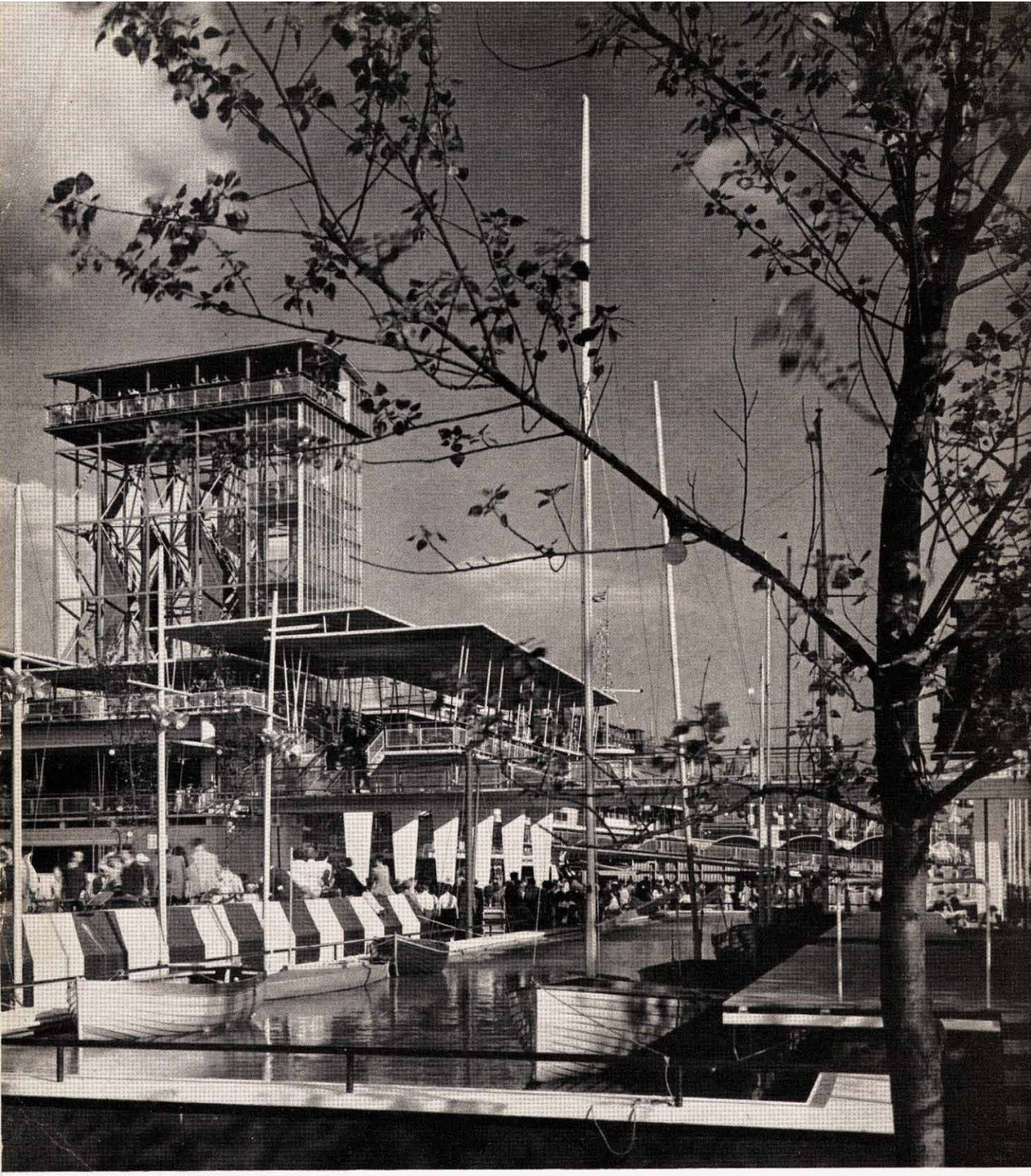
CEMENT AND CONCRETE ASSOCIATION

FESTIVAL

CONCRETE

QUARTERLY

AUGUST—OCTOBER 1951: PRICE: TWO SHILLINGS



The miniature harbour, with the Waterloo Bridge entrance and the prestressed footbridge in the background.

Festival

CONCRETE QUARTERLY

CEMENT AND CONCRETE ASSOCIATION : 52 GROSVENOR GARDENS S.W.1

CONTENTS FOR NUMBER 12: AUGUST—OCTOBER 1951

WE, THE PEOPLE of this Festival year of 1951, are very different people from those who throughout the summer of 1851 flocked to Hyde Park to applaud the Crystal Palace and the Great Exhibition. It has become a truism to say we are more sophisticated ; we no longer enjoy the facile tears of our grandparents nor their facile enthusiasms ; we are more critical, more cynical, perhaps more tired ; we demand more—and get, perhaps, too much. Our horizons have immeasurably widened, but widened beyond our sight, and we have lost as well as gained by that widening. Lost, primarily, the sense of expectation that filled the Victorians, and the congratulation (which we characteristically are taught to interpret as self-congratulation) that went with it. There is a story of the construction of the South Eastern Railway, when a crowd of thousands was gathered to watch the blasting away of the Round Down Cliff to enable the line to reach Folkestone. When the explosion died away it was followed by a spontaneous explosion of cheers for William Cubitt, the engineer who had achieved the wonder.

As for us, marvels crowd upon us and become commonplace ; marvels become horrific and we turn our backs upon them. We have seen vistas ending in destruction and are disillusioned. Invention and elaboration and discovery are no longer friends on whom we can rely ; and even Progress—half Goddess, half Victorian matron—is not necessarily on the side of the angels or even on the side of mankind : to us she behaves more often like the fairy unbidden to the feast.

The Victorians' was an age that brought the apotheosis of the railway, and the great stations of London—temples to the new god, but named after the Roman god of boundaries, Terminus—brought to his worship a new architecture expressed in new materials. It was an architecture that was essentially the work of engineers rejoicing in the manipulation of iron and glass, and as such it spread to great commercial buildings and found its final expression in the Crystal Palace, itself the work of an amateur engineer.

In one respect at least we stand to-day a better chance than the Victorians of participating in ' progress.' Architecture, since 1851 a dead, or at least a Sleeping Beauty, art, has been moving of late, and we with it. Unlike the Crystal Palace, which was in some respects the beginning of an end, the buildings of the South Bank confidently appear as the end of the beginning.

And far from being shocked, the British public has quietly taken them for granted. What emotion there has been has been one of *background* pleasure—of something that has been an extra delight, without obtrusion. Our new architecture has taken the public, as it were, unawares and found its place. There is a simplicity about this new South Bank architecture—it is not something that can be written off as catchy exhibition stuff. It is genuine building with a sobriety that comes of doing a sound job well, and a happy light-heartedness

that comes of knowing that the biggest part of its job is to give pleasure. The South Bank is no Battersea Park; Battersea Pleasure Gardens are fairyland nonsense; the South Bank is genuinely functional architecture, which here means architecture intimately allied to imaginative engineering, with both enjoying themselves.

It is this that gives the Exhibition as a whole its character. Throughout the accent is on lightness—a deftness that is the fruit of certainty, never mere slickness. There is nothing that is sensational but much that is new—not actually in the materials used, or even in expression, but new in spirit. There is gaiety and originality in every line and detail, but it is a natural unforced gaiety and not a striving after ' Exhibitionism.'

There is no reason, for instance, why a new town should not flank its streets with just such an arcade as that beneath the Waterloo Bridge entrance, or why a new home, hotel or restaurant should not offer just such terraces open to the sun and air, and sheltered from wind and cold by just such delicate dancing roofs. There is no reason why just such imagination should not go into the everyday design of stairs and fences as is shown in those of the Transport Pavilion and in so many of the airy staircases of concrete, steel or timber, all over the site. There is no reason why the clean, clear colours of these buildings should not become the commonplaces of our surroundings; why their expressive roof lines should not become familiar; why structures of the airy lightness of the prestressed concrete footbridge should not be encountered every day, now that prestressing exists to make them possible. Or why wide, clear areas should not make use of a prestressed roof construction like that in the Fairway Restaurant—so decorative in its undisguised utilitarianism. There is no reason why the function of a building —the very shape of its bones—should not be clearly visible in its outward appearance, as in the sharply defined and so colourful outlines of the Telekinema. (And after all, has not precisely that been done on a grand scale in the Concert Hall?) Or why the raising of a building on stilts, so long practised by Le Corbusier and here charmingly exampled in the Television building, should not bring more open space to squares or streets or gardens. Or, more fundamentally, why the happy union here achieved, between concrete and steel and glass, concrete and glass and aluminium, concrete and timber and glass, should not continue and be extended.

And why not more of the butterfly lightness of the concrete canopy that shelters the Chicheley Street entrance?

While we have been looking the other way this new art has grown up. An art notable, among other things, (as the new engineers' art of the Victorians was for the recognition of iron) for its final cheerful recognition of concrete, as no longer a material to be hidden. The South Bank's concrete is proud of itself, proud of its form-marks, proud of its texture; it has no desire to be covered up. Because, largely, by now, concrete has learned to be good concrete. In fact concrete is itself making the covering. Concrete facing slabs have come into their own on the South Bank: to them the Transport Pavilion owes a great part of its facades and much of its colour. Here is another development that has come to stay.

The Festival of Britain was created not, as Prince Albert's Great Exhibition, for moral uplift; not to foster (particularly) the brotherhood of man, or to educate (particularly) public taste. It was started, perhaps, a little in a spirit of braggadocio; with a flourish, a feeling that we owed ourselves something, perhaps even a pat on the back, so why shouldn't we have it? After all, we had come through a lot—pretty bloody, but still unbowed. More officially, the Festival's brief was to show the British contribution to civilization against the background of the initiative of the British people and the resources of their land, and those gifts of justice, liberty and poetry admirably suggested, rather than displayed, in the Lion and Unicorn Pavilion.

At our own more apprehensible level this ' contribution to civilization ' is made no less plain for being, much of it, incidental. The excellence of design, the restraint, the quiet charm, the unexpected quirks of originality, the touch—so light—of fantasy on a sober background, are implicit not only in the exhibits that are put on show, but as clearly in the pavilions that house them: even in the bins that house the litter and in the direction signs. That, with a love of flowers and growing things, and of that proverbial " much water " that has flowed and is flowing under the bridges, make up a fairly good summary of this ' contribution.' Probably most people couldn't care less about its significance, but for one bright summer the Festival has been, in spite of the critics, a lot of fun—and a lot more than fun.

COVER: *The South Bank*

The

SOUTH BANK

Exhibition of the Festival of Britain

1951

THE FESTIVAL has run four months. The South Bank Exhibition which, to Londoners certainly, and probably to most of the world, epitomises the 1951 Festival, draws near its close. It has had its crowds—its delighted multitudes, its footsore admirers, its critics. And it has proved itself a civilized success.

An exhibition is made for the million, and day after day crowds have furnished the South Bank as the exhibits themselves have furnished the buildings.

But there are those who remember a preview of the Exhibition one windy April day of bright sunshine and blue sky, when the place was empty of all but a scatter of people and the buildings were undisguised either by exhibits or by visitors; when all their clean, new lines were sharp against blue shadows, and their colours were fresh and bright; a day of torn white cloud when the raked flagpoles seemed already a-flutter with pennants and a regatta spirit was in the air. When, for those interested in such things, it was possible to see, more clearly than it has ever been since the opening, the sheer outlines of the buildings themselves, their gay colours, and to notice individual details of materials, of finishes, of the originality that everywhere gives point to so functional an object as a wall, a handrail, a staircase, a window opening.

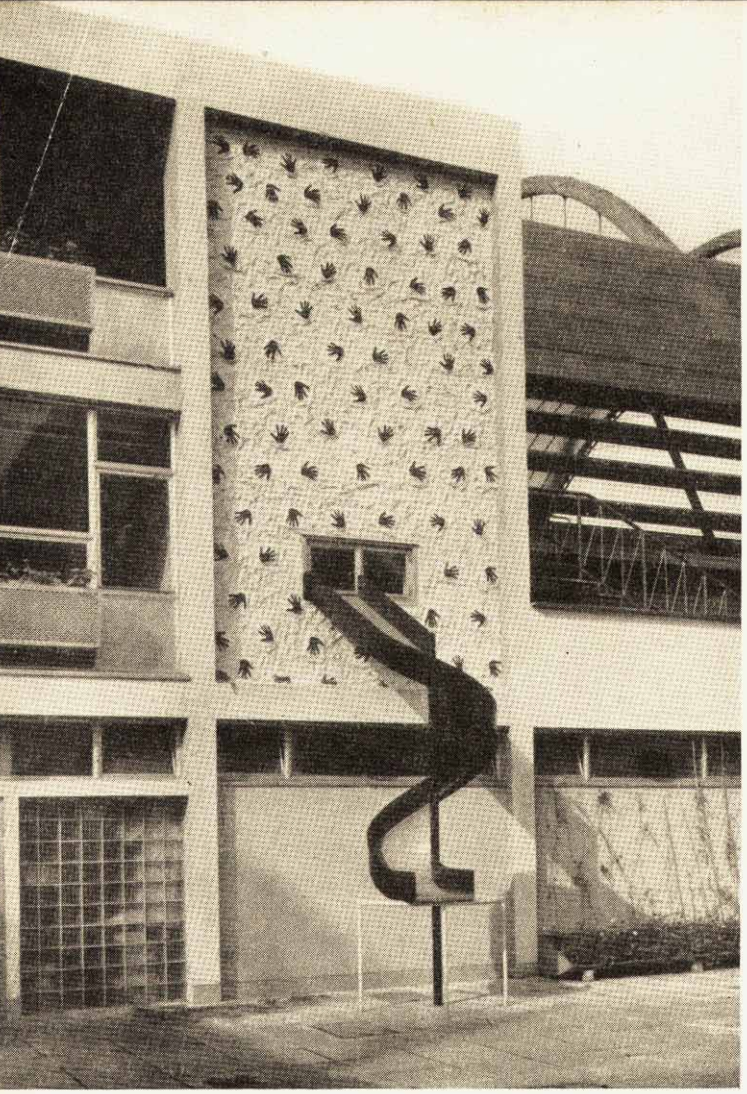
Sprayed renderings, finished both rough and smooth and painted over, were responsible for most of the colour—pale blue, primrose, lime green, white, sail red.

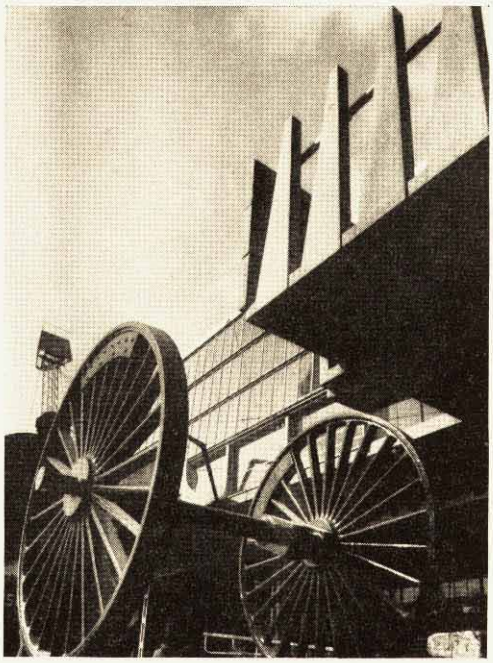
Widest range of colour for one building is to be found at the Station Gate entrance (architect Gordon Tait, F.R.I.B.A., of Sir John Burnet, Tait and Partners; contractors, Richard Costain Limited) a three-storey structure which consists on the ground floor of the booking hall and escalator head for Waterloo Underground Station. Structurally, this building has a frame part reinforced concrete and part steel, with a glass roof suspended from sweeping arches of laminated timber.

Externally it is finished with precast concrete blocks and cement rendering. The blocks are attractive; they are the warm brown of old brick and are pointed with off-white. The sprayed renderings are gay with colour. Inside the booking hall they are a brave tomato red and a sea blue that matches sea blue tiles and flooring. On the first floor, which provides the entrance from Waterloo main-line station, renderings are buff and primrose. Ceilings in each case are an unusual night-sky blue.

The front terraces of this building look across to the Skylon and the Dome of Discovery; the Transport Pavilion stands on the right, with its back to Hungerford Bridge.

In this building, a structure of steel and glass with asbestos cement roof and end wall, concrete has been used with charm and imagination for the details that give the place originality. An





The Transport Pavilion : a corner of a characteristic staircase of precast concrete units.

A scatter of black hands on grey rendering, framed in more orthodox sprayed renderings in buff and lime yellow : the north wall of the Waterloo Station entrance.

unusual small fence of precast concrete units lines the road. An external staircase leads to the upper floor and inside flocks of stairs reach up, turning and twisting—all concrete, all unusual, all of an inspired simplicity. All are built with a central spine of in situ concrete and treads that are separate cantilevered precast slabs, each secured to the spine by four bolts. In some the treads and balustrades are formed in one, as U-shaped units, and strangely recall the backbone and ribs of some prehistoric mammoth—which the architect in fact admits was his inspiration.

One section only of this pavilion, a building within the building, is constructed entirely of reinforced concrete. Here a concrete ramp, supported by in situ concrete columns, winds up to the higher floor which is itself of reinforced concrete. This section is in a sense self-contained, standing free of the outer steel frame and glass windowing.

Architects for the Transport Pavilion were Arcon, with F. J. Samuely, in collaboration with H. Gottfeldt, as consulting engineers. The general contractors were Richard Costain Limited. Of the detailed work, the staircase treads were cast by the Liverpool Artificial Stone Company and the precast flooring slabs that form the upper levels by Holland & Hannen and Cubitts Limited.

Pass under Hungerford Bridge and the Concert Hall is on your left hand, the " Lion and Unicorn " building on your right. This pavilion is simplicity itself in outline. All glass on one side, on the other it has a buff-coloured, rough-surfaced rendering with a glint of mica in it.

The sprayed rendering on the Television building at its south end makes contrast with a brilliance of pale blue, white and sail-cloth red. This reinforced concrete and steel building is described by the architect as basically a " tray on stilts." The " tray," which forms the essential part of the building—the upper floor—is a reinforced concrete slab carried on an encircling concrete beam 3 ft. deep and 8 in. wide which is supported by in situ concrete columns cast with steel formwork. Above this floor the structure is light steel framing. Walling, internally, is of breeze blocks finished with plaster, and externally is a skin of lathing with sprayed rendering washed in clear and vivid colours.

Beyond it lies the Telekinema, with its unusual buttoned-in, mattress-looking side walls. This effect is obtained by the sound-proof wall covering hung on studs that are fixed into the ' core ' wall of 10 in. thick concrete. A layer of rockwool adjoins this concrete wall ; follows an airspace, and finally a layer of expanded metal and a cement rendering. Internally the series is repeated. The rendering outside is finished terracotta and the studs are shining aluminium. The concrete external staircase that leads to the door in this side wall makes a sharp angle with the line of the balcony ; this balcony line is expressed externally in a concrete trim and a change of material below it.

These two buildings, Television and Telekinema, were designed by Wells Coates, O.B.E., R.D.I., F.R.I.B.A. Consulting engineers were Freeman, Fox and Partners.

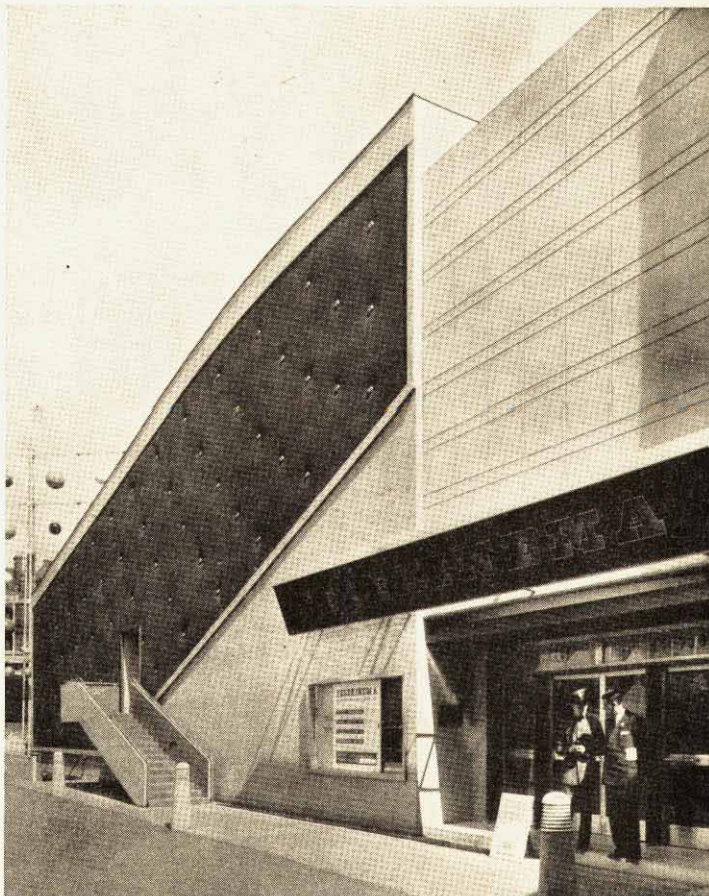
Over against Waterloo Bridge is that lovely building, " New Schools " and the Waterloo Bridge Gate—roof poised above roof, terrace above terrace, stairs and ramps and tapered columns and the soaring glass tower over all. A concrete ramp sweeps up to the terrace, supported on tapered, slab-shaped concrete columns. Tall columns of like shape carry the terrace itself, and appear again in the prestressed footbridge which leads from this terrace to that of the Concert Hall.

