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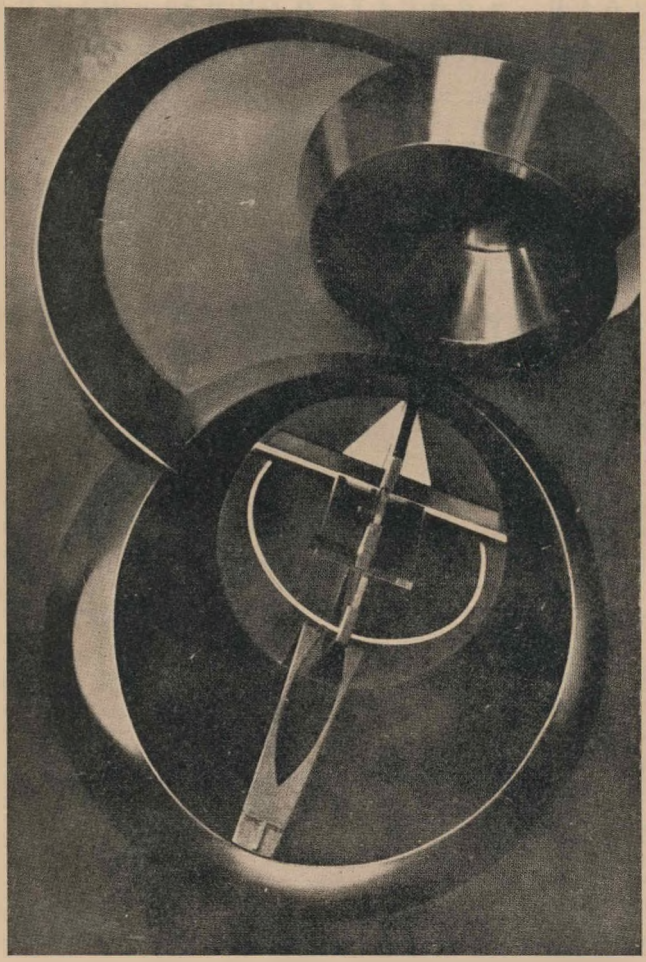


PEVSNER. 1936

ART AND ENGINEERING

BY M. MARCUS

A LECTURE DELIVERED TO THE ARCHITECTURAL SOCIETY OF THE UNIVERSITY OF THE WITWATERSRAND ON TUESDAY, 24th APRIL, 1945

Having been invited to address you on the subject of "Art and Engineering," I first of all have to thank you for the honour conferred upon me. But, far from taking that in any personal way, I very much appreciate the idea underlying this series of lectures, which, if I understand it correctly, consists in investigating the relationship between art in general and various other activities of special interest to the architect. This appears to be the more difficult, as there is hardly any field of human activity which does not come in contact with architecture somehow. Indeed, this age of specialisation, where we all crawl under the narrow shelter of our particular profession, leaves the architect cruelly out in the cold. Not only does Mr. Fassler want to make engineers out of you, presumably much to your horror, although civil engineering is, after all, still a related subject; you must, in order to cater for society's demand for buildings, also find your way through bioscopes, opera houses, schools, hospitals, city halls and law courts, factories, hotels, museums, churches, railway stations and aerodromes, observatories—you must know materials, gardening, lighting, sanitation, acoustics—mechanisms from door handles to transformers and refrigerators, financing, psychology, sociology . . . fine specialists you are. To crown it all, you are artists on top of it, with a code of professional conduct. Compared with that the engineer, a true specialist, works almost in the monastic seclusion of the research worker.

Let us see what an architect has got to say about the engineers. In an article on "Modernism in Architecture" Clough William-Ellis, F.R.I.B.A., writes :

"The engineers are the slaves of natural laws, mechanical, chemical, optical, gravitational and the rest—they are bound to follow their own questing and highly intelligent noses along one relentless trail for ever and for ever towards one inevitable end : the highest possible ultimate efficiency. In fact, they really have no free will or choice at all; they are just the helpers and servers of their machines, blunderingly, slowly but very surely unwinding the wrappings from mystery after mystery towards a fuller and fuller understanding of the nature of things and of what has been always there, waiting to be recognised, controlled, exploited. They are the exploiters, not the creators. There is but one creator, and he is the artist; and the architect, being an applied artist, is as a demi-god between heaven and earth, with the feet in the clay of his foundation trenches and his head among the stars. The engineer's selfless innocence in regard to form and style (as witness even the lettering and figuring on his drawings) makes one see him, not as a leader, but as one led; not as one imposing his own will, but as one anxiously propitiating the forces of Nature; not as a designer or an orator, but as an amanucusis, an interpreter."

How it is, then, after this devastating critique of the engineer as a creator, that you, the artists, invite an amanucusis, an interpreter, to talk to you about art? How is it that occasionally a pure engineering work, aiming, as we have heard, at efficiency only, appeals to us in a way which is at least similar to that of pure art? How is it that engineering, the most sober of all professions, can produce, at times, ravishing beauty?

I have been specially requested not to add here a new definition of art to the 5,000 odd already in existence. I shall gladly refrain, because the 5,000 definitions agree perhaps only in one point : they tell us nothing. And this is not really surprising. Defining means : to explain in terms of simpler, more basic conceptions. Clearly, then, defining has its limits.

The most basic conceptions cannot be reduced any more. We cannot define time, life, hunger, love, happiness. All these things can only be experienced. Certainly physical science defines "blue" as light of such and such a wavelength, but this definition means nothing to the colour-blind, who cannot experience it, in whose consciousness it does not exist. Well, it appears that art belongs to the same category. Art is a biological necessity of our species, discovered by man rather than invented; a drive, not a pastime or a luxury. Surely, the savage decorated his implements, sang and danced from inner necessity long before anyone said: "Let there be art." What, then, can a definition help us? We cannot, in the last resort, understand art. It does not want to be understood; it is there to be felt, sensed, experienced, lived. And the man in whose soul this urge is dead, does he not, to the enthusiast, seem so much poorer, for all the quieter life he may lead? Let any society's life be free, healthy, strong, and art will be its most beautiful blossom—art itself, not its theory, philosophy, aesthetic. Art is only a matter for textbooks and discussion, is only a problem, when it is on the decline. Contemporary music seems to be in a bad way, not because I don't like Rachmaninof or Shostakowich, but because people write books: This modern music, a guide for the bewildered listener. They analyse it, they explain it. They cannot even explain Mozart's G Minor Symphony to me if my ears can't do it. Let us stop worrying about art; we have no medicine for its ailments except perhaps fresh air.

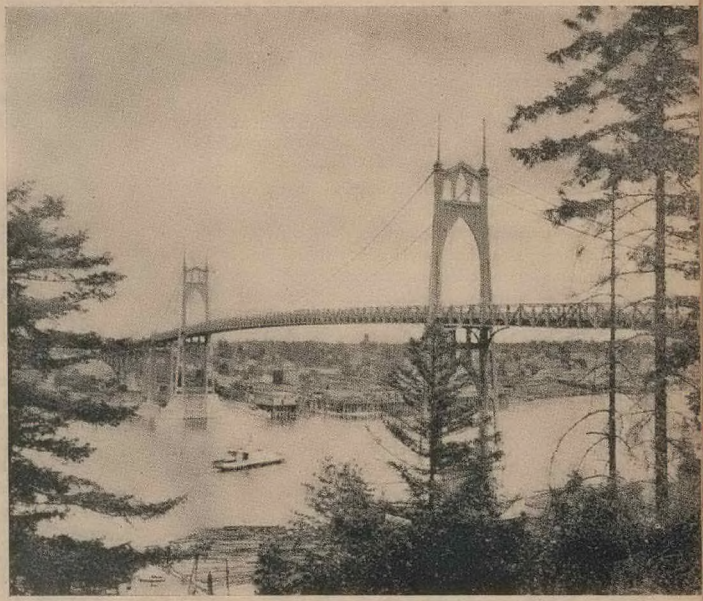
And, possibly, we have reason to believe that there will be no lack of fresh air. Perhaps we may hope that the revolution in the Western world, having continued for 150 years, is coming to an end. It seems it has taken two world wars to finish off what the French Revolution and the Industrial Revolution have started. The romantic movement was the first sign of alarm in the realm of art. When the poets and artists felt the onrush of that world going mad with cheap iron and coal, the dirt and din of factories, mass fabrication and greed for profit, they found no other way out but headlong flight—into the past, like the pre-Raphaelites, into Utopia and fairyland, into phantasy, if only away from this unbearable reality of the 19th century. When they struggled to get solid ground under their feet again—and indeed, they struggled hard—Paul Whiteman's "Rhapsody in Blue," Dadaism in poetry, match boxes and newspaper cuttings pasted on the canvas—from all this turmoil architecture was perhaps not the first to find its way, but it was the surest. Certainly there was the usual objection against new fangled ideas, bewilderment, hostility. Nevertheless, on the whole the new architecture was accepted, welcomed, praised and has come to stay much more definitely than any other modernism. Music is still in the melting pot; abstract painting, cubism, surrealism, all still seems to experiment. Drama, poetry and dancing—do they exist at all? Are they still in their hideouts from the days when the machine monster first reared its ugly head? Yes, I fear, the heritage of the 19th century has still got to be overcome. This is actually our task. We are still scared by the ugliness of the machine and all it stands for. Technical progress has been faster than was good for us, faster than we could assimilate it. Our emotions and habits were left behind. The social structure became, and still is, utterly inadequate. Art seems to be in the process of re-orientation right now, with architecture, as far as the classical arts are concerned, leading by a wide margin. Architecture alone is not questioned any more; the only true, forceful and convincing expression of our age, which slowly begins to find its way. The machine is gradually losing its horrors for us; we are shaping a friendly and beneficial industrial aera. The industrial architecture consolidated itself first, the well-earned reward for the courage to face to facts.

