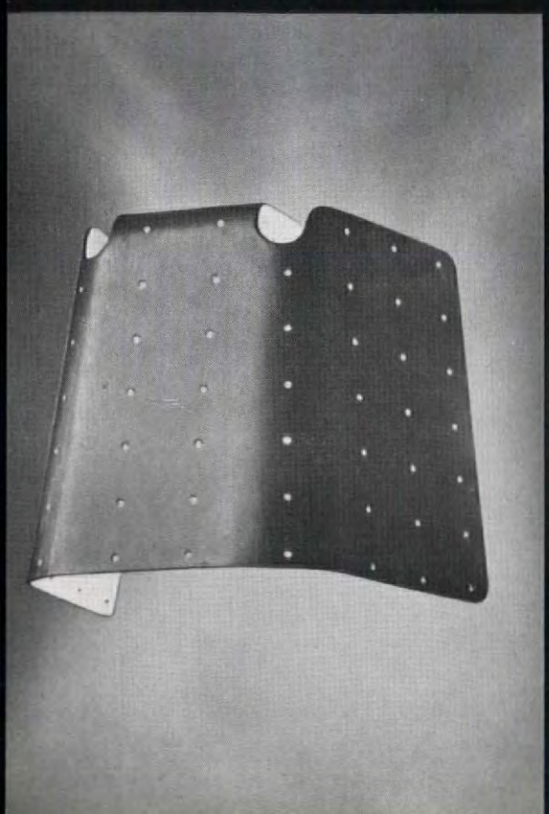
The Mondolite range of electric lighting fittings includes several that have proved so successful in the past, together with many new designs of particular merit which we have recently added. Wherever possible component parts have been made interchangeable giving great flexibility in design and purpose. This has been made possible by large scale production to precise manufacturing standards. Illustrated here are some examples of the Mondolite range. The complete range can be seen at the Lighting Centre in Knightsbridge, where you can also see our other ranges, Tubalux (fluorescent), Ultralux, and Versalite.

TROUGHTON & YOUNG (LIGHTING) LIMITED

The Lighting Centre

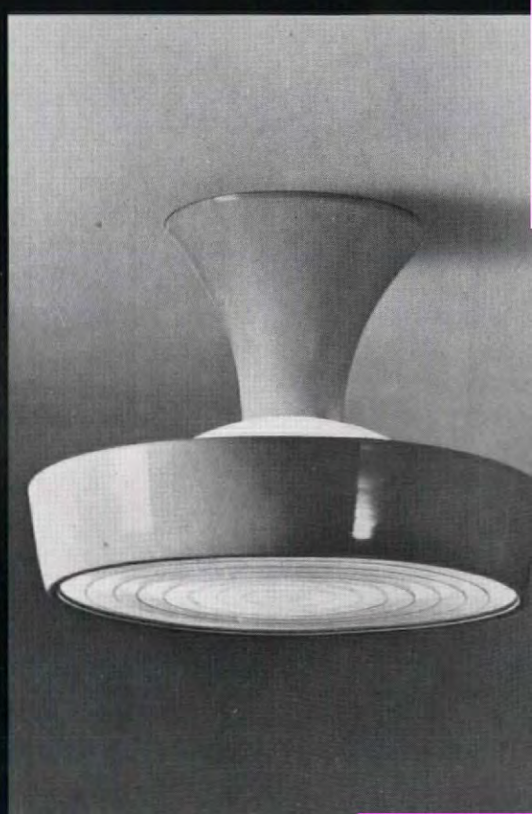
143 KNIGHTSBRIDGE, LONDON, S.W.1. TELEPHONE: KENSINGTON 7457 (15 LINES)

F.954 WALL BRACKET. Dimensions : 7⅛" x 6" x 5". Finish : satin aluminium. Lamp : 60 watts.



F.816 PENDANT. Finishes : bowl support and ceiling plate, off-white ; lamp housing and bowl, gilt anodised aluminium ; suspension, satin brass. Dust cover : obscured glass. Lamp : 200 watts.

F.936 CEILING. Finish : all off-white. Dust c obscured glass. Lamp : 300/500 watts.



ANTHOLOGY

The Absent Eccentric: Paris 1878

The plan of the Paris Universal Exhibition of 1867 did not ill resemble that of a system of concentric oval dishes. The plan of the Universal Exhibition of 1878 is, so far as the Champ de Mars is concerned, simply an immense parallelogram, intersected at right angles by innumerable avenues between blocks of glass cases full of the most ingenious and the most highly-finished specimens imaginable of everything that can contribute to the convenience, the comfort, and the luxurious enjoyment of life. There is obviously no limit to the productive powers of humanity, if there be an adequate supply of raw material, of capital, and of mechanical or of manual labour; but there does, so it appears to me, occur from time to time a visible halt and surcease in human inventiveness. Such temporary stoppage of the inventive faculty seems to be the most prominent characteristic of the enormous Bazaar at the foot of the Bridge of Jena. The 'roaring looms of Time' make as thunderous a clatter as ever; but it is the old, old tissue that is being woven. There is a maximum of gregariousness and a minimum of isolation among the exhibitors. You look in vain in these interminable corridors of shop-windows for such naïve specimens of individual ingenuity and labour as were delightfully manifest in our World's Fair in Hyde Park seven-and-twenty years ago—models of Tintern Abbey or Rochester Castle in cork; Pharaoh and all his Host Engulfed in the Red Sea, burnt with a red-hot poker on a deal board, by a clergyman in the vale of Taunton; Comical Creatures from Würtemberg; Gulliver and the Lilliputians, in wax; Susanna and the Elders, in Berlin wool, by a Lady Twenty-five Years Bedridden; or a Model in Ivory of the Old Téméraire, by Two Congenital Idiots. These were unpretending 'Exhibits' enough; but they spoke of the craft and patience of individual Man. In more recent Expositions, and notably in the gigantic Bazaar which I am at present painfully exploring, individual man, save in a very few instances, disappears, and is replaced by great Companies and great Firms solicitous of orders, and eager to sell their wares.

GEORGE AUGUSTUS SALA, *Paris Herself Again*. Vizetelley and Co. 1879.

MARGINALIA

This Month's Anthology

Much interest was caused when an appeal was made to the public by the 1951 Festival authorities to help them find exhibits illustrating English eccentricity for display in the section of the South Bank exhibition dealing with the English character. The results of the appeal can now be seen in the Lion and Unicorn Pavilion.

But a display of eccentric products is no new thing; there were a number to be seen at the Great Exhibition of 1851, as George Augustus Sala recalls in the passage quoted above. He complains of their absence from the Paris Exhibition of 1878, and in doing so underlines the difference of character between the earlier international exhibitions and those of the end of the nineteenth century and the beginning of the twentieth, when they became, in effect, indistinguishable from a trade fair.

The book from which the passage is taken, by one of the most celebrated English journalists of all time, was the outcome of a visit the author paid to Paris for the *Daily Telegraph*. He was asked to describe to *Telegraph* readers how Paris looked and what it had to offer to the visitor on its recovery from the effects of the Franco-Prussian war, and gives a lively account, not only of the 1878 exhibition, but of life in the streets of Paris, the characters to be met there, the restaurants, the shops and the opera.

War Damage Records

In a recent letter to *The Times* Alec Clifton-Taylor asked whether there was any prospect of the early publication of an official list of British buildings destroyed or damaged in the war. He pointed out that as long ago as 1945-6 the Stationery Office had issued a series of booklets called *Works of Art: Losses and Survivals in the War*, which covered Italy, Malta, Greece and the British zones of Germany and Austria, and that a little later an inventory of war damage in France, classified by *departements* and according to the degree of damage, had appeared. 'Yet,' he continued, 'after nearly six years and although much work was, I believe, at one time devoted to its compilation by the staff of the National Buildings Record, a comparable list relating to England has still to be published. From many points of view this is most regrettable. . . .'

THE ARCHITECTURAL REVIEW agrees with Mr. Clifton-Taylor. The continuing lack of such a list is more than an inconvenience, while to foreigners it must seem symptomatic of a strange indifference on the part of this country to its architectural heritage. Mr. Clifton-Taylor, the REVIEW understands, is perfectly correct in thinking that much of the spade-work has already been done. It is high time that the public was shown some results.

