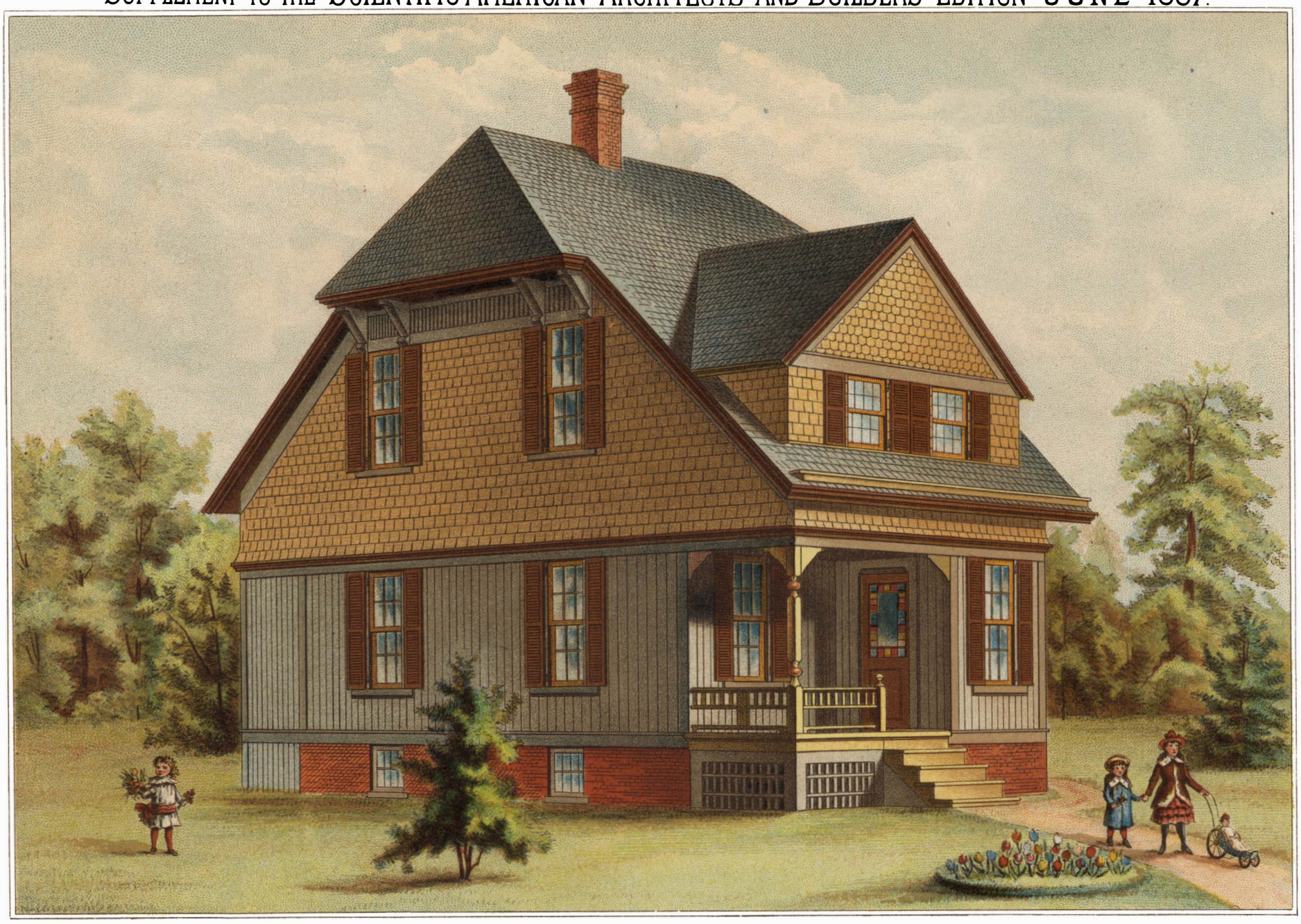
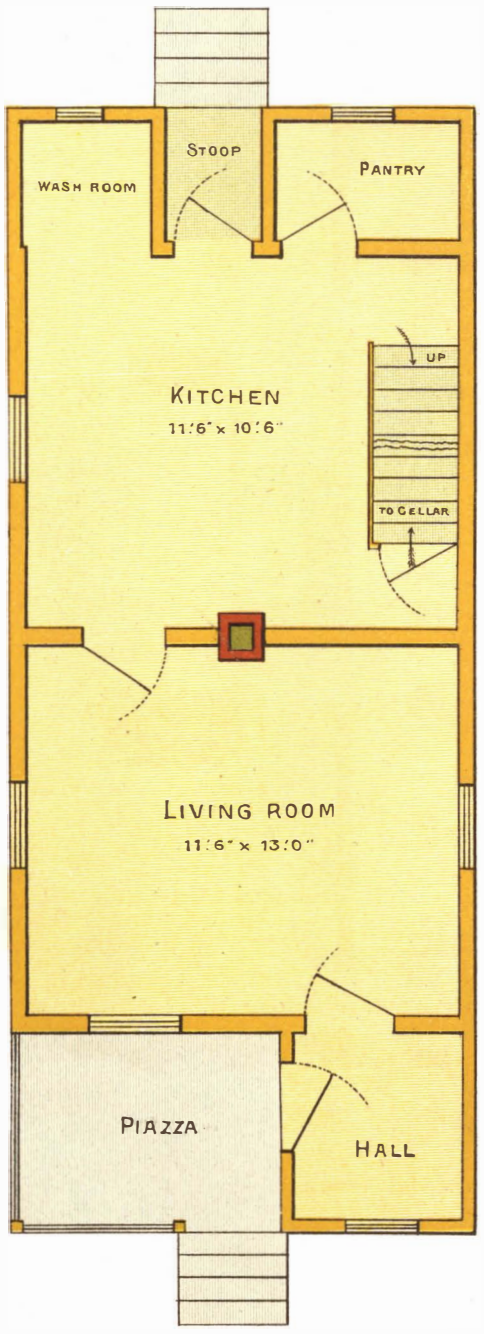
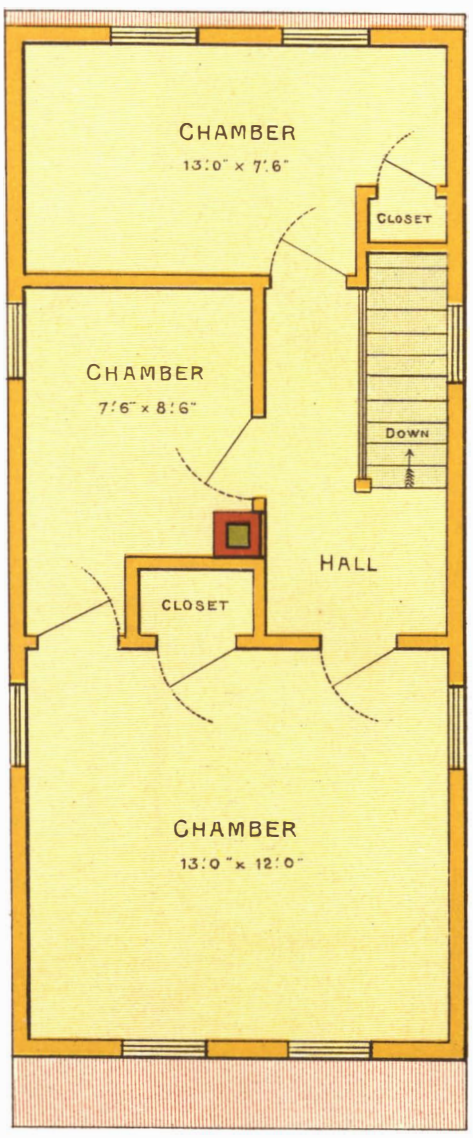


A Twelve Hundred Dollar Cottage

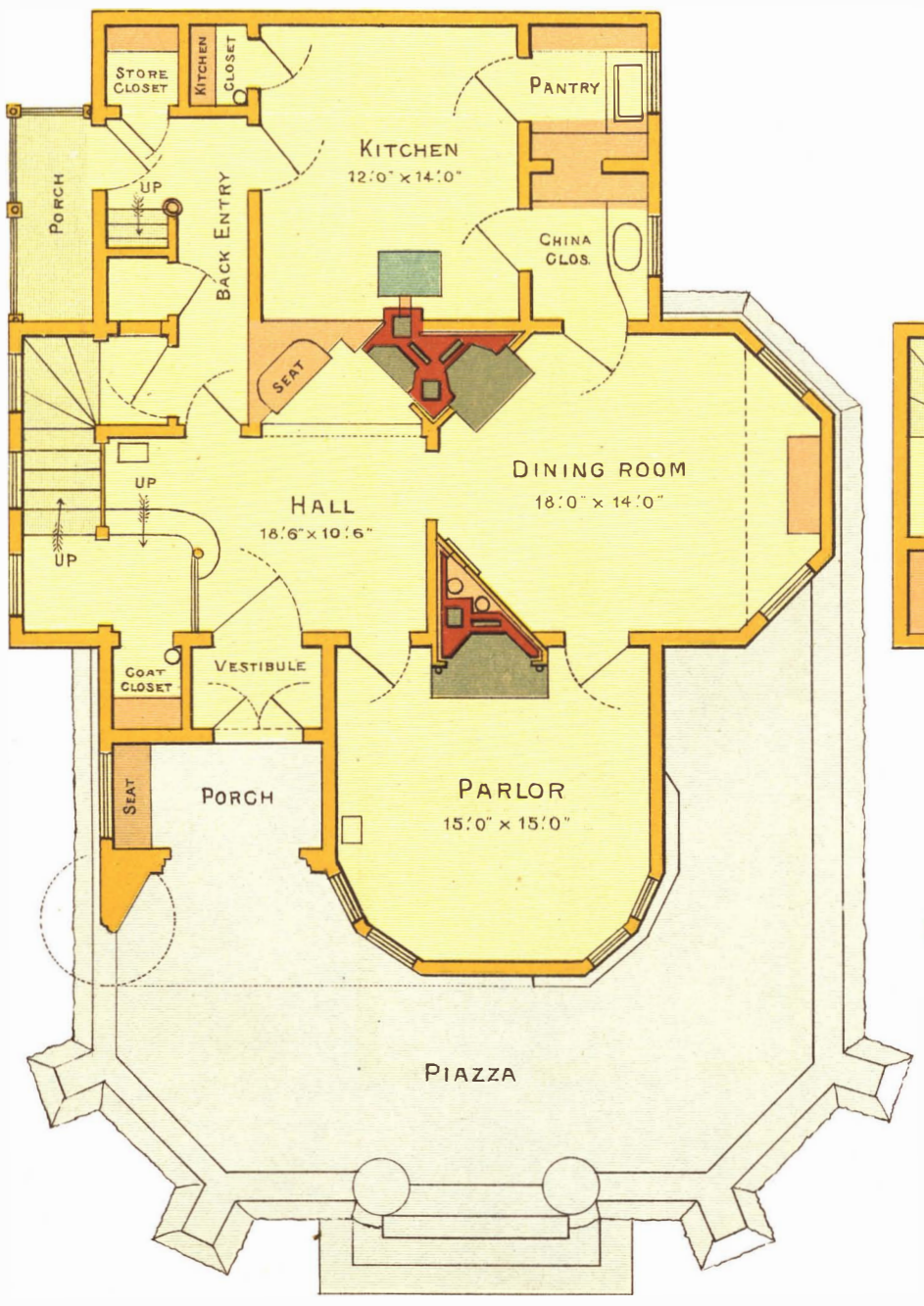


Plan of First Floor.

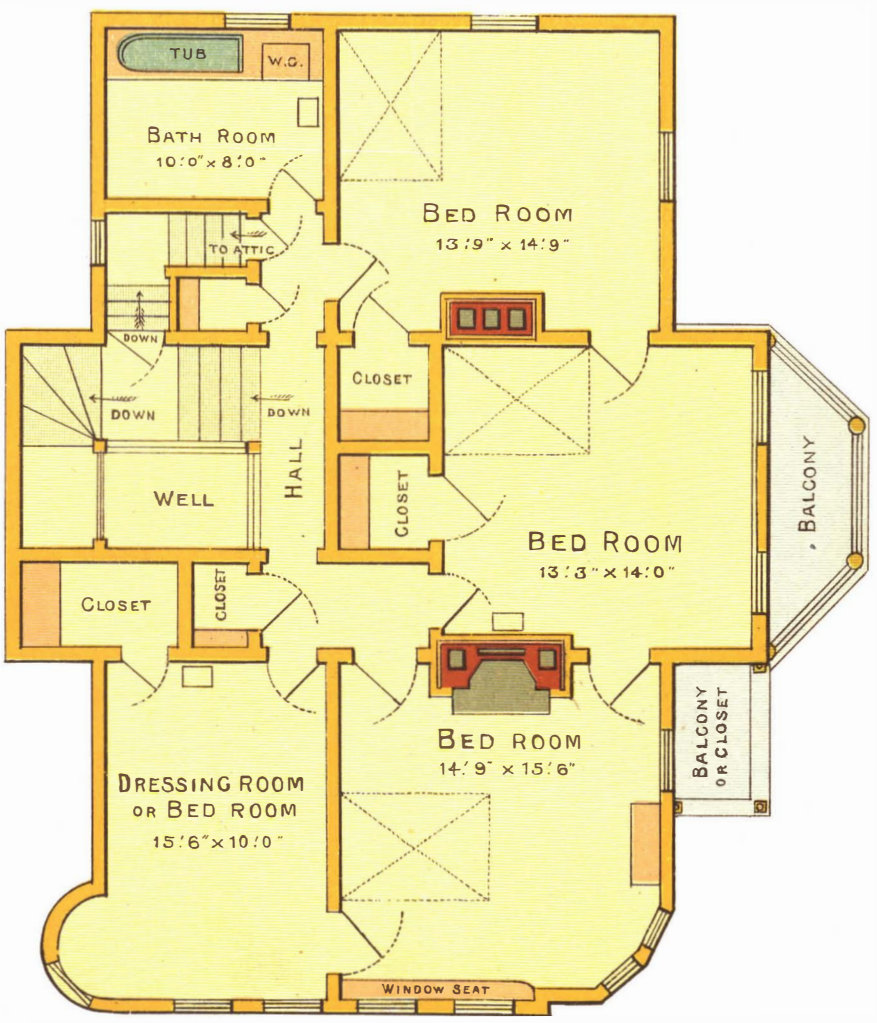


Plan of Second Floor.

A Residence Costing Five Thousand Dollars



Plan of First Floor.



Plan of Second Floor.

SCIENTIFIC AMERICAN

Entered at the Post Office of New York as Second Class Matter.

ARCHITECTS AND BUILDERS EDITION.

Vol. III. Subscription, $2.50 a Year. NEW YORK, JUNE, 1887. Single Copies, 25 Cents. No. 6.

RESIDENCE OF GEORGE NOAKES, ESQ., RIVERSIDE PARK, NEW YORK CITY.

[For description see page 127.]

Scientific American.

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NEW YORK, JUNE, 1887.

THE

Scientific American,

ARCHITECTS AND BUILDERS EDITION.

$2.50 a Year. Single Copies, 25 cents.

This is a Special Edition of THE SCIENTIFIC AMERICAN, issued monthly. Each number contains about forty large quarto pages, forming, practically, a large and splendid **Magazine of Architecture,** richly adorned with *elegant plates in colors* and with fine engravings; illustrating the most interesting examples of modern Architectural Construction and allied subjects.

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CONTENTS

Of the June number of the ARCHITECTS AND BUILDERS EDITION of SCIENTIFIC AMERICAN.

(Illustrated articles are marked with an asterisk.)

CREOSOTE WOOD PRESERVING STAINS.

Wonderful has been the artistic improvement in wooden exteriors of the last lustrum, indeed of the past ten years. We have only to look back at the houses of the last generation, with their dreary lines of clapboards covered with a monotonous veneer of thick paint, to rejoice at the changes that have occurred. Is it not perhaps a process of evolution, this abandonment of the clapboard for the shingle?

May it not be compared to the change from the rectilinear exactness of the reptile's scale to the varied and exquisite beauty of the feathers of birds?

This analogy becomes still more suggestive when we observe the beautiful results that the introduction of stains in the place of paint has accomplished. Most artistic effects have been obtained by mixing shingles stained in different tones, thus giving the soft and deli cate shading seen in the plumage of birds.

A word of warning may not be here amiss in regard to stains.

First.—They should not contain benzine, as some of the imitations of creosote stain have lately done.

Second.—They should not be made by mixing dry color, English or otherwise, with linseed oil, as some others have been. Such a stain may be known by the rapidity of its settling on standing, and by having only a smell of linseed oil. Such a material is not a stain, but merely a thin paint, lying wholly on the surface and masking, rather than enhancing, the beauty of the grain.

The creosote stains are the result of many years of experience, and are the only *true* stains made for exterior work.

In color and intensity they vie with the best paints, while their effect is much more artistic and transparent. The preserving properties of these stains are perfectly understood, but not until lately was it generally acknowledged that creosote diminishes the risk of fire, while also toughening the fiber of the wood.

ARCHITECTURAL EDUCATION.

Among the many inquiries upon this topic we find upon our table one from a young man of Pittsburg, Pa., to the following effect:

"I am twenty-six years old, and would like to study architecture. I have worked two years at outside carpenter work, and am now entering my second year on inside finish, in which position I hope to remain for two years more, and during this time I desire to study such matters as will thoroughly prepare me for architectural work. I have done considerable designing, can make the working drawings, and do perspective work. Now, will you be kind enough to please inform me through your columns the proper books to study, naming them in the order in which I should study? Am now studying algebra and geometry.

"2d. Is it possible for one who has always been fond of study, and who has a general knowledge of the practical part of the business, to become an architect without professional assistance, or would it be necessary to enter an office? Is there any law to govern this?"

Here is a young man who has had some practical acquaintance with the constructive branch of architectural art. The mechanical drudgery of his work has not daunted his spirit, nor quelled the artistic instinct within him, and the query is fairly presented, How shall he gain knowledge of the coveted art? Shall we turn him over to the course recommended by our esteemed contemporary, the *Sanitary Engineer*, who says, first he must take a regular course at one of the architectural schools, four years, then the routine of a year's office work as draughtsman, then one or two years in one of the ateliers of the Ecole des Beaux Arts, Paris, and. finally, the usual round of travel and observation throughout Europe—a very good course, we will admit, for a young man who can afford to spend nine years of his life in getting ready to begin, but what of the young man who has not the nine years and the nine thousand dollars to devote to its acquirement?

Would we have had a Christopher Wren, had he been obliged to take such a course? And is it the course that makes the artist, or the man? With all due respect to the Ecole des Beaux Arts, believing it to be the best art school in Europe, and while admiring the spirit of its work, yet we must protest against its methods as being the best adapted to the future needs of our architectural students. Its efforts to galvanize the corpse of the Renaissance can be of little value to the wants of our own country. As Owen Jones well says, in France drawing schools exist in every town, where the young may obtain much elementary knowledge, and there are in Paris many studios where professors devote their time to the instruction of a large number of pupils, making them thoroughly acquainted with the works of every period, and giving them a thorough knowledge both of architecture as a fine art and of construction in theory. The difficulty with our lack of progress in architectural art lies not so much with architects as with the public, and it is our people, as a people, who need to be architecturally educated. The beginning of such an education lies naturally in our public schools, and the various schools of design now under full headway are doing encouraging work in many of the large cities of the country.

Again, we must take exception to the remark of our contemporary that "an exhaustive technical, or, rather, engineering, education is apt to be a hinderance rather than a help. Aside from a certain limited amount of calculation, the engineering ability involved in the construction of even the heaviest buildings is a matter of experience and judgment rather than of abstract learning"—a doctrine which implies that skill in fine art means deficiency in practical matters of construction, and which we believe is pernicious to the highest degree.

For example, how easy it would be to a man who was simply a colorist, a decorator, or a designer, but deficient in the technical art of stone cutting, to have designed the beautiful marble stairway in the *foyer* of the Equitable building, and to have determined the proper size of its voussoir steps, and the thrust of its low segmental arch, and the proper thickness of the wall to sustain its thrust, and, on the other hand, how absurdly difficult it would be for the technically educated engineer-architect to have designed such a beautiful structure! Forsooth, what does an engineer know about Mexican onyx balusters or endolithic marbles?

One of the most prominent architects in this city, a graduate of the Ecole des Beaux Arts, is of the opinion that the technically educated mechanical or civil engineer, with an ardent love for architectural art, has received the best preparation possible as an introductory to his architectural studies and future career. Safe building construction is not second to artistic creation, and the man who can accomplish the latter without the former is not entitled to the name of architect. To design the former necessitates the technical knowledge, training, and thinking of the engineer. To attain the latter, simply a knowledge of the artistic work of all ages, with the spirit and instinct of an artist within him. On the other hand, it is equally true that a man deficient in the faculty of æsthetic expression can never attain an enviable height as an architect. He must have within his own breast an inherent love of the fine arts, but all the schools in the world, not even the Ecole des Beaux Arts, can make an artist-architect of a man who is not endowed with a keen sense of harmony of proportion, color, and expression before he goes there. Architecture is nothing if not an expression of individualism. True it is, traditions, precedents, and the art expression of all the ages come down to the individual, and it is the impression of them all upon himself that is worked out in that individualism. It is, finally, an ideal creation manifested through the image of one mind, consonant with the instinct of one soul, harmonious, beautiful, not the confused, distorted, inharmonious conception of many minds acting together in patchwork order, not that monster of modern times "administrative" architecture.

Before us lies the memorial resolution of the American Institute of Architects, adopted in honor of the late Mr. Ferguson, than which no brighter name adorns the page of architectural fame of the nineteenth century, and, in the words of that resolution, "his 'History of Architecture' forms the highest authority on the subject for English-speaking architectural students and connoisseurs," and yet "a most notable fact in connection with Mr. Ferguson's long and highly honorable career is that he was not educated to architecture, either as a practitioner or an amateur, but to mercantile pursuits, and that he voluntarily gave up fine prospects in this direction for the sake of devoting himself to the disinterested study of architecture and to the literary elaboration of the history of its forms." But if the architectural student has carefully read the statement that he must take a nine years' course of study before he can accomplish anything, and yet

stumble upon the fact that our best authority upon architecture not only did not take this prescribed course, but was not even a practitioner, or, stranger still, an amateur, he will be sorely puzzled.

Should the student happen to learn of that *chef d'œuvre* of architectural books, Viollet Le Duc's "Discourses on Architecture," he will discover no sickening masquerading with truth and sentiment, but the principles of truth, unity, and beauty, each allotted to its appropriate place, each characteristic of good architecture, truthfully, carefully drawn; and no writer ever lived who more fully despised the deceits of false art, its shams, and its hypocrisy than Le Duc, and he it is who announces that a building, to entitle it to rank among architectural work, must, first, be safely built, second, durable, and, lastly, beautiful—the relative importance existing in the order named.

Reader, were you ever a builder? and have you tried ever to interpret and execute some detail that the poetical architect has just "*sketched in*" for picturesque effect? If you have not, just try it; if you have, what did you say, and what did you do? An eminent writer in an English architectural journal recently said: "If knowledge of construction is thus essential to the architect on the utilitarian side of his art, it is not less necessary in an artistic sense. Not only is it important to know in what positions of a design certain materials may be safely used, but also what will be their appearance and effect. The former requirement applies to the scientific, the latter to the artistic element in architecture. Do you not see how carefully the line is drawn? Art and science are sworn enemies. Designs which may be effective in one material will be unfitted for others, but you know it will be very scientific to be acquainted with the nature of your material, its durability, the tests which it may have been submitted to by scientific men; but it will shock your artistic sense to know it, so if you are going to be an architect you must not know it. It is very vulgar to know anything about it. Faults of execution may interfere with well studied detail. Oh, yes; your detail must be masterly studied, must be skillfully colored, no striking contrasts, you know. But, if the execution is faulty, why—blow up the builder, or contractor, or what not. Color may be well or ill introduced, but it will violate the canons of propriety for you to study the physical laws of color harmony. That is scientific, but it is low art. Magnificence or meanness of effect may be produced by the dimensions or quality of the materials used, but you must never study the anatomy of proportion, that would be scientific. The end justifies not the means, but the means the end in architecture."

If the above were true, architecture would be destitute of principles, and how can the application of the knowledge of principles, which is the expression of art, exist without principles? Ah, but some writers will tell you art is above all principle, transcends all knowledge, and, therefore, it must be out of sight, invisible, intangible.

In truth, what shall a young man study who desires a fundamental knowledge of architecture? In the special course at Cornell University, the following subjects are mentioned: Building materials and construction, mechanics, designing, shades, shadows and perspective, free hand and linear drawing, decoration, photography, modeling, acoustics, Egyptian, Greek, Roman, Romanesque, Renaissance, Gothic, and modern architecture, and the books from which to study them are:

Ferguson's "History of Architecture," Viollet Le Duc's "Discourses on Architecture," "The Principles of Design in Architecture," by E. L. Garbett, Wightwick's "Hints to Young Architects," Lubke's "History of Architecture," Wincklemann's "Ancient Art," Reber's "Ancient and Mediæval Art," Stevenson's "House Planning," Street's "Brick Architecture of the Middle Ages," Gell's "Pompeiiana, Photographic Prints of Greek and Roman Remains," Grote's "History of Greece," Ihne's "History of Rome," Pugin's "Gothic Architecture," Parker's works on "Gothic Architecture" and "Domestic Architecture of the Middle Ages," Rivington's "Building Construction," Clark's "Building Superintendence," Barlow's "Strength of Materials," Stoney on "Strains," Shreve on "Roofs," Prof. Ricker on "Graphic Analysis of Roof Stresses," Wood on "Resistance of Materials," Goodeve or Twisdew on "Elementary Mechanics," Weisbach on "Higher Mechanics," Helmholtz on "Acoustics," Tyndall on "Sound," Miller on "Essentials of Perspective," Day on "Design," Japanese art decoration, Builders' Edition of SCIENTIFIC AMERICAN, *American Architect*, *Building*, *Carpentry and Building*, the *Sanitary Engineer*, *Decorator and Furnisher*, *Moniteur des Architectes*, *Materiaux et Documentes*, and latest works on electric lighting and house sanitation.

In the opinion of the writer, who, if he were a graduate of the Ecole des Beaux Arts, would be of the same opinion still, it is quite possible to become an architect without professional assistance, but he would advise a year of conscientious work and close application under the kindly directing guidance of a practicing architect, as the routine of office work will be of great value. The current architectural literature of the day is the most valuable and available avenue now open to theoretical and practical knowledge of architectural scientific art and artistic science. Its progress, enlightenment, and wise counsels have elicited the admiration of Europe, and should not be neglected at home.

A TWELVE HUNDRED DOLLAR HOME.

On a portion of our colored plate is shown a little house which has been specially designed with the view of providing a dwelling at the lowest possible cost consistent with sound construction. The architect has taken the minimum requirements to be a kitchen, a living room, and three bed rooms—one for the parents and one for the children of each sex—and has produced a design which, while possessing a pleasing appearance and a convenient arrangement, may be carried out at the low cost of rather less than twelve hundred dollars. This sum is that within which the house could be built in almost any locality, but in many places $1,000 would easily cover the expenditure.

The floor plans show the desirable arrangement adopted; the little hall, the small wash room, and the nice sized pantry, are conveniences which cost little, but add much to the comfort and completeness of the house, while the position of the stairs permits of the upper rooms being warmed to some extent from the kitchen heat below.

Full specifications and bill of cost will be found below, which, taken in connection with the accompanying sheet of elevations, plans, and detail drawings, will be amply sufficient to build from.

SPECIFICATION

of material to be provided and labor to be performed in building and completing a one and a half story and cellar frame dwelling house.

Specifications and Drawings.—The specifications and drawings are intended to co-operate, and, taken in connection with this specification, to provide for the completion of the entire carpenter, mason, painting, tinning work, etc., as well as everything mentioned in this specification. Any work shown on the drawings and not mentioned in the specifications, or *vice versa*, is to be executed the same as if both mentioned in the specications and set forth in the drawings, to the true intent and meaning of the said drawings and specifications, without any extra charge whatsoever.

Quality.—The whole of the work is to be executed in a good, thorough, and workmanlike manner. All the materials used to be of good quality, free from all defects impairing their strength or durability. The timber, except where otherwise specified, to be of good, well seasoned hemlock.

Sizes.—Plates and interties, 4″×4″; posts, 4″×6″; first and second floor beams, 2″ × 8″, all 16″ on centers. Rafters, 2″ × 6″; valley rafters, 2″×8″, 24″ on centers; all studding, 2″×4″, 16″ on centers; bridging, 2″×2″; ridges, 2″ x 8″; and ceiling beams, 2″ × 6″.

Framing.—All the studding to be placed 16″ on centers; door and window studs, 2″ × 4″, doubled, including the heads; all partitions to be bridged horizontally once in their height with 2″ × 4″ bridging, well nailed at each end. Partitions coming over one another to rest upon the partitions below, and not upon the floor beams. All floor beams to be bridged with one tier of herring bone bridging in center, well nailed at each end. The entire frame to be mortised, tenoned, and pinned together with horizontal pieces 2″ × 4″, cut in on height on first story 3′ from centers, to nail vertical boards to. The trimmers, headers, and beams running under and parallel with partitions to be doubled beams, well spiked together. All floor beams to be laid with crowning edge up, and all studs to have hollow sides out. All sills to be halved at angles and corners, and the rafters to be neatly fitted to ridge and plate valleys, ceiling beams to be well spiked to side of rafters.

Flooring.—First and second floors to be laid with wide pine flooring, ⅞″ thick, well driven together and nailed to each and every beam.

Siding, Shingling, etc.—Do all necessary furring, and shingle the vertical sides, where shown, with XXX 18″ pine shingles; the bottom course to have rounded ends and to be laid not more than 5″ to the weather, on 1″×2″ laths, 5″ apart. Cover the lower portion of the building where shown with narrow tongued and grooved ⅞″ boards, driven perfectly tight together. No battens to be placed over joints.

Roof.—The valleys and gutters to be lined with the best I. C. charcoal tin, with all joints carefully soldered. Do all necessary flashing around chimneys, cheeks, etc. Shingle the entire roof with XXX 18″ pine shingles, laid on 1″×2″ lath, not more than 5½″ to the weather. Put up, where required, 3″ tin leaders, and connect with drains where directed.

Piazza.—The sills and bearing timbers for porches to be 3″×6″, floor beams 3″×6″, placed 20″ from centers, notched into the sill and well nailed; the floors to be ⅞″ thick, 4½″ wide, laid in paint, and blind nailed. Steps to have 1¼″ treads and ⅞ risers; columns, plates, balusters, ceiling, etc., to be white pine, worked and trimmed as per details; the piazza to be ceiled level on the under side with 4½″ beaded ceiling, ⅞ thick. The ceiling beams to be 2″×4″.

Blinds.—All windows except those in cellar to have 1¼″ outside blinds, made, hung, and fastened in the best manner and painted three coats at the factory.

Exterior.—The water table, corner boards, cornice, window frames, porches, and all other exterior ornamental work to be made of merchantable white pine, in accordance with the drawings; the ends of rafters overhanging the plate to be worked as per detail.

Window and Door Frames.—Window frames to be made for 1¼″ double hung sash, with 1¼″ pulley and hanging stiles; 2″ sills, and ⅞ subsills; 1¾″ axle pulleys, stops, etc., all complete. Small cellar frames to be made with rabbeted frames, cased inside and hung at top with 3″ narrow butts and proper fastenings. Door frames to be made of 1¼″ plank, with rabbeted jambs; outside doors to have 1¼″ outside casings.

Sashes.—All sashes, except those in cellar, to be 1¼″ thick, of the dimensions and number of lights shown in drawings, and to be glazed with third quality French single thick glass; cellar sashes to be glazed with fourth quality glass. The double hung sashes to have best Russian hemp cord, proper weights, and Berlin bronze sash fasts.

Doors.—The front door to be 1½″ thick, moulded as shown on drawings, and hung on 4″ cast loose butts, fastened with 4½″ brass face mortise lock, and fitted with porcelain furniture and drop escutcheons. Closet doors to be 1¼″ thick, paneled and moulded one side, hung on 3½ cast iron butts, and fastened with 4″ rim locks, with porcelain furniture for principal part of first story and mineral for second floor. Kitchen closet doors to be white porcelain reverse bevel rim locks. All doors, where needed, to have rubber tipped base pins and ash saddles.

Stairs.—Build the stairs as shown on the plans, from first to second stories with 1¼″ treads, ⅞″ risers, and 1¼″ strings, put up in the best manner, with the steps wedged with glue. Put in newel on second story with handrail, and plain balusters of ash, as shown on drawings. Cellar stairs to be rough spruce plank steps, housed into strings.

Trimmings.—The architraves for all doors and windows throughout the house to be 5″ wide, with bead on each edge. First and second stories to have turned corner blocks. The bases to be 6″ wide, moulded on top. All to be of well seasoned and clear white pine.

Pantries.—Kitchen pantry to be fitted up with wide shelves on three sides as directed. Bed room closets to have one shelf with strips fitted with japanned hooks for coats and hats. Wash room to have strip with wardrobe hooks screwed thereto.

Grading.—The grading will be done by the owner.

Mantels.—Put up shelves around chimney and support same on brackets.

Privy.—Build privy 4′ 6″×4′ 6″×6′ 6″ high, of narrow beaded ceiling, and shingle roof; provide one small window to slide, and finish complete; put in batten door hung and latched complete; ceil the overhead part and floor the bottom; put in seats, two large and one small, these to have hinged covers, holes, and risers complete.

Back Panels.—All the windows to have neat moulded stools and aprons.

Painting.—Paint all the exterior woodwork usually painted, including privy, with two good coats of best "Atlantic" white lead and linseed oil paint; shellac all knots and sap before priming; and putty over all cracks, joints, nail holes, and nail heads after priming is done. Paint all tin-work with two coats of Prince's metallic paint, and the chimney with two coats.

All the colors are to be selected by the owner. The blinds will be painted at the factory. The whole of the interior work to be painted with two coats of such color as the owner may select. All the doors and saddles to be oiled, and the whole of painting to follow immediately after the carpenters.

MASON'S SPECIFICATION.

Excavations.—Excavate to a proper depth, as shown on plans, for the cellar proper, which is to be about 4′ 6″ below ground. Excavate for all foundations of piers, etc., 2′ 6″ deep, and stoop foundations, 2′ 6″ deep. All water that may accumulate during the excavation, from any cause whatever, to be removed at once, and the premises kept dry.

Brickwork.—Build up 8″ cellar walls, of good hard burnt brick (those generally used in the vicinity), to the full height of cellar, which will be seven feet in the clear, bricks to be laid in cement and lime mortar, mixed with sharp sand. Brickwork to have a course of headers in every seven, to be finished with struck joints inside and out. All angles and corners to be perfectly plumb and the walls level on top.

Brick Piers, etc.—Build brick piers where shown on plans, of good hard burnt brick, of dimensions indicated. All piers outside to be excavated for at least 2′ 6″ deep, and filled in with small stone and well hammered down to a solid bed.

Stoop Stones.—Put down stoop stones where shown, with foundations at least 2′ 6″ deep, filled in with small stones. On this lay flags, in two lengths, and 2′ wide, and of the full length of each stoop. Furnish and set bluestone sills to the cellar windows.