Now it has been argued that this is really no triumph for the artist. He merely and cleverly made use of what science and industry had put at his disposal. Steel structures enabled him to use unheard-of spans; reinforced concrete permitted an unlimited variety of structural shapes; he only exploited the cantilever, the shell roof, the electric hoist, the steel girder, asphalt, glass, etc.; and his concoction of all these things he called his modern style. As if a strong and convincing expression were to emerge automatically from the use of certain materials and methods! It is, of course, true that steel and concrete have enabled the architect to make headway. Certainly have his methods been evolved by the engineer. But one can make good or bad use of a given material or none at all.

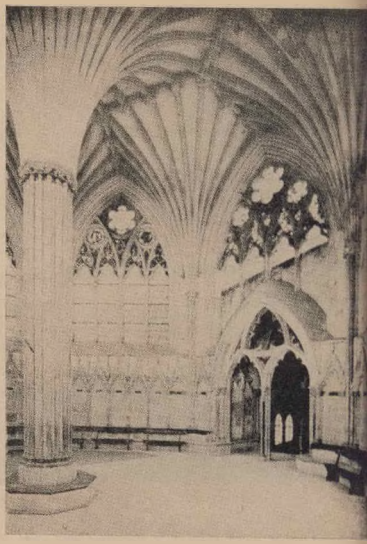
Perhaps we should even go further. Maybe the basic idea of functionalism, the sacrifice of ornament and decoration, has been stimulated by products of the engineering industry. This would still not mean anything. No machine, no aeroplane, no ship looks good because it has no decoration. It is the will, the creative imagination, that gives form, style, character, interest, harmony, expression to the dead matter. This, I believe, is about the usual array of words one finds in discussions on this subject. Emotion is missing, for I believe it plays a minor part and is quite secondary.

It is difficult to give the reason for this statement, for it is entirely a matter of feeling, but I shall try, as it is an essential point. One hears rather often that an engineering structure cannot have anything to do with art, because it has no emotional appeal. The same person is likely to argue that Bach's organ fugues are scholarship rather than music, for the same reason. Here the argument seems to end. If someone appreciates art mainly for the sake of its emotional content, there is nothing to be done about it; architecture will hardly have any appeal to him at all. But we must disagree. We must point to the formal side, the more intellectual interest, and we shall be much nearer to the true essence of all the

GEORGE WASHINGTON BRIDGE, N.Y.C. Engineering beauty. The pylons were to have been sheathed in masonry, which was subsequently omitted when the beauty of the structural steel frame was apparent.



ST. JOHN'S BRIDGE, PORTLAND, OREGON. This bridge serves its purpose. It is said that the pylons were designed to harmonise with the pines in the vicinity. They carry aero-navigation lights.



WELLS CATHEDRAL. A view from high ground showing the rich texture of the towers and eastern link. Right: The elegant functionalism of the Gothic structure.

arts in their entirety. Emotion is personal, individual—form is timeless, general.

The Greek temple, as an expression of religious feeling, is meaningless to us. We cannot hope to see it with the same eyes as the contemporary worshipper. As form it speaks to us directly. If we pay attention mainly to the feeling expressed in a Gothic church and a Baroque church, should we not think that people venerated there quite different Deities? The one—remote, cold, serene, like the sound of the organ and Gregorian chant; the other one much more of this world, warm, like the sound of strings. And somehow we feel that all these descriptions in terms of feelings are beside the point. Emotion wears off; form lasts. In the long run the formal appeal is deeper, truer, be it a Gothic cathedral or the George Washington bridge. And it does not matter whether we call the builder of either of them an architect or an engineer. The Gothic arch and the suspension bridge are our clearest examples of functionalism, because in these two cases the structural element and the architectural feature are in themselves identical. To that extent they represent perhaps structural ideals. Both of them have evolved from a technique. The Gothic vault from the skill of the mason. Waldram says the builder may even have been forced to use the pointed arch because his mortar seems to have been inferior to that used by the Romans. That may be so, but once the technique was mastered, the Gothic builder became bold; he went further than he had to; he played with the material, a very essential element in all art, which our language expresses only in connection with music. The musician plays his instrument.

And the George Washington bridge does its job playingly. The suspension bridge became a possibility through steel and all the mechanical devices for putting it up. But again we ask for more, and rightly so. It is not enough that a thing is good, good enough to serve its purpose. We want it to be beautiful as well.

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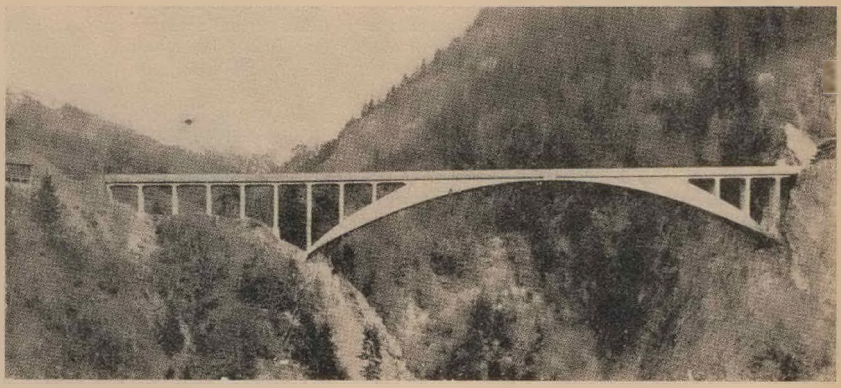
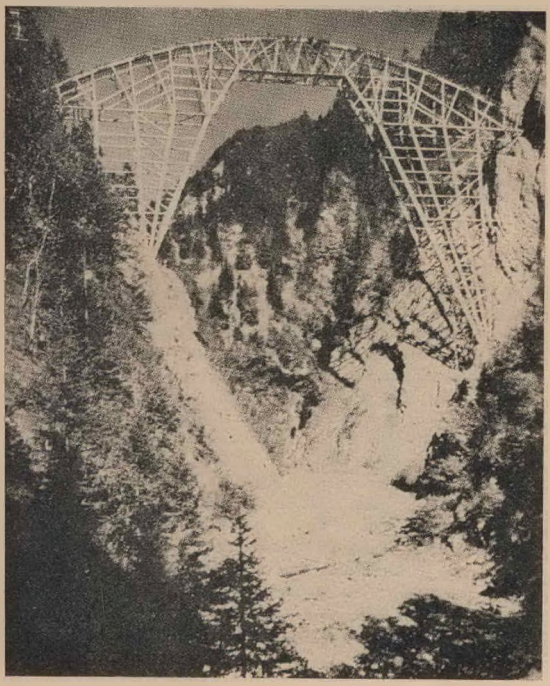
We have discussed these two supreme examples of functionalism in a little detail for the sake of clearing up this one point. One can build on purely functional lines, that is to say by strictly following the structural properties of the materials, with completely different results as regards style; with or without ornament. The style is dictated by factors independent of technical details. With the same methods and materials one can build quite differently if there is a will directed towards a different aesthetic. It is not true that the machine has done away with frills and mouldings; we did it. With our machines it would be an easy matter to turn





BRIDGE OVER SALGINA-TOBEL, SWITZERLAND, by MAILLART.

For sheer beauty of design in an engineering structure, Maillard's bridges are outstanding examples. Even the false work has a quality to be admired.

out all the decorations we wanted; 19th century machines themselves were often enough decorated. We could build in any historical style we liked. The last century did it with nauseating results. The point is that we don't want to. Why modern man prefers good inherent form to fancy work, I do not know; let the art philosophers find out if they can. We can only say we do not like rosettes and volutes; it does not suit our taste. That's all there is to it. I think you are on the wrong track when you discuss what modernism comprises. There can be no other measuring rod for it but your taste. A thing is modern if modern man finds its suitable for himself, uses it, likes it; nothing but subjective criteria.

A thing is modern because modern man likes it. Does that mean it is a piece of art? Engineering works are modern. Do they represent art? The question boils down to this: Does engineering constitute one of the essential parts which make up an integral cultural epoch? It would be fatuous to venture any prediction, for the cultural face of our age is still in the making. But are there any signs for us to read? I believe there are: the abstract paintings and sculptures by artists such as Mondrian, Pevsner and Gabo can be understood, perhaps can only be understood as an attempt to come to terms with this technical world of ours. If the pure artist is a sensitive barometer for the happenings in the spiritual world surrounding him, then it looks as if we are beginning to digest, to assimilate all that technical stuff. That does not mean we have got to understand all technical details. But we shall come to be on friendly terms with a mechanised world and not be afraid any more of the machine being our master. If this comes to pass, if we succeed in building up a world where machines will be only useful and not a nuisance like screeching trams, motor cycles, smoke and dust and polluted air—then engineering will be art. In the meantime it is on the way towards that goal.