Behind these concrete columns, at ground level, is the New Schools Exhibit ; above is the terrace, and above again the upper floor with its turnstiles, their tiers of delicate roofs supported on slim raked posts, painted white and blue.

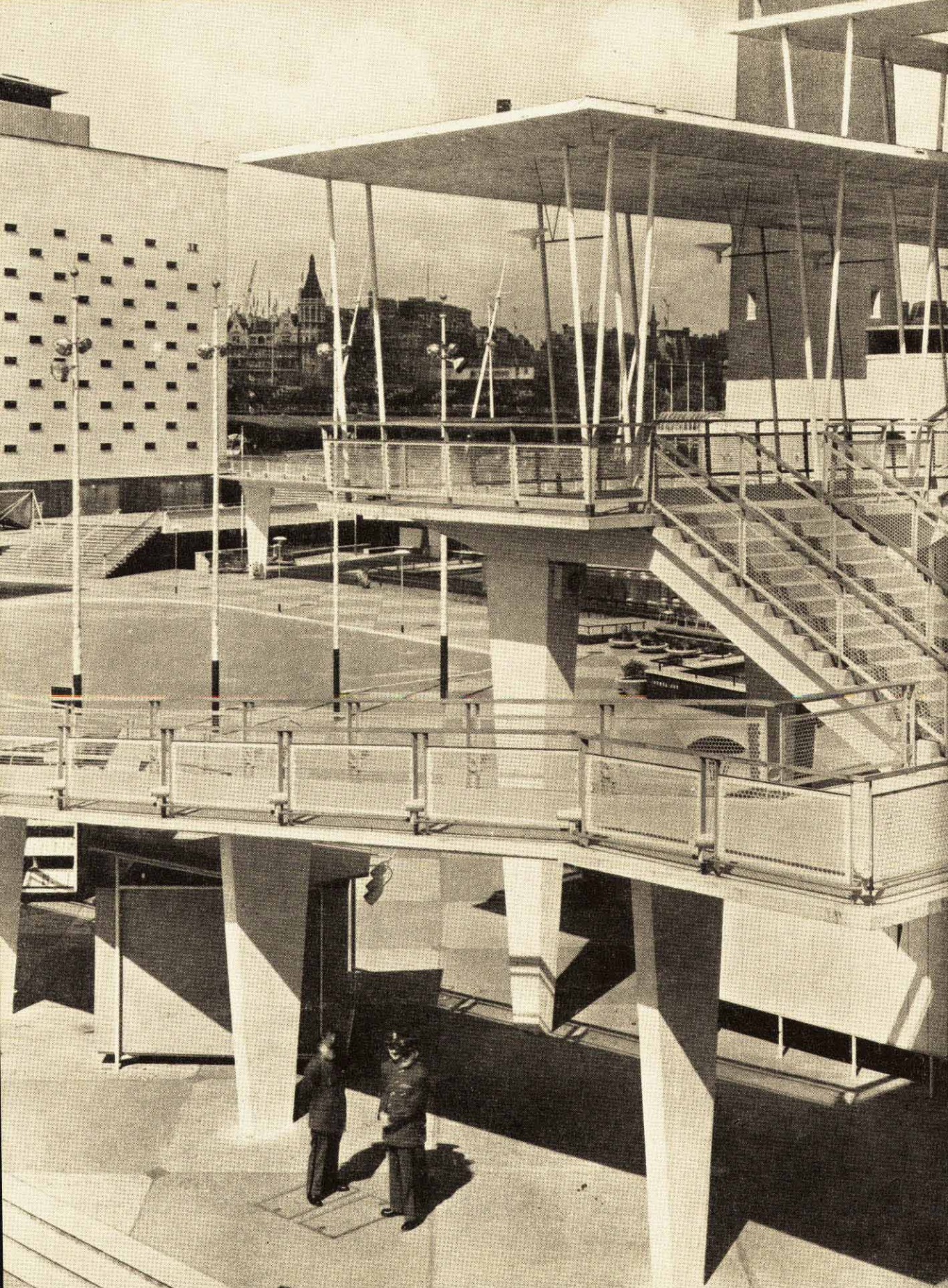
All the concrete here is as it was left from the formwork, but for a coat of white paint. End walls are rendered and sprayed with natural grey rendering that harmonizes with the stone of Waterloo Bridge behind.

The structure consists of four main sections : the main entrance platform, the ramp, the administration block which supports the steel and glass tower, and the nursery roof terrace and stairs.

The main entrance section consists of two terraces connected by three flights of steps. The upper terrace, at Waterloo Bridge level, is a five-inch concrete slab carried on concrete main and secondary beams, supported on seven 24 in. diameter columns in two rows, and four smaller columns on one side of the administration block. At the outer edge of the platform the secondary beams continue as cranked beams to support the flights of steps and merge with the construction of the lower platform. The lower terrace, which is connected by further flights of steps to the ramp, the nursery roof terrace and the prestressed concrete footbridge, is a 5 in. thick concrete slab, carried on a hollow box beam 4 ft. wide and 26 in. deep, which is supported on the tapered columns so characteristic of this building. These columns are 4 ft.



The Telekinema, with its rendered sound-proof wall built up on a reinforced concrete core.



wide at the head, tapering to 18 in. at the base, and are 9 in. thick throughout their height.

The long curving ramp—salient feature of this building—consists essentially of a large T-beam supported on tapered columns at about 19 ft. centres. The slab which forms the beam flange is 6 in. thick at the rib, tapering to 4 in. at the edge, and the rib is 4 ft. wide by 1 ft. deep. The columns, like those of the main building, are 4 ft. wide at the top, tapering to a base thickness that varies with their height.

The nursery roof terrace is a 4 in.-thick concrete slab supported on concrete beams, and the stair which leads from it to the ground is constructed with a flat cranked beam and cantilevered precast concrete treads and landings.

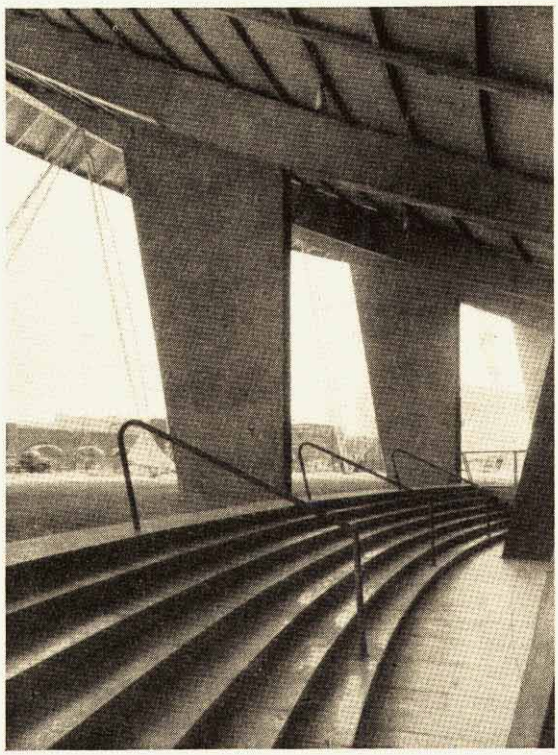
The four-storey high administration block forms the lower part of the glass and steel viewing tower. Its third floor is level with Waterloo Bridge. It has 3 in.-thick concrete floors carried on concrete beams and columns that are rectangular in section. This block is founded on a reinforced concrete raft slab 24 in. thick, that also acts as a floor sunk about 2 ft. lower than normal ground level in this area.

This pavilion, designed by Fry, Drew and Partners in collaboration with Ove Arup and Partners, consulting engineers, is one of the most successful in the Exhibition, and most clearly demonstrates the place of concrete in the new architecture. It is clever, but it is carefree and unselfconscious ; it is light, and right.

The same architects and engineers were responsible for the prestressed footbridge which connects the lower terrace of the building with the Concert Hall terrace. It is 284 ft. long in all, and, like the ramp, consists of a T-beam 4 ft. wide with a cantilevered flange forming the deck. In this case, however, the beam is prestressed. Supporting columns, also prestressed, are at approximately 75 ft. centres. Like those in the Waterloo Bridge building, they taper from a top section of 3 ft. 9 in. by 2 ft. 3in. to a base section of 1 ft. 9in. by 1 ft. 6 in. The footbridge is described in detail in this issue.

The enchanting little Thames-side restaurant at the extreme downstream corner of the site, with its aluminium and cork shell roof and its very nautical deck overhanging the river, has no concrete in its construction, but like so many of the Exhibition buildings, it owes much of its

The Waterloo Bridge gate and New Schools Pavilion : delicate concrete terraces poised on tapering concrete columns.



The majestic concrete buttresses of the Dome of Discovery.

charm to the coloured rendering on its walls, rough texture contrasted with smooth and the whole painted the pale blue of an early morning sky. The effect is charming and cries for a background of white sails and dancing water.

The boating pool—concrete obviously, blue-painted—has an ingenuous charm and gaiety. It is that tiny fishing harbour of one's nicest—or one's dreamed-of—holidays, with the clustered spikes of its small masts, the winking water, the bright paint of the little boats and even the husky white jerseys and navy slacks of the girls and boys who man them.

The new river walk, with its seaside air, its raking masts, its small landing piers with the precast decks, leads naturally to the Seaside exhibit. Here, on the rear wall, is an interesting experiment—a revival of the ancient art of sgraffito, practised particularly in the 16th, 17th and 18th centuries in Northern Italy and the Swiss Alps. This consisted basically of two renderings of lime mortar, the undercoat slightly tinted, the upper whitewashed and then engraved to show the deeper tone below.

Here the experiment has been carried out in

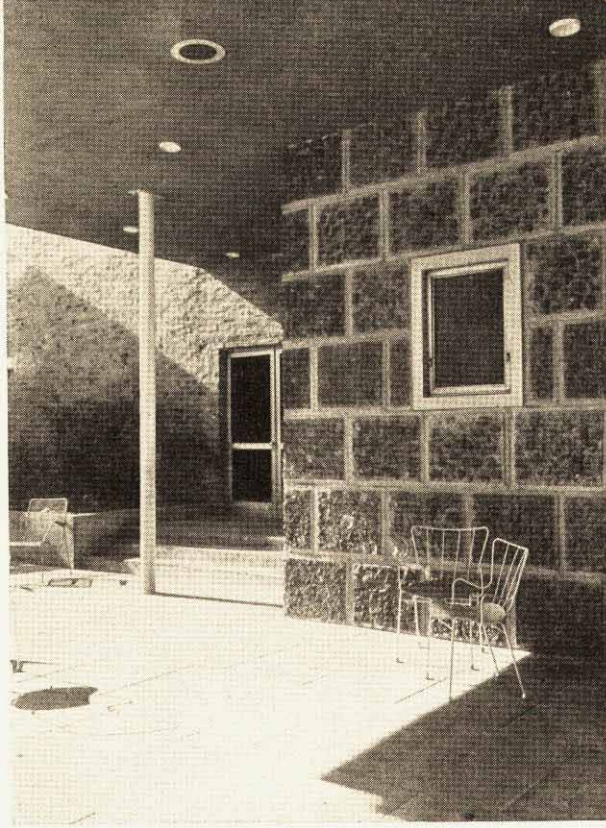
three colours, white, terracotta and black, and the result has a delightful spontaneity, due greatly to the fact that speed is essential to the process—the rendering can only be engraved while still soft. The sculptor, H. A. Lunn, A.R.C.A., who consulted the Architectural Department of the Cement and Concrete Association before carrying out the work, intends to proceed from lime mortar to experiments with cement renderings, which should yield very interesting results.

The Sea and Ships Pavilion, steel framed, is built up like many others of cement rendering on a wire mesh lathing studded with clay nodules, and much of the pavilion is plaster finished, with the sharp whiteness proper to ships. A concrete staircase sweeps up in a lovely curve to the concrete-floored upper level, and in its circle is a small concrete pool in which a large propeller turns.

Really to appreciate the majesty of the Dome of Discovery it is necessary to go back earlier than our sunny day in April—to a cold, gusty day of driven rain clouds, early in January. The Dome was still unfinished and the great concrete fins stood out stark under the spreading framework of the canopy—surrealist shapes of bold simplicity, cut sharply to queer angles and giving a quality of fantasy to turreted Victorian Gothic glimpsed across the river in the frame of their asymmetrical openings. Then, no walls or staircases, railings or girders were there to disguise the broad sweep of the roof, and the grandeur of those strange, monumental concrete buttresses.

Now this stark beauty is lost among the galleries, the enclosing walls that divide the buttresses in two, the railings and staircases and decks and fire escapes—all necessary to an exhibition of many things gathered in a huge space, but nevertheless diminishing the visual grandeur of the structure. The largest dome in the world remains—a remarkable feat of engineering and the Exhibition's outstanding landmark. There is something ship-like, now, about the precision of that great sweep of metal and those delicate struts; something ship-like, too, about the railings and decks and companion-ways that enable the diversities of chemistry, exploration, biology, astronomy, to be exhibited under the one vast roof.

The spreading dome, carried on its steel struts, is quite independent of the reinforced concrete buttresses, which support the circular gallery. The fins themselves are 35 ft. high and only 15 in. thick. The surface of the concrete has been most fittingly left as it came from the formwork, being only painted—the outer 'leg' in natural cement colour, the inner in tomato red.



The precast concrete slabs that face the lower part of the Transport Pavilion.

The Dome's architect was Ralph Tubbs, A.R.I.B.A., and the consulting engineers Freeman, Fox and Partners.

From the decorative point of view, the Power and Production Pavilion that takes up much of the Exhibition's southern end owes much to the three concrete figures in relief upon the yellow brick wall at one end (this sculpture is described elsewhere in this issue) and to the precast concrete slabs and panels that face the greater part of the building.

The pavilion is constructed with projecting galleries carried along most of its length and the long walls of these galleries are formed by vertical precast concrete panels, running the full height of the gallery and $16\frac{2}{3}$ in. wide. Reinforcing ribs down the edges of each panel give the surface a striped pattern and at the same time provide a watertight joint which allows for movement. The creamy buff colour of these

The butterfly canopy at the Chicheley Street entrance, painted blue beneath and white above.

panels is obtained from a mix of Portland stone aggregate, Portland stone dust and extra light cream cement ; their smooth exposed aggregate surface was obtained by polishing with carborundum and a mechanical polisher. Sills, precast gutters, corner posts and window surrounds throughout the building are of similar concrete.

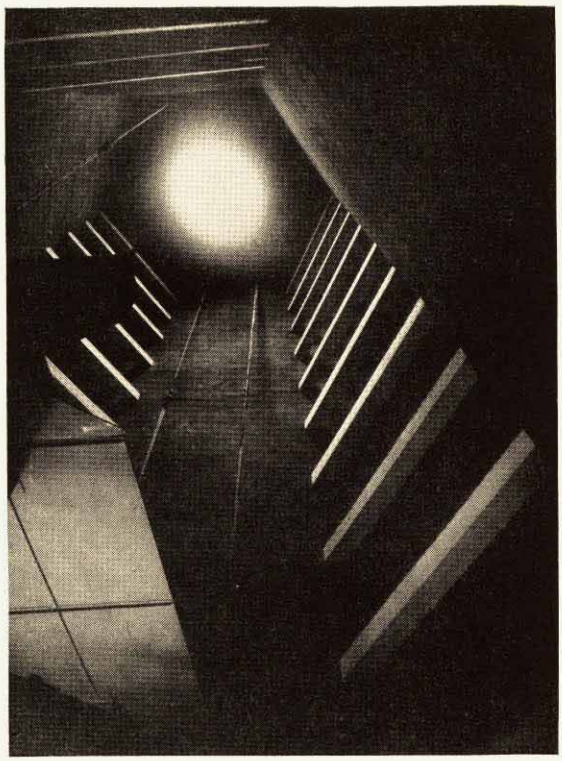
Walls below the galleries, and the return walls of the galleries themselves are of 2 ft. by 1 ft. 6 in. precast concrete slabs with an exposed brick aggregate surface. Bricks used were blue Staffordshire engineering, yellow London stock, and red Fletton, and large lumps up to 2½ to 3 in. in size have been exposed on the surface by spraying. The slabs are tongued and grooved all round, and have a plain border. They are laid with staggered vertical joints.

The upper part of the main hall of this building is faced with corrugated asbestos cement sheeting.

This pavilion was designed by George Grenfell Baines, A.R.I.B.A., A.M.T.P.I., in collaboration with H. J. Reifenberg, Dipl. Ing. Arch. The consulting engineer was F. J. Samuely.

The 70 ft. high black pyramid that makes the ' vertical feature ' of the " Minerals of the Island " Pavilion is an all-concrete structure, as, in fact, is the whole pavilion, which forms the pyramid's base, grass covered outside.

Inside the pyramid a series of triangular landings built into the sides are connected by

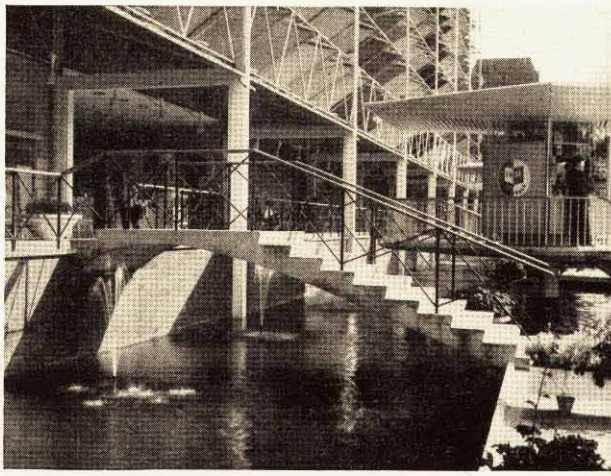


Looking upwards, in the shaft of the Minerals of the Island Pavilion.

flyover reinforced concrete stairs. Above, in the shaft of the pyramid, three sets of concrete struts across the corners, which diminish in size and spacing as they reach the top, give by false perspective the illusion of great depth.

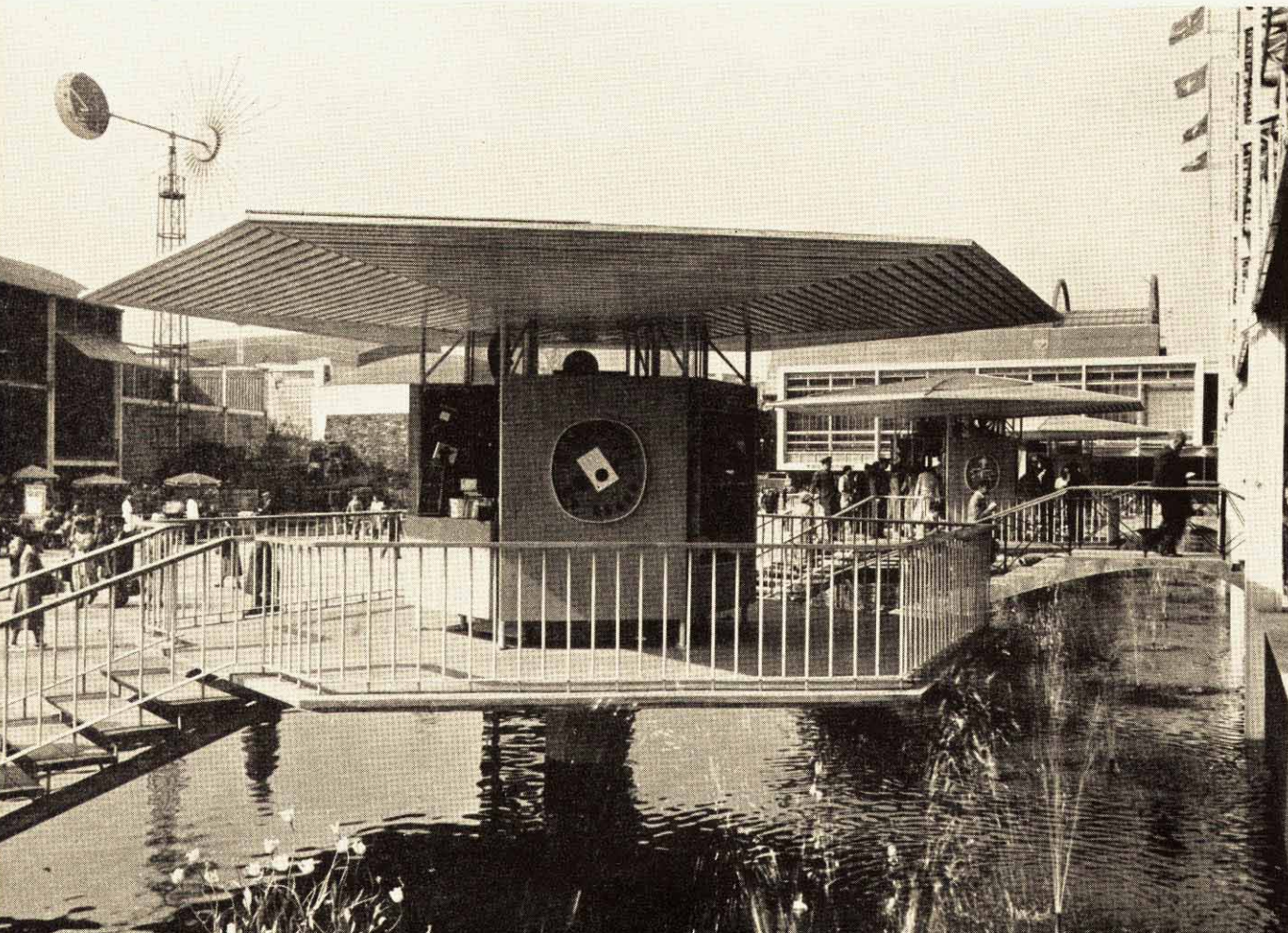
On one of the triangular landings, in the section devoted to silica and clay, is a showcase containing Joseph Aspdin's original patent for Portland cement, granted by George III, and sealed with his massive six-inch waxen seal.