Chimney Flues, etc.—Build chimney flue as shown on plans, of good hard burnt brick, with joints struck smooth, and capped with bluestone cap, 3" thick, with hole cut through.

Furnish and set a thimble where directed.

Vault.—Excavate and build privy vault where directed, 4' deep, and projecting back 2' in rear; this opening to be covered with a box neatly fitted.

Lath and Plastering.—The entire house to be lathed and plastered, except cellar, with one coat and hard finish; all done in the very best manner, and with the best materials. The mortar to lie at least one week before using.

Generally.—The mason will make all his work good after all other trades are done, and leave the building broom clean immediately after the plastering is finished.

Estimate and Bill of Materials.

MASON'S WORK.

No.		At	
56	yards excavating	$0 25	$14 00
8,000	bricks for foundations, laid	15 00	120 00
7	outside piers	2 50	17 50
1	chimney	..	17 00
4	bluestone sills	1 10	2 40
356	yards plastering, two coat work	30	106 80
	Cistern, finished complete	..	40 00
			$317 70

CARPENTER'S WORK.

2	2"×8"×24'	= 64 ft.		
2	2"×8"×14'	= 37 "		
1	4"×6"×18'	= 36 "		
1	4"×6"×14'	= 28 "		
1	4"×6"×16'	= 32 "		
38	2"×8"×14'	= 710 "		
6	4"×6"×15'	= 180 "		
6	2"×6"×20'	= 120 "		
8	2"×6"×23'	= 184 "		
8	2"×6"×26'	= 208 "		
6	4"×4"×14'	= 112 "		
4	4"×4"×12'	= 64 "		
1	4"×4"×18'	= 24 "		
1	4"×4"×24'	= 32 "		
6	2"×6"×16'	= 96 "		
275	2"×4"×12'	=2,200 " = 4,127 feet hemlock timber	$15 00	$61 91
850	ft. vertical siding		30 00	25 50
11,000	18" pine shingles		4 50	49 50
300	1"×2" shingle laths		4½	13 50
1	turned piazza column		..	2 25
10	ft. piazza rail		..	5 00
1	short column		..	1 25
4	piazza brackets		55	1 20
100	ft. water table		4	4 00
100	" band course		5	5 00
8	small cornice brackets		50	4 00
160	ft. main cornice		20	32 00
100	" of tinning		6½	6 50
30	" " 3" leader		10	3 00
2	sets of steps, complete, ready to put up		..	6 00
10	ft. lattice under stoops		20	2 00
60	" piazza ceiling		3	1 80
60	" " flooring		3	1 80
4	cellar windows, complete		..	6 00
7	first story windows, complete, with blinds		7 00	49 00
8	second ditto, ditto		7 00	56 00
1,000	ft. flooring		3 00	30 00
12	doors, complete, with trimmings		..	48 00
225	ft. surbase		3 00	6 75
	Main and cellar steps, complete, with ceiling and rail		..	26 00
	Shelving, kitchen pantry		..	3 50
	" two closets on second story		..	3 00
3	shelves around chimney		..	6 00
	Pump and sink, complete		..	25 00
	Labor for all carpenter work		..	250 00
	Incidental items, jobbing, etc.		..	60 00
				$795 46

SUMMARY.

Mason's work	$317 70
Carpenter's work	795 46
Painting	60 00
Total	$1,173 16

A FIVE THOUSAND DOLLAR RESIDENCE.

This picturesque and attractive residence was designed for Mrs. W. B. Chapin, of Pomfret, Conn., by Howard Hoppin, architect, of 33 Westminster Street, Providence, R. I. The treatment of the elevation is most pleasing, the arrangement of the roof lines producing a very graceful effect, while the dwarf stone wall surrounding the piazza gives the whole design a very substantial and superior appearance.

The cost of the house is estimated at $5,000, made up as follows:

Mason.

Grading	$60 00
Excavation	70 00
Stonework	425 00
Brickwork and chimneys	225 00
Concrete, cementing, etc	100 00
Lathing and plastering	385 00
Outside plaster	45 00

Carpenter.

Heavy timber	400 00
Joists and flooring	370 00
Studding and boarding	275 00
Shingling sides	75 00
" roof	175 00
Outside finish	250 00
" mouldings	50 00
Sashes and frames	280 00
Doors, frames, and trimmings	325 00
Outside finish	250 00
Staircases complete	175 00
Mantelpieces	100 00
Tinning, gutters, conductors, etc	75 00
Plumbing	420 00
Painting, papering, etc	300 00
Incidental items	170 00
Total	$5,000 00

Mr. Hoppin, the architect of this house, has a very extensive practice in Rhode Island, Connecticut, and elsewhere.

Among the buildings for which he is responsible are the Union churches at Fruit Hill, R. I, and Buttonwood, R. I.; the Episcopal churches at Warwick Neck, R. I., Compton, R. I., Apponaug, R. I., Abington, Conn., and Riverside, R. I.; the residences of Bishop Clark, of Rhode Island, Mortimer Hartwell, Esq., Henry C. Bowen, Esq., and a large number of other extensive and important erections.

Specification.

MASON'S WORK.

Loam.—Take off, remove, and pile on lot where directed, all turf loam from under building and for 20 feet around same

Excavation.—Excavate, remove, and pile where directed on lot, all soil, gravel, clay, loose stones, etc., for cellar to house, as shown, and for trenches, piers, and foundations.

Trenches for walls to be dug 6" below cellar bottom. On outside of cellar all trenches to be at least 3' below grade.

Footings.—Bed on solid bottom, a footing course of good levelers under all walls, chimneys, piers, and foundations.

Cellar Walls.—Build cellar walls and foundations as shown, of good ledge and field stone, showing rough rubble on outside, all to be 18" thick, and in half and half mortar up to sill. Rubble to be rough, with carefully bonded joints.

Wall Drain.—Dig a trench from outside foundation walls 6" below cellar bottom, and fill with broken stones. Upon this put smaller stones, then hay, and fill up over with dirt. Level up all around house with pitch away from house. At southeast corner of drain dig trench from drain, with good pitch for 50 S E., and fill in same in the same way.

Cementing Cellar Bottom.—Cover the whole of cellar bottom with a layer of cement, composed of two parts of sand to one cement. Lay even to a depth of 2" thick. Also cover whole piazza floor with same, 3" thick, and with good pitch, to outlet marked.

Cistern.—Excavate for and build a cistern 6'×8'×10' deep, also a cesspool of same size and material. Both to be of stone laid in lime mortar, and thoroughly cemented both on bottom and sides. Build 8" brick arch over top of each, with manhole, with iron rim and cover.

Overflow from Cistern—One inch below inlet of water to cistern put in 3" tile drain pipe, and dig trench and lay a line of 3" tile pipe from same to grade with pitch from cistern to W. or S.W. of house. Protect outlet by heavy wire netting, with tile rim over end of pipe at grade, to keep out dirt, etc.

Caps to Stone Posts.—Furnish and put on with cement two terra cotta caps to front stone posts, and allow $25 for same.

Drains.—Lay a 4" tile drain from 6" above ground, where shown, to cesspool and connect same. Put in Y branch where shown, and lay a 2" branch from same to waste from kitchen sink. At S.W. corner of house lay a line of 4" tile pipes to join conductor to cistern. Both lines of pipe to be carefully and securely laid with close cemented joints. All joints to be wiped out as each pipe is set.

Chimneys.—Build chimneys as and where shown, of any good hard body brick acceptable to architect. The brickwork showing outside of house to be selected to even color and laid in red mortar.

Outside Plastering.—Provide and put on outside plastering, half lime, half Portland cement. Same to be carefully put on as directed by architect.

Fireplaces.—Build four fireplaces, as and where shown, of same brick, selected to even color and laid in red mortar with brick hearths. Flues to be 8"× 12", parged up full length. Exterior of chimneys (inside of house) to be plastered up full length.

Thimbles.—Provide and set 6" earthenware thimbles into flues extending from inside of flue to face of plaster, and no farther.

Lathing.—Lath both walls and ceilings of first, second, and third stories, also laundry and cellar, with good spruce laths, securely put on. Plaster the whole of the above with a good heavy coat of hair mortar, carefully put on and evened off. When this coat is dry, go over the whole with a good even coat of lime putty, leaving the whole even and clear.

Furnace.—Set a portable furnace (supplied by carpenter) in best manner on cement floor, no brick.

Whitewashing.—Whitewash whole of cellar walls and ceiling (except laundry), and leave same clean and white at end of job.

Lead Flashing.—Carefully flash with lead (supplied by carpenter) around all chimneys.

Stone Steps.—Furnish and set at front of piazza a flight of granite steps as shown. To be dressed off with hammer, squared, and set with slight pitch to front.

CARPENTER'S WORK.

The whole of the timber for framing to be of good, sound quality, free from shakes, sap, and other defects. Sills, 4"×6"; girders (two), 2"×8", spiked together; posts, 4" × 6"; plates, 4" × 4"; studding, 2" × 4" and 2" × 3" (inside); floor joists, 2" × 9", set 16" on centers; rafters, 2" × 9", 24" on center; studding to be doubled at all openings, studs set 16" on center.

Crossbridging.—Crossbridge both floors through length of building in two lines, in secure manner.

Cover.—Cover all roofs, sides of building, and floors with ⅞" hemlock boarding, laid close and securely nailed.

Paper.—Before laying upper floors and before putting on outside finish, cover floors and outside boarding with a thickness of good heavy sheathing paper laid close, with edges overlapping.

Shingling.—Cover all roofs and sides of building as shown with good clear butts sawed cedar shingles, laid with lap of 4" on roofs, 4½" on sides.

Lead.—Furnish sufficient 4 lb. lead for mason to flash around chimneys.

Flashing.—Lay all valleys of roofs, also on all hips and ridges, with good tin, and extend on valleys 8" on both sides. Carefully flash with tin on all joints of roofs, and of roofs and sides, and lay good strips over all exposed doors and windows, and leave the whole water tight. Shingles valley to be close.

Roofs—To be looked over carefully at end of job. To be left clean and tight, and warranted so for one year from completion of work.

Gutters.—Provide and securely put on good tin gutters to roofs, as shown, with good pitch to outlets.

Conductors.—Provide and put on 3" tin conductors. Pipes from connection with gutters to joint with tile pipes to cistern.

Furring.—All plastered ceilings to be furred, also over stone walls of laundry.

Upper Floor.—Lay a first quality upper floor ⅞" thick. Matched Norway pine on whole of first story. To be blind nailed, and no boards wider than 5". Other parts of house to have upper flooring of matched ⅞" spruce of good quality. Laundry to have ⅞" hard pine floor, on strips over cement, matched.

Thresholds.—To be of hard pine ⅞" thick.

Frames.—All window and door frames to be of good quality white pine.

Sashes.—Make, glaze, fit, and hang all sashes for building of sizes and shapes as shown, of good white pine 1¼" thick. Cellar windows to be hung at top, with button and hook, complete. Four sashes of west bed room to be hung at side with bolt and hook, as per details. All other windows to be sliding sashes, catch fastened.

Glass.—For whole of building to be of first quality, free from spot and stains.

Doors—Doors of first story, front hall, vestibule, library, and dining room, and doors opening into same, to be moulded. All other doors chamfered. All to be stock size and finish. Vestibule and front doors to be gotten out to details. Front door, 1¾" thick. Vestibule doors, 2¼" thick. Back door and cellar door, 1¾" thick. Other doors, 1¼" thick.

Hardware.—Furnish and put on all butt locks, knobs, latches, bolts, handles, catches, etc., etc., to doors and windows of whole house. Locks to be strong and of good make. Allow the sum of $1.75 per door for trimmings, to be selected by architect.

Cutting and Jobbing.—Do all necessary cutting, jobbing, and boxing for plumbing, mason, and hot air pipes.

Inside Finish.—For whole house to be of Norway pine of first quality. Casings and bases to front hall, vestibule, library, and dining room to be moulded with simple member, as per details. All other finish to be perfectly plain. Casings, 4" wide. Bases, 7" wide.

Cellar.—Build coal partitions, where shown, of 1¼" spruce plank, securely braced about 4' high. Partitions of laundry on outside to be sheathed on cellar

side up to ceiling with ⅞" spruce, also under stairs for closet.

Laundry.—Build table, as shown, of good white pine, 1¼" thick.

Stationary Tubs.—Build and set up three wash tubs, where shown, of 1¼" pine plank, with 10" back, board over in best manner.

Finial.—Furnish and put on a finial, selected by architect, at a cost of $15.

Wire Netting for Outside Plastering.—Upon ⅞" furring strips nail heavy ½" mesh wire netting, as per details for outside plastering.

Closets.—To be fitted up as shown, all closets (except closet of kitchen) to have 12 double wardrobe hooks.

Tank.—Build and put up a tank in third story where shown, of 1¼" pine plank, securely made, size 2' × 3' × 2' deep.

Stairs.—Stairs from first and second stories as shown with rail and balusters between, all to be of hard pine, of following sizes: Posts, 5" diameter turned. Rails, 2" × 4" stock. Balusters, turned out of 2¼" stock. Risers, ⅞"; Treads, 1¼". Make and set cellar and back stairs as shown, with plain rail and square balusters of hard pine. Treads and risers, ⅞".

Steps.—Build outside steps as and where shown of hard pine.

Fresh Air Inlet.—Partition off cellar window as shown, and provide and put in same a galvanized iron fresh air box, about 18" × 24", with "damper" to furnace.

Furnace.—Supply and set a Chillson portable furnace, No. 8, where shown, with good sized japanned registers in position and floors as marked, and connect same with furnace as marked, care being taken to protect woodwork from hot air pipes or furnaces, where nearer than 2" from same, by covering wood with bright tin.

Outside Finish.—All outside finish to be as per details, and to be of first quality white pine. Balusters of porch 2 square. Floor of porch to pitch 1½" to front. Under side of overhangs on south and west sides and overheads of porches to be sheathed with ⅞" Norway pine.

Blinds.—Furnish and hang securely outside half swivel white pine blinds to all windows, except those in cellar.

Bell.—Furnish and put on a brass pull at hall front door, with all necessary wire, cranks, etc., to bell in kitchen, and to leave all in good working order. Pull to match trimmings of front door.

Mantel Pieces.—Make and put up mantel pieces in front hall, library, and dining room, and put up shelf over fireplace in second story bed room as shown. All to be gotten out as per details and to cost $100 finished.

Glass Partition.—Make, glaze, and fit a glass partition to back porch, with door as shown.

Bath Tub, Bowl and W. C.—Seat and riser of W. C. to be hung. Bowl to have cupboard and door. Sheath around bath room with ⅞" Norway pine up to line of rail on level with top of marble backing over bowl. All wood for same to be of Norway pine.

PAINTER'S WORK.

Outside.—Give all shingles (except roofs) outside one coat of Cabot's creosote stain of number selected by architect (probably No. 321). Give all trimmings, wood finish, blinds, gutters, conductors, etc., outside two coats of first quality paint, in such color as the architect may direct. Under side of porch roofs and overhangs to have coat of boiled linseed oil, with yellow stain in it. Hard pine outside to have good coat of raw linseed oil.

Inside.—Give all sashes inside, and iron and lead pipes, etc., inside, two coats of first quality paint, of such color as the architect may direct. All other woodwork to have two coats of shellac.

Front Stairs.—To have coat of good filler and three coats of shellac, all rubbed down with pumice and oil to dead finish.

Wall Paper.—Furnish and hang wall paper with borders, etc., as selected, on walls and ceilings, as directed. Allow the sum of 75 cents a roll put on for said papers and borders. The walls and ceilings of vestibule, front hall, coat closet, library, dining room, second story halls, dressing room, three bed rooms of second story, tower bed room of third story, and closets opening out of same, to be papered.

Give the walls and ceilings of kitchen, pantry, china closet, back entry, first story, bath room and closets opening out of all, two good coats of first quality paint, in colors selected by architect.

PLUMBER'S WORK.

Supply.—Run tin lined lead pipe, ¾" inside, from cistern to a double branch cock under kitchen sink and through same to pump at sink; from pump run a ¾" lead pipe straight to tank in second story and over top of same.

Pump.—Supply and put in a first quality force pump, of make selected by owner, and connect same with supplies as specified.

Tanks, etc.—Line tank with 4 lb. lead, in the best manner; cap other arm of branch cock under pump, and to join to second line of supply from a well if that is put in. (Supply from well to be put in by owner.)

Waste.—Provide and put in a 4" line of iron soil pipe from connection with the tile drain outside of wall under cellar floor, with quarter bend to Y branch, and from same straight up to water closet, with branch for same, and from thence straight up to and through roof and for one foot above, and securely connected and flashed at roof; provide and put in a 2" iron waste pipe from connection with the tile drain outside of wall under cellar to kitchen sink; to have Y at kitchen sink, and pipe to run to and through roof, for vent, flashed and made tight like main 4" vent.

Supply from Tank.—Run a ¾" lead supply pipe from tank to bath room, thence to supply service tank to W. C. by ¾" pipe and floating ball cock. Supply tub by ¾" branch and bowl by ½" branch from same. From bath room run to kitchen sink a ¾" pipe with ¾" branch to tubs in laundry, and with ¾" supply to boiler in kitchen. Tank to have ½" tell tale to kitchen sink.

Boiler.—Provide and put in a first quality copper boiler of 30 gallon capacity, supplied from tank as specified, and connected by ¾" brass pipe in best manner, with water back in stove. Boiler to supply kitchen sink, laundry tubs, and tub and bowl in bath room, and from highest point of same to return to and over tank in third story for exhaust.

Bath Tub.—Provide and set a first quality tin lined copper bath tub in bath room, supplied by ¾" cold and hot water, and with 1¼" lead waste by S trap directly to main waste.

Water Closet.—Provide and put in a first quality "National" water closet, supplied from service tank by chain pull through 1¼" lead pipe, and with waste by 4" lead trap to main 4" iron soil pipe.

Bowl.—Provide and set a good porcelain wash bowl where shown, with hot and cold supply as specified, and with 1¼" lead waste by S trap to under side of trap of bath tub. Bowl to have marble slab and back pieces on each side, 8" high. No countersinking.

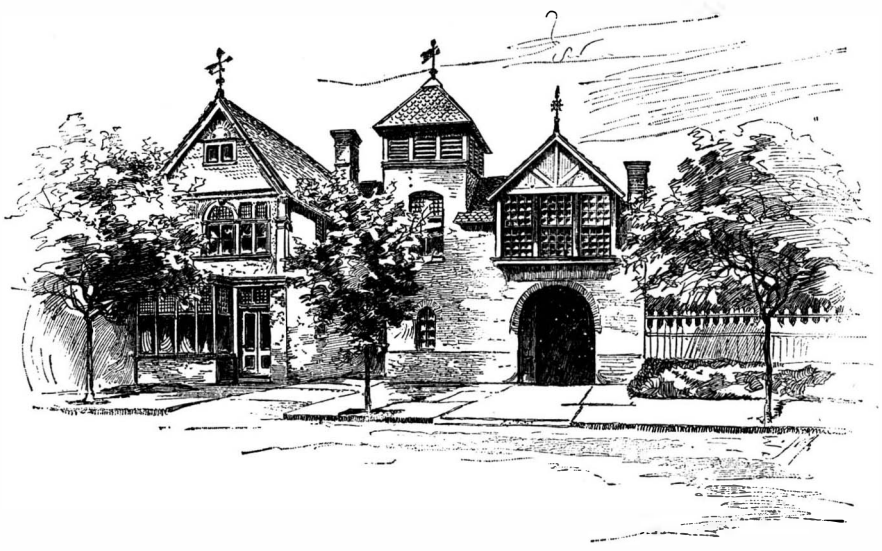
Kitchen Sink.—Provide and set in kitchen where shown an iron sink about 2'×4' with hot supply as specified, and with cold supply through double cock by pump, with 1¼" waste to 2" iron waste by S trap.

Laundry Tubs.—Connect with laundry tubs in best manner, with hot and cold supplies as specified, and with 2" lead waste by S trap main, 4" waste from bath room.

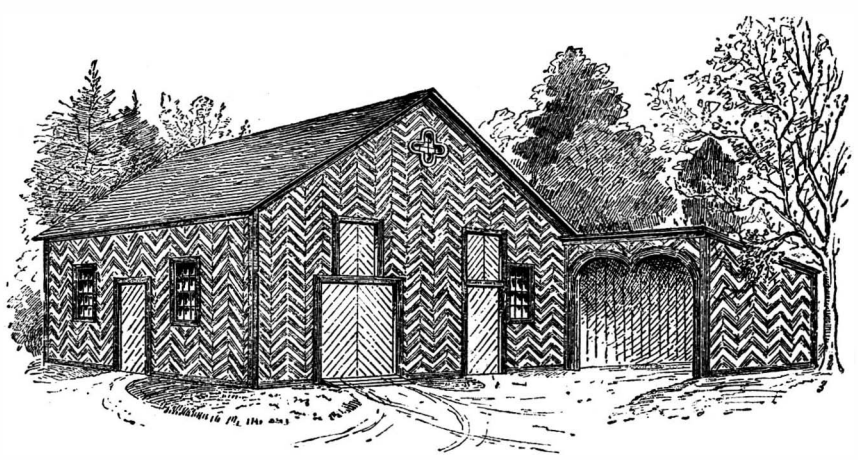
Joints.—All joints of iron pipe to be carefully calked with lead. All joints of lead pipe to be wiped.

Trimmings.—All trimmings and screws of bath room to be brass nickel plated. All other trimmings to be brass.

Back Air.—From upper bend of trap at laundry tubs to run a line of 2" iron bent pipe, straight up and to connect by easy bend to main, 4" waste above all fixtures. Connect same with upper bend of W. C. trap, and with trap of bath tub, in best manner for back airing.



DESIGN FOR A STORE AND STABLE ADJOINING.



A CARRIAGE HOUSE AND STABLE OF MODERATE COST.

A COTTAGE ON RIVERSIDE PARK, NEW YORK.

The Riverside Park, New York City, occupies a narrow strip of land on the edge of the Hudson River, extending from 72d Street to 124th Street. The river views are magnificent in all directions. The city building lines extend to the edge of the Park, and buildings fronting thereon may be said to stand within the Park itself. Probably there is not in any city of the world a more sightly place for private residences than Riverside Park. The Park is not yet wholly finished, and but few dwellings have been erected. One of the few is the residence of Mr. George Noakes, a sketch of which we give. It is admirably located at 113th Street, fronting the Park, which it overlooks, and from its windows and balconies the prospect is grand. The broad bosom of the Hudson River appears in view in all directions, giving the impression of a great lake.

The house is built of granite, and was designed by A. B. Jennings, architect, New York.

STORE AND STABLE.

This design for a store, with a stable adjoining, is rather pleasing. It is from a recent issue of the *Sanitary Engineer*.

CARRIAGE HOUSE AND STABLE.

A friend in New Hampshire sends us this sketch of the building, which stands near a little grove in a picturesque location. The walls are double boarded and battened. In place of clapboards, pieces of birch and pine are nailed to the outside, as shown in the picture. The pieces were cut 18 inches long, and split. This covering gives a neat and rustic appearance.—*Rural New-Yorker.*

The Silver Birch.

I have often felt surprised that this tree should not be more extensively planted in pleasure grounds, parks, and on large estates generally than it is. In manner of growth it is so graceful, so distinct from all other forest or hardy trees, as to render it eminently fitted for purposes of isolation. A large well-developed tree, so placed that its natural habit is fully displayed, forms a very pleasing feature in the garden landscape, not only when in full leaf, but also during the winter months, when, denuded of foliage, its characteristic features are more fully revealed. The graceful, spray-like, pendulous growth and silvery bark show up charmingly against the fresh bright turf of a well kept lawn, a tree dotted here and there about pleasure grounds doing much toward relieving them of their sameness, and, where evergreens are largely employed, the rather somber aspect during the dull months of the year. There are, however, a variety of ways in which the silver birch might be employed. It has a very pretty appearance when so placed among coniferous trees and evergreen shrubs that they form a background to it, in such a manner that the head of the birch stands out clear and well defined, while the white stem is, as it were, framed in verdure. In parks, good use might be made of this tree by grouping it here and there in such a manner that the bright stems would be distinctly visible when the foliage was off. I may mention, however, that there is considerable variety among the silver birches, some having the bark much more silvery than others, and having consequently, from an ornamental point of view, a much higher value. It is a pity that seeds should be saved from inferior varieties.—*J. C., the Garden.*

DWELLINGS AT EVANSTON, ILL.

In the *Building Budget* for April we find a very pleasing group of semi-detached dwellings, which we here reproduce. They are of moderate cost, but substantial in structure and appearance. It is pleasing to note how rapidly the erection of handsome dwellings is progressing in Evanston and neighboring places.

The Architect and House Drainage.*

It is very evident that the most important part of an architect's labor is that which concerns his client's health and comfort; therefore, the architect ought to be familiar with all the details of his work; for on him rests the responsibility for the healthfulness, comfort, and cost of the work over which he has charge, and in a degree for the general standing or rank of the art of plumbing throughout the country.

In planning for a house, some of the first and most important details to be considered are its location, character of the subsoil, construction of foundation, and means for preventing dampness of walls, properly lighted cellars, ventilation, drainage, water supply, arrangement of plumbing fixtures, the instant removal and proper disposal of water after it has performed its duty, being then fouled and mixed with excrement, greasy matter from the kitchen and pantry sinks, after its use in the bath tubs, wash basins, etc.

Our time will not permit taking up all these in detail, as they should be, in the few evenings you have set aside for this subject, but I hope in a general way to cover as much ground as possible, offering a few suggestions as to the mechanical execution, construction, latest sanitary ideas, and most improved fixtures inside of a building. For this purpose, let us suppose that the site has been selected and the building so far advanced as to receive, probably, the first thing to be located and constructed—the drain with its trap and fresh air inlet. This should be four inches in diameter, of extra heavy tar-coated, cast iron pipe, very rarely more than five inches, with a fall of at least one-fourth of an inch to the foot, either suspended from cellar ceiling or along the foundation wall unless there are fixtures in the cellar. In this case, it is not advisable to bury it all below the floor.

SEMI-DETACHED DWELLINGS, EVANSTON, ILL.—A. M. F. COLTON, ARCHITECT.

Iron soil or drain pipes should not be made too light, for a number of reasons. They do not possess the required strength. It is impossible to cast them with any degree of evenness in thickness; one side may be one-sixteenth of an inch thick, while the other would possess its own thickness with that which is wanting or taken from the other side. When cast so thin, they are as hard as chilled iron, and about as brittle and difficult to cut as glass; a slight blow with a hammer or knock would crack and splinter them in atoms. They are more likely to have sand holes and, on the whole, are utterly untrustworthy at all times. The additional cost of extra heavy iron is only for the iron—the labor remains the same.

The trap should be located just inside the cellar wall, or outside the house in a man hole with a fourth inch fresh air inlet branching from it as close to the inside of the trap as possible, to secure a free circulation of air throughout its entire length, and carried outside the house two feet above the surface of the ground, away from windows.

It is a common practice here in Philadelphia, as well as in New York and some other cities, to locate the fresh air inlet at the edge of the pavement or at the face of the curb, and covered with a perforated plate. They are sometimes closed for days in bad weather by snow and ice, and I have not the least doubt that some of them are closed, or nearly so, the year round by mud and rubbish. When this occurs, their usefulness and security cease. The proper place is certainly above the surface of the ground, and not too near windows or doors.

All branches entering this drain should be made with Y-fittings, and never with T's. All vertical lines of soil and waste pipes should be turned at their base to a horizontal one with long ¼ or ⅛ bends of a large radius and running in the most direct and straight line to and through the roof, full size, above the highest point, remote from the windows, ventilators, and chimneys. If alongside the chimneys, keep the soil pipe well below the top, on account of a down draught, which has been known to occur quite often in practice, especially in the unused flues for open fireplaces.

* Address by Geo. F. Brown, sanitary engineer, before the Philadelphia Chapter of Junior Architects.

The tops of these pipes ought to be left perfectly free and open without cowl or ventilator, which not only aggravates the circulation of air, but affords a good place for the accumulation of hoar frost, by the warm air from the drain in severe cold weather. I know of an instance where the cowl was so incased with ice as almost to make it air tight, and the result was the siphoning of a number of traps. Col. Waring says that all vent pipes, of whatever size, ought to be increased two sizes as they pass through the roof, and, by experimenting, it was found that a universally effective increase of the movement of air is secured by increasing the diameter of the pipe at its upper end.

It is also a well known fact that every deviation from the straight line obstructs the current by increasing the friction. Therefore, the cap, or bend, or cowl, one or another of which is almost always used, is of no real utility in a high wind, and is an absolute obstructor during light winds or calms. The best results will always be obtained by running the soil pipe straight up to a certain elevation above the roof, more or less according to the exposure, and leaving it entirely open at the top; or, to prevent accidental or intentional obstructions, where it is likely to occur, the ordinary spherical wire basket should be inserted into the mouth of the pipe and securely fastened.

The horizontal drain in the cellar should be suspended from the ceiling by strong wrought iron double hangers, dogged to the timbers at least every ten feet; or, if along foundation walls, supported by brick piers or strong wrought iron rests driven well into the wall between the joints.

The vertical line of soil and waste pipes ought to be supported at their base by brick piers or stone posts, to carry their weight, and not depend on the frail clamps which are very commonly used by some plumbers. The settlement of soil pipes has very often caused serious trouble (in good work every other way), by the neglect of the workman giving it the proper support at its base during its construction. In jointing cast iron pipe, the spigot end of one pipe must enter as straight as possible into the hub end of the next, to secure a perfect joint. In any change of direction in a line of pipe, the proper bends must be used, of which there are enough varieties in the market to form almost any angle.

On one of my inspections not long ago, I found a joint so calked as almost to close one side of it, which, of course, must be imperfect, for though the lead did completely fill the joint, it was impossible to calk it tight at the contracted part. In making these joints, a gasket of oakum or hemp should be well rammed in first to about one-third its depth, to prevent the molten lead from running inside the pipe—the rest of the space filled with soft pure lead and thoroughly calked, or about one pound of lead to every inch diameter of pipe. In a residence in Boston a few years ago, in applying the water test, I found that almost every joint leaked more or less throughout the whole system, owing to the fact that the plumber, either by mistake or economy, used old lead mixed with tin, zinc, or some other hard metal in making the joints, which, of course was so hard as to prevent his calking it with any degree of safety without bursting the hubs. These joints can and should be made tight without the use of putty or paint. I would suggest that they never be treated with cements of any kind, but left exposed, showing the marks of the calking tool in the lead, and after the lead wastes are calked into their respective branches, subject the whole system to a water or peppermint test, and inspected by the superintendent or engineer. In passing through the foundation wall, the opening should be enough larger than the outside diameter of the pipe to allow the walls to settle without crushing or deflecting the pipe.

In my estimation, based upon experience and careful examination of good work, the best sizes and weights of lead waste pipes for the different fixtures are as follows:

For sinks—kitchen, scullery, and pantry—1½ inch, 3 pounds per foot.

Bath tubs, 1½ inch, 3 pounds per foot.

Wash basins, 1¼ inch, 2½ pounds per foot.

Row of basins, 1½ inch, 3 pounds per foot.

Urinals, 1½ inch, 3 pounds per foot.

All waste pipes should have a sufficient fall to insure the running off of all water and leaving them stand empty. Avoid long horizontal runs by placing fixtures as near as possible to the vertical lines, and keep them open and above ground or floor. No pipes should be concealed behind anything but a hinged casing, or, if under the floor, provided with a continuous support on boards with proper grade, and the boards covering them screwed down for examination or repairs.

All jointing of lead wastes should be made by wiped joints and connected to the iron with a brass ferrule or sleeve, soldered to the lead pipe and then thoroughly calked into the iron pipe with molten lead.

There are some fixture and waste pipes that to connect them with the drain would be very apt to cause serious results. For instance, the refrigerators ought never to be connected directly with any drain or sewer, but may waste into a pail or zinc pan movable by hand, or into an open sink, or the open air. Large sizes, say for hotels, where it is impossible to do otherwise than waste into a drain, they should first waste into an open pan or cup below the water line, and that be connected to the drain by a deep sealed trap. A stop cock may be placed in this pipe, so that when not in use it can be cut off from the drain, independent of trap.

Overflows from tanks, drip pipes from safes and floor linings, sediment, or waste pipes from boilers, must never be connected under any circumstances with the drain. The former can be discharged into the gutter of the roof, an open sink, or the open air. This case only applies to storage tanks for drinking and cooking purposes.

Water closet tanks are provided in themselves to overflow into their bowls. Drip pipes, or, in other words, tell-tales, which they are, should terminate just below the ceiling of the basement or cellar, either with end left open, or, perhaps, a better way is to turn the end up, forming a trap, and then caging a rubber ball on top. This is merely to cut off the circulation of air from the cellar, or the odors from cooking in the kitchen rising through this pipe into the rooms above.

Boiler wastes, or the sediment pipe, can discharge into an open sink if convenient, or in place of this, and a simpler way, is to insert a common hose bib or faucet into the cold water or lower pipe leading from the boiler to the range.

FINAL RULES.

All fixtures should be located as near as possible to the soil pipes, both for economy and safety. On the score of economy, the saving should be in quantity, and not in quality. Concentrate all plumbing on each floor as near to the vertical line of soil pipe as possible, and make one stack of pipe answer. Secure the utmost simplicity consistent with needed convenience. One soil pipe with one bath and two closets, all of the very best, will answer the necessary uses of a large family, and will be safe. Two stacks with half a dozen closets and baths, if as good, will cost vastly more and will be less safe.

On the score of safety, one stack will be more regularly used and flushed than two, consequently cleaner.

Secure an absence of dribbling streams, and use fixtures that produce the most copious flushing when used; the freest possible circulation of air in all parts of the system, except so near traps as to evaporate their seals; the absence of all avoidable casing, and above all get all the wastes completely out of the house before they begin to decompose. Let the water closet be as smooth and plain and fair as a new egg, and the waste pipes stand empty when not in use.

A CORRESPONDENT of the *Country Gentleman* tells of butter pressed in a mould so as to look exactly like a large fine strawberry. One of these berries was put by the side of each plate, and an extra supply stood in the center of the table on a fruit dish. Gilt edged butter, in such fancy shape, should sell for high prices.