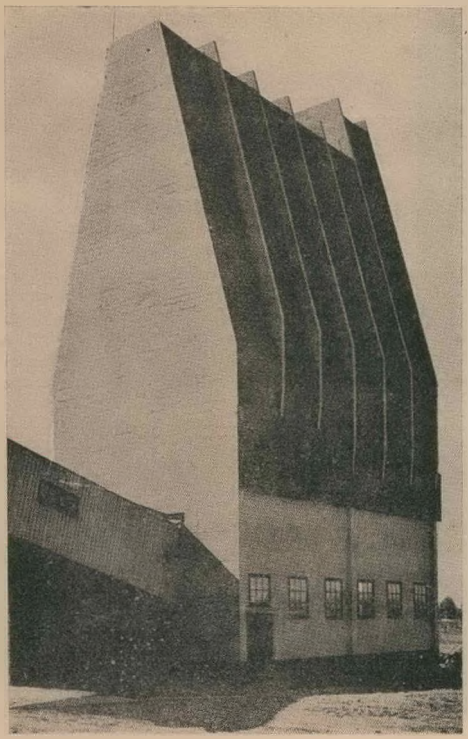
But let us approach the question from a different angle. Does engineering represent art? If I have to answer, not as an amateur prophet, but just as an ordinary engineer, I should say: it does not matter. We are not concerned about it. We make the things we need; we endeavour to make them aesthetically pleasing. Whether anyone a thousand years hence will go to a museum to gaze at 20th century motor cars, electric globes, sewing machines, locomotives—whether he will call them classical art—who cares? We go to a museum and admire a Greek vase. Let us go back 2,500 years and ask the slave who made it whether he is producing art. Most likely he would not understand our question. He had only one word Tekuch, which we are at liberty to translate as art, fine art, applied art, handicraft, technique or engineering. There was no muse of pottery, nor of architecture for that matter. He turned out his vases, fashioned them as best he could in his own modern way and this was all.

The engineer to-day does the same. His product has to fulfil its function, obviously, and it shall look good. What does that mean? Again we are at a point which defies definition. It shall appeal to our sense, please our taste, satisfy our sense of beauty—merely different words for the same thing: it shall look good.

Whether the finished article is a piece of art, we can therefore not decide by applying some test or measurement. But we can perhaps trust our feeling. After all, whether the famous composition "In a Persian Market" is genuine music or trash, can also not be settled by argument; and if we were to settle it by majority vote I would be scared of the outcome. People who prefer Cezanne to bazaar style bedroom sunset pictures have also no better measuring rod than their instinct. Here the problem of education crops up, but, cutting it short, let us consider ourselves as educated and look at a number of engineering works. Let us simply rely on our aesthetic instinct; leave it to our senses whether we discover any of the attributes which usually appeal to us as artistic. No attempt has been made to find outstanding examples. Art is—or should be—an integral part of our daily life, surrounding us as a matter of course, and not to be tucked away in museums. Let us see, then, if anything produced by the engineer might have a quality which we may call gripping.

The photos illustrated here, chosen more or less at random, whatever came to hand, form, I think, a fairly representative collection. There are, of course, plenty of articles produced by the engineering profession which are aesthetically uninteresting or even ugly, but that does not affect the issue. I have only endeavoured to pick out examples showing some characteristic shape, clean and harmonic or sometimes bizarre, or even grotesque, as long as they can arouse our interest. Can they claim to be art? I have outlined my opinion. You, as students of applied art, are much more competent to judge.

If there is, possibly already, an art value in engineering, how has it come about? Or, what amounts to the same, provided that buildings such as you design will one day rank in history side by side with St. Peter's or the Parthenon, how has this come about? There appear to be two possibilities. Either the artist creates a style and impresses it upon his period; or a period contains somehow a certain style and the artist reveals it. In other words: either the artist propagates a style, stimulated by his technical means, his purely personal predelections and even his fancy, and exhibits it until the public, shall we say, gets used to it, accepts it and finally comes to like it, merely by force of habit. Or: a period, shaped by thousands of sociological factors, has a latent, unconscious craving for an appropriate expression of its being, its spiritual essence; and the artist, more sensitive than his fellow-men, divines how to express it, so that the public will greet it as a revelation: this is what we have been waiting for.

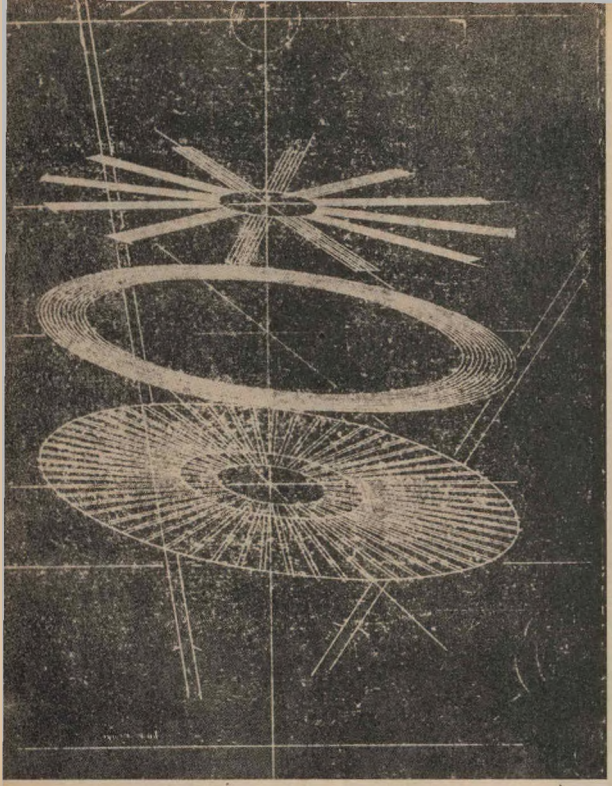


FLAKE BINS OF THE TOPPILA CELLULOSE FACTORY, FINLAND, by ALVAR AALTO.
Contemporary functionalism; the aesthetic appeal in this example is somewhat impaired by the excessively "domestic" character of the lower portion of the structure, which is scarcely in keeping with the industrial quality of the superstructure.

Photo: P. Morton Shand.

Both these possibilities can become facts. We do come to like things from habit, but mainly and generally it is the task of the artist to reveal what the community darkly and unconsciously demands. Habit can even bribe us into liking ugliness. The most dreadful industrial township, mellowed by morning mist, can have a fascinating effect. Besides, life produces many appealing views by chance, not designed at all; they just grow. As an instance, let me quote the children's poem, "I Like the Town on Rainy Nights."

But great art will not grow by chance; it must be cultivated. And if its inherent laws are, in a way which we do not understand, the organic outcome of social life, then so much more difficult is the artist's work and so much greater his responsibility. For art in this sense will be a most valuable means of education in as much as it reveals forcibly the spirit and essence of culture and will also make the less advanced elements aware of it. Particularly great responsibility rests with the architect, and also with the civil engineer, simply because buildings, bridges and such like are so big, so inescapable. One can stay away from concert halls and picture galleries. One cannot escape buildings, railway stations, factories. Architecture is the most obtrusive art, and the fact that the new architecture is already established is very significant. It gives us good reason to be hopeful.



DUCHAMP

Does the eye of the layman also begin to take delight in glimpses of the engineer's world? Those film producers in Hollywood know very well what the public wants to see. They must have their reasons when they use a steelworks as a background and when they interrupt the story for a moment to let us look at blast furnaces, coke ovens and teeming steel, as in "Major Barbara" or "An American Romance."

Whether or not the layman understands everything he sees there, is not very important. After all, how can he? It has been said that a machine, a building, a bridge is automatically beautiful if it is correct. The phrase was very likely invented by engineers and is, of course, nothing but wishful thinking. It is, to-day, hardly maintained any more; but one still hears frequently that a technical creation cannot be beautiful unless it is also correct. This, I am afraid, is likewise a fallacy logically. When I see a lathe, it might strike me as beautiful; but I cannot judge its quality. We are specialists; that means, somewhere we are all laymen. When you pass a hospital you may judge its architectural appearance. About its plan, its functioning, you know nothing. I have occasionally been asked why some silos have that peculiar corset-shaped outline and why they steam on top; the alleged silo being, of course, a hyperbolic cooling tower. Now, I do not want to ridicule the questioner by any means. Our technical world is too complicated to be comprehended by the layman. Why cooling towers at all? And why do they have a narrow waist? Both questions can only be answered by delving into all the intricacies of thermodynamics; well—we are specialists, aren't we? Let our structures be honest, simply because there is no reason to lie; there is no sense in dressing a railway station up as a castle. But this is all we can do for the man-in-the-street. He will always recognise a bridge, a crane, a locomotive because he knows their function. Whether he can tell a rectifier from a generator, a pump from a concrete mixer, a blast furnace from a power station, depends on him. Experience

shows that one can fully enjoy technical beauty without understanding all the technicalities.

Why has the aeroplane within comparatively short time come to aesthetic perfection? The reason is, partly, at any rate, lack of tradition. The engineer has—compared with the architect—the one great advantage that he cannot get entangled in history. He is not worried by scruples: is it as good as ancient Greece? He simply had to start from scratch. This is not absolutely true all round. The five-masted China clipper certainly has a tradition, a history older than we can trace back, but for all I know, the designer of ocean liners does not study the aesthetics of Roman galleys or Viking ships, beautiful though they were. Some aborigines do build suspension bridges, but these have hardly served as models for the Golden Gate bridge. Whether Maillart has studied Roman viaducts I do not know. At any rate, when he designed his own bridges, he must have looked the other way.

I cannot help feeling that the architect is a little hampered in his work by too much history. When your right hand sketches a chimney stack, the left one grabs for the book in which to look up the proportions of the Doric column. You lack some of that healthy barbarian spirit of the early Middle Ages, when Italian builders, with utter disrespect for history, went along to the Forum to pick from that heap of ruins some useful stones; but not for entablatures—for foundations! Forget a little of history, grasping the spirit of this age and putting it into material form; that is art. Study of archaeology is useless.

The invention of the cantilever in itself is useless. As I have said before, new materials and methods mean nothing; only what we make of them counts. Has the modern chemical dye industry produced a Renaissance in painting? Has the typewriter improved literature? Has the electric organ given us new organ music? Has the film industry created any great art? The true lovers of drama still prefer the stage play. And Bernard Shaw, who is not known for his abundant modesty, ranks Shakespeare higher than himself, in spite of electric footlights and the revolving stage. We had better expect from television likewise nothing at all, as far as art is concerned. The technical means count for nothing; they are always there when we need them. The engineers will see to that. They have always been quite useful servants in working for society's needs; even if they have still to go a long way in realising that one of society's needs is beauty.

