of a mile away. There had, too, been an assertion that the site of a famous battlefield would be submerged, but Captain Reid was able to refute it by proving that the battlefield in question was no less than nine miles away from where it is sought to form the reservoirs. As a result of the debate, an amendment to refer the Bill to a Committee with special powers was negatived by 276 votes to 91, and the Bill was read a second time.

Tariffs and Trade.

The introduction of a Bill by the Government of Belgium during the month for raising considerably the import duties of foreign goods is a characteristic example of the policy of retaliation which is being forced upon some countries by the commercial exactions of others. Having always adopted liberal trade principles, Belgium found herself placed at a great disadvantage in the negotiations being carried out with France for a commercial treaty. The object of the separate treaties formulated by the French Government is to secure special advantages for the many new industries that have been created during the past few years, particularly in the way of opening up markets in countries which are offered reciprocity in favour of goods that do not compete seriously with French products, and when industrial interests clash, as is the case with Belgium, there is obviously no way out of the difficulty except by a change of fiscal policy which will enable Belgium to offer reciprocal advantages. As a matter of fact, Belgium aims at treating with France on the basis of facilitating imports of essentially French goods in exchange for lower tariffs on Belgian manufactures entering France. For that reason the proposed Belgian duties will be a serious burden upon the essentially French products which bulk so largely in foreign trade, unless the French Government accepts an arrangement whereby foreign engineering goods are allowed to enter the country under favourable tariff conditions. The negotiations have shown the French Government that it is practically impossible to develop a foreign trade and at the same time adopt a rigid policy of protection for certain branches of the engineering trades which cannot exist in face of foreign competition. For the time being those industries are favoured to a certain extent by the currency depreciation; but the advantage is only temporary, and the considerable changes that may take place in the future will certainly upset any commercial arrangement which aims at conferring one-sided benefits. The progress of negotiations between France and Belgium will show whether it is possible in present circumstances to fix upon a reciprocal basis for commercial treaties.

The Vindication of the Therm.

As everyone who had any real knowledge of the matter imagined would be the case, the Departmental Committee appointed by the Board of Trade to inquire into the therm basis of charging for gas declared itself to be in favour of that much-maligned unit. In fact, it not only recommended, in a report published during the month, that the therm system should be continued, but suggested that it should be extended to all statutory gas undertakings within the scope of the Gas Regulation Act. The inquiry certainly did good, in that irresponsible and ignorant critics are no longer able to accuse gas authorities of unfair dealing with their customers, and it seems not unlikely that to it the recent reductions in the price of gas may be, indirectly, attributed. Suppliers of gas have been reviewing their charges, with the result that there have been reductions in various directions, to the benefit not only of the consumers, but of the shareholders as well, who have been faring unhappily during the period of high charges which have automatically resulted in reduced dividends, for, as our readers are aware, the dividends of gas undertakings vary inversely with the price of the gas. Dr. Charles Carpenter, the president of the South Metropolitan Gas Company, recently stated at a meeting of shareholders that there was nothing wrong about the therm, but that there had been with the price charged for it. If the suppliers have been tardy in reducing the price, the shareholders have had more cause to complain than the consumers, for they have been doubly taxed. They have not only had to pay a high price for the gas they have burned, but have received smaller returns from their investments. It is only just recently that the dividends of gas companies have begun to approach pre-war figures, but hopes are felt in many quarters that, before very long, the price of the therm may be so far reduced that gas may become as cheap as it was nine years ago.

The Stadium in Wembley Park.

The Stadium which is being built in Wembley Park in connection with the British Empire Exhibition of next year, is nearly completed, its erection having been specially expedited in order that the structure may be available for the Football Cup Ties Final on April 28th. The photograph taken from an aeroplane, which is reproduced in Fig. 1, hardly gives an adequate idea of its size, for it is a large and imposing building, which has been designed to provide, under cover, sitting accommodation for 25,000 persons, in ring seats for 10,000 persons, and standing room for an additional 91,500, so that it is capable of holding no fewer than 126,500 people, all of whom will have a practically uninterrupted view of the whole of the arena. A plan of the building is given in Fig. 2. The arena itself, which is intended for both sports and games, has in its centre an absolutely level round-ended oblong of grass which measures 492ft. long—for some 375ft. of which the sides are parallel—and 260ft. wide. In passing, we may say that we understand the ground on which the Final Cup Tie is to be played will measure 115 yards—or 345ft.—long by 75 yards—or 225ft.—wide, so that the area provided is more than ample for the purpose, as was, of course, intended that it should be. We may here remark too—though it has nothing whatever to do with engineering—that the grass, the turves of which were obtained in various portions of the estate, and were laid as long ago as September last, is really in excellent condition. Encircling the grass is a flat and level cinder running track, about half of which is 42ft. wide, the remainder being 18ft. wide. The dimensions are such that a line drawn at a distance of 1ft. from the edge of the track right round the oblong measures exactly one quarter of a mile in length, so that four laps constitute a mile. A feature, to which we shall refer in more detail later, is that, by making special arrangements, in accordance with a decision arrived at after the building operations had been actually started, a perfectly straight and level track, 220 yards—*i.e.* just over 200 m.—long, has been provided, and it is, we believe, the only straight cinder track of that length in this country.

