

In the CAUSE OF ARCHITECTURE

By
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PART III. STEEL

STEEL IS THE epic of this age.

Steel has entered our lives as a "material" to take upon itself the physical burden of our civilization.

This is the Age of Steel. And our "culture" has received it as ancient Roman culture received the great gift of the masonry arch. For centuries the Romans pasted the trabeated Greek forms of their "culture" on the arch in front as architecture, while the arch did the work behind.

Finally the noble virtue of the arch overcame the sham culture of the period and came forth and lived as a great and beautiful contribution to mankind.

Steel is still smothered in aesthetic gloom, insulted, denied and doomed by us as was the masonry arch by the Romans. Inherent virtue will triumph here, too, in course of time. So much wasted time!

This stupendous material—what has it not done for Man?

What may it not yet do for him with its derivatives and associates as the glare of the converters continues to mount into the sky, day and night.

Now, ductile, tensile, dense to any degree, uniform and calculable to any standard, steel is a known quantity to be dealt with mathematically to a certainty to the last pound; a miracle of strength to be counted upon!

Mathematics in the flesh—at work for man!

A mere plastic material, thin and yet an ultimate rigidity, rolled hot or rolled cold to any desired section of any strength unlimited in quantity; or, continuously night and day, drawn into thin strands of enormous strength and length as wire—enough to wind the world into

a steel covered ball; or, rolled in any thickness into sheets like paper, cut by the shears into any size.

A rigidity condensed in any shape conceivable, to be as easily bored, punched, planed, cut, and polished, too, as wood once was. More easily and cheaply curved or bent or twisted or woven to any extent and the parts fastened together. A material that in the processes already devised not only takes any shape the human brain can reduce to a diagram but can go on producing it until the earth is covered with it—and there is no escape from it. No, none!

For it is cheap.

Cheaper in its strength and adaptability than anything man ever knew before—thousands of times over.

But it has it in its nature to change its volume with changes of temperature.

It has a fatal weakness.

Slowly it disintegrates in air and moisture and has an active enemy in electrolysis. It is recovering from this weakness. It is only fair to say that it may become, soon, immune. Then, what?

Meanwhile, owing to its nature it may be plated with other metals or protected by coverings of various sorts, or combined with them. In itself it has little beauty, neither grain, nor texture of surface. It has no more "quality" in this sense than mud. Not so much as sand. It is a creature wholly dependent upon imaginative influences for "life" in any aesthetic sense at the hand of a creator.

So is terra cotta. So is concrete, although both these friable materials have certain internal possibilities of texture and color.

So also relatives of steel have beautiful permanent surfaces—bronze, brass, sil-

ver, gold, aluminum, copper, tin and zinc and others. It would be interesting to write about them all.

But the weaknesses of steel are not fatal to beautiful use, nor is the lack of individuality in texture other than an opportunity for the imagination.

Yet, how or where is steel evident in our life as a thing of beauty in itself? In tools? Yes, in knives and saws and skates: in hardware. In engines, in the rails of the railroad, in the locomotive, the submarine, the torpedo boat, the aeroplane. In bridges? Yes, but only where the engineer was inspired and allowed his stresses and strains to come and go clean in the members, innocent of any desire or intent on his part to "ornament" them. Used honestly by engineers, steel has something of the beauty of mathematics.

Remember, however, that music is but sublimated mathematics. And the engineer is no more capable of giving steel structure the life of "beauty" it should have than a professor of mathematics is capable of a symphony in music.

The principles of construction which find in steel a medium that will serve with safety economically in various designs as support for enormous loads to span wide spaces, or supporting enormous loads to enormous height, are, as long as they are really kept scientific and clean, showing as such, the best work we have to show.

And it is much.

But it is not the architect who can show it.

When the architect has dealt with it what has he done? The skyscraper and lied about it. The modern Cathedral, lifeless, dummy, supported from within to appear "life like" without. Anything you wish to name as architecture will be likewise.

Anything you may name as engineering where architects cooperated will be similar, probably.

An exception here and there is now manifest, already late. This era is fast and furious in movement. But all movement is not progress. Architecture has not progressed with steel. "Architecture"

has all but died of it while architects were singing their favorite hymns and popular Christmas carols to the medieval antique.

Incredible folly! "Tower" Buildings, East River bridges, St. John the Divine's, States Capitols, and all. How all of them mock integrity! Wherein lies the artist's grasp of the "masters" who design such structures?

Had Bach or Beethoven made music the mathematics of which would be like the principles of construction in such edifices, what would such music sound like? Pandemonium, requiring hideous grimaces and falsities of tone and absurdities of concatenation with no rhythm, obvious or occult, outrage to the mind. Inconceivable!

For the principles of construction now find in steel because it is a strictly calculable material of miraculous strength, ideal expression as the sinews and bones of structure.

The architect has been satisfied to leave the mathematical sinews and bones unbeautiful, although serviceable as such, and content to hang garments over them rented from some costumers or not even that—pawed from the scrap heap of antiquity.

It is superstition or plain ignorance to believe these sinews and bones incapable of beauty as such—if such, to be clothed with a flesh that will be living on them, *an expression of them!*

Is it reasonable too to go further and say "sinews and bones"? Yes, but not as in the human frame but as a new world of form in themselves capable of being beautiful in themselves in a new sense, so devised in construction that flesh is unnecessary.