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If the creative will, the cultural urge of our epoch is strong enough to build the world up anew and to make it a place worth living in, then and only then will we see a Renaissance of art. And engineering will have its share in it.

ACKNOWLEDGEMENTS FOR ILLUSTRATIONS.

The works of Pevsner and Duchamp, illustrated on pages 88 and 96, and Maillart's bridge, illustrated on page 93, are from "Circle" (Esd.: J. L. Martin, Ben Nicholson, N. Gabo), Faber & Faber, Ltd., London. The George Washington and St. John's bridges, illustrated on page 91, are from "Bridges and Their Builders," by D. B. Stainman and S. R. Watson; G. P. Pulman's Sons, New York. Wells Cathedral, on page 92, is from "The Cathedrals of England," by Harry Batsford and Charles Fry; B. T. Batsford, Ltd., London. The illustration on page 95 is from "Art in Industry," by Herbert Read; Faber & Faber, Ltd., London

BUILDING IN BAMBOO

BY DONALD PILCHER A.R.I.B.A.

These are some notes about an emergency building method which has proved extremely useful during the war.

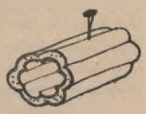
Security forbids a detailed description of the way in which bamboo building has been adapted for war purposes in the Far East, but such a description should prove of the greatest interest if it is ever seriously undertaken. It is, however, possible to give a brief account of the traditional use of bamboo in one of its most prolific breeding grounds, the jungle country of Upper Assam, and to illustrate this by one of two small buildings in which it has been adapted to more sophisticated needs.

It would be interesting to compare the techniques of bamboo building evolved by primitive peoples in different continents. Not being qualified to make such a comparison, I can only point out that, for instance, the woven bamboo wall appears to take very similar forms in Africa and the Far East, so that it is possible that the whole technique of bamboo building which I am describing represents a tradition more or less common to jungle peoples throughout the world. There is, in fact, this secondary interest in bamboo as a medium in which man made some of his first adventures in architectural expression, as well as its interest in contributing to certain practical problems to-day.

Bamboo seems to be a material specially suitable for the climate in which it flourishes. In Assam climatic conditions make very special demands on building. Rainfall, which rises to a pitch of some four hundred inches a year at Cherapunjee, probably averages two hundred inches a year over the whole of Upper Assam. As well as continuous, and often almost horizontally driving rain, the building must be designed against heat, dangerous hailstones, wind squalls, occasional earth tremors—and mosquitoes. Against all of these, except perhaps the last, it is possible that bamboo, properly used, gives a better protection than many more sophisticated building materials. I have seen apparently flimsy bamboo buildings remain standing after a sudden wind squall had uprooted properly carpentered timber buildings beside them. For the bamboo has a special quality possessed by few other building materials—the quality of flexibility. In bowing before the storm, the bamboo building manages, paradoxically enough, to stand up to it, and it is this maintenance of flexibility throughout the structure which lies behind the whole technique of using it.

There are, of course, many varieties of bamboo, large and small in diameter, thick and thin in their external walls and supple or brittle in their fibres. It is a combination of these which gives the proper answer to difficult climatic conditions. Such a combination brings us to the principle, beloved of modern architects, of distinguishing between structure and enclosing envelope of the building. In Assam the structure is made from the immensely strong Bulokka bamboo: the enclosing envelope, including sometimes the roof, of the brittle Jathi bamboo.

Conforming with the principle of flexibility, the structural joints should be bound rather than nailed or rigidly fixed in any other way. Nailing is also inadvisable because it splits the wood. The nail appears to penetrate cleanly enough when it is driven, but after a few days the bamboo will begin to buckle round the hole until the wood takes up a sort of multifoil section which considerably weakens it.

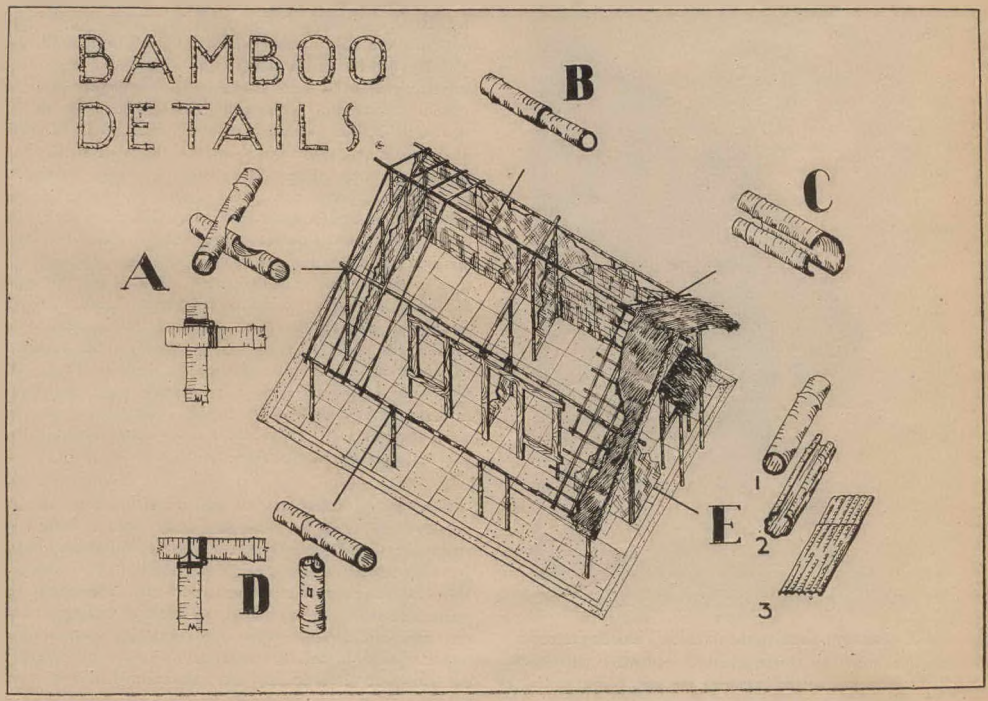


In considering the joints it should be remembered that the basic form of bamboo building is the post and lintol type of construction, but with a difference—the difference, already referred to, that the joints are bound and not firmly fixed. For this work only one tool is used: a sort of chopper with the end curved to a point. The binding material is cane, a tough concolvular plant common enough in the jungle. Here it may be of interest to note that the Indian worker (and this probably applies to the East in general) finds it easier to work with a pulling, instead of as in the West, with a pushing action. For example in sawing wood, the operative action is the pulling one and not the pushing one, as it is in our sawing; so that Indian saws are made with their teeth pointing, in our opinion, in the wrong direction. Again in digging, the Indian has no use for a spade or fork. He digs with a hoe, pulling the cut earth towards him. So for this bamboo and cane work he has a natural aptitude, and can pull the cane to make very strong joints.

The common bamboo joints are illustrated opposite. For joining posts and beams there is the joint D. Two strokes of the chopper cut the top of the upright bamboo into a segmental shape. With the point of the chopper notches are made through the walls of the bamboo and through these the cane is passed, turned over the beam bamboo and

generally lashed in the way shown. A second joint, A, is used for tie beams and similar members. Both bamboos are notched to form a halved joint which is bound with a square lashing. Bamboo scarfing, B, is a simple operation, consisting of tapering the small end of one bamboo and inserting it into the large end of the other. This is about the sum total of the joints necessary for the structural bamboos.

If the ideal bamboo structure is a flexible cage, the ideal wall should be something like a sponge. Short of complete air conditioning, this is the only type of building capable of reconciling two conflicting demands, the demands of ventilation in a hot climate and of absorption in a wet one. For here it is not only a question of keeping out continuous driving rain, but also of absorbing the atmospheric humidity which, in Upper Assam, is rated at 99%, and so of avoiding condensation on inside surfaces. The woven bamboo wall, as shown in 1, 2 and 3, does go a long way towards fulfilling these conditions. A double thickness of this walling will keep out all but exceptionally heavy rain and will let through an appreciable amount of cooling wind. The bungalow shown in 1 has a wall consisting of an outer skin of woven bamboo and an inner skin of Chatai : reeds woven something in the manner of coarse Chinese matting, and which can just be seen on the underside of the window hood in 2. This gives a reasonably well-finished appearance to the interior and, in conjunction with other features of the design, deals successfully with the difficult climatic conditions. The bungalow, for instance, is sited so that the verandah faces the direction of the prevailing wind, and so protects the wall from driving rain on that side. The roof is brought very low down, to within some five feet of the ground. This means that the view can only be seen when sitting down and that the verandah is only accessible from the end, but in view of the site, which falls down steeply on all but the access side, this, in appearance and in fact, turns out to be a reasonable arrangement. The back wall has no openings and the thatch roof is given a big projection with the thatch left untrimmed on this side. This gives increased protection both from sun and rain. Driving rain seldom comes from this direction and cooling breezes do, so that the less protected wall is satisfactory here.



1. BAMBOO BUNGALOW. General view of the front, showing the deeply overhanging roof of the verandah.

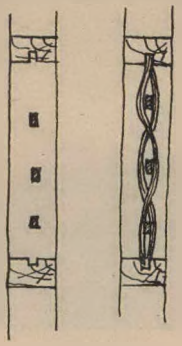
2. End view, showing the "window" with its protective hood the woven bamboo wall mats and the construction at the corner of the wall.

