THE ARCHITECTS'

JOURNAL

THE ARCHITECTS' JOURNAL WITH WHICH IS INCORPORATED THE BUILDERS' JOURNAL AND THE ARCHITECTURAL ENGINEER IS PUBLISHED EVERY WEDNESDAY BY THE ARCHITECTURAL PRESS (PROPRIETORS OF THE ARCHITECTS' JOURNAL, THE ARCHITECTURAL REVIEW, SPECIFICATION, AND WHO'S WHO IN ARCHITECTURE) FROM 9 QUEEN ANNE'S GATE, WESTMINSTER, S.W.

Our readers will be pleased to learn that we shall be publishing, during the next few weeks, two further articles on Architectural Drawing by R., author of *R.'s Methods.* R.'s last articles in this JOURNAL appeared in the issues for December 9 and 23, 1925.

THE ANNUAL SUBSCRIPTION RATES ARE AS FOLLOWS:

BY POST IN THE UNITED KINGDOM.......	£1 3 10
BY POST TO CANADA........................	£1 3 10
BY POST ELSEWHERE ABROAD............	£1 8 6

SUBSCRIPTIONS MAY BE BOOKED AT ALL NEWSAGENTS

* * *

SINGLE COPIES, SIXPENCE ; POST FREE, SEVENPENCE. SPECIAL NUMBERS ARE INCLUDED IN SUBSCRIPTION ; SINGLE COPIES, ONE SHILLING ; POST FREE, 1S. 2D. BACK NUMBERS MORE THAN THREE MONTHS OLD (WHEN AVAILABLE), ADD 1S. 6D. TO ABOVE PRICES

* * *

SUBSCRIBERS CAN HAVE THEIR VOLUMES BOUND COMPLETE WITH INDEX, IN CLOTH CASES, AT A COST OF 10S. EACH. CARRIAGE IS EXTRA. A USEFUL BINDER, ALLOWING THE COPIES TO OPEN FLAT FOR READING, COSTS 4S. 6D. POST FREE

* * *

9 Queen Anne's Gate, Westminster, London, S.W.1
TELEPHONE : VICTORIA 6936 (OWN EXCHANGE)
TELEGRAPHIC ADDRESS: BUILDABLE, PARL., LONDON

WEDNESDAY, NOVEMBER 24, 1926. NUMBER 1662 : VOLUME 64

PRINCIPAL CONTENTS

CHRISTIAN BARMAN, *Editor*

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

RENDERINGS OF ARCHITECTURE

Selected and annotated by Dr. Tancred Borenius.

xlv : Emanuel de Witte (*c.* 1618-1692).
Interior of a Church.

Emanuel de Witte belongs to the group of Dutch seventeenth-century painters of architectural subjects who specialized in church interiors, and among the painters of this category de Witte holds a very distinguished place by reason of his fine sense of design and his delicate feeling for atmospheric tonality ; his touch, avoiding pettiness of detailed statement, is very broad, vigorous, and free. In comparison with Saenredam (see No. ix) *de Witte favours much greater contrasts of light and shade, and he has a remarkable power—suggestive of Pieter de Hooch—of rendering the play of sunlight on the walls and columns of the austere Dutch churches, which he generally depicts—as he has done in the present example—crowded with a congregation listening to a sermon. As a figure draughtsman de Witte was also possessed of no mean powers, and in a few occasional pieces has treated subjects from everyday life (e.g. Fish Markets) in the accustomed Dutch seventeenth-century style, with the architectural element entirely banished from the compositions.*—[National Gallery, No. 1,053.]

THE ARCHITECTS' JOURNAL

Wednesday, November 24th, 1926

CONCRETE

LARGE quantities of ink have been spilt on the subject of concrete, and critics have given the most varied advice to those engaged in designing in this material. Never was a subject brought to such a state of intellectual confusion. The reason for this confusion is, however, a very simple one. Most of the writers who are puzzling their brains and the brains of their readers by discoursing upon the difficult problem of how to design in concrete are debarred from arriving at any solution of it, not because they are insufficiently familiar with concrete, but because they have the very vaguest notions about design. In their minds they are spelling design with a small d, and concrete with an inordinately large C, with the result that their sense of proportion is far to seek. But let these same critics allow the concept of design to assume its proper status and they will be surprised to find how humble, how obedient, and how manageable the once formidable " Concrete " has become.

The statement may seem a paradox, but it is true, nevertheless, that the cleverer and more competent our engineers become the less right have they to determine the forms of building. For engineering can only influence design if it has the characteristic of being a limitation or restriction to the artist's fancy. The artist says: " I want a building of walls a certain height roofed in a certain manner, or a bridge with so many spans to be constructed upon a certain site," and it is only when the engineer intervenes and explains: " I can't do this," or " I can't do that," that the artist has to modify his ambitions and accept what he describes as the collaboration of the engineer, this collaboration consisting of a whittling down of the artist's scheme to something which is within the capacity of the engineer to execute. It is, therefore, exceedingly clear that the more incompetent the engineers are the more restrictions do they impose upon the artist, and the greater is their direct influence upon the forms of building and upon the very characteristics of architectural style itself. And the converse also holds good. When, as is taking place to-day, the engineer ceases to say, " I can't," and to nearly every demand of the artist is ready to reply with alacrity, " I can," his influence upon design must necessarily diminish. If the compositor has only a hundred words already made up in single pieces of type then the poor authors must do the best they can to deliver their messages by means of the vocabulary which the compositor provides, hoping that his choice of words is a fairly intelligible one. It is easy to imagine, however, that if the choice of these words were left to the compositor he could exercise a veto upon literary composition, even to the extent of forbidding certain subjects to be discussed at all. No ! it is not for the compositor to choose the words, it is not for the cook to choose the menu, unless he is a bad cook and can only serve up one or two of the simplest dishes, and it is not for the engineer to determine the forms of building unless he is a thoroughly bad engineer in which case, of course, we must approach him with obsequience and wait upon his pleasure.

Reinforced concrete is a medium which imposes few restrictions upon the designer. All shapes of building, large spans, wide overhanging projections, curved surfaces of walls can be stably constructed in this material. Moreover, in addition to various new and untried architectural forms, the whole repertory of the " traditional " styles of building can be executed in reinforced concrete. In fact, in nine-tenths of the buildings where this method of construction is utilized there is not the smallest occasion for any departure from the gracious forms which have distinguished structures erected in the days preceding the era of ferro-concrete. Urban façades with elegantly proportioned rectangular windows and elaborated by ornament and mouldings may easily be erected on a ferro-concrete framework, and may show to the street a comely face of painted stucco. If Nash and his collaborators in the old Regent Street had had at their disposal the medium of reinforced concrete there is no reason to suppose that they would have modified their designs in any essential respect. Perhaps it will presently be realized that as far as street architecture is concerned the age of concrete should be a stucco age.

If it is occasionally irksome to architecture to have to restrict its form on account of the limitations of constructors, it is a thousand times worse for it to be whipped-up to perform preposterous antics simply because these same constructors have recently acquired a genius for constructing almost anything. Because a material *can* do certain things this is not an adequate reason why it *should* do them. For architectural design is governed by certain social and formal considerations which have nothing whatsoever to do with the qualities of materials, and the æsthetic factors, vital to the highest expression of the art, are not present in the minds of engineers unless these latter have made a great effort to go outside their specialist subject in order to become acquainted with them. It is for architects, therefore, to convince not only the general public, but engineers themselves, that the social and æsthetic factors of design, founded as they are upon reason and propriety, cannot be disregarded without detriment to civilization itself.

NEWS AND TOPICS

THE ROME SCHOLARSHIP DESIGNS—THE CASTING OF A BIG BELL—SIR REGINALD BLOMFIELD ON SOME MODERN MOVEMENTS—A CHAIR OF BUILDING AT MANCHESTER—THE GLOOMY DEAN'S EPITAPH.

THE designs submitted in the final competition for the Rome Scholarships are now on view at the Imperial Institute, South Kensington. The exhibition has already proved to be a popular one, and it may be hoped that many more architects will avail themselves of the opportunity of studying the work of the Rome scholars, which is important, not only on account of its individual merit, but because the British School at Rome occupies a peculiarly influential position. It is no small matter for an institution to take upon itself the responsibility of singling out for special commendation students of the arts to train them in a special manner and then to proclaim to the world that they possess a certain hallmark of distinction. The Rome scholars are now, in fact, coming to be regarded as a race of junior Academicians. This is all to the good, for it means that a definite attempt is being made to establish among the younger generation of artists a respect for tradition, using this word in its noblest sense; while at the same time the besetting sin of Bohemianism is being discouraged. This Bohemianism, from which the visual arts now suffer so severely, may be described as the practice of making art an individual affair which has no relation to any social function or set of formal conventions existing independently of the artist himself. The Rome scholars are in process of acquiring a position of privilege which will entitle them to the receipt of important artistic commissions. In France it is customary for them to be given official appointments in the architectural departments of the State. In England, as I mentioned in the last issue of this JOURNAL, the determination to give to the Rome scholars a suitable field for the exercise of their talents was expressed in the scheme initiated by Lloyds Bank, Limited, whereby these scholars would be invited to submit designs for new bank buildings. It is not to be supposed, however, that the authorities of the British School desire to establish a class of official artists or architects, all of whom are attached either to the departments of State or to great commercial houses. It is rather their desire so to equip their students that, without being specially favoured on account of their status as Rome scholars, they will be able by sheer merit to establish their claims to recognition.

* * *

At the present exhibition the subject illustrated in the architectural designs was a Royal Naval College. The main object of this programme is to gauge the ability of the competitors to deal with a large site which offered an exceptional opportunity for effective planning, and to produce a design of an architectural character worthy of the importance of the subject. The site selected was on a plateau on the side of a hill facing south and east. To the north of the plateau the ground rises sharply to wooded hilly country, while to the south it descends to an old town with an harbour overlooking the sea. Here we have a subject well fitted to inspire the enthusiasm of anyone who has in him a talent for architectural design. The schemes submitted all reach a high standard and show great skill in the art of formal planning. The style chosen is, in all instances, based on the classic tradition. This convention is good inasmuch as the students are far more likely to devote themselves with success to the problems of architectural composition if they are not at this stage troubling their heads about questions of style. The first part of this competition was held in London at the Royal Institute of British Architects, and consisted of a continuous examination of thirty-six hours *en loge*, during which time the candidates were required to make a sketch design of the subject. Keeping a tracing of these sketch designs the candidates were then given a period of twelve weeks in which to draw out their schemes. This gives, say, about twenty-five hours for the conception of each scheme, and about 7,500 hours for its execution in terms of elaborate draughtsmanship. The discrepancy, however, between the time allotted to the two processes is really much greater than these figures indicate, because during the period when the candidate is working *en loge* he must get out his scheme in very considerable detail. In the exhibition we are privileged to see these preliminary sketches besides the completed set of drawings, and cannot help being impressed by the manner in which the candidates exhibited such powers of speedy concentration upon the essentials of a highly complicated architectural "programme."

* * *

To all lovers of sanity in art, and it is understood that there are just a few remaining, it will give acute pleasure and satisfaction to read Sir Reginald Blomfield's indictment of the crazier of our modern movements. Sir Reginald Blomfield compels our admiration by the way in which he stands out as a doughty champion of those ideas on æsthetic philosophy characterized by decency and honour. Very wide scholarship, a keen sense of humour, and an ever readiness to strike a blow on behalf of what he considers to be the truth are what make him such a formidable controversialist. He is far removed from those critics who before they pronounce opinions upon works of art habitually wait to see which way the cat is about to jump, the cat in this instance being the popular fashion of the moment or the prejudice of some powerful coterie which the critics in question would never have the courage to oppose. Sir Reginald is quite as ready to pronounce his views upon painting and sculpture as upon architecture, and upon whichever subject he is discoursing his remarks express the same robust common sense. In particular, the movement in painting called Expressionismus arouses his ire. The method of Expressionismus, according to Sir Reginald Blomfield, is to cast about for what the artist assumes to be the salient characteristics of his subject and then to express them by diagrams and symbols without the slightest reference to any physical appearances. "Harlequin, for instance, with his tight-fitting parti-coloured dress, his black cap and mask, and flexible lath is the familiar figure whom we all know, but M. Picasso produces a series of vertical cylinders with two or three triangles and some scratches here and there, which no doubt have significance for M. Picasso, but are intelligible to anyone else." And Sir Reginald proceeds to affirm that the predilection for incomprehensible geometrical diagrams in various colours is a relatively harmless amusement for those who indulge in it, but there was another and more sinister side to the movement which was very much the reverse, and that was the instinct for the morbid, the hideous, and the unclean. "Judging from some of the exhibits in this year's exhibition at Dresden, some of the sculptors must be half-way to the lunatic asylum already. Nude figures of men and women, impossibly thin, and about sixteen heads high, figures like lumps of putty without any semblance of form, figures which are brutally indecent, do not induce one to think that that way lies the path of progress in art." With regard to the present fashion for things Scandinavian, Sir Reginald reminds us that English architects can absorb all that is good in the Scandinavian breakaway from tradition without throwing overboard all that we have acquired in an immense historic past.

* * *

Bong-g-g ! As I passed into the Croydon Bell Foundry the air around me quivered with the sound of one of the big bells. A sound that was warning and silencing; a sound that would brook no other sound, save perhaps the bronze voice of a sister bell. For this was one of the big bells of the world; a bell in which four or five men could have stood. From all parts of the works came the sound of bells—bells solemn and mournful, like funeral bells coming over the sea; cathedral bells that struck in me deep moods of devotion; curfew bells that toll the ending of day. In Messrs. Gillett and Johnston's foundry I was present at the casting of a bell—one which was to take its place among the great carillon of fifty-three (the largest in the world) for the Victory Tower of the new Canadian Houses of Parliament at Ottawa. With the Prime Minister of Canada, I saw the electric playing apparatus for the carillon, saw the slow-turning lathe upon which the bells were being tuned, and the big frames of elm upon which English church bells would swing. And now the metal was ready for the casting of a bell, and we assembled in the foundry with strange men about us, and our footfalls silenced by a carpet of black foundry dust. A trap in front of the furnace was dropped, and a river of molten metal poured down into a great bucket lined with loam. The flames from strange gases burned around: sparks swept up. An unholy glare fell upon our faces. As if to waken the livid metal to intenser fury, a chief devil or priest of the foundry approached and stirred and skimmed the molten metal of its dross.

* * *

And still the molten river ran, but more slowly now, and at last it ceased. And now there was a slow hauling upon pulley blocks, until the bucket of glowing metal swung clear of its pit. It was raised . . . it was raised. And slowly moved sideways through space. I stepped back deferentially as it went by. It came to attention in front of the big bell mould, and again there was a hauling upon chains. After a long waiting at this altar it leaned forward, to imprint a fiery kiss upon the bell-mould's ashen lips. . . . So was created one of the big bells for the Ottawa Parliament House. Its voice will sound over the Ottawa River and the Gatineau Hills. In five hundred years—in a thousand—it will give out the same note as now. Bong-g-g !

* * *

Since the opening in October by the Prince of Wales of the Canadian Students' Home in Paris, a £100,000 scheme has been put forward for the realization at the "Cité Universitaire" of a British hostel. It will be remembered that the "Cité Universitaire" comprises the foreign groups and the buildings erected through the generous gift of ten million francs by Monsieur Deutsch de la Meurthe, on a site of about 70 acres of land given by the "Ville de Paris." The situation is a healthy one on the outskirts of the town, occupying a position on a part of the old fortifications immediately behind the "Parc de Montsouris," not extremely far from, nor very close to, the "Sorbonne" and the once famous "Quartier Latin." A curious point in connection with the "Cité Universitaire" is the fact that the group of buildings of the "Fondation Deutsch de la Meurthe" for French students, designed by Monsieur L. Bechmann, are very foreign-looking to Paris and decidedly English in architectural style, while the Canadian Hotel is decidedly French and modern ! The architects for the latter were Monsieur George Vanier (French Canadian), together with Monsieur Emile Thomas, D.P.L.G., the latter finally taking sole control as head of the "Société Thomas, Pavot, Vanier et Cie." This firm of architects have designed many buildings in Soissons. It was a pouring wet day when the establishment was inaugurated, nevertheless, all the young ladies in Paris flocked to the site to see the "Prince Charmant," which they thought worth while even at the risk of pneumonia. Royal patronage has a mysterious power more dazzling than the question of architectural style. It is officially estimated that there are over 22,000 registered students in the Capital, of whom 3,300 are foreigners. The majority of these students are not considered to be blessed with a superabundance of wealth, often being the sons of "anciens riches" or "nouveaux pauvres," and frequently obliged to house themselves under unhygienic conditions. It would seem that French culture still maintains a high degree of international reputation. Five million francs were given to the "Université de Paris" for the construction of a house to receive 200 Belgian students. One million two hundred and fifty thousand francs have been used for the erection of two pavilions for fifty Argentine students. Senator Wilson gave 2,600,000 francs for the Canadian Hotel. Many generous gifts have been made from various other quarters. The Americans have asked for a site, and negotiations are now in hand with the Swiss, Dutch, Spanish, and Cubans. Since the visit of the Prince of Wales to Paris, official circles in England appear to view the project of a British hostel with great favour. It is to be hoped that the architecture of the building will be in sympathy with its age and surroundings.

* * *

Good progress is being made, so I hear, with the project for the establishment of a Chair of Building at Manchester University. The builders in the north-west of England have for some time past been contemplating such a chair, and have not been unduly enthusiastic regarding the proposals made by the Institute of Builders in London for the creation of a chair at Cambridge University. The Lancashire building industry has always been extremely interested in building education, and not long ago subscribed liberally towards studentships. It is hoped to raise some £20,000 for the establishment of this professorial Chair of Building Science. The first requirement in a Professor of building is scientific training, and I hope, therefore, that those who have been suggested for the Manchester appointment who have not got this training will be winnowed before any decision is made.

Now that our late enemies have returned to ways of peace it is possible to spare some sympathy for their heroic endeavours to save the Cathedral of Mainz by up-to-date measures of reinforcement and underpinning. An interesting account of the work has been issued in pamphlet form under the title *Mainz Cathedral in Danger*, and an English translation has been prepared by Major Douglas R. Bennett, R.E., and Dr. K. Roos, which shows how admirable and how adventurous works of repair to an ancient monument may be. The important works started in 1925 may have been influenced by the controversy concerning St. Paul's, for they are of a comprehensive order and are founded upon a minute analytical survey. Or perhaps the Germans are familiar with such matters, anyhow. A note to one of the illustrations shows how the compilers of the account expected their readers to understand the mechanics of structure. "The joints in the regular coursed ashlar work show great pressure on the outside (left) and tensile stress as shown by the gaping joints on the right." One looks in vain for any such ability to read the meaning of the bends and distortions of the masonry in the reports of our own St. Paul's Commission. Mainz Cathedral is nothing like the size and weight of St. Paul's, but the engineers in charge have had the discretion to provide tie-rods to restrain the outward thrusts of the arches, and have erected a rigid steel centering under the arches of the principal tower, which, with its supporting piers, weighs something like 12,000 tons. Our brave engineers at St. Paul's think fit to bore holes in the piers which support 67,270 tons without first erecting centering !

* * *

The Dean of St. Paul's is the custodian of a public monument, and the criticisms concerning the repair of the cathedral which I have made from time to time are primarily addressed to him in the confident belief that he will ultimately learn to understand and act upon them. Already the programme of repair works has been considerably amended and enlarged to give a colour of science to the original scheme of patching and grouting, and further advances may be expected as examination of the building brings enlightenment and prepares a more receptive and appreciative attitude of mind towards sound criticism. But time is short. Any serious slip will mean a public inquiry and a comparison of the achievements of the cathedral experts in theory and practice with the theory and practice of other conservators who have had the advantage of more minute study and vastly more specialized experience. In such a serious investigation, the adroit employment of verbal subterfuge such as "No further movements have been *reported*" would hardly raise a smile. In the face of the needs of the cathedral its fatuity is too patent. The grim liability is that the building itself may make the report.

* * *

The Dean's repetition of his ridiculous accusation that warnings are "all newspaper stunts," after he has had ample time and opportunity to learn that they are both friendly and sincere shows how little he is interested in his office of custodian. Though he does not yet seem to have realized the fact, he is engaged in a race with the forces of decay. Either he must become an efficient custodian before movements in the structure become recognizable by the public, or the control of the great national monument will naturally drift into other hands. No stunts will be needed to hasten the event, and though stunts may be employed to prevent it, they will be inadequate.

* * *

That the Gloomy Dean, wisely pessimistic in most things, should be optimistic in his capacity as custodian of his cathedral has been the subject of comment in an article entitled "Dean Inge on Newspaper Stunts" in *Truth* (for November 17). Mr. William Harvey had already pointed out, in *The Preservation of St. Paul's Cathedral*, how buildings fail through this "irresistible temptation to an optimistic frame of mind," and the Dean seems bent on adding another example to prove him right. To have remained impervious and indifferent to the warnings of a careful inquirer for nearly two years and then to affect to regard them as fictitious shows to what lengths this natural optimism of the custodian can go. Living in or about the cathedral which has been more or less continuously under repair during his tenure of office, the Dean, like any other man placed in a similar position, has become callous to the signs of continued decay, and unconsciously assumes that their very continuity is normal; a world-without-end affair. He fails to realize that the movement of the building in the last century is no just measure of its prospect of movement during the next. It is ignorance of the manner of a building's decay, the slow adjustment followed by the sudden plunge, that keeps custodians comfortable and apathetic. When at the last St. Paul's crashes down upon its latest custodian, the tail-end of Sir Christopher Wren's inscription will serve for his epitaph. Fitted up on the monstrous heap of dust and rubble it would invite the reader who requires his monument to look about him !

ASTRAGAL

ARRANGEMENTS

FRIDAY, NOVEMBER 26

At the Royal Technical College Architectural Craftsmen's Society. 7.45 p.m. W. Basil Scott, M.I.STRUCT.E., on Constructional Steelwork.

MONDAY, DECEMBER 6

At the Royal Institute of British Architects. 8.0 p.m. Arthur H. Smith, C.B., F.S.A., HON. A.R.I.B.A., on The Building Inscriptions of the Acropolis of Athens.

TUESDAY, DECEMBER 7

At the Design and Industries Association. 8.0 p.m. Marriott Powell and Harry Trethowan on Glass Ware.

At the Royal Institute of British Architects. 3.30 p.m. First meeting of the Council for the Preservation of Rural England. The Earl of Crawford and Balcarres and Mr. Neville Chamberlain will speak. Members of the general public are invited to attend.

THURSDAY, DECEMBER 9

At the Architectural Association. The Conversazione.

FRIDAY, DECEMBER 10

At the Royal Technical College Architectural Craftsmen's Society, Glasgow. 7.45 p.m. James Gillespie on Scottish Domestic Architecture (illustrated).

The Town Planning Institute. (At the Caxton Hall.) 6.0 p.m. G. L. Pepler on "Land" in Many Countries; Information Extracted from the Papers presented to the International Federation for Housing and Town Planning.

ON THE EXTERNAL EFFECT OF CONCRETE

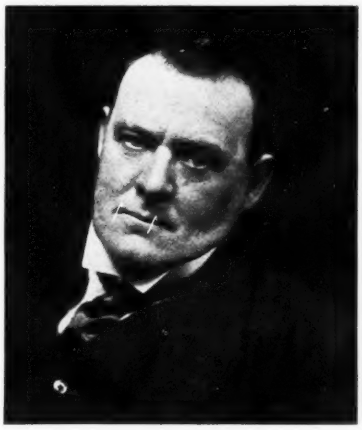
[BY HILAIRE BELLOC

WHAT I want to say in this little article is so simple and so low that I am almost ashamed to ask for its being printed in a journal dealing with the great affair of architecture; but I think it is something which is running in a great many people's heads and is worth expressing.

For all I know it has already been much better expressed before by dozens of other people, but at any rate I have not come across that expression, and now that we are having examples of concrete building on all sides, the idea presses upon me whenever I travel and see a new structure rising in London or Paris or on the Rhine.

It is this: Why should people be afraid of decorating concrete precisely as stone was decorated in its time, or for that matter, brick? Why should our architects to-day be ridden by this self-conscious nightmare that ornament must conform exactly to material, or rather, to be more accurate, that reason, reason from exact cause to exact effect, should trammel the arts?

The nineteenth century, which was for ever giving reasons for things and for ever making a fool of itself, started the idea upon the Continent that ornament, or if you like a more general phrase, diversity in surface and plan, must be connected with utility; or, at the very least, with material.



Mr. Hilaire Belloc.

That was all part of their itch for putting things neatly into a box. If I remember rightly (and dimly) Ruskin took up the matter over here, or at any rate a whole school did so, and we were solemnly told in 300 books and 3,000 lectures, not as a piece of advice, but as a religious command, that ornament must follow utility, and nothing must be "meaningless"—and so on. Why?

That was the fundamental question they never answered—for they never dug down to the foundations. The intellect was having a rest. And by the way, while the intellect reposed, what tremendous conquests the fool part of the soul of man achieved over the forces of Nature, and what catastrophes it blundered into! But that, I repeat, is only by the way.

Well then, we had this gospel preached to us, or rather this dogma imposed upon us. And what is it worth?

It has been said that the Greek architecture in stone was but an imitation of the older Greek architecture in wood; that the pillar of the trunk of the tree; the pediment, the two beams supporting the roof-tree at an angle to keep off rain. The parallel groves in sets (I do not know their name) appearing at intervals on the horizontal which supported the roof (I do not know its name) was the "survival" of the ends of rafters formerly of wood, and those decorated; that the skulls of animals sacrificed were once put up on the wooden structure, and then reappeared in stone ornament.

It may well be so. Or it may be that the whole thing sprang up first in stone. I am no bone-head evolutionist, and I do not pretend to decide without evidence—perhaps there is evidence. I do not know. But anyhow, the fact remains that these things *were* done in stone, and were successful beyond the dreams of avarice. Whether they were copies of, or survivals from, wooden structure and its crude ornamentation with bones, or whether they were part of an original stone design with no wooden parentage, sprung directly from the creative mind, there is no doubt at all that their architects pulled it off.

Yet none of these things were necessary to stone, nor was stone necessary to any of these things. It would have been perfectly possible for the old Greeks to have made a stone structure anyhow—simply to keep out the wet, or to give shade from the sun. There was nothing in the material, stone, which compelled them to make the particular ornament they did, save, of course, in the sense that you cannot work in any material without considering the limitations and nature of that material. Stone did not suggest the head or skull of a sacrificed animal, still less did stone suggest the curling leaves of the acanthus, or the curling horns of the ram. Stone did not suggest the human figure, which was the glory of frieze and pediment. Stone was compelled to take on these forms whether it liked it or no. The mind desired beauty, and beauty arose. Material was enforced by mind.

Now what I am asking is, Why should it not be so with concrete, and (for the matter of that) with steel?

How often have I not heard men crying out pedantically against a concrete surface whereupon had been imitated the courses of stone blocks? They have said that it was "a prostitution of the material," that it was a "sham," that it had "no sort of structural meaning," and so on. That it had no structural meaning, and that it was sham in the sense of not being the thing itself, is true; but why "a prostitution of material"?

One of the loveliest things antiquity has left us, a repose to the eye everywhere throughout Europe, is the hanging garland of fruit and flowers, carved in relief upon stone—and even upon brick. When properly made it follows the true Catenian curve—and how the eye is satisfied! But are there then stone fruits and flowers, and garlands, or such things in brick? Certainly not!

I see no reason whatever why man building in concrete should not imitate upon its surface the forms and details of stone. If he wants a reason (and I can conceive no better reason than beauty) let him console himself with the modern guess-work at hereditary memory. Let him say that as we have had stone work for many centuries, so that the eye needs a continuation of the old appearance in the new material. But whatever reason he chooses to give (and it is unimportant) let him gladden us with beauty.

Here I may be met with an argument—I have heard it—somewhat to this effect: "The new methods of building give us, when we choose to use them, vastly greater spaces than did the old method. We can build more securely upon a larger scale, we can span greater gulfs (whether this be true of concrete I do not know, it is certainly true

The Menai Suspension Bridge.

of steel), therefore you must have a type of ornament suited to this new scale." By all means! (as the Duke of Sussex used to say when the parson remarked "Let us pray"). But what has that to do with the fear of ornamenting steel and concrete after the fashion of older materials?

What I am driving at is, that the right way for the mind to go to work is the production of beauty. It is to begin with beauty and to consider material afterwards. You ought to say to yourself, "This great chasm will be spanned, a bridge is about to be made, but on a scale which our fathers could not have attempted. What external form of line, quite apart from the structure, will convey symbolically to the onlooker the majesty of the great task? Shall we have a gigantic figure supporting the bridge on either side? Shall we mask the real lines of the structure (which may very well be ugly) by false lines like a sort of drop scene? Shall we create a pleasant skyline with a balustrade, although, as a fact, the traffic will go under the top of the bridge and not over it?" That is my point; that is my argument.

There is an instance worth remarking with which we are all familiar: the tubular bridge across the Menai Straits. I was staying at a country house some weeks ago, during the summer, from the windows and gardens of which a man enjoyed one of the most beautiful natural sights in the world, the great lift of the Snowdon mountains, the sea river, and its hanging trees. The view was marred by this disgusting tubular bridge. It was not marred by the suspension bridge because (for some reason of which I know nothing) the "curve of the chain" is beautiful to the human eye, and at a reasonable distance the suspension bridge does not swear. But the tubular bridge is an abomination. It fits in with that lovely landscape about as well as one of our new peers would fit in with Jane Austen or a jazz-band with an ode of Keats.

People tell me that this is so because it is made of iron. I entirely refuse to believe it. Iron is the material of certain gates of which I could make you a list, in Somerset, in Flint, in the Cathedrals of Salamanca and Saragossa, outside the neglected avenue of a French château which haunts my memory. Iron is the material of the sword and of the dagger, and of the halberd and of the helm. There is nothing the matter with iron. What is the matter with the tubular bridge across the Menai Straits is that men in making it did not want to make it beautiful, and that's all that is the matter with it. If man in making it had decorated the outside so that it looked like a series of hanging wreaths, or a fine great beam, or anything else he felt inclined to put up by way of illusion, man would have been perfectly justified; for our end is happiness, and beauty is one of the means thereto.

But that we must first of all set about considering our material, and then wonder how we can achieve beauty without offending the sanctity of the material, seems to me altogether putting the cart before the horse.

THE ARCHITECT'S FEES

[BY THE EDITOR]

THERE has been some talk lately on the question whether an architect should or should not design his own reinforced concrete. There are some who say that unless he designs his own reinforced concrete he is not an architect. Others say that if he does design it he becomes an engineer. They cannot both be right; there must be a misconception somewhere. What, we may well ask, is the architect's proper work? It is to design buildings. These buildings contain certain structural units. Does he design these units? Most certainly. The structural units are built up of some material or other. Does he design this material? Does he design the molecular structure of Portland stone? He does not. Does he design the fibres of his oak, the crystals of his steel, the cortical scales of his cow-hair? We know very well that he does none of these things. Some of these materials, such as the stone and the cow-hair, are the work of Nature. Others, like the steel and the glass, are the work of man. None are the work of the architect; to design materials is not his job, nor has it ever been. And reinforced concrete is a material just like these others, differing from them only in this: that every inch of it has to be specially designed for its place in the building. Now, it would be quite possible to understand the mentality of a person who held that where a material is used that gives *less* trouble than other materials, this material might be left to the architect to design. But if instead it was suggested that the architect should be made to add the design of a material to his duties because the material gave *more*—very much more—trouble than others, then we should begin to wonder what was wrong with such a person.

It is surely impossible to be of two minds on the point. If you cut your hand your general practitioner will raise no objection against the minor surgical operation that may be involved in cauterizing and stitching up the wound. But if an internal operation *more* than usually complicated becomes necessary, he will not *therefore* waive his custom of handing you over to the care of a surgeon. The question is as simple as any question could be, and I feel almost bound to apologize for having dwelt upon it with such emphasis. There seems, however, to be some little doubt regarding the proper answer to it. Worse still, the Ministry of Health, in no apparent doubt but with every air of certainty, has felt called upon of late to give it the wrong answer, insisting, not that a reinforced concrete specialist should not be employed, but that if he is employed he should be paid by the architect out of his own commission. This decision, whose consequences for the profession of architecture may yet become exceedingly grave, must appear all the more arbitrary when it is remembered that it is the custom of the Ministry of Health to insist that large public buildings shall, whenever possible, be constructed of reinforced concrete so that our few remaining English bricklayers may continue to build houses undisturbed.

Now, the R.I.B.A. issues a scale of professional charges which fixes the architect's rate of remuneration and also the conditions of his engagement. One of these conditions is that the fees of any consultant or consultants retained for any part of the work with the concurrence of the client shall be paid for by the client. Now, if a scale of this kind is to be successful and yet remain, like the present one, entirely voluntary, it is necessary that the outline of it should first find general acceptance. Provided the majority thinks such a scheme right and fair, and is prepared to act upon it, the minority may be left to follow or not to follow as it likes. As a rule, of course, it will follow. On the scale of charges opinion is mostly solid. There are a few disagreements on minor points; a few people still go on charging 5 per cent. on contracts worth over £2,000; some find the graduated scale for smaller work insufficient; others find it too troublesome and discard it for the standard rate; and so forth. The bulk of the profession, however, is content to adopt the clauses of the scale *in toto*, and on this point all is therefore well. But the same is not true of the clause in the conditions to which I have referred. It is clause *f*. And the trouble about clause *f* is that its definition covers two kinds of people. The words " consultant or consultants " cover the people who make a speciality of producing shop-drawings for steel framework and certain parts of building equipment, just as much as it covers those who design this new material, reinforced concrete. And between these two groups of people there is a very great difference indeed.

