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WE have not, at our day of writing, learned the conclusion of the coroner's inquest on the Adrian disaster. The testimony given in the course of the examination is, as usual, somewhat vague, and conflicting enough to make it probably a difficult matter for a jury to distribute their blame. We say distribute, for without attempting to anticipate the verdict, or to decide who was most in fault, or where the technical responsibility lies, we can easily see by the evidence — and here is the real significance of the accident, for it typifies the conditions under which such building as here led to disaster is done all over the country — that nobody concerned in the building of the stand at Adrian had any adequate idea of what he was doing. The person who has been spoken of as the architect of the stand (and we notice that where a building comes to disaster the designer of it is always punctiliously spoken of as an architect) was not an architect, but a carpenter. He did not design the stand, but went, by request of the proprietor, to Toledo, where he examined the stand there, and, returning, made general drawings, without details, for one in imitation of it, with a description or specification in explanation of them. For this service he received five dollars, his chief interest in it being, as he said, the expectation of doing the work himself under contract. He was outbid, however, by other persons. The mechanic who did the work was not a master-builder, but a painter, who had picked up what knowledge he had of building as he went along, and made no pretence at his examination of being able to judge of the proper strength of such a structure. The proprietor had, it seems, some anxiety for its strength, and made his builder brace it with a number of iron straps, which were not called for by the specification. He even proposed putting in iron rods across it, but this was pooh-poohed by Mr. Sizer, who made the plans, and who, having been requested to examine the work when it was done, gave it his approval, so that the rods were not put in.

A FEW particulars of the evidence are enough to show the main facts and their essential bearing. Mr. Sizer testified that, having visited Toledo at the request of Mr. Lawrence, the proprietor, he made general plans and specifications for the stand at Adrian, but not such plans or specifications as he should have made for other mechanics to estimate from. He did not, however, explain to Mr. Lawrence that the plans and specifications were incomplete, although he considered that the builder, Mr. Armstrong, was not competent to carry out the work properly. The builder testified that he was a "carpenter and painter," but principally a painter; had learned his building in the car-shops, without having served any apprenticeship; and did not claim to be competent to build from an architect's plans. He nevertheless perceived that in Mr. Sizer's plans all the cross-sills and seven of the posts were omitted, which Mr. Sizer agreed was possible. He put the building together entirely with nails, because the specifications called for nothing more, only the sills being framed together, and even the braces being merely "toenailed" to the posts and plates. Some of the workmen found the frame unsteady, but when the seats were put in it stiffened up. At Mr. Lawrence's recommendation, he spiked some iron

straps to the front posts; but when Mr. Sizer inquired whether the bracing joists were spiked to the girders it appeared that they were not. Mr. Sizer replied that he could spike them at any time, — and he did not spike them. As for the outside persons who expressed fears that the stand was not secure, he considered that they did not belong to the Inspecting Committee, and disregarded them. The designer of the stand in Toledo which served as a model testified to the insufficiency of the plans at Adrian, and especially to the omission of ties to keep the roof from spreading, admitting, however, that those which had been put in at Toledo were an afterthought. The inevitable inference from all this is that the coroner's examination will amount to a certificate of general incompetence, and that, as we have intimated, there was no one at hand who knew what sort of precautions were necessary, or even was sure that any were needed. The ominous thing is that this simply typifies a condition of things which is common all over the country. The only exception to the general *laissez-faire* seems to be that of a bridge-builder, who was at work elsewhere on the grounds, and who, after inquiring "what kind of a damned dead-fall they were putting up there," dissuaded his friends from risking themselves upon it.

SINCE the above was written we learn that the coroner's jury has rendered a verdict which, so far as a coroner's verdict can, makes the case exemplary. It finds that Mr. Sizer was guilty of criminal negligence in preparing the plans and specifications for the stand; that the builders, Messrs. Armstrong, being incompetent mechanics, were guilty of criminal negligence in undertaking such a construction, and grossly negligent in the way they carried it out; and that Mr. Lawrence, the proprietor, was also guilty of gross negligence in employing such incompetent men, and further negligent in not examining the methods and principles on which his stand was constructed. It recommended that these persons should be held for murder or manslaughter resulting in the death of Mr. Johnson, whose death was made the occasion of the inquest. Thereupon warrants have been issued for the arrest of them all on the charge of manslaughter. The verdict satisfies the feeling of the community, which is greatly excited by the injury to its members, and which was in not unnatural fear that, as must often happen in like cases, the inquiry would result in bringing nobody to the bar. How far its judgments will be borne out by the more deliberate decision of the court remains to be seen. As far as concerns its assignment of blame, doubtless the coroner's jury is right; when it comes to the assignment of responsibility, there is some question how far such sweeping doctrine is judicious. Men who assume to do the work of architects and engineers in planning structures to which the safety of other persons is to be trusted, should fairly be held to competency, and the punishment of manslaughter is not too great for the fatal result of flagrant incompetence; without this there is no general safety. Mechanics who assume to do work on which life depends should be held responsible for the mischief of negligently and incompetently carrying out the directions given them. Both these classes make it their trade to do work which, if badly done, imperils the lives of others, and they should be held to do it properly.

IN the same way the owner who endangers people by carelessly employing incompetent agents cannot, perhaps, with safety be left to the discipline of his personal losses, and it may do to assume that he can always find competent agents if he will. Certainly there is very great need to enforce upon the community the paramount importance of employing competent constructors. But it is claiming too much to say that the employer must acquaint himself with the "methods and principles" of the construction he orders built. In many cases this is impossible, and in most not worth while. It is better to leave the entire responsibility with those whose business it is to prescribe the methods and principles. It is desirable, too, that in this case the proprietor should not be regarded as an exceptionally guilty person. The lesson of the disaster will be in great measure lost unless it is realized that the Adrian disaster is only a warning of what our whole community tends to. It is happily exceptional in its result, but not at all exceptional in its conditions. The whole public should be led to see themselves vicariously punished in Mr. Lawrence, who is after all but a representa-

tive man. The probability is that the majority of his neighbors—the majority of all men under like circumstances—would have done pretty much what he did; that is, would have turned to whatever carpenter happened to be at hand, and asked him for a plan, and then would have given out the work to any tolerably promising mechanic who bid lowest for it, without inquiring curiously into his knowledge of his trade. The public authorities do the same thing, and are expected to, even up to the United States Government itself. Every mechanic who appears to be solvent claims a right to enter all public competitions and to consider himself defrauded if he is not treated as the equal of any other. The stand that fell in Blackstone Square, Boston, during a celebration two or three years ago, was built under the same general conditions of ignorance and lack of supervision,—excepting that in Boston, as in the other older and larger cities, the general standard of construction is better than in the smaller and newer towns of the country,—and the result was the same. It is to be hoped that the community which is exasperated at the calamity in Adrian will not forget that the most important thing of all is to reform our own ways, and that punishment of the offenders is of use only as it points to that. In the matter of construction we are the most reckless people in the world. The lesson of the calamity will be lost unless it helps us to insist on a higher standard of competency on the part of designers and mechanics, a better appreciation of this competency and a better habit of building on the part of the public.

We find the English building papers occupied with a variety of competitions that have a familiar ring. The town council of Greenock, Scotland, the great ship-building town on the Clyde, having determined to build a town-hall, or "Municipal Building," has lately held a competition for designs, in which, after promising some small premiums as consolation to the defeated, it offered a commission of four per cent to the successful architect for full services. The competition was, so far as we hear, properly conducted, and fifty designs were sent in. Mr. Charles Barry, president of the R. I. B. A., was called upon to give his opinion concerning them, who selected what he considered the best six. Among these the council chose three, to which they awarded the premiums, and have adopted for execution the one they put first, on condition that the architect shall give a written guaranty that the building shall not cost more than eighty thousand pounds, after the Town Works Committee and the Police Commissioners shall have made "such modification and rearrangement of the buildings as they may deem necessary." The terms of the competition have roused some irritation in the profession, and Mr. Barry, before the council arrived at their decision, appealed to them to reconsider their resolve fixing the architect's fee at four per cent instead of five. The council, however, decided not to "alter the rate of commission upon which all the competing architects had sent in their plans." In like manner, the small town of Staines has advertised for designs for a town hall, for the more modest cost of twenty-five hundred pounds; but, improving on the example of Greenock, has fixed its architect's compensation definitely in advance at one hundred pounds, or four per cent on the intended limit, whatever the actual expenditure may be. This, again, has excited some professional indignation, and we notice in both the *Builder* and the *Building News* protests from architects who hope their brethren will let the uninviting competition alone. Notices and correspondence concerning other competitions are full of complaints, the like of which are very familiar to American ears.

It appears, then, that our English brothers have the same difficulty with competitions that we have at home. They, like us, are enticed by competitions into doing work for less than the profession considers to be its due remuneration, and we must say of them, as we have said of the profession in this country, that it seems to be mainly their own fault. There are too many architects in the profession, both here and there, who, like hucksters in the markets, will ask one price and take another, or who, when the regular asking price is plainly out of the question, will take what they can get. Now it is of little use to complain of municipal governments being stingy. It is their trade to be stingy, and it is idle to expect them to pay five per cent for what they know that four per cent will bring, while it cannot increase their respect for architects to find that they can always get them to do work for less than they ask. If the architects whom the Greenock council asked for

plans had refused to compete, and if Mr. Barry had declined to act as referee in a competition which he considered to be unfair to his profession, the authorities would doubtless have modified their programme, or if they did not would at least have had convincing proof of their mistake. But when fifty architects had submitted plans on the terms offered by the council, and the president of the Royal Institute had consented to act as adviser, it would have been rather strange if the council had not refused to alter the terms in deference to any subsequent protest. Architects who take part in a competition accept its terms, and therefore cannot either with dignity or effect complain of them after the decision. Neither in England nor here at home do building-committees or town-councils show themselves disposed to respect subsequent complaints; and it is not so very singular if they are led to look upon architects as a querulous and weak-kneed lot, who can always be got to work for less than they claim; or if in both countries the effect of the common professional attitude is to invite rough handling, or if, as one of the protesters in the *Builder* writes, "the profession is losing caste and its members have in a great measure to thank themselves for it." The time to protest is before a competition is accepted, and the way to make an effectual protest is to refrain from entering it.