The method of making the bamboo wall is probably a familiar one in Africa. For this a special bamboo is used (in Assam the Kaka bamboo) which is chosen for its brittleness and the thinness of its walls. Cut in seven or eight foot lengths, it grows in such abundance in the jungle that it is seldom necessary to cultivate the Jathi bamboo, as, for instance, the Bulokka bamboo is sometimes cultivated. Bamboo, of course, is only solid at its joints, and the joints of the Kaka bamboo are very brittle. This enables the whole bamboo to be split and opened out. This is done by beating it with wooden clubs until it opens in the sequence shown in E 1, 2 and 3. The opened bamboos, each some 6 inches in width, are then woven into the walling mats, which are attached with cane to the uprights of the structure. (2) illustrates this type of walling, as well as a half-opened bamboo used to cover the corner joint of the mats. It is of course immaterial whether the mats are fixed to the outside of the structure or the inside, but as they are generally made in single units the height of the building, it is generally more convenient to raise and fix them from the outside. The Chatai mats are made some six feet by four feet and are bound direct to the bamboo wall after it has been raised.

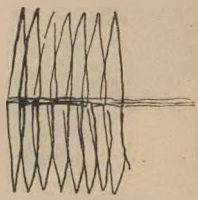
There are, of course, several varieties of bamboo wall. A primitive variety is the "Single Terza" wall, in which, in contrast to the "Double Terza" of cross-woven bamboos, they are only woven vertically across horizontal bamboo slivers. This sometimes provides a basis for mud and cow-dung plastering: the cow-dung making an effective antiseptic and the whole often being worked into interesting sculpturesque shapes. Here, of course, the wall loses its virtue of porosity, but it may be useful to treat the wall facing the driving rain

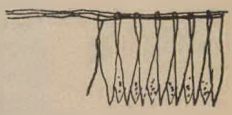
in this way. A light coat of plastering can be seen on the second hut, in (4). The Double Terza wall, which can be woven in rectangular or diamond formation, produces characteristic patterns of weft and warp. These tend to disappear as the bamboo bleaches, but remain for a considerable time on inside walls. The life of these walls can be extended and insects discouraged by treating them with coal tar or wood oil.

The bamboo slivers, or Camis, have already been mentioned. These are simply split from the bamboos as shown in C, and they can be used to make a very satisfactory type of walling for timber-framed structures. This construction is virtually the same as the "wattle and daub" familiar in European timber-framed buildings. When bamboo is used in this way the horizontal members of the framing are slotted before being assembled and holes are bored in the vertical members. Camis are then fitted into the side holes and other Camis woven over them, their ends being held by the shallow slots (Caminicks if you like) in the top and bottom timbers. Two coats of plaster complete the wall, an example of which is shown in (5).



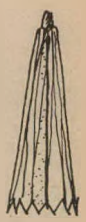
The roof, if no other material is available, can be formed of bamboo shingles. The beaten bamboos are woven into mats about seven feet long by two feet wide, which are laid with a lap of some four inches. The ridge, however, presents an awkward problem, and a cover of thatch gives the best finish here. Thatch, in fact, is altogether more reliable and quicker to fix as a roofing to bamboo buildings. I do not know how this thatching compares with the technique used elsewhere, but the general principle is to lay the eaves-thatch with the bundles thick-end-downwards and the remainder thin-end-downwards, carrying this over the first eaves-thatching. Nets of cross-woven bamboo slivers, seen in (5), are sometimes used at ridge and eaves to give the thatch a firmer fixing. The straw used seems to be finer, at any rate, than that generally used in England, and perhaps for this reason is laid at a considerably lower pitch: generally at 30°. Considering the amount of rain that these roofs will stand, this does, however, suggest investigating whether the steep pitches customary elsewhere are, in fact, actually necessary. Thatch, however, is a cultivated and so a somewhat sophisticated building materials which detracts from the formal value of bamboo comes direct from the jungle. Here two kinds of leaf are plentiful, the Jeng leaf and the Toco leaf, and both make an excellent roofing. Jeng leaves have a very regular formation, the actual leaf being about five feet long, with a sturdy centre spine with numerous blades, each about fifteen inches long, attached to it. For convenient carrying, the leaves are bent so that both rows of blades fall on the same side of the spine and the roof is thatched by overlapping the doubles leaves. Jeng leaves should be soaked in water for two or three days before being used, otherwise they will breed a sort of death-watch beetle which will devour the whole roof in a few days after it has been completed. Toco leaves, on the other hand, can be used green. Large, flexible, and completely waterproof, they are sometimes used by coolies as capes, and produce curious Birnham Wood effects when used as such in the mass. They are also used for making the large coolie hats which are finished with cane woven in a 1½-inch mesh. The leaf has a remarkable glazed surface and a linenlike structure. About 3-ft. 6-ins. long, it tears exactly like draughtsman's linen and folds exactly like an umbrella.



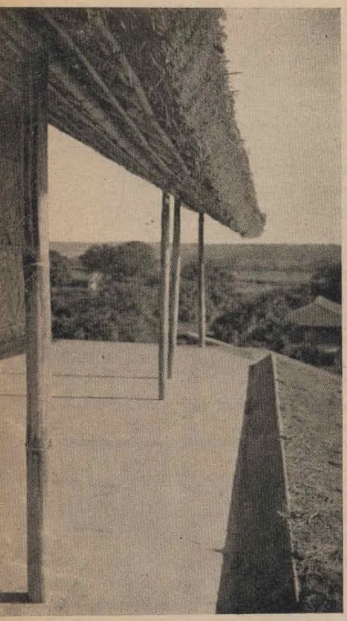


For roofing it is used half-folded and lapped three times. Partisans of Jeng and Toco leaves will make varying claims for their longevity in jungle buildings. It seems safe, however, to put the life of Jeng leaf roofs up to four years and of Toco leaves up to seven years. Jeng leaves can be seen on the roof of the third hut in (4).

The traditional jungle roofs probably derive their form more from these leaves than from thatch. The seductive Burmese hips are seldom seen here. Instead a square-cut gable is the rule with a straight verandah slope. A special type worth noticing is, however, the hogs-back shape, common in East Bengal, a suggestion of which can be seen behind the Indian in (4). From this, essentially thatch-cum-bamboo form are probably derived many of the characteristic shapes of Hindu temple roofing.



Doors and windows provide some of the most interesting examples of bamboo craftsmanship, but are admittedly flimsy affairs, and if only for protective reasons, some form of framed timber doors and windows are generally desirable. The mixing of bamboo and framed timber doors does, on the other hand, mean a confusion of structural principles and makeshift junctions between the materials which detracts from the formal value of bamboo architecture as such. As a means of ventilation the pure bamboo structure suggests such special forms as the stopping



3. THE BUNGALOW VERANDAH, showing structural arrangement of bamboo posts and lintols, the woven bamboo wall panels and the encircling gutter. The eaves are brought well down to protect the wall from driving rains.

4. BAMBOO HUTS, showing Jeng leaf roofing on the third hut, and a suggestion of the hogsback roof, common in East Bengal, on the hut immediately behind the figure in the middle distance.

5. A raised timber framed bungalow with Cami plastered walls. This building also illustrates the use of nets of cross-woven bamboo slivers at ridge, hips and eaves to secure the thatch of the roof.

of the wall envelope a foot or two short of the eaves, this space being filled by a grille of cross-woven slivers. This additional ventilation will allow the windows to be as small as is convenient for bamboo work. The best arrangement is probably to hang the window from the top, so that the opening is protected against sun and rain. Solid timber windows, however, are too heavy to handle conveniently if they are top-hung, and one solution is to use side-hung shutters with a projecting hood, as shown in (2). Glass, even if it were available, would be of doubtful value in jungle buildings, whose windows must in any case be open during the day for ventilation and closed at night against insects and marauders in general. A good example of bamboo craftsmanship is the door in (6), formed of a single thickness of matting, cross-braced with Camis and with an ingenious hingeing device in which the upright revolves inside a larger diameter bamboo sunk into the ground.

Finally there is the problem of the floor, which is perhaps best solved by raising the building altogether off the water-logged ground, as has been done in the timber-framed building in (5). Precast concrete slabs, floated with a neat cement finish and laid on a bed of sand, do however give a reasonable, if sometimes damp, floor. Slabs of this sort are used in the bungalow in (1), which, being at the summit of high ground, has a site which drains reasonably quickly in any case. Roof water is caught by a broad ground gutter running completely round the building.

This building does, I hope, illustrate that traditional bamboo work can be adapted to give a reasonably comfortable form of dwelling in a very exacting climate. Its advantages are obvious. First, extremely rapid construction: apart from the floor slabs and doors and windows, small bungalows like this can be put up in a day. Second, cheapness and lightness of the materials used and cheapness of the labour required, as any coolie can learn to do bamboo work in a few days, or at most, weeks. The bungalow illustrated was, for example, put up for a rough cost of £12 10s. But it is just this factor of cheapness which is the enemy of bamboo building, or rather of its use outside its own natural territory. For there is no profit in bamboo building, either in materials or labour. Nevertheless, it can be imagined, in theory, as a solution to Europe's temporary housing problem. Co-related with the mass-production of a heating and plumbing unit and with, say, the addition of a sheet of aluminium foil between the wall mats, this type of building could provide temporary houses above the standard both of comfort and appearance that most Europeans are likely to get during the next ten years. Its lightness makes bamboo a very cheap material to transport, and a handful of Liberty ships from the Far East could carry material for hundreds of thousands of houses. To carry this too-logical fantasy further, one can see people learning to build their own houses, with bamboo weaving and cane-work part of the curricula of schools and women's institutes: a legitimate outlet at last for the latent art and craft spirit. But a fantasy it remains, unless re-housing is to be considered, as there seems no reason why it should be considered, as a mere matter of re-housing, instead of as a matter of re-housing plus profit to the building industry. Bamboo building is, both in the best and in the worst sense of the word, an ideal solution to the temporary housing problem.

