

THE ARCHITECTURAL REVIEW VOLUME CVII NUMBER 640 APRIL 1950
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Traductions Übersetzungen Переводы

THE ARCHITECTURAL REVIEW

APRIL 1950

Avril 1950

Page 219: *La Nécessité de la Fantaisie*, par Charles Marriott. Un des principaux attraits, selon Charles Marriott, du livre de Geoffrey Scott intitulé 'L'Architecture de l'Humanisme,' c'est qu'il peut être interprété comme fournissant, avec une ingénuité charmante, un jugement de l'architecture selon le principe de la morale, mesure d'appréciation que l'auteur s'est donné beaucoup de peine à expliquer; 'de toute façon, en tant que constituant une renaissance des styles de l'antiquité, l'architecture de l'humanisme... sert de justification morale de la Fantaisie, une tentative—pour ainsi dire—visant à faire d'une frivole une femme honnête.' Mais si le baroque représentait au fond un effort pour transformer le 'fantaisiste' en architecture 'sérieuse,' il est certain qu'une grande partie de l'architecture du dix-neuvième siècle n'était également qu'une tentative de transformation de l'architecture 'sérieuse' en fantaisiste. Ce n'est que depuis peu que la tendance à la construction fantaisiste ait été presque complètement réprimée, et Mr. Marriott estime que nous y perdons beaucoup avec notre solennité récemment adoptée. Néanmoins, ainsi qu'il le fait remarquer, 'si les architectes s'éloignent de nouveau de la construction sérieuse pour folâtrer dans le domaine de la Fantaisie, ils ne devraient pas, tout au moins, gâter deux bons styles en les mélangant.'

Page 231: *Les Premières Constructions à Charpente Métallique*, par Turpin Bannister. Le motif universel caractérisant le récit de l'architecture du dix-neuvième siècle réside, non pas en cette historicité qui mena à toute une série de renaissances des styles du passé, mais dans le développement de nouveaux types d'édifices et de nouvelles méthodes de construction. Un de ces nouveaux genres de constructions, l'entrepôt, ou le bloc de bureaux, a fait l'objet d'un article récent par Henry-Russell Hitchcock dans LA REVUE ('Monuments de Commerce Victorien', février 1949). Dans le présent article, Turpin Bannister fournit le premier résumé des résultats de dix années d'investigations au sujet de cette méthode de construction qui, plus que toute autre, a rendu finalement possible l'émergence du Mouvement Moderne—la charpente de fer—et l'application du fer à la construction en général. L'importance de ses conclusions sera appréciée lorsqu'on considère que, tandis qu'il a été accepté jusqu'à présent par toutes les autorités compétentes que le premier bâtiment anglais à charpente métallique était certaine usine construite par Boulton et Watt à Salford en 1801, le Professeur Bannister est à même d'en nommer trois autres également armés de fer qui l'ont certainement précédée—la filature de calicot de William Strutt à Derby, datant de 1792-3, l'usine de la maison Benyon, Bage et Marshall, remontant à 1796, à Shrewsbury, et une autre usine se trouvant à Belper, aussi attribuée à William Strutt, construite en 1797; la seconde et la troisième de ces constructions existent toujours et, comme dit le Professeur

Bannister, 'en tant que véritables monuments de culture appartenant à l'Age Industriel, qui commencent alors à éclore, ils méritent d'occuper une place honorable de même que les autres monuments d'architecture nationaux, et des dispositions appropriées devraient être prises sans retard pour en assurer la protection et la conservation.' En outre de son application aux édifices industriels, une description est fournie de l'usage du fer dès les premiers temps dans l'architecture religieuse.

Page 255: *Les Bibliothèques du Baroque*, par F. Hepner. Il existait une ancienne règle des Bénédictins, selon laquelle un monastère sans bibliothèque était aussi inconcevable qu'un château sans arsenal; le Dr. Hepner discute dans cet article, illustré de ses propres clichés, les résultats architecturaux de l'imposition de cette règle en Bavière et en Autriche. Un grand nombre des plus splendides bibliothèques monastiques se trouvent dans les endroits les plus isolés, car c'était dans de tels lieux que l'Eglise devait faire face au mouvement populaire de l'hérésie, sorte de protestantisme démocratique, et qu'elle avait donc le plus besoin de l'appui des arts pour impressionner les laïques, ainsi que les élèves des écoles monastiques, à l'égard de sa propre grandeur; en outre, il lui était toujours possible de faire appel aux artistes et artisans pour compenser le manque de volumes figurant dans ses collections. Metten, Waldsassen, Furstenzell, Linz, Melk, Seitenstetten, Vöran et Altenburg sont parmi les endroits mentionnés par le Dr. Hepner dans son aperçu.

Page 261: *Vue Préliminaire de l'Exposition de 1951 sur la Rive Sud de la Tamise*. LA REVUE présente ici le premier exposé compréhensif de l'Exposition de 1951 (ainsi qu'elle apparaîtra une fois achevée) qui ait été publié jusqu'ici, sous la forme de huit perspectives, indiquant tous les édifices, et accompagné d'un texte descriptif.

AVIS AUX PERSONNES DESIRANT S'ABONNER À LA REVUE

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

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April 1950

Seite 219: *Die Notwendigkeit von 'Follies'*, von Charles Marriott. Einer der grossen Vorzüge von Geoffrey Scott's Buch: 'The Architecture of Human-

ism' besteht nach Charles Marriott darin, dass es unbewusst einen ethischen Massstab an Architektur anlegt, den klarzulegen sich der Verfasser viel Mühe gegeben hat. 'Soweit es sich um eine Wiederbelebung der Stile der Antike in der Architektur des Humanismus handelt... ist die ethische Rechtfertigung der "Folly" gewissermassen ein Versuch das galante Abenteuer ehrbar zu machen.' Wenn aber der Barock im wesentlichen ein Versuch war, aus der 'Folly' ernsthafte Architektur zu machen, so war die Architektur des 19. Jahrhunderts nicht weniger darauf bedacht, 'ernsthafte' Architektur in 'Follies' zu verwandeln. Erst in allerjüngster Zeit wurde der Impuls zum Spiel in der Architektur völlig unterdrückt, und Charles Marriott ist der Ansicht, dass diese neue Ernsthaftigkeit nur einen Verlust bedeutet. Trotzdem betont er 'wenn Architekten sich wieder von dieser Ernsthaftigkeit befreien und sich in leichtem Spiel ergehen werden, so werden sie gut daran tun, nicht zwei gute Dinge zu zerstören, indem sie sie durcheinander bringen.'

Seite 231: *Die ersten Eisenskelettbauten von Turpin Bannister*. Das Streben nach Vereinheitlichung in der Geschichte der Architektur des 19. Jahrhunderts äussert sich nicht in den historizistischen Tendenzen, die zu einer Reihe von Wiederbelebungen vergangener Stile geführt haben, sondern in der Entwicklung neuer Bautypen und neuer Konstruktionsmethoden. Einen dieser neuen Bautypen, das Lagerhaus oder den Block von Geschäftshäusern hat Henry-Russell Hitchcock in der ARCHITECTURAL REVIEW kürzlich behandelt ('Victorianische Geschäftshäuser', Februar, 1949). Im vorliegenden Aufsatz fasst Turpin Bannister die Ergebnisse zehnjähriger Untersuchungen zusammen, die mehr als alles andere dazu beigetragen haben, die neue Bewegung zu schaffen—das Eisenskelett und die Verwendung von Eisen im allgemeinen. Die Bedeutung seiner Untersuchungen wird am besten durch den Hinweis klar, dass während alle Sachverständigen bisher angenommen hatten, dass der erste Bau mit eisernem Rahmenwerk in England eine Fabrik war, die Boulton & Watt 1801 in Salford errichtet hatten, Professor Bannister drei Fabriken nachweisen kann, die Boulton & Watt's Gebäude vorangegangen sind: William Strutt's Kattunfabrik 1792-93 in Derby, die Fabrik von Benyon, Bage & Marshall in Shrewsbury 1796 und William Strutt's Fabrik in Belper 1797. Die beiden zuletzt genannten Fabriken sind erhalten, und Professor Bannister nennt sie 'wahre Kulturdenkmäler der beginnenden Ära des Industrialismus. Als solche verdienen sie einen Ehrenplatz neben anderen Baudenkmälern. Geeignete Massnahmen müssen schnellstens zu ihrem Schutz und ihrer Erhaltung getroffen werden.' Ausser Fabrikanlagen wird auch die frühe Verwendung von Eisen im Bau von Kirchen geschildert.

Seite 255: *Barockbibliotheken von F. Hepner*. Nach Ansicht der Benediktiner war für ein Kloster die Anlage einer Bibliothek ebenso notwendig wie

eine Waffensammlung für eine Burg. Im vorliegenden Aufsatz untersucht und illustriert Dr. Hepner mit eignen Aufnahmen die Anwendung dieser Vorschrift in Bayern und Oesterreich. Viele der grossartigsten Bibliotheken befinden sich in den entlegensten Plätzen, denn gerade dort hatte die Kirche eine ketzerische Volksbewegung, einen demokratischen Protestantismus zu bekämpfen und so bedurfte sie der Kunst als Stütze, um die Laienwelt zu beeindrucken. Dazu gehörten ausserdem umfangreiche Klosterschulen mit einer grossen Zahl von Zöglingen; Künstler und Handwerker sollten gleichfalls durch ihre Zahl und Bedeutung etwaige Lücken in der Bibliothek kompensieren. Metten, Waldsassen, Fürstenzell, Linz, Melk, Seitenstetten, Vornau und Altenburg gehören zu den von Dr. Hepner untersuchten Klöstern.

Seite 261: *Vorschau. Die Southbank Ausstellung 1951.* Die ARCHITECTURAL REVIEW bringt in acht bildlichen Darstellungen mit dazu gehörigem Text ihre erste Uebersicht der grossen Ausstellung von 1951, wie sie nach ihrer Fertigstellung auf dem Südufer der Themse aussehen wird.

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Da Papier in England für Export nicht länger rationiert ist, können Abonnements auf die ARCHITECTURAL REVIEW vom Ausland angenommen werden.

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Апрель 1950 г.

КРАТКОЕ СОДЕРЖАНИЕ СТАТЕЙ

Стр. 219. ЧАРЛС МАРИОТТ. ПОТРЕБНОСТЬ В АРХИТЕКТУРНОЙ ЭКСТРАВАГАНТНОСТИ

Чарлс Мариотт пишет, что одним из достоинств книги Джеффри Скотта „Архитектура Гуманизма“, является то, что ее можно рассматривать, как очаро-

вательно-бессознательное применение того же этического стандарта в суждении архитектуры, которую автор так усердно старается показать; „во всяком случае, по стольку по скольку это является возрождением старинной, архитектура гуманизма является этическим оправданием архитектурной экстравагантности... это, как бы сказать, равносильно попытке облагородить женщину легкого поведения“ Но если стиль „Барокко“ был по существу попыткой превратить „экстравагантность“ в „серьезную“ архитектуру, то таким же образом большая часть архитектуры 19-го века, была попыткой превратить „серьезную“ архитектуру в „экстравагантную“. Еще не так давно, движение экстравагантного строительства почти всецело подавлялось, и г-н Мариотт считает, что мы только теряем от нашей вновь приобретенной „формальности“. Тем не менее, как указывает автор статьи, „если архитекторы опять решат отставить „серьезность“ в архитектуре и перейти к „экстравагантности“, то пусть уж они постараются не испортить, смешивая оба стиля“.

Стр. 231. ТЕРПИН БАННИСТЕР. ПЕРВЫЕ ЖЕЛЕЗО-КАРКАСНЫЕ СТРОЕНИЯ

Об'единяющую тему, проходящую через историю архитектуры 19-го века, нужно искать не в историчности, а в развитии новых типов строений и новых методах конструкций. Недавно, в РЕВЬЮ, один из этих новых типов строений, товарный склад, был рассмотрен Генри-Рассел Гитчкоком. („Викторианские Памятники Коммерции“, Февраль 1949 г.) В этой статье Терпин Баннистер представляет первое резюме результатов десятилетнего исследования метода конструкций, который больше, чем какой либо другой сделал возможным окончательное появление Современного Движения в архитектуре — употребление железного каркаса в постройках и применение железа в архитектуре вообще. До сих пор, всеми авторитетами было принято, что первое английское железо-каркасное строение была фабрика, построенная Будтоном и Воттом в городе Салфорде (предместие Манчестра, графство Ланкашир) в 1801 г. Но теперь, профессор Баннистер может назвать три железо-каркасные постройки, которые предшествовали фабрике в Салфорде. — Ситцевая фабрика Вильяма Стратта, построена в 1792-3 г. в Дарби (графство Дарбишер), фабрика Бенион, Бэйж и Маршалл была построена в 1796 г. в Шрусбури (графство Шропшер) и фабрика в Белпере, построенная в 1797 г., тоже создание Вильяма Стратта; две последние постройки стоят и по сей день, Профессор Баннистер говорит: „как настоя-

щие культурные памятники, начинающей Эпохи Индустриализации, они заслуживают почетного места на ряду с другими национальными архитектурными памятниками, и необходимо предпринять шаги к тому, чтобы обеспечить их сохранность. Употребление железа, помимо индустриальных построек, описано тоже и в ранней церковной архитектуре.

Стр. 255. Ф. ГЕПНЕР. БИБЛИОТЕКИ СТИЛЯ „БАРОККО“

Монастырь без библиотеки, как гласит старое правило Бенедиктинцев, все равно, что замок без оружейного склада. В этой статье д-р Гепнер рассматривает и иллюстрирует собственными фотографиями, архитектурные результаты применения этого правила в Баварии и Австрии.

Многие из самых замечательных монастырских библиотек находятся в самых отдаленных местах, потому что в таких местах церкви боролись с популярным движением ереси и демократическим протестантизмом, и потому она крайне нуждалась в поддержке искусств для внушения прихожанам и ученикам монастырских школ величие церкви.

Кроме того, при создании таких замечательных библиотек, церкви была в состоянии полагаться на работу художников и ремесленников, чтобы скомпенсировать недостаточное число книг.

В этой статье, среди мест, указанных д-р. Гепнером, находятся следующие: Меттен, Вальдсассен, Фурстенцелл, Линц, Мельк, Зайтентштегген, Форау и Альтенберг.

Стр. 261. ПРЕДВАРИТЕЛЬНЫЙ ОБЗОР: ВЫСТАВКА ЮЖНОГО БЕРЕГА ТЕМЗЫ 1951 г.

В этой статье, АРХИТЕКТУРАЛ РЕВЬЮ представляет исчерпывающее, впервые опубликованное, описание выставки 1951 г. (как она будет выглядеть в законченном виде). Оно состоит из восьми различных видов выставки, показывающих все постройки с приложением об'яснительного текста.

ОБ'ЯВЛЕНИЕ ПОДПИСЧИКАМ

Ввиду того, что в Англии ограничение бумаги для экспорта больше не существует, „АРХИТЕКТУРАЛ РЕВЬЮ“ восстановил прием подписки для СССР и других заграничных стран.

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THE ARCHITECTURAL REVIEW

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April 1950



The Cover If photography had given us nothing else, we would owe it a debt of gratitude for the visual delights of the negative. Just why the reversal of light and dark should produce such exciting effects it is hard to say—unless it be that by freeing the tonality of a scene from its practical implications it makes it easier for us to see it as pure pattern. The house, designed by Tayler and Green, is described on pages 252-254 of this issue.

218 *Blaise Hamlet* by John Nash

219 *The Necessity of Follies* by Charles Marriott One of the attractions of Geoffrey Scott's *The Architecture of Humanism*, says Charles Marriott, is that it can be read as a charmingly unconscious application of the ethical standard in the judgment of architecture that its author has been at such pains to expose; 'at any rate in so far as it is a revival of the styles of antiquity the architecture of humanism . . . is an ethical justification of the Folly, an attempt to make an honest woman of the light o' love, so to speak.' But if the Baroque was fundamentally an attempt to turn the folly into 'serious' architecture, in the same way much of the architecture of the nineteenth century was an attempt to turn 'serious' architecture into follies. It is only quite recently that the impulse to folly-building has been almost entirely repressed, and Mr. Marriott believes that we are the losers by our new-found solemnity.

Wall Surfaces in Brazil

221 *Bank at Rio de Janeiro* Architect: Oscar Niemeyer

224 *School at Rio de Janeiro* Architects: Marcelo, Milton and Mauricio Roberto

229 *Flats at Sao Paulo* Architects: Marcelo, Milton and Mauricio Roberto

231 *The First Iron-Framed Buildings* by Turpin Bannister The unifying theme running through the story of nineteenth-century

architecture is not that historicism which led to a series of revivals of past styles but the development of new types of building and new methods of construction. One of these new types of building, the warehouse or office block, was dealt with by Henry-Russell Hitchcock in the REVIEW recently ('Victorian Monuments of Commerce,' February, 1949). In this article Turpin Bannister presents the first summing-up of the results of ten years' research into that method of construction which more than any other made the eventual emergence of the Modern Movement possible—the iron frame—and the application of iron to building in general. The importance of his findings will be suggested when it is said that whereas it has hitherto been accepted by all authorities that the first British building with both stanchions and beams of iron was a mill built by Boulton and Watt at Salford in 1801, Professor Bannister can name three buildings which certainly were before it in this—William Strutt's Calico Mill of 1792-3 at Derby, the Benyon, Bage and Marshall mill of 1796 at Shrewsbury, and a mill at Belper, also due to William Strutt, which was built in 1797; the second and third of these are still standing and, as Professor Bannister says, 'as true cultural monuments of the budding Age of Industrialisation, they deserve an honoured place with other national architectural monuments, and appropriate steps should be taken promptly to ensure their protection and preservation.'

The Progress of Stylization

247 *House at Grosse Point, Michigan* Architect: Alexander Girard

252 *House at Kingston on Thames* Architects: Tayler and Green

255 *Libraries of the Baroque* by F. Hepner

There was an old Benedictine rule which said that a monastery without a library was like a castle without an arsenal; in this article Dr. Hepner discusses, and illustrates with his own photographs, the architectural results of the application of this rule in Bavaria and Austria. Many of the most splendid monastic libraries are in the most remote places, for it was in such places that the Church had to contend with a popular movement of heresy, a democratic protestantism, and so had most need of the support of the arts in impressing laymen, with its greatness; besides, the artist and craftsman could be called on to compensate for any numerical deficiencies in the collection of books. Metten, Waldsassen, Furstenzell, Linz, Melk, Seitenstetten, Vornau and Altenburg are among the places mentioned in Dr. Hepner's survey.

261 *Preview: 1951 South Bank Exhibition* The REVIEW here presents, in a series of

perspective drawings, the first comprehensive survey of the exhibition as it will appear to the visitor strolling about the grounds.

269 *Popular Art*

270 *Decoration*

271 *World*

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278 *Exhibitions*

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282 *Correspondence*

286 *Acknowledgments*

The Authors Turpin C. Bannister is Professor of Architecture and Head of the Department of Architecture, University of Illinois. From 1944 to 1948 was Dean of the School of Architecture and the Arts, Alabama Polytechnic Institute. In 1928-29 he held the Perkins-Boring Fellowship, Columbia University, for European travel and study, and in 1937 the Henry Adams Fellowship of the American Institute of Architects for research in medieval architecture. He is chairman of the American Institute of Architects Committee on the Preservation of Historic Buildings, and has published more than twenty articles in professional journals. Charles Marriott. Born 1869. First architectural effort paper model of Gloucestershire village church designed by G. E. Street. No regular architectural training but broke the ice of the subject in classes under Professor Hagreen and at lectures by Hugh Stannus, who had actually known Alfred Stevens, at what is now the Royal College of Art, where Marriott studied for two years. Kept up interest by drawing and photographing buildings at home and abroad. 1924-40, art critic and architectural correspondent of *The Times*. His published works include 'Modern Movements in Painting,' 1920. 'Modern English Architecture,' 1924. 'A Key to Modern Painting,' 1938. 'British Handicrafts,' 1943. David Green, born 1910. Works on 'The Countryman' and is preparing a book on Blenheim. Publications include 'Good Neighbours,' 1948 and 'In the Wood,' 1947.

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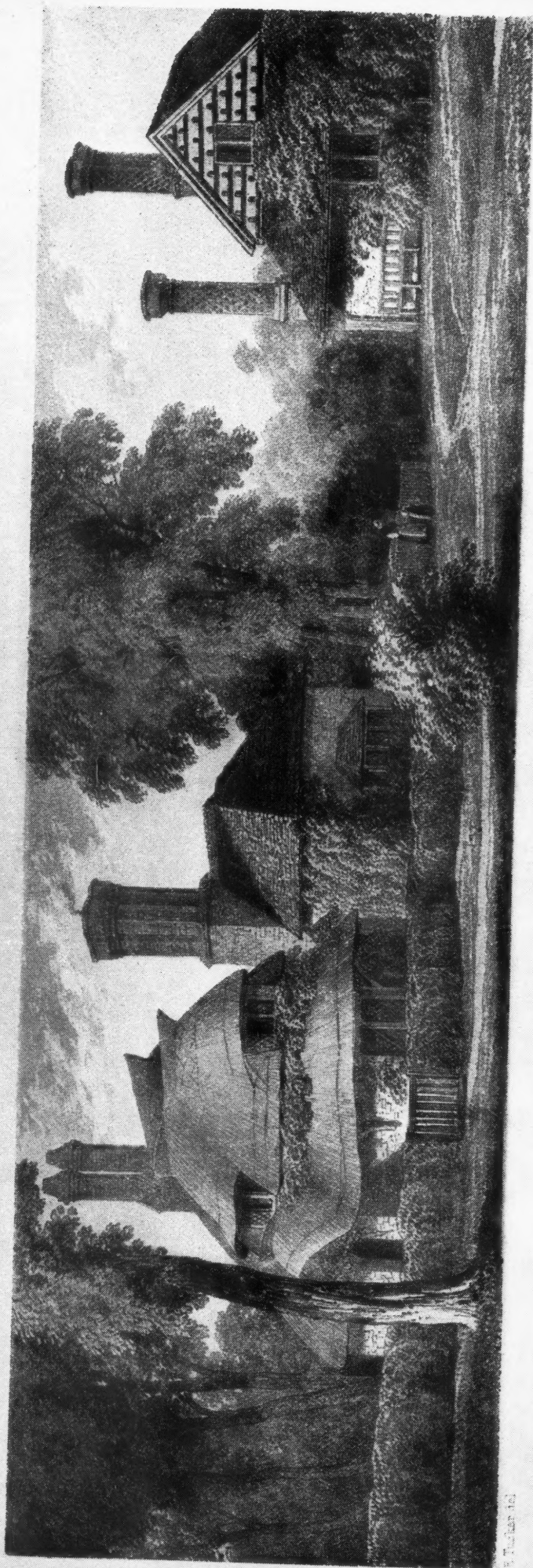
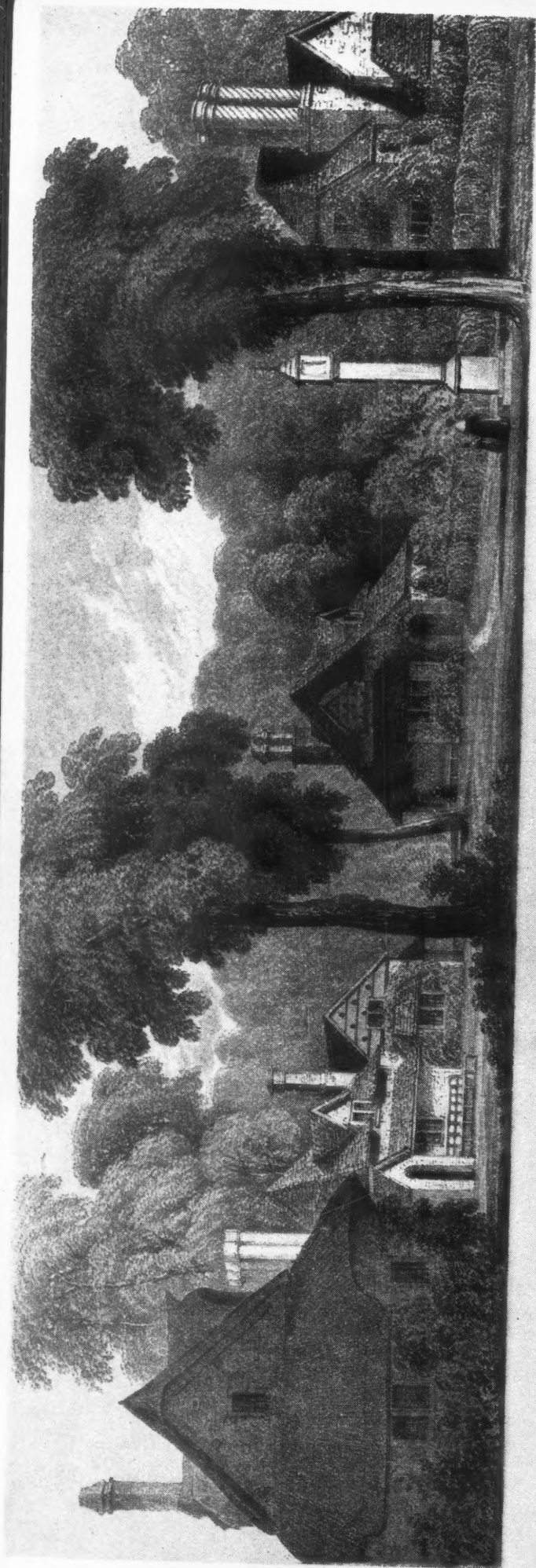
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THREE SHILLINGS AND SIXPENCE



W. & A. S. 1817. 1/2

W. & A. S. 1817. 1/2

The folly, as Mr. Marriott considers it in the article below, is not merely a piece of architectural whimsicality or a Gothick eye-catcher designed to enhance a picturesque landscape. These have had perhaps more than their due share of attention in recent years. Mr. Marriott uses the term to suggest all those buildings which, though they serve a functional purpose, are designed to assault the eye and proudly to disclaim the necessity of a moral justification. He suggests that revivals of past styles are generally launched by means of some folly, and instances Blaise Hamlet near Bristol, designed by John Nash, who, as early as 1811, exploited there the romance of rusticity. Blaise Hamlet is depicted opposite in a lithograph of the time, one of a pair by R. Tucker.



Charles Marriott

THE NECESSITY OF FOLLIES

THE REFERENCE, with apologies to the shade of Erasmus, is to what a recent broadcaster happily called 'architectural conceits,' that is to say the structures, whether classic or Gothic, with which our forefathers delighted to adorn their estates, and it was prompted by a re-reading of *The Architecture of Humanism*, by the late Geoffrey Scott.

For one of the attractions of that famous book is that it can be read as a charmingly unconscious application of the ethical standard in the judgment of architecture that its author has been at such pains to expose. At any rate in so far as it is a revival of the styles of antiquity the architecture of humanism—oddly so named in view of its frequent disregard of human comfort and convenience in the interests of the street façade—is an ethical justification of the Folly, an attempt to make an honest woman of the light o' love, so to speak.

Probably all revivals begin with Follies—Renaissance details in the Gothic form of Tudor buildings and the 'Gothick' of Walpole and Beckford that preceded the Gothic Revival of the nineteenth century, for examples—for the simple reason that revivals are born of taste and not, like Greek, Byzantine and Gothic, of the necessities of building with particular materials at a particular time and place, under the control of taste, no doubt.

Nor are there wanting examples in the opposite direction, for it is evident that the 'rogue architecture' of the Victorian period, brilliantly named and described by Mr. Goodhart-Rendel in a recent address to the RIBA, was a clumsy attempt to give to 'serious architecture' as Geoffrey Scott calls it, the freedom of the Folly, an attempt to emancipate the light o' love from the 'chores' imposed upon her by the ethical fallacy.

As the title of this article will suggest, present concern is with the dismal effect of that fallacy upon the Folly, and not with the effect of the Folly on serious architecture. For it stands to reason that in proportion as you give an ethical, or even a practical, turn to your diversions you rob them of their glorious inutility. Fortunately, however, there are enough surviving Follies to make us familiar with the kind. Whatever the practical use to which it was and continues to be put the Brighton Pavilion is essentially a Folly, and though the Quadrant has gone, the Folly-making impulse of Nash came out, unless I dreamt them, in the truly fantastic cottages of the two Park Villages between Albany Street and Regents Park. And did not Nash design Blaise Hamlet, hard by

where with commendable enterprise the Bristol Corporation has just opened a Folk Museum? According to Mr. John Summerson, Blaise Hamlet preceded Nash's work in London by a good many years, which tells its own tale of unregenerate youth.

To continue the list, there are the Palladian bridges at Wilton and Prior Park and the garden houses and temples at Stowe. Calton Hill, Edinburgh, is crowned with Follies. No doubt Edinburgh New Town is a worthy piece of planning, but the only possible comment on the flagrant picturesqueness of the view from Calton Hill into a stormy winter sunset is 'I don't believe it!'

Nor are these escapes from drab utility into free and disinterested art limited to the Classic styles. Three Follies of the Gothic persuasion that happen to be familiar are Cook's Folly, overlooking the Avon Gorge at Clifton; Walton Castle, in Somerset; and Castle-an-Dinas, in Cornwall. Walton Castle, with its keep, bastions and curtain walls, commands the narrow gap where the low converging hills that mooch along beside the Gordano valley pull up short as if to avoid collision, letting the road to Clevedon slip through at the last moment like a cat through a closing door. Castle-an-Dinas (presumably 'the castle on the castle') forms a sort of triumphal gateway to the ancient fortified camp of Chysauster, just off the old road from St. Ives to Penzance, where there are also hut circles. It gains in atmosphere from being within hailing distance of the Romano-British inscribed stone that marks the grave of Riolo-bran the son of Cymbeline, which, in turn, is heightened in its appeal to the imagination by being within a few yards of an electric pylon, so that, instead of by the tramp of Legions, the dreaming Riolo-bran is lulled by the humming stride of power. One would like to have his comment on the queasy folk who talk about vandalism.

All this praise of Follies is not to say that the architecture of humanism has not produced some noble things of a more dutiful kind, particularly in Italy, though even so some of us find a livelier pleasure in the architectural conceits of Pannini and his like than in their domestication. But it was not until the Renaissance was established in England that an ethical tendency crept into building. There are hints of smug complacency, of best behaviour, even in the orderly squares and terraces of the eighteenth century, and when we come to the strip-tease Classic of modern banks and town halls a desire to improve the occasion cannot be ignored.

There seems, indeed, to be something in the air of England or the British character that has the double effect of making duties out of what should be pleasures and using words like 'ethical' and 'moral' as terms of reproach in æsthetic discussion—on pot and kettle principles, one supposes. They don't seem to do this in France, and the Latin disposition to regard love and marriage as separate questions has an obvious parallel in the Folly as distinct from serious architecture. When the French use the word 'moral' they refer to public morals, as in the action against Baudelaire for *Fleurs du Mal* which has recently been quashed on a re-hearing, leaving the æsthetic question for separate consideration. But in England you can hardly pick up a piece of art criticism without coming upon the word 'moral' as a term of reproach. Thus, in a review of Mr. Gloag's book on cast iron in architecture it was said that the argument against the imitation of one material in another is a moral and not an æsthetic argument. On the contrary, the objection to such imitation is that it crabs if it does not destroy the special qualities of the imitating material, which is a strictly æsthetic objection. The classical and extreme instance was the frog that tried to imitate the bull—and burst himself in the attempt. As Sir Philip Hendy said the other day, if you try to make marble look like lace you distort marble; and stucco, which as Nash understood is a convenient basis for painting, is distorted—besides becoming a danger to the public—when it is used to imitate cornices or other projections in stone. Exactly the same principle runs through all questions of imitation. The objection to artificial flowers is not that they deceive by imitating nature, but that in doing so they limit the possibilities, which a few artists have had the wit to exploit, of artificiality. Any objection to cosmetics, again, is not that they deceive by imitating the glow of health, but that in trying to do so they defeat the role of cosmetics as decorative adjuncts to costume. Cosmetics come to their own æsthetically in the hands of the woman who, as was said of a 'little' Irish dressmaker, knows how to 'slash,' just as, to return to our muttons, the architecture of humanism comes to its own in the Folly.

It is hardly necessary to say that the British tendency to give ethical justification to what should be regarded as diversions is not limited to the arts. We do not, like the Teutons, play games in order to be strong, but for their own sake, but we have been known to defend fox-hunting on the grounds that it improves the breed of horses, and in humble

circles the British matron cannot whole-heartedly enjoy her glass of stout unless by doctor's orders, 'to feed the nerves.'

Speaking generally, architects are inclined to damn the Folly with faint praise. But here and there an architect has grasped the intrinsic meaning of the Folly. It is said of an eminent supporter of the Georgian Group that in the privacy of his Georgian home he adopts Georgian costume, and I can vouch for it that when you lunch with him at his Georgian Club, for he is notoriously hospitable, he sends the waiter for the Georgian betting-book. That is the right spirit in which to salute the irrelevancy that distinguishes the Folly from serious architecture.

Painters, possibly because they feel no responsibility in the matter, generally welcome the Folly unreservedly. Some of them, like the late James Pryde and the late Rex Whistler have actually invented Follies. If memory can be trusted, Mr. John Piper has not yet invented a Folly, but he is a connoisseur of the kind, celebrating with equal impartiality the Classic and the Gothic and giving to each its appropriate atmosphere. Writers, too, are generally alive to the charms of the 'architectural conceit.' The very titles of Peacock's novels are Follies; the 'stately pleasure dome' of Kubla Khan was evidently a poetical version of the Brighton Pavilion; and for a minor example there is Mr. Wemmick's castle.

Though here and there a functionalist Folly, looking oddly out of date, still masquerades as serious architecture, contemporary architects do on the whole make the right distinction between serious architecture and the Folly, working to the principles of tradition in the one case and reserving the stylistic accidents—but there's the snag. Because, unfortunately, this purification of architecture, this banishment of the light o' love from the domestic circle, seems to have checked the impulse to commit Follies. No doubt there is an excuse in the pressure of the times, but when things have settled down a bit it is to be hoped that architects will once again exploit Folly-making possibilities. Some years ago Mr. Wyndham Lewis wrote to the text of 'Architects, where is your Vortex?' He might well follow it up with 'Architects, where are your Follies?' Only, if architects do again take holiday from their serious building to frolic in Follies, let them not spoil two good things by mixing them up. It may be folly to be wise, but it is not wise to clip the wings of folly, put the racehorse to the plough, break the butterfly on the wheel, or reduce the light o' love to a domestic drudge.



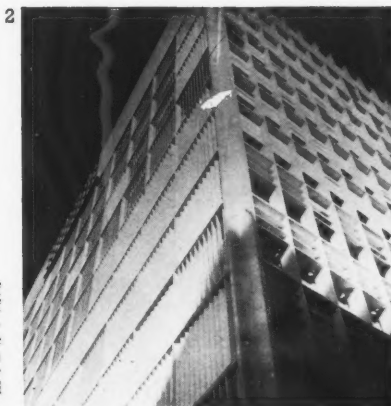
WALL SURFACES IN BRAZIL The three recent Brazilian buildings illustrated on the following pages have in common a varied treatment of wall surfaces, giving them more colour, texture and modelling than is customarily found in modern buildings of reinforced concrete construction. The *brise-soleil*, a Brazilian contribution to the modern architectural idiom which provides a three-dimensional pattern value in addition to its functional advantages, is already well known. These buildings show several forms of the *brise-soleil*; they also show exterior walls enriched and patterned in a number of other ways, by the use of glass blocks, curved and flat, of mosaics, simple and elaborate, of marble and granite facings and of stone walls built in traditional style. Contrast with the adjoining surface enhances the richness of each wall surface.



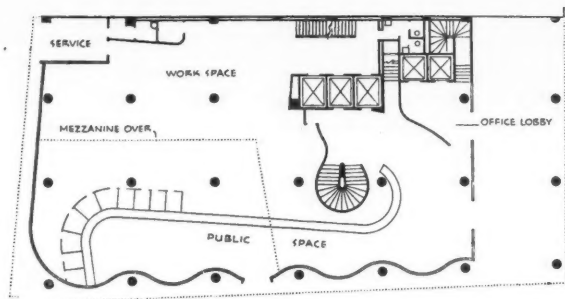
BANK AT RIO DE JANEIRO

OSCAR NIEMEYER: ARCHITECT

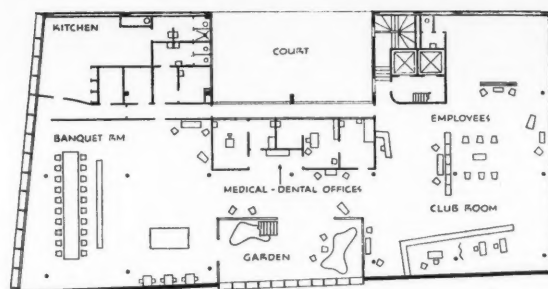
1. an undulating wall of glass blocks, the height of the ground floor and mezzanine, runs the length of the building and lights the main banking hall. The upper floor windows, 2, are protected by a wooden *brise-soleil*



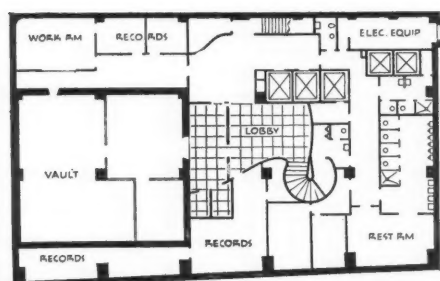
This is the headquarters of the Boavista Bank, which occupies five floors of the building, the other floors being let as offices. The top floor provides club rooms and medical and dental rooms for the bank employees. The building occupies a busy corner in the down-town section of the city, with its main frontage on a narrow street. It is near the cathedral, with which it makes a dramatic contrast. The plan was determined by the need for maximum utilization of ground floor space and for good natural lighting of the offices above. Lifts, stairs and lavatories are grouped along the back wall. Here the building is set back on the upper storeys to form a light well. Construction is of reinforced concrete, allowing exterior walls to be treated simply as curtains. On the ground (banking floor) these curtain walls are of glass blocks to give the maximum light without permitting passers-by to see inside. They have an undu-



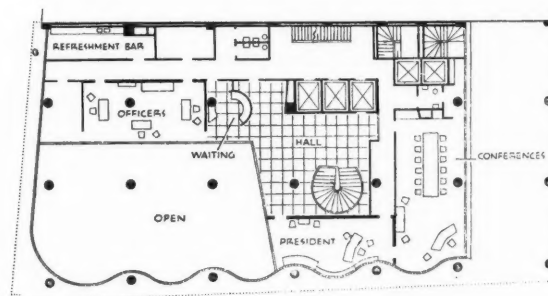
ground floor



top floor



basement



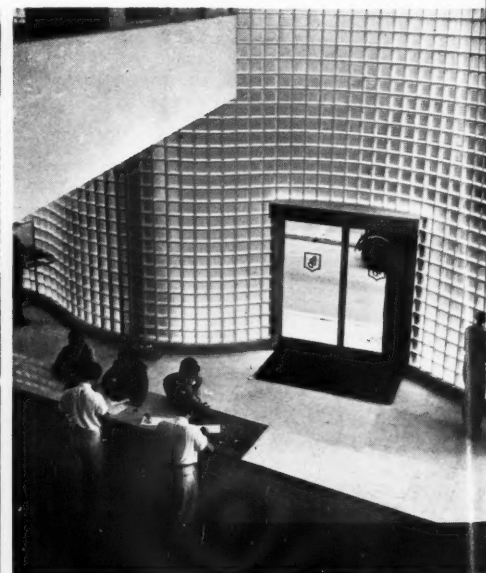
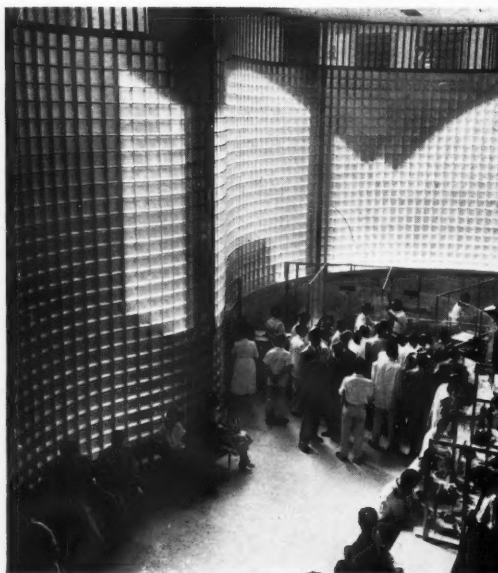
mezzanine

BANK AT RIO DE JANEIRO

Below, the banking hall. Its undulating glass-block wall is set back, 3, inside the circular reinforced concrete columns that support the superstructure. The public part of the hall, 4 and 5, rises through two storeys. There is a partial mezzanine in the form of a gallery, seen in the corner of the right-hand picture, containing offices that overlook the hall through plate-glass partitions

lating plan. The directors' offices are on the mezzanine floor, from which clear glass partitions allow a view into the two-storey banking hall. The ground floor columns that carry the main structure are of larger diameter than is structurally necessary or than the architect wished owing to the requirements of local by-laws. The building is luxuriously finished in various marbles and travertine, both externally and in the banking hall and lift hall. The *brise-soleil* is of wood and is painted bluish-green, light at the bottom and getting darker towards the top of the building in order to give an effect of even colour over the whole façade in the very narrow street.