Shop-drawings are, of course, required for any part of a building that is *made*. Sometimes they are prepared by the maker of the thing, as in joinery. Sometimes, as in steelwork or central heating, they are prepared by a consultant. If they are done by a consultant they should, says the R.I.B.A., be paid for by the client. If they are done by the maker they are, *ipso facto*, so paid for. But there are a number of architects who regard it as unfair that a client should be made to pay, in connection with a building job, fees other than those due to the architect. These architects would sooner impoverish themselves than confess to a client that their design and their fee were only one of several designs and several fees, and that other designs must be got from other professional men, and other fees paid for these designs. Side by side with these, you have the rare and doubly fortunate architects whose technical knowledge enables them to dispense with such outside help. They are complete and self-contained, these men, and the thought of retaining a consultant—whether for concrete, heating, acoustics, or electric lifts, whether with or without the concurrence of the client—they reject with scorn. It cannot be said, of course, that they reject or infringe clause *f* of the conditions, for to them this condition simply does not apply. Their attitude, however, has precisely the same effect as that of the too scrupulous architect who rejects the condition. But there is yet another and less honourable way of rendering the provisions of clause *f* nugatory, and that is to make the client pay for the shop-drawings without telling him that he is paying for them. This may be done either by causing the drawings to be prepared by the maker of the piece of equipment, in which case the cost of the shop-drawings is included in the contract price; or by retaining a consultant and burying his fee very deep with those of the quantity surveyor or among the provisional cost items in the bill of quantities. Again we see a choice between the *evasion* and the *infraction* of clause *f*; again the effect is the same. The effect is to make it increasingly hard for an architect to go to his client and demand, as a generally accepted custom, that he should pay substantial fees for shop-drawings to various consultants engaged by the architect.

Such a difference of opinion is unfortunate, for how can the R.I.B.A. support the claim brought by Mr. A., a member, against his client for consultant's fees when Mr. B., also a member, is known by all deliberately to forgo such fees? (I forbear to speak of Mr. C., who sees that the specialist gets paid somehow without the client being any the wiser.) Would not the R.I.B.A. by so doing lay itself open to the charge of permitting its members to compete on wholly different terms? It is not as though Mr. B. were secretly evading an obligation placed upon him by his adherence to that body. On the contrary, he is disagreeing on principle with an important ruling, and is able to support his dissension with arguments of considerable force. But the dissension only exists on the subject of shop-drawings for equipment. There is, so far as I am aware, only one tenable opinion concerning the drawings for a reinforced concrete structure. This opinion is, I repeat, that the architect should no more be asked to design reinforced concrete than he should be asked to design a brick; nay, that he should be so much the *less* asked as the work involved is greater. The R.I.B.A. have as yet, however, provided only one clause for the consultant on a structural material and the consultant on equipment. It may be that two clauses will be found necessary so that the position of the structure consultant may become clear beyond a possibility of doubt or dispute; it may be that the existing doubt regarding the equipment consultant will have to be resolved. These things are beyond the scope of the present article. But what is entirely certain (as, indeed, this article is written solely to show) is that if the profession allows the Ministry's view of its responsibilities to be upheld, it will have to pay dearly for its complaisance.

It does not need any profound thought to realize that the danger is one whose greatness could scarcely be exaggerated. There are buildings in which the cost of the reinforced concrete structure equals one-tenth of the total cost. There are others (and their number, let it be noted, will necessarily increase) in which it equals four-fifths, nine-tenths even, of the total cost. If concrete is used to such an extent in a building it must be for a very good reason. It may be used because it is cheaper, or quicker, or because the Government requires it to be used. But whatever the reason may be, it should be clearly impressed upon the client that the advantages he hopes to gain will be (to a small but varying extent) balanced by a greatly increased expenditure on what the Americans call "draughting." To the great number of drawings required for a building in the traditional materials there will be added a yet greater number. Now, we must remember that clients are sometimes so foolish and so thoughtless that, until they have been taught by experience, they wonder what an architect is for, and why he should be paid to make drawings. Institutions like the R.I.B.A. and papers like THE ARCHITECTS' JOURNAL may do what they will to combat this ignorance, both directly and indirectly; some of it will always remain. And it will not only remain, but will spread and strengthen if the client, seeing a large number of drawings for the most substantial, the most conspicuous and the most expensive part of the building made by an engineer, is allowed to harbour a suspicion that the preparation of these drawings is, or ought to be, part of the architect's ordinary work, the work for which he is remunerated under the R.I.B.A. scale of charges. There is no reason whatever why the architect should not, if he chooses to do so, make all these drawings himself; but he should not be expected to throw them in for nothing. For if this fallacy is allowed to gain ground, in such a manner that the Ministry's attitude on fees becomes the general attitude, then the activities of many of our profession will, I submit, come to a sudden end.

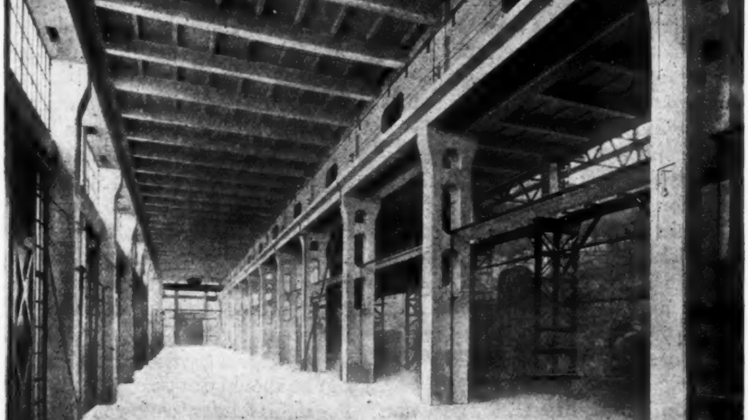
FRAMEWORK DESIGN

[BY A. TRYSTAN EDWARDS]

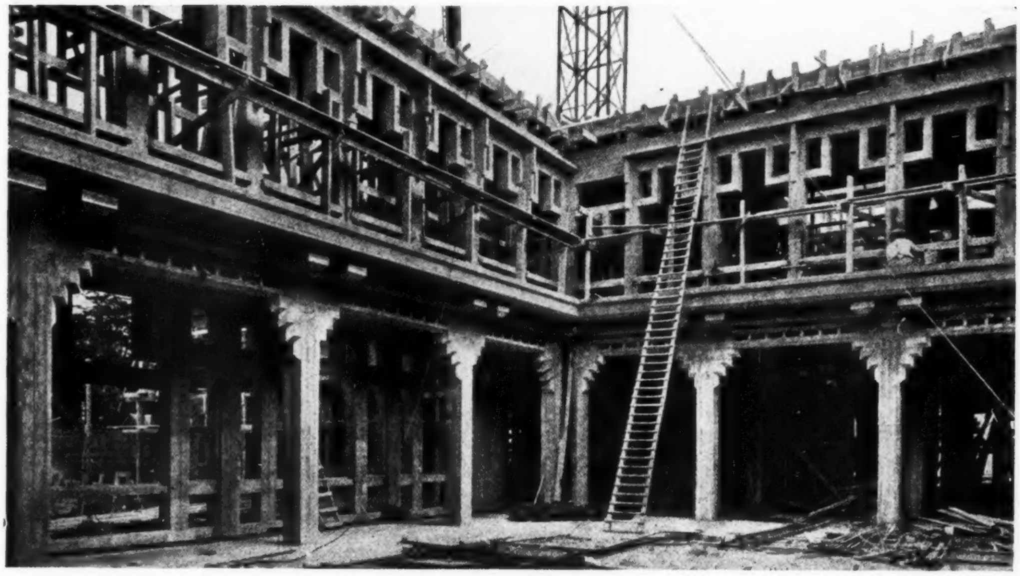
Concrete framework differs from steel framework in an essential respect. Steel framework is something which serves its purpose best if it be covered up. The corrosion of steel is so rapid that without this protection it needs constantly to be painted. There are occasions, of course, when it is necessary to display gigantic steel trusses, as in the Forth Bridge, for instance, and other famous bridges. But although these examples exist and some of them show framework which has been designed with the object of not only being constructionally stable, but of also being attractive to look at, it is true to say that, in general, the design of steel frameworks has suffered æsthetically, for the simple reason that the majority of them are covered up and the convention is established that the appearance of the steel truss does not matter very much. One has only to compare, for instance, the roofing of the older railway stations, such as Paddington, with some of those more recently erected. In the former case engineering had not yet completely emancipated itself from the traditions of architecture, and designers of steelwork felt it to be incumbent upon themselves to combine the constructional members into patterns having some formal significance. With the advent of reinforced concrete, however, there are signs that a new era of engineering is making its commencement, namely, an era in which engineering will tend to resume that close association with architecture which was characteristic of it at the beginning of the industrial era. One reason for this happy change is that concrete framework not needing to be covered up in order to preserve it from corrosion, will tend to belong, as it were, to the open, and when once it is established that forms of design are displayed for all and sundry to look at, there sooner or later arises a desire to give to the forms thus exposed an attribute of beauty.

In discussing concrete I do not now refer to that quite legitimate use of this material by which it is made into solid walls which are not formally distinct from walls constructed in brick or stone, but shall confine myself to the consideration of concrete framework. There is, of course, a school of thought whose adherents maintain that the proper expression of reinforced concrete has only been achieved when the framework has been laid bare, and they would deny the legitimacy of using the new constructional device for the purpose of erecting plain wall surfaces of the traditional type. These doctrinaires seem anxious to proclaim the thesis that reinforced concrete should only make piers, and cannot or ought not to make walls. If we were to accept such a conclusion as that, then reinforced concrete construction would be a very poor and inadequate instrument for the purposes of architectural design, which requires for its mature expression both piers and walls. Considerations of social function will determine in each instance whether the architectural elements enclosing a building should consist of framework with glazing in between the vertical supports, or whether it be more convenient to have smaller apertures surrounded by plain wall surfaces, and in extolling the possible virtues of concrete framework I am not suggesting that it should encroach upon the proper domain of walls, for walls are eternally useful, and cannot be superseded by any constructional device whatsoever. I am concerned rather with the design of concrete framework as it may appear on the prescribed number of architectural occasions when this framework may legitimately be exposed.

Let me take as my first instance a design for gas purifiers at Bargoed, South Wales. Here is obviously a place where it was desirable that the interior of the structure, although provided with floors and ceilings, should yet be open to the air. Where rooms do not require to be glazed the exposure



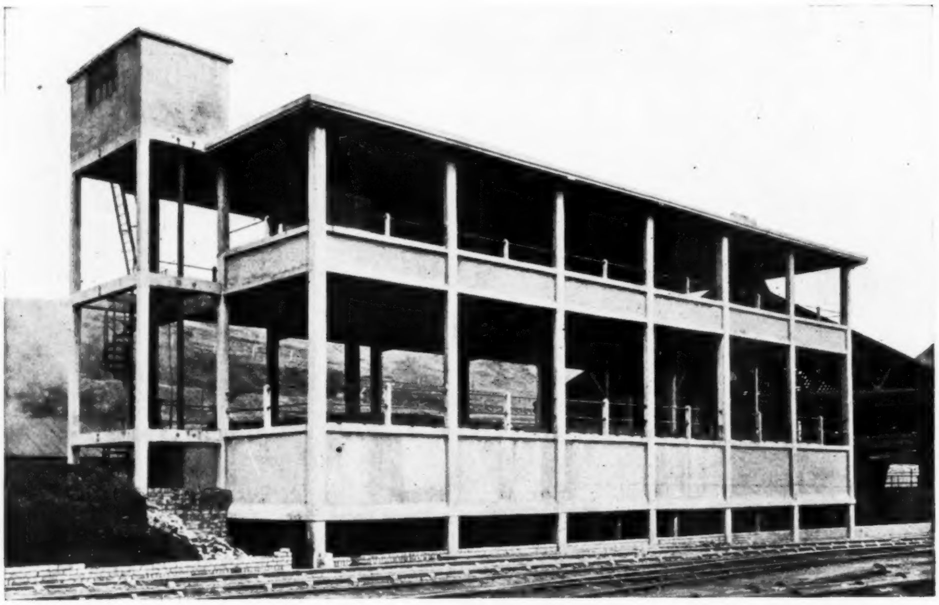
Reinforced concrete factory building at Witton, Birmingham. By Thomas Wallis. This building exemplifies the principle of punctuation, for here the vertical members which support the ceiling spread outwards at their upper extremities, and whether or not this spreading was dictated by structural considerations, it provides a pleasing, formal effect.



De Nederlanden: a modern office block at The Hague. By H. P. Berlage. This building is a very important experiment, because it shows evidence of a desire to profit from the vast experience in "post and beam" design which is embodied in the wooden buildings of China and Japan. The framework is composed in a pattern having rectangular subdivisions, and so is æsthetically related to the horizontal and vertical lines of the building itself.

of reinforced concrete constructional framework is especially appropriate, for here the upright members perform the same function as columns, and are not merely a device for strengthening and economizing the material in walls. Having exposed the framework, the question arises: What principles of composition should govern its arrangement? The answer to this question must necessarily be that the design of reinforced concrete framework is governed by the same principles which must be observed in architectural design in general. It is very often stated that reinforced concrete construction, inasmuch as it renders possible wider spans to the apertures of building, will lead to the creation of a new style, and that the old proportions of architecture will be superseded. Very long bressummers, unsupported except at their extremities, may cause us æsthetic displeasure, but we are told that as soon as our senses are trained to familiarity to these they will seem not only satisfactory, but even elegant. A fallacy appears to be involved in this assumption, and as this fallacy is brought forward again and again in numerous articles and discussions on the æsthetic factor in rein-

A reinforced concrete gantry at the works of the South Metropolitan Gas Company at Greenwich. The reinforced concrete members, although they serve their utilitarian purpose admirably, and provide an economical solution of the problem of how to support the roadway at the required level, seem to comprise a bewildering complex of forms.

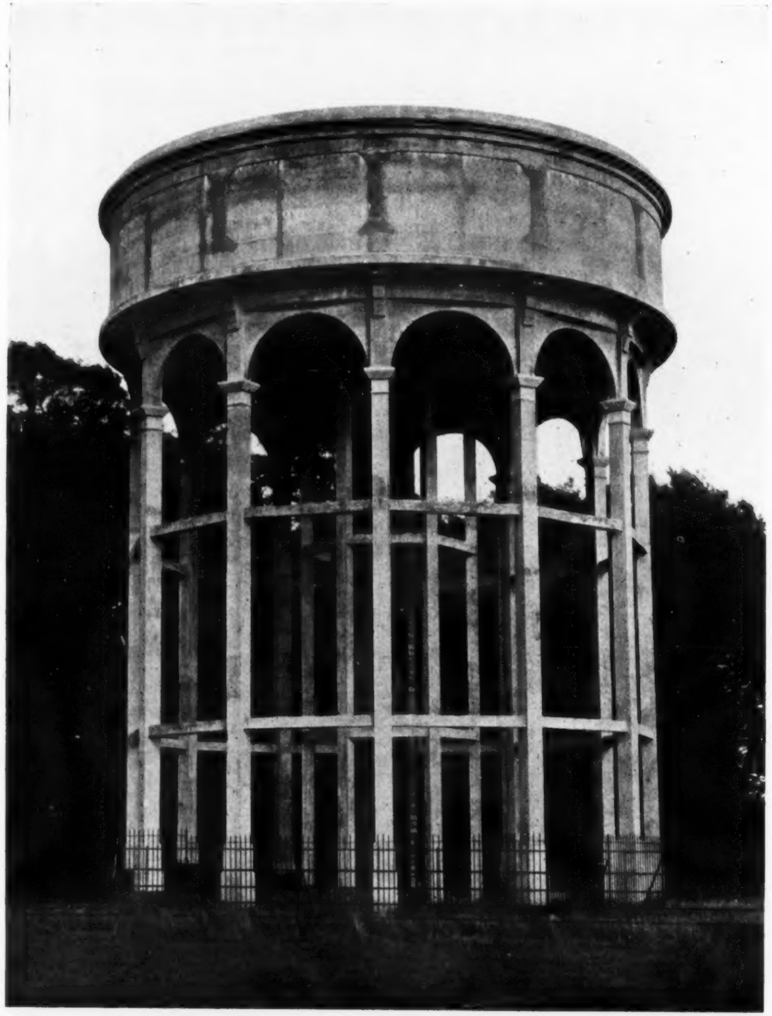


Gas purifier, Bargoed, South Wales. Here the framework is legitimately exposed because it was desirable that the interior of the structure, although provided with floors and ceilings, should be open to the air. The design has several qualities which bring it into the category of architecture.

forced concrete construction, I propose to devote a few paragraphs to attempting its refutation. The fallacy is due to a misapprehension of the meaning of the word "proportion."

It is assumed that, because reinforced concrete enables designers to use larger dimensions for horizontal beams and other features, we are therefore justified in putting aside theories of proportion which were applicable to buildings erected before the invention of this constructional device. The opinion is even occasionally expressed that people trained to appreciate the beauty of buildings erected in the historic styles of architecture are by reason of this very training incapable of judging the æsthetic qualities which may distinguish a reinforced concrete structure. Good proportion, however, is not dependent upon the size of any one feature, but can only be shown in the relative dimensions of the several parts of a building. Horizontal beams may be as long as the engineers can safely construct them, but on one condition, namely, that this dimension has an æsthetic relationship to the dimensions of the other parts of the building. This æsthetic bond, to which a structure must submit before it can be considered a work of art, has several aspects. Its main purpose is the achievement of unity and the subordination of the parts to the whole. In striving for unity the designer must avoid duality, which is its opposite. He must give the structure a recognizable boundary so that it has the quality of an integer rather than that of a fraction; and, lastly, the parts of the structure must express by their shape and disposition that they take cognizance of other parts and of the whole; and this whole itself, if set in association with other structures, must also take some formal cognizance of these. The design under consideration has several of the qualities which bring it into the category of architecture. We notice that the vertical posts at the top story are shorter than those down below. This considerably helps the design, because it prevents the two main stories competing on equal terms, and thus compromising

Refrigerating station for the Port of London Authority. Here the constructional members which support the ceiling are composed of framework of a pattern consisting of a series of triangular shapes. These are in themselves quite orderly, and as they are enclosed within long rectangles, having their sides parallel to the wall and to the floor respectively, they are well subordinated to the surrounding architecture.



Left, this design for a water-tower for the Bath Corporation is an elegant composition in which the supporting members are well punctuated at both top and bottom. The arched heads of the interval between the vertical posts have a decorative rather than a constructional significance. The structure would be improved by the addition of a concrete base. Right, a pithead gear over an intake shaft for the Fife Coal Company at Lochore, near Lochgelly, Fifeshire. This structure of naked concrete framework serves its utilitarian purpose admirably, and its designs suggest a severe economy of means to an end. It is, however, somewhat lacking in formal cohesion, the lower portion of the composition being not æsthetically related to its superstructure.

the unity of the composition, while at the same time it gives expression to the fact that the two floors have not identical functions to perform. In the case of the tower, however, the duality is more apparent, as there is no parapet on the second stage, such as would have produced the appearance of inequality between the vertical dimensions of the posts belonging to the first and second stages respectively. The box-like structure, however, at the top of the tower helps matters considerably, for although it is not homogeneous with the stages below, it at least has the character of being a third story. It is noteworthy that the tower is punctuated by the slight overhang of its flat roof, while the main part of the structure has a similar feature, the formal emphasis of its upper extremity being also assisted by the capitals to the posts which, though structurally unnecessary, yet greatly improve the appearance of the building. Again, it so happens that the short stilts which support the structure enclose long rectangles which themselves form a pleasant punctuating feature to the design at ground level.

The reinforced concrete factory at Witton, Birmingham, by Mr. Thomas Wallis, F.R.I.B.A., also exemplifies the principle of punctuation, for here the vertical members which support the ceiling spread outwards at their upper extremities, and whether or not this spreading was dictated by structural considerations, it provides a highly pleasing formal effect, for it gives to each vertical member, as it were, a crowning feature or head. It is not, however, provided with feet, for the lower extremity is without any formal expression. Hence the columns seem to disappear through the floor, and one might easily be led to imagine that they originally extended over two stories, and that the floor was added as an afterthought. There is, however, an excellent reason why the columns have not, in this instance, been provided with spreading bases, for this treatment would have taken up additional floor space, and might have been in the way of such operations as were taking place in the factory. It may be suggested, however, that in such cases, without encroaching upon the floor space, the formal expression of the foot of each post might possibly have been achieved either by a coloured band around the base or by some form of articulation which would necessitate some slight diminution of the girth of the column at its nether extremity.

In the highly interesting design of the Kantoorgebouw De Nederlandente 's-Gravenhage it is again apparent that, while an ornamental punctuation has been given to the top of the columns, the lower extremities are without formal expression. As a result the length of the columns appears indeterminate. The building is a very important experiment, however, because it shows evidence of a desire to learn from the vast experience in "post and beam" design which is embodied in the wooden buildings of China and Japan. It is not generally realized what a source of inspiration for designers in reinforced concrete is to be found in the architecture of the Far East, for the qualities of wood and of reinforced concrete are similar, each of these materials being capable of enduring considerable transverse stresses. The reason why the example of Chinese and Japanese architecture is so valuable is that the æsthetic possibilities of timber construction are therein exploited to the full, even at the expense of economy in material and constructional means. In the Japanese architecture one seldom sees compressional and tensional members of wood arranged haphazardly at all angles as one does in the timber trusses designed by European architects, but the framework is always composed in a pattern having rectangular subdivisions, and so is æsthetically related to the vertical and horizontal lines of the building itself. In this Dutch design we see on the first story the punctuation at the top of the posts is achieved by the addition of just such rectangular elements of framework, which obviously do little to support the bressummer above, but were designed to perform a purely æsthetic function. While finding reasons, however, to admire frameworks which are based upon a rectangular pattern, one may still recognize such formal excellence as may distinguish trusses in which the members are placed at various angles.

In the design for a refrigerating station for the Port of London Authority, here illustrated, the constructional members which support the ceiling are composed of framework of a pattern consisting of a series of triangular shapes. These are in themselves quite orderly, and as they are enclosed within long rectangles, having their sides parallel to the walls and to the floor respectively, they are well subordinated to the surrounding architecture.

In the case of the reinforced concrete gantry at the works of the South Metropolitan Gas Company, East Greenwich, however, the reinforced concrete beams, although of course they serve their utilitarian purpose admirably and may be an economical solution of the problem of how to support the roadway at the required level, seem at sixes and sevens, and to comprise a bewildering complex of forms.

Bridge over the little belt, Denmark. By Jultent and Fyn. In this design for a reinforced concrete bridge a series of arches follow the main pattern of the structure, while all the other members of the framework are either vertical or horizontal.

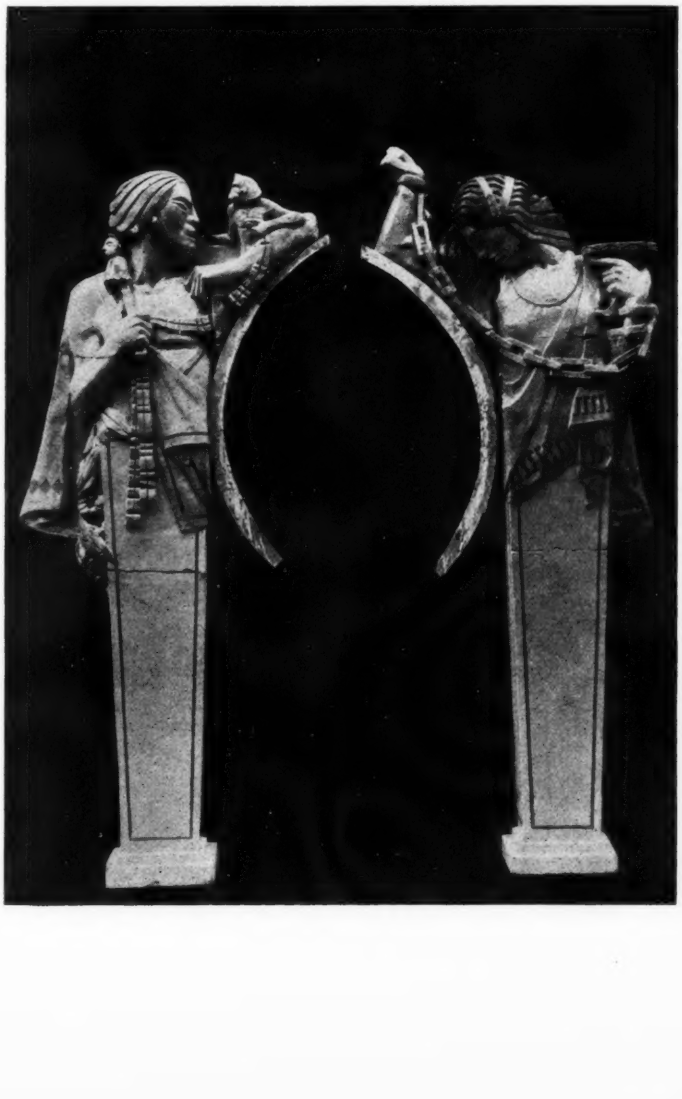
CONCRETE SCULPTURE

[BY KINETON PARKES]

THE fine arts are fine, but the applied arts are finer. The world contains more than enough pictures and ideal sculptures. Studios are full of both, to the despair of their owners. The owners, the makers of these superfluous things of beauty, are themselves to blame. They do not apply their art; they do not even effectively insist that their art shall be applied. In consequence, the art of mural decoration, of domestic decoration, and the art of architectural decoration do not fill the place in the world to which they are entitled, and while there are many fine artists, such work goes to the few who have sense and courage enough to apply it, cater for it, and dominate it. A new opportunity offers itself not only to the practising applied artist, but to the fine-arts painter and sculptor. Material is always of the utmost importance, and with a new material there opens out a fresh field in which its possibilities can be exploited. Concrete is the latest medium for the practise of the arts. Hitherto it has been regarded as without artistic possibilities. This is entirely wrong, for it is full of such. The painter is provided with a surface, and the sculptor with both a plastic and glyptic medium for his work, either in relief or in the round. Moreover, concrete has a great advantage in offering a cohesion of artistic work for architectural purposes that has not been possible before, for concrete is the building material of the future.

As to the properties of concrete there is no question. It can be cast or carved, that is to say, it is as legitimate to model in clay for casting in concrete as in bronze, and it may be carved direct without the superfluous plastic process interposing between the artist's conception and its realization in glyptic form. The virtues of either process are readily preserved, which is only possible with concrete for permanent work, for plaster is not a permanent material. Above all, however, concrete dominates modern architectural work for the reason that a homogeneity of structure and adornment is inevitably ensured, as the material may be the same throughout whenever so required. Concrete is not merely architectural. It offers to the ideal sculptor, to the maker of portrait busts and statues, and to the experimenter in ideas, a medium ripe with possibilities. There may be a return to polychrome sculpture, such as the Greeks and Chinese produced, not to mention the great men of the Gothic period. It is true that it does not offer the texture of wood, the metallic richness of bronze, and the exquisite surface of marble. Such pretensions would be not only injurious, but absurd. It does, however, provide a surface quality of its own which can be conjured with by the sculptor in all ways except that of imitating other materials. Concrete on its own offers a wide field for exploitation, even in the domain of fine art.

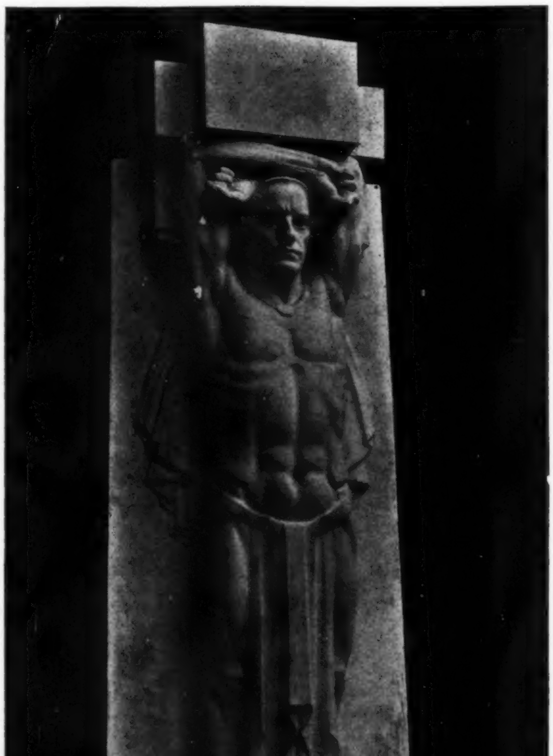
It is encouraging to observe the increase in co-operation between sculptor and architect already achieved. In the work of Gilbert Bayes, F. W. Doyle-Jones, W. B. Fagan, and less extensively in that of Reid Dick, the capabilities of concrete are demonstrated. They were seen at Wembley in the garden sculpture of Phœbe Stabler; in that of Eric Aumonier; in allied forms at exhibitions, by Rupert Lee; and here and there are works by unnamed modellers, such as may be seen decorating Adshead and Ramsey's pavilion and band enclosure at Worthing. These were executed from drawings supplied by the architects, and the blocks were left boasted for carving, and the carving was done by the man who did the modelling. Boasting is a useful and economical process. It eliminates



Comedy and Tragedy: half-figures by Eric Aumonier, modelled from cement: work forming part of the cement decorations done for the Cinema de Paris, London, the architect for which was Robert Atkinson. These figures are in high-relief, but certain panels for over-doors are low and sharp-cut, suitable for colour treatment.

Carved concrete head by Phœbe Stabler. A garden-piece in which the material has been left to speak for itself by the sculptor. For its purpose nothing could be better, and it is in no way inferior to natural stone. The treatment has been kept quite simple.

Head of a dairy-maid by W. B. Fagan. An experimental piece in cast-stone. The modeller has simplified the treatment, but has added detail which is successfully brought out.



Atlantis: a carved concrete figure by F. W. Doyle-Jones. It forms a prominent feature of the entrance to Portland House, Westminster.

the superfluous stone, and thus does away with the necessity of pointing; the carver can get to his work at an earlier stage. The concrete or artificial stone is cast with a facing of crushed natural stone, and this material carves similarly to ordinary stone. Natural stone is used in the facings for a depth sufficient to permit of carving, the remainder of the block being of granite chippings and cement, but when necessary the whole block can be made of crushed stone. The appearance of this new material may be seen on T. P. Clarkson's buildings for Peter Robinson's. The architrave, frieze, bed mould, and large projecting cornice with their enrichments are carved in it.

It is to the artists who have practised in this medium and to the results of their labour that we have to look for its vindication. The practical outcome of the experimentation of Gilbert Bayes was seen at the Concrete Utilities Bureau at Wembley, by Clough Williams-Ellis, where there were at least four large and important panels symbolic of industries. Further, on T. P. Bennett's new buildings for Brinsmead's in Wigmore Street are four delightful reliefs of Music, one of which, the putti band, is very charming.

The treatment of these two sets shows how amenable the concrete, cement, or crushed stone may be to differences of application and manner. The opinion of this artist is, that as concrete buildings take on a style of their own, as they have done in some countries, and do not pretend to be stone—as indeed why should they?—the sculpture upon them will follow suit. Further inculcation may be expected from the lesser cost of execution as compared with stone or bronze. America has done much in accepting the material as honourable for an artist to work in, and has wisely experimented with many different aggregates of cement and crushed stone, as well as in types of decoration. England is now doing likewise, and proving that concrete is not the dull material to work in that is sometimes even still imagined. The one thing to be avoided is the imitation of any other material; frankness in the use of concrete is absolutely essential.

In America a great variety of aggregates are used, and where possible the local stone is crushed to save the cost of material. It is one of the virtues of concrete that almost any good stone, marble, or granite, can be used as an aggregate. In England, Portland has so far been mainly used, but Cornish granite crushed fine gives a very good result. These materials provide a veritable plastic medium in which the modelling sculptor finds a direct channel for seizing holographic results, which is not usually the case with the modeller for stone. F. W. Doyle-Jones finds it eminently satisfactory, and he has produced some of the most interesting and compelling examples of the new sculpture. In the garden of the British Pavilion at the 1925 Paris Exhibition of Modern Decorative Arts, his terrace terminal of the bust of a Faun attracted much attention. At Wembley his great figure, Britannia, was conspicuous, but the most successful essay is the brilliant Atlantis in high-relief in the entrance hall of Portland House, Tothill Street, Westminster. This was of cast stone, as were also the Britannia, and the Faun, and a charming head of a Dairy-maid by W. B. Fagan. It is a speciality and a matter of pride of manufacturers that the whole of this cast stone is homogeneous. It contains the same aggregate throughout, and has no veneer of other material. Relief to any extent is therefore possible, and in the case of the work at the Royal Ear Hospital, by Wimperis and Simpson, a depth of 10 in. was reached in the relief. On the Wandsworth Town Hall, Mabies' large sculptured coat of arms, after the design by E. J. Elford, is only less high in parts.