STATE ART IN SOUTH AFRICA

by Messrs. G. G. Allen, B. S. Cooke, J. C. Davies, M O. Evans, E. P. Friede. R. E C. Hope, S. E Smale, on Active Service

THE NECESSITY

Art is an essential part of State organisation, as a factor in all phases of education, in religion, in occupational therapy, and in the enjoyment of "amateurism" which results from greater leisure.

We require living art for a contemporary public.

Art is characteristic of the civilised State. The city in its entirety is a work of art, and consequently must be planned as a whole. We judge the civilisations of the past by their various arts and their achievementat liberty. For these reasons we feel that steps should be taken to place art on a professional footing as an essential part of every-day life in South Africa. That this necessity has already been partially recognised is evidenced by what the State has already done. In the Primary and Secondary Schools we educate the future consumer and give an opportunity for talent to grow and flourish. We must not believe that it is enough to achieve appreciation of arts which are already accepted as great. The idea that art is an exclusive segregated activity is no longer useful. It places a gulf between the artist and his audience. We require creative artists —and we must train them professionally. Art is a full-time job. Amateurism is a proof of love for the arts. Great art results from the proper encouragement of genius—the man who devotes his whole life and energy to art.

When we have trained professional artists it is surely illogical not to employ them and pay them properly.

BEFORE THE WAR

Before the war, the search for a sinecure, the hobo and the sponger were the unsatsifactory solution that faced the artist since the failure of private patronage through increased taxation. Co-operation between the architect, the sculptor and painter had broken down. The architect was expected to be a pasticheur, the painter to confine himself to small cabinet pictures, the sculptor to drawing-room ornaments.

The prospect of a decent livelihood for a painter or sculptor has been so remote for the last 50 years that parents have always opposed the natural genius. What he has done has been achieved in spite of frustration. This statement is true of all the arts.

Things were so bad that we had come to accept the idea that starvation and hardship were the ideal conditions for the production of good painting and sculpture. We know this to be fallacious. . . . Velasquez was wealthy, Rembrandt was poor, Cézanne

had a modest income, Van Gogh suffered poverty. Who had the right to insist that the genius of an artist who is starving and ill would suffer if he were properly fed, clothed and housed ? The raist's function is to produce buildings, sculpture and painting, not to be a saint or a vagabond.

THE EMPLOYMENT OF SOUTH AFRICAN ARTISTS

The purpose of this paper is to insists on the urgency of the question of how the artist in South Africa is going to be employed after the war as a professional. Are the gifted South Africans who, on completing their Art Training, joined the Army, able to expect work to await them when they return ? We point out that the arts are a full-time profession, that we have no right to begin to train a " full-blown " painter, architect or sculptor (and they must be trained together) with the knowledge that there will be no worthy and stable employment for them when they have completed from five to seven years' training.

THE DEAD OUST OF LIVING

The dealers' " ring " that sells the work of the dead at false prices is the enemy of the living painter and sculptor. It is so obviously to the dealer's advantage to sell one work at £5,000 by, for instance, Renoir, rather than twenty works at £50 by a living artist of established reputation. During the war in many respects the artist is better off than during peace. Some artists at present may even prefer war to peace.

The expensive " old masters " are safely out of the way in bombproof vaults. In England the contemporary artists were prepared to give exhibitions of their work even while there was a risk of exposing them to bombing rails, and they sold their work as never before. Cars, petrol and the week-end outing no longer monopolise the savings from modest incomes; and, further, a painting is a sound investment.

Finally, artists are employed by the State as war artists. Here is the nucleus of a State-employed art.

THE ARTIST IN POST WAR RECONSTRUCTION

The position of the artist during war is the key to the employment of the artist in post-war reconstruction. Painting and sculpture must be restored to their place in architecture once more . . . . easel pictures and drawing-room sculpture will not suffice. The Pretoria Art Centre was a good move. Let us make further decisions which will give the artist an opportunity to do his work, and let us make them now.

The South African Board of Trade and Board of Education can form a committee to enquire into what has been done in other countries and make a report on such institutions as the Federal Arts League in America and the Barnes Foundation, the State Art in Russia, the activities of Cema and Ensa in Britain and State employment of artists on the zoning system in Italy.

The South African system can be based on this report.

THE SHAPE OF SCHOOLS TO COME

BRITAIN, ARMED WITH THE BIGGEST SCHOLASTIC REFORM OF HISTORY, PLANS A NEW BACKGROUND FOR EDUCATION

By Eugene C. Kent, F.R.I.B.A., member of the Town Planning Institute, who for many years has specialised in housing and the design of school buildings.

Among the many problems confronting Britain after the war, that of providing more schools and better will have high priority.

It is now generally acknowledged (1) that the existing educational set-up, and its buildings, equipment and surroundings, are wholly inadequate to meet education's new trends; and (2) that this is a matter of public concern.

Until an enlightened age brought widespread public recognition of this due concern with the new generation's education, the training of Britain's children for citizenship went more or less by default. Reading, writing and arithmetic—the Three R's—were considered ample enough preparation until the beginning of State-aided education in 1902.

The 19th century's unexacting standards of what was due to the child gave place to a broader concept: organised, official intervention in the shape of local education authorities. But even their standards fell far short of those put forward only a quarter of a century later—so fast and progressively had standards risen by then. At the turn of the century, school buildings were of unsuitable design and the classes far too large. Fifty in a class was a normal number.

Since those days reformist ideas in elementary education have led the way in gradual improvements of one sort and another, one of the most notable milestones on the march being the recommendations of the Hadow Report in 1926. But even the Hadow Report could not go beyond the scope of its time. Anomalies concerning the authorities responsible for, or profitably participating in, the elementary education of the young were allowed to remain.

SWEEPING CHANGES.

But now Britain's Parliament has just passed a new Education Act. All the old anomalies will be swept away. The scope of the Act makes it the biggest, most progressive reform ever undertaken in the public education system of the country. More, its modernistic spirit is crystallised in these words, from the White Paper which preceded the Bill:

> "The Government's purpose . . . is to secure for children a happier childhood and a better start in life; to ensure a fuller measure of education and opportunity for young people and to provide means for all of developing the various talents with which they are endowed, and so enriching the inheritance of the country whose citizens they are."

All the specific reforms—and the larger social issues involved—cannot be outlined here; but the chief of them are these. In the future, education will be re-organised into three successive stages: primary, secondary and further education. The school-leaving age will be raised from 14 to 15 and (as soon as feasible) to 16. Sizes of classes will be reduced. Nursery schools will be provided by Local Authorities as a duty—and not, as hitherto, from a seldom-exercised choice. Secondary school fee-paying will be abolished, and qualifying examinations also; children will be allocated to the various types of secondary schools on a basis which will take into account the wishes of the parents, the school record, and probably intelligence tests. Compulsory attendance is required between 15-18 for at least one day each week at "young people's colleges."

FUNDAMENTAL PRINCIPLES.

That is the broad plan of reform. Each and every one of the foregoing entails, among other things, an enormous building programme. Existing premises will have to be enlarged; entirely new ones will have to be constructed.

During the war hardly any school building was done in Britain at all—not even current repairs. The task is of really staggering proportions. How is it to be achieved? The answer can only be: by careful, far-sighted planning.

A school is two things: a building in its own environment; and an instrument furthering the aims of education. It so happens that the school-building and remodelling plan coincides with the bigger task of town-building and remodelling (in the cases of war-scarred towns), and even also of making plans on a regional and even national scale, for the re-location of industries.

IMPINGTON VILLAGE COLLEGE, CAMBRIDGESHIRE, ENGLAND.
ABOVE : Pupils of this school, which provides educational facilities for ten surrounding villages, dancing on the lawn outside their classroom.
BELOW : The well-ventilated and well-lit classrooms of the school give a good idea of the modern trends in the design of Britain's school buildings.

Just as the proper functions of the town, the village and the countryside are being re-defined, so is the place of the school within the new pattern.

A few principles have emerged :

(1) Nursery schools need to be provided in such numbers that they are within walking distance from every home in a neighbourhood.

(2) Primary and secondary schools, requiring larger areas for buildings, playgrounds and games fields, are best placed on the fringes of built-up areas, or bedded into strips of parkland separating adjoining neighbourhoods.

(3) No nursery or primary school should be so sited that children have to cross any main traffic road on their way to or from school.

(4) Most elementary and certainly all secondary schools and "young people's colleges," with their assembly halls, gymnasia, workshops, laboratories, libraries and playing fields, should fulfil a social as well as an educational function. They should be cultural centres for the whole population of their district, particularly where there is a scarcity of other accommodation for meetings and assembly.

And with the idea of "neighbourhoods" as component elements of town planning becoming more and more accepted —the neighbourhood being a residential area with all the social, technical and cultural facilities needed for a full and happy life—the larger types of schools with their closely defined range of influence are considered by many planners as the most obvious factors determining the right size of such a community unit.

THE ARCHITECT'S TASK.

But correct siting is only one of the many problems involved. When it comes to designing the actual buildings, it is the educational requirements of to-day and to-morrow which have to be closely scrutinised. The planner has to make himself familiar not only with current practice in the everyday task of education, but also with the trend of thought, ideas of leading educationalists, with successful experiments and the like. And he has to ask himself how to translate all this into terms of physical planning.

In doing so he will come to recognise certain outstanding facts :

(1) The school of to-morrow will be a community in which pupils, teachers and parents have equal parts to play.

(2) Education is no longer confined to book-learning. Practical training in crafts, engineering and the arts, plus education for citizenship, will have equal emphasis. Thus Britain's cultural heritage as a whole will be properly understood and enhanced.

(3) Physical training and medical care are to be extended; school meals have come to stay.

(4) New age groups will have to be planned for. The 2-5's, the 14-18's, the adults will have to be provided for; particularly the accommodation for the adolescent—the new "county colleges." They, in practically all cases, have yet to be built.