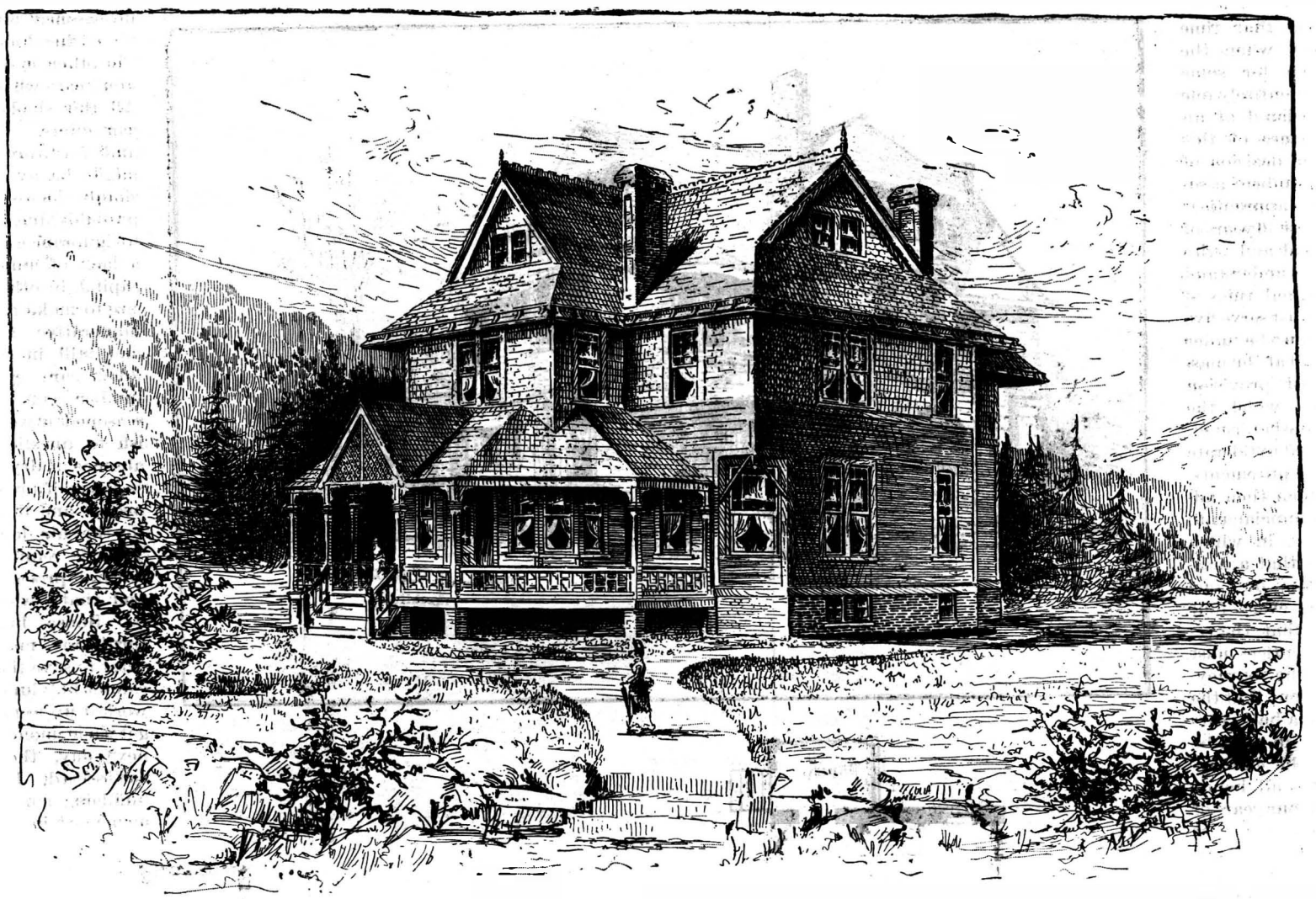
A DWELLING FOR THREE THOUSAND DOLLARS.

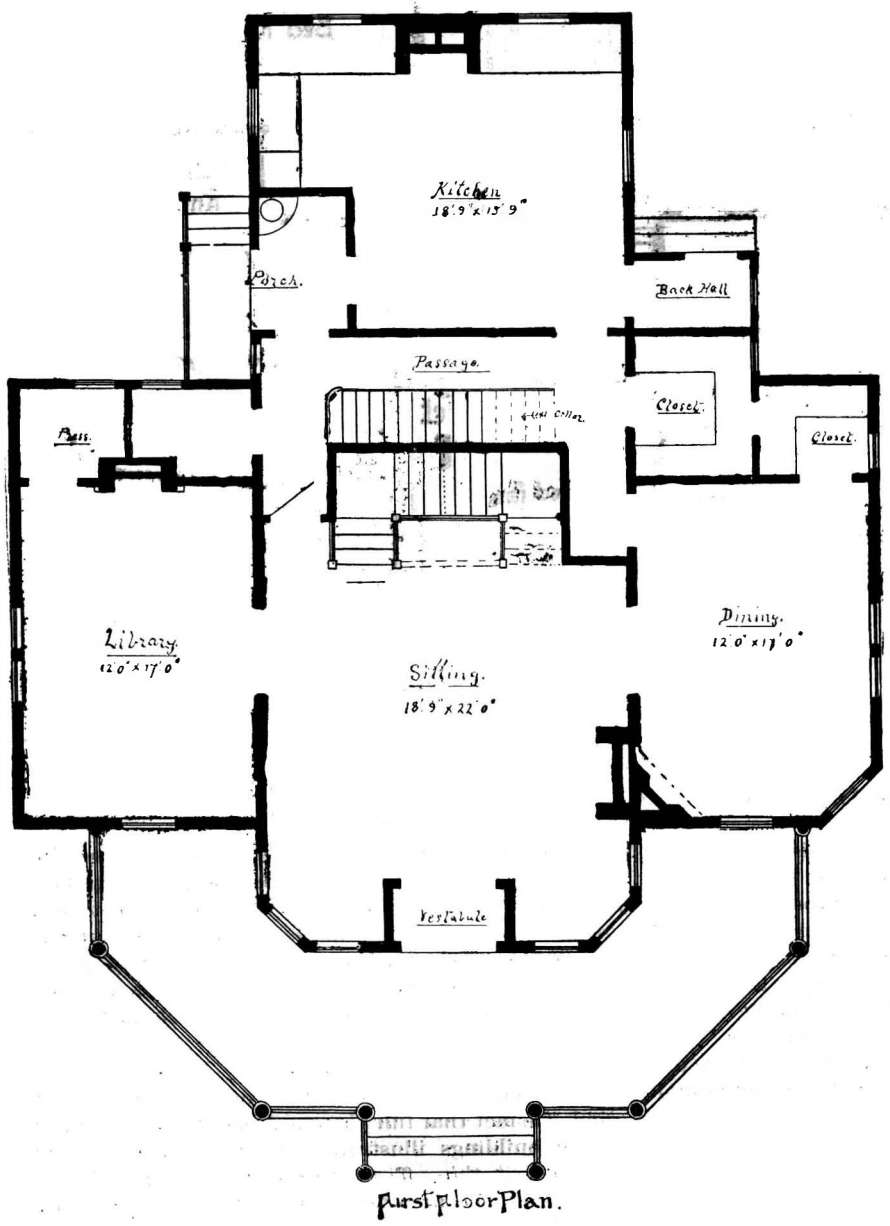
This attractive little residence was erected a short time since at Portsmouth, R. I., from the designs of George W. Cady, architect, of 164 Westminster Street, Providence, R. I., at a cost of rather less than $3,000. The rooms, as shown by the plans, are spacious and conveniently arranged, and there is a cellar 7′ 6″ deep under the whole building.

The foundation walls are of "Danvas" brick, laid in black mortar, and the chimneys and piers are carried up in the same way. The main roof is shingled with first quality Eastern shaved shingles. The corner boards are 6⅞″, base ⅞″, band ⅞″, and boarding below band ⅞″. The sizes of the main timbers are as follows: Sills and posts, 4″×6″; cross beams, 6″×8″; joists, 2″×8″; rafters, 2″×4″ and 2″×8″; main rafters, 7″×2″; hip and valley rafters, 2″×8″, and ridge, 1″×8″.

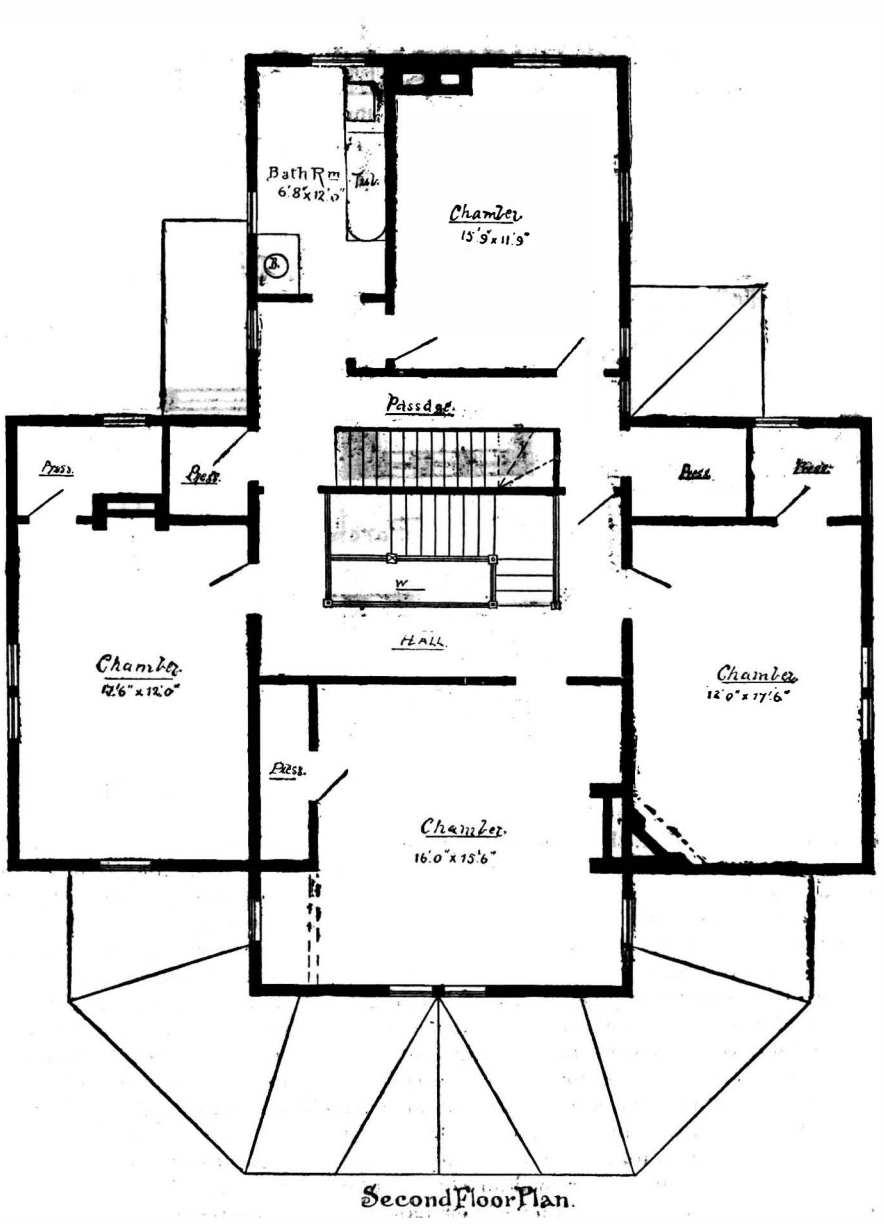
The front staircase is executed in hard wood, and has a tread 1⅛″ thick, risers ⅞″, strings 1⅛″, rail 2″×4″, and posts 4″×4″. The back staircase is of hard Southern pine. The dining room and library are finished in pine, and the sitting room in ash, with 5″ bases, 7⅛″ trim, and 2″ moulding.

The water closet apparatus is the "Bartholomew," and the sinks the "Miller" variety. The exterior of the house is painted with Johns asbestos prepared paint, of the following tints: sides and gables, red; main building, light drab; weather boarding, dark drab.





First Floor Plan.



Second Floor Plan.

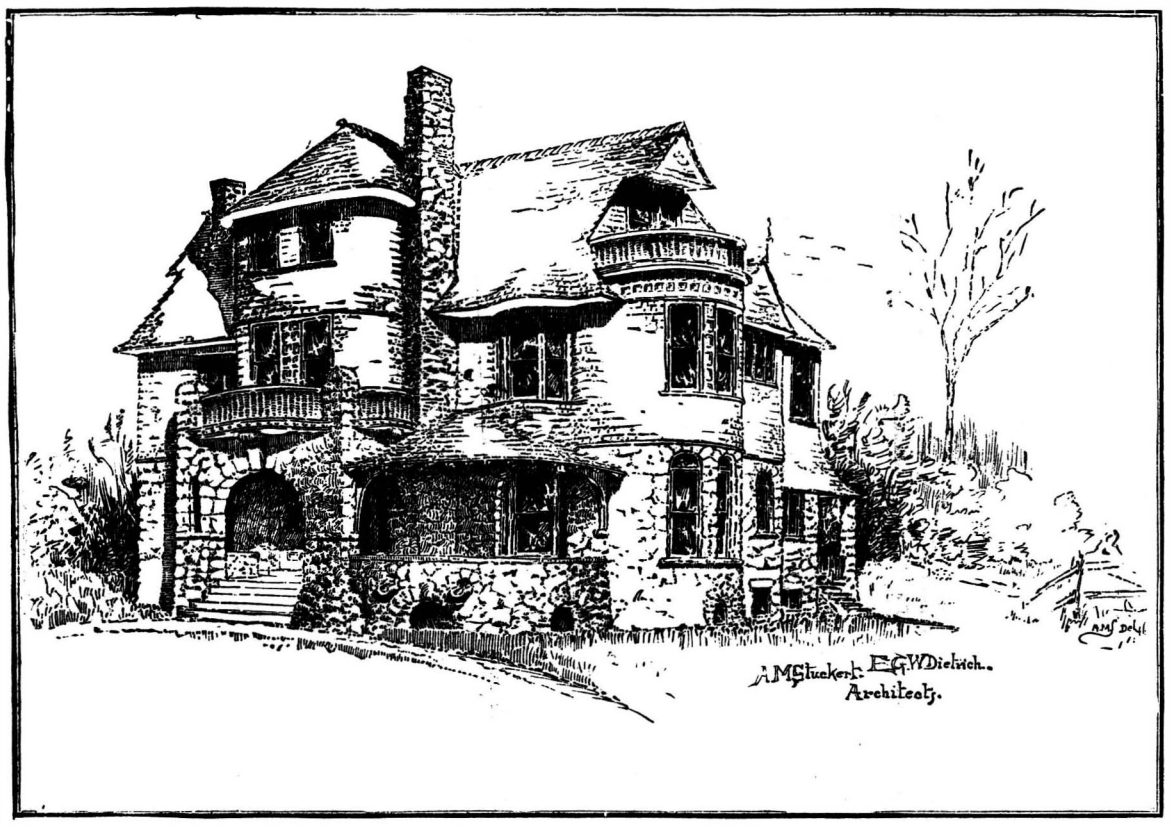
A DWELLING FOR THREE THOUSAND DOLLARS.

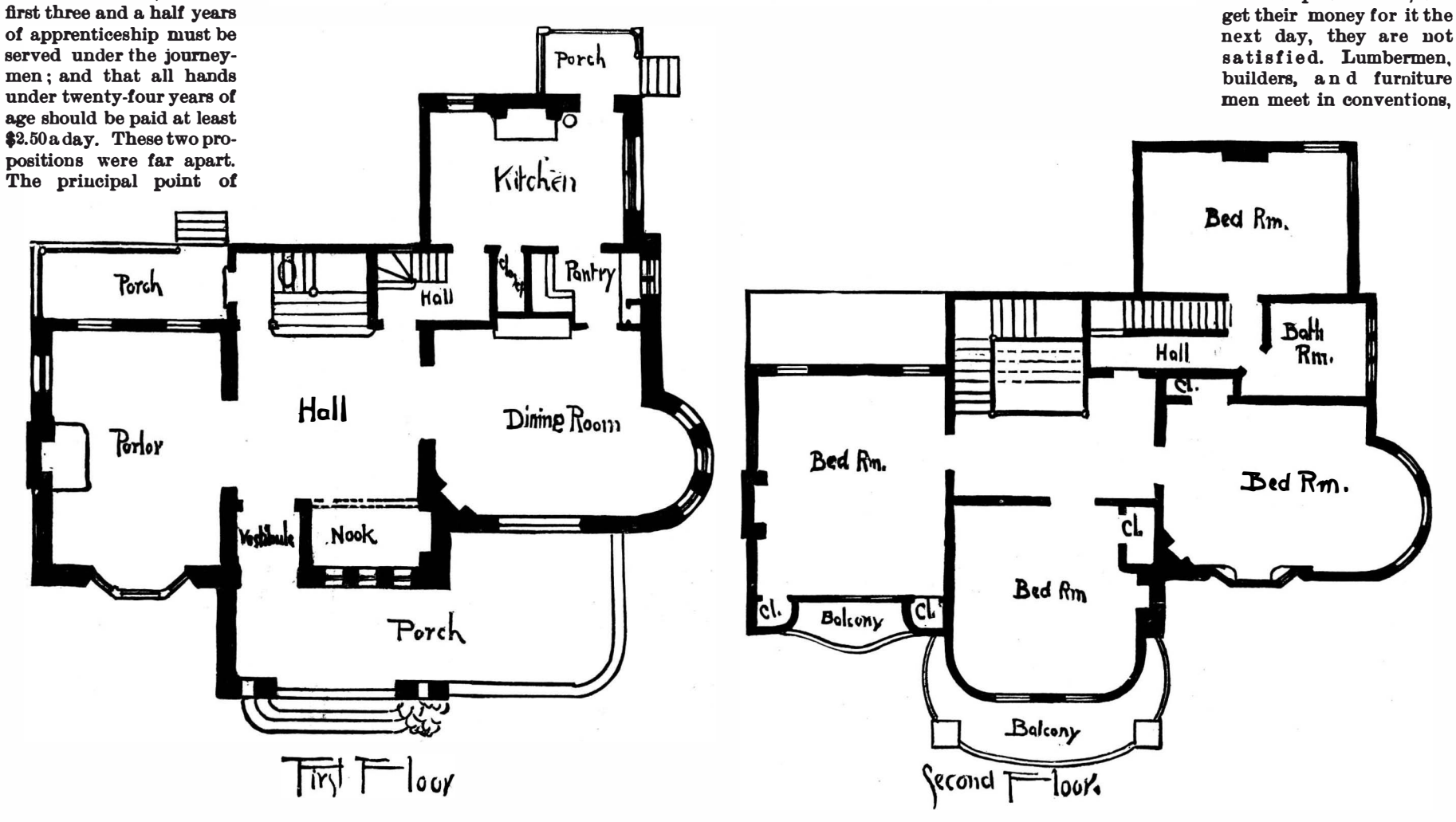
A RESIDENCE AT ORANGE, NEW JERSEY.

In a recent number of the *Builder and Wood-Worker* we find an elevation and plans for a comfortable looking house, which we herewith present. Messrs. Stuckert & Dietrich, of this city, are the architects. The house has a frontage of 48 feet. The principal dimensions are: Parlor, 14×19½ feet; dining room, 15×17; kitchen, 11×16; middle bed room, 15×15; left front bed room, 15½×18; right front bed room, 15×21; back bed room, 12×17.

Failure of the New York Plumbers' Strike.

The long strike of the journeymen plumbers of New York city has at last been declared off. The strike began September 1, 1886, and has been on since that time until recently, when the contest, which for some time had been entirely one sided, was declared at an end. The cause of this strike was the decision of the master plumbers' association that apprentices must be at least 16 years of age; must read and write English; must understand the four cardinal rules of arithmetic; must serve five years; and must be under the sole control of the masters. The last provision was the one to which the journeymen most objected, but they refused to tolerate the masters' requirements. The journeymen then addressed a pronunciamento to the masters, in which they declared that a master should take but one apprentice for every four journeymen; that the selection of apprentices must be subject to the journeymen's association; that the first three and a half years of apprenticeship must be served under the journeymen; and that all hands under twenty-four years of age should be paid at least $2.50 a day. These two propositions were far apart. The principal point of difference was, however, the control of the apprentices. All the other questions might have been arbitrated, but on this important feature neither side would yield. The masters went into the fight determined not to yield their position, which was undeniably the right one. The masters have all through these dreary seven months been nobly carrying on the "battle for the boys," and have been growing stronger every day, both in material resources and in influence in the city. The masters have secured the sympathy of all other trades in this fight, and respect for their principles. Their association has been closer knit together than it was before, and, in the end, we believe the benefits derived by the masters will more than balance the losses they sustained in the earlier part of the strike. The last portion of the strike has inconvenienced them but little. All members have had all the men they needed, and have attended to their business promptly, with but one or two exceptions. They have made gains in membership; they have established a healthy influence for other employers to follow; they have indorsed the trade school system, and have made its instruction a part of the apprentices' term of indenture. These are direct gains. The journeymen have experienced nothing but defeat ever since the beginning of the strike. They started in with the experience of previous strikes to guide them and with the promise of adequate financial support from the national association of journeymen plumbers. They made boasts about the co-operative plan of carrying on business which they were successfully to establish, but which they did not. They have drawn on their working comrades for $100,000, which has supported them in idleness. They have succeeded in driving off their most conservative and best members into the formation of an independent journeymen's association. They have disrupted their original friendly relations with the gas-fitters, and made them enemies. They have sustained defeat on every point, and have now lost the fight entirely. Could anything be more humiliating?—*Sanitary News.*





A RESIDENCE AT ORANGE, N. J.

A GREAT marble deposit has been found in Inyo county, Cal. The marble is of superior quality, hard, solid, and free from flint. A test resulted in crushing an inch cube of the Inyo marble at 26,900 pounds.

Seasoned Lumber.

Lumber drying, as a rule, is slovenly and imperfectly done. It is the most neglected branch of the entire lumber business and its attendant industries. It is rare that inside finish, thoroughly seasoned, is seen. After a little the windows become so loose that they rattle, and the panels of the doors shrink to such an extent as to show unpainted streaks. In fine and expensive hardwood work more pains is taken. When it comes to furniture, not one manufacturer in a hundred knows his business so far as seasoning lumber is concerned. They are as blind as bats to one of the most important elements of their business. Taking their output as a standard, it is doubtful if they know seasoned from unseasoned lumber. Provided they know one from the other, it is plain they don't care which they use. All this shoddy work by carpenters, contractors, and furniture makers might be avoided. It is simply the result of haste, probably due in some cases to ignorance, in others to a lack of ample working capital, in others to a desire to make capital as remunerative as possible, and still in others to a don't care spirit. That lumber can be properly seasoned it would be foolish to question. In the absence of dry kilns it will so season if a roof be placed over it and it be exposed to the air long enough. Time is required by this natural process, however, and that's where the rub is. House builders and furniture manufacturers want to save time. If they cannot buy lumber to-day, work it up to-morrow, and get their money for it the next day, they are not satisfied. Lumbermen, builders, and furniture men meet in conventions, and talk about nearly every other subject under the sun that pertains to their interests except drying lumber. Never to our knowledge has this subject been up for discussion in one of these conventions. And so long as house and furniture buyers stand ready to pay them money for what they may safely bet ten to one is an imperfect article, the subject probably never will come up.—*N. W. Lumberman.*

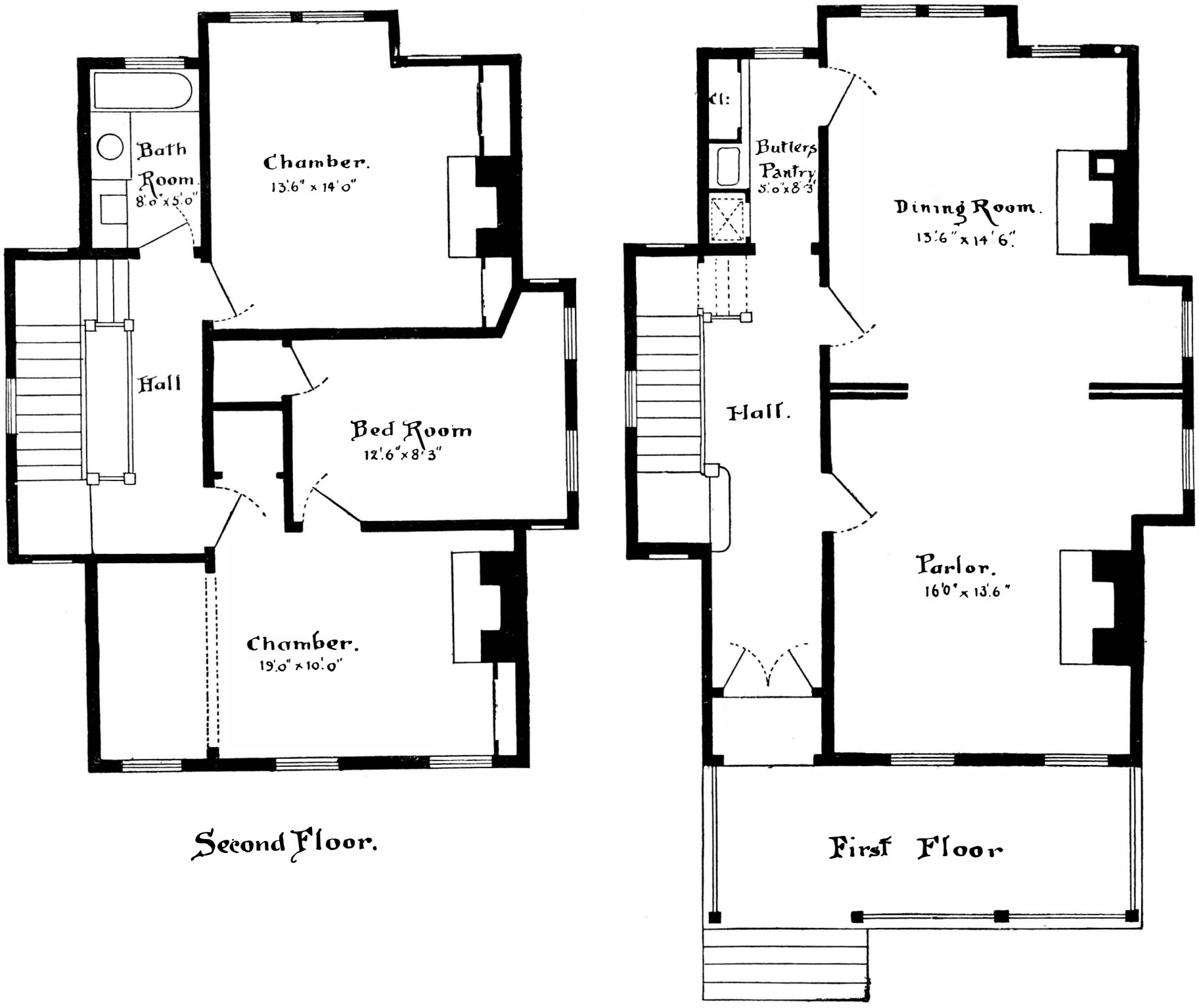
WE should be pleased to have our readers bear in mind the fact that full plans and specifications for any of the buildings illustrated in this paper may be obtained at this office on moderate terms. We are assisted by able architects, and can execute any work desired on very moderate terms. Munn & Co., 361 Broadway, New York.

A THREE THOUSAND DOLLAR HOUSE.

This attractive and conveniently arranged little residence was lately erected on Fleetwood Avenue, near Popham Street, Mount Hope, New York, for Mr. A. MacIntosh, Jr., from the designs of Architect John E. Kerby, of 280 Broadway, New York city. In the basement is a kitchen measuring 14′×16′, fitted with wash tubs, sink, and range, besides coal and other cellars and furnace room. In the attic are three good-sized bed rooms and large hall.

The foundation of the house is stone; the frame is clapboarded up to level of top of first floor and shingled above, and the chimneys are carried up in brick. The interior trim is natural cherry wood on the first floor and pine on the others. Gas, heat, and all other necessary improvements have been provided.

The house cost the sum of $3,500 to build, but with a little plainer material it could be easily erected for $3,000.



A THREE THOUSAND DOLLAR HOUSE.

A Building Union in Chicago.

At a recent conference of delegates from every building interest in Chicago, with representatives present from the Illinois Architects' Association, the Chicago Real Estate Board, and kindred bodies, the members of which hire altogether probably 50,000 workmen, a resolution was unanimously adopted that from this time forth the signature by the employe to the following card of principles be made a universal condition of employment by all the building interests of Chicago:

"I recognize the right of every man to decide for himself without dictation or interference when he shall work or cease to work, where he shall work, for whom he shall work, how many hours he shall work, and for what wages he shall work.

"I recognize the absolute right of the employer to decide for himself, without interference from any source, whom he shall employ or cease to employ, to regulate and manage his business with perfect independence and freedom, provided only that he shall deal lawfully, justly, and honorably with all men.

"I recognize the right of every father to have his son taught, and of every son to learn any lawful trade, as on a plane with his right to a knowledge of reading, writing, or any other branch of learning, and that this right should be subject to regulation only by the laws of the land. I hereby pledge myself in all my relations and intercourse with my employers and fellow-workmen to maintain and live up to these principles."

There was no debate on the adoption of this measure, and action was enthusiastically unanimous, but a general discussion sprang up when it was proposed that the same card of principles be presented for signature to every employer with the pledge thereto changed as follows:

"I hereby pledge myself to maintain and live up to these principles in the prosecution of my business, and to lend my aid to the full extent of my influence and power for their maintenance and protection among my fellow employers. I further pledge myself not to employ any workman except upon his signature of this card of principles."

When it was stated that the pledge meant the discharge of every workman who did not sign the required card, numerous objections were raised, especially by contracting plasterers, carpenters, and stone cutters, who are getting along peaceably with their men and are expecting no trouble. All objections were met with the reply that the card contained nothing not guaranteed by the Constitution of the United States, and that the country had got tired of being shackled by the labor unions.

At length a tacit understanding was reached that the pledge should be voted upon by the delegates individually, they then to go to their associations and urge its ratification. The pledge was thereupon adopted unanimously. June 1 was fixed as the date when the lockout would be declared off and business resumed with the card of principles as the basis.

MONTANA produced in 1886 55,000,000 lb. of copper.

STABILITY OF WALLS AT OPENINGS.

The following article has been written by M. Emile Trelat, architect in chief for the department of the Seine, director of the especial School of Architecture, and has appeared in *Le Genie Civil.* It contains matter of some interest, although some of the defects of which the writer complains do not obtain with English work, as English methods are not always those to which objection is taken.

Fig. 1 shows the manner in which openings in the walls are generally constructed. It will be seen that

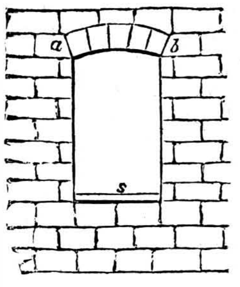


FIG. 1

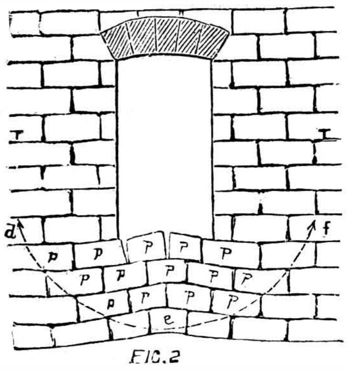


FIG. 2

the courses are simply discontinued at the place where the opening is required, except at the top, where an especial support is added, capable of sustaining the weight which surmounts the bay. This has been the method always pursued, and it is singular that its imperfections have not been recognized. On looking at a nearly finished new building, it may be observed that the stones of the masonry below the bays are displaced and raised up. This deformation gradually develops as the work proceeds. When the edifice is built of hewn stone, the displacement is scarcely perceptible, especially if the blocks are large; but if smaller

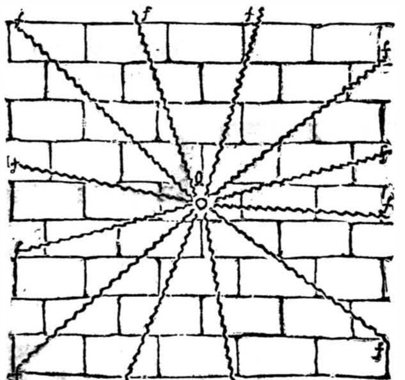


FIG. 3

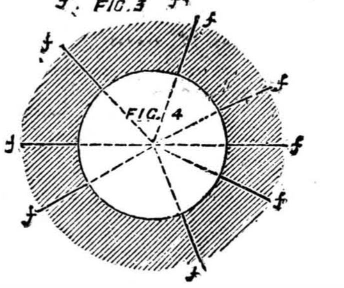


FIG. 4

materials are used, it becomes very considerable. Beyond a certain point the disorder ceases to progress, because under the upheaved layers, Fig. 2, the stones press against each other in one direction, *def*, forming an inverted arch, and the foundations from whence at first arose the dislocation of the stones, *ppp*, bring a resisting force to bear upon the piers, TT. It is on account of these disorders, limited, though not avoided, that the following rule is to be found in all treatises: "The supports and sills of the bays should never be fastened into the masonry of the jambs, and should not be placed until the sinkings have ceased." Economy

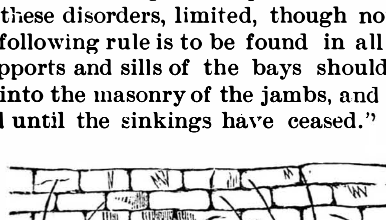


FIG. 5

requires that the sills, Fig. 1, should be reduced in thickness, which if they were fixed at their extremities would render them liable to break when what is shown at Fig. 2 occurs. Experience shows, therefore, that it is best simply to place the supports and sills between the jambs. Why should not these displacements be avoided by some appliance fixed under the bays? The question is better understood when treated mechanically. Fig. 3 shows a well made wall composed of resistant materials. It is stable and solid, because round any point, *o*, all the forces, *fff*, are equal and opposite, balanced in *o*. If the field of resistance immediately round were partially removed, the displacement of materials would follow until the forces were again balanced by new conditions set up under a new form. For instance, in Fig. 4, the forces, *fff*, or those derived from them, would continue to act on the remaining part of the wall, but the material road by which they joined the meeting point being removed, their direct reactions would be interrupted. Two results may then follow—the materials which border the hole, not being fitted to maintain the place from which the forces, *fff*, tend to remove them, are dislocated, compressed on one side, separated on the other side as in Fig. 5, so that the material path of the direct reaction of the forces becomes in a way reconstituted; but the work is then ruined, as seen by Fig. 5, by the sinking of the piers, TT, which causes the lower stones to rise and the upper ones to sink toward the aperture. The arrows show the direction taken by the derivative forces to accommodate and balance themselves in the new arrangement of the materials unless the opening is bordered by a frame of a material sufficiently resistent to preserve its form and to set up an opposition to the course of the forces, *fff*, etc., as in Fig. 6. If instead of a circular hole, the bay be rectangular, as is generally the case in edifices, Fig. 7, it will be remarked that the forces, *fff*, are all vertical and horizontal, and that the actions and reactions of those that are horizontal are so slight and accidental that it is scarcely necessary to provide against them, while those which act vertically are considerable. Under such circumstances, strength should be exclusively given at the top and the bottom of the bay, Figs. 8 and 9. In summing up these remarks the author insists that every bay should be well protected at the bottom as well as at the top, enabling the jambs to sustain and distribute the vertical changes in pressure and its line of action. He concludes by point-

FIG. 6

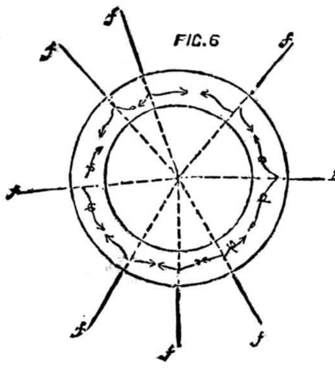
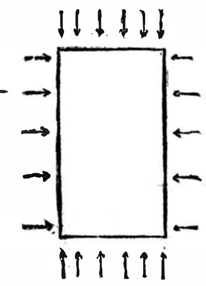


FIG. 7



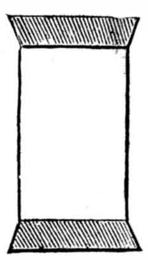


FIG. 8

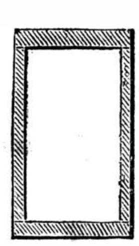


FIG. 9

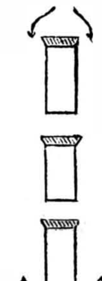


FIG. 10

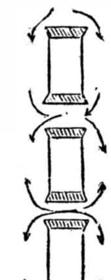


FIG. 11

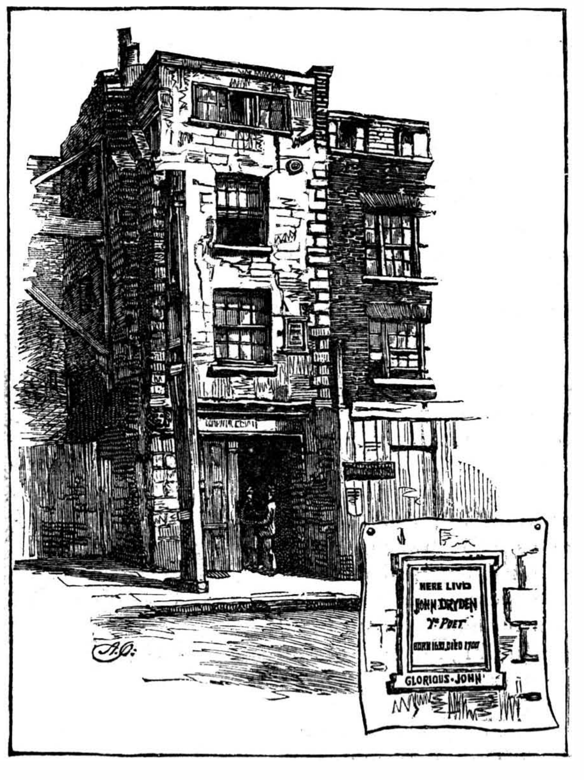
ing out the greater advantages of iron frames for stability and capacity to maintaining the form of the bay. In many storied edifices where the bays are above one another, it may be thought sufficient to strongly sill the bottom of the lowest bay only, as in Fig. 10. But it is far better to do so to the upper and lower parts of every bay, as all materials can thus be better adjusted, and the regularity of the lines maintained.—*The Engineer.*

An Ancient Theater.