THE truth is, there is an inconsistency between the claims of architects and their acceptance which is demoralizing. The public notices it and takes advantage of it, to their trouble and discredit. The profession as a whole claims—to take the most salient instance of an inconsistency that has many phases—a fee of five per cent on cost for its services, and the careful and self-respecting part of the body insists upon this as a rule. But the beginners, the obscure, the hungry, the speculating, and in many contingencies the average practitioners, will work for a less fee. In the case of any considerable public building the civil authorities or the building committee find that they can go into open market, and have offered to them the services of as many architects as they please for a less fee. They even find that men whose popular repute is high will sell their services cheaply rather than let a tempting piece of work go by, and they see that nearly all work is tempting. Under these circumstances it is useless to suppose that they will not cheapen their architect's services, since cheapening is their business, or that they will be moved by the complaint of those who are at bottom acquiescent. It would be better for architects on all accounts if they would meet the public more squarely. The long experience of the profession the world over has led them to conclude that they are not fairly remunerated for faithful service by less than five per cent; but if they think they can afford, on the whole, to work for four per cent, they ought to say so. If they cannot afford to do it, but think it better to do work for that than to let it go, and look for their real remuneration to the work for which they get their full fees, they are playing a dangerous game, for they are inviting a pressure which, in the long run, they will find it hard to withstand. If they go on the principle of taking all the work they can get for just what fees they can get, their position is at least undignified in itself and hurtful to the profession, and, considering the double face they are forced to present to their clients, we cannot easily call it anything less than dishonorable.

THE *Western Architect and Builder*, of which we have received the October number, complains that we meant to charge it with fraud when we said, in our notice of its first number, that it promised six plates, but gave in that number eight (*American Architect*, September 20, 1879), and believes that we wish to prejudice our subscribers against it. We can assure its editor that it never entered our head that there was any fraudulent intent, and we should be sorry if our readers received such an impression from us, but we do not believe that they did. As for our subscribers, we recommend them not to be prejudiced by our notice, which the editor apparently does not like, but to buy the new journal and judge for themselves. We do not expect even the most ambitious of new periodicals to show at the outset their whole capacity, and the *Western Architect and Builder*, having now a publishing company behind it, will, we may trust, take advantage of the opportunity for improvement furnished by the promise of a long career. Most journals, when they look back at their own beginnings, do not feel that they have great reason to be proud of them. Possibly the *Western Architect and Builder* may in time come to a like state of mind.

THE OPEN FIRE-PLACE. XVI.

SUGGESTIONS FOR THE IMPROVEMENT OF THE OPEN FIRE-PLACE.

If we were to see a tribe of savages sitting astride of locomotive steam engines, and, in their ignorance of the application of steam, using them as we do ordinary carriages dragged about by horses, we should be inclined to turn up our civilized noses and smile at the exhibition of simplicity. But if, when these savages learned how a single engine, with its strength properly applied, was capable of doing the work of the entire tribe, they should, instead of applying steam to the engines already built, continue to use them only as carriages, and build others to act as motors, we would have before us an example of extravagance and folly only equalled by our own in our method of heating.

We fill our houses with open fires and use them only as radiators, although we know that the heat of a single one properly applied would be capable of doing the work of the entire house. Instead of applying furnace pipes to one of the fire-places already built, we continue to use them only as radiators, and build others down cellar to act only as air-heaters.

If the savage condescended to criticise he would have the right to say, "With all your boasted civilization you are even more barbarous than we, because, while it is true that we lose the motive power of our carriages, we are still able to use the carrying power of our motors. You, however, lose both the smoke heat of your upper furnaces, and the radiant heat of your lower ones."

We have shown that open fires as they are now used are incapable, without external aid, of properly heating our buildings. The air supplying the draught must, by some means, be moderately warmed before it enters. It should not be as warm as the walls of the room, nor cold enough to occasion discomfort to the occupants. This preparation of the air is usually effected by a furnace in the cellar, and the result of the combination of furnace and fire-place is, under proper conditions, and with all precautions taken against gas,¹ satisfactory except from the one stand-point of economy. With it every desideratum given in our description, at the beginning of these articles, of ideal perfection may with care be obtained, excepting the first and all important consideration, "that all the heat generated by the combustion of the fuel be utilized in heating and ventilating the house, and that the combustion of the fuel be complete." To satisfy this condition it is evident that the furnace and fire-place must be combined in one apparatus, for it is only in this way that a single fire can do the work of both.

How this combination can best be effected, and what sanitary and pecuniary advantages may result therefrom, it is the object of this chapter to inquire.

In our historical sketch we have shown to what extent and by what steps the work has been advanced up to the present time. It reaches its fullest development in the fire-place described by Peclet, Fig. 125, but excepting in this we find no evidence of an attempt to give the air-heating surfaces an extension in the slightest degree proportionate to the size of the grate or to the amount of fuel consumed, or to adapt the improved methods and forms of the hot-air furnace to the new conditions imposed. The air-heating surfaces are small and insignificant compared with the size of the grate, and are confined in most cases to a very small area in the immediate neighborhood of the fire. In the Dimmick Heater, with a grate surface of about a tenth of a square meter, we have a radiating surface of scarcely a square meter, or about ten times the grate area. In the Fire-Place Heater,² the Jackson, Joly, Fondet, Cordier, and other similar heaters, the proportion is the same, or but little greater. Yet in our best modern furnaces it mounts to from thirty to two hundred times the grate area.

The Sanford's Challenge Furnace, No. 40, for instance, to take an American example, has a heating surface of seventy times the grate surface. According to Bosc, the proportion should be one hundred and sixty or one hundred and eighty to one, and according to Morin, from one hundred and eighty to two hundred to one, though in American practice it is seldom over fifty to one, with a heating efficiency of perhaps sixty or seventy per cent of the total heat produced by the fuel. The Peerless Furnace (No. 16), with a grate area of 0.13 square meter, has an air-heating surface of 6.7 square meters, or fifty-one times its grate surface. The Chilson (No. 8), the Golden Eagle (No. 8), the McGregor (No. 4), and the Soapstone Furnace (No. 18), have respectively, according to measurements made by the writer, heating surfaces of forty, fifty-six, thirty-one, and seventy-four times their grate surfaces.

Our ventilating fire-places, then, should have a much greater air-heating surface than has heretofore been given them, if we would obtain from the fuel the greatest amount of heat possible.

In a furnace all the air which enters the fire-pot is brought into close contact with the fuel by the position of its entrance below the grate. The amount of air entering the smoke flue is, therefore, but slightly in excess of what is actually required to support combustion, and its temperature is correspondingly high. But with an open fire

a greater amount of cold air enters the flue, and its temperature is lowered in proportion. It may, therefore, reasonably be asked if this cool air from the room would not so much diminish the heating power of the flue as to render its development into a complete furnace useless.

This first and most important consideration should be carefully looked into before we proceed further, and any conclusions reached by reasoning should be tested by actual experiment.

Theoretically, wood perfectly dry requires for each kilogram burned, say, ten cubic meters of air, developing, say, 4,000 units of heat. The temperature of this air as it leaves the fire would therefore theoretically be $\frac{4000}{10 \times 1.3 \times 0.24} = 1,282^\circ \text{C.}$, which is about the melting point of steel. So that a certain quantity of air beyond what is absolutely demanded by combustion is necessary to prevent the destruction of the furnace. Were twenty cubic meters of air instead of ten used, the temperature of the air would be 641°C. , or sufficient to raise iron to a dull red heat. In an open fire-place with a contracted chimney-throat tested by the writer, a little over thirty-five cubic meters of air per kilogram of wood passed up the flue, and its temperature, as tested by a chemist's thermometer placed in a hole perforated in the flue for the purpose, rose somewhat above 300°C. In another fire-place having a larger throat, much more air entered, and the temperature of the smoke in the flue could not be raised above 200°C. with the same quantity of wood burned one kilogram at a time. But with a throat contracted still more than in the first fire-place, a still higher temperature of the smoke was obtainable, showing that by regulating the size of the chimney-throat, any temperature of the smoke may be easily obtained up to four or five hundred degrees. When hard coal is used for fuel, a good draught is necessary in order to produce a combustion of the requisite rapidity to heat the house. When the feed-door of a furnace is left open, this draught may be insufficient where hard coal is used. But where soft coal or wood is used, as is generally the case with open fires, no difficulty is found in obtaining ample heat with the feed-door standing open.

In an open fire-place the chimney-throat corresponds with the feed-door of a furnace, and it is this which regulates the amount of cool air entering the chimney, and not the size of the fire-place itself. When this throat is small, the hot products of combustion will fill it to the exclusion of the cold air from the room, and the temperature of the smoke in the flue will be high independently of the actual size of the fire-place.

It must be borne in mind that the flues of a furnace do not heat the fresh air by radiation, but by convection or contact of air. With radiation the higher the temperature of the heating surface the greater the proportion of heat given out. But with convection, according to the researches of Dulong, the yield is, for all practical purposes, irrespective of the absolute temperature of the heated body, or of the difference of temperature between the heated body and the air in contact with it. With a radiant body at a clear red heat of $1,015^\circ \text{C.}$, the amount of heat transmitted per meter per hour is about 300 times that transmitted at 100°C. , and at a bright white heat of $1,415^\circ \text{C.}$, it rises to 4,604 times that amount! The extreme rapidity with which a body at white heat cools down to orange and cherry red, etc., indicates that at high temperature the loss of heat is exceedingly great.

With convection, however, the loss of heat is comparatively slight. Supposing that with the heated body at 0°C. and the air at 15°C. , the loss by contact or by radiation were 1, at 250°C. it would be by contact only 1.9, while by radiation it would be as high as 3; at 310° , 510° , $1,015^\circ$, and $1,415^\circ$, the loss by contact would be 2, 2.3, 2.7, and 2.9 respectively, while by radiation it would be 4, 13, 300, and 4,604 times greater respectively than at 0° .

There is, therefore, with furnaces no gain of heat in quantity to compensate for the loss in quality by having the heating surfaces raised to a high temperature.

For a given amount of fuel the same number of units of heat will be generated by combustion, whether the combustion be slow or rapid. But where it is rapid the products are carried away more rapidly, and the loss of heat at the top of the chimney is greater.

Bernan, treating of furnaces, says: "When only a small quantity of air passes through the stove, the cockle is in danger of being overheated. Mr. Sylvester says, 'the cockle surface should not rise above 280°(F.) . Beyond this it has a tendency to injure the materials of which the flues are formed. It is also heated with less economy, since, as has been observed, the smoke will pass away at a higher temperature.' The temperature of the surfaces he recommends is, however, a great deal too high; and much of the prejudice against stoves has arisen from this circumstance. Were the surface never to exceed 130°(F.) , although the size of the stove would be increased, the salubrity of the air as well as the economy of the fuel would be increased also."

Theoretically, therefore, the temperature of the smoke in the flue of an ordinary fire-place, with its throat properly contracted, is sufficiently high for our purposes, and may be regulated at pleasure.