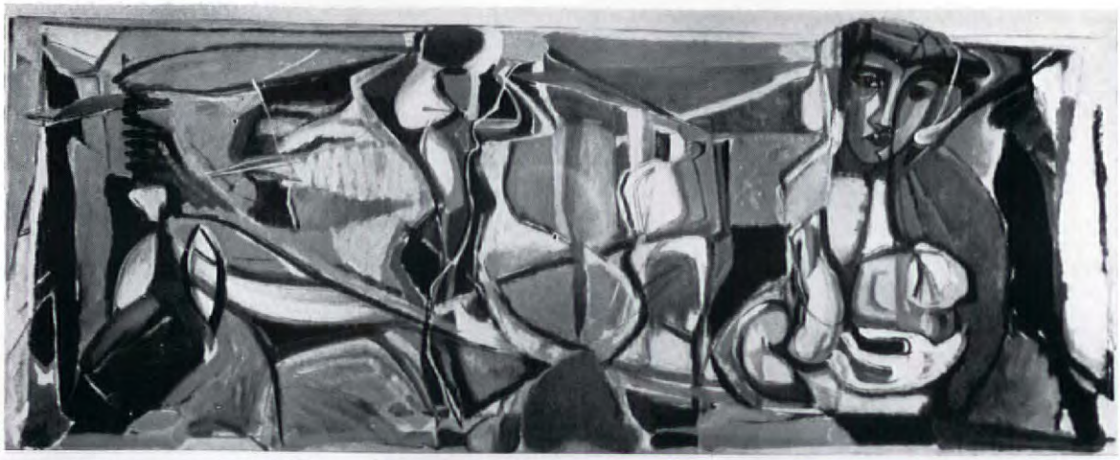
Crime in Piccadilly

The stretch of Piccadilly nearest to St. James's Church has been peculiarly unfortunate in recent years. First came the memorial garden (in the Chelsea Flower Show style) in front of the churchyard. More recently, a corner site opposite has been taken by an advertising agency, and as a result the public has been treated to a succession of outsize wash-tubs, Christmas puddings, squirrels and so on about which the only question could be

1, *advertisement in Piccadilly.*

whether their innate vulgarity or their unsuitability for such a position was the greater. Nevertheless the latest monstrosity, of which a photograph is reproduced on this page, has all its predecessors easily beat. Visitors to Britain for Festival year must be more than a little puzzled that a nation which is capable of *ad hoc* achievements like the South Bank Exhibition should be so indifferent to its everyday surroundings as to tolerate this kind of thing in one of the principal—and, let it be said, one of the most beautiful—streets of its capital. There is some comfort to be had, however, from the thought that it may not tolerate it much longer. The 1947 Town and Country Planning Act gives local authorities powers to control outdoor advertisements. The LCC has delegated

2, *Crewe House, Curzon Street, London.*



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ARTS COUNCIL PURCHASES The Arts Council of Great Britain have announced the five paintings to be purchased for £500 each from their Festival Exhibition Sixty Paintings for '51. *They are:* 3, Aquarian Nativity *by Ivon Hitchens;* 4, Bicyclists against a Blue Background *by Robert Medley;* 5, Interior near Paddington *by Lucien Frend;* 6, Autumn Landscape *by William Gear;* 7, Miss Lynn, *by Claude Rogers.*

these powers to the Metropolitan boroughs, before whom existing advertisement sites come up for review on July 1. The Westminster City Council will then be able to take action to restore the proprieties in Piccadilly; by acting strongly they will earn the gratitude of every Londoner with an eye in his head.

And having done that, it might turn its attention to the numerous lesser examples of tactless advertising that deface the West End. Among the most inept are the hoardings in Curzon Street which, as shown in the other photograph here reproduced, successfully block the view of Crewe House from the south-east. As it is only recently that this view of Crewe House has been vouchsafed to the public it is insufferable that it should be taken from them in this way.

Corrections

The Table, c. 1919-20, by Pablo Picasso, illustrated in the article *Architecture and Modern Painting* in the February REVIEW, is in possession of the Smith College Museum of Art. The introduction to *Early Cast Iron Façades* in the same issue suggested that the cast-iron façades of Glasgow were earlier than those of Bogardus in New York. This is not in fact the case. James Bogardus' best known building (for Harper and Brothers) in New York was built in 1854. In addition Professor Hitchcock has pointed out in a private letter recently that the Penn Mutual Building in Philadelphia, which is still standing, was built between 1850 and 1851, and is thus probably the earliest extant iron façade. It is by no means certain that the façade of 76, Oxford Street, mentioned in *The Builder* in 1851, was of glass and iron all the way up. In the caption to illustration 6, page 116, of the same article the location should read Bath Street.

INTELLIGENCE

The 1951 Summer School of Architectural History and Measured Drawing at Oxford takes place from July 21 to August 4. The School will include tours to the Cotswolds and to Blenheim Palace and a number of places will be reserved for students and architects from overseas. Further details can be obtained from the Berks, Bucks and Oxon Architectural Association or the Southern Regional Council for Further Education.

Wilton House, Salisbury, is now open to the public for the first time since the war.

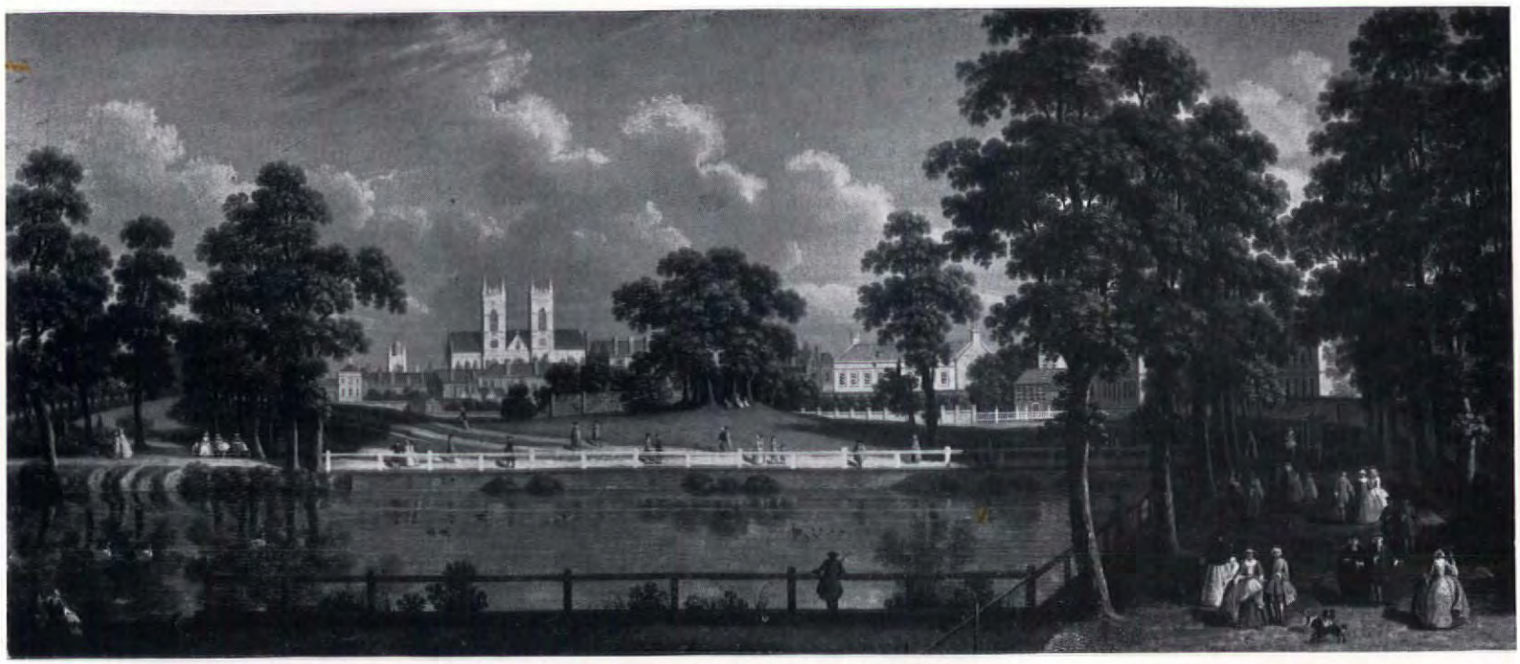
A Summer School of Architectural and Historical Study will be held in York from August 11 to 25 this year. Applications to The Secretary, York Civic Trust (Academic Development Committee), 6, High Petergate, York.

An Eliel Saarinen Memorial Exhibition was held recently at the Museum of the Cranbrook Academy of Art at Bloomfield Hills, Michigan.

New members of the Department of Scientific and Industrial Building Research Board are Sir Luke Fawcett, H. J. B. Harding, L. C. Howitt and Miss J. Ledeboer.