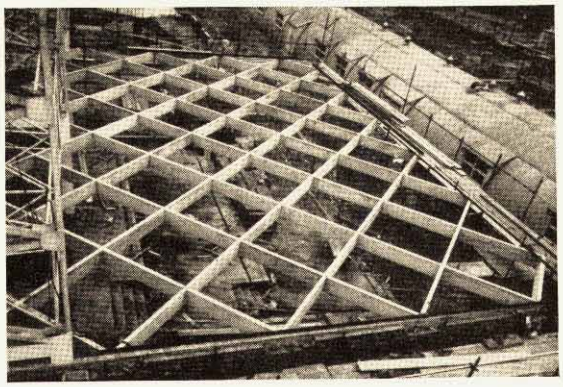
Adjoining the "Minerals of the Island" Pavilion is the Chicheley Street entrance, with its poised butterfly of a canopy that looks ready to take flight. This canopy is a delightful combination of plastic art and engineering. Painted white above, sky blue on the underside, its lines are enhanced by extreme contrasts of light and shade. There are the regular square steel shuttering marks on the broad sweeps of the soffit, the true clean edges of the 3-in. slabs and the harmony of the transverse ribs and their flat V shapes as they progress from one end of the canopy to the other. The plan shapes of



Concrete footbridges span the fountain pool before the Information building.

Kiosks for the sale of souvenirs stand like reinforced concrete mushrooms in the pool in front of the Information building.





The prestressed concrete roof of the Fairway restaurant under construction.

The Fairway restaurant, showing the lattice of prestressed beams, with the anchorage cones encased in silver cylinders.

the two halves of the canopy are the same but the wide end of one half is opposite the narrow end of the other half, so although there is overall balance about the line of the columns, there is a twist developed which is apportioned between bending in the columns and torsion along the central beam, in accordance with their relative rigidities.

Along York Road is the Information and Post Office building backed by the tall screen of steel and multi-coloured canvas that stretches like an immense sail down this side of the site. Both screen and building are constructed on concrete strip foundations.

In front of the building a concrete pool runs its full length, bridged in three places by slender asymmetrical reinforced concrete arches. Three kiosks standing in this pool are built on reinforced concrete mushroom platforms.

Here, at the end of the screen building is what is, structurally, perhaps the most interesting piece of construction on the South Bank—the Fairway Restaurant with its prestressed concrete roof. This roof partly interpenetrates, but is independent of, the screen structure. It covers a clear area of 40 ft. by 60 ft. with a flat lattice of slender precast prestressed beams each $3\frac{1}{2}$ in. wide, 15 in. deep and 6 ft. 9 in. long. Each line of beams is post-tensioned with a 12-wire Freyssinet cable. At the points where four beams meet a square space is left which is filled in by grout. The cables are anchored by Freyssinet cones at the outer edge of the roof and this essentially constructional feature is made into a feature of architectural design by being encased in cylinders of gleaming silver, that ornament the overhanging edge. The prestressed beams, painted white, are undisguised from below, the roof covering being painted sky blue on its underside.

The " Minerals of the Island " Pavilion, the Chicheley Street canopy and the Fairway Restaurant were all designed by the Architects' Co-operative Partnership and Ove Arup and Partners.

A word about the paving. Much of it is concrete—in situ and precast. Not all is successful. Much was laid at the last minute, too hastily to give really good results—but what a small complaint among so much that is magnificent. The South Bank is a revelation of what British architects and engineers can do, and their freshness of imagination has nowhere been more sincerely expressed than in the concrete structures.

The prestressed concrete footbridge

ON THE SOUTH BANK

ONE OF THE SOUTH BANK'S most successful structures is the slim white arrow of a footbridge that spans the "Waterway" and the wide square between Waterloo Bridge Gate and the Concert Hall terrace.

The bridge is 284 ft. in total length, and has a deck only three inches thick at its cantilevered edges, and less than 2 ft. at the centre, poised on tapered columns some 17 ft. high.

A staircase at one end of the terrace of Waterloo Bridge Gate leads on to this footbridge; a similar staircase at the building's other end joins the ramp that curves down to the square. The three—ramp, pavilion and footbridge, all structures where concrete platforms are carried on narrow tapered concrete columns—together make three sides of a square, with a unity of design that has throughout a flyaway, dancing charm.

In the footbridge, the combination of this delicacy with strength sufficient to carry the Exhibition's thousands of visitors over comparatively long spans, is achieved by prestressing. Cables run the length of the deck in the central rib, and vertically in the columns, and column cables are stressed to anchorages in the top of the deck, making the structure into a monolithic whole.

In plan the bridge is dog-legged, with three straight spans, 76 ft., 59 ft. and 76 ft. in length and, at an angle to them, a fourth span 54 ft. long and a final 19 ft. cantilever. Depth to span ratio is thus approximately 1 : 40.

A cross-section of the bridge shows a T-beam, with a wide shallow rib. The deck is 11 ft. 10½ in. wide, 9½ in. thick at the rib face and 3 in. thick at the edge, and is cantilevered from a rib 4 ft. wide and 1 ft. 10 in. deep.

Columns are tapered from a section of 3 ft. 9 in. by 2 ft. 3 in. at the top to 1 ft. 9 in. by 1 ft. 6 in. at the base, with the one at the angle slightly thicker.

To allow the deck to take up its shortening freely under prestressing, alternate columns were given temporary hinges at bottom and top. These hinges take the form of deep grooves in two sides of the column which reduce the section to 2 in. At the bottom, these grooves, made shallower by a packing of dry cement mortar added before the columns were stressed, are a feature of the completed design. Shallow grooves were made in the fixed columns to create a uniform pattern throughout.

The columns are founded on individual reinforced concrete bases 1 ft. 6 in. deep and measuring, for the four standard columns, 12 ft. by 8 ft. 6 in., and for the larger, 16 ft. by 8 ft. 6 in., which spread the load to a maximum bearing of half a ton per square foot.

Construction was carried out in two distinct stages, as part of the site was otherwise occupied until too late to allow for completion of the whole bridge in the time remaining. The first portion to be built was the straight section adjoining the terrace of Waterloo Bridge Gate. It comprised the first span and approximately half the second span, which was constructed as a cantilever. The second stage took in the whole of the remaining dog-legged portion up to the Concert Hall terrace, including, again, just under half the second span as a cantilever. When the two sections were completed and prestressed, the centre gap was finally joined up.

This arrangement, unavoidable in view of the site restrictions, had nevertheless an advantage in that it limited the length of cable to be stressed in each operation—a factor which is considered desirable when waved cables are used, as it reduces the loss of prestress by friction.

The Freyssinet system of prestressing was used, the long, three-span, section of the bridge being prestressed with twenty-four 12-wire

The lightness of the prestressed concrete bridge on its tapered columns, echoes the design of the Waterloo Bridge Gate building adjoining it.


WATERWAY

cables, and the short span and end cantilever with fourteen similar cables.

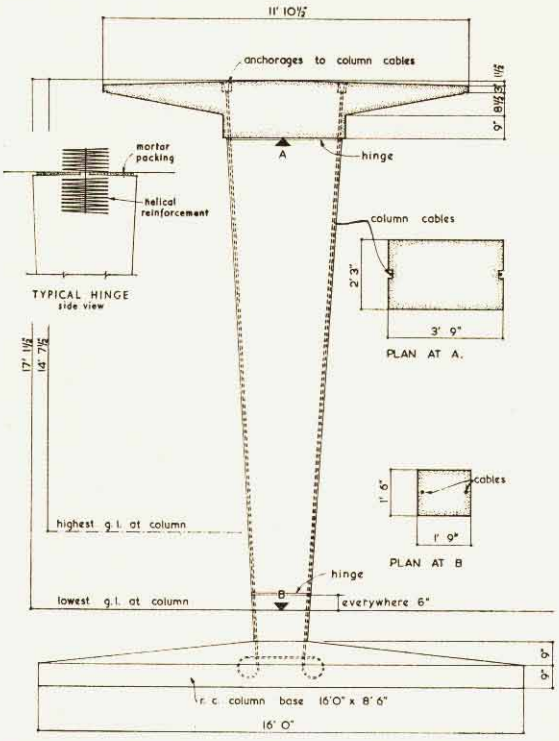
Precast reinforced concrete anchorage blocks, in which the Freyssinet anchorage cones were concreted in advance, were cast into the deck rib, one at each end of the first section to be built, and one at each end and two in the angle of the dog-leg section. Twenty of the twenty-four cables in the three-span portion of the bridge were stressed and anchored on completion of each half of the work ; the remaining four are continous throughout the whole of the three-span length, and were stressed up after the centre gap had been concreted.

To provide space for the prestressing jacks at the angle where the series of twenty-four and the series of fourteen cables intersect, the outer corner of the deck slab was omitted until after stressing had been carried out. It was then concreted on and anchored to the main structure by the outer two cables in each direction, which are splayed out and looped in the projecting slab, and are stressed at anchorages in the opposite end. A similar procedure was necessary at the Waterloo Bridge end of the first span, and at the cantilever end of the last span, adjoining the Concert Hall terrace.

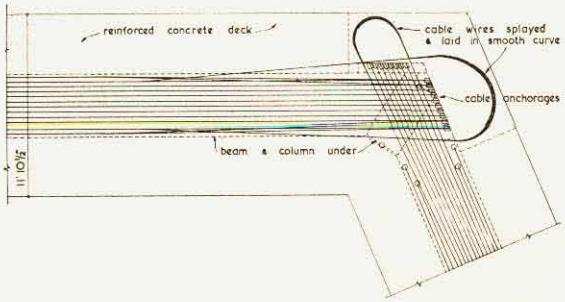
Prestressing cables in the columns run in grooves down either side. They are left visible and, painted red, form a distinctive feature in the design. The cables pass under the bottom of the column where they are secured by spiral anchorages, and are tensioned and anchored at the top of the deck.

The concrete was carefully controlled throughout to achieve the required strength and quality. The specification called for an average strength of 4,000 lb. per sq. in. at the time of stressing—at 5 to 7 days—and 6,000 lb. per sq. in. at 28 days. A white surface was required for the top and sides of the bridge, and owing to the small overall depth it was decided that the topping, which is about $\frac{1}{2}$ in. thick, would have to have a strength similar to that of the structural concrete and would have to be cast with it.

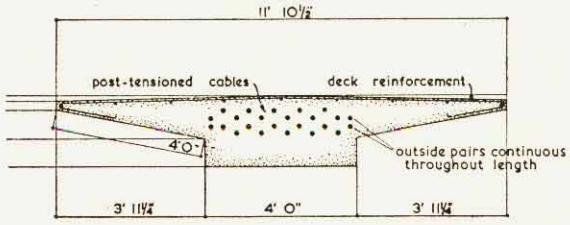
The assistance of the Cement and Concrete Association's Research and Development Division was called up to determine the most suitable mix and to supervise the control of the concrete. After trials a mix was chosen using rapid-hardening Portland cement and Thames Valley aggregates in the proportions of 1 part cement, 2·1 parts sand, 1·5 parts $\frac{3}{4}$ in. gravel and 1·4 parts $1\frac{1}{2}$ in. gravel and with a water-cement



Typical column elevation, showing position of cables and anchorages.



Plan showing arrangement of cables at angle of footbridge. Two splayed-out cables in each direction extend into the outer flange of the deck to anchor this portion which was concreted on after stressing of the main cables was completed.



Section CC

ratio of 0·50 by weight. This mix gave a slump of 1 in., a compacting factor of 0·77 and an average compressive strength at five days of 4,300 lb. per sq. in. At 28 days the average compressive strength was 6,330 lb. per sq. in.

For the white topping, white Portland cement was used, with silver grey Cornish granite and Buckland sand as aggregates. The proportions by weight were 1 : 0·9 : 2·1 with a water-cement ratio of 0·45 by weight. This mix gave a slump of 3 in., a compacting factor of 0·87, a compressive strength at five days of 5,430 lb. per sq. in. and at 28 days of 8,450 lb. per sq. in.

In order to obtain the necessary degree of control the aggregates used for structural concrete were stacked on the site in three separate sizes: $1\frac{1}{2}$ in. to $\frac{3}{4}$ in., $\frac{3}{4}$ in. to $\frac{3}{16}$ in., and $\frac{3}{16}$ in. sand. All batching was by weight with quantities based on the bag of cement.

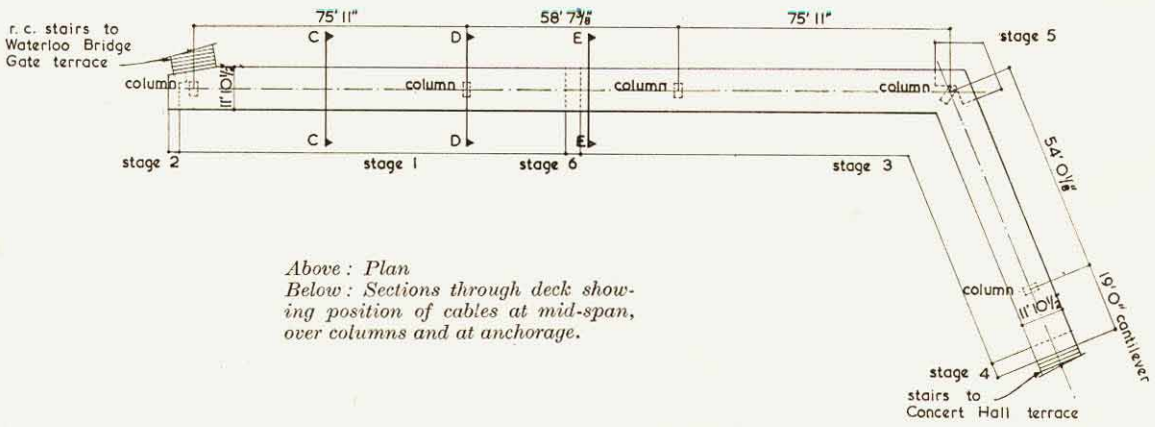
The moisture content of the aggregate was regularly determined by the siphon-can method and the amount of added water adjusted accordingly. Adjustments of the water content were further made as conditions of placing required, the mix being made slightly more workable if congested cables or reinforcement made compaction more difficult. Compaction was carried out by vibration.

Throughout the work slump tests and 6-in. cubes were made several times a day, the cubes being compacted by vibration.

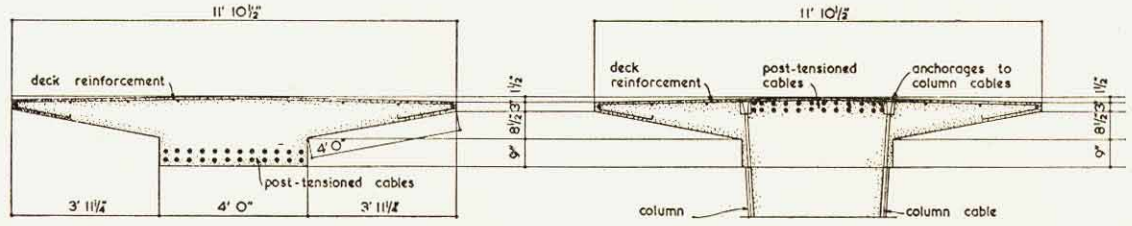
For the topping concrete the quantities of aggregates, based upon one bag of cement, were batched by volume, allowance being made for bulking by determining the moisture content of the aggregates. The materials were mixed and placed by hand. During the work slump tests and 6-in. cubes were made several times a day in the same way as for the structural concrete, the cubes in this case being compacted by hand.

During part of the work fairly severe night frosts were experienced and precautions had to be taken to maintain the quality of the concrete. Whenever necessary the stockpiles were thawed out before work was started in the mornings and the finished concrete was covered by tarpaulins and heated by steam pipes. No concreting work was done during a frost.

Maxwell Fry, Jane Drew and Partners, architects of the Waterloo Bridge entrance, planned this bridge as part of the same design ; the consulting engineers were Ove Arup and Partners.



Above : Plan
Below : Sections through deck showing position of cables at mid-span, over columns and at anchorage.



Section DD

Section EE

THE

Royal Festival Hall

SOUTH BANK

THE CONCERT HALL already standing on the South Bank is only a beginning. Here London is to have what has so long been needed—a home for music, painting, sculpture, theatre, ballet, and good food, in a lovely setting. Our great concert hall is later to have a satellite hall, suited to chamber music, drama or ballet, and an exhibition hall for paintings and sculpture, and the whole is accompanied by what should, if the cooking remains equal to the siting, be one of the most delightful restaurants in London.

The site, prejudice apart, is superb, and imaginatively, the architects have made the most of it. It was a site long derelict, waterlogged, cluttered below ground with the remains of ancient foundations—difficult in every way for building and in any case frequently objected to for a place of entertainment as being "on the wrong side of the river." But its outlook was superb and the new hall, completed in time for the Festival of Britain, has amply justified the faith of its promoters, the London County Council, who commissioned it for completion in time for the Festival of Britain.

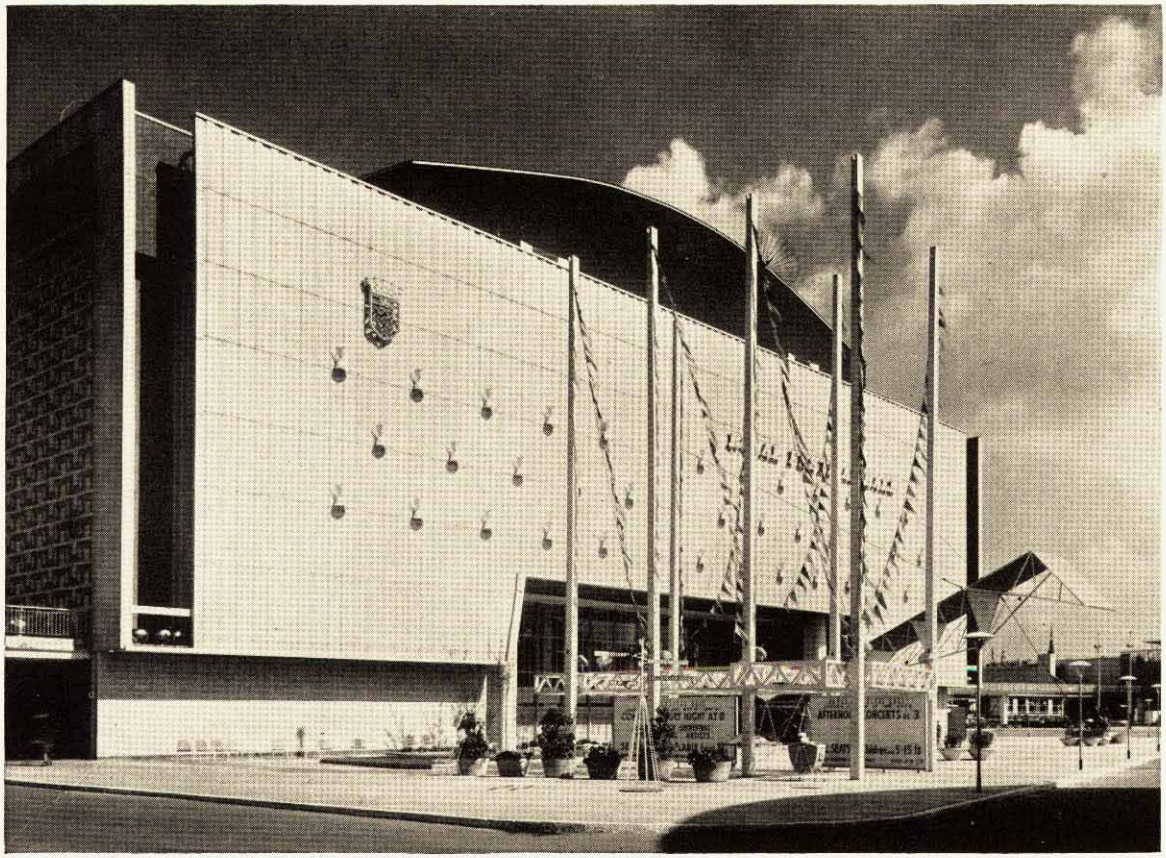
Externally, the concert hall has its critics. Its river frontage, many say, is unnecessarily heavy and fails to express the soaring lightness within. On the other hand, the side—the Waterloo side in particular—almost immediately reveals its structure. The transparent glass screen shows columns rising from ground to curving roof, carrying foyers, terraces and restaurants and, poised in the centre, isolated and insulated, the precious 'egg' which is the auditorium itself, apparent in all its lines—the line of its vaulted copper-clad roof against the sky and the line of its stepped floor hung above the foyer.