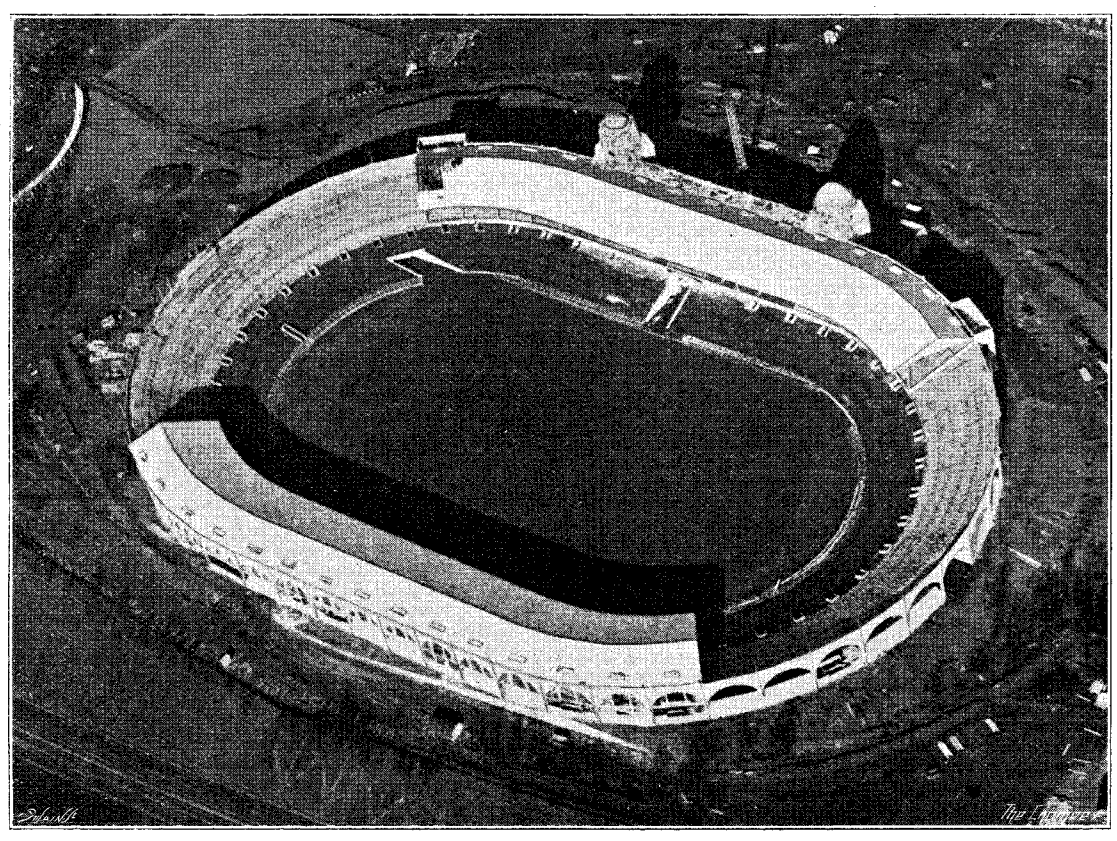


FIG. 1—VIEW OF THE WEMBLEY STADIUM FROM THE AIR

Immediately encircling the running track, a strip of ground just over 11ft. wide, which is enclosed both in front and behind by an iron ring fence, is to be devoted to five rows of "special ring seats" arranged at three levels, and supported on blocks of concrete. We understand that, when the arena is not being used for racing pruposes, seats of various heights will also be placed, temporarily, over a certain width of the running track itself, so that, at times, there may be as many as ten rows deep of these "special ring seats." For a width of nearly 56ft. 6in. right round the inner fence of the ring seats enclosure, tiers of forty-eight steps are formed, the steps being just over 1ft. 2in. wide, the risers varying from 3½in. in the lower rows to 4½in. in the upper rows, and being formed by means of 5in. by 2in. timbers set on edge. This oval annulus—if such an expression be permitted—will be for standing spectators only, and there will be no cover. For obtaining access to these terraces of steps there are forty-nine openings formed in the wall enclosing them and nine radial gangways. Access is also possible by way of the main tunnel which leads directly into the arena, and to which reference will be made later; but whether or not that will be permitted we cannot say. The difference in vertical height between the lowest and the highest steps is just over 16ft. 6in. In order, apparently, to prevent rushes from the top to bottom of these terraces of steps, and of compelling the use of the gangways, three rows of barriers have been formed between each of the latter. Their arrangement will be seen in Figs. 10 and 13, page 368. They consist of steel pipes fixed horizontally at a height of about 4ft. above step level and carried at their ends and at intervals in their length by angle iron brackets of inverted V shape. The steps, the treads of which are filled in with coarse clinker at the bottom and a topping of 1½in. of fine cinders, have in some parts been formed directly on solid ground, the soil being given the necessary slope; but where the original contours of the land did not permit of that being done—and that was the case in the major portion—filling-in had to be resorted to. Although in selecting the site for the Stadium advantage was taken as much as possible of favourable contour lines, a very considerable amount of excavation had to be carried out. In fact, for one purpose and another, as many as 120,000 cubic yards of material—mostly yellow clay—had to be removed, and an equal amount used in filling. As will be seen from the plan given in Fig. 2, the original ground level of the arena site varied between 165.5ft. above Ordnance Datum at the east end to something over 180ft. above Ordnance Datum at the west end, with intervening eminences above the average between these two figures coming in between. The excavation was, to a large extent, done by a Bucyrus drag-line excavator. We may here say that the clearing of the site was started in February, 1922, and that the work is now complete. The actual building operations, which are now virtually finished, occupied less than a year.

It is around the outermost of the terraces of steps referred to above that the building proper of the Stadium may be said to commence. All round the building there is a practically uninterrupted series of thirty-one terraces of concrete steps measuring 2ft. 2in. wide and having rises of 1ft. 1in. These steps are formed in the manner shown in the drawing, Fig. 6, and in Figs. 3 and 4. They are erected on bearers consisting of 14in. by 6in. by 46 lb. and 57 lb. rolled steel joists spaced generally at 14ft. 4in. centres. The joists, which are set at a slope of 2 to 1 with the horizontal, are supported at their lower extremities by being attached to the reinforced concrete wall which stands on a solid concrete foundation, and is built round the outside periphery of the ramp of steps first mentioned—see Fig. 5. At their upper ends they are supported by the outside wall of the Stadium, which will be referred to later. These joists are at three points in their length connected together by lattice girders to which they are riveted, and every third joist is supported at the junctions of the joists with the girders by steel columns of increasing heights. These columns—see Figs. 5 and 6—are made of steel channels and lacing bars, and they are spaced radially at 17ft. 4in. centres. The tallest of these columns is 32ft. high and the shortest 16ft. high. In the shortest there are two 9in. by 3in. channels; in the intermediate two 10in. by 3½in. channels; and in the tallest two 11in. by 3½in. channels, the lacing bars in all cases being 2¼in. by $^5/_{16}$in. These columns are erected on solid concrete foundations taken well down into virgin ground. It may here be stated that the tops

of these foundations came just above the floor of a concrete corridor which stands at a level of 174.75 above Ordnance Datum. This corridor, which runs at the same level practically all round the Stadium, will be referred to later. The two outer rows of columns are braced together, and the outermost row is braced to the outer wall in the manner shown in the engravings. The risers of the steps are formed of pre-cast reinforced concrete beams 14ft. 3in. long high, and 13in. by 13in. in cross section for the major portion of their length, but increased in dimensions at the top and bottom. There are sixteen of these supporting columns on the south side of the arena all spaced at equal distances apart—*i.e.*, 43ft. On the other side of the arena there are only twelve columns for the same length of roof. For the five columns at each end of the row the spacing is the same in each case, but the spacing between the two centre columns so that the roof actually projects for some 20ft. beyond the line of the columns. The arrangements are well illustrated in the various engravings—see Figs. 5, 6 and 7 and in Figs. 10, 12 and 13, page 368—and call for no further comment.

The method of supporting the joists for the concrete steps on the north side of the arena, that is to say, where the block of buildings comes, is shown in Fig. 8. It is different from that employed in other