EXHIBITIONS

In Europe, as Roger Fry pointed out, sculpture which takes animals other than man for its raw material is more often than not vitiated either by excessive stylization or by the process, resulting from an anthropocentric view of the universe, which endows animals with human qualities. (Horses are noble, dogs faithful, owls wise, and so on.) Fry thought that the ancient Greeks, to whom Europe owes its belief that man is the measure of all things, were to blame for this state of affairs; and evidence in support of this view was provided by the recent exhibition of work by John Skeaping at the Leicester Galleries. For Skeaping, an absentee from exhibitions for the past fifteen years, has spent a year and a half among the Zapotec potters of Mexico—well beyond the reach of the Greeks—and among the works which he has produced from that experience are a number of terracottas which over and above their more strictly formal qualities show a sympathetic appreciation of the specific characteristics of birds and



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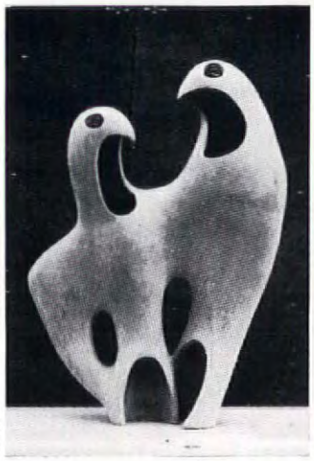

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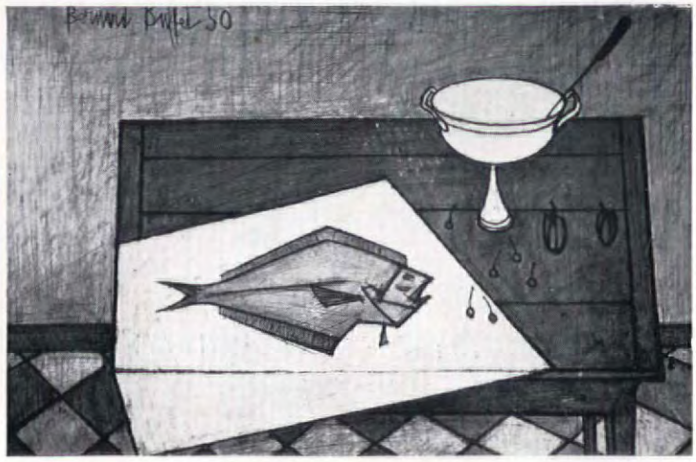

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8, A view of St. James's Park *by Samuel Scott from the exhibition at Agnew's;* 9, Two Parakeets, *painted clay, by John Skeaping from his exhibition at the Leicester Galleries;* 10, Nature Morte Bleu *by Bernard Buffet from his exhibition at the Lefevre Gallery;* 11, Le Journalier et le Gigant *by Jean Hélion and* 13, Tête, *bronze, by Fritz Wotruba from the exhibition at the Hanover Gallery;* 12, Portrait of Somerset Maugham *by Graham Sutherland from the retrospective exhibition at the Institute of Contemporary Arts.*

animals together with a rare faculty for heightening them, so that his bulls are more bovine, his pigs more porcine than life.

Also at the Leicester Galleries were Muriel Pemberton and Algernon Newton. Muriel Pemberton, to whom as a teacher St. Martin's School of Art owes much, has as pretty a talent for linear pattern as one could easily find. Algernon Newton continues to paint certain of the less populous aspects of London in his well-known style. His pictures must have opened the eyes of many Londoners to the decaying Regency beauties of their metropolis —and such a one as the *House by the Surrey Canal* in this exhibition is at its own level irresistible. When he tackles more grandiose subjects, as in *St. Paul's Rising out of the Fog* or *Waterloo Bridge*, 1951, he is less successful.

The London of Algernon Newton's choice disappears almost as fast as he can paint it. Samuel Scott, of whose more lively though in certain respects less skilful paintings Agnew's put on a show, did not have to cope with this difficulty; nor did he need to be so selective. Scott has been called 'the English Canaletto,' though in fairness to him it should be realized that he was producing his views of London before the Italian set foot in England. Historically, this was an exceptionally interesting exhibition, for in addition to *Bedford House, Russell Square* (already reproduced in the REVIEW, November 1950) there were other pictures showing Old London Bridge, Labelye's Westminster Bridge, Holbein's gateway in Whitehall, Northumberland House at Charing Cross, and Westminster Abbey with a central spire as proposed by Wren.

At the Lefevre Gallery we have had Bernard Buffet, a very young French painter—he is 23—who has had a considerable success both in France and in America. The subject-matter that he favours in his still-lifes—odds and ends of tableware, kitchen utensils, skinned rabbits and cherries of a manifest inedibility—is more than a little cheerless, while for his people suicide seems to be the only alternative to starvation. Yet Buffet is a designer of power,

his pictures have charming surface qualities, and when he ventures outside his customary grey monochrome he shows himself a delicate colourist.

Jean Hélion's recent paintings, ten of which were shown at the Hanover, are quite another matter. The obvious epithet for Hélion's post-war work—no longer abstract, of course, but still-life and (most recently) large nudes and men reading newspapers—is 'striking'; indeed, this encounter with it in the close quarters of the Hanover could hardly fail to leave the visual sense somewhat bruised. In the upper gallery were a score of small pieces by the Viennese sculptor Fritz Wotruba (born in 1907 of Czech and Hungarian parentage; since his return from Switzerland in 1945 Professor of Sculpture at the Academy of Fine Arts in his native city). All but two were bronzes, though the forms of which these were built up were reminiscent of rough-hewn blocks of limestone, which is this sculptor's favourite material. By the time this note is published work by Wotruba on a larger scale will be on view in Battersea Park.

Of the seventy works in the retrospective Graham Sutherland exhibition at the Institute of Contemporary Arts the portrait of Somerset Maugham has naturally been the most discussed. Is the great English tradition of portraiture to be revivified by the greatest living English landscape painter? It would be quite in accord with the way things happen in England if it were to prove so; but time alone can give the answer. Meanwhile, one can remember this exhibition with much gratitude, and a little regret that even though the Northampton *Crucifixion* could not be shown its early stages were not better documented.

The award of one of the five premia in the Arts Council Festival competition to William Gear must have seemed fitting to anyone who had visited his exhibition at Gimpel's, which was on when the awards were announced. Gear's paintings are more immediately communicative of pleasure than those of any living English artist, and their abstract or near-abstract forms are instinct with a Wordsworthian sense of wonder at the richness of the countryside. At the same time, there is obviously a limit to the number of paintings of this kind that anyone can turn out without becoming a member of the school of himself. Where Gear goes from here is a question of some importance.

CORRESPONDENCE

Man Made America

To the Editors
THE ARCHITECTURAL REVIEW

DEAR SIRS,—Your December issue on 'Man-Made America' was most interesting for anyone who has ever given the American scene any thought.

All that your contributors and you yourself say editorially is perfectly true: 'Man-Made America' is for the most part appalling. But I wonder whether the ugliness of American cities is seen by you in its right context. Is it not rather typical of our time, in Europe as well as America? Both Europe and America spawned ugliness on a gigantic scale over the last 150 years in practically all their towns and cities. In Europe it was an unfortunate addition to the cultural heritage of more harmoniously creative centuries; in America it was in most cases laid down on virgin soil and therefore in no way mitigated by a core of pre-existing order and beauty. Were one to take only the portions of English or continental cities built since, let us say, 1850, I wonder whether one's judgment would not be much the same as that which you level at America as America? The situation is revealed rather interestingly in some of the German cities where the old beautiful centers have been obliterated by bombing in the last war and only the shoddy, pretentious and chaotic nineteenth century sections remain. Is not what you find so deplorable in America rather a universal disease of our time?

Lacking an earlier heritage, and having been as sterile and uncreative during the last 150 years as all the rest of the western world, America must be looked at not for what it has done in the past or what it is at present, but rather for what it can do and will do in the future. I can assure you that if it were not for a vision of America as the land where our own time and its potentialities may, for the first time, find a valid expression, it would be almost impossible for a European to live here.

Aside from the fact that there are many positive æsthetic values in America even as it is, and also values which are perhaps even more important than æsthetic ones, there are in America factors which may lead to a New World. There is first the very lack of an earlier heritage to which in Europe reference will always be made whenever anything new appears; and second, there are those non-æsthetic values which form the climate of this land and which have been proven to be essential to the encouragement of creation wherever those values have been obliterated.

Actually, I suppose, it is of the essence of America to look with confidence to the future, and perhaps therein lies one of the causes for the deficiency of the present, but that faith, coupled with a maturing view and creative talent, will contribute to the Man Made America To Come. Its beginnings can be seen in many places, and each beginning is productive of more.

Aside from these general comments, I would like to say a few words about the gridiron plan to which is attributed so much of the existing evil in America. Quite apart from the fact that it was not at all an American invention (the Greeks used it under identical circumstances when their colonists laid out new cities in the wilderness, and, just as in America, regardless of topography), its use has an explanation which is not referred to by any of your contributors. This was the so-called Land Ordinance of 1785 which established the method of surveying the land and laying out towns on this continent. It provided that the land was to be surveyed and parcelled out before it was sold, and by a method which had to result in the grid system. The land was surveyed into townships of six square miles, on lines always running parallel to the latitude and longitude of the earth, subdivided into lots of one mile square, and these sections to be subdivided again into squares.

One of the square mile lots was reserved for the benefit of education. Education then and for a long time to come was thought of in terms primarily of moral and political ends, and so one might almost say that the consequences of the Land Ordinance of 1785 were admirable in helping to create a homogeneous democratic society, and deplorable in contributing to the ugliness in which it has to exist.

Incidentally, the whole question of the planned community in America was investigated before the war by Frederic R. Stevenson, of the University of Sheffield, and the American Carl Feiss. Their researches were to be published in book form, but the war intervened. A brief introduction to their material has appeared recently in the *Journal of the Society of Architectural Historians* (Vol. 8), and when, and if, it is published *in toto* it may provide an excellent contribution to the subject of 'Man-Made America.'

Yours, etc.,
HERWIN SCHAEFER.
Newton Centre, Mass.