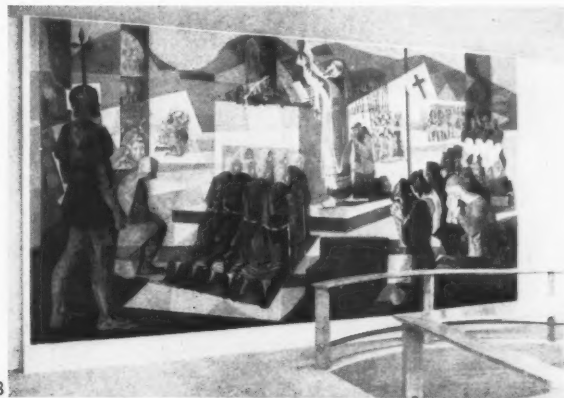
3
4
5



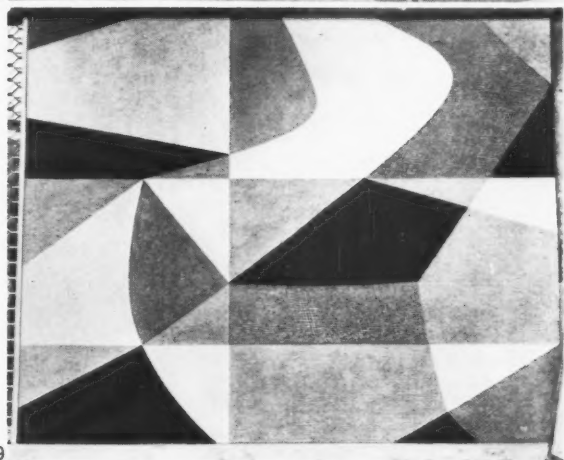


6

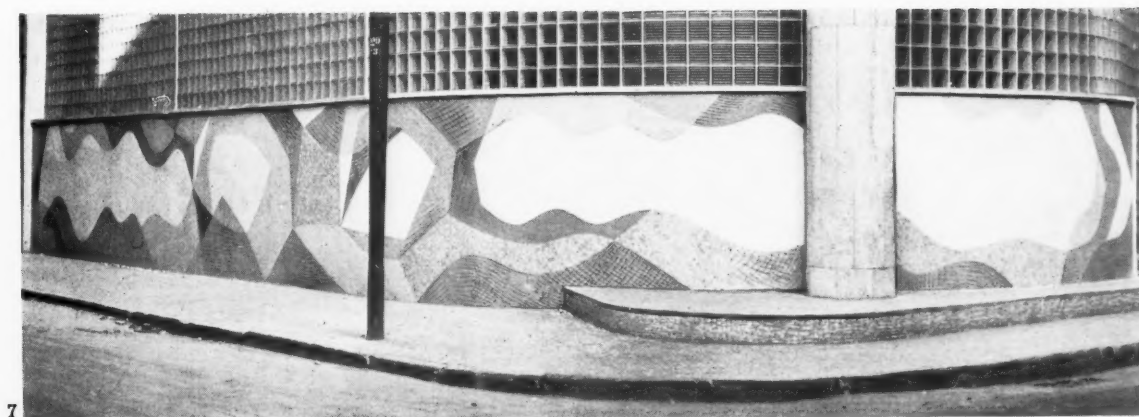
8, a wall painting by Henrique Coimbra at mezzanine level, by the top of the stairs from the banking hall. 9, another exterior mosaic by Paulo Werneck. This one takes the form of a panel, 16 ft. by 13 ft., under the cantilevered end of the building shown in the exterior view on this page



8



9



7

6, the exterior from the south. In the glass can be seen reflected the dome of the nearby cathedral. 7, a mosaic panel, 70 ft. long, which provides a strongly coloured base to the exterior, curving round two sides. It stops short on the right where the undulating glass-block wall of the banking hall begins. The artist is Paulo Werneck

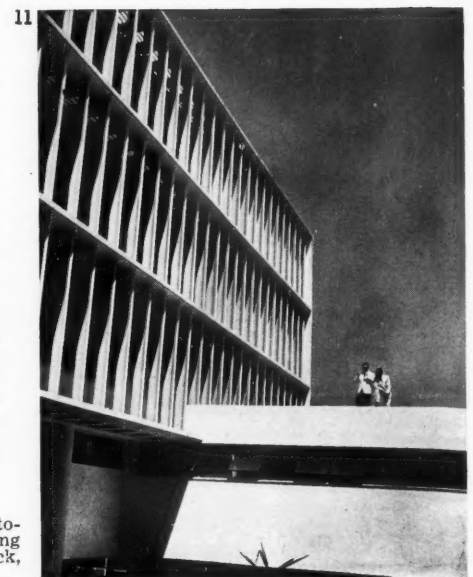
SCHOOL AT RIO DE JANEIRO

MARCELO, MILTON AND MAURICIO ROBERTO: ARCHITECTS



This is a technical training school for factory workers, built for the National Service for Industrial Apprenticeship in the industrial zone of Rio de Janeiro. It has a capacity of 1,400 students working in two daily shifts. The site is small and irregular and the architects had to work to a strictly limited budget. Easy horizontal and vertical circulation was required for staff and students. The building occupies four storeys, with all services centrally planned. The heavy workshops and a combined gymnasium and auditorium are on the ground floor. On the upper floors are light workshops, classrooms and other departments. The classroom block faces south and north, the northern elevation being protected against the sun by a *brise-soleil* or screen of vertical concrete

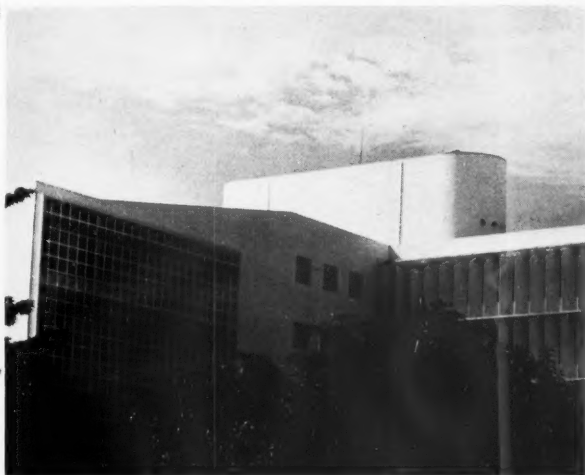
10, a general view of the school, photographed from the roof of a neighbouring building. 11, detail of the classroom block, showing the *brise-soleil*



louvre. The structure is reinforced concrete with a rendered finish, and a concrete slab roof covered with asbestos cement. The restaurant has a mosaic decoration by Paulo Werneck. The landscaping of the gardens is by Roberto Burle-Marx.

12, the central tower containing water tanks and lift machinery. On one side is the ramp access; on the other, part of the classroom block. 13, corner of the workshops

12



13



14



14, staircase leading to the restaurant. Its frame is faced in brown mosaic and the curved wall in the foreground in light blue mosaic



15, inside one of the workshops



16



17

16, the combined gymnasium and auditorium, looking towards the stage. 17, a mosaic wall decoration, depicting a football match, in the restaurant. The artist is Paulo Werneck

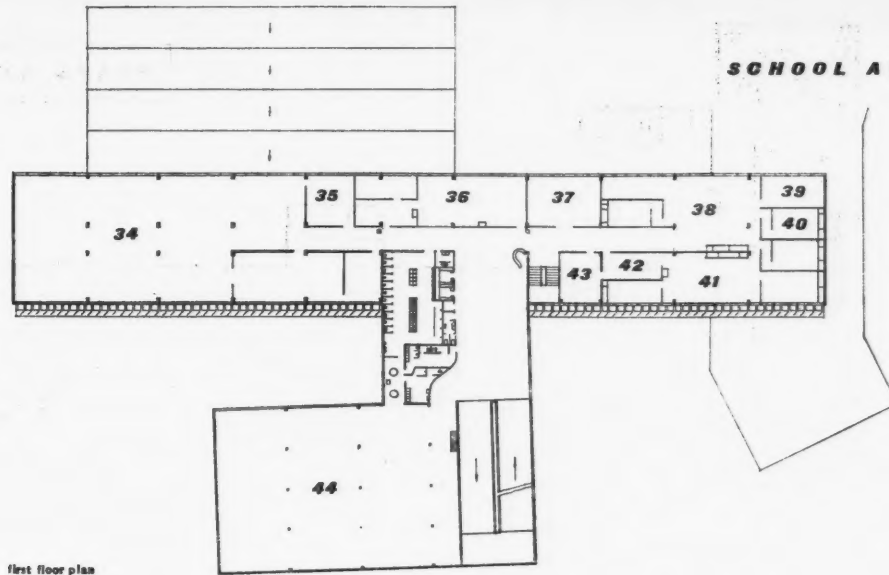




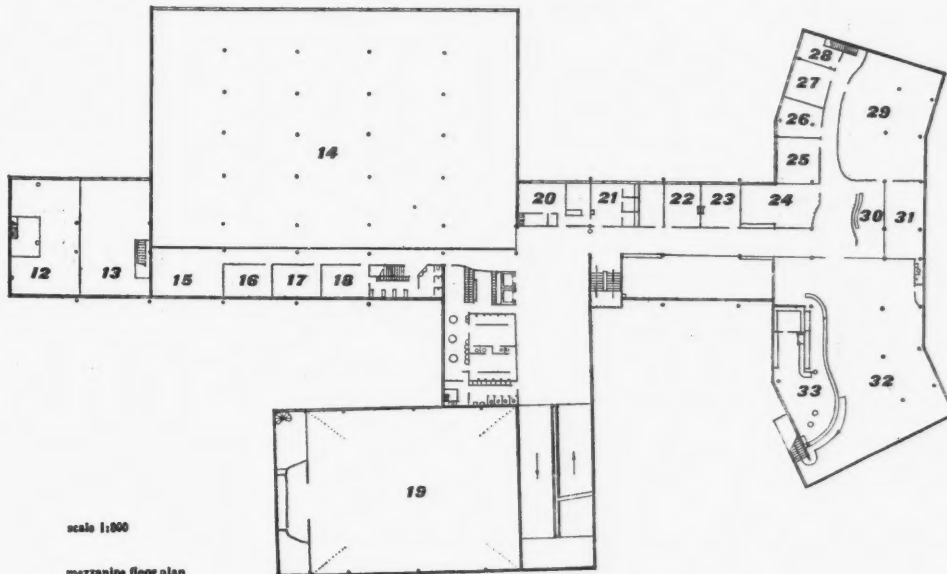
SCHOOL AT RIO DE JANEIRO

key

1. parking shelter. 2. foundry. 3. work-shops. 4. electrical welding. 5. store. 6. wash basins and drinking fountains. 7. enquiries. 8. stage. 9. gymnasium-auditorium. 10. chair storage. 11. wash basin. 12. foundry. 13. modelling. 14. upper part of workshops. 15. drawing. 16. headmaster. 17. meeting room. 18. teachers' common room. 19. upper part of gymnasium. 20. radiology. 21. consultation. 22. infirmary. 23. dentist. 24. establishment. 25. stationery. 26. professional orientation. 27. educational orientation. 28. stationery store. 29. secretary. 30. waiting room. 31. director. 32. restaurant. 33. kitchen. 34. printing press. 35. teachers' room. 36. engraving. 37. rotogravure. 38. photography. 39. air-conditioning plant. 40. dark room. 41. copying. 42. mounting. 43. lithography. 44. workshop.

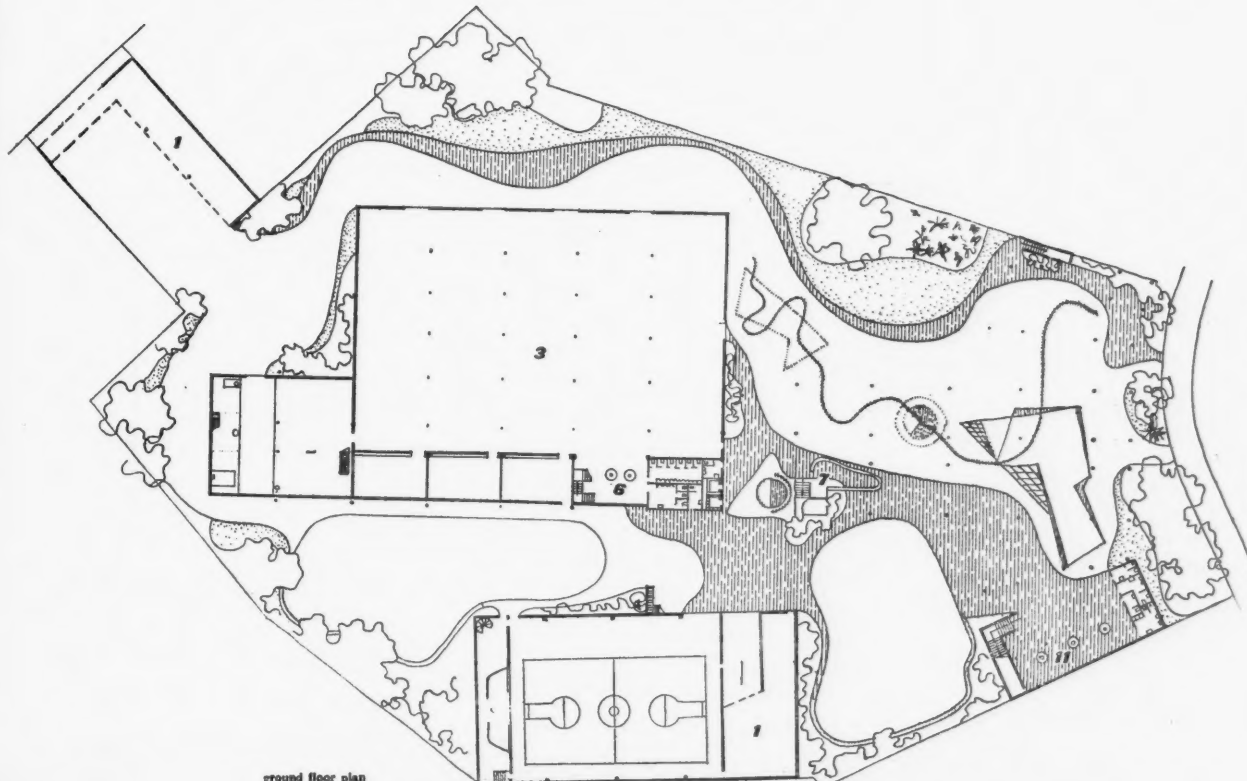


first floor plan



scale 1:800

mezzanine floor plan



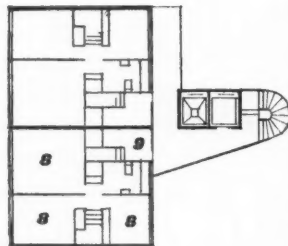
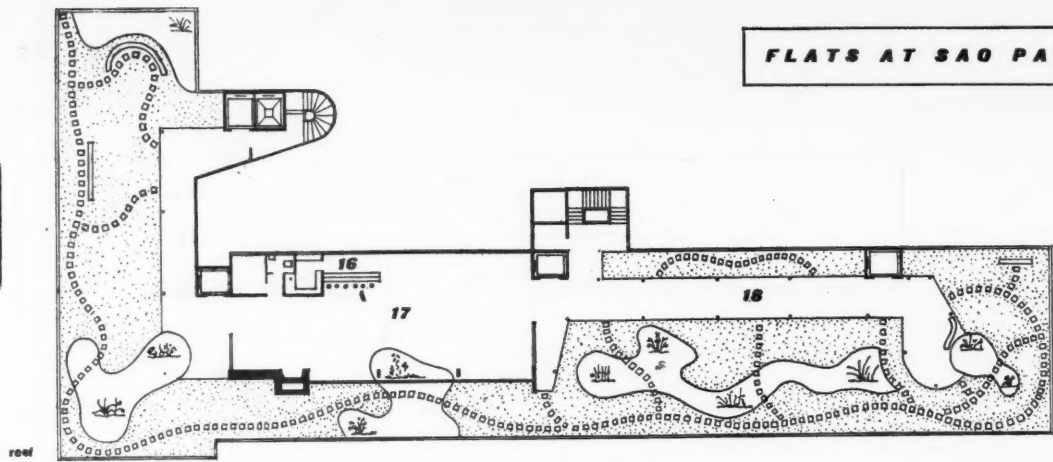
ground floor plan

FLATS AT SAO PAULO

Key

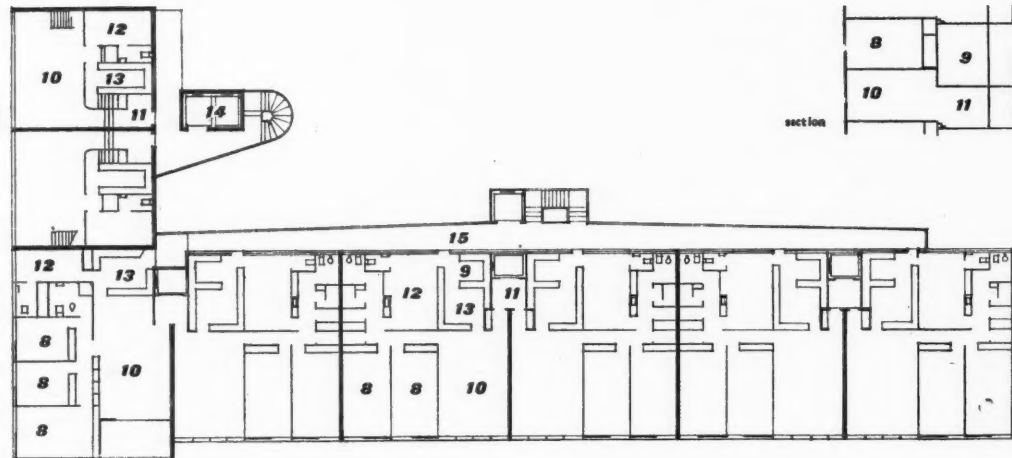
- 1, garage. 2, garage office. 3, hall—enquiries. 4, incinerator. 5, tenants' hall. 6, shop. 7, caretaker's flat. 8, bedroom. 9, service. 10, living room. 11, hall. 12, servants' room. 13, kitchen. 14, lifts. 15, servants' gallery. 16, bar. 17, social room. 18, pergola.

scale 1:400

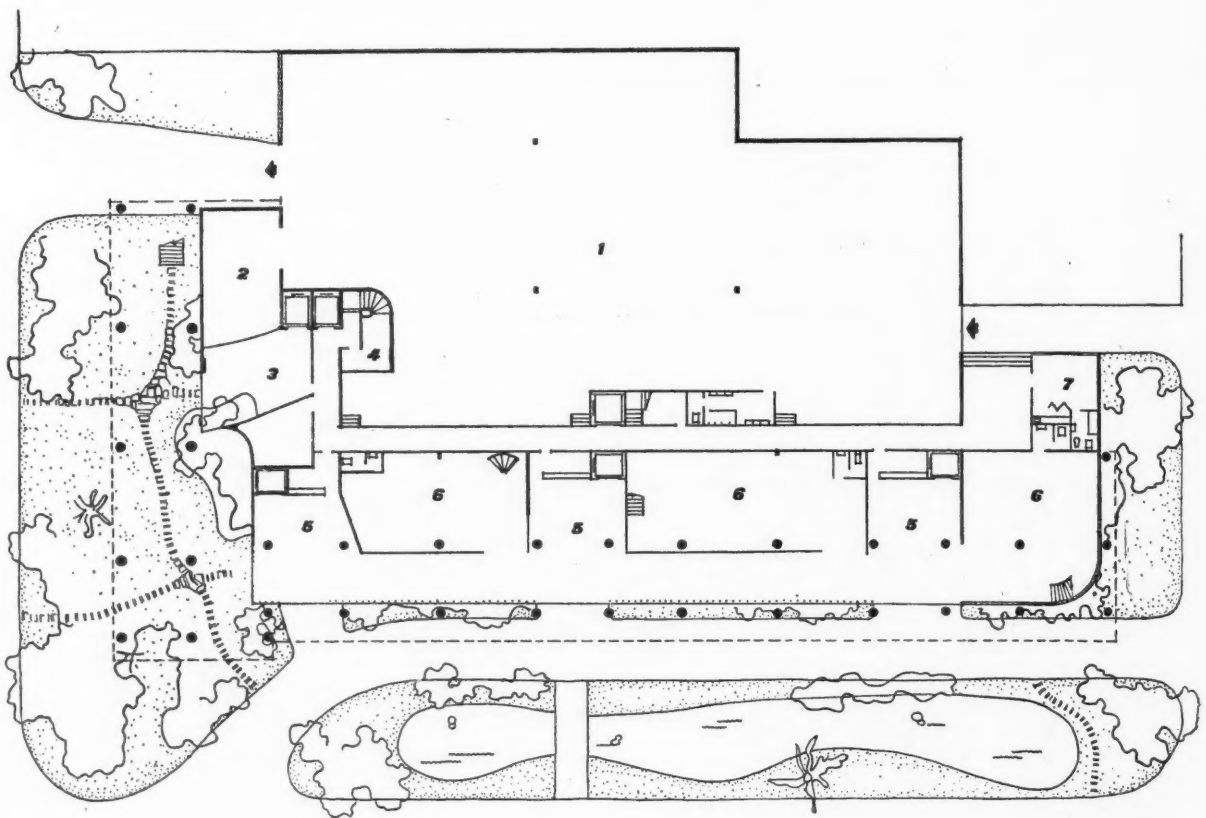


3rd, 5th, 7th and 9th floors.

right, plan of 2nd, 4th, 6th, 8th and 10th floors: intermediate floors are identical except for the shorter wing, above, which contains bedroom floors of two-storey flats. The arrangement of these is shown in section on the far right.



section



ground floor





18
19



18, 19, two ground floor details, showing the effect of raising the whole block on columns and taking the garden beneath it. On the left is the arcade of shops. 20, a general exterior

FLATS AT SAO PAULO

MARCELO, MILTON AND MAURICIO ROBERTO: ARCHITECTS

These flats, built for the employees of an industrial insurance company, stand on a hill-top about a mile from the centre of the city of S. Paulo. The planless growth of the city forced the architects to build to a high density for so cramped a site but they have minimised the disadvantage of this by raising the building on columns, thus freeing ground space for playgrounds and gardens. Flat roof surfaces are similarly made use of. Seventy flats were required, each with two or three bedrooms as well as servants' accommodation, with separate access for tenants and servants. A garage, three shops, a social room and children's playgrounds had also to be provided. Planning was complicated by the small, irregular site and by restrictive local by-laws. On the ground floor are four tenants' entrances, the servants' entrance, a caretaker's flat (from which the servants' entrance can be supervised), management offices, a garage for forty cars and the three shops, planned as an arcade and separated from the street by

20



a light vertical trellis. Each shop has a mezzanine belonging to it. At mezzanine level there is also a playground for tenants' children. Most of the flats have all their accommodation on one floor, but those facing the Avenida Angelica are duplex flats. The planning maintains a separate circulation in living and service areas. On the roof garden is a social room which can also be hired by tenants for private parties. There are also a sheltered verandah and pergola. The climate of S. Paulo being often foggy and cold in the winter, the roof garden has been provided with a fireplace. The wall surrounding it is built by the traditional method (called *cangicado*) with small blocks of stone wedged with smaller stones, using a very small quantity of mortar. The building is of reinforced concrete construction, with hollow brick filling between the framework. The facing materials are marble, granite, mosaic and glass brick.



21. ground floor with shopping arcade. 22. service staircase and gallery. 23. corner of main front showing effect of varied facing materials: light grey marble walls, granite columns and blue mosaic balcony parapets. 24. pergola in the roof garden. 25. roof garden with social room on left, showing traditional stone walling

F L A T S A T S A O P A U L O



THE FIRST IRON-FRAMED BUILDINGS

Professor Turpin Bannister is Dean of the Faculty of Architecture at the University of Illinois. He has spent the last ten years on concentrated research into the earliest architectural uses of iron. The following article is the first summing-up of his most important results. It is revolutionary in its contents and places our knowledge of early metallic construction on a completely new basis, supplementing and correcting the information existing in this branch of architectural history. The article deals chiefly with the first factories using iron columns and beams, but also with such early uses of iron as the tracery in church windows.

THE ORIGINS AND EVOLUTION of metal-framed construction comprise an enthralling story, but despite the fact that it is to-day one of the most prevalent systems of modern building, and despite the widespread curiosity shown by both laymen and architects as to its inception and growth, it has thus far escaped definitive investigation. Four recent publications¹ continue to quote the statement by William Fairbairn, that indefatigable protagonist of iron, that Boulton and Watt built in 1801 in Chapel Street² at Salford, across the Irwell from Manchester, the first iron-framed building, the Cotton Twist Mill owned by Philips, Wood and Lee. One must suppose that Fairbairn's authoritarian certainty and the wood-cut sections and plan he published satisfied historians that further search was unnecessary.³

Nevertheless, the Salford mill must relinquish its century-and-a-half-old claim to priority, for it is now evident that it followed three other successful iron-framed mills. Their precedence is unequivocal and they comprise enlightening instances of the application of that inventiveness which was so characteristic of the new industrial revolution. From them stemmed directly a novel structural technique that dominated British and American building for a century and which through ingenious improvements conquered at last the hazards of combustibility and the limitations of height. This structural evolution, rather than the Battle of the Styles, gave fundamental unity to nineteenth century architecture.

It was poetic justice to have the factory introduce and typify the architecture of the new industrial age. Here raw materials, specialized power machines, and specialized workers were assembled to form a new instrument of centralized large-scale production. Although late Roman armament plants, the great

medieval naval arsenal at Venice, and seventeenth-century Italian textile mills contained elements of the factory system, it remained for Richard Arkwright and his licensees to achieve the full expression of this extraordinary principle. Extension and diffusion of the system have transformed all aspects of contemporary life.

Early eighteenth-century English spinning mills were rectangular masonry boxes with timber beams and posts supporting the several floors. John Lombe's Silk Mill, built at Derby, 1718-22, set the pattern. This building was 89 by 110 feet, with five storeys plus the 'underworks,' furnishing eight large apartments lit by 468 windows. An 18-foot-diameter water wheel activated 26,000 machine wheels. Arkwright, Strutt and Need's mill at Cromford, 1771, Arkwright and Strutt's mill at Belper, 1776, and Arkwright and David Dale's mill at New Lanark, south-east of Glasgow, 1784, were typical solutions of this new architectural problem,⁴ but their timber-framed multi-storey structural system had descended through the centuries from Roman tenements, Hanseatic warehouses and metropolitan lofts.

Such construction was an obvious fire hazard. Warehouses, bursting with valuable goods, burned regularly at enormous losses. The new timber-built textile mills, filled with combustible fibres, with floors soaked by oil drippings from whirling shafts, with unguarded candles or open oil lamps, and with static electrical sparks generated from belts and machines, were even more vulnerable. The complete destruction by fire in 1791 of London's costly Albion Flour Mill, built 1783-86 by Samuel Wyatt, architect, and James Rennie, engineer, posed the necessity of incombustible construction with inescapable insistence.⁵ It is no wonder that insurance companies either refused to issue policies on industrial risks or else quoted prohibitive rates.

The use of masonry vaults to render buildings fire-safe had been practised for centuries, but their excessive cost had restricted them

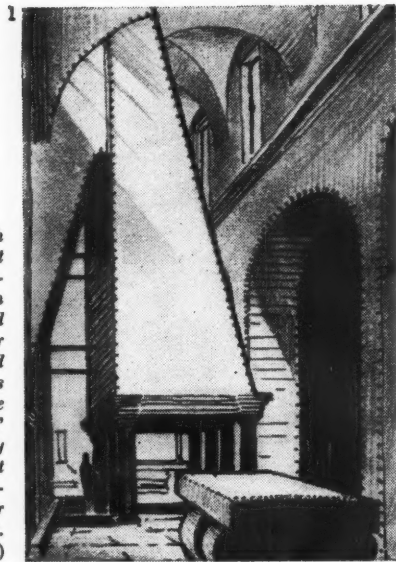
¹ Giedion, Sigfried: *Space, Time and Architecture*. (Cambridge, Mass., 1941), pp. 124-125; S. B. Hamilton: *The Use of Cast Iron in Building* (*Transactions, Newcomen Society*, v. 21 (1940-41), p. 141; Gloag, John and Bridgwater, Derek: *A history of cast iron in architecture*. (London, 1948), pp. 113, 179; S. B. Hamilton: *Old Cast-Iron Structures* (*Structural Engineer*, v. 27 (1949), p. 183).

² Slugg, J. T.: *Reminiscences of Manchester Fifty Years Ago*. (Manchester, 1881), p. 242.

³ Fairbairn, William: *On the Application of Cast and Wrought Iron to Building Purposes*. (London, 1854), p. 3, and Figs. 3, 4, 5.

⁴ Hutton, W.: *The History of Derby*. (London, 1817, 2nd edition), p. 163; Podmore, Frank: *Robert Owen, a biography*. (New York, 1924), pp. 80-81; Pierson, William H., Jr.: *Notes on Early Industrial Architecture in England* (*Journal, Society of Architectural Historians*, v. 8 (1949), no. 1-2, pp. 1-32).

⁵ Dale, Anthony: *James Wyatt, architect, 1746-1813*. (Oxford, 1936), p. 32.



In 1752 the hood of the hearth in the monastic kitchen at Alcobaça, Portugal, was supported by eight cast-iron columns, the earliest dated structural use of iron thus far discovered. William Beckford described this room in 1794 as 'the most distinguished temple of gluttony in all Europe.' The spacious hearth, 11 by 28 feet, had 'room to roast three oxen including the vegetables.' A rivulet in the floor could be dammed to wash it. (From a sketch after Aldemira.)

to only the most important monuments, and their weight and buttressing had limited their application almost entirely to single-storey structures. One notable exception was Genoa's Magazzini del Magistrato dell'Abbondanza, the public granary, built about 1625 by Giovanni Aicardi to store over 42,000 bushels of grain. Four rectangular wings, each five storeys high, provided twenty vaulted halls, a record for multi-storeyed fireproof construction, equalled only by the five-storey, brick vaulted Bureaux de la Guerre et des Affaires Etrangères, built at Versailles in 1759 by Jean-Baptiste Berthier.⁶ Such solutions were completely beyond the resources of the early mill owners.

The replacement of inflammable timber by incombustible metal had been the dream of generations of architects. Hadrian had used bronze trusses to cover the Pantheon portico,⁷ but the excessive cost of iron limited its use in medieval and renaissance buildings to cramps, chainages, tie-rods and armatures.⁸ Slowly military demands stimulated improvements in metallurgical processes which in the eighteenth century gradually reduced the cost of iron until it became economically feasible as a primary material for construction.

This trend toward the structural use of iron is well illustrated by the development of iron bridges. In 1719 Garrin proposed to span the Rhône at Lyon and John Theophilus Desaguliers suggested a similar crossing of the Thames at London.⁹ Both were probably inspired by projects for a bronze truss bridge and an iron link suspension bridge published at Venice in 1595 by Fausto Veranzio.¹⁰ The 80-foot iron chain footbridge, built in 1741 over the Tees near Winch, County of Durham, was the first permanent suspension bridge in Europe.¹¹ In 1755, Goiffon and Montpetit

⁶ Gauthier, M.-P.: *Les plus beaux édifices de la ville de Gênes et ses environs*. (Paris, 1818), p. 6, plates, 44-45; Blondel, Jacques-François: *Cours d'architecture*. (Paris, 1776), v. 6, Chap. 2.

⁷ Many drawings of this roof, made before its destruction by Pope Urban VIII in 1625, record its form. Palladio's representation is typical: *Il Quarto Libro dell'Architettura* (Venice, 1570), pp. 77, 79, but in Isaac Ware's English edition, the engraver redrew the plates as if the trusses were of timber (as indeed they were in his day).

⁸ Bannister, Turpin C.: *Iron and Architecture: a study in building and invention from Ancient Times to 1700*. (Typescript, 1944), Chap. 3, 4. This work was done, and much of the material contained in the present article was gathered through the aid of grants from the American Institute of Architects, the American Iron and Steel Institute, and Rensselaer Polytechnic Institute. The author is continuing it to cover the period down to 1860.

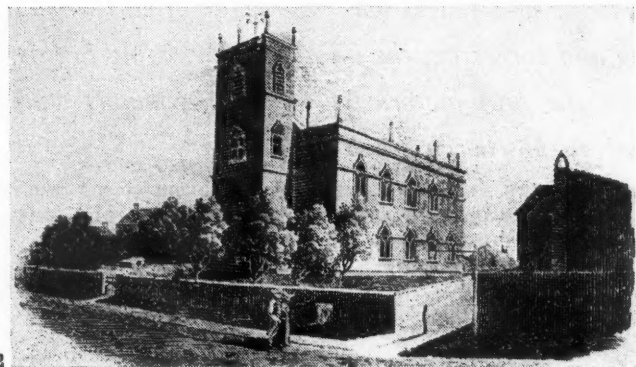
⁹ Beck, Ludwig: *Geschichte des Eisens in technischer und kulturgeschichte Beziehung*. (1891-1908), v. 3, p. 759; Gauthier, E.-M.: *Traité de la Construction des Ponts*. (Paris, 1818), p. 113.

¹⁰ Veranzio, Fausto: *Machinae novae*. (Venice, 1595), p. 12, pl. 33.

¹¹ Hutchinson: *Antiquities of Durham*. (1790), p. 279.

began a three-arch wrought-iron bridge at Lyon, but were forced to abandon the work due to technical difficulties and insufficient funds.¹² The first significant and successful iron bridge was that designed by the Shrewsbury architect, Thomas Farnolls Pritchard, cast at the foundry of Abraham Darby III, and erected 1777-79 across the Severn at Coalbrookdale.¹³

The third quarter of the eighteenth century saw the first applications of iron to the major structural elements of buildings. The remarkable geographical distribution of these experiments parallels the similar spread of contributions characteristic of all the emerging sciences and technologies of the Enlightenment. The earliest cast-iron columns thus far revealed were the eight, 7½ inches in diameter, that supported the pyramidal hearth hood in the fabulous kitchen added in 1752 to the vast Cistercian Monastery at Alcobaça, in Portugal (Fig. 1).¹⁴ The earliest found in England carried the galleries of St. Anne's Church, built in 1770-72 at Liverpool (Fig. 2).¹⁵ The earliest iron beams formed the rafters of the copper-covered roof of Count Gregory Orlov's Marble Palace built by Antonio Rinaldi at St. Petersburg in 1768-72.¹⁶ Perhaps the beams were fabricated in the Old Arsenal, which Orlov had built and presented to Catherine the Great, and which he managed as Director-General of Engineers.¹⁷ By far the



Cast-iron columns, the earliest dated English examples, carried the side and rear galleries of St. Anne's Church, Liverpool (1770-72), a Georgian Gothic church, built by Mr. Dodd as an attraction for prospective purchasers in his new residential street. (From *The Stranger in Liverpool*.)

most exotic reference to Russian iron construction is reported by the amorous traveller Casanova, who, during his stay in St. Petersburg in 1765, states that he visited a house built by Count Demidov, owner of huge iron mines, which house was entirely of iron from foundations to roof, including all the furnishings.¹⁸ This may have been Count Paul Grigorievich Demidov (1738-

¹² de Montpetit, Armand-Vincent: *Prospectus d'un Pont de Fer d'une seule arche*. (Paris, 1783), p. 4.

¹³ White, John: *On Cementitious Architecture as applicable to the construction of Bridges; with . . . the first introduction of iron . . . for arches of large span by T. F. Pritchard*. (London, 1832), p. 1; Telford, Thomas: *Life of Thomas Telford, Civil Engineer, written by himself*. (London, 1838), p. 29.

¹⁴ Viera Natividade, Manuel: *O Mosteiro de Alcobaça*. (Coimbra, 1885), p. 89; Twiss, Richard: *Travels through Portugal and Spain*. (London, 1775), p. 41; Aldemira, Luis Varela: *Alcobaça Ilustrada*. (Lisboa, 1940), p. VII.

¹⁵ *The Stranger in Liverpool*. (Liverpool, 1812, 3rd edition), p. 87.

¹⁶ Storch, Heinrich Friedrich von: *The Picture of Petersburg*. (London, 1801; translated from the German), p. 34; (Reimers, Heinrich Christoph von): *St. Petersburg am Ende seines Ersten Jahrhunderts*. (St. Petersburg, 1805), v. 1, pp. 328-329. The dates given are taken from Thieme-Becker, art. 'Rinaldi, Antonio.' Other sources give later dates, 1783 and 1785, for the completion, but these probably refer to the decoration and furnishing of the interior (Reimers: *op. cit.* p. 328; Baedeker: *Russia*. (Leipzig, 1914), p. 116). It would seem reasonable to assume that the beams would have been installed by 1772.

¹⁷ Sears, Robert: *Illustrated Description of the Russian Empire*. (New York, 1855), p. 424; *Ency. Britannica*: art. 'Orlov, Gregory.'

¹⁸ *Mémoires de J. Casanova de Seingalt, écrits par lui-même*. (Paris, 1931), v. 10, p. 119. I am indebted to my friend Professor Talbot Hamlin for this reference.

1821), a noted lover of science, the grandson of Nikita, the Tula blacksmith who, under Peter the Great, established his family's vast fortune by gaining complete control of Russian iron production.¹⁹ Long search has failed to uncover any other reference to this entirely plausible structure.

During the last rumbling decades of the old regime, Paris became the vital centre of pregnant experiments in the use of iron, a structural counterpart to the æsthetic revolution led by Ledoux and Boullée. The instigator was the royal architect, Jacques-Germain Soufflot, who, in erecting the giant portico of Ste.-Geneviève (now the Pantheon) in 1770-72, had revived the use of wrought-iron armatures to reinforce its flat-arched architraves and flat vaults,²⁰ a system which stemmed from Claude Perrault's eastern façade of the Louvre, built 1667-70,²¹ and ultimately from the reinforced masonry of the thirteenth-century cathedrals of the Ile-de-France.²² When, in 1776, Soufflot was ordered to study the alterations necessary to install a museum of the king's collection of paintings in the long river gallery of the Louvre, he planned, in 1779, a public entrance and stair leading to the Salon Carré and the Grande Galerie. Over the stair hall he designed a roof framed entirely of wrought iron (Fig. 3). The span was 51 feet 8 inches. The outer mansard profile and the coved ceiling within joined to allow a 17-foot skylight at the centre. The frame itself, composed of forged bars assembled with numerous collar joints, closely paralleled the technique of the Pantheon armatures. It was Soufflot's last design before his death on August 28, 1780. His assistant, Maximilien Brébion, succeeded him as architect and completed the iron roof in 1781. The hall was rebuilt by Percier and Fontaine about 1805.²³

The structural novelty of Soufflot's roof, together with the prestige accruing to it from its successful erection at the Louvre, stimulated immediate interest. In 1782, the following year, M. Ango, an obscure Parisian architect, used wrought iron in a similar way to carry a floor, the earliest example of such use thus far discovered. Ango's client was Charles-Joseph Panckoucke, publisher of the *Mercur de France*, and recently appointed editor of the revision of Diderot's famed encyclopedia. Thanks to the new work, the *Encyclopédie Méthodique*, which on completion in 1832 was to encompass 166 volumes of text and 33 of plates, Ango's experiment is known to-day.²⁴ In Panckoucke's house, located in Boulogne, a south-western suburb of Paris, the problem was to erect a mezzanine within an area, 17 by 20 feet, enclosed by masonry walls. Perhaps it covered a kitchen and thus suggested an incombustible solution, or, perhaps, a thinner construction than an ordinary timber beam floor was needed to conserve headroom, or, perhaps, Ango simply yearned to try a new idea. In any case, he installed four open-web joists, each 18 feet 8 inches long and assembled with a curved upper chord (1.06 by 2.4 inches) and a straight lower chord (1.33 inches square), notched and clipped at the ends and joined by four equally spaced intermediate clips. These joists were spaced 4 feet 3 inches apart, and carried in turn light bars spaced 3 feet apart, to reinforce the 9.5 inch plaster of paris slab which formed the floor surface and encased the ironwork. Including two tie-rods the iron weighed 1,650 pounds.²⁵

Apparently, Ango believed his new system constituted a

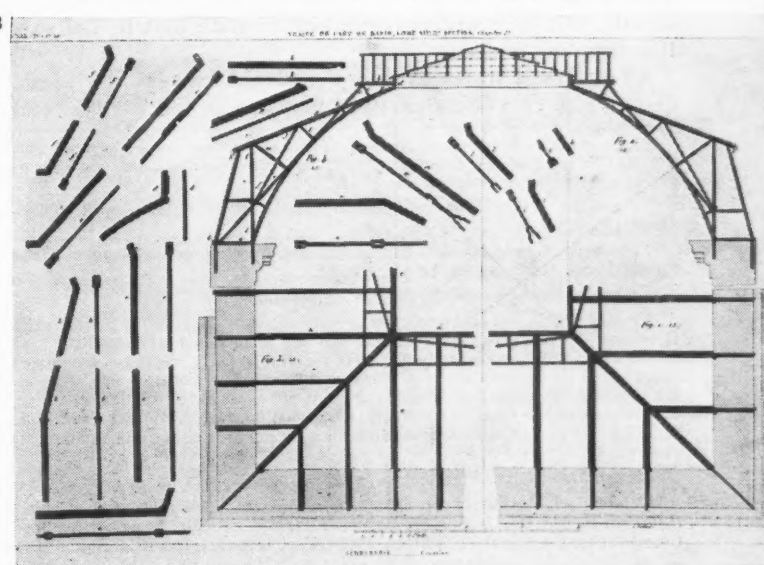
valuable new technique that would replace traditional timber floor framing. In order to spread its use he wrote the Académie d'Architecture in 1782 and on invitation demonstrated a model of his work. A committee was appointed to inspect an actual installation, but the one committeeman who did so reported that conditions on the job did not permit him to make an adequate report. On February 27, 1786, Ango again persisted and the original committee was again charged.²⁶ No further reference is found in the Académie's minutes, but Rondelet records that the committee visited the Panckoucke job and reported on June 18, 1785 (!) that 'we have found it very solid, without any defect or disturbance, whatever strain it has imposed above. . . . Thus it is desirable that M. Ango's system should be practised by all builders in order that many examples will come to confirm the favourable opinion we have given the experiment which we report.'²⁷ It is interesting to note that Ango achieved an approximation to present-day open-web joist constructions which are protected from fire by concrete encasement. Perhaps his solution was arrived at without premeditation, but in any event it was a most remarkable premonition of modern techniques.

A parallel structural development appeared in Paris in 1785, when M. de St. Fart, an architect specializing in hospitals, revived the late Roman method of constructing light-weight vaults through the use of hollow pots, or what is now called 'hollow tile.' On May 9, St. Fart presented a memoir to the Académie d'Architecture. This time a committee, composed of Hazon, Boullée, Guillaumot, Malduit, and the elder Peyre, acted promptly, for on May 12 and 19, they visited the tile-yard of M. Goblet in the Rue Copeau and inspected a sample bay that had been erected the previous fall, of hexagonal hollow pots forming a flat vault, 6 feet square, carried on a timber framework. Six labourers stood upon it to demonstrate its strength. Other examples of different forms and spans were likewise studied. On June 26, the committee reported that in view of the inflammability and increasing price of timber, the new technique should prove a welcome resource, especially since 'it can be hoped that it will diminish the use of iron.' Perhaps this attitude, arising from observations of damage to

²⁶ Lemonnier, Henri, editor: *Procès-Verbaux de l'Académie Royale d'Architecture, 1671-1793*. (Paris, 1911-20), v. 9, pp. 77, 79-80, 175.

²⁷ Rondelet, *op. cit.* (1834), Book VII, Sect. II, Chap. I, p. 313, note 1.

Soufflot adapted the armature system he had used in the portico of Ste.-Geneviève to construct this incombustible wrought iron roof frame in the Louvre, Paris, in 1779-81. It spanned a stair hall 51 feet 8 inches wide and was the first such use on record. The hall abutted the north wall of the Apollo Gallery. (From Rondelet.)



¹⁹ Kluchevsky, V. O.: *History of Russia*. (1926), pp. 121-122; Mavor, James: *Economic History of Russia*. (1924, 2nd edition), p. 434; *Ency. Britannica*: art. 'Demidov.'

²⁰ Mondain-Monval, Jean: *Soufflot, sa vie, son œuvre, son esthétique*. (Paris, 1918), pp. 461-463; Rondelet, Jean-Baptiste: *Traité théorique et pratique de l'art de bâtir*. (Paris, 1812), Atlas, v. 2, pl. 29. (or pl. 151 in 7th edition, 1834).

²¹ Rondelet: *op. cit.* (1834), pl. 150.

²² Viollet-le-Duc, E.: *Dictionnaire raisonné de l'architecture française du XIe au XVIe siècle*. (Paris, 1858-1872), art. 'Armature.'

²³ Mondain-Monval: *op. cit.*, pp. 222-223; Hauteceur, Louis: *Histoire du Louvre*. (Paris, 1928), pp. 78, 83-84; Rondelet: *op. cit.* (1834), pl. 155.

²⁴ *Ency. Britannica*: art. 'Encyclopædia.'

