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ARCHITECTS AND BUILDERS EDITION.

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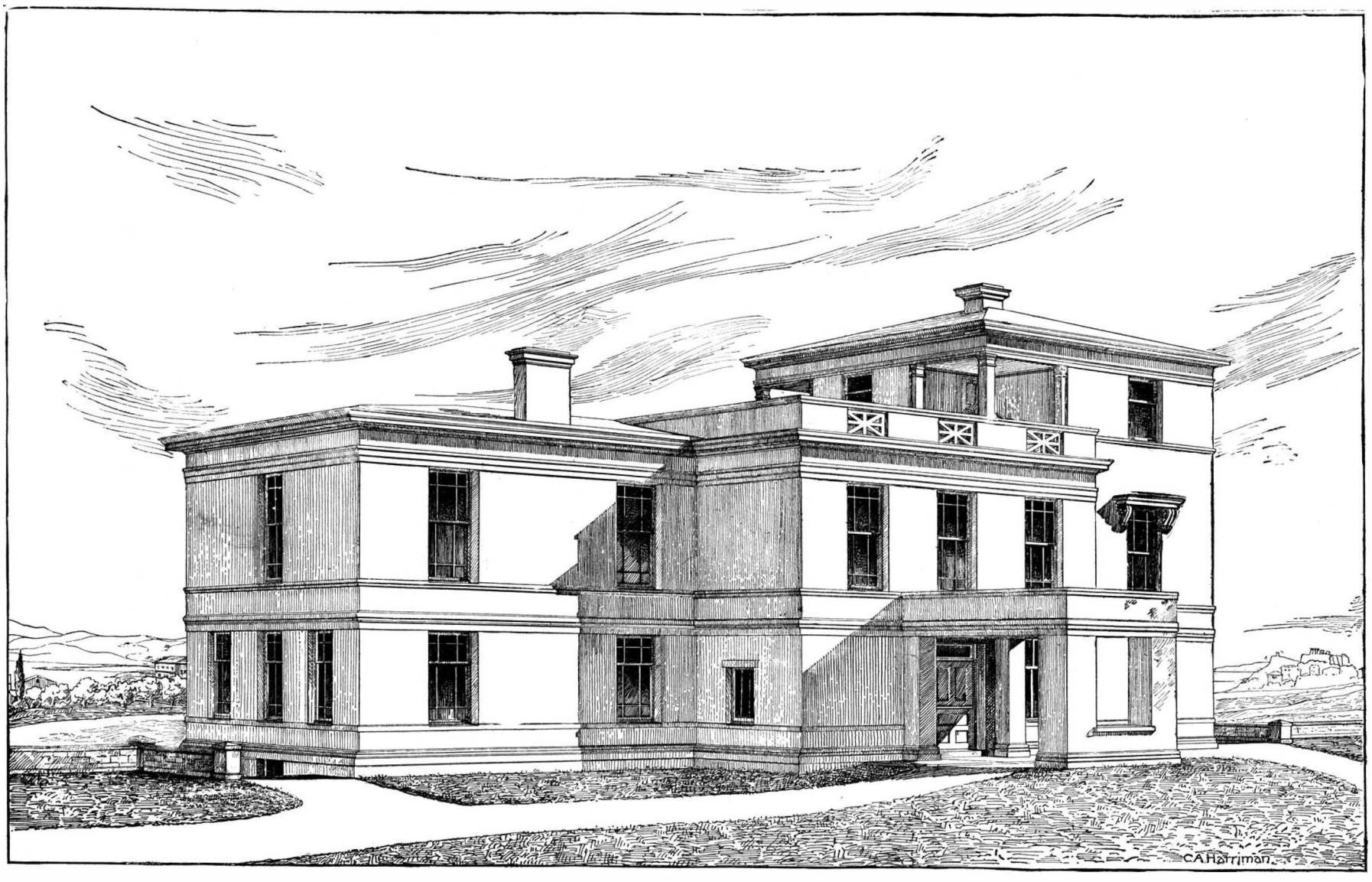
THE AMERICAN SCHOOL AT ATHENS.

In presenting a view of the building now erecting for the *American School of Classical Studies at Athens*, we desire to call attention not so much to the building itself as to the enterprise of which it is to be the seat. It is an undertaking of which every American may be proud, whether he regards the noble ends it has in view or the distinctively American method in which it is carried on. While other nations have founded in Greece schools for special archæological research, France having its school and Germany its institute, the American school aims to quicken, from the original fountain head, all those currents of life which had their origin in Greece, and which constitute the intellectual life blood of modern civilization. Here the student of the history, art, and literature of antiquity may, upon the field of their first triumphs, learn the better to understand them in making acquaintance with the scenes amid which they arose and the objects of which they treat. The country itself is the subject matter of a history and literature which can never be fully understood, and hence never taught with fullness of understanding, unless a visit to Greece has made it familiar. This, at any rate, is the testimony of those who have tried it. Says Professor Goodwin, the first director of the American school: "The whole literature of Greece is full of passages which can be fully appreciated only when they are read or remembered on the spot, in full view of the scenes which they describe. Where else than in Athens can the noble verses of the Attic poets, in which they celebrate their beautiful home, be so thoroughly understood? The historic scenes on which one looks down from Mount Pentelicus are far more vivid to the eye than years of study can make them We have here unfolded before us a map of Attica such as no Kiepert can draw for us. . . . What a change is effected in every student's mind when first he can substitute the glorious panoramas which he beholds from the Attic Hills, from Ægina, or from Salamis, for the maps which have hitherto represented these scenes to his mind!"

These advantages are even greater to the student of art, achæology, and architecture than to the student of history and literature, the matchless remains of art with which the country is covered surpassing nature itself in interest and charm. But Greece is the most inacessible of European countries, and hitherto these privileges have been enjoyed only by an occasional student, traveling well out of the beaten path, to find himself without guidance or companionship in a field where guidance and companionship are specially needed. This want the American school will now supply. That the want has been felt, and that an actual demand exists for just these opportunities, the brief experience of the school has already sufficed to prove. Over a score of students have already availed themselves of its privileges. "These students," says a writer in the *Century Magazine*, "are now instructors and investigators in their own land, and have brought back the enthusiasm for their work which is so strengthened by the seeing of the eye, the touch of the hand, and a general experience of classic lands. One of them, by the generosity of Miss Wolfe, was enabled to extend his researches to Asia Minor, from which he brought away a collection of over nine hundred inscriptions, which, in the opinion of the great European epigraphists, is second to no other in historical value, and will, when edited and published, add great luster to American scholarship in the person of Doctor Sterrett."

The school is now supported by the annual contributions of no less than sixteen American colleges, which take turns in sending out an Annual Director. But it is obvious that this is but a temporary experiment, to try the ground; and the trustees of the school, of which Mr. James Russell Lowell is chairman, are proposing presently to obtain for it an endowment sufficient to support a Permanent Director. Dr. Charles Waldstein, of New York, now Director of the Fitzwilliam Museum at Cambridge, England, will become director of the school in the autumn of 1888, provided a sufficient sum is secured by that time.

The building contains a home for the Director, and in a wing, shown on the left of the drawing, rooms for half a dozen students, more or less, on the lower floor, and above, a large library. For this, fifteen hundred carefully selected volumes are already in hand. Close by is the English school, founded in imitation of our own, and already ready to enter into friendly rivalry with it. The best relations obtain between the two schools, the students of each frequenting the exercises of the other. As the director of the British school is the eminent architect, Mr. Penrose, it will be seen that for students of architecture the opportunities of study now opened are beyond all comparison with what has hitherto existed. The design for the American school was prepared by Professor Ware, of Columbia College, and the building is going up under the supervision of Mr. S. B. P. Trowbridge, a graduate of the Department of Architecture in the School of Mines, and now a student in the Athens school. It will be finished during the coming summer. It stands on the southern slope of Mount Lycabettus, on the eastern outskirts of the city, in ground given to the school by the Greek government, and commands a prospect of surpassing beauty.



THE AMERICAN SCHOOL OF CLASSICAL STUDIES AT ATHENS.

Strength of Brick Walls.

The question of strength of brick walls is often discussed, and differences of opinion expressed. The following is one of the rules given: For first class buildings, with good workmanship, the general average should not exceed a greater number in height than three times its thickness of wall in inches, and the length not to exceed double the height, without lateral supports of walls, buttresses, etc., as follows, for safety:

Thickness.	Safe Height.	Length.
8½ inch walls	25 feet.	50 feet.
13 "	40 "	80 "
17 "	55 "	110 "
22 "	66 "	130 "
26 "	78 "	150 "

Where the lengths must exceed these proportions, as in depots, warehouses, etc., thickness should be increased, or lateral braces instituted as frequently as practicable.

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THE

Scientific American,

ARCHITECTS AND BUILDERS EDITION.

$2.50 a Year. Single Copies, 25 cents.

This is a Special Trade Edition of THE SCIENTIFIC AMERICAN, issued monthly—on the first day of the month. Each number contains about forty large quarto pages, equal to about two hundred ordinary book 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.

A special feature is the presentation in each number of a variety of the latest and best plans for private residences, city and country, including those of very moderate cost as well as the more expensive. Drawings in perspective and in color are given, together with full Plans, Specifications, Costs, Bills of Estimate, and Sheets of Details.

No other building paper contains so many plans, details, and specifications regularly presented as the SCIENTIFIC AMERICAN. Hundreds of dwellings have already been erected on the various plans we have issued during the past year, and many others are in process of construction.

Architects, Builders, and Owners will find this work valuable in furnishing fresh and useful suggestions. All who contemplate building or improving homes, or erecting structures of any kind, have before them in this work an almost *endless series of the latest and best examples* from which to make selections, thus saving time and money.

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The fullness, richness, cheapness, and convenience of this work have won for it the **Largest Circulation** of any Architectural publication in the world.

An Increase of Trade will necessarily accrue to all Manufacturers and Dealers whose establishments are conspicuously represented in this important edition of THE SCIENTIFIC AMERICAN. Terms for advertising very moderate. A card of rates sent on application.

Back Numbers.—At present we are able to supply to new subscribers all the back numbers of this journal from its beginning, in November, 1885. Each number is accompanied by a sheet of colored plates and a sheet of details. Price 25 cents per copy.

Bound Volumes.—Volumes 1 and 2, being for the year 1886, including the whole work, from beginning to close of past year, may now be obtained at this office, or from Booksellers and Newsdealers. Price, bound in paper, $1.50 per volume. Two volumes per year. Forwarded to any address.

Including all the separate diagrams and engravings of construction details, the two volumes present not far from two thousand illustrations. The reading matter covers a large variety of useful and excellent subjects, interesting to every one. No architect, builder, contractor, engineer, or householder can afford to be without this splendid work. It is full of useful information, and its illustrations have a permanent value for suggestion and reference. It never grows old or useless.

MUNN & CO., Publishers,

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CONTENTS

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

(Illustrated articles are marked with an asterisk.)

Acoustic hints..... 92
Birds, incendiary..... 71
Black birch..... 76
Building Employers' Protective Association..... 81
Business house and residence*.... 90
Cathedral of Mexico*.....91, 94
Church of moderate cost*..... 82
Color Works, Summit, the..... 71
Coloring of houses, artistic..... 92
Cottage, a $1,000*.....84, 91
Cottage adapted for future enlargement*..... 68
Cottage, stone and brick* 78, 79
Door hangers, sliding*..... 93
Dwelling for an elevation, design for*..... 81
Feed water heaters, exhaust, Wainwright*..... 92
Flooring maple 82
Floors and ceilings, ancient and modern 71
Floors, roofs, etc., filled with mineral wool*..... 73
Furnace, improved*..... 93
Gate, ornamental, design for*..... 80
Grano-metallic stone..... 80
Grate and open fireplace* 74
Heating by combination of water and steam 92
Home, an East Orange, N. J.*..... 69
Hot water apparatus for warming dwellings*..... 93
Hotel, summer, design for* 88, 89
House, country, English*..... 91
Ice house*..... 93
Iron, old..... 90
Jointer, pedestal, improved*..... 92
Lantern, telegraph..... 72
Lawn, a quick..... 91
Monument, Grant*..... 85, 86, 87
Mortar, use of, during frost..... 88
Nail set, diamond point*..... 85
Oils, to bleach..... 88
Plans and specifications..... 93
Plaster work, ornamental*..... 76
Plumbing, hot water*..... 77
Plumbing, tests of, in Minneapolis*..... 72
Porch, entrance*..... 72
Pulpit, Gothic*..... 78
Real estate title insurance..... 70
Redwood logging in California..... 80
Residence, a $3,000*.....82, 83
Roofs, slate..... 78
Roofs, water-tight..... 90
School, American, at Athens*..... 67
School, manual training, Chicago 90
Shingles in modern architecture.. 85
Tent, improved*..... 93
Trousers stretcher, Weston's*..... 74
Vaults, elliptical, joints in, laying out*..... 77
Walls, brick, strength of..... 67
Water tests, easy..... 74
Windows, Mexican..... 74
Wood measuring rack, adjustable*..... 85

Building Plans and Specifications.

In connection with the publication of the BUILDING EDITION of the SCIENTIFIC AMERICAN, Messrs. Munn & Co. furnish plans and specifications for buildings of every kind, including Stores, Dwellings, Carriage Houses, Barns, etc. In this work they are assisted by able and experienced architects. Full plans, details, and specifications for the various buildings illustrated in this paper can be supplied.

Those who contemplate building, or who wish to alter, improve, extend, or add to existing buildings, whether wings, porches, bay windows, or attic rooms, are invited to communicate with the undersigned. Our work extends to all parts of the country. Estimates, plans, and drawings promptly prepared. Terms moderate. Address Munn & Co., 361 Broadway, New York.

A COTTAGE ADAPTED FOR FUTURE ENLARGEMENT.

A problem of almost every day occurrence is the alteration and enlargement of existing buildings. A dwelling may be erected by a man for the accommodation of his small family, and a few rooms be quite sufficient for his wants. But, with increasing years, his family augments, and he finds it necessary to either build a new house or to enlarge his old one. There are, generally, many reasons why he should do the latter. The individual and family associations connected with the old house render him anxious to preserve it in detail as far as possible. Then, on the score of economy, he will wish that the old structure should be utilized.

To make extensive additions to a house under these circumstances is not, as a rule, easy; but that, with a little foresight, provision may be made for such a contingency, is shown by the design represented in the colored plate accompanying this number.

Here we have a house complete in itself, and pleasing in appearance, which may be readily added to without in any way interfering with the existing building, or necessitating the waste of material. This would be effected by building on the left hand wall. Exactly how it is proposed that it should be done will be shown by full drawings in a future number. As it is now represented, the little house would be a convenient and attractive one.

Below is an estimate and bill of quantities, showing the cost of the house to be $1,819.37. These prices are based upon the high current value of labor and materials in New York and its vicinity. In many localities the house might be erected for a good deal less.

The full specification given below, and the sheet of detail drawings and elevations clearly indicate the precise construction of the building.

This design has been specially prepared for the SCIENTIFIC AMERICAN by Mr. Christopher Myers, architect.

ESTIMATE AND BILL OF MATERIALS, AS PER SPECIFICATION BELOW.

MASON'S WORK, ETC.

		At.	
92	yards excavating	$0 25	$23 00
43	perches stone	4 50	193 50
	Cement bottom	....	15 00
2	piers in cellar	3 50	7 00
4	outside piers	3 00	12 00
2	stoop stones	4 00	8 00
2	chimneys complete	37 10	75 00
5	window sills in cellar	....	4 00
	Cellar steps and copings	....	20 50
726	yards plastering	40	290 40
	Cistern	....	40 00
	Cesspool	....	20 00
	Drains, as specified, complete	....	20 00
	Total		$728 40

CARPENTER'S WORK.

Timber Bill.

No. of Pieces.	Size.	Description.
1	6″× 8″×20′=	80 trimmer.
3	3″× 8″×12′=	72 sills.
1	" ×16′=	32 "
1	" ×24′=	48 "
1	" ×14′=	28 "
1	" ×30′=	60 "
8	4″× 6″×22′=	352 posts.
2	" ×20′=	80 "
3	4″× 4″×16′=	64 ties and plates.
3	" ×14′=	57 feet ties and plates.
1	" ×24′=	32 " " " "
6	" ×12′=	96 " " " "
2	" ×19′=	50 " " " "
20	2″×10″×16′=	540 " beams.
36	" ×21′=1,260	" "
10	2″× 9″×16′=	240 " "
18	" ×21′=	567 " "
20	2″× 6″×21′=	420 " rafters.
19	" ×16′=	340 " " and collars.
6	" ×18′=	180 " "
1	3″× 6″×16′=	24 piazza.
1	" ×22′=	33

4,547 feet spruce at per M. worked..$28 00 $127 32

425	2″×4″×12″ studs = 3,400 feet hemlock	24 00	81 60
800	feet hemlock boards for roof, put on finished	20 00	16 00
800	slates, put on, per foot	7	56 00
2,000	feet sheathing and paper, put up	22 00	44 00
1,500	feet siding, at per M	35 00	52 50
600	" shingles on side, at per foot.	6	36 00
200	" main cornice and gutter	30	60 00
100	" band course	20	20 00
130	" water table and piazza fascia	10	13 00
50	" piazza gutter cornice and plate	30	15 00
2	back piazza columns	....	3 00
1	short post on back piazza	....	$2 00
10	feet rail and balusters, back of piazza	$0 20	2 00
13	" filling in back piazza	30	3 90
2	turned columns front piazza	2 25	4 50
1	" short column	....	2 00
13	feet rail front piazza	30	3 90
6	brackets for same	25	1 50
100	feet piazza floor, ceiling, roof trimmed	....	25 00
	Stoops, lattice, steps, etc., complete	....	18 00
7	cellar windows complete	....	12 25
13	windows on first story	8 00	104 00
11	" " second story	7 00	77 00
4	" " third "	5 00	20 00
2	flights of stairs complete	....	75 00
	Cellar stairs	....	4 00
300	feet of surbase	....	12 00
6	closets complete	....	18 00
	Front door complete	....	10 00
7	doors, first story	5 50	38 50
6	" second story	5 00	30 00
4	" third "	4 50	18 00
	Pump and sink	....	25 00
	Incidental expenses	....	60 00
			$1,090 97
	Mason's work, as above		728 40
			$1,819 37

SPECIFICATIONS.

Specifications and Drawings.—The specifications and drawings are intended to co-operate, so that 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 and set forth, to the true intent and meaning of the said drawings and specifications, without any extra charge whatsoever. The drawings in connection with this specification are intended to provide for the completion of the entire carpenter, mason, painter, plumbing, slating, tinning work, etc., and everything mentioned in this specification.

Quality.—All materials used to be of good quality, free from all defects impairing their strength and durability. All timber, except where otherwise specified, to be of good, well seasoned spruce.

MASON'S WORK.

Excavate cellar to average depth of about 3 ft., the soil to be put in a separate pile for future use. Other dirt to be roughly leveled off at sides, and in front of house. Cistern and cesspool earth to be left in heaps.

Foundation Wall.—To be 16 in. thick, laid up with quarry stone, of good size, to the height of 7 ft. in the clear. Angles and corners to be plumb and true, perfectly level on top. No footing course under foundation wall. Build and excavate for piazza piers at least 2 ft. 6 in. deep.

Bluestone.—Furnish bluestone sills for all cellar windows.

Stone Walls.—All stone wall to be laid with sharp sand and lime mortar, using small quantity of cement. Stone work to be pointed inside and out. The outside to have cut cement joints. Furnish and set bluestone cellar steps with brick risers and brick walls, and capped on top. Piazza piers to be brick.