Early Cast-iron Facades

To the Editors
THE ARCHITECTURAL REVIEW

DEAR SIRS,—In connection with Professor Hitchcock's article on early cast-iron façades, may I draw your attention to a passage in Gottfried Semper's *Wissenschaft, Industrie und Kunst*, a pamphlet written in London in 1851 and published at Brunswick in 1852. Semper writes (I am translating) that in England 'furniture, wallpaper, carpets, windows, doors, cornices, whole furnishing schemes for rooms . . . and even whole houses can be bought from stock. Domestic architecture in England, and even more decisively in the United States of America, has already changed completely in accordance with these conditions' (p. 28). Semper then describes, on the evidence of 'a German engineer' how houses are built in America, and he ends by saying: 'Often the whole front consists of richly ornamented cast iron' (p. 23). He would, no doubt, have mentioned similar cases in England, where he lived, if he had known them. So this remark, especially in conjunction with the Lorillard warehouse of 1837 in Gold Street, New York, mentioned by Talbot Hamlin and illustrated in the new edition of my *Pioneers*—means that, in the match between Britain and the United States for priority in the use of façades completely of glass and iron, the States go one up.

Yours, etc.,
London. NIKOLAUS PEVSNER.

Furniture since the War

To the Editors
THE ARCHITECTURAL REVIEW

DEAR SIRS,—In your article entitled 'Furniture since the War,' by H. McG. Dunnett, THE ARCHITECTURAL REVIEW, March, 1951, Mr. Dunnett implies a fact that I believe to be erroneous. Mr. Dunnett gives the impression that the fibreglass plastic chair designed by Charles Eames for the Herman Miller Furniture Co. (*reproduced here*) is quite expensive. This is achieved by his statement concerning item 77, pictured on page 163, that 'the production is a complicated and expensive process.'

I think that it will be of interest to know that

[continued on page 400

Corset Department, Messrs. Selfridges of Oxford Street

EFFECTIVE display setting can interpret an atmosphere appropriate to the product; interpretation of design characterises the work of the George Parnall Organisation.

Messrs. Selfridges of Oxford Street, London, W., have completed certain re-planning of departments and it was the pleasure and privilege of George Parnall & Company Limited to carry out this work under the direction of the House Architect Mr. R. L. Heath, L.R.I.B.A., and Consulting Architect Mr. J. S. Beaumont, F.R.I.B.A.

Design and Craftsmanship by

GEORGE PARNALL

GEORGE PARNALL & CO. LTD. 4 BEDFORD SQUARE LONDON, W.C.1

continued from page 398]

this chair retails for around $32 in the U S.

My compliments to THE ARCHITECTURAL REVIEW and Mr. Dunnett on a well-done article.

Yours, etc.,

RALPH RANDALL, JR.

Michigan. Herman Miller Furniture Co.

Building with Wit

To the Editors

THE ARCHITECTURAL REVIEW

DEAR SIRS,—Many thanks for showing me Professor Pevsner's article on the Lutyens Memorial Volumes. I had not seen a copy of the REVIEW for about twenty years and was a bit startled—especially when I read that Tigbourne Court was the climax of Lutyens's work. An odd view to take of such an immature building. I wish somebody would tell me, without clouds of words, what architects of the last fifty years have striven for; and *why* it is wrong, when you are designing in Portland stone, to enjoy and use with great delicacy the Roman Doric Order; and *why* nearly every modern building has to look rather like a clinic for unmarried mothers in Sweden.

Yours, etc.,

London. A. S. G. BUTLER.

TRADE & INDUSTRY

The Royal Festival Hall

It is impossible in the small space available to do full justice to the many items of structural equipment that a building of the importance, interest and size of the Royal Festival Hall involves. In the following a random selection has therefore had to be made.

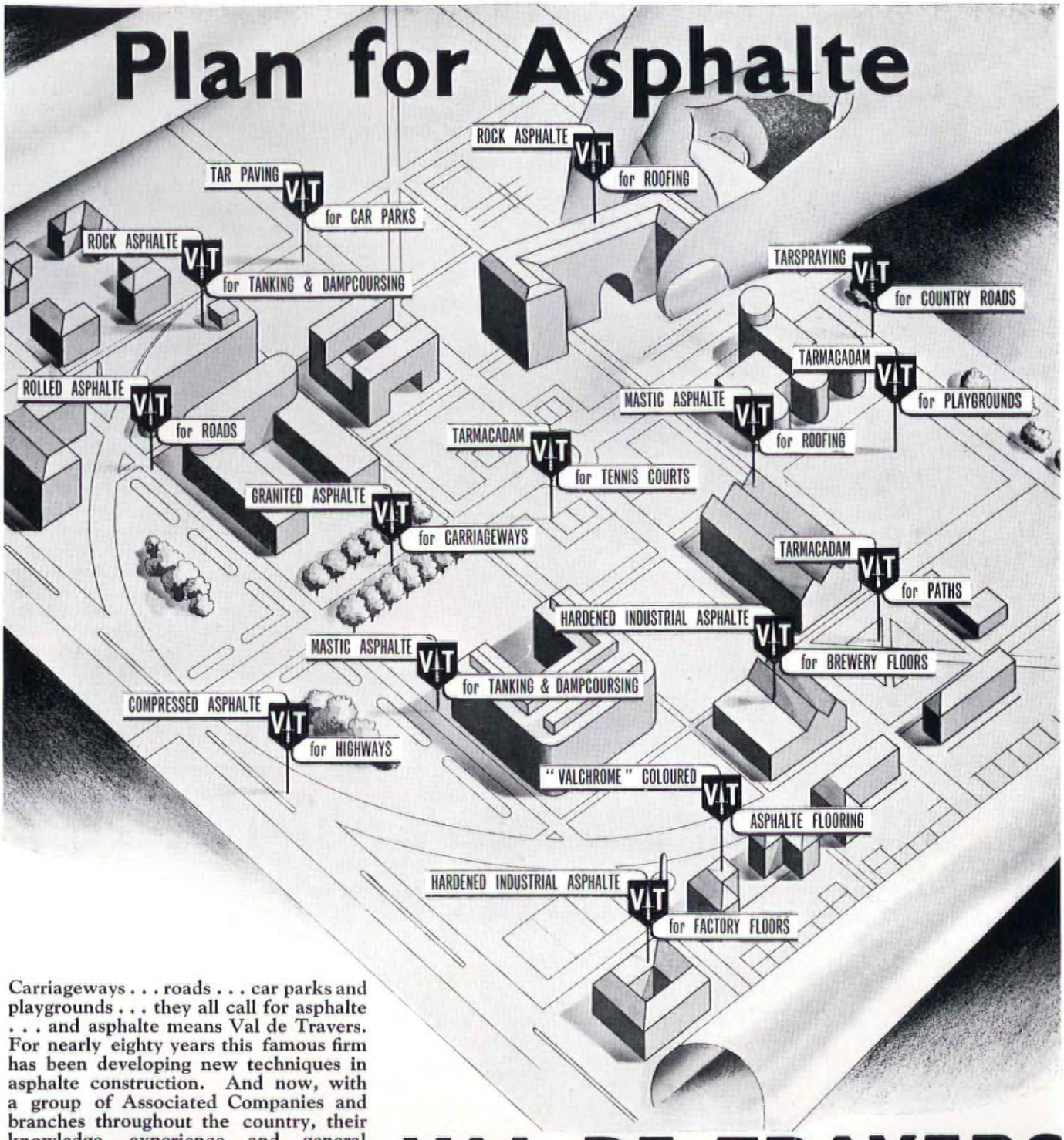
Acoustics

The acoustical problems in the Royal Festival Hall have been solved by structural treatment combined with a special sound absorbent material. This special material (*Acoustics and Sound Exclusion*, p. 380), rock-wool, is a felting of mineral fibres manufactured by Stillite Products Ltd. from slag-heap waste and made in a variety of densities. In this building both quilting and semi-rigid slabs have been used to meet different situations. Quilted Stillite consists of a low density quality packed in flat envelopes of scrim or paper, up to 20 feet long by 3 feet wide, which can be suspended vertically in cavity walls or applied in various ways. Semi-rigid slabs need to be framed and are available in sheets varying in size from 36 inches by 24 inches to 24 inches by 6 inches. Thicknesses range from ½ inch to 4 inches.

In general, throughout the restaurants, foyers and lobbies, this rock-wool felting has been used behind Holoplast perforated sheets so that the sound which might be communicated to the auditorium is broken up by the perforations and absorbed by the rock-wool medium behind. It is similarly used in the auditorium on the undersides of seats, which tip up mechanically when unoccupied and serve to replace the acoustic value which an occupant would otherwise provide.

A similar principle is used on the walls of the auditorium near the stalls area, where the 'Knuckle bone' panelling incorporates cavities which allow the sound to penetrate to the quilting behind. A different principle arises with the elm panelling used in another part

[continued on page 402



Carriageways . . . roads . . . car parks and playgrounds . . . they all call for asphalte . . . and asphalte means Val de Travers. For nearly eighty years this famous firm has been developing new techniques in asphalte construction. And now, with a group of Associated Companies and branches throughout the country, their knowledge, experience, and general resources make them pre-eminent in this field.