Foyers and entrances are generous, spacious, and feel 'right'. From the main entrance, in the east side of the hall, stairs lead on the right to the cloakrooms and, straight ahead, sweep up higher to the great glass-walled 'sunk foyer.' Up wide, shallow steps you go from here to the main foyer with its sunk bar, and at each end of this main foyer a lovely cantilevered flight of stairs leads to the promenade above and to the front stalls entrance to the auditorium.

From the promenades at higher level cantilevered landings seem to float in space, glass on every side, to front, above, below: looking out in front over the glittering lights of the river and the floodlit radiance of the far bank, on one side over the dancing fairyland that is the Festival by night, and on the other, through the upper restaurant, plunging down through space to the lower—the two linked by an enchanting spiral staircase.

The concrete hall, for all its massive foundations 22 ft. below ground, seems nowhere linked to the earth—it floats among the lights and the colours, and raised in the centre of this bubble, sound-proofed by space, is the auditorium, centre of it all.

Here all is restful and quiet. Colours are the muted browns of natural wood, lines are simple and flowing, with only the sudden surprising break of the boxes, like half-open drawers pulled out of the side walls. Does one like these



The rear, or east, elevation of the Royal Festival Hall—a temporary façade faced with asbestos cement sheeting.

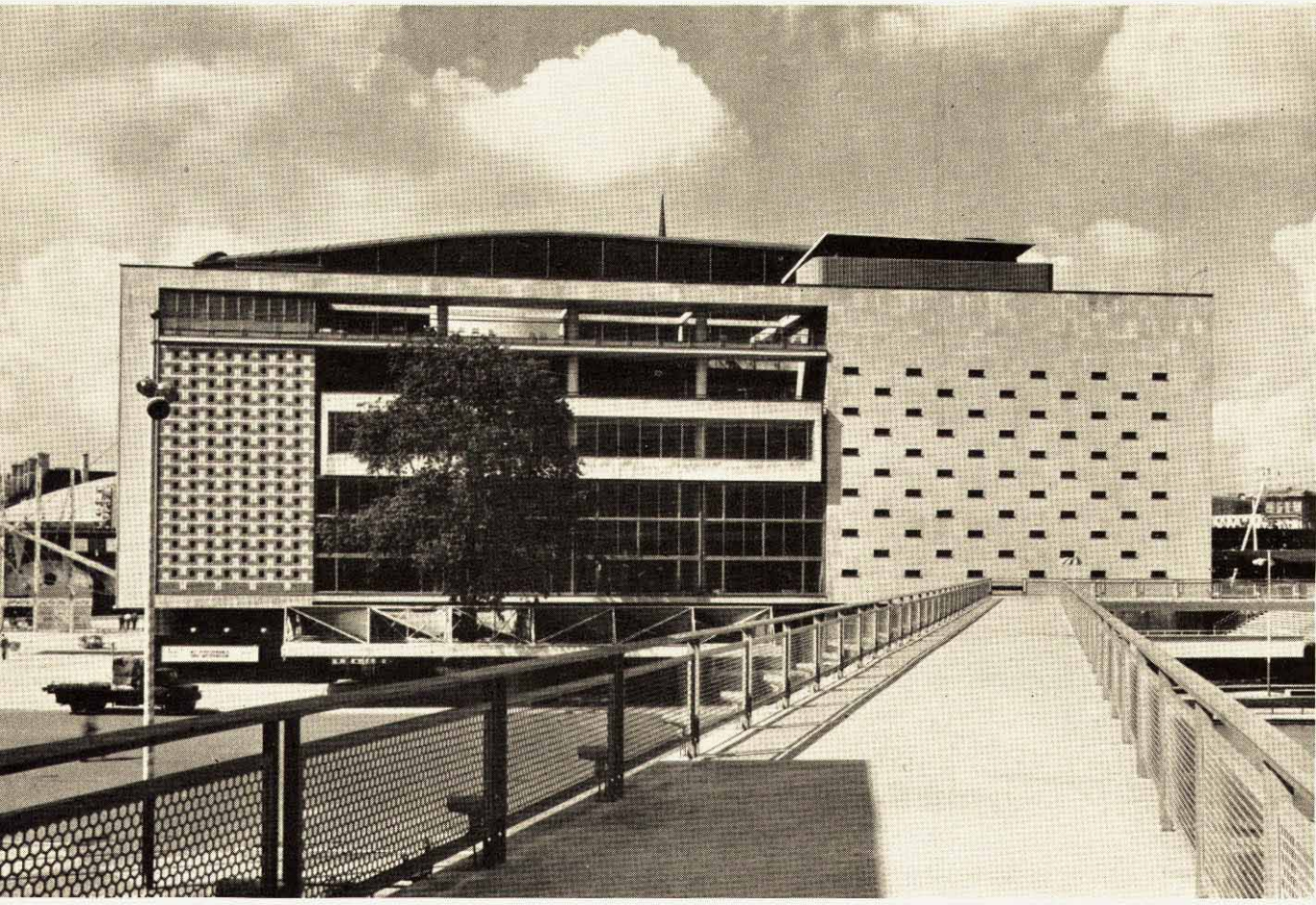
boxes ? True it is, they make a discord in the hall's quiet harmony, but may not that be, as sometimes in music, a good thing ? True, in any case, it is, too, that they are good to see from, good to hear from, and good for the acoustics of the hall in general.

All this brilliant designing has achieved the miracle of insulation, and inside the auditorium is pure music. Underground trains may rumble below, steam and electric trains thunder over the bridge alongside, jet planes scream overhead, but all are blotted out while the last frail thread of a violin's high note fades to whisperless silence. Internal acoustics are as remarkable—an orchestra's crashing fortissimo with brass and drums and cymbals is cut with a knife and a cool clear fiddle draws out of it with not a trace of echo to blur its purity.

This hall, so novel in its design, is yet orthodox in its construction : it is built throughout with reinforced concrete, cast in situ, with steel trusses in the auditorium roof. The only introduction of ' new ' methods has been in a temporary roof over one of the basements, where prestressed beams have been used.

Outside the auditorium, in the ' wing ' portion of the hall, construction is with reinforced concrete floor slabs carried on beams and columns, with the exception only of a staircase and lift-shaft block at each corner. These are built with load-bearing walls and serve as buttresses to give stability to the whole. The auditorium itself, an egg on stilts, has load-bearing cavity walls and is carried twenty-eight feet above ground on slender reinforced concrete columns.

When work started on the site water was encountered three feet below the surface and the first task that confronted the engineers was to de-water it. This was done by surrounding the area with a stockade of well-holes only three feet apart, and each containing a steel pipe connected to a header pipe encircling the site.



The Festival Hall from the footbridge. Through the glass wall can be seen the columns rising from ground to roof, and the superimposed floors of foyers and promenades.

ROYAL FESTIVAL HALL: *continued*

Pumps were installed at each corner.

The nature of the subsoil made deep foundations necessary and the building generally is carried on mass concrete piers carried down 22 ft. to a stratum of gravel. On these piers are constructed heavy reinforced concrete bases which carry the columns and the ground floor slab. Two separate basements, linked by passages, are constructed below the building on either side; their heavy concrete floors are waterproofed with bituminous fabric as they lie below ground water level. The temporary roofing mentioned earlier occurs over one of these basements, which is later to be covered by the small hall, and here precast concrete floor joists have been used, factory-prestressed on the Hoyer system. The remainder of the area between the column bases has been backfilled with earth.

The columns that rise from the massive reinforced concrete bases to carry the auditorium and the different foyer, restaurant and promenade floors are slender, and circular in section. Two only are exceptions: the two 10 ft. by 3 ft. rectangular buttresses that support the 104 ft. span balcony beam.

Eight of the columns carrying the auditorium

at the orchestra, or southern, end have a double duty to perform: they will also act as supports to the smaller concert hall which is to be built immediately below, and so are specially constructed to prevent any conduction of sound from one hall to the other.

The construction of these columns is described as 'annular' or sleeved: the inner, auditorium, columns are carried down to the foundation, while those supporting the small hall are built as a shell around them and have their own separate bases. For further insulation the 2 in. space between the core and the shell is packed with glass silk.

The double auditorium walls are 32 in. thick in all, made up of two 10 in. leaves of reinforced concrete with a 12 in. cavity between. The outer leaf is lined with a 1 in. layer of wood wool.

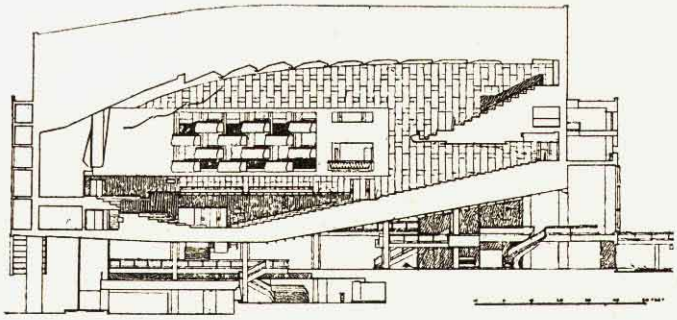
The roof, again, is of cavity construction—two curved concrete slabs with a space between that varies in depth from 3 ft. 6 in. at the springing to 1 ft. 8 in. at the crown. This double roof follows the curve of the steel bowstring trusses that carry it, the inner slab being in fact integral with the steel: the arc of the truss is channel-shaped and was filled with concrete as the roof was cast. The outer slab is simply an extra sound-proofing layer and is raised above the inner by concrete dwarf walls, further insulation being provided by two inches of glass silk draped over these walls before the concrete was placed. The in situ concrete of both leaves was cast on permanent formwork of precast concrete slabs supported on small precast concrete cross-beams.

Except for a small area immediately in front of the orchestra, where special acoustic arrangements are incorporated, the floor of the auditorium is also of cavity construction in reinforced concrete. The steppings that form the tiers of seats are precast concrete units.

So protected, nowhere touching the rest of the building and connected with the earth only by its supporting columns, the auditorium is already sound-proofed, and made ready to receive all the perfection of acoustics developed in such detail within.

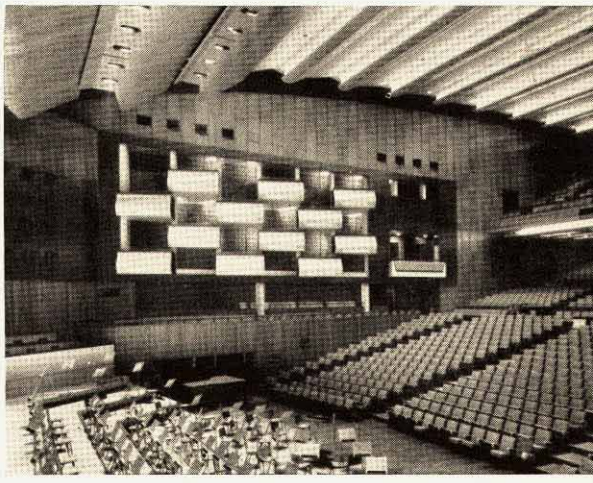
The balcony is constructed as a quadrilateral box of which the deep face constitutes the main girder carrying vertical loads and the box itself acts as a torque member to carry loads whose centre of gravity does not coincide with the geometric curve of the main girder. The main girder is framed into massive rectangular buttresses with which it forms a rigid frame. The balcony tiers are, like the stalls, formed of precast concrete stepping units.

Every detail within the auditorium is considered for its effect on acoustics: not only the lines of walls and ceiling, the rake of the floor, the jutting boxes, but the light fittings, the upholstery, the flooring and carpeting; not only the perforations in walls, ceiling and fronts of boxes, but perforations in the underside of seats, that absorb the sound when the seats are



Longitudinal section.

(Photograph by courtesy of THE BUILDER*)*



The interior of the auditorium.

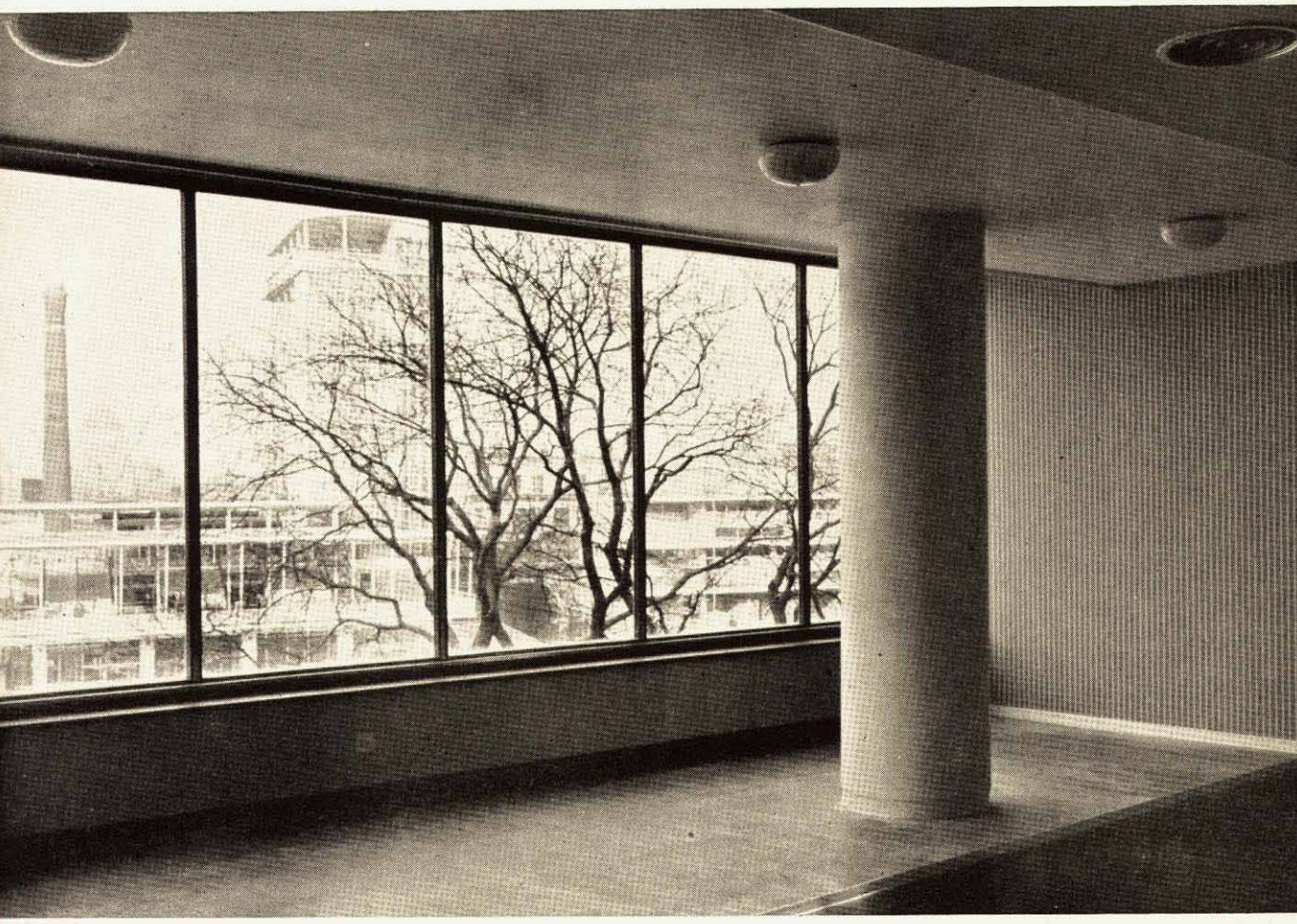
The reinforced concrete spiral staircase that links the upper and lower restaurants.

ROYAL FESTIVAL HALL: *continued*

tipped up. Wall finishes have had the same detailed thought: the candlewick hangings behind the boxes—like them or not—serve the same purpose, as do the smooth and lovely woods and the padded leather that line the rest of the walls.

In the promenades and foyers finishes are chosen for beauty alone. Notable is the polished greenish-grey Derbydene fossil stone that faces so many walls, and also part of the riverside façade. The same stone, unpolished, is used in places for flooring. Cast stone slabs pave the entrance.

This concert hall will be a credit to London—



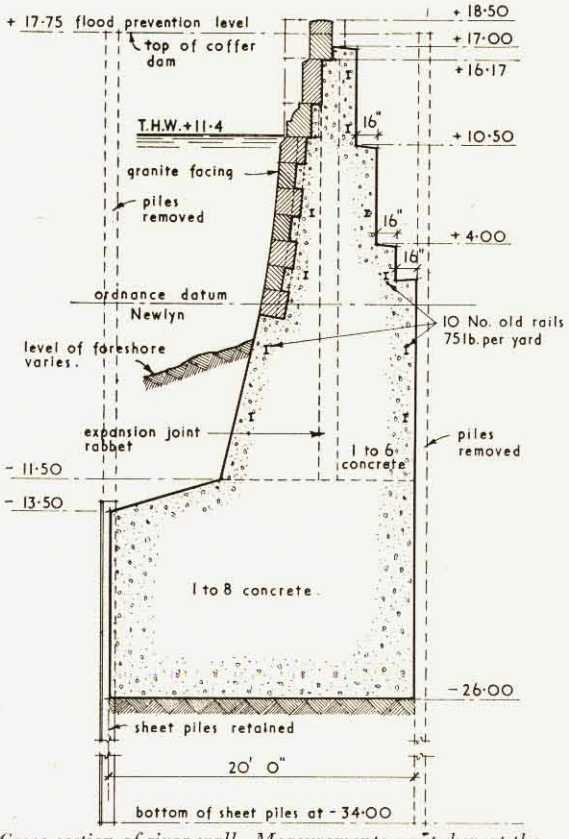
The Committee room, looking towards Waterloo Bridge Gate Pavilion, with St. Paul's cathedral in the distance.

and Londoners seem to feel a sense of what is due to it: it is not insignificant that more evening dress and *careful* dressing is to be seen there than at any other place of entertainment in town—not excepting Covent Garden! It is spacious, leisured; its broad lines have a fine grandeur—and its detail is beautiful, not with the extrinsic beauty of most theatrical ornament, but with the intrinsic beauty of pure design—of engineering. Witness, for instance, the cantilevered dog-leg stairs that link the foyer with the upper promenade; witness the charming staircase that links the two restaurants—terrazzo treads poised on a central spiral of reinforced concrete. Witness, again, the shining beauty of the unornamented finishes, the ingenuity of the lighting. . . . The foyers and promenades are essentially social—and sociable; and inside the auditorium is a pin-point concentration on music. This, surely, is the very function of a concert hall.

Architects: Robert H. Matthew and J. L. Martin, architects to the London County Council.
Consulting Engineers: Scott and Wilson.
Contractors: Holland & Hannen and Cubitts Limited.
Acoustic Consultants: Hope Bagenal and members of B.R.S. staff.

THE NEW RIVER WALL

Lambeth



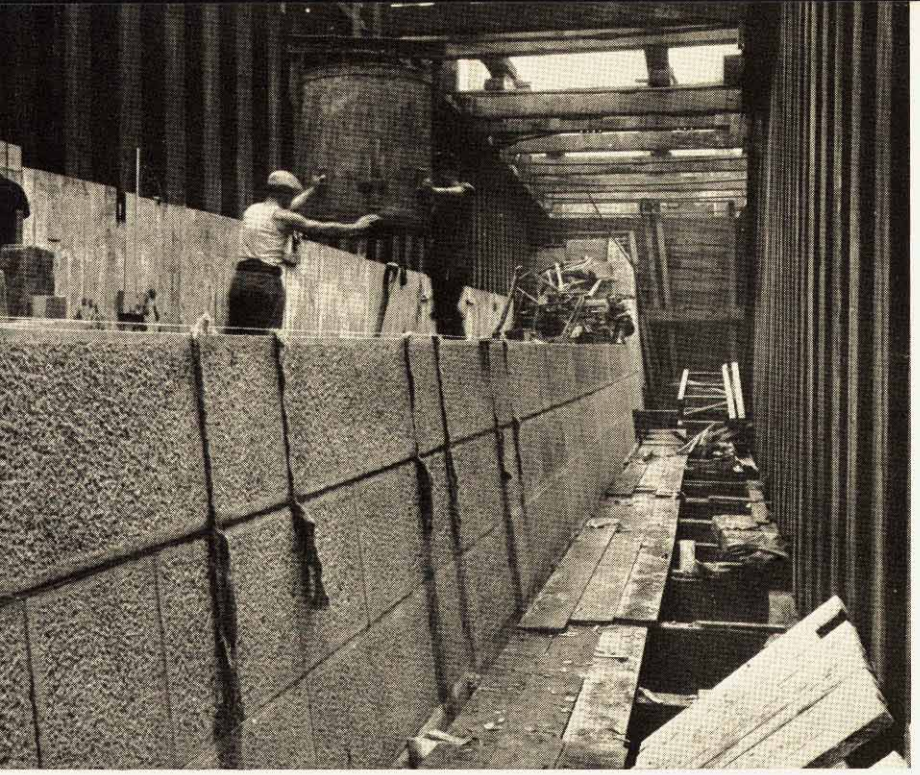
Cross section of river wall. Measurements are taken at the largest point and reduce towards the downstream end.