To our mind, the most interesting relic of old Syracuse is the Greek theater. This, like the quarries, the catacombs, and the amphitheater, has been cut out of the rock, so that, considering its antiquity, it is in a very much better state of preservation than buildings of a similar character which have been "put together." It was built about 500 years before Christ, and consists of forty-two rows of seats, divided by two corridors, most of which are in excellent preservation. A long pit extends from wing to wing across the semicircular space at the foot of the seats, and this may have been a receptacle for the curtain. Beyond this, confused masses of stone mark the area of the stage proper, from which steps still lead to the cliff above. The view from the theater on a bright, sunny day is a scene not easily forgotten by the spectator, and is only surpassed in Sicily by the view obtained from the theater at Taormina. The eye wanders over the glimmering stonework, across a fertile tract of orchard land, to the deep blue waters of the Greater Port, one of the most magnificent natural harbors in Europe, and beyond this again to the low swampy shore of the peninsula of Plemmyrium, now known as Isola, and famous for the wine of that name. Not a sound breaks upon the ear as we sit here and sentimentalize. Despite the bright scene, we feel that we are in a land of the dead, and find it hard to realize that all around rose a city called by Cicero "largest of Greek cities, and most beautiful"—that the unbroken surface of the blue waters stretching away before us was once alive with the navy of a great nation and the argosies of every commercial state in the ancient world. The lizards dart about the sunlit stones, birds flutter in and out of the ancient vestibules and retiring rooms, but we are alone, and are thankful for it.—*London Society.*

THE HOUSE OF JOHN DRYDEN.

The demolition of an old house in Fetter Lane, upon which the inscribed tablet bears witness that it was

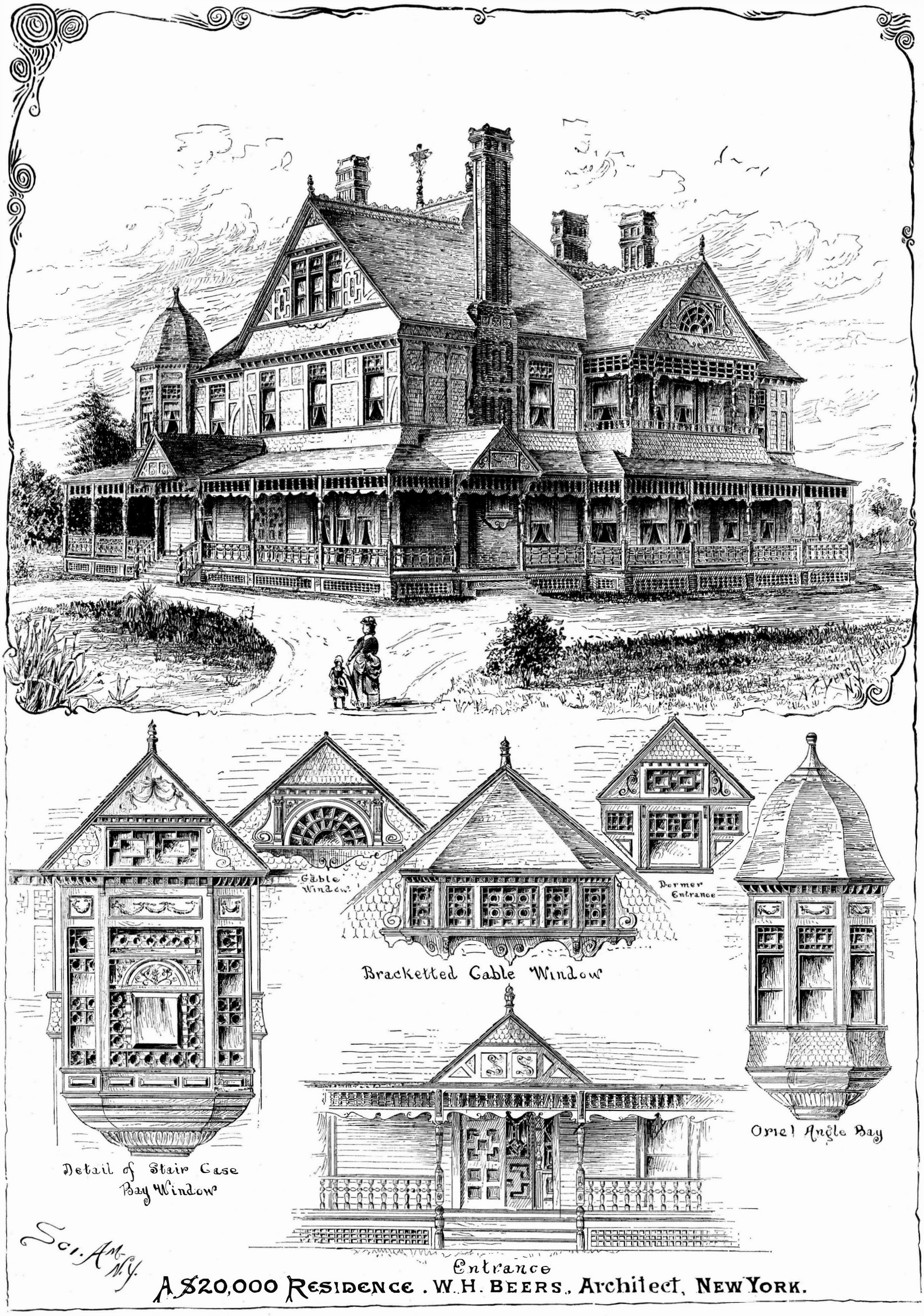


THE HOUSE OF JOHN DRYDEN, IN FETTER LANE.

once the residence of Dryden, removes one of the few remaining antiquarian relics of a period, nearly two centuries ago, when most of the "men of wit about town," especially the professional authors, inhabited the narrow streets and courts north of Temple Bar and the upper part of Fleet Street. Dryden and Otway, rival dramatists but friendly companions, lived directly opposite each other in Fetter Lane. Otway called one morning at breakfast time, and was told that Dryden was out—that he had gone to breakfast with the Earl of Pembroke. The poet of "Venice Preserved" said he would call again; he did so, and was informed that Dryden was gone to see the Duke of Buckingham. A little disappointed, but not mortified with jealousy, Otway took a piece of chalk that lay on the table, stepped outside the front door, and wrote

BACK OF DRYDEN'S HOUSE, IN FETTER LANE.

upon it, what was true and kindly meant, "Here lives Dryden, a poet and a wit." Presently, Dryden came home, saw the writing, took the chalk, and added a second line, "This was written by Otway, *opposite.*" It was certainly a rude piece of verse, for such a masterly hand; but we do not like to believe that Otway took offense at the joke, as intended to signify that *he* was the opposite to a poet and wit. Dryden's publisher, Jacob Tonson, had a shop near the Inner Temple gate.—*Illustrated London News.*



A $20,000 RESIDENCE . W. H. BEERS., Architect, NEW YORK.

[For description see page 134.]

HEATHCOURT, MAIDENHEAD.

Our illustration represents a house recently erected for Mr. Arthur Lawrence at one of the most attractive spots near London, bordering on the well known Maidenhead Thicket, and adjoining the old London and Bath high roads. The ground is high, about 1½ miles from the railway station, and in a locality rapidly and deservedly becoming very popular. The building has been constructed in red brick with Doulting stone dressings and Broseley tiles. Mr. Arthur Vernon, of 26 Great George Street, Westminster, is the architect. —*Building News.*

A SUBURBAN RESIDENCE.

We publish an admirably planned and picturesque design of a suburban residence, by Mr. Wm. H. Beers, architect, New York. The house has been designed to occupy a corner lot, with a frontage of one hundred feet on the main street and two hundred on the side street, giving ample room for a stable in the rear of the lot. The house has an extreme frontage of 55 feet by 65 feet in depth. All the principal rooms on the first and second floors have an outlook on the main street; and while the dining room is in the rear of the library, a view of the main street is possible, as here has been thrown out an octagonal projection, producing a very pretty effect, both as to exterior and interior. This projection is carried up two stories, giving the same advantage to the chamber over dining room, with the addition of a second story piazza off this room.

The exterior of the house on first story is finished with clapboards and trimmed with corner boards, belt courses, etc , as shown on the drawing, and over each window is placed a swinging transom glazed with stained glass. These transoms are very pretty in their interior effect, and also furnish an excellent means for ventilation, when opened, in connection with the open fireplaces in each room. The second story is carried out in the "Old English" half-timbered style, with the panels filled in with round cut shingles. On the front there is a gable extending half the width of the house, with a very effective group of windows in same. The panels in this gable are filled with shingles, carved woodwork, rope twisted in artistic designs, secured to the wood, and finished in bronze, producing an excellent effect.

The two most beautiful and striking effects produced are the bay windows—at corner of house on second story, and the bay which forms the staircase landing. These two superbly designed windows are equally effective in their interior effects. The chimneys are tall, and are quite an architectural feature in themselves, and in the library chimney there is a window over mantel shelf filled with an artistic piece of stained glass work. On all sides of the buildlng there is some interesting architectural feature or bit of detail that pleases the eye. Passing up the front steps on to the piazza, which runs across the front and side of the building, you enter the house through a large vestibule, finished in "old English oak," highly polished, with vestibule door and side filled with beveled plate glass, entering a wide hall, finished in "quartered oak," with wainscoting five feet high, and panels of wainscot filled in with relief work, finished in old silver. A hat rack with large mirror, built in, and forming part of the wainscot, is placed beyond the parlor doors. In the rear of the hall, facing the front entrance doors, is a large and massive oak mantel, with tile hearth and facings; frame and andirons finished in old silver.

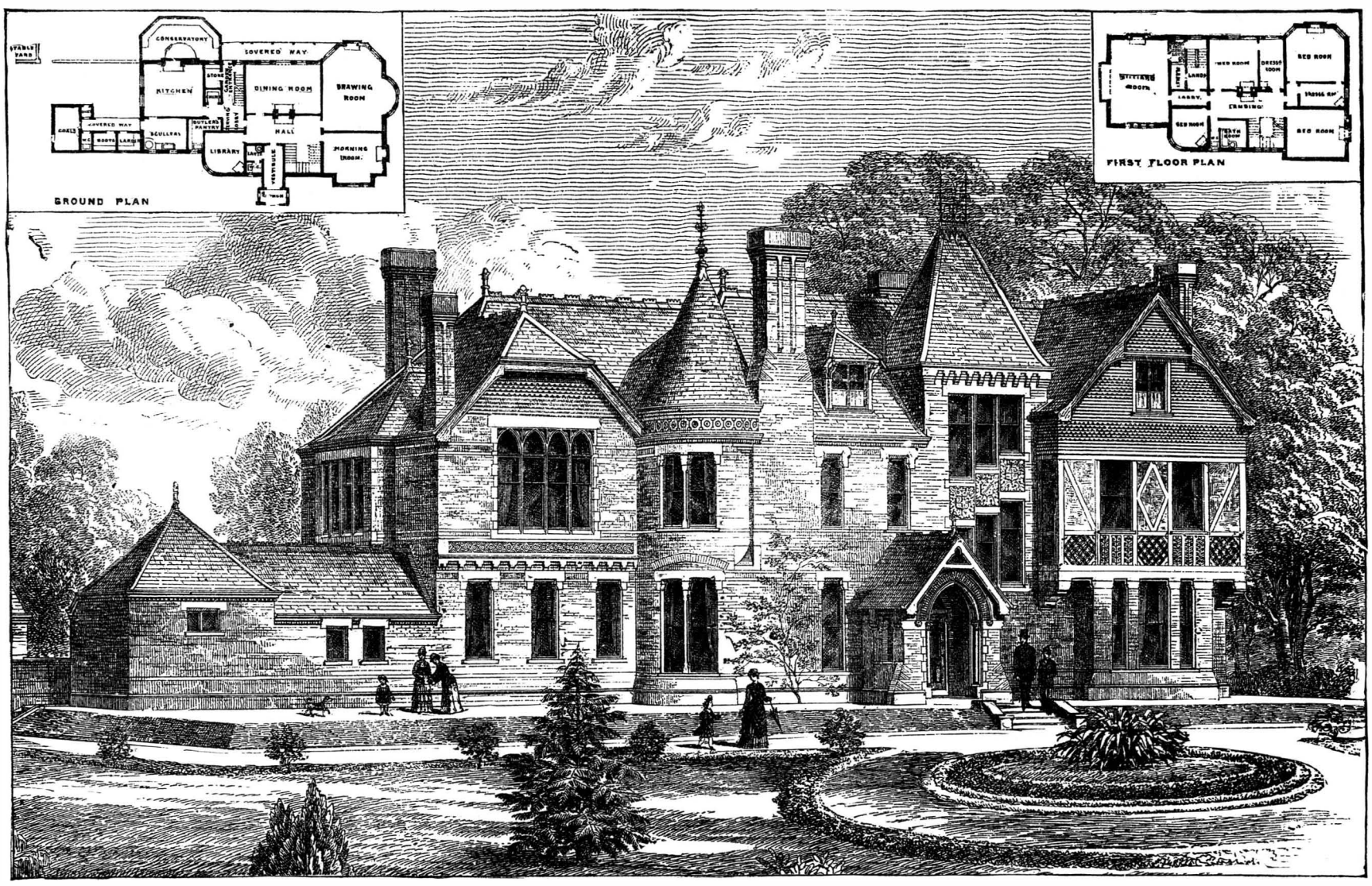
The principal feature in the house is the staircase at the right of the mantel. This staircase, occupying as it does the full width of the staircase hall, is built in quartered oak. The first flight of steps are six feet wide, flanked on the right by a massive carved newel, with a "dragon" holding a newel light finished in old silver. After ascending the six steps you reach a broad gallery, running the full width of the hall, with rail, newel, and an open screen, with carved posts, spindles, etc., dividing gallery from the hall proper. With a rug on the floor, and a few tropical plants placed about, this makes an effective and desirable resting place. Ascending a short flight of six steps, you reach the second gallery or bay window landing, with upholstered seats about windows in bay. This beautiful window produces a truly magnificent effect, with its fine stained glass, reflecting its various colors in the hall below. From this landing, by ascending six steps more, you arrive at the level of the second story. On the right of the entrance hall you enter the library through large sliding door opening, and find this room finished in dark antique mahogany, finished with a high polish, and a large, massive mantel running to ceiling. In front of room there are a charming group of three windows with their broad panes of plate glass looking out on the main street. At the opposite end of this room, on each side of the large sliding door opening, leading to dining room, are low bookcases with silk curtains hanging from brass rods. The remaining wall space in this room is reserved for furniture.

Passing from the library into the dining room, you find a large, spacious room with a large mantel, in English oak, facing you as you enter from library, while at the end of the room an octagonal bay has been thrown out to give a view of the main street. With its broad sheets of plate glass, the stained glass above gives this room a very cheerful effect. The buffet and mantel are in one, the buffet extended on each side of the chimney, which as designed produces a novel and pretty effect. All the wood in this room is "old English oak," finished to a dull gloss.

Passing from this massive room, we enter the drawing room, which is finished in white maple, with elaborately carved mantel and trim. This room is carpeted with carpet in the most delicate colors, while the side walls and ceiling are decorated in delicate shades of cream, pink, and gold. All the rooms, except drawing room, have parquet floors. The kitchen, laundry, pantries, etc., are as perfect in their arrangement and details as could be desired, and as a study of the plans will reveal.

On the second floor all the chambers are light and cheerful, and have a pleasant outlook, and are finished in white maple, cherry in its natural color, and white ash, all rubbed down and brought to a high polish. The bath room is finished in white maple, with cream white tile dado, four feet high, and tiled floor. Some of the bed rooms have dressing rooms adjoining, and each chamber has from one to two large closets fitted up with shelves and drawers.

In the attic there are a number of servants' rooms, trunk rooms, packing room, etc., all fitted up complete in every detail. The cellar is large, open, and light, with a large hot air furnace which heats the whole house perfectly. There is also a large storage refrigerator, inclosed with brick walls, and built in a most perfect manner. The cost is estimated at about twenty thousand dollars.



RESIDENCE OF MR. ARTHUR LAWRENCE, MAIDENHEAD THICKET, BERKS, NEAR LONDON.—ARTHUR VERNON, ARCHITECT.

Egyptian Reliefs.

The wall was first chiseled as smooth as possible, the imperfections of the stone were filled up with cement or plaster, and the whole was rubbed smooth and covered with a colored wash. Lines were then ruled perpendicularly and horizontally with red color, forming squares all over the wall, corresponding with the proportions of the figures to be drawn upon it. The subjects of the painting and of the hieroglyphics were then drawn on the wall with a red line, most probably by the priest or chief scribe, or by some inferior artist, from a document divided into similar squares. Then came the chief artist, who went over every figure and hieroglyphic with a black line and a firm and steady hand, giving expression to each curve, deviating here and confirming there the former red line. The line then traced was then followed by the sculptor. In this stage there are instances of a foot or head having been completely sculptured, while the rest of the figure remains in outline. The next process was to paint the figure in the prescribed colors, and in some cases the painted line deviates from the sculptured line, showing that the painter was the more important workman, and that even in this last process no possible improvement was omitted. There are other instances where a considerable deviation from the position of a leg or arm has been made after the sculpture was finished and painted; the part was recarved and the defective portion filled in with plaster, which, having since fallen out, furnishes us with this curious evidence of their practice.—*Owen Jones.*

FLOORS AND CEILINGS: ANCIENT AND MODERN.

BY C. POWELL KARR, C.E., CONSULTING ARCHITECT, NEW YORK.

(*Continued from page* 117.)

III.—JAPAN—THE MODERN HOUSE.

According to Fauld, however humble a Japanese home, it is always guarded by a moat. In a feudal mansion the moat was usually deep enough to prove a genuine obstacle. We should call the modern moat a gutter. While it is still almost universally retained, the muddy water is hid in the summer time by duckweed or the broad leaves of the lotus. Even in front of the humblest dwellings is the inevitable miniature moat, which is often dry, of a foot or so in breadth, and at most about two inches deep. These moats or gutters are lined with stone in receding layers, in the better class of dwellings. The humble habitations have their moats lined by thin pine boards pegged down into the ground. As their sides and bottoms are of course open to absorb the drainage, and as all the surface sewage passes into them, the sanitary results are sometimes disastrous.

Approaching the gate, we are awed by a massive arrangement of black wood. Its form, in some cases, approaches that of the so-called "bird rest" in front of Japanese temples. The wall or fence may consist of bamboos, whole or split, or of thin wooden planks blackened with a mixture of India ink and the juice of the unripe persimmon, which is highly bitter, astringent, and antiseptic, preserving the wood for a long time.

In the houses of some pretensions there is an embankment behind the moat, topped by a quick-set hedge of either holly, privet, camellia, or the like. Behind this there is either the fence already described or a wall composed of thin tiles laid horizontally, with much white shell lime; or a bamboo lath and plaster wall, sometimes covered by diamond shape tiles, the joining lines of which are concealed by diagonals of white lime laid on smoothly, rounded, and as thick as three fingers This has a pleasing appearance, quite characteristic of Japanese architecture. As the name of the street is not to be found at the street corners, it is repeated at every doorway. The towns are divided into wards and blocks, and the numbers of the houses are often confused and misleading.

A slip of whitewood is nailed on one of the posts of the gate and is inscribed with the name of the street or block, the number, name of householder, numbers and sexes of household. Besides this combined street sign and door plate there is often a charm to keep away the wolf from the door, an animal which was literally once known in the vicinity of Tokio, and greatly dreaded. Within the porch there are racks for halberts and other grotesque instruments of formidable shapes. These accouterments have been removed, but the racks still remain, the traditional sign post of an obsolete custom. The gates of the larger houses are heavy, and are adorned with copper or bronze mountings, and often studded with large nails.

Upon entering the gate you find a court, from the several sides of which the open verandas of the building may be approached. Entrance to the high verandas is effected by means of heavy wooden stairs. The court is sometimes paved with water-worn stones, larger than a goose egg. Sometimes it is level, weedless, perfectly well swept earth, and in either case lines of smooth stepping stones are placed in the regular pathways.

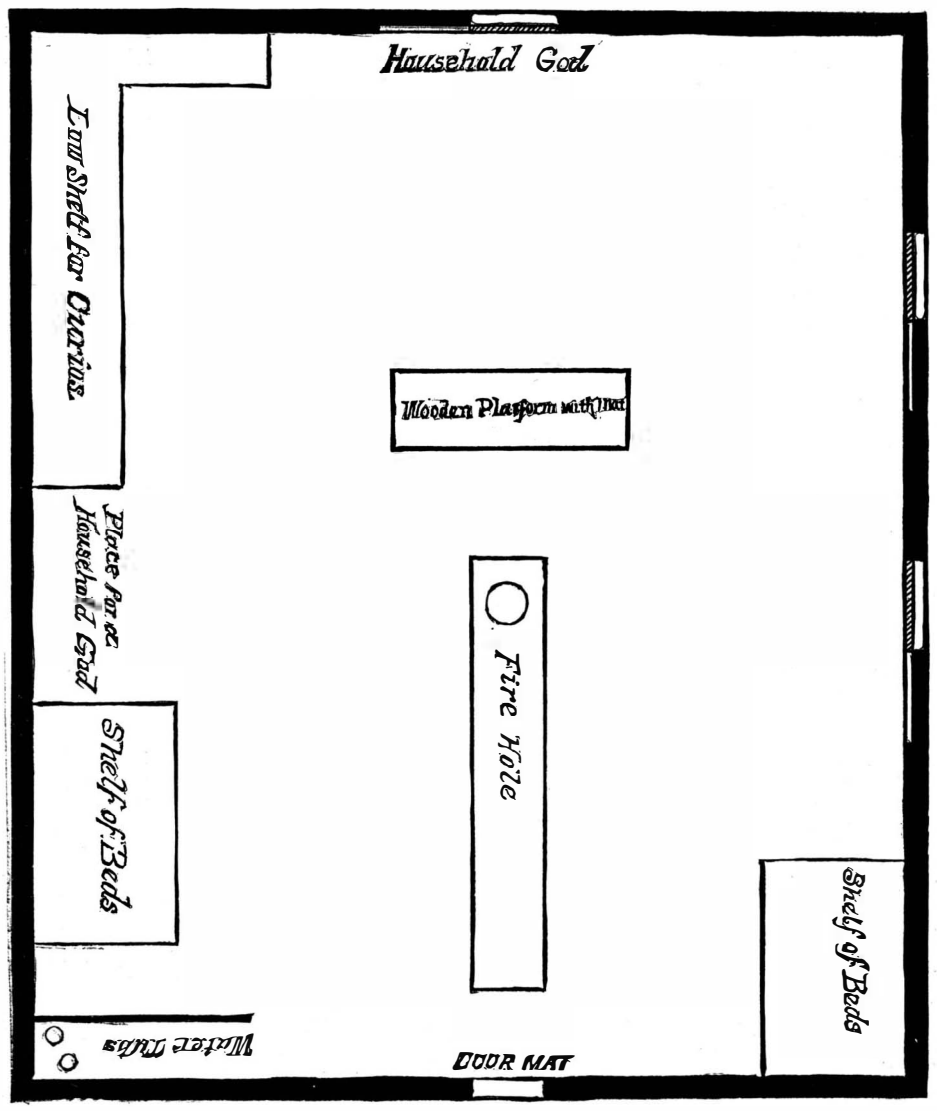


Fig. 1.—INTERIOR ARRANGEMENT OF AN AINO DWELLING.

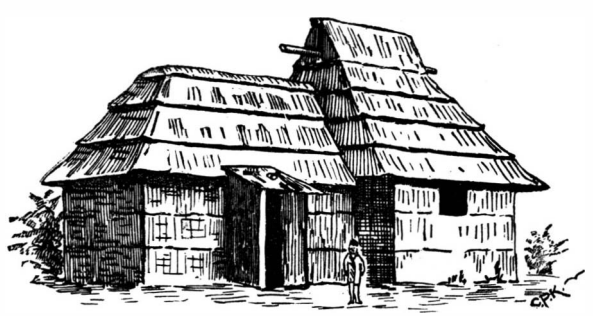


Fig. 2.—AINO HOUSE YEZO.

The gardens, even of somewhat humble mansions, are often graced with carved stone lanterns. The roof is of black tiles in Tokio, and the darkness of the clay from which they are made is due to the presence of organic matter. In the poorer houses, wooden shingles are sometimes used.

In front of the doorway is a small space unfloored, called the *doma*, where you take off your shoes after announcing yourself in the words, "O tonomi mosu" ("I beseech you") or by ringing a gong suspended from the door post. The beams supporting the roof are ponderous. The walls are hung with paper lanterns, and there is a range of white wooden fire buckets, all stamped with the crest of the owner. Some of the lanterns are cylindrical, and open out like a concertina. They are suspended from a hooked stick, and are similar to those that were used in ancient Egypt. In one part of the house, according to Mr. Fauld, is the altar shelf, on which images of saints or sages or pictures of ancestors may be seen, with incense tapers burning before them by day and lamps at night. Photographs of the dead are often honored in this way. In drawing Fig. 1 we show the interior arrangement of an Aino dwelling, in which the position of the altar shelf is indicated by a diagram. It is sometimes called the ancestral shelf.

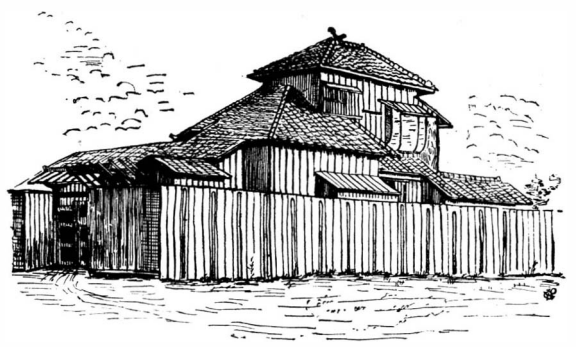


Fig. 4.—A MODERN JAPANESE HOME.

In the walls are recesses with sliding doors, into which the bedding is thrust in the day time. Clothes are kept in plaited bamboo boxes, usually covered with black or dark green water proof paper. The furniture is very simple. There are often in the best houses no chairs, no stools, no tables, no bedsteads. There may be some low short-legged side tables of characteristic Japanese pattern and one or two costly vases or other ornaments, a few scroll pictures, which are changed in deference to guests and seasons, some flowers or dwarf trees in vases and a lamp or two. In summer a well planned Japanese house is the very ideal of coolness, grace, and comfort. In winter it is the realized dream of misery. Fire places are unknown, and the ventilation is conspicuous by its absence. The walls within are wainscoted and hung with painted and variously colored paper. Mr. Hildreth, the historian, suggests the probability of the derivation of paper hangings as a substitute for tapestry from this circumstance. To every house is attached a back yard, which, though never so small, yet always contains some curious and beautiful plants, and they are attended to with a great deal of care. In Fig. 2 is shown an Aino house, by permission of Prof. Morse and his publishers, Messrs. Ticknor & Co. In Fig. 4 the street view of modern house in Tokio, and in Fig. 5 the framing plan of an ordinary two storied house, a description of which we take from "Japanese Homes and their Surroundings." The Japanese standard of measurement is a *sun*, which is nearly equal to our *foot*, and is divided

Fig. 3.—A STREET SCENE IN KIOTO.

into tenths. The wood employed in the frame is usually cedar or pine. The corner posts, as well as the other large upright supports, called *has hira* (H), are square, and five tenths of a foot in thickness; these are tenoned into the plate upon which they rest. This plate is shown at D. It is made of cedar and sometimes of chestnut. Its cross section is six tenths of a foot square, and rests directly on a number of stones, F. Between the principal uprights smaller uprights or studding are placed as indicated at B, and the cross section is two tenths of a foot square. Through these pass the cross pieces called *nuki* (see A). They are four tenths of a foot wide and one tenth of a foot thick. To these are fastened bamboo slats, the substitute for laths. The horizontal beam to support the joists of the second story floor is called the *nikai bari* (shown at C). This is of pine, with a vertical depth of one and two tenths feet, and a width of six tenths of a foot. The rafters of the roof, called *yane shita* (see I), in this frame are nine feet long, three tenths of a foot wide, and eight tenths of a foot in depth, thus showing that they recognize the engineering axiom that with any given cross sectional area the deepest beam is the strongest, if prevented from lateral motion. Cross beams (see J) from the upper plate are called *taru ki*. From them spring short posts to support the ridge pole. The first floor is sustained by posts that rest on stones embedded in the ground, as well as by a beam called *yuka shita* (E). This is secured to the upright beams at the height of one and one half or two feet above the lower plates. The upper floor joists are of pine, two inches square. The flooring boards are six tenths of a foot in thickness and one foot wide. The lower floor joists, called *neda maruta* (G), are rough round sticks, three feet in diameter, hewn on opposite sides. On top of these rest pine boards six tenths of a foot in thickness.

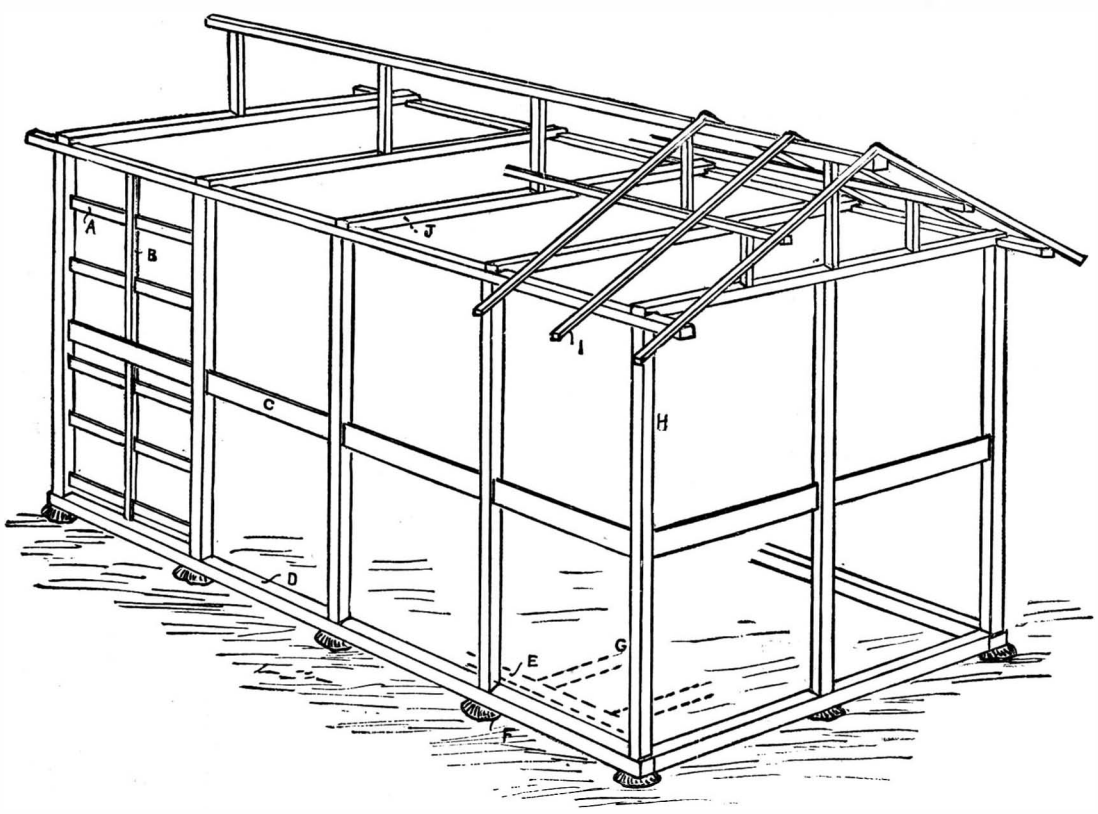


Fig. 5.—FRAMING OF AN ORDINARY TWO STORIED HOUSE.

In Fig. 3 we show a street scene in Kioto, one of the most beautiful cities of the Japanese empire. Japan is a land of littles. Their most beautiful objects are generally little. The knob of a stick or the button of a tobacco pouch is often an art work of the highest elaboration, and their dainty foods are served in small portions. It is also a land of earthquakes, and this brings us to one of the most singular facts connected with the structure of Japanese buildings—a method adopted with the special view of insuring safety during these periods of the earth's vibrations. Japanese houses and temples are put together in a solid and simple manner, each work being complete in itself, and having an altogether independent existence. Thus, a Japanese house is in no way built upon foundations, or fixed to the ground on which it rests. It stands upon a series of legs, and these legs usually rest on round-topped stones of such a height as will during the rainy season support the timber uprights above any water that may lie upon the ground. In Fig. 5, showing the framing of an ordinary dwelling, which we have taken by permission from Prof. Morse's "Japanese Homes and their Surroundings," this arrangement of short posts upon foundation stones is very well shown.

It is obvious that while an object fixed to the earth might if rocked be broken off from the ground, or become strained and destroyed, that which is loose would simply oscillate and settle down again after the vibration had ceased, whereas, if the posts were fixed, the application of a small amount of pressure on the upper part (especially if the top was heavy), or any upheaving of a portion of the ground on which it rests, would be likely to do it an injury or effect its destruction.