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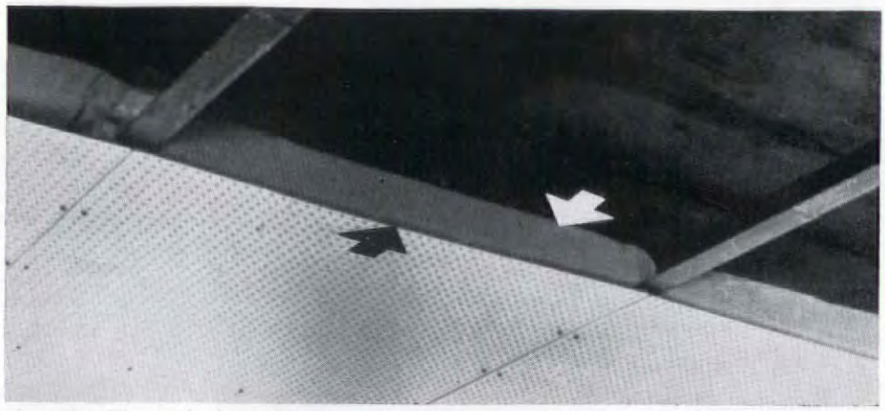


14 *Acoustic ceiling to the foyer. Black arrow points to edge of ⅛ inch perforated plastic sheet, and white arrow to rock-wool insulation in muslin bags. Self-tapping screws can also be seen.*

continued from page 400]

of the auditorium. The sound sets up vibrations in the panelling which are transmitted to and absorbed by the quilting behind it.

Elsewhere semi-rigid slabs and quilting have been used above the fibrous plaster ceilings, in lift shafts, behind access doors to lights, in ventilating ducts to baffle the sound emanating from the motors of the ventilating machinery, and in the wall cavities that serve to insulate the building itself from the very considerable noise from outside.

The walls of the lobbies to the auditorium have been covered in Connolly's 'Vaumol' leather, over padding. As a material leather is both decorative and hard-wearing. In addition it has been utilized because of its value in a padded form as a sound absorbent, for the lobbies act as sound-traps between the auditorium and the foyers. Padded and buttoned leather has been used on the back walls to render them semi-sound absorbent.

Structural Waterproofing

Damp-proofing compounds are one of those materials essential to good building which do their job unseen and sometimes unappreciated. In the Royal Festival Hall, a variety of RIW products have been employed for this purpose.

RIW Marine Cement Liquid Asphalte Composition has been used in horizontal 'sandwich' concrete raft construction as a permanent waterproofing membrane, on basement walls as a vertical membrane to the external face before the backfill and as a waterproof barrier on the external face of the superstructure before the erection of the natural stone facing.

In some cases where the marine cement could not suitably be used, *RIW No. 110 Damp Resisting Composition* has been applied to the back of the natural stone and over the joints. This composition is similar to the first, is damp-proofing and stain-proofing, neither will it stain the stone or marble to which it is applied.

The walls of the boiler-house and basement were treated with *RIW Cement Floor Enamel*. The object here was to apply a finish direct to the concrete surface which would not only provide a hard tile-like quality but would be dust-proofing and impervious to the action of water, oil and grease.

In the Royal Festival Hall, the time factor was important, and *RIW White Wall Primer* was therefore used as a priming coat before the enamel was applied to the concrete. The oils used in its composition resist vaporization and so withstand the reaction from chemically active surfaces.

For the interiors of the many concrete ducts used in the ventilating system, *RIW No. 2626 Cement Filler* was used. This is a transparent material designed for hardening, dust-proofing and oil-proofing concrete surfaces. It is unaffected by the lime in the concrete and in this case was used to prevent 'dusting' and consequent injury to ventilating machines and motors.

To provide a waterproof backing for external tiling Tretol liquid cement waterproofer has been used.

[continued on page 404

continued from page 402]

The Roof

The whole of the cushion-shaped roof surface of the Royal Festival Hall will, over the next decade, gradually turn from its present dull brown to a bright green. 30,000 square feet in extent, it has been given a skin of copper sheeting one-fortieth of an inch thick. Holloway Metal Roofs Ltd. who supplied and laid the sheeting used twenty tons of it, together with some 35,000 copper cleats. Despite the bad weather for a job of this kind, no more than nine men, working at any one time, were required to complete the job well within the specified time. This was largely due to the system of prefabricating parts in the works.

Cork Tiles

In the auditorium, cork has been used as a flooring material in certain instances because of its value as an acoustic absorbing medium, thus ⅜ inch polished cork tiles have been fixed to the risers and as treads under the seating. In the latter instance it has been preferred to carpet which would have had no decorative value in that position and would have been more difficult to keep clean. Jaconello Ltd. were the sub-contractors for this work.

Asbestos Composition Ceiling

In the kitchen department Kimolo board panels have been chosen for the ceiling since this material is not only hard but slightly absorbent at the same time. The panels, which can be removed to give access to the services above, are of a fireproof asbestos composition and are held in place by patent pinned metal battens, the whole being suspended by wire hangers from the concrete above.

Auditorium Lighting

General lighting and stage lighting is a combined system of tungsten floods, spotlights and cold-cathode fluorescent units, with colour-change equipment remotely controlled from a light console control deck manufactured by Strand Electric and Engineering Co.

ACKNOWLEDGMENTS

Cover designed by Gordon Cullen; all photographs Galwey Arphot except page 338 top, page 354, nos. 15, 17, page 366, no. 40, page 380 bottom, page 381 top left and bottom, page 383 top, page 384 left, LCC; page 338 bottom, William Davis; page 341 Aerofilms Ltd.; page 353, nos. 11, 12, 13, page 356, no. 16, page 373, nos. 64, 65, page 376, nos. 73, 74, page 391, bottom left and right, Margaret Harker; page 379 left, page 384 centre, BRS; plans and other drawings throughout the issue were prepared by J. Mayo, W. E. Greaves and members of the LCC Architect's Department except detail sketches on pages 359-376 and pages 389 and 390, the latter by permission of the Institution of Civil Engineers from a paper read by E. O. Measor. MARGINALIA: 1, 2, Galwey Arphot; 3, G. G. Garland; 12, A. C. Cooper; 14, LCC.

Appointments

Appointments—*continued.*

architects

Robert H. Matthew and J. L. Martin: Architect and Deputy Architect to the London County Council
Edwin Williams: Senior Architect in Charge; Peter Moro: Associated Architect

specialists

Scott and Wilson : Civil Engineers
Frank Falkner and Partners : Quantity Surveyors
Hope Bagenal and the Building Research Station : Acoustics
J. Rawlinson, Chief Engineer to the LCC : Boilers and Electrical Work
R. Coe and staff of the Heating and Ventilation Section of the LCC Architect's Department : Heating and Ventilation
Ralph Downes : Organ Consultant
Timber Development Association

architects' staff

A. Mackenzie
B. A. Le Mare
R. A. Laker
J. Ball
T. W. Bliss
J. S. Cousins
J. T. Dannatt
G. W. Dunton
Miss M. M. Forster
W. E. Greaves
J. F. Hammond
A. J. Hepworth
Mrs. M. Hurst
M. H. Kenchington
M. Le Pelley
A. J. Lyne
J. Mayo
P. K. Nicoll
F. L. Peatfield
C. F. Overy
P. J. C. Scott
J. W. G. Smith
G. Subiotto
G. F. Turner

Clerk of Works in Charge : T. W. Turner
Administration: Miss K. L. Gumley

designers

Robin Day and LCC Chief Officer of Supplies: Furniture
Hilary Bourne and Barbara Allen: Fabrics
Milner Gray: Engraved Glass
Peter Morton: Lettering
Jesse Collins: Door Motifs
Chief Officer, LCC Parks Department: Indoor and Outdoor Planting

general contractors

Holland & Hannen and Cubitts. Contract Manager: S. L. Reynolds. Site Agent: G. Herbert.