There have been some interesting new ventures up and down the country—sponsored partly by private enthusiasts, partly by some of the more progressive education authorities which point the way . . . . school camps, village colleges and some of the more recent secondary schools.

THE "OPEN PLAN."

What characterises most of these new schools is the "open plan"—the loosely-knit layout of the different groups of rooms. It appears far better suited to the new educational demands than the older, four-walled type of school. There is no doubt about the general tendency to get away from the drab, institutional character of so many of the older school buildings. A closer relationship must be established between the classroom or workshop and the surrounding grounds. These need to be laid out both to please the eye and function in actual use.

In many modern schools classrooms are all at ground-floor level, communicating with an outdoor space immediately adjoining. Workshops are in separate wings away from the classrooms, to avoid disturbance by noise. The assembly hall, library, medical inspection rooms, dining hall, kitchen and the school administration are usually in a separate block, often the solid core in the scheme, as being the part of the buildings not likely to need modification. Classrooms and workshops may expand with the school development or progressive class-size reduction.

Questions of equipment, lighting, heating and sanitation have all to be thought out afresh. Modern techniques of instruction, work in study-groups, individual study, school broadcasting and television, and the trend of admitting a maximum of fresh air into the building at all seasons, put these matters on a new footing.

The fixed benches of the old classroom have given way to light movable furniture, which can be arranged—or dispensed with—according to the changing needs of the changing work done. Class-room walls are often entirely glazed, and sometimes fitted with sliding doors so that the room can become an open, covered verandah in suitable weather.

The communication of the class and workroom wings with one another, and with the central building, is often by covered ways; and the whole layout is adapted to the existing natural features of the site, combining with, rather than disregarding, landscape effects.

By planning schools while recognising the function of every room and its relationship to the whole, an environment should be created in which future generations can more happily learn and develop.

WHEN AND HOW IT CAN BE DONE.

There still remains the question of time.

There will be many equally urgent claims on Britain's building resources after the war. Will it be possible to build the new schools needed and to bring older ones up to the new standards within a reasonable time ?

The time-lag so probable between planning and completion can be shortened in several ways.

In the first place, surveys on a county scale will assess what accommodation exists; how far it is obsolescent or adaptable; how much new building is required; and its order of priority in conjunction with existing possibilities of staffing and finance.

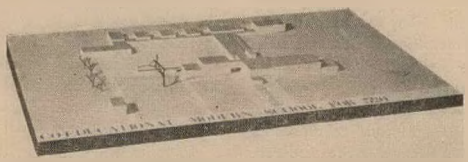
When a schedule has been drawn up on the basis of such a survey, a decision on suitable methods of construction will be made. The aim here is to use labour and material to the best possible advantage, as both are likely to be post-war shortages.

A committee appointed by the Minister of Education has suggested standardised construction for speeding up building processes and economising labour and materials without reducing structural efficiency. They have pointed out the adaptable uses of standardised units (not, of course, whole buildings), particularly for such one-storey parts of the layout (classrooms and workshops) which call for modification with changing needs.[1]

The technique recommended leaves full scope for the architect in avoiding the uniformity so easily associated with the idea of standardisation. Another reason why adaptable construction appears such a good solution is that so much of what is done to-day in education is felt to be, as yet, experimental; the less permanent buildings are, the better will they serve their changing purpose.

And it is of paramount importance to employ all and any suitable methods to create, both in quality and quantity, and within the shortest space of years, what amounts to a completely new background for education..

[1] Standard Construction for Schools, Post-War Building Studies, No. 2, H.M. Stationery Office, London, 1944.



Architectural model of a modern co-educational school for 320 pupils, planned to be built in Britain. This is one of many new designs of school buildings which will ensure that children are educated in light, healthy surroundings, with plenty of space for games and outdoor activities.

PLASTICS IN POST-WAR BUILDING

by Philip Murray

With the advent of war traditional building was stopped in Britain. Large numbers of building operatives and employers joined the Services, and those who remained in the industry were concentrated on operational building. This break with continuous traditional building gave the building industry time to take stock of its knowledge and to initiate research that may well revolutionise building methods.

During the last two years many new methods and materials have been tried out, and so much publicity has been given to the possibilities of plastics that the public has been led to expect too much of them: to believe that all-plastic houses in permanent and varied colours will soon be de rigueur. The balance has now been corrected by the publication of a report on plastics as part of the comprehensive study of building practice organised by the Ministry of Works.

Plastics are defined in the report as a group of materials which, though stable in use at normal temperatures, are plastic at some stage of their manufacture and can be shaped by the application of heat and pressure. They fall into two main classes: thermoplastics and thermosetting. Thermoplastics soften on heating and harden on cooling, and this softening or heating process can be repeated as often as desired. Thermosetting plastics are initially thermoplastic, at which stage they can be moulded under appropriate conditions of temperature and pressure: further heating at quite moderate temperatures (260-350° F.) causes them to set permanently. They cannot again be softened by heating, but, being organic materials, char at a temperature of about 650° F.

Plastics have taken the place of metals, wood and ceramics in many articles in common use, but while they have many uses they are not suitable for all purposes. They have their merits and their limitations, and their uses must be chosen accordingly.

One hundred and eighty-four actual and potential uses for plastics in building are listed in this report. These applications are classified under: (i) constructional components, such as doors, windows, fireplaces, skirtings and so on which are installed by the builder in the normal way; (ii) load-bearing members, i.e., stanchions, rafters, purlins and joists; and (iii) fittings used in the general equipment of buildings or in the installation of electrical, heating, plumbing and other services (these are mostly specific articles such as taps, switches, cupboard hooks and door furniture). In addition, plastics can be used for applied finishes of the more durable types, as sound absorbent for acoustical control in auditoria and offices, and for farm buildings, such as barns, chicken houses, cowsheds, portable sheds and silos, in which resin-bonded plywood may play an important part.

This report stresses that whereas complete structures have been erected almost entirely of plastics, these have been for exhibition purposes: that there is a big difference between the production of a model designed to attract attention to the use of plastics, regardless of cost or practicability, and a house intended for permanent use which must be economic to construct.

Before the war the plastics industry in Britain was so fully occupied in other directions that there was little material or plant capacity to spare for the production of structural materials for building. To-day, however, the possibility of expanding the industry in this direction is being investigated. Since thermoplastics soften at comparatively low temperatures, the risk of collapse in case of fire makes it quite impossible to contemplate their use as load-bearing members. Thermosetting plastics could be used in some cases, however, particularly by the application of resin-bonded plywood and laminated wood, which have been used extensively as linings for walls and ceilings.

Laminated plastics have hygienic qualities, water resistance, good appearance, ease of cleaning and wearing qualities that fit them for domestic use, particularly in bathrooms and kitchens, though their higher cost as compared with fibreboard, plasterboard or asbestos cement sheet tends to limit their use.

The fact that plastics can be made in a wide range of colour and have a clean finish which is not subject to corrosion, and does not need further protection with paint or lacquer, is an advantage in public and commercial buildings, where personal idiosyncrasy need not be catered for; but domestic interior decoration is very much a personal taste, and a permanent colour scheme in a living room or bedroom may not be acceptable, especially to an owner-occupier. In rented flat property, however, laminated plastics are invaluable because their resistance to wear and tear saves expenditure on redecoration at each change of tenancy.

Plastics have been little used as floor coverings in Britain and there is lack of information on their wear resistance and

general suitability. Plywood makes a satisfactory floor covering, provided the top ply is thick enough, and the waterproofness of resin-bonded plywood is particularly advantageous in bathrooms and kitchens.

Window frames, doors and door frames, skirting and staircases are discussed only tentatively in the report, because a very limited range of experimental trials has been made. Moulded window frames have been used successfully in cars and in refrigerator display cabinets, and there would be no difficulty in making fixed frames for borrowed lights or service hatches, with doors sliding in moulded or extruded channels. Frames with opening lights, designed to suit the method of manufacture, could be moulded in complete units in shock-resistant moulding materials, or could be fabricated from laminated, moulded or extruded sections. Flush doors have been made with facings of plywood or laminated plastics, but to make complete doors as mouldings would probably be too expensive. Further, it is considered that there is nothing unreasonable in the idea that complete staircases might be produced by a moulding process. For this purpose wood veneers or a combination of wood veneers and resin-impregnated paper would seem desirable to provide the required strength and resistance to impact.

To enumerate and discuss the individual fittings that have been and will be made in plastics would occupy too much space in this article, but it should be noted that application of plastics to plumbing is receiving considerable attention. Many sanitary fittings have been made in plastics, including plugs for baths and basins, tap capstans, the upper parts of tap bodies, handles for mixing valves, waste pulls, toilet seats and ball floats for cistern valves. A recent development in the manufacture of flushing cisterns has been the casting of two-gallon tanks in bituminous compound.

Besides the many established uses of plastics in building, there are others which have yet to prove their practical worth. Where a new proposal involves the production of a moulded article, the manufacture of prototypes for trial cannot be lightly undertaken. The moulds are expensive and the cost must necessarily be spread over a large number of articles if the process is to be economic. Some articles can be produced in plastics with greater efficiency and at less cost than in other materials. Some may be more expensive. In the post-war period choice may be guided by the relative availability of the various alternatives, irrespective of their relative cost, and in Britain plastics are not yet produced in such large quantities as to compare with the basic materials of building, such as steel, cement and brick.