Chimneys.—Build chimneys, as shown on plans, of good, hard Jersey brick, laid in good sharp sand and lime mortar. Select best bricks for topping. Chimneys to have Portland cement caps moulded on. Build brick piers under girder.

Lath and Plaster the entire first, second, and third stories. Mortar to be made in best manner for first class work, well put on, hard finish, to be gauged high. First and second stories to be three coat work, to wit, scratch coat, brown, and hard finish. Attic and closets to be laid on and hard finished.

Thimbles.—Furnish and set all necessary thimbles for chimneys.

Stoop Stones.—Furnish and lay on good foundation two good stoop stones of proper size.

Cistern.—Build cistern of common brick, 9 ft. by 9 ft. in clear. Manhole in top, with bluestone to cover. Cement inside in best manner, and warrant perfectly tight. Place stone at bottom for water to strike on.

Cesspool.—Build cesspool, where directed, about 50 ft. from house, of rough stone laid in dry, with stone at top 5 ft. by 6 ft. in the clear. Do all necessary excavation, and lay 3 in. drain tile from foundation wall to cesspool, with cemented joints.

Drain.—Do all necessary excavation, and lay 3 in. tile from discharge of leaders to the cistern. Cement joints, and fit into cistern all complete.

Chimney Flues.—All joints in chimney flues struck smooth. Do all necessary patching after other trades are through, and leave the house in good order all complete.

CARPENTER'S WORK.

Sizes.—Girder to be 6 x 8 in.; sills, 3 x 8 in.; plates and interties, 4 x 4 in.; posts, 4 x 6 in.; first and second floor beams, 2 x 10 in.; third tier 2 x 9 in., all 16 in. on centers; rafters, 2 x 6 in.; hip and valley rafters, 3 x 8 in., 24 in. on centers; all studding 2 x 4 in., 16 in. on centers.

Framing.—Frame the building in the strongest

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manner, in accordance with the drawings. All joints to be closely fitted and the frame mortised and tenoned together. Fasten with spruce pins well spiked.

Floor Beams.—Each tier of floor beams to have one row of bridging, accurately cut and well nailed at each end. Beams to be doubled under partitions running parallel. Headers and trimmers all double.

Studding.—All studding placed 16 in. on centers, door and window studs to be double bridged once on each floor. Partition studs to rest on partitions below where possible, and not on the floor beams.

Sheathing.—The entire frame, from sill to plate, to be sheathed with 1 in. rough hemlock boards, put on diagonally, and well nailed at every post and stud. This to be covered with No. 30 Manila building paper, well lapped and laid under door and window frames.

Flooring.—First and second floors to be laid with narrow spruce flooring, well driven together and nailed to each beam. Attic floor to be pine, 9½ in. wide, well driven together and nailed to each beam.

Siding.—Cover entire building, except where otherwise shown in drawings, with sound and clear No. 1 beveled clapboards, 4 in. to the weather, nailed every 16 in., and set nails for putty. Shingle vertical sides where shown with 18 in. xxx pine shingles, laid not more than 5 in. to the weather, and clipped as shown on the plans. Do all necessary furring. Set grounds for all doors.

Roof.—The roof is to be boarded with sound rough hemlock boards. Covered with tar felt. Valleys and gutters to be lined with I. C. charcoal tin, all joints to be carefully soldered. Do all necessary flashing around chimneys, dormers, bay windows, porches, etc. Slate the entire roof with 8″ x 16″ black slate. Put up where required 3 in. tin leaders, connected with drains where directed.

Piazza.—The sill and bearing beams for porches to be 3 x 6 in. Floor beams 2 x 6 in., placed 20 in. on centers, notched into the sill and well nailed. The floors to be 1 in. thick, 4½ in. wide, laid in paint, and blind nailed. Steps to have 1¼ in. treads and 1 in. risers. The roof to be ceiled and tinned. Columns, plates, bolsters, ceiling, etc., to be white pine worked and trimmed as per detail. Piazza ceiled on the under side.

Blinds.—All windows except cellar to have 1¼ in outside blinds, made, hung, and fastened in best manner.

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

Window and Door Frames.—Window frames to be made for 1½ in. double hung sash, with 1¼ in. pulley and hanging stiles. 2 in. sills and ⅞ in. sub-sills. 1¾ in. axle pulleys, stops, etc., all complete. Small cellar frames to be made with rabbeted jambs, cased inside and hung at top with 3 in. narrow butts, and proper fastenings. Door frames to be made of 1¼ in. plank with rabbeted jambs. Outside doors to have 1¼ in. casings.

Sashes.—All sashes, except cellar, to be 1½ in. thick. Dimensions and number of lights as showing in plans. To be glazed with second quality French sheet glass. Cellar to be glazed with third quality. The double hung sash to have best Russian hemp cord, proper weights, and Berlin bronze sash fasts. Size and number as per plan.

Doors.—The front doors to be 2 in. thick, moulded, and as per plan. Upper panels to be glazed, hung with 4 in. cast loose butts, fastened with 4½ in. mortise lock, brass face, white porcelain furniture, nickel plated seats and drop escutcheons, brass flush bolts top and bottom. Second floor closet doors 1¼ in. thick, paneled and moulded one side. All other doors, 1½ in. thick, paneled and moulded both sides, hung with 4 in. loose joint butts, fastened with 4½ in. mortise locks, porcelain furniture, etc. Locks for closet doors to be reverse bevel rim locks. All doors, where needed, to have hardwood, rubber tipped stops, and ash saddles.

Stairs.—Build the main stairs as shown on the plan, from first to third stories, with 1¼ in. treads, ⅞ in. risers, 1¼ in. strings of white pine, to be put up in the best manner. The steps wedged. To be supported on strong carriage timbers. Newels, hand rails, and balusters made of ash, as per details.

Trimmings.—The architraves for all doors and windows throughout the house to be made 5½ in. wide, moulded on face. First and second stories to have turned corner blocks in the attic. The bases to be 7½ in. wide, moulded on top, all to be of clear, well seasoned white pine.

Pantries.—Kitchen pantry to be fitted up with wide shelves on two sides, as directed. Bed room closets to have one shelf with strip, with japanned hooks.

Kitchen Sink.—Kitchen sink to be 18″ by 36″, cast iron, with No. 2 "Douglass" lift pump, fitted and cased properly, with proper suction and discharge pipe complete.

Finials.—Put up metal finials where shown on the elevations. These to cost $3 each.

Generally.—Do all work necessary to completely finish carpenter's work.

PAINTER'S WORK.

All the exterior woodwork usually painted, including privy, to be painted two good coats of white lead and linseed oil paint. All knots and sap to be well shellacked before painting. All cracks, joints, and nail holes, and over nail heads to be well puttied after priming is done. All tin work to have two coats of "Prince's" metallic paint. Also paint the chimneys two coats. All the colors to be selected by the owner. The blinds will be painted at the factory. The interior will be wood filled with "Wheeler's" wood filler, then two good coats of hard oil. Stair rails and balusters will be rubbed down to a smooth surface. All the doors, saddles, hearth borders, and hard floors will be oiled. All sash and outside doors must be painted on top and bottom. The painting to follow immediately after the carpenters.

AN EAST ORANGE HOME.

One of the most admired residences of the many picturesque ones found in East Orange, N. J., is the house of F. W. Coolbaugh, erected last year, on Burnett Street, which forms the subject of illustration in our colored plate and sheet of details in this issue. Located in a slightly elevated position, at a well judged distance back from the road, the house at once gives the impression of being essentially a handsome one. The whole effect is well conceived, and exhibits evidence of much care and thought having been expended upon it, while many of the minor details are of a novel and interesting character.

Coming to the interior, one is immediately struck with the comfortable and homelike appearance and arrangement of the rooms, which open into one another, and are well calculated for the accommodation of guests. The kitchen leads off from the dining room, and a small serving lobby is placed between them, as shown upon the plan.

The hall is very prettily arranged, the construction of the staircase being particularly novel and pleasing. This is executed in hard wood, and is formed with a quarter space, raised three steps up, and approached from two sides, viz., either from the entrance door or dining room, as will be understood on reference to the plan. On the second story four good sized bed rooms are provided, with bath room and ample space for closets and trunks. The top floor contains servants' and other rooms, as represented.

The decoration of the house is carried out in a very superior manner. In the vestibule the walls are covered with stamped paper in imitation lincrusta walton; while the hall is provided with a dado and a filling of embossed paper. Most of the rooms are decorated in well chosen metal hangings, with deep friezes, and the ceilings are finished in light one-colored papers and borders. In several of the windows stained lead lights are used, with charming effect. Some of this work is of a description not often seen, being partly composed of broken pieces of thick colored glass set in the lead work, and giving the appearance of crystals. The design of the lead lights in the window in dining room is shown in our supplementary sheet. Set in the wood work of piazza are several rondels of colored glass, which aid in producing the good effect.

Among the special features in the house which greatly add to its comfort and completeness is a very nicely designed buffet, built in hardwood and fitted in the dining room, in the space underneath the stairs. Fitted wash basins, with marble tops, are provided in the dining and several of the other rooms, there being five in number altogether. A large heater, built in brick work, is provided in the cellar, with registers in the halls and all the principal rooms, and there are grate fires in the library and parlor in addition. The mantel pieces are of excellent design, and are represented in our sheet of details. Electric bells are fitted throughout in a most complete manner, the servants' call being so arranged that on pressing the button three bells in different parts of the house may be made to ring simultaneously. The drains are all ventilated with cool air spaces, and are built with special openings designed for the purpose of access in case of stoppage.

The cost of the house to duplicate would be about $5,000. Mr. Coolbaugh spent a total of some $6,000 in its erection, the extra sum being expended in decoration and plumbing, both of which are of a very superior kind. The original estimates on the drawings and specifications did not exceed $5,000.

The acting architect was Mr. George Cooke, of Orange, although to the talented wife of the owner, Mrs. F. W. Coolbaugh, is due the credit of arranging the general design and of planning the rooms. Indeed, to that lady is to be largely attributed the completeness and success of the whole structure.

Cooke & Berryman, of Orange, were the carpenters; Henry Dickson, Newark, N. J., mason; Orren Ford & Son, of E. Orange, decorators; and George Southward, of Montclair, N. J., the plumber, to whom much credit is due for the excellency and completeness of his work.

SPECIFICATION

of the work and materials requisite in the erection of a frame dwelling for F. W. Coolbaugh, Esq., to be located on the east side of Burnett Street, East Orange, N. J.

CARPENTER'S WORK.

Timber.—Sills, 4″×10″. Posts, ties, and plates, 4″×6″. First and second tiers of beams, 2″×10″. Third tier, 2″×9″. Rafters and long collar frames, 2″×6″. Collars in gables, 2″×4″. Valley rafters, 3″×7″. Floor beams, 16″ from centers. Third tier of beams to rest on 1¼″×5″ ribbons, let into stud, and to be well spiked to stud where possible. Piazza sills and ties 4″×8″ beams, 2″×8″, on 2″ centers. Door and window stud, 2½″×4″. All other studding, 2″×4″. All framing lumber to be of spruce. All studding of hemlock. Girders in cellar, 4″×8″. All framing to be done in best manner, mortised, trimmed, pinned, spiked, etc. Cut in large braces. Where necessary, trimmers, headers, and beams under partitions to be doubled. Piazza plate, 3″×8″. Rafters and collars, 2″×6″.

Bridging.—All beams having a span more than 10 ft. will have one row of herringbone bridging, 1¼×2, nailed with two nails at each end.

Furring.—Do all necessary furring.

Sheathing.—The entire frames and all roofs will be sheathed with tongued and grooved hemlock, well driven up and nailed with two eightpenny nails at each bearing. Cover all plumb parts with resin sized sheathing paper.

Outside Trimmings.—As shown on elevation. Water table in two parts. Belt courses will be formed by continuing the outer members of piazza cornice around the house. Second story will be continued around main house, and have 2″ mould under same, as shown. Sawed ends of rafters ceiled on top with 1″ ceiling plinth and 4″ crown mould, to be continued around all parts, as shown. Gables will be finished with hanging verges, brackets, rafters, etc. Brackets to be beaded on face, and have turned rosettes on sides. Gutters will be formed with 1″×5″ plinth, 1″×2″ mould, and 1″×2½″ cap. All gutters will be lined to form descent to outlets, and 1½″ sawed gutter ends, as shown. Cresting on main ridge of house will be formed with overlapping 1″ pine pieces, with 4″ roll on top, and have 6″ trimmings at ends, as shown. All other ridges will have 2″ roll for quirk. Galvanized iron vane in front gables. Dormers will be cased up, as shown, and have cornices to match main cornices.

Inclosure.—The plumb sides of house will be covered with 6″ beveled siding, with ¾″ lap, well nailed at each bearing, where shingles are shown, and they will be of even width, and cut to pattern, and smoothed on face.

Roof.—The main roof will be covered with 8″×16″ No. 1 ribbon slate portions, to have clipped corners. Do all necessary flashing around dormers and chimneys, etc. Counterflash chimney. Slate laid in tar paper.

Tinning.—All gutters, valley, balcony floors, and veranda roofs will be lined with I. C. charcoal tin, well fitted and soldered. Put up 3″ tin leaders to all outlets to convey water to ground. Tin back of all chimneys.

Piazza.—Floor will be laid with 1×4½″ tongued and grooved pine. Ceiled overhead with ½×3 leaded ceiling. Floors to be nosed on edge, and have 1″ fascia and cove under same. Steps and strings will be 1¼″, sizes ⅞″. Plate will be boxed and be 6×8″. Cornices, as shown, with ⅞″ soffit, 1×5″ drop and cap, 3″ crown mould, 2″ bed mould. Form gutters at eaves same as main house. Columns 6″×6″ whitewood, turned newels, 5″×5″ turned caps. Spindles, as shown, 1″×1¼″, with 1½″×2″ bar under, and 2″ sawed brackets. Square turned balusters, 2½″×4″, beaded top rail, 2″×3″ bottom rail. Space between piers will be fitted with ⅜″×2″ lattice, with 1″×4″ frames to same. Build back stoop, as shown, with 1″×4½″ floor fascia posts, steps, and railings, etc.

Windows.—The frames will be made in the usual manner; 1¼×5 casings, 1¼ jambs, and blind stops, ½″ parting strips, 2″ main sill, 1″ top sill, 1¾ axle pulleys, pockets, etc., complete. All other sash will be 1½″ thick, glazed with French sheet glass, double thick for large lights. Sash on stairs and center of dining room bay will be glazed with leaded stain glass. All meeting rails 1½″ thick, with burglar proof bronzed sash fasts on same. Sash will be hung with Russian hemp cord and cast iron weights.

Blinds.—All windows above cellar less than 3 ft. wide, except stained glass windows, small dormer, and quarter circle windows in front gable, will have rolling slat binds, made, hung, and fastened in best manner, and painted two coats.

Doors.—Front doors made of pine as shown, 2″ thick, upper panels filled with cathedral glass. Vestibule doors to have leaded cathedral glass to cost $3 per foot. All to have suitable frames, jambs, etc. Sliding doors 2″ thick panels, not more than 10″ wide, all other doors four paneled, closet doors 1¼″ thick, all others not otherwise described, 1½″ thick.

Floors.—First and second floors will be laid with 1″ × 4½″ tongued and grooved pine flooring, free from loose knots and all bad defects, well driven up and blind nailed to each beam. Attic floor may be of wider pine.

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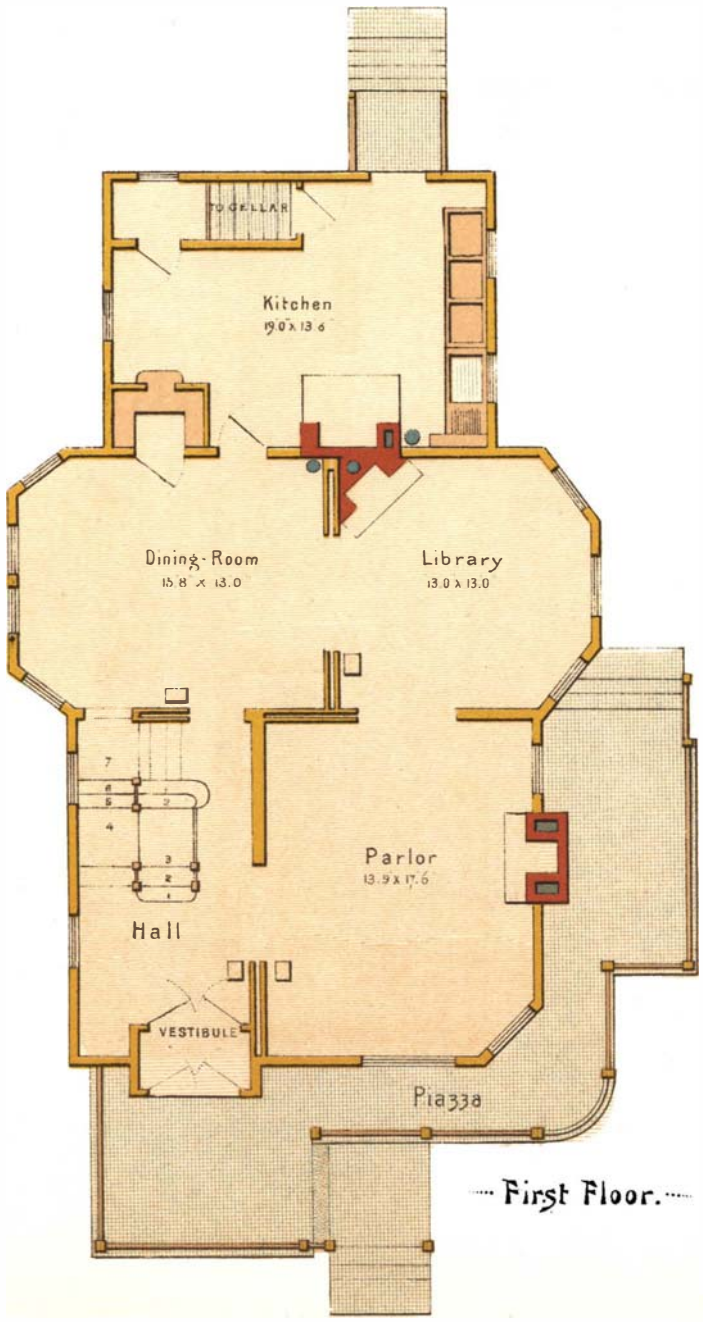
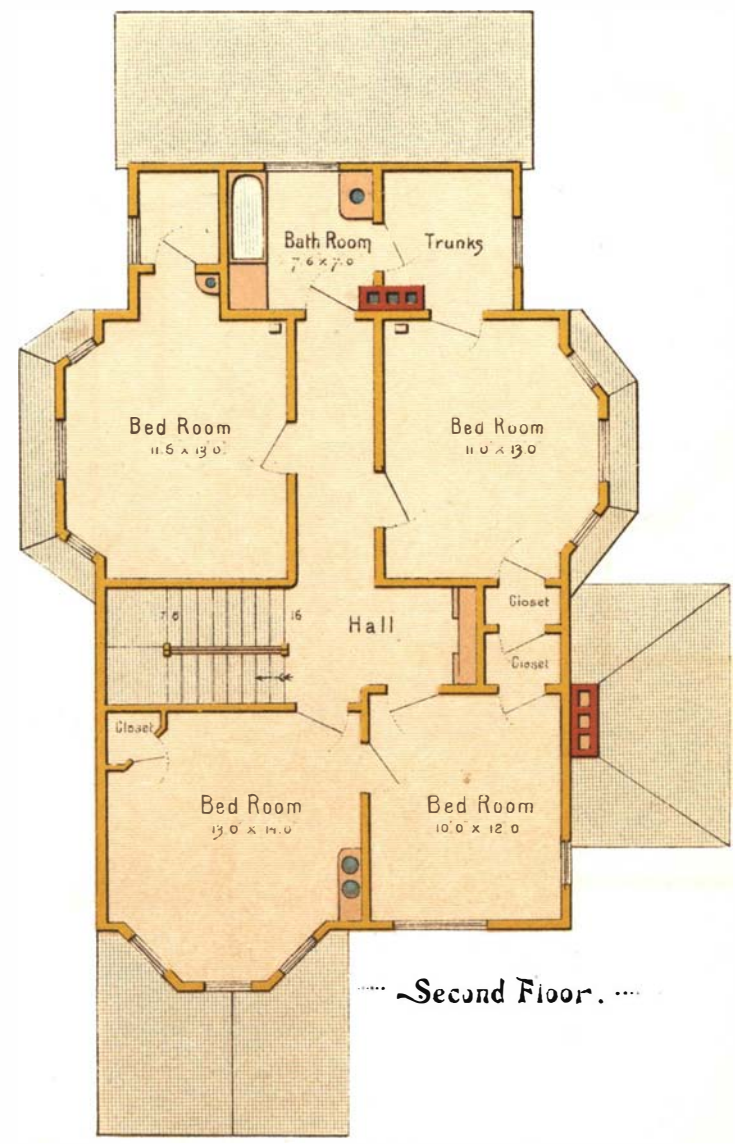
RESIDENCE OF F.W. COOLBAUGH, ESQ. EAST ORANGE N.J. GEORGE COOKE, ARCHITECT.