Moulded concrete panel. By Gilbert Bayes. One of four sharp-cut low-reliefs at Wembley. The subjects represent the manufacture and uses of the material. The one here shows in a simple way the mix being poured into a mould. It is a symbol rather than an illustration.

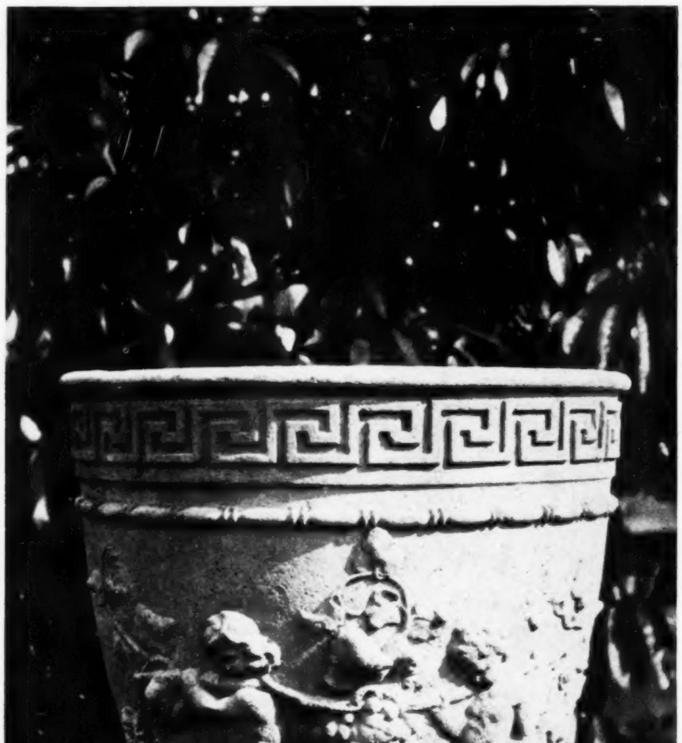
For casting reliefs, whether high or low, some knowledge of sculpture is required; for all undercutting has to be filled in with clay or plaster so as to get a clean mould. When the stone casting has been made, a carver has to cut away the excess material so as to restore the undercut. It is quite a simple matter in reliefs, but for casting in the round it becomes complicated and requires a good deal of expert craftsmanship; but there is no real difficulty. Consequently, figure statuary in concrete is an altogether effective proposition.

Generally speaking, such work is carved afterwards, but sand casting leaves so fine and generous a surface that, for colossal figures especially, I should like to see it retained, and no doubt some chemical hardening process could make it permanent. So far as surface finish is concerned stone casting falls into three classes: the sand finish, a rough finish, and a tooled finish, according to the purposes for which the work is required. So far as pure sculpture is concerned cast stone is no different in working in result from natural stone. A block, square or boasted, is taken on by the sculptor, who proceeds with his carving from start to finish just as in a natural material, and the technique is in no way different.

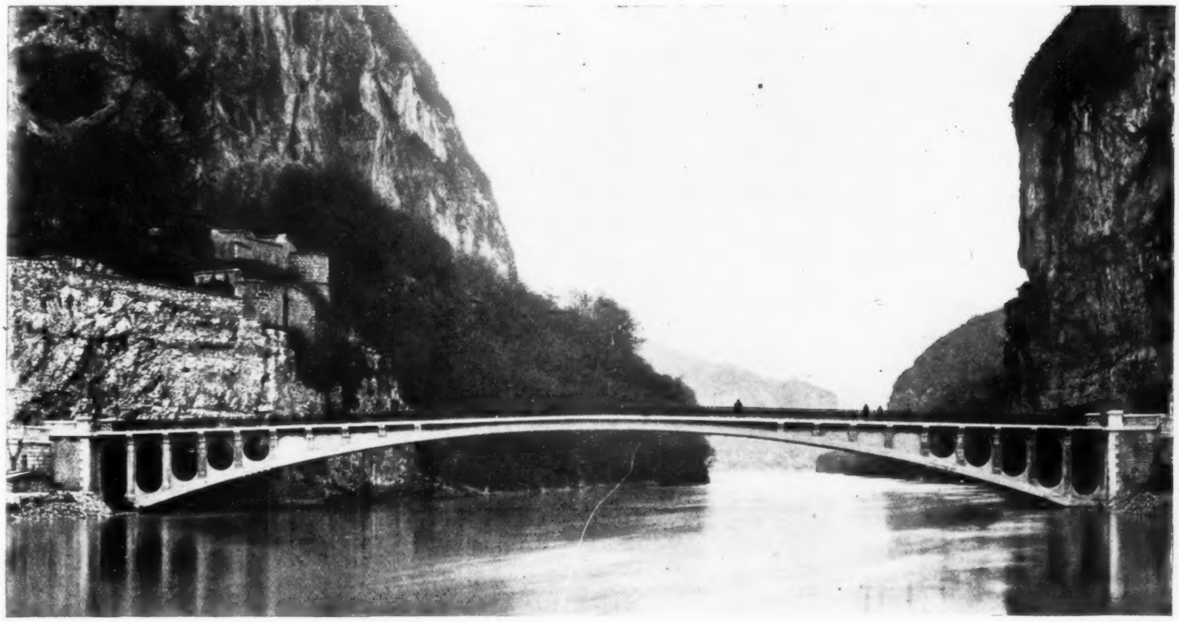
In Doyle-Jones's practice two processes are considered necessary. He models, and afterwards carves. This would seem to be the direction which concrete sculpture will for a time take. I hope that very soon this dual and in some ways—purist perhaps—antagonistic technique will not be persisted in. Pre-cast cut masonry or carving means castings from a mould carved or cut subsequently, so that, providing the models are good and sincerely made, the expensive pointing of the rough is avoided. This is one of the factors in rendering concrete sculpture cheaper than the usual method, which is of the greatest importance to the art of decorative sculpture, as the high cost of materials condemns architects to the elimination of expensive decorative details. The sculptor should always overlook the castings and the subsequent carving and finish.

Great improvements in the technique of concrete sculptural production are being made. The old method was to use wood or plaster moulds into which the mobile material was more or less incontinently poured, leaving a rough result which had to be considerably worked on. A refinement of this is the newer practice of sand-moulding. This method of dealing with masonry as well as sculpture consists in the taking of impressions in sand from plaster or wood models, much as in bronze casting in sand, but with the use of a much thicker and more closely-packed case of sand. This quickly takes off the moisture in the mix and secures a dense setting, as well as eliminates bubbles and blow-holes. After casting, such work is tooled or carved all over to open the surface, get rid of the skin or crazing, and to reveal the texture of the aggregate. In Doyle-Jones's practice the material is generally cast solid, which is, as a rule, required for architectural purposes, but for ideal sculpture and even busts it is possible to lighten the work as in bronze casting, by the use of a core. This is interesting in view of the probable exploitation of cement as a fine art plastic medium. In figure work, animal and bird studies as garden figures have been used extensively by Doyle-Jones.

Rupert Lee has also made separate figures of animals for garden decoration. Architecturally his idea is that—as in the case of decorating a building which is a genuine concrete structure, that is not faced with imitations of the Parthenon decorations—the moulds for the sculptures could in some cases be incorporated with those into which the building is poured. Phœbe Stabler has made concrete war memorials for Durban and the Underground Railway. An example of Reid Dick's work in this direction is a very pleasant panel of putti with a garland for his studio designed by Thomas S. Tait at St. John's Wood. Eric Aumonier, of the W. Aumonier studios in Charlotte Street, Fitzroy Square, has done a number of excellent low-reliefs in carved cement, including a panel on the Cinema de Paris for Robert Atkinson. Working in a new sculptural material, this young artist also introduces a modern feeling into his glyptic pieces, and adds further to the interest by using colour. Investigations as to the possibilities of permanent pigmentation of concrete are now proceeding, and it is not unlikely that a new polychrome sculpture may result.



Garden vase in Renaissance style with putti and grapes and garlands. It is in castone with fairly high-relief. Its height is 16 in.



SOME LARGE SPANS

[BY H. V. LANCHESTER]

THE unfortunate divorce between the architect and the civil engineer, which is more definite in Britain than in any other European country, is responsible for the almost uniform failure of our bridges, for nearly a century past, to display beauty in themselves, or harmony with their surroundings. The engineers of the eighteenth century, and even later, clearly recognized that structural fitness was not incompatible with good proportion and grace of line; but when metal took the leading place the study of its possibilities became so absorbing that the engineer felt impelled to give this his whole attention, and very soon the architectural aspect was forgotten. This did not occur immediately, because that was impossible. Old Southwark Bridge, and several others of about the same date, were on good lines owing, to some extent, to their following the traditions of the stone arch. Then Stephenson's Menai Bridge has dignity, but we see Brunel, whose masonry and timber bridges were particularly fine, making daring experiments with iron that cannot be regarded as satisfying to the eye. From his time forward nearly all our bridges have been failures artistically by reason of sins of commission or omission, with perhaps an exception in the case of some suspension bridges, a type of structure which it is difficult to render wholly unbeautiful.

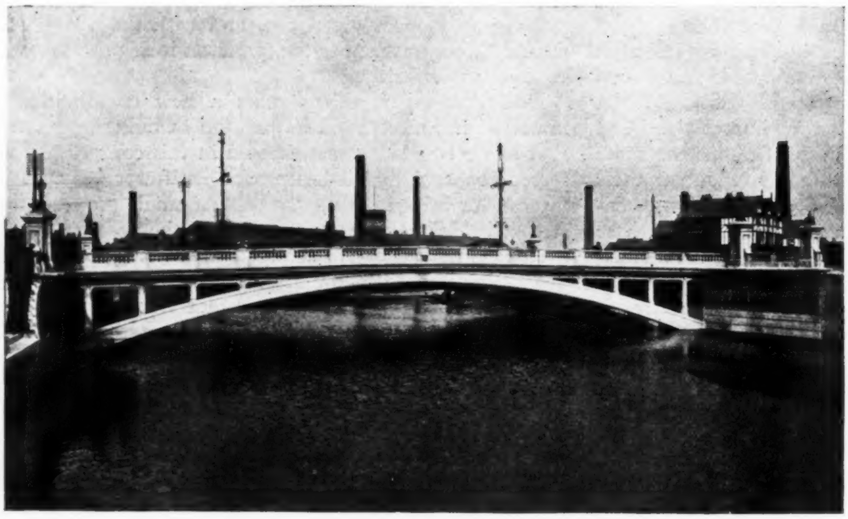
The Continent can show many fine nineteenth-century bridges, not only in stone, but also in iron and steel. These latter materials were employed on the structural lines suggested by the stone bridge, but advantage was taken of their increased strength to give lightness in effect, and wider spans with a smaller proportionate rise. The culminating effort in this direction is the Pont Alexandre III in Paris, which has a span of 353 ft., and a rise of 21 ft. With this rise a stone arch would have to be limited to a span of about 160 ft. Thus we see that the use of steel more than doubles the possible span for a given rise, and with the adoption of cantilever construction in the spandrels it might be possible to go even farther.

During the past thirty years a new combination of materials has established its position in building, namely, that of steel and concrete, known in this country as reinforced concrete, and it has proved itself especially advantageous for bridge building. With a small proportion of steel a bridge can be constructed on the general lines of a stone one, but it is usually desirable to use a higher proportion and to follow more nearly the structural lines of a steel bridge. Being somewhat heavier than steel relatively to its strength, the material demands arches of higher, or cantilevers of deeper, proportions. This is usually no disadvantage æsthetically, and the gain of increased solidity in effect, together with the economic one in respect of upkeep, have brought the reinforced bridge into general favour. It is quite practicable, and often, owing to surroundings,

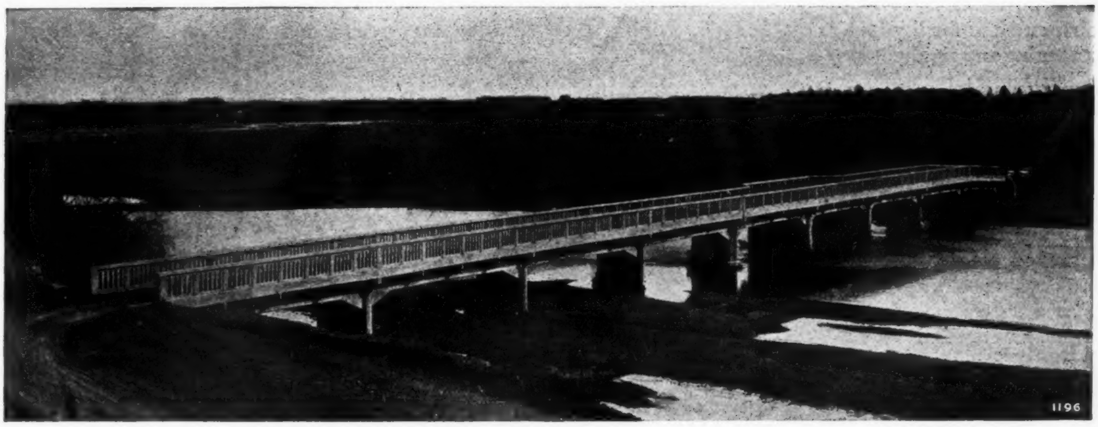
Above, a reinforced concrete bridge over the Rhône, in France. It illustrates the way in which the material lends itself to the use of very flat arches.

A bowstring bridge over the Vesubie River. It has a span of 315 ft., and is constructed with temporary hinge joints, filled in after the structure had taken up its permanent position.

Bowstring bridge at Nantes. It has a span of 180 ft. This type of bridge is, perhaps, not so well suited to city surroundings as an arched bridge, but it is sometimes necessary to use it in order to provide the greatest possible head-room beneath.



Warrington Bridge. This was built in 1913. It has a span of 134 ft., a rise of one-tenth of this, and it is 80 ft. wide. The false work was hung from above so that it would not interfere with navigation. The bridge itself was built in two halves to avoid closing the roadway.



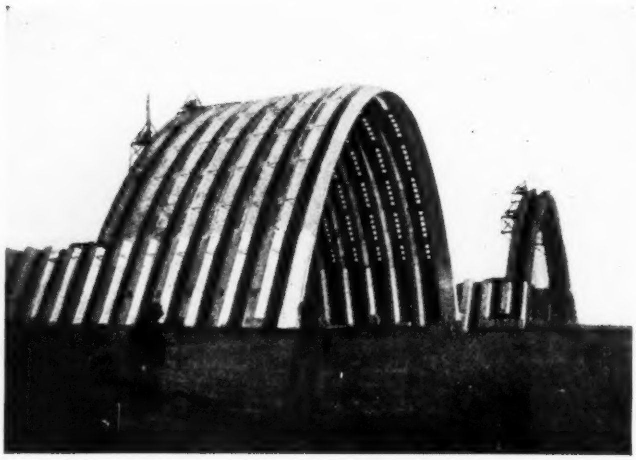
The bridge at Waipurkarau Gorge. It is 360 ft. long, and has nine spans of 40 ft. each. A suggestion of timber construction is noticeable, although the bridge is actually of reinforced concrete.

desirable, to adopt the structural forms of masonry in reinforced concrete. It would not, however, normally develop on these lines if it were regarded solely as a material for the erection of economic structures. On a small scale it is more akin to timber construction, and on a large one to steel. In fact, in the latter case, where heavy reinforcement is necessary, it becomes in effect a protected steel structure. The concrete and steel each has its own function to perform, but the members take almost the same relative positions as would be the case with metal alone.

Thus we have examples of reinforced construction which, while reminding us of wood, of stone, or of steel, exhibit in each case an appropriate modification, imparting characteristics advantageous, rather than detrimental, to the architectural effect. The "timber" treatment becomes more homogeneous, the "stone" bolder and lighter, and the "steel" treatment gains by the elimination of æsthetically inessential detail. Some further explanation seems desirable as to the structural principles involved in these three types of structure. Both timber and metal are relied upon to provide for tensile and compressive strains either in the same member or in different ones; whereas stonework must be designed, except in a few abnormal cases, such as a lighthouse, to eliminate tension. In reinforced concrete the combination of materials aims particularly at providing for tension and compression, either or both; therefore it can follow the lines of any timber or steel structure without drastic modifications. For the same reasons it is not equivalent to masonry. In consequence, though it can adapt itself to the general forms, we shall find that probably the actual structure is radically different. Even where the concrete arch is a real one it is not stressed

Abercynon Bridge. This has a span of 130 ft., and the radius of the arch is 156 ft. 8 in. The footways are cantilevered out from the main body of the structure.

as would be a series of voussoirs, and the facility for distributing and rigidly connecting masses makes the design of thrust resisting abutments quite a different proposition. But we may go even farther. It is quite possible that a reinforced bridge of the arched type could be more economically designed as a succession of cantilevers, balanced over the piers, and meeting in the centres of the spans. In this case will not the purist tell us that we should visualize the bridge as cantilevers, and not as arches? Let us look a little closer into this. Admitting that the diminishing taper of the arch spandrel is not the most economic form for the cantilever, what shall we substitute? We may not go upwards, as this is destructive to the amenity of the road line and outlook from it, and if we increase the depth downward towards the centre of the cantilever this will cramp the headway under. All that we could gain with an ideal cantilever outline would be a little on each side of the piers, which is seldom wanted. Therefore we may just as well keep our arched treatment, which is based on the need for harmonizing the horizontal surface of the bridge with the vertical lines of the piers and abutments. This æsthetic need is the main reason why an arched bridge is always more pleasing than any of the girder types. Even a flat segmental arch suggests the carrying of the weight down into the earth where it must ultimately go, and thus the arched form of bridge is inherently expressive in a manner that no other can emulate.



Reinforced concrete airship sheds at Orly, France. By M. Freyssinet. The view shows the inner and outer surfaces of the hangar and the windows. The spans are 300 ft. in each case, and the heights 196 ft., the corrugations being 17 ft. deep. The timber centering was in the form of a parabola with cross-latticed ribs which travelled along the whole of the 1,000 ft. lengths of the sheds.

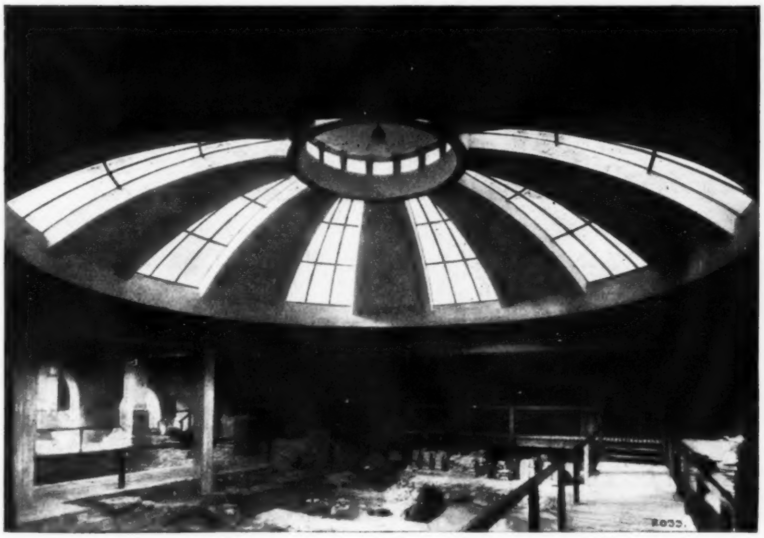
It would be unreasonable to claim that this is the only type of bridge worthy of adoption. We can call to mind some of the others that fit quite well into their place in the picture. Often the large bowstring or girder bridges placed amid bold hills and rocks look light and graceful, but transfer these to the city and we should find them crude, and out of scale. Imagine Stephenson's Menai Bridge across the Thames. Would it look much better than the bridge at Charing Cross? At Lyons there are a number of beautiful bridges, among which almost the only one which fails to harmonize with its surroundings is designed on the bowstring principle.

In view of the increasing intensity of traffic in our great cities it seems likely that an attempt will be made to disengage the main routes. This could be achieved by carrying them over or under others, as has already been done in a few instances near the banks of the Thames, at Holborn Viaduct in London, and in other places where the levels have facilitated this course. There will then be a demand for bridges with a span of from 60 ft. to 100 ft., designed with a degree of refinement that will maintain the scale of the surrounding buildings. Reinforced concrete lends itself to the purposes of such structures, as both material and treatment, combining the texture of stone with the lightness of steel, offer opportunities for this unity with the normal types of modern façades. When the buildings are solidly massed it may be felt that there is a certain discontinuity where streets cross at two heights, as the crossing cannot be resolved architecturally like one on the level. This difficulty might be met by a suspended bridge, with a light deck hung from arches or beams at the height

Pootnung Bridge, Shanghai. A typical example of the traditional footbridge in reinforced concrete. A feeling of restlessness is conveyed by the fact that the central span does not follow the line of the footway.

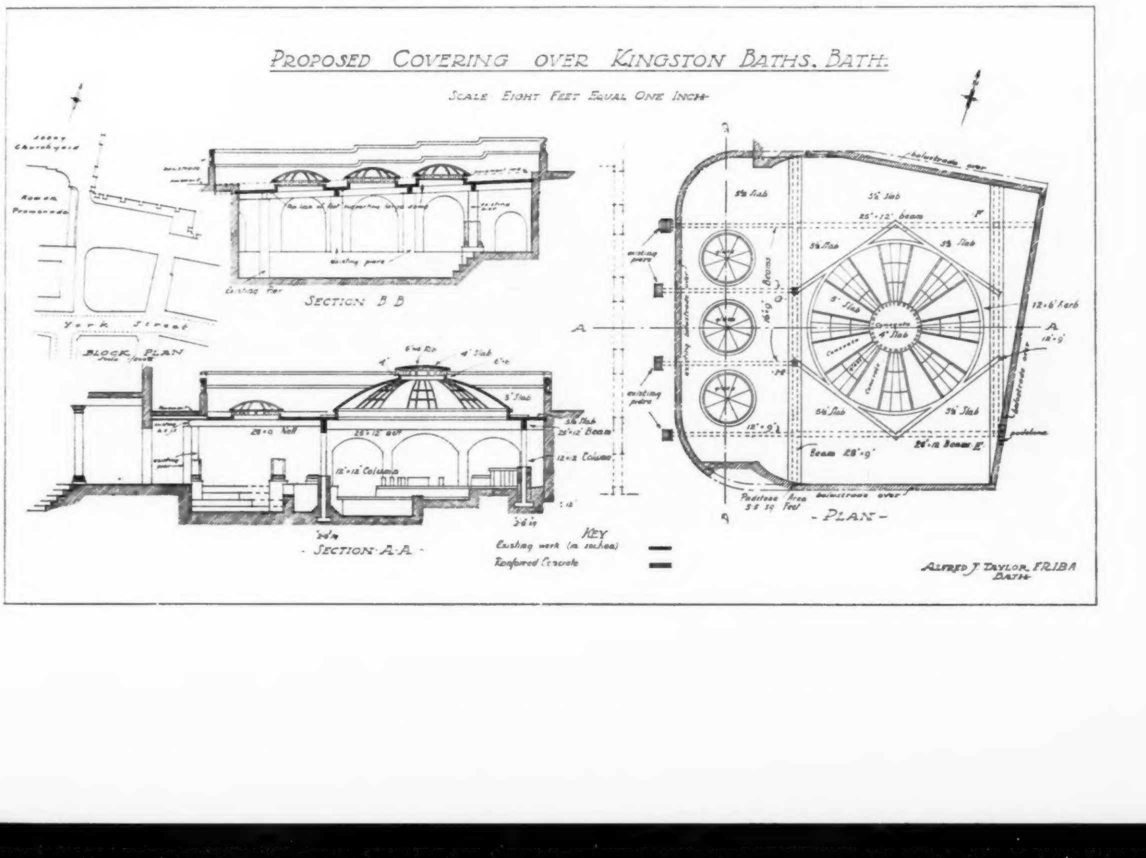
of the main entablatures of the building façades. Thus the eye would be carried across the gap, and the bridge itself lightened so that the difference between the upper and lower levels could be reduced to a minimum.

Besides actual bridge work, there is a demand for the construction of large span roofs for halls, aerodromes, and other purposes where reinforced concrete is establishing a preferential position. An ingenious and efficient method of dealing with such a roof is by employing the concrete in a series of corrugated ribs springing from the ground, and taking a parabolic line across the area to be covered. This is probably the most logical way of roofing in a large space, but the purposes of the buildings will primarily dictate the most suitable form of construction to be adopted. In some cases longitudinal beams may be preferred, in others transverse beams or arches, while where intermediate supports are not disadvantageous the stresses can be reduced.

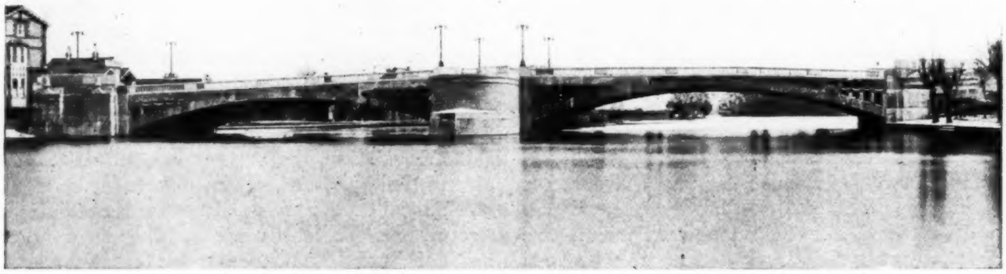


The covering to the Kingston baths at Bath. By Alfred J. Taylor. The dome is 35 ft. in diameter, with a rise of 10 ft. The lantern and the ribs of the dome are of reinforced concrete. Above, an interior view. Below, plan and sections.

With regard to the way in which the detail of concrete structures should be handled, it is hardly necessary to enforce the desirability of avoiding a merely imitative treatment, in view of the fact that there are numerous examples in which the design has been developed from the structural character of the material. There is, however, a natural feeling that owing to the material being cast in moulds, with the result that a skin of cement is left on the surface, the appearance does less than justice to its actual texture, is unpleasant in effect, and unduly emphasizes the jointing of the forms which is not necessarily related to the ultimate masses. These defects are of less importance in works on a large scale, which are usually appreciated from a distance, but they certainly demand consideration when the structures or buildings may be studied at close quarters. The removal of the surface skin exposes a good texture—varying in accordance with the aggregate employed—which is in general effect appropriate to the structural method, and equal to stone of a granitic character. Practically the only objection to this surface treatment is its cost. A number of experiments have been made, and the cost will not be so great when it is feasible to remove the shuttering before the cement has fully set. This is not always desirable, and we must look to the possibilities of mechanical dressing as an aid towards obtaining an attractive surface texture at a reasonable expense. It should be borne in mind that the success of this treatment presupposes a uniform standard in the selection, preparation, and mixing of the aggregate.



This bridge at Barrow-in-Furness is strongly reminiscent of timber construction in its actual span, whereas the treatment of the abutments is one which is only possible in concrete.



Caversham Bridge, Reading, is a very interesting example of the double-span type of bridge. In this particular case the existing conditions of the banks and river bed suggested the introduction of the massive central pier. This pier divides the spans into unequal units of 126 ft. 4½ in. in the clear on the Reading side, and 106 ft. 4½ in. on the Caversham side.

Weegin's Bridge, Herefordshire. An example of a concrete structure based upon traditional masonry design, with spandrels unpierced.

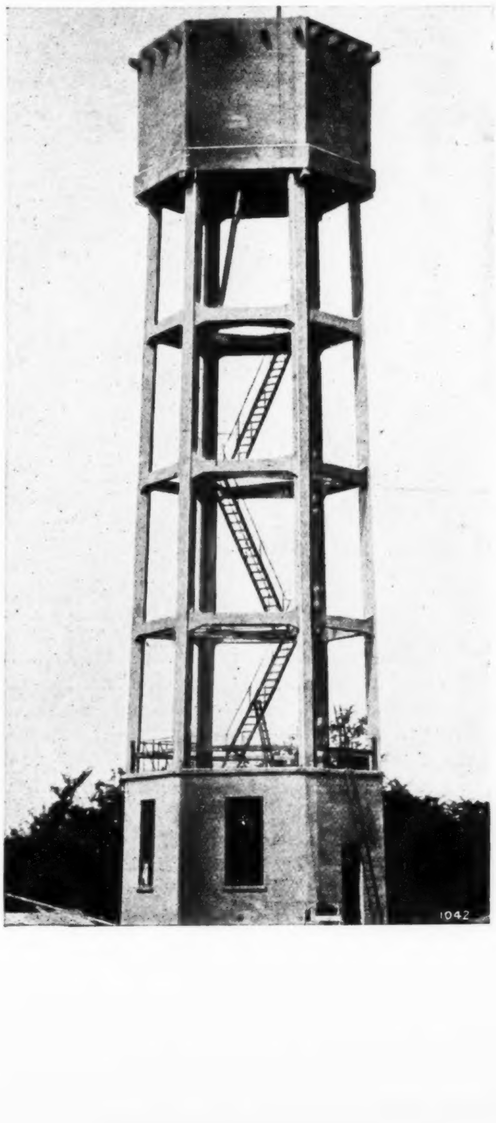
THE CONCRETE CONTAINER

[BY ERIC L. BIRD]

THAT most modern of structures, the gigantic silo or bunker, presents a novelty in that it is a type of building made possible by, and almost exclusively built of, reinforced concrete. Here there is no question of rivalry with older methods of building, no disputations of the theorists as to changes in expression due to changes in material. Indeed, the architectural theorists have been strangely blind to the silo that looms so big in the landscape. While they have been discussing the dominance of the church and hall in the town plan, the engineer has quietly erected a building that shoots out of the scenery like a medieval castle, dominating everything for miles. A few—very few—of the more discerning of mankind have realized that this monstrous building is not only worthy of æsthetic consideration, but from its sheer, flagrant bulk demands it, if it is not to be merely a monster. Still fewer have designed silos with that idea in their minds. The illustrations in these pages are picked from several hundred, the large majority of which looked like the dustbins of some nightmare giant. Of course, in all building the purpose, cost, and structural limitations are of primary importance, and the æsthetic must grow out of these conditions. That this can be done is amply proved by the illustrations. There are no grounds for assuming that the Kesselhaus or the Consett bunkers are less efficient or cost more than the many whose illustrations were rejected. They still dominate their surroundings — they cannot help doing so—but the spectator will look at them with interest and even pleasure; at least, they will not evoke a curling lip and a feeling of nausea. The more honest-minded will congratulate the designer on a courageous and satisfying solution of an inescapable problem which the majority make no attempt to solve.

The conditions governing the design of silos are easily stated; they are simple, but stringent, and only through these conditions may any æsthetic result be achieved. They are intended for the storage of liquids or small-bodied solids, the latter imposing somewhat similar loads to the former. The contents are hoisted by elevators to the top, where there is usually a room for the purpose of distribution to the compartments. The whole building is customarily raised on legs to allow the hopper mouths to discharge into trucks either at the side or below. The reason for the circular shape of the cells is in itself interesting. Apart from the fact that a circle is the best shape for resisting internal lateral stresses, the provision of formwork is comparatively a simple matter since the shape is an unbroken cylinder. Usually a steel pole is erected in the centre from which radiate struts to steel forms. As the concrete sets, the whole apparatus of steel forms and struts rise up the pole, which is sometimes threaded. A number of other considerations enter, such as wind pressures, unequal lateral and foundation stresses due to unequal filling of the compartments, stresses due to adjacent wet and dry surfaces (in some cases), and the question of economy in formwork. Lastly, there is the greatest factor of cost. No firm desires to show off with its coal bunkers, as it not infrequently does with its headquarter buildings, and cost, therefore, is of first importance. A silo would have been described by our grandfathers as a utilitarian building (as opposed to a work of architecture). We now hold that no such distinction is permissible, and we think that buildings of all kinds and for all purposes are worthy of the attention of the designer. This being allowed, let us examine the possibilities.

Fortunately it is not difficult to make an interesting structure under these conditions. There is great size to begin with, always impressive in itself, and it may be emphasized by adjacent low buildings. The shape is essentially a good one. Great wall surfaces with apparently small windows at the top afford a contrast, and there is a further contrast in the probable proximity of spidery steel cranes and elevators. (See the illustration of the Montreal elevator.) The structure being composed of similar cells, there is a fundamental rhythm which the designer may choose to emphasize even if there is an enclosing wall to the circular compartments. The



Water tower, Coventry. An early but nevertheless remarkably good design. The relative proportions of base, supports, and container are good; the tapering form gives a great effect of sturdiness. The design is free from the faults of most water towers, which are often top-heavy, without a base, and ungraceful.