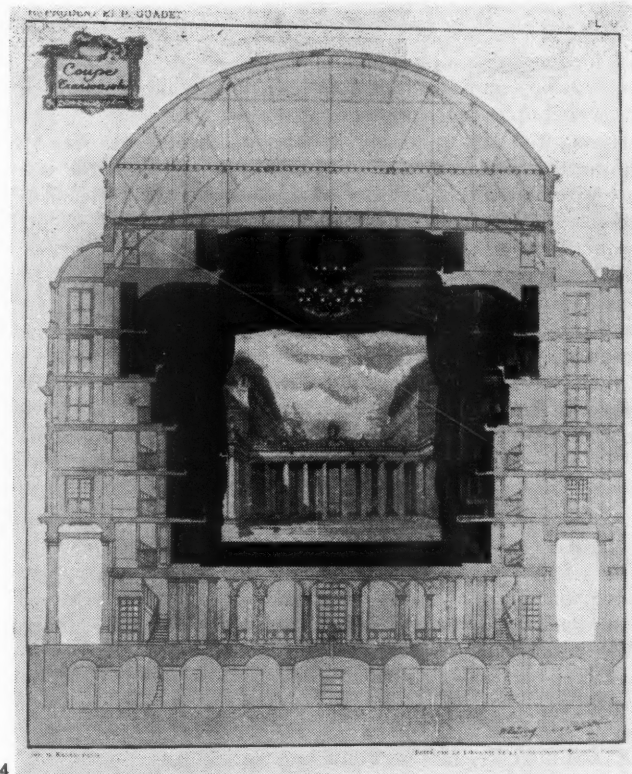
²⁵ *Encyclopédie Méthodique*. (Paris, 1782-1832), v. 162, pl. 52.

masonry caused by the disrupting power of rusting cramps and armatures, explains the Académie's prolonged silence on Ango's invention. On September 6, the Académie des Sciences likewise received a favourable report on St. Fart's proposals.²⁸

The experiments of Soufflot, Ango and St. Fart coalesced immediately in the reconstruction of the theatre at the Palais-Royal. Cardinal Richelieu's small *Salle de spectacle*, built in the palace by Lemercier in 1639-41, and the centre for opera in Paris, had burned in 1763. Since Louis-Philippe, Duc d'Orleans, had conveyed to the city the privilege of giving opera, it was the city architect, Moreau-Desproux, who built on the same site the new and larger Opera which opened in 1770. In 1780, Louis-Philippe gave the neglected palace to his son, Louis-Philippe-Joseph, Duc de Chartres (later known as Philippe Égalité), in anticipation of his inheritance. The new owner appointed Victor Louis, who had just won fame for his splendid Opera at Bordeaux, to plan improvements, when on June 8, 1781, the palace theatre burned, carrying with it many victims. Louis had already prepared a design and four days after the fire his patron approved it, but due to continued study and difficulties with leases, the new theatre was delayed. Meanwhile, from 1781 to 1784, Louis transformed the vast garden which the duke had opened as a fashionable resort by enclosing it with majestic colonnades.²⁹

When, on November 18, 1785, the old duke died, leaving his title and vast fortune to his son, the theatre project was revived. Louis selected a new, less restricted site at the south-west corner of the plot and created a new design. When it opened, on May 15, 1790, just ten months after the storming of the Bastille, its structural innovations were as remarkable in their way as the political scene. For Louis had constructed a theatre, a type infamous for its hazards and combustibility, that was now made safe through the complete elimination of inflammable materials. Timber floor beams were replaced by stone vaults, wooden stairs by flagstones, wood partitions and ceiling by hollow pot masonry, and the usual timber roof by an ingenious wrought-iron frame (Fig. 4). Even the tiers of loges were supported by iron brackets.³⁰ Hollow pot vaulting was generously used in other parts of the palace as well.³¹ How quickly he had caught the significance of the ideas proposed by Soufflot, Ango and St. Fart is easily seen by comparing the progressive character of the Théâtre du Palais-Royal with the traditional structural techniques that he had used in the Bordeaux Opera.³² Did Louis have assistance, especially on the iron roof? In 1800, Quatremère de Quincy wrote, following a passage on the Théâtre du Palais-Royal, that 'M. Ango has also found a very ingenious means of building roofs and floors of iron.'³³ This may or may not mean that Ango assisted Louis directly, but later writers either hint or state that he did so.³⁴ It is tempting to agree.

All of these Parisian examples employed wrought iron which, despite high cost of material and labour, was still less dear and



Victor Louis, perhaps with Ango's assistance, combined Soufflot's type of wrought iron roof framing with St. Fart's hollow-pot vaulting to eliminate all timbering from the Palais-Royal Theatre, Paris (1785-90), thus making it fire-safe. Its innovations inspired Soane and Strutt in England. (From Prudent and Gaudet.)

less difficult to procure than cast iron. Ango's floor was small in scale and his client could well afford a modest experiment. At the Louvre, the King's treasury could still finance fine construction. At the Palais-Royal, two severe fires, one of France's largest fortunes, and an eye for speculative returns combined to encourage the adoption of new techniques. These experiments set the course of future development, but cataclysmic events intervened before it could continue in France. By then Britain would grasp leadership in the use of iron in building construction.

News of these Parisian innovations crossed the Channel immediately. In official circles, Sir John Soane adopted St. Fart's system of pot vaults in rebuilding the Bank Stock Office in 1792-93, his first major work at the Bank of England, and over the 20-foot diameter eye of its shallow dome Soane placed a twelve-sided lantern constructed of iron.³⁵

A more important stimulus, however, was exerted outside the architectural profession on William Strutt of Derby, the builder of the first incombustible, completely iron-framed building. William's father was Jedediah Strutt (1726-95), a farm boy from South Normanton, below Derby, who had learned the wheelwright trade. In 1758 and 1759, Jedediah patented a machine to knit ribbed hosiery and soon owned a very prosperous hosiery mill at Derby. In 1762, he and Samuel Need, a hosier of Nottingham, 16 miles east of Derby, became partners, and six years later, in 1768, when Richard Arkwright was struggling in his tiny Nottingham horse-powered mill to perfect the water frame, Strutt and Need supplied capital and general experience and became partners

²⁸ Eck, Charles-Louis-Gustave: *Traité de Construction en Poteries et Fer*. (Paris, 1836), pp. 2-4; Quatremère de Quincy: *Dictionnaire historique d'architecture*. (Paris, 1832), v. 2, p. 295.

²⁹ Fontaine, Pierre-François-Léonard: *Histoire du Palais-Royal*. (Paris, 1834), pp. 299-307.

³⁰ Prudent, H., and Gaudet, P.: *Les Salles de Spectacle construites par Victor Louis*. (Paris, 1903), pp. 41-42, pls. 5-8, 13.

³¹ *Ency. Méthodique: Architecture*, v. 3, p. 637.

³² P. Morton Shand (ARCHITECTURAL REVIEW, v. 72, p. 169ff) states that the Bordeaux Opera illustrates a 'partial' use of iron in the roof, but all the iron in the whole building cost only 38,000 livres (Rousselot, Ernest: *Les travaux de construction du Grand-Théâtre de Bordeaux*. (Bordeaux, 1918), p. 35), whereas for the Théâtre du Palais-Royal, the ironwork cost 753,828 livres, or about 84 per cent of the total expenditure. (Prudent: *op. cit.*, p. 41). At Bordeaux, therefore, no more than the usual amount of iron was used for straps, anchors, etc.

³³ *Ency. Méthodique: Architecture*, v. 2, p. 16.

³⁴ Vierendeel, Arthur: *La construction architecturale en fonte, fer, et acier*. (Louvain-Paris, 1903), p. 25; Meyer, Alfred Gotthold: *Eisenbauten, ihre Geschichte und Aesthetik*. (Esslingen, 1907), Part 1, Sect. 1; Daub, Hermann: *Die Vergangenheit des Hochbaues*. (Wien-Leipzig, 1911), pp. 136, 191.

³⁵ Steele, H. R., and Yerbury, F. R.: *The Old Bank of England, London*. (London, 1930), p. 12. The pots were probably supplied by Mr. Morris, of Child's Hill, near London (Holland, Henry: *Resolution of the Associated Architects, with a Report of a Committee appointed to consider the causes of the frequent fires, and the best means of preventing the like in future*. (London, 1798), p. 25).

in the venture. In 1771 the three built the first water-powered spinning mill at Cromford, on the Derwent, north of Derby. Need was eliminated from the business two years later. In 1776, Strutt and Arkwright expanded by building a second mill at Belper, likewise on the Derwent, eight miles north of Derby. In 1781-85, Arkwright failed in prosecuting infringers of his invention, and in 1782, Strutt dissolved the partnership. Cromford went to Arkwright while Strutt kept the Belper mill to which he gradually added others both there and at nearby Milford.³⁶

As Jedediah's holdings expanded, as he acquired sole responsibility, and as he approached an advanced age, more and more he looked to his son for active assistance in the business. William, born in 1756, had grown up with the mills and, inheriting his father's gift for mechanics, made contributions of his own to methods and equipment. For several years the firm had been working on the problem of weaving calico, that is, goods entirely of cotton, as distinct from goods with linen warping. Reverend Edmund Cartwright had achieved the power loom, patented in 1785, 1786 and 1787. Soon the Strutts perfected the production of calico by power and by 1792 decided to build a new mill at Derby to house this part of their work. Since William had already assumed direction of the Strutt hosiery mills in Derby, it fell to him to plan the new building, although, of course, his father, residing at Milford, was readily available for advice.³⁷

Through long experience, William Strutt must have been singularly conscious of the threat of fire in cotton mills. No doubt, too, the burning of the Albion Mill in 1791 drove home the advantages to be derived from an incombustible structure. Moreover, with the tripling of the production of pig-iron between 1740 and 1790, this material was becoming available for ordinary use. Nevertheless, the cost of structural iron would be much greater than ordinary timber framing, but this would be largely offset by the positive protection it gave to huge investments not only in the building itself but also in the costly, vulnerable machines. Exorbitant insurance premiums would be reduced or eliminated, and the danger of uninsurable losses to the firm and workers from interruption of work would be escaped. Here all the permissive factors of motive, ability and resources combined to foster a major step in architectural progress.

Strutt immediately surveyed the possibilities and sought out the latest developments that might contribute to a solution. England had done little thus far in applying iron to buildings. Cast-iron columns had been used increasingly over the past ten years or more, principally for church galleries.³⁸ It has been stated that about 1800 some mills with timber floor beams used cast-iron columns.³⁹ Perhaps the practice began in the late 1780's, but no specific documented examples have yet been reported. In bridge construction, however, iron made more headway. In September, 1787, interest in iron structures had been greatly stimulated by the arrival in England of Thomas Paine, who brought with him a model of an iron bridge which he had proposed

a year before for a crossing of the Schuylkill at Philadelphia, which model he had exhibited with acclaim before the Académie des Sciences in Paris. In London the Royal Society likewise evinced great interest. Paine patented his design in August, 1788, and soon interested the Walkers, who gave him facilities in their large iron works at Rotherham, to cast and test a sample rib. In 1789, the Walkers cast the parts for a 110-foot exhibition bridge which Paine erected the following summer on Leasing Green (now Paddington Green) in north-western London. The bridge attracted much attention and orders seemed imminent, but in March, 1791, Paine's sympathy for the French Revolution caused him to publish *The Rights of Man*, which was soon suppressed, and led, in May 1792, to his indictment for treason. At the same moment Paine was elected in absentia as the representative of Calais to the French Convention. William Blake smuggled Paine out of England and his interest in iron bridges devolved upon the Walkers and Rowland Burdon, who began the Wear Bridge at Sunderland the following spring.⁴⁰ These events could hardly have escaped Strutt's active mind.

Moreover, Strutt soon learned of Victor Louis' innovations at the Palais-Royal. A letter, dated October 29, 1792, sent to Strutt from 'Ashburn' (Ashbourne, 13 miles north-west of Derby), by John Walker, an architect possibly practising in London, reads as follows:—

Dear Sir:

I am afraid I shall have more difficulty in getting you the drawings than I was aware of. As soon as I received your letter I wrote to an English architect in Paris for them. But three days before I left London a Frenchman who had made his escape informed me that the massacres of the 2nd September⁴¹ had driven him to England, as they did all ye English, and notwithstanding my enquiries I cannot learn where he is. . . . Previous to your letter I had ordered one of each sort of the hollow bricks, of which the Arches are composed, to be sent to me, and I expect soon to hear of their being arrived in London. . . . Unluckily I only saw the building the evening before I left Paris, at a time when I was unwell, so that I have not so perfect a recollection of the Plan as I should have had, had I reviewed it at my leisure. However, perhaps I will give you as good a description as I can, least perchance I should not be able to obtain drawings at all.

The Building of the Palais Royale seems to me to be about 24 feet wide, the iron bars supporting the Arches are about four feet from each other . . . etc., etc.

My friend, ye Architect, has brought into London a quantity of Paris Plaster, and has got a Parisian to shew the method of using it. Here the plaster is burnt with wood, but there is a method of burning it with coals; I scarcely recollect the contrivance, tho' I think it is not a very difficult one. . . .

The roof of the Palais Royale is of framed Iron, with the larger sort of hollow bricks to fill up the panes.

Yours sincerely,
John Walker.⁴²

³⁶ *Dictionary of National Biography*: art. 'Strutt, Jedediah'; *Ency. Britannica*: art. 'Strutt, Jedediah.'

³⁷ *Ibid.*

³⁸ A dated example, subsequent to St. Anne's, Liverpool, was in Wren's St. Mary Magdalen, Old Fish Street, London, where an organ gallery supported on iron columns was added in 1784. (Godwin, George: *The Churches of London*. (London, 1838), v. 2, p. 3.) At Shrewsbury, the upper tier of gallery columns in St. Chad's Church, designed on a circular plan by George Steuart, a London architect, and built 1790-92, were of iron cased in deals (Owen, Hugh, and Blakeway, John Brickdale: *History of Shrewsbury*. (London, 1825), v. 2, p. 252). Systematic search will no doubt uncover others.

³⁹ Hamilton (*Trans., Newcomen Soc.*, v. 21, p. 139). If this statement is based on Giedion (*op. cit.*, p. 119) who cites a 1782 mill at Bolton with cast iron columns and timber floor framing, it is erroneous because the original reference quoted by him states that these columns occur, not in the 1782 structure, but in an extension which was 'probably much later' (Hill, Harold: *Mill Construction, in Official Record of the Annual Conference of the Textile Institute at Bolton, June 7, 8, 9, 1927*, p. 46). Hill does mention an adjoining mill which had cast-iron columns supporting timber floor framing that existed in 1803 (p. 47). This partial use of iron may have been a posterior cheapening of already established incombustible construction, rather than a step toward it.

⁴⁰ Conway, Moncre Daniel: *The Life of Thomas Paine, with a history of his literary, political and religious career in America, France and England*. (New York, 1892), v. 1, pp. 218 ff; Conway, M. D., editor: *The Writings of Thomas Paine*. (New York, 1908), v. 4, pp. 445 ff.

⁴¹ These were the 'Prison Massacres' in which 1079 counter-revolutionaries were executed between September 2 and 6 (Gottschalk, Louis R.: *The Era of the French Revolution*. (New York, 1929), p. 211).

⁴² *Life of William Strutt*. (Typed copy of an anonymous undated manuscript in the Derby Public Library), p. 28. I am deeply indebted to Mr. Arthur Strutt, of Belper, for obtaining, through Mr. C. H. Aslin, RIBA, former Borough Architect for Derby, and Dr. W. Alfred Richardson, Principal of the Derby Technical College, a typescript of the sections referring to Strutt's mill. Dr. Richardson reports that the manuscript is said to have been written by one of the Strutts, possibly George Strutt, and probably in the 1830's. Mr. Arthur Strutt is the great-great-grandson of George Benson Strutt, a brother of William.



Part of Derby from the Rogerson map (1819). The circle marks William Strutt's Calico Mill, 1792-93, the first multi-storeyed iron-framed incombustible building. It inspired English 'fireproof' mill construction and led directly to the steel skeletons of modern skyscrapers. (Courtesy of Dr. W. Alfred Richardson.)

It is not known whether Strutt ever received the plans requested from Paris, and it would have been remarkable had a subject of Britain, then the most feared antagonist of revolutionary France, been accorded access and safety to prepare measured construction drawings of the Palais-Royal. It seems more likely that Strutt read Walker's brief description and was stimulated to work out a solution on his own terms.

So it was that Strutt built the Calico Mill on the west bank of the stream (now covered to form Albert Street), just south of the bridge joining Tennant Street to Morledge. The large structure was a prominent landmark on Brayley's map of 1806, and Rogerson's map of 1819 (Fig. 5).⁴³ Construction began in 1792, probably late in the year, and ended in the following year.⁴⁴ In plan it was 80 feet wide and 115 feet long, and it rose six storeys high. It was 'remarkable for the floors being all constructed on brick arches and paved with brick' and it was 'rendered absolutely

⁴³ I am indebted to Dr. Richardson for photostatic copies of these maps. Brayley's map was published in: Britton, John, and Brayley, Edward Wedlake: *Beauties of England and Wales*. (London, 1802.)

⁴⁴ 1792 is given as the building's date in *Life of William Strutt*, and in Sylvester, Charles: *The Philosophy of Domestic Economy*. (Nottingham, 1819), p. 8, note; the date, 1793, is given in Britton and Brayley, *op. cit.* v. 3, p. 364, and in Glover, Stephen: *History of the County of Derby*. (Derby, 1829), v. 2, p. 424. A. W. Davison, in his *Derby: Its Rise and Progress* (Derby, 1906), p. 266, states that the 'old Calico Mill' was built by Jedediah Strutt in 1775, but this must obviously refer to one of the early timber-framed structures. I am indebted to Mr. James Ormerod, librarian of the Derby Public Libraries, for the Davison reference.

indestructible by fire.'⁴⁵ These brick arches were actually segmental vaults running across the 30-foot width and supported by cast-iron beams running in the same direction. The thrusts of adjoining vaults thus counteracted each other, except in the end bays where probably pilasters braced the wall or wrought-iron rods tied the walls to the last transverse beam. The iron beams transmitted their loads to cast-iron columns.⁴⁶ It is probable that cast-iron window sash and gutters were employed to eliminate the last vestige of wood.⁴⁷ Thus in the Calico Mill, Strutt established the first prophetic example of a multi-storeyed iron-framed structural system and earned the right to be known as the grandfather of skyscraper construction.

Unfortunately, the Calico Mill no longer exists. In 1829, it was being used for other than its original purpose.⁴⁸ No other contemporary reference has come to light. Since it was a prime technical monument in the rise of modern architecture, it is a pity that it found no one to cherish it. It shared with many other prophetic structures the fate of obsolescence and neglect wrought by the relentless course of the nineteenth century.

Strutt's achievement soon stirred interest among progressive mill men. The oldest existing mill of this type is the second in date of construction, the Benyon, Bage and Marshall Flax Spinning Mill, built in 1796 at Shrewsbury. Flax fibres had been more recalcitrant to mechanical manipulation than cotton, so that not until 1787 was the first patent for a flax-spinning frame granted to John Kendrew, an ingenious self-taught mechanic and optician, and Thomas Porthouse, a clockmaker, both of Darlington, County of Durham. Their first machines were set up at Darlington, in Kendrew's grinding shop, the Low Mill, on the River Skerne.⁴⁹ Here, John Marshall, of Leeds, who had been working on the same problem, came and obtained a licence to use the new frames.⁵⁰ In 1788, Marshall began operations in Scotland Mill, at Adel, 5 miles north of Leeds, and he and Matthew Murray, a gifted mechanic who soon joined him and who some years later formed the famous Leeds machinery firm of Fenton, Murray and Wood, made many improvements in methods and equipment. In 1791, Marshall and Benyon⁵¹ built a timber-framed, 900-spindle linen mill in Water Lane, Holbeck, a south-western district of Leeds.⁵²

⁴⁵ Britton and Brayley, *op. cit.*, v. 3, p. 364; Sylvester, *op. cit.*, p. 8, note; Glover, *op. cit.*, v. 2, p. 424.

⁴⁶ Iron beams and columns are not mentioned by Britton and Brayley, or Glover, but the *Life of William Strutt* (p. 28) implies their use by stating: 'He was the first person who attempted the construction of fireproof buildings in this country, and with the most perfect success. The great improvements made of late years in the formation of castings of iron have given great facilities to the mode of construction, which is now very extensively in use.' Sylvester (*op. cit.*, pp. 7-8) practically states their incorporation by writing: 'The most important of the modern discoveries is the means of rendering buildings fireproof by substituting iron and brick in the place of wood. The utility and practicability of this invention has been fully evinced in the erection of cotton mills. . . . The first fireproof mill that was ever constructed was built by Mr. W. Strutt, of Derby, in the year 1792; this building is 115 ft. by 80 ft. wide, and six stories high, and forms at present (1819) but a small portion of the buildings erected by himself and partners on the same principle. At Shrewsbury, Manchester, and some other places, also, immense buildings have since been similarly constructed, which completely answer the intension.' Strutt's later mills, discussed below, used cast-iron columns (I am indebted to Mr. Arthur Strutt for obtaining this statement from Mr. T. G. Ryde, who in 1944 was assistant manager of the English Sewing Cotton Co., which occupies the old Strutt mills at Belper).

⁴⁷ These features appeared in the Belper buildings (reported in Loudon's *Gardener's Magazine*, cited in *Civil Engineers' and Architects' Journal*, v. 2 (1839), pp. 361-2).

⁴⁸ Glover, *op. cit.*, v. 2, p. 424.

⁴⁹ Warden, Alexander J.: *The Linen Trade, ancient and modern*. (London, 1864), p. 690.

⁵⁰ Smiles, Samuel: *Industrial Biography*. (Boston, 1864), p. 317.

⁵¹ This may have been Thomas Benyon, of New Grange, who died November 29, 1833, aged 69, as recorded in the Register of Headingley church (*Publications of the Thoresby Society* (Leeds), v. 29, p. 184), but it is more probable that it was Benjamin Benyon, who also was Marshall's partner in the Shrewsbury mill. (Hulbert, Charles: *The History and Antiquities of Shrewsbury*. (London, 1837), v. 2, pp. 312-3.)

⁵² Baines, Thomas: *Yorkshire, past and present*. (London, c. 1874), v. 2, p. 158.

In the flax-spinning world Marshall and Benyon were soon the acknowledged leaders.

Since the sixteenth century Shrewsbury had been an important cloth market to which coarse Welsh woollens were brought for finishing and distribution. Toward the end of the eighteenth century, however, Shrewsbury's cloth trade declined, due to the establishment of new markets in Wales itself as a result of improved roads.⁵³ Shrewsbury needed new industries to replace the loss. News of the mechanization of flax spinning seemed to Charles Bage⁵⁴ to offer a suitable opportunity. The growing of flax in Shropshire had recently increased chiefly as a means of claiming the bounty of fourpence per stone, but cottage hand-spinning prevailed.⁵⁵ Bage may have had family connections in Leeds that opened the way to negotiate with Marshall and Benyon.⁵⁶

The Benyon, Bage and Marshall Mill was described in 1808 as follows:—

In the year 1796, a considerable manufactory of linen yarn was established at the end of the suburb called Castle-Foregate, by Messrs. Benyons [*sic*] and Bage, of this place, and Mr. Marshall of Leeds. This has already attained to great perfection under the spirited and skillfull management of those gentlemen, who are entitled to just praise for their humane and judicious attentions to the health and morals of the numerous young persons whom they employ. The buildings are very extensive, and are secured from the ravages of fire by the exclusion of timber from almost every part of their construction, the roofs and floors are supported on brick vaults, the window frames, and all other parts where wood is used in buildings, are here of cast-iron. The machinery, which is of wonderful contrivance, is worked by two steam engines.⁵⁷

After more than a century of anonymity, this mill is now identified as that known as 'The Maltings,' at present occupied by Messrs. William Jones & Son, Ltd. (Fig. 6).⁵⁸ The site lies on the west side of Castle Foregate at a point one-half mile north of the railroad station viaduct, and at which point a canal crosses the

street. This district is called Ditherington. A survey drawn in 1855 and showing the lands and buildings of the business, then owned by Messrs. Marshall and Company,⁵⁹ reveals at the scale of one inch equals one chain (66 feet) that the interior dimensions of the original five-storey-and-attic mill building are approximately 35 feet by 195 feet, not including the two engine houses at the ends. Three rows of cast-iron columns divide the floors into four aisles, each about 8 feet 9 inches wide (Fig. 8). On them rest the inverted T-section cast-iron beams, which in turn carry the twenty bays of segmentally arched brick vaults, each spanning approximately 9 feet. The transverse beams were cast in two pieces about 18 and 17 feet long, with end flanges to permit them to be bolted together. These joints are located

⁵⁹ I am indebted to Mr. W. R. Franklin, managing director of Messrs. Jones & Son, for presenting this survey drawing to me for study.

⁵³ *Ency. Britannica*: art. 'Shropshire'; Pidgeon, Henry: *Memorials of Shrewsbury*. (Shrewsbury, 1851, 2nd edition), p. 259.

⁵⁴ Bage was evidently a substantial citizen of Shrewsbury, for in 1784 he was one of the original directors of the House of Industry. ((Owen, Hugh): *Some Account of the Ancient and Present State of Shrewsbury*. (Shrewsbury, 1808), p. 340.)

⁵⁵ Page, John, editor: *Victoria County History of Shropshire*. (London, 1908), v. 1, p. 421.

⁵⁶ In 1774 a Thomas Bage, of Armley, registered the christening of a daughter at Armley Chapel, Leeds. (*Publications of the Thoresby Society*, v. 31, p. 137.) Or perhaps the link came through Benjamin Benyon, for the surname occurred twice in Shrewsbury during the seventeenth century. (Owen and Blakeway, *op. cit.*, v. 1, pp. 408, 490), and Benjamin was described as of Shrewsbury (Owen: *op. cit.*, p. 61). If Benjamin was also the Benyon who was the partner of Marshall at Leeds, he may have made the contact through relatives at Leeds. (see note 51.)

⁵⁷ Owen: *op. cit.*, p. 61; this identical description was included in Gregory: *Shropshire Gazetteer*. (1824), p. 496, for which reference I am indebted to Mr. Ernest J. James, former librarian of the Borough Library in Shrewsbury.

⁵⁸ I am indebted to Mr. James and his successor, Mr. John L. Hobbs, for this identification. Mr. Hobbs graciously arranged to have the West Midlands Photo Services, of Shrewsbury, make the first photographic record of the building for the purpose of historical studies.

The Benyon, Bage and Marshall Flax Spinning Mill at Shrewsbury (1796). Top, exterior from south. During conversion in 1897, most of the windows were blocked up, but something of the mill's original sobriety and scale remains. Steam engines in the end blocks were linked by shafts and gearing to the machines on each floor. Centre, interior of attic. A central line of columns was omitted to gain unobstructed space. Cast-iron columns, principal rafters, purlins and wall plates carry timber roofing. Bottom, detail of a typical bay. Beams were cast in two pieces and joined by bolting through end flanges. The joint was located off the column axis to preserve full strength of the beams at the columns. (Photographs taken in 1947.)

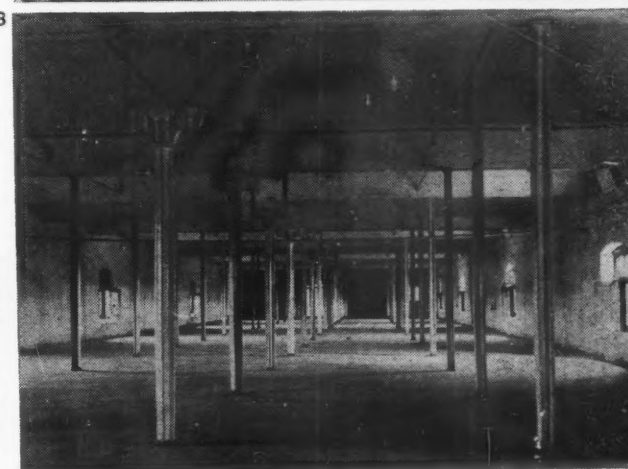
6



7



8



uniformly about one foot off the axis of the central file of columns in order to preserve the full strength of the beams at the column axis itself (Fig. 8). Tie-rods, properly located just above the lower flange, hold the beams secure against any thrust from the floor arches. In section the columns are cruciform, that is, with four projecting rounded ribs, and these ribs possess a subtle taper from midpoint to top and bottom, in contrast to the smooth round, hollow, classically inspired columns that later became so common. Originally each bay was provided with a large window along each longitudinal wall, and each window had sash and frame of cast iron. However, when the building was converted to its present use, all of these windows were blocked up, except four on each side of each floor which, however, were greatly reduced in area. In the attic storey, a favourite location for bulky machinery, the central file of columns was omitted to gain unobstructed space. It was lighted by a long skylight (Fig. 7). The main members of the roof frame are all of cast iron, but the common rafters and decking are of wood, which, perhaps, are late replacements.

This Shrewsbury mill, therefore, presents a thoroughgoing application of the new material, iron, and raises the problems of authorship and inspiration. Since Shrewsbury is only 14 miles up the Severn from Coalbrookdale, a famed iron centre and the site of Pritchard's cast-iron bridge, built 1777-79, and since Pritchard himself practised in Shrewsbury, the use of structural cast iron in this region was already well established. As to direct authorship, there are a number of indications that Charles Bage himself was responsible for the design of the mill. First, Bage's own church, St. Chad's, just completed, had used iron gallery columns. Much more important is the strong probability that he had family connections with Derby which would have made it easy for him to have known of, seen, and derived inspiration from Strutt's Calico Mill.⁶⁰

More certain evidence of Bage's reputation for pioneering work in structural iron derives from two links with Thomas Telford, the famous civil engineer. Telford, after his apprenticeship as a stone mason, had come to Shrewsbury in 1787 to remodel the Castle as an occasional residence for Sir William Pulteney, the richest commoner in England and then Member of Parliament for Shrewsbury. Telford was also immediately appointed Surveyor of Public Works for Salop, and in succeeding years he built 42 bridges in the county.⁶¹ In 1795, the old masonry bridge over the Severn at Buildwas, less than 2 miles upstream from Coalbrookdale, was destroyed by a high flood, and Telford replaced it during the following year by an iron arch, 130 feet in span, cast at the Darby's Coalbrookdale foundry.⁶² Also in 1795, he was designing an iron aqueduct for the Shrewsbury Canal.⁶³ These structures may well have given Bage further encouragement to use structural iron.

Telford's direct connection with Bage appears on April 23, 1801, when, along with other experts, Bage testified on his own experience with cast iron as a structural material before a parliamentary Select Committee upon further Measures for the Improvement of the Port of London, which was investigating the feasibility of a design submitted by Telford and James Douglas for a 600-foot

clear span, cast-iron arch bridge across the Thames.⁶⁴ Even more important is a section in Telford's Memorandum Book, comprising useful technical notes, recording the results of breaking tests of cast-iron beams carried out by Bage.⁶⁵ A sketch of the beams tested shows that they had a 10-inch deep section with a bottom flange 10 inches wide, and that their length was 9 feet. The correspondence of this length with those installed in Bage's mill strongly indicates that the tests were actually made on beams intended for incorporation in it. Thus Bage, apparently, was actively engaged in the construction of the mill, and was probably the author of its design.

The subsequent history of Bage and his mill is fairly clear. In 1804, Bage joined with two Benyon partners to erect another large iron-framed linen mill in Shrewsbury east of the Canal Basin and Coal Wharves.⁶⁶ Since this separation corresponds closely to the date of the Benyon and Bage partnership at Leeds, it is possible that John Marshall took over the 1796 Shrewsbury mill at this time. In 1837, Messrs. Marshall owned it,⁶⁷ and in the 1850's it was still theirs.⁶⁸ In 1897, the firm then occupying it decided to overcome high American tariffs by moving all the equipment and employees to the United States.⁶⁹ The building was then converted to its present use as a malt-house.⁷⁰ During World War II, the old structure still had sufficient sturdiness to be classified as a war plant. To-day its gaunt, austere exterior gives little hint of its claim to fame as the oldest existing ancestor of modern skyscrapers. As a significant technical monument in the evolution of modern architecture, it deserves to be recognized and carefully preserved.

In 1807, Charles Bage served a term as mayor of Shrewsbury.⁷¹ He was said to be 'a man of considerable talents, author of some excellent electioneering pamphlets, addresses, etc.'⁷² Benjamin Benyon also sought office, standing unsuccessfully for Parliament from the Borough of Shrewsbury in 1814, but later winning a seat

⁶⁴ *Reports from Committees of the House of Commons, Miscellaneous Reports, 1793-1802*, v. 14, p. 631. Of the seventeen who rendered opinions on the design of the project, six were mathematicians (Nevil Maskelyne, the Astronomer Royal; A. Robertson, Professor of Geometry, Oxford University; John Playfair, Professor of Mathematics, University of Edinburgh; John Robeson, Professor of Natural Philosophy, University of Edinburgh; Dr. Milner; and Charles Hutton, Royal Military Academy, Woolwich), eight were engineers (Mr. Atwood, Col. Twiss, William Jessop, John Rennie, James Watt, John Southern, Thomas Wilson, and General Samuel Bentham), and three (William Reynolds of Coalbrookdale, John Wilkinson of Bradley, and Bage) were 'persons having had long and extensive experience in the nature and construction of works of iron' (*ibid.*, pp. 605-6). It is interesting to observe that Bage's reputation merited his inclusion in such distinguished company. The resulting arguments in favour of iron were recapitulated by Telford and Douglas in *An Account of the Improvements of the Port of London* (London, 1802), on page 6 of which the Shrewsbury mill is mentioned. (Cited by Pevsner, Nikolaus: *Pioneers of the Modern Movement from William Morris to Walter Gropius*. (New York, 1937), pp. 182, 219.)

⁶⁵ Telford: *op. cit.*, p. 682.

⁶⁶ Hulbert: *op. cit.*, v. 2, p. 312. The date, 1804, is given in Howell, Thomas J.: *The Stranger in Shrewsbury*. (Shrewsbury, 1816), p. 141, who rhapsodizes: 'To the indefatigable perseverance of Messrs. Benyons' is Shrewsbury indebted for the erection of its first manufactory of any size. These gentlemen possessed of ample fortunes, and therewith of the elegancies and luxuries of life, have voluntarily given up the enjoyment of those pleasures which their station in society gave them the command of, in the patriotic endeavour to benefit their native town, notwithstanding its unfavourable situation for commercial transactions. That some inconveniences arise from the establishment of large manufactories there is no doubt; but when we consider the importance to the commerce and manufactures of England, have raised her in the scale of nations, what is there which more deserves the applause of their contemporaries, than that truly noble character—a British Merchant?'

⁶⁷ Hulbert: *op. cit.*, v. 2, p. 312.

⁶⁸ In 1851, it was described as theirs (Pidgeon: *op. cit.*, p. 259), and the 1855 survey drawing (see note 59) names them as owners. In 1816, Marshall and Atkinson owned another steam linen mill near the 1804 Benyon and Bage mill. (Howell: *op. cit.*, p. 142.)

⁶⁹ Information from Mr. James.

⁷⁰ Information from Mr. Franklin.

⁷¹ Owen and Blakeway: *op. cit.*, v. 1, p. 536.

⁷² Hulbert: *op. cit.*, v. 1, p. 248.

⁶⁰ Charles Bage, born 1752 (see note 75), was probably the son of Edward Bage, who died at Shrewsbury in 1812. Edward Bage had been an 'eminent surgeon' at Tamworth, Derbyshire, and the brother of Robert Bage (1728-1801), who had owned a paper mill at Elford, north of Tamworth, and who from 1781 became an author of several popular novels. Edward and Robert had been born at Darley, a hamlet just north of Derby. Their father operated a paper mill at Darley. (*Gentleman's Magazine*, v. 71 (1801), pt. 2, pp. 862, 1206; v. 82 (n.s. 5) (1812), pt. 2, p. 191.) A brief sketch of Robert Bage is given in Hutton, W.: *History of Derby*. (London, 1817, 2nd edition), pp. 247-249.

⁶¹ V. C. H. *Shropshire*, v. 1, p. 415.

⁶² Telford: *op. cit.*, pp. 29-30.

⁶³ Gibb, Alexander: *The Story of Telford, the rise of Civil Engineering*. (London, 1935), pp. 30-31.



The Strutt 'Fireproof' Mill at Belper (1797), the oldest remaining example of the work of William Strutt. Sturdy sobriety characterizes this rectangular five-storey-and-attic brick structure. Ground-storey windows preserve the original muntin scale. Left, exterior from west; below, interior of fourth floor. Cruciform cast-iron columns carry cast-iron beams that support floor arches formed of 'flower pots.' No tie-rods were used. Interior liteness contrasts markedly with exterior solidity.



as Member from the Borough of Stafford.⁷³ About this time, Bage built a Linen Weaving Factory, in Coleham, a Shrewsbury suburb on the south-eastern bank of the Severn. Of this venture, Hulbert wrote that Bage possessed 'great talents and enterprize [that] certainly merited and deserved more success than awaited his endeavours. He expended on these premises many thousand pounds in Buildings and Steam Loom Machinery; they did not succeed, and anxiety brought on disease, and he died.'⁷⁴ The buildings became Burr's Lead Manufactory. Bage had been caught in the post-Napoleonic depression. He died in 1822, aged 70, and was buried in the new churchyard of St. Chad's in Shrewsbury.⁷⁵ Probably at this time the 1804 mill was taken over entirely by the Benyons, for it continued to flourish until the early 1830's, when discord, perhaps between the heirs, required a forced sale that despite all 'the ironwork and immense buildings' brought only £1,600.⁷⁶ Bage's career, as industrialist, technician, politician, and capitalist, forms a typical example of the new age. His final distress reminds us that the new system demanded both ability and luck for financial success.

The third incombustible mill was built by William Strutt at Belper in 1797, the year of his father's death. Jedediah's old timber mill, erected in 1776, the first at Belper, was demolished to provide the site.⁷⁷ The new mill repeated the 30-foot width, the six storeys, and the fire-resistant construction of masonry floor arches, cast-iron beams and cast-iron columns that had been used at the Calico Mill.⁷⁸ After 152 years of service to the textile industry, it still stands as the south-easternmost unit of the Strutt group which lines both sides of Bridgefoot, the street leading

from the north end of the town to Belper Bridge.⁷⁹

The exterior displays a forthright rectangular block with a gable roof accented by a wide chimney at the south end and at the north a square base on which a cupola with the factory bell, no doubt, stood (Fig. 9). The ground storey is of stone, but those above are of brick. In contrast to the altered aspect of Shrewsbury, here sixty windows, about 4 feet square, and with stone sills and slightly arched brick heads, preserve the sober unbroken rhythm that gives so much character to the structure. Two stone string courses articulate the mass at the second and fourth floor sills. The attic is lighted by a series of dormers in which the sash slopes back at an angle of about sixty degrees.

On the interior, two rows of iron columns, 10 feet on centres, form three longitudinal aisles and a series of transverse bays

⁷⁹ I am indebted to Mr. Marcus Whiffen for obtaining this identification at Belper, and for photographing the mill. He reports that he was given satisfactory assurances of its identity. Nevertheless, several problems arise in reconciling the mill identified for Mr. Whiffen with early descriptions of the group. In 1802, Britton and Brayley (*op. cit.*, v. 3, p. 530) wrote that the 'main mill' was 30 by 200 feet, six storeys high, and constructed in a fireproof fashion like the Calico Mill. If this 'main mill' is the one identified for Mr. Whiffen, one must count either the attic or the basement as the sixth storey, but this is a frequent and understandable difficulty with terms. A more recalcitrant discrepancy is the length. The existing mill consists of twelve bays, giving a length of about 110 feet, which corresponds almost exactly to the 115 feet of the Calico Mill, and which agrees with Cooke (*Topographical and Statistical Description of the County of Derbyshire*, (London, c. 1821), p. 164) who stated that the five rectangular mills he saw had ten to twelve windows on each floor (on each long side?). In 1829, Glover (*op. cit.*, v. 2, p. 101) mentions only four mills. A wood-cut view of the Strutt mills, as seen from the north-west across the Derwent, was printed in White, G. S.: *Memoir of Samuel Slater*. (Philadelphia, 1836). Slater, who built the first successful American spinning mill, was a native of Belper and had served his apprenticeship in the Strutt mills. In this picture, two mills are shown. On the east (left) is a three-storey rectangular block with a four-bay wing projecting to the north. To the west, across Bridgefoot, is a rectangular mill with twenty-four bays, approximately 200 feet long, and five storeys high. The date of the view is not given. Mill buildings of the approximate shape and size of those shown in the view still stand on the same locations. However, the view does not show any large structure on the site of the building identified for Mr. Whiffen, although Davies (*op. cit.*) stated in 1811 that Strutt's 1776 mill was demolished to build the Fireproof Mill. It is probable that the view shows the group as it was at the time of Slater's departure in 1789. Pending further investigation of the chronology and placement of various mills, it is here assumed the 1776 structure was too small to appear in the wood-cut view, that the identification of the existing mill obtained by Mr. Whiffen is correct, that the 200-foot 'main mill' was rebuilt in fireproof form shortly before 1802, and that Britton and Brayley emphasized the latter because of its size and newness. It is admitted that these assumptions fail to account for Cooke's indication of lengths in 1821. Other later authors seem to derive their facts from Britton and Brayley.

⁷³ *Ibid.*: v. 2, p. 313; Owen and Blakeway: *op. cit.*, v. 1, p. 553.

⁷⁴ Hulbert: *op. cit.*, v. 2, p. 308.

⁷⁵ Owen and Blakeway: *op. cit.*, v. 2, p. 255; *Gentleman's Magazine*, v. 93 (n.s. 16), pt. 1, p. 93.

⁷⁶ Hulbert: *op. cit.*, v. 2, p. 312.

⁷⁷ Davies, D. P.: *View of Derbyshire* (1811); Ure, Andrew: *Cotton Manufactures in Great Britain Investigated and Illustrated*. (London, 1861), v. 2, p. 312.

⁷⁸ Britton and Brayley: *op. cit.*, v. 3, p. 530; Glover: *op. cit.*, v. 1, p. 252; v. 2, p. 101. Ure (*op. cit.*, v. 2, p. 312) errs in stating that the Belper mill was the first to use fireproof construction.

having a span of about 9 feet (Fig. 10). The columns have a cross-shaped section, and since it is probable that they followed the form of those used at the Calico Mill and also probably were cast from the same moulds, their similarity to those used at Shrewsbury would seem to be an additional indication that Bage drew his inspiration from Strutt's building. The form of the transverse cast-iron beams is obscured by the vaults, but apparently the beams were cast in three sections which join to create sockets at the columns. It is interesting to note that no tie-rods were employed, and this suggests that Bage's introduction of them at Shrewsbury constitutes evidence that despite his inspiration from Strutt he analysed for himself the implications of the new technique. Finally, for the segmental vaults themselves Strutt used the hollow-pot system derived from the Palais-Royal.⁸⁰

The Belper mill is important, therefore, not only as the second oldest existing structure of its type, but also because of the loss of the Calico Mill it is the oldest remaining example of Strutt's work. It is, indeed, remarkable that two of the first three iron-framed mills still stand as monuments to the ingenuity and perspicacity of their builders. As true cultural monuments to the budding Age of Industrialization, they deserve an honoured place with other national architectural monuments, and appropriate steps should be taken promptly to ensure their protection and preservation. It would be a happy solution if the textile and iron industries of Britain could unite to secure their perpetuation.