Why should not the structural principle be expressed artistically as well as scientifically for its own sake in this ideal material? Expressed with a knowledge of rhythm and synthesis of form that a master musician would bring to his mathematics? Can we not imagine a building to be serviceably beautiful and beautifully serviceable as it is naturally made—in steel? Glass is all that is needed really

after we have honestly insured the life of the steel.

And, added to this immense possibility, here enters a vital modern probability:

Steel is most economical in tension; the steel strand is a marvel, let us say, as compared with anything the ancients knew; a miracle of strength for its weight and cost. We have found now how to combine it with a mass material, concrete, which has great strength in compression. The co-efficient of expansion and contraction of both materials is the same in changes of temperature. The more bulky material protects the slighter material from its enemy, disintegration. The heavier material, or protector, strangely grows stronger as it grows older. Permanent "flesh" if we care to so regard it.

A valuable partnership in materials in any case more congenial to the architect than steel alone for he can do more richly with flesh and sinews than he can with sinews and bones, perhaps. Certainly, if regarded as such by him.

Here we have reinforced concrete, a new dispensation. A new medium for the new world of thought and feeling that seems ideal: a new world that must follow freedom from the imprisonment in the abstract in which tradition binds us. Democracy means liberation from those abstractions, and therefore life, more abundantly in the concrete. This is not intended as a pun. It happens to be so literally, for concrete combined with steel strands will probably become the physical body of the modern civilized world.

Here again and especially has the machine liberated the creative architect.

And he prefers his bonds!

The old structural limitation that took form as masonry, lintels and arches, "natural" posts and beams, is all gone. There is in their place a science of mathematics applied to materials of marvelous new properties and strength, here to the architect's hand instead—"mathematics materialized at work for man."

What are we, as architects, going to do with it? For as yet, we have done nothing

with it on principle. We have merely "made shift." Architects have avoided an open break with the powers that be, on the ground of impotence, only by psalm singing and caroling in the name of tradition. But, enough.

Here in addition to the possibility of steel alone, is a perfect wedding of two plastic materials. A wondrous freedom! Freedom worthy of ideal democracy. Astounding! That upon so simple a means such a vast consequence to human life depends. But so it does. And just so simple has the initiation of far reaching changes brought by evolution always been.

The limitation of the human imagination is all that ties the hands of the modern architect except the poison in his veins fostered by "good taste" for dead forms.

His imagination now must devise the new cross sections for the machine more suitable for use in harmoniously framing steel. Rivets have interesting effects as well as facts. Steel plates have possibilities combined with posts and beams. And now there is electric welding to make the work more simple and integral. Posts may become beautiful, beams too. The principle of the "gusset" has a life of its own, still. Strangely, here is plastic material delivered by the Machine in any rigid structural form to be fastened together as members in a structural design.

The design may emphasize the plastic as structural or the structural as plastic. What that means in detail is a liberal education in itself. It must be had by the young architect. He will have to go to work at it himself.

And again, easier to comprehend are the new forms brought to hand by reinforced concrete.

First among them is the slab—next the cantilever—then the splay.

To be able to make waterproof, weather-proof slabs of almost any size or continuity is a great simplification. A great means to a great end. To be able to make these slabs so they may be supported beneath as a waiter supports his tray on the fingers of his upraised arm, leads to another marvelous release, a new freedom.

This is the economic structural principle of the cantilever. A new stability as well as a new economy. The most romantic of all structural possibilities is here.

And last, there is the splay or sloping wall, used as a slide from wall into projections or from floors into walls or used in connection with the cantilever slab. It may be used as an expression of form in itself for protection or light. For economy it may be useful as support in both cases and enhance the plastic effect of the whole.

There is nothing in architecture ready made to meet these sweeping new "freedoms."

What a release is here! The machine brought it in the ubiquitous ductile steel-strand with its miraculous strength and the fortunate wedding of that strength with poured concrete.

What a circumstance!

Here, "young men in architecture," is your palette. The "foyer" of your new world.

Let us of the former generation see you at work on it, in it for all you are worth.

And here again, the password is the word "plastic." "Structuralities" as such must be forgotten. If you will take paper and fold it and bend it, or cardboard sheets and cut them and fit and arrange them into models for buildings, you will see the sense of the new structure in its primitive aspect. And then, after this superficial external view, get inside and make the whole line as one plastic entity—however the slabs tend to separate or fall to themselves.

And never lose sight of the fact that all in this new world is no longer in two

dimensions. That was the old world.

We are capable of a world now in three dimensions; the third, as I have said before, interpreted as a spiritual matter that makes all integral—"at one."

How life may be blessed by the release this simple development of its viewpoint will bring to mankind.

Paintings and sculpture for use to enrich and enhance the work, still live. They now live a detached life as things apart, for and by themselves. It is a pity, for they can never thrive in that separate life.

Unfortunately, there is a conviction in certain quarters—if it amounts to a "conviction,"—chiefly European,—that ornamentation is untrue to the Machine in this, the Machine Age. That the use of ornamentation is a romanticism and therefore inappropriate.

The contrary is the case.

But it is true that ornamentation in the old sense as an "applied" thing, as something added to the thing superficially, however cleverly adapted or "composed" is dead to this new world.

Ornamentation in the plastic sense* is as characteristic of the thing we call the machine as ornamentation in the old sense was a characteristic feature of "The Renaissance"; more so, because it is the imagination living in the process and so woven into the life of the thing. A matter of the "constitution" of the thing. The trace of human imagination as the poetic language of line and color must now live *in* the thing so far as it is natural to it. And that is very far.

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*This phase of the machine as the creative architect's tool will be treated next as *Fabrication and Imagination*.