ON THE 17TH JANUARY 1949 work on the new South Bank river wall was inaugurated by Mr. Herbert Morrison. In the course of the ceremony, the Chairman of the London County Council (then Mr. W. R. Owen) described the new work as the first major contribution to the County of London plan for the reclamation of several miles of riverside, now " disfigured, desolate or inaccessible." Mr. Morrison for his part stressed the value of the new embankment to the coming Festival of Britain, and spoke of the happy buildings which in his mind he already saw arising on " this site that we are winning from the river and from dereliction."

The new river wall is in fact serving two purposes—the immediate one of providing an enchanting riverside promenade for Festival goers, and at the same time the long-term one of London planning, the need for which did not originate with, but was merely intensified by, the blitz.

The new embankment stretches from County Hall to Waterloo Bridge, a length of some 1,700 ft. Its curve does more than follow the line of the old foreshore—it stretches beyond, an average of 110 ft. into the river, reclaiming an additional 4½ acres which has been filled with some 108,000 cu. yd. of rubble, much of it the product of the war-time destruction of London.

The wall is a mass concrete structure faced with Cornish granite. It was built within a coffer dam of steel sheet piling driven down to a depth



(Photograph by courtesy of THE ENGINEER*)*

Concreting the river wall within the sheet piling coffer dam ; granite facing blocks are used as permanent formwork.

that varies according to the nature of the subsoil between 24 ft. and 34 ft. below ordnance datum. The trench within the coffer dam was excavated by grab, the spoil (except the ballast, which was used for filling) being taken away by lorries.

The concrete wall is 20 ft. wide at its base (26 ft. below datum) at the upstream end where it is founded on clay, and 15 ft. wide at its base (14 ft. below datum) at the downstream end where it is founded on ballast. Above the −11 ft. 6 in. level it is reduced in thickness, at the back by three successive steps and at the front by a curved batter.

Rebated expansion joints—nine in all—are provided at intervals of about 180 ft. They are formed by a $\frac{3}{4}$ in. gap filled with elastic filler and covered at the back face of the wall and over the toe by precast concrete slabs 8 in. wide, 3 in. thick and about 3 ft. long.

The concrete in the 20 ft. wide base of the wall is a 1 : 8 mix ; above that it is 1 : 6, and here old rails are inserted longitudinally near the surface. The water-cement ratio was kept constant at 0·8 and the moisture content of the aggregate was determined daily, or more frequently when necessary.

The cement was delivered in bulk, in $2\frac{1}{2}$ ton steel cylinders with hopper bottoms. These discharged direct into the elevator which filled the cement bins above the batching plant.

The aggregate was all-in ballast of 2 in. maximum size, screened and graded at the pits and delivered by barge.

Timber formwork was used for the back face of the wall, and large quantities of timber were also absorbed in the struts to the steel walings and in the stagings protecting the coffer dam. The greater part of this timber was obtained from the dismantled emergency bridges that crossed the Thames during wartime.

The Cornish granite which faces the wall above the level of the river bed was used as permanent formwork for this part of the structure.

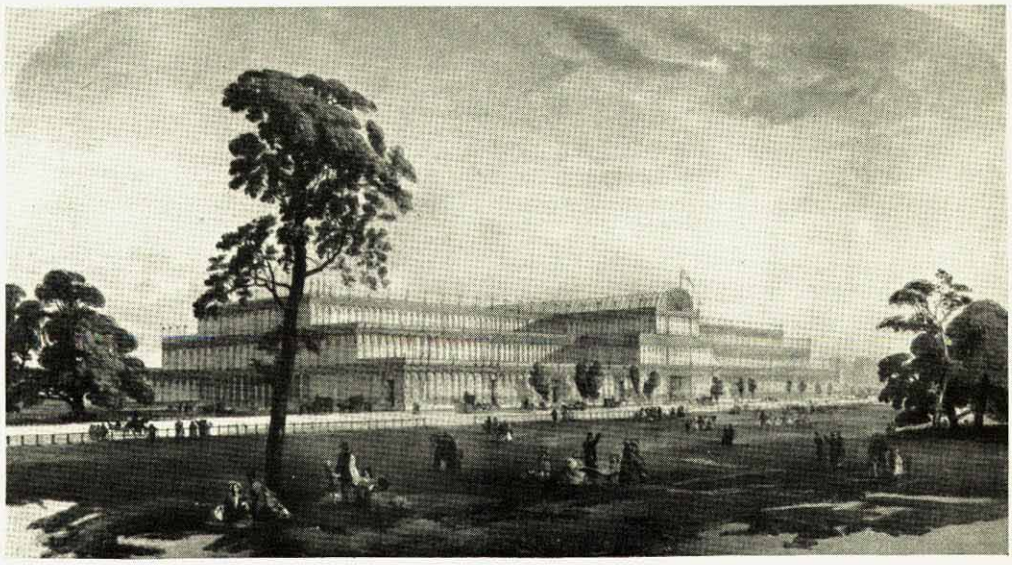
The only break in the sweeping curve of the embankment is a double flight of waterman's steps about midway between Waterloo Bridge and Hungerford Bridge—opposite what is now the Festival Seaside exhibit.

An open handrail completes the wall—more sympathetic to river-gazers than the heavy stone parapet on the opposite bank, and more suited, certainly, to the Festival mood of the embankment's inaugural months.

Work on the wall was completed in September 1950—three months ahead of schedule. The designer was J. Rawlinson, M.I.C.E., chief engineer of the London County Council, who was also responsible for erection. The Council's architect, T. A. Matthew, advised on the architectural treatment. The contractors were Richard Costain Limited.

The South Bank and river wall from Waterloo Bridge.

THE GREAT EXHIBITION



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THERE IS AN ALMOST IRRESISTIBLE temptation to draw a parallel between the Great Exhibition of 1851 and its centenary in 1951—because parallel there has been. The delays, the difficulties, the last minute despairing scrambles and the ultimate barely-hoped-for triumphs were common to both, and so was the attitude of the people who watched both grow—some violently partisan, some violently antagonistic, most completely indifferent.

Prince Albert's high-minded aim was " the brotherhood of man " and the propagation of " industrial education ". The Great Exhibition was to show the world's best, not only in decorative art but in industry, and so educate public taste. Our own Festival aim has undoubtedly been less high-minded, but insensibly the

education has been there, in this exhibition that not only shows our best achievements but houses them in the best of our modern architecture.

It is interesting to remember that the 1851 Exhibition grew out of the Annual Exhibitions held by the Society of Arts (as it was then), and that this Society was foremost in making Prince Albert's inspired idea of a World's Fair an accomplished fact. Fittingly, it was again the Society, now " Royal," which first advocated a Centenary Exhibition for 1951.

Prince Albert's scheme was launched with Government approval and at first enjoyed the support of the all-powerful *Times*. An Organizing Commission was set up that included many well-known names in politics, art and engineering, and after much discussion Hyde Park was chosen as the site.

It was not long, however, before trouble began. First blast came from the House of Commons and from Colonel Sibthorpe, the Member for Lincoln, who constituted himself protector of the Hyde Park elms, foreshadowing, in his wrath at the whole affair, the critics who arose a century later to inveigh against the Festival of Britain. " For what were they to be cut down?" he thundered in the House. " For one of the greatest humbugs, frauds and absurdities ever known. " The Government was " guilty of demolishing valuable public property" and it was this cry, perhaps, that led *The Times* to change its attitude and prophesy that the Exhibition in Hyde Park would bring disaster to Kensington.

Next difficulty arose over the design of the building. Design by competition, considered but discarded in 1951 as being too extravagant of time, was the first solution attempted in 1851. None of the designs submitted was, however, in the least satisfactory ; a ponderous building evolved by the Commissioners themselves was, if anything, worse and would have cost far more than subscriptions could provide. It was at this stage that Joseph Paxton appeared on the scene.

Paxton was no architect, nor even, by profession, an engineer. Starting as a gardener's boy at the Royal Horticultural Society, he had by the time he was twenty-three become head gardener on the Duke of Devonshire's Chatsworth estate. But Paxton was an engineer by instinct, and his delight at Chatsworth had been the development of greenhouses with larger areas of glass and lighter sash bars than had ever before been attempted, and ten years later— in 1837—he was building a great conservatory for the Duke and winning the Society of Arts medal. By 1850 he was a recognized personality in engineering circles.

Through his friend Barry, architect of the House of Commons and member of the Exhibition Building Committee (which included among others Brunel and William Cubitt, founder of the firm that bears his name to-day), Paxton heard of the Commission's difficulties and offered to submit plans for a building. The offer was accepted and the plans were produced, complete, within ten days.

Paxton's building was to be entirely prefabricated, demountable, with interchangeable parts, of iron, wood and glass only. With its 2,150 cast iron girders, its 272 roof trusses, its 205 miles of sash bars, its 900,000 square feet of glass and its ridge and furrow roof, it was a gigantic version, covering 800,000 sq. ft., of the Victoria Regia lily house at Chatsworth. It was as modern as the minute, it was new and unexpected ; it was the kind of thing the die-hards hate, and it was unimaginably succesful. And it was cheap. The tender, at £79,800, was some £20,000 lower than for any previous design. The contractors, Fox and Henderson, (the South Bank's overall consultants, Freeman, Fox and Partners, are their direct descendants) undertook to have the building ready by January 1851, for the Exhibition to be opened the following May.

For greater security the hollow cast iron columns forming the walls and galleries were founded on concrete. A letter written on September 27th 1850 informed the Prince's aide-de-camp that : " The first of the iron columns was erected yesterday and 18 or 20 will be up tonight. The iron columns stand upon concrete, instead of being placed upon timber ; and these concrete foundations go down to the gravel, the clay or soft mould being first dug out. Thus the iron columns will stand on firm foundations."

When, during the last war, shelters were being dug in Hyde Park, workmen encountered remains of these concrete foundations, and a piece of the concrete can now be seen in the Victoria and Albert Museum.

Every imaginable test of stability was made on the building as it went up. The galleries were tested under the weight of workmen walking, running and jumping on the floor, but still there were prophets of doom. Colonel Sibthorpe continued to maintain that the building was unsafe so the Guards were drafted in to parade in force, and finally a machine was designed which produced a load of 100 lb. per sq. ft. at walking pace over the galleries.

Once again, the Colonel found his counterpart a century later, when it was publicly stated that

the South Bank was being made a danger spot and that if more than 20,000 people visited the exhibition there might be a disaster. But not only, fortunately, in its unfavourable aspects did history repeat itself. As in 1951, so in 1851, the Exhibition brought not the promised crime, disease and disaster, but gaiety and brightness, to London. Houses and shop fronts were re-painted and decorations brought colour to shabby streets. The Crystal Palace itself with its paint of yellow, red and blue, its sunblinds, its gleaming glass, its fountains, was a delight to every visitor. After the usual British disapproval of anything new, particularly in architecture, and a spate of chilly misgivings, Britain took to the new style and loved it—as, on the South Bank, Britain faced with modern architecture that it had always mistrusted, suddenly found it enjoyed it.

Its contents were equally a revelation. Workmen up from every corner of the country gazed in admiration at the work of their hands and their machines. Those machines themselves filled the Victorians with amazed admiration. It was the triumph of steam, the triumph of mechanics, of new methods and new materials.

Among the new materials was Portland cement.

It was less than thirty years before that Joseph Aspdin had taken out a patent for the new cementing agent which he called " Portland cement ". Incidentally, Aspdin's original patent is on view at the " Minerals of the Island " pavilion at the South Bank Exhibition this year—an impressive document weighted with a massive waxen seal, lent by the inventor's great-grandson for the duration of the Exhibition.

In 1851 Aspdin's cement manufacture was largely in the hands of his son William, partner in the firm of Robins, Aspdin and Company, exhibitors of Portland cement at the Great Exhibition. Their exhibit included " a gigantic slab of Portland cement, measuring 20 ft. by 12 ft. and 10 in. thick, weighing 15 tons; numerous blocks of cement and concrete, proved to various pressures up to 154 tons, showing the strength to be greater than that of Portland stone; of bricks cemented together and placed so as to give a pressure of 3 tons on the first brick; and of several other similar illustrations."

Another British exhibitor of a " Portland " type of cement was J. B. White and Sons, who showed, among other items, a block of concrete which, at least until just before the war, could still be seen in the London offices of the Concrete Utilities Bureau, forerunner of the Cement and Concrete Association.

Both firms were awarded Prize Medals by the Jury. Considerable rivalry arose between them, however, as to the merits of their respective exhibits, and they eventually put them to the test by organizing a series of experiments which were carried out in the presence of the Jury and a " number of scientific gentlemen."

First in the ring were White and Sons with nine experiments—mainly comparisons between Portland cement, either neat or used as a mortar, with other cements used in a similar way.

The *pièce de resistance* of White and Company's experiments was a beam constructed of ten courses of hollow bricks cemented together with Portland cement and strengthened by 15 lengths of hoop iron, which was loaded up to 62,800 lb. before it broke in two.

Robins, Aspdin and Company's experiments were similar though not identical. Most of their specimens were on a larger scale than White's, though none so large as their brick beam. This, however, was later castigated by William Aspdin in a booklet issued by his firm as " a brick and iron beam—so much hoop iron was there embedded in the courses." Aspdin's successors, in fact, expressed horror that such a " worthless article " should have been described as Portland cement.

Robins, Aspdin and Company's tests were devoted less to comparison than to proving the strength of their product. As blocks it was crushed and " pulled asunder " by being weighted at the bottom; as beams it was broken by application of a weight at the centre, or, cantilevered, by a weight at one end.

The Jury, having seen the two series of experiments completed to their satisfaction, placed on record the view that " they fully prove the value of the peculiar material known as Portland cement, and its great advantage over the Roman or Parker's cement."

Nothing could more appropriately illustrate the development of concrete in the last hundred years than a comparison between these two Exhibitions—Hyde Park and South Bank. The invention of Portland cement gave concrete—that inconsidered material—an impetus it has never since lost, and Portland cement concrete, at Hyde Park the new material to be exhibited as an interesting novelty, is on the South Bank the workaday stuff that is used as a matter of course to house the exhibits.

Illustration from an original lithograph in the Victoria and Albert Museum.

CONCRETE SCULPTURE

in the Festival exhibitions

TWO YEARS AGO Londoners first saw an exhibition of modern or near-modern sculpture in Battersea Park, and realized, perhaps for the first time, the gain that comes to sculpture by being freed from the walls of a gallery and set in the open and in the light and air.

This Festival year a similar exhibition is again being held in the peaceful green setting of Battersea Park's tree-shaded lawns. As before, this exhibition is international, and covers the work of the last fifty years.

On the South Bank is another exhibition of sculpture, scattered, this one, almost casually among the crowds and the picnic baskets, the publicized buildings and exhibits. Here the artists were all British, and the works were all created for this particular purpose and this particular setting.

Together the two exhibitions provide a remarkable display of modern plastic art—the one restrospective, the other ' purpose made '—and, more unusual, a remarkable example of the use that modern sculpture is making of concrete. Between them they show seven works in concrete by seven different sculptors, and anyone interested in the planning of public places, the decoration of buildings, or simply in the development of modern art as a practical proposition, should make a point of noticing these works while there is yet time.

The technique adopted by the different sculptors, while it has a basic similarity, differs widely in detail. In every case it is the personal development of the artist, to a great extent experimental, and as such highly interesting. It is for this reason that *Concrete Quarterly* has asked each of the artists to contribute details of his—or her—methods of working and at the same time to add an explanatory note on the significance of the sculpture itself, from the artist's point of view.

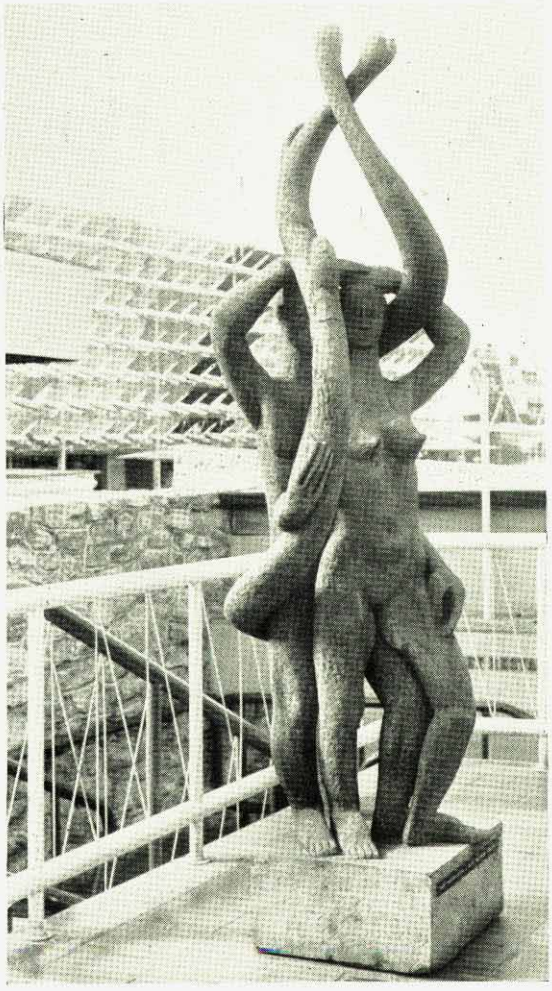
At the South Bank there are four concrete works, two by women and two by men, two free standing and two in relief on the walls of buildings.

ROOT BODIED FORTH, by Mitzi Solomon Cunliffe, stands on the terrace of the Waterloo Station building. This terracotta-coloured group was first modelled in clay over a heavy wire armature. A plaster mould was taken from this original, and a concrete cast was made, consisting of one part Portland cement to two parts spar, with a proportion of red oxide added. The mould was made up in sections and the front portion (the front of the woman's body) was filled with a fairly dry concrete before the remaining sections were added. The mould was then completed, $\frac{1}{2}$ in. and $\frac{3}{4}$ in. reinforcing bars inserted, and the whole turned upside down and filled with concrete of a pouring consistency.

When de-moulded it was found that, with the exception of the front portion, the cast was not sharp enough in detail, and the artist spent many weeks re-modelling the entire surface of the sculpture by adding fairly dry concrete with small spatulas.

Mrs. Cunliffe considers this method of working suitable only for a temporary sculpture. For a permanent work, to be set up in the open air, she recommends making a very rough model in clay and casting it in Portland cement concrete. This concrete could then be carved in the same way as a stone carving, exposing the aggregate and giving the concrete not only a more durable but a ' livelier ' surface.

Mrs. Cunliffe has explained as follows the



Root Bodied Forth, by Mitzi Solomon Cunliffe

symbolism of ' Root bodied forth ' :

" It represents Man at one with Nature. It is man, woman and a growing thing. I want it to be all growing things, not just a particular tree, and therefore it may not look like a tree at all. I particularly wanted the arms and legs and trunk and branches to be similar, almost interchangeable forms, so that buds, breasts, buttocks and the backs of the heads are harmonious variations on a basic burgeoning shape. This similarity and overlapping of shapes which may be confusing, though evident, to the layman is part of my aesthetic plan. This subject matter was selected because the sculpture is in the section of the Festival devoted to the people and the land, and I wanted the gate sculpture to announce a positive mood of growth and potential."

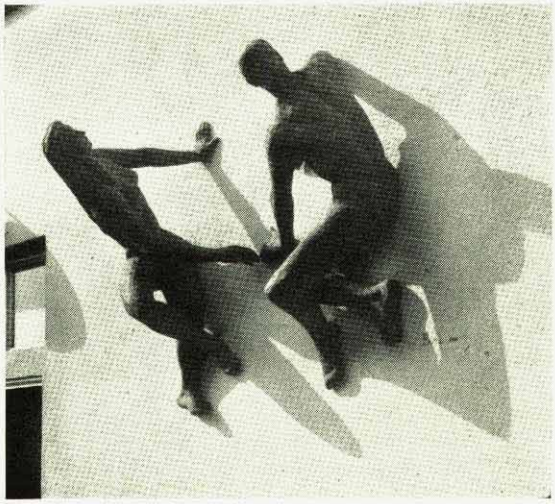
STANDING GIRL, (in front of the '51 Bar) by Daphne Hardy, is a tender, delicate figure, standing with one hand outstretched and one raised above her head.

The statue was modelled in clay on an armature, a mould taken from this and the statue cast in a concrete consisting of one part white cement, one part sand and one part white and cream marble chippings. The mix was used very dry, and rammed into the mould.

The figure was reinforced with a 1-in. bar through each leg and smaller bars in the arms and head.

Miss Hardy's views on concrete as a medium for sculpture are best expressed in her own words:

" I think concrete is a most useful material for sculptors— particularly for those who are really ' modellers ' rather than sculptors, and who otherwise have a choice of fragile plaster, expensive bronze, or terracotta as a final material. Terracotta has the disadvantage of imposing certain restrictions on design and size. Concrete, on the other hand, is cheap, weatherproof and strong, and if suitably reinforced allows a certain freedom in composition. It also provides a great variety of colours and textures and can be carved and in some cases polished like stone if required."



Mural by L. Peri

Daphne Hardy designed her figure in close relation with its intended background. "A graceful and friendly personality" is her description of the girl she was creating, and its lightness and slenderness is very much in line with the lightness of the bamboo and flowery terrace behind.