To put the matter to practical test, the writer has made numerous experiments, with the following results:—

A furnace of wrought-iron was constructed for the purpose, having a radiating surface above the fire-box of 7.5 square meters, or equal to that of a Magee furnace, No. 24. This was attached to the top of an open fire-place (the Fire-Place Heater), which served as the fire-pot, grate, and ash-pit. The apparatus was tested alternately with the feed-door (sliding blowers) open and shut. In each case

¹ It is probable that the use of steam for heating this fresh air will become much more general, and that in cities and towns steam-pipes like gas, drain, and water-pipes, supplied from a central source, will take the place of furnaces in places where open ventilating fire-places are found inconvenient or insufficient. Any improved form of apparatus for heating air by indirect radiation will assist, but can never supplant, the open fire-place.

² The jackets surrounding the heater add considerably to the heating power, but cannot, of course, be included in the estimate of direct heating surface. They correspond to the casing of a furnace, and might be extended *ad libitum*.

three kilograms of wood, containing ten per cent of water, were burned, and it was found that nearly the same amount of heat was obtained from the flues, whether the blower was open or shut, the throat being small and the fire brisk. Sufficient air entered to keep the pipes from becoming red-hot, but not enough to reduce the temperature to too low a point. Therefore while all danger of burning or injuring the air was avoided, the heat was utilized to the best advantage.

Tables VIII. and IX. give in a condensed form the record of two of the experiments referred to.

TABLE VIII.

Temperature of the outer air, 22° Centigrade; of the room, 22° Centigrade; size of fresh-air opening, .05 square meter.
Door Closed.

Time: September 2, 1879, A. M.	Temperature of the Fresh-Air Current.	Velocity of the Air in Meters per Minute.	Cubic Meters of Air entering the Room.	Difference of Temperature between Outer Air and Air entering Room.	Equivalent in Cubic Meters raised 1° Centigrade.	Weight in Kilograms.	Temperature of Room.	Thermometer in the Direct Radiation of Fire-Place at one Meter distant.	Remarks.
1	2	3	4	5	6	7	8	9	10
8.10	22	0	0	0	0	0	22	22	Fire lighted.
8.20	49	63	3.	27	294.3	294.3	23	23	Second kilogram.
8.30	73	54	3.	51	1028.8	1028.8	24	80	Third kilogram.
8.40	83	78	4.	61	1893.	1704.	26	81	
8.50	68	36	2.	46	1178.	1178.	26	80	
9.	54	30	1.5	32	723.	723.	26	77	
9.10	48	27	1.3	26	351.	386.	26	76	
9.20	42	25	1.3	20	258.	283.	25	75	
9.30	37	23	1.3	15	191.	210.			
9.40	36	22	1.3	14	173.	196.			
9.50	35	22	1.1	13	133.	150.			
10.	33	22	1.1	11	125.	137.			
10.10	32	22	1.1	10	114.	125.			
					6415.				

TABLE IX.

Temperature of the outer air, 25° Centigrade; of the room at beginning of experiment, 26° Centigrade; size of fresh-air opening, .05 square meter.
Door Open.

Time: September 2, 1879, P. M.	Temperature of the Fresh-Air Current.	Velocity of the Air in Meters per Minute.	Cubic Meters of Air entering the Room.	Difference of Temperature between Outer Air and Air entering Room.	Equivalent in Cubic Meters raised 1° Centigrade.	Weight in Kilograms.	Temperature of Room.	Thermometer in the Direct Radiation of Fire-Place at one Meter distant.	Remarks.
1	2	3	4	5	6	7	8	9	10
3.32	27	0	0	2	0	0	27	27	Fire lighted.
3.42	49	39	1.9	24	239.7	263.7	29	88	Second kilogram.
3.52	67	57	2.8	42	861.0	861.0	30	94	Third kilogram.
4.2	91	78	3.9	66	2002.8	1802.5	32	107	
4.12	65	52	2.6	40	1240.0	1240.0	32	84	
4.22	54	36	1.8	29	582.4	582.4	29	83	
4.32	50	34	1.7	25	450.5	450.5	29	82	
4.42	45	29	1.4	20	324.5	357.0	28		
4.52	42	27	1.3	17	234.5	258.0	28		
5.2	39	21	1.0	14	176.1	194.0	28		
5.12	36	21	1.0	11	59.4	65.3	28		
5.22	33	14	0.7	8	28.8	34.5	27		
5.32	30	7	0.3	6	9.0	11.0	27		
					6120				

In the first of the two experiments here recorded, Table VIII., the doors of the fire-place were tightly closed and strips of paper glued over the cracks and joints of the doors to make them air-tight, the base draught damper under the grate being alone left open. The apparatus then formed an ordinary furnace. The air-box was small, and the register throwing the heated air into the room measured but 15×33 cubic meters, or 0.05 square meter, so that the heating surfaces were only partially cooled or utilized. Nevertheless, column 7 shows that enough heat was abstracted by what air was allowed to strike the flues to raise the temperature of 6,415 kilograms of air 1° C. This is equivalent to 1,540 units of heat. A thermometer placed one meter from the fire-place rose (column 9) 59 degrees, showing that a large portion of the radiant heat of the fire passed through the iron doors. The heat saved by contact of air amounted to $\frac{1540}{3860 \times 3} = 14$ per cent of the whole. Adding 3 per cent for that obtained by radiation, we have a total saving of 17 per cent. The temperature of the room (column 8) was raised 4 degrees.

In the second experiment, Table IX., the doors were left open, and the apparatus formed an ordinary open fire-place, with a furnace attached to its smoke-flue above. Column 7 shows that 6,120 kilograms of air could have been raised 1° C., which is equivalent to 1,469 units of heat, or 13 per cent of the whole. A thermometer

placed 1 meter from the fire-place rose (column 9) 80 degrees. Adding 6 per cent for direct radiation, we have a total saving of 19 per cent.

The temperature of the room (column 8) was raised 6 degrees. All the conditions were as nearly as possible the same in both experiments. The supply of fresh air brought to bear on the pipes was limited, but the same in both cases. In other experiments made to test the heating power of the apparatus, where double or triple the supply of air was brought in contact with the heating surfaces, and where a proper arrangement of the fresh-air box and registers was provided, the amount of heat saved was two or three times greater than that here effected.

Having found that there is neither theoretical nor practical difficulty on the score of the entrance of cool air through the chimney-throat in the way of our combination, it remains to see what kind of furnace is best adapted for our peculiar purposes.

THE ILLUSTRATIONS.

COMPETITIVE DESIGN FOR THE UNION LEAGUE CLUB-HOUSE, NEW YORK. MESSRS. WEST & ANDERSON, ARCHITECTS, NEW YORK.

The third and fourth stories in this plan, which was voluntarily submitted, are occupied, as in most of the others, by suites of private rooms,—chambers and parlors. The kitchen is in the sixth story; the billiard-room and bowling-alley in the basement.

HOUSE FOR HENRY RUSSELL, ESQ., WASHINGTON PARK, ALBANY, N. Y. MR. WM. M. WOOLLETT, ARCHITECT, ALBANY.

The house is built of red brick and terra-cotta, and finished inside in hard woods.

HOUSE OF W. H. COFFIN, ESQ., COMMONWEALTH AVENUE, BOSTON, MASS. MR. W. P. WENTWORTH, ARCHITECT, BOSTON.

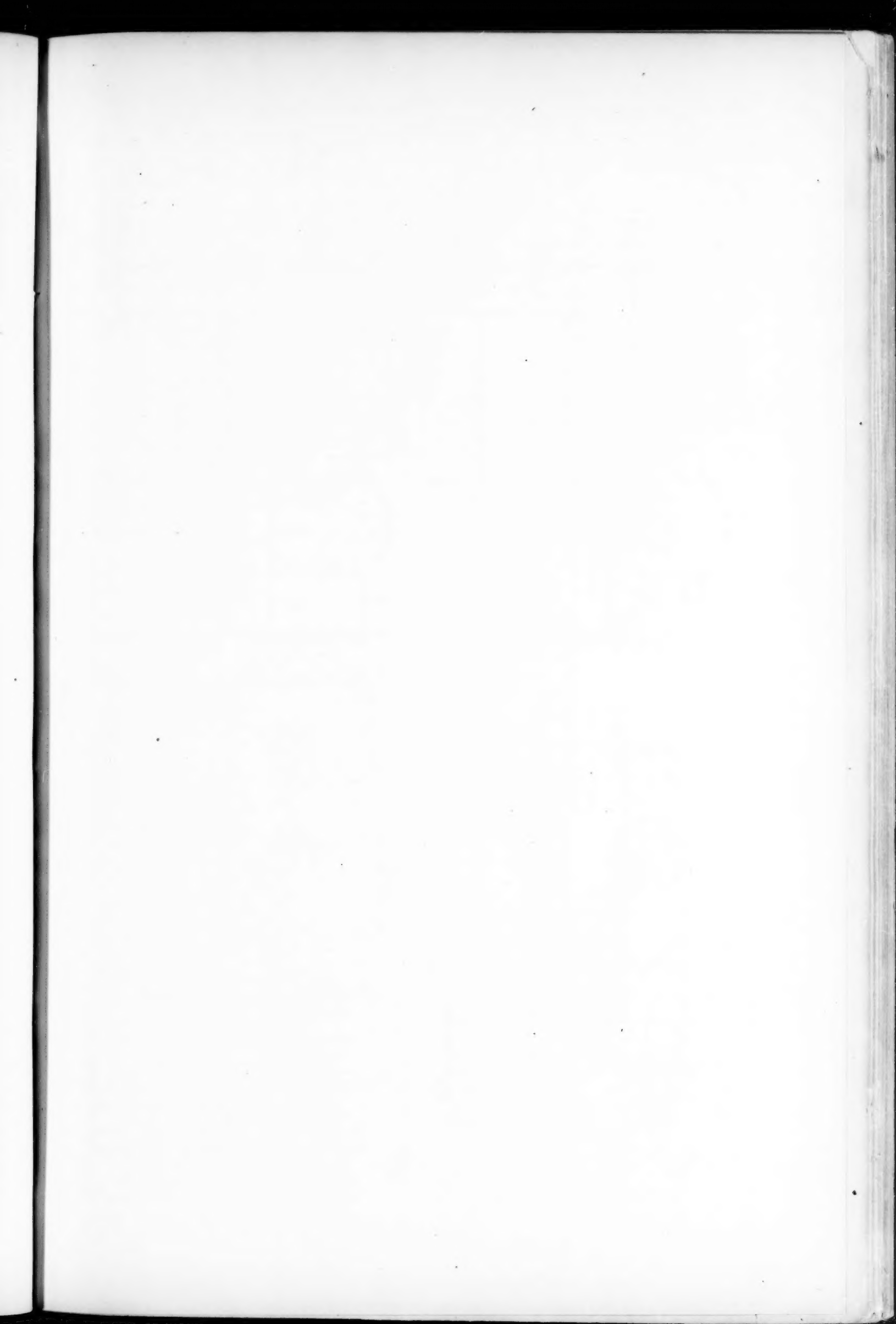
PART OF THE FRONT OF THE WIGGINS BUILDING, CINCINNATI, O., FROM AN ETCHING BY THE ARCHITECT, MR. J. W. McLAUGHLIN.