First Floor.



Second Floor.

SCHUMACHER & ETTLINGER, NEW YORK

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Stairs.—Will be constructed as shown, of white pine lumber, 1¼" steps and strings, ⅞" risers, 6" main newels, turned 4" pedestals, turned caps 1½", turned balusters 2½" × 4", moulded rail, newels, rail, and balusters of dark ash. Seat side of stairs, with lid to lift, hung with brass butts. Hat closet over seat, cased in and have door paneled. Closet under first platform. Back stairs to cellar, of pine, 1¼" steps and risers. Main stairs to be furred and plastered underneath, steps to have nosings and cove.

Trimming.—Door and window casings throughout the house will be 4¾" wide, moulded and beaded on face, and have neat turned corner blocks. Windows in hall, parlor, library and dining room will have moulded panel backs. All others will trim on neat mould nosings, with moulded aprons under same. Base on first story will be 7" wide, beaded on face, and have 1½" mould on top, mould to continue around trim. Base in second story 6", other parts 5". Neat moulded chair rail to continue around hall and dining room. Wash tub lids clamped, and hung with brass hinges and screws, turned legs under same. Kitchen sink to have pine apron and ash cap and drip grooved.

Bath Room.—Will be wainscoted with ½" × 2½" pine 3' 6" high with rabbeted cap. Face of tub and basin same. Basin to have door under. Brass butts and small cupboard catch.

Sundries.—Put down hardwood stoppers and saddles to all doors, also angle beads to all corners needing them. Build coal bin as shown.

Privy.—Privy 5' × 5', to be built of ceiling boards, joints battened. Shingled roof. To have floor, and seat, with two large and one small hole, with lids on same. Panel door, hung with butts, and have lock and key.

Hardware.—All doors to be hung with loose pin steeple tip butts, and furnished with mortise or rim locks, as the case may be. All 1½" doors to have mortise locks. Front door lock to have night works complete, with bronze knobs and escutcheons. Porcelain knobs in first and second stories, with silver mountings. Kitchen and attic, japan trimmings. The sliding doors to have patent spring flush handles and locks bronze.

MASON WORK.

Cellar.—Excavate about 3 ft. earth, leave on premises, and level to a grade line against house. Excavate for cesspool, drain pipes, privy vault, etc.

Foundation.—Wall, up to grade line, to be laid up with good building stone and mortar. The balance of good hard burnt brick and good mortar. The stone wall will be 16" thick, the brick 8". Earth to be well rammed around foundation.

Piers.—To be as shown on drawings. Plaster on top of wall inside of sill with good cement, to keep cold air out. Put down cement bottom in cellar, of good cement and gravel, to the depth of 2½".

Bluestone.—All window sills, copings, steps, cesspool cover, chimney caps and stone at bottom of stoops, hearth in kitchen, to be of suitable thickness bluestone.

Walls.—To be covered throughout with two coats scratch brown sand finish. Mortar to be made up at least five days before using. Plaster two rooms and hall in attic.

Cesspool.—Build cesspool 6' × 8', laid up with building stone.

Drain Pipe.—Lay five vitrified tile pipe, 17 ft. distance, to cesspool, to take waste water from closet sink.

Chimney.—Topped out with good hard burnt brick. Hackensack red mortar. Mason to build in all hot air pipes required furnished by the plumber.

Cement Bottom.—Cement cellar bottom with ⅓ Portland, ⅓ Rosendale cement, and ⅓ sand, 2½ inches thick. Cement under foundation before wall is laid, and extend cement, etc., inside of foundation.

PLUMBER'S WORK.

Soil Pipe.—From five feet outside of cellar wall furnish and lay a 5" cast iron soil pipe, and connect in cellar with a 5" cast iron running double hub trap, with 4" double vents. From cesspool side of trap extend a 4" galvanized iron pipe outside of house to the highest point of roof, and there cap with ventilation cap, for cesspool vent. From the end of the trap reduce the iron pipe to four inch cast iron pipe, and from that point run a 4" cast iron pipe through the bath room to roof, leaving all necessary Y branches for fixtures in bath room, and cap with ventilating cap.

Soil Pipe Connection.—All joints to be packed with oakum and calked with hot lead. All lead connections to be made to iron pipes to be done with brass ferrules soldered on the end. Fresh air vent from trap to be carried up in cellar high enough so that a four by four T can be put in, and from said T carry a 4" pipe to outside of cellar wall for fresh air vent. On top of said T calk in a 4" trap screw for cleaning trap when necessary. Run all necessary lengths of 2" cast iron pipe to receive the wastes from sink and wash trays, and connect to cast iron pipe in cellar.

Boiler.—Furnish and set up one forty gallon dome headed copper boiler, best make, set upon Lockwood's boiler stand, and connect the same with water back of range by ¾ AA lead pipe.

Wash Trays.—Supply three stone wash trays, with hot and cold water, through ⅝ AA lead pipe, and ⅝ flange and thimble wash tray bibs and 1½ inch wash tray plugs, and necessary length of 2" lead waste pipe and 2 inch "Dubois" lead trap, connected to 2 inch iron pipe, with brass ferrule in cellar.

Sink.—Furnish and put up in kitchen one 30"×20" crockery sink. Second, 6" deep, with iron back, hot and cold water through ⅝ AA lead pipe and ⅝ compression flange and thimble bits. Waste through 2" D lead pipe and 2" "Dubois" trap.

Bath Tub.—Furnish and supply one 14 oz. copper, tinned and planished bath tub with hot and cold water through ⅝ AA lead pipe and nickel plated double compression bath bib, waste through 1½" lead pipe and 1½" "Dubois" lead trap.

Wash Basins.—Furnish and fit up two of the best Italian marble slabs, one 30"× 22" oval bowl, and one corner slab 1¼" thick, countersunk and polished, with back 12" high; supply the same with one 14" patent overflow marble basin, with hot and cold water through ½" AA lead pipe and nickel plated handle compression basin cocks, with nickel plated plug, chain, and chain stay. Waste through 1½" lead pipe and 1½" "Dubois" lead trap.

Hot Water Pipe.—Connect a ⅝ AA hot water pipe from boiler. Make all connections in said pipe for kitchen sink, wash trays, bath tub, and basin. Run a ¾ AA lead pipe from main supply pipe to bath room, to supply the same fixtures with cold water.

Ventilation.—Connect a 2" vent pipe, from water closet traps, and connect it to 4" soil pipe, 16" above the bath room floor. Vent the traps under bath tub and basin by 1½" lead pipe, with 3" lead pipe from water closet vent.

Safes.—Line under bath tub, water closet, and basin with 3 lb. sheet lead turned up 3" all around. Run a ¾" E lead pipe from the safes down to the cellar ceiling, and there left open for safe waste. Place a 3" brass strainer over every safe waste.

Water Closet.—Furnish and fit up one rapid stream washout water closet. Supply through a 1¼ C lead pipe. Supply to cistern through ½ AA lead pipe and ½" stop cock. Connect to main soil pipe.

Stop Cocks.—Furnish and connect necessary stop cocks.

Circulation Pipes.—Connect at bottom of boiler a ½" AA lead pipe, and run up to connect with hot water pipes in bath room for a circulation pipe. Place in one ⅝" compression bib at bottom of boiler for sediment cock.

Heater.—Furnish and fit up in cellar one of Boynton Furnace Co.'s No. 114 brick-set furnaces, with heater pipes, registers, and dampers complete.

Heater Pipes.—One 10 inch pipe to hall; one 10 inch pipe to parlor; one 9 inch pipe to dining room; one 9 inch pipe to library, and pipes and heaters to other rooms as required.

Range.—Furnish and fit up in kitchen one No. 80 Newport, eight inch holes, with lower hot closets and canopy, ventilator, shelf register, water back, and couplings complete.

Tubs.—Furnish and fit up three tubs, one to be single and one double cement tubs. Large size with stands to cost $19.50.

Wash Bowls.—Two Italian marble wash bowls, 30 × 22, with oval bowls, complete, with hot and cold water, with double combination faucets. Connect the water to the furnace to feed water pan or bowl. Provide one of Southworth's "Celebrated" grease traps, with iron ladle attached.

The Luminous Bacillus.

Before the Physiological Society, Berlin, Dr. Hermes recently showed the luminous bacillus brought some time ago with marine fish from the West Indian Ocean, and bred in pure cultures. In nutrient gelatine the bacillus formed funnel-shaped cultures at the surface. Inoculated into sterilized fish, it rendered them luminous to a very high degree. The bacillus developed also in fresh water fish, but only when these were placed in salt water. In fresh water the bacillus disappeared. At temperatures below 25° Celsius, the luminosity ceased. It was easy with this fish bacillus to render a large quantity of sea water luminous. If, however, the water were allowed to stand for twenty-four hours, only the surface was luminous; but by stirring it up, the whole mass again became luminous in consequence of the interpenetration of the air.

THE aroma of red cedar is fatal to house moths; the aroma of black walnut leaves is fatal to fleas. It is a matter of common observation that persons engaged in the business of making shingles from odoriferous cypress timber in malarial districts are rarely, if ever, affected by malarial diseases, and that persons engaged in distilling turpentine do not suffer from malarial diseases or consumption. It is said that when cholera was epidemic in Memphis, Tenn, persons working in livery stables were entirely exempt from it. It is affirmed that since the destruction of clove trees on the island of Ternate, the colony has suffered from epidemics unknown before; and in times when cholera had prevailed in London and Paris, those employed in the perfumery factories have escaped its ravages.

Real Estate Title Insurance.

Real Estate Title Insurance is an important factor which has been recently introduced into real estate transactions, assuring property owners of the validity of their titles beyond question or dispute; and is a substitute for the present expensive and tedious system of examination of titles, affording to the parties insured complete security against loss.

This relief and protection to purchasers or mortgagees of real property is to be found in an absolute insurance of title, by a sound and permanent corporation, with a large cash capital, standing ready to make good any insured title found defective from whatever cause.

The German-American Real Estate Title Guarantee Company, No. 34 Nassau St., New York, has been organized pursuant to Chap. 538 of the New York State laws of 1885, with a capital of $500,000, placed by statute under the supervision of the Superintendent of the Insurance Department of the State of New York, and will, upon the proper application, examine titles to real estate, and issue a policy of insurance which shall afford absolute protection to the purchaser, his heirs and devisees, and to the lender upon bond and mortgage, against all loss from defective title.

The company for its own protection will examine the titles it insures in a most thorough manner, by experts in its employ and by means of records and a plan of its own, and will then *guarantee its work.*

It will defend all actions brought against holders of its policies by reason of defects in the title insured, at its own expense, and will pay all losses to the extent of the policy issued.

If after an examination of the title the company refuse to issue a policy upon it, no fee is charged for the examination.

The usual fee of the company for the examination and guarantee in New York is $50 and disbursements, with an additional $5 on each $1,000 in excess of $5,000. In Brooklyn it is $30 and disbursements, with an additional $5 on each $1,000 in excess of $3,000.

Special rates for building operations, auction sales, and titles involving $50,000 or more.

The payment of a small fee permits a transfer of the guarantee with the deeds, in case of sale of mortgage.

Reissues to subsequent purchasers or mortgagees within five years, at one-third original fee.

If the title, when examined, is rejected by the company, no charge is made except for actual disbursements.

The law directs that the company, before it issues a policy, shall set apart a sum not less than two-thirds of the amount of its capital stock as a guarantee fund, to be invested as the statute provides, and to be applied only for the security and payment of losses incurred by reason of guarantees issued. A solid foundation for business is thus insured.

This system accomplishes the following:

1. *Security.*—It is the only system that affords absolute protection against defective titles.

2. *Saving of Time.*—The company proposes, by means of its superior facilities and the employment of a number of skilled lawyers, engaged exclusively in the searching of titles, to pass upon them with promptness. A property, the title to which has once been guaranteed, can be transferred within a very short time after application is made; and institutions, estates, and individuals holding mortgages upon such property can convert them into cash at once, instead of consuming from twenty to thirty days, as is now required, in having the titles researched upon each transfer.

3. *Saving of Money.*—It is proposed to guarantee the title, in the first instance, for a less sum than must now be paid to have the same title searched by a competent attorney; thus additional security is obtained, as well as time saved, at less cost.

After the title has once been searched and guaranteed, the property may be transferred, or a mortgage upon it assigned, and a similar guarantee obtained by the purchaser for one-third of the sum paid for the first guarantee.

4. *Ease of Transfer.*—A guaranty policy will enable an owner of a piece of property to convert it into money within a day or two, or obtain in the same time a loan upon it, on bond and mortgage; and will thus make real estate as available for collateral as stocks and bonds. This will serve to increase the demand for real property. Thus, briefly outlined, the new system offers absolute security from loss, saving in expense of conveyancing, charges fixed and known before the work is begun, special safeguards for mortgagees, and expedition in the transaction of business

The officers of the company are:

President, Andrew L. Soulard; *Vice-President*, Charles Hauselt; *Secretary*, Adolph Koppel; *Treasurer*, William Wagner; *Counsel*, Charles Unangst.

The directors are:

Charles Hauselt, John A. Beyer, A. J. D. Wedemeyer, George W. Quintard, Charles F. Tag, George C. Clausen, William Wagner, James Fellows, John Straiton, Jacob F. Miller, Adolph Koppel, Charles Unangst, Andrew L. Soulard.

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The Summit Color Works.

It is evident that an architecturally beautiful house may be rendered unsightly by the use of inharmonious and gaudy paints, and it is equally evident that the most commonplace structure may be made attractive by the judicious selection and application of appropriate colors. Fortunately, the individual who is devoid of taste in this direction is generally aware of the fact, and therefore relies, for the ornamentation of his house at least, upon some one more artistically inclined. But instances are only too common of buildings covered with colors that seem to be at war with each other, and the casual observer feels a deep seated disgust for the owner and a sincere pity for the neighbors who are compelled to live in close proximity to the eyesore, especially when he remembers that the case might easily have been reversed had the owner possessed common sense enough to have placed the ornamentation of his dwelling in other hands.

This difficulty of selecting colors that will blend well, so as to produce the most pleasing effects, has been recognized by the well known firm of Chas. M. Childs & Co., of 225 Pearl street, this city, who have adopted an admirable method for presenting their pure ready mixed paints to builders and property owners who may not have the facilities for selection found in the large cities. Upon their specimen card they display the best and latest styles of colors, arranged in combinations of three each; and each combination shows the body. trimming. and blinds. The card before us contains twenty-seven colors, forming nine combinations, the upper color of each of which is the body, just beneath which is the trimming, with the blinds at the bottom. It is not an easy task, even for one having some experience, to select from the colors now so much in demand those which will appear well when spread over large surfaces, as the use of a wrong shade may destroy the intended general effect of the whole work. But by means of this card the various colors can be studied to the best advantage, and an accurate estimate formed regarding the effect to be produced when applied to any building. As the combinations were arranged by one of the best decorators in the country, the colors may be relied upon to blend well and be in harmony with each other, and to produce tasteful and pleasing effects. Although the user is, of course. free to make such other combinations as he may think best, he may rest assured that if he employs either of those presented, he will obtain attractive results.

It is apparent that this method of presenting colors will not only be appreciated by those who may be said to be "color blind" regarding the harmonious blending of shades, but will also be welcomed by the professional builder and architect, to whom it will prove to be of much assistance.

Scattered here and there throughout the country are a few who, through ignorance or design, cheapen or water their materials. The paint they use looks well enough when fresh, or until the job is complete; but it soon begins to present a weather beaten and dilapidated appearance. There are also owners—landlords—who have the notion that a cheap and inferior paint will last "long enough," and that it is more economical to cover frequently with poor material than it is to pay a little more at first. and get the best. Both of these classes ignore the fact that good paint to start with is, in the end, the cheapest. It would be to the decided advantage of some house owners to try the experiment of using a superior quality of paint, and ascertain for themselves if the difference in the first cost is not more than compensated for by the durability of the paint and the better general appearance of the house.

These paints are made only of material carefully selected, and of the purest quality. The greatest care and skill are exercised in their preparation, and they are guaranteed to be equal in all respects to any manufactured. They are presented in packages of various sizes, from a barrel of fifty gallons down to as small a quantity as one quart, and are also put up in cans containing from one to ten pounds.

The Messrs. Childs & Co. also prepare white paint for inside and outside work, and will at all times make any shade desired, when ordered in quantities of five gallons or over. This is an important consideration, and one that will be well received by builders, since it practically places at their disposal all the skill, experience, material, and machinery of an extensive paint works, and enables them to experiment with new colors at a moderate expense, and to order new shades of their own selection, with the certainty that their instructions will be faithfully followed.

It would be well for those contemplating building or painting this spring to send for one of these cards, even if for no other purpose than to have specimens of the shades that will be widely used. Further information concerning these paints, prices, etc., may be obtained by addressing Messrs. Childs & Co., as above.

THE total production of pig iron in the United States in 1886 was 6,366,688 net tons. This includes 47,982 net tons of spiegeleisen. The unsold stock of pig iron on hand on the last of December was 249,504 net tons.

Floors and Ceilings: Ancient and Modern.

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

I.