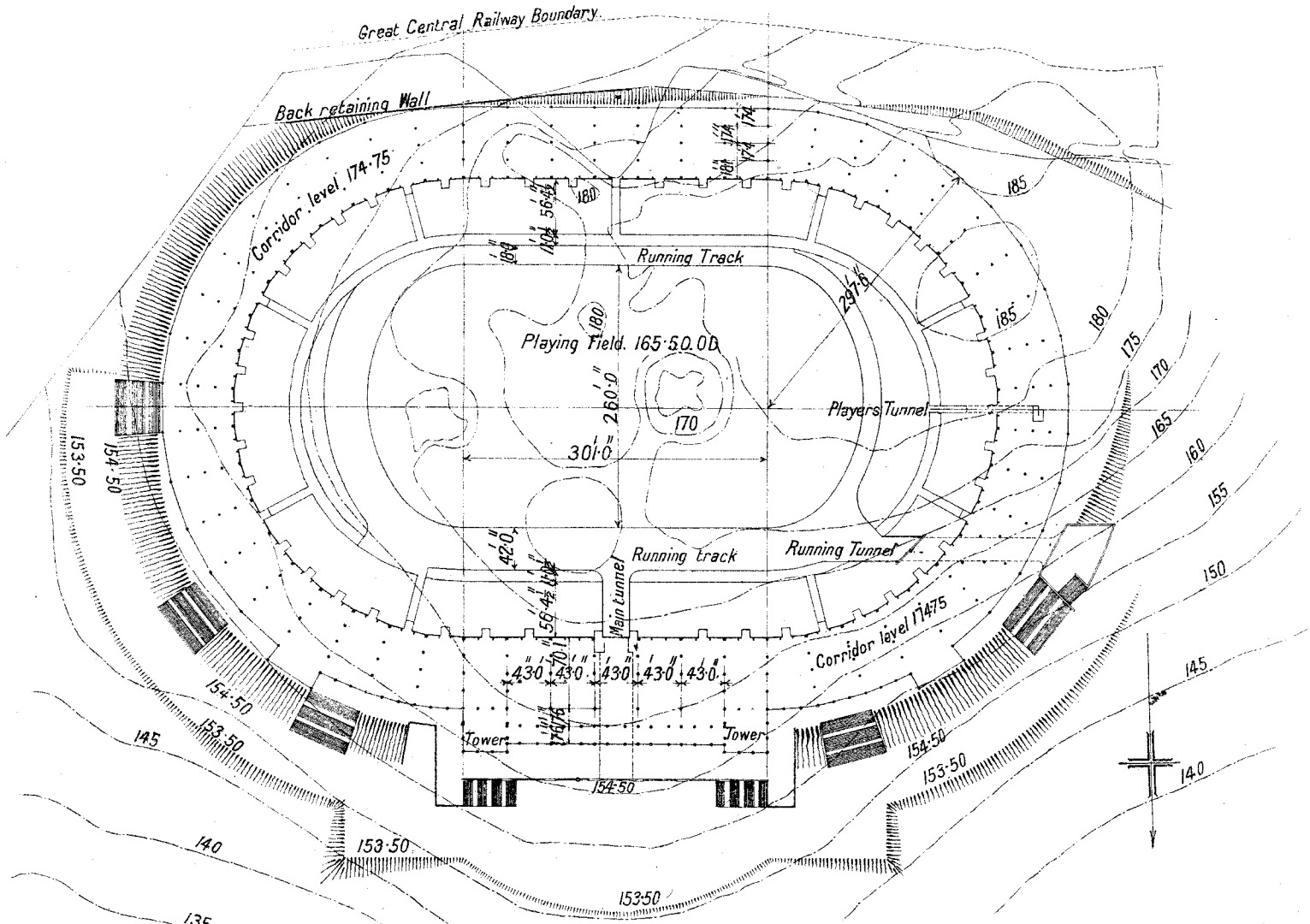


FIG. 2—GENERAL PLAN OF THE STADIUM SHOWING THE ORIGINAL CONTOUR LINES OF THE SITE

by 4½in. wide and 1ft. 4½in. deep, set on edge. The ends of these beams rest on specially shaped pressed steel knee pieces of the steel joists—see Fig. 6. No less than 5000 of these beams were required. The treads of the steps are formed of reinforced concrete 1½in. thick and were cast *in situ*—see Fig. 4.

For a length of 650ft. on each side of the Stadium these steps are roofed in and it is the roofed-in portions which will provide sitting accommodation. The steps

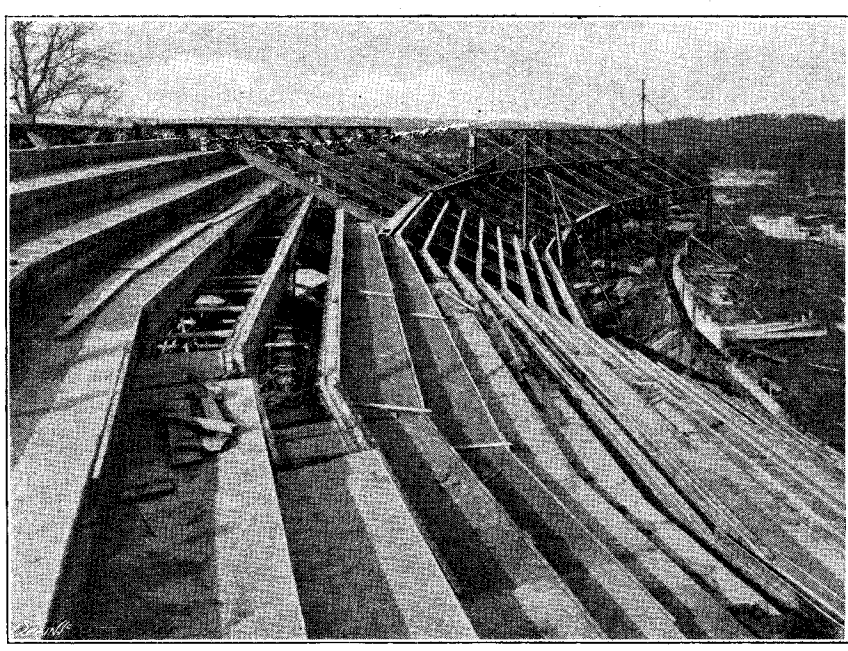


FIG. 3—VIEW SHOWING ERECTION OF TERRACES OF CONCRETE STEPS

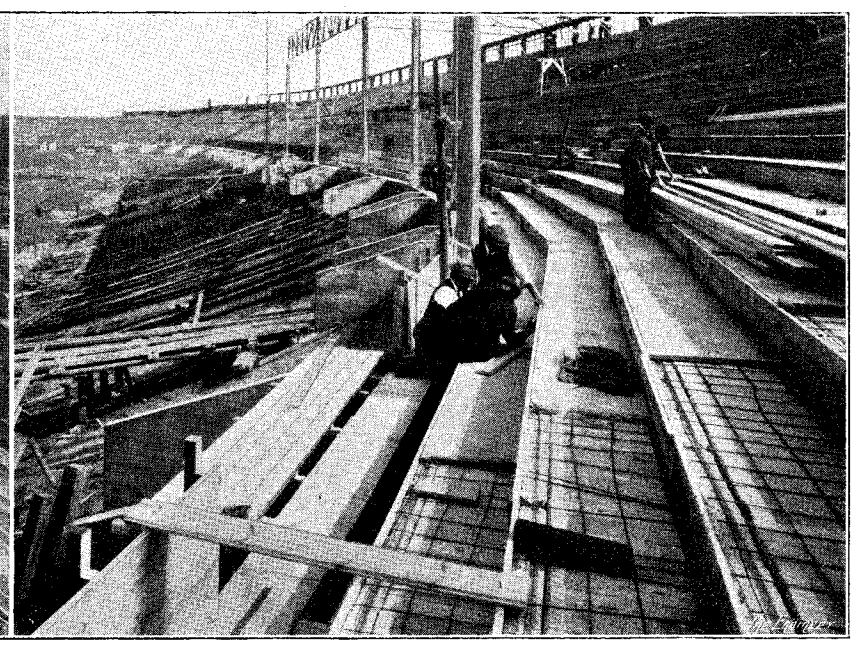


FIG. 4—CONCRETING TREADS OF TERRACED STEPS

situated in the centre portions of the covered areas have been furnished with lift-up wood seats each 16in. wide. In the wing portions of the covered area sitting accommodation is provided by means of planed wood planks fastened to the concrete treads. The roofs have steel framework, covered with corrugated asbestos sheets. The principals are supported partly by the outside wall and partly by means of pre-cast octagonal reinforced concrete columns 32ft. as will be seen from Fig. 8, comes immediately behind, but at a considerably higher level than the Royal box. The three columns where the wider spacing comes are stouter than the other columns, and measure 15in. by 15in. in cross section. They are, however, otherwise identical with the others. Resting on the caps of the columns, and tying them together, are steel lattice girders, and worked into these girders are the roof principals, which are extended, cantilever wise, parts of the oval, since they had to be taken over the top of the banqueting hall, the span of the ceiling of the main bay of which is 34ft. 8in. from centre to centre. The construction will be readily understood from the drawing. The banquetting hall is a large room which measures 215ft. long by 70ft. wide, and from it doors lead on to a wide terrace which runs along the north face of the building. As many as 1000 persons will be able to be seated at one time. The floor of the room stands at an elevation of 174.75ft. above Ordnance Datum, that is to say, at the same level as the corridor, mentioned above, which runs right round the building. Immediately over the hall and at a height of 25ft. above it is a tea room, which is also a large room that will be able to accommodate 600 people at a time.