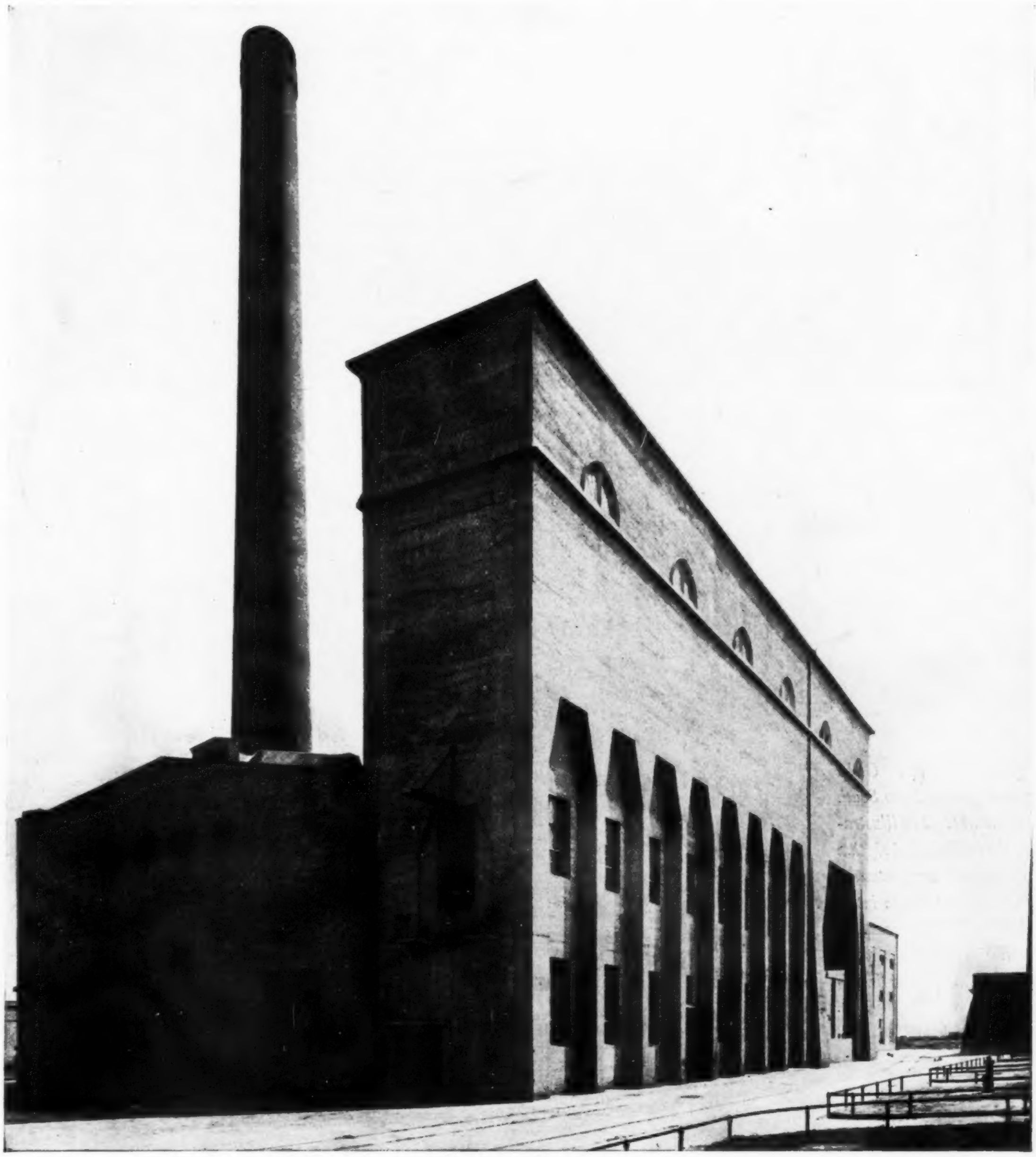
whole question of good appearance resolves itself into an emphasis of mass by the few available contrasts, on a shape either satisfactory in itself or easily made so. The absence of tradition is perhaps fortunate. The architect who gives his silos the proportions of the Orders, or divides his surfaces up into an arrangement of classic panels, or indulges in fancy shapes to please his own eye—all of which things have been done—is guilty upon three counts. First, he is throwing away a splendid opportunity for original thought and treatment; secondly, he is letting down his client, who will hesitate to employ him again; and, thirdly, he is letting down his profession as being unpractical.

Of course, it is not to be assumed that the bare, dry bones of the structure are sufficient, though these sometimes by chance may make a good composition. There is no element of chance about the Kesselhaus coal bunkers, their design is most carefully considered, and they are obviously the offspring of a cultivated and logical mind. Yet there is hardly a single detail which could be pointed out as being extraneous or added for effect. The logical is not necessarily beautiful, but a logical treatment more than half solves the architect's problems for him. Some civil and structural engineers feel this, and sometimes produce an interesting design. More often they achieve the dull practical and no more; that something more is wanted is realized by the designers of motor-cars and locomotives. Although efficiency is their god they seek to add a beauty of subtle curves, careful streamlining, and the concealment of unimportant details, and their products are among the greatest artistic achievements of the twentieth century. But the beauty has its origin in the mechanical structure; nothing is added.

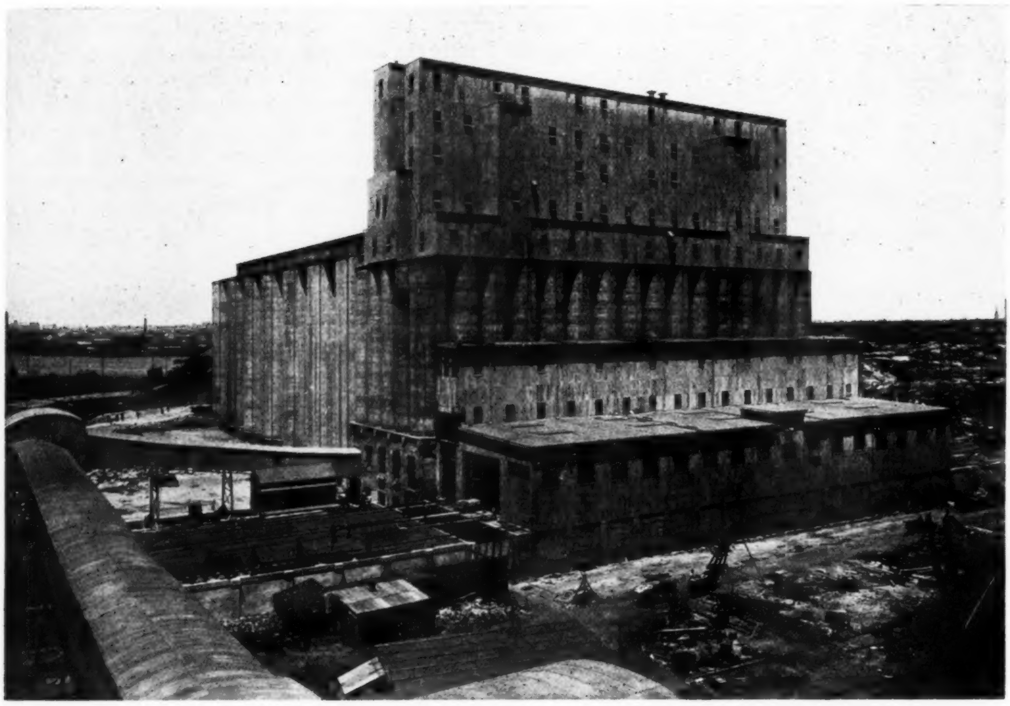
Above, interior of the Kesselhaus coal bunkers. A most astonishing interior to a vast rectangular container, reminiscent of German film settings. The great corbel heads of the posts and the giddy staircase give a weird sense of unreality to the spectator.

We have no intention of recalling time-worn disputes between architects and engineers; what is really to be deplored is the unfortunate division of the building profession into two bodies. Many architects know or care little about modern engineering—i.e. constructional problems. The engineer likewise knows or cares little about the principles of design. Both are even inclined to despise the other. Could anything be more deplorable for the art of building? Almost all the really great architects of the world have been the leading engineers of their day. Brunelleschi practically brought a new constructional principle into architecture, Michelangelo built excellent fortifications, Wren was a mathematician and England's leading constructional expert. In them we see the whole art and science of building, one and indivisible. A good piece of architecture may conceivably be produced by an engineer and an architect working together, but one does not see many good examples of their work. Almost every day new types of building are called for, of which the gigantic concrete container is an example, and each new type seems to accentuate the division. The results of division are manifold and disastrous; the engineer is accused of vandalism and the erection of atrocities, the architect is labelled an unpractical applier of decoration and "conceits," the national taste suffers and true architecture—the complete union of efficiency, constructive science, and design—dies of inanition.

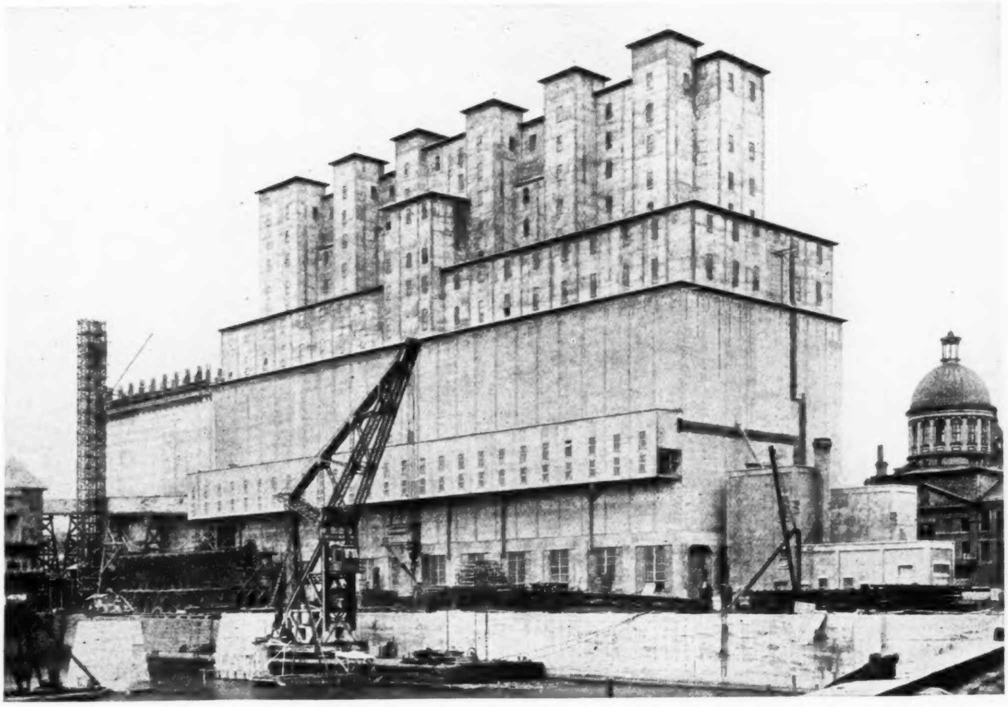
We have spoken above of types of building. Is not the division of the profession in part due to our distorted and muddled ideas as to the true nature of architecture? Is not this in its turn a consequence of our method of training in architectural history and our outlook upon it? We are taught history in the light of styles and ornament. The medieval designer, taken as a convenient example, thought first of the function of his building; secondly, of the best structural methods for fulfilling that function, taking care that the resultant form should be a good mass capable of receiving logical decoration; and, finally, he thought of his decoration. Roughly speaking, those were the guiding principles, though probably not fully realized by any one man. This is not to be construed into a subtle plea either for a Gothic revival or for expressionism in architecture. But it may be regarded as an advocacy of thinking of function first and letting the building—guided and glorified by the designer—evolve from it. Each building—or better still, each group of buildings—has its own purpose, method of structural fulfilment, and history of evolution. Should we not obtain a better grasp of new types of building, such as the silo, factory, railway station, tram shelter, engine shed, if we had learned in the schools the fundamental ideas and structural history of other and older types of building?

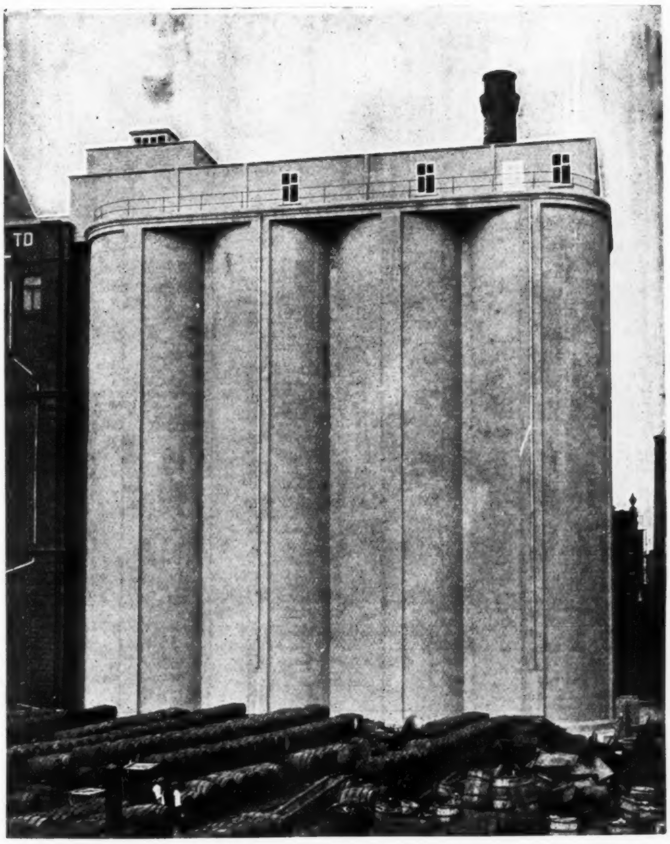


Kesselhaus coal bunkers. An excellent illustration of what it is possible to do with an engineering structure without forcing, or the addition of extraneous ornament. The designer, as well as being thoroughly conversant with his material and the structural problems, has a fine feeling for their interpretation in an unusual and striking design.

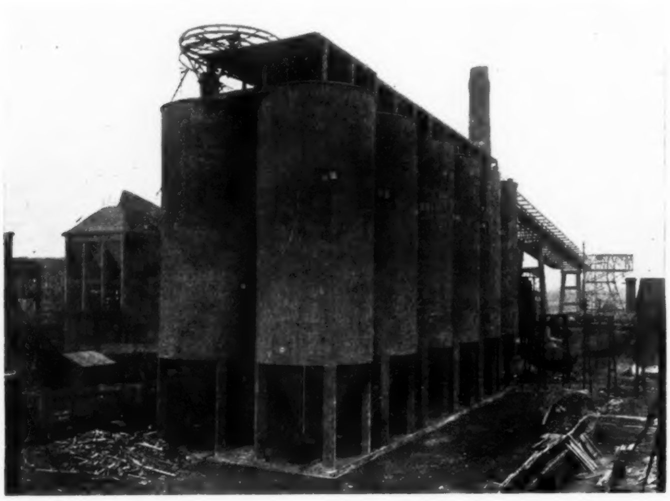


Above, grain elevators, Glebe Island, Sydney, for the New South Wales Government. The illustration shows the fundamental rhythm of the cylindrical compartments which is accentuated by the interesting shadows. The mass is most impressive, and the comparatively low foreground buildings emphasize the great height. Below, slurry basin at Mickley. Such weird and exciting shapes as this are only possible in reinforced concrete. The high ground level is unfortunate, as it gives the building the appearance of being pushed into the earth. The contrast of shapes is very well handled.

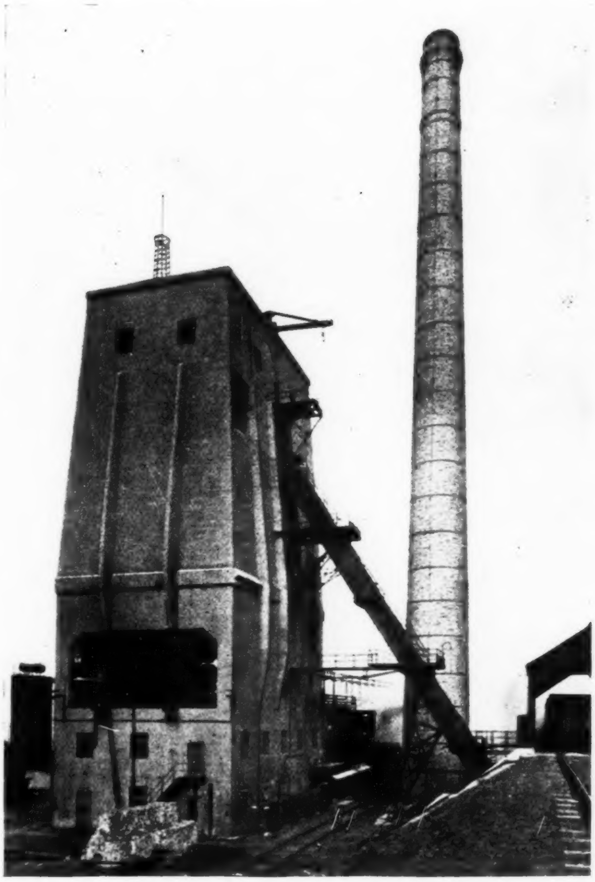


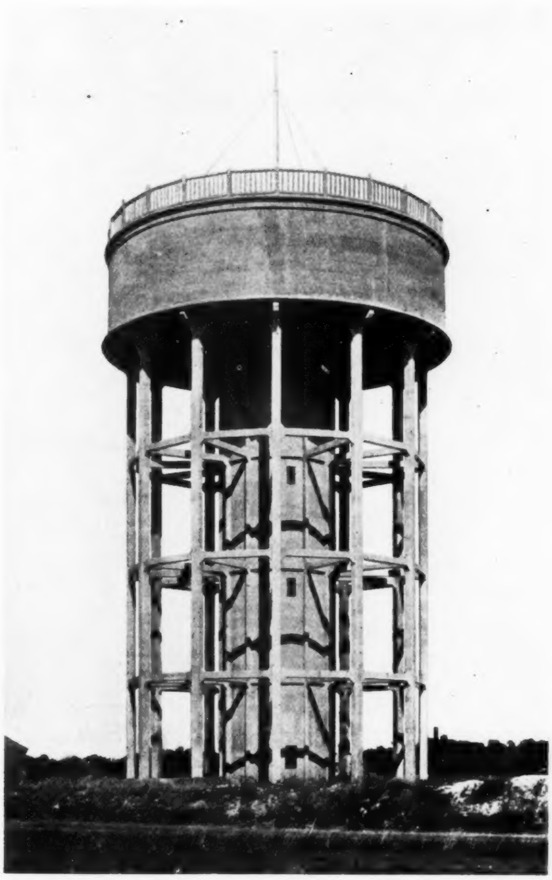


Above, grain elevator, Montreal. The photograph illustrates the complete dominance of its surroundings by the giant silo. The proximity of the domed building—doubtless intended to be dominant by its designers—is most unfortunate for itself. Points worth noticing are the interesting silhouette and the contrast of the crane with the concrete wall. Below, silos at Silvertown flour mills. The illustration barely does justice to the impressiveness of this building. The scale is maintained merely by the windows of the distributing chamber and the thin band at the top. This last also serves, together with the flat links between the cylinders, to obtain cohesion.

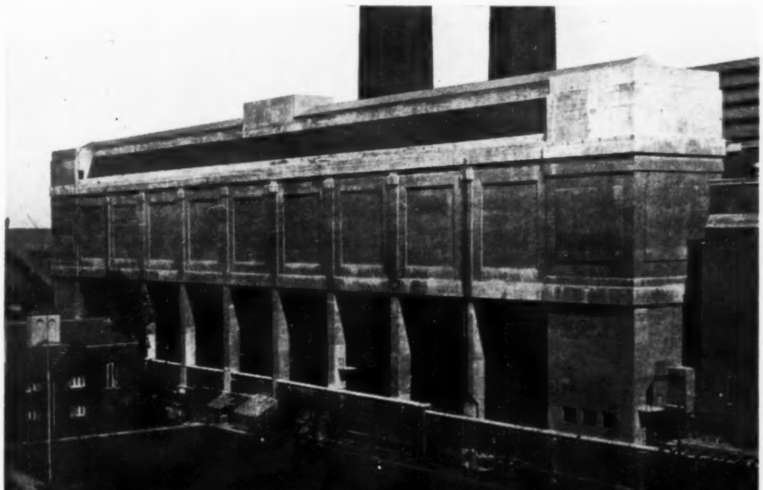


Above, coal bunkers, New Markton. The cylindrical silo form undisguised. These bunkers represent the barest elements of silo construction, and suffer, perhaps, from a want of unifying links. There is, however, a certain stark grandeur. Below, coal storage bunker at Redcar. An excellent mass with careful proportions of the supports and panels. The staircase clinging to the side gives just the required contrast both in mass and line. The whole design is an excellent piece of post and panel work.

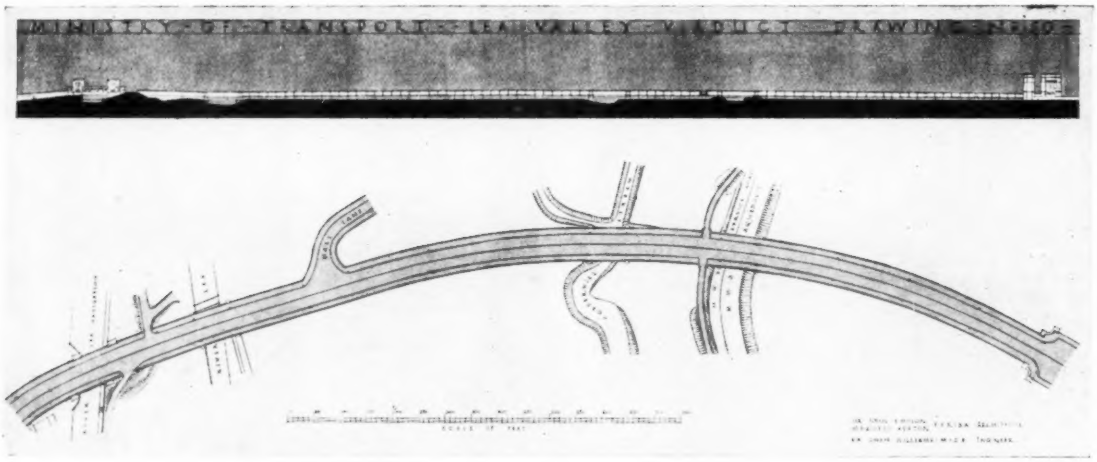




Left, coal bunkers, Consett. Skilful handling of an imposing mass. The treatment of the strengthening ribs is admirable, accentuating the form and adding to its sturdiness. The openings are handled better than is usual. The effect of the design is anything but fortuitous. Right, a water tower at Broadstairs. The illustration presents an unusual type of tower with a central solid. It is a logical and rational structure, and the radial bracing gives an impression of strength.



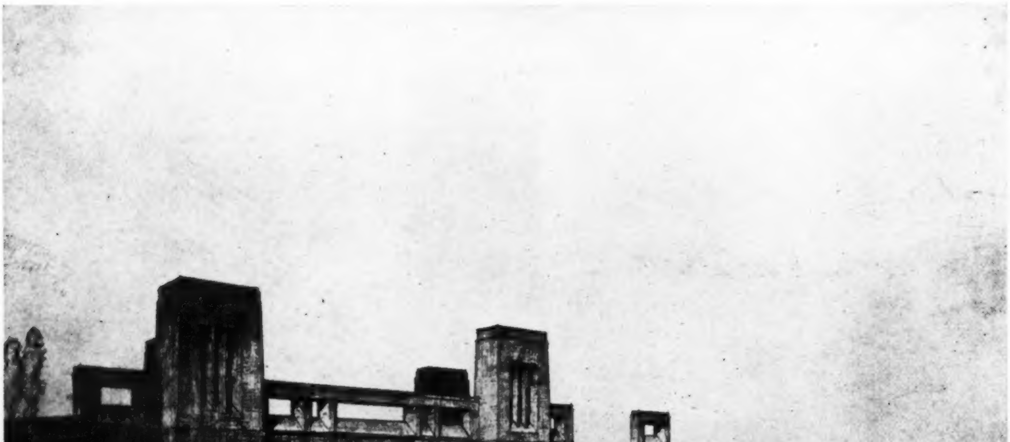
Silos at Greenwich. The designer is thoroughly well aware of the rhythm of the containers, and has made the most of it. The whole effect is, perhaps, a little forced, specially in the ends, but there is an air of immense solidity and great dignity with a feeling for shadow effects.



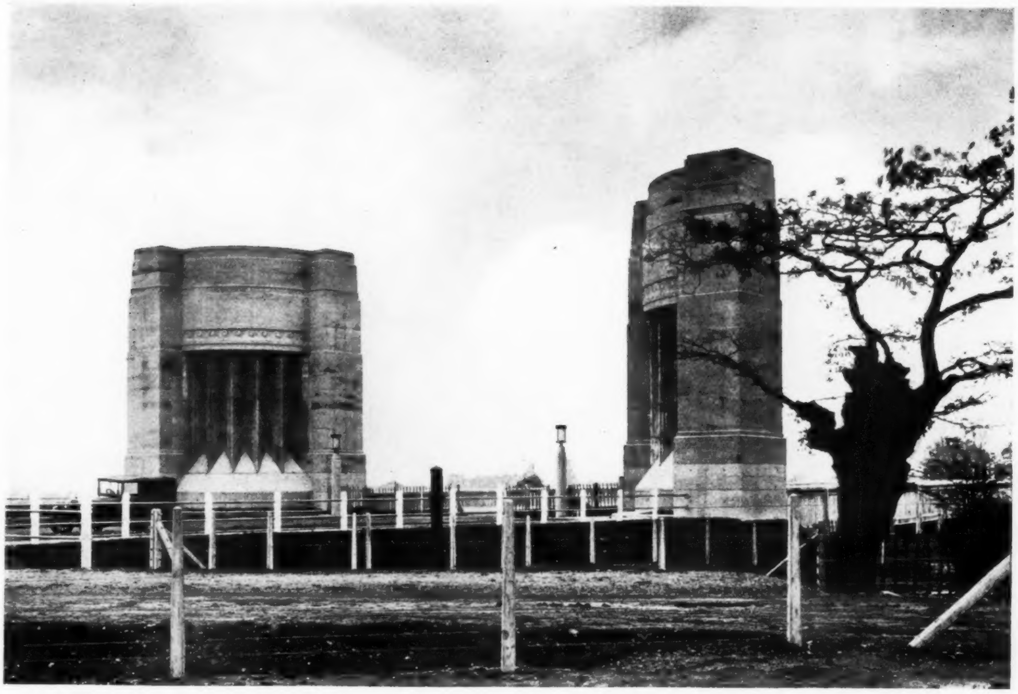
A MODEL PARTNERSHIP

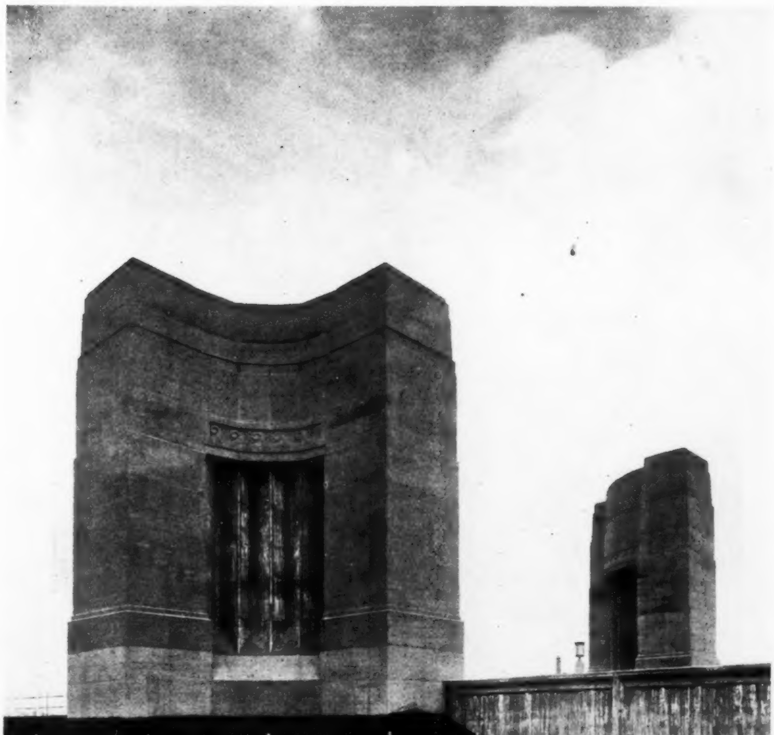
[BY CHRISTIAN BARMAN]

SIR ERNEST OWEN WILLIAMS is an engineer with a faith. There may be other engineers with faiths, but as Sir Owen's is a particularly interesting one, and as it goes a long way to explain the extent and the quality of his success, I need not apologize for stating it here. I give his *credo* as briefly as I can, and using as far as possible the words that I remember hearing used by him. The makers of things in this world, he says, subserve the great purpose of life, of human life. Whatever is made by the hand of man [with the exception, I suppose, of poisons, guns, explosives, current art criticism, and other such-like agents of destruction, about which I do not quite know his views], whatever is so made is made, if it is made rightly, in order to further, to maintain, to protect this life in its highest and its fullest sense. These products of human skill are good in so far as they obey this law, and bad when they fail to obey it; and as the result of observance is Life, so the wages of transgression is Death. The Death may be of the body or of the spirit; it may be sudden or slow; it may be torturing or gentle; but it will follow as surely as night follows the

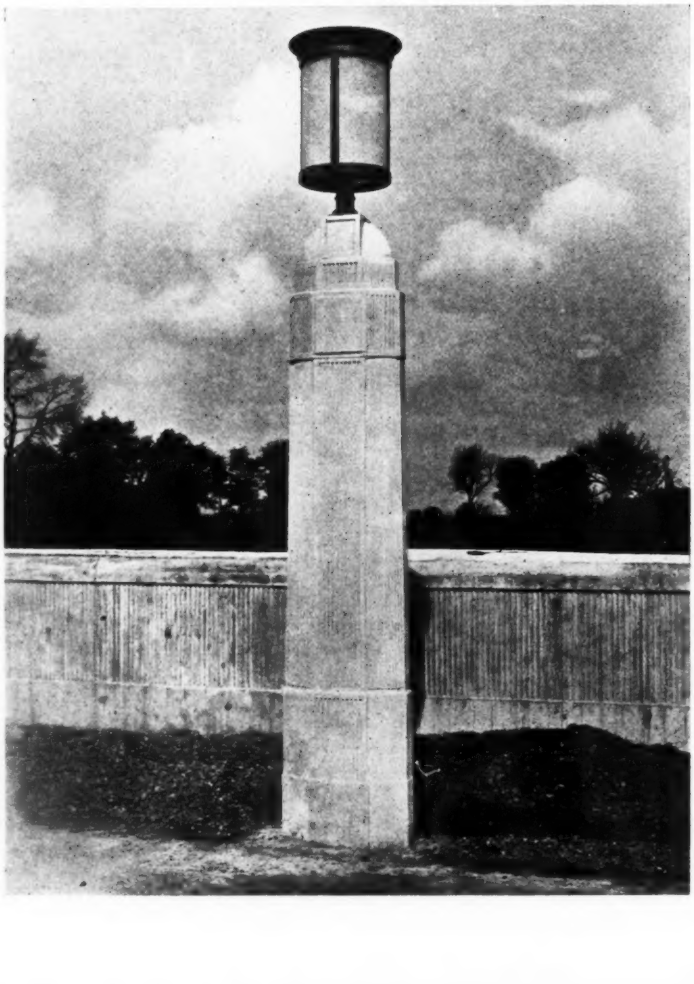


The Lea Valley viaduct on the north circular road now under construction. By Sir John Simpson and Maxwell Ayrton, architects, and Sir E. Owen Williams, engineer. Above, general plan and elevation showing the relation between the pylon and the four bridges. Below, perspective view of the bridge over the River Lea navigation. This bridge occurs on the extreme left in the upper illustration.

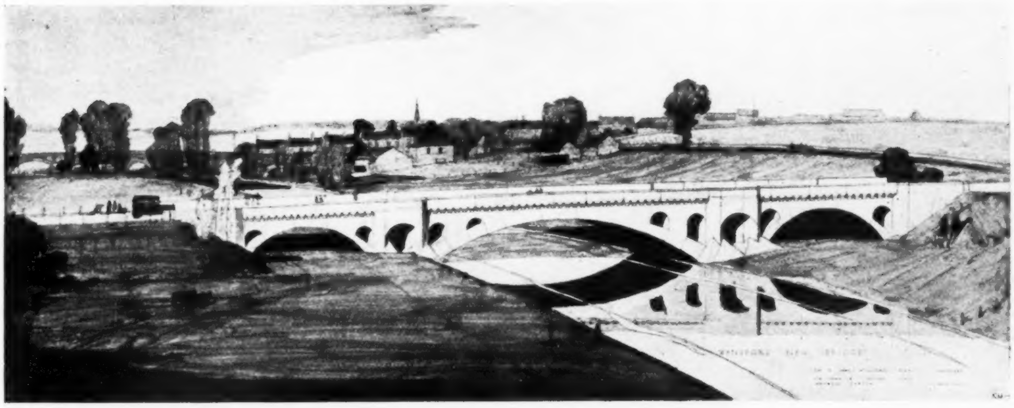




The Lea Valley viaduct. By Sir John Simpson and Maxwell Ayrton, architects, and Sir E. Owen Williams, engineer. Two views of the concrete pylons at the eastern end of the viaduct. The pylons face south-east; the upper illustration is taken looking westward; the lower looking south; the viaduct parapet here comes into the right of the picture.