In this series of articles the writer will endeavor to present a graphic account of the floors, floor coverings, and ceilings of the world. It would be interesting and profitable to visit the homes of the cave dwellers of India, the lake dwellers of Europe and the mound builders of America, but we should be obliged to invade the domain of regions still unexplored, and about which our knowledge is still in a formative state. We shall feel it a necessity, in some instances, to visit the huts of primitive man in many countries, but we shall not pause to discuss the archæology of remains of civilizations, but shall try to confine ourselves to races of men that are now living, or of whom we have positive information. We shall begin our journey in the land of the rising sun, and shall make the tour of the world, following the sun in its path to its setting in the golden gate of "the new world, which is the old." We shall visit Japan, Corea, China, Farther India, India, Siberia, Africa, the countries of Europe and America. In our wanderings, we shall try to enter the hut of the savage, the home of the working class, the buildings of state, and the palaces of potentates. Some of the buildings that we are privileged to enter we shall describe and illustrate, from both an æsthetic and technical point of view, and where it is possible, we shall give a technical description of floor construction, and the manufacture of fabrics that cover the floors. We shall try to point out the art and science of such construction, whenever it is possible to obtain such information. Our data have been collated from authentic sources, chiefly from travelers who have been eyewitnesses and observers of what we shall attempt to describe. We shall begin with "Mother Earth," the floor of primitive man in all ages, and conclude with the earthen floors which have been metamorphosed by heat and the arts of man, and to which we have given the generic title of tiling. Where man in his primitive state has found it necessary to provide his habitation with some kind of a floor, his instinct for want of definite knowledge has prompted him to make use of clay, as the best mineral substance adapted to his purpose, and the researches of the most learned modern scientists have so far been unable to discover any better material, although the treatment of it has been widely different. The primitive man has added sufficient water to the clay to make a stiff paste and spread it over the surface, kneading it with his feet, or ramming it with sticks or stones until it has become compact. The wind and sun complete his work by making the floor as hard as stone. The man of the nineteenth century has simply selected his material from the resources of the earth's crust, ground them to a fine powder, studied the properties of their elements, learned their chemical affinities and relations, studied the precise conditions his work must fulfill; his art has triumphed over nature, and he has been able to produce the marvelous mosaics and encaustic and endolithic art tiles which meet us in every building of note of modern times. From the first floor to the last floor, are many gaps in the records of locality and time, but we shall endeavor to trace the connection between the two, and in the endeavor we shall go from empire to kingdom, from principality to state, and from earliest historic time up to the present day.

We shall begin our journey with a brief description of the country itself. The name Japan, pronounced in the native language Nipon, is of Chinese origin, in the Mandarin dialect Jih-pun, that is sun source or eastern country. The celebrated Venetian, Marco Polo, was the first European to write an account of the country and its people. His work was written in 1298, in the Latin language. The Japanese chronicles go back of this date many centuries. The empire lies in the northwestern part of the Pacific Ocean, and consists of four large islands and a great number of small ones. It is separated on the west from Corea by a strait, which is about one hundred miles wide. At its northwestern extremity is the island of Tisima, or the "Thousand Islands," and at the north is the island of Krafto, or Saghalien, formerly a part of the empire, but now owned by Russia. The largest of the islands which make up the empire is Nipon, and it contains about 95,000 square miles; the next in size is Yesso, having an area of 30,000 square miles; then Kinsin, 16,000 square miles; and last, Sikok, with 10,000 square miles. The total length of the empire is 1,600 miles, and its greatest breadth is 200 miles. In all it numbers 3,850 islands. Its total area is 148,456 square miles. It is slightly larger than Montana, and only 644 square miles smaller than Dakota.

THE ART OF JAPAN.

From the wonderful works in ivory, lacquer, metal, embroidery, enamel pottery, and color work which have come to us from time to time, from the glowing accounts of travelers who have spent many years of study and research in that remarkable group of islands, we may well concede to Japan, of all oriental countries, the most pre-eminent position in all matters connected with the decorative and ornamental arts. In a number of branches of art manufacture, it is without a peer in the civilized world. Mr. Audsley well says that the peculiar habits and simple modes of life of the Japanese have not favored the general production of what may be considered important works of art.

Their tastes and industry have expended themselves in the formation, in an artistic form or with elaborate ornamentation, of countless articles of utility, articles of every day use, suitable for all classes of people. Beyond a few small cabinets, tiers of shelves, low stands, trays, and similar objects, they have no household furniture. Mats cover the floors, and on these they sit during the day and sleep at night. Japanese houses are divided into apartments at will by sliding screens, formed of wood frames, covered with paper, patterned or painted with landscapes, flowers, and birds.

Folding screens, either painted or embroidered, are also used Special works of art in the shape of pictures, *kakemono*, or hanging pictures, are hung up on certain occasions, and help to relieve the extreme simplicity of the apartments. The most talented Japanese artists have produced many of their best drawings in the shape of kakemono.

According to Mr. Audsley and other writers of note, it is a fact worthy of notice that many of the most talented artists which Japan has produced have been satisfied to labor in the humble fields of art industry; and painters and designers of repute have not thought it beneath their dignity to display their manipulative skill and the wealth of their imagination in the adornments of common objects of daily use.

Honest workmanship is a leading characteristic in all branches of Japanese ornamental art. There is a greatness about such loving honesty which cannot be overestimated, and its influence is stamped upon every genuine art work which has been produced in Japan.

According to Louis Gonse, the architectural art of Japan has two dominant qualities; first, its intimate association with the character of the landscape which makes its *mise en scene*, and its decoration. This, though, in two senses, is more in the structure itself than in the brilliancy of the Japanese genius. That minuteness of finish which we admire in such a small type as a lacquered box, or in what may be an unimportant and common object, will be found equally carried out in the ornamentation of a temple. In it all, and through it all, we see the same good faith in execution, the same fidelity to the main conception. No matter how minute the details, the same regard is exhibited and the work is executed with like scrupulosity. In his luxurious work Mr. Gonse has likened them to the master workmen of the thirteenth century, who judged of the beauty of their work by its complication, and declares that it is nothing if not indigenous to their solicitude. The Japanese have a marvelous understanding of how to express exquisite elegance with moderation. His summary of the household appointments does not differ in any particulars from what we have related. He remarks that it is only when the proprietor of the house is a man of taste that the kakemono carries the signature of the master, and the screen becomes a veritable work of art.

(*To be continued.*)

Incendiary Birds.

To the Editor of the Scientific American:

I write to relate an incident which may be of interest to some of the readers of your valuable paper. There is a bar iron mill situated in a neighboring town four miles from here, that has been on fire three or four times, in which the English sparrow might be called the incendiary. These sparrows pick up old pieces of cotton waste, which they build in their nests, among the timbers of the roof of the mill, and in every case of the fires above mentioned, these nests were the cause, either from spontaneous combustion or from sparks from the hot iron striking and lodging in the nest. If you could suggest some way of getting rid of the sparrows, I think the manager of the mill would be glad to adopt your plan. R. W. KEAR.

Pottsville, Pa., February 14, 1887.

PATENTS.

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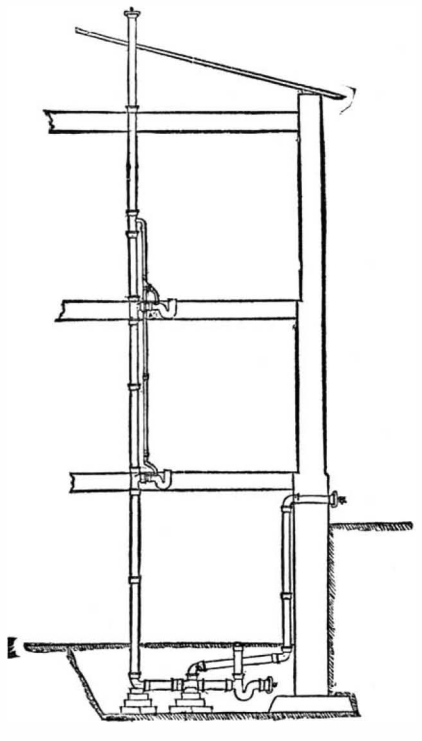
AN ENTRANCE PORCH.

Our illustration, from *The Builder*, is a sketch of the entrance porch of Dutton Hall, one of the famous old English homes. The curious and ornamental construction here so well blended affords a good subject for study.

TESTS OF PLUMBING IN MINNEAPOLIS.

This cut represents a section of a two story and basement house, with the plumbing ready for inspection.



The stack is complete from top to, and including, the running trap and fresh air inlet. The traps for water closets and wastes for wash bowls, bath, and kitchen sink, are all calked in, the traps wiped on to wastes, pinched together at the top, and soldered up. A piece of heavy sheet lead is soldered on top of the water closet traps; the ventilation pipes are connected with the crowns of traps; the soil pipe is sealed at top and bottom, and the fresh air inlet is left to attach the proving apparatus. We have the whole system of plumbing under test; whereas, if only the soil pipe were tested, there are yet three joints to make for every fixture, which will never be under proper test. While it is not practicable in all cases to connect the traps as soon as the soil pipe is roughed in, owing to the unfinished state of the carpenter work, yet, as a rule, water closet traps, lead bends, and a short piece of waste pipe can generally be calked in when the roughing-in is done. Then if it stands the test, there is little danger from open joints in the balance of the work. However, when it is possible, the whole of stem of plumbing should be under test at the same time. Ten pounds of compressed air to the square inch, on a complete job, is a fair test. If the work stands under that pressure, it will, as a rule, stand fifteen pounds or more. Good workmen have no trouble in making their work absolutely air tight, with extra heavy soil pipe. The greatest danger is in calking around brass ferrules, and great care should be taken lest they "buckle in."

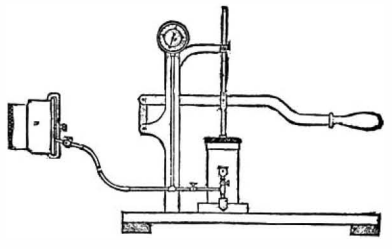
The other cut represents a testing apparatus recently devised (not patented) by Plumbing Inspector Hazen, and as any mechanic can construct one, we take pleasure in presenting it to our readers. It has been in use in this city about two months, and gives entire satisfaction to plumbers, architects, and owners. Its ability to make a thorough test, together with its simplicity, commends it at once.

To test a job of plumbing with the proving apparatus, it is necessary to have a two or four inch iron plug with rubber gasket to fit on the shoulder of the pipe in the hub F, held in place by a clamp over the end of the hub, with a set screw in the center to screw down on the plug. Into one side of this plug, screw in a short nipple and cock, G, to attach a hose from the pump; close cock, D, and open cock, E; work the pump until the gauge, C, shows five pounds pressure, then close cock, E. If the work is absolutely tight, the indicator will remain at five pounds; if defective, the indicator will go down. Now unscrew cap of ether cup, B; open cock, D, and let the pressure off from the pipe; close cock, D; put one ounce of ether in the cup; screw on cap; open cock, D, to let the ether down, and at the same time begin to work the pump; close cock, D; pump up to five pounds pressure, and close cock, E. The ether will indicate where the leaks are, which the plumber will at once calk tight. Test the work again at ten pounds pressure, and if the indicator stands at that, the work is absolutely tight.

To test the pump, put on ten pounds pressure, close cocks, G and E, and if the indicator stands, the pump is tight.

A little soap and water put on the leaky joints with a brush will show the exact location of a leak, by the formation of bubbles.

For good sanitary plumbing, a strict observance of



INSPECTOR HAZEN'S PUMP.

the city ordinances by the plumbers, and thorough examination and inspection, Minneapolis is second to no other city in the Union.—*N. W. Architect.*

A Telegraph Lantern.

The Oatman signal telegraph lantern is intended for military and naval use. This lantern is of a convenient size, strong and simple in construction, and can easily be carried around. A blowpipe flame is used, which so intensifies the light that it resembles an electric light, and can be easily seen with the naked eye for 10½ miles, and with a glass for 15 miles. The messages are exchanged by the Continental code or Morse system, the dot being signified by a quick flash and the dash by a flash of longer duration. Ordinary mineral oil is used, and the light will burn for about five hours with the one filling. Rain or wind has no effect on it.

In a letter of indorsement from the Chief Signal Officer, War Department, to whom lanterns were given for trial, it is stated that messages were exchanged between Sugar Loaf and Camp Biddle, a distance of 20 miles. A board of officers appointed by the Navy Department to examine the lantern also attest its value.

AN ENTRANCE PORCH.

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MINERAL WOOL AS A FILLING.

The necessity for using non-conducting substances as filling material between floors, partitions, side walls, and roofs is now very generally recognized and practiced by architects and builders. Of the various substances proposed for this purpose, probably the best, regarded in all aspects, is the article now widely known in the trade as *mineral wool*. This substance is, in fact, nothing more nor less than a species of glass, drawn out by a peculiar process into the form of fine threads, which are curled up into innumerable convolutions, and hence the name *mineral wool*.

It will at once be apparent from the enduring nature of its composition that it is admirably adapted for the purpose mentioned. It is now very extensively employed, and its use is becoming quite general. We give herewith an engraving of an ordinary dwelling house, with parts broken out to illustrate how the *mineral wool* is applied and used, between the floors, in the roofing, the side walls and the partitions. Now the objects of these fillings may be stated as follows :

As to Heat and Cold.—A filling of *mineral wool* in the ground floor, say two inches thick, protects against the dampness of cellar. In the outside walls, from foundation to peak, between the studding, it will prevent the extraction of the warmth of interior, and will destroy the force of winds which otherwise will penetrate and cause draughts. In the roof, say two inches thick, it will retain the heat which rises through stair wells, bringing about regularity of temperature in cold weather. The upper rooms will not receive the heat of the summer sun and store it up for the occupants during the night, but remain as cool as those on the floor below. The water fixtures in bath rooms, closets, and pantries will not be exposed to extremes of heat and cold.

As to Sound.—As sound is communicated by the actual contact of beams, and also by the vibration of the air between them, it can well be understood how a porous material like *mineral wool* will have a muffling influence on the solid parts of a building, and so occupy the space that wave motions will not be possible. Such a lining is especially desirable about bath rooms to deaden noise of valves and flowing water.

As to Rats, Mice, Insects, and Disease Germs.—The analysis of *mineral wool* shows it to be a silicate of magnesia, lime, alumina, potash, and soda. The slag wool contains also some sulphur compounds. It is plain there is nothing organic in the stuff to decay or to furnish food and comfort to insects and vermin. On the other hand, the fine fibers of glass are irritating to anything which attempts to burrow in them. We feel confident in saying that new houses lined with *mineral wool* will not become infested with animal life, and old walls may be ridden of their tenants by the introduction of it.

All earths, mortars, felts, and sheathing papers contain organic matter, such as hair and vegetable fiber, which, after a time, undergo decomposition and create a variety of disease germs. The dangers to health arising from the presence of these sources of infection are greatly aggravated by the continued filtering of dust particles and water through cracks. To leave the floor spaces empty would not avoid contamination in this way, except such parts are open to thorough ventilation, otherwise they would simply form a refuge for a mixed population.

As to Fire.—An incombustible material like *mineral wool* renders a building slow burning. We do not claim that it will be *fire-proof*, for that is impossible so long as inflammable stuff is used in construction. In passages occupied by the *mineral wool* flames cannot spread. Thus surely will they be exposed to sight, and an opportunity for quenching them be offered at the outset. It hinders the spread of fire, and thus gives time for *escape for the inmates, thus serving better than ladders.*

Spontaneous combustion sometimes takes place when the floor beams, for instance, have been dried until the point of ignition is very low, and when in conjunction with this the freely circulating air is charged with moisture. With these two conditions fulfilled, it only needs the fanning action of a draught to start combustion. Such a coincidence of conditions cannot be brought about if the spaces between beams are filled with indestructible mineral wool.

In all its uses *mineral wool* must be held in position by retaining walls, which should be sealed tight to keep the finer particles from sifting out. The house should be closed in, so that the material may not become wet, and the wall filled from the inside. The job should be done at the same time that the laths are being put on. Apply by the handful, and only press into place so that it fills the spaces completely. Do not jam or push roughly with sticks. Being applied *dry*, the other work is not delayed at all, and there is no possibility of dampness. Once in place, it remains intact until the retaining walls are removed. The presence of *mineral wool* behind the lath does not prevent the plaster *keying*. It is pliable, and gives way readily to the pressure.

If the owner of a house is thinking of insulating it by *back plastering*, or deadening it with *mortar*, or making it free from vermin by a filling of *shavings*, or rendering it incombustible by sheathing the air spaces with *tarred paper*, he is fortunate in having but one object to gain, and but one way of accomplishing it. It is obvious that to ask the cost of this vitreous substance as compared with that of the usual devices is not pertinent, because it substitutes them all, while none of the others serves more than *one specific purpose.*

A car load of ordinary slag wool containing 1,400 cubic feet will answer to fill 4,200 square feet 4 inches thick or 8,400 square feet 2 inches thick. The approximate cost will be $200. The value of such a quantity must be in its affording comfort, besides securing economy in heating and insurance.

Mineral wool is invaluable in hospitals and asylums on account of its arresting the spread of fire, not to mention its other properties. Equally important applications can be made with it in public and private schools, music and concert rooms, sounding boards, botels, cottages, country residences, charitable institutions, and in deadening the flats of apartment houses, and insulating the outside walls of conservatories, hen and pigeon houses.

Mineral wool is made by converting vitreous or scoriaceous substances into a fibrous state. The slag of blast furnaces affords a large supply of material suitable for this purpose. The product thus obtained is known as *slag wool.* For the reason that slags are seldom free from compounds of sulphur, which are objectionable in the fiber, and in order to be independent of the action of furnaces, we prepare a cinder from which we make *rock wool.* These two products comprise the two kinds of *mineral wool.* They are not to be distinguished from it, but from each other.

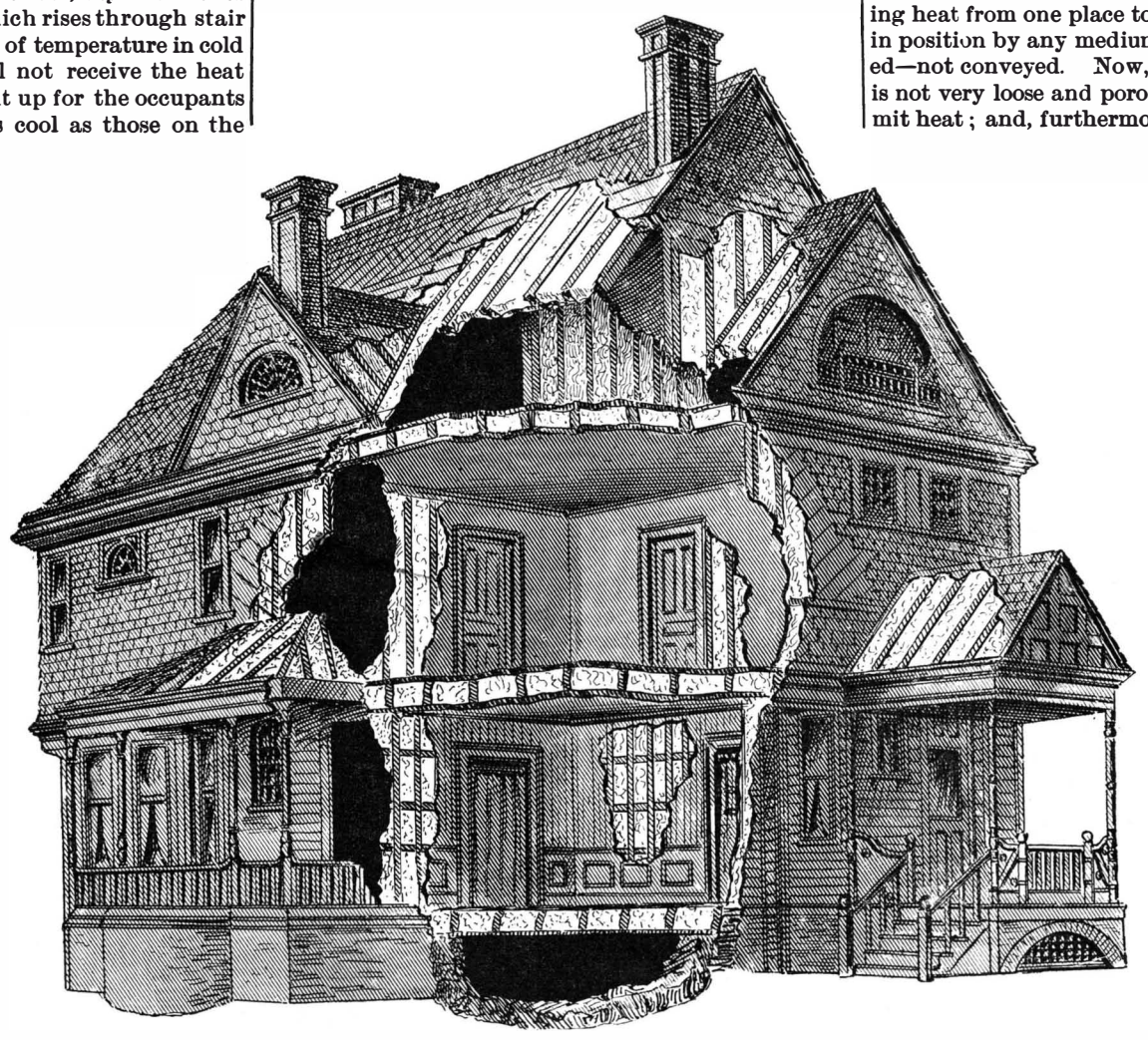
The grades of *mineral wool*, *extra* and *ordinary*, are based upon difference in weight and quality. There is no distinction in composition. The ordinary grade contains the coarser fibers intermingled with a few shot, which it is not possible to shake out entirely.