The Royal box or balcony, the floor of which stands at a height of about 21ft. above the grass in the arena,

THE STADIUM IN WEMBLEY PARK

MESSRS. JOHN W. SIMPSON AND MAXWELL AYRTON, ARCHITECTS, AND MR. E. O. WILLIAMS, ENGINEER

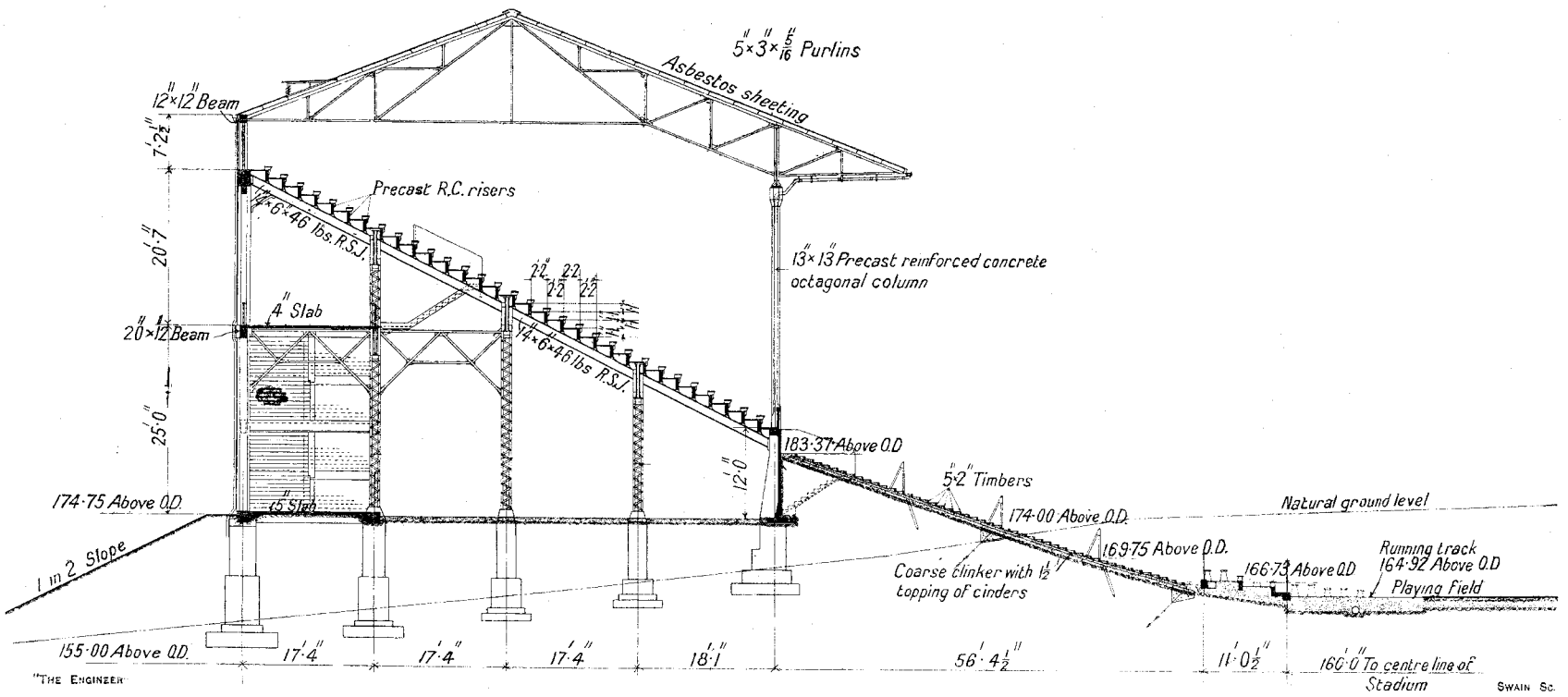
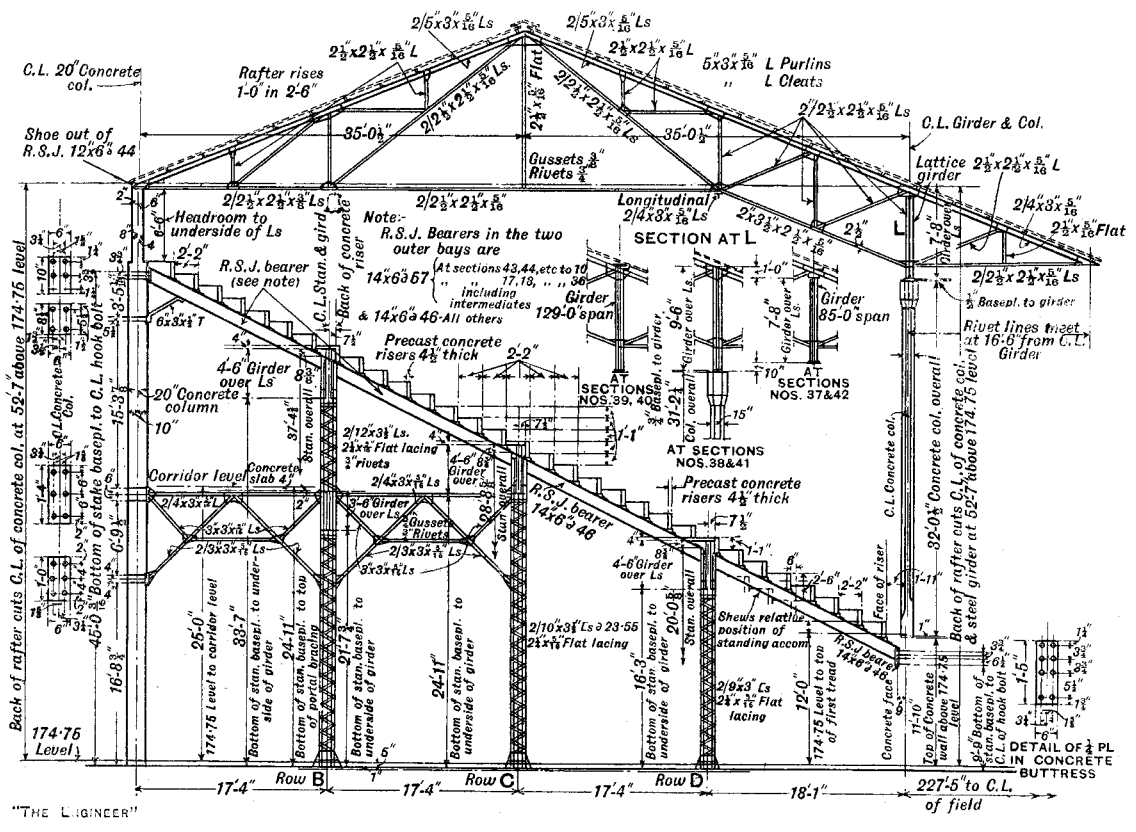