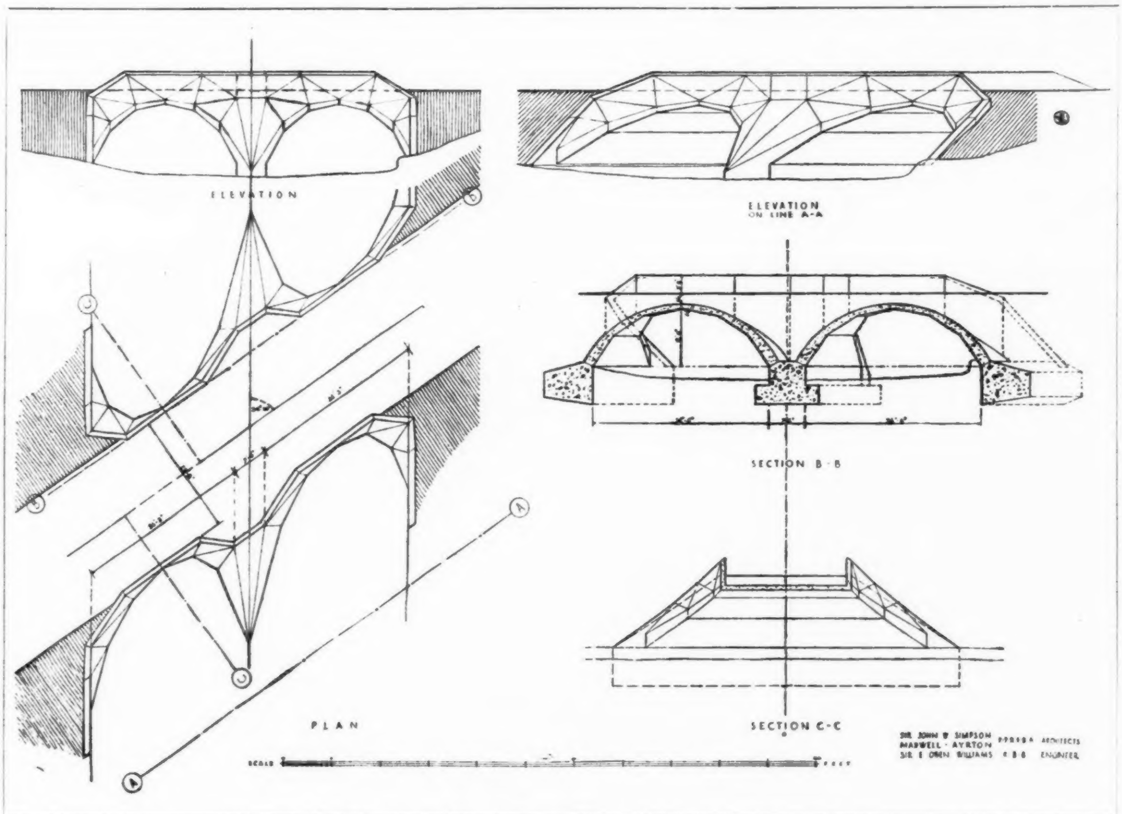


The Lea Valley viaduct. By Sir John Simpson and Maxwell Ayrton, architects, and Sir E. Owen Williams, engineer. Above, view of a portion of the viaduct, with the bridge over the Coppermill stream in the foreground. With the exception of the reeded band and the tall bush-hammered panels, the concrete remains as it came out of the forms. Below, one of the cast-stone lamp standards.

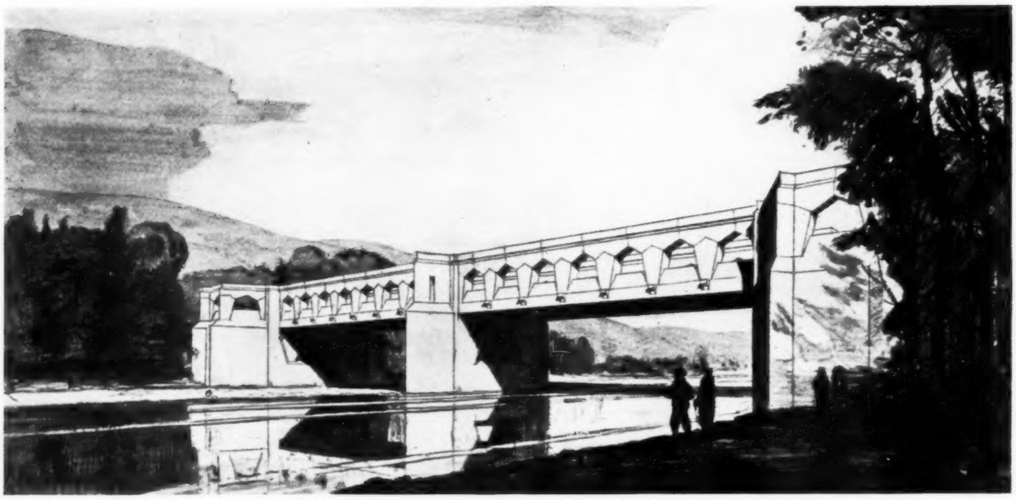


day. A faulty wire or bolt in an aeroplane may mean an individual death, and an instantaneous one; a faulty bridge approach may bring about the death of a city after a period of many years. This is the substance of what Sir Owen Williams believes.

It is a solemn faith for a working engineer, and one of the effects of such a faith must be to infuse into his work that seriousness of purpose, that vigilance, that concentration of mind and eye, which are necessary if the exploitation of new materials and the development of new processes are to bring forth good instead of evil. This seriousness is clearly written in all Sir Owen's work, and nowhere more clearly than in that wherein he has enjoyed the collaboration of Mr. Maxwell Ayrton, Sir John Simpson's able and enthusiastic partner. For Sir Owen Williams is no less anxious to ward off the danger of bad form than he is that of bad construction; nor would he dream of considering himself an expert in beautiful form any more than



Above, the Wansford new bridge. Below, one of the smaller bridges on the Perth-Inverness road. By Sir John Simpson and Maxwell Ayrton, architects, and Sir E. Owen Williams, engineer. The Wansford new bridge is of "massed" concrete without reinforcement. The old bridge is shown in the background. In the base of the piers at Wansford, and in the whole of the smaller bridge, the design is governed by a combination, more or less intricate, of plane triangles.



One of the greater bridges on the Perth-Inverness road, that over the River Findhorn. By Sir John Simpson and Maxwell Ayrton, architects, and Sir E. Owen Williams, engineer. A remarkable point in this bridge is the resting of the concrete girder on tapering feet as shown in the pier on the far bank.

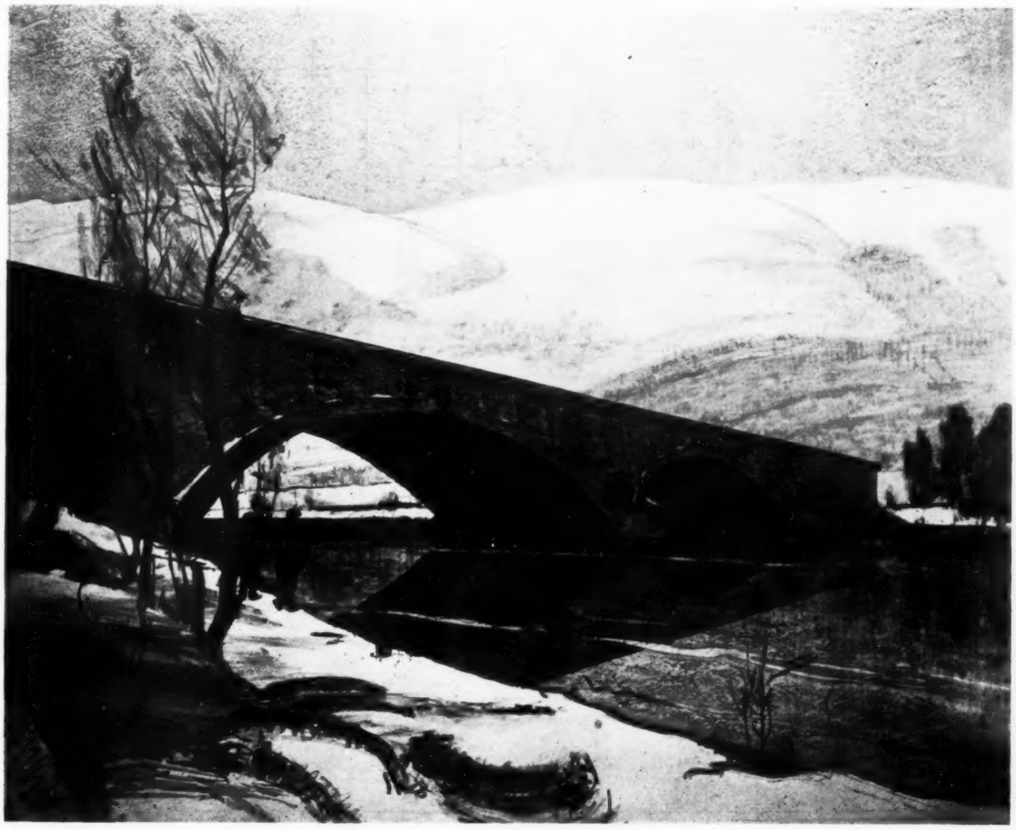
Mr. Ayrton would consider himself an expert in construction. The collaborators make, it will be noticed, an ideal pair, and it is to be hoped that they will long continue to work together. They are so nicely balanced that it is difficult, if not impossible, to say where the labour of one ends and that of the other begins. Too many modern engineering structures belong to one of two varieties. They either appear to care not the least little bit what they look like, or else they care too much and strike attitudes. Between this showing-off of impudence and pretentiousness there is very little to choose: architectural coxcomb and ragamuffin engineer are equal nuisances. There is nothing of either in the structures for which Mr. Ayrton and Sir Owen Williams are responsible, or if there are any traces of one they are cancelled out, I imagine, by a judicious dash of the other. None of these products of their joint skill either sprawl or strut; they just stand up and are natural. When I say that each of them makes us feel that it is *one of us* I am—regardless of lesser and subtler questions of design—paying them the first and greatest compliment that may be paid to works of this kind.

The first of these new joint efforts to be approaching completion, and the only one, alas, to be illustrated at all adequately in these pages, is the Lea Valley viaduct, a raised track one-third of a mile in length which forms an all-important link in the Ministry of Transport's new north circular road. The viaduct includes one medium-sized bridge and two smaller ones; the first, still unfinished, carries it over the canalized River Lea, and the others over the River Lea proper and an aqueduct supplying a neighbouring metropolitan pumping-station. Let me say at once what every reader will quickly discover by looking at the illustrations of the Spey and Wansford bridges, namely, that the strongest point in Messrs. Ayrton and Williams's work is the astonishing skill they have brought to bear on the design of arches. Now, there are no arches in the Lea Valley viaduct, and it must therefore lack the most exciting element in their art. But if we look carefully at the simple flat beam that spans the Lea navigation we shall find in it a surprising number of formal qualities. The designers have not made the error of allowing the beam to look as though it had been hitched on to the pylons on either bank. It is given a broad seating on this bank, and its extremities project many feet beyond the pylons. It will further be noticed that these extremities are pierced with a rectangular opening which corresponds to another opening on the opposite side of the pylon. And these four openings are dominated by a central one of twice the length, from which they are separated by another pair of very narrow openings. This narrow opening is echoed in its turn in the accordion-mullioned recesses in the pylons. The pylons themselves are thus relieved of any great apparent effort: they do not so much support the beam as hold it down. For such an imaginary purpose their symmetrical, slightly tapering mass fits them most admirably.

If the bridge pylons, appearances apart, justify their existence in this way, what, it may be said, about the far more conspicuous pylons at the outer end of the viaduct? Do not these at first glance appear to serve no purpose at all except a decorative one? The answer is that they are there to do and to say something, and they discharge their double function extremely well. They form a gateway to the open country, but a kind of gateway which is far more adapted to its work and its situation, far more expressive of the entrances and exits it makes possible, than the ordinary kind of gateway which is symmetrical about both its axes. Messrs. Ayrton and Williams have succeeded in designing a gateway which, by spreading out where it leads out, and contracting where it leads in, tells the traveller not only that he is crossing an important boundary, but also in which direction he is crossing it. The acres of waterlogged land traversed by the viaduct are bleak and desolate; no setting could be more visibly in need of some such signpost. The pylons, each a quadrant of a circle on plan, remind us of those shaped pieces of metal used by the mechanical engineer to guide a striking object, such as a typewriter hammer. Not only, therefore, does their outline remind the motorist that he is entering a great city: it is as though it were also warning him to steady his course before he enters the concrete channel of the viaduct.

These pylons have another interest in that their surface texture proves as I do not believe it has been proved before how well concrete can be made to look provided it is divested of the unpleasant cement skin with which it issues from the forms. A glance at the accompanying photographs will show the vast difference between the surface of the pylons and that of the adjoining parapets. The parapets have been allowed to retain this coat of cement. The result is that their surface reminds us of wooden boarding encrusted with dirt and bearing traces of decrepit paint. The buttress-like panels in the pylons suffer from the same defect, though it is there less visible because, like the inside of the parapets, they have had their surfaces broken up by means of reeded forms. The pylons themselves, however, look clean and crisp, of a delightful granite colour; and, what is more important still, they do not show boardmarks of any kind, nor are they stained, as the parapets are, by patches of free lime. This, quite clearly, is the only thing that can be called true concrete, for concrete as it issues from the forms is no more suitable for decent building than is timber straight from the forest. The trouble is, as Mr. Ayrton points out, that whereas we do not specify timber in its crude form and put in an extra for removing the bark, we do allow, and even expect, contractors to quote for concrete in a form in which it has no business to be used. I suppose there are still barbarians who regard a forest log as a proper building material, and to whom barked timbers are a luxury for the wealthy few. By this analogy we have still, in our use of concrete, to emerge from a state of barbarism. Surely one would have thought that with one of the cheapest structural materials yet devised there ought to be no need for such abject economy!

Among the various Scottish bridges now being built to the designs of the same collaborators the Spey and Findhorn bridges, here shown, illustrate two opposite types. The Findhorn bridge has an almost urban dignity, and though provided with sharply peaked cutwaters, it stands easily on its piers, its rectangularity not visibly disturbed by any heavy stresses from without. The Spey bridge, on the other hand, flings itself on the stream with savage force, and appears as if determined not to be overthrown by the wildest torrent. I do not remember any bridge that gives one such an impression of tremendous lateral strength, a strength resembling that of the prow of a battleship. But in their forms both these bridges are essentially concrete bridges. This cannot be said of the Wansford new bridge, whose design is equally reminiscent of masonry construction, though it is none the worse for that. The moulding of concrete into a shape which would be impossible in other materials is not a virtue in itself. But the pyramidal lattice-members in the Findhorn bridge, and the bold forward leap of the arch in the other, are good examples of the formal inventiveness kindled by this interesting union of two creative minds.



Another bridge on the Perth-Inverness road, crossing the River Spey. By Sir John Simpson and Maxwell Ayrton, architects, and Sir E. Owen Williams, engineer. The River Spey is known for the strength and rapidity of its flow at certain seasons. This peculiarity finds an interesting reflection in the lines of the bridge.

THE CONCRETE SWIMMING-BATH

[BY KENNETH M. B. CROSS]

REINFORCED CONCRETE is at the present day a comparatively new building material in this country, and its influence upon architectural design in the future will be more startling and more revolutionary than is generally realized. But to enter into the somewhat academic discussion which this proposition involves is not our purpose, and it would be generally admitted by modern architects that reinforced concrete has secured a footing amongst the various accepted methods of building construction for general purposes, and its eminent suitability for certain types of building has ensured that it has before it, from the point of view of sound structural economy, a vast and almost limitless future.

In connection with the design of public and private swimming-baths the primary consideration for the architect is, of course, the best method of resisting the pressure set up by a considerable volume of water upon the side and end walls of the bath tank. Modern practical experience has shown that reinforced concrete is admirably suited to this purpose, and in the writer's opinion it is a form of construction which is unrivalled in this connection. When it is remembered that in the construction of large swimming-ponds as recently as fifteen and twenty years ago it was necessary to build the walls in brickwork about 2 ft. 3 in. or more in thickness laid in cement, with a vertical damp-course of asphalt, and with brick buttresses 9 ft. or so apart, a comparison with the modern method of bath tank construction is most striking.

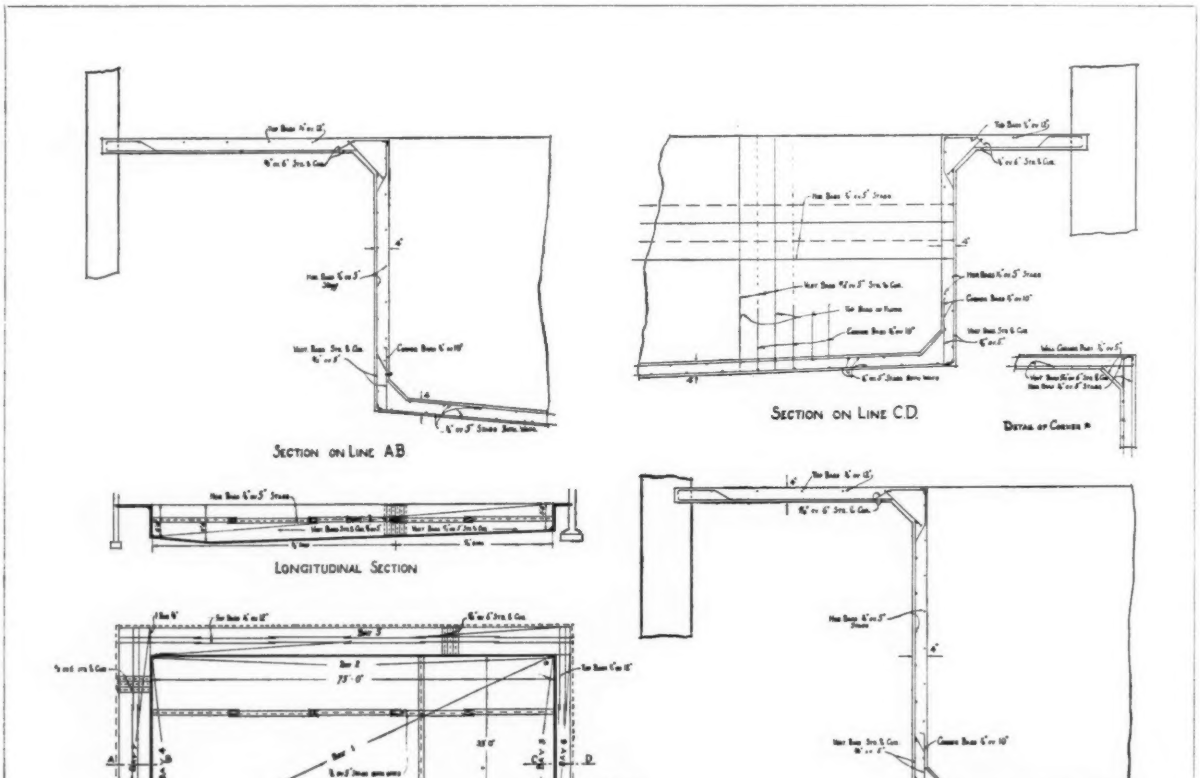
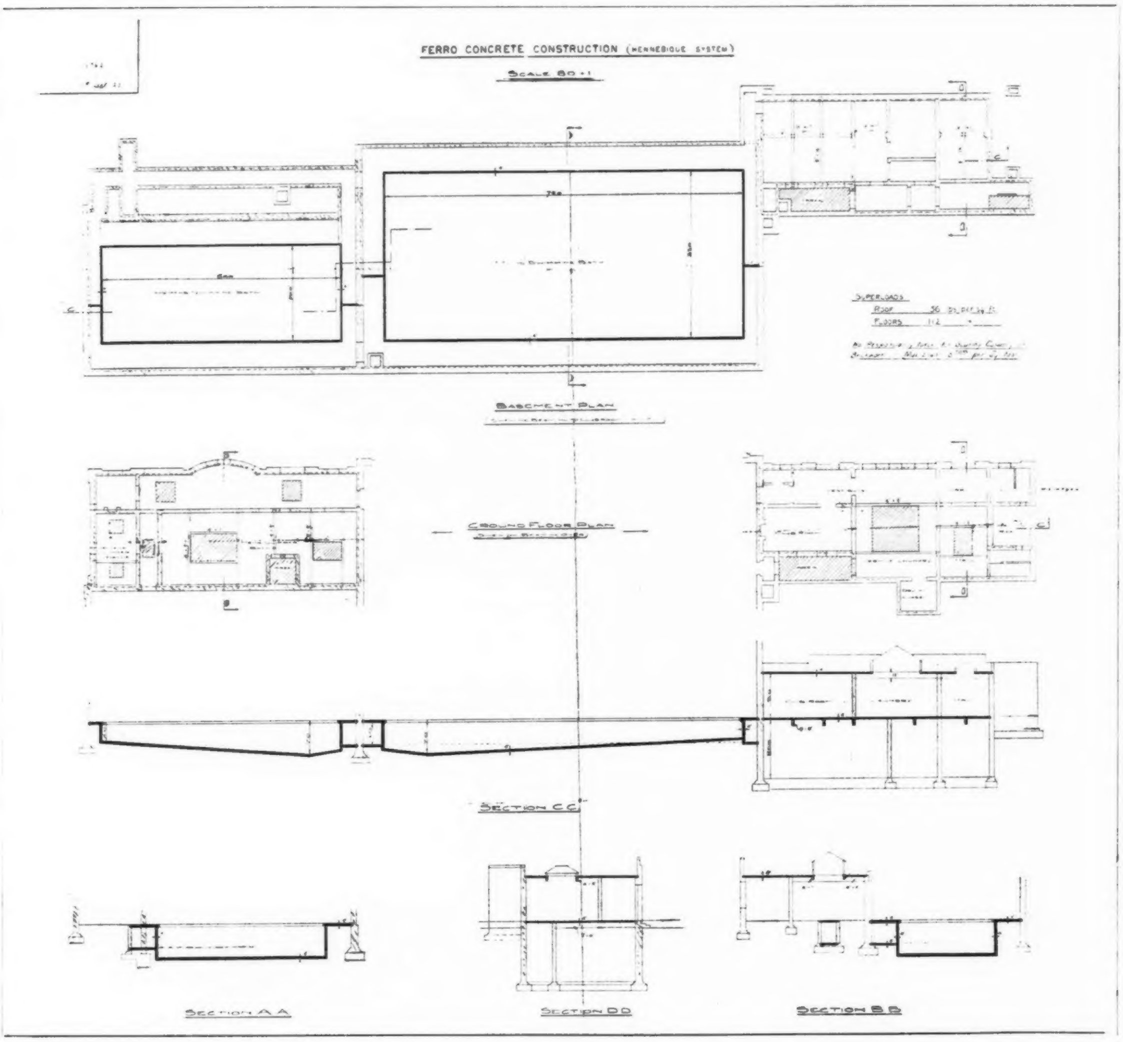
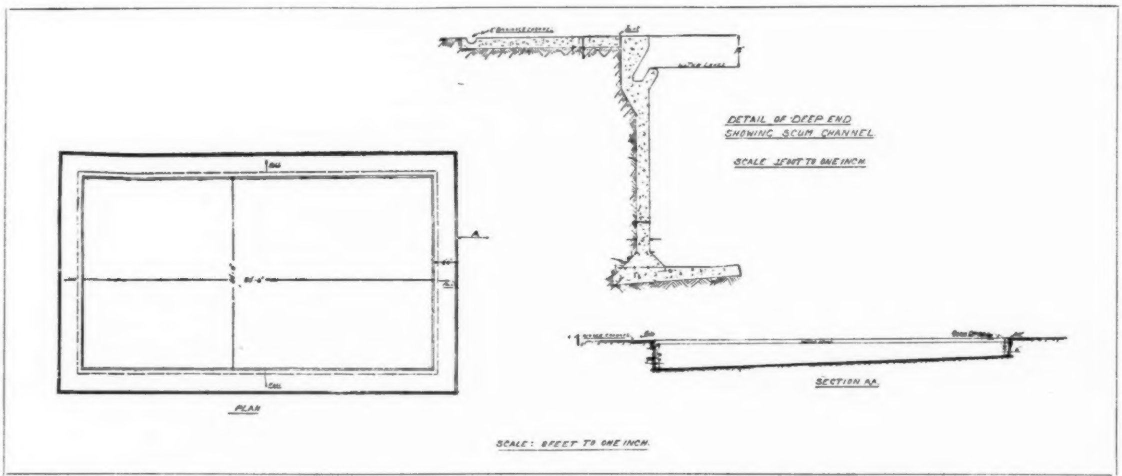


Figure one. These typical reinforced concrete details at the public baths at Heaton, Newcastle-upon-Tyne (by A. W. S. and K. M. B. Cross), form an interesting comparison with the old brick and concrete construction of twenty years ago. Brick walls to the bath tank, 2 ft. 3 in. or more in thickness, with buttresses at regular intervals, are now superseded by reinforced concrete walls 4 in. in thickness.





Above, figure two. In this illustration a typical lay-out plan for a public baths establishment is shown (Walker public baths, A. W. S. and K. M. B. Cross, architects) in which the bath tanks are constructed of reinforced concrete. Below, figure three. The advantages of homogeneity of construction are again exemplified in the illustration of a typical scum trough formed in reinforced concrete.

It is now possible to obtain the strength resulting from this form in a wall 5 in. thick, made of concrete and steel rods. (Typical details of baths at Heaton and Walker, Newcastle-on-Tyne are shown. Figures one and two.)

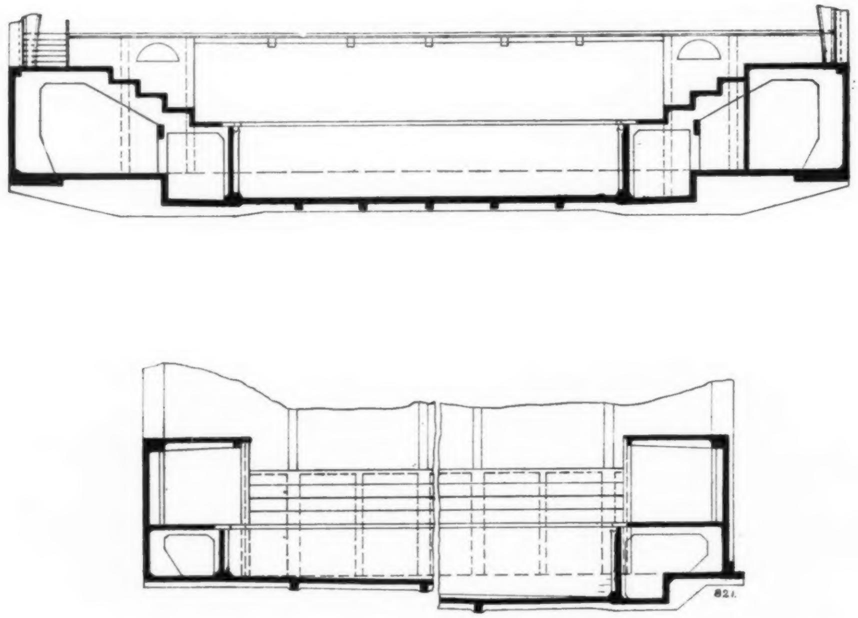
Further, the walls and the floor of the bath tank can now be made to possess the additional obvious advantage of homogeneity, and if the bath platforms surrounding the pond are also of reinforced concrete, a still greater increase of strength is obtained. The requisite scum troughs, bath nosings, and other moulded work can be efficiently carried out in this material and, further, a great saving of space and a clear run for pipes, unobstructed by buttresses in the subways, is obtainable. In this connection the accompanying design for the tank and platform to an open-air bath is of special interest (see figure three), and the sections of the Madeley Street bath at Hull further emphasize these points. (Figures four and five.)

The interior lining of the bath pond should be of white marble slabs with strips of dark-coloured marble inlaid to mark the water-levels, distances, depths, etc. Where considerations of cost preclude the use of this material, white glazed tiles may be used for lining the tank or a form of terrazzo made with white cement would be a suitable innovation. Red quarry tiles, granolithic paving, or rubber tiling are frequently used as a finishing for the bath platforms.

In the case of the recently erected public baths at Woodcock Street, Birmingham (figure six), for which Mr. Arthur McKewan was the architect, the large swimming-bath hall is spanned by elliptical arches, and seating arranged on the amphitheatre system is planned on either side of the swimming-pond. Gallery accommodation is provided in an absidal recess at the end of the hall. In many respects this is an exceedingly attractive type of swimming-bath design.

Mr. Arnold Mitchell's bath at Greenhithe (figure seven), designed for the use of boys of the training ship *Arethusa*, is of special interest in that the floor of the reinforced concrete bath tank is continued in all four directions, and forms a raft foundation for the walls of the building.

In many modern bath buildings, in addition to the construction of the swimming-pond and surrounding platforms in reinforced concrete, the main walls and the roof of the bath hall are built entirely of this material, and the considerable saving in building area resulting from the reduced thickness of walls is of importance in restricted sites. The great arched reinforced concrete ribs which are thrown across the bath hall, when properly treated, can be made to form impressive architectural features. In the case of one of the swimming-baths, erected for the Croydon Borough Council (see figure eight), bold reinforced concrete ribs, elliptical in form, are thrown across the hall, and the plastered ceiling leaves the outline of the intermediate reinforced concrete purlins exposed. The



Madeley Street Bath, Hull. Above, figure four. Cross section. Below, figure five. Longitudinal section at both ends.

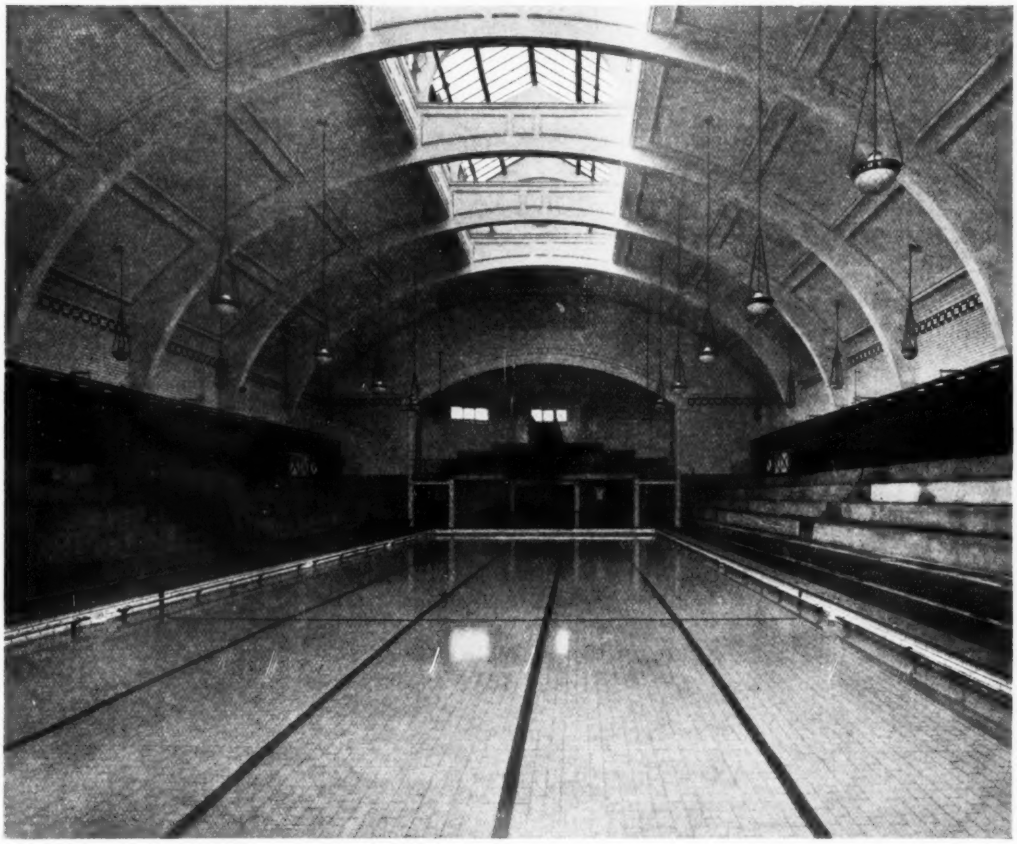


Figure six. Woodcock Street Baths, Birmingham. By Arthur McKewan. Seating arranged on the amphitheatre system, with dressing-boxes at a high level, are always, where obtainable, attractive features in swimming-bath design.

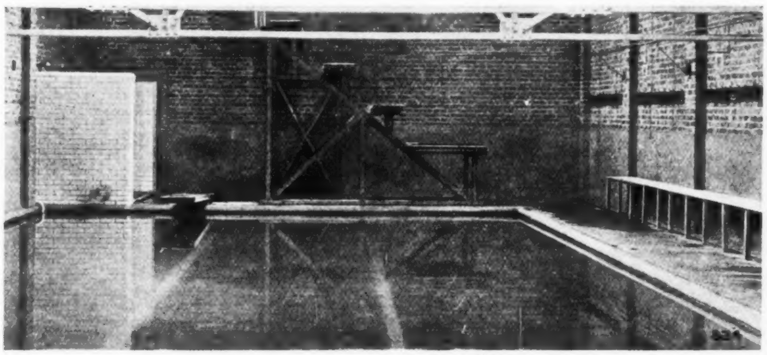


Figure seven. Bath at Greenhithe. This bath presented considerable structural difficulties which the architect, Mr. Arnold Mitchell, was able successfully to overcome.