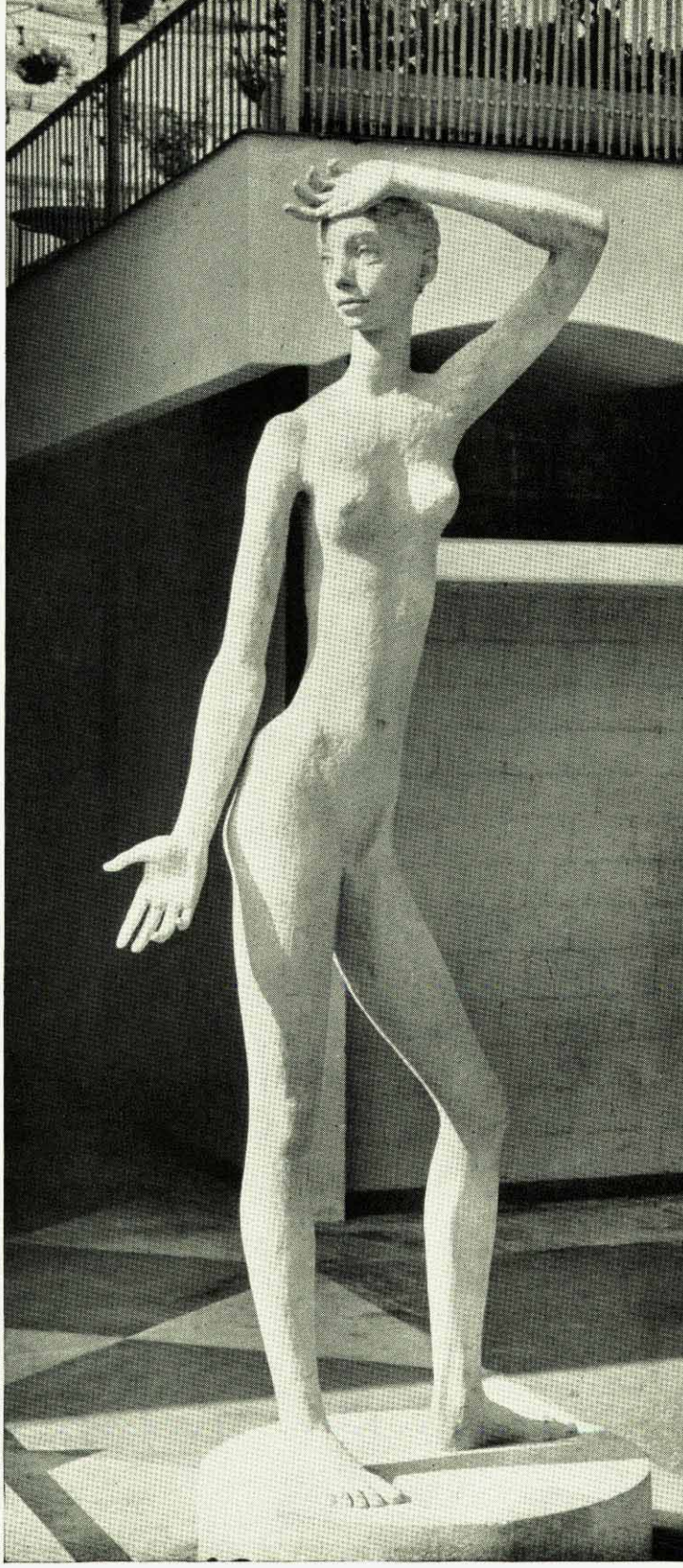
THE MURAL SCULPTURE by L. Peri, on the north wall of the Waterloo Station building, might be an aerial view of a man and a woman resting, perhaps, on a sandy beach.

This sculpture, two figures jutting far out from the wall to which they are attached at a few points, is a new departure in relief work. It is, in fact, almost sculpture in the round, and it is modelled direct on the background. Mr. Peri has developed a technique all his own in this new method of using concrete for sculpture and he feels it has great possibilities. The mix he used for this particular work was one part cement, one part sand, and one part coarse aggregate, but he makes it clear that the proportions would vary according to the size of the sculpture, the finish required, and whether it is to be placed indoors or in the open air.

Mr. Peri is one of the pioneers of concrete sculpture. He started experimenting with methods of modelling in concrete in 1920 and held an exhibition of this form of sculpture and reliefs in 1922 in Berlin, and in London in 1935. Since then his technique has developed greatly in sureness and originality, and his years of experiment have confirmed him in his belief in concrete as a medium for the sculptor. Here are some of his impressions :

"The sculpture, which gets stone-hard during the process of modelling, retains the freshness of conception and is a unique work as a carving. The colour, which always played an important part in sculpture in the past, is not painted or sprayed on the surface but is a part of the texture. The reliefs can be modelled directly on the wall, and figures can be built up in the open air. There is no limitation to the size possible ; large or small (less than 12 in.) figures can be modelled by using different aggregates.

"There is no time limit to the work on a concrete sculpture—it can be done in a day or worked on for a year. The difference is only that what can be done in minutes in the first week, takes many hours a month later. There is no restriction on the type of sculpture possible. The use of a medium in a new way leads to new



Standing Girl by Daphne Hardy

Figures of Industry, by Karel Vogel

formal developments."

With regard to the group on the Waterloo Station building, Peri says :

" The figures jutting out from the wall enrich the flat surface of the architecture, and the whole group can be seen and appreciated at once. The group in its relation to the neutral wall attracts the eye. The ' unusual ' angle is easily accepted, as people have become accustomed to it through aerial photography."

FIGURES OF INDUSTRY, by Karel Vogel, stand in relief on the river end of the Power and Production building. These three large figures were modelled and cast in the studio. Clay models were first made and the mould cast in sections. The sections were joined together,

the seams carefully made good before casting, and the mould shellac'd and greased.

The concrete, a 1 : 3 mix of white cement and a mixture of silver sand and ordinary washed sand, was used fairly dry and was compacted by hand.

The figures are hollow, the concrete shell being about 1½ in. thick, reinforced with expanded metal, and the whole further reinforced with iron bars which at the same time serve to fix the figures to the wall.

The concrete was left in the mould for a week to mature, and when de-moulded it was found that no re-touching was necessary. The figures were then left in the open exposed to the weather, and were placed in position three weeks later.

The method of fixing is interesting. To make sure of the correct position, templates were made of the outline of the figures while they were still in the mould and slots cut in the template to give the position of the reinforcing bars which would attach the sculpture to the wall. The templates were then positioned on the wall and the carrying brackets concreted in. The reinforcing bars in the sculpture are hooked to these brackets.

Mr. Vogel has explained that the three figures together symbolize the industries : the flying figure at the apex conveys the speed and movement of electricity ; the contemplative figure on the left expresses the comparative quiet of the light industries ; the more forceful one on the right represents the heavy industries. The style is a combination of the new and the traditional—close enough to the traditional to be comprehensible to the layman, yet creating something novel in the rhythm and form of the composition.

Karel Vogel is in charge of the Sculpture Department at the Camberwell School of Art, and throughout this work he was assisted by several of his senior students who worked on the making and the casting of the figures.

There are three concrete sculptures at Battersea Park—" Girl with Fish," by Frank Dobson, " Mother and Child," by Willi Soukop, and " Standing Figure," by Bernard Meadows.

GIRL WITH FISH, by Professor Frank Dobson, C.B.E., A.R.A., is a statue of a seated girl holding a curving fish against her knees.

Girl with Fish, by Frank Dobson

The figure was first modelled by the artist, a mould made and the figures cast in a concrete consisting of two parts aluminous cement and six parts of coarse silver sand, mixed with one part of water.

The cast is hollow. The mould was made up in sections and each section coated on the inside with the concrete to a thickness of about one inch. The sections were than assembled and the joints made good from inside.

As Professor Dobson points out, a number of sculptors have worked and are now working in concrete, but they have worked individually so that no tradition of technique has ever been established. Frank Dobson, however, is Professor of Sculpture at the Royal College of Art and his students are getting the benefit of his experiment and his experience. He is enthusiastic about concrete as a medium for sculpture. As he says, "The sums of money available for sculpture on contemporary buildings seldom allow for stone carving, and scarcely ever for bronze, but concrete work can be produced fairly quickly and at reasonable prices." In any case,

he says, concrete is more in harmony with present day architectural developments, and he believes that concrete sculpture has an important future.

MOTHER AND CHILD, by Willi Soukop, is unusually interesting from a technical point of view, consisting as it does partly of cast and partly of directly modelled concrete, the latter being added to concrete already ten years old.

The sculpture was begun in 1939. It was modelled in clay, a mould taken and a concrete cast made with a mix of one part of red coloured cement to two parts of red marble aggregate. No sand was used. The cast was reinforced. The mix was used fairly dry and rammed into the mould which had first been shellac'd and oiled.

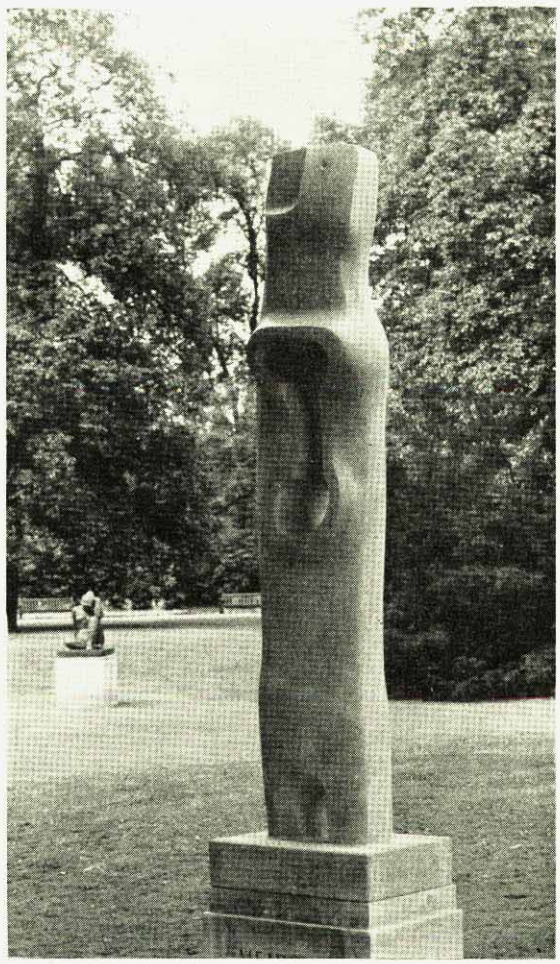
On de-moulding it was found that the cast was rather porous and it had to be filled in before being polished. On completion the surface had the appearance of polished granite.

This original figure was of a woman alone, and in that form the sculpture remained in the artist's studio for ten years. It was two years ago that he decided to re-design the sculpture and create a mother and child group. With a hammer and chisel he knocked off the head, one arm and part of the body, then drilled holes into the old concrete and cemented in irons to reinforce another head and arm and the body of the child. These new portions were modelled directly in concrete, the mix used being red coloured cement, $\frac{3}{16}$ in. black granite aggregate and ordinary sand. The head was built up on a strong iron and wire armature and modelled with comparative ease—Soukop says he enjoyed the speed with which it had to be worked. Most shapes were built up in two or three stages. First a rough central shape, or core, which was allowed to set slightly before the next stage, the finer shaping, was carried out, possibly a day later. By keeping the work covered with a wet cloth it was possible to continue for several days. The ten-year-old concrete and the new joined perfectly and invisibly.

The soft broken colouring of the sculpture was obtained by painting the concrete with white cement paint mixed with a trace of black pigment. The surface was than rubbed down and polished to give the warm patina of the present work.

Willi Soukop feels that concrete is a most interesting material for the sculptor, but that to give its best it should be used in an unconventional and imaginative way—then it will prove responsive and wonderfully versatile. Though, like Professor Dobson, Soukop recognizes that a sculptor's experiments are individual and rarely scientific and are therefore difficult to repeat.

The significance of this group is implicit in its ovoid shape—the cycle of womanhood, the egg, the woman, the child, motherhood expressing both body and spirit. This inspiration is curiously symbolized in the actual development of this group—first the woman form alone, and then the child created as part of her own body, the whole enclosed in the flowing egg-like shape.



Mother and Child by Willi Soukop.

Standing Figure by Bernard Meadows.

THE STANDING FIGURE, by Bernard Meadows, was modelled by the sculptor, a mould taken, and the concrete cast and finally polished. The plaster mould was made in six separate pieces—one 7 ft. 6 in. long for the back, with five, of an average depth of about 18 in., forming the front. Before being filled the mould was painted on the inside with a mixture of wax and paraffin, and it was filled upside down, a section at a time, starting with the head.

The concrete was a 1 : 3 mix of rapid-hardening cement and washed Thames sand, $\frac{3}{16}$ in. down, and used very dry. It was placed in layers of about 6 to 8 in. at a time and compacted entirely by hand, the whole figure being completed with about ten separate mixings of concrete, each separate mix having its cement, sand and water carefully measured.

The figure was reinforced with one U-shaped rod $\frac{3}{8}$ in. in diameter suspended from the base of the legs by a stick across the top of the mould and held in position until the concrete was built up around it.

Each front section of the mould as it was added was closely fitted to the back with a scrim binding and joints filled as well as possible. After filling, the figure was kept in the mould for fourteen days, the whole being kept continuously damp during that time. After de-moulding the joints were made good and any necessary patching carried out. These patches were then cured for a further fortnight.

The concrete was left to mature for three months before being polished. Polishing took Mr. Meadows and an assistant a week to complete. Initially it was carried out with coarse carborundum and then with progressively finer carborundum, and was finished with snakestone. A final rub with emery cloth gave an extra shine to the high points. The finished work has a beautiful close, smooth texture and a granite hardness. No visible trace remains of any patching or re-touching.

Mr. Meadows contributes this note on the development of his work :

" One starts," he says, " with a ' form idea ' which is exciting as form and which has some human element. The idea develops and is composed, parts being modified or changed to give the whole a sculptural power, impressiveness and monumental quality, but still retaining the original ' form idea ' which was the point of departure—in fact, the whole reason for doing that piece. The human element which is inseparably bound up with the form is there all the way through because one is human : those qualities—how people stand or hold their heads, the richness and variety of human forms impress themselves perhaps subconsciously on everything one does, and if they weren't there one would miss them because the forms would be dry and empty.

" If, as in the present work, one is designing in plaster in order to cast later in concrete, the technical limitations of the concrete must be considered all the time in the same way as if one were designing a model for bronze, stone or wood, when these materials would dictate to a certain extent the ' form idea ' which would be suited to them."

In a ' Profile ' of Henry Moore, the *Observer* recently said : " It is almost impossible to visit the South Bank Exhibition without contrasting the gaiety and confidence of its architecture with the solemn and self-conscious air of its more advanced sculptural exhibits. What a pity that sculptors do not need to work with other people such as constructional engineers, to seek buyers before they start work, to contend with genuinely functional problems!"

One may agree or disagree with the writer, but certain it is that the four concrete sculptures at the South Bank would be exempt from his criticism. They are none of them either self-conscious or solemn, but look very much at home in their present surroundings. Furthermore, their authors *have* had to work with other people—with the architects who commissioned them, and *have* had to contend with a general functional problem—that of using an essentially structural material.

At Battersea the artists have been freer of outside responsibilities but the essential feeling of ' being in touch ' is there. Frank Dobson's ' Girl with Fish ' has an unmistakable architectural quality ; Soukop's ' Mother and Child ' has a touching spontaneity that speaks straight to the heart. Meadows, the disciple of Henry Moore, has in the quality and finish of his material achieved a mastery of a functional problem in a way that any engineer would be proud of. His concrete gives pleasure for its own sake.

From these seven different works and seven different methods of working should grow something of value—not only to the artists who can study one another's technique, but to the architects who can judge here the value to modern buildings of modern sculpture, when both architect and artist are using the same material.

PLEASURE GARDENS

and Fun Fair

BATTERSEA PARK

FILIGREE AND BAMBOO, colours sombre and brilliant or light as a spring morning, lacy paint, imitation marble, cords and tassels, sparkling water, dancing fountains, formal colonnades that laugh at their formality—Chinoiserie parodying Versailles—and the billowing canvas of looped marquees that owe something to the Orient, something to the fairground, something to the stage. Lamp standards like birdcages and bright parrots on perches. Walks among the flowers and a walk among the branches of the trees. Towers and turrets and temples, wide stairs and slender pillars, statuary of twisted cane and obelisks of glass—nothing tries to look like what it is, nothing tries to be what it is like.

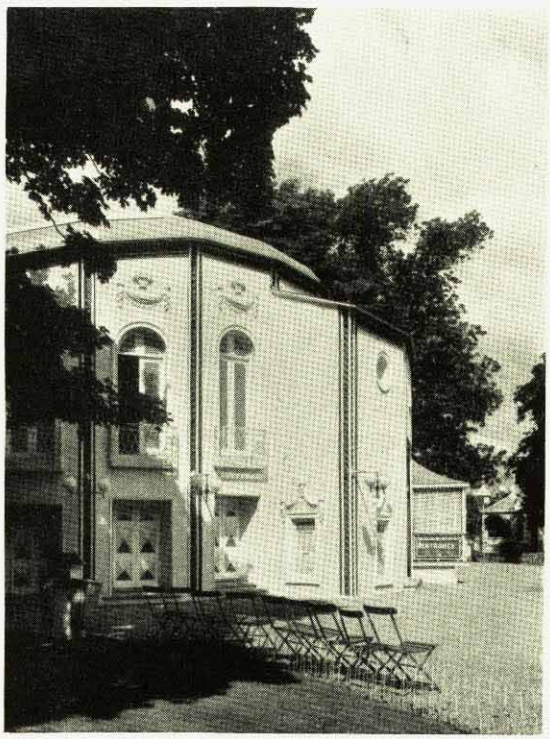
Battersea Pleasure Gardens are absurd, and delicately sophisticated; an elegant, frivolous and delirious fairyland, architecture and mere building in fancy dress. The lightness of touch hardly ever fails: the age of elegance lifts its hooped petticoats and dances an impertinent polka that never degenerates into the jitterbug.

To this dancing place of frivolous mock-formality, concrete, inevitably, has made its contribution.

Primarily the fountain pools. Their sides, painted in such a deliberately artificial imitation of horizontal masonry, are in fact vertical precast concrete slabs, used as permanent formwork to the backing of mass concrete poured behind. The method was quick, economical and eminently satisfactory.

Then the irresponsible flower boxes like rounded stars, grouped in a great semi-circle before the Crescent Restaurant, and the concrete flower beds that grow happily from the central pool.

Then, of course, the theatre. This, apart from



The Riverside Theatre: walls are rendered, painted pale green, and decorated with white festoons and metal work.

its foundations, is a completely removable, in fact portable, structure. Concrete foundations it has, of course, and a base of concrete blocks to doorstep height. Above that the structure has a light welded metal frame, and on this are hung wall-high panels of metal lathing, cement-rendered and finished with paint. In one case the rendering was applied before the panel was placed in position; generally, though, it was found best to render after placing.

The result is a structure, painted palest green with white festoons of fruit and flowers, that has an air—it is to be hoped not a deceptive air—of permanence, though it is obviously made for a park; its dainty formality is of outdoors—Marie Antoinette playing at milkmaids, or if you like, milkmaids playing at Marie Antoinette.

The Riverside Rooms—Festival 1951's most elegant and most charming restaurant—uses concrete to do a solid structural job: its pleasant terrace overhanging the river is formed by a cantilevered slab of reinforced concrete.

The two permanent buildings in the gardens, the Riverside Tea Room and the open-air theatre, are composite structures of brick and concrete.

The Riverside Tea Room has concrete foundations and a floor and roof constructed with precast concrete beams. The cavity walls are brick.