FIG. 5—TYPICAL CROSS SECTION THROUGH SOUTH FACE OF THE BUILDING



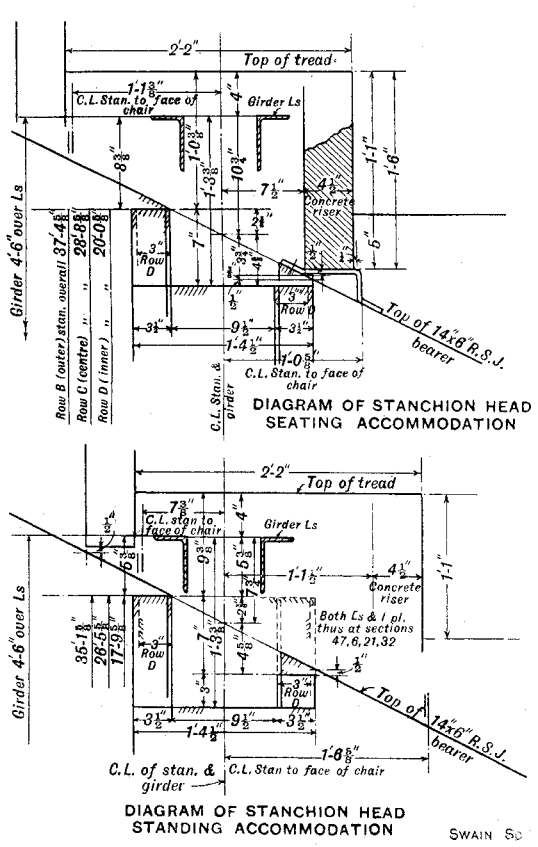


FIG. 6—ARRANGEMENT OF ROOF, TIERS OF STEPS, AND STEEL WORK

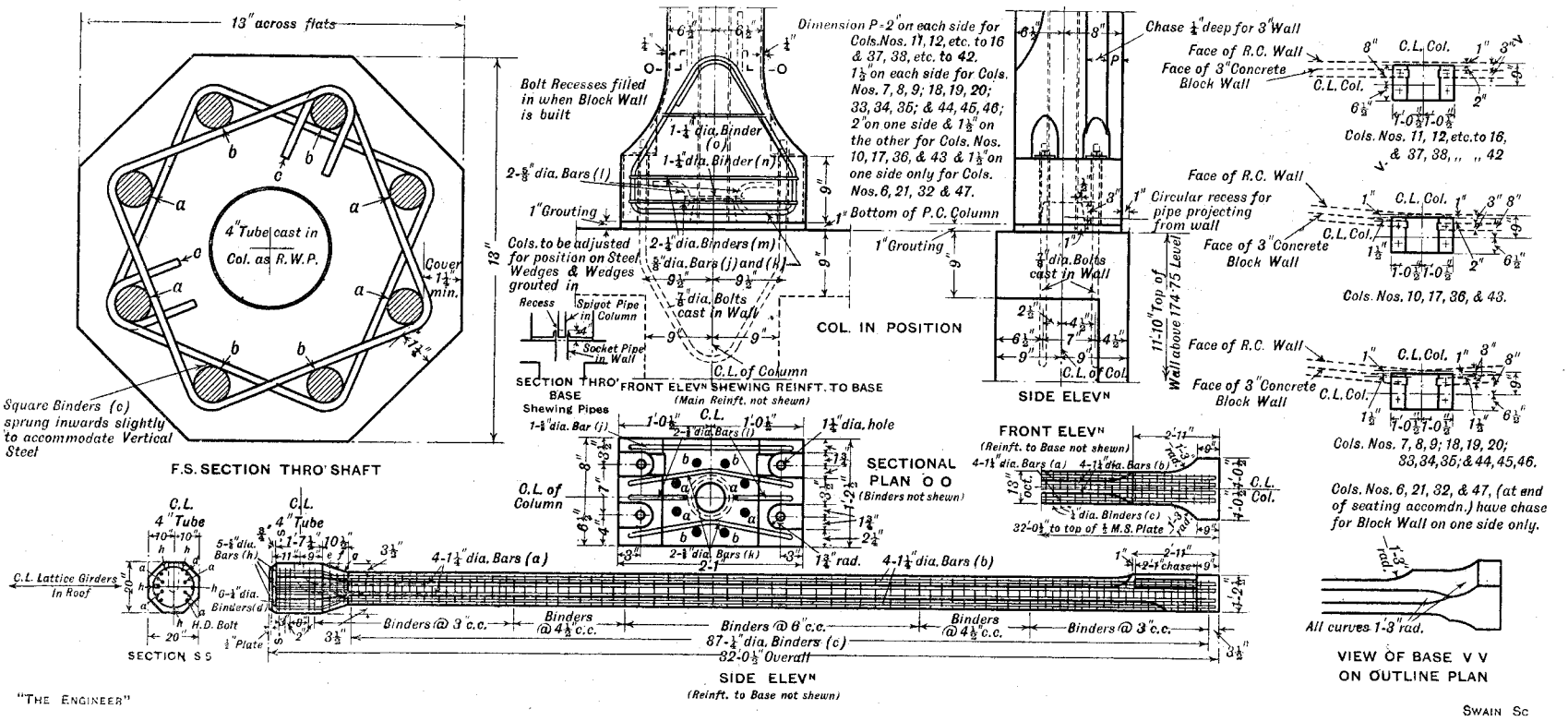


FIG. 7—DETAILS OF REINFORCED CONCRETE ROOF-SUPPORTING COLUMNS

is approached by means of five flights, having a total of forty-seven steps, from a tunnel formed from the north face right under the main building and giving access at the other end to the arena. This tunnel, which is 40ft. wide, varies in height from 20ft. at the entrance to 13ft. at the exit, has a concrete arch at either end.

The whole building is constructed of concrete on a steel skeleton. A noteworthy feature is that fluted shuttering has been employed with excellent effect, the somewhat distressing monotony of large areas of concrete facing having been practically entirely avoided, the employment of horizontal V-shaped

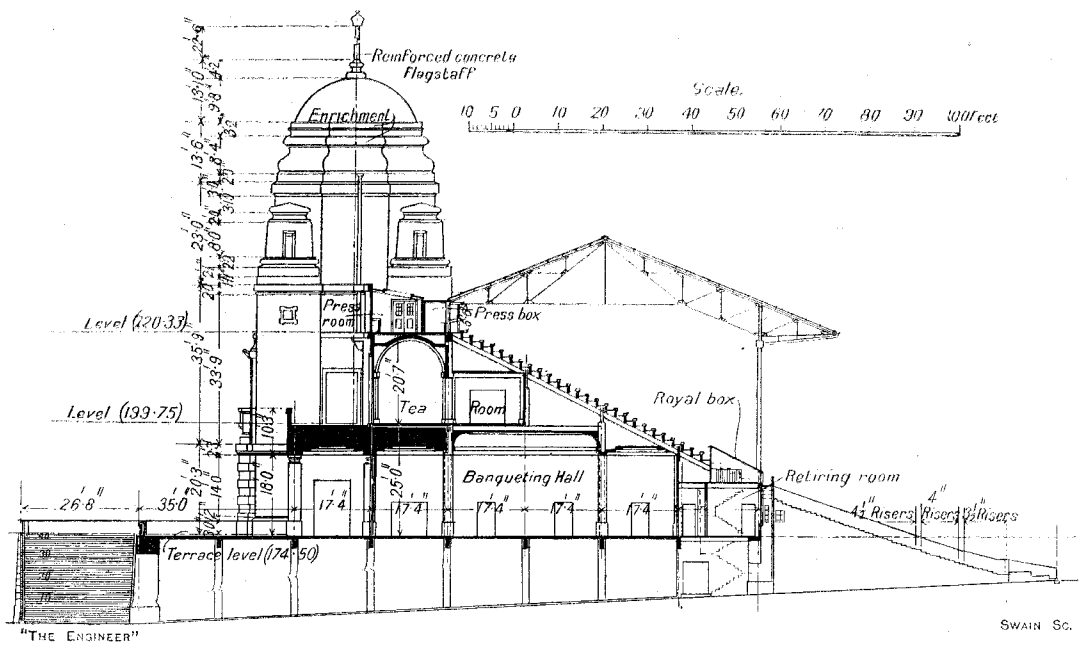


FIG. 8—CROSS SECTION THROUGH BUILDING ON NORTH FRONT

channels in the material aiding in the effect. Another advantage of the fluted shuttering is that the disfiguring marks which are usually caused by the divisions in ordinary shuttering have been almost completely done away with. Imposing features of the front are two concrete towers which rise to a height of 106ft. 4in. above the terrace, and reach to over 280ft. above Ordnance Datum, being surmounted by a reinforced concrete flagstaff rising to a further height of 22ft. 6in. to the underside of the trucks, which are fashioned in the form of Imperial crowns, and are also of reinforced concrete.