Strutt built two more fireproof mills at Belper and one at Milford, one and a half miles to the south. None of them was as large as the first Belper fireproof building, but all employed the same structural system. One may have replaced a timber-framed mill that burned on January 12, 1803.⁸¹ Strutt was especially concerned to prevent the spread of fires that frequently flared up in the cotton breaking and scutching machines. For these processes he constructed a circular building in which fire walls formed separated fire-tight compartments. All of these buildings are still being used to-day.⁸²

Some idea of the scale of the Strutt enterprises is indicated by their 1,300 employees at Belper and 600 at Milford. Along both sides of the Derwent, the long, straggling village contained paved streets and many cottages of excellent gritstone built by the firm. One-third of the inhabitants worked in the mills, while the rest supplied them with food and clothing. The Strutts, too, contributed largely to the building and operation of the Sunday School, the Unitarian Chapel (1782), the Lancastrian Day-school, the New Church (1822), and the Almshouses (1829).⁸³ Workers enjoyed a refectory, free medical service, and 'a dancing room for the young.'⁸⁴ This picture of benevolent paternalism was not unusual in the earliest decades of the factory system. The 66-hour work week was long by modern standards, but probably little worse than the previous cottage system. The early mill owners won great fortunes, but they resided near their businesses and displayed considerable concern for the welfare of the workers. The frightful evils commonly associated with industrialization arose chiefly in the next generation when competition ran amuck, absentee ownership abdicated the responsibilities of welfare, and urban steam mills replaced those in rural locations nestling beside running streams.

Fireproof buildings were not the only concern of William Strutt. His restless inventive genius applied the new principles of experimental engineering to many age-old problems. Strutt was a fellow of the Royal Society and served as president of the Derby Philosophical Society, which Dr. Darwin had founded in 1772, one of

the earliest of such groups.⁸⁵ Of the Belper mills' eleven large water-wheels, six for high water and five for normal flow, and each 21 feet 6 inches in diameter and 15 feet long, two were built by the Manchester mechanic, T. C. Hewes, while the others were constructed by William Strutt at the mill's own forge. The shafts were of cast iron to which the rims were joined by 1½-inch iron rods.⁸⁶ In 1792, he designed and installed, probably in the Calico Mill, a new type of furnace to improve its warming and ventilation. One wonders if his workmen complained as those of a later day did that fresh air increased their appetites and so would require increased wages.⁸⁷ In 1796, he built a steam-powered laundry for the hosiery mill.

Strutt's own house, near Belper, was 'a school of experiment and a triumph of science,' in which 'steam, gas, heat, hot air, philosophy, and mechanics are all brought to bear on these premises, on every branch of domestic economy.' Hot air heaters maintained a uniform temperature 'never below 55 degrees.' A small steam boiler provided hot water for the kitchen and the bath, 'a frequent source of enjoyment to Mr. Strutt.' A one-horse power steam engine ran machines for washing, drying, mangling and pressing. His hothouse was 'the most perfect in the country,' in which steam percolated through the beds to force a luxuriant growth of evergreens and grapes.⁸⁸ Strutt's greatest tour-de-force, however, was the construction and equipment of the Derbyshire General Infirmary, built at Derby 1806-10. Here, every detail benefited by his ingenuity, but it must suffice to mention that the baths were covered by a vault formed of hollow pots.⁸⁹ Thus Strutt, before his death in 1830, typified the impact of the new applied science, so characteristic of the industrial age, upon the construction and equipment of buildings, problems that loom so large and seem so new in our own day. He deserves an important niche in the history of modern architecture.

The models of incombustible construction built at Derby, Shrewsbury and Belper established the structural character of the better English mills for the next thirty years.⁹⁰ As the type became accepted, early nineteenth century topographers and recorders no longer considered them as objects worthy of special note. Thus there exists the curious paradox seldom encountered by architectural historians in that the later mills have a less precise chronology than those that initiated the type.

Leeds may have seen an example of incombustible construction soon after the 1791 mill owned by Marshall and Benyon burned in 1796. Simon Goodrich, Mechanist in the office of Sir Samuel Bentham, Inspector-General of Naval Works, described in his *Journal* in 1804 the new fireproof mill just built at Leeds by Benyon and Bage as being 'on the same plan as Marshall's, they having dissolved partnership.'⁹¹ Since the Benyon and Bage mill was incombustible, Goodrich's statement may or may not mean that Marshall's used the same structural system. The absence of specific mention of structural iron in Marshall's mill may indicate, however, that it was rebuilt in its earlier form, but if this is true one must wonder why Marshall did not adopt a safer mode, especially since the Shrewsbury mill in which he was a partner had just been completed.

⁸⁵ Cooke: *op. cit.*, p. 165; Murray, John: *Handbook for Travellers in Derbyshire, Leicestershire and Staffordshire*. (London, 1892, 3rd edition), p. 7.

⁸⁶ Glover: *op. cit.*, v. 2, p. 101.

⁸⁷ Ure: *Philosophy*, p. 381.

⁸⁸ Cooke: *op. cit.*, p. 165.

⁸⁹ Sylvester: *op. cit.*, p. 8. Sylvester describes and illustrates the Infirmary in detail.

⁹⁰ Ure: *Cotton Manufacture*; p. 312.

⁹¹ Goodrich, Simon: *Journal and Papers*, now in the South Kensington Science Museum, London, cited in Forward, E. A.: Simon Goodrich and his Work as an Engineer (*Trans., Newcomen Society*, v. 3 (1922-23), p. 12). See also note 116. Marshall owned a fireproof mill which collapsed in 1827, but there is no evidence as to the date of its construction, and it may well have been built after the critical period discussed in this paper. (Report by Mr. Farey cited in Braidwood, James: *On Fireproof Buildings (Minutes of Proceedings, Institution of Civil Engineers*, v. 8 (1849), p. 144, note).

⁸⁰ Mr. Whiffen reports that he was told by the present occupants that the vaults employed 'flower-pot construction.'

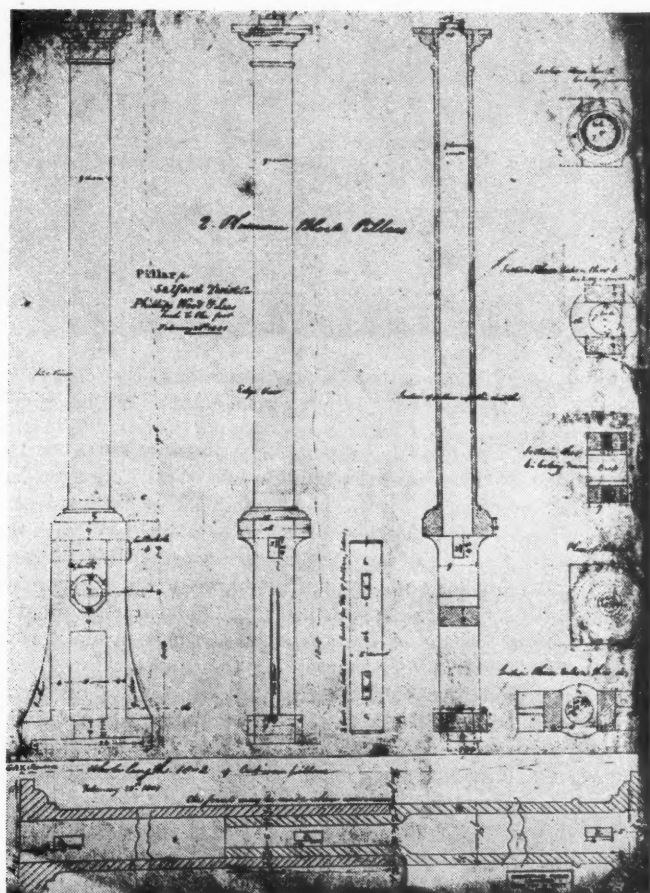
⁸¹ Britton and Brayley: *op. cit.*, v. 3, p. 530; Glover: *op. cit.*, v. 1, p. 252.

⁸² Information from Mr. Ryde; *Life of William Strutt*, p. 28.

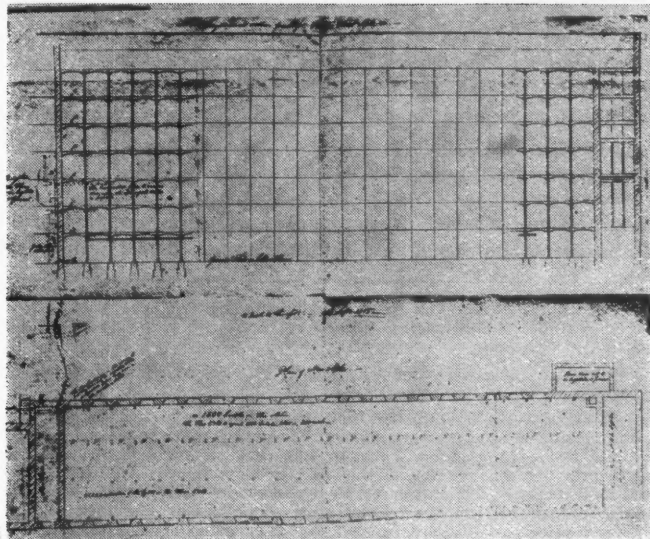
⁸³ Glover: *op. cit.*, v. 2, pp. 101, 103.

⁸⁴ Ure, Andrew: *The Philosophy of Manufactures*. (London, 1885), p. 343.

If Marshall's mill was of timber, then the next example of fireproof mills was the structure which for over a century has been erroneously credited as having been the first iron-framed building, namely, the Philips, Wood and Lee Cotton Twist Mill, built in Salford, in Chapel Street, on the banks of the Irwell across from



11



12

The Philips, Wood and Lee Cotton Twist Mill at Salford (1799-1801). Above, longitudinal section and plan (1805 drawing from Boulton and Watt Collection, photograph by courtesy of Dr. Sigfried Giedion). These drawings, although made for installing gas lights, give only remaining contemporary graphic description of iron-framed construction. Top, detail of 'Plummer Block Pillar' (1801 drawing from Boulton and Watt Collection, photograph by courtesy of Dr. Sigfried Giedion). Both title and dimensions associate this detail with the machinery rather than the building's structure.

Manchester. The oldest spinning mill in Manchester had been established in 1780 by Arkwright, Simpson and Whitenburgh.⁹² In 1798, Philips and George Augustus Lee had a steam-powered mill in Salford.⁹³ Since the fireproof mill no longer exists, it is known to us only by a few brief notices and by four drawings, consisting of a plan, longitudinal section, cross-section, and a detail of a column, now in the Boulton and Watt Collection in the Birmingham Reference (the Central Public) Library (Figs. 11, 12),⁹⁴ on which the three woodcuts given by Fairbairn were based.⁹⁵ No doubt Fairbairn used them for he resided in Manchester from about 1815, and from about 1818 to 1853, when he retired, he operated a large machine works there.⁹⁶ He developed a keen interest in the early uses of structural iron and recorded much of its history in his voluminous writings.

Fairbairn attributed the structural design of Lee's mill to Boulton and Watt, probably because he had found the drawings in the collection of their papers, but this claim needs thorough review. As has been pointed out elsewhere,⁹⁷ the detail drawing, entitled 'Pillar for Salford Twist Co., Phillips, Wood & Lee, February 28th, 1801' and '2 Plummer Block Pillars,' shows a column that is 18 feet 8 inches high which cannot be fitted into the clearly dimensioned section drawings of the building. Nor does the 9-inch diameter marked on the detail agree with the 6½-inch diameters shown on the sections. Likewise, the column shown in the detail provides a shaft-bearing or pipe holder. Therefore, it seems safe to assign this detail drawing to the steam engine which Boulton and Watt furnished for the mill. The single sheet on which the plan and longitudinal section are drawn is titled 'Longitudinal Section of Messrs. Philips and Lee's Mill,' and 'Plan of the New Mill,' and is dated September 14, 1805. Numerous notes and lines indicate that these drawings were made, not as working drawings to guide erection of the building, but to plan the gas lighting that William Murdoch, chief engineer for young Boulton and Watt after their fathers' retirement in 1800, installed in the third and fourth floors in 1805.⁹⁸ Although these drawings constitute useful structural records and may have been copied by or for Murdoch from the original working drawings, they were made after its construction, and, therefore, their presence in the Boulton and Watt Collection does not prove Boulton and Watt authorship of the architectural design. The cross-section drawing does not carry a title and the indications of walls, columns and beams are unfinished above the third storey. The drawing presents neither positive nor negative evidence about the designer.

The earliest claim thus far discovered for Boulton and Watt's authorship of the structural ironwork was stated in 1831 by Eaton Hodgkinson, first systematic investigator of the form and strength of cast-iron beams,⁹⁹ but Hodgkinson carried out his tests with

⁹² Ure: *Cotton Manufacture*, p. 251. Another source states that the first was built by Messrs. J. and R. Simpson in 1782. (*An Examination of the Cotton Factory Question* (pamphlet) (1819), Appendix, cited in Earwaker, John Parsons: *Local Gleanings relating to Lancashire and Cheshire*. (Manchester, c. 1877), v. 1, p. 80.)

⁹³ Knoop, Douglas: *The Development of Power in Lancashire Cotton Mills* (in Farrer, William and Brownbill, J.: *Victoria County History of Lancashire*. (London, 1908), v. 1, p. 386). Lee (1761-1826) was the son of John Lee, the famous actor. (D.N.B., art. 'Lee, John,' v. 11, p. 801.)

⁹⁴ The drawings from the Boulton and Watt Collection were first published by Giedion (*op. cit.*, figs. 64, 65, 66). The printed figures do not include the whole area of the drawings. I am indebted to Dr. Giedion for permission to copy his photographs of the original drawings.

⁹⁵ See note 3.

⁹⁶ Pole, William: *Life of Sir William Fairbairn, bart.*, partly written by himself. (London, 1877.)

⁹⁷ Bannister, Turpin C.: Review of Giedion's 'Space, Time and Architecture.' (*Art Bulletin*, v. 26 (1944), p. 136.)

⁹⁸ *Ibid.*; Murdoch, William: *An Account of the Application of the Gas from Coal to economical Purposes* (*Royal Society of London, Philosophical Transactions*, v. 98 (1808), p. 129).

⁹⁹ Hodgkinson, Eaton: *Theoretical and Experimental Researches to Ascertain the Strength and Best Forms of Iron Beams*. (*Manchester Literary and Philosophical Society, Memoirs*, v. 2, ser. 2 (1831), p. 544.)

encouragement from and at the Manchester works of Fairbairn.¹⁰⁰ It therefore appears that this and all later attributions rest on Fairbairn, who, despite good historiographic intentions, assumed that the drawings found in the Boulton and Watt Collection proved that the mill's structural design was theirs. Whoever was the technical designer of the structure, the inspiration came from Strutt, who is recorded as having been a friend of George Augustus Lee.¹⁰¹

As portrayed in the plan and sections mentioned above, Lee's Mill was seven storeys high, not counting the attic, each storey forming a room 42 by 207 feet.¹⁰² Two rows of hollow, round cast-iron columns, 6½ inches in diameter in the lower two storeys and 5½ inches above, divided the space transversely into three 14-foot aisles and longitudinally into twenty-three 9-foot bays. The transverse beams, 44 feet long including the 12-inch bearings in the side walls, were cast in two equal parts and were bolted together through end flanges at the midpoint of the centre aisle, where the passageway above was free of machinery, and thus supported only a light live load. The section of the beams consisted of a web, 1½ by 11 to 13½ inches, with a small lower flange, 1½ by 3½ inches.¹⁰³ The depth of the web varied from 11 inches at the wall line to 13 inches at the centre of the side aisle, to 11 inches at a point 4 feet 9 inches from the columns, to 16 inches at the column, and to 11 inches at the bolted end at the middle of the centre aisle. Apparently this design was conceived as if the member acted as a simple beam in so far as the outer aisles were concerned. The central cantilevered sections eliminated awkward and weakening joints around the columns. Two holes in the beam, just below each column base, provided for longitudinal tie-rods to resist any displacement arising from the thrust of the floor arches. If these rods had been located just above the lower flange they would have been safer.¹⁰⁴ In the central aisle, the cantilevered ends of the beams had four integrally cast shelves (like pieces of a wider lower flange) which no doubt served to support the shafting that transmitted power from the engines to the machines. Brick segmental vaults spanned the 9-foot bays between the beams and sprang from the slight projection formed by the beam flange. These vaults were 9 inches thick at the spring, 7½ inches for a short distance on each side, and 4½ inches (a half-brick) over the central section.¹⁰⁵

Lee's beams were designed by intuition and experiment. Mathematical methods awaited the work of Tredgold and Eaton Hodgkinson in the 1820's. It is not surprising, therefore, that the form and weight of the Salford sections have been frequently criticized. Fairbairn found them light, but safe.¹⁰⁶ Hamilton agrees with Fairbairn in pointing out that the section did not take into account that cast iron is five times as strong in compression as in tension.¹⁰⁷ But Scott asserts that according to modern standards the safe load of the Salford beams was less than the dead load of the floor arches, and that they did not fail simply because the feet of the machines rested so near the walls and columns that the beams actually carried little more than the dead load of the floor. In discussing this criticism, however, G. R. Palmer calculated

¹⁰⁰ Fairbairn: *op. cit.*, p. 5.

¹⁰¹ 'Mr. Lee was the first to improve upon the fire-proof mills of his friend, Mr. William Strutt, by the employment of cast-iron beams.' (*Annual Biography and Obituary*, v. 11 (1827), pp. 245-49). I am indebted to Mr. John Replinger for this reference. Lee cannot be credited with the introduction of cast-iron beams, since the mills at Derby, Shrewsbury and Belper clearly antedate his Salford structure.

¹⁰² Fairbairn: (*op. cit.*, p. 3) errs in stating the length was 'about 140 feet.'

¹⁰³ *Ibid.*: fig. 1.

¹⁰⁴ Failure to locate tie-rods properly contributed to the collapse of Messrs. Samuel Radcliffe and Sons' cotton mill at Oldham on October 31, 1844. A defective arch in the top storey was being repaired when the thrust of the adjacent arch broke the cast-iron beam between them. No rods had been provided in these bays. The impact and weight of the debris demolished other arches below and twenty were killed in the ruins. (*ibid.*: pp. 170-175).

¹⁰⁵ *Ibid.*: p. 4.

¹⁰⁶ *Ibid.*: pp. 3-4.

¹⁰⁷ Hamilton: *Use of Cast Iron in Building*, p. 141.



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that the beams were safe for a total load of 200 pounds per square foot.¹⁰⁸

The date of Lee's mill has always been given as 1801, but the cross-section drawing from the Boulton and Watt Collection has a note that indicates that it was begun at an earlier date. It states 'Built up to this line in 1799,' and refers to a line level with the bottom of the first tier of beams. Thus the design of the structure must be placed at least in that year. One wonders if the burning of Messrs. Robinsons' mill in Manchester in 1799 with an estimated loss of £12,000 prompted Lee to adopt the new incombustible system of building.¹⁰⁹ Another note on the same drawing reads 'Solid stone built after the failure of July 27, 1801.' This seems to refer to a filling in with 4½ feet of stonework of a space extending from bedrock to the top of the foundations. The nature of the failure is not given, but it may have involved a threatened displacement of the column footings. The later history of the building is uncertain, but by the 1840's the works had apparently been sold to the Manchester Bonding Warehousing Company, and the old mill structure may have been that which collapsed in March, 1845.¹¹⁰

With the turn of the new century the British textile industry mushroomed. New mills crowded the landscapes of Lancashire, Derbyshire and Yorkshire. The loss of new and old timber-framed factories by fire mounted apace,¹¹¹ and the adoption of incombustible iron-framing steadily expanded. In 1802, H. Houldsworth built the first example in Glasgow.¹¹² Reference has already been made to the linen mills built at Shrewsbury in 1804 and at Leeds probably in the same year, both by Benyon and Bage. In 1805, James Kennedy, one of the most enterprising cotton manufacturers of Manchester, rebuilt his German Street mill, which

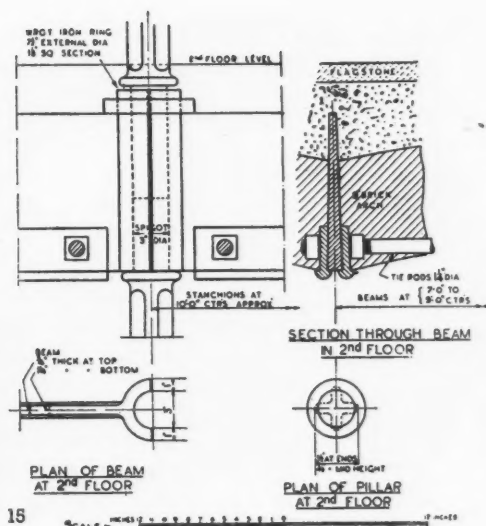
¹⁰⁸ Scott, W. Basil: Some Historical Notes on the Application of Iron and Steel to Building Construction. (*Structural Engineer*, v. 7 (1929), pp. 4-12, 99-100.)

¹⁰⁹ Axon, William E. A.: *The Annals of Manchester*. (Manchester, 1886), p. 127.

¹¹⁰ *Builder*, v. 3 (1845), p. 119, quoted from the *Manchester Guardian*. This notice refers to a 'cotton warehouse . . . used for many years by Messrs. Philips, Lee and Company. . . . 40 by 120 feet . . . with a cast-iron roof . . . on two rows of iron columns . . . the building being fireproof.' During repair of the roof, a section fell dragging with it one row of columns until two-thirds of the roof came down. The columns were very slight in weight and the light cast-iron principals of the roof rested on iron cups on the columns. 'Nearly all these cast-iron cups were cracked or torn, apparently for a long time, by some severe shock or strain.' The report does not mention a multi-storey structure, and may, therefore, refer simply to a single storey shed, but it serves to illustrate, in any case, the hazards encountered in the early design of cast-iron framed buildings.

¹¹¹ Between 1800 and 1820, in and around Manchester, Axon (*op. cit.*, pp. 127-155) lists the burning of twenty mills, many of which constituted an estimated loss of £20,000.

¹¹² Ure: *Cotton Manufacture*, p. 312.



The Benyon and Bage Flax Mill at Leeds (c. 1804). Facing page, interior; left, exterior and details of structural ironwork. (From S. B. Hamilton: *The Use of Cast Iron in Building*.) The first two tiers have experimental jointing with compound beams held to the column by a wrought iron ring.

had burned two years before, and used incombustible framing.¹¹³ In the following decade, the Stanley Mill at Stroud, built in 1818, witnessed the penetration of the new system into Gloucestershire.¹¹⁴ Ure reported that 'most good factories since have been built fire-proof.'¹¹⁵

No text yet found describes the Shrewsbury mill of Benyon and Bage, but the Leeds mill is mentioned by Baines as 'very large' and 'completely fireproof, no timber whatever being used in the building, its place being supplied by cast iron. The floors were on arches raised on cast-iron beams supported by iron pillars, the whole firmly united. It must have been amongst the earliest applications of iron to that purpose.'¹¹⁶ At least a part of the Leeds mill still stood in Meadow Lane in 1940, being used as a transport depot by J. Lyons (Figs. 13, 14).¹¹⁷ Hamilton's measured drawings of the details of its structural ironwork constitute important documents (Fig. 15).¹¹⁸ The columns had the cross-shaped section and taper (4½ inches at midheight and 3½ inches at top and bottom) as at Shrewsbury, and they were spaced to form aisles approximately 10 feet wide, about one foot more than at Shrewsbury. The longitudinal spacing varied from 7 to 9 feet, which was close to Shrewsbury's 9 feet. At the third floor level and above, the transverse beams were bolted together through flanges, placed 6 inches beyond the column axis, and the tie-rods were likewise close to the column line, both details similar to Shrewsbury. The beams were cast with a round sleeve that fitted over the spigot which projected up from the column head.

¹¹³ *Ibid.*: Axon: *op. cit.*, p. 132.

¹¹⁴ ARCHITECTURAL REVIEW, v. 93 (1943), pp. 53-54.

¹¹⁵ Ure: *Cotton Manufacture*, p. 312.

¹¹⁶ Baines: *op. cit.*, v. 2, p. 158. Baines probably quoted from *The Leeds Guide* (1806). The last sentence, by its implication that iron construction was unusual in Leeds, seems to be a further indication that Marshall's new mill used timber framing.

¹¹⁷ Hamilton: *Use of Cast-iron in Building*, p. 141. Hamilton first dated it about 1816 and attributed its ownership to Thomas Benyon (see note 51) and its design to John Farey, a Leeds iron master. In 1949 (*Old Cast-iron Structures*, p. 183) he acknowledged the advice of Forward that the mill had been seen in 1804 by Goodrich. Forward had published this item in 1923 (see note 91). On the basis of the new date Hamilton attributed the structural ironwork to Matthew Murray who, in 1795, had left Marshall's employ and had established the famed ironworks firm of Fenton, Murray, and Wood, at the 'Round Foundry' close to the mills of both Marshall and Benyon and Bage. 'Here Murray devoted almost his entire energies to making improvements in the steam engine,' that involved him in patent difficulties with Boulton and Watt, who in turn sought to spy out the secret of Murray's excellent castings (Tyas, G. F.: *Matthew Murray, a Centenary Appreciation*. (*Trans., Newcomen Society*, v. 6 (1925-26), pp. 112, 123, with a view (plate 9) of the ironworks dated 1806, which seems to show Marshall's mill in the left background)). In the light of Bage's apparent authorship of the Shrewsbury mill and of structural similarities between the two mills, and of Murray's more exciting preoccupation with engines, it seems probable that Bage supplied the design for the Leeds mill, and that Murray, if he had any part, simply produced the castings.

¹¹⁸ Hamilton: *Use of Cast-iron in Building*, figs. 65 (beam and column connection at the third floor), 66 (same at the fourth floor).

The beam section, on the other hand, differed from its Shrewsbury counterpart in having a web 14 inches deep, tapering from ¾ inch at the top to 1¼ at the bottom, and a lower flange 1¼ inches deep by 8 inches wide. These were almost exactly the dimensions of the beams used in Lee's mill at Salford.

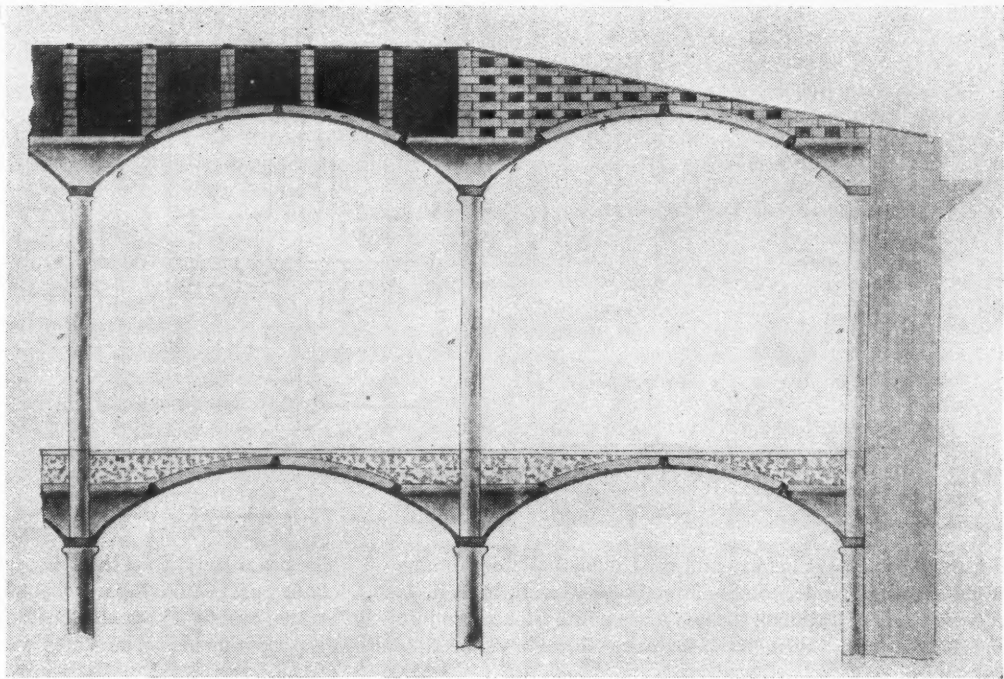
For the first and second tiers of beams, the Leeds mill used a compound section formed of a web piece 12½ inches deep and tapering from ¾ inch at the top to 1½ inches at the bottom to which was bolted at the bottom on both sides a ¾ by 4¼-inch piece with a small rounded projecting lower flange. Such a section, depending for strength on its bolted connections, was a very questionable solution, but its durability to the present day is its own vindication.¹¹⁹ These lower beams were cast with half-sockets so that adjoining beams met to form a sleeve equivalent to the beams of the upper floors. Here, however, the beams were not bolted, but were held snug to the column spigot by a wrought-iron ring placed around the upper projections of the half-sockets. The bottom spigot of the next column above was then dropped into the same socket, and the security of the whole joint rested with this single ring. Comparing the two systems of jointing, the lower tiers seem to possess an experimental character. Despite its simplicity, the original system was abandoned in the upper storeys for a method ensuring greater security.

The achievement of iron-framed multi-storeyed textile mills established a pattern of major importance in the evolution of industrial architecture, but it quickly influenced many other types of buildings as well. Its inception in England had been accomplished by mill men and builders outside the architectural profession, but with surprising rapidity English architects, both large and small, began to apply iron even to monumental structures. Before the Derby Calico Mill and Bage's mill at Shrewsbury, architects had already been deeply concerned with improving the fire-resistance of buildings. In 1793, the Association of Architects in London, the membership of which included most of the metropolis' leading practitioners, published a review of their tests of known preventives,¹²⁰ but these were all palliatives, such as the

¹¹⁹ Since Hamilton does not note any difference of material for these flange strips, it must be assumed that they were of cast iron like the web. But if they had been of rolled wrought iron, their strength in tension would have been vastly greater, they would have acted in combination as a kind of tie, and their introduction would have shown an unusual experimentalism. Although Cort had patented his process of rolling iron bars and rods in 1783, it is questionable whether the production of bars with formed heads was yet possible. The tie-rods themselves were always of wrought iron.

¹²⁰ Holland: *op. cit.* The members listed were Robert Brettingham, Joseph Bonomi, John Carr, Sir William Chambers, Samuel Pepys Cockerell, George Dance, Thomas Hardwick, Henry Holland, Richard Jepp (Jupp), James Lewis, Robert Mylne, James Payne, Nicholas Rivett, Thomas Sandby, John Soane, James Wyatt and John Yenn (p. V). Richard Holland lent two houses for the tests (p. 79).

In 1800 Samuel Wyatt patented 'a method of constructing bridges, warehouses and other buildings without the use of wood.' Right, one of his patent drawings showing the system of hollow cast-iron units. In 1802, James Wyatt applied his brother Samuel's invention of iron construction to the palace, foot of page, that he built for George III at Kew. (From Lysons.)



metal fire plates patented by David Hartley in 1773,¹²¹ the pugging of timber floors developed by Viscount Mahon (Earl Stanhope) in 1777,¹²² and the fireproofing of timbers by a liquid coating suggested by Henry Wood in 1792.

During the next few years, however, architects reoriented their point of view and utilized the new material, iron, in many different ways. About 1796, George Dance, Jr., then 56 years old and a respected architect in official circles, proposed to his former assistant, John Soane, that they join forces to develop, test and patent a system of incombustible floors employing iron.¹²³ In 1800, Samuel Wyatt, architect of the Albion Mill that had burned so disastrously nine years before, patented 'A Method of constructing bridges, warehouses, and other buildings without the use of Wood,'

¹²¹ Great Britain, Patent Office: *Alphabetical Index of Patentees and Applicants for patents of invention*. (London, 1854), p. 254; *House of Commons' Journal*, v. 34, pp. 746-748; Hartley, Winchcombe Saville: *An Account of the Invention and Use of Fire-Plates*. (London, 1834.)

¹²² Mahon, Charles; Viscount: *Description of a most effectual Method of securing Buildings against Fire*. (*Philosophical Transactions, Royal Society of London*, v. 68, part 2, pp. 884-895); *Architectural Publication Society: Dictionary of Architecture*. (London, 1853-92), art. 'Stanhope.'

¹²³ Bolton, A. T.: *The Portrait of Sir John Soane*. (London, 1927), p. 58. Bolton notes that Soane had left Dance because he considered him lacking in the constructive side of architecture.

¹²⁴ Patent No. 2410 (*Alphabetical Index; Repertory of Arts and Manufactures*,

consisting of a system of tubular, hollow cast-iron units (Fig. 16).¹²⁴ Two years later, Samuel's famous brother, the Surveyor-General, James Wyatt, used the system in the New Palace, a castellated extravaganza nicknamed 'The Bastille,' begun at Kew for George III (Fig. 17).¹²⁵ More directly inspired by cotton mills were the great warehouses surrounding the vast new dock basins for commercial and naval use. In 1799, the engineer, Ralph Dodd, submitted a design, in connection with the proposed improvements of the port of London, in which he included a series of quays with fireproof warehouses, the ground storey of which consisted entirely of cast-iron columns.¹²⁶ In 1807 Sir John Rennie wrote regarding the proposed new naval dockyard at Northfleet, that 'In the establishment of the magnitude and national importance of the proposed dockyard, I should advise every means be adopted to prevent of accidents by fire; for this purpose, all the storehouses and other buildings should be rendered fireproof, by constructing them in the first instance of incombustible materials, upon the plan of the cotton and flax mills lately erected at Derby, Leeds, Manchester and Glasgow. . . .'¹²⁷ In his huge harbour works of the 1820's, Rennie followed his own advice at Sheerness, Plymouth, Devonport and the docks at London.

The burning of Covent Garden Theatre on September 20, 1808, and the Drury Lane Theatre on February 24, 1809, immediately provoked many pleas for incombustible construction.¹²⁸ In re-

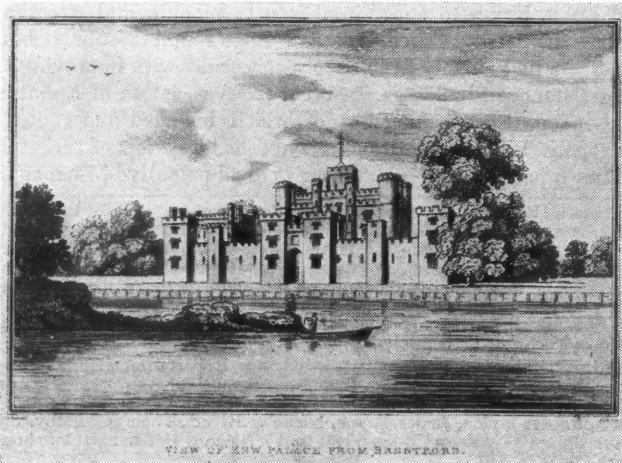
v. 14, no. 81). Chancery, Specification and Surrender Rolls (Petty Bag Office Series) 40 George III Part 75 (c. 210/75).

¹²⁵ Dale, *op. cit.*, p. 97; Bolton, *op. cit.*, p. 94; Chancellor, E. Beresford: *The History and Antiquities of Richmond, Kew, Petersham, Ham, etc.* (London, 1894), p. 297; Lysons, Daniel: *Historical Account of the Environs of London*. (London, 1811), v. 6 (Supplement to the first edition), p. 25, with a view. The building progressed very slowly and was never finished.

¹²⁶ *Reports from Committees of the House of Commons, Miscellaneous Reports, 1793-1802*, v. 14, p. 560, pls. 32-33. He describes the warehouses as 'built upon iron pillars and circular groins, with all their parts incombustible, and leaving a sufficient height underneath them for all the purposes of commerce.'

¹²⁷ Rennie, Sir John: *The Theory, Formation and Construction of British and Foreign Harbours*. (London, 1854), v. 1, p. 59. Apparently, the earliest dock warehouses, those built by George Gwilt, Sr., in 1800-2 for the West India Docks, and those built by Daniel A. Alexander in 1800-5 for the London Docks, employed massive timber framing, but secured some protection through subdividing between strong fire walls and double fire doors of iron (*Dictionary of Architecture*, arts. 'Alexander, D. A.', 'Gwilt, George, the Elder'; Brewer, J. Norris: *Beauties of England and Wales*. (London, 1815), v. 10, part 3, p. 145).

¹²⁸ *Emporium of Arts and Sciences*, v. 2, pp. 350-57, 379-85.



building them, Robert Smirke at Covent Garden and Benjamin Dean Wyatt, the son of James, at Drury Lane, took thoroughgoing precautions against future hazards, but neither employed iron to any great degree.¹²⁹ Complete application of iron to theatre construction remained for the architect, John Foulston, of Plymouth. Beginning in 1811, he built the Theatre Royal at Plymouth, a remarkable tour de force in which wood was practically eliminated by cast and wrought iron (Fig. 18).¹³⁰ The roof, composed of wrought-iron members, recalls that of the Théâtre du Palais-Royal.

As cast iron had cheapened and grown plentiful, the ease of forming it had greatly encouraged its use for moulded decoration. Especially for those who desired Georgian Gothick at low cost, iron was the answer. William Porden used it profusely between 1804 and 1812 in rebuilding Eaton Hall, the Cheshire seat of the Marquis of Westminster, casting it into Gothic window tracery and 'stone' balustrades.¹³¹ John Wilkinson, the renowned ironmaster, had assisted his workers, about 1790, in building their Wesleyan Chapel at Bilston, in Staffordshire, by casting at his nearby Bradley works iron columns, window frames and pulpit.¹³² When Wilkinson died in 1808 he had ready both coffin and monument fashioned of his favourite material, cast iron.¹³³

But the ultimate amalgamation of these structural and decorative trends was finally and appropriately accomplished in Liverpool, where St. Anne's Church, in 1770-72, had exhibited the earliest dated cast-iron columns in England, and where, in three

¹²⁹ Britton, J., and Pugin, A.: *Illustrations of the Public Buildings of London*. (London, 1825), v. 1, pp. 225, 250, 255-59. Especially notable at the Drury Lane was Sir William Congreve's apparatus to pump water to upper tanks which fed sprinklers to quench fire. One jet flowed through an Apollo's head decorating the auditorium ceiling.

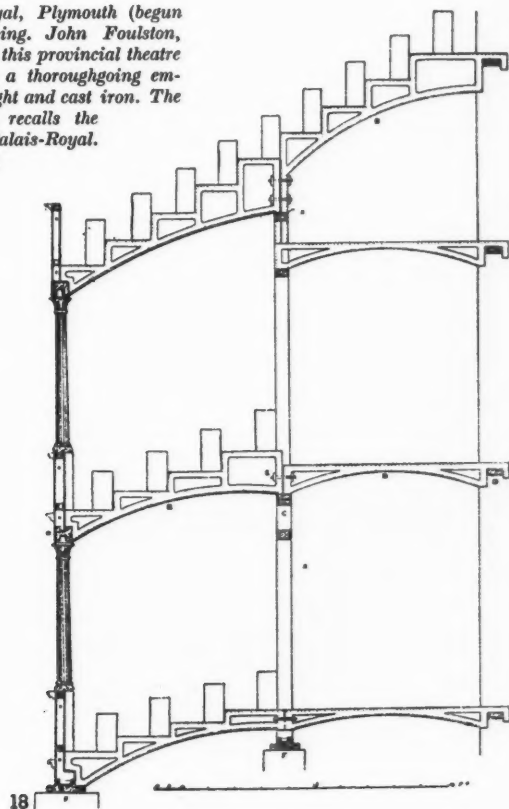
¹³⁰ Foulston, John: *Public Buildings, erected in the West of England*. (London, 1838), pp. 11-34.

¹³¹ Eastlake, Charles L.: *A History of the Gothic Revival*. (London, 1872), p. 77.

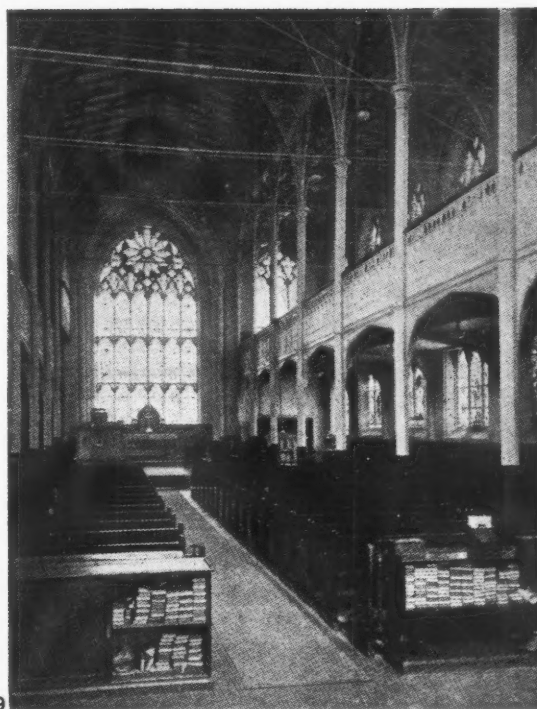
¹³² Dickinson, H. W.: *John Wilkinson, Ironmaster*. (Ulverstone, 1914), p. 39; Lawley: *History of Bilston*, p. 169.

¹³³ Dickinson: *op. cit.*, p. 46.

The Theatre Royal, Plymouth (begun 1811): loge framing. John Foulston, architect, designed this provincial theatre to be fire-safe by a thoroughgoing employment of wrought and cast iron. The iron-framed roof recalls the Théâtre du Palais-Royal. (From Foulston.)



18

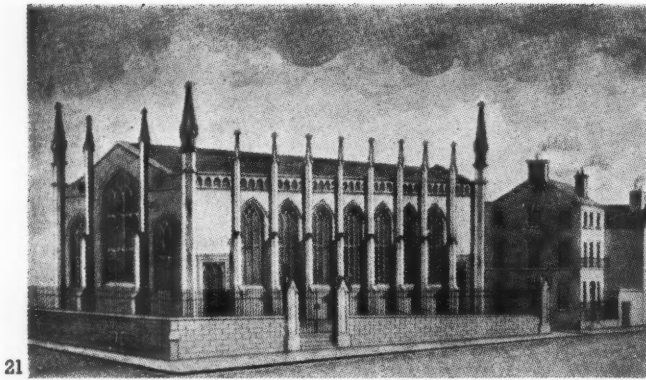


19



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The interior of St. George's Church, Everton, Liverpool (1813-14), top, was the first design of Thomas Rickman, antiquary-architect. It was fabricated in iron by John Cragg at his Mersey foundry. Cragg enthusiastically patented his system of industrialized archaeology. St. Michael's, Toxteth Park, Liverpool (1813-15), bottom, was Cragg's second church with iron both inside and out. It was a speculative venture for which he re-used the wooden patterns left over from St. George's. (From *How Gothic Came Back to Liverpool*, a paper read by A. T. Brown to the Liverpool Literary and Philosophical Society in 1937.)