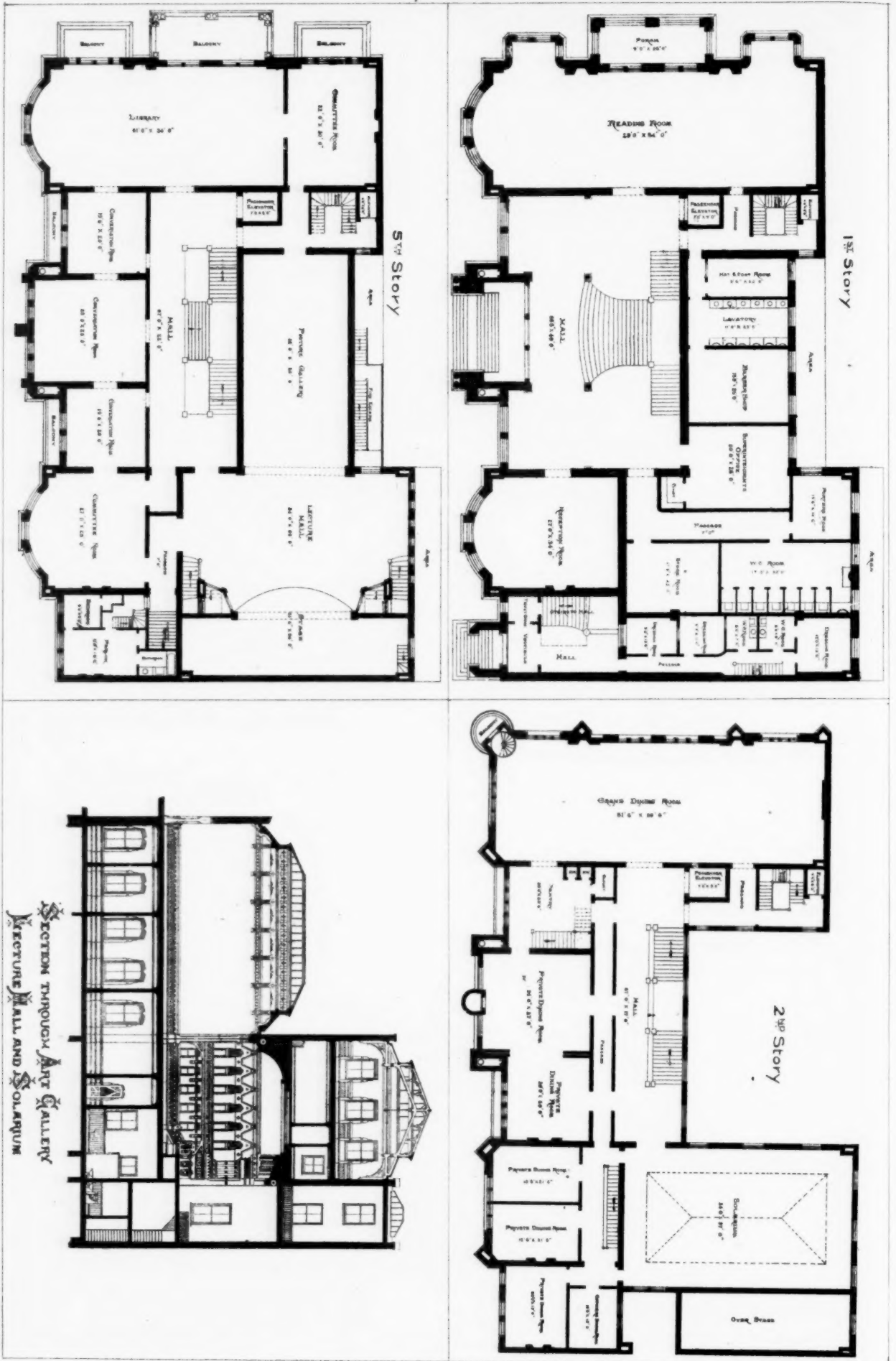
THE LAST PARIS SALON. II.

PARIS.

ALTHOUGH her father is Spanish, Mdle. A. de Bañuelos, on her mother's side, claims the interest of Americans, and especially of young ladies studying painting, for she shows how possible it is with capacity and purpose—those without these qualities are out of the question—to reconcile art-work with all social duties. Living in a gay circle which would seem to leave little opportunity for work, Mdle. de Bañuelos, besides three portraits at the Universal Exhibition, has since painted several others, and sends to the Salon a group of two Italian children, life-size, which well deserved the central position given it on the line. American ladies would do well to remember that female artists on the Continent do not find that their talent requires them to live differently from other ladies, and I believe women in America have a feeling that to paint like men they must be emancipated from ordinary female conventionalities. Then is it certain that the wisest aim for women is to paint like men? If women are to paint, why should they forego their special qualities in which they are superior to men? Mme. Le Brun's charming portraits hold their place at the Louvre, not because they look like a man's work, but because they were done by a woman proud of being a woman. Miss Dodson exhibits a life-size Deborah which, I imagine, she will be pleased to hear does not look like "woman's work." It is more masculine than many a man's work, but her decided talent would not be lost in giving us a woman's thought in a woman's words. A contralto need not imitate the ruder timbre of a bass. Both Mr. Healy's portraits and Mr. E. H. May's work are so well known at the Salon and at home that they call for no special mention. Mr. May has for many years been about the only American who exhibited life-size compositions, but now a new generation has come boldly forward. Mr. S. H. Parker bravely attacks "*la grande peinture*" and so boldly that the battle is half won. His Last Cares to the Body of St. Sebastian is a large canvas, freshly and broadly painted, but hardly sufficiently finished to do him justice, and he will probably work it up more before it reaches America.

Mr. Charles Sprague Pearce, of Boston, in a very large picture of The Sacrifice of Abraham, has made a noble effort (I believe no American has yet exhibited so ambitious a canvas), but he has done far more than this, and the picture has so many good qualities that I believe no one would have been surprised had he been awarded a medal. As it was he received nothing—an alternative which also was not surprising, for to the rigorous figure of Abraham was weak and without dignity, while in the flying angel he has sought a pose more forcible than graceful. The figure of Isaac, on the other hand, is remarkably painted. The whole tone of the picture is strong and bold, and suggests not unworthily the style of his master, Bonnat. If I have kept for the last Mr. John T. Sargent's portrait of his master, Carolus Duran, it is that I may criticise him, not merely as an American, but as a painter who has already fairly won a place in the foremost rank of young French painters. This portrait of his certainly shared with one by Douce—who very nearly won the Prix de Rome this year—the distinction of being by far the best by any of the younger artists. Without giving Mr.



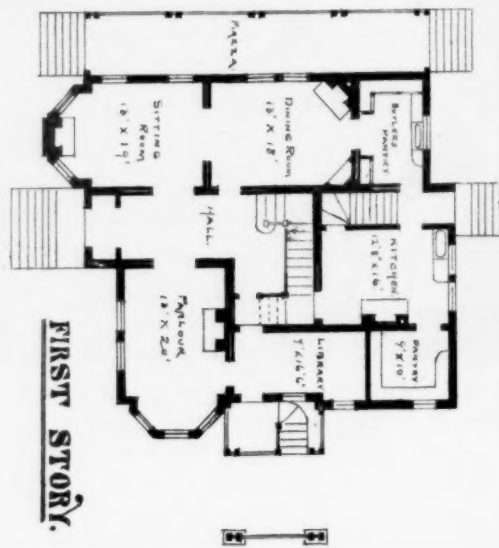


UNION LEAGUE CLUB HOUSE
WEST & ANDERSON ARCHTS.

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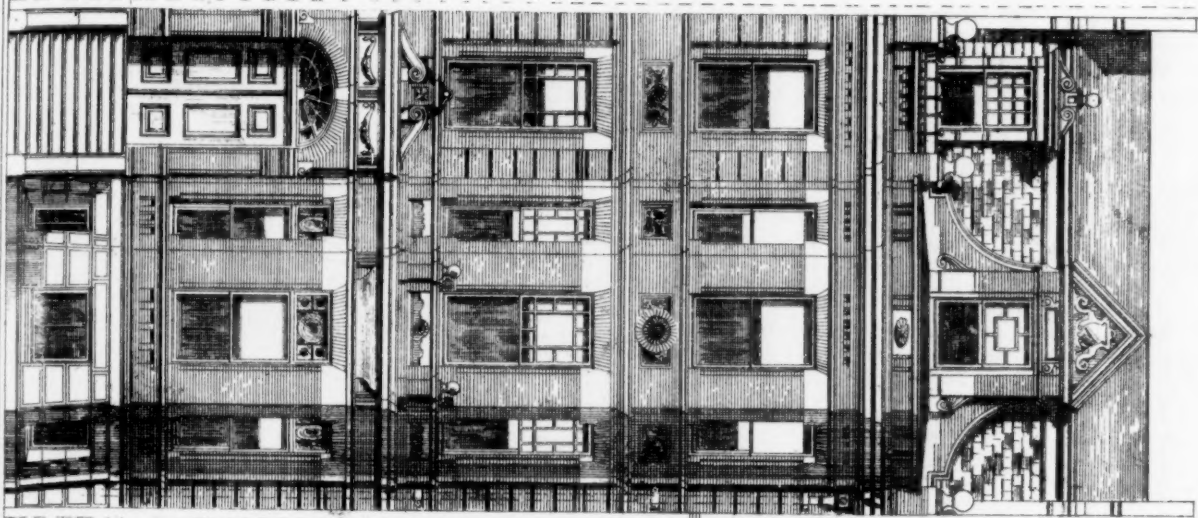
RESIDENCE FOR HENRY RUSSELL ESQ., ALBANY N. Y.