In the open-air theatre the stage and all construction work below it are of concrete. Artists' changing rooms are at stage level, but below the stage are changing rooms for band and chorus, Manager's and Sub-Manager's rooms, B.B.C. room and various stores, and for this basement the retaining wall was constructed of 14 in.-thick reinforced concrete with a brick

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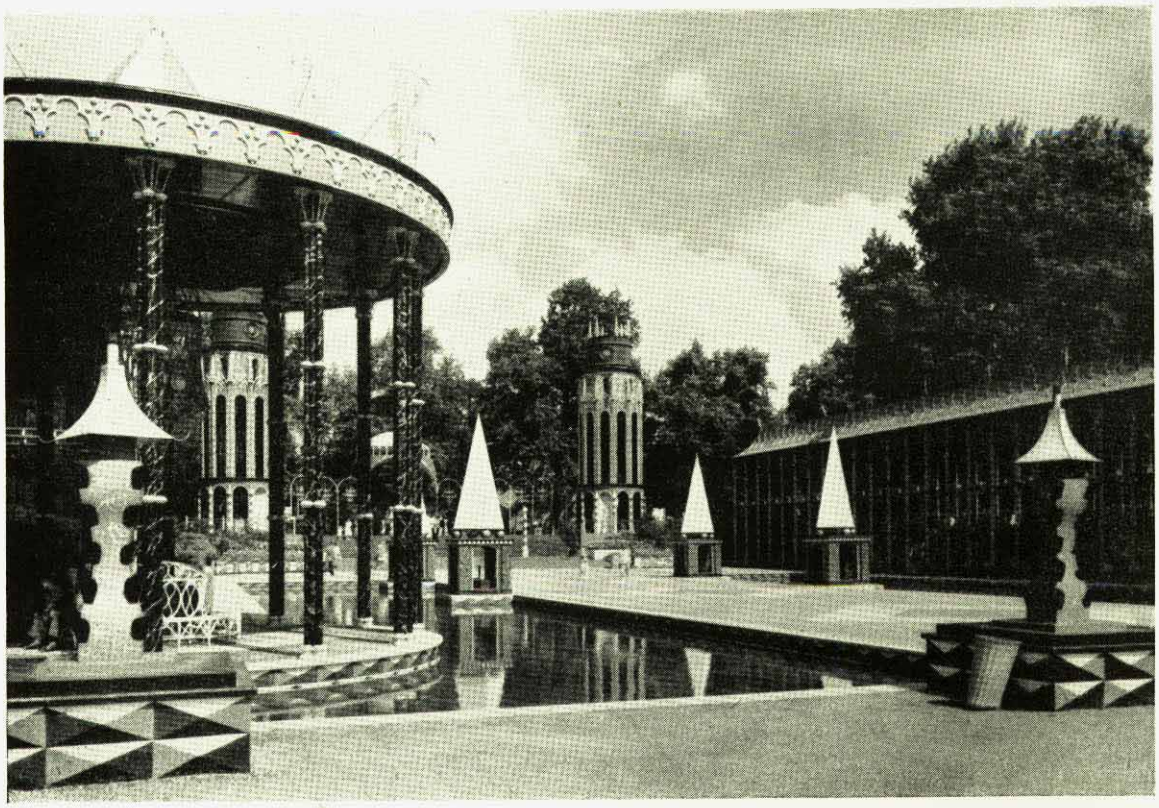
Concrete flower boxes in front of the Crescent Restaurant.

The towers, arcades, temples, obelisks and pools of the Grand Vista.




Forte's
RESTAURANT

inner and outer skin used as permanent formwork. Above ground, stage walls are brick, and the roof is a reinforced concrete slab. The seating terraces are formed with 2 in.-thick precast concrete slabs topped with asphalt, and precast concrete kerbs.

After the flower beds and the hooded wicker chairs, Pleasure Gardens become Fun Fair, with a grand entrance—an entrance straight from Russian opera crossed with Toy Town: two crazy buildings (light framework and renderings for the walls) topped with centaurs, domes, turrets, pinnacles—cock-eyed, askew and bright with colour. Enormous cockerels are splashed in scarlet and green over the walls of 'Fun House'; centaurs caracole among the onion domes, the ochre and gold, of Nestlés 'Play House.' Behind is the boating pool, built in the same way as the fountain pools, with precast slabs and backing of in situ concrete.

The centaurs and cockerels on the Play House and Fun House guard the entrance to the Fun Fair.

Back in the Pleasure Gardens after dark another magic comes to Battersea—a magic that, the product of artificial light, is somehow more natural than the fantasy revealed in sunlight. The emphasis is shifted from the exotic imaginations of the architects to the suddenly revealed fantasy of emerald and gold trees—branches and leaves plunging upwards in depths above depths of vivid tracery and gold coins scattered on pools of bottomless darkness.

Festoons of golden lanterns tremble back from the black water of the river, fountains dance and shiver and sparkle in splashes of brilliance, and globes of fairy fruit, blue, gold and crimson, shine among the bushes; tables cluster under sparkling lights, but the strange unreal trees press round, stealing the play, until the fireworks make them once again only a setting for their own more brilliant performance. Fireworks that are eminently civilized, eminently man-made; that draw the gathered crowds together into one delighted audience and shake over them their quivering, shimmering rain of light, their bursting flowers of emeralds and rubies and diamonds, their whirling rain of gold; that make the blue sky a black backcloth for their dancing fire and catch the breath of thousands in one delighted gasp.

Battersea Pleasure Gardens are well named. They have brought pure, useless pleasure—just for fun—to London.

ARCHITECTS DESIGNING IN CONCRETE:

Co-ordinating architects: Harrison and Seel, A/A.R.I.B.A.

Main vista, lakes, fountain pools: Harrison and Seel, A/A.R.I.B.A. (with John Piper and Osbert Lancaster, designers).

Nestlés Play House and Fun House: Harrison and Seel, A/A.R.I.B.A. (*Designer:* Hans Risdall).

Riverside theatre: Harrison and Seel, A/A.R.I.B.A. (*Designer:* Guy Shepherd. *Engineer:* C. V. Blumfield, B.Sc.(Eng.), A.M.I.C.E., M.I.Struct.E.).

Riverside Rooms: Basil Duckett, F.R.I.B.A. (*Designer:* James Gardner, O.B.E., R.D.I. *Structural consultant:* Laurence Kenchington, B.Sc.(Eng.), A.M.I.C.E., A.M.I, Struct.E.).

Open air theatre and tea room: Roger Pullen, A.A.Dip., F.R.I.B.A. (*Structural consultants:* S. H. White, M.I.C.E., M.I.Struct.E., and D. White).

Main contractors:
Dowsett Engineering Construction Limited.

Lansbury

LIVE ARCHITECTURE EXHIBITION

POPLAR

IT WAS AN INSPIRATION to make the London County Council's rebuilding of Poplar part of the Festival exhibition of building and town planning. Instead of the originally planned 'Lilliput' town, here is the real thing—a new town growing out of ruins and already living with a busy small life of its own.

'Lansbury' (its name is a tribute to the great-hearted man who never forgot Poplar) is not only an interesting display of practical architecture—it is a heartening experience. Pre-war Poplar was, frankly, a slum. Poplar, since the blitz wiped out more than half of its crowded streets, has been a desert. Now Poplar is being rebuilt as a series of 'neighbourhoods'—pleasant name—and neighbourhood Number 9 is Lansbury. London encloses it and it is London in its bones, but at the same time it is a self-contained small town. It seems a place where people will know each other, meeting in the churches, the pubs, the market place, the shopping street, watching the kids in the school playground and at their open air lessons, chatting with the teachers... a neighbourly place.

That is still to come. Lansbury now is still very much 'under construction.' From an architectural point of view there is little that is outstanding, but much that is sound and homely. The little yellow brick houses in the old East End tradition, the not-too-big blocks of yellow brick flats, will never make history as the scheme as a whole is doing, but they are sensibly designed, sturdily built, do their job pleasantly and are essentially livable.

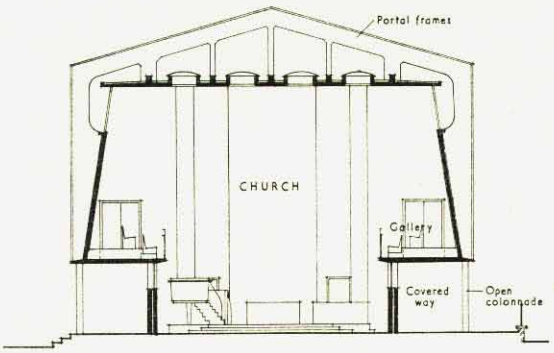
More likely to catch a visitor's eye is the market place, admirably planned, gay with blue-tiled colonnades, with electricity laid on for every one of the many stalls provided for (concrete bollards contain the electric connections), with its covered section for meat and fish, its 'pedestrians only' shopping street leading from it and its pub on the corner with a cheerful little merry-go-round sign outside.

All that is good town-planning. Architecturally, the outstanding things are two—Trinity Congregational Church and the Ricardo Street Primary School. These two are definitely forward looking. Every detail of the school acknowledges that our children are of tomorrow; in the church the same statement is confidently made of Christianity.

Trinity Church is unquestionably the most striking building in Poplar, and one of the most successful churches for many a long day. Nor is it by any means church—in the sense of a church building—alone. Much more, it is church in the sense of a community. Three related buildings, designed for social as well as religious life, enclose three sides of a quadrangle, the church itself to the south parallel with the East India Dock Road, opposite it the hall, and linking them, the meeting rooms, the Sunday School rooms, the playrooms that tell of the place that Trinity Church holds in the life of Poplar.

Scarlet geraniums are bright around it, and inside and out, the church looks sunlit. Outside it is yellow stock brick, yellow precast slabs and copper sheeting; inside, flooded with light from clerestorey windows, it is the paler neutral tones of natural fibreboard, natural wood, Hopton-wood stone, honey-cream glass of pendent lights, and pale blue ceiling. It will seat a congregation of 400, 200 in the body of the church and another 200 in the gallery that surrounds it on three sides.

The hall, with its large stage with green rooms behind, its theatrical lighting arrangements, its rows of seats and the gay curtains to its tall windows, is intended for concerts and stage shows, and is planned on the best acoustic principles with special shaped and perforated wall facings.



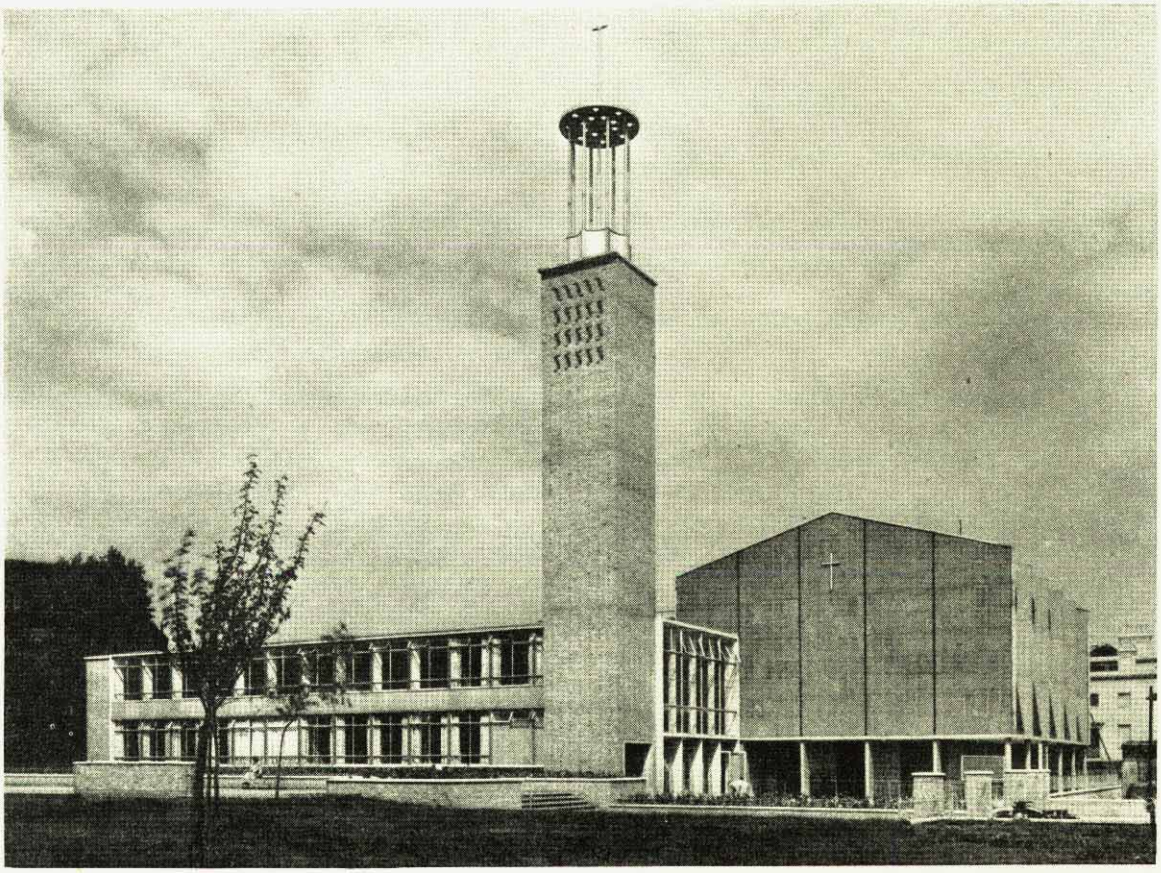
Trinity Congregational Church : cross section through church.

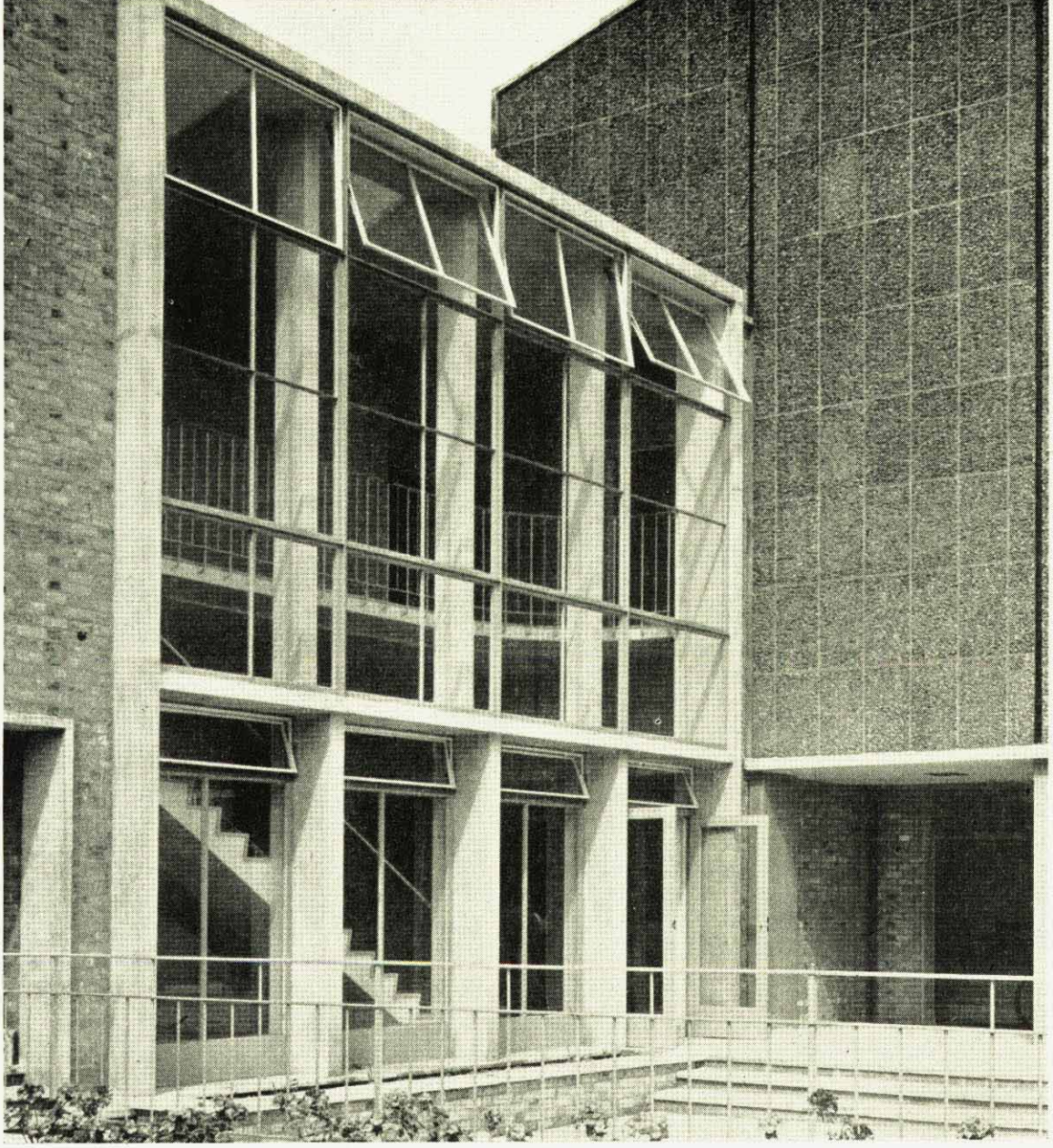
LANSBURY, POPLAR: *continued*

Construction in all three buildings is with reinforced concrete framing. Both church and hall are built with concrete portal frames cast in situ. In the church these frames make a striking decoration, projecting on the outside of the walls and standing clear beyond the clerestorey windows. In the hall the frames are incorporated in the side walls, but stand free, like a series of flying buttresses, outside the clerestorey windows and above the roof. The frames in the church reach down only to gallery level; below that the church walls are set in and the frames carried on slim precast columns with a grey terrazzo finish, that form an external colonnade below the overhanging upper part of the building. The reinforced concrete gallery which is monolithic with the frame serves a structural purpose by acting as a stiffening beam to take the horizontal thrust from the frames.

The wall infilling to the church is of in situ

Trinity Congregational Church: west elevation.





Precast brick-aggregate facing slabs on the west front of Trinity Church, and the glass wall of the two-storey meeting room block

concrete. The sloping side walls above gallery level are faced externally with copper sheeting; the recessed lower walls and the east wall are yellow stock brick; the west end is faced with precast concrete slabs with an exposed aggregate finish of broken yellow brick. In the hall the outer walls are yellow brick; the inner, facing the courtyard, is entirely glass. The portal frames and entrances in both cases are natural concrete with a bush-hammered finish.

Linking church and hall on the west side of the quadrangle is a reinforced concrete framed building of normal construction. Its two stories contain, on the ground floor, a meeting hall and kitchen, the Minister's room and office, a clothing centre and a men's games room, and on the first floor Sunday School room and playroom for the tiny children, a women's sitting room, and rooms for Scouts and Guides. External walls in this section are almost entirely glass, with a horizontal band of precast grey terrazzo slabs between two bands of window. An all-glass

end wall framed in concrete reveals the reinforced concrete staircase with terrazzo treads that links the two floors, and at the corner of this wall rises the tall slender tower of yellow brick, topped with a slim-pillared structure and cross of aluminium.

The church was designed by Cecil Handisyde and Rogers Stark A/A.R.I.B.A., with F. J. Samuely, B.Sc.(Eng.),Lond., A.M.I.C.E., M.I.Struct.E., F.I.A.S., M.I.W., as consulting engineer. The brick-aggregate facing slabs were made by F. Bradford and Company, and the grey terrazzo slabs and columns by the Liverpool Artificial Stone Company Limited. Contractors were Tersons Limited.

Lansbury's other outstanding building is the Ricardo Street Primary and Junior School, designed for the London County Council by F. R. S. Yorke, E. Rosenberg and C. S. Mardall with a light steel frame, concrete floors and staircases, a wall facing mainly of precast concrete slabs and wide expanses of window.

The school is a long two-storey building constructed in two parallel wings linked by bridge corridors, and with an assembly hall block at one end faced with Horton stone.

The front of the school is separated from Ricardo Street by a wide stretch of grass with occasional squares of concrete paving where classes can be held in the open air. At the back is a large playground where a few young trees are newly planted.

The main entrance to the assembly hall block offers a refreshingly gay welcome. Walls are faced with patterned tiles in lemon, white and grey, and the white staircase of concertina treads cantilevered from a central spine is supported on the angle of one tomato-red beam.

The two long wings are faced with precast concrete slabs 8 ft. $2\frac{5}{8}$ in. long, 1 ft. $3\frac{5}{8}$ in. deep and $2\frac{1}{2}$ in. thick, with an exposed aggregate finish of white Derbyshire spar in cream cement. These slabs, which are lightly reinforced and have grooved edges for fixing, were manufactured by Hills (West Bromwich) Limited.

A single-storey nursery school similarly constructed is now being built at one end of the main building.

The contractors for this school were Tersons Limited.

Another school in Lansbury, the Roman Catholic Cardinal Griffin Secondary School, is as yet incomplete. It is being constructed with an in situ reinforced concrete frame and in situ concrete floors. Flat roofs are also of in situ concrete; sloping roofs are constructed with in situ portal frames and precast slabs, with the exception of the assembly hall, where steel trusses are used. Wall infillings are brick, red brick here making a variation on the general yellow stock.

The architect was David Stokes, F.R.I.B.A., the engineers were Considère Constructions Limited and the contractors C. Miskin and Sons Limited.