Air is so subtile and rapid in movement when unconfined, and so slow to convey heat, except by its own motion, that it is at once the very best distributor of heat and also the greatest barrier to its transmission, according as it has or has not freedom to circulate. It is not a matter of surprise that this apparently anomalous state of things is misleading and constantly giving rise to popular errors. That the dimensions of what is called an air space are entirely arbitrary, no one will deny. It may have a volume of one cubic foot, or it may be the smallest unit of volume into which air is divisible. We are disposed to classify the first case under *climatology*, and the second under *insulation ;* for so long as air may circulate at all, it is conveying heat from one place to another, while if it is held in position by any medium, the heat must be conducted—not conveyed. Now, if the air-confining material is not very loose and porous, it will be found to transmit heat ; and, furthermore, the reduction of the percentage of volume of air, by making the material more compact, develops its capacity for conducting heat. Therefore, so far as theory goes, the poorest conductor of heat is the material which contains the largest percentage of volume of air. Any other view of it is at variance with science and the many illustrations found in nature.

We find that 192 pounds, or *one cubic foot*, of slag make 192 pounds, or *ten cubic feet*, of ordinary mineral wool, so that the resulting fibers incase nine cubic feet of air. In other words, the cubic foot, before conversion, contained 100 per cent. of material, and after conversion only 10 per cent.; therefore the product must contain 90 per cent. of its volume of air. In same way the *extra* grade is found to have 95 per cent. of its volume of air in it, and, consequently, it is a poorer conductor than the *ordinary.* It is certain that this proportion of air is not incased by any other product, natural or artificial, which is, at the same time, indestructible.

The transmission of sound is prevented by a filling of *mineral wool*, because of its slight elasticity and want of solidity. This is a very important feature, because no other material in general use for heat-proofing and fire-proofing possesses also the property of sound-proofing. A fourth advantage, which is of equal value with the others, is the irritation which the glass fibers cause both to insects and vermin. There is nothing in its composition which can help to breed or harbor insects, and no animal life will remain in it.

Further information can be obtained respecting the advantages and uses of this excellent material by addressing the United States Mineral Wool Co., 22 Cortlandt Street, New York.



FLOORS, ROOFS, PARTITIONS, AND SIDE WALLS FILLED WITH MINERAL WOOL

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Mexican Windows.

Mexicans seem to entertain the idea that windows were made to look in at as well as to look out of, and it is a matter of daily occurrence for men, women, and children of the *gamin* order, including peddlers and professional beggars, to congregate outside the bars and stand calmly staring in at us by the hour. The first sight of these barred windows strikes the stranger in Mexico rather unpleasantly, and he is apt to fancy himself in prison behind them, with his iron bedstead and brick floor for suitable accessories. In time, however, he realizes not only the conveniences but the necessity of them, and by and by feels an uneasy sense of insecurity if by some rare chance he finds himself not thus protected. The greater portion of Mexico is a land of perpetual summer, where windows must be open both night and day, and these gratings cannot be "picked" like locks, or noiselessly cut like panes of glass. But though one may sleep here in perfect security without closing a shutter, it is well to move one's effects from proximity to the windows, for the *ladrones* have a habit of throwing in ropes with hooks attached and dexterously drawing out even your garments—from which practice, perhaps, originated the Texan slang word "hooking," for stealing. It is only justice to add that there is far less thieving going on in Mexico, in proportion to population, than in our own country, for the influence of Roman Catholicism is paramount, especially among the poorer classes. I venture to assert that with all your spring bolts and careful precautions to bring in even the door mats at nightfall, there is more stealing done in any Northern city in a single day than in all Mexico in a year's time. —*Phil. Record.*

THE LEWIS GRATE AND OPEN FIREPLACE.

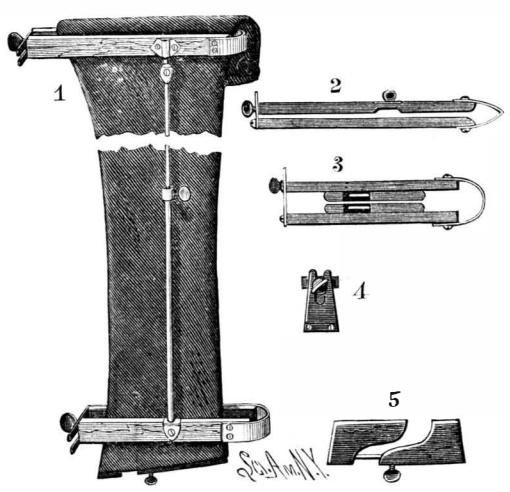
The advantages possessed by the grate herewith illustrated, when compared with the old style, are so strikingly evident as to need but a brief description. The heat and products of combustion pass from the fire in the basket, A, under the hood, B, down the flues or columns, CC, into the hollow base, D, and thence back under the grate to the main flue or chimney. The course is clearly indicated by the arrows in the sectional view. The back fire wall, I, is composed of four pieces, the upper one being of corrugated iron so arranged as to receive the lower half of back and two side pieces, which are of fire tiling 2¾ inches thick, thus making a smooth, firm, and durable back. If thought desirable, the back wall can be built altogether of fire tiling. The door, E, in the front of the hollow base is for the purpose of removing all accumulations of soot and ashes that fall down the chimney. It is also provided with a register to check the draught after the fire has burned to a bed of coals, thereby retaining the heat. The chimney walls are represented at HH. As the heat is retained in the fire chamber by the hood, B, a more perfect combustion is created, and the heat is thrown out into the apartment instead of passing up the chimney, as in the grates now in use.

The following claims are presented for this grate over others: A more perfect draught; to give double the heat with the same amount of fuel; to heat a room in one-third of the time; no soot can possibly fall down the chimney to injure rugs, carpets, etc; while poking the fire, no ashes will fly over the room, covering everything on the mantel and surroundings; no possible danger of flues catching fire, and endangering life and property; no need of stopping up flue or taking out basket during the warm season; it is ever ready to build a fire on cold, damp days in spring and fall. By having a water tank of from three to five gallons capacity placed on top of the hood, it is possible to have hot water in the room at all times during the winter season.

All further particulars concerning this grate, which is spoken of in the highest terms by those who have used it, can be obtained by addressing The Lewis Grate Co., of 316 West Sixth Street, Cincinnati, Ohio.

TROUSERS STRETCHER.

It is claimed for the trousers stretcher here illustrated that it is adjustable to any size of trousers; that



WESTON'S TROUSERS STRETCHER.

it will not form creases in them; and, by the use of adjustable forms inserted in their bottoms, it not only does not give an objectionable shape to them, but directly tends to restore their original shape. It is thoroughly effective in stretching the trousers as well. The upper part of the trousers is grasped by the clamp shown in Fig. 2, while the lower parts are held by the one shown in Fig. 3. Each clamp consists of two bars, united at one end by a bent spring, and provided at the other end with a slotted strap and screw (Fig. 4), by means of which the bars are held against the trousers. Within the bottom of each leg is placed a tree, Fig. 5, the bars of which can be adjusted by means of a rod and set screw so as to properly occupy the bottom portions of the pantaloons. The ends of the trees are inclined, as shown, so as to conform to the shape of the bottoms of the trousers. The use of trees is, of course, unnecessary with the upper clamp. The position of the clamps, when in use, is clearly indicated by the perspective view, Fig. 1. The forcing of the clamps away from each other, and the consequent stretching of the trousers, are effected by a simple telescopic connection, which also adapts the stretcher to trousers of different lengths. When the straps are released, the springs cause the bars to spring apart and thereby disengage the clamps from the trousers.

This invention has been patented by Mr. E. C. Weston, of 17 South Fortieth Street, Philadelphia, Pa., who will furnish particulars concerning the sale of the patent or manufacture on royalty.

Easy Water Tests.

1. *For Detecting Organic Matter in Water.*—To half a wineglassful of the water add about a dozen drops of a solution of *permanganate of potash* (Condy's fluid). This will give a *rose color* to the water. Let it stand for two hours. If the color changes to *dull yellow*, the water is unwholesome. If the color disappears, the water is positively dangerous.

2. *For Detecting Lead in Drinking Water.*—To half a wineglassful of the water add a dozen drops of a solution of *bicarbonate of potash.* If the water becomes dull or clouded, there is lead in it, and it is, therefore, injurious to health.

3. *For Detecting Carbonate of Lime in Water.*—To half a wineglassful of the water add twenty or thirty drops of a solution of *caustic lime.* Presently, the water will have a milky appearance if it contains carbonate of lime Let it then stand for two or three hours, and there will be a white sediment.

4. *For Detecting Sulphate of Lime in Water.*—To half a wineglassful of the water add twenty to twenty-five drops of a solution of *nitrate of baryta.* A *milky* appearance afterward and a white precipitate will indicate the presence of sulphate of lime.

5. *For Detecting Ammonia in Water.*—To half a wineglassful of the water add twelve drops of a solution of *zinc.* There will be a *cloudy* or milky appearance if *ammonia* is present.

6. *For Detecting Iron in Water.*—To half a wineglassful of the water add a few drops of a solution of *prussiate of potash.* A *blue* color will be produced if *iron* is present.

7. *For Detecting Phosphates in Water.*—To half a wineglassful of the water add five or six drops of *ammonia.* A *white, cloudy* appearance will result if phosphates are present.

8. *For Detecting Sewage in Well Water.*—Pour some of the water to be examined into a very weak solution of *permanganate of potash* (Condy's fluid). It will be turned *green* or be bleached if *sewage* is present.

9. *A Negative Test for Determining whether Water can hold Lead in Solution.*—To half a wineglassful of the water add a few drops of a solution of *acetate of lead.* If a *cloudy or milky* appearance results, the water *cannot* hold *lead* in solution.—*Industrial Review.*

Hon. S. Hallett, F.R.G.S., referring to the great changes in every department of trade, commerce, manufactures, etc., in a lecture before the Society of Arts, London, said that in Great Britain fifty years ago, two-thirds of the working classes were engaged in agriculture, while now only one-fourth are thus employed.

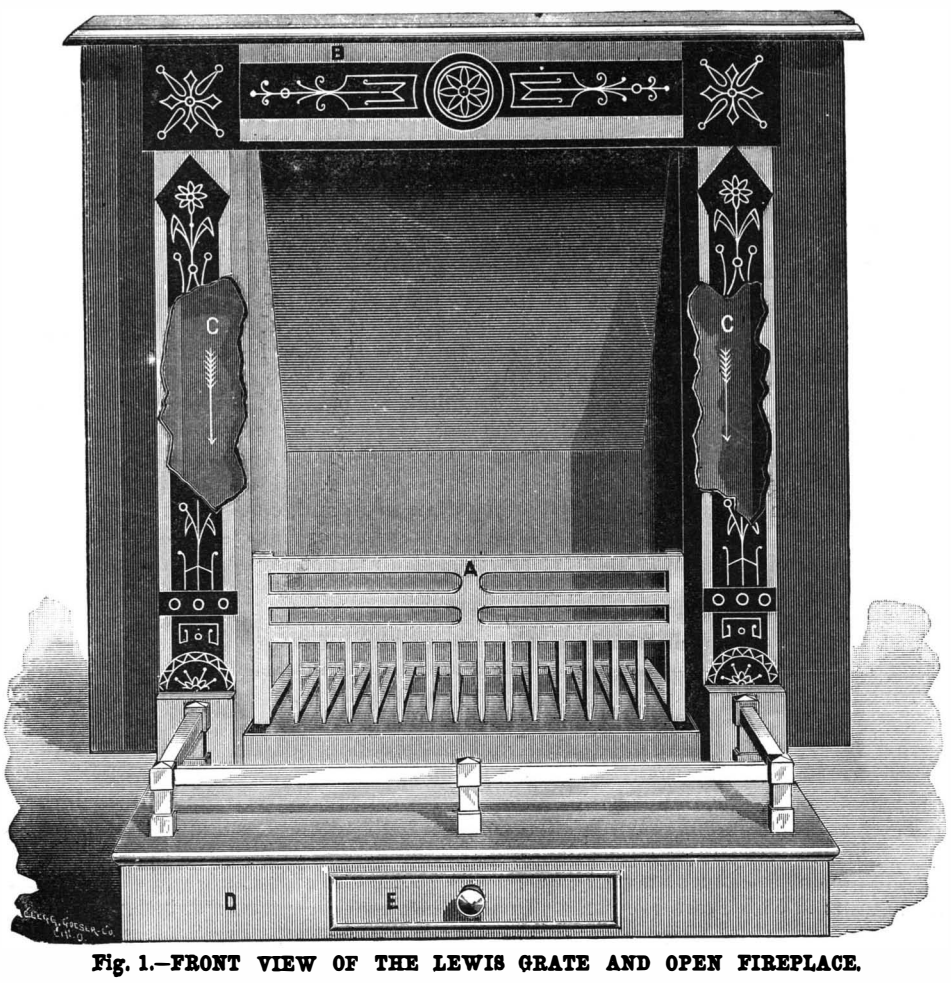


Fig. 1.—FRONT VIEW OF THE LEWIS GRATE AND OPEN FIREPLACE.

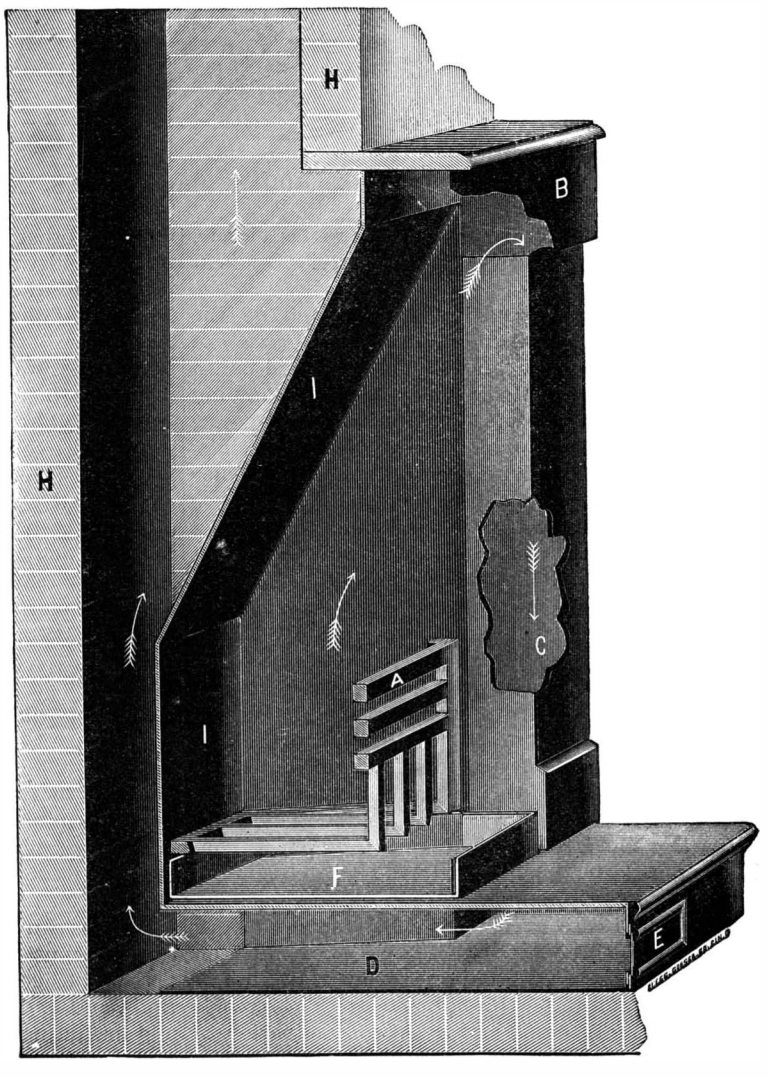


Fig. 2.—SECTIONAL VIEW OF THE LEWIS GRATE AND OPEN FIREPLACE.

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Plaster Work

Designs & Working Drawings.

Detail of Moulding in A.

B

A

Wood Mouldings

Detail of Rosette in C

B

Queen Anne Motives
from Designs by E.L. Aves.

Combed and Stamped Cove. on Wet Patterns

Wood.

Detail of Leaf in B

D

E

Detail in D

Detail in E

Front & Side View of Bracket for D.

Section of Cornice

Cornice to go with D

Composite Motives.

Scientific American N.Y.

Designed by B. Day

B. Day. Del 1886

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ORNAMENTAL PLASTER WORK.

The art of plastering is as old as the art of building, and yet, except in the case of expensive houses, built in or near large cities, its use is confined to the covering of flat surfaces and the running of plain cornices, very little thought being given to using its resources as a means of ornamentation. A suitably decorated ceiling, one in which the cornices have beautiful lines well proportioned to the size of the room, with an artistic center piece, is a source of never failing gratification when well conceived and artistically modeled. The reverse is true of a poor conception carried out in bad taste. The interior decorator should always bear in mind that his work is constantly before the eyes of his client, and, like the pictures on the wall, is criticised, not only by the owner, but by his friends. There is no reason why any intelligent plasterer should confine himself to flat surfaces, nor why he should not utilize his spare time in attempts at drawing, sculpture, modeling, etc. There are times of the year, when his trade is dull, which he could well employ in the study of decorative sculpture, and we propose to give him a hint how to get at it.

DRAWING

for this purpose is mostly linear or outline drawing. Any small design can be enlarged by means of the square, as shown in Figs. A and B. Make a series of squares on tracing paper that will cover the design to be copied, then divide the proposed size to which you wish to enlarge the design into a similar number of large squares, as shown in Fig. B. By numbering two sides, as shown in both diagrams, you can easily find the square you wish to copy and that portion of the design contained in such square. Copy each square until the whole design is enlarged. In the diagram, B, is also shown the manner of enlarging the shapes of cornice moulds from the designs thereof on page 75 of designs. The shaded portion represents the metal shape of the cornice mould. The outline is traced on the metal by cutting the shape out in paper and laying it or pasting it on the sheet metal of which the mould is formed.

This same method applies to designs from which you propose to model. Enlarge your design always before modeling it. It will help you greatly in its execution.

MODELING

is the shaping of any plastic material in forms either representing natural objects or combinations of beautiful shapes, termed ornaments. It is essentially a building process, and hence the reverse of sculpture, which consists in cutting away the material sculptured until the desired shape is obtained.