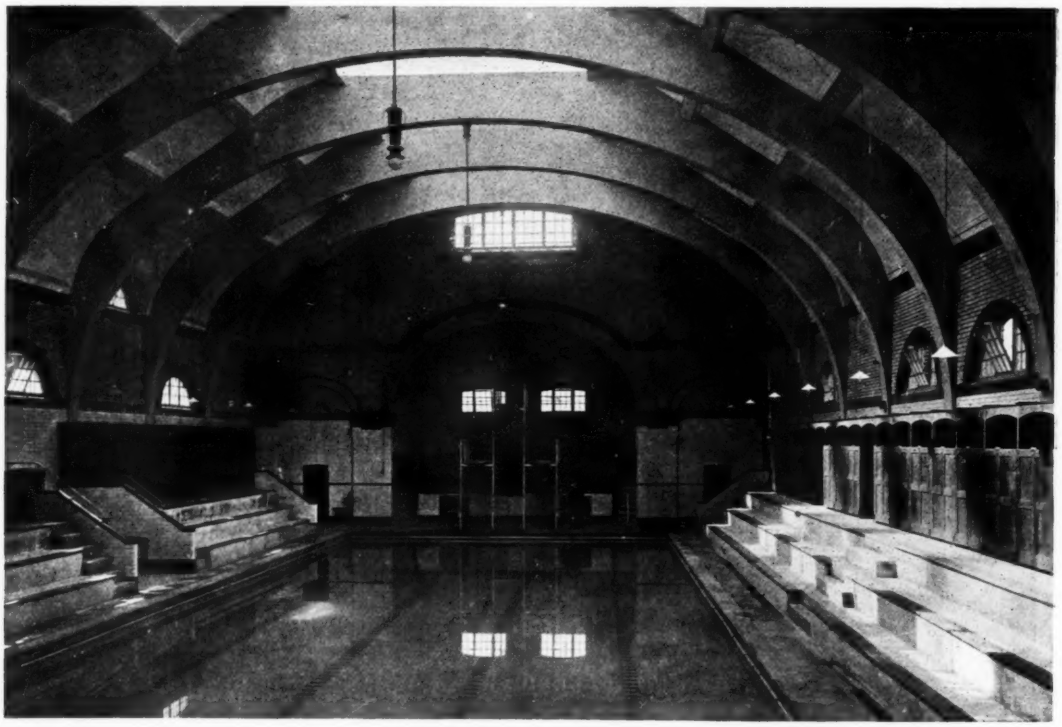


Figure eight. The bold reinforced concrete ribs, elliptical in form, which are thrown across the hall, are features in this design, in which the amphitheatre system of seating with dressing-boxes planned at a higher level is also adopted.

Figure nine. The reinforced concrete swimming-bath recently erected in Paris is unusual in treatment, and shows a more imaginative use of the material than is usually to be found in this country. There are no dressing-boxes.

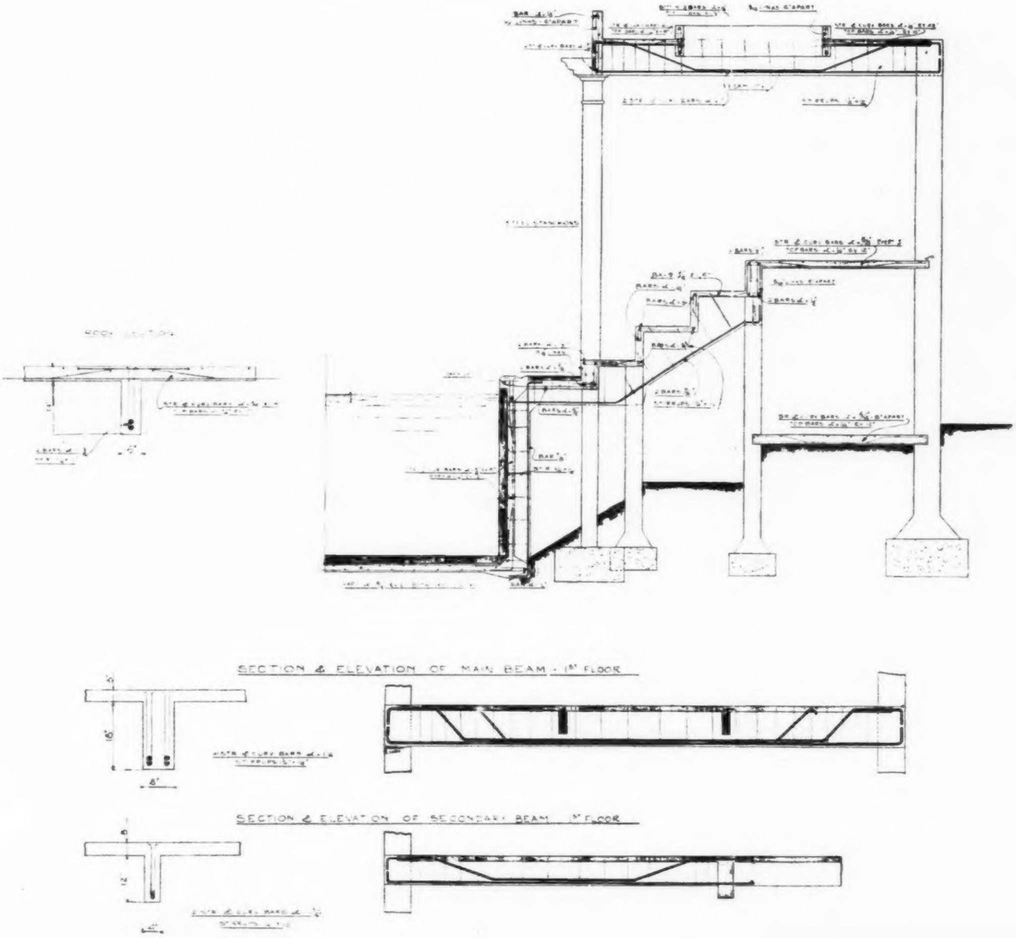


Figure ten. Gallery seating arranged on the amphitheatre system is, where space permits, the best method of providing accommodation for spectators of aquatic displays. The advantages of the construction of the gallery being designed so as to form a homogeneous part of the swimming bath are obvious.

Figure eleven. Bath at Hammersmith. By J. E. Franck. The orthodox arrangement of dressing-boxes under an overhanging gallery is here followed. Special attention has been given to the excellent design of the top-lighted bath hall.

filling-in work between the principals is constructed in glazed brick, and the top lighting is supplemented by side and end windows, which form excellent additional means of ventilation. In connection with this bath it will be noted that the amphitheatre system of raised side seating is adopted, and the dressing-boxes are planned along the walls upon the highest stage. This is an arrangement which has much to recommend it, for the boxes are well under observation, and at the same time spectators are able to obtain a good view of the aquatic sports or races. The increased floor area required for this scheme of bath-planning naturally constitutes an item of some financial importance, and where, as frequently occurs in the London area, the site restricted, the adoption of amphitheatre system is precluded. A detail drawing illustrating the amphitheatre seating constructed in reinforced concrete is shown in figure ten.

In the case of the Hammersmith bath, J. E. Franck, F.R.I.B.A., architect, the more orthodox arrangement of dressing-boxes under a gallery providing raised seating accommodation is followed, and the roof to the bath hall, always a difficult problem, with its long length of lantern light, has been treated in a masterly way (figure eleven).

It cannot be too strongly emphasized that an architectural treatment of the swimming-bath hall is of the greatest importance when, as often happens, the hall is to be converted for use as a public or entertainment hall.

Since the introduction of folding dressing-boxes in the Hoxton public baths, some years ago, this practice has increased considerably, and municipal authorities are awakening to the fact that a swimming-bath hall, if properly designed, may be a revenue-producing asset in winter months.

As an example of reinforced concrete as applied to open-air baths, those constructed at Rossall School are of interest, whilst a side-lighted bath of somewhat unusual design has been carried out at the Red Triangle Club at Plaistow (figure twelve).

From the purely architectural point of view one of the most satisfactory of modern swimming-bath buildings is that now in course of erection, from designs of Messrs. Nicholas and Dixon Spain, at Newcastle-on-Tyne (figures thirteen, fourteen, and fifteen). The recently erected reinforced concrete swimming-bath and hall in Paris shows an imaginative treatment eminently suitable to the material (figure nine).

An inspection of a large number of bath buildings discloses the fact that in many cases borough surveyors have been entrusted by their municipal councils with the planning and design of these buildings, and in many cases this accounts for the apparent complete absence of architectural treatment which is discernible. No blame must be attached to these gentlemen, whose *métier* is not architecture, if in carrying out the instructions of their committee they do not produce workmanlike buildings of æsthetic value.

For our purpose it is sufficient to note and to deplore the fact that the services of architects are frequently dispensed with in this most important branch of public building. Public baths are frequently relegated to a back street, unlighted and undrained, and their design becomes part of the routine in the office of the borough council surveyor. While this state of affairs remains unchanged it would be premature for us in England to enlarge upon the amenities or the beauties of our cities, or to laud the merit of our twentieth-century civilization at the expense of that of ancient Rome.

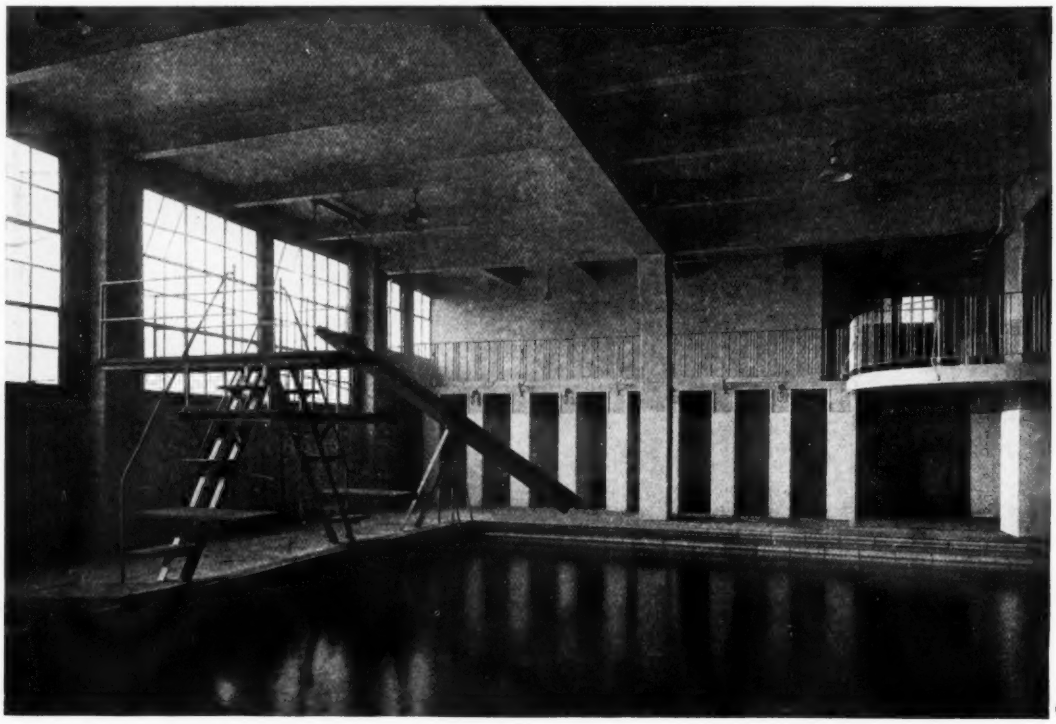


Figure twelve. Bath at Red Triangle Club, Plaistow. An interesting and unusual type of bath design in which side lighting only is obtainable.

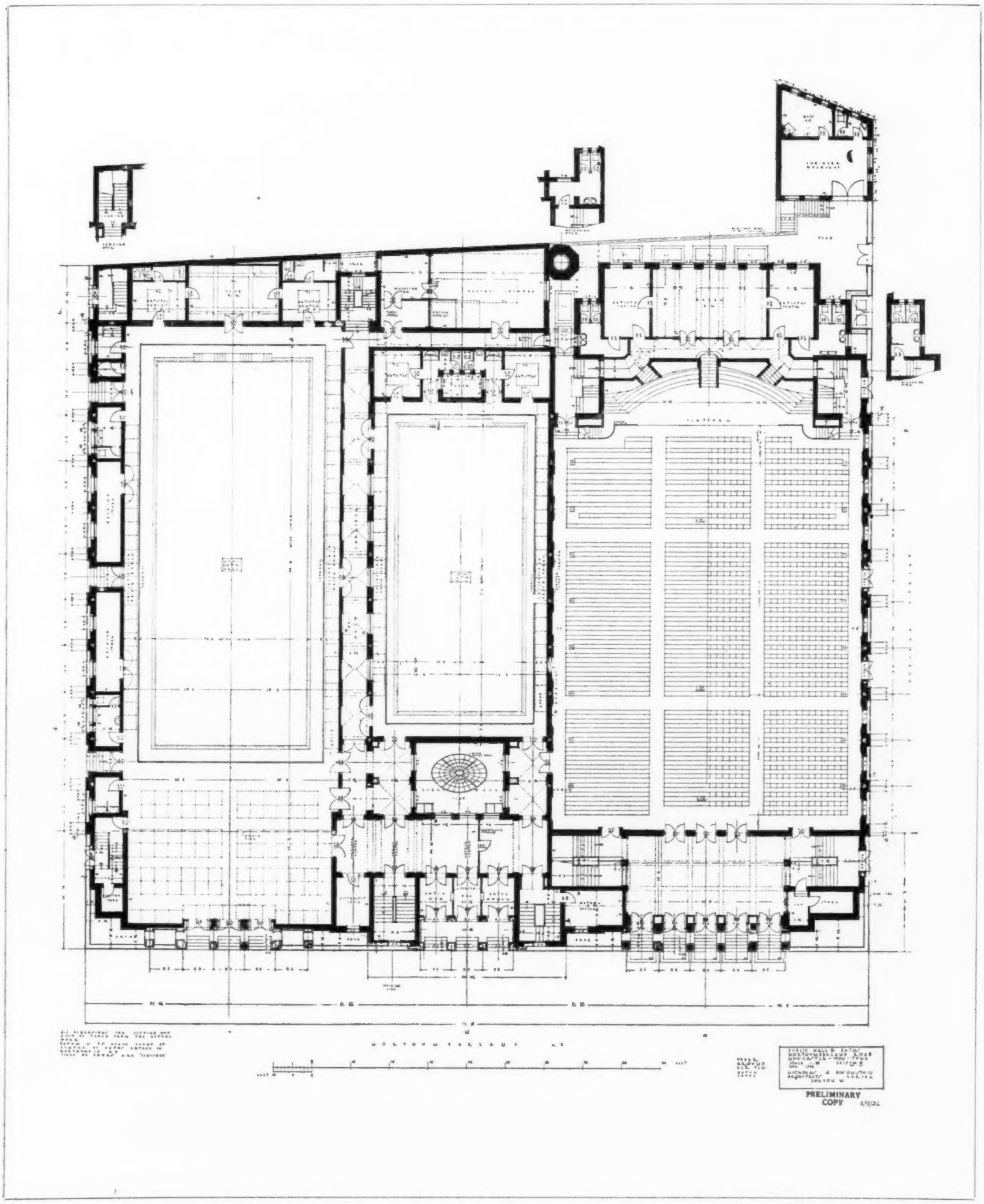


Figure thirteen. The ground-floor plan of Messrs. Nicholas and Dixon Spain's design for the public hall and baths at Newcastle-on-Tyne is a good practical solution to the somewhat difficult problem of designing a public building to suit two purposes. It will be remembered that Messrs. Nicholas and Dixon Spain's design was placed first by the assessor in an open competition for this building a few years ago.

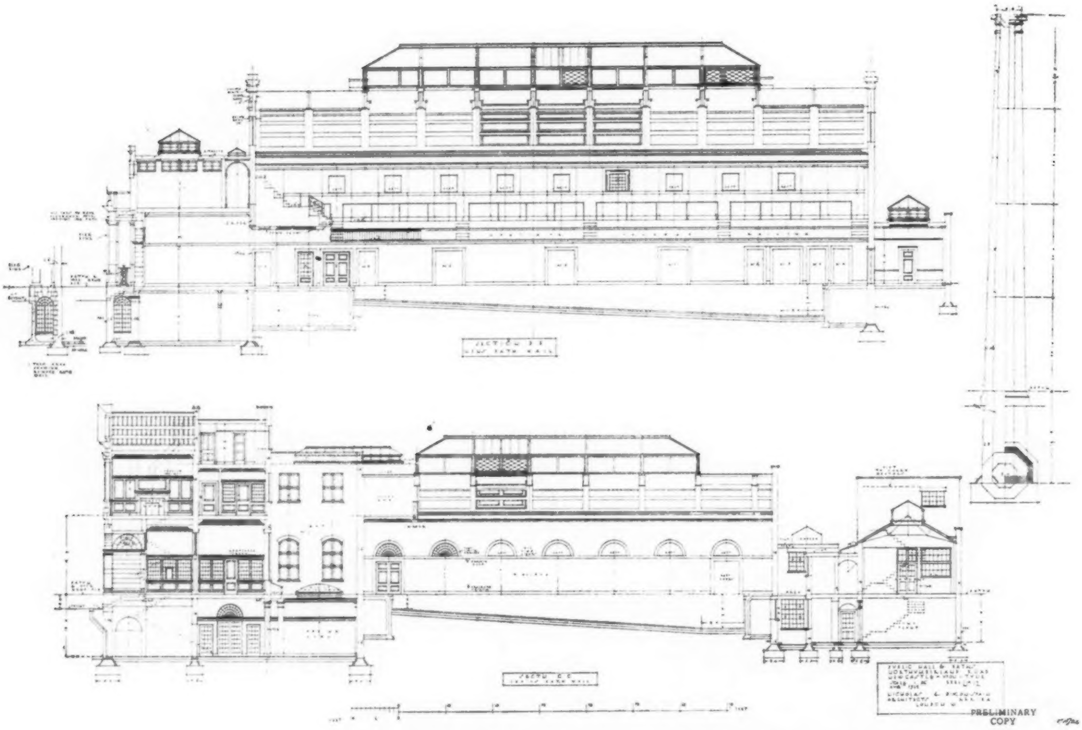


Figure fourteen. These sections taken from the working drawings of Messrs. Nicholas and Dixon Spain's design for the public hall and baths in Northumberland Road, Newcastle-on-Tyne, show the reinforced concrete work to the swimming bath tanks.

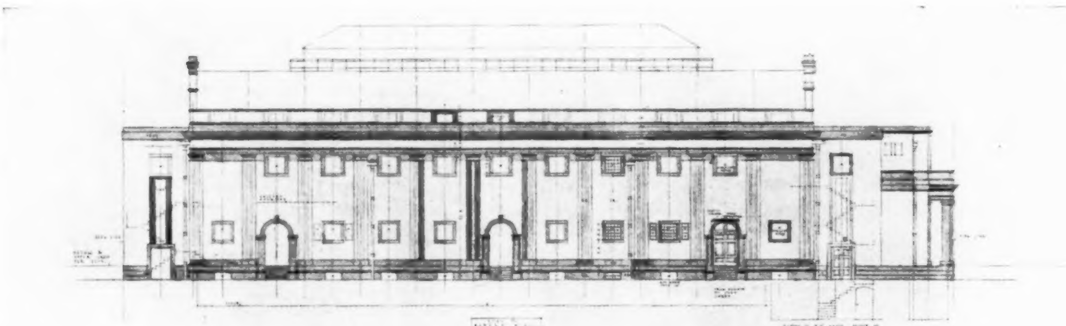


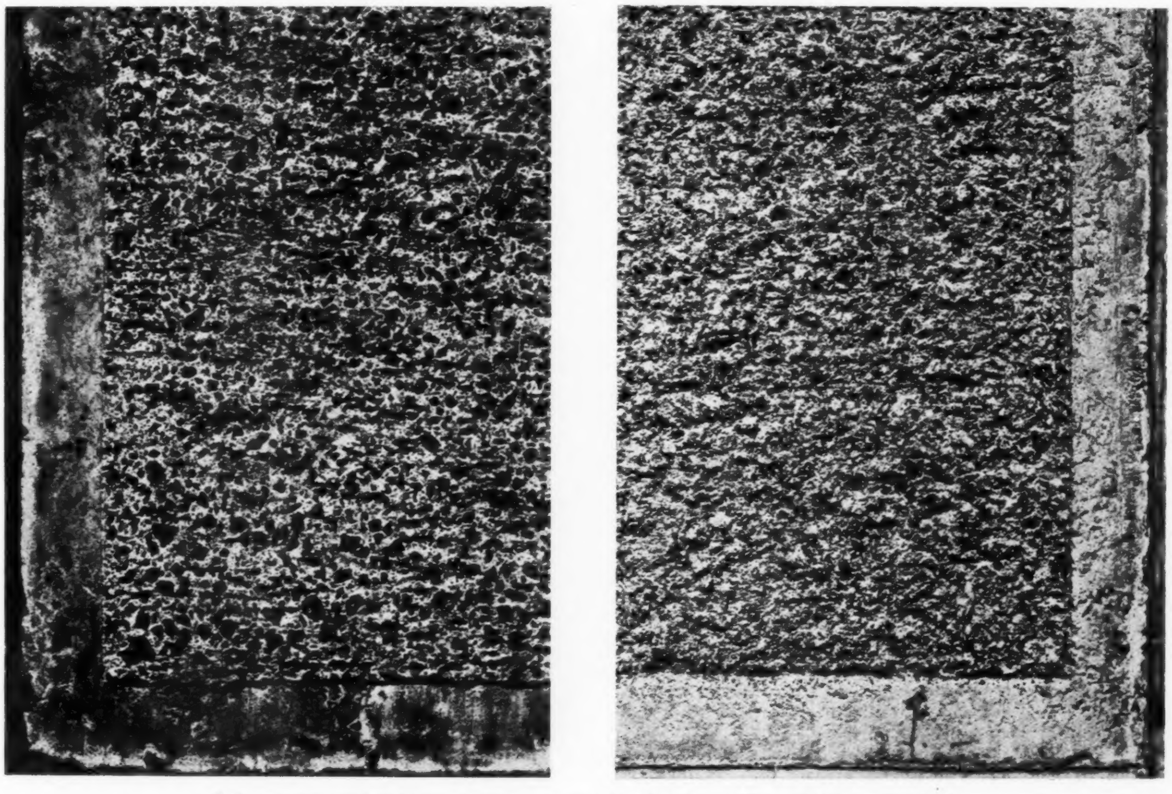
Figure fifteen. The elevations of the public hall and central baths establishment in Northumberland Road, Newcastle-on-Tyne, designed with considerable feeling of dignity and restraint, are entirely suited to their purpose, and are in keeping with the dominant tradition of architectural design in Newcastle. Messrs. Nicholas and Dixon Spain are the architects.

SURFACE, TRUE AND FALSE

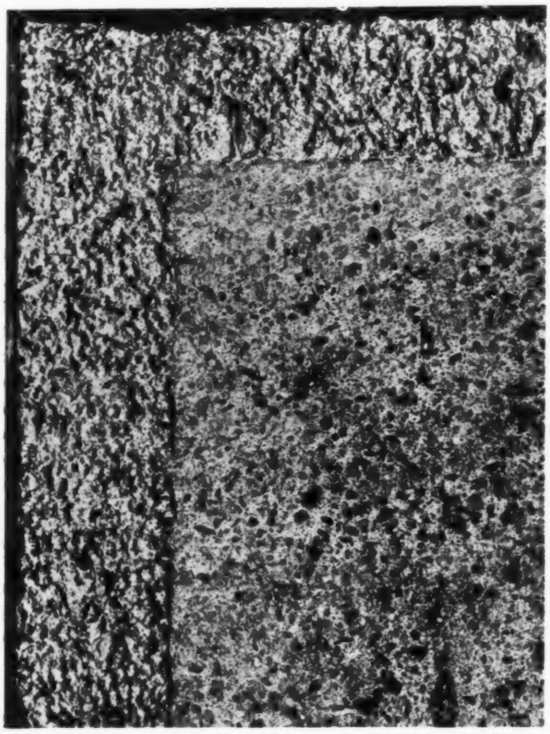
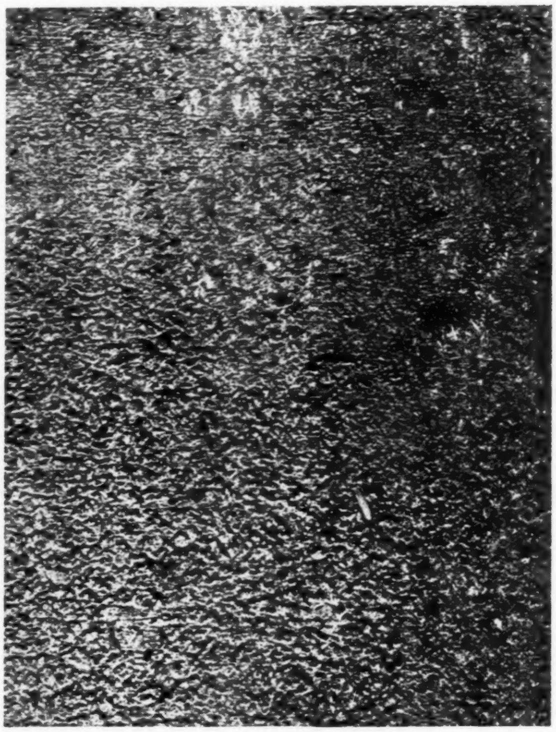
[BY MAXWELL AYRTON]

IN the selection of the material to be used for any particular work, suitability from two points of view calls for the consideration of the architect: a: durability, strength, and upkeep; b: æsthetic value. Architects in the majority of cases are more concerned with the latter, that is to say, it is not usually of structural importance that a certain stone or brick shall be used for safety's sake; the choice is more often decided by the suitability of the material æsthetically. Now, though the costs of different stone, brick, marbles, etc., vary considerably, and economy may be effected by careful selection, the cost of the finishing or tooling of the stone, or the careful burning of the brick, and the subsequent specification of the jointing, etc., of facework, is quite naturally and properly taken as part and parcel of the total cost of such work. In other words, it is not usual to consider a stone or brick-faced building at a cost of " X " pounds, and then add so much for the cost of dressing the stone, or pointing the bricks, or going still a step farther, and adding the cost of burning the brick in such a manner as to ensure good colour. It is usual, on the other hand, to select one's material according to the amount that can be spent, and, having selected it, this amount includes the cost of producing the best that the particular material is capable of giving.

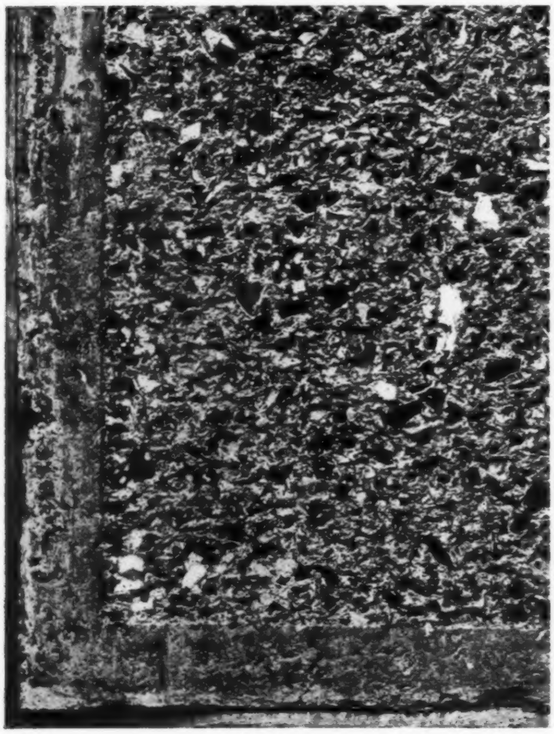
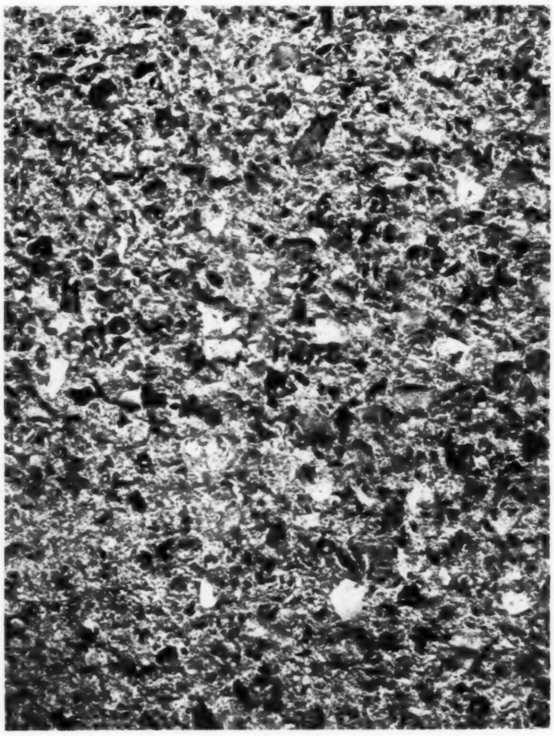
Concrete, unfortunately, is not dealt with in this manner. Its history is that of a system of construction invariably built up either as a skeleton, to be subsequently clothed, or, where left bare, to be used only on such works as are deemed, by those responsible, to have no claim for decent appearance. At the most, where other covering is not considered, the best that has been thought fitting was a coat of cement. Concrete suffers from having always been regarded as a cheap material, with the result that any suggestion of treating it in a seemly manner as a material worthy of architectural recognition has been regarded not only as an extravagance, but as an actual misuse of concrete. The surface of concrete as it is left when the form-work is removed is an abomination in ninety-nine cases out of a hundred. The " fatty " face of the almost pure cement, reproducing the finest lines of the timber surface of the forms, is unpleasing both in colour and texture. Movement in timber form-work cannot be entirely eliminated even with the greatest care, and is usually marked. But why in the case of concrete only should finishing work



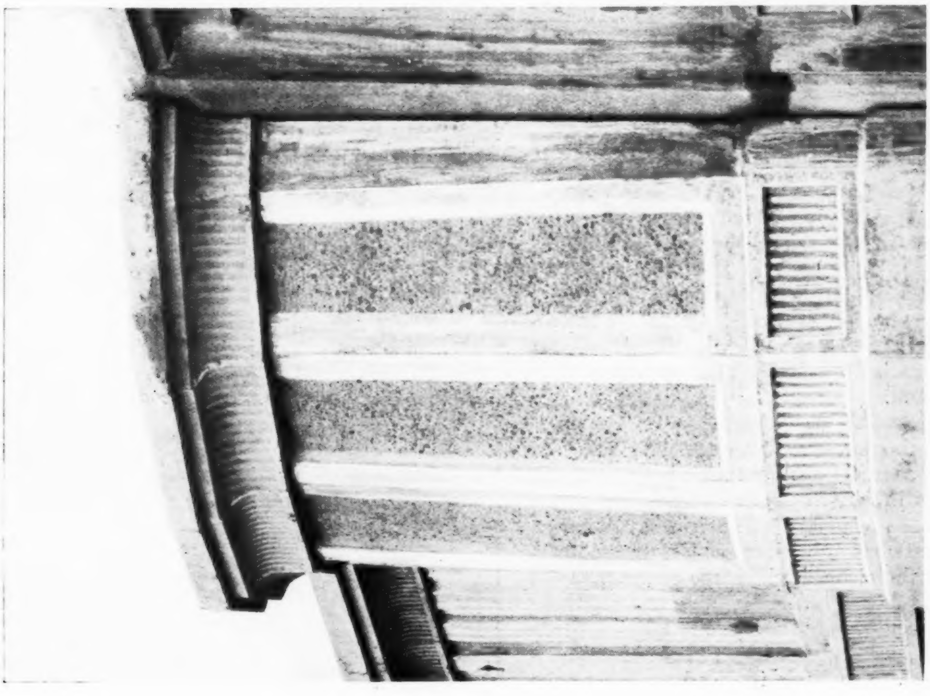
Left, concrete made with an aggregate of crushed red brick. The surface has been bush-hammered, except a narrow band at the edge, which is just as the form-work left it. Right, concrete made with an aggregate of crushed blue brick. The surface is again bush-hammered. The general tone of the material is not, of course, blue, but a deep plum red in colour, blue fragments appearing where the outer surface of the virginal brick shows through.

Left, concrete made with an aggregate of crushed yellow brick. The surface has been rubbed with carborundum brick; that along the edge is bush-hammered. Right, concrete made with an aggregate of crushed yellow brick. The surface has been wire-brushed; the implement used is a revolving brush driven by machinery.

Left, concrete made with an aggregate of crushed flints. The surface has been bush-hammered. The border shows the concrete as it issued from the form. Right, concrete made with an aggregate of flint gravel, as used in the pylons of the Lea Valley viaduct. The surface has been bush-hammered.



The Lea Valley viaduct. Sir John Simpson and Maxwell Ayrton, architects, and Sir E. Owen Williams, engineer. Left, a projection in the parapet surmounting one of the bridge piers. The aggregate is flint gravel. The panels are bush-hammered; the rest of the surface is left untouched. Right, a detail of one of the pylons. The aggregate is flint gravel. The whole of the surface except the corrugations at the bottom is bush-hammered, but the part forming a background to the wave is cut deeper than the rest.

or initial care be grudged in the effort to show it at its best? In works where the use of concrete is economically sound it is unnecessary to be parsimonious in its use, and additional cost incurred in form-work or in subsequent work upon the face will still leave it an economical material.