21

St. Philip's, Hardman Street, Liverpool (1816). Exterior ornaments and the interior of this 'feeble imitation of King's College Chapel' were of Cragg's ironwork, which Rickman thought 'too stiff to bend to any beauty.'

years, between 1813 and 1816, the team of Thomas Rickman and John Cragg built three churches almost completely of iron. Cragg (1767-1854) was the principal partner of the Mersey Foundry, an enterprising and wealthy businessman, an active churchman with a strong desire to build, and an ardent, if eccentric, protagonist of iron.¹³⁴ Rickman, a Quaker, was then an accountant, but as an amateur antiquary he had long studied the Gothic churches of England.¹³⁵ On April 3, 1812, Rickman summed up his studies in a paper, entitled 'Distinctive Principles of Grecian and Gothic Architecture,' read before the Literary and Philosophical Society of Liverpool. In it he probably traced for the first time his new system of stylistic classification that laid the groundwork for later understanding of English medieval architecture.¹³⁶

Ten days later Rickman met Cragg, and subsequently the two spent much time together discussing the design of churches. In December, when a public meeting was held to organize the construction of a new church, St. George's, at Everton, a suburban village north of the city, Rickman furnished the design, the first of his career, and Cragg, in order to reduce its cost, fabricated the whole interior of iron (Fig. 19). Construction began in April, 1813, and the church was consecrated on October 30, 1814. Slender cast-iron columns bordered the nave and carried the galleries above the side aisles. From simple capitals sprang cast-iron traceried arches for the support of the iron and slate roof. Cast-iron tracery subdivided the stained glass. The exterior walls were of local stone.¹³⁷ 'The motive of every portion was derived from a careful study of ancient examples . . . [but the] effect [of thinness and stiffness] is doubtless heightened by the employment of cast

iron.'¹³⁸ It was at once the opening of a new phase in the Gothic Revival and a monument to the new age of iron.

St. George's was hardly started when Rickman designed and Cragg built on speculation another iron church, St. Michael's, Toxteth Park, 1813-15, using many of the wood casting patterns already at hand; for example, the large eastern window over the altar is identical with the upper part of that in the first structure (Fig. 20). St. Michael's, however, went further, for it used iron liberally on the exterior as well.¹³⁹ St. Philip's Church, Hardman Street, Liverpool, 1816, completed the iron trinity. Its brick exterior, 'a sort of feeble imitation of King's College Chapel at Cambridge,' enclosed an iron interior (Fig. 21).¹⁴⁰ Rickman was not too pleased with these metal essays, for he wrote that 'His [Cragg's] ironwork is too stiff in his head to bend to any beauty.'¹⁴¹ Cragg, in contrast, foresaw tremendous potentialities in the new material. In order to profit by the trend, he obtained, on November 29, 1813, a patent for 'Facing walls of Gothic or other structures with slates, secured by mouldings, grooves, and ties of cast iron, so as to have [when sanded] the appearance of finely wrought stonework; also ceilings of the same materials; capping buttresses in Gothic architecture with pinnacles of cast iron; spiral-stair of cast iron for the interior of a tower, wall, or turret.'¹⁴²

With the victory at Waterloo in 1815, the war prosperity of English ironmasters came to an abrupt end. The price of iron plunged from £20 to £8 per ton.¹⁴³ It was imperative to exploit new markets. Because of this crisis the evolution of iron construction entered a second stage of wider use and more scientific design, a chapter that must be traced at a later time.

Thus, for their pioneering of new structural techniques, all modern architects owe to Strutt and Bage a long neglected debt of gratitude. Three of the first five mills still stand to attest their builders' prescience. Stark, ascetic, even gloomy as these first mills appeared, disdained by the intelligentsia as without the pale of Architecture, they—rather than their more stylish monumental cousins—contained the seeds of present-day principles. In structure, they led to the metal skeleton; in their adjustment of space to the industrial process, they pioneered the evolution of exact functional planning; and in the directness and drama of their formal statement they and their successors pointed the way to many elements of our own taste. In 1826, Karl Friedrich Schinkel, on tour in the Midlands, acknowledged the impact of the great cotton mills of Manchester. 'Here,' he wrote, 'are buildings seven and eight storeys high and as big as the Royal Palace in Berlin.'¹⁴⁴ Their influence upon his later work was symbolic of their meaning for the whole course of modern architecture.

¹³⁸ Picton: *op. cit.*, v. 2, p. 370.

¹³⁹ Brown: *op. cit.*, pp. 19-20, pls. 15-17; Picton: *op. cit.*, v. 2, p. 479.

¹⁴⁰ Picton: *op. cit.*, v. 2, p. 248; Brown: *op. cit.*, p. 20, pl. 18.

¹⁴¹ Rickman, Thomas Miller (son): *Notes on the Life . . . of Thomas Rickman*, FSA, p. 13 (cited in Brown: *op. cit.*, p. 22).

¹⁴² Patent No. 3761 (*Alphabetical Index*); *Repository of Arts and Manufactures*, 1825, p. 75. The patent was noted in Germany by *Dingler's Polytechnische Journal*, 1825, p. 262.

¹⁴³ Slater, Gilbert: *The Growth of Modern England*. (New York, 1933), p. 250.

¹⁴⁴ Wolzogen, A. von: *Aus Schinkel's Nachlass*. (Berlin, 1863), v. 2-3, cited in Ettlinger, L.: *A German Architect's Visit to England in 1826*. (ARCHITECTURAL REVIEW, v. 97 (1945), p. 133.)

¹³⁴ Picton, J. A.: *Memorials of Liverpool*. (London, 1875, 2nd edition), v. 2, p. 74.

¹³⁵ DNB, art. 'Rickman.'

¹³⁶ Later in 1812 he developed his system in an article that appeared in James Smith's *Panorama of Science and Art*. In turn, this became in 1817 his *Attempt to discriminate the Styles of English Architecture*, which through its seven editions 'elevated the study of an art into a science.' (Brown, A. T.: *How Gothic came back to Liverpool*. (London, 1937), pp. 14-15. I am indebted to Dr. John P. Coolidge for bringing this book to my attention.)

¹³⁷ *Ibid.*: pp. 18-19, pls. 13-14; *The Stranger in Liverpool*. (Liverpool, 1825, 8th edition), p. 295.

THE PROGRESS OF STYLIZATION In domestic architecture particularly, there have been many signs recently of the emergence of certain design formulæ which, repeatedly used, are calculated to give the small house idiom of the mid-century a clearly recognizable style. This process can be observed in both the houses illustrated on the following pages, especially in the interiors of the American house, which is remarkable for the large number of familiar conventions and conceits displayed under one roof. In spite of their elegance and charm, these interiors derive their character from ingenious variations on certain decorative themes that are becoming the hall-mark of sophisticated modern design. In a more subtle way the English house illustrated also has a definite character derived from stylized detailing and the use of motifs that are becoming accepted as part of today's domestic idiom.



HOUSE AT GROSSE POINT MICHIGAN

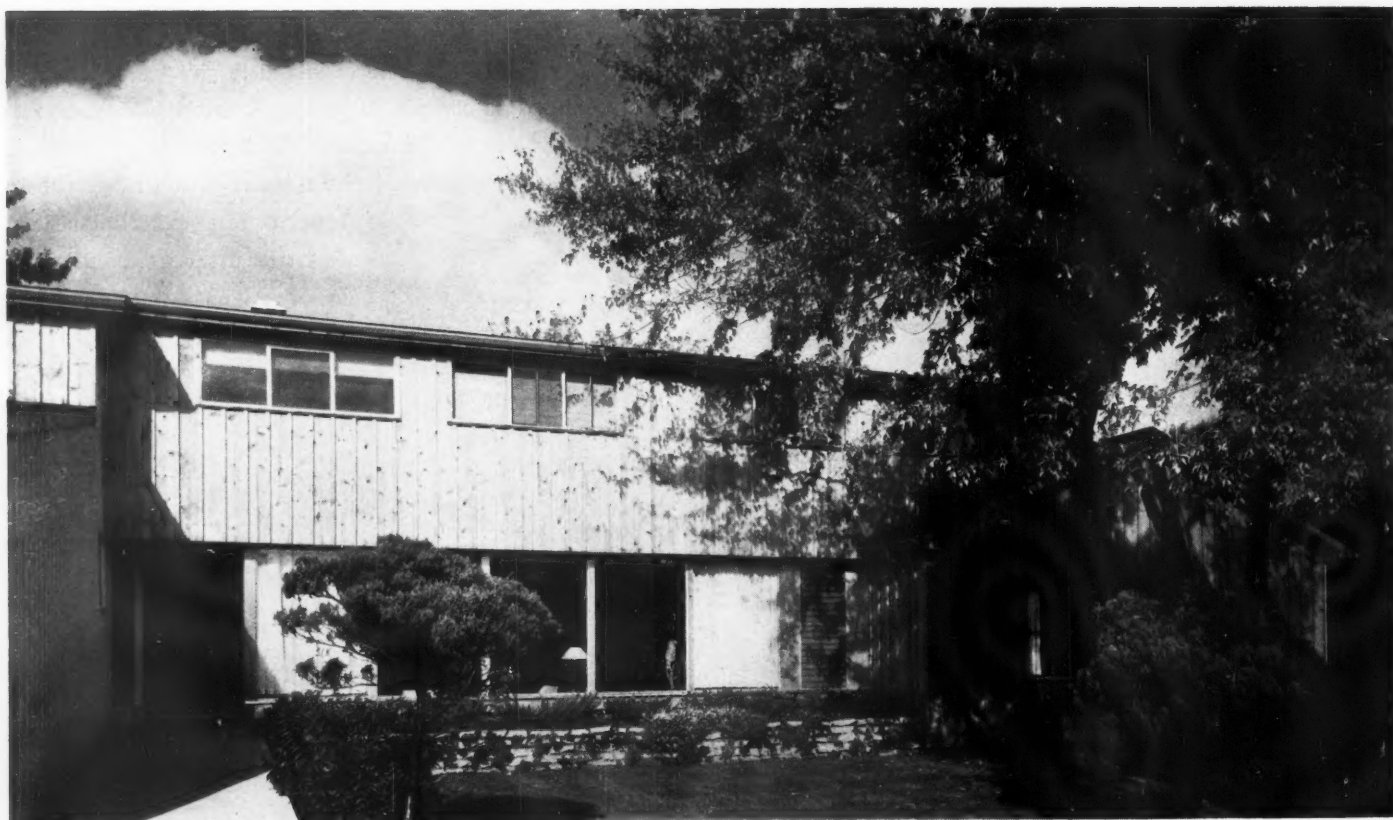
ALEXANDER GIRARD: ARCHITECT

When designing this house in Michigan for his own occupation, the architect followed certain basic family requirements. Rooms were required for seven adults and two children; one room was to do double duty as sitting room and occasional guest room; a working space, protected but not isolated, was essential; accommodation for growing children had to be flexible; and a maximum feeling of space was required.

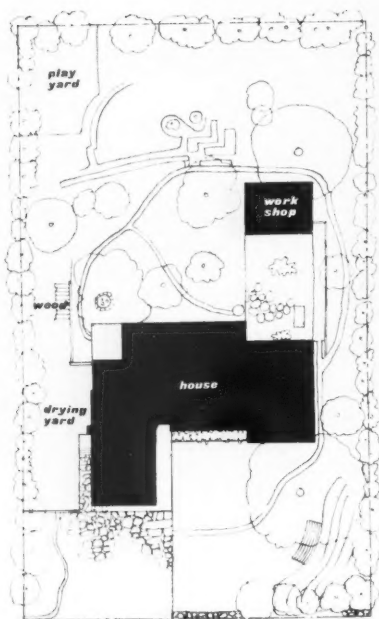
The plan, on an open site, resolved itself into a main ground floor with a smaller upper storey. The ground floor consists of a large centrally-placed living room, with a block of two bedrooms and bathrooms to the north-east, and dining area and domestic rooms to the south-east. On the upper storey are four bedrooms, a room for storage and a children's playroom; these are all placed to one side of a corridor running the length of the house.

Above, the living room, with free-standing brick chimney on the right. Screen wall behind settee separates the living area from the work space behind. Below, exterior from the east.





Above, south front; right, exterior from south-east. Walls covered with vertical pine boards and battens with natural finish on the two-storey portion. Garage wing is painted white; bedroom wing (on the right of each picture) orange.

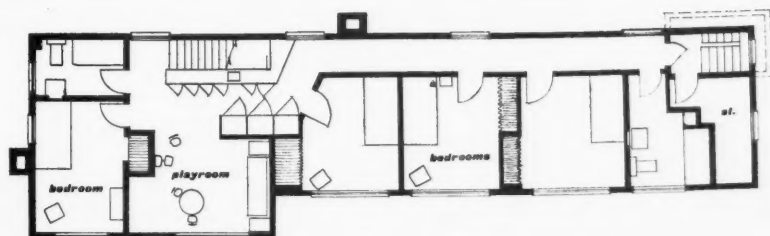


site plan
scale: 1/64 in. = 1 ft.

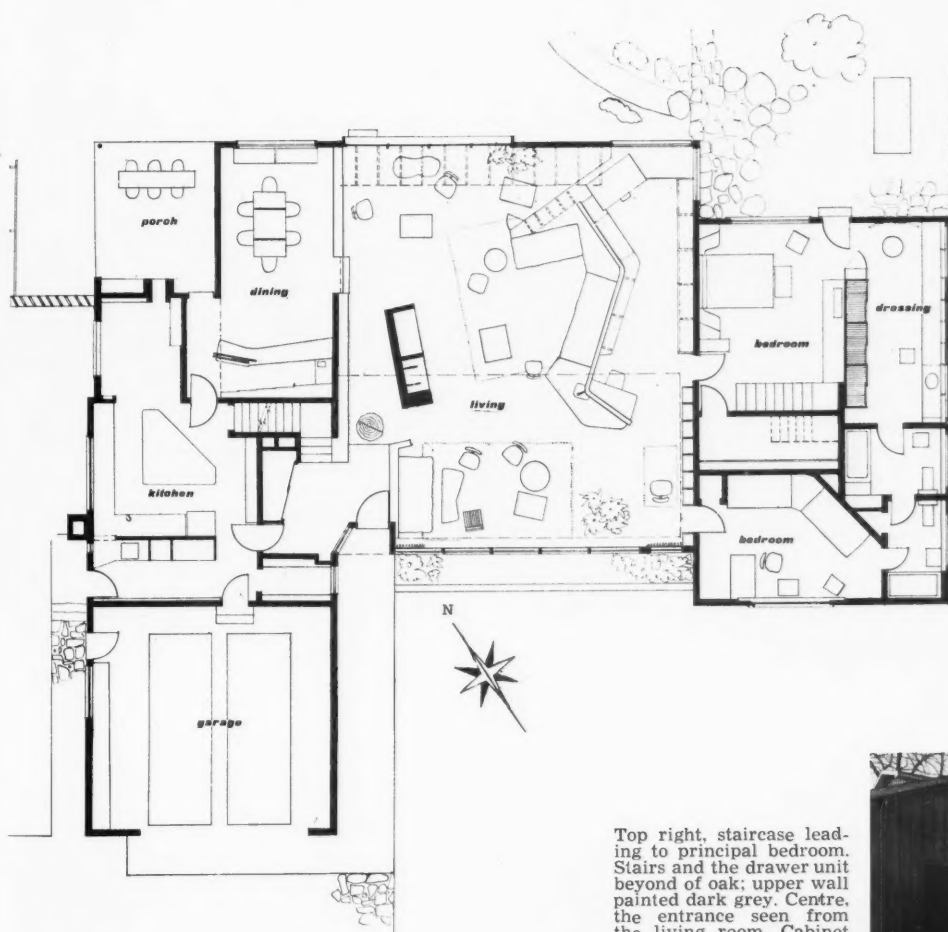
HOUSE AT GROSSE POINTE, MICHIGAN



The large ground floor living room is the focal centre of the house, and part of it is used as a space for working, sufficient privacy being given by a screen of plywood painted grey. The main walls are white plaster, and the ceiling is partly plaster and partly pine beams; the central open hearth, with chimney and fuel box, is natural brick; the floor is waxed cement. One wall, of oak boards, has removable panels, and this opens the living room into the garden. Within the dining area are plywood storage cupboards of various depths; sliding



1st floor plan



ground floor plan
scale: 1/16 in. = 1 ft.

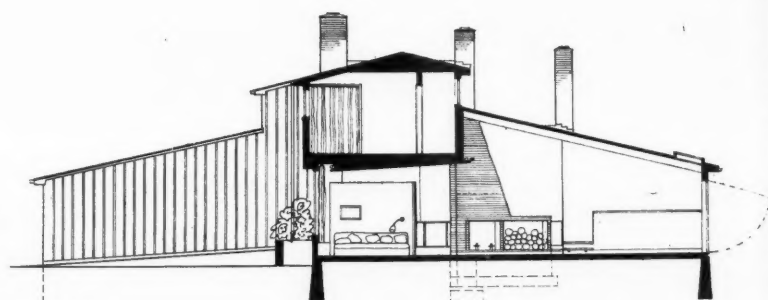


Top right, staircase leading to principal bedroom. Stairs and the drawer unit beyond of oak; upper wall painted dark grey. Centre, the entrance seen from the living room. Cabinet has dark red lacquered top and ends and natural chestnut doors. Right, north front; terrace paved with log sections. Cantilever type door opens living room to garden in the summer.

doors and a screen shield the kitchen; the service counter is enamelled white with black linoleum top. The dining table, of laminated cherry wood, seats 16 people and comprises several units, enabling differing combinations to be used.

The window of the main bedroom faces a terrace paved with stone and log sections; the walls are partly white plaster and partly dark grey paint. The staircase wall, open staircase, and counter woodwork are natural oak; the ceiling is plaster. The kitchen has a plaster

ceiling, natural fir plywood walls, and black and white asphalt tiled floor. The counters are covered with black linoleum, and the sliding cupboards are of black composition panelling. An alcove area contains a brick chimney with a grille; this opens similarly outwards to the porch for outdoor cooking. The breakfast table is black composition; the central wall is painted bright blue. The second floor playroom has walls of brightly-coloured stained fir plywood—yellow, magenta, blue and purple.



transverse section
scale: 1/16 in. = 1 ft.

Below, living room looking towards dining space. Wall of oak boards on right has removable panels opening room to garden in summer. Wall behind free-standing brick fireplace is of fir plywood painted black. Ceiling beams are natural pine, walls plaster and floor waxed cement. Left, south end of living area with furniture by Saarinen and Eames (furniture is otherwise by the architect). Bookcase has oak uprights and glass shelves.





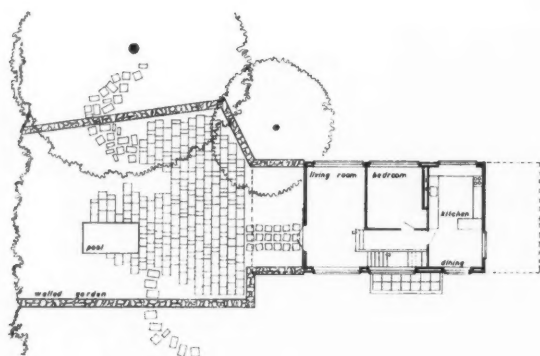
Above, top, office and work space at back of living room screen wall. Cupboards have sliding fibre-board doors. Bottom, the kitchen. Walls natural fir plywood; floor asphalt tiles. Counter tops are black linoleum with maple cutting board.



Top right, principal bedroom. Continuous radiator under window. Bedback of straw matting; bedspread of red handwoven fabric. Centre and bottom right, the dressing-room. All woodwork natural oak. Wall cabinet has sliding fibre-board doors. Wash basin is set flush in the black linoleum counter. Carpet natural felt.

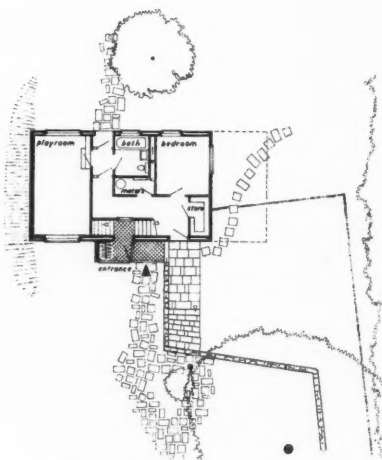
HOUSE AT KINGSTON ON THAMES

TAYLER AND GREEN: ARCHITECTS



upper ground floor

scale: 1/32 in. = 1 ft.



lower ground floor

Below left, living room end of the house from the garden side, showing slope of the ground allowing access to the garden from two levels. Yellow stock bricks for lower portion of side wall; rustic feltons colour-washed lemon yellow for upper portion. Below right, end wall of living room from paved terrace. Facing material is cedar shingles; sun-blinds are blue and white striped canvas.



The site of about one acre is part of a hill (the original Robin Hill of Galsworthy's *Forsyte Saga*), thickly wooded with oaks, sweet chestnuts and silver birches. There is a considerable fall both across the width of the site and along its length, both these falls sloping away from the sun and from the road. The best view is facing away from the road to the north.

Instead of being placed on a levelled platform, the house is tailored to the existing ground slopes. It is hoped later to extend the house to more than twice its present size, and the present house, built within the restrictions of size and cost permitted, is as it were the central core of the future house, containing its basic permanent features, stairs, and main services duct. Additions will be made at both ends of the house and an extra storey added. For this reason, both the end outer walls and all internal partitions are non-structural. The structure is thus a hollow shell of floor and roof supported on two walls at front and back only. Within this shell only the stairs and the plumbing stack are permanently fixed, enabling rooms to be altered in position, shape and size.

Access from house to garden is at three different levels: lower ground floor to drive (or to future garage) and to back garden; ground floor to walled garden (from living room); and by front door at level halfway between the two floors. The existing ground slopes were slightly remodelled near the house to suit windows and doors. The walled garden was levelled with soil from the excavation for the house. The principal rooms enjoy both sun from the front and view from the back, and the living room and future main bedrooms have a third aspect to the sides of the house.

The external walls at front and back are of cavity brickwork, the upper part colour washed in lemon yellow. The end walls are timber framed, fabricated in sections and bolted together for future removal and re-use for the extended house. They are faced with cedar shingles. The stairs and floor are reinforced concrete, the latter supported on four steel joists spanning from





Above, entrance front from living-room end of the house. Paved terrace at left; porch at right, beyond which is site of future garage.

front to back of the external walls. The roof is temporarily covered with corrugated asbestos sheeting. Windows are standard metal casements, painted grey in wood frames. All other paintwork is white. Insulation is by glass fibre in end walls and roofs and fibre-board on internal stud partitions.

The drawings on the right show the road elevation as it will appear after the proposed extension in two stages. At the first stage (top) a garage has been added on the east side, alongside the entrance. It has a flat roof-deck, reached from the existing casement doors leading from the dining end of the present kitchen. At the second stage (bottom) the house has been enlarged at both ends and another storey added. At this stage the main ground floor living room will have become larger, the bedroom next door to it will have become a dining room and the dining space, now part of the kitchen, a nursery. On the lower floor, beneath the enlarged kitchen and the nursery, will be staff rooms and beneath the living room a guest room. The new top floor will contain three bedrooms and two bathrooms.





18

Above, living-room end of the house in its woodland setting, looking north across the paved terrace. Terrace and pool will later be enclosed within a brick wall raised on the stone base already built. Trees existing on the site were large specimens of oak, sweet chestnut and silver birch. New planting aims at a maintenance-free arrangement of flowering shrubs and trees with only small areas of herbaceous and bedding plants in the walled garden and in pots near the house. The garden is already shaped to receive the eventual extensions to the house, and planting largely completed. The planting consultant was Michael Haworth-Booth. The owner is Mr. Godfrey Imhof.



19



20

Left, top, garden front, with large living-room windows on upper ground-floor level. Left, bottom, entrance front. The upper window on right, now protected by a railing, will eventually give access to flat roof of garage.

Libraries of the Baroque

IN BAVARIA AND AUSTRIA

WITH THE PRINTING press, book production increased a hundredfold. It became a problem to house these intellectual treasures. Architect and decorator seized with enthusiasm the opportunity of showing that they, like their patrons, came up to the standard of the renaissance of learning. To-day we can scarcely appreciate how thrilling it was to the student and the scholar to be able to retire to a library to consult the adored classical writers, or the fathers or commentators of the Scriptures, and revel in the hundreds (and later thousands) of new books which every year produced.

Thus libraries during the sixteenth century grew rapidly in scale. The Vaticana and that of the Escorial testify the spirit of fighting Catholicism.

With the Baroque the spirit changed. Jubilantly the allegories now swing through the room; they decorate from the ceiling down every corner which is not needed for the books, they greet the visitor at the entrance, they tease the student when he looks up from his books, they introduce an exuberant vitality into the temple of learning.

Many of the most spectacular Baroque libraries are in remote little-known places. They were built in monasteries on the outskirts of Catholicism, in the regions where the Ecclesia Militans had to struggle not so much with humanism and scientific

criticism as with a popular movement of heresy, with a democratic Protestantism. There the paramount task was to get hold of people's emotions and to stimulate religious enthusiasm by all the pomp of allegory and decoration.

In accordance with the old Benedictine rule: *Clastrum sine armario quasi castrum sine armentario* (a monastery without a library is like a castle without an arsenal), the monks prided themselves on their library and relied on it for intellectual defence. As the contents of the intellectual arsenal of the monasteries—especially the works of antiquity, humanism and enlightenment—could not always be used without restriction, and as the quantity of the collected books did not always correspond to their quality, special care had to be taken to make up for any such deficiencies by the most elaborate decorative framework. Many of the monasteries were schools too, and when favoured pupils or laymen were admitted to the sanctuary of the library it was essential that they should be impressed by the overwhelming splendour of allegories and caught by the rhythm of the decoration.

At this time the rivers of South Germany were called 'Pfaffengasse'—that is Clergy Lane; for every-

where majestic churches, monasteries and convents greeted the traveller. The Danube especially, as it flows through Lower Bavaria and into Austria, has both its banks crowned by these clerical palaces.

Metten, between Regensburg and Passau, may be the start of our library peregrination. The library here is one of the earliest of the highly decorated—1628 to 1645—but a second period of renovation is recorded in 1720. In any case the wildly moving caryatides look as if they must be of the seventeenth century. They show the influence of Michelangelo and Bernini even in this remote corner. Sciences and professions are allegorically represented by *amoretti* who intrude freely into the sacrosanct rooms of the monastic library. One of these even uses the newly invented telescope.

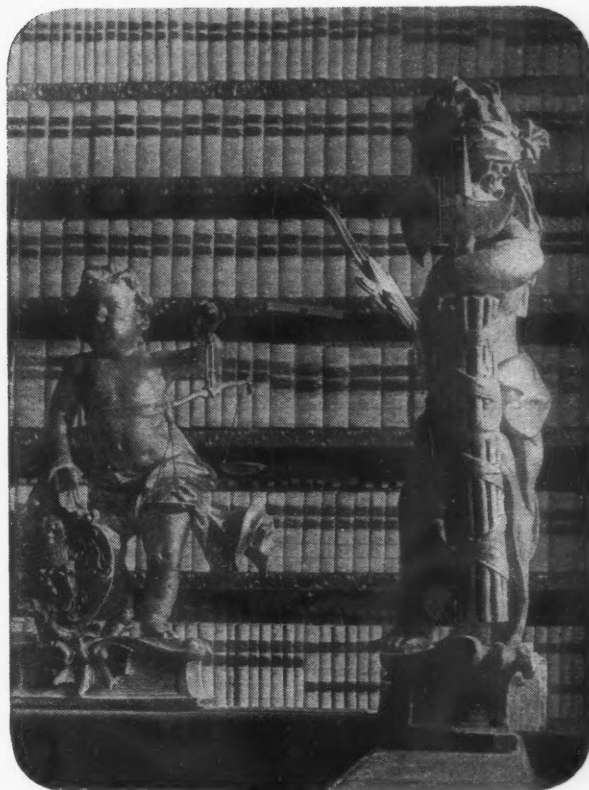
Tucked away in a remote corner of Bavaria, north of Regensburg, lies Waldsassen. Scarcely any traffic touches this former Cistercian abbey. However, before the construction of railways in the middle of the nineteenth century the mail coaches from the north passed in sight of its towers on the way to Regensburg, whence travellers took ship to Vienna. Goethe, the son of Rococo, and the man of Enlightenment, devoted to a classicism of his own, could 'not bear garlic, bugs and the Cross.' Hence on his journey to Italy he turned his head with indignation from this castle of catholic faith. He could not appreciate the glowing beauty of the rose-coloured sandstone of the church, one of the first monastic masterpieces built in southern Germany after the Thirty Years War. Thus Goethe missed also the humour in this library. It was begun in 1681, but the decoration of the library dates from 1724. The meaning of the carved figures which support the gallery is not known. It is, however, evident

that the artist, Stilp of Salzburg, represented types well known at this time in this region, maybe people who started trouble against the ruling church—artisans, foresters or charcoal burners still secretly adhering to some protestant heresies. Now they have to carry the gallery with the shelves full of literary armaments. The benevolent humour of the artist left some doubt where his sympathies lay: with the oppressed or with the churchmen who paid for his work. We should remember that in the remoter valleys under the dominion of the Archbishop of Salzburg protestantism lingered on up to 1730, when Cardinal Count Firmian expelled the last of these peaceful people. Active pity for those refugees resounds in Goethe's *Hermann and Dorothea*.

Wherever his sympathy leaned, the impression is left that the artist did not take either side too seriously. Probably he neither liked clerical zeal nor Protestant puritanism, but at the same time he obviously portrayed with the greatest gusto the old rogue with the big knife, a character no doubt never to be awed by the monks. Maybe the mice running over the long plaited beard of the figure on the left indicate the artist's disapproval of the stubbornness of an old-fashioned schoolmaster, and maybe the figure in the middle with his knife-edge profile and his elaborate old-fashioned dress could be some local alderman or sheriff.

Be that as it may, we have here an early example of how fun found its place in the libraries, especially in those of the Cistercians and Benedictines, during the eighteenth century, when it was banned from the choir stalls of the churches themselves where it had been hiding during the Middle Ages.

The galleries and shelves at Waldsassen carved by Witt (1710-20),



Right, the library at Seitenstetten, Lower Austria. The monastic buildings were begun by Munggenast in 1719. The paintings in the library are by Troger and the groups of figures depicting the four faculties, which decorate the balustrade, by J. P. Sattler. Top of page, one of these groups of figures, that representing jurisprudence.

still show a little of a restrained Renaissance tradition, but the stucco-work by the celebrated Appiani which links the bookcases with the ceiling, and its frescoes by Hoffreiter, indicate already the Baroque on its way to going Rococo.

If we return from Waldsassen to the Danube valley there is to the west that miracle of Baroque design, the former Praemonstratensian Abbey of Speinshart by Wolfgang Dientzenhofer, a lesser member of the family to which we owe Banz and the Baroque churches of Prague, but nothing of the monastic library is left. The same is also true of Weltenburg some miles south on the left bank of the Danube. Yet surely the vanished library might have corresponded to the glories of the Asam church. Still farther south in the direction of Landshut is the old Asam miracle in the former abbey church of Rohr, but Bavarian Enlightenment at the beginning of the nineteenth century used the monastic buildings as a quarry.

Following down the Danube now towards Austria we pass Metten again, and then Ober-Altaich and Nieder-Altaich, Osterhofen—also decorated by the Asams—and the picturesque Passau. Just this side of the border we reach Fürstentzell and here, besides the remarkable church, there are still the buildings of the Cistercian Abbey, and although the library of 1770 is empty, the galleries and sculpture are preserved. There a putto dressed à la mode as a cavalier, is shooting another in a duel with a sausage, a veritable German one, not an innocent English one of bread-crumbs and pepper. These German monks were not elegant French Abbés, but of small bourgeois or peasant stock. They were delighted to poke fun at the aristocracy as was done quite often under the crozier. Nowhere are such caricatures more delightful than in the park of the Prince-Bishop of Würzburg, at Veitshöchheim.

Descending the Danube we pass Engelhardtszell, with its gay abbey church, to alight at Wilhering near Linz. This Praemonstratensian monastery, with one of the finest churches of the eighteenth century, is decorated by the greatest of the Wessobrunn stuccoists Feichtmayr and Übelherr. The library, however, is nothing special. On the other side of Linz is situated the famous St. Florian, a house of Augustinian Canons, with a library of 1744-50 in a noble imperial style.

The abbey of Kremsmünster, higher up in the hills, has a dignified library very different from those exuberant rooms of Metten and Waldsassen. Bookshelves, cupboards, stucco-work and paintings all date from the last years of the seventeenth century, earlier than is than anything else we have looked at so far. Here

everything is still under the spell of the famous Vaticana.

A speciality of those Austrian and South German monasteries which hold their secular powers direct from the Emperor, was a wing erected and furnished for the use of the Imperial family. Even the princesses were allowed into the otherwise inaccessible parts of the monasteries to which the library usually belonged. I have, however, not been able to find any evidence that the female members of the Hapsburg family have ever availed themselves of this opportunity; and it is not likely that they could, as they were kept in strict seclusion at this severely formal, half-Spanish court. The libraries of Austrian monasteries are often placed in the wing which corresponds to the Imperial Wing. This is the case for instance at St. Florian and at Melk. Melk (by Jacob Prandtauer) is perhaps the grandest of all, spacious and dignified, with caryatides supporting the galleries and *amorette* holding the coat of arms of the Abbot. The statues to the left and right of the doors represent the Four Faculties.

Further down the Danube Göttweig greets us, and then Klosterneuburg, now hardly more than a suburb of Vienna. Neither of the two has a specially remarkable library, and the crowning glory of Austrian libraries, Fischer von Erlach's Hofbibliothek at Vienna, is secular and not clerical.

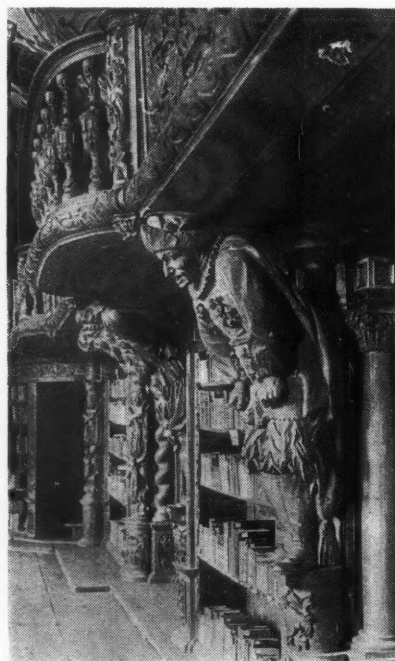
To complete our tour of monastic libraries we have now to leave the river highway and branch off into three valleys, two south of the Danube, and one north.

Seitenstetten, not far from Steyr and Kremsmünster, has a library of 1741, reticent in its decoration and with a large ceiling painted by Troger. The eight putti represent the four faculties. The warm brown and gold blend exquisitely with the vellum backs of the books. Much farther away, right up in the hills of Steiermark, lies Vorau with its Augustinian house. The *piquant* contrast of thin bandwork stucco of about 1730 with sumptuous bookcases of 1767 dominates the effect of an otherwise modest library. The *rocaille* is of exceptional vigour.

Finally, in the so-called Waldviertel (Forests-Quarter) of Lower Austria there is the Benedictine Abbey of Altenburg. Josef Munggen-

ast's Library has the size and the splendour of a banqueting hall. It is nearly 150 feet long and reached by means of a two-armed staircase with stucco caryatides. The library itself has giant columns, an inextricable wealth of small-scale Rococo ornament and plenty of allegories in paint and stucco. Two sphinxes—a little confusing one may assume to some of the tonsured readers—and two leaping horses are particularly prominent. What is their meaning? I have not been able to find out. Iconography of these monastic libraries is a specialized study. Arts and Sciences appear, the Alliance of Religion and Philosophy, Virtues and Vices, Hercules, Chronos, Fama—a pageant of Christian and Pagan love, as it ought to be in rooms in which Christian and pagan traditions are blended with so much confidence—a confidence sometimes the outcome of naivety and sometimes of scepticism, sometimes of ignorance, and sometimes of enlightenment.

Detail of the realistically modelled figures painted by Troger and Zeiler, above the main cornice in the library at Altenburg, 1742.



Detail of the carved caryatid figures by Stülp, supporting the gallery in the library at Waldsassen, 1724. Additional photographs on page 260.



M E T T E N

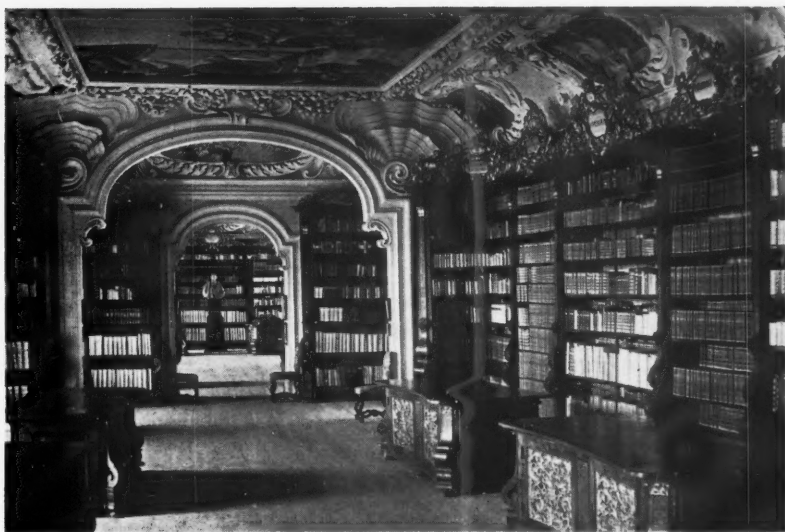
Metten in Bavaria, between Regensburg and Passau, is one of the earliest of the highly decorated baroque monastic libraries. The church dates from 1720-29; the decoration of the library shown on this page, including the caryatid figures swirling with movement, is of the same date, but its structure goes back to 1628-45.



W A L D S A S S E N

The library at Waldsassen, a former Cistercian abbey in a remote corner of Bavaria, north of Regensburg, was decorated in 1724. The principal artists responsible were Appiani for the plasterwork, Hofreiter for the paintings, Stilp for the caryatides and Witt for the cabinet-work.





KREMSMÜNSTER

Kremsmünster was one of the most famous abbeys in Upper Austria. It was founded in 777, and new buildings were begun on a vast scale about 1690. The library, which consists of three large rooms, is a very early interior, certainly before 1700.

ST. FLORIAN

The rebuilding of St. Florian in Upper Austria was begun in 1686. The library, left below, dating from 1744-50, was designed partially by J. Prandtauer. The paintings are by Altomonte and the furnishings by J. C. Jegg. Melk, in Lower Austria, was rebuilt in 1702-36 by the same architect as St. Florian.

MELK

The magnificent library, right, was painted by Paul Troger in 1731-32. The figures beside the doors, by Josef Pöbl, represent the academic faculties: art, law, medicine and divinity.





VORAU

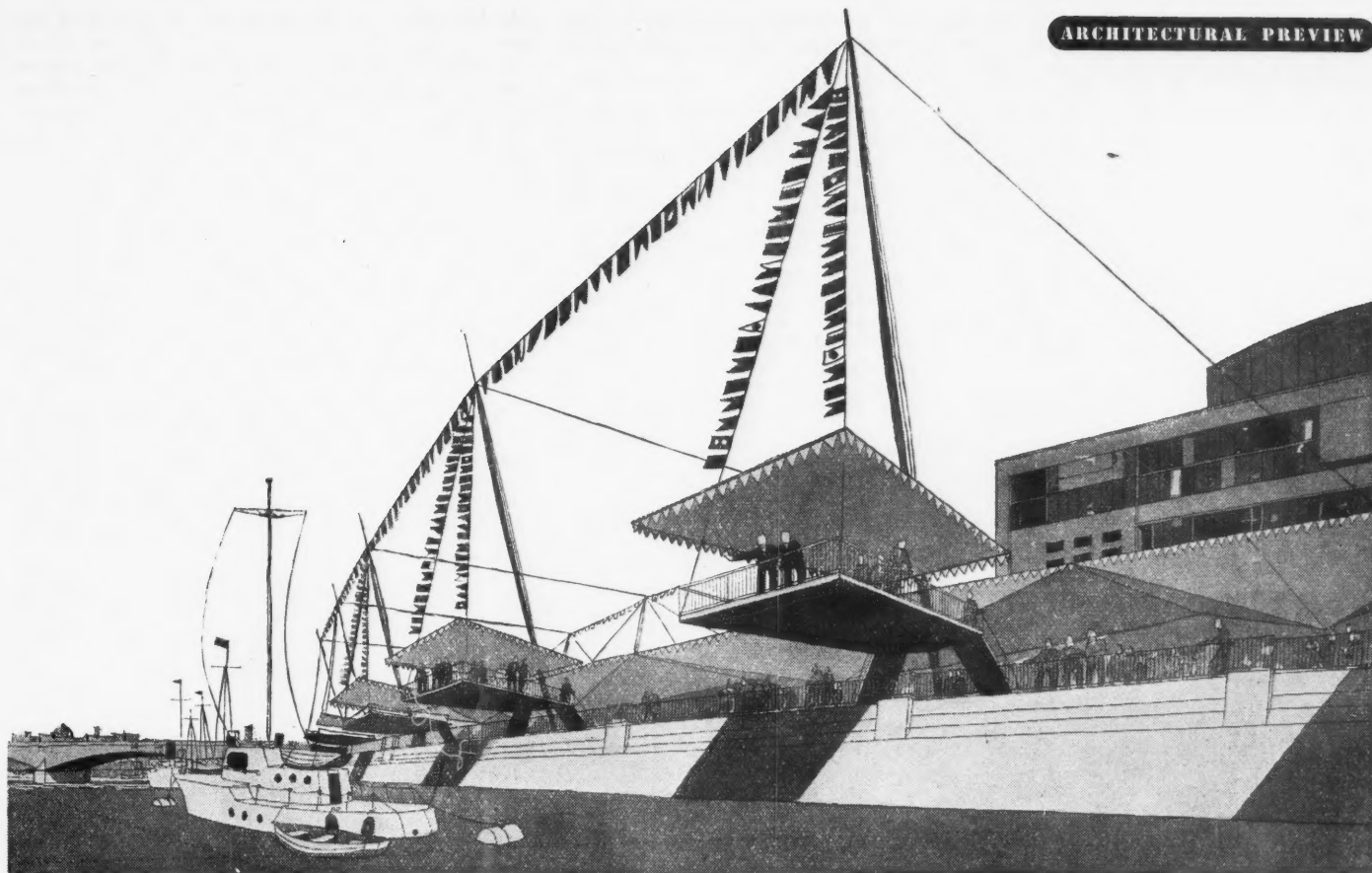
Vorau in Styria is the only monastery illustrated here which is distant from the Danube basin. The library dates from about 1731 and has plasterwork by J. M. Bistoli. The cabinet-work is obviously later; the date of the bookcases is 1767.



ALTENBURG

Altenburg in Lower Austria was rebuilt in the seventeenth century and again, more drastically, in 1725-42. The library is probably more grandiose than any other in Austria. It rises through two storeys and is about 145 feet long. The frescoes are by Troger and J. Zeiler and the plasterwork by J. M. Flor, 1742.





A. From the river, looking towards Waterloo Bridge, with the Concert Hall in the right background.

1951 SOUTH BANK EXHIBITION

The perspective drawings on the following pages are designed to give a general picture of the exhibition as it will appear to the visitor strolling about the grounds. Nearly all the thirty or so buildings occur in the foreground or background of one or other of the drawings, which are accompanied by sketch plans on which the view-points are marked. Many of the details are only provisional, but the design of the whole exhibition is now sufficiently advanced for a fairly complete impression of its appearance to be given. The information has been taken from the architects' own working drawings from which the various buildings are now being constructed.