The mud pie and the snow man are the most primitive forms of modeling, and yet really indicate the very best method of procedure, which consists in building up the object to be modeled by the gradual addition of the plastic material to a base. The French, than whom no greater modern sculptors exist, do not cut away their clay or sculpt it, but build up their statues and designs by the gradual addition of small pellets of clay, which their fingers shape, while their eyes and minds seek the place to apply them. It is a fascinating sight to see an object take shape under the skillful manipulation of a good modeler, a sight that impels even the most timid to try their hand at it. The best part of the work is done by the thumb and fingers, and the most useful tools are those shaped like small thumbs. Of course, a variety of tools is necessary, especially in ornament. Their shapes vary from chisel shapes to small trowel shapes. The best way is to make or buy these tools as their need is felt, but, as in many other professions, the fewer the tools, the better the work.

Clay is the material most used for modeling. This can be puddled with water in a tub, allowed to settle for a day or two, then pour off the water, and use only the finer parts, which will be on the top layer, as the grit will settle at the bottom; but as it is cheap, it is perhaps less trouble to buy it already prepared. While modeling in clay, spray on water from time to time to keep the clay from cracking, but don't get it too wet. Always cover your work with wet cloths after your day's work, and if you lay it aside for a day or two, be sure and wet the cloths at least twice a day.

Wax is another material used for modeling. It requires no wetting to keep it in a plastic condition, like clay, but, being expensive, is not much used except for small work. Mr. Leonard Sence gives the following recipe for modeling wax:

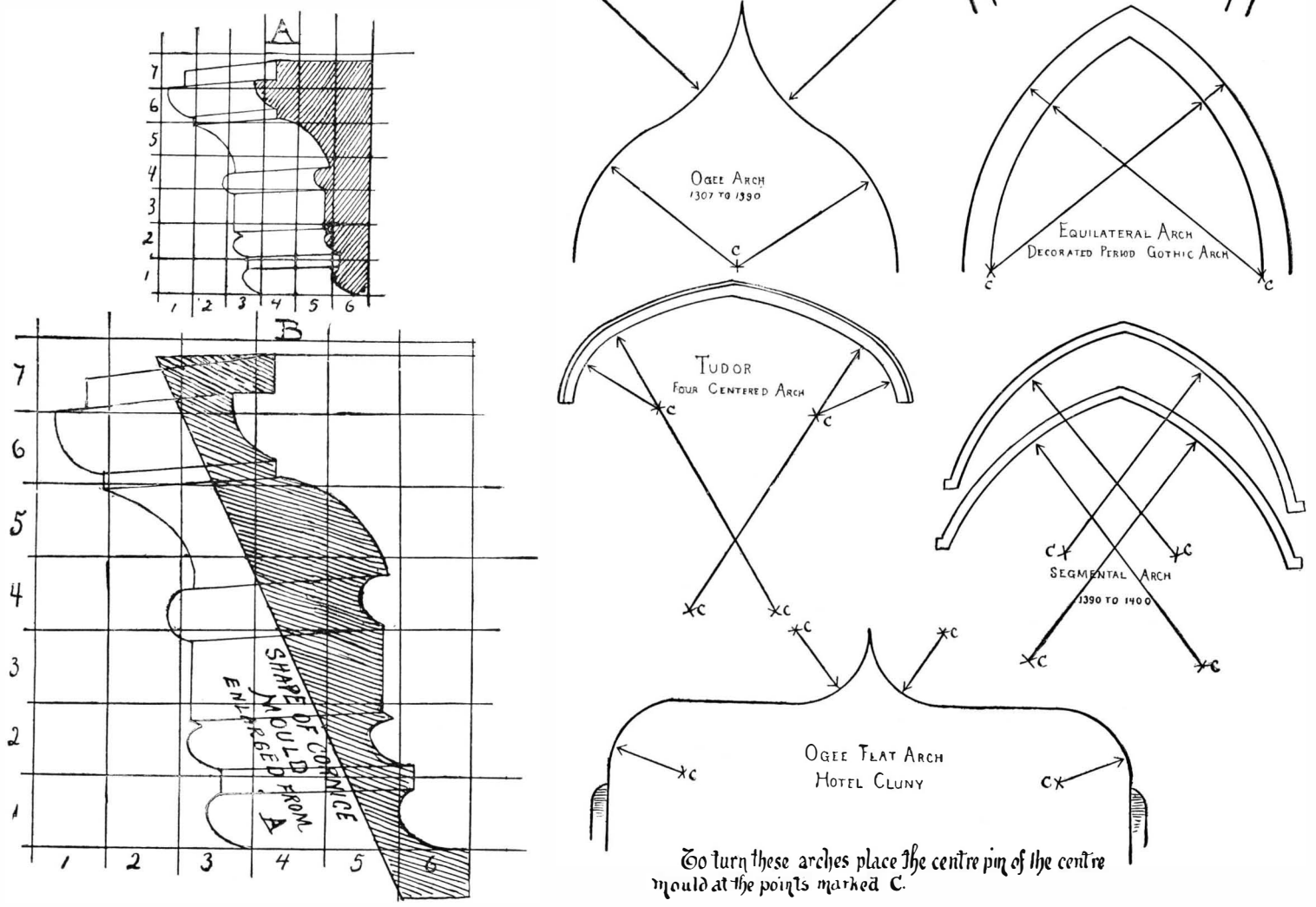
Yellow wax	4 lb.
Canada balsam	1 "
White resin	1 "
Potato fecula	6 "
Four tallow candles.	

Melt the wax over a gentle fire, add gradually the balsam and resin and two of the candles, then gradually work in the potato fecula, and lastly the other two candles. Color with any finely ground innoxious pigment, such as jeweler's rouge, lamp black, indigo, etc. Lead or mercurial colors should be avoided, on account of their poisonous nature.

To cool, pour on a cold oiled marble slab, after which you work it up with your hands like dough, to get it in working condition.

The same modeling tools can be used for wax that are used for clay, the fingers of course playing the most prominent part in the work. Saliva is used on the modeling tool, to prevent the tool from adhering to the wax, although glycerine will answer the same purpose.

In this article we have given you the required hints to enable you, if you have any notion of drawing or modeling, to make an attempt at it. In our next we will endeavor to explain the processes of moulding and casting in plaster, and we hope by that time you have something modeled that you may wish to cast.



ORNAMENTAL PLASTER WORK.

Black Birch.

The price of black birch of the best quality has recently gone up from $7 to $95 per 1,000. The extraordinary advance is due to the discovery that boards cut out of the first logs are susceptible of a very high polish, and can be used for almost any purpose hitherto exclusively reserved for mahogany, which is worth about $250 a thousand. The advance has been expedited by the discovery that the best black walnut is giving out. Black walnut from Arkansas and the South is so porous that it is of very little use in furniture making. The best black birch is found almost exclusively on the barren copper ore regions between Milwaukee and Ashland, where all other timber is stunted in growth and very poor. Here boards out of the butt cut quickly assume a beautiful red tint on being exposed to the atmosphere, and can be polished up to a great degree of fineness. The price will soon fall to $50 to $60 a thousand, as a railroad is being laid right through the very inaccessible region where it grows, and the high prices have tempted several men to open out saw mills. Red beech has also advanced in price very rapidly. It could be bought up recently in Indiana and Ohio for the bare cost of sawing, but now it is worth $30 a thousand.—*Lumberman's Gazette.*

A COMBINED door plate, bell pull, and mail receiver has been patented by Mr. Michael A. McGlinn, of Lancaster, Pa. The plate has an oblong aperture corresponding with the mail-receiving aperture in the door, and a pivoted spring-actuated plate, which acts also to operate the door bell.

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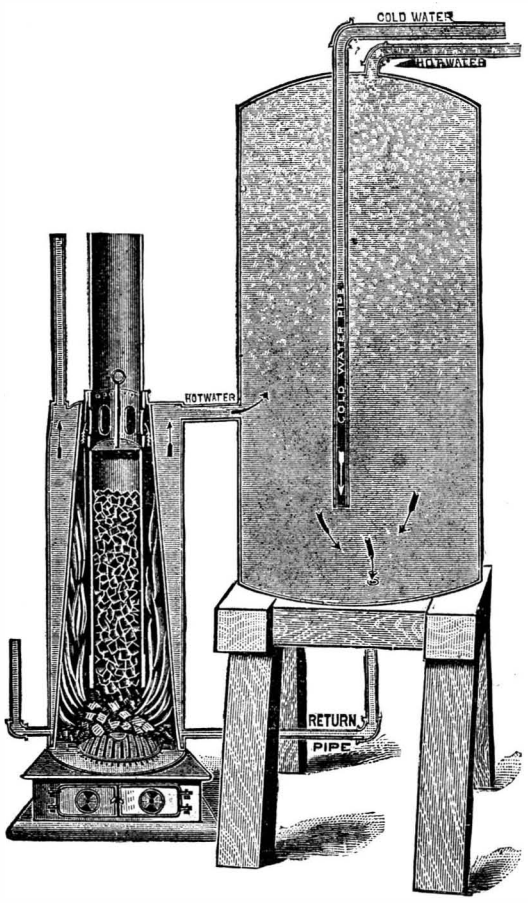
HOT WATER PLUMBING.

The agreeable heat which may be secured by a system of hot water, its cleanliness of operation and its noiselessness, are great items in its favor, and inquiries for systems of hot water heating are beginning to increase from clients to architects and from architects to plumbers and steam fitters.

The circulation of water is the cardinal principle in this system of heating. Plumbers are all thoroughly conversant with the fact that water may be made to circulate by the proper construction of the boiler and its accompanying pipes, but what many do not understand is that the laws which govern the circulation of heated water are so simple that any deviation from them in practice either prevents or greatly impedes the circulation. Hence it is often found by plumbers that, after great care has been taken to secure a proper construction of the system, the water will not circulate and they are unable to explain the cause. It will be the endeavor of the *Sanitary News* in this article to make these laws so plain that they may always be remembered.

The circulation of the water is caused by unequal pressure on some portion of the system. The most common system of heating water for circulation is that required in connection with the kitchen range by every modern city house. It is easily illustrated in the subjoined engraving of Wilke's circulating heater and hot water reservoir. The reason that the water circulates in this or any similar apparatus is that, when heat is applied to the water in the chamber



about the fire box, a dilation of the volume of the water takes place and it becomes lighter. The heated water rises in the chamber and finds its outlet through the short pipe leading to the boiler. The moment heat is received by the water and it becomes lighter, a change in the pressure occurs and the cold water, being heavier, begins to flow through the return pipe into the bottom of the water chamber in the heater, and this movement continues. If we suppose, for the time, that the circulating system includes nothing but the heater and the water reservoir, and that the two pipes attached to the top of the water reservoir are removed, we shall see that the hot water will flow into the reservoir and collect at the top, and the cooler and heavier water will gather at the bottom and flow down the return pipe to replace the water moving out at the top. There is nothing more simple than this movement. Persons not familar with the laws of hydrostatics might not see at a glance that the pressure would be even in this system before heat was applied, when they consider the great difference in size between the columns of water maintained in the water chamber in the heater and in the one inch return pipe. The pressure of fluids depends on the height of the column only, and is entirely irrespective of the bulk. Therefore, the one inch pipe exerts as much pressure as the much larger heating chamber.

If the pipes referred to were entirely disconnected, and the reservoir and return pipe allowed no heat to escape from the water, the circulation would take place until the water was of a uniform temperature, which would occur only when no more heat could be received from the fire, when the circulation would stop. This, however, would never occur in practical work, for the water is continually losing its heat by conduction and radiation, and a uniform degree of heat can never occur. The quicker the water loses its heat, the heavier it becomes and the more rapid the circulation becomes.

This brings us to the point where circulation of hot water throughout the house to different fixtures is desired. For this purpose, the pipes are carried from the crown of the reservoir, the hot water pipe always leading from the top of the reservoir, where the hottest water always is. The cold water supply pipe empties down in the lower part of the reservoir where the cool water is, to avoid reducing the temperature of the hot water by mixing cold with it.

It is evident, after the explanation of the pressure law of fluids, if the hot water pipe and the return pipe are carried to the same height in a building and there connected, that circulation will always result, as the pipes form a simple elongation of the two original columns of water.

In practical plumbing it is necessary to supply fixtures on different floors, and at different levels, and the question of securing a circulation becomes an important one.

The main flow pipe, after leaving the crown of the boiler, is carried horizontally to a point over the sink. Here a branch is dropped down to the level of the sink cock. The main flow pipe is then carried to the next floor, on which there are fixtures, by as direct and straight a route as possible. The pipe is led as near to the fixture as possible and a branch taken off to the cock. The main flow pipe then continues to the next floor, on which is the bath room, probably. The pipe is connected to the bath cock by as short a branch as possible, and is then carried around the side of the bath tub to the wash basin. These generally complete the fixtures to which hot water is conducted; to complete the circulation, the main flow pipe is continued directly back, without any branches, to a point underneath the boiler, where it connects with the return pipe leading from the boiler to the fire back. This system, if properly constructed, will form a circulating system which will work satisfactorily.

For convenience, the cold water pipe is constructed parallel with the hot water pipe, but it has no return pipe, and comes to a dead end at the highest fixture.

It is frequently noticed that upon opening the hot-water faucet a large amount of cold water is expelled before the hot water begins to flow. This need not necessarily be so, and if it occurs, can be remedied. It is caused by leading a long branch from the circulating system, instead of so placing the circulating pipes that a very short branch would be necessary to reach the hot water faucet.

Another annoying feature in some hot water systems is the belching of air from the hot water fixtures on the upper floor. This is because the plumber has neglected to supply an air vent at the highest point on the system. Vapor is always present in water. As it becomes heated, the air is expelled from the water and collects at the highest part of the system. Here a cock is usually placed to allow its escape. In case the water pressure in the house is from a tank, the air vent may be left permanently open, if it extends above the level of the cistern.

The pressure exerted in the hot water system of a house is principally exerted on the boiler. If the pipe leading from it is 34½ feet long from the bottom of the boiler, and is full of water, the bursting pressure on every square inch of the inner surface of the boiler will be fifteen pounds. The requirement for boilers of a good tested strength is very apparent.

In this apparatus, where hot water is continually being drawn off and is replaced by cold, there will be a greater or less deposit of mineral matter, according to the degree of hardness of the water. This is provided for to some extent by the sediment cock at the bottom of the boiler; yet the pipe which runs through the fire back is often stopped up with lime. In some localities, notably Sioux City, Ia., this deposit is very extensive, constantly requiring the substitution of new connections.

Another source of trouble with fire backs is in their freezing in severe weather. It is impossible to prevent it in houses which will not withstand the inroads of cold, except by keeping fire in the stove all night. Drawing off the water at night is futile, because it necessitates looking out for air binds; and if there is a dip, even of slight extent, in any portion of the system, it is impossible to empty the system of water, and it is liable to freeze, and to require the whole plumbing to be torn out to find the stoppage. If there is a suspicion that the water back is frozen, it is best to burn a newspaper or two under the connecting pipes. If water exposed about the room is frozen, it would be desirable to do this any way. If the lead pipe is slightly bent, the cracking of the ice inside will determine if it is frozen. If, after the fire has been burning a few minutes, the upper pipe does not feel warmer than the lower, the supposition that the pipes are frozen will be always correct.

There is one cause for the non-circulation of water in pipes which plumbers should be constantly alive to. It is that the most trivial obstruction, such as a lead shaving lodged in the pipe, in a tank system where the pressure is not aided by the pressure from the mains, may entirely prevent the circulation. This is because the motive power of the heat upon the water is so small. It is so small that an ounce, or even a fraction of an ounce, often expresses it. This small amount of motive power is easily overcome.

The velocity of the circulation is another point in which plumbers are interested. As the movement of the water is dependent upon the difference in temperature of the water in the rising pipe and in the return pipe, it is evident that any measure to maintain the temperature in the hot water pipe, such as packing, etc., and to reduce the temperature in the return pipe, such as doubling it back and forth horizontally, thus increasing its length, and increasing the amount of heat lost by radiation, will increase the velocity of the circulation, and deliver the water to distant fixtures at a higher temperature than otherwise would be the case.—*Sanitary News.*

SIMPLE METHOD OF LAYING OUT THE JOINTS IN ELLIPTICAL VAULTS.

Mr. Maurice d'Ocagne points out in the *Annales des Ponts et Chaussees* the following simple method of drawing the outlines of the joints in elliptical vaults:

Let $M_1, M_2, M_3, \ldots M_7$ (Fig. 1), be the points of

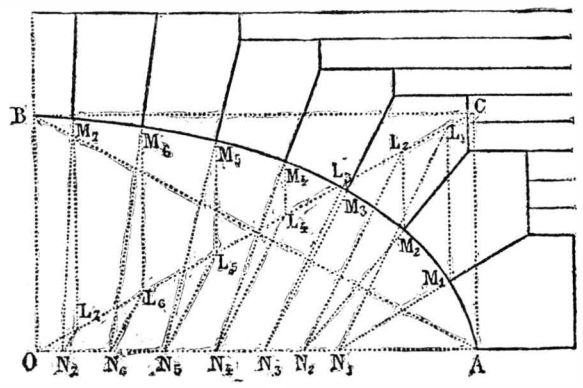


Fig. 1.

the quarter ellipse, A B, through which it is a question of outlining the joints, that is to say, the perpendiculars to the ellipse.

As the tangents at the summits, A and B, intersect each other at C, let us draw the straight lines, A B and O C.

The perpendiculars to O A, extended through the points, $M_1, M_2, M_3, \ldots M_7$, will intersect the straight line, O C, at the points, $L_1, L_2, L_3, \ldots L_7$.

The perpendiculars to A B, extended through the points, $L_1, L_2, L_3, \ldots L_7$, will intersect the axis, O A, at the points, $N_1, N_2, N_3, \ldots N_7$. The straight lines, $M_1 N_1$, $M_2 N_2$, $M_3 N_3$, $\ldots$ $M_7 N_7$, are the perpendiculars sought.

In fact, let M N (Fig. 2) be the perpendicular to the

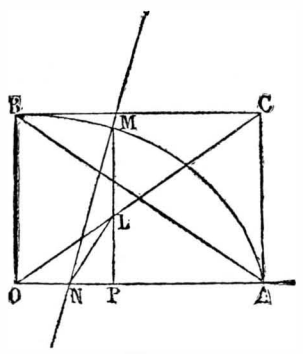


Fig. 2.

ellipse at the point, M. From the point, N, suppose we let fall upon the line, A B, the perpendicular, N L, which intersects the ordinate, M P, at the point, L.

Then, by virtue of a well known property of the ellipse, we have

$$\frac{PN}{OP} = \frac{b^2}{a^2}$$

As the triangles, P L N and O A B, have sides that are perpendicular to each other, we have also

$$\frac{PL}{PN} = \frac{a}{b}$$

Upon multiplying these equalities, member by member, we obtain

$$\frac{PL}{OP} = \frac{b}{a}$$

an equality that shows that the point, L, is situated on the straight line, O C, *quod erat demonstrandum.*

A House Designed for Future Enlargement.

We give with this number a colored plate of a house designed for future enlargement. It is complete in itself; but at some future time, when prosperity comes to the proprietor or his family increases, he may need to enlarge and extend his homestead. With our next number, May, we intend to illustrate the same house and show its plans and appearance when enlarged.