The outside wall of the Stadium, saving where the building on the north face—just described—comes, is formed of a series of nearly semi-circular arches carried on vertical piers. The piers arise to a height of 25ft. above the corridor, and the height to the crown of the arches is another 20ft. 6in. The arches vary slightly in span according to their positions and to the amount of curvature of the outside face of the wall at the points where they occur. The average span is, however, about 50ft. Both piers and arch ribs are of reinforced concrete cast *in situ*. Expansion joints are provided at intervals of four arches, and where they come the break is made at the centre of the crown of the arch. In such cases, of course, the two halves of the arch are cast separately and act as cantilevers. In a majority of cases the arches are simple, but, where extra loads from roof have to be taken, a 20in. by 12in. reinforced beam is arranged on the tops of the piers at springing level. In such cases two equally spaced spandrel posts connect the top of the beam with the soffit of the arch. Expansion joints are also formed in these beams where the joints in the arches come. The dimensions of the piers vary with the weight they have to carry, but the cross section of the majority is 3ft. by 1ft. 8in. They are erected on solid foundations with wide stepped footings taken well down into virgin soil. Only at one place has a retaining wall been formed, and that is at the south-east end, where the building approaches most nearly to the Great Central line, which at that point is in a somewhat deep cutting. This wall, as well as the railway line, can be seen in the view from the air given in Fig. 1. Above the crown of the arch the wall is taken up for another 7ft. 2½in. by means of pre-cast concrete blocks and a surmounting reinforced concrete beam 12ft. by 12in., and it is to the latter that the roof principals are attached. The top of the wall therefore reaches a height of 52ft. 9½in. above the level of the corridor or 227ft. 6½in. above Ordnance Datum.

The level of the corridor is, as has been said, 174.75 above Ordnance Datum, or at 9.83ft. above the running track which stands at 164.92 above Ordnance Datum. Access to the corridor from the outside is obtained by means of five separate flights of reinforced concrete steps, while the terrace on the north front, which is practically at the same level as the corridor, is reached by means of two sets of forty reinforced concrete steps which are about 25ft. wide. It is from the corridor that all parts of the Stadium are approached. First of all there are round the periphery of the inner ramp of standing places the forty-nine concrete openings formed in the dwarf wall, which are reached by flights of ten steps up from the corridor level. Then at an elevation of 25ft. above the corridor is a gallery with a reinforced concrete floor, about 16ft. wide, which runs from end to end of the south portion of the building which is roofed over. It is reached by a series of double stairways of reinforced concrete, which are built at intervals of 150ft. From that corridor flights of ten steps lead up to openings formed at intervals of 50ft. in the tiers of concrete steps.

The quarters assigned to the competitors are at the western end of the Stadium, where there are dressing rooms, lavatories, and a small concrete plunge bath. The competitors reach the arena by means of a tunnel, the floor of which is at the same level as the running track.

Mention was made above of the tunnel which has been formed through the structure of the Stadium in order to provide a straight track one furlong—220 yards—in length. The flexibility of concrete construction is well exemplified in the arrangements which have been made. The tunnel is some 24ft. wide, and since it was necessary to make provision for carrying not only the weight of the superposed structure but also that of the spectators, specially designed reinforced concrete beams had to be worked in. These beams measure 3ft. by 2ft. and they are connected together by means of cross beams which carry the floor of the corridor. The length of the tunnel is nearly 150ft., and for that part of the distance the competitors will, in consequence, run under cover. Perhaps at this point a word as to the excellence of the cinder track throughout may not be out of place.

As giving some idea of the immense size of the undertaking, we may say that the overall length of the Stadium on its major axis is 900ft., and that the maximum overall width is 650ft. The following is a list of the quantities of the various materials used:—1400 tons of structural steel work; half a million rivets, for which one and a-half million holes had to be drilled; 600 tons of steel rods for reinforcing the concrete (total length of these rods is about 500 miles, and the total numbers of the rods one-quarter of a million); 25,000 tons of concrete, using 3500 tons of Portland cement; 14 miles of concrete beams to form the terracing in the stands.

The concrete in the north or main front has been and still is being placed by means of an "Insley" tower. The tower is of light steel work and is 160ft. high, and may be seen in Fig. 9 and in Fig. 11, page 368. It carries a long movable jib from the end of which is suspended a balanced truss which can be turned in any direction. There is a hopper near the top of the tower and from it leads a chute to a further hopper on the truss, along which is taken another chute. The concrete is mixed at ground level in a machine, is lifted in a box, which travels in guides arranged inside the tower. When the level of the top hopper is reached the concrete is tipped from the box into the hopper and thence finds its way by gravity to the delivery end of the balanced truss. The material can be deposited at any desired point within a radius of 400ft. from the tower, so that an area of something over 11½ acres can be covered

We may say that the building has undergone some severe tests, and though the results have not yet been completely worked out, we believe that they will prove to be eminently satisfactory. Some of the deflections measured, have, at any rate, been well within permissible limits. The tests were made with both dead and live loads. The dead load consisted of bags of sand and the load imposed was about 60 per cent. in excess of the load which is to be expected in actual service. On the occasion of one of our visits a dead load of 300 tons was in position on the centre of the curve at the east end. It so happened that on the same day the live load test was applied. A body of workmen released for the time being from their labours on the site, and numbering, we were given to understand, 1280, was first of all drawn up outside the building and then marched in, in companies, and led to the banks of seats immediately behind the Royal box, where they closely filled a section of the seats right up to the topmost level. It was quite obvious that the great majority of these men had seen service in the war, for otherwise we do not think that it would have been possible, without preliminary drill—which they had not had—for them to act in unison with such wonderful precision as was actually the case. Under the command of Captain F. B. Ellison, who, during the course of the work, has been resident architect, the men were put through a series of movements, such as standing up, sitting down, swaying from side to side and backwards and forwards, and marking time, all of which had to be, and actually were, done to time. The men appeared to the onlooker to be wonderfully together in their movements, and the whole business must have been a very useful test. Then the instructions were to shout and jump about and wave the arms frantically so as to reproduce as nearly as possible the movements of a crowd watching an exciting match. Afterwards the test was repeated on the other side of the Stadium at a point not quite opposite the Royal box; just outside the eastern end of the covered area, in fact. Then the men were marched along the steps until they came beside the portion which was loaded with dead weight. There, further movements were gone through, including marking time at the double—an experience which the structure is never likely to have to undergo when fulfilling its usual functions. Finally gangs of the men were ordered to run down several flights of the steps. In every case, as was, of course, anticipated, the test was without visible result, there being no sign of weakness.

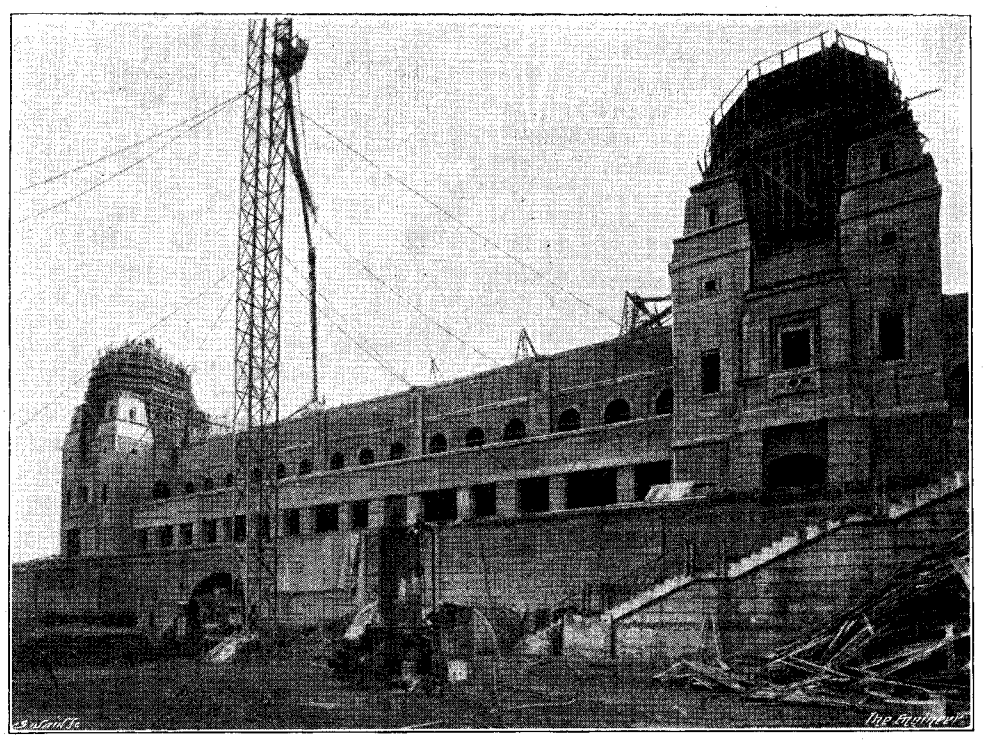


FIG. 9—BUILDING ON NORTH FRONT UNDER CONSTRUCTION

The architects of the building are Messrs. John

W. Simpson, P.P.R.I.B.A., and Maxwell Ayrton, F.R.I.B.A., and the Consulting Engineer is Mr. E. O. Williams, A.M. Inst. C.E., to whom we are indebted for a large proportion of the information contained in the foregoing. The quantity surveyors are Messrs. Baker and Mallet, the contractors Sir Robert McAlpine and Sons, with Edward Wood and Co., Ltd., of Manchester, as sub-contractors for the steel work, and the resident engineering inspector, Mr. J. Underwood.