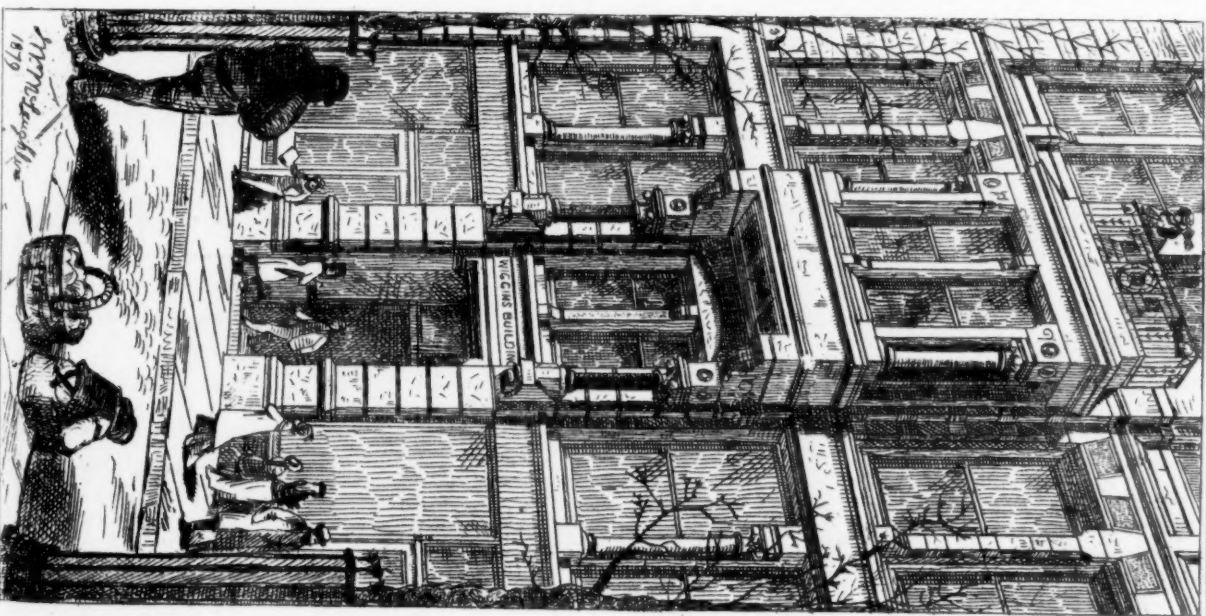
SCALE. 1" = 10'

W. M. WOLLETT, ARCHT. ALBANY N. Y.

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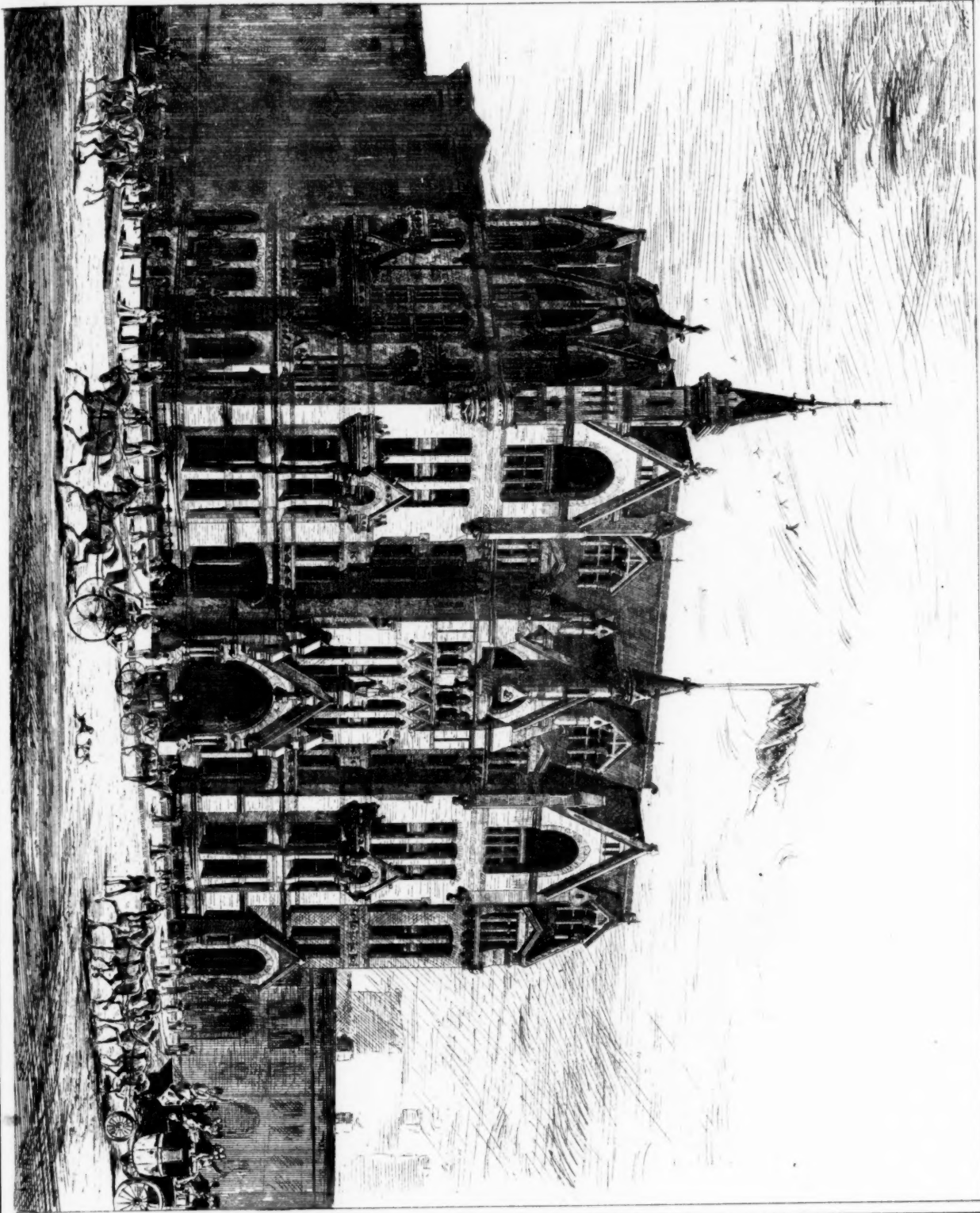


DWELLING HOUSE ON COMMONWEALTH AVE BOSTON
FOR CH. COPPIN.
W. WENTWORTH ARCHT.



WIGGINS BUILDING CINCINNATI
J. W. M. LAUGHLIN ARCHT.

Illustrated by F. H. H. Co. 220 Broadway St. Boston



UNION LEAGUE CLUB-HOUSE
WEST & ANDERSON ARCHTS.

THE HOLLAND PHOTO CO. AND PUBLISHERS OF BOSTON

Sargent too much credit for the admirably spirited pose — it is quite in Duran's temperament himself to take the most becoming pose — one cannot fail to admire his original and masterly scheme of color. It was a happy idea to paint his sitter in a loose morning-jacket, of soft pale yellow, against a cold gray background, but only the highest artistic sensibility would have thought to call out all the subtleties in this gray harmony, and set it vibrating by a single gleam of turquoise blue from the arm of the chair. The interest centres in the pale expressive head, — flattened, Duran's enemies say; a fair and generous expression of the man when at his best and aglow with his noblest thoughts, cry his friends; and a portrait is painted for a man and his friends, not for his enemies. A quite unconscious idealization is a characteristic of Mr. Sargent's talent. Even in his daily atelier studies he manages, without sacrificing their value as studies, to throw over the coarse vulgarity of the model a charm and elegance quite his own. It is a rare gift, this atmosphere of sentiment, which is too distinguished ever to be sentimental. But this would attract little attention from the prosaic French art-world were it not seconded by as distinguished technical qualities. Mr. Sargent, like a true colorist, models, rather than draws, but there is no suggestion of feebleness in drawing, and the only adverse criticism I have heard brought against this much-noticed portrait was a thinness in the painting. This, however, taking in view the rather sketchy scheme of the work, has little weight, and is quite lost sight of in the charm of the wonderful simplicity and freshness of the brush work, qualities which are at present so much the fashion here that many clever painters are sacrificing all else to them. Chief among these is M. Duran, but though Mr. Sargent is his favorite pupil, he has managed to escape his master's exaggerations. This year, however, M. Duran escaped them himself, and the result was so magnificent a portrait that it carried all before it and won the *medaille d'honneur*. In this full-length portrait of a lady there is none of the crudity or vulgarity which has generally marred the artist's former works. The lady is thoroughly *grande dame*, as she stands holding back her fur mantle from the white satin dress, bestrewn with pearls, such as Velasquez loved to paint, and which he would have been proud, if not jealous, to see thus painted by one of his pupils. If not jealous, I say, for I believe a hundred years from now this portrait, so similar in *technique*, will be fairly compared with the best of Velasquez. Lefebvre has a noble picture of Diana and her Nymphs, which, before the Salon opened, it was thought would win for him the *medaille d'honneur* to which he is entitled by his many fine pictures, but Duran's portrait was such a rare *chef d'œuvre* that it carried the jury with it. Of other painters best known in America, Bouguereau has a large Birth of Venus, a hackneyed subject and composition which it required all his refinement of color and drawing to lift from the commonplace. Bonnat has a grand portrait of Victor Hugo, whose strong, deep-furrowed face gives better scope to his powerful, rugged brush than the delicate features of the young Boston lady on his second canvas. Couture, who died during the year, was represented — certainly against his will, as he refused sternly, during his later years, to exhibit at the Salon — by a life-size Pipe Player, which was a double injustice to the brilliant painter, as it was only painted to explain something to his pupils, and over a previous figure whose red robe has worked through and discolored the later work with a brick-like tone. Jules Breton has nothing of interest, and the same may be said of Cabanel and several other well-known men. Before closing, I must note the scarcity of landscapes from our countrymen, who are supposed to excel in that branch. Mr. W. P. W. Dana, whose grand Wave bore off a medal at the Universal Exhibition, has nothing this year of equal power. Mr. Bunce, of Hartford, has a Venetian scene, good in color, but suggesting atelier fancies, rather than Venetian facts. On the whole, the Americans have made, this year, a notable advance in the Salon, and as they all show pluck and energy, they should show a like progress yearly. R.

TECHNICAL EDUCATION IN RUSSIA.

ONE of the principal establishments for technical education in Russia is the industrial school of the Czarevitch Nicolas, at St. Petersburg. This school, which bears the name of the late heir to the throne of the Russias, the Grand Duke Nicolas Alexandrovitch, is an establishment of a character which has not found much favor in our own country, combining general education with instruction in everything connected with scientific and manual industries. It originated in the benevolence of private individuals, who founded first an asylum for poor children destined to become artisans. The society obtained royal authority to open other similar establishments, and it has founded an industrial school for girls on the same principles as the preceding. The society and its foundations are placed under the patronage of the present heir to the throne of the Czar, the Grand Duke Alexander Alexandrovitch, who subscribes three thousand roubles annually towards its funds. The idea of the establishment of such a school in the capital of the kingdom was taken up very warmly; the members of the society already referred to gave 200,000 roubles for the construction of the building, and the merchants of St. Petersburg and others supplied more than 30,000 roubles. During the construction of the school, which occupied three years, the Municipal Council of the capital made an annual grant of 25,000 roubles, and the Government gave the site for its erection and a sum of 75,000 roubles. The value of the whole, as it stands, is set down at

175,000 roubles. The liberality in the supply of money enabled the architects and organizers of the school to pay special attention to the arrangements, not only for the instruction, but for the health of the pupils; and the lighting, heating, and ventilation of the building are considered eminently satisfactory.