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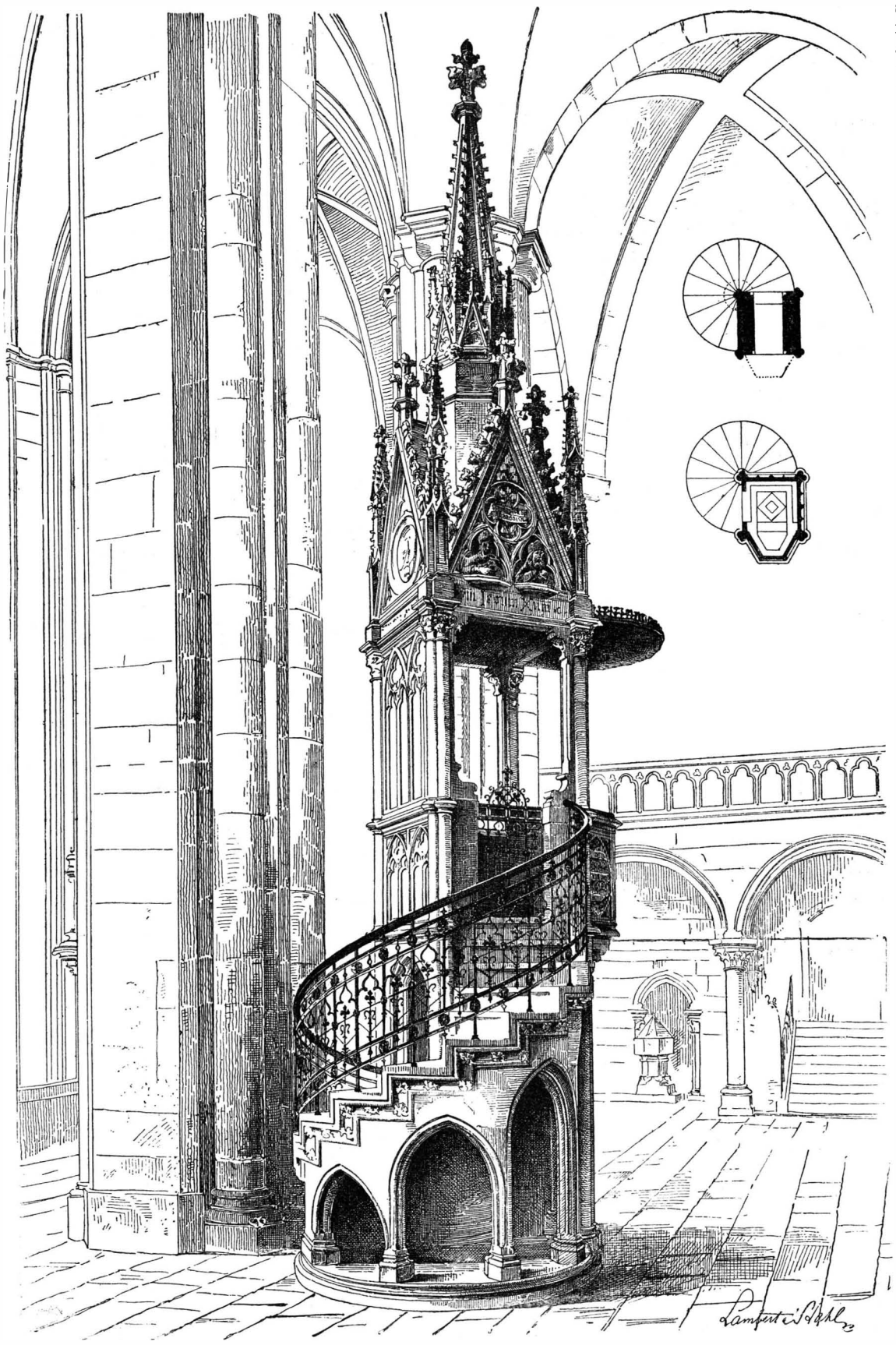
A GOTHIC PULPIT.

The architects had to solve the problem of building a stone pulpit worthy of the time-honored Church of the Holy Cross on a comparatively small space. For this reason they deviated from the ordinary design, and obtained the desired breadth by the balcony-like broadening of the platform. The platform of the old pulpit was about eight feet above the floor of the church, and the beginning of the staircase was in the massive foundation.

The center of the pulpit has a breadth of 4 feet, and it is 35 feet high, while the radius of the staircase is 4 feet. The foundation and the cluster of pillars is made of "Grisignano," and the back wall and the baldachin of "Savoniere" stone. The variegated sounding board is of wood. The dimensions of the latter are moderate, in accordance with the design, but it answers its purpose perfectly. The entire cost is about $4,600.—*Architektonische Rundschau.*



PULPIT, CHURCH OF THE HOLY CROSS, LOWER AUSTRIA.—AVANS & LANGE, ARCHITECTS, VIENNA.

Hints on Building.

Put up the frame and get a roof over it as soon as may be, say in May or earlier. Then let it stand until the first of September to season. This is the old fashioned way, and it has advantages which those who have had experience with shrinking timber will not be slow to appreciate. In this part of the country the timber for a frame is always green when it is put up. Indeed, hemlock could not be worked very well dry. It is much better to have the shrinkage done before the inside finish is on than after.

All floors should be double. A layer of sheathing paper between them would not be a bad idea, and would pay for itself. The upper floor ought to go down after the mason work is done. A smooth, nice floor is a great preserver of carpets.

Back of the wash boards the space should be filled in with bricks. The ends of the floor timbers ought to be filled in such a way as to prevent rats and mice from having a free passage. Such a filling greatly diminishes the danger from fire.

Do not let the tinman or the contractor persuade you that the gutters should be left until red with rust before they are painted. It is a plan which is designed to benefit them exclusively. The paint goes on more easily after the red rust begins. The tin, however, has begun its own destruction, and will go on rusting under the paint just as steadily as though it had no protection, though perhaps not quite so fast. Tin roofs should not be allowed to get red. They can be cleaned and painted on one side in the shop. The objection to this is that the resin or acid (none of the latter should be used) needs to becleaned off by the rains, so that the paint will stick. The best plan is to have the cleaning done at once, without waiting for the rain.

All piping should be put into the house while it is in the frame. This saves expense and much cutting of woodwork. Alongside each chimney it is a good plan to have a space extending from floor to floor in which pipes can be run if desired. The chimney breasts and the spaces which they cover ought to be plastered on wire lath, for safety, and thus avoid shrinkage.

Have a spare flue in each chimney, to be used for ventilation. The open fireplace, as a ventilator, however, is a delusion. Make openings into the flue at the base board, and by proper management of doors and windows, perfectly pure air can be secured in every room.

Heat by a big hot air furnace several sizes larger than the furnace makers recommend. This furnishes the means for perfect ventilation, by providing an ample supply of warm, pure air. Keep the pipes and registers perfectly clean, or the smell of cooked dust will be mistaken for that bugaboo "burnt air."

In plastering do not use a "brown coat" of mortar. Put the finish directly on the "scratch coat." Time, labor, and patience will be saved, and the work will be better, harder, and more durable. Build the foundations for the piers, in the cellar, with as much care and deeper than those of the external walls. These piers support the center of the house, and they are frequently neglected. The result is a great crop of cracks in the plaster.

Have the walls of the upper floor 9 feet high in the clear, even if you have to cut off six inches from the floor below. This is of course for a moderate size of house. High ceilings for sleeping rooms tend toward giving the sleepers purer air by furnishing greater space. When one is drawing plans, it is best to consult with a carpenter and see whether the framing will come out even multiples of commercial lengths. It is sometimes cheaper to use the full lengths of the timber than to cut off six inches from the ends. Increasing the size of a house six or eight inches may frequently be done without any appreciable addition to the cost.

In designing, get the inside arrangement right. Have places for every piece of furniture. Arrange the bedrooms so that they will contain beds without putting them against doors or windows. Put them against inside walls if possible. Have some connecting rooms and some which do not. After all this is done, put the outside on. Let doors and windows come where they will, and do not spoil your own comfort for the sake of an external appearance which is for the benefit of your neighbors.

Lastly, have a garret by building a sharp roof. Cover the roof with dark colored slate from Maine or Vermont. Lay it in cement, and be happy.

Moral: Alterations on paper cost much less than those in wood and stone. Therefore it is better to spend a long time over the plans than to make changes on which the builder charges his own price.—*The Mechanical News.*

A STONE AND BRICK COTTAGE.

This house, which belongs to Mr. J. N. D'Andrea, is built on the Basque principle, under one roof, with covered balconies on the south side, the north side being kept low to give the sun an opportunity of shining in winter on the house and greenhouse adjacent, as well as to assist in the more picturesque grouping of the two. On this side is placed, approached by porch and lobby, the hall with a fireplace of the "olden time," lavatory, etc., butler's pantry, vater closet, staircase, larder, kitchen, scullery, stores, etc.

On the south side are two sitting rooms, opening into a conservatory. There are six bed rooms, a dining room, bath room, and housemaid's sink.

The walls are built of colored wall stones, known as "insides," and half timbered brickwork, covered with the Portland cement stucco, finished Parian, and painted a cream color.

All the interior woodwork is of selected pitch pine, the hall being boarded throughout. Colored lead-light glass is introduced in the upper parts of the windows in every room, etc.

The architect is Mr. W. A. Herbert Martin, of Bradford, England.—*Architect.*

Slate Roofs.

C. C B., of Jackson, Mich., wishes to know (1) of any way to fix a slate roof so it will not leak, or (2) of any paint or preparation that a roof can be covered over with, to prevent the water from working back up under the slate.

(1) When slates are laid upon a board roof, the boards should be covered with waterproof bitumenized felting, overlapping on the incline of the roof. If upon battens, a sheet wire netting can be stretched from batten to batten to keep the felt from sagging, and the slates laid with the proper tilt to make the tails lie close.

(2) To keep out draughts, as well as a special precaution against leakage occurring on exposed sites from driving rain or melting snow, the slates are often pointed with hair mortar on the inside, or *torched*, as it is termed; or they may be shouldered or bedded for about two inches at their heads in hair mortar, generally mixed with coal ashes, *which have been sifted and washed*, to give a good slate color, and this method is more effectual than mere pointing, as it does not get loose nor drop out, while it tends to keep the *tails* or *feet* of the slates down tight.

Sometimes the slates are rendered on the under sides with hair mortar, both to keep out the weather and maintain a more equable temperature within.

If the slates are already laid, pointing must be resorted to as suggested, but there is a cement for pointing which has been in successful operation in this country and England for a long time, and it is superior to hair mortar. It is this: Take equal parts of whiting and dry sand, and 25 per cent of litharge, made into the consistency of putty with linseed oil. Use just enough sifted and washed coal ashes, in addition, to give the mixture a good slate color. It is not liable to crack when cold, nor melt like coal tar and asphalt with the heat of the sun.

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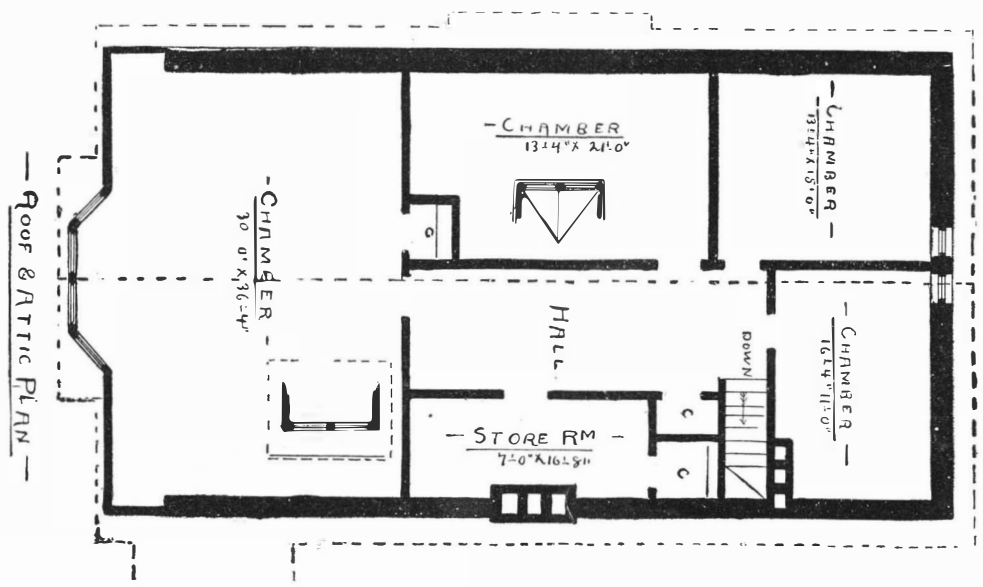

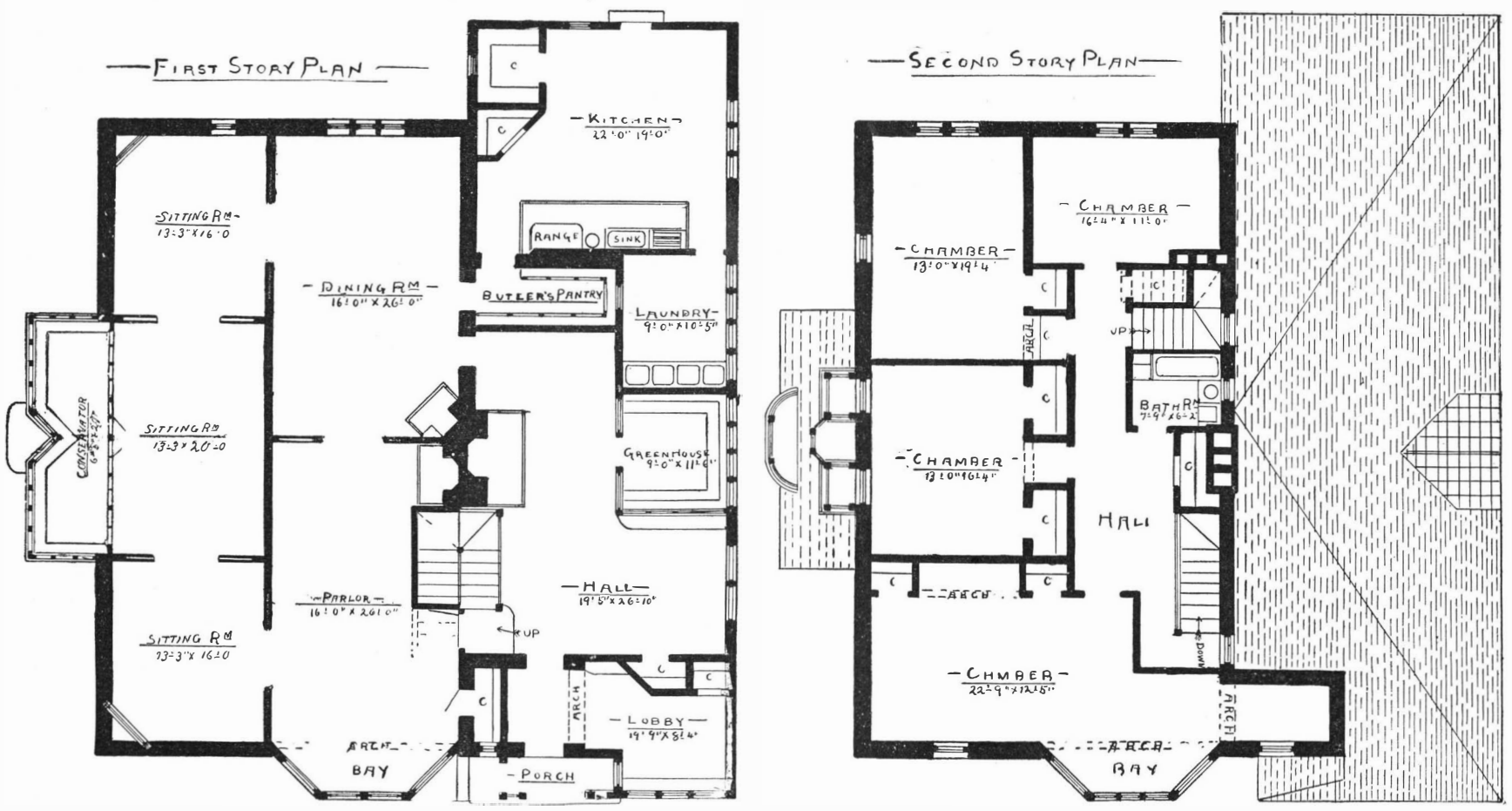

A STONE AND BRICK COTTAGE.

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Redwood Logging in California.

The whole world concedes to America pre-eminence in the size of her trees available for timber. In no part of the world are trees to be found equaling in size the forest monarchs of California, save in certain parts of Australia and Tasmania, where the eucalyptus trees grow, perhaps, to equal dimensions, but the wood of the eucalyptus is gnarled and worthless, twisting and warping if used. California's big trees are of two varieties, the Sequoia gigantea, the most celebrated examples of which are found in the vicinity of the Yosemite, and the Sequoia sempervirens, or redwood, which, through extending from the vicinity of Santa Barbara on the south to Oregon on the north, are found in greatest size in Humboldt County. In the early English works on phytography, it was sought to link the name of their great Wellington to the trees of the Yosemite, but now it is agreed that to the father of the American nation this honor appropriately belongs, and the name of Washingtonia gigantea is now coming into favor in popular and scientific usage.

In the forests of Norway, Sweden, and Finland, the great timber-producing countries of northern Europe, the standard width of boards is 6 inches, and trees larger than 8 to 10 in. diameter are unusual. Several years ago a large American locomotive establishment shipped a cargo of locomotives to Hangho, the terminus of one of the Finnish railways. They were packed in boxes of Michigan two inch pine plank, many of them 15 in. to 18 in. or more in width. Boards of this extraordinary width attracted much attention, and an employe of the railway obtained sufficient of the empty boxes and fashioned them into a house—the best in the place—and people came in considerable numbers to marvel at trees which could produce boards like those. The thrifty housewives greatly prized pieces of the same boards for making moulding boards, and many were distributed for this purpose. If our ordinary lumber of commerce could excite such surprise, how much greater the astonishment and admiration of the same people at California's wonders!

An American gentleman was once waiting at a Russian custom house to have his effects examined and passed. As he opened his trunk a photograph of one of the great trees was lying on top exposed to view. The inspector examined it eagerly. "Ah," said he, "that is from California. I have a brother there who has written us at home much about them, but we could not credit it. I have never seen a photograph of them."

The picture was presented to him, whereupon work was suspended until it had been handed about and discussed by all, up to the chief of the custom house. The photograph showed a great tree partially cut for felling, with twelve persons sitting uncrowded in the V-shaped cutting. This calls to mind a *bon mot* of the late George Whitney, of Philadelphia, who, on seeing the same photograph, exclaimed, "Why, it is a photograph, but it really looks like a wood-cut!"

A peculiarity of the redwood forests is the absence of undergrowth. It is, therefore, difficult to realize their magnitude without a familiar object near by with which to compare them. Until one begins to make such a comparison the trees do not appear of extraordinary size. Like the cataract of Niagara, the first view is frequently disappointing, and familiarity, far from breeding contempt, serves to increase the feeling of awe inspired by overpowering magnitude.

In consequence of the great size of the redwood, the process of getting the logs to the mills has been a slow and expensive one. Floating has been impracticable, owing both to the size and the weight of the logs, even where there are streams. Hence, logging railroads are in California a necessity, instead of an economic convenience, as in the pine forests east of the mountains. Many of the readers of the *Lumberman* are familiar, by pictures and otherwise, with the old methods in use on the coast. In some cases long lines of oxen laboriously drag the logs through the woods, and in other cases tackling, operated by cattle or mule power, or sometimes by donkey engines, is employed to load the logs. But those methods are too slow, and are being superseded by steam power conveniently applied.