The site of the exhibition is just over 27 acres, including the ground now being reclaimed from the river. It stretches along the south bank of the Thames from County Hall to Waterloo Bridge. Hungerford railway bridge, therefore, cuts across it at a high level. All the existing buildings on the site (mostly derelict industrial buildings) are being cleared away with the exception of the old shot-tower, a 150-foot-high brick structure like a lighthouse, which is being incorporated in the exhibition. It will probably have to disappear later as it is on the site reserved for the proposed national theatre, which is to be erected just west of Waterloo Bridge some time after 1951.

The exhibition buildings will all be temporary, but the south bank site also includes the London County Council's new concert hall, now building. This is to be ready for use by May 1951, the time of the opening of the exhibition, and it therefore forms part of the exhibition layout. The theme of the exhibition is the British contribution to civilization, which is here regarded as the product of two forces: the initiative of the people of Britain and the resources of their land. Two sequences of buildings, one upstream of Hungerford Bridge and one downstream, house exhibits illustrating these two

subdivisions of the theme: upstream—the land; downstream—the people.

There are about thirty buildings altogether (see layout plan on the next page) including a number of restaurants and administrative buildings, and there is also a quantity of outdoor display. Each building is designed by a different architect or group of architects, but the whole is co-ordinated and supervised by a Design Group of five, who have also been responsible for the layout of the site. This group of designers consists of Hugh Casson (Director of Architecture for the Festival), Misha Black, James Gardner, James Holland and Ralph Tubbs. The consulting engineers are Freeman, Fox and Partners.

The first view, A above, is taken from outside the exhibition, looking along the riverside promenade from river level. Waterloo Bridge can be seen in the distance. It shows the Seaside Section (architects, Eric Brown and Peter Chamberlin). This section, part of the downstream sequence, lies across the front of the LCC concert hall (in the background on the right) and is treated in an open manner so as not to form a barrier between the concert hall terraces and the river view. Six tubular steel masts about 65 feet high overhang the

river, carrying a canvas velarium at the rear, and supporting small covered viewing points suspended above the water.

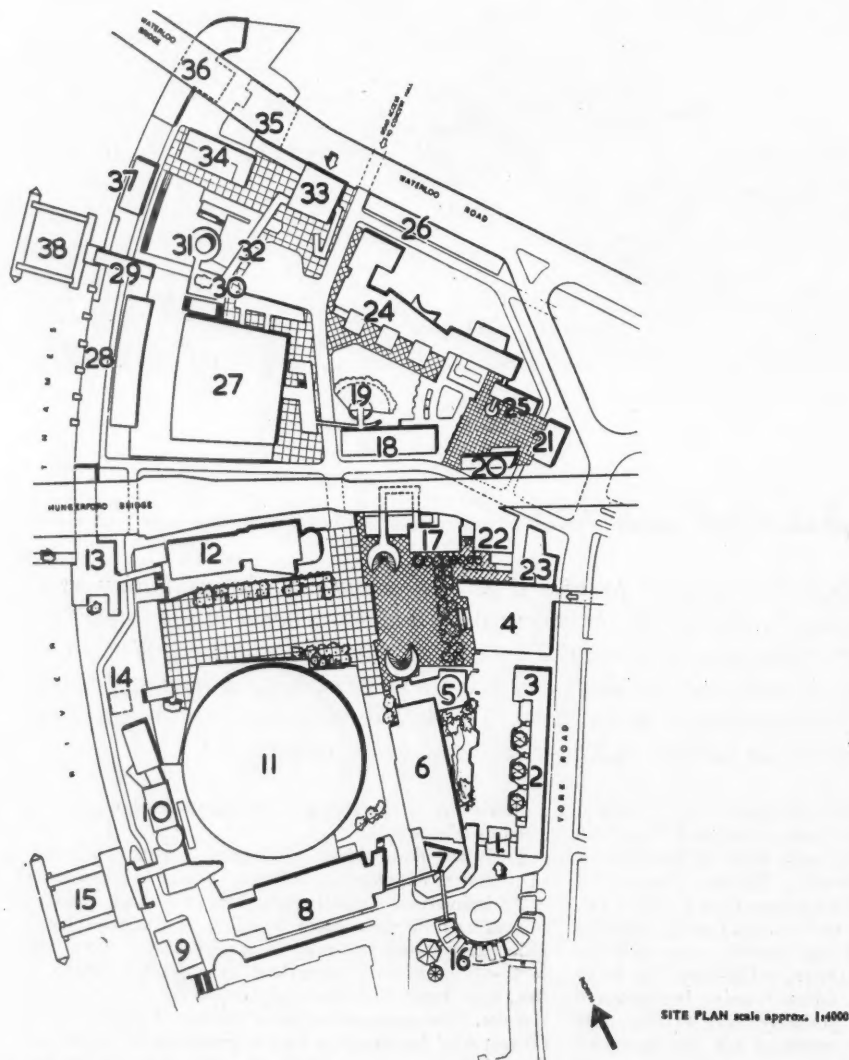
There will be five public entrances to the exhibition: from Waterloo Bridge at high level; from Waterloo Station, by means of a footbridge over York Road and an escalator leading direct into the grounds from the Underground; from Chicheley Street; by water to two specially constructed landing stages; and direct from the north bank of the river by means of a Bailey Bridge, 30 yards upstream from Hungerford Bridge.

The second view, B (facing page, top) shows the main street-level entrance from Chicheley Street at the south-west corner behind County Hall. For the convenience of

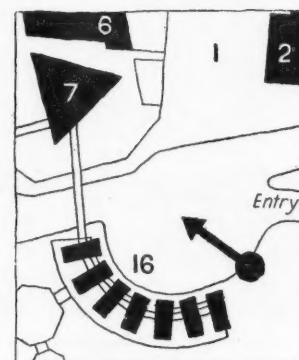
wheeled traffic, a turning courtyard off York Road has been provided. On the left can be seen the curved Administration Building. The ground floor has a wide corridor on the public side, behind which are offices looking on to a small garden. The first floor consists of a series of boxes suspended from steel bipods, and connected by corridors in the form of enclosed bridges. A light aluminium bridge connects this block with the towering tetrahedron which houses the Raw Materials display. This is lit from the top, is built of reinforced concrete and is clad with coal-faced precast concrete blocks. It stands on a grass-covered podium. On the right of the drawing are the entrance turnstiles beneath a canopy. The designers of all these buildings are the Architects' Co-operative Partnership (Ove Arup and Partners, consultant engineers).

After passing through the Chicheley Street turnstiles, the visitor enters the first courtyard, shown in the lower view, C, on the facing page. On the left is the Agricultural Pavilion (architect, Brian O'Rourke), separated from the courtyard by an informal garden and entered eventually through the romantically composed feature at the far

1951 SOUTH BANK EXHIBITION

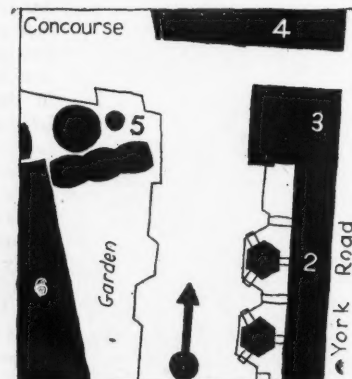


- Key
1. Chicheley Street entrance. Architects' Co-operative Partnership.
 2. Information, Post Office, etc. Architects' Co-operative Partnership.
 3. Restaurant. Architects' Co-operative Partnership.
 4. Entrance from Waterloo Station. Gordon Tait (Sir John Burnet, Tait & Partners).
 5. The Land of Britain. H. T. Cadbury-Brown.
 6. Agriculture. Brian O'Rourke.
 7. Natural Resources. Architects' Co-operative Partnership.
 8. Industry. S. Grenfell Baines and H. Reilenberg.
 9. Restaurant. Leonard Mansueti.
 10. Sea and Ships. Basil Spence and Partners.
 11. Domes of Discovery. Ralph Tubbs.
 12. Transport. Arcon.
 13. Restaurant and entrance from Bailey Bridge. Misha Black and Alexander Gibson.
 14. Vertical Feature. Powell and Moya.
 15. Pier. Basil Spence and Partners.
 16. Administration Building. Architects' Co-operative Partnership.
 17. The People of Britain. H. T. Cadbury-Brown.
 18. Character and Tradition. R. Y. Goodden and R. D. Russell.
 19. Cafe. R. Y. Goodden and R. D. Russell.
 20. Film and Television. Wells Costes.
 21. Telecinema. Wells Costes.
 22. Locomotive Exhibit. H. T. Cadbury-Brown.
 23. Administration. Gordon Tait.
 24. Homes and Gardens. Bronek Katz and R. Vaughan.
 25. Introduction to Homes and Gardens. Denis Clarke Hall. Courtyard. Hugh Casson.
 26. Administration and Stores. Edward Mills.
 27. LCC Concert Hall. Robert Matthew and J. L. Martin.
 28. Seaside. Eric Brown and Peter Chamberlin.
 29. Restaurant. Eric Brown and Peter Chamberlin.
 30. 1851 Pavilion. James Gardner.
 31. The Shot Tower. Hugh Casson and James Gardner.
 32. Bridge to LCC Concert Hall. Maxwell Fry and Jane Drew.
 33. Entrance from Waterloo Bridge. New Schools Exhibit below. Maxwell Fry and Jane Drew.
 34. Cafe. Maxwell Fry and Jane Drew.
 35. Health. Existing Vault.
 36. Restaurant. Maxwell Fry and Jane Drew.
 37. Sport. Gordon Bowyer and Ursula Meyer.
 38. Pier. Eric Brown and Peter Chamberlin.

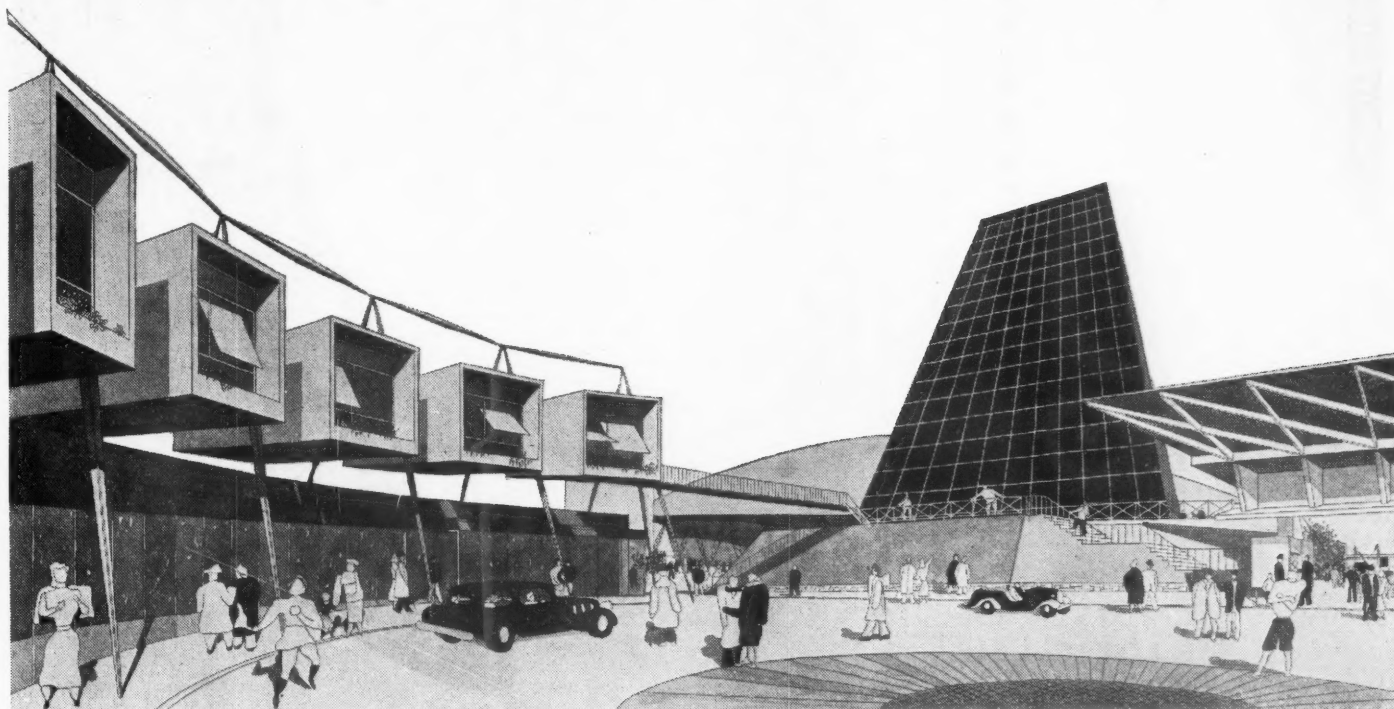


Plan of view B

end (architect, H. T. Cadbury-Brown), which houses the Origins of the Land section. The centre part of the Agricultural Pavilion consists of a 60-foot span open Dutch barn, with flat-roofed two-storey buildings at either end. These are enclosed with walls of natural stone and other materials typical of farm buildings. A glazed gallery runs the length of the first floor. On the ground floor are stock pens and displays of agricultural machinery. On the right of the picture is a series of information offices, cloakrooms, etc., and a post office, entered through free-standing kiosks standing in pools of water and backed by the main perimeter screen built of steel scaffold tubes and canvas (designers, Architects' Co-operative Partnership). Closing the vista at the far end of this courtyard are one of the restaurants and the Waterloo Station two-level approach (architect, Gordon Tait, of Sir John Burnet, Tait and Partners). The landscape consultant for this area is Peter Youngman.



Plan of view C

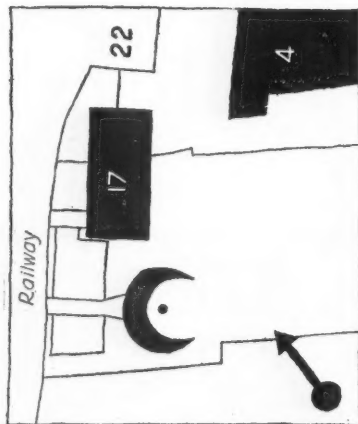


B. At the south-west (Chicheley Street) entrance; the Administration Building on the left and the Raw Materials Section in the centre.

C. The first courtyard, looking east; on the left the Agricultural Pavilion, on the right information kiosks and the main perimeter screen, and in the distance the two-level approach from Waterloo Station.



1951 SOUTH BANK EXHIBITION



Plan of view D

The Dome of Discovery and the river front are hidden to the left, enhancing the sudden visual drama when they come into view as the visitor turns the corner at the end.

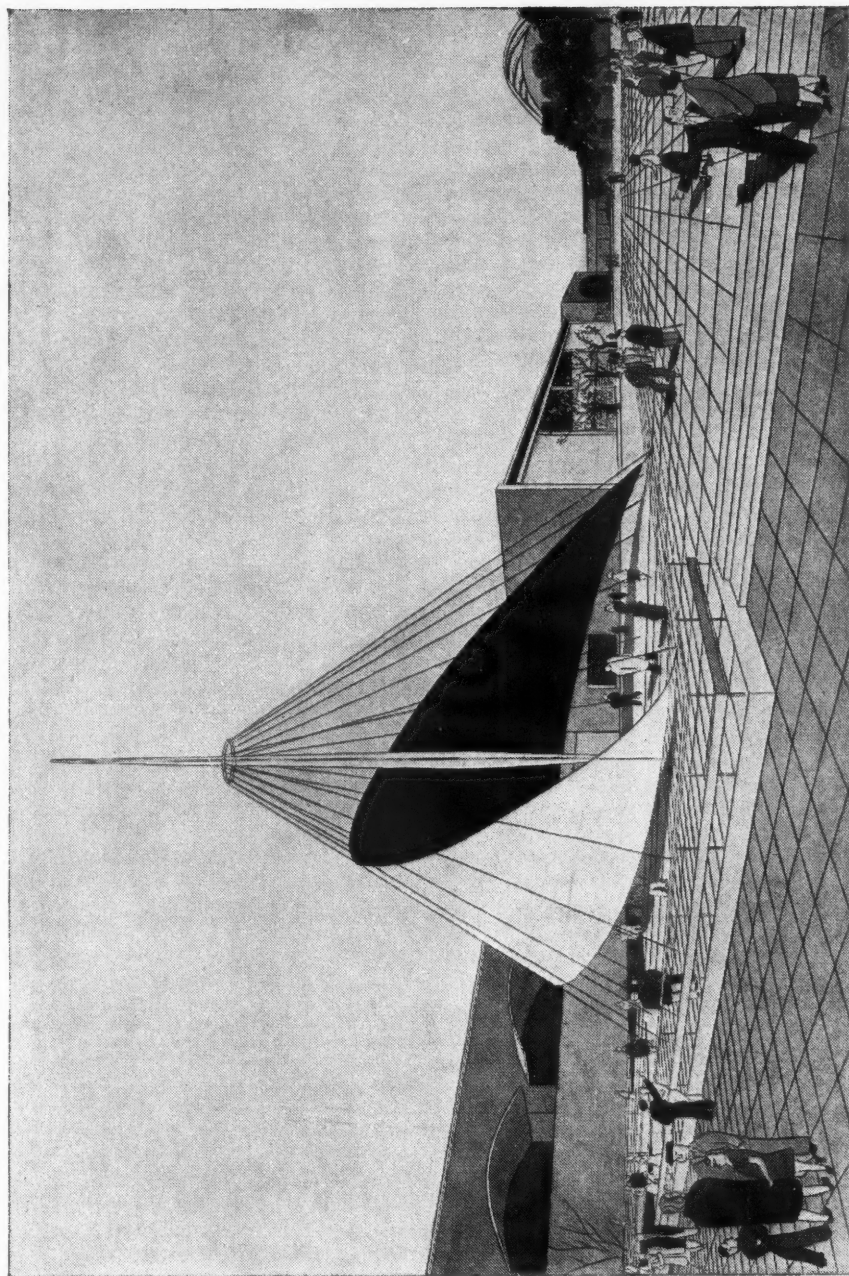
When he has done so he finds himself at one end of the main concourse of the exhibition, running at right angles to the river, shown on this and the facing page (architect, H. T. Cadbury-Brown; landscape architect, H. F. Clark). It measures approximately 400 feet long by 150 feet wide and is sunk slightly below the surrounding levels. It is formally planned, and laid out approximately on the main viewing axis between the Waterloo two-level entrance structure and the river frontage. The concourse is the starting-point for both sequences of buildings—the downstream and the upstream sequence. In each sequence there will be a logical development of the theme from one building to the next. All sections, however, will be complete in themselves, and visitors will be free to see them in any order they wish.

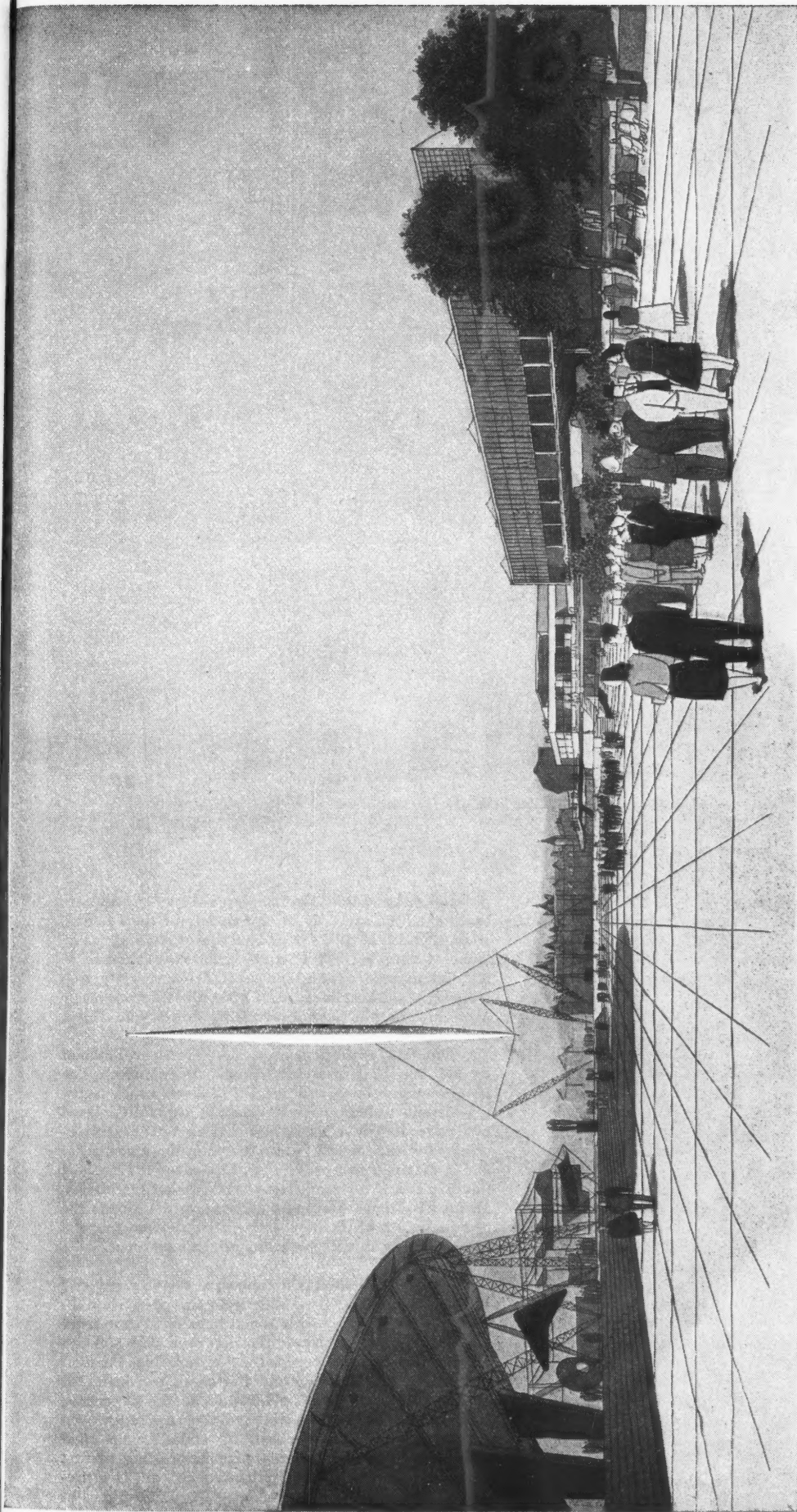
The two sequences are entered from either side of the main concourse through two shaped aluminium cones, serving as porticoes. The cone in the view on the right, D, looking down the concourse away from the river, leads to the section entitled the Origins of the People (architect, H. T. Cadbury-Brown), a precise and careful building, with an emphasis on the juxtaposition of simple planes and contrasting textures. Behind the screen of trees at the back on the right can be seen once more the building (architect, Gordon Tait, of Sir John Burnet, Tait and Partners), designed to house the two-level entrance from Waterloo main and underground stations. Above this two-floor structure is a curved roof suspended from five timber parabolic arches of laminated construction. On the left of the picture can be seen the arches of Hungerford Bridge.

On the facing page is a view, E, looking down the main concourse of the exhibition in the other direction, towards the river. On the left is the Dome of Discovery (architect, Ralph Tubbs) standing upon a severely classical stepped podium, across which it will throw its huge circulating shadow throughout the day. Under this dome, which is the principal building in the upstream sequence, will be told the story of British achievements in exploration and scientific research. It is without windows and has a diameter of 365 feet and a maximum height of 97 feet. It is sheathed in aluminium and supported on sloping latticed steel struts. The struts form equilateral triangles and are pin-jointed top and bottom to allow for expansion. Within the dome are three platforms from which visitors will look down on the exhibits below. The highest is 35 feet, supported on reinforced concrete fins. The other two are respectively 12 and 22 feet high, supported on the steel framework. There is an escalator up to the 35-foot platform.

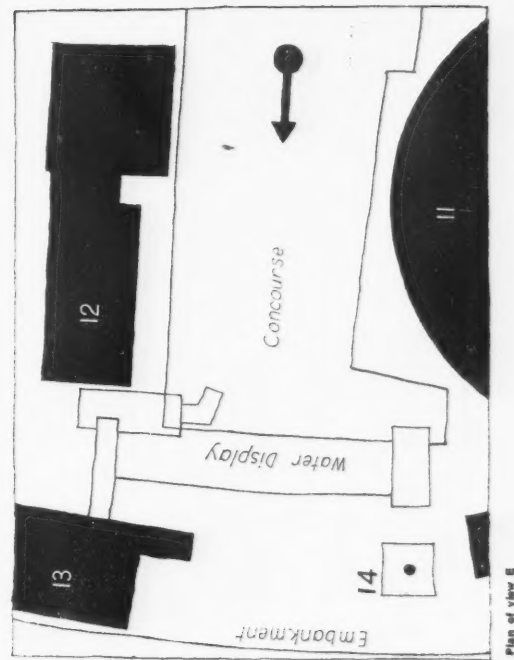
On the left in the distance, between the dome and the Vertical Feature, can be seen the sculpture by Barbara Hepworth. It will be nearly 10 feet high on a 7-foot

D. Looking up the main concourse away from the river; in the foreground the entrance to the Origins of the People.

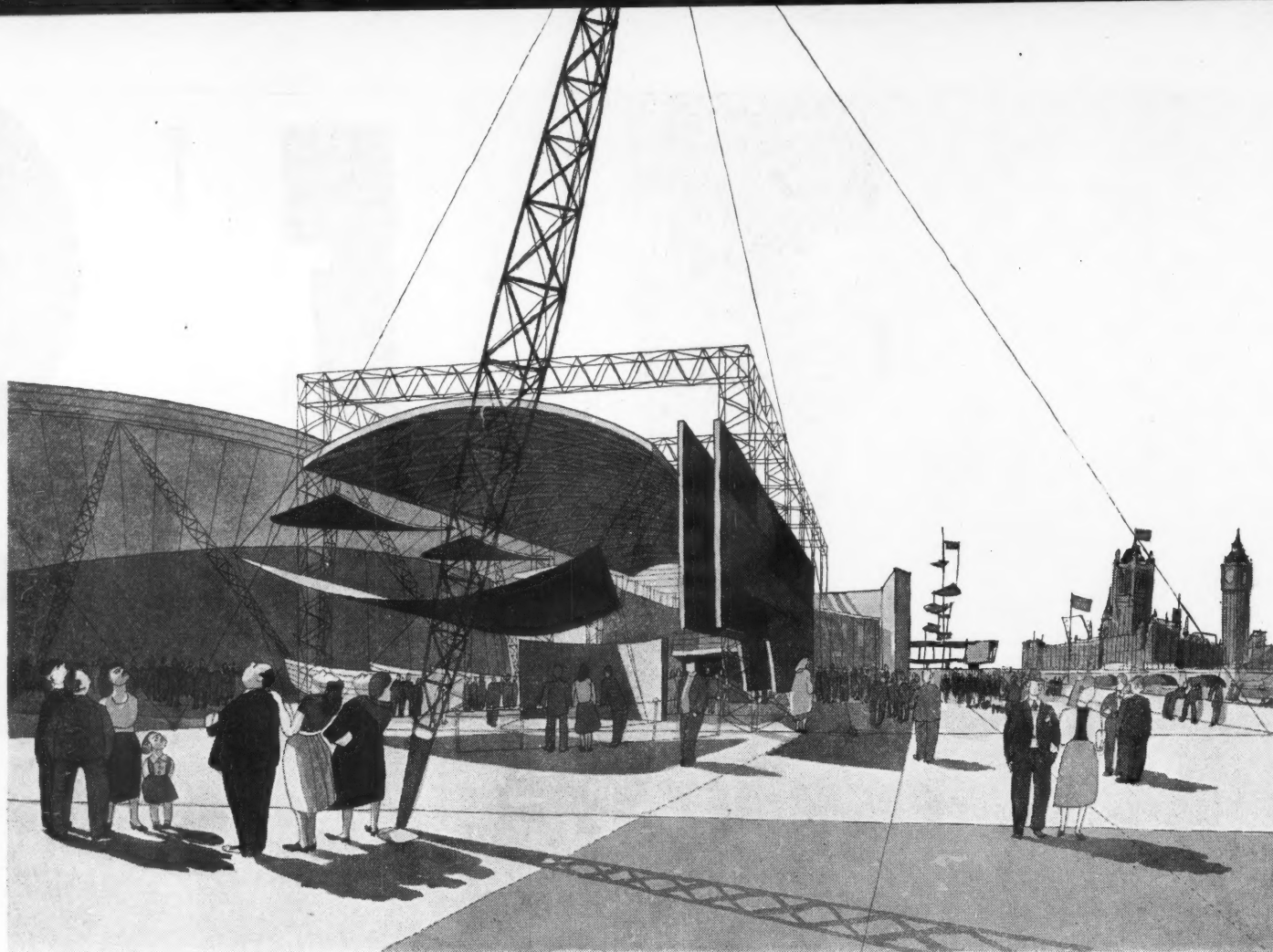




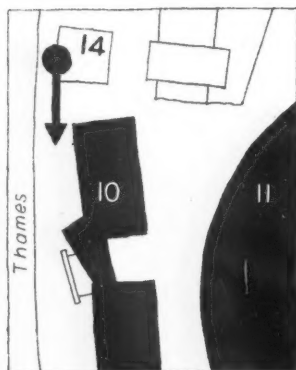
E. Looking down the main concourse towards the river; on the left the Dome of Discovery, on the right the Transport Pavilion, in the centre the Vertical Feature.



Plan of View E



F. River front of the upstream section, looking towards Westminster; on the left the Sea and Ships Pavilion.

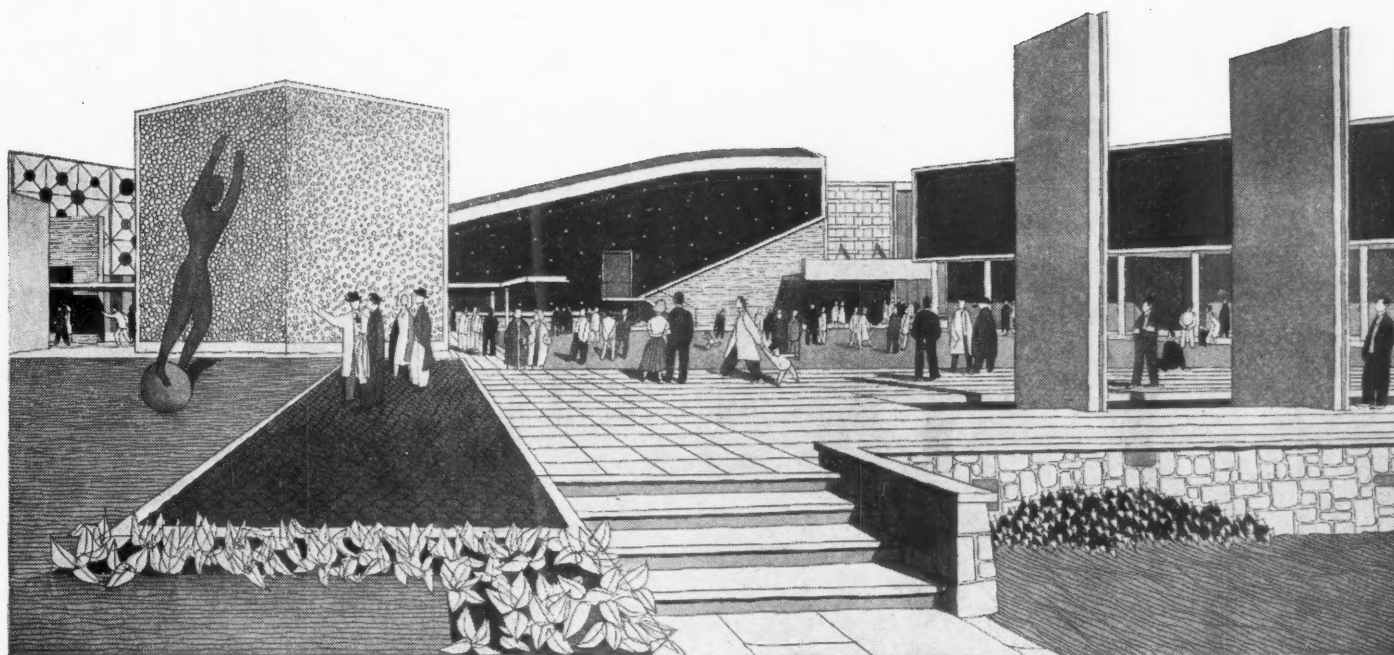


Plan of view F

pedestal and is one of the four large works of sculpture that have been specially commissioned for the Festival. Alongside it, at the far end of the concourse, is the 250-foot-high Vertical Feature, a lattice-work tube in aluminium, tapered at both ends, its lower tip resting on a cradle of steel cables. It will be illuminated from inside at night, and has been designed by Powell and Moya, the winners of an open competition.

On the right of the concourse is the Transport Pavilion by ARCON (F. J. Samuely, consultant engineer). The ground floor is open and laid out to display such heavy exhibits as railway engines. Behind the fully glazed upper facade will be seen suspended aircraft. The river-side end of the fairway is terminated by a water display and by the main river promenade. Linked to the Transport Pavilion is a two-storey riverside restaurant (architects, Misha Black and Alexander Gibson), which forms the terminal point of the new Bailey Bridge connecting the exhibition site to the north Thames embankment.

Walking down the main concourse to the river, and turning to the left, the visitor gets the open view, F, shown on this page, with the towers of Westminster visible in the distance above the river wall. The building in the centre of the picture is the Sea and Ships Pavilion (architects, Basil Spence and Partners), consisting of 40-foot-high lattice-type steel frames, at 20-foot centres, forming an open grid into which displays are interwoven on various levels, approached by stairs, ramps and gangways. Extending from the main building at first floor level, as far as the embankment wall, is a pre-stressed concrete bridge, T-shaped in plan, serving as



G. The Television Courtyard, at the far end of which is the Telecinema; on the right the Television Pavilion with the Great Britons feature in front of it.

a display area for marine engines and providing a viewing platform overlooking the arrival landing stage. The river elevation of the building will carry a 40-foot-square relief sculpture by Siegfried Charoux, and in front of it, on the river edge, will be a mobile water-display feature in the shape of a 45-foot mast carrying vanes and vessels of abstract form, which activate and are activated by water gushing from the top. The paint finishes on the Sea and Ships Pavilion will show broad areas of pure strong colour.

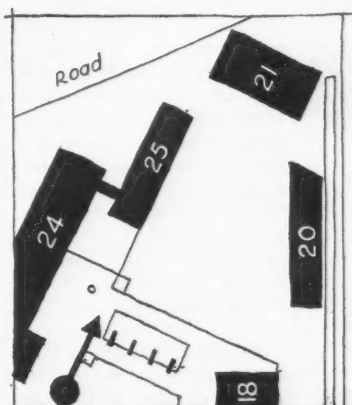
The raking strut in the foreground of the same picture is one of the supports of the Vertical Feature (see previous page) at which the group of visitors on the left is gazing. Beyond them is, once again, the swinging arc of the Dome of Discovery, with which the Vertical Feature is designed to compose.

Turning the other way, and passing beneath Hungerford Bridge, the visitor can now make for the downstream sequence of buildings. The river front of this area, lying between Hungerford and Waterloo Bridges, is occupied by the Seaside Section (which was shown in the view from the river, A, at the top of the first page) and the sport section, with another riverside restaurant between. Behind the Seaside Section is the LCC concert hall and behind that still, at the back of the downstream half of the site, is the television courtyard, the subject of the picture, G, above. This is a view looking along the paved pathway leading from the direction of the concert hall. Out of the picture, on the left, is the Homes and Gardens Pavilion, a series of light structures made out of Dutch barn units and tubular

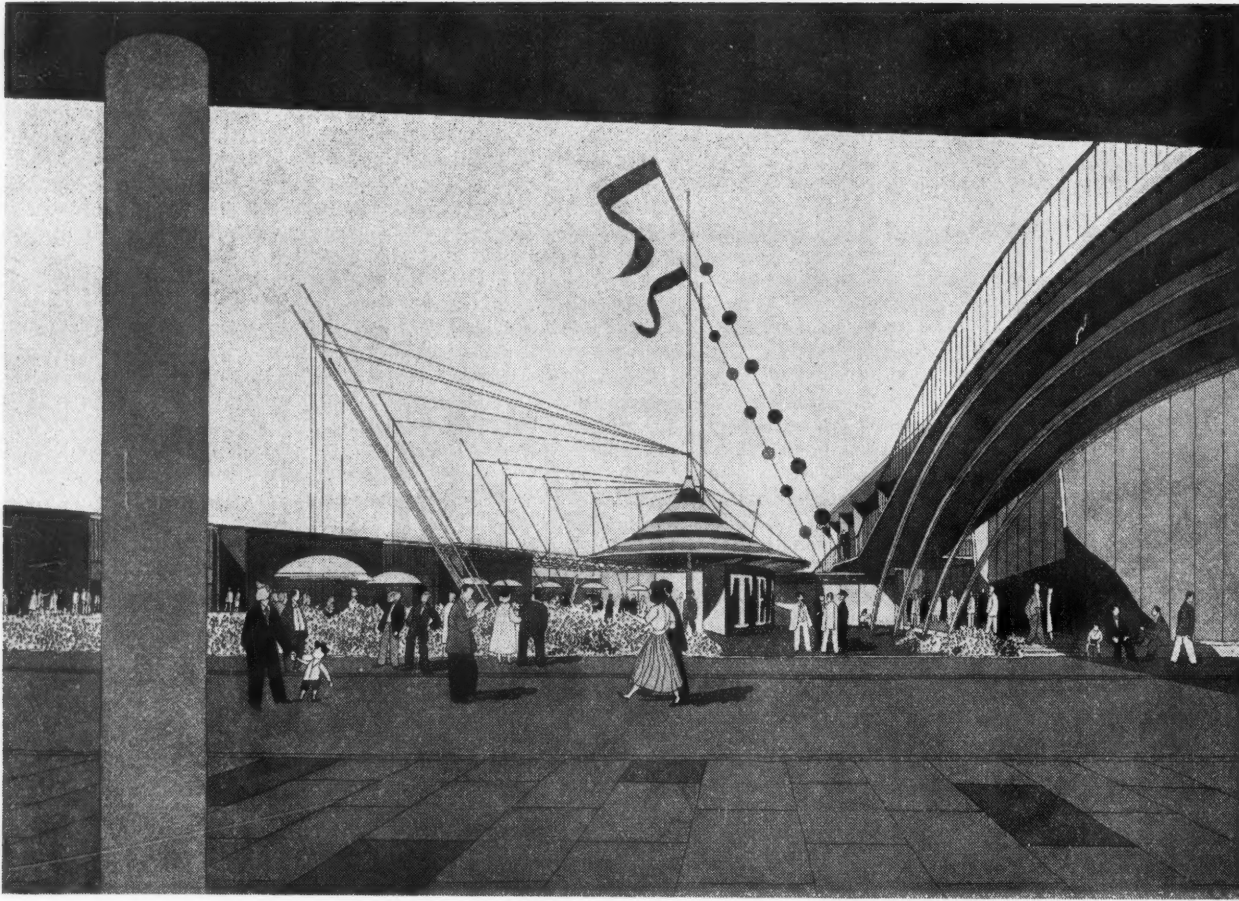
scaffolding (architects, Bronek Katz and R. Vaughan), which provides the background to another of the specially commissioned works of sculpture, that by Jacob Epstein.

Beyond the statue can be seen the flint-faced end wall of the Introductory Pavilion (architect, Denis Clarke Hall), which links the Homes and Gardens Pavilion to the Telecinema (architect, Wells Coates). The latter, closing the vista at the far end, is a reinforced concrete building. The side wall seen in the picture will have a quilted surface, resulting from the method of fixing the surface finish so as to dissociate it from the structure and provide sound insulation. The two pylons on the right of the picture, standing in reflecting water, carry symbolic representations of great Britons (architects, Goodden and Russell). They form an open link between the paved courtyard and the forecourt gardens, and through them can be seen the two-storey Television Pavilion (architect, Wells Coates), which screens the downstream elevation of Hungerford Bridge. Half the ground floor of this reinforced concrete structure is left open to provide a public way through from one half of the exhibition to the other.

The permanent concert hall



Plan of view G



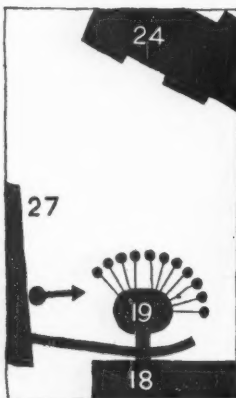
H. The tented restaurant in the downstream section, seen from the Concert Hall; on the right the fly-over bridge.

(designed by the LCC architects, Robert Matthew and J. L. Martin) is the dominating element in the downstream area and the exhibition buildings of the downstream section are grouped round it. It is linked at high level with the southern part of this section, illustrated on the previous page, by a light arched bridge, part of which can be seen in the view above, H. It spans Belvedere Road, the main traffic artery of the site. This view is taken from under the shelter of the concert hall itself, one of the concrete columns of which is seen on the left. The bridge (architects, Robert Goodden and R. D. Russell), of laminated timber, is on the right, and on the other side of

the road is the tented restaurant, by the same architects. It consists basically of a marquee slung from two 70-foot-high masts carrying pendant umbrellas and awnings in brightly coloured canvas. This restaurant is screened from passing traffic by thick planting. The landscape consultant for this part of the site is Peter Shephard.

Alongside the concert hall, in the centre of the downstream section, is the old shot-tower which is to carry

a beacon and radar apparatus. The base of the interior is to be used for an exhibit commemorating the Great Exhibition of 1851. The sketch below shows the treatment of the area round the tower (architect, Hugh Casson), which is being simply laid out with paving, planting and decorative water. In the background is the Waterloo Road High Level Entrance (architects, Maxwell Fry and Jane Drew). The shot-tower itself will be entered at first floor level, from which visitors will pass into the adjoining tank-house and thence descend to the main ground level of the riverside promenade.



Plan of view H



The base of the Shot Tower, looking east, with the Waterloo Road High Level Entrance in the distance.



POPULAR ART

SLATE ENGRAVERS IN THE MIDLANDS

The work of the Cornish engravers has already been described,¹ but that of the craftsmen of Leicestershire and Nottinghamshire who, as John Piper says, 'produced the most delicate and inventive slate-engraving of all,' is less well known. The purpose of this note is to illustrate some of the more interesting examples, but more particularly to attach these memorials to the men who made them, and to comment on the growth of a new craft. This is possible because after about 1730 the stones are signed, and the engravers' output and development can be observed. Swithland slate from the Charnwood Forest area of Leicestershire, already in widespread use for roofing, and also for firebacks, hearth slabs and the like, began



At Kinoulton, one of three by the same hand, all dated 1701-3.

to be used for headstones in the neighbourhood of the quarries in the last quarter of the seventeenth century. From 1700 onwards it was in considerable demand in south Nottinghamshire; craftsmen living up to twenty miles from the quarries used no other material, and isolated examples in Derbyshire and mid-Lincolnshire show that the masons who habitually worked in millstone grit or limestone occasionally used it. Not only did the fashion for headstones, presumably a response to a rising standard of living, develop rapidly; the demand was met from the first by crafts-

men whose output shows that this was their main, if not their only, occupation. How and whence they were recruited, and how they made their products known over half a county, we cannot tell. It was originally a rural craft, and not an urban; not until the last twenty years of the



Upper left-hand corner of a headstone at Clifton, by William Haywood. Though dated 1738, it still has the asymmetrical layout taken over from the scriveners, such as Baskerville.

eighteenth century could craftsmen in Nottingham, Newark and Grantham, getting their raw material no doubt by canal, invade the rural market.