Pagodas are often of great height, yet many have existed for seven hundred years, and have withstood successfully the many vibrations of the ground, which must have inevitably achieved their overthrow had they been erections of stone or brick.

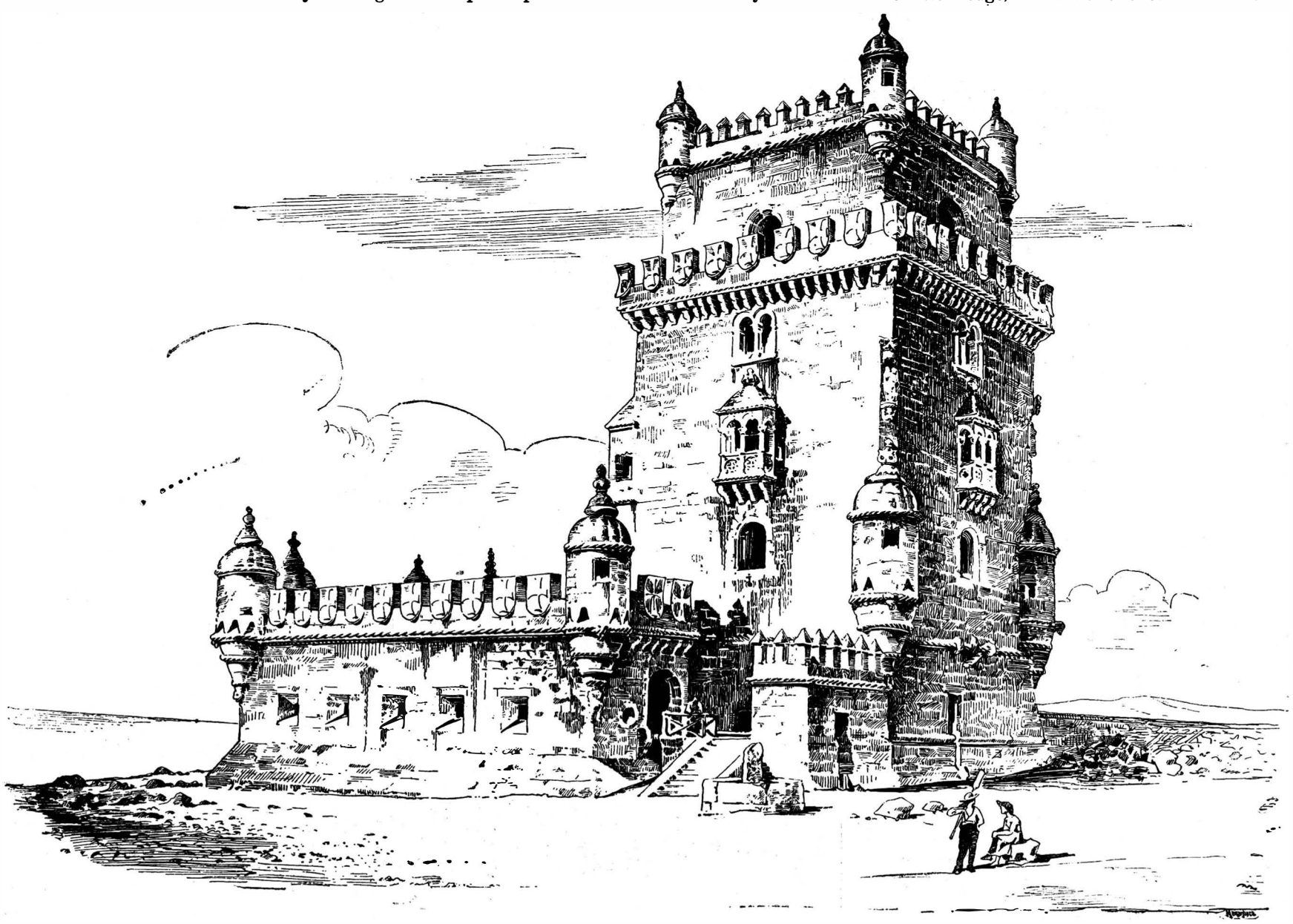
(To be continued.)

Portugal Laurels by the Seaside.

For general planting near the sea, the best shrubs are to be found among evergreens, though some of these do not appear to thrive any better than the deciduous trees, and among the worst is the Portugul laurel. Within the shelter of the low walls in front of the villa gardens facing the beach it grows, but above the shelter of the wall it makes no progress, and the tops look as if they had been scorched by fire. Beside the Portugal laurel, and fully exposed to the blast—and we should say within reach of the spray from the sea—the laurustinus thrives amazingly, making a large and densely furnished bush, such as is seldom seen in inland situations. It is quite a substitute for the laurel.

THE TOWER OF BELEM.

The annexed engraving, taken from *Architektonische Rundschau*, represents the singularly picturesque fortress called the Torre de Belem, which was erected about the end of the fifteenth century, in the town of Belem, a suburb of Lisbon, Portugal. The building is situated on the north bank of the Tagus, close to the water's edge, and its batteries command that river.

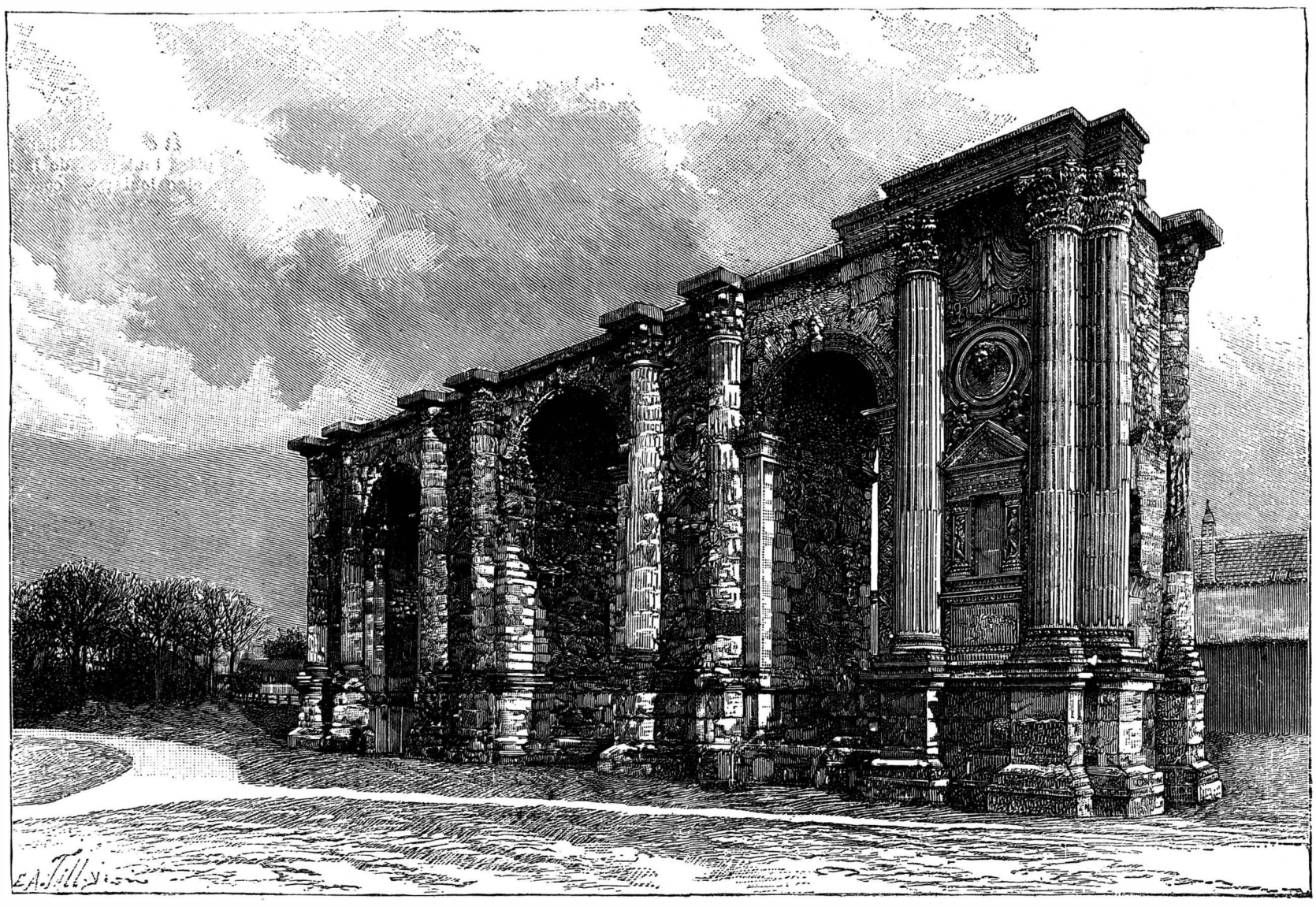


THE TOWER OF BELEM, NEAR LISBON.

RESTORATION OF ROMAN RUIN AT REIMS, FRANCE.

The gate known as the Porte de Mars at Reims, in France, one arch of which has been recently restored, a first step toward the restoration of the whole monument, is the only one remaining of four similar gates or triumphal arches which were used in the city of Reims while under the dominion of Rome. It consists of three arches and eight columns of the Corinthian order, measuring 42½ feet in height. The middle arch, which is the largest, measures 49 feet in width and 38 feet in height. It is called the Arch of the Seasons, and the sculptor had represented the twelve months of the year. Unfortunately, five of these bass-reliefs are al most entirely destroyed, and the seven others are very much damaged. The left hand arch is called the Arch of Remus, and represents Romulus and Remus under the wolf, and at the right and left of the children are standing figures of Faustulus and Acca Laurentia. The arch at the right is called that of Leda, and represents Leda and the swan, with a Cupid carrying a torch above them.

Until 1544 the Porte de Mars was actually used as the gate of Reims, but at that time, owing to the growth of the city, it became necessary to carry the gates further out, and the Porte de Mars is found buried (incredible to believe) under the rubbish brought there for leveling the new routes. Discovered and unearthed in 1812, the government has recently classed it among the monuments of historical interest, and has voted, in conjunction with the municipal government, the funds necessary for the preservation and restoration of this important ruin.—*L'Illustration.*



THE HISTORIC MONUMENTS OF FRANCE—THE ROMAN ARCH OF MARS, AT REIMS.

The Equitable Building, New York.

Another wonder has been added to the many—of an architectural kind—to be found in New York, and that is the court or arcade of the remodeled Equitable Life Assurance building, on lower Broadway, opened on May 2 for the first time.

The court is in the center of the building on the ground floor, and is 100 feet long, 44 feet wide, and 30 feet high. Its walls, for their entire height, are made of highly polished Ste. Baume granite. Double pillars of the same material are ranged along the sides of the walls at regular intervals. Their bases are made of Knoxville (Tenn.) marble and their capitals of Algerian onyx, all highly polished, and producing a beautiful effect. Around the tops of the columns runs a layer of polished Knoxville marble, then a layer of dark Italian marble, then another layer of Knoxville marble, from which the arched roof of the court springs in a graceful, symmetrical curve.

The roof or dome of the arcade is of prettily designed stained glass and rests on arches of Knoxville marble, in which panels of bright polished Italian marble are set.

The floor of the arcade is tessellated, white and pink marble being used in its construction, and being set in squares, with diamonds cut in each corner and a circular piece of pink marble set in the center of each.

At the end of the arcade is the wide marble staircase that runs up through the entire eleven stories to the roof. Above the first story the railing is of iron, in fancy and elaborate design, neatly gilded and painted, but on the first story the balustrades are of pure Mexican onyx, beautifully carved, and are capped by a huge rail of polished granite. The newels of this staircase are also of Mexican onyx, a foot thick. They are surmounted by two bronze figures, which are to support candelabra of electric lights, and on their face have the monogram of the society, "E. L. A. S.," in big letters of polished brass.

At the eastern end of the arcade, in the arch of the dome, there is a panel of mosaic work that is said to be one of the finest things of the kind in this country. In its center is the draped figure of a woman seated on a dais, with her hands about two children on either side of her, as though protecting them from some impending danger. On either side of the figures of the woman and children are those of two warriors—Greek in spirit—one of whom holds a sword and the other a spear, and under the panel the motto of the society, "Vigilance and strength defend the defenseless."

The arcade was crowded with people on the opening day, and every one of them, after they had explored all the beauties of the place, returned to get another look at the wonderful mosaic.

The arcade is reached by the main entrance on Broadway, a hallway twenty-two feet wide, in the construction of which the same materials were used as in the arcade, and running from the arcade through to Nassau Street is another wide hallway which is intersected at right angles by the hallways running from Pine and Cedar Streets. In all these hallways, which are brilliantly lit up with electric lights, the walls are of Ste. Baume granite, the columns of the same material, with bases of Knoxville marble and capitals of Algerian onyx.

The frames of all the doors and windows in these hallways are of old English oak, elaborately and beautifully carved. This oak lay in a lumber yard in England for sixty years, and was imported by the life assurance society for the very use to which it has been put.

Along the sides of the hall leading to Nassau Street there are to be erected a lot of shops or booths, which will be called "a bazar of all nations," where one can buy anything from a toothpick to a theater ticket. These will be opened in a few days.

It was on May 1, 1886, that the alterations on the Equitable Life building were commenced, and now the work is practically done. In that time two immense buildings were torn down, one side was taken out of the Equitable building itself, almost its entire interior was remodeled and another story was added to it, and the huge wing on the corner of Pine Street built from the foundations up.

It was a tremendous job, and an army of men were kept at work day and night in the whole of that time. Mr. Henry B. Hyde, the president of the society, personally watched every detail of the work, which was under the direction of George B. Post, the architect, and David H. King, Jr., the general contractor. No less than thirty-one sub-contractors were employed on the work.

"We worked night and day," said Mr. Hyde to a *Herald* reporter, "and now everything is ship shape. Our building covers an acre of ground, and has six hundred offices in it, less than twenty of which yet remain unrented. You may get an idea of the work we have done when I tell you that about a year ago all the granite and marble used in the new portion of the building lay in the quarries uncut and untouched."—*N. Y. Herald.*

Enameled Brick of Different Colors.

A building brick which is in use in England and Germany is covered with an enameling compound made as follows: One hundred and fifty parts fluorspar, 60 parts Paris white, 50 parts lime, 50 parts oxide of tin, and 50 parts kaolin. These ingredients are pulverized and triturated to an impalpable powder, and reduced to a homogeneous mass, which is calcined in a crucible. After it has cooled it is again reduced to a powder. Water is added and the mass is ground to the consistency of cream. The portion of the brick to be enameled is then dipped into it and the brick submitted in fire clay cases to a heat which fuses the enameling compound. A black enamel is produced by adding to the ingredients mentioned above black oxide of cobalt, black oxide of manganese, and umber previous to the pulverizing and calcining. Blue enamel can be made by adding black oxide of cobalt; green by adding sub-oxide of copper; red by adding sub-oxide of copper and red oxide of iron.

Preservative Fire-proof Paint.

To the Editor of the Scientific American:

I give you, and the many intelligent readers of your valuable journal, a recipe for the best fire-proof paint extant.

Take equal quantities of common salt, alum, soluble glass, and tungstate of soda, four parts lime or lead; mix with linseed oil to proper consistency; put on three coats. It is fire-proof, and posts and other woods exposed to the weather will last 30 to 60 years.

F. M. SHIELDS.

Coopwood, Miss.

WARNER'S IMPROVED DRY PLATE HOLDER.

One of the most serious annoyances a photographer has to contend with in the present day of lightning dry plates is a leaky plate holder, particularly when the latter is composed of one or more separable parts, since the slightest trace of light entering at some minute crevice will frequently damage a day's work. By its simplicity, solidity, and ease of operating, the holder here shown possesses features very desirable for out of door photography, in that it is perfectly light tight, strong, and compact.

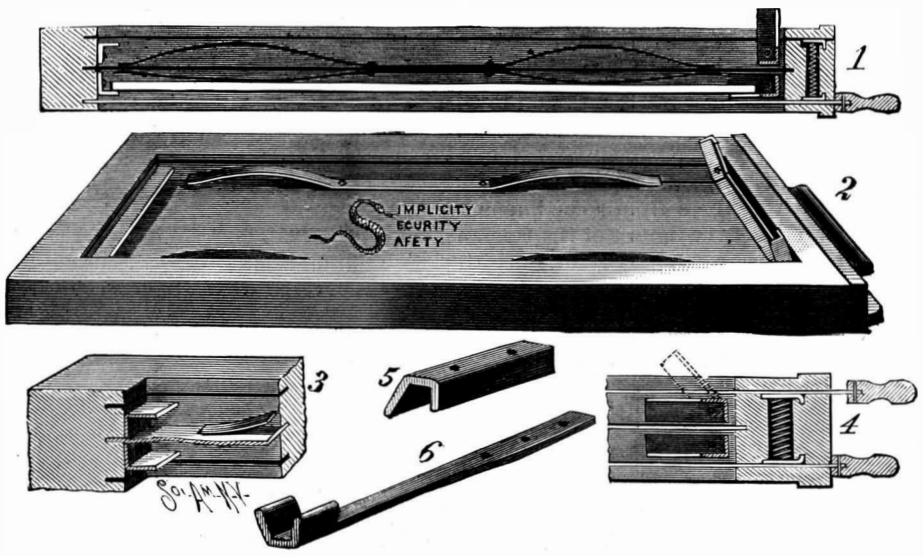
Fig. 1 represents a longitudinal section, in which the upper slide is withdrawn. The body of the holder consists of a light hardwood frame, having a metal or gelatinized fiber septum in the center, upon each side of which are riveted very light flat steel springs, shown clearly in Fig. 2. In the lower half of the holder (Fig. 1) may be seen a plate in position. An angular metal strip is rigidly secured on the left hand end of the inside of each plate compartment, intended to hold one end of the sensitive plate, while at the opposite end is a movable or pivoted angular strip or clamp provided with projecting ends, which, when thrown up, permits the sensitive plate to freely drop down into the holder, resting, as it were, upon a bed of springs.

To insert the plate, the holder is held with its narrow end resting on a support at a slight angle, then the exposing slide is withdrawn, and the plate, film side out toward the operator, is slid over the spring under the left hand angular strip. In this position the other free end of the plate projects slightly above the holder. The right hand clamp is now turned down over the end of the plate, pressing the same down into position. The springs compensate for any variability in the thickness of the glass. Hence the film side of the plate remains always in the same plane and in focus. The exposing slide is next inserted, and the holder is filled ready for use.

The pivoted clamp, it will be noticed, has the pivot located just one side of the center, and as it is turned down over the plate, the latter pushes past the line of the pivot, thus securely locking the plate. The upward pressure of the plate cannot open the clamp. The latter is also held by friction on the sides of the holder.

Special cut off light valves, consisting of plates with one side bent down, forming an angle, to prevent slipping, and also arranged to fly outward by a miniature spiral spring between them, as the slide is withdrawn, and effectually close the slit, may be seen in Figs. 1 and 4.

In removing the sensitive plate, the pivoted clamp is first turned up. At once the springs underneath force one end of the plate up and out of the holder, when it is easily caught with the fingers and slipped out. This feature of the holder is quite important, since in ordinary holders the operator is obliged in many cases to dig out, as it were, the plates with the fingers, being very apt to injure or scratch portions of the film. Fig. 3 is an enlarged view of the rigid angular strip. Fig. 4 shows the pivoted clamps down, when holding the plates. The dotted line indicates the position when thrown up.



WARNER'S IMPROVED DRY PLATE HOLDER.

Fig. 5 represents another form of a rigid angular strip, made in one or two lengths, intended to be substituted for that shown in Fig. 3, with the bevel side downward, and in conjunction with two spring clamps, bent in the shape of a half bow, secured to the inside end of the holder in place of the pivoted clamp. With this latter device the plate is inserted by putting its lower end in the two spring bow forks, then by pressing down on the edge the plate until its upper end slides under and snaps, or pushes up into the rigid beveled lugs in the upper end of the holder. To remove the plate a knife blade or a thin steel key is passed over the upper edge of the plate. Then by pressing down it is quickly pried out from the rigid lugs. The beveled shape of the latter is intended to compensate for the varying thickness of plates.

The holder being made in one piece is perfectly tight, while the arrangement of the clamps permits uneven and rough-edged plates to be quickly and easily inserted.

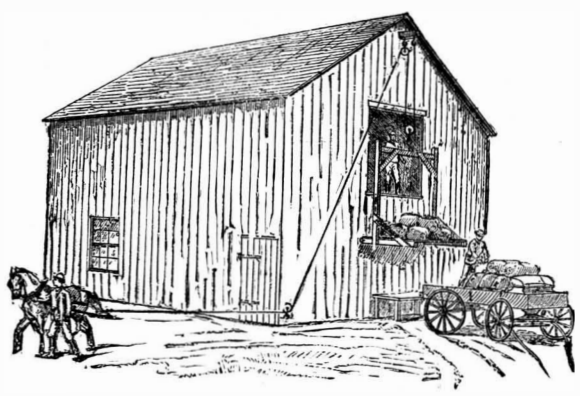
It should also be mentioned that the slides of the holder are made of gelatinized fiber, a new material, light and as enduring as steel and not affected by moisture. The surface is slightly roughened and may be written upon, serving as a memorandum of exposures. The inventor claims that by substituting this fiber for metal, together with the other features, he has an extremely light holder, one that, in fact, is without a peer for convenience and safety.

Further particulars may be had from the patentee, Mr. M. P. Warner, 69 Lincoln Street, Holyoke, Mass., who, we understand, desires to negotiate for the sale of territorial rights.

UNLOADING GRAIN.

Mr. M. H. C. Gardner of Orange Co., N. Y., writes as follows to *The Rural New-Yorker:*

"One of the most tiresome jobs in the busy days of thrashing is to put the grain up in the granary, while the machine stops for a rest. The bags must be emptied, and quickly, as time is precious and all hands have to work hard to feed the machine and take care of the straw, so that when it stops men are usually not in the humor to carry away 75 to 150 bushels and empty it into bins up a pair of stairs. The thrashers who come and thrash my grain, year after year, all say my way of hoisting wheat or other grain "beats 'em all." Back the loaded wagon to the elevator, which rests on a platform level with the wagon, place the bags on the elevator, and the horse instantly raises it to the second floor, where men empty the bags into bins. It is surprising how quickly 100 bushels can be unloaded without any straining or unnecessary lifting. The contrivance is simple to construct. It can be made with saw, hammer, and nails, or it may be mortised together."



UNLOADING GRAIN.

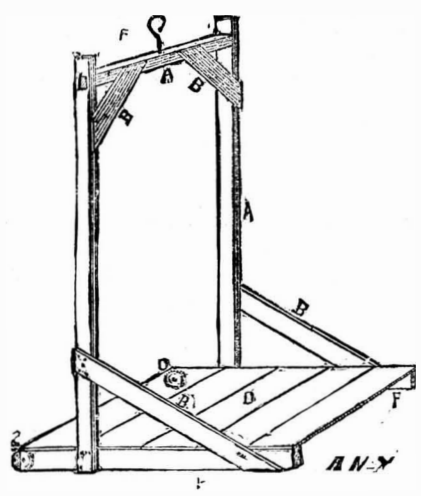


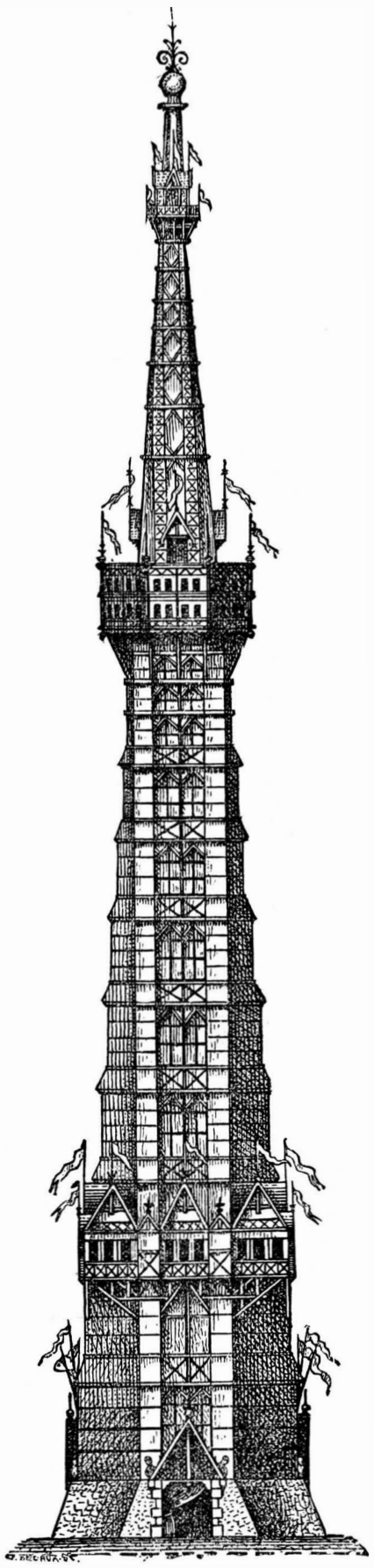
Fig. 1.

Fig. 1 shows how the elevator is made. The dimensions are as follows: A A A, 3 × 4 inch scantling; B B B B, 1 × 6 or 8 inch; C C, small wooden friction wheels to run against the side of building; D, inch flooring; E, screw hook; F F, sills, 2 × 4 or 6 inches.

A WOODEN TOWER NEARLY 1,000 FEET HIGH.

On the occasion of the great International Exhibition of Sciences and Industry at Brussels in 1888, it is proposed to erect a 300 meter (984 foot) wooden tower after designs by Messrs. Hennebique and Neve.

This tower, a general view of which is given in the annexed engraving, is to be 174 ft. square at the base. It will consist of a parallelopipedon supported by eight counterforts having a projection of 49 ft. and being 16 ft. in thickness. The calculations have been based upon the supposition that the tower will, through its inertia solely, resist an upset thrust produced by a wind exerting a pressure of about 65 pounds to the square foot. On giving the tower a total weight of 15,000 tons, with a base 174 ft. square, the moment of resistance to overturning would be much greater than the moment of overturning due to a wind such as above supposed.



WOODEN TOWER NEARLY 1,000 FEET HIGH.

The sections of the framework at each point of the height have been determined in the same way. The wood required would thus be 353,200 cubic feet.

Seven elevators in the interior will give access to the three stories, in which will be established restaurants, a belvedere, and an observatory. It will be possible to erect the tower in one year, and it will cost, at the most, $400,000. The authors of the project think that this sum can be easily raised by the formation of a society issuing stock at $2 per share, and giving the right to ascend the tower.—*Chronique Industrielle.*

GEORG EBERS.

Georg Ebers, the German Egyptologist, has just celebrated his fiftieth birthday; and as this point of a man's life is supposed to be the time of all others for reviewing his past, we, too, will take at least a hasty glance at the work of this scientist, novelist, and poet. He was born in Berlin, and went to school and college there and at Gottingen; but while still quite young he was obliged by illness to leave his home, and he went to Egypt. During this and a subsequent journey to the land of the Pharaohs he pursued the studies on which his books were afterward founded. His labors for the dissemination of knowledge of the history of the Nile country were not, however, confined to his writings, for he taught at the University of Jena, and afterward received a professorship at Leipzig.

Even a short sketch of the life of Georg Ebers would be incomplete without some reference to his charming family life and his delightful home on the banks of Starnberger Lake, in Bavaria, which is shown in the accompanying cut, taken from "Ueber Land und Mehr." Here he has written some of his best poems, and we trust that these congenial surroundings will continue to inspire him in the future as they have in the past.

THE COUNTRY RESIDENCE OF GEORG EBERS, STARNBERGER LAKE.

Nothing could be more charming than the scenery in the immediate vicinity of this comfortable little dwelling. The water view reminds one of our own "Thousand Isles" on the St. Lawrence.

Copper as a Roofing Material.

Some time ago we drew attention to the reduction in the price of copper, and to the advantages possessed by it in comparison with other roof coverings. Since our remarks appeared there has been a desire on the part of many to introduce the material for buildings. As a roofing material copper has pre-eminently those properties which render it particularly desirable. In the first place, it can be hammered and shaped to any form without injury. Resisting oxidation and acids, it is found to last much longer than other metallic coverings; it is more durable than lead as a material for bearing traffic, it is considerably lighter, and, on the whole far more pleasing in color. Perhaps its most important qualification is its comparative lightness for roofs. The same firm remarks that "it may be used advantageously at one-fifth the weight of lead—that is to say, a building which would require five or six tons of lead to keep it weather proof may be rendered equally secure and for as long a time with one ton of copper." Even if we say that copper of one-third or one-fourth the weight of lead can be used, a very important reason can be given for its preference. The saving of timber or iron in the roof framing is a consideration of great moment in very many instances.

If copper can be bought at less than half its former price, and can be used at considerably less weight per foot than lead, there is evidently great advantage in using it. We have good reason for stating that 16 oz. sheet copper can be supplied and laid at from 1s. 3d. to 1s. 6d. per foot superficial. For lead coverings the timbering must be of heavy scantlings compared with those required for copper. For traffic, the latter material is found to be far more able to stand the wear than either lead or zinc. The cost of laying copper is rather more than that of lead. Referring to Laxton's, 16 oz. sheet copper to flats and gutters, including seams, labor, ties, and nails per foot super., is 2s., and 20 oz. sheet for flats 2s. 6d.; but these prices are high, and tend to mislead. Comparing copper with zinc, the latter has the advantage in first cost, since zinc can be laid down as light as copper for one-half the price. But what of other matters? The two coverings cannot be compared as regards durability or appearance. We all know how zinc wears in most towns; how it gets eaten away by the action of the atmosphere, or rather by a voltaic action that is set up. We have known zinc roofs and flats that have had to be replaced in the course of seven or eight years. Copper will last at least four or five times that period uninjured. It may be stated generally that the cost of 16 oz. copper is about double that of 16 gauge (24¾ oz.) zinc. Of course copper, like zinc, should be laid without solder, and allowance made for expansion and contraction. The adaptability of copper for architectural purposes, especially roofs, mansards, domes, and lighter ornamental features, such as turrets, is one, we think, of its chief recommendations. In London the material, wherever it has been used, has worn well. The roof of the pumping station of the Main Drainage System, Grosvenor road, is covered with copper, and is a very good test of its durability in a very exposed situation. It has also been used to cover the cupolas of the new meat, fish, and vegetable markets at Smithfield; these features having the material applied in stamped patterns, the work having been executed by Messrs. Holden & Co. To the architect the value of using a covering for his ornamental features, that are generally inaccessible for ordinary repair, is of importance. In these cases, even if a little more expense is incurred at the commencement, the cost is quickly saved in repairs. The great toughness and malleability of copper enable the workman to bend it to all ordinary curves and angles, and to boss the work by hand. It can be even beaten into thin leaves. From these considerations we think that the profession would be consulting their best interests in availing themselves of copper for their ornamental roofs, or where durability and lightness are desirable qualities. Comparing the appearance of copper with zinc and lead, we think it will be at once admitted that the former possesses a more agreeable color for this climate, and that the rust or green coating it takes after a few years is by no means unpleasing. In France and, indeed, in this country, copper was much employed by the mediæval builders; but since the introduction of zinc, which is much cheaper, it has seldom been used. Now, however, the extremely low price of the material has called attention to its qualities, and it is destined once more to take its place as the best covering metal we possess.—*Building News.*

Waxing Floors.

Take a pound of the best beeswax, cut it up into very small pieces, and let it thoroughly dissolve in three pints of turpentine, stirring occasionally if necessary. The mixture should be only a trifle thicker than the clear turpentine. Apply it with a rag to the surface of the floor, which should be smooth and perfectly clean. This is the difficult part of the work, for, if you put on either too much or too little, a good polish will be impossible. The right amount varies, less being required for hard, close-grained wood, and more if the wood is soft and open-grained. Even professional "waxers" are sometimes obliged to experiment, and novices should always try a square foot or two first.

Put on what you think will be enough, and leave the place untouched and unstepped on for twenty-four hours, or longer if needful. When it is thoroughly dry, rub it with a hard brush until it shines. If it polishes well, repeat the process over the entire floor. If it does not, remove the wax with fine sandpaper and try again, using more or less than before, as may be necessary, and continuing your experimenting until you secure the desired result. If the mixture is slow in drying, add a little of any of the common "driers" sold by paint dealers, japan, for instance, in the proportion of one part of the drier to six parts of turpentine. When the floor is a large one, you may agreeably vary the tedious work of polishing by strapping a brush to each foot and skating over it.

THE fastest train in the world is said to be one between London and Bristol, England, which makes the distance (118¼ miles) in 120 minutes.

THE EDELWEISS.

(LEONTOPODIUM ALPINUM.)

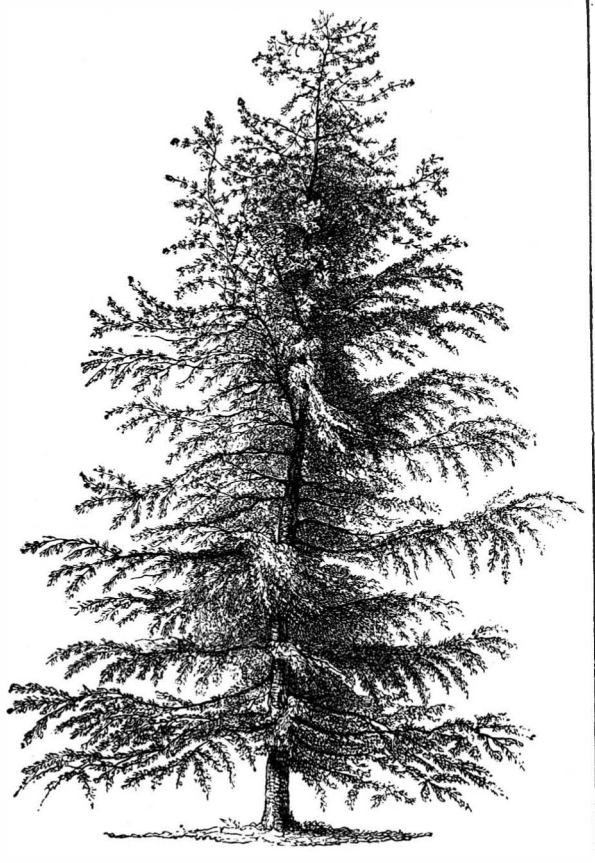
If there is one plant more than another that is sought after by tourists on the Swiss Alps, whether they be plant lovers or not, it is the edelweiss, a singularly curious plant—so curious, in fact, that no one who once sees it is likely to mistake any other for it. It is the badge of tourists, although, as everybody knows, they often get their badges second hand, for to get to the haunts of the edelweiss is sometimes not an easy matter. There has been—indeed, still is—a good deal of nonsense written about the edelweiss. Some would lead us to believe that some deep secret is connected with its culture, and that it will not succeed except in the temperature of an ice-house. As a fact, it is one of the easiest plants to grow if not coddled. Where failure occurs most frequently is in the case of old plants that have been torn up carelessly and sent home, where they, perhaps, arrive half rotten; whereas, if people gathered the seeds and sent them instead of old plants, they would experience no trouble concerning culture, for home-raised seedlings are as easy to grow as those of any other hardy perennial. Even with us the edelweiss dislikes division, and rarely if ever does well after that operation. The best plan we find is to choose a rather sunny position for it, close to a bog or shallow swamp; give it a good depth of rich peaty soil, and prick out the seedlings as soon as ready to handle. Where the bottom is not cool, a little more shade will be required than where it is so, and if grown close to a wall, better success will be attained than elsewhere. The plan of raising plants from seed applies also to most other alpines. The edelweiss is very plentiful on the Himalayas, at 14,000 feet elevation, in Cashmere, Kurum Valley, and Southern Europe. With us it flowers in July and August.—*K.*

THE EDELWEISS (LEONTOPODIUM ALPINUM).