Import Trade of India During Period April—December, 1922.

Several interesting facts are brought out in a report which has recently been made by the British Senior Trade Commissioner in India (Mr. T. M. Ainscough) to the Department of Overseas Trade on the import trade of that country during the period from April to December last year.

It appears that the total imports of merchandise for the nine months declined from 197 crores of rupees in 1921 to 173 crores in the corresponding period of 1922. The shipments from the United Kingdom declined from 111 to 106 crores, but it is satisfactory to note that the British share of the total rose from 56 to 61 per cent., as contrasted with a reduction of the share of the United States from 9 to 6 per cent. A striking feature was the increase in the proportion of goods derived from Germany, from 2.4 to 5 per cent. Imports from Japan also increased slightly from 5 to 6 per cent.

Machinery and Millwork.

After discussing the import values of cotton yarns, piecegoods (unbleached and bleached), piecegoods (coloured, printed or dyed), sewing cotton, haberdashery, &c. &c., the Commissioner turns to machinery and millwork. and remarks that in view of the acute trade depression and the difficulties that many industrial concerns, which were floated during the boom period of 1919–20, are encountering, it is not surprising that the total imports for the nine months—17.86 crores—showed a heavy fall as compared with the corresponding period of last year—25.44 crores. It is satisfactory, however, he points out, that the reduction in the case of the imports from the United Kingdom was less than that of our principal competitors. British shipments fell from 20.79 to 15.07 crores, and American from 3.76 to 1.77 crores ; but, on the other hand, imports from Germany advanced from 39 to 59 lakhs, and those from Switzerland from 3 to 9 lakhs. The total imports under the various classifications of machinery were as follows :—

	1921. Rs. lakhs.	1922. Rs. lakhs.
Cotton machinery	493	620
Jute machinery	344	135
Electrical machinery	275	254
Boilers	191	101
Mining machinery	59	25
Oil-crushing and refining machinery	39	8
Paper mill machinery	27	6
Refrigerating machinery	11	6
Rice and flour mill machinery	51	33
Sawmill and woodworking machinery	23	7
Sewing and knitting machines	16	40
Sugar machinery	74	16
Tea machinery	15	17
Metal working, including and mainly consisting of machine tools	103	44

American competition was slightly more successful in electrical machinery, but in most of the other items the imports from the United States fell to a greater extent than those from the United Kingdom.

Railway Plant and Rolling Stock.

As regards railway plant and rolling stock, the total imports were reduced from 14½ to 9¼ crores, and the British share fell from 14 to 8.69 crores. That of the United States remained stationary at 12 lakhs, while Australian imports fell from 15 to 8 lakhs. The share of "other countries" rose from 8 to 30 lakhs, which is to be accounted for by increased purchases from the Continent.

Iron and Steel.

The total trade in iron bars and channels advanced from 28 to 35 lakhs. The British share fell from 18 to 13 lakhs, while Belgium more than doubled her shipments from 8 to over 16 lakhs. There was a considerable increase from Sweden (Rs. 85,000 to 3 lakhs), and from "other countries" (Rs. 38,000 to 2½ lakhs). The total trade in steel beams, pillars, girders, and bridge work was reduced from 114 to 92 lakhs. The British share remained fairly stationary, only falling from 58 to 57 lakhs, while Belgian imports shrank from 38 to 28 lakhs, and those from America from 11 to a mere Rs. 54,000. Those from "other countries" remained stationary at about 6½ lakhs. The total trade in bolts and nuts rose from 22 to 28 lakhs. The British share fell from 15 to 14 lakhs, as contrasted with a rise in the case of America from 3 to 4¾ lakhs, and in the case of "other countries" (Germany and Belgium) from 3½ to 9 lakhs. The total imports of hoops and strips rose from 39 to 43 lakhs, the British share advancing from 27 to 30 lakhs, and that of "other countries" from 4¾ to 9½ lakhs, while imports from America were reduced from 6¾ to 3½ lakhs. The trade in nails, other than wire nails, rivets and washers showed a noteworthy expansion from 23 to 43 lakhs, British imports rising from 12½ to 16 lakhs, Swedish from 1 to 9 lakhs, Norwegian, from Rs. 56,000 to 8¼ lakhs, and German from 1¾ to 3 lakhs. Belgian, imports, however, declined from 4½ to 3½ lakhs, and those from the United States from 1½ to 1 lakh. The total imports of cast pipes and fittings fell from 76 to 54 lakhs, those from the United Kingdom from 54 to 40, and those from the United States of America from 21 to 9 lakhs. The share of "other countries" advanced from 1 to 5 lakhs.

In galvanised sheets and plates there was a most satisfactory increase in the total imports from 173 to 249 lakhs, and it is most encouraging to observe that the United Kingdom had practically regained her exclusive position in the trade, British imports advancing from 155 to 235 lakhs. Those from the United States fell from 14 to 12 lakhs, while those from "other countries" were reduced from 3½ to 1¾ lakhs. The returns for tin-plates showed an advance from 100 to 130 lakhs, the British share rising from 96 to 115 lakhs, while American shipments increased from 3½ to 13½ lakhs. Over a lakh's worth of tin-plates were obtained from "other countries." The total trade in sheets and plates, not galvanised or tinned, increased from 113 to 144 lakhs, the British share advancing from 56 to 66 lakhs, that of Belgium from 31 to 42 lakhs, and that of Germany from 17 to 29 lakhs ; whereas the imports from the United States fell from 5½ lakhs to Rs. 62,000.

The contraction in the total trade in wrought tubes, pipes and fittings by more than half was noteworthy, the total imports falling from 268 to 114 lakhs. Imports from the United Kingdom shrank from 64 to 49 lakhs, and those from America fell from 187 to 48 lakhs, while imports from Germany increased from 8 to 13 lakhs. In wire nails the total trade rose from 21 to 27 lakhs. The British share remaining fairly stationary at just over a lakh, but the share of Germany being doubled from 7 to 14 lakhs. Belgian shipments were reduced from 11 to 8 lakhs. There was a slight expansion in the total trade in wire rope from 18 to 19½ lakhs. The British share rose from 15 to 16¾ lakhs. American shipments fell from 2.77 to 2.04 lakhs, while those from "other countries" rose from a negligible quantity to just over a lakh.

The trade in steel bars and channels showed a slight reduction from 219 to 212 lakhs. It is noteworthy, however, that the Continent maintained its position, the Belgian share being practically stationary at 117 lakhs. Germany increased her shipments from 21 to 39 lakhs. The British share fell from 37 to 33 lakhs, and that of the United States from 26 to 7 lakhs. Luxemburg and France sent most of the remainder.

Hardware.