The strong prejudice against concrete has grown entirely from neglect or lack of vision in seeing in it a material with æsthetic possibilities. If the cement face, which is in itself of no practical value to the concrete, is removed and the aggregate from which the concrete is made is exposed, at once a variety of texture and colour is revealed which has an individuality and attractiveness all its own.

It must be in surface treatment that the future of concrete lies. In spite of concrete being a flowing material in which the most exacting casting can be performed, the more it is used the more clear does it become that it is in large simple planes that it is at its best, where the mass is of importance, to the exclusion of all unnecessary detail.

Pleasing variation in colour is obtained naturally by the use of different aggregates, and it is conceivable, for example, that where old bricks are available that they might well be used, crushed as aggregate, in conjunction with concrete made with gravel. Staffordshire blue brick mixed 4 to 1 gives a fine rich coloured concrete, and in a milder way crushed yellow stock or a good red brick are interesting. Various gravels or crushed stone give their particular tone or colour, but in all cases whether by pigment or aggregate the "fatty" face must be removed or the surface so broken as to overcome the deadly effect of the form-work boarding.

A chemical substance has been produced in the U.S.A. with which the forms may be covered. It is claimed that this prevents the "setting" of the cement face immediately in contact with the form-work, so that upon the removal of the forms the face may be washed down leaving the clean aggregate exposed. Up to the present this preparation has not been obtainable in England, but the possibilities of some such process appear to be considerable.

The use of reeded and moulded form-boards is satisfactory in eliminating to a large extent the reproduction of the grain and knots in the timber and in disguising inequalities in the surfaces due to movement. It also has the desired effect of necessitating more careful work in the preparation of the forms—an essential to good concrete, which is more frequently than not forgotten or regarded as non-essential.

Bush-hammering, or dressing down with a steel chisel, is probably, however, the most satisfactory method of surface treatment. Where a gravel aggregate has been used this hammering splits or breaks off the face of the majority of the individual pebbles, but the effect is most pleasing. In the case of crushed stone or brick aggregates the hammering merely exposes the clean, broken face of the material and the surrounding skin of cement binding the fragments together. By this method all arrises are softened and the general feeling of a building cast in a flowing material is greatly enhanced. It also lends itself admirably to the introduction of flat, simple forms of ornament, obtained by hammering portions of the work to a greater depth than their surroundings. In addition, the roughened surface is slightly absorbent, which immediately gives the texture necessary for weathering qualities. A good gravel concrete of 4 to 1, bush-hammered, has, indeed, much the texture of a hard granite coarsely tooled with infinite variation in colour and tone.

There remain, of course, many other problems confronting the designer in concrete, such as the utilization of expansion joints as definite features in the design—the consideration of mouldings, their form in connection with the flow of the material, and so on. But with all this the point of outstanding importance which governs the acceptance of concrete as a monumental material is the satisfactory solution of its surface treatment, and, foremost, the admission that it demands the right to such treatment.

"FILLER-JOIST" CONSTRUCTION

[BY EWART S. ANDREWS]

A CONSIDERABLE amount of attention has been given in recent years to the form of construction known as "filler-joist" concrete construction. This consists of rolled steel joists, the space between which is filled with concrete. It has the advantage of simplicity of construction, combined with the fact that, as the steel joists themselves are capable of taking most of the load, great care in the grading and mixing of the concrete is not essential. Some authorities have held that in this form of construction the steel joists should be designed as capable of carrying the full dead and superimposed load at the working stresses appropriate to naked steel, thus neglecting the strengthening effect which the concrete has upon it. Recent tests made in this country and abroad have demonstrated the fact that such construction is much stronger than the plain steel, but no clear agreement appears yet to have been reached as to the stresses which should be employed in designing filler-joists.

While walking recently alongside a mountain torrent in Italy, the writer came across a footbridge of approximately 20 ft. span and 6 ft. in width composed of three steel joists. The space between the joists was filled with concrete, as illustrated in the

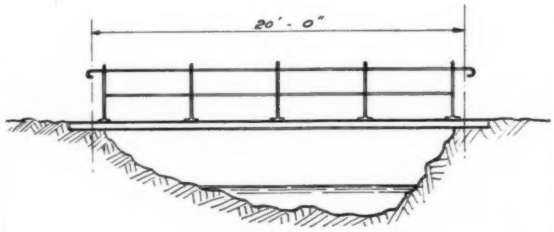


Figure one.

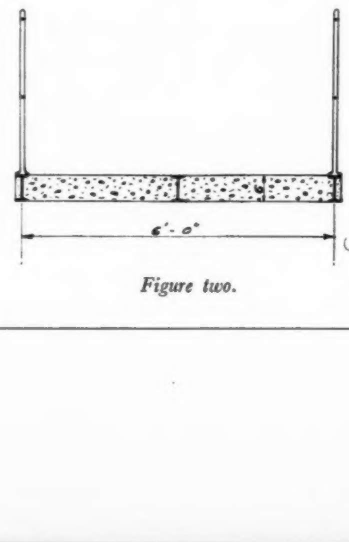


Figure two.

accompanying drawings, and it appeared so light that he thought it would be of interest to examine the stresses in it according to the ordinary methods of calculation. The joists were approximately $6 \times 2\frac{3}{4}$ in., and as there is a metric section 5.91×2.76 in., this is doubtless the section employed—the section modulus of this section is 5.97 in. units. According to the orthodox method of calculation the central joist would be regarded as being twice as heavily loaded as the outer ones, that is to say, it will carry 3 ft. width of the slab, whereas the outside joists will carry half this load.

The dead load of concrete 6 in. thick, including the weight of the joist, will be about 72 lb. per sq. ft. We can thus calculate as follows the stress in the central joist due to dead load alone.

$$\text{Load} = W = \frac{20 \times 3 \times 72}{2240} = 1.93 \text{ tons.}$$

$$\text{Maximum bending moment} = \frac{Wl}{8} = \frac{1.93 \times 20 \times 12}{8} = 58 \text{ in. tons.}$$

$$\therefore \text{Stress due to dead load alone} = \frac{\text{Maximum bending moment}}{\text{Section modulus}} = \frac{58}{5.97} = 9.7 \text{ tons per sq. in.}$$

Now, this footbridge leads from a road alongside the stream or torrent to a few buildings on the other side, the nearest of which was a *trattoria*—the Italian equivalent of a country tavern—just on the other side of the bridge. The bridge was the only means of access to this festive building, and all the casks or large flasks of wine must pass over it. We will take 80 lb. per sq. ft. as equivalent dead load equivalent to the live load; in this country we think very few authorities would allow this to be taken as less than 112 lb. per sq. ft., but we take 80 lb. in order to present the case in as favourable a light as possible. Working as before we shall have:

$$\text{Stress due to superimposed load alone} = \frac{9.7 \times 80}{72} = 10.7 \text{ tons per sq. in.}$$

$$\therefore \text{Total stress} = 20.4 \text{ tons per sq. in.}$$

These joists being of Continental steel are almost certainly of the usual quality there obtaining, with a yield point of about 14 tons per sq. in., and an ultimate strength of about 25 tons per sq. in.; from the fact that the bridge was not appreciably bent it is clear that these stresses could not possibly be present in the steel.

We must, therefore, look for the explanation that this bridge is apparently carrying its load with perfect safety; it appeared to be slightly deflected, but the amount of the deflection was probably not more than the natural deflection of the joists before the concrete had set. We think that the explanation is two-fold. In the first place, we have the strengthening effect of the concrete upon the steel, and here we would draw particular attention to the fact that the concrete was flush on the upper surface with the flanges of the steel, the latter being worn quite smooth by the traffic —the day that the writer was there happened to be a "festa" or public holiday, and the house of refreshment was well patronized. We lay stress on this point of there being no top cover to the steel because some authorities while willing to allow higher stresses when a top cover of at least 1 in. is provided, have suggested that no such allowance should be allowed in the case of a flush finish.

We have always dissented from this view because the real cause of failure of naked steel beams under test is a kind of lateral buckling of the flange which the relatively thin web is unable to resist; this is why a thick section, such as a railway rail, shows a higher calculated stress at failure as a beam than a naked joist. When joists are embedded in concrete this lateral buckling tendency is resisted, and there is, therefore, a much larger interval between the elastic limit load and the failure load in an embedded joist than in a naked one. Although for the reason above stated we think that higher stress should be allowed in the case of joists with concrete flush top and bottom than in the case of naked joists, there is no doubt whatever that a layer of concrete above the top of the compression flange adds still further to the strength, and that in formulating any rules for the design of filler-joist floors the thickness of concrete above the top flange should be taken into account.

The other explanation can be found in the distributing effect of the concrete of the load from the centre joist to the outside one. We have not the slightest doubt that in fact the outside joists in the present case are stressed almost as much as the centre one; with the figures that we have taken this will reduce the stress on the centre joist to two-thirds of its previous value.

This question of the dispersion effect of concrete slabs upon point loads is one to which insufficient attention has been given by theoretical investigators in the past, although practical designers have attempted to deal with it.

Let us consider a construction such as shown in figure two, and suppose that a point load is placed on the central joist; from a superficial theoretical point of view it would appear that this joist should be designed to carry the whole bending moment caused by this point load. The centre joist cannot, however, possibly deflect without causing the other joists to deflect to some extent. In fact, we believe that on test it would be found that the difference between the deflections of the outside and centre joists would be very small indeed. If the outside joists deflect, then some of the load must be transferred to them so that in this type of floor point loads become distributed over a considerable width. The effective width over which a point load may be considered dispersed will be rather greater for large spans than for small ones, and is probably never more than three-fifths of the span. With this proviso, we suggest that for the purpose of designing filler-joist floors we should be allowed to regard point loads as dispersed between the joists contained in as many feet in width of floor as there are inches in depth of concrete above the bottom flanges of the joists.

Returning to the example which we have been considering we think that our investigation shows that we can with perfect safety design a construction of this kind on the assumption that the joists contribute equally to the resistance to the forces, and that we may design the joists as if they were acting alone and stressed up to 10 tons per sq. in. The filler-joist form of construction has many practical advantages from the standpoint of ease of support, of centering, and of the "foolproof" nature of the work which makes it quite safe to be employed by the ordinary builder who may not specialize in reinforced concrete construction; if designed in accordance with the method suggested above it will be found to be very economical.

OFFICE ORGANIZATION

[BY ALAN E. MUNBY]

FEW professions make such varied demands as architecture. Though, perhaps, popularly regarded as only an art, it is, as is all too well known to many of its votaries, a series of diverse operations involving usually far more attention to administrative and business details than to matters artistic, and as the technicalities of buildings increase this side of an architect's work becomes ever more important. We are so insistent in our claims for good design that we are at times apt to forget that for a successful building good office administration is equally important, and it implies no reflection on the claims of art to add that this side of professional work often lacks the attention it deserves. An artistic temperament and business capacity seldom go hand-in-hand, hence possibly the lack of interest which is usually displayed towards this mundane topic. None the less, organization means besides good administration a considerable saving of time and hence economy in effort and money. How often in times of pressure have we all longed for leisure for "a good clear up," and how often when the much-sought opportunity has arrived have we experienced an extraordinary disinclination to take advantage of it? Yet the time wasted in hunting up necessary information may well be a serious factor and justify some little thought and trouble for its reduction.

The American Institute of Architects has been, and is, interesting itself in this subject, and we deal here with one phase of its activities, relative to a matter universally a difficulty, namely, the filing of trade catalogues and current technical information. Every day an architect receives a number of trade lists ranging from a single sheet to a volume, and though some of this material is useless, he cannot afford to reject much of it if he intends to keep abreast of the times in constructional practice. Materials and equipment have to be selected, prices compared, and clients advised upon new goods constantly clamouring for recognition. Further, draughtsmen have to be informed of stock sizes and builders' requirements in the utilization of many trade products. The A.I.A. has examined a number of systems as used in libraries and elsewhere, most of which have proved too elaborate, requiring in addition to a file, a complete card index, and we think that it is upon the upkeep of an index that most of our efforts break down. A scheme begins well, but in times of pressure the index is not kept up, hence the material accumulated becomes unmanageable, and from calls upon it is soon reduced to a disorderly assortment of lists which never get returned to their proper places.

Architects know their own weaknesses, and the A.I.A. has set itself to produce a filing system requiring the minimum of labour, and has adopted as a basis the kind of system generally used by architects. It is a system not only applicable to trade lists, but also to the filing of technical data, and is arranged upon the use of the product required in construction with certain modifications, and aims at the reduction of the necessity for cross references. This classification by purpose is probably the best, for reference is most required in formulating specification clauses, and when a particular maker's goods are to be investigated his list will be readily found under the product sought.

One of the greatest difficulties in filing consists of the diverse and omnibus nature of many catalogues, and the system endeavours to meet this in a manner which really forms the essence of the scheme. There are forty main divisions numbered consecutively, starting with "preparation of site," passing on to brickwork, carpentry, paving, and the like, and ending with acoustics and regulations. Each of these groups is divided into sub-groups, denoted by letters after the number; thus, under structural steel No. 13 we have properties and tests No. 13a. These sub-groups are, when necessary, again divided by numbers after the sub-group letter; thus, hardware is as a group, No. 27, specialities 27c, and under this sash operators are 27c4. Hence an omnibus list containing all kinds of hardware goods is filed merely under the number 27 and, thus disposed of, leaving the sub-divisions for the more specialized catalogues. It is not quite clear what happens to a general list embracing more than one main division, but these will be few, and the tendency nowadays is all in the direction of sectional publications. The A.I.A. hopes that as this scheme obtains recognition in America its general adoption will eventually result in inducing traders to print the appropriate file designations prominently on their publications.

OBITUARY

Mr. Harold H. Sissons.

We regret to announce the death at a nursing home in London, of Mr. Harold H. Sissons, J.P., of Ferriby, Yorkshire, chairman of Sissons Brothers and Co., Ltd., paint and varnish manufacturers, Hull. Until a few years ago, when failing health caused Mr. Sissons to give up many business and social activities, he was one of the most prominent figures in the paint and colour industry. Among other activities he was the first chairman of the National Federation of the Associated Paint, Colour, and Varnish Manufacturers of the United Kingdom, which position he occupied for two years.

SOCIETIES AND INSTITUTIONS

R.I.B.A. Council Meeting

Following are notes from the minutes of the last meeting of the Council of the R.I.B.A.:

Council for the Preservation of Rural England. The Council nominated Mr. E. Guy Dawber (President) and Professor S. D. Adshead as the representatives of the R.I.B.A. on the Council for the Preservation of Rural England, and voted £100 as a contribution towards its expenses for the first year.

Representation of the Allied Societies on the R.I.B.A. Council. A revised scheme of representation was approved and ordered to be submitted to the general body for approval.

Applications for Membership. Applications were approved from: Forty candidates for the Fellowship; seventy-one candidates for the Associateship; five candidates for the Hon. Associateship; eight candidates for the Hon. Corresponding Membership; one candidate for the Hon. Fellowship.

Reinstatement. The following were reinstated by the Council: As Fellow: J. Leonard Williams; as Associate: M. H. C. Doll, M.A.

Retired Fellowship. Mr. T. Stevens (F.R.I.B.A.) was transferred to the Retired Fellowship.

Election of Students. Ninety probationers were elected as students of the R.I.B.A.

Sheffield and South Yorkshire Architects

According to the eighth annual report of the Sheffield, South Yorkshire, and District Society of Architects and Surveyors the total membership in April last was as follows: 22 Fellows, 44 Associates, 1 student, and 4 lay members, making a total of 71 as against 78 last year. During the year the Society suffered a severe loss in the lamented death of its President (Mr. H. L. Paterson, F.R.I.B.A.) in March, when his second year of office was approaching completion. Mr. Paterson had served on the Council since 1902. In June last the question arose as to the desirability of continuing the Architectural Department at the University. After the matter had been discussed with the University authorities, who asked the Society to guarantee a fixed sum, an appeal was sent to all members of the Society asking for support, and although it was not found possible to provide the full guarantee asked for, the University authorities decided to carry on the department for a further period of one year. In March last further meetings were held with the University authorities, when it was decided after a full discussion that the department should be carried on for a further year, viz. up to June, 1927, with the proviso that the Society should agree to provide a slight increase in the amount of their guarantee of the previous year. A comparison of the two years shows that the number of students, except for evening classes, has been maintained, and the Council hope that every member of the Society will endeavour to give all the support possible to the department during the coming session. The president of the Society is Mr. F. E. Pearce Edwards, F.R.I.B.A.

COMPETITION CALENDAR

The conditions of the following competitions have been received by the R.I.B.A.

November 30. *a:* Design for a house costing £1,500; *b:* design for a house costing £850. Assessors, Messrs. E. Guy Dawber, P.R.I.B.A., Louis de Soissons, F.R.I.B.A., and C. W. Miskin. Premiums in each section: First, £150; second, £100; third, £50. Particulars from the secretary, *Daily Mail* Ideal Houses Competition, 130 Fleet Street, E.C.4. The prize-winning £1,500 house will be erected and completely furnished and equipped at the 1927 *Daily Mail* Ideal Home Exhibition at Olympia to be held next March.

January 3. Academy, Perth. Open to Architects practising in Scotland. Assessor, Mr. James D. Cairns. Premiums: £100 and £50. Particulars from Mr. R. Martin Bates, Education Offices, Perth. Deposit £1 1s.

January 8. Town Hall Extensions and Public Library Building, Manchester. Assessors, Messrs. T. R. Milburn, Robert Atkinson, and Ralph Knott. Particulars from Mr. P. M. Heath, Town Clerk. Deposit £1 1s.

January 15. Designs for complete modern furniture for *a*, a double bedroom, *b*, a drawing-room, *c*, sitting hall, *d*, dining-room. Assessors, the Countess of Oxford and Asquith, the Lady Islington, Sir Frank Baines, C.V.O., C.B.E., F.R.I.B.A. (Director of H.M. Office of Works), Messrs. H. Clifford Smith, F.S.A. (Department of Woodwork, Victoria and Albert Museum), F. V. Burridge, O.B.E., R.E., A.R.C.A. (Principal of the Central School of Arts and Crafts), P. Morley Horder, F.S.A., Philip Tilden, Percy A. Wells (Principal of the Cabinet Department, Shoreditch Technical College), Holbrook Jackson (Editorial Director, The National Trade Press, Ltd.), and Captain Edward W. Gregory (Editor, *The Furnishing Trades' Organizer*). For the preliminary adjudication there are 200 guineas in prizes, and for the final, 300 guineas. Particulars from the Editor, *The Furnishing Trades' Organizer*, Regent House, Kingsway, London, W.C.2. An exhibition of prints and drawings of modern furniture and decoration is being held in the Gallery of Carlton House, Great Queen Street, W.C.2, until November 27.

***January* 25. Conference Hall, for League of Nations, Geneva. 100,000 Swiss francs to be divided among architects submitting best plans. Sir John Burnet, R. A., British representative on jury of assessors.**

No date. Incorporated Architects in Scotland: 1: Rowand Anderson Medal and £100; City Art Gallery and Museum; 2: Rutland Prize (£50) for Study of Materials and Construction; 3: Prize (£10 to £15) for 3rd year Students in Scotland; 4: Maintenance Scholarship, £50 per annum for 3 years. Particulars from Secretary of the Incorporation, 15 Rutland Square, Edinburgh.

The conditions of the following competition have not as yet been brought to the notice of the R.I.B.A.

No date. Town Hall and Library, Leith. Assessor, Sir George Washington Browne, R.S.A. Particulars from the City Chambers, Edinburgh.

TRADE NOTES

It has been written that when you have pushed farthest north, or south—farther than any man before you—you will turn a corner and run into a Scotsman—a Scots engineer. He may be parted from his tools—though this is unlikely; he may have nothing engineering about him except his language, but by this language you will know him, and he will swear by the name of Braby & Co. of his native Glasgow. For, indeed, were it not for Braby & Co. of Glasgow the numbers of Scots engineers would have to be noticeably fewer, else where would they get their steel?—the steel that goes to the building of so many big bridges, to the reinforcement of dams? Nearly everything steel, as is shown by their recent catalogues, can be got from Braby's, from the steel barrow that will carry away the first earth excavated, to the steel body of the motor-car that will take the directors' ladies safely across. Read partly down the list: steel-framed mill buildings, engineering workshops, warehouses, garages, auction marts, station platform roofing, factories, sheds, and industrial buildings of all sizes, girderwork, built columns, floor construction, gantries, bridges, tanks, colliery construction, pithead frames, boiler-houses, towers, derrick frames, etc., right down to the aforementioned wheelbarrow. When I had finished looking through their many catalogues, I do not know why, but I thought less of the mighty Roman Empire, and more of our own.

Metco Columbian pine doors are the subject of a useful catalogue just issued by The Merchant Trading Company, Ltd. These doors are stocked in no fewer than thirty patterns, aggregating a total of 240 different sizes. This makes it a simple matter to select a door of good design for any particular requirement. All Columbian pine doors marked Metco or Metco Comet are guaranteed by the importers, who will replace any door sold under the above trade marks should any defect develop due to faulty material or manufacture. The firm state that in the manufacture of the doors only soft, old-growth Douglas fir is used, and that the timber and workmanship are inspected at every stage of the work, from the tree to the trade mark. It is also stated that the mill has a daily eight-hour output of 5,000 doors, and that over 50,000,000 ft. of wood and 10,000,000 super ft. of 3-ply (rotary cut) plywood is consumed annually in their manufacture. From 125,000 to 175,000 doors, of sizes as shown in the catalogue, the firm state, are always actually held in stock at the warehouses. A coloured inset in the catalogue shows actual photographs of six pieces of Metco Columbian pine plywood stained with Metco stains, and a full-sized panel of the plywood shows the full character and the beauty of the grain. A handy vignette, presented with the catalogue, when placed on any particular door pattern shown gives the effect of the door in architrave. A copy of the catalogue can be obtained from The Merchant Trading Co., 34 Bishopsgate London, E.C.2, and at Cunard Building, Liverpool, or from any of the Metco or Comet door distributors.

Messrs. J. and W. Stewart, builders and decorators, specialists in reinforced concrete construction and concrete piling, of 12 Berkeley Street, London, W.1., have removed their head office to 105 Baker Street, London, W.1.; telephone numbers, Langham 3541-2-3; telegraphic address, Cymplecks, Baker, London. All correspondence should be sent to this new address.

OUR CONCRETE ISSUE

Following are the names of the proprietors and general contractors for some of the work illustrated in this issue:

Lea Valley Viaduct, North Circular Road, London (page 646), for the Ministry of Transport. General contractor, Sir William Prescott and Sons, Ltd. Resident engineer, Mr. Andrew Hood.

Wansford Bridge (page 649), Huntingdonshire, Soke of Peterborough, for the Ministry of Transport. General contractor, Aubrey Watson & Co. Resident engineer, Mr. Andrew Hood.

Findhorn Bridge, Perth-Inverness Road (page 650), and Spey Bridge (page 651), for the Inverness County Council. General contractor, Sir Robert McAlpine and Sons. Resident engineer, Mr. H. Richards, A.M.I.C.E.

Public Hall and Swimming Baths at Northumberland Road, Newcastle (page 652), for the City and County of Newcastle-upon-Tyne. General contractor, Mr. Stanley Miller. Clerk of works, Mr. W. Boocock.

Broadstairs Water Tower (page 645). General contractors, Rice and Son.

Caversham Bridge (page 638), The Bromsgrove Guild; cast stone ornaments and lamp standards.

We are indebted to the following firms for their kindness in lending us blocks and photographs to illustrate certain articles in this issue:

British Reinforced Concrete Engineering Company (The Concrete Container). Grain elevator at Sydney, New South Wales (photograph); coal storage bunkers, Redcar.

Bromsgrove Guild, Ltd. (Concrete Sculpture). A vase for garden decoration.

Edmond Coignet, Ltd. (Framework Design). Water tower at Bath (photograph).

Considere Construction Company (Some Large Spans). Vesubie Bridge; Nantes Bridge; Warrington Bridge.

Christiani and Nielsen (Framework Design). Bridge in Denmark (photograph).

Indented Bar and Concrete Engineering Company, Ltd. (Some Large Spans). Waipukarau Bridge; Abercynon Bridge; Pootnung Bridge, Shanghai; Covering of the Kingston Baths, Bath. (Framework Design): Refrigerating station for the Port of London Authority. (The Concrete Container): Water tower at Coventry. (The Concrete Swimming Bath): Bath at Greenhithe; Madeley Street Baths, Hull.

Industrial Construction Company (The Concrete Container). Slurry basin at Mickley; coal bunkers at New Monckton; silos at Greenwich (photograph); coal bunkers at Consett.

Peter Lind (Framework Design). Gas purifiers, Bargoed, South Wales.

Mouchel and Partners (Some Large Spans). Caversham Bridge (photograph). (The Concrete Container): Silos at Silvertown Flour Mills. (The Concrete Swimming Bath): Walker Public Baths (drawings); bath at Heaton, Newcastle-on-Tyne (drawings).

Rice and Son (The Concrete Container). Water tower at Broadstairs (photograph).

Trussed Concrete Steel Company (Some Large Spans). Bridge at Barrow-in-Furness; Wergin's Bridge, Hereford. (The Concrete Swimming Bath): Bath at Croydon; bath at Hammersmith; bath at the Red Triangle Club, Plaistow. (Framework Design): Pithead Gear for the Fife Coal Co.