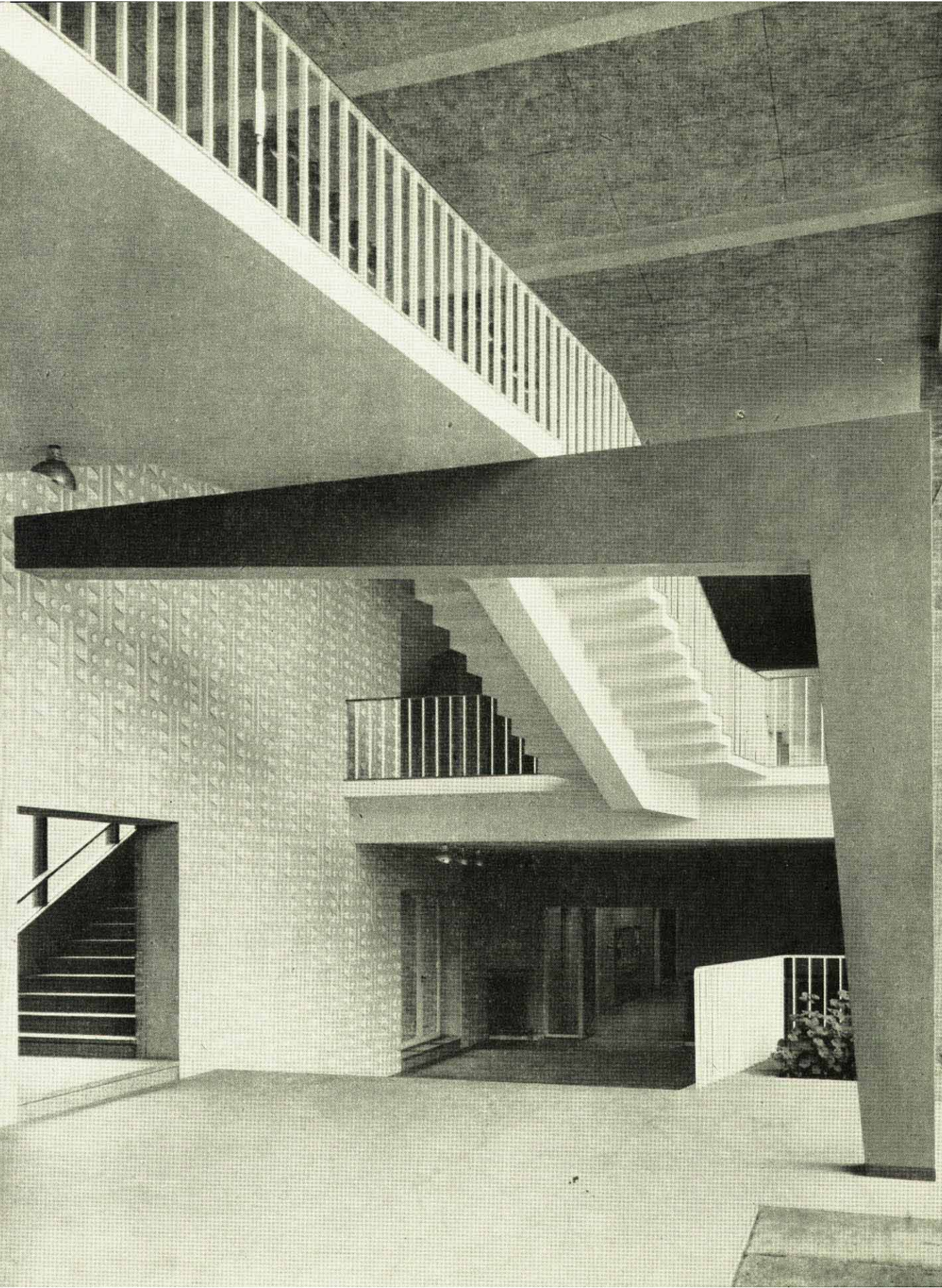
But Poplar is not only an exhibition of what is being done. It also contains an exhibition of how to do it—and even how not to do it. One of the sites has been devoted to a Festival exhibition of building methods of to-day and examples of town planning. Charmingly and intelligently displayed are such aspects of building as structure, damp-proofing, sound and thermal insulation, heating and lighting, each in its own small pavilion with a linking corridor between.

' How not to do it ' is illustrated by " Gremlin Grange," a section of jerry-built between-war suburban villa, pseudo-Tudor in its fake timbering, horrific with ' modernistic ' coloured glass above the door, pathetic in its cracked rendering, leaking roof, damp walls and flaking plaster. ' How to do it ' comes last, illustrated by a section of a small well-built modern house, with the cavity walls recommended by the Building Research Station—outer leaf of brick and inner of lightweight concrete blocks—with solid concrete ground floor, and concrete short bored piles carrying the structure.

Finally, there is a model of a new town—a town where many old buildings have clearly been destroyed and have been replaced with new office blocks, flats and houses, and where many old buildings yet remain; the two marry harmoniously, reflected together in the river that winds through this miniature and charming city.

From the road the whole small exhibition is gay with bright colours and brings a liveliness to Poplar which it cannot have known for long enough. An immense crane announces its presence from far away, symbolic not only of Poplar's Festival exhibition, but of the rebuilding that will have to go on for many years before these endless desolate acres are all happy, lived-in streets.

The cantilevered concrete staircase in the entrance to Ricardo Street School, supported on a tomato-red beam.



The Royal Show

CAMBRIDGE

THE ANNUAL SHOW of the Royal Agricultural Society of England—the proudly named ' Royal Show '—is essentially the countryman's occasion. It is there for the practical purpose of promoting good farming and makes few concessions to the city sightseer. But here are gathered together the countrymen of all Britain, here can be heard the accents of all Britain, from the Highland herdsmen, watching over the Highland cattle, to the soft slow burr of the West country. Here is a Britain with more time, even if less leisure, broader of shoulder, as broader of vowel, than the Britain of the towns. Here is a Britain that might seem to have changed little in a hundred years, but that has changed utterly and radically.

How great the change has been was underlined at this year's ' Royal', which showed a sense of Festival occasion in exhibits of methods and implements in use a century ago.

In 1851, at the time of the Great Exhibition, the Royal Show was being held at Windsor. The Milk Marketing Board's display, " One hundred years of dairy progress", with its lovely Wedgwood dairy crockery and the century-old farm machinery shown by the Royal Agricultural Society gave some idea of that distant ' Royal.' The dairy china, incidentally, must have roused a passing nostalgia even in the most progressive—a wish that sometimes charm of design did not so often have to vanish with the approach of hygiene!

In 1851 the first Royal Show had been held only twelve years before, and it was only some twenty years earlier that, thanks largely to that great and progressive farmer Thomas Coke of Holkham Hall, farming methods had emerged from something like mediaeval conditions. It was still to be some time before the advantages of hygiene in the housing of animals were to become generally apparent. As late as 1889 bullocks fattened for market were penned from calfhood to killing time in the semi-darkness of a far-from-clean building, in stalls sunk below the level of the ground, deprived of exercise, and grossly fed.

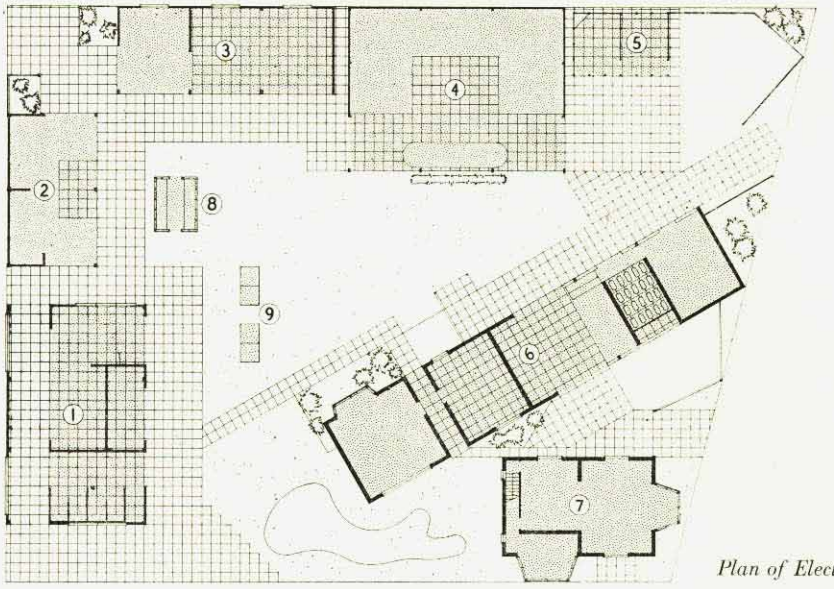
To-day's method of scientific feeding, and housing conditions that insist on cleanliness, light and air are all exemplified at this year's Show. The Ministry of Agriculture's exhibit of calf rearing shows what the right food in the animal's first months will do for its development; while the Ministry is only one exhibitor to demonstrate what a well-designed, easily-cleaned building will do for an animal's well-being throughout its life.

M.A.F. PIGGERIES

The Ministry's stand shows two indoor piggeries, both designed on the principle that the pig needs, or at least appreciates, deep straw to burrow in in the cold weather. In the case of the " Reid " piggery, this is obtained by a sloping floor; in the " David Black " piggery it is obtained by a floor on two distinct levels.

The " David Black " piggery is designed with a wide central feeding passage that has small cross passages, each serving a pair of pens, set at right angles to it. At the trough in each pen is an unstrawed area; the rear of the pen, set at a lower level, is divided by a concrete dwarf wall into a deeply strawed sleeping area and a dunging area which can be cleaned out directly from the central passage.

The " Reid " piggery also has a central feeding passage, but in this case the pens are set along either side. The feeding passage and troughs are constructed some 18 inches above ground level and from them the concrete floor of the pen falls fairly steeply to the outside wall, giving a considerable depth of straw at the rear of the pen which gradually decreases to the front.



Plan of Electricity Farm.

ELECTRICITY FARM

" Electricity Farm " might equally well have been called " Concrete Farm." This exhibit, organized by the Electrical Development Association and the Eastern Electricity Board to demonstrate the use of electrical equipment on the farm showed a great variety of electrical appliances housed in seven typical farm buildings, each of concrete and each constructed according to a different method.

First was a " Dairy," constructed with a precast concrete frame manufactured by Saunders (Ipswich) Limited, and infilling and partition walls of hollow precast concrete blocks painted with ' Snowcem ' and ' Cemsyl ' in such attractive colours as pink, light blue and duck egg green as well as white. A section was equipped as a cowhouse, with concrete standings and precast concrete mangers and divisions ; another was the dairy ; other sections again were arranged as storage space.

The next building, Number 2 on the plan and known as the " Water Supplies Building", was a typical general-purpose shed with open front. The precast concrete frame with its pleasant raked columns was manufactured by Beecham Estates Construction Company Limited, of Shipston-on-Stour, Warwickshire. Dwarf walls of 3 ft. long precast concrete blocks, painted with ' Snowcem ' in white outside and duck egg green inside, surround the shed on three sides, with asbestos cement sheeting above.

Number 3, the " Workshop," is another open-fronted shed, divided by a partition wall of precast blocks into implement section and workshop section. External walls here are of rock-faced blocks, and internal finishes are duck egg green and deep cream ' Snowcem.' The frame of this building was manufactured by Croft Granite Brick and Concrete Company Limited, of Croft, near Leicester.

The " Barn Machinery Building " was a large barn-type building with a precast concrete frame and infilling walls of precast concrete blocks finished with buff ' Snowcem.' The frame was manufactured by Stent Precast Concrete Company Limited, London.

Beside the " Barn Machinery Building " was a small pigsty and run constructed with precast concrete panels fitted into grooved precast concrete posts, the units for which were manufactured by Anglian Building Products Limited, Lenwade, Norwich.

The " Crop Treatment Building," constructed with a precast concrete frame manufactured by Tidnams Limited of Wisbech, had infilling walls of terracotta-coloured ' Dri-crete ' blocks. These hollow blocks are designed with an overhanging edge on the outer side which gives a very attractive weatherboarding effect and are laid dry, requiring no mortar. They are manufactured by the British Art Tile Company Limited, of Cambridge.

A section of this building was used to demonstrate the platform method of drying grain in the sack. Structurally, the installation consists of a raised platform of precast concrete

slabs, I-shaped in plan, which are laid side by side to produce openings about 2 ft. long by 1 ft. wide. The openings are covered by steel gratings on which the sacks of grain are laid to be dried by hot air blown beneath the platform. The drying platform is raised on dwarf walls of precast concrete blocks, the inner walls being laid with the cavity horizontal to allow for the free circulation of air. The concrete platform units are manufactured by the Leighton Buzzard Concrete Company (1933) Limited.

Last building on Electricity Farm is the cottage, a typical two-storey building with a pitched roof, constructed with load-bearing walls of terracotta 'Dri-crete' blocks and roofed with similarly coloured concrete pantiles made by the Marley Tile Company Limited, Sevenoaks. This building was used to demonstrate an electricity service centre.

On the stand were also a greenhouse and cold frame constructed with precast concrete units manufactured by Concrete Utilities Limited, Ware; post and panel fencing manufactured by George W. King Limited, Hitchin, and fencing of 'Dri-crete' blocks; a garden seat with a concrete frame and wooden slat seat manufactured by Mono Concrete Company Limited of West Drayton, a precast concrete lamp standard manufactured by Concrete Utilities Limited and a G.P.O. public telephone kiosk also of concrete. The paving slabs, asbestos cement roofing and rainwater goods throughout this display were manufactured by Atlas Stone Company Limited and windows to all the farm buildings were the special controlled-ventilation type manufactured by George W. King Limited.

MILKING PARLOUR

The Milk Marketing Board, as last year, made a feature of one of the series of combined milking parlour and dairy buildings which were designed, in collaboration with the Board, by the Cement and Concrete Association. The type shown, intended for a producer with up to fourteen cows and with electricity available, is a small and inexpensive building designed to bring the labour-saving and hygienic advantages of the milking parlour system within reach of the smaller farmer. It is constructed with load-bearing walls of hollow precast concrete blocks and a roof of asbestos cement sheeting. The concrete units for this building were supplied by Precast Utilities (London) Limited, who were also responsible for erection.

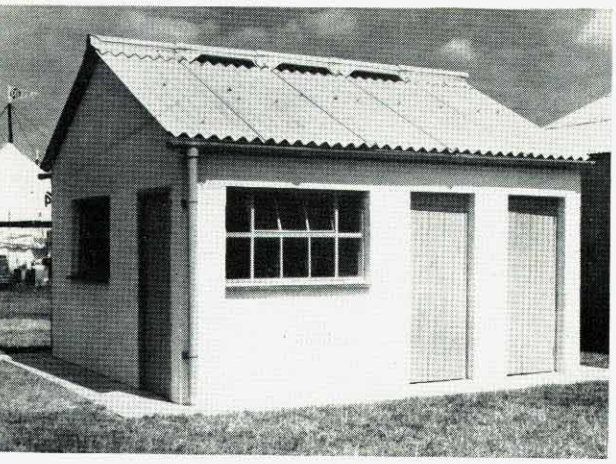
OTHER CONCRETE BUILDINGS AND FITTINGS

Other concrete buildings and fittings were on view in every part of the showground.

There was a precast concrete framed building with a roof covering of asbestos cement sheeting, in which were displayed precast concrete mangers and divisions. (Exhibitor: Beecham Estates Construction Company Limited).

There were M.A.F. type buildings, of precast concrete posts, steel roof trusses with precast concrete purlins and a roof covering of asbestos

Three buildings on Electricity Farm: that in the centre houses the 'In-Sack' drying plant.



The small milking parlour and dairy displayed by the Milk Marketing Board.

cement sheeting.

There was a large double range cowhouse with load-bearing walls of ' Dri-crete ' weatherboarding type blocks, a concrete floor and roofing of asbestos cement sheeting, and beside it there was a bull-pen constructed with ' Dri-crete ' blocks and tubular steel. (Exhibitor : Salopian Engineers Limited, Prees, Salop.).

There was a covered yard built with precast concrete posts and steel roof trusses, and roofed with corrugated asbestos cement sheeting ; one side of this yard was designed to be used for milking—standings with partitions ran its full length, divided from the yard by a rail to be opened at milking time. On the remaining sides of the yard, separated by concrete partition walls, were dairy, bull pens and calf pens, all concrete floored and fitted with precast mangers. (Exhibitor : Simplex Dairy Equipment Company Limited, Cambridge).

There was a two-stall milking parlour with a precast concrete frame, wall infilling of precast concrete blocks, concrete floor, and asbestos cement roofing ; a pigsty and run and a double calf pen, both built with precast concrete posts and panels ; a concrete churn stand with a curved shelter of asbestos cement sheeting ; cowstalls, drinking troughs, a grain silo and a clamp silo, all in precast concrete. (Exhibitor : Stent Precast Concrete Limited, London).

There was a garage built with load-bearing walls of brown ' Dri-crete ' blocks with a weatherboarding finish. (Exhibitor : British Art Tile Company Limited).

There was a large cowhouse equipped with precast concrete mangers and divisions and a central passage and dung channels of precast concrete units, and with precast concrete-framed windows of the controlled-ventilation type. Beside it was a bull pen constructed with precast concrete posts, and a ventilated bin silo. And there were precast concrete framed greenhouses, and precast concrete cold frames, enclosed within precast concrete fencing. (Exhibitor : George W. King Limited).

There were two other exhibits of the platform grain drying installation, one by the Gas Council and one by the General Electric Company, both with similar concrete platform units manufactured by the Leighton Buzzard Concrete Company.

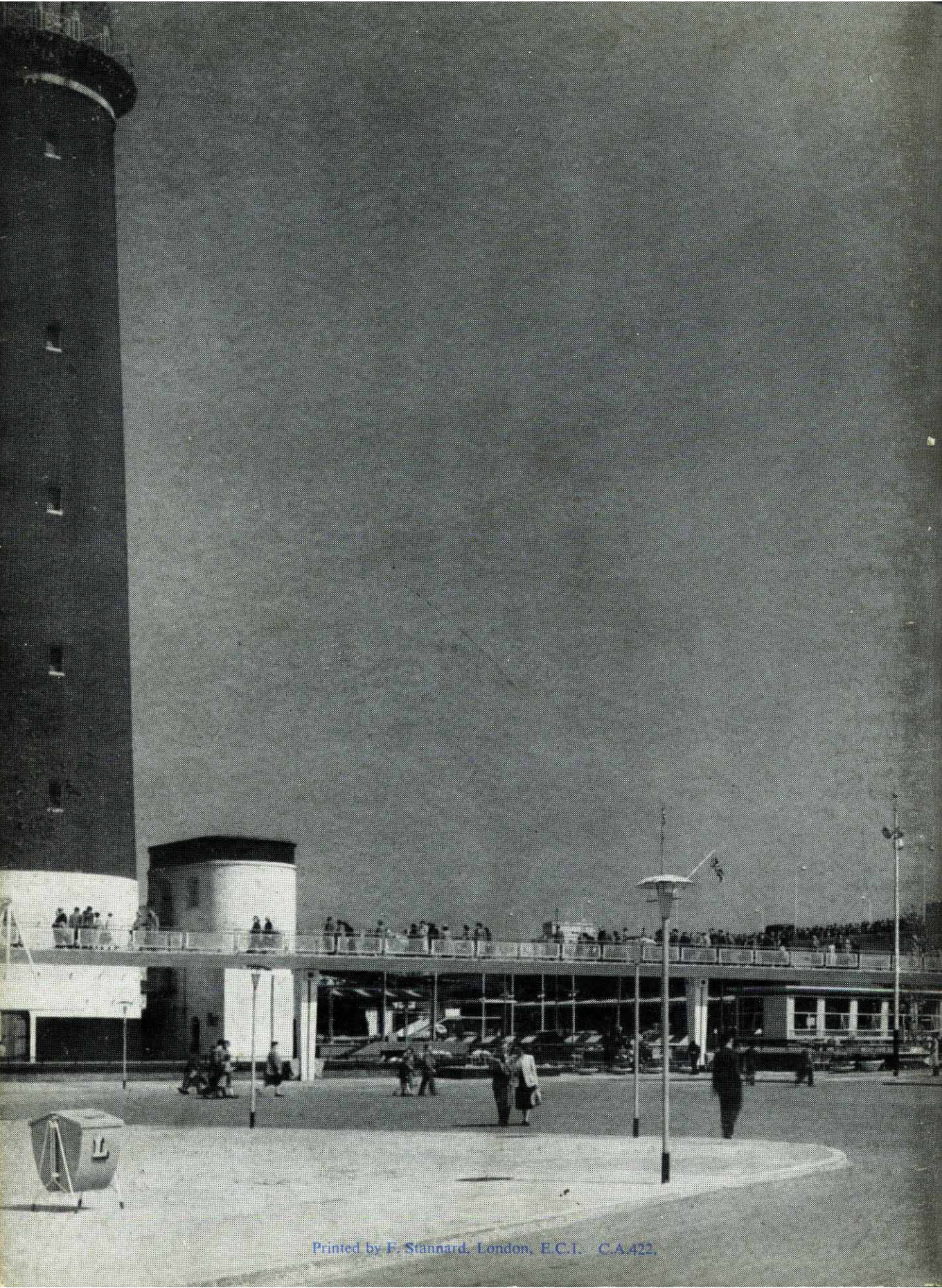
ROADS

The Ministry of Agriculture had this year provided a comprehensive display of farm road construction, in which more than half the exhibits made use of concrete, and twice daily an interested audience gathered round to watch a demonstration of the construction of a typical concrete farm road. The work was carried out as it might be on a farm with the simplest of equipment. Farmers were able to watch the concrete being batched by the bucketful, mixed in a small mixer and placed on a prepared base consisting of two inches of ash covered with waterproof paper. Compaction was carried out with a hand tamper.

Another concrete road displayed was a ' fen road '—a reinforced construction recommended wherever a poor subgrade demands extra strength in the road slab. A part of the concrete was cut away, displaying the subgrade, the layer of ash and the layer of mesh reinforcement embedded in the 6-in. thick concrete, 2 in. from the bottom.

Concrete wheel tracks were also on show, as an inexpensive and more quickly laid alternative to a completely concrete road, and the other concrete display was of a soil-cement road. This is made with the natural soil dug out on the spot and stabilized by the addition of cement and water. This type of road is economical and quickly laid, and can be very satisfactory used on a farm where the soil is of the correct constitution, or can be made so.

This year's ' Royal ' was, in fact, one in which the place of concrete on the farm was fully recognized. It is by now a well-established place. Concrete is a kindly and adaptable material when intelligently used, and no farmer visiting the ' Royal ' need have remained long in doubt as to its ability to ' settle down ' on his land, and provide him with the standard of housing and equipment that 1951 demands.



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