Under the general heading "Hardware," Mr. Ainscough gives the following comparative analysis of imports :—

	1921. Rs. lakhs.	1922. Rs. lakhs.
Agricultural implements	18	17
Builders' hardware	23	29
Domestic hardware, other than enamelled ironware	10	6
Enamelled ironware	15	16
Implements and tools, other than agricultural implements and machine tools	55	60
Metal lamps	26	46
Parts of lamps, other than glass	8	9
Safes and strong boxes	4	2½
Stoves	3½	4¼
Gas mantles	4¾	4¾
Buckets of tinned or galvanised iron	¼	½
Glass lamps	Negligible	
Other sorts	288	200

The total imports of hardware fell from 457 to 398 lakhs. The reduction was, it is remarked, particularly noteworthy in the case of the United Kingdom, from 286 to 193 lakhs, and of the United States, from 87 to 62 lakhs. There was, however, an extraordinary increase in German imports from 39 to 89 lakhs. The Japanese share advanced from 16 to 22 lakhs, while that of "other countries" remained almost stationary at 24 lakhs. While British manufacturers are retaining a fair share of their higher grade trade in goods used by Europeans and in industries, German makers are rapidly regaining their position in the bazaars of India in the cheapest forms of hardware and in novelties.

Electrical Instruments and Apparatus.

There has been a considerable diminution in the total imports of electrical instruments and apparatus, from 335 to 166 lakhs. The falling off was particularly notable in the case of the United Kingdom shipments, which declined from 232 to 116 lakhs. Imports from America shrank from 71 to 14 lakhs, those from Italy from 14 to 9 lakhs, and those from Japan from 3 to 2½ lakhs. Dutch shipments were fairly well maintained at 5 lakhs, while those from "other countries" rose from 10 to 19 lakhs.

Motor Cars.

The total number of motor cars imported during the nine months rose from 1893 to 3307, but the total value fell from 126 lakhs to 109 lakhs. This is accounted for by the fact that whereas the number of British cars fell from 565 to 330, French from 127 to 37, and Italian from 155 to 95—these reductions being almost entirely in the higher priced cars—the imports from the United States advanced from 512 to 1381, and from Canada from 289 to 1147, the shipments from both these countries representing the cheaper makes of cars. It is practically certain that this decrease in the imports of higher priced English, French and Italian cars is due to the fact that vehicles from Great Britain, France and Italy cannot stand an import duty of 30 per cent. in competition with the cheap Canadian and American types, the effect of the heavy duty being, apparently, to give a preference to the American type of cars. The number of motor omnibuses, vans, and lorries increased from 309 to 379, but the value was reduced from 21 to 17 lakhs. The total imports of motor cycles—including scooters—rose from 543 to 609, but the value fell from 6.67 lakhs to 6.35 lakhs. The British share was reduced from 387 to 347, while that of America advanced from 80 to 103 vehicles. The total trade in rubber tires for motor vehicles increased from 58 to 77 lakhs. The British share rose from 15 to 20 lakhs, that of France from 14 to 29 lakhs, and that of the United States from 11 to 14 lakhs, while Italian imports fell from 7 to 4 lakhs.

Paper and Pasteboard.

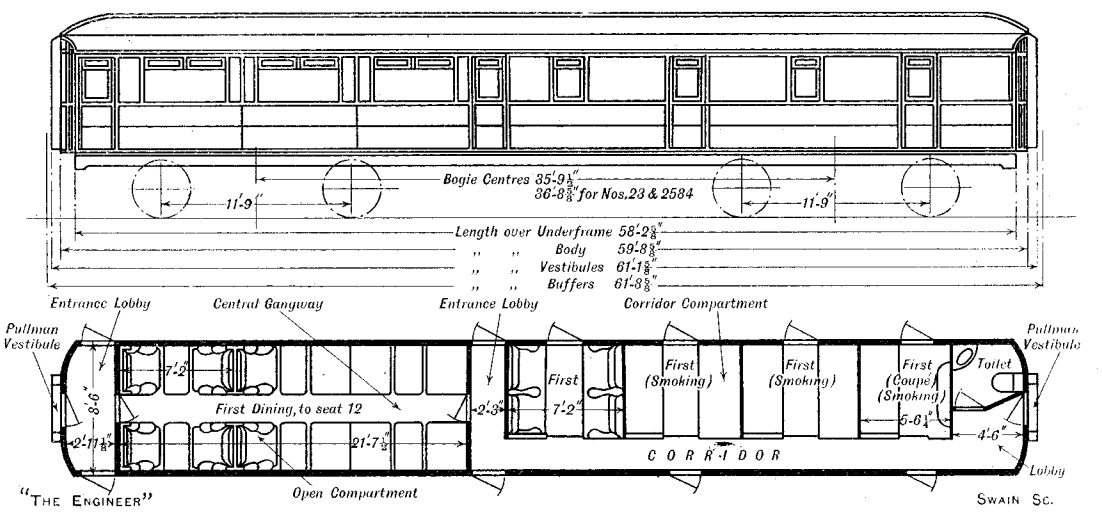
The total trade in paper and pasteboard rose from 15 to 22 lakhs. The British share fell slightly from 7.8 to 7.4 lakhs, while that of Sweden rose from 1.7 to 3 lakhs, Norway from .7 to 2.3 lakhs, the United States from .8 to 2 lakhs, and "other countries"—mainly Germany—advanced from 3½ to 7 lakhs. The value of printing paper imported rose from 57 to 71 lakhs. The British share advancing from 19 to 24 lakhs, that of Norway from 14 to 23 lakhs, and that of Germany from 5 to 8 lakhs. "Other countries" and Swedish shipments fell from 9 to 7 lakhs, Belgian shipments from 3 to 2 lakhs, and the United States from 2.3 to Rs. 37,000. In writing paper and envelopes again there was an increase in the total trade from 37 to 45 lakhs. The British share advanced from 26 to 29 lakhs, that of Germany from 1¾ to 4 lakhs, and that of Norway from 1 to 4 lakhs. Swedish imports remained stationary at 1½ lakhs, while imports from the United States were reduced from 1.6 to 1 lakh. "Other countries" slightly increased their share from 3.8 to 4½ lakhs.

Coal.

Although the total trade fell from 401 to 262 lakhs, the reduction was mainly in Natal, Portuguese East African, and Australian coal. The imports from the United Kingdom were reduced from 182 to 169 lakhs, those from Natal from 112 to 59 lakhs, those from Portuguese East Africa from 55 to 12 lakhs, and those from Australia from 28 to 6 lakhs. At the present time, British coal is largely dominating the Bombay, Karachi and Colombo markets.

Names of Parts of Railway Coaches.

Having been asked by several readers what are the correct designations of the various parts of a modern railway coach, we have pleasure in reproducing, herewith, a drawing of a Great Northern Railway first-class dining and corridor coach, for which we are indebted to the courtesy of Mr. H. N. Gresley, and on which the names of the different portions are clearly set out.



GREAT NORTHERN RAILWAY—FIRST-CLASS DINING AND CORRIDER COACH

The New South Wales Government announces an extension to November 30th next of the time during which tenders will be received for the erection of the Sydney Harbour Bridge. The extension has been rendered necessary by the adoption of an alternative design for the bridge. The original plan provided for a cantilever bridge of a total length of 3810ft., including a clear central span of 1600ft. While this plan has not been abandoned, contractors may tender alternatively for an arch bridge of a total length of 3770ft., with a main span of 1650ft. In either case the bridge will provide for four lines of railway, six lines of vehicular traffic and pedestrian accommodation. Specifications for both designs may be seen at the New South Wales Agent-General's office in London.

The *Bulawayo Chronicle* recently published news of an important new financial concern, entitled the Rhodesian-Congo Border Concession Company. This report probably has reference to the great copper deposits which are known to extend from the Katanga far across the Rhodesian border, and of which Bwana M'Kubwa is an example. Altogether, it certainly seems likely, according to the *S.A. Mining and Engineering Journal*, that copper mining in Southern Africa will witness a substantial revival in the near future, and if the price of the metal continues to advance as rapidly and substantially as it has done during the past few weeks it is considered locally that a distinct movement in copper mining activity in the sub-continent cannot be long delayed.