RATES OF WAGES

Grade	Town	District	I s. d.	II s. d.
A	Aberdare	S. Wales & M.	1 8	1 3¼
A_1	Abergavenny	S. Wales & M.	1 7½	1 2¾
B	Abingdon ..	S. Counties	1 6	1 1¾
A	Accrington	N.W. Counties	1 8	1 3¼
A_3	Addlestone	S. Counties	1 6½	1 2
A	Adlington	N.W. Counties	1 8	1 3¼
A	Airdrie ..	Scotland	*1 8	1 3¼
C_1	Aldeburgh	E. Counties	1 4	1 0¼
A	Altrincham	N.W. Counties	1 8	1 3¼
B_3	Appleby ..	N.W. Counties	1 4½	1 0½
A	Ashton-under-Lyne	N.W. Counties	1 8	1 3¼
A_3	Atherstone	Mid. Counties	1 6½	1 2
B_3	Aylesbury ..	S. Counties	1 4½	1 0½
B_3	Banbury	S. Counties	1 4½	1 0½
B_2	Bangor ..	N.W. Counties	1 5	1 1
A	BarnardCastle	N.E. Coast	1 8	1 3¼
A	Barnsley ..	Yorkshire	1 8	1 3¼
B_1	Barnstaple	S.W. Counties	1 5½	1 1¼
A	Barrow ..	N.W. Counties	1 8	1 3¼
A	Barry ..	S. Wales & M.	1 8	1 3¼
B_3	Basingstoke	S.W. Counties	1 4½	1 0½
B	Bath ..	S.W. Counties	1 6	1 1¾
A	Batley ..	Yorkshire	1 8	1 3¼
B	Bedford ..	E. Counties	1 6	1 1¾
A_2	Berwick-on-Tweed	N.E. Coast	1 7	1 2½
A_3	Bewdley ..	Mid. Counties	1 6½	1 2
B_3	Bicester ..	Mid. Counties	1 4½	1 0½
A	Birkenhead	N.W. Counties	†1 9	1 3¼
A	Birmingham	Mid. Counties	1 8	1 3¼
A	Bishop Auckland	N.E. Coast	1 8	1 3¼
A	Blackburn	N.W. Counties	1 8	1 3¼
A	Blackpool	N.W. Counties	1 8	1 3¼
A	Blyth ..	N.E. Coast	1 8	1 3¼
B_3	Bognor ..	S. Counties	1 4½	1 0½
A	Bolton ..	N.W. Counties	1 8	1 3¼
A_3	Boston ..	Mid. Counties	1 6½	1 2
B_1	Bournemouth	S. Counties	1 6	1 1¾
A	Bradford ..	Yorkshire	1 8	1 3¼
A_3	Brentwood	E. Counties	1 6½	1 2
A	Bridgend ..	S. Wales & M.	1 8	1 3¼
B_2	Bridgwater	S.W. Counties	1 5	1 1
A_1	Bridlington	Yorkshire	1 7½	1 2¾
A	Brighouse	Yorkshire	1 8	1 3¼
B_1	Brighton ..	S. Counties	1 6	1 1¾
A	Bristol ..	S.W. Counties	1 8	1 3¼
B_3	Brixham ..	S.W. Counties	1 4½	1 0½
A_3	Bromsgrove	Mid. Counties	1 6½	1 2
C	Bromyard ..	Mid. Counties	1 4	1 0¼
A	Burnley ..	N.W. Counties	1 8	1 3¼
A	Burslem ..	Mid. Counties	1 8	1 3¼
A_2	Burton-on-Trent	Mid. Counties	1 7	1 2½
A	Bury ..	N.W. Counties	1 8	1 3¼
A_3	Buxton ..	N.W. Counties	1 6½	1 2
B	Cambridge	E. Counties	1 6	1 1¾
B_3	Canterbury	S. Counties	1 4½	1 0½
A	Cardiff ..	S. Wales & M.	1 8	1 3¼
A	Carlisle ..	N.W. Counties	1 8	1 3¼
B	Carmarthen	S. Wales & M.	1 6	1 1¾
B_2	Carnarvon	N.W. Counties	1 5	1 1
A_1	Carnforth ..	N.W. Counties	1 7½	1 2¾
A	Castleford	Yorkshire	1 8	1 3¼
B_1	Chatham ..	S. Counties	1 5½	1 1¼
B_1	Chelmsford	E. Counties	1 5½	1 1¼
B	Cheltenham	S.W. Counties	1 6	1 1¾
A	Chester ..	N.W. Counties	1 8	1 3¼
A	Chesterfield	Mid. Counties	‡1 8	1 3¼
B_3	Chichester	S. Counties	1 4½	1 0½
A	Chorley ..	N.W. Counties	1 8	1 3¼
B_2	Cirencester	S. Counties	1 5	1 1
A	Clitheroe ..	N.W. Counties	1 8	1 3¼
A	Clydebank	Scotland	1 8	1 3¼
A	Coalville ..	Mid. Counties	1 8	1 3¼
B_1	Colchester ..	E. Counties	1 5½	1 1¼
A	Colne ..	N.W. Counties	1 8	1 3¼
B_1	Colwyn Bay	N.W. Counties	1 5½	1 1¼
A	Consett ..	N.E. Coast	1 8	1 3¼
B_1	Conway ..	N.W. Counties	1 5½	1 1¼
A	Coventry ..	Mid. Counties	1 8	1 3¼
A_3	Crewe ..	N.W. Counties	1 6½	1 2
A_3	Cumberland	....	1 6½	1 2
A	Darlington	N.E. Coast	1 8	1 3¼
A	Darwen ..	N.W. Counties	1 8	1 3¼
B_3	Deal ..	S. Counties	1 4½	1 0½
B_1	Denbigh ..	N.W. Counties	1 5½	1 1¼
A	Derby ..	Mid. Counties	1 8	1 3¼
A	Dewsbury	Yorkshire	1 8	1 3¼
B	Didcot ..	S. Counties	1 6	1 1¾
A	Doncaster	Yorkshire	1 8	1 3¼
C_1	Dorchester	S.W. Counties	1 4	1 0¼
A_3	Driffield ..	Yorks	1 6½	1 2
A_3	Droitwich	Mid. Counties	1 6½	1 2
A_2	Dudley ..	Mid. Counties	1 7	1 2½
A	Dundee ..	Scotland	1 8	1 3¼
A	Durham ..	N.E. Coast	1 8	1 3¼
B_1	Eastbourne	S. Counties	1 6	1 1¾
A	Ebbw Vale	S. Wales & M.	1 8	1 3¼
A	Edinburgh	Scotland	1 8	1 3¼
A	E. Glamorganshire & Monmouthshire	S. Wales & M.	1 8	1 3¼
B	Exeter ..	S.W. Counties	§1 7	1 2½
B_2	Exmouth ..	S.W. Counties	1 5	1 1
B	Felixstowe	E. Counties	1 6	1 1¾
A_3	Filey ..	Yorks	1 6½	1 2
A	Fleetwood ..	N.W. Counties	1 8	1 3¼
B_3	Folkestone	S. Counties	1 4½	1 0½
A	Frodsham	N.W. Counties	1 8	1 3¼
B_3	Frome ..	S.W. Counties	1 4½	1 0½
A	Gateshead	N.E. Coast	1 8	1 3¼
B_1	Gillingham	S. Counties	1 5½	1 1¼
B	Gloucester	S.W. Counties	1 6	1 1¾
A_2	Goole ..	Yorkshire	1 7	1 2½
B_1	Gosport ..	S. Counties	1 5½	1 1¼
A_3	Grantham	Mid. Counties	1 6½	1 2
A_2	Gravesend	S. Counties	1 7	1 2½
A	Greenock ..	Scotland	*1 8	1 3¼
A	Grimsby ..	Yorkshire	1 8	1 3¼
B_1	Guildford ..	S. Counties	1 5½	1 1¼
A	Halifax ..	Yorkshire	1 8	1 3¼
A_1	Hanley ..	Mid. Counties	1 7½	1 2¾
A	Harrogate	Yorkshire	1 8	1 3¼
A	Hartlepools	N.E. Coast	1 8	1 3¼
B_2	Harwich ..	E. Counties	1 5	1 1
B_3	Hastings ..	S. Counties	1 4½	1 0½
B_1	Hatfield ..	S. Counties	1 5½	1 1¼
B	Hereford ..	S. W. Counties	1 6	1 1¾
B	Hertford ..	E. Counties	1 5½	1 1¼
A_1	Heysham	N.W. Counties	1 7½	1 2¾
A	Howden ..	N.E. Coast	1 8	1 3¼
A	Huddersfield	Yorkshire	1 8	1 3¼
A	Hull ..	Yorkshire	1 8	1 3¼
A	Ilkley ..	Yorkshire	1 8	1 3¼
A	Immingham	Mid. Counties	1 8	1 3¼
B	Ipswich ..	E. Counties	1 6	1 1¾
C_1	Isle of Wight	S. Counties	1 4	1 0¼
A	Jarrow ..	N.E. Coast	1 8	1 3¼
A	Keighley	Yorkshire	1 8	1 3¼
B_2	Kendal ..	N.W. Counties	1 5	1 1
B_2	Keswick ..	N.W. Counties	1 5	1 1
B	Kettering ..	Mid. Counties	1 6	1 1¾
A_3	Kidderminster	Mid. Counties	1 6½	1 2
B_2	King's Lynn	E. Counties	1 5	1 1
A_1	Lancaster	N.W. Counties	1 7½	1 2
A_3	Leamington	Mid. Counties	1 6½	1 2¾
A	Leeds ..	Yorkshire	1 8	1 3¼
A	Leek ..	Mid. Counties	1 8	1 3¼
A	Leicester ..	Mid. Counties	1 8	1 3¼
A	Leigh ..	N.W. Counties	1 8	1 3¼
B_3	Lewes ..	S. Counties	1 4½	1 0½
A_3	Lichfield ..	Mid. Counties	1 6½	1 2
A	Lincoln ..	Mid. Counties	1 8	1 3¼
A	Liverpool ..	N.W. Counties	‖1 10	1 4½
B	Llandudno	N.W. Counties	1 6	1 1¾
A	Llanelly ..	S. Wales & M.	1 8	1 3¼
	London (12 miles radius)		1 9½	1 4½
	Do. (12-15 miles radius)		1 9	1 4
A	Long Eaton	Mid. Counties	1 8	1 3¼
A	Loughborough	Mid. Counties	1 8	1 3¼
B	Luton ..	E. Counties	1 6	1 1¾
A	Lytham ..	N.W. Counties	1 8	1 3¼
A_1	Macclesfield	N.W. Counties	1 7½	1 2¾
B	Maidstone	S. Counties	1 5½	1 1¼
A_3	Malvern ..	Mid. Counties	1 6½	1 2
A	Manchester	N.W. Counties	1 8	1 3¼
A	Mansfield ..	Mid. Counties	1 8	1 3¼
B_3	Margate ..	S. Counties	1 4½	1 0½
A_3	Matlock ..	Mid. Counties	1 6½	1 2
A	Merthyr ..	S. Wales & M.	1 8	1 3¼
A	Middlesbrough	N.E. Coast	1 8	1 3¼
A_3	Middlewich	N.W. Counties	1 6½	1 2
A	Monmouth S. and E. Glamorganshire	S. Wales & M.	1 8	1 3¼
A_1	Morecambe	N.W. Counties	1 7½	1 2¾
A_3	Nantwich	N.W. Counties	1 6½	1 2
A	Neath ..	S. Wales & M.	1 8	1 3¼
A	Nelson ..	N.W. Counties	1 8	1 3¼
A	Newcastle	N.E. Coast	1 8	1 3¼
A	Newport ..	S. Wales & M.	1 8	1 3¼
A	Normanton	Yorkshire	1 8	1 3¼
A_2	Northampton	Mid. Counties	1 7	1 2½
A	North Staffs.	Mid. Counties	1 8	1 3¼
A	North Shields	N.E. Coast	1 8	1 3¼
B	Norwich ..	E. Counties	1 6	1 1¾
A	Nottingham	Mid. Counties	1 8	1 3¼
A	Nuneaton ..	Mid. Counties	1 8	1 3¼
B	Oakham ..	Mid. Counties	1 5½	1 1¼
A	Oldham ..	N.W. Counties	1 8	1 3¼
A_3	Oswestry ..	Mid. Counties	1 6½	1 2
B	Oxford ..	S. Counties	1 6	1 1¾
A	Paisley ..	Scotland	*1 8	1 3¼
C	Pembroke	S. Wales & M.	1 4½	1 0½
A	Perth ..	Scotland	*1 8	1 3
A_3	Peterborough	Mid. Counties	1 6½	1 2
A	Plymouth	S.W. Counties	¶1 8	1 3¼
A	Pontefract	Yorkshire	1 8	1 3¼
A	Pontypridd	S. Wales & M.	1 8	1 3¼
B	Portsmouth	S. Counties	1 6	1 1¾
A	Preston ..	N.W. Counties	1 8	1 3¼
A	Queensferry	N.W. Counties	1 8	1 3¼
B	Reading ..	S. Counties	1 6	1 1¾
B	Reigate ..	S. Counties	1 5½	1 1¼
A_3	Retford ..	Mid. Counties	1 6½	1 2
A	Rhondda Valley	S. Wales & M.	1 8	1 3¼
A_3	Ripon ..	Yorkshire	1 6½	1 2
A	Rochdale ..	N.W. Counties	1 8	1 3¼
B	Rochester	S. Counties	1 5½	1 1¼
A_1	Ruabon ..	N.W. Counties	1 7½	1 2¾
A_2	Rugby ..	Mid. Counties	1 8	1 3¼
A_3	Rugeley ..	Mid. Counties	1 6½	1 2
A	Runcorn ..	N.W. Counties	1 8	1 3¼
A_3	St. Albans	E. Counties	1 6½	1 2
A	St. Helens	N.W. Counties	1 8	1 3¼
A_1	Scarborough	Yorkshire	1 7½	1 2¾
A	Scunthorpe	Mid. Counties	1 8	1 3¼
A	Sheffield ..	Yorkshire	1 8	1 3¼
A	Shipley ..	Yorkshire	1 8	1 3¼
A_3	Shrewsbury	Mid. Counties	1 6½	1 2
A_2	Skipton ..	Yorkshire	1 7	1 2½
B	Slough ..	S. Counties	1 5½	1 1¼
A_2	Solihull ..	Mid. Counties	1 7	1 2½
B	South'pton	S. Counties	1 6	1 1¾
B_1	Southend-on-Sea	E. Counties	1 5½	1 1¼
A	Southport	N.W. Counties	1 8	1 3¼
A	S. Shields ..	N.E. Coast	1 8	1 3¼
A_2	Stafford ..	Mid. Counties	1 7	1 2½
A	Stockport ..	N.W. Counties	1 8	1 3¼
A	Stockton-on-Tees	N.E. Coast	1 8	1 3¼
A	Stoke-on-Trent	Mid. Counties	1 8	1 3¼
B	Stroud ..	S.W. Counties	1 5½	1 1¼
A	Sunderland	N.E. Coast	1 8	1 3¼
A	Swansea ..	S. Wales & M.	1 8	1 3¼
B	Swindon ..	S.W. Counties	1 6	1 1¾
A_1	Tamworth	N.W. Counties	1 7½	1 2¾
B_1	Taunton ..	S.W. Counties	1 5½	1 1¼
A	Teeside Dist.	N.E. Counties	1 8	1 3¼
A	Todmorden	Yorkshire	1 8	1 3¼
A_2	Torquay ..	S.W. Counties	1 7	1 2½
B_1	Tunbridge Wells	S. Counties	1 5½	1 1¼
A	Tunstall ..	Mid. Counties	1 8	1 3¼
A	Tyne District	N.E. Coast	1 8	1 3¼
A	Wakefield	Yorkshire	1 8	1 3¼
A_2	Walsall ..	Mid. Counties	1 7	1 2½
A	Warrington	N.W. Counties	1 8	1 3¼
A_3	Warwick ..	Mid. Counties	1 6½	1 2
B	Wellingborough	Mid. Counties	1 6	1 1¾
A	West Bromwich	Mid. Counties	1 8	1 3¼
B	Weston-s-Mare	S.W. Counties	1 6	1 1¾
A_3	Whitby ..	Yorkshire	1 6½	1 2
A	Widnes ..	N.W. Counties	1 8	1 3¼
A	Wigan ..	N.W. Counties	1 8	1 3¼
B_2	Winchester	S. Counties	1 5	1 1
B	Windsor ..	S. Counties	1 6	1 1¾
A	Wolverhampton	Mid. Counties	1 8	1 3¼
A_3	Worcester	Mid. Counties	1 6½	1 2
A	Worksop ..	Yorkshire	1 8	1 3¼
A_1	Wrexham ..	N.W. Counties	1 7½	1 2¾
B	Wycombe	S. Counties	1 6	1 1¾
B_1	Yarmouth	E. Counties	1 5½	1 1¼
B_2	Yeovil ..	S.W. Counties	1 5	1 1
A	York ..	Yorkshire	1 8	1 3¼

The initial letter opposite each entry indicates the grade under the Ministry of Labour schedule. The district is that to which the borough is assigned in the same schedule. Column I gives the rates for craftsmen; column II for labourers; the rate for craftsmen working at trades in which a separate rate maintains, is given in a footnote. The table is a selection only. Particulars for lesser localities not included may be obtained upon application in writing.

* Plasterers, 1*s.* 9*d.*
† Carpenters and Painters, 1*s.* 8½*d.*
‡ Plumbers, 1*s.* 9*d.*
§ Painters, 1*s.* 6*d.*
‖ Carpenters and Plasterers, 1*s.* 8½*d.*
¶ Painters, 1*s.* 7*d.*

PRICES CURRENT

EXCAVATOR AND CONCRETOR

EXCAVATOR, 1s. 4½d. *per hour* ; LABOURER, 1s. 4½d. *per hour* ; NAVVY, 1s. 4½d. *per hour* ; TIMBERMAN, 1s. 6d. *per hour* ; SCAFFOLDER, 1s. 5½d. *per hour* ; WATCHMAN, 7s. 6d. *per shift.*

	£	s.	d.
Broken brick or stone, 2 in., per yd.	£0	11	6
Thames ballast, per yd.	0	13	0
Pit gravel, per yd.	0	18	0
Pit sand, per yd.	0	14	6
Washed sand	0	15	6
Screened ballast or gravel, add 10 per cent. per yd.			
Clinker, breeze, etc., prices according to locality.			
Portland cement, per ton	£2	19	0
Lias lime, per ton	2	10	0
Sacks charged extra at 1s. 9d. each and credited when returned at 1s. 6d.			

Transport hire per day :

	£	s.	d.		£	s.	d.
Cart and horse	£1	3	0	*Trailer*	£0	15	0
3-ton motor lorry	3	15	0	*Steam roller*	4	5	0
Steam lorry, 5-ton	4	0	0	*Water cart*	1	5	0

	£	s.	d.
EXCAVATING and throwing out in ordinary earth not exceeding 6 ft. deep, basis price, per yd. cube	0	3	0
Exceeding 6 ft., but under 12 ft., add 30 per cent.			
In stiff clay, add 30 per cent.			
In underpinning, add 100 per cent.			
In rock, including blasting, add 225 per cent.			
If basketed out, add 80 per cent. to 150 per cent.			
Headings, including timbering, add 400 per cent.			
RETURN, fill, and ram, ordinary earth, per yd.	£0	2	4
SPREAD and level, including wheeling, per yd.	0	2	4
PLANKING, per ft. sup.	0	0	5
DO. over 10 ft. deep, add for each 5 ft. depth 30 per cent.			
HARDCORE, 2 in. ring, filled and rammed, 4 in. thick, per yd. sup.	£0	2	1
DO. 6 in. thick, per yd. sup.	0	2	10
PUDDLING, per yd. cube	1	10	0
CEMENT CONCRETE, 4-2-1, per yd. cube	2	3	0
DO. 6-2-1, per yd. cube	1	18	0
DO. in upper floors, add 15 per cent.			
DO. in reinforced-concrete work, add 20 per cent.			
DO. in underpinning, add 60 per cent.			
LIAS LIME CONCRETE, per yd. cube	£1	16	0
BREEZE CONCRETE, per yd. cube	1	7	0
DO. in lintels, etc., per ft. cube	0	1	6

DRAINER

LABOURER, 1s. 4½d. *per hour* ; TIMBERMAN, 1s. 6d. *per hour* ; BRICKLAYER, 1s. 9½d. *per hour* ; PLUMBER, 1s. 9½d. *per hour* ; WATCHMAN, 7s. 6d. *per shift.*

	£	s.	d.
Stoneware pipes, tested quality, 4 in., per yd.	£0	1	3
DO. *6 in., per yd.*	0	2	8
DO. *9 in., per yd.*	0	3	6
Cast-iron pipes, coated, 9 ft. lengths, 4 in., per yd.	0	6	9
DO. *6 in., per yd.*	0	9	2
Portland cement and sand, see "Excavator" above.			
Lead for caulking, per cwt.	£2	5	6
Gaskin, per lb.	0	0	5½

	£	s.	d.
STONEWARE DRAINS, jointed in cement, tested pipes, 4 in., per ft.	0	4	3
DO. 6 in., per ft.	0	5	0
DO. 9 in., per ft.	0	7	9
CAST-IRON DRAINS, jointed in lead, 4 in., per ft.	0	9	0
DO. 6 in., per ft.	0	11	0

Note.—These prices include digging and filling for normal depths, and are average prices.

Fittings in Stoneware and Iron according to type. *See* Trade Lists.

BRICKLAYER

BRICKLAYER, 1s. 9½d. *per hour* ; LABOURER, 1s. 4½d. *per hour* ; SCAFFOLDER 1s. 5½d. *per hour.*

	£	s.	d.
London stocks, per M.	£4	15	0
Flettons, per M.	2	18	0
Staffordshire blue, per M.	9	10	0
Firebricks, 2½ in., per M.	11	3	0
Glazed salt, white, and ivory stretchers, per M.	23	0	0
DO. *headers, per M.*	23	10	0
Colours, extra, per M.	£5	10	0
Seconds, less, per M.	1	0	0
Cement and sand, see "Excavator" above.			
Lime, grey stone, per ton	£2	17	0
Mixed lime mortar, per yd.	1	6	0
Damp course, in rolls of 4½ in., per roll	0	2	6
DO. *9 in. per roll*	0	4	9
DO. *14 in. per roll*	0	7	6
DO. *18 in. per roll*	0	9	6

	£	s.	d.
BRICKWORK in stone lime mortar, Flettons or equal, per rod	33	0	0
DO. in cement do., per rod	36	0	0
DO. in stocks, add 25 per cent. per rod.			
DO. in blues, add 100 per cent. per rod.			
DO. circular on plan, add 12½ per cent. per rod.			
FACINGS, FAIR, per ft. sup. extra	£0	0	2
DO. Red Rubbers, gauged and set in putty, per ft. extra	0	4	6
DO. salt, white or ivory glazed, per ft. sup. extra	0	5	6
TUCK POINTING, per ft. sup. extra	0	0	10
WEATHER POINTING, per ft. sup. extra	0	0	3
GRANOLITHIC PAVING, 1 in., per yd. sup.	0	5	0
DO. 1½ in., per yd. sup.	0	6	0
DO. 2 in., per yd. sup.	0	7	0
BITUMINOUS DAMP COURSE, ex rolls, per ft. sup.	0	0	7
ASPHALT (MASTIC) DAMP COURSE, ½in., per yd. sup.	0	8	0
DO. vertical, per yd. sup.	0	11	0
SLATE DAMP COURSE, per ft. sup.	0	0	10
ASPHALT ROOFING (MASTIC) in two thicknesses, ¾ in., per yd.	0	8	6
DO. SKIRTING, 6 in.	0	0	11
BREEZE PARTITION BLOCKS, set in Cement, 1½ in. per yd. sup.	0	5	3
DO. DO. 3 in.	0	6	6

THE wages are the Union rates current in London at the time of publication. The prices are for good quality material, and are intended to cover delivery at works, wharf, station, or yard as customary, but will vary according to quality and quantity. The measured prices are based upon the foregoing, and include usual builders' profits. Though every care has been taken in its compilation it is impossible to guarantee the accuracy of the list, and readers are advised to have the figures confirmed by trade inquiry.

MASON

MASON, 1s. 9½d. *per hour* ; DO. *fixer*, 1s. 10½d. *per hour* ; LABOURER, 1s. 4½d. *per hour* ; SCAFFOLDER, 1s. 5½d. *per hour.*

Portland Stone :

	£	s.	d.
Whitbed, per ft. cube	£0	4	6
Basebed, per ft. cube	0	4	7
Bath stone, per ft. cube	0	3	0
Usual trade extras for large blocks.			
York paving, av. 2½ in., per yd. sup.	0	6	6
York templates sawn, per ft. cube	0	6	9
Slate shelves, rubbed, 1 in., per ft. sup.	0	2	6
Cement and sand, see "Excavator," etc., above.			

	£	s.	d.
HOISTING and setting stone, per ft. cube	£0	2	2
DO. for every 10 ft. above 30 ft., add 15 per cent.			
PLAIN face Portland basis, per ft. sup.	£0	2	8
DO. circular, per ft. sup.	0	4	0
SUNK FACE, per ft. sup.	0	3	9
DO. circular, per ft. sup.	0	4	10
JOINTS, arch, per ft. sup.	0	2	6
DO. sunk, per ft. sup.	0	2	7
DO. DO. circular, per ft. sup.	0	4	6
CIRCULAR-CIRCULAR work, per ft. sup.	1	2	0
PLAIN MOULDING, straight, per inch of girth, per ft. run	0	1	1
DO. circular, do. per ft. run	0	1	4
HALF SAWING, per ft. sup.	£0	1	0
Add to the foregoing prices if in York stone 35 per cent.			
DO. Mansfield, 12½ per cent.			
Deduct for Bath, 33⅓ per cent.			
DO. for Chilmark, 5 per cent.			
SETTING 1 in. slate shelving in cement, per ft. sup.	£0	0	6
RUBBED round nosing to do., per ft. lin.	0	0	6
YORK STEPS, rubbed T. & R., ft. cub. fixed	1	9	0
YORK SILLS, W. & T., ft. cub. fixed	1	13	0

SLATER AND TILER

SLATER, 1s. 9½d. *per hour* ; TILER, 1s. 9½d. *per hour* ; SCAFFOLDER, 1s. 5½d. *per hour* ; LABOURER, 1s. 4½d. *per hour.*

N.B.—Tiling is often executed as piecework.

Slates, 1st quality, per M :

	£	s.	d.
Portmadoc Ladies	£14	0	0
Countess	27	0	0
Duchess	32	0	0
Clips, lead, per lb.	0	0	4
Clips, copper, per lb.	0	2	0
Nails, compo, per cwt.	1	6	0
Nails, copper, per lb.	0	1	10
Cement and sand, see "Excavator," etc., above.			
Hand-made tiles, per M.	£5	18	0
Machine-made tiles, per M.	5	8	0
Westmorland slates, large, per ton	9	0	0
DO. *Peggies, per ton*	7	5	0

SLATING, 3 in. gauge, compo nails, Portmadoc or equal :

	£	s.	d.
Ladies, per square	£4	0	0
Countess, per square	4	5	0
Duchess, per square	4	10	0
WESTMORLAND, in diminishing courses, per square	6	5	0
CORNISH DO., per square	6	3	0
Add, if vertical, per square approx.	0	13	0
Add, if with copper nails, per square approx.	0	2	6
Double course at eaves, per ft. approx.	0	1	0
TILING, 4 in. gauge, every 4th course nailed, in hand-made tiles, average per square	5	6	0
DO., machine-made DO., per square	4	17	0
Vertical Tiling, including pointing, add 18s. 0d. per square.			
FIXING lead soakers, per dozen	£0	0	10
STRIPPING old slates and stacking for re-use, and clearing away surplus and rubbish, per square	0	10	0
LABOUR only in laying slates, but including nails, per square	1	0	0

See "Sundries for Asbestos Tiling."

CARPENTER AND JOINER

CARPENTER, 1s. 9½d. *per hour* ; JOINER, 1s. 9½d. *per hour* ; LABOURER, 1s. 4½d. *per hour.*

Timber, average prices at Docks, London Standard, Scandinavian, etc. (equal to 2nds) :

	£	s.	d.
7 × 3, per std.	£20	0	0
11 × 4, per std.	30	0	0
Memel or Equal. Slightly less than foregoing.			
Flooring, P.E., 1 in., per sq.	£1	5	0
DO. *T. and G., 1 in., per sq.*	1	5	0
Planed Boards, 1 in. × 11 in., per std.	30	0	0
Wainscot oak, per ft. sup. of 1 in.	0	2	0
Mahogany, per ft. sup. of 1 in.	0	2	0
DO. *Cuba, per ft. sup. of 1 in.*	0	3	0
Teak, per ft. sup. of 1 in.	0	3	0
DO., *ft. cube*	0	15	0

	£	s.	d.
FIR fixed in wall plates, lintels, sleepers, etc., per ft. cube	0	5	9
DO. framed in floors, roofs, etc., per ft. cube	0	6	3
DO., framed in trusses, etc., including ironwork, per ft. cube	0	7	3
PITCH PINE, add 33⅓ per cent.			
FIXING only boarding in floors, roofs, etc., per sq.	0	13	6
SARKING FELT laid, 1-ply, per yd.	0	1	6
DO., 3-ply, per yd.	0	1	9
CENTERING for concrete, etc., including horsing and striking, per sq.	3	10	0
SLATE BATTENING, per sq.	0	18	6

PRICES CURRENT; *continued.*

CARPENTER AND JOINER: *continued.*

	£	s.	d.
DEAL GUTTER BOARD, 1 in., on firring, per sq.	£3	5	0
MOULDED CASEMENTS, 1½ in., in 4 sqs., glazing beads and hung, per ft. sup.	0	3	0
DO., DO. 2 in., per ft. sup.	0	3	3
DEAL cased frames, oak sills, 2 in. d.h. sashes, brass-faced pulleys, etc., per ft. sup.	0	4	0
DOORS, 4 pan. sq. b.s., 2 in., per ft. sup.	0	3	6
DO., DO., DO. 1½ in., per ft. sup.	0	3	0
DO., DO. moulded b.s., 2 in., per ft. sup.	0	3	9
DO., DO., DO. 1½ in., per ft. sup.	0	3	3
If in oak multiply 3 times.			
If in mahogany multiply 3 times.			
If in teak multiply 3 times.			
WOOD BLOCK FLOORING, standard blocks, laid in mastic herringbone :			
Deal, 1 in., per yd. sup., average	0	10	0
DO. 1½ in., per yd. sup., average	0	12	0
DO., DO. 1½ in. maple blocks	0	15	0
STAIRCASE WORK, DEAL :			
1 in. riser, 1½ in. tread, fixed, per ft. sup.	0	3	6
2 in. deal strings, fixed, per ft. sup.	0	3	9

PLUMBER

PLUMBER, 1*s.* 9½*d. per hour ;* MATE OR LABOURER, 1*s.* 4½*d. per hour.*

	£	s.	d.
Lead, milled sheet, per cwt.	£2	4	6
DO. *drawn pipes, per cwt.*	2	6	0
DO. *soil pipe, per cwt.*	2	8	0
DO. *scrap, per cwt.*	1	9	6
Copper, sheet, per lb.	0	1	0
Solder, plumber's, per lb.	0	1	2
DO. *fine, per lb.*	0	1	5
Cast-iron pipes, etc. :			
L.C.C. soil, 3 in., per yd.	0	4	1
DO. *4 in. per yd.*	0	5	0
R.W.P., 2½ in., per yd.	0	2	0
DO. *3 in., per yd.*	0	2	5
DO. *4 in., per yd.*	0	3	3
Gutter, 4 in. H.R., per yd.	0	1	5
DO. *4 in. O.G., per yd.*	0	1	9
MILLED LEAD and labour in gutters, flashings, etc.	3	12	6
LEAD PIPE, fixed, including running joints, bends, and tacks, ½ in., per ft.	0	2	1
DO. ¾ in., per ft.	0	2	5
DO. 1 in., per ft.	0	3	3
DO. 1½ in., per ft.	0	4	6
LEAD WASTE or soil, fixed as above, complete, 2½ in., per ft.	0	6	0
DO. 3 in., per ft.	0	7	0
DO. 4 in., per ft.	0	9	9
CAST-IRON R.W. PIPE, at 24 lb. per length, jointed in red lead, 2½ in., per ft.	0	2	5
DO. 3 in., per ft.	0	2	10
DO. 4 in., per ft.	0	3	3
CAST-IRON H.R. GUTTER, fixed, with all clips, etc., 4 in., per ft.	0	2	7
DO. O.G., 4 in., per ft.	0	2	10
CAST-IRON SOIL PIPE, fixed with caulked joints and all ears, etc., 4 in., per ft.	0	7	0
DO. 3 in., per ft.	0	6	0
Fixing only :			
W.C. PANS and all joints, P. or S., and including joints to water waste preventers, each	2	5	0
BATHS only, with all joints	1	18	0
LAVATORY BASINS only, with all joints, on brackets, each	1	10	0

PLASTERER

PLASTERER, 1*s.* 9½*d. per hour (plus allowances in London only) ;* LABOURER, 1*s.* 4½*d. per hour.*

	£	s.	d.
Chalk lime, per ton	£2	17	0
Hair, per cwt.	0	18	0
Sand and cement see "Excavator," etc., above.			
Lime putty, per cwt.	£0	2	9
Hair mortar, per yd.	1	7	0
Fine stuff, per yd.	1	14	0
Sawn laths, per bdl.	0	2	9
Keene's cement, per ton	5	15	0
Sirapite, per ton	3	10	0
DO. *fine, per ton*	3	18	0
Plaster, per ton	3	0	0
DO. *per ton*	3	12	6
DO. *fine, per ton*	5	12	0
Thistle plaster, per ton	£3	9	0
Lath nails, per lb.	0	0	4
LATHING with sawn laths, per yd.	0	1	7
METAL LATHING, per yd.	0	2	3
FLOATING in Cement and Sand, 1 to 3, for tiling or woodblock, ¾ in., per yd.	0	2	4
DO. vertical, per yd.	0	2	7
RENDER, on brickwork, 1 to 3, per yd.	0	2	7
RENDER in Portland and set in fine stuff, per yd.	0	3	3
RENDER, float, and set, trowelled, per yd.	0	2	9
RENDER and set in Sirapite, per yd.	0	2	5
DO. in Thistle plaster, per yd.	0	2	5
EXTRA, if on but not including lathing, any of foregoing, per yd.	0	0	5
EXTRA, if on ceilings, per yd.	0	0	5
ANGLES, rounded Keene's on Portland, per ft. lin.	0	0	6
PLAIN CORNICES, in plaster, per inch girth, including dubbing out, etc., per ft. lin.	0	0	5
WHITE glazed tiling set in Portland and jointed in Parian, per yd., from	1	11	6
FIBROUS PLASTER SLABS, per yd.	0	1	10

GLAZIER

GLAZIER, 1*s.* 8½*d. per hour.*

	£	s.	d.
Glass : 4ths in crates :			
Clear, 21 oz.	£0	0	6
DO. *26 oz.*	0	0	7½
Cathedral white, per ft.	0	0	6½
Polished plate, British ¼ in., up to 2 ft. sup.	0	2	0
DO. *3 ft. sup.*	0	2	6
DO. *7 ft. sup.*	0	3	6
DO. *25 ft. sup.*	0	4	0
DO. *100 ft. sup.*	0	4	6
Rough plate, 3/16 in.	0	0	6
DO. *¼ in., per ft.*	0	0	6½
Linseed oil putty, per cwt.	0	16	0
GLAZING in putty, clear sheet, 21 oz.	£0	0	11
DO. 26 oz.	0	1	0
GLAZING in beads, 21 oz., per ft.	0	1	1
DO. 26 oz., per ft.	0	1	4

Small sizes slightly less (under 3 ft. sup.).

Patent glazing in rough plate, normal span 1s. 6d. to 2s. per ft.

	£	s.	d.
LEAD LIGHTS, plain, med. sqs. 21 oz., usual domestic sizes, fixed, per ft. sup. and up	£0	3	6

Glazing only, polished plate, 6½d. to 8d. per ft. according to size.

DECORATOR

PAINTER, 1*s.* 8½*d. per hour ;* LABOURER, 1*s.* 4½*d. per hour ;* FRENCH POLISHER, 1*s.* 9*d. per hour ;* PAPERHANGER, 1*s.* 8½*d. per hour.*

	£	s.	d.
Genuine white lead, per cwt.	£3	11	0
Linseed oil, raw, per gall.	0	3	7
DO., *boiled, per gall.*	0	3	10
Turpentine, per gall.	0	6	2
Liquid driers, per gall.	0	9	6
Knotting, per gall.	1	4	0
Distemper, washable, in ordinary colours, per cwt., and up	2	0	0
Double size, per firkin	0	3	6
Pumice stone, per lb.	0	0	4
Single gold leaf (transferable), per book	0	1	11
Varnish, copal, per gall. and up	0	18	0
DO., *flat, per gall.*	1	2	0
DO., *paper, per gall.*	1	0	0
French polish, per gall.	0	19	0
Ready mixed paints, per gall. and up	0	10	6
LIME WHITING, per yd. sup.	0	0	3
WASH, stop, and whiten, per yd. sup.	0	0	6
DO., and 2 coats distemper with proprietary distemper, per yd. sup.	0	0	9
KNOT, stop, and prime, per yd. sup.	0	0	7
PLAIN PAINTING, including mouldings, and on plaster or joinery, 1st coat, per yd. sup.	0	0	10
DO., subsequent coats, per yd. sup.	0	0	9
DO., enamel coat, per yd. sup.	0	1	2½
BRUSH-GRAIN, and 2 coats varnish, per yd. sup.	0	3	8
FIGURED DO., DO., per yd. sup.	£0	5	6
FRENCH POLISHING, per ft. sup.	0	1	2
STRIPPING old paper and preparing, per piece	0	1	7
HANGING PAPER, ordinary, per piece	0	1	10
DO., fine, per piece, and upwards	0	2	4
VARNISHING PAPER, 1 coat, per piece	0	9	0
CANVAS, strained and fixed, per yd. sup.	0	3	0
VARNISHING, hard oak, 1st coat, per yd. sup.	0	1	2
DO., each subsequent coat, per yd. sup.	0	0	11

SMITH

SMITH, *weekly rate equals* 1*s.* 9½*d. per hour ;* MATE, *do.* 1*s.* 4*d. per hour ;* ERECTOR, 1*s.* 9½*d. per hour ;* FITTER, 1*s.* 9½*d. per hour ;* LABOURER, 1*s.* 4*d. per hour.*

	£	s.	d.
Mild steel in British standard sections, per ton	£12	10	0
Sheet steel :			
Flat sheets, black, per ton	19	0	0
Do., galvd., per ton	23	0	0
Corrugated sheets, galvd., per ton	23	0	0
Driving screws, galvd., per grs.	0	1	10
Washers, galvd., per grs.	0	1	1
Bolts and nuts, per cwt. and up	1	18	0
MILD STEEL in trusses, etc., erected, per ton	25	10	0
DO. in small sections as reinforcement, per ton	16	10	0
DO. in compounds, per ton	17	0	0
DO. in bar or rod reinforcement, per ton	20	0	0
WROT. IRON in chimney bars, etc., including building in, per cwt.	2	0	0
DO. in light railings and balusters, per cwt.	2	5	0
FIXING only corrugated sheeting, including washers and driving screws, per yd.	0	2	0

SUNDRIES

	£	s.	d.
Fibre or wood pulp boardings, according to quality and quantity. The measured work price is on the same basis . . . per ft. sup.	£0	0	2½
FIBRE BOARDINGS, including cutting and waste, fixed on, but not including studs or grounds, per ft. sup. . . . from 3d. to	0	0	6
Plaster board, per yd. sup. . from	0	1	7
PLASTER BOARD, fixed as last, per yd. sup. . from	0	2	8
Asbestos sheeting, 5/32 in., grey flat, per yd. sup.	0	2	3
DO. *corrugated, per yd. sup.*	0	3	3
ASBESTOS SHEETING, fixed as last, flat, per yd. sup.	0	4	0
DO. corrugated, per yd. sup.	0	5	0
ASBESTOS slating or tiling on, but not including battens, or boards, plain "diamond" per square, grey	2	15	0
DO., red	3	0	0
Asbestos cement slates or tiles, 5/32 in. punched per M., grey	16	0	0
DO. *red*	18	0	0
ASBESTOS COMPOSITION FLOORING :			
Laid in two coats, average ¾ in. thick, in plain colour, per yd. sup.	0	7	0
DO. ½ in. thick, suitable for domestic work, unpolished, per yd.	0	6	6
Metal casements for wood frames, domestic sizes, per ft. sup.	0	1	6
DO. *in metal frames, per ft. sup.*	0	1	9
HANGING only metal casement in, but not including wood frames, each	0	2	10
BUILDING in metal casement frames, per ft. sup.	0	0	7

Waterproofing compounds for cement. Add about 75 per cent. to 100 per cent. to the cost of cement used.

	£	s.	d.
Plywood :			
3 m/m alder, per ft. sup.	0	0	2
4½ m/m amer. white, per ft. sup.	0	0	3¾
¾ m/m figured ash, per ft. sup.	0	0	5
4½ m/m 3rd quality, composite birch, per ft. sup.	0	0	1½