CONTEMPORARY JOURNALS

"PENCIL POINTS" April, 1945

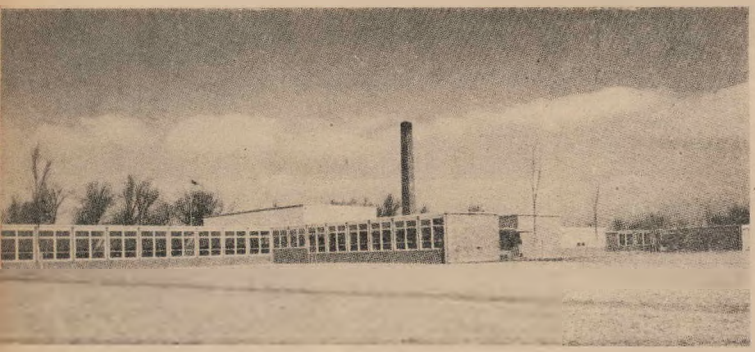
This issue is devoted entirely to the design of the contemporary school building in America. The comprehensive and stimulating review of this ever-present problem from the purely American viewpoint, illustrated by means of eight examples of school building, both existing and projected, shows, how universal the pattern of school planning is becoming, in spite of widely dissimilar curricula. The illustrated examples range from nursery and kindergarten to high school buildings, and again the idea of the school facilities being shared by the entire community is presented.

The examples, all of which are representative of the contemporary desire for flexibility in use, line up with varying degrees of success with the ideal that the school "should offer pupils a congenial environment, understandable to them as children, well related to the community it serves."

Some of the schools illustrated were built directly as a result of the war, and some show war's effects on the materials employed. Many adhere to unilateral classroom lighting, but in these the windows are ceiling high and extend from wall to wall, thus eliminating the "glare-causing contrast between window glazing and adjacent dark interior wall surfaces." And while some show the "imprint of the dead classic thumb," yet all are striking advances in school design.

As is the tendency in England, these schoools show a clear adoption of a classroom standard and a structural unit. The use of a four-foot module is suggested and demonstrated in one example. The open or free plan, too, fittingly demonstrates its efficiency in sheltering the developng and changing demands of modern education.

"Pencil Points" April 1945



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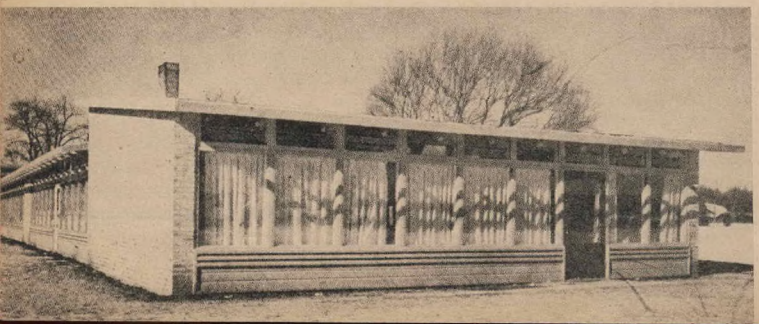


KINDERGARTEN OF THE RUGEN SCHOOL ADDITION, GLENVIEW, ILL.
Perkins, Wheeler & Will, Architects.

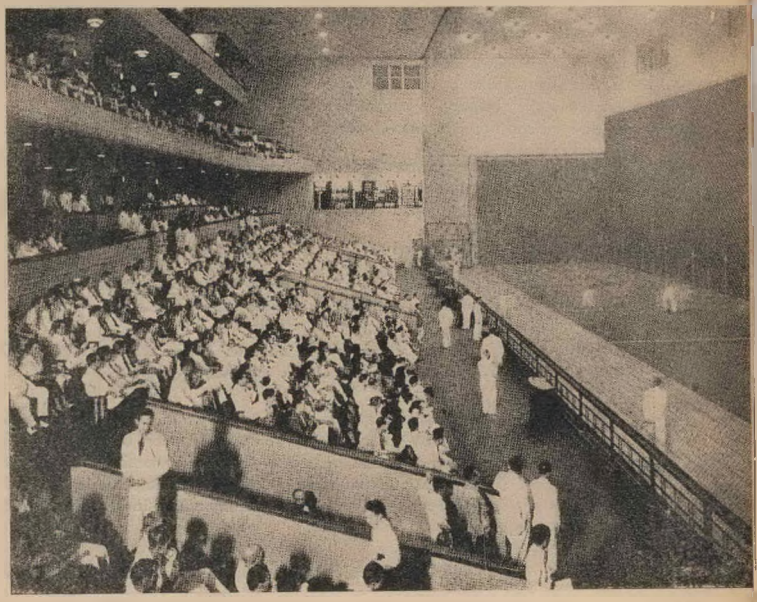
The Pratt and Whitney aircraft engine plant at Kansas City, by Albert Kahn Associated Architects and Engineers, Inc., is illustrated and described in the February issue. Like most of America's vast war production plants, this great manufacturing building, owing to the restrictions on critical materials, posed structural and constructional problems. Here a "straight-line" constructional system permitted the pouring of 200,000 super feet of roofed area each week and rapidly produced the main building, more than 1,000 feet wide and over twice as long. Operational requirements necessitated spacing columns 40 feet apart each way, and the structure had to be erected in reinforced concrete. The designers developed a multiple-arch, thin-slab roof for the purpose.

Another interesting feature is the Jai Alai sports centre in Manila, completed shortly before the war. As the building illustrated shows. "Jai Alai involves more than a game, however exciting the sport itself. In the Basque language 'Jai Alai' means 'merry festival,' and the game itself is called 'pelota vasca.' Jai Alai is known as the fastest game in the world, also the most interesting to watch." It is played with a ball about the size of a baseball and "twice as resilient" as a golf ball on a court measuring 180 by 30 feet.

The auditorium in the Manila building "seats 3,500 spectators; it also has five bars, two restaurants and a night club. While there are bars at each of the four levels, the whole of the top floor is developed for a combination of night club and gallery, where patrons may view the game in progress 65 feet below."

This month's Building Types Study presents the Grand Rapids Parking Plan—the outcome of years of study by the Architects' Civic Design Group of Grand Rapids. "The plan has significance that reaches far beyond the immediate project. It suggests at coherent method of approach, from the standpoint of physical planning and construction, to the most troublesome problem of the urban central district. It proposes economic formulas to help salvage slipping values. Its architectural value is perhaps even greater. Though it starts as a 'parking plan' for the sake of better shopping terminals, it ends by opening the possibility of re-creating the downtown area as a distinctive and coherent urban district. It affords

SPECTATORS' GALLERIES AND COURT, JAI ALAI SPORTS CENTRE, MANILA. Walter Wurdeman and Wetton Becket, Architects.



a technique for placing the need high and low buildings in a restful and harmonious relationship."

There is also "a survey by an accomplished architect, specialising in stone work of recent design trends"—including the planning, design and lighting both internal and external retail shops.

In the March issue, Joseph Hudurt reviews and comments on "Architecture's Place in City Planning." He refers to the "heroic abstraction of vista and monument" in the Plan for Washington, and to the critical rôle the architect inevitably plays in shaping the city. He concludes that "there are, then, at least three justifications, if such are needed, for assigning to architecture a dominant rôle in city planning. Because cities are built of buildings; because buildings are in modern practice definite elements in the social no less than the physical pattern of cities; because the architectural idea, invading all elements of the city, can lift it into an agency of the spirit; because, in short, city planning is an architectural no less than a political and social art, the architect, who invented city planning, who guided and sustained it through centuries, must not, whatever his sins of omission, be rudely dismissed from this his most urgent and congenial field."

The Building Types Study reviews the striking change in building needs in the field of Banking. Plans of completed and projected banks are illustrated, and two articles, "What Bankers want of their Buildings" and "Fundamentals in Modern Bank Planning," are included.

Elsewhere in this issue is a series of plans and photographs illustrating the planning and arrangement of various types of offices.

"THE ARCHITECTURAL REVIEW" April, 1945

This issue is a special number devoted to a survey of "Electricity in its Regional Setting." This survey takes the form of a series of fifteen separate articles. "The writers of the articles in this issue put the case for a plan for electricity in its wider regional setting and from many viewpoints, some of them perhaps conflicting. They are, however, unanimous in demanding a social and economic assessment of all the implications." As is pointed out in the introduction, electricity can be generated almost anywhere, and it can be made available anywhere. It demands not piecemeal but careful integrated development.

The articles, many of them highly critical, range from the question of the siting of the power station, its relation to electrotechnical and other industry, to the design of generating stations and their introduction into historic cities like Durham. In the words of Thomas Sharp, "The Durham project is plain philistinism." In drawing a comparison, he points out that "the station buildings will have more than three times the total bulk of the cathedral buildings; the roof of the main building will be twice as high as the cathedral roof. . . . ." He makes the plea that no power station should be built in or immediately near to a town or village.

The concluding article by Colin Brooks reviews the "Responsibility of the Citizen," with some well-pointed comments on the apathy of the average citizen in regard to general planning and amenities.

The whole issue is well illustrated and contains not a few examples of the T.V.A. works—so well known for their high standard of design and co-ordination.

PROFESSIONAL NOTES AND NEWS

NATAL PROVINCIAL INSTITUTE

The following office-bearers were elected to the new Committee for the ensuing year at the Eighteenth Annual General Meeting :—

B. V. Bartholomew, J. Corrigall, G. E. Le Sueur, D. C. McDonald, I. Park Ross, F. W. Powers, J. S. Simpson, S. N. Tomkin and Alan Woodrow.

Among other items discussed were Publicity, whereby the Institute is being brought into greater public prominence; the Sub-Committee's report on Post-war Development in Durban, in which work has been hampered by lack of plans; the Symposium and Exhibition, "Rebuilding South Africa," which was a great success; and Bye-laws—the Institute having received an assurance from the Town Clerk that proposed amendments will be submitted to it before submission to the City Council.

NOTICE

We are pleased to announce that Mr. J. Seaton Hodge has returned from Active Service and is resuming practice in St. Andrew's Buildings, Rissik Street, Johannesburg.