THE LARCH AS A LAWN TREE.

W. GOLDRING.

Mr. Marnock was not singular in his opinion when he said some time since that "the larch as an ornamental tree is much neglected." It is indeed a neglected tree in ornamental planting, even in parts of the country where it is not grown in plantations for timber. Perhaps it is because it is such a common plantation tree that it is ignored by planters, yet in the whole range of ornamental trees there is certainly none more beautiful than a vigorous young larch, particularly when seen in early spring, just as its tassels of new foliage unfold, accompanied, may be, by strings of tiny cones brightly colored and fragrant. The larch, like the



A YOUNG EUROPEAN LARCH.

deciduous cypress (Taxodium distichum), seems to burst out suddenly with the freshness of its young leafage, but the exquisitely graceful growth of the larch makes it the most beautiful tree of the only two deciduous conifers commonly cultivated. To be really beautiful as a lawn tree, a larch must be young, vigorous, and well cared for from its youth upward, and must always have plenty of room about it to develop itself fully; otherwise, it soon loses its branches, and then half its beauty is gone. An old plantation larch is not a lovely object, not even picturesque, as an old Scotch fir generally is; but, planted in good soil in a sheltered spot on a lawn, and perfectly isolated, a larch may be kept in perennial youth, so to speak, and produce a finer effect than half the modern conifers which crowd every garden. I remember seeing last year a grove of young larches on a lawn that greatly impressed me by their elegant growth. They were of different sizes, the tallest being about 30 feet, the shortest about 10 feet, and they were so grouped that the whole mass, numbering about a score, looked as if they were nature-sown seedlings, so informal, yet so effective, was the outline of their tops. The spot was sheltered by a plantation from the prevailing winds from the southwest, and the soil was good, so that the trees were in favorable circumstances. A grove of larches, including, besides the common, the American, Japanese, and others, should be planted in every good garden, on a lawn, or in the pleasure grounds.

CONING BRANCH OF LARCH AND WINTER TWIG.

PALMS FOR ROOM DECORATION.

(CHAMÆDOREAS.)

This genus consists of numerous dwarf growing plants, with, for the most part, slender stems and elegant pinnate or feather-like foliage. In a wild state they are always found growing in comparatively elevated situations under the larger forest trees as underwood, and but rarely in the open. Under cultivation they thrive best in an intermediate house, well shaded and liberally supplied with moisture, and many of them are admirably adapted for room decoration, as, just after the first year from seed, they become extremely ornamental, and their bright, smooth, green leaves are easily cleansed from dust. Even in comparatively small pots they continue to increase in beauty and stature annually. As a matter of course, they should not be allowed to stand close to the windows in severe weather, nor should they be subjected to cold draughts. If the foliage is occasionally sponged and the roots well supplied with moisture, in the form of tepid water, given at midday, few plants excel these chamædoreas as decorative objects, a fact fully recognized in Germany, where they are largely used in this manner. Many of them flower annually, and their long, branching inflorescence adds materially to the interest that attaches to them. As in most instances they perfect their seeds, a supply of young plants can be easily obtained at little expense, which is not the case with the majority of the palm family. Chamædoreas should be potted in a mixture of peat and loam, and liberally supplied with water. Indeed, failures with them are usually traceable to a meager supply of moisture. The first year's seedlings produce broad, simple leaves, deeply divided at the ends, but even in this state they are ornamental. In the second year they begin to develop pinnate leaves, which increase in length and breadth as they get older. In a few instances, however, this broad, deeply cleft leaf (bifid) is the normal condition of the species of which C. geonomæformis affords an excellent example. The Chamædoreas are all natives of America, and the following kinds are among those which we have found to thrive best as indoor plants, viz.: C. graminifolia. This is a slender, grass leaved kind, as its name implies, and it is one of the most elegant of the family. Its leaves are plume-like, dark glaucous green, and when fully developed attain a length of a yard or more. Its branching inflorescence is pendulous, and about a foot long. C. elegans has a more robust stem than graminifolia, and the foliage, which is gracefully arched, grows from three feet to four feet long in fully developed specimens, while the leaflets are some six inches long and about one inch broad, tapering at either end, and bright green. C. sartori resembles elegans, but the leaflets are broader, and do not taper so much toward the base. It has a very hardy constitution, and is one of the best for the purposes indicated. C. arenbergiana is also a very beautiful kind. Its bright, green leaflets are pendent, and taper to a tail-like point. C. wendlandi is another beautiful species, and, perhaps, the most useful of all for room decoration. Its bold, arching green leaves are about a yard long, while the leaflets are some twelve inches in length and two inches in breadth. C. glaucifolia is a slender stemmed kind, with long, arching, feather-like leaves, having a milky glaucous hue on both surfaces. C. geonomæformis attains a height of about four feet, and bears simple, deeply cleft or bifid, strongly ribbed, deep green leaves, which are some nine inches or more in length, and from four inches to six inches in breadth. Its graceful pendent flower spikes add much to the general effect, although the flowers are of the same hue as the leaves. C. ernesti-augusti is also a bifid leaved species, which attains, when fully grown, a height of five feet or six feet. Its stem is about two inches in diameter, and conspicuously ringed by the scars of the fallen leaves. These are broadly sheathing and stem clasping at the base, from one foot to two feet long, cleft for about half their length, serrated at the edges, conspicuously ribbed, and dark green in color. When in flower this little palm is especially ornamental. The male and female flowers are produced on separate plants. In the former the spadix is branched, the numerous long, slender branches being densely clothed with little round orange scarlet flowers. The female plant produces a single (or more rarely a double) thick, fleshy green spadix, studded with numerous bead-like, coral red flowers.—*W. H. G.*

CHAMÆDOREA GEONOMÆFORMIS.

For the foregoing engravings and descriptions thereof we are indebted to *The Garden.*

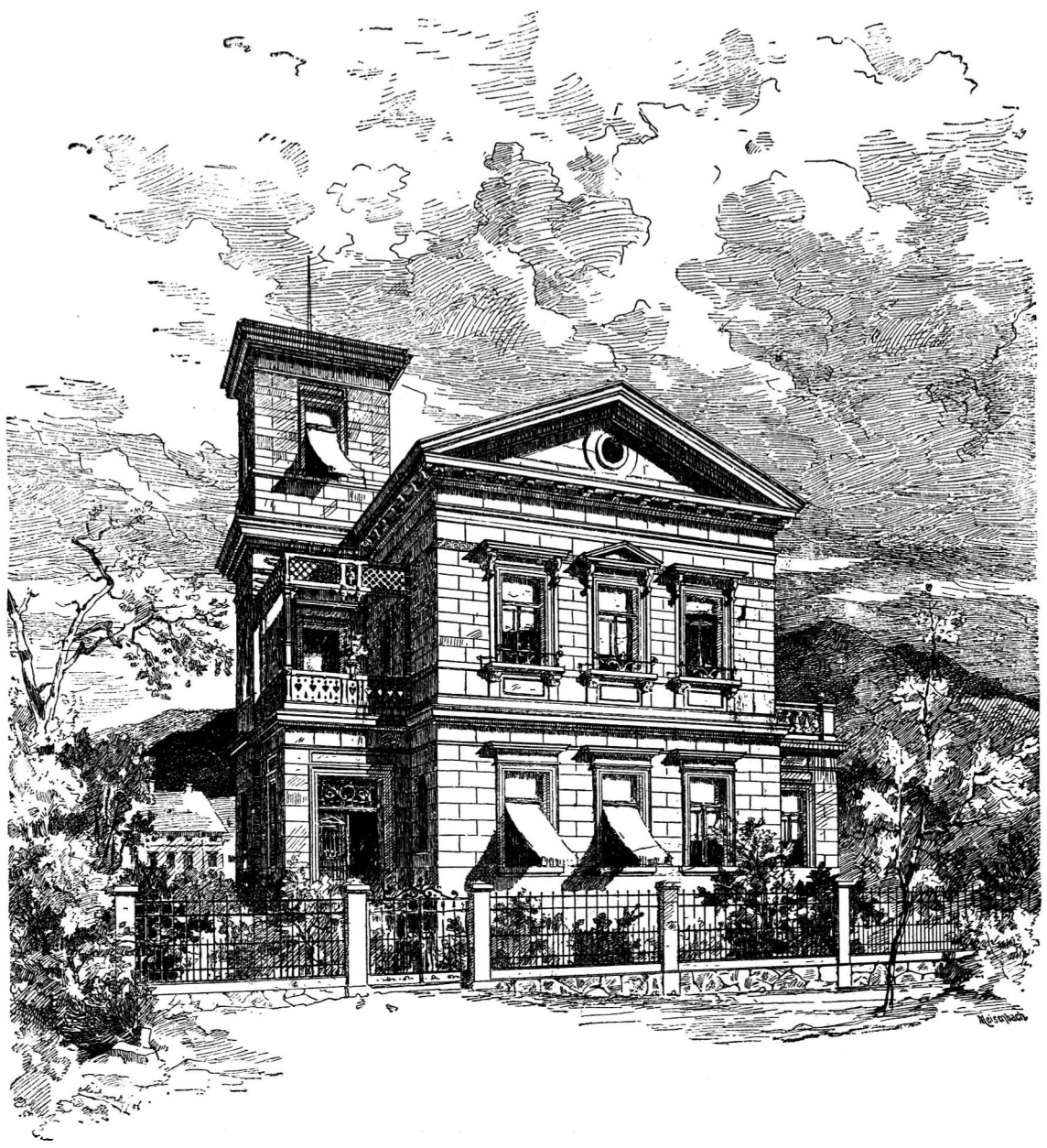
A NEW pocket camera has been invented. It is inclosed in an ordinary silver watch case, and is said to do very good work by the dry-plate process.

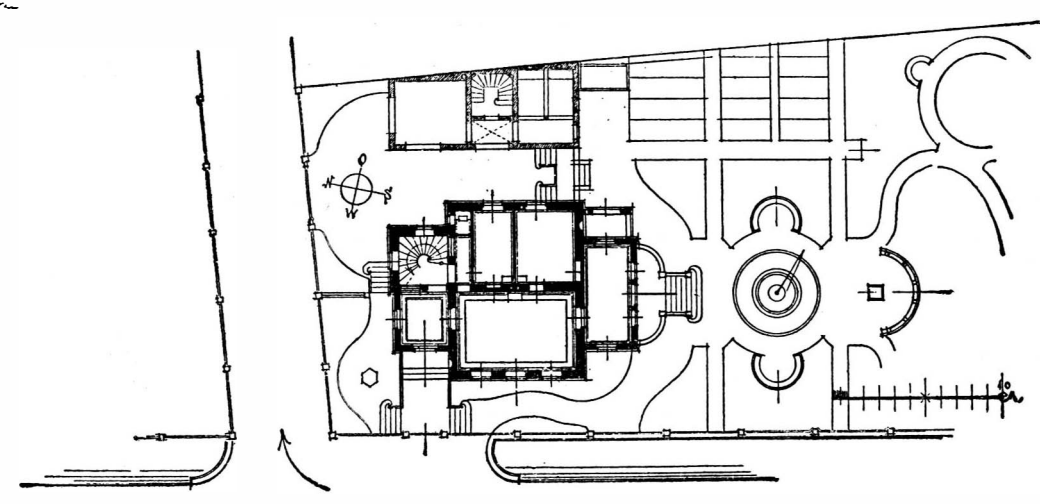
A HUNGARIAN VILLA.

We give a sketch of a country house or villa lately erected in Loebau by Theobald Hofmann, architect, Budapest, Hungary. Our engraving is from *Architektonische Rundschau.*

Cathedral of Notre Dame, Paris.

The cathedral of Notre Dame, Paris, was built about 1177; its length is 414 feet, height 102 feet, and width 144 feet, without accounting for the space allowed to the forty-five minor chapels; it is built in the Gothic style of architecture, in the shape of a crucifix; it has two large square towers that impart an aspect of stateliness to the fabric. The four lofty windows of stained glass are elaborate; the sanctuary and high altar are of marble. On the front are three doors ornamented with antique sculpture; a gallery, supported by small columns, extends from one extremity of the building to the other. The two square towers, above the lateral doors, are each 204 feet high; a staircase, containing 389 steps, leads to their summit. From the towers a splendid view of Paris and its suburbs can be obtained. Victor Hugo laid the tragic fate of the Goblin Monk, in his romance of "Esmeralda," to occur from one of these lofty pinnacles, denominated the South Tower, in which there hangs a bell similar to Big Ben, termed "Bourdon;" it weighs 2,000 lb.; it is 8 feet in diameter, 8 feet high, 8 inches thick, and the clapper weighs 976 lb. The edifice is decorated with pyramids, figures, and obelisks. The roof is covered with lead. Three exterior galleries surround the building; the first, higher than the chapel; the second, above the choir and nave; the third, about the great roof, furnishes a passage. One hundred pillars support the interior vaults; the nave and choir are bordered by a couple of double aisles. Above the vaults of the aisles are spacious galleries, from which all the religious ceremonies are seen. The interior is also lighted by 113 window and three rose lights. The entry to the choir is adorned by two estrades of Italian marble and a handsome grate, raised 5 feet above the pavement. The grate contains four square panes, two of which are fixed; these are surmounted by eight bronze spears, finely worked and tipped with gold; the panes are of Tuscan design, on a blue enameled surface of stars at each angle. The six arches of the sanctuary have handsome grates, crowned with Etruscan frieze; they were constructed of steel after the designs of Fontaine and Percier. In the choir are a pair of pulpits, a double row of stalls, crowned by a carved wainscot, representing the circumstances in the history of St. Mary. To the right are bass-reliefs, executed by De Goulon, Taupin, Goupel, and Bellau. The two pulpits are enriched with bass-reliefs showing the martyrdom of St. Denis, the cure of Childebert I. by St. Germain, Bishop of Paris, from sketches by Masse. Eight paintings depict in the upper section of the choir actions in the life of the Virgin Mary. To ascend the sanctuary are four steps of Languedorian marble, with balustrades of fine Egyptian marble, adorned with two chandeliers, each 7 feet high, the lower portion of green marble, richly gilt. The pillars are of Serancolian marble; the main altar is 12 feet 10 inches in height.





A HUNGARIAN VILLA.

AN excellent home made axle grease is said to be made of two parts tallow, two parts castor oil, and one part of pulverized black lead.

Cast Iron Beams under Repeated Impacts.

The effect of impact and vibration upon structures was a leading object of inquiry with the Commission on the Application of Iron, and the first series of experiments instituted upon this subject was to determine the power of beams to sustain impacts many times repeated. For this purpose sixteen bars were cast, all from Blaenavon iron, No. 2, and five at least of the sixteen were found to be slightly defective at some place where they gave way. Whether these small defects were more numerous than would be found in practice, it would be difficult to determine. Six of the bars were each 15 ft. long and 3 in. square, and placed on supports 13 ft. 6 in. asunder; seven were each 10 ft. long and 2 in. square, and 9 ft. between the supports; and three were each 5 ft. long. 1 in. square, and 4½ ft. between the supports. Of these bars, six were bent through one-third of their ultimate deflection at each blow, and five of them bore each 4,000 blows without breaking. The sixth was broken at a flaw with 1,085 blows.

One large bar, bent by impact through five-twelfths of its ultimate deflection, was broken at a defective place with 1,350 blows. Of six bars bent by blows through half their ultimate deflection, five were broken with less than 4,000 blows each; one with 29; one with 127, etc. The only bar which bore the 4,000 blows was one of the smallest kind, or 1 in. square. Of three bars, one bent to seven-twelfths, and two to two-thirds the ultimate deflection. all were broken, the two latter with 127 and 474 blows respectively. The former required 3,700 blows to break it.

Of ten bars of Low Moor iron, No. 2, each 10 ft. long and 2 in. square, placed on supports 9 ft. asunder, and struck in the middle with long continued impact, as before, four broke at defective places and two at sound ones. Three were subjected to impacts bending them through one-third of their ultimate deflections, and bore the test without fracture; of three bent by blows through half their ultimate deflection, two were broken; those bent through two-thirds were all broken. On the whole, it appears that no bar but one, and that a small one, stood 4,000 blows, each bending it through half its ultimate deflection; but all the bars when sound stood that number of blows, each bending them through one-third of their ultimate deflection. It must, however, be borne in mind that a cast iron bar will be bent to one-third of its ultimate deflection with less than one-third of its breaking weight laid on gradually, and one-sixth of the breaking weight laid on at once would produce the same effect, if the weight of the bar was very small compared with the weight laid on it. Hence the prudence of always making beams capable of bearing more than six times the greatest weight which will be laid upon them.—*E. Hodgkinson.*

Cheap Steel Girders.

As an indication of the way in which steel is supplanting iron for structural purposes, it is announced that a leading Middlesbrough firm, Messrs. Dorman, Long & Co., who have attempted to compete with Belgian makers of rolled iron girders and joists, have determined to practically abandon this branch of manufacture, and to roll only steel girders and joists. It is reported that this decision has been made in consequence of the persistence of the Belgian makers in underselling their English rivals, whereby the market is choked with iron girders and joists of very inferior quality, but offered at a price that suits builders and others to whom iron is iron, so long as it is the required size and is painted red. Messrs. Dorman & Co. have, however, started new works for the manufacture of Siemens-Martin steel, which are calculated for an output, when in full operation, of more than 1,200 tons per week. It is intended to turn out all dimensions and sections of girders and joists, which will carry loads of forty per cent. more than corresponding sections of iron, while the increase in price will only be twenty-five per cent. To show how cheap sections of steel suitable for gas holder and roof work can be made, it may be stated that steel joists up to ten inches deep are quoted at £6; joists twelve inches deep are quoted £6 5s.; and fourteen inch joists £6 10s. at Middlesbrough. The largest sections made at these works will for the present be 15 in. by 5 in. by 5 in. to 20 in. by 8 in. by 8 in. Engineers specifying these steel girders will at least have the satisfaction of knowing what they are getting.

A Good Floor.

A good floor should be—
A test of the builder's skill;
Of thoroughly seasoned lumber;
Without creaking boards;
Without splintering edges;
Without gaping joints;
Without curling section;
Flat as a table top;
Rigid and smooth;
Almost imperceptibly jointed;
Undisturbed when laid;
Laid on straight-edged joists;
Without heading joints;
Laid without showing nails;
Of edge-nailed boards;
Laid on a bed floor.

A good floor is a rarity.

THE METROPOLITAN MUSEUM ADDITION, CENTRAL PARK, NEW YORK.

Under the direction of the present board of trustees of the Metropolitan Museum of Art, not long ago, an appropriation of $350,000 was made to add to the building. Mr. Theodore Weston, one of the trustees, was engaged as the architect, and with his partner, Mr. Tuckerman, prepared plans for the structure.

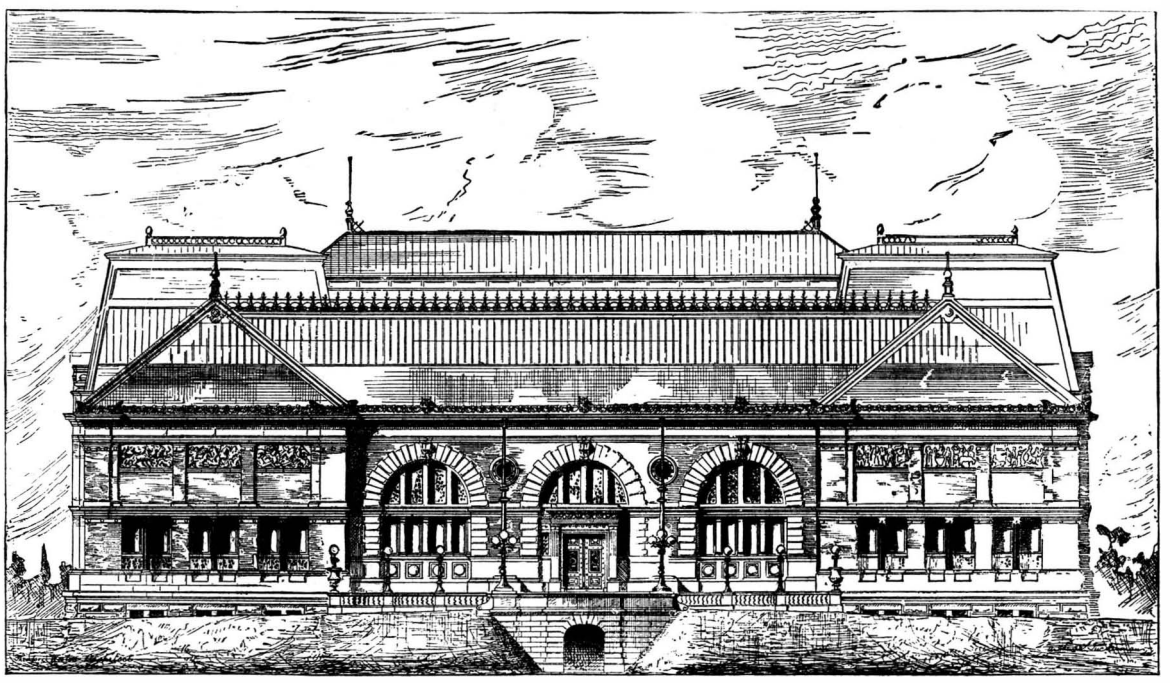
The addition, in connection with the old building, forms a hollow square, the center being an open court across which runs a bridge connecting the two portions of the building.

The intention and aim of Messrs. Weston & Tuckerman has been to provide a building which would be architecturally an ornament to the city and at the same time keep the main idea of the ultimate object of the structure evident.

The treatment is simple and classic, in the modern French school, suggesting the Prix de Rome contests in the Ecole de Beaux Arts, which are famiiiar to all students of architecture.

The approach to the main facade, which fronts toward the south, passes over a terrace 100 feet in depth, and extending the whole front of the curtain, winding away toward the main driveway in front of the two wings. Directly in front of the portal is the covered driveway leading under the terrace to the administrative departments in the basement. From the terrace is the entrance to the building, which has a frontage toward the south of 233 feet. The front is divided into two pavilions and a curtain.

From the base course of granite rise three round, arched openings, the two end ones serving as windows, the center being the entrance portal. The impost moulding running as a string course through the entire length of the building, and returning on the sides, breaks these openings, the upper part of which is filled between the triple mullions with a rich bronze grille. As is the case with all the openings in the face of the building, the reveals are very deep, and consequently cast extremely heavy shadows, giving a richness, tone, and general effect of solidity. In the spandrels between the center and end arches are two bronze portrait medallions in circular granite frames, one of Michael Angelo and the other of Raphael. The double billet moulding running around the inside of the frame is very rich, and gives the bronze a striking effect in conjunction with the selected brick which fills up the remaining space in the spandrels.



THE NEW ADDITION TO THE METROPOLITAN MUSEUM OF ART, CENTRAL PARK NEW YORK.—WESTON & TUCKERMAN, ARCHITECTS.

The window openings and the transom over the entrance are triple mullioned. The effect of the deep reveal of the arches in these openings has been still further heightened by this arrangement of the mullions, causing almost the entire upper portion of the opening to be thrown into deep shadow. The entrance itself is strictly classic in outline and treatment, and with the bronze door executed in heavy relief, and the bronze grilles, both in the door itself and the windows on either side, give strong effect. In the windows in the side wings the reveals are four feet deep. The heavy lintel is supported by a compound mullion, the main feature of which is a detached column of polished black granite. Behind this comes a pilaster of tooled granite. There are three of these windows in the front of each wing. Above the impost moulding running just over the lintels of these windows the space is divided into three recessed panels, in the upper part of which are set three frieze reliefs in Indiana limestone.

In all there will be eleven new galleries added to the museum.

The partitions throughout the building will be of peculiar construction. Instead of studs, a skeleton iron framing will be used, filled in with plaster of Paris and sheathed on both sides with one and one quarter inch spruce, and covered outside of the sheathing with tightly stretched cloth. The object of this arrangement is to present a uniform wall surface upon which pictures may be hung at any point without having to search about for a convenient beam or piece of studding in which to firmly fix a nail or screw.

The galleries are to be lighted by double skylights. The outer roof is glazed over the iron trusses half way down to the gutters, and beneath this glass and iron roof are other skylights, more ornamental in construction, forming the ceiling to the rooms. This arrangement admits of the inside lights being opened at any time of the year without danger from the weather, and at the same time distributing the light in a very good manner.

The building is strictly fireproof, that is, as strictly fireproof as it is possible to make any building, for no matter how it is constructed, its interior arrangements demand the use of materials that fire will burn. The floors are supported upon iron girders, filled between the spaces with beton cement arches. The surfaces of the floors are housed to correspond with those in the old building. The inner rooms and galleries in the addition, and in that portion of the old building fronting upon the court which is faced with imported glazed white brick, receive by reflected light plenty of illumination. For illumination at night a full electric and gas plant will be provided. The whole arrangement of the building is complete. The necessities and exigencies of a building of this kind have been carefully weighed by Messrs. Weston & Tuckerman, and the result should be highly gratifying to them. The treatment is in good, wholesome architectural taste.

For the foregoing particulars and for our illustration we are indebted to the *Art Age*.

In addition to the rich store of art treasures now within the walls of the Metropolitan Museum, it is pleasing to be able to add that one of the principal galleries of this new building is to be specially graced by a magnificent private collection of paintings, the generous legacy of a wealthy lady of New York. "The Catherine Lorillard Wolfe Collection," for so it is to be known and styled, consists of a large number of celebrated works of art, valued in all at half a million dollars.

The collection is a remarkably even one, showing scarcely a single indifferent piece, the examples of each painter being quite up to his best level. Many of the famous modern painters are represented. Meissonier has two large canvases, "The Two Vanderveers" and "A General and his Adjutants," and one water color, "The Sign Painter." Jules Breton is represented by his big "Pardon in Brittany," a peasant church procession. Rosa Bonheur has a Scotch landscape with cattle in it, and her well known picture of a hound. Troyon has a Dutch landscape, with cattle also. L. Bonnat is represented by "The Egyptian Fellah Woman and a Roman Girl on the Campagna." Cabanel painted a full face and three-quarter length portrait of Miss Wolfe for the collection, and a symbolic "Bride of the Church." "The Christian Martyr" is Gabriel Max's, and "The Ford," Fromentin's. Among the others are Bouguereau's "A Girl and a Child," Bangs' "Arabs in a Turkish Café," Piloty's "Wise and Foolish Virgins," Alfred Stevens' "The Japanese Toilet" and "Preparing for the Promenade," Detaille's "The Freebooters in the Woods," Gerome's "The Arabs at Prayer in a Mosque at Cairo" and "An African Chief," Vibert's "The Reprimand" and "The Startling Confession," Bellecour's "The Betrothal," Hans Makart's "After the Ball," Munkacsy's "The Mont de Piete," and Domingo's "A Spanish Interior." Knaus' "Holy Family" is, perhaps, the best known piece in the collection. Knaus had painted the picture on a commission from the Empress of Russia some thirteen or fourteen years ago, and Miss Wolfe saw it in Berlin before it was finished. The Empress would not take it afterward, and Knaus put it aside, declaring that he would never sell it. Miss Wolfe finally got it at a cost of more than $30,000. Among the other painters represented in it are Edward and Theodore Frere, Henner, Jules Dupre, Diaz, J. W. Preyer, Brion, Merle, Chaplain Chevet, Madrazo, Worms, Gallait, Wehrbach, Daubigny, Volon, Andreas and Oswald Achenbach, Verboeckhoven, Riefsthal, Rousseau, and Hamon.

EXPOSITION OF FINE ARTS AT VENICE.

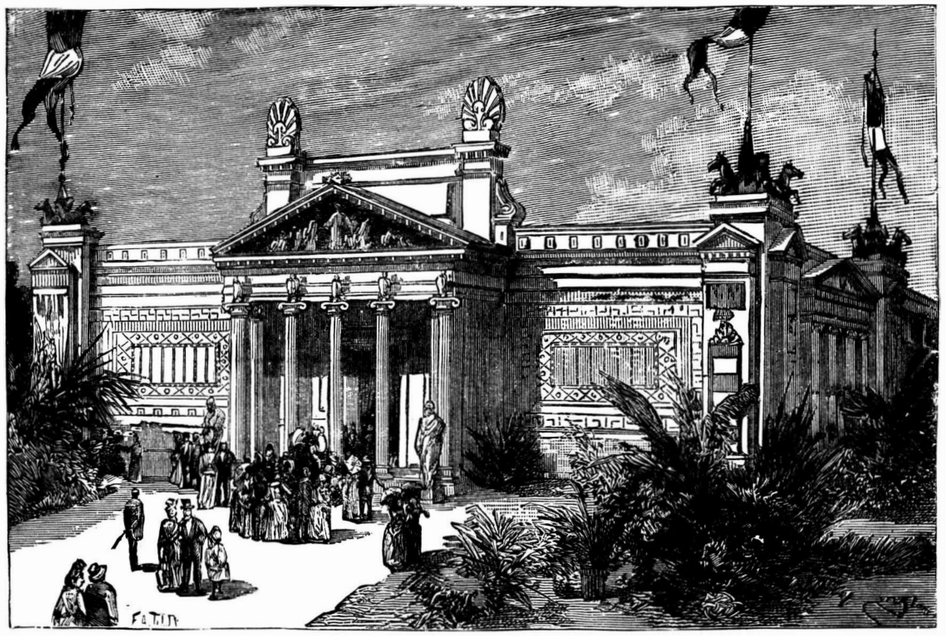
No place could possibly be found better adapted for an exposition of the fine arts than Venice. It would seem almost that paintings and statues must have been especially made to be placed in that city of palaces. The Italians, be it to their honor, are endeavoring to mend the chain of their glorious past, which has been so long broken. After Milan, Turin, Rome, have done so much, this city of the Doges is now trying to inspire a little life into the arts which formerly were held in such high esteem.

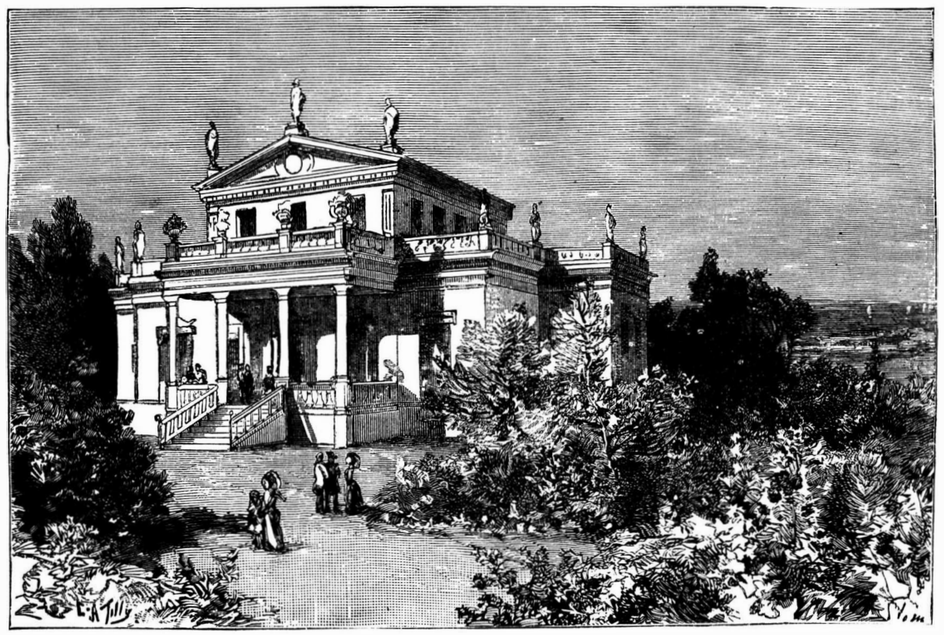
The exposition which will soon be opened at Venice will be held in a palace of a Greek style architecturally, near the Public Gardens, and occupying a plat of land of about 8,000 square feet. It contains forty rooms. It may be reached either by land, by the street San Francesco, where one of the principal entrances is placed, or by gondola or launch on the canal, where the other principal entrance is placed.

The general view of the exposition, which we publish herewith, shows what a magnificent scene will be offered to those who approach the palace by water. Those who are wearied with the promenade through the galleries may rest and regale themselves at the Cafe du Belvedere, which has been built especially for the exposition, but which will be kept after the exposition has been closed. From the terrace of the cafe one may enjoy the beautiful view of the canal, the tide, and sea.—*L'Illustration.*

Root Choking of Drains.

Deep as drainage may be laid, it is never altogether free from the possibility of being put out of order by the roots of trees or of certain kinds of crops, which may penetrate the drains, and form a hindrance to the free passage of the water through them. The roots of the elm, ash, willow, and other trees are known to enter the pipes, and even pass through the ground for several yards to reach them, as if they were attracted by the moisture and air which they find in the pipes, and by the nourishment afforded them there. To obviate this difficulty, it is advisable, where it occurs or is apprehended, to use socket pipes jointed with cement, or to lay the pipes as far as possible from the trees. I have found that embedding the pipes in lime, mortar, or concrete has prevented them from being choked, although close to trees which it was impossible to avoid, and has kept them clear for some years. The roots of some crops, if they should penetrate the pipes, die away when the crops are removed, and are frequently washed out at the mouths of the drains by the strong flow of water through them. Other substances give the drainer a vast amount of trouble in obstructing pipes. Ocherous water, depositing oxide of iron, is a common source of obstruction. It appears to harden and consolidate as it receives air through the pipes, and ultimately chokes them. I have found it best to get at the source of the spring or springs, and conduct the water away by large pipes independent of the general system. Confervæ and parasitic plants will also get into the pipes, grow, and ultimately stop the flow of water through them. Another source of trouble is the percolation of sand into the pipes, which necessitates patience and care in taking them up frequently after being first laid, and relaid, until all the water has run out of the bed, and then laying them in straw and on strips of wood. P.





Entrance from San Francesco Street.

Principal Front of the Exhibition Palace.

Cafe of Belvedere.

EXHIBITION OF FINE ARTS, VENICE.

WOOTTON.

The residence of Mr. Geo. W. Childs is situated about two miles from Bryn Mawr, a station on the Pennsylvania railroad, and ten miles from Philadelphia. It was at this beautiful place that Mr. Childs so elaborately entertained about 800 of the florists and their friends on the 20th of August last, during the convention of the National society; and as only a small proportion of the florists of America were present on that occasion, it may interest many of our craft to know something of this country seat.

Wootton, as it is now called, was at the time Mr. Childs bought it, in 1880, but a rough farm of about 116 acres. This has been converted into park and garden, with a lawn of thirty-five acres in most perfect keeping, and one of the finest "Queen Anne" country houses to be found in America.