The rural origin of the craft can be seen in the churchyards of the Vale of Belvoir, where there are some 200 examples. They are unsigned, but judging from the style and distribution of these archaic monuments, some 150 of them were produced by two craftsmen living at Hickling or a nearby village. The style probably comes directly from the adjacent area to the south-east, where masons were working in Ketton stone,² and it is backed by the tradition of seventeenth century wood carving. The style endures for sixty years without any development, and then vanishes abruptly and completely.

Apart from this isolated school, the Nottinghamshire engravers grasped instantly the limitations and affinities of their material, and went to the scriveners for their models,³ in lettering, in ornament, and even in layout. There is little carving,

² See F. Burgess in *Monumental Journal*, May, 1948, pp. 237-8.



Incised angel from headstone at Radcliffe-on-Trent, 1731, by an unknown craftsman from Bingham. This form of spandrel decoration lingered on till the 1760's.

and right to the end of the eighteenth century an angel's head, or a winged hour-glass, executed in unbroken flourishes, is considered an apt way of filling a spandrel or making a tail-piece. At a superficial glance, the limitations imposed by the material seem narrow, but examination of



At Wilford: the work of J. Radcliff, a woodcarver from Nottingham.

many headstones reveals an astonishing variety and vitality of fancy, which is responsive to national changes in fashion, but absorbs them and is never merely recipient of them.

After about 1785 the influence of the scrivener is displaced by that of the jobbing printer, whose fat face and ornamented face types were, as in Cornwall, widely adopted. This is part of the growing urban domination; what had been a monopoly of full-time rural craftsmen becomes a sideline of builders. Already in 1778 William Stretton, a Nottingham builder, advertised in the *Nottingham Journal* 'a curious Assortment of Marble, from most Parts of the known World' and 'Mansfield Stone or

³ Baskerville, who before becoming a type-founder was a writing master and engraver of epitaphs, illustrates this connection in the Birmingham area. A slate engraved by him with 'Grave Stones Cut in any of the Hands by John Baskervill Writing Master,' dated about 1735, and illustrating his gothic, roman and italic styles of lettering, is in the Birmingham Public Library.

¹ In *THE ARCHITECTURAL REVIEW*, April, 1944, pp. 99-105.



At Lowdham, an example of James Sparrow's classical style of lettering.

Swithland Slate Tombs or Headstones executed in a superior manner.' The products of the urban masons were at first elegant, but were monotonous in design and rather anæmic in execution; after 1820 or so they were bare and mechanical. Nottinghamshire, less isolated and self-contained than Cornwall, was the less able to resist the current of industrial and social change, and Stretton's advertisement must be the earliest description of the modern cemetery.

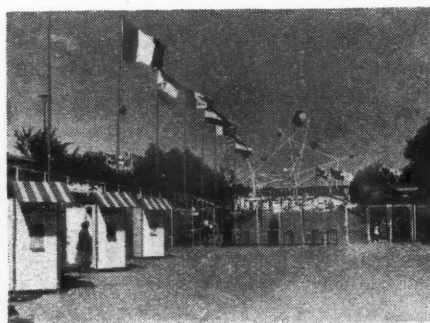
M. W. Barley

DECORATION

STOCKHOLM SPORTS EXHIBITION

Two illustrations of the 1949 Stockholm World Sports Exhibition were published last month as a good example of the way exhibitions can serve as a nursery for new architectural ideas. Since they are temporary, the designer need not be afraid of rash experiments; they even gain by having a somewhat makeshift character, and they can afford to be light-hearted and witty in

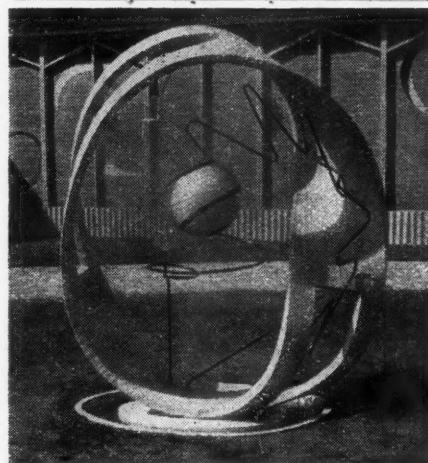
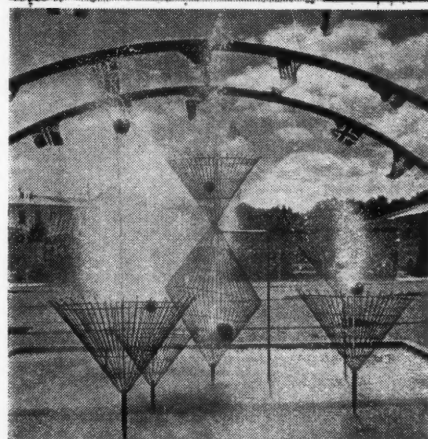
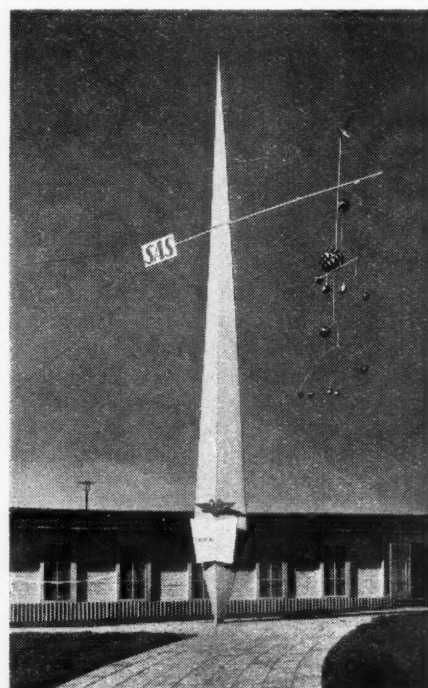
a way which might become tedious elsewhere. Herewith are some details of the exhibition (Bengt Gate, architect) showing how the light-hearted effect was obtained on this occasion with the utmost economy by the enterprising collaboration of the architect with some of the younger Swedish abstract painters and sculptors.



The site is the same as the famous Stockholm Exhibition of 1930. The buildings were wholly constructed of existing prefabricated material, re-used from previous exhibitions. Little attempt was made to give visual interest to the buildings themselves; instead they were treated

as a non-committal background to a series of three-dimensional decorations that were gay, eye-catching and frankly ephemeral.

The main entrance strikes this note at once: the ticket kiosks have gaily striped canvas roofs, and from these the eye is led, by way of an avenue of flags, to a con-



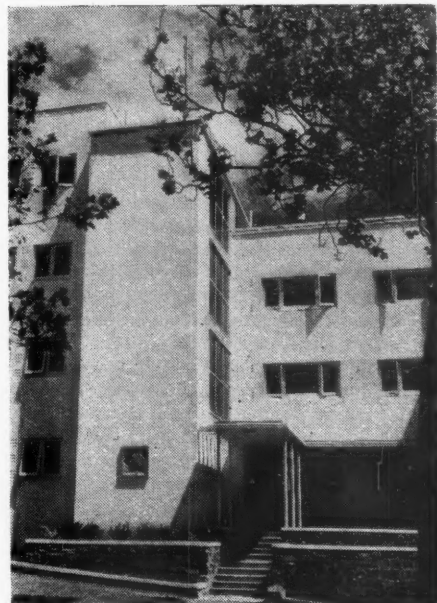
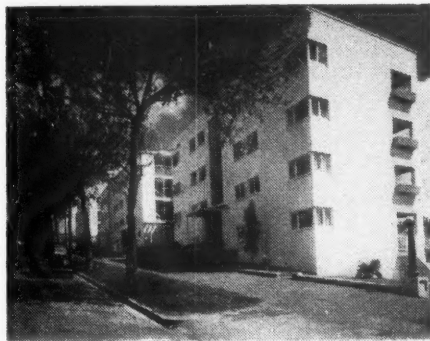
struction over the turnstiles of metal tubing and coloured balls. Inside the grounds are many similar constructions, using not only static geometrical elements but moving objects, fountains and running water. The obelisk with mobile arms is by Anders Beckman and Lars Brandberg. The fountain, formed of a series of inverted wire cones in which balls are kept rising and falling on the jets of water, is by the architect of the exhibition. The spherical sculpture, enclosing a ball supported on a rigid scribble of wire and enlivened by running water, is by Arne Jones.

Flags have long been the traditional way of adorning architecture with spots of bright colour. In this exhibition the flag family has been provided with offspring endowed, as it were, with acquired as well as inherited characteristics, and of an unorthodox, exciting kind.

WORLD

FLATS AT AUCKLAND

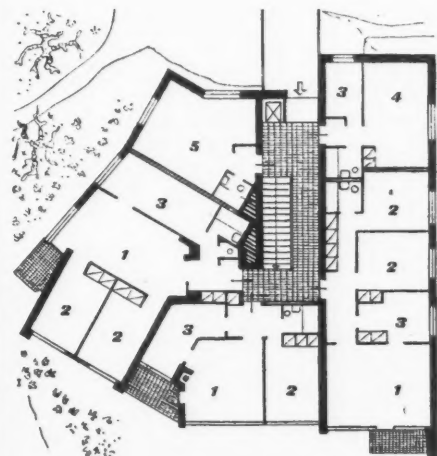
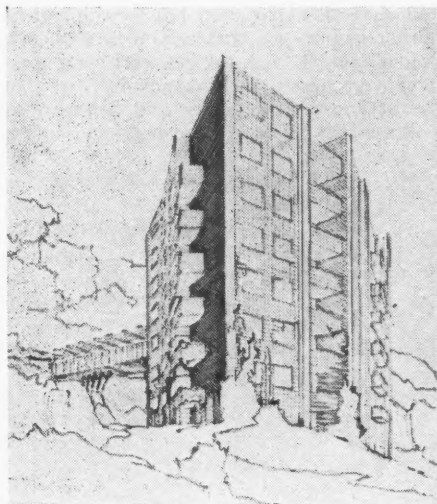
These new State flats, designed by the Department of Housing Construction, in



Auckland, New Zealand, are part only of an extensive scheme aimed to provide small but up-to-date accommodation within a few moments of the heart of the city in an area now largely occupied by dilapidated buildings. There are individual entrances and staircases to each wing. The porches are finished in red and yellow, in contrast to the white of the rest of the building.

ESTATE AT NYMNÄSHAMN

This unit is part of a comprehensive plan for a housing estate at Nymnäshamn



key

1, living rooms. 2, bedrooms. 3, kitchen and dining rooms. 4, one room dwelling with kitchen. 5, single room with cooking facilities.

scale 1:350

in Finland, by Alvar Aalto and Albin Stark. The seven-storey block of flats, shown here from the west, is one of five similar fan-shaped towers. The scheme also contains blocks of three-storey terrace houses and isolated buildings containing various common services, disposed at different levels on a hilly site.

HISTORY

BLenheim COLUMN OF VICTORY*

Your Grace is pleased to mention . . . Augustus's Pillar; permit a Native of England to give the Laurels to the Blenheim Pillar, where he reads and Feels his Liberty preserv'd and confirm'd in Every Line. . . .
—Sir Thomas Pengelly to Sarah, Duchess of Marlborough, 30th September, 1728.

AMONG THE DISAPPOINTMENTS attendant upon Vanbrugh's enforced resignation in 1716 from the building of Blenheim Palace none can have been sharper than the lost opportunity of raising in the park a monument worthy of his hero John, first Duke of Marlborough. 'Here is a pompous funeral preparing,' Vanbrugh writes to Lord Carlisle after the Duke's death in 1722, 'I don't know whether it won't cost her Ten Thousand pounds. What a Noble monument wou'd that have made. . . .¹ In his mind's eye he saw the site he would have chosen 'in Blenheim Park, with some plain but magnificent and durable monument over him.' It was hard indeed that his differences with the Duchess not only debarred him from building a plain and yet magnificent mausoleum but precluded him from, as it were, setting his seal to the park layout with at least one, but preferably several obelisks, such as he was later to design for Eastbury and Castle Howard.

In 1714 Vanbrugh had sent Marlborough 'a Draught of the Obelisk my Lord Carlisle is raising to express his grateful sense as an Englishman of what he thinks the Nation owe to your Grace. It is in all a hundred Feet high,' and as his great plan for the grounds of Castle Howard unfolds we find his letters to the owner (1721-24) fairly bristling with obelisks great and small, some topped with balls, 'notwithstanding there are four of them already upon the Obelisks in the Parterre'; others perhaps a little more fanciful, to be 'scatter'd up and down the woods.' 'I keep to the Proportion of a Dorick Column,' he explains to Carlisle, himself by this time an obelisk-addict, 'which is eight diameters and that is the usual proportion of those in Italy, and succeeds mighty well in two pretty large ones in Mr. Dodingtons Garden' (at Eastbury).

Blenheim meanwhile remained unfinished. It is the popular notion that, on his chief's withdrawal in 1716, Nicholas Hawksmoor, who had been assisting him, automatically took over and under the Duchess's supervision finished the works. Yet we find him in the Spring of 1722 writing to her:

'Your Grace, I am inform'd, is finishing the Bridge and other affairs, which I most extremely commend and applaud, although I sincerely wish they had been finished upon another foot and as the Building was begun, but I am sure it was not my fault it happen'd contrary and

* Blenheim Palace is being opened to the public as from the first of this month.

¹ All Vanbrugh letters are quoted from the collection edited by Geoffrey Webb, 1928.

Your Grace knows it. . . .² In Vanbrugh's phrase, the Duchess had 'taken a Run to finish Blenheim in earnest;' but it was not until 1723 that Hawksmoor was called upon to design the triumphal arch.³ His Blenheim visits were intermittent, partly though not mainly because, like Sarah herself, he suffered from 'rugged' attacks of gout which kept him in London.

In September, 1725, Hawksmoor advises the Duchess, 'I think you might provide Stone for ye Historicall Pillar you have intended, if Your Grace continues still so determin'd, and the best Sort of Stone for that purpose will be the Plymouth Moor Stone. . . . It will Stand for Ever as hard as Brass and decay as little. . . .'⁴ And in the following December, 'I hope your Grace has not forgot ye Column of Trajan.'⁵ That was important. For his part, as we shall see, Hawksmoor had not forgotten the Queen Anne Column affair of 1713 (for St. Mary-le-Strand), when his excellent design had been passed over in favour of James Gibbs', the latter showing marked similarity, in its frieze rings, to Trajan's Column.⁶

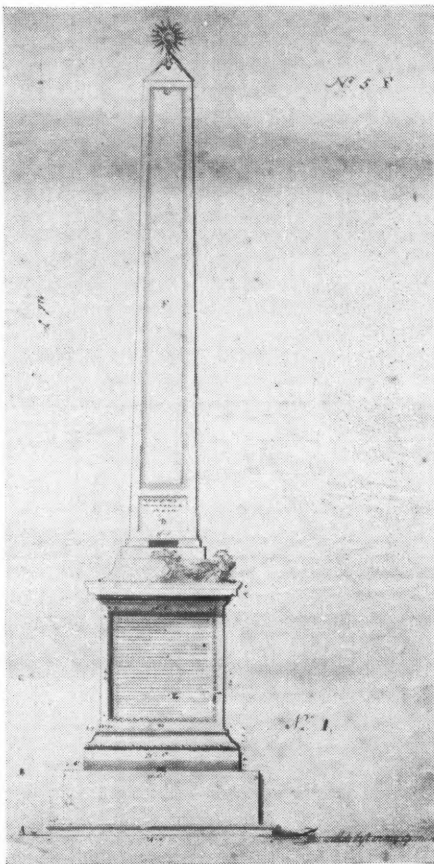
But at this point in the history of the Blenheim column we need to consider two pieces of evidence, both suggestive of the conception of some such scheme before 1720; though both documents are undated and unsigned. The first, a Muniment Room paper listing 'what was done by the Duke of Marlborough about 1716 to make this Place a Habitation' has an item: 'The Pillar which is near finish'd,' implying that when building was resumed in 1716 the Duke was at least planning a pillar; that, in other words, a pillar or an obelisk was a part of Vanbrugh's scheme. The second document is from a portfolio labelled 'Inscriptions at Blenheim,' which is kept in the Long Library. It reads as follows:

'I have now chang'd my mind as to the place where the obelisk is to Stand Having found out two others that are better. One is, at the entrance of the Avenue that leads from the bridge. The other is upon the Ground on one side of the Bridge where King Henry ye 2nds House was, That I believe would please Sr. John best, because it would give an opportunity of mentioning that King whose Scenes of Love He was so much pleas'd with. [Above the scored-out lines is written:] but if there were obelisks to be made of what all our Kings have don of that sort the country would be stuffed with very odd things.'

The memorandum continues: 'I fancy Mr. Pope could add something very right to this Inscription, but that His inclinations are so different from ours as to Liberty, and I don't know Him at all, but if You approve of this thought perhaps we may

find out some Friend of His that will persuade Him to exert His Talent upon this occasion which I would acknowledge in the way that would be most agreeable to Him.'

Mr. Laurence Whistler suggests that the writer of this letter was Marlborough himself and that he wrote it between 1714, when Vanbrugh was knighted, and 1716, when he quitted the works. Unquestionably the witty interpolation is from the quick pen of Sarah Duchess. A comparison with signed letters of Marlborough's, while not perhaps wholly conclusive, by no means rules out the probability, and it is an extremely interesting one. It would show that the Duke had all along intended raising an 'historical pillar,' and that not of course to his own glory but for some quite different purpose: there was plenty to commemorate. As a lesser outwork, though a very large one, it was not likely to be embarked on till palace and bridge were completely or nearly finished; and in the



Hawksmoor's draft elevation for an obelisk with star, submitted to the Duchess of Marlborough.

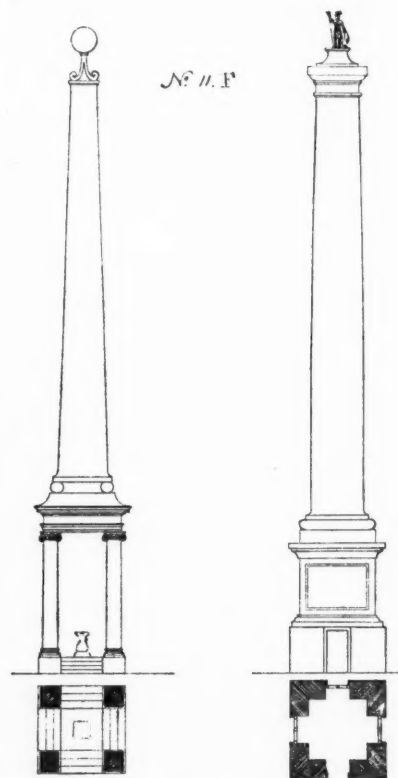
meantime political and financial difficulties caused the whole scheme to be shelved until a period when neither the Duke nor Vanbrugh could be there to have his say.

As a memorial to the great Duke the column—or Pillar of Truth, as Sir Thomas Pengelly called it—had now taken on new and important significance. It was time for Hawksmoor, enamoured as he now was of classical architecture, to remember Trajan's Column and send the Duchess a large

drawing of it together with carefully drawn suggestions of his own.

Thanks to the kindness of the Duke of Marlborough in allowing the writer to search the Blenheim archives, several draft elevations by Hawksmoor and others have recently come to light. One of them, illustrated here, shows a one hundred and twenty foot obelisk topped with a star. The drawing is unsigned, but style and handwriting are unmistakably Hawksmoor's. At the foot he has written, 'This will do best in my opinion.' Referring to the 'Inscriptions at Blenheim' portfolio we find that this star-obelisk sketch is in fact the illustration to a detailed description given—almost certainly by Hawksmoor, for Sarah's benefit—in a long and remarkable document headed 'Explanation of the Obelisk.' The Grand Plinth was to have been based nine feet above ground, 'to keep Idle Persons from making Letters, and writing what Stuff they please upon it, and doing other Mischiefs and Brutalities'; and also so that 'the Mob' might not injure the inscription, whether they were on foot or horseback. Upon the cornice, at the foot of the shaft, space was to have been found for 'the Roman Eagle and other Supporters, with ye Laurels and proper Emblems, as it was and Still remains to this Day upon the Pedestals of the column of ye Emperour Trajan, One of the best of the Roman Emperours.' There was also to have been a noble inscription in Latin, which Hawksmoor prudently indicates with: 'This ye Learned must direct.'

For the star at the apex Hawksmoor had



Alternative suggestions for a plain obelisk resting on four columns and for a column on a square pedestal.

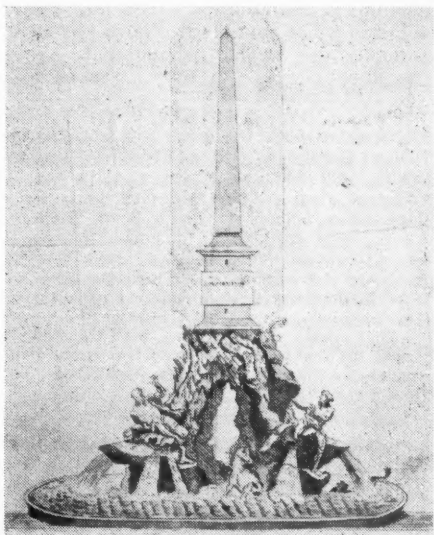
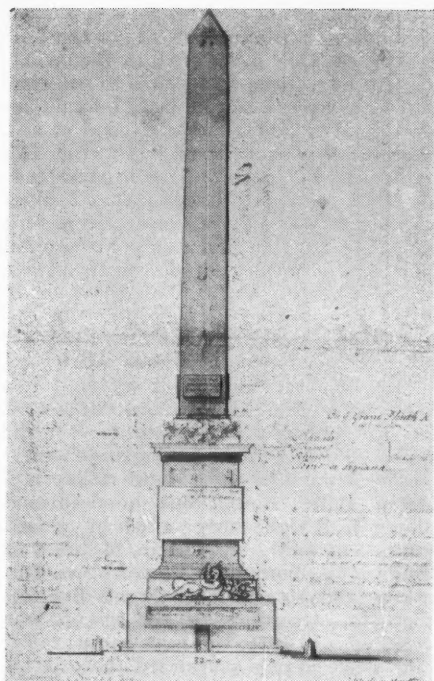
² Hawksmoor to Duchess of Marlborough, 17th April, 1722. BM Add. MS. 9123.

³ Some Unpublished Letters of Sarah, Duchess of Marlborough, relating to the Building of Blenheim Palace. *Transactions of Birmingham and Midland Institute* for 1884-5.

⁴ Hawksmoor to Duchess of Marlborough, 2nd September, 1725. BM Add. MS. 9123.

⁵ Ibid. 23rd December, 1725. Blenheim Papers E. 47.

⁶ Both were published by H. M. Colvin, 'Fifty New Churches,' *THE ARCHITECTURAL REVIEW*, March, 1950.



Hawksmoor's design (top) for an obelisk with sculpture round its base and (bottom) contemporary drawing of the Bernini river-gods fountain in the Piazza Navona at Rome, on which the sculpture was modelled.

again the most impressive authority. 'The Emperour Constantius,' he informs the Duchess, 'Set up one at Rome as big as all this, in One Stone, and placed ye Sun on the Summit of it.⁷ The French Set up an Obelisk at Arles to the Late Lewis the 14th with four Inscriptions in Latin full of Complements. On the Top was placed the Sun, the devise ye French King was fond of. But as that false Sun was forced to Leave Shineing by the Influence of a British Starr, the brightest Europe has yet at any time ever Seen, the Emblem of a Starr may not be improperly placed on the Top of this obelisk (with a Motto by ye

⁷ A watercolour by Francis Nicholson, RA, in the BM Print Room shows an obelisk surmounted by a sun in the grounds of Stourhead, Wilts.

Learned to make the Allusion obvious to any One.' The cost was to be £1,529. And in case that would not serve, still further drafts were submitted.

In the absence of fuller evidence it is not easy to be sure of the correct chronological sequence of the drawings; though it would seem reasonable to suppose that those of plain obelisks precede those of ornamented, and that those with statues upon the summit are the latest of all. Yet it is surely puzzling that Hawksmoor, while submitting what he called 'the Scheme of Trajan ye Emperour' and adopting its 'supporters,' rejected the statue motif in favour of a star. (Would the cost of such a statue be, in his opinion, too high for the Duchess to contemplate?) Nor is the evolution of the Blenheim column made plainer by his introduction of a quite new element in his design 'much Like that set up in ye Piazza Navona by Cavalier Fontana (Bernini).⁸

In 1710 Bernini's model for his river-gods fountain had found its way from Rome to Blenheim. Vanbrugh was pleased with it. Grinling Gibbons pronounced it genuine and saw to its safe loading at the Tower into the West Country barges. But no one, we can be certain, was more delighted with it than Hawksmoor. Here in the flesh—for stone to him was flesh and subject to its ailments⁹—was a masterpiece direct from that unseen city whence sprang authority and inspiration! True, it was not antique, but it was fully allegorical and in Gibbons' view 'scarce to be valued.' With its dolphins and seahorses it was charming, lighthearted, baroque but not extravagantly so; while from the midst of it rose a slim obelisk of severe and quite unexceptionable form. Surely the least one could do was to rear a grotto for its enshrinement. He suggested as much. 'I cannot help remembering,' he wrote, 'how fine a Grotto may be placed under the Bridge, finished with Rocks and Shells and a plentiful command of Water, and how nobly the little fountain of Cavalier Bernini may be placed in it, being too tender to stand without doors in the Frosts and violent Weather of this Climate.'¹⁰

For all his fond enthusiasm, however, no grotto was built, nor was the little fountain (admittedly on rather too small a scale for Blenheim) even set up, but lay in pieces among the nettles and violent weather for many years.¹¹

In the meantime, immobilized by gout as she was, the Duchess directed her lively mind to two subsidiary problems: the placing of the monument and the inscription

⁸ Bodl. MS. Top. Oxon. B 37.

⁹ After Vanbrugh had designed obelisks which seemed too small and Carlisle had sought Hawksmoor's opinion, Hawksmoor wrote (March, 1724): 'If they were mine I would not let them stand upon ye Cold ground but lift em up ye same sort of Pedestall in ye piazza Navona, don by Dominico Fontana.'—*English Homes* (Vanbrugh vol., p. 49).

¹⁰ Hawksmoor to Duchess of Marlborough, 17th April, 1722. BM Add. MS. 9123.

¹¹ The Bernini fountain was set up, probably in the 1760's, about fifty yards south-west of Brown's cascade. In 1925 the 9th Duke had it incorporated as an important feature of his Water Terrace Gardens, between the Long Library and the lake.

upon it. On the first question she had Hawksmoor's advice, expressed at some length in his 'Explanation of the Obelisk.' There were, he suggested, four possible sites, north, south, east and west. Many people would be for the entrance into the great north avenue; whereas the Duchess herself had suggested the junction of the two main drives on the east. A site in the middle of the Great Parterre on the south would not, he feared, be 'quite so convenient'... The Duchess, who kept everything—somewhere—searched for Lord Marl's paper. ... Ah, here it was—'... the entrance of the Avenue that leads from the bridge. ...' Then let it be so.

Today the Column of Victory stands two-thirds of a mile north of the north portico, at what was once the beginning of the avenue intended for the grand approach. As the visitor from the north drove in he would have for nearly two miles the Duke's statue to look up to until, passing it on left or right, the horses trotted across the Grand Bridge and so carried him up to the house.

With the inscriptions the Duchess should indeed have felt well at home. Endless letters and self-vindications had made her, as she said, 'a kind of author;' and nothing could have been more to her taste than sub-editing others. Yet, as with everything at Blenheim, there were difficulties; and from her friend Lady Lechmere came a warning. 'I believe,' she wrote, 'you could engrave some mighty sentences, but the times are dangerous and 'tis not worth going to the Tower for it, or else one might—cut deep.'¹² All the same, to one of Sarah's calibre (and she had braved the Tower once already) it was tempting. 'If I should have a mind to expose the ingratitude,' she mused, 'even of those that repudiated the advantages of these successes, the whole Parke and gardens would not hold Pillars sufficient to contain the infamy of that relation.'¹³ Hour after bitter hour she must have turned the thing over; but in the end she decided against it.

On three sides of the pedestal, then, she would have 'as vouchers to the inscription' a recital of those Acts whereby the estate had been bestowed on the Marlborough family; well-intentioned Acts that had led to infinite trouble, yet for posterity's sake it was prudent to have them incised in black and white, 'to stand as long as the British name and language last.' And on the fourth side, facing the palace, the side reserved for the inscription itself—Was there anyone in the world worthy and capable of composing Marlborough's panegyric? The first attempt—drafted, it is said, by Bishop Hare, Marlborough's chaplain—was soldierly, but by no means the deathless classic the Duchess sought.

As the months went by and revision after revision failed to please, she saw only too plainly—with the great column rising and no fit inscription ready for it—the makings of a desperate situation. And indeed

¹² Quoted by Dr. Reid in his *John and Sarah, Duke & Duchess of Marlborough*.

¹³ Duchess of Marlborough to Sir Thomas Pengelly, 3rd October, 1728. *Blenheim Papers* (Inscriptions portfolio, Long Library).



The column as it stands in Blenheim Park today.

nothing short of desperation can in the end have overcome her resistance to what all along she may have realized to be the inevitable truth—that the only writer capable of what was called for was her worst enemy, St. John (now Lord Bolingbroke), the man who had done his vilest to undermine Marlborough influence; and who shall say what it cost her to send him those inadequate drafts, for him to improve on?

From a batch of letters¹⁴ between the Duchess and her masons, John Townsend and Bartholomew Peisley, we see that throughout 1730 a great deal of her time was spent in trying to procure for the pedestal the best marble from 'Mr. Flitcroft,' and to impress upon the workmen the care and dispatch expected of them for the execution of his 'scheme.' She makes no mention of Hawksmoor in connection with the monument, and one can only

¹⁴ *Transactions of Birmingham and Midland Institute for 1884-5*, op. cit.

suppose that to an even greater extent than was the case with his mausoleum at Castle Howard the Burlington group had stepped in and insisted, ironically enough, in topping the column (no longer an obelisk) with a statue as, when he had first submitted his drawing of the Trajan Column, he himself might have been understood to suggest.

Flitcroft, it seems, was called upon only to find marble and advise on the cutting of the inscriptions. The architect who finally 'conducted' the column was Lord Herbert (later Earl of Pembroke, the 'architect earl').¹⁵

It is unfortunate that at this point the documentation of the monument becomes so scanty that for the final stage we are left with nothing more informative than a

¹⁵ There is evidence that Roger Morris, Herbert's clerk of the works at Wilton, worked at Blenheim (a 1732 letter of Sarah's published in *Letters of a Grandmother*). It seems probable that he had directly to do with the building of the column while Herbert 'conducted' it.

brief statement of Hawksmoor's, contained in a letter (4th October, 1731) to the Earl of Carlisle. 'We came next to Blenheim,' he tells him, 'haveing a minde to see what was don since I saw it last. I found no great matter added either of good or any more mischief don since my last visit. The Historical Pillar is set up in the park: (conducted by my Ld Herbert). . . . I must observe to you that ye Inscription is very long . . . but very legible . . .'¹⁶ No mention of design or statue; not a word to suggest that he himself had had anything to do with the monument's conception! As to the Duchess's commissioning Lord Herbert—whom she once described as 'often mad and always very odd'¹⁷—it was only less improbable than that she should accept an inscription from Bolingbroke; yet the evidence points to her having done both.

The monument as it stands today is a fluted Doric column one hundred and thirty feet high, surmounted by a lead statue, probably by Cheere, of the first Duke of Marlborough in Roman dress. This statue, though said to be twenty-five feet high, is, according to the mason who repaired it in 1936, less than half as tall.¹⁸ The Duke gazing southward towards his palace, 'holds in his hand a winged figure of Victory, as an ordinary man might hold a bird.'¹⁹ The cost of the figure was £340, and of the whole monument about £3,000.²⁰

David Green

¹⁶ Walpole Society Vol. XIX, p. 127. For this important reference the writer is indebted to Mr. Howard Colvin.

¹⁷ Duchess of Marlborough to Lady Di Spencer 21st July, 1732; also 9th July, 1732. *Letters of a Grandmother*, edited by Gladys Scott Thomson.

¹⁸ Mr. Dan Collett, who measured the statue, told the writer that to the best of his memory its height was 6 ft. 11 in. 'The pillar does not sway in the least. I stood buckets of water up there on purpose to see, but the water didn't even ripple. I always reckoned that, with the stone, I picked up ten to twelve ton; the figure itself weighs anything from six to eight ton. The pedestal is five foot in diameter.'

¹⁹ Nathaniel Hawthorne: *Our Old Home*, 1868.

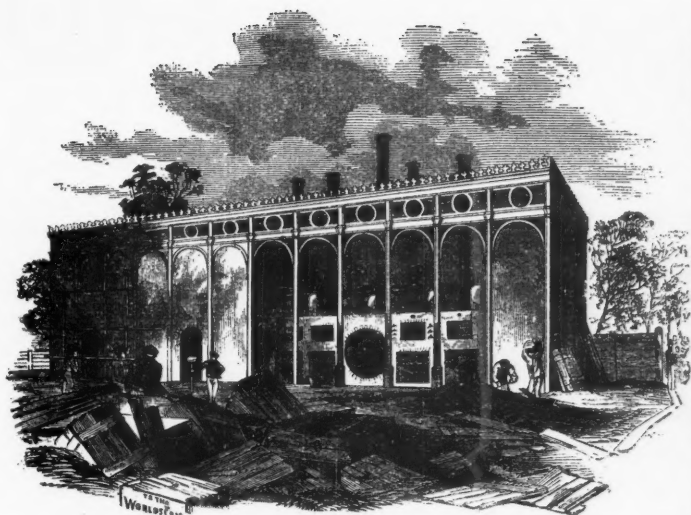
²⁰ According to an MS. notebook in the Long Library at Blenheim.

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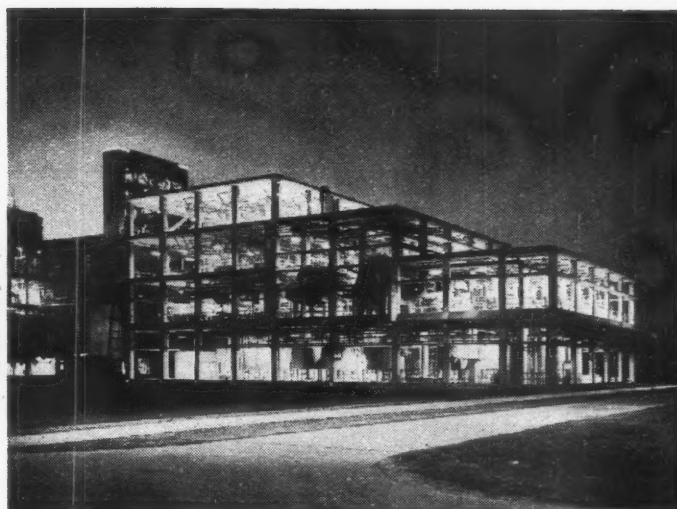
OPEN FRAME CONSTRUCTION: 1850—1950

Ever since the large-scale factory production of structural components began to have an influence on architecture, two tendencies have been marked: the use of the structure of the building as an independent frame, all other parts being removable and non-weight-bearing; and the use of standard wall panels which may be closed by opaque partitions or glazed to form windows at will.

The Crystal Palace, designed by Sir Joseph Paxton for the Great Exhibition in Hyde Park in 1851, is generally regarded as the first important prefabricated structure, but rather than the main exhibition building, it is the boiler house that best

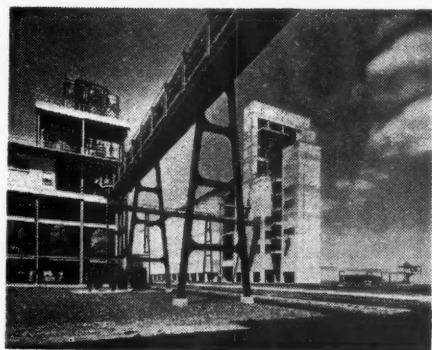
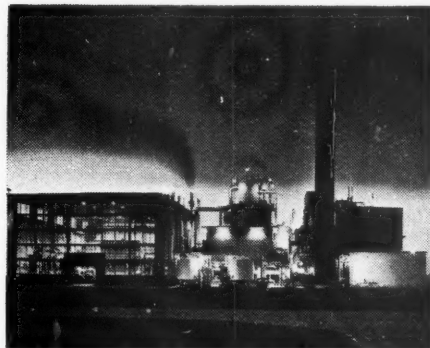


The power-house of the Crystal Palace, 1851, compared with a modern example in Texas with similar open panel walls. More views of the latter are below.



illustrates these two tendencies. It consisted of a number of standard cast-iron bays, forming a structurally independent frame within which the machinery could be freely disposed. Some bays were open, allowing a view of the machinery; others were closed by partition walls and pierced by doors. The illustration, a contemporary engraving of the work in progress (another, of the main building, provided last month's cover), shows this frank iron-frame character clearly, and it is here compared with a modern example, serving much the same purpose and illustrating the same principles: the power-house of a corn-refining company in Texas.

Throughout this plant—in the mill, above, the grain-processing plant and the power-house, below, an uncovered structural frame both contains and reveals the



machinery. The panels between each structural member are either open, or glazed, or filled in with a non-weight-bearing wall. The plant was designed by the H. K. Ferguson Company, industrial engineers.

BOOKS

PIPER'S EYE

BUILDINGS AND PROSPECTS. By John Piper. Architectural Press. 18s.

There are people who seem to be drawn, without search or calculation, to periods and places where imminence of discovery is in the air. Most of them are archaeologists, but not all. For John Piper is one of them. He is not an archaeologist, but he has a sense of the historic which leads him straight to situations where there is something queer—where no simple ordering of facts suggests itself and where, indeed, a kind of mythological appearance has formed over deceased actuality. Piper is not an archaeologist; he is a painter. There was a time when one thought of him as one of those rare artists who live on the arris of 'the present,' obeying the continuous injunctions of intuition and nothing else. But in 1937 he painted Welsh chapels, and by 1939 was drawing the old barn at Coxwell and the insides of Norman churches, and those dreadful villas at Cheltenham of which John Betjeman had already written:

Do you know that the stucco is peeling?
Do you know that the heart will stop?
From those yellow Italianate arches
Do you hear the plaster drop?

Piper heard the plaster drop all right. The old, ugly, forgotten villas caught his imagination as they had Betjeman's—he painted them, and painted them truthfully so that the word 'Italianate' uncoils itself in his pictures as it does in Betjeman's line. 'Italianate'—the academic, impersonal word; and the old woman who has just died and who did not know that the house wheresh she was dying was 'Italianate.' There was an allurements—a patch of time-space where discovery seemed imminent. Discovery of what? Nothing in particular: except, indeed, a poem and a painting.

Since then—thirteen years ago—Piper has been living in perpetual astonishment at the

wonder of the half-forgotten, finding it in the nursery engineering of the seaside, in the lush neglect of Hafod, in country ale-houses and Pimlico gin-palaces, in Pugin's uncomfortable-looking little house near Salisbury, and in caves—caves, I think, because of their association with a kind of tourist-enthusiasm now at its lowest possible ebb.

To me, Piper's best paintings are those which seize and fix the sense of imminent discovery with the simplest possible means, selecting the most unlikely and yet most memorable bits of debris in the scene before him, and leaving out great chunks of what one is (just) able to take for granted. His selection is often witty and even moving. It is so in his paintings and the same gift for witty selection comes out in the articles he has written (many for THE ARCHITECTURAL REVIEW), some of which form the contents of this book. To turn over its pages is to see the world for a few moments with Piper's Eye, an organ just a bit sharper, a bit more inquisitive, than other people's. It is an album. Here are photographs of the shards and *trouvailles* of this decaying England, old wood-engravings and lithographs, sketches and paintings by the author. There is a freshness and unexpectedness about it all which makes one want to exclaim, 'what on earth is this?' or, 'how on earth did that get built?' How, for instance, did a copy of the Flora in the Vatican Museum get attached to the Lord Nelson at Boston, Lines? And how, in what mood, and under the stimulus of what incentive did the architect of the Louth Corn Exchange compose that deliciously idiotic façade?

The written part of the book adds (for me) little to the pictures and even sometimes subtracts from them in so far as it betrays a methodical scruple in the author that he ought to be didactic about the things he paints and photographs—that he ought, for instance, to plead for their preservation, or possibly against it; or to convert his own discovery of the 'Nautical Style' into some sort of positive doctrine about what architecture at the seaside ought to be like. Certainly, there are many excellent observations. The article on 'Pleasing Decay' is full of them (and good quotations, too) and it ought to be circulated in the Ancient Monuments Branch of the Ministry of Works, if only as a wholesome irritant, 'not to be taken.' But Piper's genius is the genius of the eye. Simply by looking and noting he has presented his own and a younger generation with a new excitement in landscape and architecture and

a new curiosity about unnoticed, unlisted things. He has even (and this, surely, is a triumph) made it respectable for the toughest of fifth-year architectural students to look at Norman fonts—and like them.

John Summerson

DISCOVERIES IN SCULPTURE

ROOF BOSSES IN MEDIAEVAL CHURCHES. By C. J. P. Cave. Cambridge University Press, 1948. 35s.

We may just as well face up to the fact that it will never be possible to form an accurate idea of the quality and wealth of mediaeval sculpture in England. Thomas Cromwell and Richard Cromwell have been too thorough and efficient. What they have destroyed and defaced to serve their political and religious principles cannot be recovered. The Wyatts and Scotts, if acting from different motifs, were no less fatal. The evidence which now remains and is available in textbooks is inconclusive. The façade of Wells, and even the *Annunciation* of Westminster, prove undeniable inferiority in comparison with France. Not even the most ardent British nationalist can overlook this, if he takes the Angel of the Westminster Annunciation and places him in his mind by the side of the Angels of the Rheims west front. On the other hand, there are a few solitary figures, such as the *Synagogue* at Winchester, which incline one to dream of, or speculate on, whole Chartreses and Rheimses, once ours and now shattered. This evidence for the defence has recently been strengthened to a decisive degree by the publication of *Roof Bosses in Mediaeval Churches*. These bosses are evidence of supreme importance. Their position high up saved them from destruction by even the most ardent iconoclast or restorer. Besides, lighting is not usually good enough for details of roofs to be seen by anybody. So Holy Virgins, Saints and Popish mockery, and also plenty of levity, remained untouched.

To have recovered this *corpus* of English sculpture, hidden by distance and darkness, remains the immense merit of Mr. C. J. P. Cave and his mastery of the telephoto lens camera in conjunction with a daylight signalling lamp and opera-glasses. For ten or fifteen years he has published illustrated articles in archaeological journals, and now a book has come out, showing three hundred and sixty-eight of his pictures. The text is chiefly descriptive, and the appendices catalogue places with roof bosses, and give an exact account of how these photographs were taken.