The school was opened in 1875, with the three lower classes only, but the number was soon afterwards raised to five, according to the original scheme. Last year the number of pupils was 240, and that of professors and teachers 24. Twelve of the pupils are maintained at the cost of the Grand Duke, and one at that of the Grand Duchess. The authorities of the city maintain 100 pupils at the cost of 25,000 roubles per annum (£3,400, nearly); and the original society supports 38 other pupils. A few of the others are maintained by the establishment itself or some of its individuals, others by governmental departments, and the rest by their parents and friends, who pay 250 roubles per annum (about £32).

This establishment is capable of receiving 300 pupils, all resident; there are no day scholars. The total expenses of the school, with the full number of scholars, would be 95,000 roubles.

The boys are admitted to the lowest class at the age of 11, those who are older are examined, and may be admitted to either of the three lower classes.

The instruction includes:—

1. Catechism and sacred history, the Russian language, arithmetic, geometry, history, natural history, geography, physics, mechanics, and the technology of woods and metals.

2. Freehand and mechanical drawing, writing, singing, and gymnastics.

3. Trades.

The programme of studies is arranged by a committee composed of the heads of the establishment, and secular representatives of the arts, sciences, and education.

The amount of time devoted to the various studies is fixed as follows:—

The five classes of instruction occupy 69 hours per week, 21 being devoted to the Russian language, 14 to arithmetic, 9 to catechism and sacred history, 8 to geometry, 5 to history, 4 to geography, 5 to writing, and 3 to natural history. In addition to the above, 9 hours are devoted to special instruction in physics and mechanics, 4 hours to the technology of woods and metals, 5 hours to singing, and 6 to gymnastics; making up a total of 89 hours per week.

Besides the above subjects and exercises, drawing, of course, fills a prominent place; to it are devoted 41 hours in each week, by the five classes. After an elementary course, the pupils draw from geometrical solids and plaster casts, and execute special designs for furniture and wood carving. The course of mechanical drawing includes a section specially adapted to iron-workers and mechanicians. The instruction in drawing terminates with working-drawings belonging to the various trades taught in the school.

The industrial instruction is confined to the three upper classes of the school, and ordinarily occupies 20 hours per week, but the two weeks preceding the holidays are exclusively devoted to work in the various ateliers of the school, which include shops for cabinet-making, modelling, turning, wood-carving, fine iron-work, metal turning, soldering, forging, and fitting.

The instruction in the workshop is on a very methodical plan, including the teaching of the elementary data, as well as the special processes of each craft. Correct and precise work, and the proper employment of tools, are the objects in view. Orders are executed in the workshops and ateliers, but no pupil is permitted to execute such work until he shall have passed satisfactorily through all the prescribed courses of study and instruction.

When the pupils have completed their studies, they may remain one or two years longer in the school, to perfect themselves in any one of the crafts, and obtain the title of apprentice-workman; this extra time is devoted exclusively to work.

On quitting the school, each pupil receives a certificate, and those who have passed with great credit through their examinations earn the titles of foremen, and assistant-foremen, and obtain assistance to enable them to establish themselves in business, or to complete their industrial education and practice.

The industrial institutes, schools, and museums of St. Petersburg and Moscow made a very remarkable show in the machinery court at the Paris Exhibition last year. The extent of the collection of diagrams, models, and other educational material, and the admirable execution of a large number of tools, machines, and models made by the pupils in these establishments, attracted much attention, the unavoidable inference being that the Russian Government and people are intent on raising the industrial and artistic level of the population as much and as rapidly as science and organization can effect. — *Journal of the Society of Arts*.

THE SIMPLON TUNNEL.

OUR French neighbors, recognizing the vast importance of the proposed Simplon Tunnel to their commerce, have, during the last few months, been in negotiation with the Swiss Government; and a treaty similar to the one which was concluded in 1871 between Germany, Switzerland, and Italy, concerning the St. Gothard Tunnel, will shortly be signed, by which permission will be granted to the French Government to subsidize the Simplon Railway Company to

the amount of some 48,000,000 francs [\$9,600,000]. M. Léon Say, the French Minister of Finance, arrived at Vevey on the 16th inst. to make a personal inspection of the site of the tunnel and of the works which have already been carried out, in order that he may possess full *connaissance de cause* in recommending his government to grant the subsidy in question.

The works alluded to consist of a line of railway, lately completed and opened to traffic, which extends from Lausanne up the Rhone Valley to Brigue, at the foot of the Simplon, — the very spot where it is proposed to pierce the tunnel. On the other side of the mountain, the Italian Government is engaged in constructing, at a cost of 28,000,000 francs [\$5,600,000], a line railway which will unite Iselle, at the southern end of the tunnel, with Arona, on the Lake Maggiore, the present northern terminus of the Haute Italie railways. The Simplon Railway Company are now, therefore, about to commence the tunnel which, when terminated, will complete the straight line of railway extending from Paris to Brindisi, via Pontarlier, Lausanne, the Simplon, and Milan, — thus obviating the immense angle described by the Mont Cenis route.

It may be remembered that the proposal to subsidize the Simplon route was already submitted to the French Chambers in 1873, when it was indefinitely postponed without discussion. This want of proper consideration must be attributed to several reasons. In the first place, the resignation of M. Thiers and other political events absorbed men's minds in France at that moment. Secondly, the *Compagnie de la Ligne d'Italie*, in whose favor the concession had originally been granted, had just failed in an exceedingly discreditable manner, and had been wound up by order of the Swiss Government. Lastly, at that time, when the prospect of completing the St. Gothard Tunnel was apparently hopeless, the Simplon route not only seemed to offer no very special advantages to French commerce, but even appeared in the light of a competitor with the Corniche and Mont Cenis Railways; nor were the Paris-Lyon-Méditerranée Railway Company in favor of the undertaking. Now, however, the aspect of affairs has entirely changed. Since 1874 a new company has been intrusted with the execution of the enterprise, and has given most satisfactory proofs of its activity by the completion of the railway up to the very entrance of the proposed tunnel at Brigue. Colonel Ceresole, formerly President of the Swiss Confederation, is the leading spirit and managing director of this company; and is encouraged in his work by the earnest support of such men as Gambetta, Grévy, Léon Say, and others.

To-day the St. Gothard Tunnel is within 1,000 yards of completion, and much of the traffic which now passes over the Mont Cenis will prefer the shorter and more direct route of the St. Gothard. It is of the greatest importance to French interests that the Simplon Mont Cenis Tunnel should be immediately commenced; for not only is France threatened with the danger of losing all her English and Belgian transit traffic, but also with the mortification of seeing all the produce of her wealthy northeastern and eastern provinces pass on to German lines, and go, via Basle, through the St. Gothard Tunnel, — a construction subsidized by the German Government.

The Simplon route, however, will have the power of retaining on French territory the traffic which the St. Gothard would draw away from it; and, as matters now stand, will greatly favor the traffic of French railways, notably those from the northeast, and those extending from Paris to the southeast.

Although the tunnel will be rather longer than that of the Mont Cenis, or of the St. Gothard, it will be constructed and worked under very much more favorable conditions than either of them. The entrances to the St. Gothard and Mont Cenis Tunnels are both situated at a considerable altitude, — the former being at 1,152 metres [3,790 feet], and the latter at 1,560 metres [5,000 feet], above the level of the sea. Consequently, costly zigzag and corkscrew lines of access have been resorted to in order to reach the entrance of the tunnels; and, owing to the very steep gradients, the power of traction required is something enormous.

The Simplon Tunnel, on the other hand, enters the mountain at its very base. The railway extending from Lausanne up the lower part of the Rhone Valley is perfectly straight and without any curves, while the gradient nowhere exceeds ten millimetres (1 in 100). At its exit on the southern side of the mountain, in the Diviera Valley, the gradient is somewhat stronger, — 13 in 100. In fact, when the tunnel is completed, the highest point of the line between Paris and Milan will not be in the Simplon, but between Dijon and Lausanne. Owing to the low level of the tunnel, the line will not suffer from the frequent interruptions which the snow causes in winter on the Mont Cenis and St. Gothard routes.

Competent geologists declare that the granite and rock of the Simplon are less hard and compact, and that the infiltrations are less serious, than those of the St. Gothard and the Mont Cenis. The Rhone at the Swiss end, and the Diviera at the Italian extremity, of the tunnel will provide the hydraulic power necessary for the boring; while, thanks to the temperate climate of the Valais, the works will not be exposed to the risk of being deprived of their motive power during severe winters, as were those of the Mont Cenis and the St. Gothard.

The tunnel will be eighteen and a half kilometres [about eleven miles] in length, as compared with the fifteen kilometres [nine miles] of the St. Gothard, and the twelve kilometres [seven and a half miles] of the Mont Cenis Tunnels, and, as it is estimated that a daily

advance will be made of nine to ten metres in the boring, we may look for its completion in seven or even six years' time. Eighty million francs are to be devoted to the undertaking, under the following items: 74,000,000 francs for the tunnel itself, estimated at the rate of 4,000,000 francs per kilometre. This estimate appears somewhat high when compared with that of the St. Gothard, which is being pierced at the rate of 2,500,000 francs per kilometre. One million francs are required for the completion of the roadway in the tunnel, and 5,000,000 francs for the construction of a great international station at Brigue, similar to that at Modane, on the Mont Cenis Railway.

Only a very small portion of this sum, namely, 13,500,000 francs, consists of stock subscriptions, the balance of 66,500,000 francs being granted to the company in the form of the following subsidies: 4,500,000 francs from the Swiss Federal Government; 5,000,000 francs from the Government of the Canton de Vaud; 1,000,000 francs from the Government of the Canton du Valais; 3,000,000 francs from the Governments of the Cantons de Berne, Fribourg, and Geneva; a grant of 5,000,000 francs from the Swiss Occidental Railway Company, which will derive great advantages from the undertaking; and, lastly, 48,000,000 francs, the subsidy about to be granted by France.

But little opposition is expected in the French Chambers to this vote, as the leading statesmen of all parties are thoroughly imbued with the necessity of supporting an enterprise which will be so advantageous to the commerce of France. — *London Times*.

THE IMPORTANCE OF FIRE-PROOF STAIRWAYS.

TO THE EDITOR OF THE AMERICAN ARCHITECT:

Sir, — The stairways of all buildings are places of peculiar danger when any accidents by fire occur, whether serious or slight. The passages and stairways are the great air-courses. Then as flame generates movements of air, and these then increase to active currents, ascending and becoming intensified in violence by every foot of their ascent, it is owing to these circumstances that many buildings, public and private, are constantly being destroyed by conflagrations, a large proportion of which, no doubt, could be saved if the right kind of precaution were employed in advance of the trouble. In Italy and many other parts of Southern Europe a time-honored practice of the architects and builders has been that of introducing slate and flag-stone stairways. This is the wisdom of the past, and it is worthy of our recognition and observance. Whenever slate or any varieties of flag-stone, or other tabular forms of rock materials, are not to be had, good substitutes can be adopted most handily in using the very heaviest metallic fire-proof paints and hydraulic cement washes to coat over thoroughly all combustible surfaces and objects.