sub-contractors: structure

Redpath Brown & Co.: *Steel roof trusses, steel frame for temporary end, etc.*
Holloway Metal Roofs Ltd.: *Copper roofing.*
Neuchatel Asphalte Co.: *'Nacocrete' flat roofing.*
Triad Floors Ltd.: *Precast concrete roofing.*
Carter & Co.: *External tiles.*
Nine Elms Stone Masonry Works Ltd.: *Stone and marble facings.*
Lenscrete Ltd.: *Translucent masonry.*
Wm. Briggs & Sons: *D.P.C. and basement tanking.*
Bath and Portland Stone Firms Ltd.: *Portland stone.*
Faulkner, Greene & Co.: *Plate and general glazing.*
Crittall Manufacturing Co.: *Large aluminium and steel windows.*
James Gibbons Ltd.: *Metal windows.*
Scaffolding (Great Britain) Ltd.: *Steel scaffolding.*
Willment Bros.: *Site excavations.*

structural finish

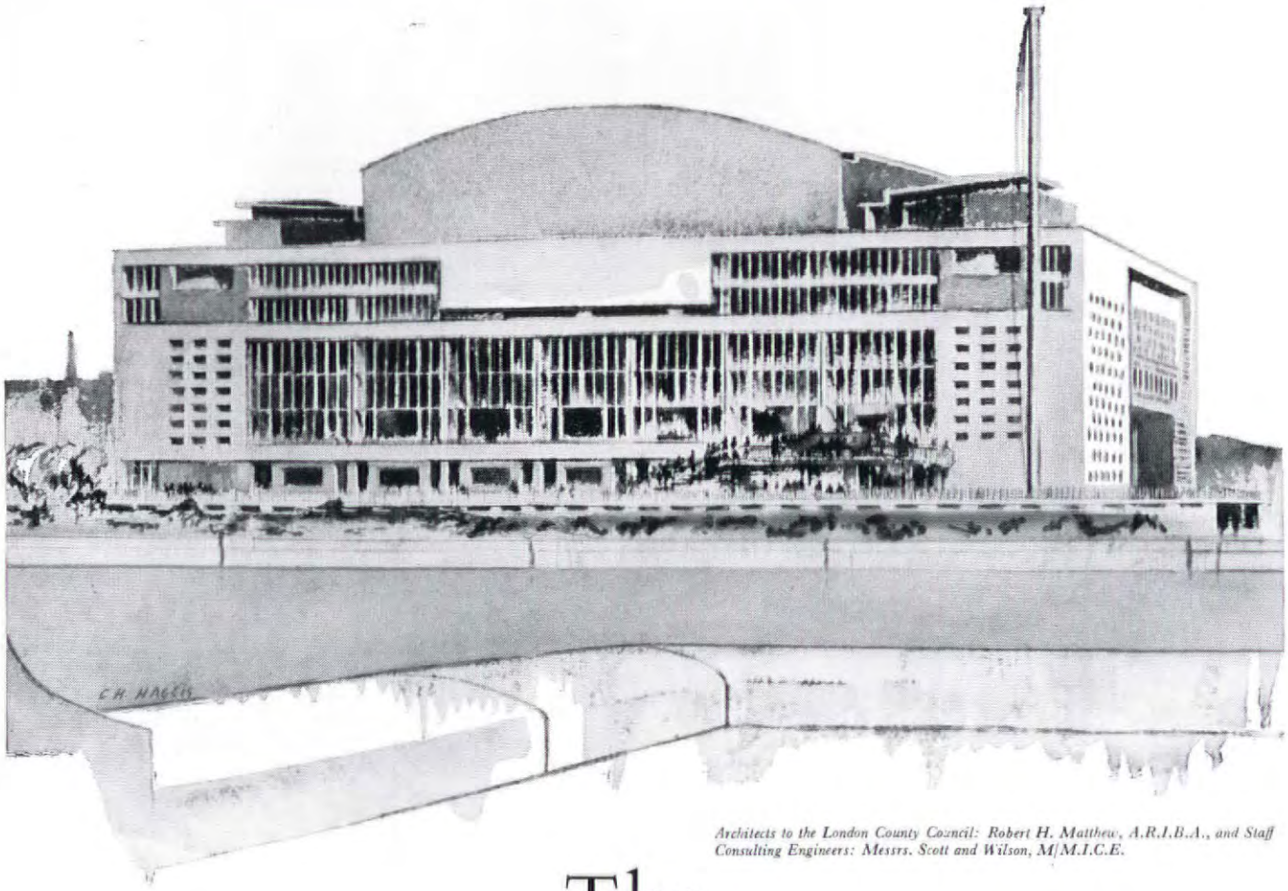
R.I.W. Protective Products Co.: *Waterproofing and damp-proofing.*
Tretol Ltd.: *Waterproof solution and dye in bedding for external tiles.*
A. H. Butcher: *'Stonite' external rendering.*
David Esdaile & Co.: *Fibrous plaster ceilings and decorative plasterwork.*
Bracketing, Centering & Lathing Ltd.: *Hangers and lathing auditorium ceiling.*
Campbell Denis Ltd.: *'Fabrilath' grids for fibrous plaster.*
Holoplast Ltd.: *Acoustic ceilings in foyers.*
Stillite Products Ltd.: *Rockwool insulation.*
Structural Insulation Ltd.: *Asbestos (Kimoloboard) kitchen and other ceilings.*
Expanded Metal Co.: *Expanded metal.*
Parkinsons (Wall Tiling) Ltd.: *Lavatory and kitchen wall tiles and floor quarry tiles.*
Jaconello Ltd.: *Stucco-marble to columns, auditorium cork floor tiles.*
H. H. Martyn & Co.: *Ply panelling to boxes in auditorium and leather in lobbies, etc.*
Diespeker & Co.: *Terrazzo in lavatories.*
Belmont Building Supplies Ltd.: *External asbestos sheeting.*
Universal Asbestos Mfg. Co.: *External asbestos sheeting.*
Callow & Keppich Ltd.: *External rendering (Stonite).*
Joseph Freeman & Sons: *External paints on concrete. (Cementone.)*
Robert Adams Ltd.: *Floor springs.*
William Miller (Plasterers) Ltd.: *Plasterers.*
Bath Cabinet Makers & Arteraft Ltd.: *Cloakroom fittings.*
F. Bradford & Co.: *Granolithic finishes to staircases and granolithic paving.*
Haywards Ltd.: *Fireproof doors.*
Haskins: *Collapsible grilles.*
The Lion Foundry Co.: *Spiral metal stairs.*
Marriott & Price Ltd.: *Terrazzo to staircases.*
Mather & Platt Ltd., Matthews & Yates Ltd.: *Ventilation equipment, etc.*
Nicholls & Clarke Ltd.: *Shower fittings.*
Alfred A. Odoni & Co.: *Cycle racks.*
Rippers Ltd.: *Handrail to stairs and doors and various panelling.*
A. Arden & Co., Ltd.: *Special metalwork and orchestra guard rail.*
Adrian Stokes Ltd.: *Ironmongery.*
Supalith Ltd.: *Insulation material.*
Vigers Bros.: *Hardwood flooring.*
The Airscrew Company & Jicwood Ltd.: *Orchestra canopy and other joinery.*
Horace W. Cullum & Co.: *Sound absorbent lining and splitters to ventilating system.*
The Cement Marketing Co.: *Cement.*
Eastwoods Ltd.: *Flettons.*
Fibreglass Ltd.: *Insulation material.*
Gyproc Products Ltd.: *Insulation material.*
G. A. Harvey & Co.: *Wire mesh screen.*
Newalls Insulation Co.: *Paxfelt insulation.*
Abbey Building Supplies Co.: *Metal cramps and concrete anchors.*
Pilkington Brothers: *Armour plate glazing.*
Dennis Ruabon Ltd.: *'Heatherbrown' quarry tiles.*

mechanical equipment

Automatic Sprinkler Co.: *Sprinkler installations and hydrants.*
Allen & Greaves Ltd.: *Railings, metal stairs and ventilation grilles.*
Bull Motors Ltd.: *Electrical power motors.*
Benham & Sons: *Kitchen equipment, cold stores, etc.*
Berkeley Electrical Engineering Co.: *Electrical installation.*
William Newman & Sons: *'Britannic' floor springs.*
Broads Manufacturing Co.: *Manhole covers (heavy).*
Gent & Co., Ltd.: *Electric clocks.*
Chloride Batteries Ltd.: *Electrical batteries.*
C. A. Dunham & Co.: *Heating convectors.*
Davidson & Co.: *Ventilating fan.*
Econa Modern Products Ltd.: *Lavatory basin traps.*
W. J. Furse & Co.: *Lightning conductors.*
Fairitt Engineering Co.: *Heating equipment.*
Gardiner & Sons: *Bostwick gate.*
J. Gardner & Co.: *Duct work.*
Matthew Hall & Co.: *Plumbing, heating and ventilating.*
Cochran & Co. (Annan) Ltd.: *Boilers.*
Hume Atkins & Co.: *Special lighting fittings.*
Holden & Brooke Ltd.: *Heating equipment.*
Royles Ltd.: *Calorifiers.*
Rheostatic Co.: *Heating equipment.*
Sturtevant Engineering Co.: *Vacuum plant.*
Standard Telephone & Cables Ltd.: *Sound amplification.*
Thermocontrol Installations Co.: *Boiler house equipment and thermostatic control.*
Waygood-Otis Ltd.: *Lifts.*

general equipment and decoration

Cox & Company: *Auditorium seating.*
The Dunlop Rubber Co.: *'Dunlopillo' upholstery to auditorium seating.*
Catesby's Ltd.: *Linoleum.*
Tidmarsh & Sons: *Curtains and blinds.*
Connolly Bros. (Curriers) Ltd.: *Leather upholstery and acoustic panelling.*
A. Edmonds & Co.: *Box office fittings.*
S. Hille & Co.: *Special furniture.*
Siemens Brothers & Co.: *Internal automatic telephones.*
J. Starkie Gardner Ltd.: *Ornamental balustrades and light fittings.*
Strand Electric & Engineering Co.: *Orchestra lighting.*
John Wright & Sons (Veneers): *Veneers.*
Adamsez Ltd.: *Sanitary fittings.*
Gaskell & Chambers Ltd.: *Bar fittings.*
The General Electric Co.: *Central incinerator and light fittings.*
London Sand Blast Decorative Glass Works Ltd.: *Ornamental glass panels.*
T. F. Firth & Sons: *Moquette for auditorium seating.*
Kingfisher Ltd.: *Stacking chairs and restaurant tables.*
Fothergill & Harvey Ltd.: *Tygan plastic chair covering.*
Morton Sundour Fabrics Ltd.: *Auditorium wall curtains.*
Druce & Co.: *Underfelt and carpet laying.*
North British Rubber Co.: *Rubber matting.*
Dare-Inglis Products Ltd.: *Restaurant chairs.*
Venesta Ltd.: *Permaply for restaurant chairs.*
James Templeton & Co.: *Carpets.*
Samuel Jones & Co.: *Fire extinguishers.*



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Consulting Engineers: Messrs. Scott and Wilson, M/M.I.C.E.