Entering at the lodge, one sees on the left a fine carpet bed containing about 25,000 plants, a very striking feature. Leaving this by a gentle curve in the carriage drive we come to the stables and coach houses, fitted up with all modern improvements, almost in front of which is a fine plant of Abies nobilis, sent as a cutting to Mr. C. by Professor Meehan when with the Hayden exploring expedition in the Rocky mountains. At the rear of the stables, and placed as a facing to a fine grove of natural timber, are some large clumps of miscellaneous plants, very interesting to many visitors, as they contain many things not often seen in this present rage for carpet and other formal styles of bedding. In front of these is a fine stream of running water, which is a great attraction to the whole, and planted on one of the natural curves are some handsome clumps of arundo, rivina, and eulalia. Immediately in the rear of these again is a bed of fancy caladiums, which seemed to luxuriate in the partial shade, and made a happy blending between the natural woods and the dressed lawn in front. Passing on up through this glen we come to a grotto of rocks, through which a small waterfall trickles, and in which it is intended to collect every known variety of fern to be found hardy in North America, all of which will be correctly named. Passing on south from this we strike the open lawn, directly facing the house. Here are dotted among lots of choice trees and shrubbery some fine plants of Picea pungens, retinosporas, Taxus canadensis, pinus in variety, etc., which, for the short time they have been planted, are remarkably thrifty trees. These, as well as other similar classes, are very effectively arranged for future development.

In front of the house stands the magnificent vase illustrated and described in the *Florist* of Nov. 1, and above this, on each side of the steps leading to the front door, stand two grand plants of Cycas revoluta and a fine one of Araucaria bidwilli. In close proximity stands a purple beech planted by Madame Nilsson. On the west side of the house is an effective design planted with coleus and other summer plants.

On the gentle slope northwest of the house are situated most of the memorial trees planted by illustrious visitors to Wootton. These are all to be labeled with botanic names, circumstances of planting, etc., thus giving the collection a sentimental as well as scientific interest for the future visitor. Noticeable among them is a fine piece of Picea nordmanniana planted by Mrs. Nellie Grant Sartoris, and in close companionship a fellow tree and a Quercus palustris and Norway spruce planted by the three daughters of the late F. A. Drexel, all growing into nice trees; but those near by, planted by Thos. Hughes and Herbert Spencer, are both dead, which is much to be regretted. There are on this broad expanse of lawn many other trees planted by men of mark, but their enumeration would take too much space. There is one other, however, which probably would interest all who behold it. Standing close to the lower or farm entrance is probably the finest specimen in the country of Carya porcina (common hickory); stretching away from this is a fine avenue of platanus leading to the farm, dairy, and green houses.

The greenhouses are a fine combination of houses built to suit the various classes of plants required for a well-appointed gentleman's garden, and their contents show the skill of its able superintendent, Mr. John M. Hughes, as do all other parts of this fine place. Among the many other choice attractions of the greenhouse, a fine bench of gloxinias was particularly striking.

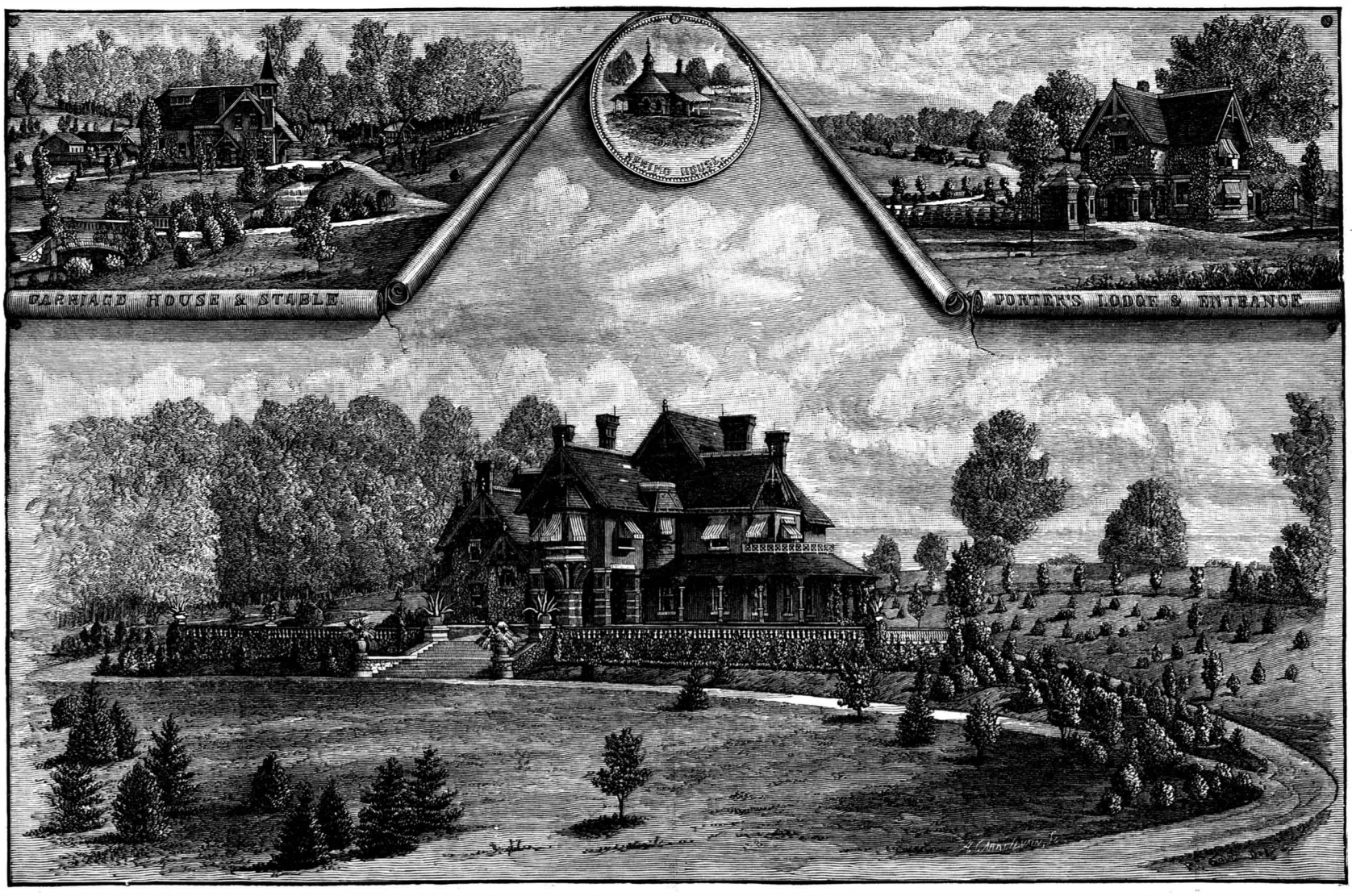
Running at the bottom of the vegetable garden is another fine stream of water, from which is pumped (itself furnishing the power) all the water required for the farm and greenhouses. In the same locality is the dairy, supplied with a constant stream of pure water from a natural spring flowing into a shell presented to Mr. Childs by the late General Grant, and brought by him from Yokohama, Japan. From this shell the water flows gently over beautiful clear white tiling all around the dairy, thus forming a cooler for the milk. Everything is in the most perfect order, and the whole building is unique in every way.

After taking a comprehensive view of this fine place, one is greatly impressed with the splendid results accomplished in the short space of six years. Not only lavish expenditure, but the most refined taste, were requisite for this end, and I only wish that many others with wealth at their command might be induced to become as liberal patrons of horticulture, for by such is our calling elevated and refined. Here the gardener is not treated as a necessary evil, as is often the case, but as a friend and trusted steward, employer and employed mutually considering each other's best interest and happiness.

The accompanying engraving beautifully illustrates the house and part of the lawn near to it, with the fine grove of natural timber in the distance, whose beautiful shade protected the florists and their friends while enjoying the lunch provided by Mr. Childs on the occasion of their visit. But this picture of Wootton, though excellent, does not give a true impression of the harmonious blending of art and nature which is so striking to all visitors. It must be seen to be appreciated.

John N. May.

Summit, N. J. —*Amer. Florist.*



"WOOTTON,"
DELAWARE COUNTY, PENNSYLVANIA.
RESIDENCE OF GEORGE W. CHILDS, Esq.

From Ashmead's History of Delaware County, 1884.

To Transfer Prints to Wood.

The whitewood used being perfectly smooth, should receive a few coats of French polish. The print to be transferred having been dampened with a sponge soaked in spirits of wine, is placed on the wood with a piece of thick cloth over it. A warm iron is then passed gently over the cloth, care being taken not to shift the picture. Keep the iron rubbing backward and forward for ten or fifteen minutes, then take off your cloth and leave it for some hours. Now get some cold water, dampen your finger in it, and rub the paper. Great care must be taken not to disturb the impression. Keep damping your finger as you go on. When you have got the paper all off, you can polish over. Any kind of print will do which is not glazed. Ink impressions are the most easily transferred.

Tree Growth.

The following figures may interest those of your readers who have paid attention to the growth of trees. I have carefully measured these seven trees annually, and give you the sum of ten years' growth.

	Jan., 1878.		Jan., 1887.	
	ft.	in.	ft.	in.
A sycamore	7	½	7	7½
A cut leaved alder	8	6	9	1½
An oak	10	0	10	7½
A Cryptomeria japonica	2	3¾	4	2
A Spanish chestnut that has been pollarded	13	10	15	5
The above trees are in the garden, the two following in the park:				
A Spanish chestnut	12	7	13	7
Another	8	8	9	5

It will be seen that the Spanish chestnuts grow faster than the other trees, and the pollard the fastest of all. The trees are measured at four feet from the ground.—*Wm. Wickham, Binsted-Wyck, Alton, in the Garden.*

CHURCHES OF MODERATE COST.

We present herewith a couple of sketches of churches of moderate cost, for which we are indebted to our esteemed cotemporary, *Building*. The cost of erection is stated in connection with the engravings.

National Association of Builders of the United States.

The first convention of this important body was held at Chicago, March 29, 1887. A full report of the proceedings was given in the March number of the *Building Budget*. The following is the

DECLARATION OF PRINCIPLES.

1. This association affirms that absolute personal independence of the individual to work or not to work, to employ or not to employ, is a fundamental principle which should never be questioned or assailed. That upon it depends the security of our whole social fabric and business prosperity, and that employers or workmen should be equally interested in its defense and preservation.

While upholding this principle as an essential safeguard for all concerned, this association would appeal to employers in the building trades to recognize that there are many opportunities for good associations of workmen, and, while condemning and opposing improper action upon their part, they should aid and assist them in all just and honorable purposes. That, while upon fundamental principles it would be useless to confer or arbitrate, there are still many points upon which conferences and arbitrations are perfectly right and proper, and that upon such points it is a manifest duty to take advantage of the opportunities afforded by occasions to confer together, to the end that strikes, lockouts, and other disturbances may be prevented. When such conferences are entered into, care should be taken to state clearly in advance that this fundamental principle must be maintained, and that such conferences should only be competent to report results in the form of resolutions of recommendation to the individuals composing the various organizations participating, avoiding all forms of dictatorial authority.

2. That a uniform system of apprenticeship should be adopted by the various mechanical trades.

That manual training schools should be established as a part of the public school system, and that trade night schools should be organized by the various local trade organizations for the benefit and improvement of apprentices.

3. This association earnestly recommends all its affiliated associations to secure as soon as possible the adoption of a system of payment by the hour for all labor performed other than piece work or salary work, and to obtain the co-operation of associations of workmen in this just and equitable arrangement.

4. That all blank forms of contracts for building should be uniform throughout the United States.

That such forms of contract, with the conditions thereof, should be such as will give the builder as well as the owner the protection of his rights such as justice demands.

That whenever a proper form has been approved by this association, after consultation with the American Institute of Architects and the Western Association of Architects, we recommend its use by every builder and contractor.

5. The legislatures of the various States should be petitioned to formulate and adopt uniform lien laws, and every organization represented in this association is recommended to use its best endeavors to secure the passage of the same.

6. Architects and builders should be required to adopt more effectual safeguards in buildings in process of construction, so as to lessen the danger to workmen and others.

7. We recommend the adoption of a system of insurance against injury by accident to workmen in the employ of builders wherein the employer may participate in the payment of premiums for the benefit of his employes. Also in securing payment of annuities to workmen who may become permanently disabled through injuries received by accidents or the infirmities of old age.

The next convention is to be held in Cincinnati, on the first Tuesday in February, 1888. The officers for the present year are: President, J. Milton Blair, of Cincinnati; first vice-president, John S. Stevens, of Philadelphia; second vice-president, Edward E. Scribner, of St. Paul; secretary, W. H. Sayward, of Boston; treasurer, John J. Tucker, of New York.

The Vast Sums of Money Expended by Builders.

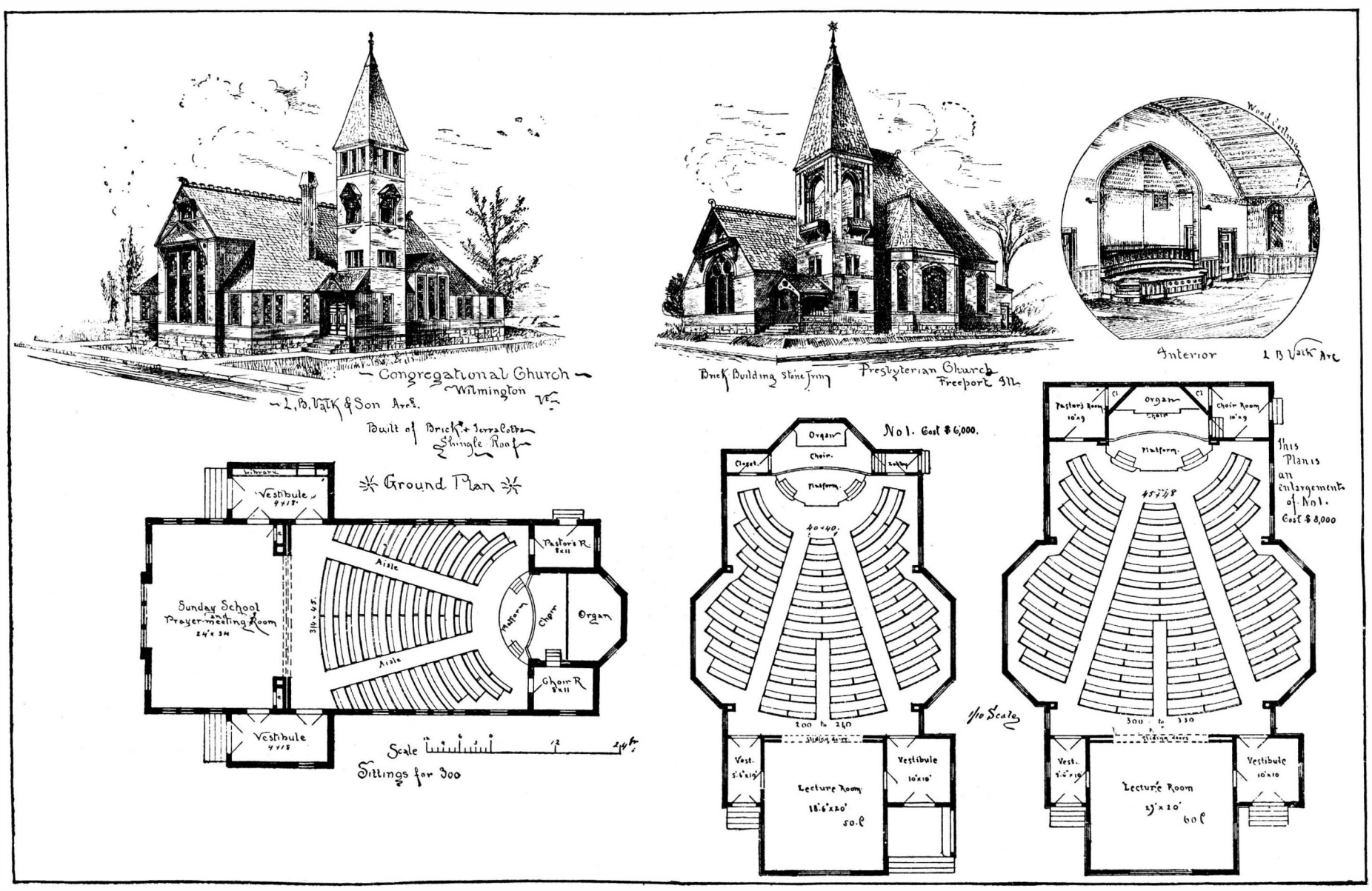
At the recent Chicago convention of American builders, Vice-President Stevens said:

By an examination of the census of 1880, I found that there were in Philadelphia 146,412 dwellings, that they had an average of 5·79 persons to a dwelling. In New Orleans they had 36,347 dwellings, with a percentage of 5·95 persons to a dwelling; in Baltimore, 50,833 dwellings, a percentage of 6·54; in San Francisco, 34,110 dwellings, a percentage of 6·86; in St. Louis, 43,026, a percentage of 8·15; in Chicago, 61,069, a percentage of 8·24; in Boston, 43,944, a percentage of 8·26; in Brooklyn, 62,233, a percentage of 9·11; in Cincinnati, 28,017, a percentage of 9·11; in New York, 73,684, a percentage of 16·37. Now that is a matter of interest.

I then went to our building inspectors to ascertain what had been done in that line for the past six years. I found by an examination of our records that there had been 38,084 building operations, and of these 24,672 were dwellings, which, added to the previous number, makes a total at the first of the present year of 171,084 dwellings in Philadelphia.

I then inquired of our building inspectors as to the value of these building operations. I learned that each one of these comprised a single operation. A large store which we had built there, and which cost $300,000, was a single operation. Each of our churches, some of them costing $150,090 to $200,000, was a single operation. Some of our dwelling houses, costing $75,000 or $100,000, was a single operation. Our factories and our storehouses, ranging in cost from $25,000 to $100,000, were single operations, and so on, down to the humble home of the mechanic, costing possibly $1,000 to $1,200. They assured me that $6,000 for each operation would be a fair average. The figures startled me, and I said: "No; I cannot go away from here with a statement of that kind. I will put it $5,000. You are certainly far above the absolute facts."

Now, $5,000 for each one of those operations makes a sum of over $30,000,000 that is received and expended in a year by the mechanics of Philadelphia. Gentlemen, if we spend $30,000,000 in Philadelphia, what is spent in New York? What is spent in Boston? How much money is expended in Chicago? in San Francisco? in St. Paul? in New Orleans—all over this great country? Gentlemen, $750,000,000 would be a low estimate of the amount of money that is expended by the mechanics who are represented here in convention. Think of it! A sum of money that will exceed the amount which is expended in many of our commercial exchanges, in our boards of trade, among our merchants and our bankers, and we want the public to know it. We want them to respect us, and we want to respect ourselves. [Applause.] If these few words will make any of you go home from here feeling that you can lift yourselves up in your manhood, and feel that standing alongside of the professional man, or the storekeeper, or the merchant, you are part and parcel of the interests of this country, representing a business which exceeds in magnitude that which he represents, it will give you that much more self-respect, and you will receive respect from others in accordance with what you consider of yourselves. [Applause.]



CHURCHES OF MODERATE COST.

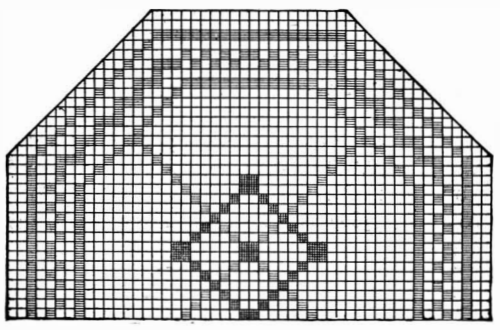
Earthen Drains.

I have never found one solitary case of an earthen drain that was properly laid. And Col. Waring states that in Memphis, where there has been every opportunity and every reason to lay the sewers as perfectly as possible, they found, when they were taken up, that the joints leaked.—*C. F. Wingate.*

END WOOD FLOORING.

Correct notions of health and improved taste have conspired in recent years to bring about a notable change in floor coverings in American houses. Almost without exception, dwellings of the better class now exhibit a sparing use of dusty carpets and a profusion of healthful and cleanly hard wood floors. This tendency has naturally incited invention, and within a decade many new varieties of wooden flooring have been introduced. Some were thick—parquetry; some were thin—wood carpet; but all or nearly all have held to the old method of laying, that is to say, with the side of the grain as the wearing surface.

A little over five years ago, a method of joining wood

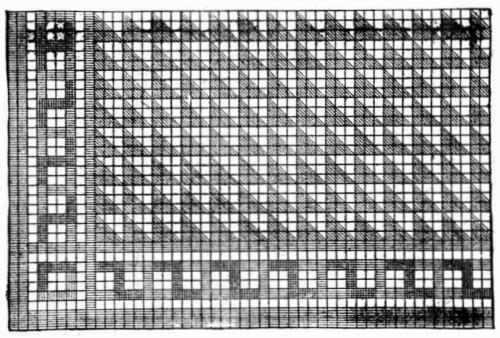


BAY WINDOW OR OCTAGON ROOM.

by molten metal was patented to an American inventor. The first and so far principal application of this method was in the construction of end wood flooring. This consists of pieces of various woods securely joined by metallic or wooden splines and *set on end* in such a manner that the end of the grain becomes the wearing surface.

In the application of joining by molten metal, the blocks of wood are first made as dry as possible, since the presence of even a small quantity of moisture causes the generation of steam when the hot lead is forced into the grooves. The blocks are then jointed to exact size, grooved, assembled into sections sixteen inches square, and showing any desired design by the necessary color selection, and finally joined into a solid section by the introduction of lead made fluid by the requisite temperature.

A more recent invention is a method of joining by

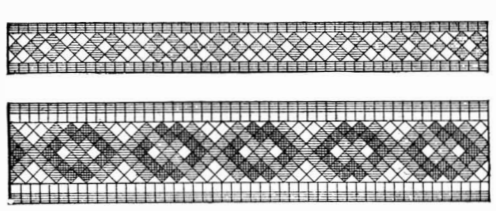


END WOOD FLOORING FOR RECTANGULAR ROOM.

wooden splines after the blocks have been subjected to the same process of drying, jointing, and grooving.

Of the extreme durability of end wood there can be no question. End wood floors in elevator cars subjected to constant wear for over three years still show no signs of loss in thickness, whereas side wood floors, under the same conditions, are found to wear through in a relatively short time. This statement is made on the authority of one of the largest manufacturers of elevators in the country, one who has over ninety end wood floors now in use.

Of the relative beauty of end wood and side wood there might naturally be doubt until the former had been seen. It is frankly admitted that certain pleasing effects are sacrificed by placing wood on end, just as in common quarter-sawed oak you lose one form of beauty and gain another, and with this the further advantage of greater durability and lessened danger



BORDERS IN END WOOD FLOORING.

from shrinkage and warping. So in end wood, unexpected beauties appear, which are no less in degree, though different in kind. Indeed, the beauties of end wood are so novel and so striking that even experts in woodwork marvel at the fact that these were never discovered before. Nearly all the hard woods in common use show beautiful variegations in color, bringing out in some the medullary rays which are otherwise rarely seen except in quartered oak, and exhibiting in all a richer, warmer tone than that shown by the same woods when the side of the grain is exposed.

But probably the greatest merit of all consists in the ease with which end wood floors are kept in order. There has certainly been considerable complaint by housekeepers about the difficulty of keeping hardwood floors in good condition. The fault doubtless lies, in many cases, in want of care and skill. In more cases, however, the complaints are well founded. Side wood floors, with even moderate wear, show such deep indentations from heel nails and furniture, that their original beauty is soon marred or wholly destroyed. End wood, on the other hand, will bear much rough usage, and still retain its perfection of surface, or be restored thereto with little labor.

The principles involved in the construction of end wood flooring, and especially in manufacturing it on a scale so extensive as to make it a practicable industry, were so novel and complex that its development has been slow. Gradually, and in the face of many opposing forces, it has grown into perfection and into public favor. There are now few States in the Union without samples of the work in actual use. Recently two floors were shipped to Greece for the new American school for classical studies in Athens.

This material is manufactured by Wood Mosaic Co., whose works are located on the N. Y. C. & H. R. R.R. in Rochester, N. Y. Their salesroom has now been for about two years at 321 Fifth Avenue, New York City. Here a large display of samples can be seen, and best of all, a floor subjected to hard usage and designed to give practical demonstration of the qualities which they claim for it.

We ought to add that the first cost of end wood mosaic hardly exceeds the cost of thick parquetry of the old style, hence its greater durability makes it in the long run more economical than any other.

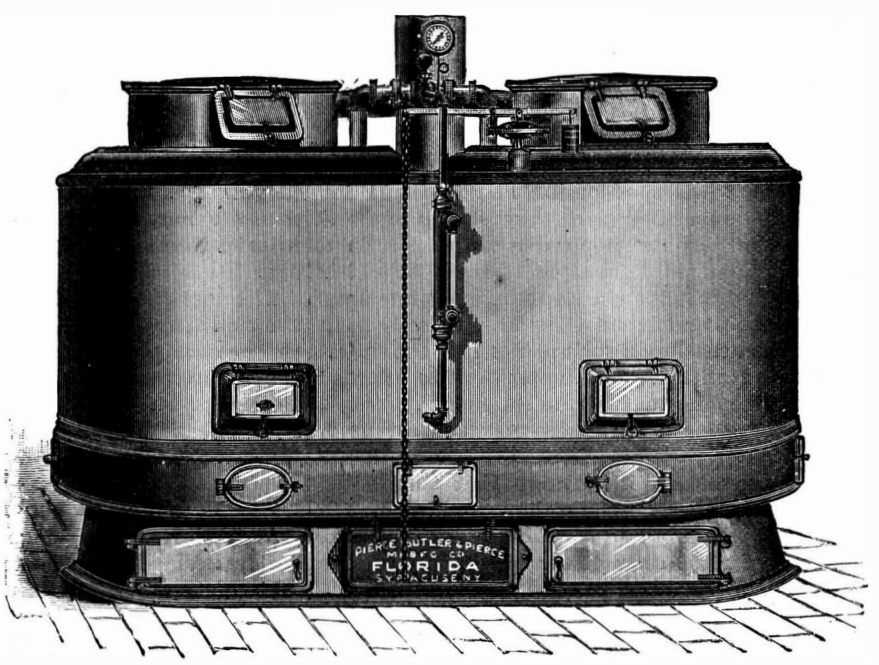
THE FLORIDA STEAM HEATER.

There are at the present time so many heaters of various kinds upon the market that the selection of the most serviceable and economical system often becomes a matter of no inconsiderable trouble and difficulty. A careful consideration of the advantages claimed for the Florida steam heater, made by the Pierce, Butler & Pierce Manufacturing Co., of 14, 16, and 18 Clinton Street, Syracuse, N. Y., is recommended before making a decision.

This firm manufactures these heaters in a variety of sizes, and for all purposes. The one illustrated in the engraving is of an extra large size, and is designed to meet the popular demand for an economical steam heater of sufficient capacity for warming public buildings, churches, schools, apartment houses, and other buildings of large extent. In it the parts are so arranged that two fire pots, two grates, and two self-feeding fuel magazines are operated, either separately or together, as may be required. In cold weather both fires are run, and in mild weather one fire is allowed to smoulder or entirely go out, with a corresponding reduction in the amount of heat generated and in the consumption of fuel. The great difficulty in large apparatus of reducing the heat without waste is thus accomplished in a very simple and satisfactory manner.

Small heaters for private residences and other purposes are manufactured, the characteristics of all the heaters being that they are not made of common cast iron, but of a carefully mixed composition of ores, which combines the maximum of durability with the quality of transmitting the heat in the greatest degree.

The construction of the Florida steam heater may be briefly stated to consist of three or more hollow cast iron water sections of circular form, with six oval shaped return flues, and three waterway openings cast in each. These openings in the sections, when set up, come in line and form the perpendicular return flues of the heater, as well as the steam communication between the sections. The construction has many other points of great advantage, to which we have not now space to refer.

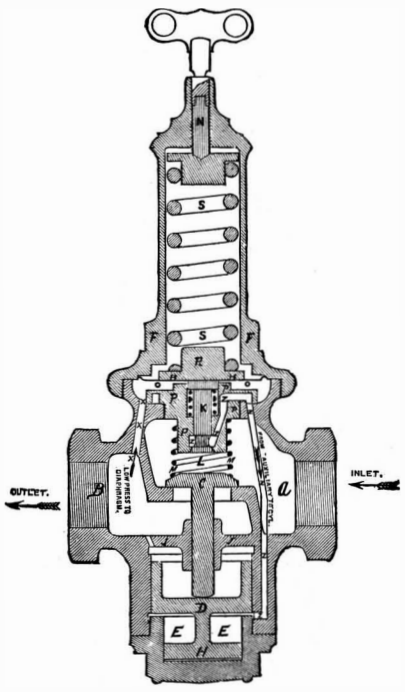


THE FLORIDA STEAM HEATER.

Among the advantages claimed for the heaters may be mentioned these: That it is cheaper, requiring no brickwork; it is sectional and easily handled; it is self feeding or surface burning; it takes up less space in the cellar, being portable; it will carry steam in the coldest weather continuously from twelve to eighteen hours without attention; and last, but by no means least, it is the most economical of fuel of any heater extant.

THE MASON REDUCING VALVE.

In the many positions where it is desired to use a lower pressure than that of the boiler, such, for instance, as for steam heating coils, dry rooms, paper making machinery, etc., the Mason valve will prove of great service in automatically reducing and maintaining an even steam or air pressure, regardless of the initial pressure. They are made in various sizes, up to and including two inch, of the best composition, and above that size of cast iron, with composition lining. The construction of the valve will be sufficiently obvious on reference to the sectional view represented in the accompanying engraving. It will be seen that the



THE MASON REDUCING VALVE.

arrangement of parts is well calculated to do the work thoroughly and efficiently.

The Mason Regulator Co., of 22 Central Street, Boston, are the manufacturers.

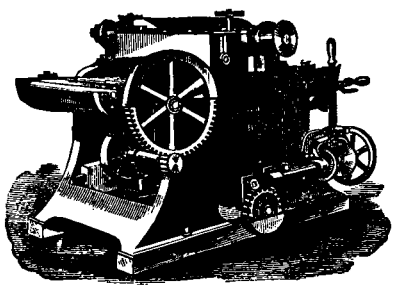
The N. Y. Central Iron Works.

The extensive manufactory of W. B. Dunning, at Geneva, N. Y., which is known as the New York Central Iron Works, is now turning out a large amount of material. Steam engines and boilers of all kinds, from 1 to 150 horse power, machinery, castings in iron and brass, and a very extensive set of steam heating boilers are among the manufactures turned out from this busy and thriving works. Of the number of these last is the patent portable base burning steam heating boiler, an excellent apparatus, having many advantages, which are of so decided a nature that it has been exported on order to England, Germany, Belgium, and even so far as Tokio, Japan.

The reputation of Mr. Dunning as a mechanic and manufacturer has grown during nearly half a century, and the excellent quality of his workmanship and materials is only equaled by the ingenuity of his many improved methods of construction.

To clean chamois leather, rub into it plenty of soft soap, and then lay it for two hours in a weak solution of soda and warm water. Afterward rub till quite clean, rinsing in clean warm water in which soda and yellow soap have been dissolved. Wring dry in a rough towel, pull out, and brush.

WOODWORKING MACHINERY.



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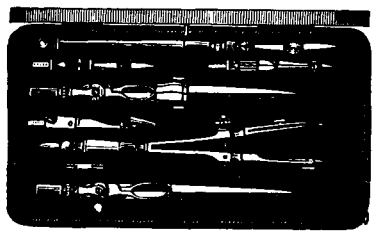

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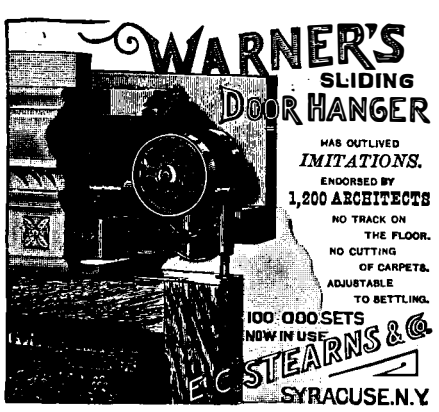

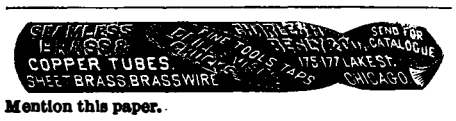

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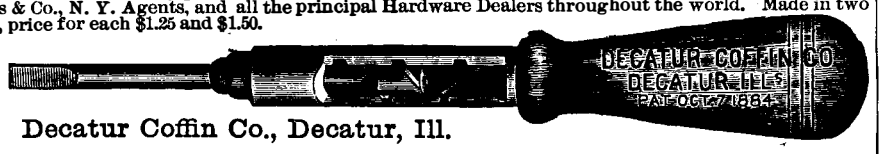

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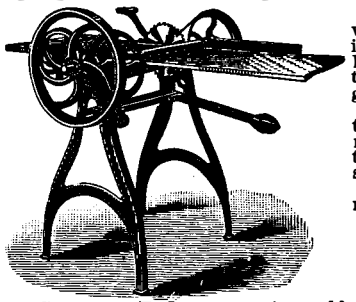

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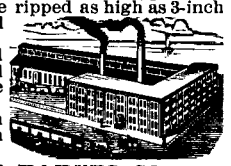

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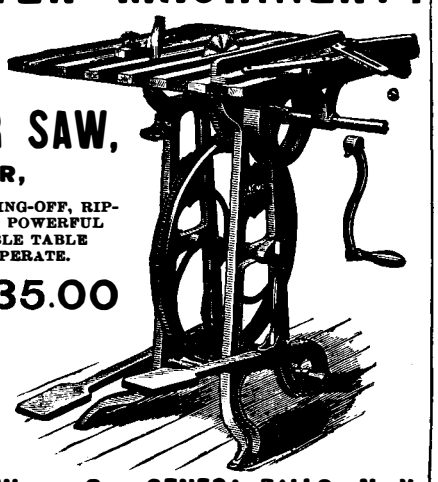

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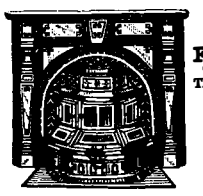

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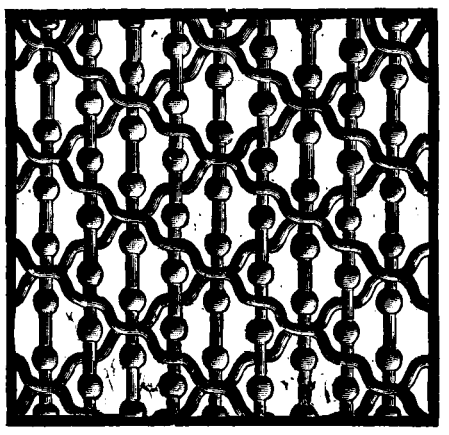

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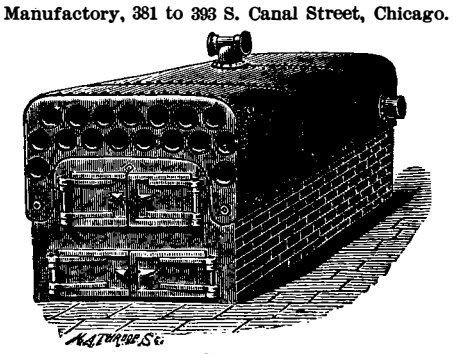

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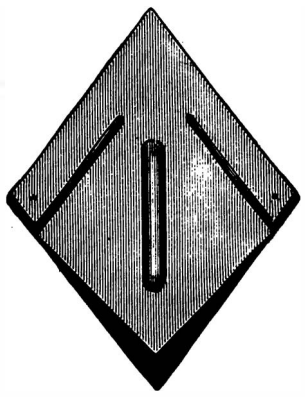

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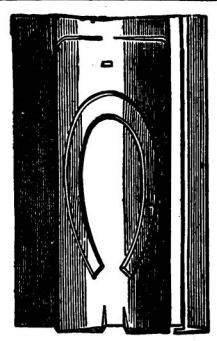

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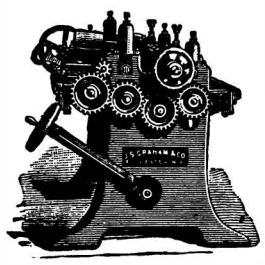

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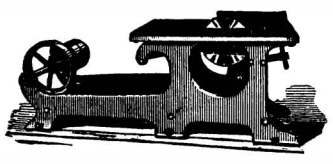
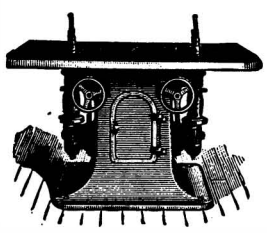


No. 2 Saw Table.