The stairways of every structure, whether large or small, become in time the driest and most tinder-like parts of the whole premises. This is ascribable to natural and obvious causes, in the perpetual circulation of the air-currents through passages, halls, and stairways, which rapidly season and dry out all the timbers until they become almost or quite as light and combustible as kindling specially prepared for fires.

All wooden surfaces are found to take kindly every variety of ferruginous, silicious, calcareous, and albuminous coating, whether the covering be thick or thin. Vegetable fibre, especially when dry, and the dryer the better, is a generous absorbent of metallic and earthy substances, when these are properly comminuted by grinding and mixing with the ordinary fluids employed as the vehicles of paints and washes. Silica, lime, clay, and iron are great preservatives of timber, either in doors or out-doors. They penetrate wood surfaces to considerable depths. Some modern applications of hydraulic cement wash, used in about the consistence of cream, for coating the plank sides of cisterns, and the good effects then noticed in its silicifying and partly, in fact, petrifying the wood, are evidences that show what can be done with the like materials in the interior of buildings, where we see such imminent and constant dangers of fires. A handy experiment to exhibit the indestructibility of wood substances or other combustibles can be performed with the very simplest means, — by soaking or painting them with any of these simple and cheap materials; and then after letting them "take a set," and properly dry out, they can be fully exposed to both fire and water, so as to satisfactorily test and show the results above spoken of. Such tests and trials are useful. The extremely simple ingredients of such paints and washes have a direct tendency to case-harden — permanently preserve both from fire and water — every part of a building. The studding, beams, girders, wall-plates, rafters, lathing, and also the doors, windows, and inside facings, mouldings and decorations, can all be easily served in the same way. It is a prevalent and woful evil of many of our people in all parts of the United States to be entirely too slow in some things, and too fast in some others. We have great need to reform in our styles of building, and in no one particular more important than in the simple and economical methods of perpetuating our structures by looking to the means of protecting them against outbursts of fires.

The ancient adage is true which says that fire and water are good servants, but bad masters. There are numberless instances of great conflagrations in the chief cities of our country which are continually occurring, and in all seasons, those in the long, deep winters of the

North being the most severe and often the most distressing in the losses of property and sometimes of human lives, and in numbers.

In the destruction of the Southern Hotel, at St. Louis, by fire, in the month of March, 1877, the losses were heavy, — perhaps quite a half million dollars, — and there was also a most appalling destruction of human life, amidst which men and women, awakened from sleep in the dead hours of night, rushed from their beds and sprang out from windows in the fourth and fifth stories of this large structure, of course to meet instant death in the fall. This hotel had immense halls, passage-ways, and one great and beautifully winding staircase, from the ground floor to the attic. It was up this great staircase that the first flames rushed, and they rose faster and faster until they made a column of living fire like that of some vast furnace. The conditions made it — as in all other instances of staircases in hotels, and houses for dwelling or occupancy of any kind — serve the purposes of an immense chimney. With its tremendous upward draught, beginning on the ground floor and receiving an accelerated speed as it rose, from all the passages and galleries of each successive floor for the six or seven stories high, the destruction to life and property was fearfully rapid, and the completeness of the havoc in an hour or two, amidst the most distressing scenes, was most appalling. Let us design our houses and arrange our stairways so that the latter will be made safeguards and preventives of ravaging fires. This can be done. There are various good devices. Perhaps the easiest, cheapest, and quickest of all is the simple one of using heavy fire-proof paints. They are extremely cheap, very durable, easily applied to all kinds of surfaces, and they possess great covering capacity. ††

SLOW-BURNING CONSTRUCTION.

New York, October, 1879.

TO THE EDITOR OF THE AMERICAN ARCHITECT:

Sir, — There are in Boston over a dozen brewery and other cold-storage houses built of brick and stone, with cement and brick floors resting on heavy iron girders, all very substantial. These houses are three and four stories high, and all the walls of these structures are lined inside with sawdust from nine to fifteen inches in width, or with hair-felt and similar highly combustible materials, which are used as non-conductors or insulators of temperature. In New York city there are over one hundred of these structures, and the New York Building Department and Fire Department have no power to prevent their inside arrangement. At the present moment a brewery cold-storage house in the city of Philadelphia is being lined with sawdust and rosin, a compound which has recently been patented by an enlightened New York chemist for the purpose of providing a suitable insulating material for the purposes mentioned. Though this has certainly no direct bearing on slow-burning construction, it may answer for a *ratio ad absurdum*.

Respectfully,

A. D. E.

PRECAUTIONS VS. INSURANCE.

TO THE EDITOR OF THE AMERICAN ARCHITECT:

Sir, — As an example of the comparative force of building-acts and self-interest, I beg leave to submit the following statement of facts.

The removal of the sheathing is an essential point in this and other cases, to which owners will submit for the sake of possible profit, but which could not be made a provision of a statute. A single spark, passing behind the sheathing into the lint that had been collecting there for some years, would have destroyed the building.

A rat's nest of oily waste is liable to cause fire behind sheathing, and in badly constructed attics, at any time. The same chance may happen if rats carry off the oily rags often used to clean furniture and wood-work in dwelling-houses and decorative warehouses.

In the summer of 1878 the owners of the Dolphin Mill, of Paterson, N. J., applied for admission to the Factory Mutual Insurance Companies of New England. The mill is occupied for the manufacture of goods from flax and jute, and was found to be well constructed of stone as to the exterior walls.

The interior was expensively sheathed with wood very closely fitted, and the fire apparatus was inadequate. The owners were advised to remove the sheathing, which they did with some unwillingness, but to their utter surprise the concealed spaces were found to contain several tons of the finest lint. A large rotary pump was put in and an adequate service of hydrants, hose, and sprinklers.

The sheathing removed was in part converted into shutters covered with tin, with which one side of the mill was protected, it being exposed to danger from another flax mill forty-five feet distant, and beyond that from the Rogers Locomotive Works.

During the first year of mutual insurance the Rogers Locomotive Works were in part destroyed by fire, which extended to and also destroyed the flax mill forty-five feet from the Dolphin Mill.

The tinned shutters and the force pump so fully protected the Dolphin Mill that no claim for damage was made upon the underwriters. Previous to insuring in the Mutual Companies the Dolphin Mill and its store-houses had been insured in the sum of \$127,000 in stock companies, at an annual cost of \$4,286.44, but some additional machinery and a heavier stock having been carried, the insurance was increased to \$173,500.

The net cost of which, in the mutual companies, has been for one year \$438 73
Actual saving 3,847.71

Had the sum of \$173,500 been insured upon the old plan the cost would have been \$5,416.68
Actual cost in Mutuals 438.73

Constructive saving, \$4,977.95

The rules and plans of the Mutuals for the prevention of fire probably saved the mill and a considerable section of the city of Paterson from destruction, and saved the owners nearly \$5,000 besides, which more than covers the cost of all the improvements and apparatus required of them as a condition of admission.

A heavy gale was blowing at the time of the fire directly upon the Dolphin Mill, and it served as a barrier by which the fire was prevented from extending to a very combustible district on the other side.
E. A.

M. VIOLLET-LE-DUC.

THE great French architect, M. Viollet-le-Duc, who died in his Swiss home at Lausanne last week, was a standing astonishment to the French clergy. Probably no other man amongst his contemporaries had so profound an acquaintance with mediæval art, or such an impassioned feeling for it. This is evident, not only in his scholarly writings, but in his magnificent restorations of the cathedrals of Notre Dame in Paris and of Amiens, and also of that most marvellous piece of work, the Sainte Chapelle, behind the Palace of Justice. He was equally at home in his knowledge and appreciative treatment of the castles of the old French aristocracy, as he has shown at Pierrefonds and at Eu. Nevertheless, M. Viollet-le-Duc was one of the most decided of French anti-clericals, and in his later years an advanced republican. During the Napoleonic Empire he did not trouble himself about politics, and it is to be presumed, from his acceptance of a Commandership of the Legion of Honor from the Emperor's hands, and his participation in the amusements of the Imperial Court at Compiègne, that he must have quieted his conscience with the casuistic axiom that he was an artist first and a republican afterwards. Hence, after the fall of the empire and his fervid announcement of republican convictions, the great architect naturally found himself in much the same position as his collaborateur in the *XXIXe Siècle*, M. Edmond About. Dean Close, if we mistake not, once wrote a pamphlet which was very popular with certain Evangelicals, in which he maintained the thesis that the restoration of churches is invariably a first step towards popery. The experience of the most eminent of modern continental church-restorers would seem to convey the very opposite moral. The cardinals and bishops who employed him, and observed his zeal in his work, and his scrupulous piety (in an architectural sense), probably thought him a living instance of the adage, "The nearer the church the further from God." It is worth observing that one of the greatest experts in English ecclesiastical architecture was a Quaker. — *The Echo*.

THE ANDRÉ MONUMENT.

THE memorial shaft erected by Cyrus W. Field, to mark the place where Major John André was executed, October 2, 1780, was placed in position and uncovered at noon yesterday in the old apple orchard on André Hill, near Tappan, in Rockland County in this State. There were no ceremonies whatever on the occasion, and not more than twenty persons were present. The workmen had placed the shaft in position, and as near as possible at the same hour that André was hanged, at noon, the covering boards were removed. Not a word was spoken by any one. The shaft is of Maine granite, and is three and one half feet square and five feet in height. There is no ornamentation, the smooth and glistening surface being relieved only by inscriptions in the most modest lettering. On the side toward the west the longest inscription is carved, as follows:—

Here died, October 2, 1780, Major John André, of the British army; who, entering the American lines on a secret mission to Benedict Arnold for the surrender of West Point, was taken prisoner, tried, and condemned as a spy. His death, though according to the stern code of war, moved even his enemies to pity, and both armies mourned the fate of one so young and so brave. In 1821 his remains were received at Westminster Abbey. A hundred years after his execution this stone was placed above the spot where he lay, by a citizen of the States against which he fought, not to perpetuate the record of strife, but in token of those better feelings which have since united two nations, one in race, in language, and in religion, with the earnest hope that this friendly union will never be broken.

Beneath is the name, —

"Arthur Penrhyn Stanley, Dean of Westminster."

On the south side, the inscription reads as follows:—

"Sunt lacrymæ rerum et mentem mortalia tangunt."

(Virgil, *Æneid*, l. 462.)

The only other inscription is upon the north side, and is this:—

"He was more unfortunate than criminal;

An accomplished man and a gallant officer."

(George Washington.)

An inscription will be placed on the east side next year, the centennial of the execution.