The Royal Festival Hall

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Cubitts wish to express their appreciation of the willing co-operation of all those associated with them in this undertaking, and to acknowledge the unstinting loyalty and enthusiasm of their own staff, craftsmen and labourers.

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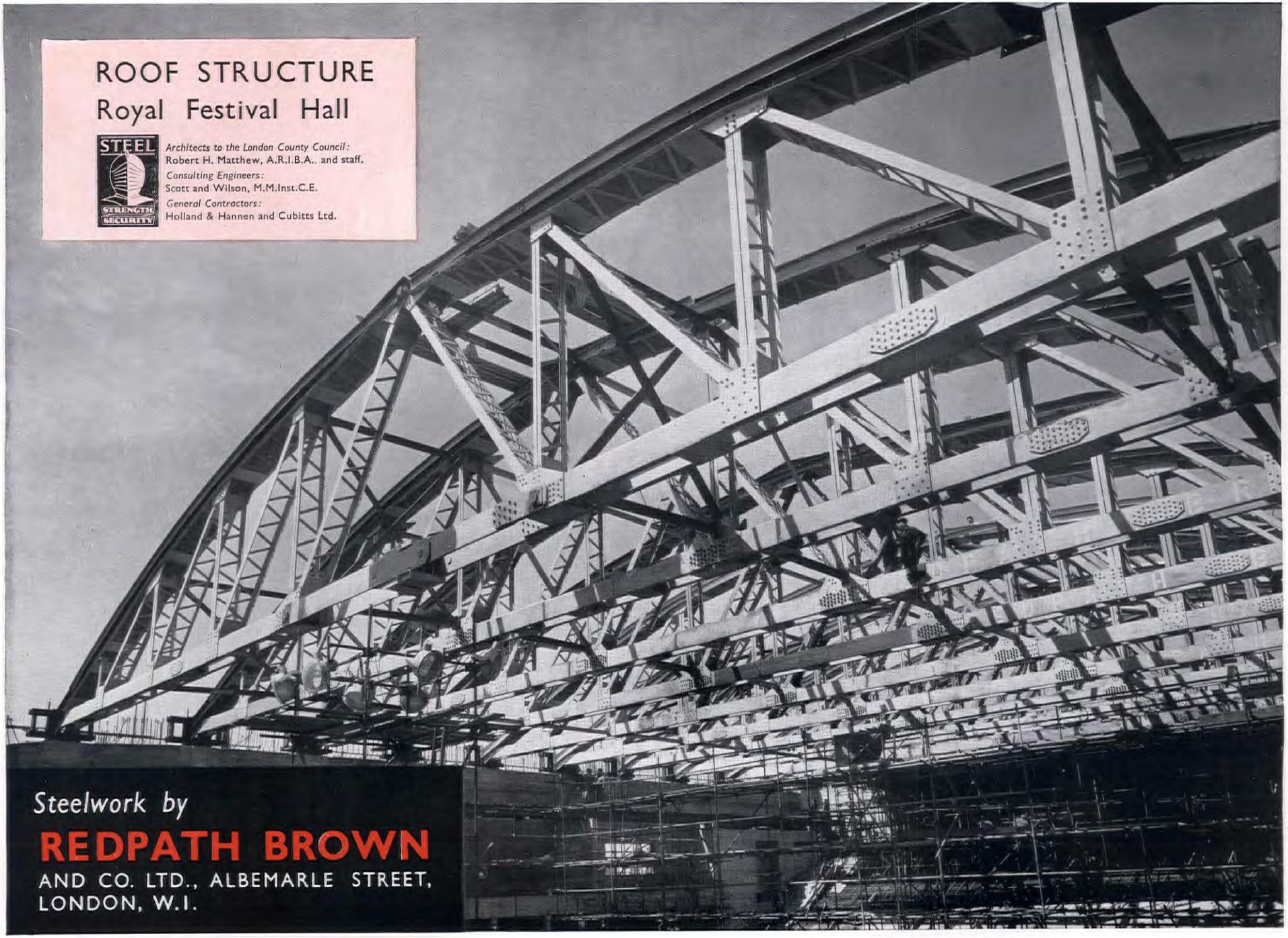
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Consulting Engineers:
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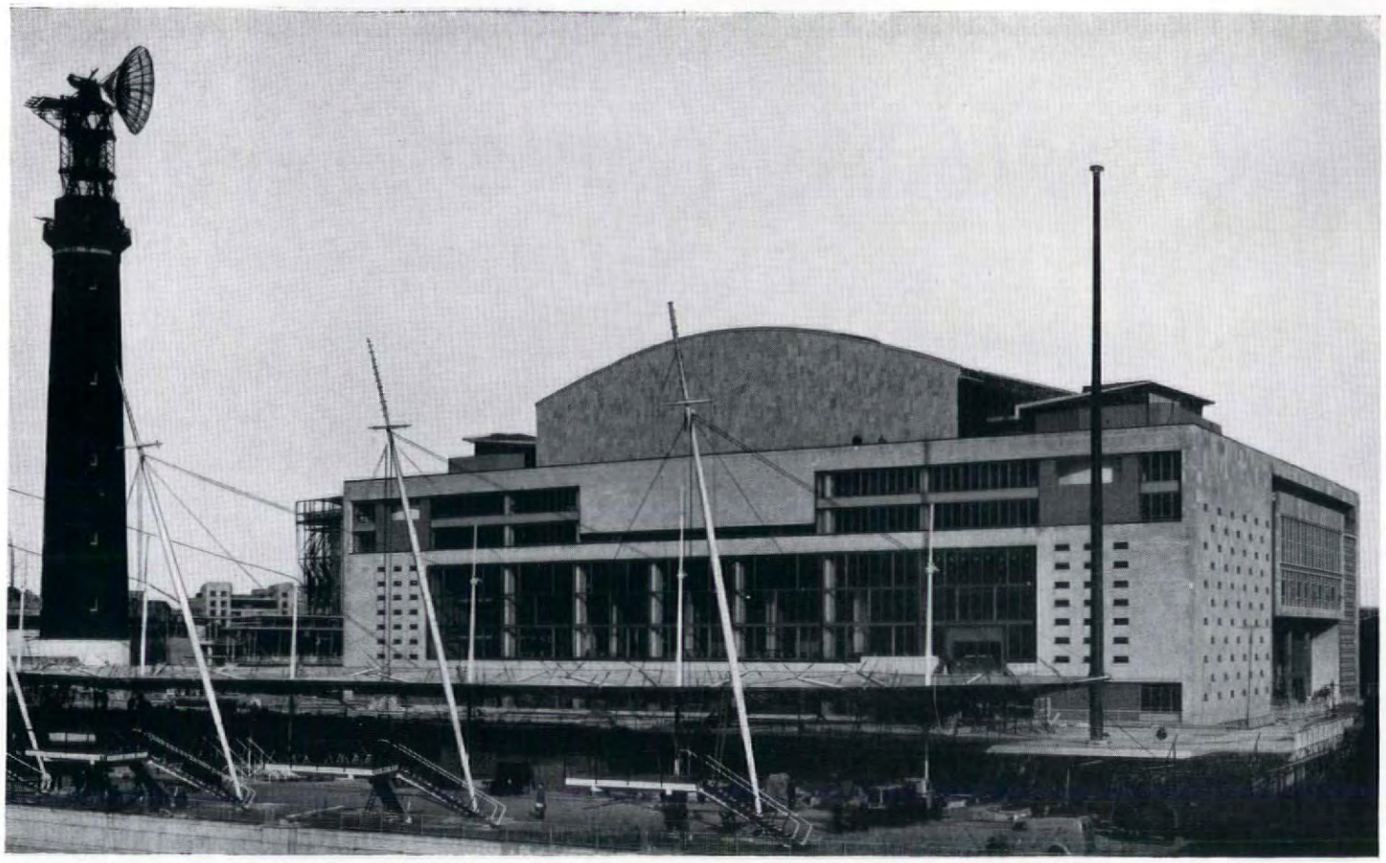

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58)

The completed ceiling of the Concert Hall Foyer—see perspective view on opposite page, showing details of construction. Note the exceptional length of fins indicated.