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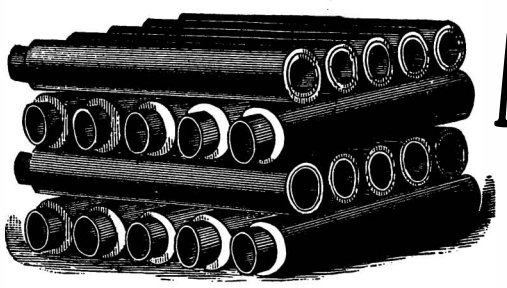

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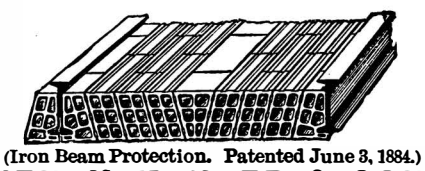

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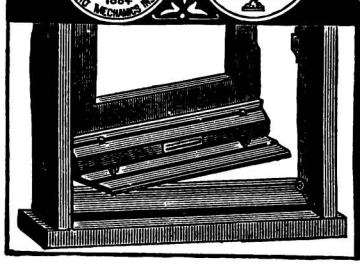

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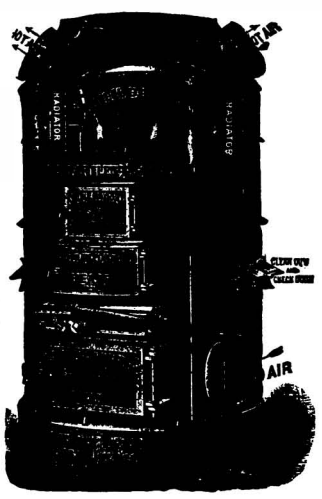

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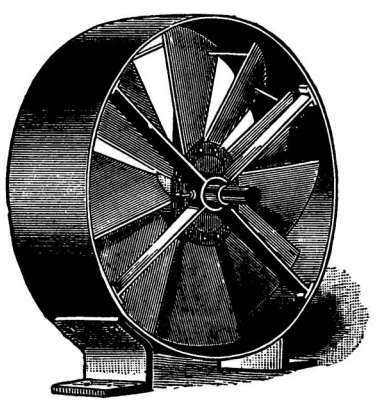

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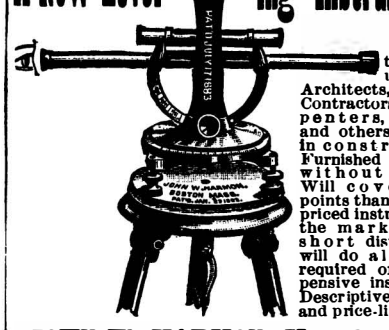

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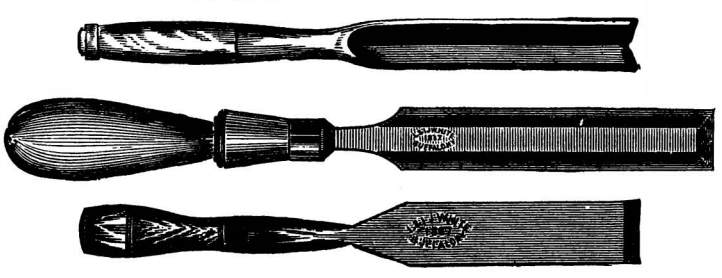

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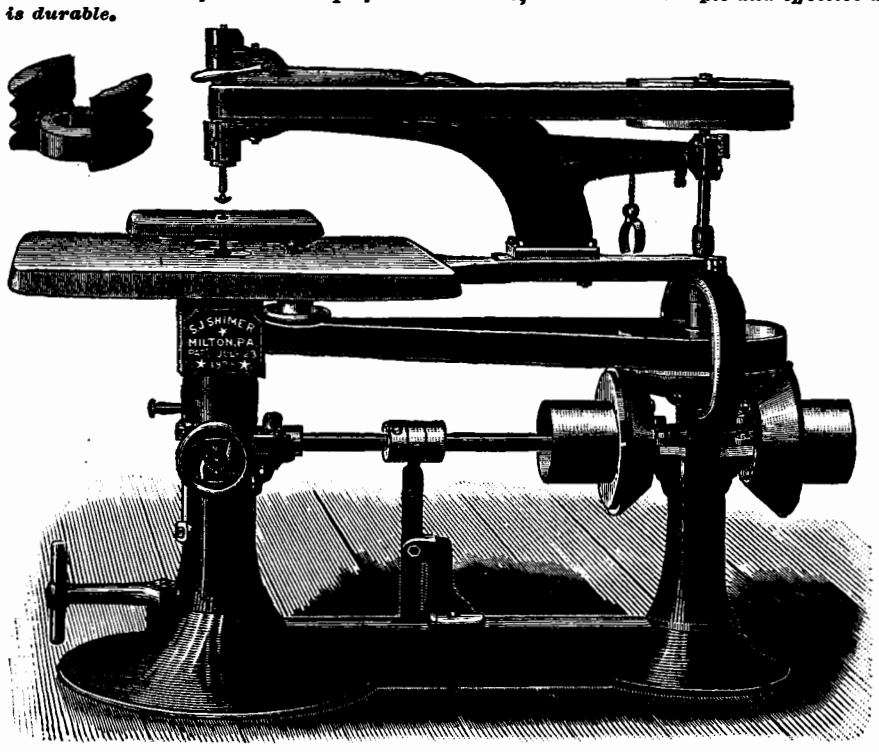

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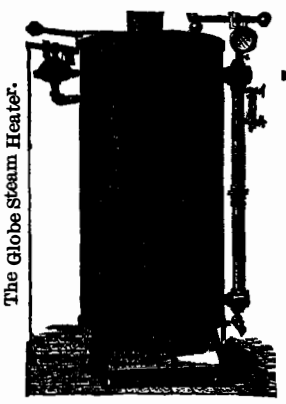

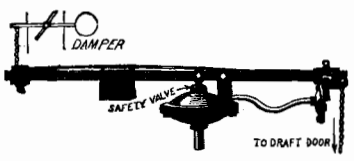

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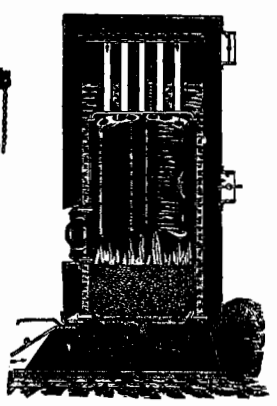

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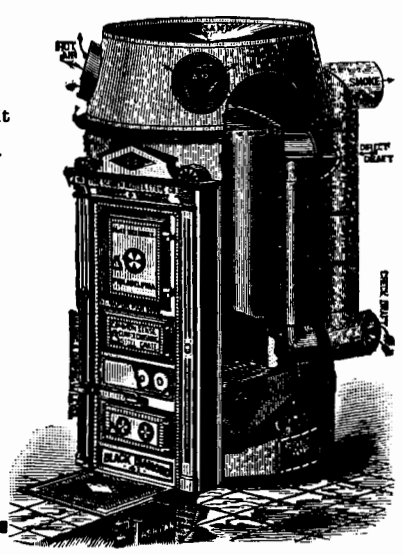

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(1) J. W. S. asks: Will you give me a receipt for a concrete walk made of gravel and cement, and inform me if such a walk will stand freezing or not, and how thick it should be? A. Remove the earth where the walk is to run to a depth of seven inches, and fill therein with loose sand to a depth of four inches. On this spread a thick mortar composed of best hydraulic cement one part, sharp clean sand three parts; the cement and sand to be thoroughly mixed. Take care to use but little water. A walk thus made will stand frost.

(2) J. B. E.—The safe load given in the calculation is for a 2 in. by 2 in. by ¼ in., instead of for a 2 in. by 2 in. by 3-16 in., as it reads. The error was made in using the area of 0·94 sq. in. for a quarter inch section. The area for a 3-16 in. section is 0·71 sq. in. The strength of the 3-16 in. beam is sufficient for a load of 198·3 lb., with a factor of safety of four.

(3) A. D. M. incloses the following slip from the New York *Sun:* Both horses pull equally on the corner, otherwise one horse would pull the other over on to the load; and both pull equally on the load, or the horses and load would move in a circle, and not forward in a straight line. Construct the two parallelograms of forces, and the resultants will balance each other, proving the truth of the above conclusions. He asks how to soften hard water in a cistern? A. In this case the water is rendered hard by the presence of lime water in solution. This could be gotten rid of by various chemicals, but we decline to recommend them, and should prefer to pump the water from the cistern and line the cistern throughout with a thin coating of neat cement, using no lime or sand.

(4) C. H. P., of Scitico, Conn., asks what is the best explosive to use under water in blasting a wheel pit? A. Probably rack-a-rock cartridges. They are inexplosive until dipped for a few seconds in a liquid which by itself is inexplosive. The latter is furnished separately. The immersion lasts but a few seconds, but after that the cartridges should stand for about 15 minutes to permit of a complete absorption of the liquid by the cartridge. Then they are ready for use at any time. They are to be fired in the same manner as dynamite. He also asks if Babbitt metal is injured by heating it red hot? A. Yes; it is. An old moulder would say the "nature would be burned out," meaning a destructive oxidation. Babbitt becomes crumbly and rotten if heated red hot and withdrawn from the fire to cool slowly. Part of its arsenic vola tilizes.

(5) C. J. W. asks: 1. Could I use railroad cinders instead of gravel in making concrete wall? A. Use Hart cement, 3 parts sharp sand, for concrete wall. No cinders. 2. Would it do to dig the excavation for building in side of hill, and put concrete wall against it? A. Yes. 3. Is it necessary to have stone foundation to start wall on? A. No. 4. How thick should wall be to make a good, warm stable? A. Sixteen inches. 5. Please identify mineral sent, and state what it indicates. A. The minerals sent are garnets. They have no value, owing to their poor quality, and do not indicate any valuable deposit.

(6) R. B. asks: Whose mortar colors are durable? We have had our attention called to the Pecora mortar colors, which they make in four colors—black, red, brown and buff. The black in particular is something hard to get—durable and free from acid. A. Made by Messrs. S. Bowen's Sons, of Philadelphia.

(7) W. H. G., of Matteawan, N. Y., desires to know how to find the subdivisions between 3 and 4, or the consecutive numbers, on a slide rule. A. For instance, on the slide B between the numbers 3 and 4 are ten divisions, and each division is one-tenth of the whole space or whatever value is assigned to 3 and 4. Thus, suppose 3 represented 30, 4 would then represent 40, the third space, beyond 3 toward 4, would represent 33, and the seventh space or index mark would represent 37. If, however, 3 and 4 are units, then each division must be read as a decimal. Thirty-three would then be three and three-tenths. Suppose it is desired to multiply 3 by 7·5. Against the 7·5 of A set the beginning of B, then over the 3 of B will be found the 22·5 on A. Division is just the reverse of this operation. The Stanley Rule and Level Co. publish a little book on the utility of the slide rule, which is a perfect exposition of the wonderful automatic calculations that can be performed by means of the rule. The book is sold at a moderate price.

(8) Some one asks if his problem of moments is correct. A. Yes; but the simplest method is by the graphical method. Lay off to any given scale the pull, AC, likewise the force, P, acting respectively at A, in directions AV and AB. Resolve the two forces, AC and AV, into their components, find their resultant. With this resultant combine the force, AB, and its resultant will be the resultant of all the forces. Its horizontal component will be the horizontal resultant component of all the forces, and similarly the vertical component. They can then be scaled off without calculation.

(*Continued on page* x.)

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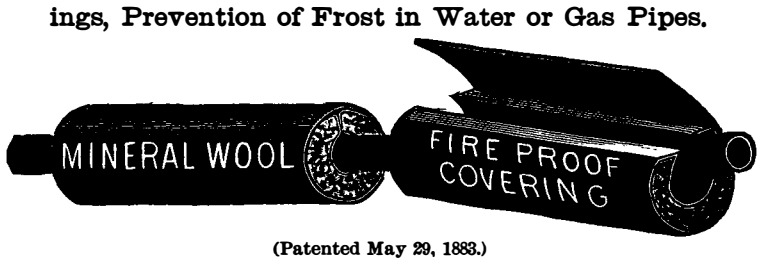

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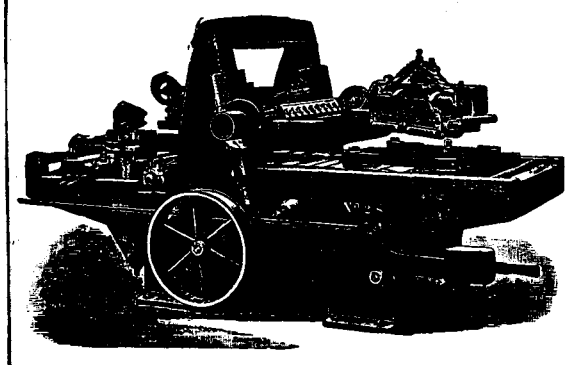

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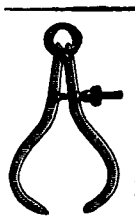

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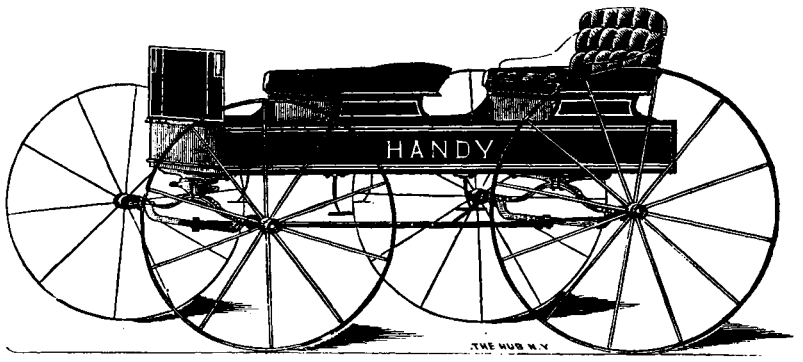

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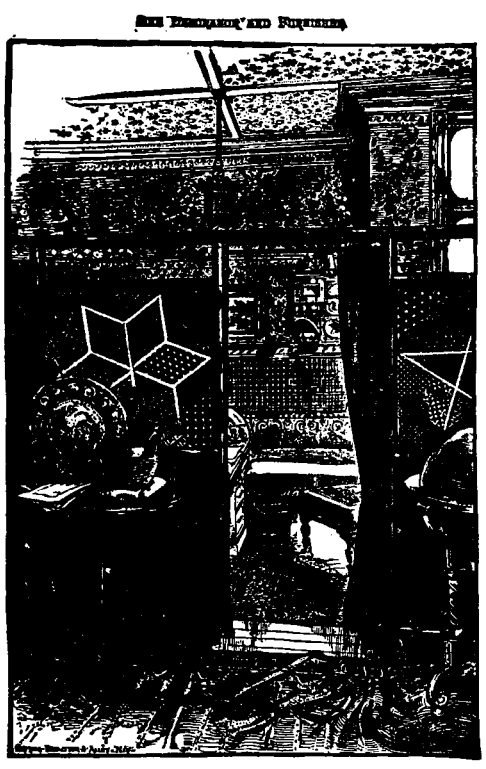

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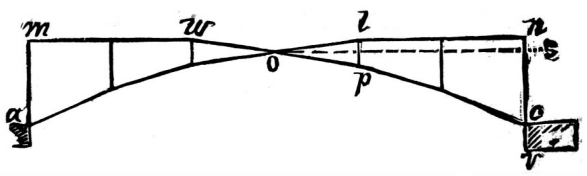
Notes and Queries.

(*Continued from page* vi.)

(9) C. C.—Plans for publication should present a perspective and floor plans, with a good general description of the building, cost, etc.

(10) In answer to B. P. L., of Ridgway, Elk County, Pa., who desires to know how to calculate the horizontal strains at the crown of braced arches, such as will be used in the proposed bridge across the Harlem river, at 181st street. A. I would use the following rule of Trautwine's for calculating the horizontal strain at the crown of a braced arch: Horizontal pressure at center, *o*, of the truss equals the weight of said half truss, and load in tons multiplied by the horizontal distance of said center of gravity from the nearest abutment, and the product divided by the vertical distance from *cs*, the abutment, *c*, to center, *o*, of truss, see drawing. 2. There are six sets of arches,



and the cross-sectional area of any pair of them is 14 ft. by 2 ft., for they are fourteen feet from center to center, and the distance between the upper and lower chord is two feet. The sectional area of the chords, the struts, and ties can be obtained from C. C. Schneider, N. Y. 3. Details of various iron or steel arch bridges have been published in *Engineering News* and *Railroad Gazette*, N. Y. 4. It would be difficult to name a book on iron or steel arches that is printed in plain, untechnical language. The nearest approach to it is Greene or De Volson Wood on arches.

(11) G. C. M.—A rough way of approximating the cost of an ordinary two story frame building would be to call it three dollars per superficial foot.

(12) R. & B., of Philadelphia, ask which is the best paint—No. 1, which will absorb or take up the most oil, or No. 2, that will take up the least oil? A. Generally speaking, the one which will absorb the most oil is best, but it depends upon the substances composing the paint body. No. 2 is the best paint, with a word of caution, but it would depend upon the character of the two paints. If No. 1 was a baryta paint, it would not absorb much oil, but it would be a better paint than No. 2, if the latter absorbed the most oil by reason of its being charged with silica, for the porosity of the latter would make the paint absorbent, but it would be a poor paint, because in time it would flake off, carrying the oil with it. The amount of oil which a paint body will carry and *retain* is what constitutes its value, and not what it may seem to carry and don't retain.

(13) E. W. B. says: Will you please answer this question: A building having a lightning rod, and the ground of the rod running into the ground and coming in contact with the water service pipe, what would be the result if the building should be struck by lightning? A. If the rod were of sufficient size and its lower end were well connected with the iron water pipe, say by soldered joint, the building would probably be protected from lightning. One of the best groundings or terminals for a lightning rod is a good connection with an iron water pipe under ground.

(14) A regular reader from Savannah inquires: Is there such a wood as white mahogany? If so, where does it grow? A. White mahogany grows and flourishes in the vicinity of Park City, Utah. It is from four to five inches in diameter, has a smooth bark and bushy top, and grows from twenty to twenty-five feet high. It is a creamy white wood, its grain is close, tight, and its surface exceedingly hard. It planes smooth and takes a high polish. It is fully as heavy as ironwood or dogwood. Some of it has been used for furniture purposes at Salt Lake City, but the principal demand for it is for wedges in splitting timber. It grows on high land. It does not split easier than red mahogany, but it is much harder. It has no appreciable value in Utah, as the cost of getting it out leaves but small margin for an investment.

(15) T. P. Y. asks: What kind and size of pipe is best to lay from a spring of ordinary soft water, 80 rods distance and 25 feet fall, for family and barn use? Will it be best to take a slight curve from a straight line to save a sag, or not? A. The size of pipe depends upon the quantity of water you may require and the capacity of the spring; 1 inch pipe will give a constant flow of 5 gallons per minute, 1¼ inch pipe 9 gallons per minute, 1½ inch pipe 15 gallons. A galvanized iron pipe is best. It will make no difference about the sag, except as every bend from the straight line increases the friction, and this would not be saved by laying the pipe in a circuitous line.

(16) O. K. L. asks: Can water 80–90° Fah. be forced by means of a hydraulic force pump under pressure 70–80 pounds into the pores of wood which has been cut across the grain in blocks a quarter of an inch thickness and put in an air tight copper or iron vessel? If so, how long a time would it take for the water to reach the center of the blocks of wood a quarter of an inch thick? Would exhausting the air from the vessel (and so in part from the wood blocks) before permitting the water to come in, facilitate the penetration of water subsequently forced under hydraulic pressure, as before described? A. Water should penetrate the blocks of wood, under the circumstances mentioned, in a few minutes. The air in the wood would be compressed to about one-fifth its volume, and would be absorbed by the water, which might take several hours. If the compression is only for a few minutes, it is possible that the air, not being absorbed, would drive out part of the water by its expansion. Exhausting the air at first would insure the immediate penetration of the water under pressure. Fill the vessel with steam, and allow it to condense; this will probably produce sufficient vacuum.

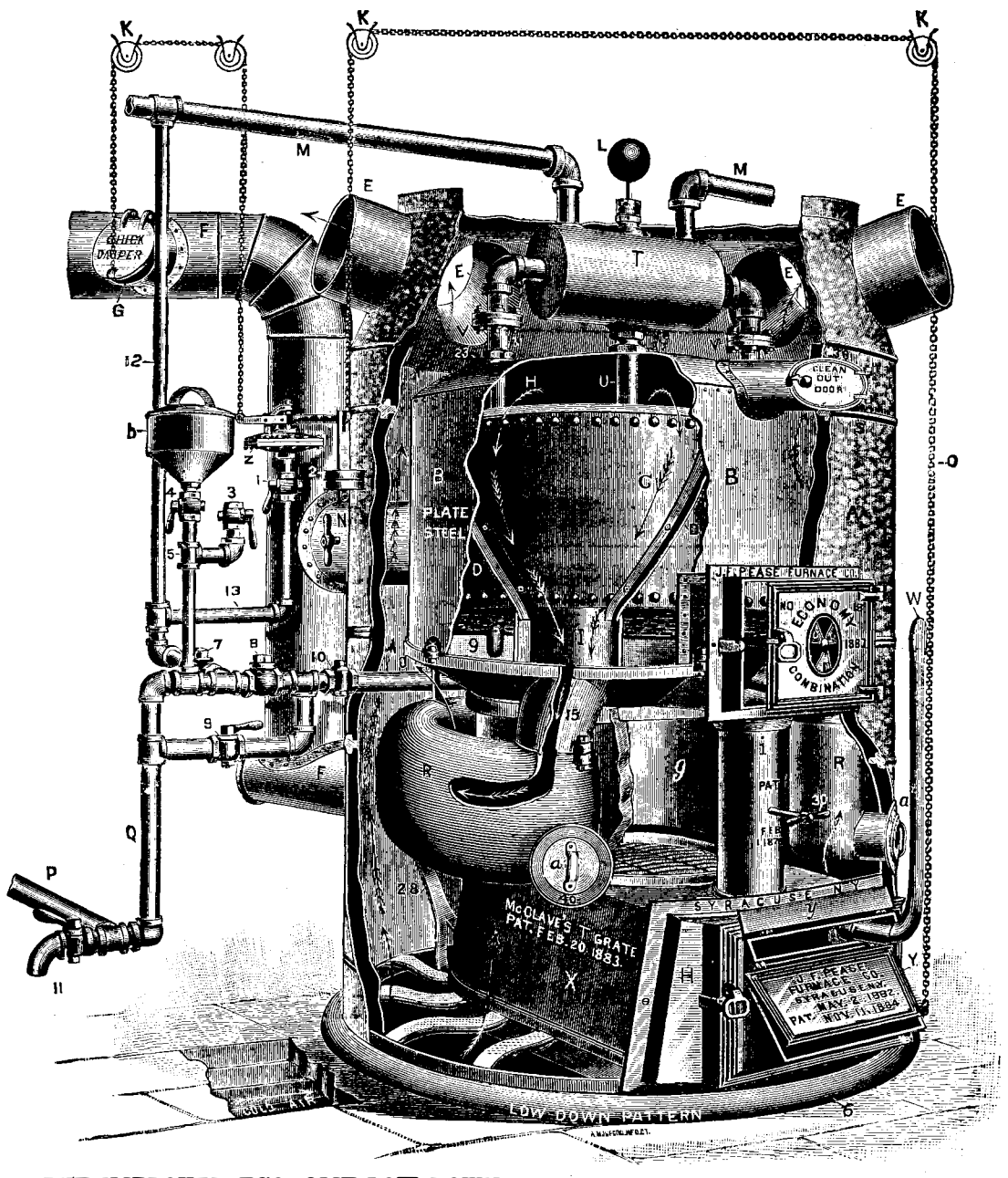
(17) R. H. asks (1) whether there is a firm manufacturing paper pipe of the same material used in making car wheels. Iron pipe rusts so rapidly in our damp, sandy soil that we thought pipe made of paper would answer better. A. We understand that paper pipe, made by rolling thick paper asphalted upon mandrels and cementing by heating, has been made and used in France. We do not know of its being made or in use in the United States. Galvanized iron pipe is now used generally underground except for the larger sizes, in which cast iron is preferred; both are durable. 2. Would also like your opinion as to whether or not water can be drawn through a 3 inch pipe a distance of 3,000 feet with gradual elevation of 25 or 27 feet with steam pump. Our factory is about that distance from a lake and about that height above the level of it, and we would like to know if we can draw our supply of water from the lake, as our wells are almost dry. A. Yes; but you will have some trouble in getting the water started in so long suction.

(18) J. B. asks (1) a receipt for a No. 1 harness polish. A. Alcohol 1 gallon, white turpentine 1½ pounds, gum shellac 1½ pounds, Venice turpentine 1 gill. Let them stand by the stove till the gum is dissolved, then add sweet oil 1 gill, and color as you wish with lampblack. 2. A receipt for a whitewash that will not crack or peel off the walls of the engine house or brick. A. The following receipt for whitewashing, sent out by the Lighthouse Board of the Treasury Department, has been found, by experience, to answer on wood, brick, and stone nearly as well as oil paint, and is much cheaper. Slake ½ bushel lime with boiling water, keeping it covered during the process. Strain it, and add a peck of salt dissolved in warm water, 3 pounds ground rice put in boiling water and boiled to a thin paste, ½ pound powdered Spanish whiting, and a pound of clear glue dissolved in warm water; mix them well together, and let the mixture stand for several days. Keep the wash thus prepared in a kettle or portable furnace, and when used put it on as hot as possible with painter's or whitewash brushes. 3. Is there any difference in the time at which different electric alarms go off, for the same alarm on one circuit? We have two circuits connected with a four circuit repeater; we have left the question to you to decide. A. Practically the gongs all strike at once; but theoretically there is a difference, that gong which is furthest off striking last. The difference in time cannot be measured, it is so infinitely small.

(19) L. S. asks for a formula for a stain, and method of applying same, that will make a good imitation of red cedar, on elm or other light colored woods. A. Either of the following will probably answer: 1. Boil ½ pound madder and ¼ pound fustic in 1 gallon water; brush over the work, when boiling hot, until properly stained. 2. The surface of the wood being quite smooth, brush over with a weak solution of aquafortis, ½ ounce to the pint, then finish with the following: Put 4½ ounces dragon's blood and 1 ounce soda, both well bruised, to 3 pints spirits of wine, let it stand in a warm place, shake frequently, strain, and la on with a soft brush, repeating until of proper color; polish with linseed oil or varnish.

(20) H. P. T. asks: What is the cause of and remedy for discoloration of slate roof? The roof is something on the French style, topped out with a tin roof. Can it be rust or the paint used in painting the tin? It gives the slate an extremely bad appearance. Thinking it was iron rust, as the roof had been previously neglected, I tried acetic acid, etc., on the slate, but it had no apparent effect on it. A. Try oxalic acid 1 part, crystallized water 6 parts, by weight. Wash the slate with a swab and the acid, then wash with clean water. Oxalic acid is poison, and a powerful eradicator of stains.

(21) J. M. E. asks directions for making a good varnish for paint that will stand the weather for doors, or if there is such a varnish. A. To make a good varnish is a trade in itself. Purchase a wearing body varnish, the make of any well known manufacturer.



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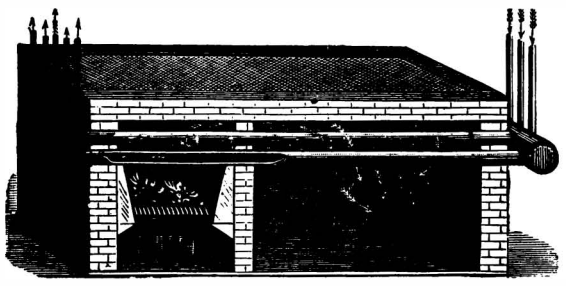

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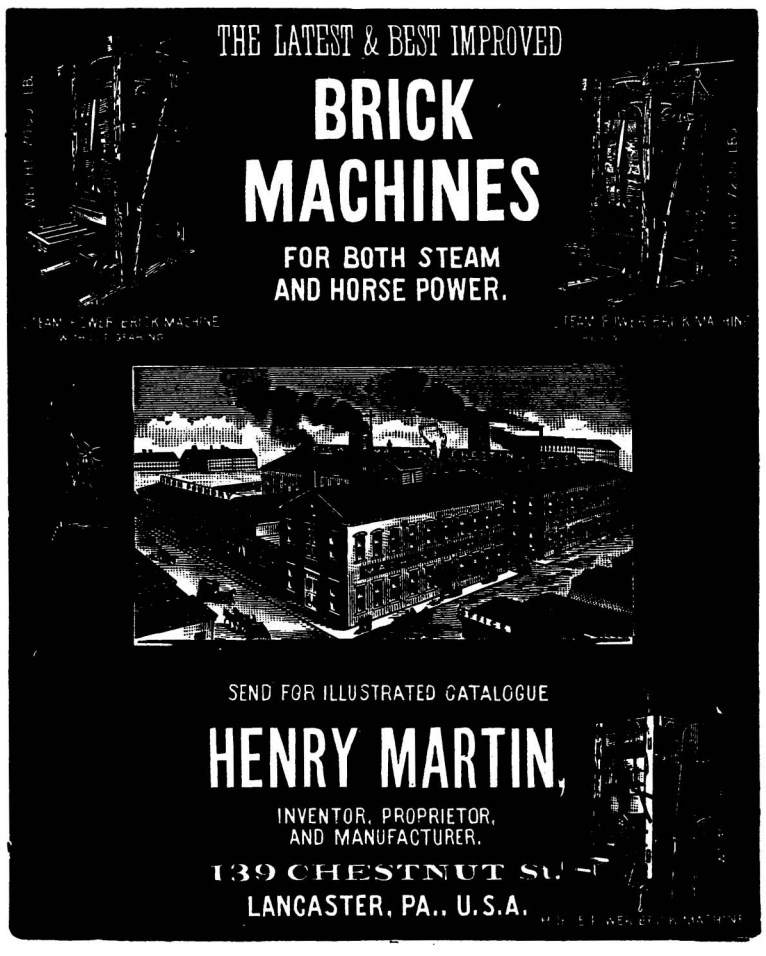

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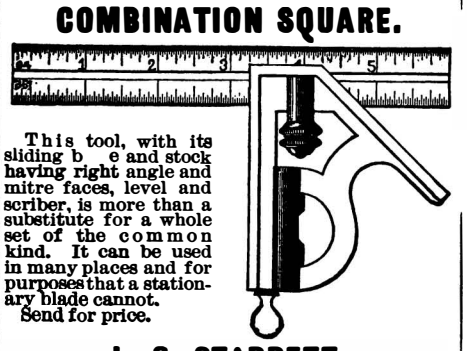

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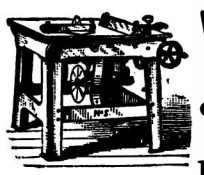

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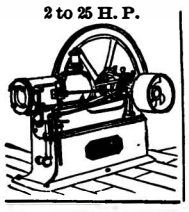

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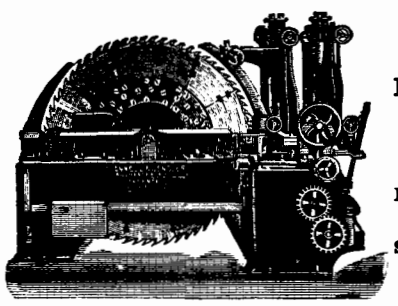

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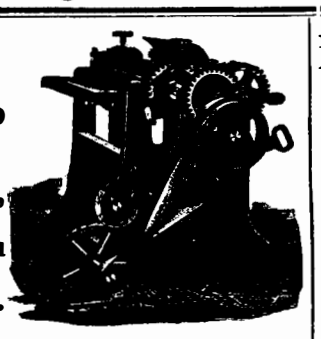

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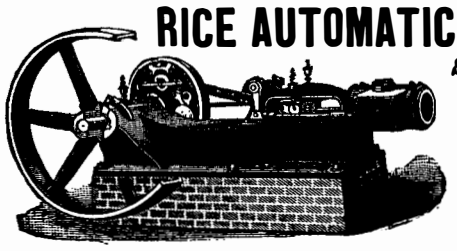

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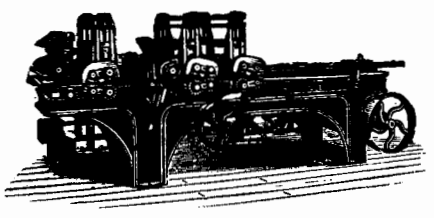

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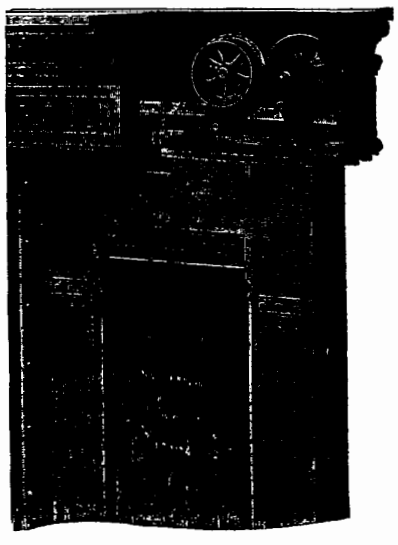

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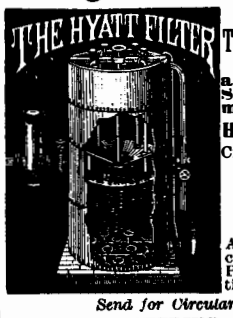

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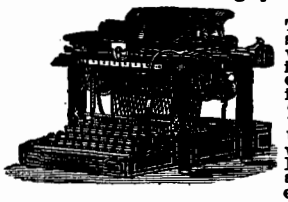

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