This André shaft stands on a high elevation, about two and a half miles from the Hudson, and not more than thirty yards from the New Jersey line, overlooking a beautiful country. Mr. Field has bought thirteen acres of land in the immediate vicinity, running to, but not crossing, the New Jersey line. He purposes to convert this property into a park, with two entrances, and carriage-ways leading to a circular drive around the shaft, which will be surrounded by an

iron railing. It is stated that when completed he will present the property to the citizens of Tappan. Four trees, two English and two American, either oak or elm, will be planted at the cardinal points around the monument.

Some doubts have been raised as to the exact spot where André was buried, but Mr. Field entertains no doubt that he has selected the right place. David D. Brower, John H. Outwater, and John J. Griffith, old residents of Tappan, agree that the spot now marked by the shaft is the exact spot where they saw André's remains exhumed in 1821, when the British Government sent the Duke of York to America to convey them to their resting-place in Westminster Abbey. It has also been questioned whether the remains taken to England were really those of André, but Mr. Field is satisfied also upon this point. He has a letter from Dean Stanley expressing no doubt upon the subject, and discrediting any attempt to raise an issue upon the point. — *New York Tribune.*

NOTES AND CLIPPINGS.

STATUE OF JOSIAH QUINCY. — A bronze statue of Josiah Quincy, the work of Mr. Thomas Ball, which has been set in front of the City Hall of Boston, was unveiled last week. It stands symmetrically with Greenough's statue of Franklin, which occupies the other side of the small open space before the building. It is a statue of heroic size, which the *Boston Daily Advertiser* describes thus: It is a noble work of art, and most creditable to the sculptor. The figure stands erect, with the weight poised on the right foot, the other foot being slightly advanced. Over the left shoulder is carelessly thrown a cloak, which appears to have slipped from the right shoulder, and the edge, passing beneath the right arm, is gathered up in front and held in the left hand, from which it hangs in heavy, bronze folds, while the right hand falls naturally by the side. This outer garment nearly conceals the lower part of the figure, and gives the opportunity for the classic disposition of drapery which most sculptors consider requisite to the best artistic effect. The disposition of the cloak is, however, such as to leave the outlines of the upper part of the figure clearly expressed beneath a closely fitting coat, buttoned to the lapel, above which protrudes the old-fashioned elaborate frill of the shirt front. The head is turned slightly to the right, and the pose, as a whole, is easy and most dignified and impressive. The countenance is said, by those best qualified to judge, to be an excellent likeness of the original.

FALLING BUILDINGS. — A wooden building 60 by 40, on the corner of Central and South Water Streets, Providence, tumbled down about ten o'clock at night. The building was formerly used as a warehouse, but of late it has been used to store low-gears. To judge from the appearance of several other buildings in that vicinity, it would not be unsafe to predict their early fall. Some of these buildings actually sag over from the top a distance of four feet, and are only kept in position by being shored up by posts.

THE U. S. CAPITOL. — The report of Architect Clark, of the Capitol Building, at Washington, shows that use has been made of the recess in making repairs which have long been needed, especially about the Hall of Representatives. Changes have been made in the rooms back of the Speaker's desk, which will allow a much increased quantity of fresh air and light to enter the hall, at the same time furnishing an airy retiring room for members. False door-ways have also been opened, and committee and folding rooms rearranged in a manner to enhance the convenience and health of all concerned. Mr. Clark recommends the removal of the wood portions of the old hall, so that the structure may be completely fire-proof. The electric light apparatus is in a fair way of being perfected, so as to be available next winter. Its use will add greatly to the purity of the air during the all-night sessions.

CHICAGO SEWAGE. — Dr. John H. Rauch, Secretary of the State Board of Health, has just returned from a trip over the Illinois and Michigan Canal and the Illinois River, with a view to investigating the effects of Chicago sewage upon the water at different points. He considers this the most serious sanitary problem to be solved in that State. He has secured specimens of the water at about two dozen points, and intends to repeat the trip once a month, and make a thorough investigation of the subject.

PHILADELPHIA SEWERAGE. — The sewerage system of Philadelphia needs improving. The length of the sewers of the city aggregates 350 miles, connected with which are more than 1,000 miles of soil and waste-pipes, communicating with more than 40,000 dwellings; and the kitchen waste from as many more dwellings finds its way to the sewers by surface drainage, to say nothing of the offal from slaughter-houses and the filth from factories. For all this vast system there is no special provision of ventilation, and for nine miles along the Delaware water front, when the wind is in the proper quarter, the sewer gas is blown at low tide into thousands of houses wherein the plumbing is defective. Consequently all that part of the city is a great place for fevers.

CLEOPATRA'S NEEDLE. — The apparatus for taking down, removing, and placing in position in Central Park, New York, the obelisk which has been presented by Egypt, has been completed at the Phoenix Iron Works, at Trenton, N. J., and shipped for its destination. It consists of two frames, composed of rolled iron beams, plates, channels, etc., to support two bearings, upon which are a pair of trunnions, which will be fastened to the obelisk at the centre of gravity. When placed in position the foundation will be removed from under the obelisk, and the immense monolith, weighing 205 tons, will be swung in a horizontal position, as a cannon lowered to the ground by jack-screws, and placed in a cradle prepared for that purpose. It will then be transported to the seaboard and shipped to New York. There the same apparatus will be used to erect the obelisk in a permanent position. Each of the trunnions weighs seven tons, and workmen have been engaged on them night and day for two months.

COMPLETION OF COLOGNE CATHEDRAL. — The first stone of the Cologne Cathedral was laid August 15, 1248, and it is thought it will be completed in another year. The two towers have now reached their last stage, and have only to be fitted with their massive caps of solid stone-work. For this purpose two great scaffoldings have to be erected at a dizzy height; one of them, however, already approaches completion. When the caps have been finished then a still higher story will have to be added to the scaffolding in order to fix on the tops of the caps the gigantic foliated crosses almost thirty feet high, which are to crown the towers. This operation will, it is expected, be performed next spring.

THE NEW OPERA-HOUSE AT GENEVA. — The first stone of the legacy left by the late Duke of Brunswick, should now be complete. The exterior has been finished for some months, and in the interior the auditorium was ready; all that remained to be done was to furnish the many dressing-rooms and foyers. Mr. J. E. Goss, the architect, expected to finish it by the 30th of September, on which day he would hand it over to the Municipality of Geneva. The house is built chiefly on the model of the Grand Opera at Paris. Round the outside are busts of musical composers, Auber, Meyerbeer, Mozart, etc., and in the entrance-hall there are also four fine busts of Molière, Corneille, Goethe, and Schiller, two of which are by M. Topfort, a Genevese sculptor. On the walls of the two grand staircases, and on the ceiling of the grand foyer, there are large pictures, painted by MM. Gaud, Millet, and Furet, which are effective, though not very extraordinary as works of art. Above the entrance-hall is the grand foyer, which is divided into three compartments, in each of which there is a magnificent fireplace of Belgian marble. Two of these fireplaces are by M. Doret, and the other by M. Charbonnier. There are three tiers of seats in the auditorium, with sitting-room for 1,350. Round its walls, beneath the cornices of the roof, are portraits of distinguished actresses — Talma, Mars, Rachel, Déjazet, etc. — in the form of cameos. The cost of the building is about \$1,000,000 or 5,000,000 francs.

LEANING TOWERS. — The most remarkable leaning tower in Great Britain is that of Caerphilly Castle, Glamorganshire. Although but between seventy and eighty feet high, it is eleven feet out of the perpendicular. The castle of which the tower forms a part was built about 1221, and the canting of the tower is said to have been caused by an explosion of hot liquid metal used by the occupants of the castle to pour on the heads of their enemies, at a siege which took place in 1326. There are also leaning towers at Bridgenorth Castle, in Shropshire, and at Corfe Castle, in Dorsetshire, both caused by the use of gunpowder during the civil war between King Charles and his Parliament.

Of churches with crooked spires, the most noteworthy is the famous one at Chesterfield in Derbyshire. It leans six feet towards the south, and four feet four inches towards the west, and its height is 230 feet. So peculiar is the distorted appearance of this steeple, that it is said to appear falling towards the spectator from whatever point he approaches it. There are several traditions extant respecting this singular architectural deformity. The subject was, however, fully discussed at a meeting of the Institute of British Architects in January, 1855, and it was ascertained that the oak planks on which the framework of the spire rests are much decayed on one side, which is sufficient to cause the divergence from the perpendicular. The timbers also have the appearance of having been used in a green and unseasoned condition. The action of the sun upon the spire would therefore cause it to become crooked, and this may account for the distortion, without attributing it to design. — *Chambers's Journal.*

THE HERMES OF PRAXITELES. — Herr Adolf Boetticher writes of the statue by Praxiteles, newly discovered at Olympia, of which a cast has just been placed in the Boston Museum of Fine Arts: "To lightness and charm of attitude is joined the masterly beautiful treatment of the body in detail. Just as in its pose it everywhere appears unconstrained and divinely free, there belongs to this body a blooming flesh that seems only nourished by ambrosia, and that has never known the tremor of pain. Far removed from serving simply as a transparent covering for the skeleton and a network of muscles, as in the Lysippos of Apoxyomenos, and just as little as a concealment for the finer play of life by a too great fullness and softness, as in the various Antinous statues, this glory of completeness, streamed through with warm blood in all its members, affects us like a blossom fresh with dew which turns to the spring sunbeams with a grand impulse in all its life-veins. That the fresh splendor of this flesh and the shimmering, silken-like surface were created in full consciousness of their effect is taught by a glance at the equally master-like execution of the two garments, the chlamys of the god which in folds of drapery hangs down over the tree trunk, and the finely-woven linen thrown around the tender body of the little one. This material is handled with a realism which we, in view of all our former knowledge of the antique, must call unexampled. The contrast of the heavier garments to the smoothly elastic surface of the body, and the contrast of the textures when together, — which indeed the photograph from the original makes much more apparent than the dead plaster, — is pronounced so clearly and master-like as only in some modern work of the Tintardini school, or much rather, in the equally grand and delightful creations of our realistically ideal master, Reinhold Begas."

PILOTY. — It is reported that Herr Piloty is about to resign the position of director of the Academy of Fine Arts at Munich. His resignation has been expected for some time, on account of various reasons, one of the foremost of which is the disfavor with which he is now received at Berlin. At the time of the attempted assassination of Emperor William there were circulated reports of a difficulty between Herr Piloty and the government, apropos of certain disloyal remarks said to have been made by that hot-headed artist. It was expected then that he would either lose his position immediately or be forced to resign in a short time. He has, however, since then held the post sufficiently long to prove that his resignation depends on his own will. Another reason why he should give place to another is that he does not represent the progressive school of painting in Germany.

MECHANICS AT ETON. — Eton College, England, has established a building of three floors, in which various mechanical appliances are to be erected, so that boys may be taught the practical use of tools.