Box fronts and underside of Balcony—note the fibrous plaster, shapes for which precision bracketing was fabricated and fixed.

IN THE ROYAL

Architect: R. H. MATTHEW, A.R.I.B.A.

PRECISION

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The Royal Festival Hall represents a very substantial application of design, materials and craftsmanship carried out by Bracketing, Centering & Lathing Ltd., the total tonnage of light steel sections used being over 100 tons, and in length more than 175,000 ft. run. Bracketing was installed to support: The Main Auditorium Ceiling and Solid Plaster Ducts; Ceiling under the Balcony; Foyer Ceiling; Ceiling over the Orchestra; Brackets and Lathing for the Booking Hall, Box Fronts and Soffits and the majority of the Suspended Solid Plaster Ceilings.

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BRACKETING

A perspective view showing the constructional features of the Foyer Ceiling. Note the finish of the completed work in the photograph at top L.H. on the opposite page. The 90 ft. long slender fins are supported on welded lattice beams designed, fabricated and fixed by Bracketing, Centering & Lathing Ltd.

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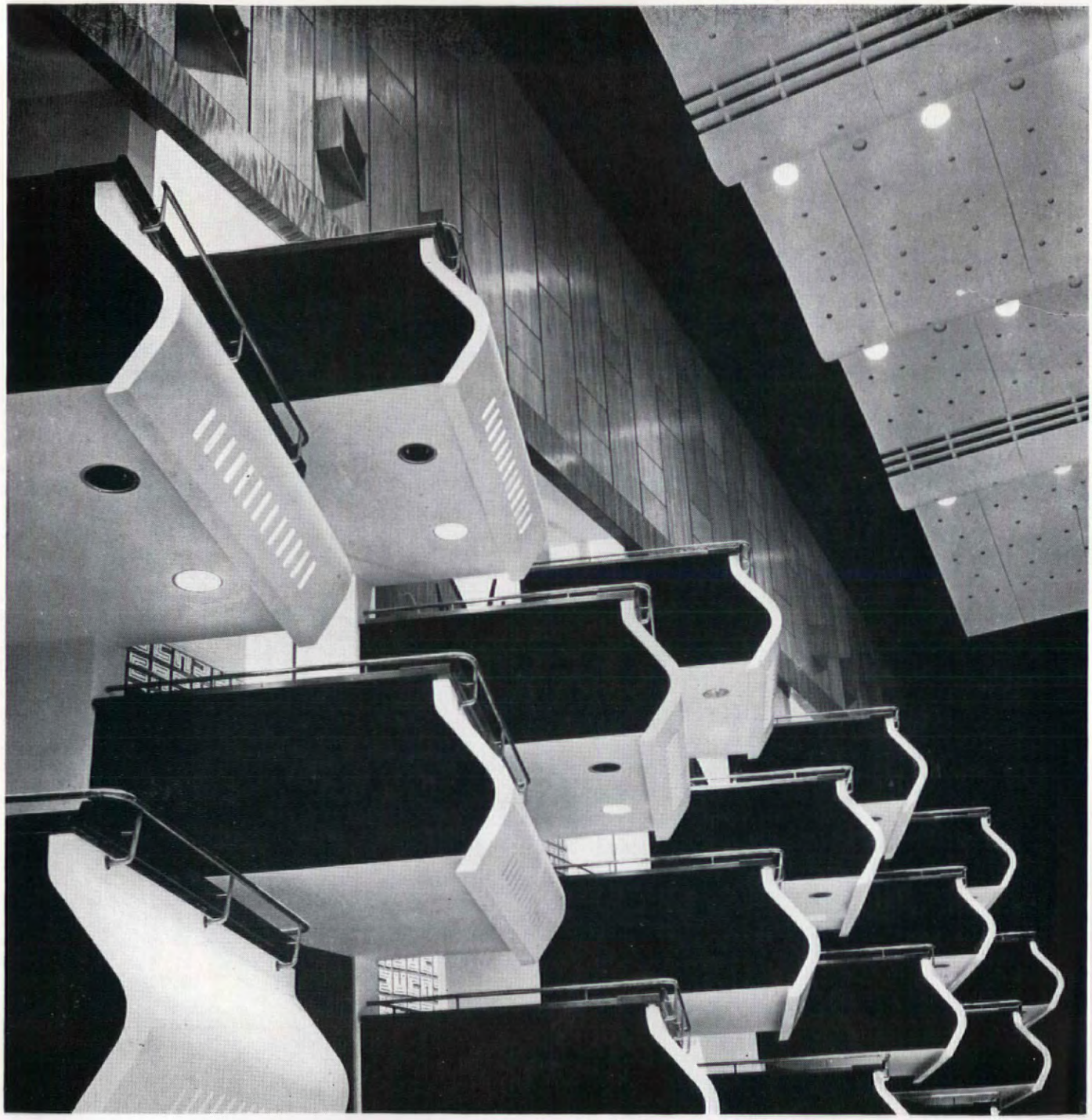
THE ROYAL FESTIVAL HALL



All the fibrous plasterwork, in particular the false ceilings to the Auditorium & Foyer were executed by

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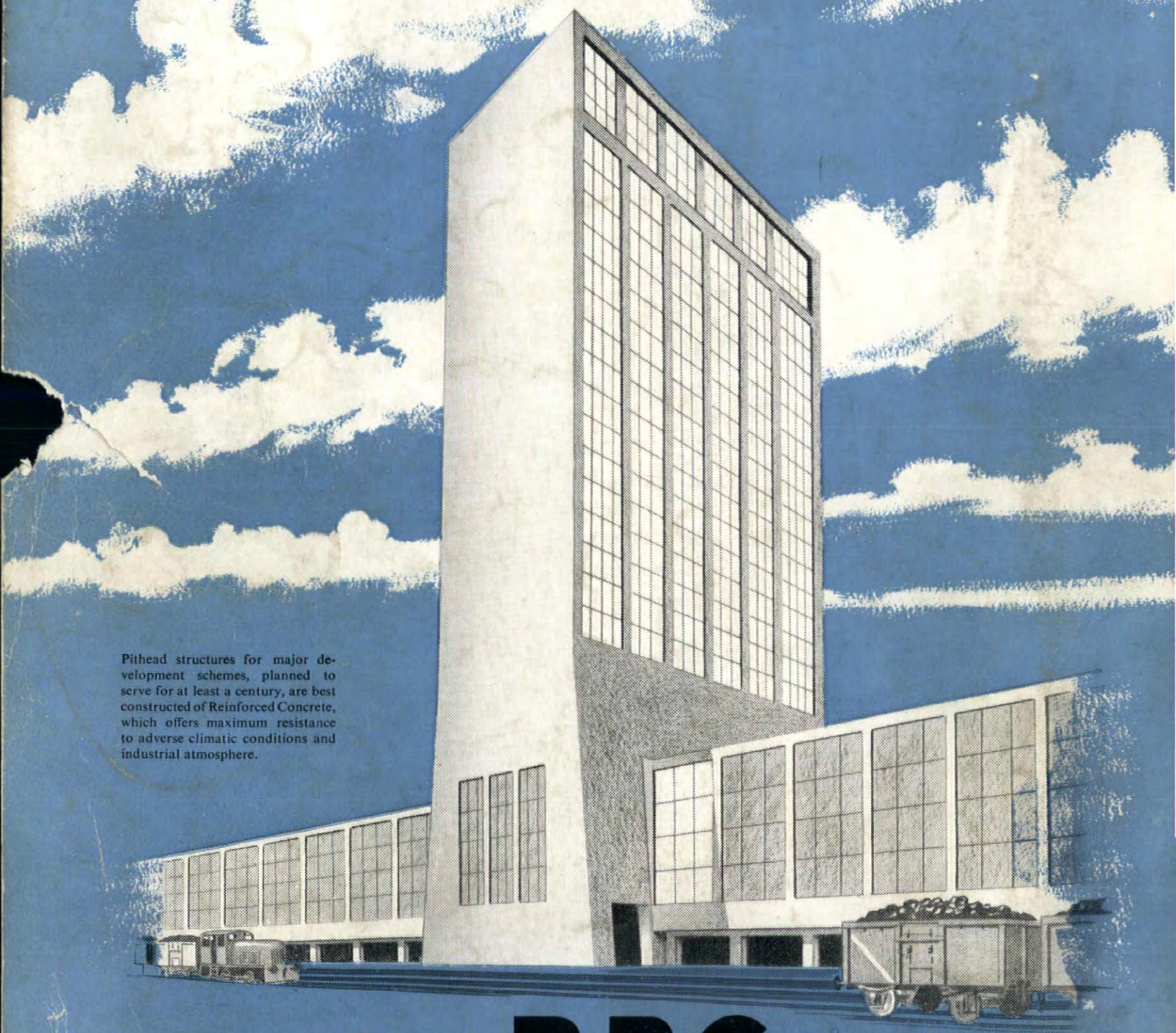

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