Of all English bosses none equals those in the Angel Choir at Lincoln, of about 1270 to 1280. Some still possess classic balance and masculine vigour; the majority, however, are already affected by the exquisite mannerism of the Paris style of St. Louis of France. We have nothing in England to emulate the courtly elegance of the young Queen with her pet dogs, or nothing, at least, as sculpture, though plenty in East Anglian illumination. Exeter is the place where the gradual change from this sophisticated, sculpturally very clear, style towards something equally delicate yet less sharp can best be observed. Both faces and folds tend to be rounder. This style appears perhaps at its most tender in some Exeter bosses, probably of the 1330's (frontispiece of Mr. Cave's book) and some no doubt by the same hand, if a little later, at Offery St. Mary. That the second half of the fourteenth century was less courtly, less delicate and more matter-of-fact is well enough known from social and literary history, and, indeed, from painting and sculpture. Mr. Cave's roof-bosses bear it out once more. Much *finesse* is gone, but an unprecedented degree of realism that is individual characterization, introduced.

The plates in Mr. Cave's book are less than five per cent of what he has photographed, and his photographic collection cannot cover more than about half of what survives. The Divinity School has 455 sculptured bosses, St. Mary Radeliffe over 1,100, Norwich Nave and Cloisters about 750, figures especially impressive, when compared with the poverty of French bosses.

Nikolaus Pevsner

AERIAL PROSPECT

AERIAL PHOTOGRAPHY IN URBAN PLANNING AND RESEARCH. By Melville C. Branch. *Jour. Harvard City Planning Studies*, No. XIV, 1948. Harvard University Press. London: Geoffrey Cumberlege. 16s.

The majority of textbooks on air photography that have been produced up to the present have been written for the benefit of the specialist engaged on air survey and consequently are too technical for those who use photographs solely for interpretation purposes as distinct from mapping and contouring. Those such as the town planner, the architect, the engineer and the surveyor, who want to know more of the uses and general principles of air photography without going too deeply into technicalities, will find this book easily read, lucid and remarkably helpful. But, in spite of the present title, only a general chapter deals with the use of photographs in urban planning with a further short chapter on interpretation in these areas.

Such aspects as the flying of photographs and the cameras used, the types and quality of photographs, mosaicing, the principles of stereoscopic examination can be extremely technical. Mr. Melville C. Branch has succeeded admirably in explaining them lucidly in non-technical language, supported by some very excellent diagrams and sketches. The small part of the book devoted to the uses and the interpretation of air photographs, whilst good, is too general and, in this respect, an otherwise excellent book is disappointing. The planner in this country wants to know first, how useful photographs can be in factual survey, in the preparation of a development plan and in development control; second, he wants to know how best to extract the information from the photographs. The interpretation of air photographs for planning purposes is a very wide subject which, as far as I am aware, has not yet been adequately treated in this or any book.

W. S. Butler

LABOUR OF LOVE

THE ARMORIAL GLASS OF THE OXFORD DIOCESE, 1250-1850. By E. A. Greening Lamborn. London: Oxford University Press. 30s.

This is one of those books which only get written from motives of the purest and most disinterested enthusiasm, and which call for generosity (in this case mainly forthcoming from the Pilgrim Trust) to publish. Few will buy it, as the author, sponsors and publishers are certainly well aware; yet to those few it may well prove a model of what such a book should be. Readable, in the normal sense of that word, of course it is not. Yet, judging at least from the examples in which the present reviewer has been able to test it on the spot, it can be said that both the recording and the commentary are quite impeccable. To those already familiar with the work of Mr. Greening Lamborn, this no doubt will come as no surprise.

In an excellent introduction, the author blows the gaff regarding the decadence of heraldry, inadvertently fostered by certain people with a kind of vested interest in keeping its terminology

unintelligible to the layman. Heraldry to-day, he says, is a dead, however heroic, language, so meaningless that a shield of arms on notepaper or a college blazer is a 'crest' and 'arms' is synonymous with public-house. But ancient heraldry is still a fascinating study: by illustrating and often elucidating genealogy it is 'one of the handmaids of history,' nor is its artistic appeal by any means absent.

On the whole, these are just claims: although one misses the colour, the lover of old stained glass will be able to derive real aesthetic pleasure from some of the sixty-five plates in this book, both from among the early examples in which small pieces of rich, mainly pot-metal, glass are set into an often intricate leading (Dorchester, Marsh Baldon, Buckland) and among the later enamel-painted shields (Bisham, Turville, Stoke Poges). Heraldic glass in private houses and in the colleges and University Buildings of Oxford has had to be excluded from this volume, but much of the former and all the latter have already been recorded elsewhere.

Alec Clifton-Taylor

Shorter Notices

CONTEMPORARY DANISH ARCHITECTURE. By Esbjorn Hior. Gjellerup, Copenhagen, 1949.

Denmark, with its fine tradition of brick building and its lukewarm response to innovation, is an excellent place in which to study two facets of contemporary architectural development. One, the effect of the new aesthetic on traditional building methods (particularly brick), and two, its handling in terms of reinforced concrete, by a people who haven't the resources to risk costly failure, nor the taste for a *tour de force*. Esbjorn Hior's book successfully reveals this two-faced aspect of Danish architecture (a phenomenon, by the way, which is not peculiar to Denmark).

The book is divided into three sections. The first and second contain illustrations and commentary on brick and concrete public buildings, respectively. The third deals with housing, in either one or other or both of these materials. Many of the examples have been the admiration of British architects for some time, and that makes a book like this one all the more welcome, containing, as it does, a commentary in both Danish and English, as well as short bibliographies of the architects concerned. The illustrations, though muzzy, are adequate, but it is unfortunate that, apart from site plans and a ground plan of the Bethlehemskirken, there are no floor plans of any of the buildings. I. McC.

Books Received

THE LAND OF ITALY. By Jasper More. Batsford. 18s.
THE FREEDOM OF NECESSITY. By J. D. Bernal. Routledge & Kegan Paul. 18s.
HOT WATER ENGINEERING (2nd Edition). Geo. Newnes. 21s.
PORTRAIT OF CANTERBURY CATHEDRAL. By G. H. Cook. Phoenix House. 12s. 6d.
THE ECCLESIOLOGICAL SOCIETY TRANSACTIONS—THE MEDIAEVAL CHURCHES OF CYPRUS. By Robert B. Francis. 10s. 6d.
OUTLINE OF NEW PLANNING LAW. By Desmond Heap. Sweet & Maxwell. 15s.
BUILDING FOR MODERN MAN. Symposium. Princeton University Press. London: Geoffrey Cumberlege. 20s.
SOUTH WALES OUTLINE PLAN. By T. Alwyn Lloyd and H. Jackson. H.M. Stationery Office. 42s.
DUDLEY AS IT WAS AND AS IT IS TODAY. By G. Chandler and I. C. Hannah. Batsford. 21s.
PAUL KLEE. By Douglas Cooper. Penguin. 3s. 6d.
DONATELLO'S RELIEF OF THE ASCENSION. Victoria & Albert Museum. H.M. Stationery Office. 2s.
THE DRAWING OF W. CURTIS GREEN, RA. Batsford. 42s.
PRACTICAL APPLICATION OF ACOUSTIC PRINCIPLES. By D. J. W. Cullum. Spon. 16s.
SOMERSET. By Sylvia Townsend Warner. Paul Elek. 15s.
SOUTH WALES AND MONMOUTHSHIRE. By Tom Richards. Paul Elek. 15s.
ESSEX. By Phoebe Fenwick Gaye. Paul Elek. 15s.
CIVIC THEATRE DESIGN. By R. Leacroft. Dobson. 10s. 6d.
THE SELECTIVE TRAVELLER IN PORTUGAL. By Ann Bridge and Susan Lowndes. Evans. 21s.
A COMPANION TO THE TOWN AND COUNTRY PLANNING ACTS AND ORDERS. By Norman C. Abbey. Eyre and Spottiswoode. 10s. 6d.

Admonition

Intended more particularly for the perusal of those who may have happened to be enamoured of some beautiful place of Retreat, in the Country of the Lakes.

Well may'st thou halt—and gaze with brightening eye!
The lovely Cottage in the guardian nook
Hath stirred thee deeply; with its own dear brook,
Its own small pasture, almost its own sky!
But covet not the Abode;—forbear to sigh,
As many do, repining while they look;
Intruders—who would tear from Nature's book
This precious leaf, with harsh impiety.
Think what the Home must be if it were thine,
Even thine, though few thy wants!—Roof, window, door,
The very flowers are sacred to the Poor,
The roses to the porch which they entwine:
Yea, all, that now enchants thee, from the day
On which it should be touched, would melt away.

WILLIAM WORDSWORTH (From *Poems in Two Volumes*, 1807).

MARGINALIA

In Anthology

In the matter of leaving well alone the poets have generally been on the side of the angels (and of THE ARCHITECTURAL REVIEW). Wordsworth's admonitory sonnet, printed in Anthology this month by way of celebrating the centenary of his death, should be framed and hung in every architect's and planner's office, together with these lines from Dryden's *Absalom and Achitophel*:

'When ancient buildings nod and threat to fall,
To patch up flaws and buttress up the wall—
Thus far is duty, but here set the mark;
To venture farther is to touch the ark!
To change foundations, cast the frame anew,
Is work for rebels, who base ends pursue.'

That Dryden should have been speaking metaphorically of the English constitution does not invalidate his remarks taken in the literal sense.

Pub Competition Result

As this number was going to press the five assessors finished judging the REVIEW's competition for the design of four public-house bars (see the October 1949 number). The entry was small but very interesting, and there were at least a dozen designs of a very high standard in which the English pub tradition was reinterpreted in spirited fashion and in a modern way.

The assessors have awarded the prizes as follows:

- First prize (£500) to Messrs. Pollak, Prus, Hasler, Sharland and Negus.
- Second prize (£250) to Messrs. Maurice Russell and Geoffrey Dunn.
- Third prize (£100) to Messrs. Ian Grant and D. B. Bullivant.

They have also highly commended the designs of two other competitors: Mr. Peter Oldfield and Messrs. Bliss and Subiotto.

The designs submitted are being exhibited at the Victoria and Albert Museum from

April 4 to April 29 and will be illustrated in the June number of the REVIEW. One of the perspectives of the winning design appears on the next page.

And Now Staunton Harold

It is now nearly a year since the Select Committee on Estimates gave it as its opinion that the Ministry of Fuel and Power's policy of increasing open-cast coal mining should be reviewed. As was remarked in Marginalia at the time (issue for June, 1949, page 309), 'so one more instance of short-term economic considerations being preferred to long-term planning considerations, and then turning out not to be preferable even on short-term economic grounds, must be added to the dismal catalogue.'

It must now be recorded not only that no halt has been called to this particularly barbarous kind of spoliation, but also that another dismal catalogue—that of places of historic interest and visual character ruined by the process—must be extended. The new addition is Staunton Harold in Leicestershire, one of the most beautiful hidden places in the whole of central England, with a large Georgian house and a church begun in 1653 of which it would be hard to say whether it is more remarkable for its 'Gothic Survival' architecture or for the quality of its furnishings. As Lord Rosse, chairman of the Georgian Group, and Sir Patrick Abercrombie, chairman of the Council for the Preservation of Rural England, recently wrote to the editor of *The Times*, 'mansion and church are attractively set in a landscape, with lake, of characteristic eighteenth-century design, with good farmland and woodland on every side. Can it really be in the national interest that this further parcel of England's once green and pleasant land should be devastated in order to yield an estimated 180,000 tons of surface coal?'

The Graphic Arts

The 1950 volume of the doyen of periodicals devoted to the graphic arts, *The Penrose Annual*, maintains the usual high standard of illustration and literary content. Among the contributions

of general interest are articles on the Swedish style in typography by Torsten Platin—an exceptionally interesting article this to those familiar with the high standard of Swedish architectural publications—on the books of the Swiss publisher Albert Skira by Douglas Cooper, on 'pattern papers' by Enid Marx, and on the colour line process by Gordon Cullen; in addition, there is a full section of technical articles. *The Penrose Annual* is edited by R. B. Fishenden and published by Lund Humphries at 25s.

Wot, No Tavern Cars?

The Railway Executive has issued a 48-page illustrated booklet called *British Railways Today and Tomorrow*, which is said to have been 'designed for traders, journalists, authors, lecturers and all those requiring authentic information about British Railways.' An excellent idea, no doubt—but it can scarcely be said that its realization has been very successful. No advantage has been taken of modern methods of presenting the quite considerable amount of information which the booklet admittedly does contain; the typography is uninspired, to put it mildly; and with its double-column text and captionless half-tone blocks printed together on art paper the whole thing has the appearance of the dullest kind of advertising brochure. Although we are told on one page that 'the appearance of British Railways is being taken very seriously, in fact more seriously than it has been for generations,' no one would guess that the Railway Executive had the slightest interest in visual design from anything else in the booklet. The best station, it is implied, is that with the longest platform face (though you can certainly do something with a pot of paint and 'careful thought'). Significantly enough, a kind of told-to-the-children tone creeps in when, in the following passage, a more strictly visual matter is dealt with:

'Our ordinary passenger and mixed-traffic engines, the rank and file of passenger motive power, are being painted in a lustrous black as of ripe blackberries, lined out in red, cream and grey. The other day we heard a disinterested lady passenger vehemently asserting that it was dark blue. No, it is black; but the heavy-duty express engines are really blue, a beautiful deep blue, lined out in white with black bands. Other express engines are dark green, lined in orange and black. Freight engines are indeed black, and that is surely fitting; whoever heard of a collier presenting himself at the pithead in a chalk-stripe suit?'

Whoever did? But we have heard of much stranger things in our time, have we not?

Plan for Cambridge

The plan for Cambridge and the surrounding district, which Prof. W. G. Holford and Mr. H. Myles Wright recently submitted to the Cambridgeshire County Council, was made public in December. They make a strong plea for limiting the growth of the town, which is likely to cause some political conflict before the plan is finally agreed upon. Under the 1947 Act, the County is the planning authority, but in the case of Cambridge all the planning problems concern the town, where most of the population lives, and the Borough Council are not likely to relish having to take advice about their future development from the County. Opposition to the plan by the borough on grounds of prestige would however be short-sighted. The planners' views about the size of Cambridge are clearly right, and it is essential in their own interest that the county, the borough and the university should co-operate whole-heartedly on the joint committee by which the plan is now being considered.

The danger the planners point out is that, if not checked, Cambridge may go the way of Oxford. There has been a rapid growth in population lately and a marked tendency for industry to settle at Cambridge, which is just outside the area surrounding London from which new industries are to be discouraged as a result of the Barlow report. Cambridge has also been found convenient for regional offices of the central government, its population of government officials having grown by 350 per cent. between 1931 and 1948. The present population is 104,000 including undergraduates, and Prof. Holford and Mr. Wright suggest a limit of 125,000.

They also suggest controlling the physical expansion of the town so as to preserve the identity of outlying villages like Grantchester and Cherry Hinton, and keep them separated from the town by open country. Instead of new housing estates on the fringe they propose the redevelopment of the largely obsolete residential area east of the inner town. They recommend sites for any necessary college extensions and new university buildings, and that all the land west of the Backs, between the Huntingdon and Barton roads, should be regarded as a university reserve.

They make a number of important road proposals, some of which are bound to arouse controversy. There will be general agreement about their two proposed inner by-pass roads, east and west of the town, designed to lead through traffic away from the centre, especially as these will take through traffic off the road along the Backs which was threatened recently with becoming part of a main arterial route. The planners' proposal is to impose a speed limit on the Backs road and treat it like the roads in the Royal Parks.

The proposal most likely to be disputed is the relief road planned to cure the present serious congestion on the main route running through the centre of Cambridge. It would be about 300 yards to the east and would help to preserve the present pedestrian character of the college area. On its completion the proposal is to close the end of Magdalene Street to vehicular traffic. The disadvantages of the relief road as planned are that it cuts across Christ's Pieces and takes a strip off Midsummer Common, and that it takes a rather indirect course by incorporating part of the present Jesus Lane. The only college to suffer is Jesus, whose lands

are separated and playing-fields reduced by the proposed road. But it is difficult to see what other course this clearly necessary road could take and still serve its purpose. The planners make a good case for the line they have given it. New roads in a closely built up and ancient town like Cambridge cannot be made without disadvantage to someone, and this seems to be a case where certain sacrifices will have to be made for the common good.

The New Housing Manual

The *Housing Manual* 1949, recently published by the Ministry of Health, differs from its predecessor of 1944 in a number of important respects, some of the differences being due to what has been learnt in five years of building, and others to changes in the composition of the national housing programme. During the recent past, it is pointed out, emphasis had been on the provision of three-bedroom permanent houses and of two-bedroom temporary houses, because a combination of these types has been found generally suitable for families who were without separate homes of their own; but now it is considered that the time has come for local authorities to review their long term housing needs more analytically and to base their future housing programmes to a larger extent on their assessment of the long term housing needs of the district, and the Minister's advisers think that in general a substantially larger proportion of the total programme should in future be devoted to larger and smaller houses as compared with the standard three-bedroom house.

The new manual differs from the old by including simple outline elevations, 'designed,' says the letter accompanying it to housing authorities, 'primarily to assist the layman to appreciate the importance of considering the appearance of houses from the street,' and to 'stimulate interest in the appearance of varied groups of dwellings.' It is added that 'if full advantage is to be taken of the present opportunities for the satisfactory design and grouping of mixed forms of development, it is essential for local authorities to employ the services of qualified architects.'

New Director of the British Museum

Appointments to the higher posts in the museum world are usually as little worthy of

comment as any other routine promotion in the Civil Service hierarchy. The nomination, however, of T. D. Kendrick to be the head of the British Museum calls for some notice, particularly in the REVIEW, to which he has frequently contributed in the past. The wide knowledge and considerable powers of exposition which have gained for his published works on Anglo-Saxon and Viking art a reputation extending far outside the world of archaeological specialists, would by itself have made his appointment a matter for general rejoicing; but, unlike so many scholars for whom a praise-worthy but narrow concentration on a particular field has produced a certain fading of visual awareness, in the case of the new director a sensibility cultivated in the course of a profound study of Northumbrian gospels and Saxon cross-shafts has been profitably applied in other fields which many of his colleagues would hardly consider worthy of consideration. For example, if we are at last becoming conscious of the fact that the stained glass of the nineteenth century is no longer to be dismissed as simply an unfortunate by-product of Victorian medievalism, but having aesthetic merits of its own is a fit subject for study, the credit is in large measure Mr. Kendrick's. Catholicity of taste has seldom in the past characterized our leading savants.

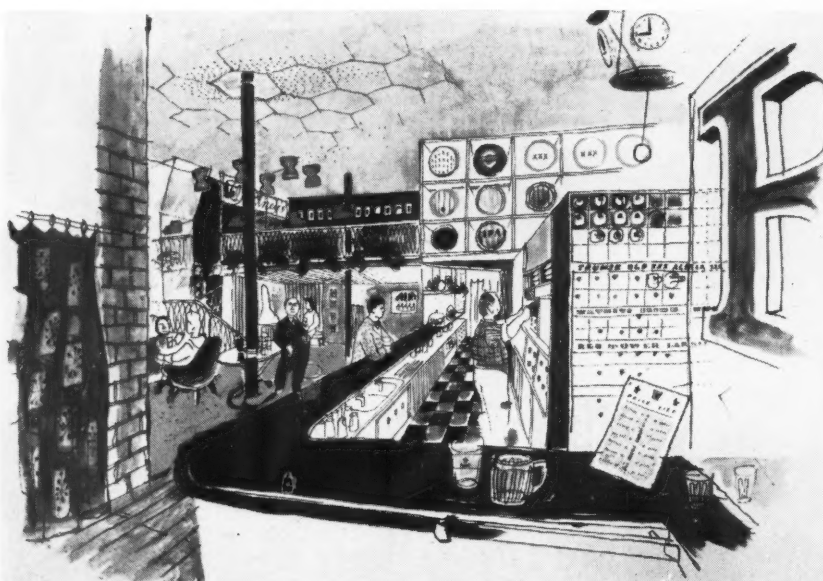
Peckham Health Centre to Close

Peckham Health Centre is to close down for lack of funds. In addition to its admirable work on the social side, the Centre has the distinction of being admirably housed (Sir Owen Williams, architect)—a combination of circumstances which makes it one of the first things that the visiting architect from abroad wants to see. Since the State can afford to run all the antiquated hospitals that come within the provisions of the health scheme, it will be fantastic if the Government does not recognize that it is its plain duty at least to subsidize this up-to-date and progressive institution, even though it lies just outside its own schemes.

EXHIBITIONS

Fernand Léger, of whose work a large exhibition was recently put on at the Tate by the Arts Council and the Association Française d'Action Artistique, is a painter for whom many future generations of art historians and experts should be grateful. Surely no other modern painter of comparable stature has been so consistent in the pursuit of his aim of the moment; no other modern painter's work lends itself so conveniently to division into 'periods.' The recent exhibition extended an invitation to every amateur to turn expert; establish the date of seven or eight pictures with the aid of the catalogue, and you could date all the rest within three years or so. This comment is not meant to be derogatory, but rather to underline the integrity of a painter who has never been sidetracked by a quest for novelty or succumbed (as one may feel that Picasso from time to time has succumbed) to the allurements offered by his own dexterity.

One of the reasons for being grateful for this exhibition is that few painters reproduce as badly as Léger. The camera, being sensitive only to light values in the quantitative sense, is incapable of giving the effect of paintings containing large areas of pure colour, as so many of Léger's do; paradoxically enough, scientific advances in photography, by providing plates equally sensitive to both ends of the spectrum, may even in certain cases make things worse—for the blue and the red in the same picture



Architectural Review pub competition: the large saloon bar from the winning entry (see page 277).

may come out equally black. Yet if it is as a colourist that Léger invades the senses, it is as a constructor of three-dimensional fantasies that he holds the mind. For Léger has always, or nearly always, been much concerned with the third dimension; in his early cubist period with the third dimension as an aspect of space, expressed in an almost baroque manner (as in the great 'Card Players' of 1917); later with the third dimension still as an aspect of space, but now the space between and beyond a succession of planes strictly parallel with the surface of his canvas; more recently with the third dimension as an aspect of matter, of sculptural form, as in the tremendous 'Composition with Parrots' of 1935-9 (reproduced on this page) and the 'Four Acrobats' of 1943. Léger's latest work, it is true, shows a certain preoccupation with line, but in such a picture as the 'Three Sisters' of 1948 it is still the definitive power of line, rather than mere calligraphy, with which he is concerned.

After what Mr. Douglas Cooper calls 'the amazing contrapuntal spectacle' of Léger's world at the Tate, the gentle lyricism of Barbara Hepworth's new sculpture at the Lefèvre Gallery. There were fourteen pieces of sculpture, all but three carved in 1949, and some forty drawings. Lyricism may seem the wrong word to those who are familiar only with the ovoid abstractions of the earlier Hepworth, but it is the word which best describes the mood informing the new work of this estimable sculptor.

The third exhibition to be noticed this month is also of sculpture—of sculpture by Eduardo Paolozzi and William Turnbull at the Hanover Gallery. The *rationale* of the school these two artists represent may be described by borrowing a paragraph from David Sylvester's introduction to the catalogue. 'Turnbull and Paolozzi,' he writes, 'are perhaps the most notable exponents, among the youngest generation of European artists, of the new method of composition informing the later paintings of Klee and Masson among others (including Victor Pasmore), and the group-sculptures of Alberto Giacometti. A picture or sculpture of this kind is devoid of a focal point, and the spectator reads it, not by confronting it as a scene detached from himself, but by entering into it and moving about in it.' This was not an exhibition for those with a prejudice in favour of formal values; but certainly some of the exhibits had a kind of life which enabled them to haunt the memory even of one so prejudiced.

Danish Architecture To-day

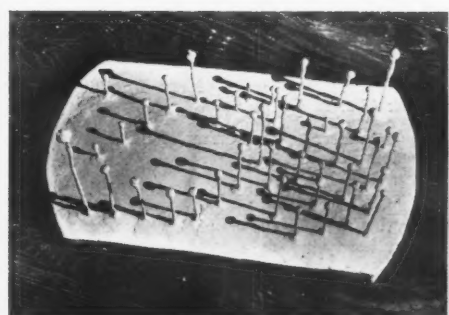
An exhibition of contemporary Danish architecture, organized by Akademisk Arkitektforening in co-operation with the RIBA and subsidized by the Danish Ministry of Labour and Housing, was held at the RIBA in March. The general effect of this exhibition was to strengthen one's impression of Denmark as a country which, while producing few masterpieces, has gone far towards accomplishing the perhaps more valuable feat of translating the universal language of the modern movement into idiomatic Danish. In addition to photographs, drawings and models of buildings, there was a small section devoted to other objects designed by architects. The whole exhibition, as one would expect, was well set out, and the fully annotated catalogue has a usefulness beyond the immediate purpose for which it was printed.

INTELLIGENCE

The International Federation for Housing and Town Planning will hold its Twentieth Congress this year in Amsterdam University from August 27 to September 2. In connection with the Congress an



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2, Composition with Parrots, by Fernand Léger, from his exhibition at the Tate Gallery arranged by the Arts Council. 3, Biolith and 5, Two Figures, by Barbara Hepworth, exhibited at the Lefèvre Gallery. 4, Growth, by William Turnbull, from the exhibition of sculpture at the Hanover Gallery.



6

The new Holophane showrooms showing on the right demonstration cabinets referred to in column 3.

international exhibition will be held similar to the one at Hastings in 1946.

Union Internationale des Architectes, founded in 1948 in Lausanne, will convene its second congress in Warsaw from September 3 to 10, 1950. Title: 'Comment l'architecte s'acquitte de ses tâches nouvelles.' Development of building construction in the different countries will be demonstrated and compared.

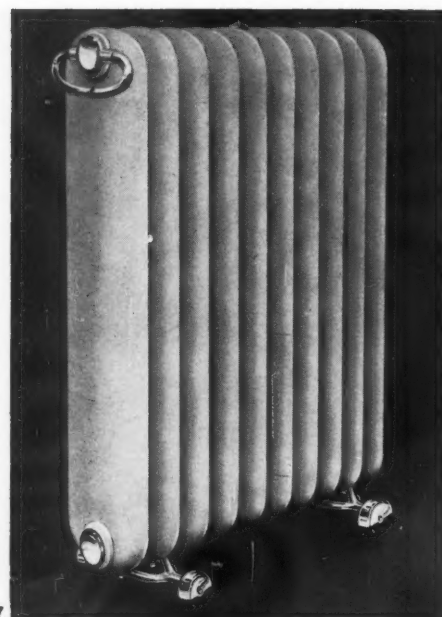
The American Institute of Architects have awarded the Gold Medal of the Institute to Sir Patrick Abercrombie.

Auguste Perret has been made Grand Officier de la Légion d'honneur.

The Ministry of Health has decided to offer annually a number of bronze medals and diplomas in each of the eleven regions for the best designed local authority housing estates—urban and rural.

Mr. Ralph Deakin and Dr. Joan Evans have accepted the RIBA Council's nomination for election to the Honorary Associateship.

M. Hubert Schumacher, Architecte de l'Etat-



7

The Graviner electric radiator (see next column)

Directeur of Luxembourg, has accepted the Council's nomination for election as an Honorary Corresponding Member.

The Council has approved the conferment of the RIBA Distinction in Town Planning on Mr. Graham R. Dawbarn who has acted as adviser to various governments and municipalities on aerodrome construction.

Donald Pilcher, who was a lecturer in the Department of Architecture at Witwatersrand University, has died in Johannesburg. He was on the editorial staff of THE ARCHITECTURAL REVIEW from 1937 to 1938, and was at the time of his death assistant editor of the *South African Architectural Record*.

TRADE & INDUSTRY

Portable Radiators

The Graviner Manufacturing Co. have recently marketed a portable oil-burning radiator. Up to a point this is a sword beaten into a ploughshare, for as engine heaters these were important items at the dispersal points on any RAF airfield. The radiator is made of cast aluminium in two sizes for a room-heating capacity of either 1,500 or 2,000 cubic feet. The paraffin oil burner is totally enclosed, and with the tank capacity of 9 pints will burn for about 60 hours on one filling. The standard finish is porcelain enamel in pastel shades of green, blue, cream or pink, with chromium fittings. There is also a finish with a veneered effect. Dimensions of the smaller model are: height, 34½ inches; length, 23 inches; width, 10 inches.

The illustration shows an electrically-heated water-filled aluminium radiator which has also been marketed recently by the same firm. It is fitted with a contact element to take a range of loading from 500 to 1,100 watts at the standard voltage of 230-240 volts, and it is claimed that by careful selection of the element in relation to requirements, a thermostat is not necessary. A costly additional item is thus avoided. The radiators are available in the same colours as the oil-burning model. Prices, including purchase tax, range from £15 11s. 7d. for a five-section radiator to £26 16s. 8d. for one with ten sections.

The Graviner Manufacturing Co., Ltd., Gosport Road, near Fareham, Hants.

Lighting Showroom

New showrooms are springing up like the flowers in May. Whether it is due to tougher selling conditions or more plentiful building licences or both, we will not hazard, but from our point of view it is to be welcomed.

The new Holophane showrooms in Westminster set out to display the wide range of lighting fittings manufactured by that firm. To a large degree these are designed for a variety of industrial and technical needs, particularly for processes which require fittings with highly specialized light characteristics. A cursory glance at one of these fittings may not reveal it to those of us who know less of the science of lighting than we ought, but there is a lot of mathematics behind the design of reflectors and the prisms through which the light emerges. Equally important is the housing of the lamp and the positioning of it in relation to its particular purpose.

On one side of the showroom is a series of demonstration cabinets which illustrate the principles of refraction, reflection and diffusion. These are the scientific pegs on which the lighting engineer hangs his blue-print. The result may be flame-proof, vapour-proof or a floodlight or street light. Examples of these and many other types from commercial pendants to a variety of fluorescent fittings are all on view for the benefit of anyone with a general illumination problem or a peculiar lighting headache.

Holophane Ltd., Elverton Street, Vincent Square, London, S.W.1.

Aluminium Alloys

Aluminium Alloys in Structural Engineering is the title of an illustrated booklet produced by the British Aluminium Company. Medium and high-strength aluminium alloys are mainly the result of developments in the wartime aircraft industry. A five-fold increase in production capacity during that period included units producing large plates and shapes for the heavier engineering industries. With the end of the war suitable aluminium alloys were adapted for use in other directions where acute shortage in the supply of more usual materials existed. Wartime experience in working these alloys combined with prices that have been relatively stable compared with pre-war levels has also had considerable influence on their use.

For structural purposes it is claimed that these alloys have three advantages: low weight with high strength, permanence under atmospheric and marine exposure, ease of manufacture and fabrication. The advantages apply in special circumstances such as movable bridges, long span bridges, long span overhead cranes of special types, and in long span roofs where the superimposed loading is small. It is pointed out that in most instances the first cost of the primary structure is higher than that of a similar steel structure but secondary factors frequently offset this initial disadvantage.

The booklet contains simple and informative tables on the various alloys, their specifications, mechanical properties and the forms and shapes in which they can be made. In addition there are notes on design, jointing, fabrication and other matters.

The British Aluminium Co., Ltd., Salisbury House, London Wall, E.C.2.

Solid Fuel Distributors' Scheme

A great deal of research and development work has been undertaken in the last twelve years aimed at increasing the efficiency of domestic solid fuel appliances. The results include open fires that can be closed up overnight and do not require lighting every morning, new types of heat-conserving cookers,

[continued on page 282]

Compressed Asphalte for roads. Tar Paving for playgrounds.
 Tarmacadam for parks. Tar spraying. Mastic Asphalte
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 coloured flooring. Mastic Asphalte for roads. Rolled
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 roads. Tar spraying. Mastic Asphaltic for
 damp courses. Compressed Asphalte for roads.
 Tar Paving for playgrounds. Tarmacadam for parks.
 Mastic Asphalte for roads. Tar spraying.
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8 The new Agamatic domestic boiler.

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new water-heating systems, multiple duty units that act as cookers, room heaters and domestic hot water heaters. Many of these devices are now on the market. To ensure that distributors are fully conversant with their operation and servicing, the Coal Utilisation Joint Council organized a service and showroom scheme and tried it out in the North of England. This 'pilot scheme' has now been in operation

over a year and is being extended to the whole Northern area. Under the scheme, an approved distributor must be fully competent to advise on all matters relating to solid fuel appliances and fuels. A Training Centre has been established in London at which the distributors and their employees will undergo courses of instruction.

The Agamatic Domestic Boiler

The Aga cooker has been the paragon of solid fuel cooker design for so long that it comes almost as a shock to be told that it is only twenty-one years old. It was designed by a Swedish scientist who went blind, was forced to be at home continually and came to comprehend the extent of the stoking, cleaning and carrying that fell to the lot of his womenfolk.

This may not be a new experience for British family men today, but twenty years ago was another matter.

Now the Aga Heat people have produced a domestic boiler to provide hot water for baths and general household requirements. In appearance it is a close relation of the cooker, in fact it is designed to adjoin the cooker when necessary. Equipped with a thermostat and fuelled preferably with coke, though any solid fuel may be used, plus the combustible kitchen refuse, it has a wide range of adaptability. The makers' performance details claim that it is equally suitable as a domestic hot water system with a storage tank range from 40 to 100 gallons, as a combined hot water supply and central heating system with a 40-gallon calorifier and up to a hundred square feet of unlagged radiating surface, or as a central heating system of double that radiating surface.

The fuel consumption is higher than in the cooker because this varies with the demands made on it. It is designed to operate at a 70 per

cent. efficiency, which is high for a solid fuel boiler, and this is done by adopting the same heat conservation principles as are embodied in the cooker. The price is £40.

Aga Heat Ltd., 20, North Audley Street, London, W.1.

The Cement Marketing Company has now vacated the offices in Ashley Gardens, S.W.1, and returned to Portland House, Tothill Street, S.W.1. Telephone: Abbey 3456.

CORRESPONDENCE

Rome: The Third Sack

To the Editors

THE ARCHITECTURAL REVIEW

SIRS,—With the article on Rome in your February issue two pictures of the Forum Romanum are printed, one showing the site in 1650 and the other in 1935. The modern excavations are deplored: 'gone are the rows of houses, the avenues of trees, the enchanting truncations of the Roman monuments, all signs in fact of the passage of time.' This is an old cry, voiced as long ago as 1834 by King Ludwig of Bavaria:

'Wie ist die Erde gewöhlt! welch Chaos erblicket das Auge!

Einst so malerisch, ach! nun keine Spur davon.'

What then can we do to satisfy the Sharawags? Clearly nothing less is demanded than to return this area, once the focus of the civilized world, to the condition of the Campo Vaccino of the late Middle Ages. If Mr. Reed could turn the clock back, where would he stop? Shall we undo Carlo Fea's work of 1803 and fill in the earth round the Arch of Septimius Severus? Reincorporate the Arch of Titus in the Frangipani's fortress wall? Bring back the great granite drinking trough, exiled to the Montecavallo since 1817, and let the cows pasture once again round the Temple of Castor and Pollux? Or if it is thought a little unseemly to bring the cows back,

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The End

To the Editors

THE ARCHITECTURAL REVIEW

SIRS,—I am unaware of the qualifications that your contributor Barbara Jones may have for writing the article entitled 'The End' in your issue of December, 1949. The article, however, strikes an unfortunate note between an uninformed treatise on Funeral Directing and a cynical expression of personal opinions on Funeral Decorations and Churchyard Architecture.

By its very nature, Funeral Directing is unfortunately subject to a considerable amount of uninformed criticism, and since I note that the article is to be incorporated in a book, I would appreciate a little of your valuable space to make a few comments.

First, in connection with embalming I must point out that hygiene is a factor equally important to 'affection,' particularly where removal of the body from one part of the country to another is involved. In America, where, according to your contributor, the practice is '... today pursued ... with a fervour almost worthy of Ancient Egypt ...' there is a Law requiring that every dead body shall be either buried, cremated or embalmed within twenty-four hours. Since the first two are not usually practicable, almost every corpse is embalmed.

Second, on the question of Funeral Colours, the contrast which your contributor makes with the '... slices of pink ham ...' of the Funeral Feast, and with White, Silver and Gold, '... the main colours at a wedding ...' appears to be in questionable taste. Black is a colour still favoured by the majority of people, and '... its most mat and dusty manifestations ...' is a completely erroneous impression of the condition or appearance of modern Funeral Decorations.

Thirdly, the quotation of the extract from *Ainsworth's Magazine* of 1842 is irrelevant, without further information. The Burial Acts of 1852-1900 closed the old Burial Grounds which had become dangerous to health, and established a Central Authority (now the Ministry of Health) to be responsible for the maintenance of Health and

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shall we send for Mr. Gordon Cullen, and ask him to townscape the area with his bollards and cobblestones in the best precinctual manner? Perhaps a few of his celebrated cafés might enliven the vicinity of Phocas' Column with their striped awnings?

The archaeologist has been depicted in 'Rome, the third sack' as an insensitive monster 'who will never be satisfied until he has the whole city flat.' This is to ignore the work of men such as the late Giacomo Boni, who did much to humanize the ruins of Rome. He restored the flower-girl lily pond in the Atrium Vestae, and did noteworthy work on the Temple of Venus and Rome. When Boni first came to this building, its platform facing the Colosseum was an unlovely shambles. It was cleared of the accumulated debris, strengthened, and its upper surface restored. The peribolus was rebuilt from circumjacent fragments, while on the bases of the prostyle and peripteral columns evergreen bushes were planted, trimmed to the shape of the lost features: a kind of reminiscential topiary work.

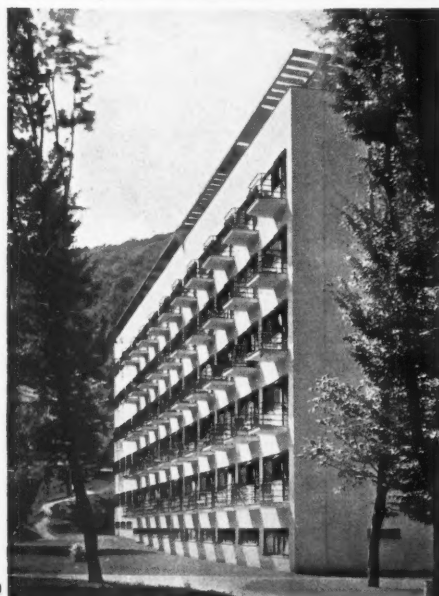
I would mention two minor points. The heroic bust depicted on p. 93 is generally considered not to represent Alexander the Great, but Belisarius, who directed the celebrated defence of the nearby Pincian Gate in 537; and the Aurelian wall was not the work of Marcus Aurelius, but of the Emperor Aurelian (271-276).

Yours, etc.,

H. A. MEEK.

Manchester.

Eugen Linhart, whose death was announced in Prague in December, was, after Frantisek Bartos and Jaromir Krejcar, the third leading modern Czech architect to die in 1949. Linhart designed the President Benes Grammar School in Prague (above) in 1936 and won first prize in the competition for the Horni-Litvinov Hostel in 1946, which is at present under construction (see *AJ*, June 26, '47, pp. 541-544). Jaromir Krejcar designed the Trencianské Teplice Sanatorium in 1929 (below), and also the Czech Pavilion at the 1937 Exhibition in Paris.



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Decency. Under the Local Government Act of 1894, Local Urban and Parish Councils (and Burial Boards elected by Ratepayers) were able to provide and manage new Burial Grounds.

Space prevents me from drawing adequate attention to a number of other passages in the article, of which the cynicism is but thinly veiled with a rather cheap 'pity'; but the statement that 'everything is very costly—Death is Expensive' must be examined.

The cost today of the services rendered by a Funeral Director ranges from £25 to £40. The 1933 Cohen Committee Report said that the average cost then was £13 in Industrial Centres. It would be fair to say that since then there has been an overall increase of 125 per cent. in the cost of all Funeral Materials. Also it is not generally realized that a number of charges may appear on the Funeral Director's Account, which are not his direct concern, but which he has undertaken to relieve the distressed relations of worry. Such charges include the cost of purchasing and preparing the grave; cemetery charges; cremation fees, even the cost of newspaper notices.

Finally, a Voluntary Agreement came into effect on June 1, 1949, limiting prices to those in force in February, 1949.

The Funeral Directing Industry deserves a far better understanding from the public generally, for its unobtrusive, considerate and efficient provision of an intimate and essential Social Service.

Yours, etc.,

F. D. HURRY (Miss)

Secretary, National Association of Funeral Directors.

Miss Barbara Jones writes:

May I explain to the National Association of Funeral Directors that in an article of less than three thousand words on a vernacular art it is impossible (even if one wished) to discuss either American law or the English burial Acts. It is equally impossible to write an economic survey of Funeral Directing, though I would of course have welcomed any relevant details, if the various Directors whom I asked to help me had been

willing to give me any such information or had referred me to the Association. My details of costs have only come from people who have paid for funerals.

On questions of taste, apart from the fact that I am as well qualified to write about death as anyone else who has not experienced it, I claim the privilege of any author—I have written to please myself about what interested me, in this case the manifestations of popular art that are still to be seen at funerals and in cemeteries.

ACKNOWLEDGMENTS

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Correction

In last month's publication of the *Offices at Wallsend on Tyne* by Richard Sheppard and Partners, the assistant architects' names were not mentioned. They were Charles E. Bantin and Derrick P. Challis.

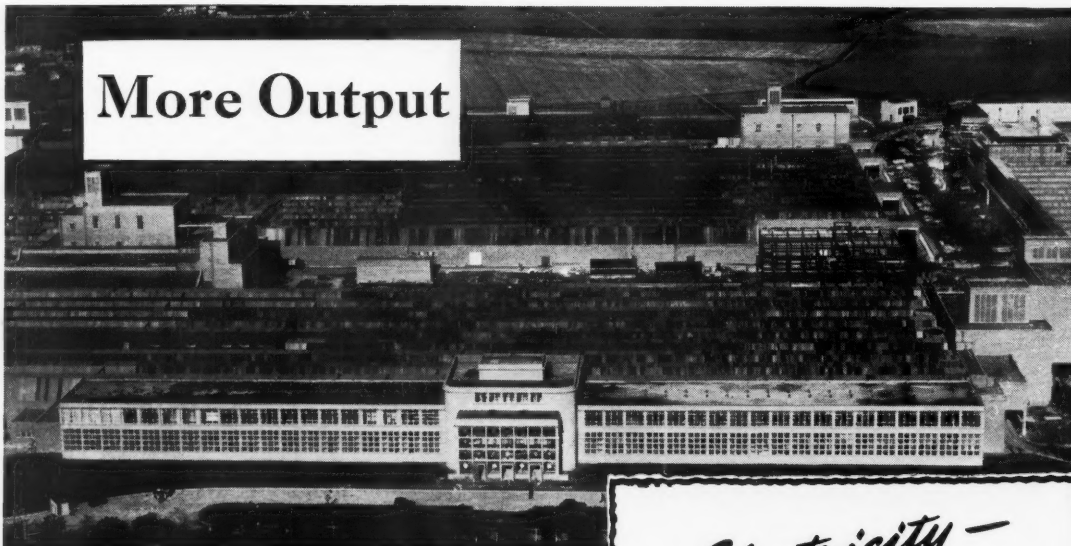
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