The necessity for some special means of handling these great logs led Mr. John Dolbeer, a large lumber operator of San Francisco, to think of attaching a steam windlass to an ordinary locomotive. A patent was granted him for a device by which the steam windlass could be thrown into gear with the driving wheels of the locomotive for the purpose of propelling it, or could be used separately for its legitimate work of lifting and handling logs. Since then the Baldwin Locomotive Works, of Philadelphia, have built, for logging railroads on the Pacific coast and elsewhere, a special type of double-end logging locomotives, equally adapted for running in either direction, and equipped with a powerful steam windlass at the forward end. Unlike Dolbeer's locomotive, however, the windlass is entirely disconnected from the driving gear of the locomotive, and the locomotive can be built either with or without it. The locomotives referred to have two pairs of driving wheels coupled and a two-wheeled or pony truck at each end. A saddle tank carries the water, and the rear truck carries a large wood box. The forward truck is center bearing, the rear truck side bearing. The wheel base is extended sufficiently to distribute the weight of the engine over a good length of track, while at the same time it is perfectly flexible, allowing the locomotive to run on the roughest track and pass the shortest curves with ease and without injury to itself or the track. A powerful steam brake acting on both pairs of driving wheels controls the motion of the engine on steep grades, and serves to lock it firmly while the windlass is in operation. The windlass is a Copeland & Bacon six inch double cylinder, with single or double gearing, as the weight of the logs to be handled requires.

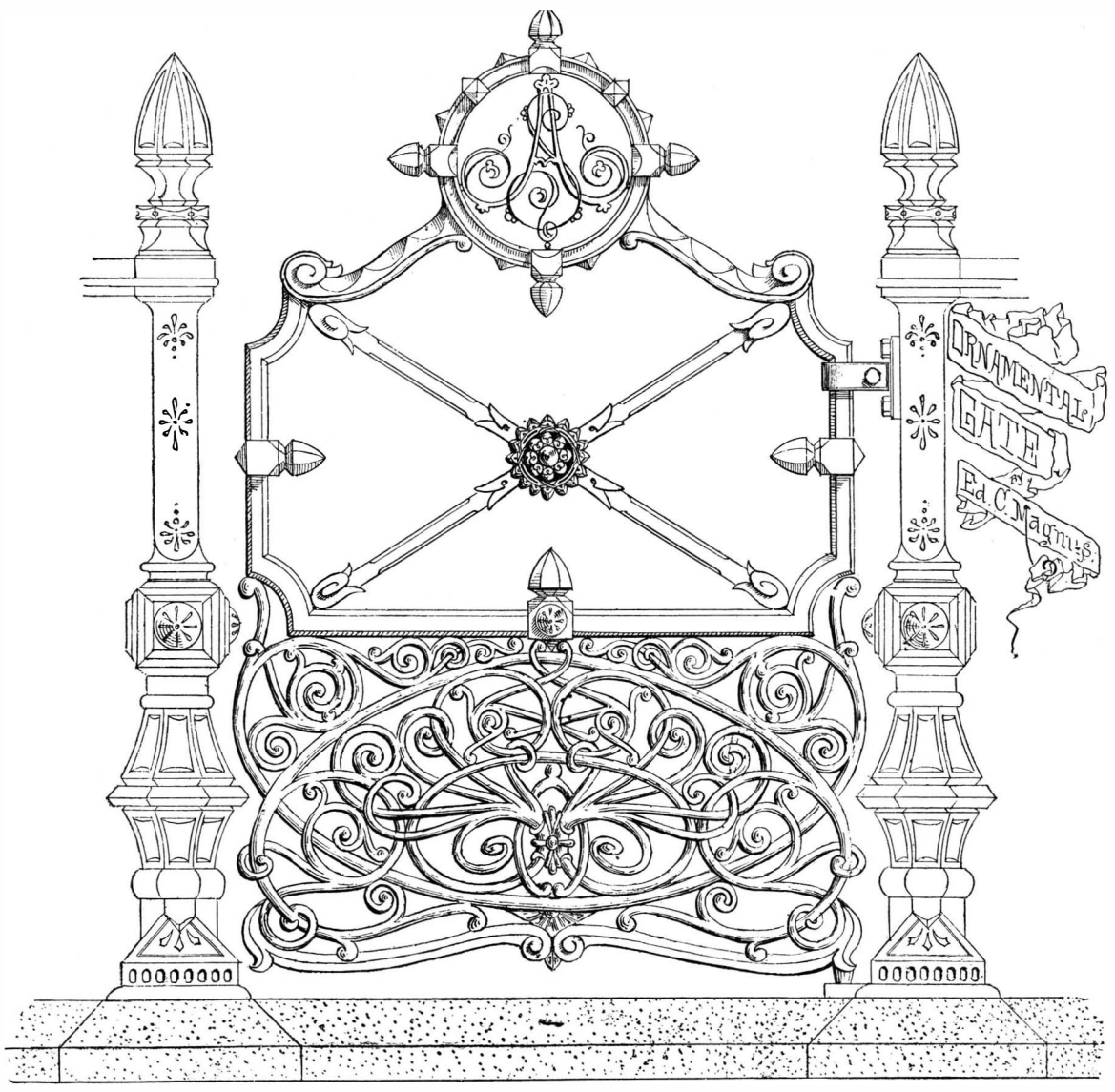
Some of the green redwood timber is very heavy, and will sink when put into water. The logs handled frequently weigh from twenty to thirty tons.

Redwood is the common lumber of the Pacific coast, taking the place of the pine and hemlock of the Eastern States and the deals of England. It is used for clapboards, siding, shingles, in fact for every purpose where it is not subject to wear. When dried, it is quite soft, and wears rapidly by attrition; it is, therefore, unsuitable for flooring or stair purposes. It is used to some extent for railroad ties, though not so well adapted to this service as harder woods. Particularly on curves, the spikes become loosened by the lateral pressure against the rails. Redwood is remarkable in that its shrinkage is mainly in the direction of its length. Though its grain is usually straight, it can be found with grain curled, bird's eye, and other fantastic shapes, rivaling in this respect the most beautiful bird's eye and curly maple. Its rich color, much resembling red cedar, its beautiful grain, when carefully selected, and its great durability, when not subject to wear, make it most desirable for interior decoration. With the low transcontinental freights now ruling and likely to continue, it must become recognized in the Eastern States as a wood rich in economic and ornamental possibilities.—*Lumberman.*

Grano-Metallic Stone.

The grano-metallic stone, the invention of Mr. J. H. Bryant, of London, is composed of blast furnace slag and granite, which are crushed, chemically treated, dried, and mixed with Portland cement. For use these ingredients are brought to a pasty consistency with an alkaline solution, and laid. It possesses the important property of always having a rough surface, which is due to the atoms of the vitreous slag always presenting themselves just above the other ingredients, which are more readily worn. This stone has undergone a special trial in one of the metropolitan gas works, where a section was laid at the request of the engineer. It was there successfully subjected to tests which natural and artificial stones have, it is stated, been unable to withstand. It is found to stand not only the wear and tear of heavy horse and van traffic, but the sudden and extreme alternations of temperature incident to the slaking of coke upon it. Valuable as this material has proved itself for paving and road making purposes, however, it has now been proved to possess the additional important feature of being highly refractory.

A cement kiln lined with this stone has stood a number of burnings without any repairs having to be done. Even where the lining happened to be torn away by a portion of adhering clinker, there is not the least sign of the stone having been injuriously acted upon by the heat. This is certainly a most crucial test, and the satisfactory manner in which the stone has passed through it stamps it at once as an absolutely fire proof material, and, therefore, of special value for constructive purposes.—*Iron.*



DESIGN FOR AN ORNAMENTAL GATE.

ORNAMENTAL IRON GATE.

I send you a design of the gate belonging to the railing which was illustrated in your building edition for August, 1886, and which shows the crossed bars in the upper part.

In designing this gate, my endeavor has been to adhere as closely as possible to the outlines of the posts. All the cornered work (posts, etc.) is *octagonal.* In carrying out the design, the cast iron scroll work shown as of a circular or oval section in the drawing was made grooved and with edges rounded. The groove following all the contortions brings well out the intersections.

ED. C. MAGNUS.

Crefeld, 1887.

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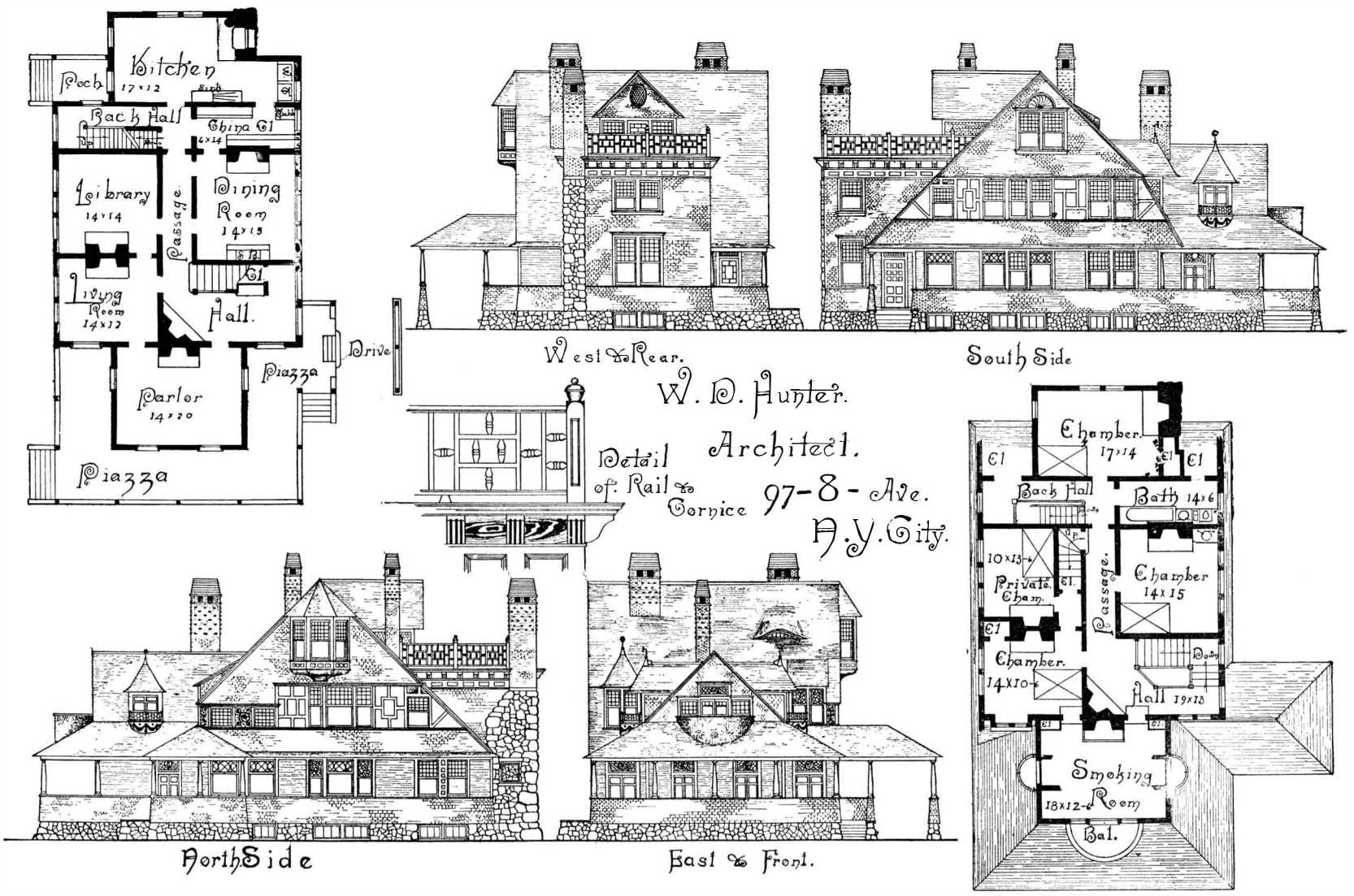
DWELLING FOR AN ELEVATION.

This dwelling was designed by Wesley D. Hunter, architect, 97 Eighth Avenue, N. Y. City. It has a large hall and convenient porch. Rooms are large and well lighted, with plenty of closet room. The front faces the east and the rear is to overlook a valley. The roof of the rear projection is to answer the purpose of a tower. It is estimated to cost $7,000 to $8,000.

Left-Handedness.

Dr. Daniel Wilson, president of the Royal Society of Canada, has lately contributed a paper to the *Proceedings* of that society on the subject of left-handedness, to which he has managed to give an unexpected and very practical interest, affecting all who have children or who are concerned in their education. The author had written previously on this subject, but not with such full and effective treatment. He reviews the various causes to which the general preference of the right hand has been ascribed, and also those to which the occasional cases of left-handedness are attributed, and finds them mostly unsatisfactory. He shows clearly that the preferential use of the right hand is not to be ascribed entirely to early training. On the contrary, in many instances where parents have tied up the left hand of a child to overcome the persistent preference for its use, the attempt has proved futile. He concludes that from our bellicose ancestors, one lobe of our brains and one side of our bodies are left in a neglected and weakened condition. The evidence which Dr. Wilson produces of the injury resulting from this cause is very striking. In the majority of cases the defect, though it cannot be wholly overcome, may be in great part cured by early training, which will strengthen at once both the body and the mind. "Whenever," he writes, "the early and persistent cultivation of the full use of both hands has been accomplished, the result is greater efficiency, without any corresponding awkwardness or defect. In certain arts and professions, both hands are necessarily called into play. The skillful surgeon finds an enormous advantage in being able to transfer his instrument from one hand to the other. The dentist has to multiply instruments to make up for the lack of such acquired power. The fencer who can transfer his weapon to the left hand places his adversary at a disadvantage. The lumberer finds it indispensable, in the operations of his woodcraft, to learn to chop timber right and left handed; and the carpenter may be frequently seen using the saw and hammer in either hand, and thereby not only resting his arm, but greatly facilitating his work. In all the fine arts the mastery of both hands is advantageous. The sculptor, the carver, the draughtsman, the engraver, and cameo cutter each has recourse at times to the left hand for special



DESIGN FOR A DWELLING FOR AN ELEVATION.

the general practice is probably due to the superior development of the left lobe of the brain, which, as is well known, is connected with the right side of the body. This view, as he shows, was originally suggested by the eminent anatomist, Professor Gratiolet. The author adopts and maintains it with much force, and adds the correlative view that "left-handedness is due to an exceptional development of the right hemisphere of the brain."

A careful review of the evidence gives strong reason for believing that what is now the cause of the preference for the right hand was originally an effect. Neither the apes nor any others of the lower animals show a similar inclination for the special use of the right limbs. It is a purely human attribute, and probably arose gradually from the use, by the earliest races of men, of the right arm in fighting, while the left arm was reserved to cover the left side of the body, where wounds, as their experience showed, were most dangerous. Those who neglected this precaution would be most likely to be killed; and hence, in the lapse of time, the natural survival would make the human race, in general, "right-handed," with occasional reversions, of course, by "atavism," to the left-handed or, more properly, the ambidexterous condition. The more frequent and energetic use of the right limbs would, of course, react upon the brain, and bring about the excessive development of the left lobe, such as now generally obtains.

The conclusions from this course of reasoning are very important. Through the effect of the irregular and abnormal development which has descended to us manipulative dexterity; the pianist depends little less on the left hand than on the right; and as for the organist, with the numerous pedals and stops of the modern grand organ, a quadrumanous musician would still find reason to envy the ampler scope which a Briareus could command."

That all this is true is abundantly shown by the numerous examples cited by the author, from the greatest of artists, the left-handed Lionardo da Vinci, to the distinguished ex-president of the American scientific association, Prof. Edward F. Morse, and (we may add) to Dr. Wilson himself, both of whom are known to be accomplished draughtsmen with this too-neglected hand. In view of these facts, it is evident that few more important subjects can be offered for the consideration of educators than that which is presented in this impressive essay.—*Science.*

The Building Employers' Protective Association.

After much deliberation and discussion, and with a unanimity of purpose peculiarly gratifying among such widely diversified callings, the various employing interests constituting the building trades of New York have resolved to organize into an association, having for its primary object the benefit of the workingman. Master painters, master plumbers, real estate dealers, carpenters, iron workers, framers, architects, masons, builders, roofers, plasterers, gas fitters, stair builders, elevator builders, marble workers, steam fitters, bluestone cutters, artificial stone manufacturers, furnace and heater makers and setters, and dealers in plumbers' materials, are all represented in the Building Employers' Protective Association, and its first object is to insure to masters the right to employ whomsoever they will, regardless of union dictation.

The importance of the step thus taken cannot be overestimated. Although there is to be no interference between employers in the different branches of business on questions of wages or hours of labor, the federation, if honestly adhered to, will really control these factors.

Nowadays, if a master is asked to pay wages he considers too high, or to work such short hours as to endanger the fulfillment of his contract, he is coerced into agreement by threats of a strike. He knows that if he lets his union workmen go he is placed at a disadvantage, for all the union workmen of other denominations engaged on his buildings will refuse to work with non-union men, and in this manner heavy pressure is brought to bear on the employer of the strikers. Not only this, but the support one branch of trade furnished another tended to prolong strikes unnecessarily and augmented the trouble.

The workman unquestionably has the right to sell his labor at the highest price it will bring, nor do we deny his claim to say how many hours he will work, or under what conditions his labor shall be performed. Here, however, the limit of his prerogative, as dictated by the usages and necessities of society, is fixed. He has no right to step beyond it and tell his employer that no other man shall work for him if he does not choose to do so. In doing this, he perpetrates an injustice on the employer and on every non-union workman, no matter what his reasons may be for not joining a labor organization. As well might the butchers and bakers combine to dictate where and of whom necessary articles of food should be purchased.

It is this abuse of the power of organization the Building Employers' Protective Association has been organized to combat. To its members, just as much as to the Knights of Labor, or any other faction among workers, the injury of one is the concern of all. A strike against the employment of non-union men is probably to be followed by a lock-out of all striking trades, and in this manner the right of a master to employ whomsoever he chooses will be asserted. There will be no limit prescribed as to the right of workmen to strike, but they must not interfere with those taking their places—in other words, the members of this association declare the labor market open to everybody, and guarantee fair treatment to all that may enter it. —*The Sanitary Plumber.*

IT is probable that the artesian well now being bored at Pesth will be the deepest in the world, having indeed already reached a point entitling it to this prominence. It is sunk for the purpose of supplying the baths and other public establishments with hot water, the temperature aimed at being 176°, with a volume sufficient for the wants of the whole city.

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A CHURCH OF MODERATE COST.

SPECIFICATION

of the work and materials required in finishing St. Andrew's Church, at Phenix, R. I., in accordance with drawings prepared by Messrs. Wm. R. Walker & Son, architects, Providence, R. I.

Furring.—Furr the walls of all rooms straight and true for lathing. Furr the ceilings of all rooms with ⅞ in. by 2 in. spruce furring strips, 16 in. from centers. Put up straight and true, and strongly nailed.

Grounds.—Put on ⅞ in. by 2 in. spruce grounds at the top line of base boards and chair or surbase moulding, and around the sides and tops of all doorways.

Partitions.—Partition the interior, as shown on floor plans, with 2 in. by 4¾ in. spruce partition studs, set 16 in. from centers, with two rows of 2 in. by 2 in. cross bridging in the height of same, and the studs doubled at the side of all doorways.

Lathing.—Lath the walls and ceilings of all rooms with five foot spruce laths, four nailings to each, and the end joints broken at every three laths, and the side joints laid 1¼ in. open.

Plastering. — Plaster all the walls and ceilings one good coat of brown plastering mortar, made from slaked, screened, and puttied lime, clean, sharp grit sand, and long cattle hair, mixed in suitable proportions for making strong mortar, and tempered with clean water. To be well rubbed into the joints between laths, forming good, strong clinches back of the same. To be trowel smoothed to a hard, even surface, when the mortar is in the proper state, so as to do without water in the smoothing. All angles to be screeded with long straight edges, and left clean, true, and straight.

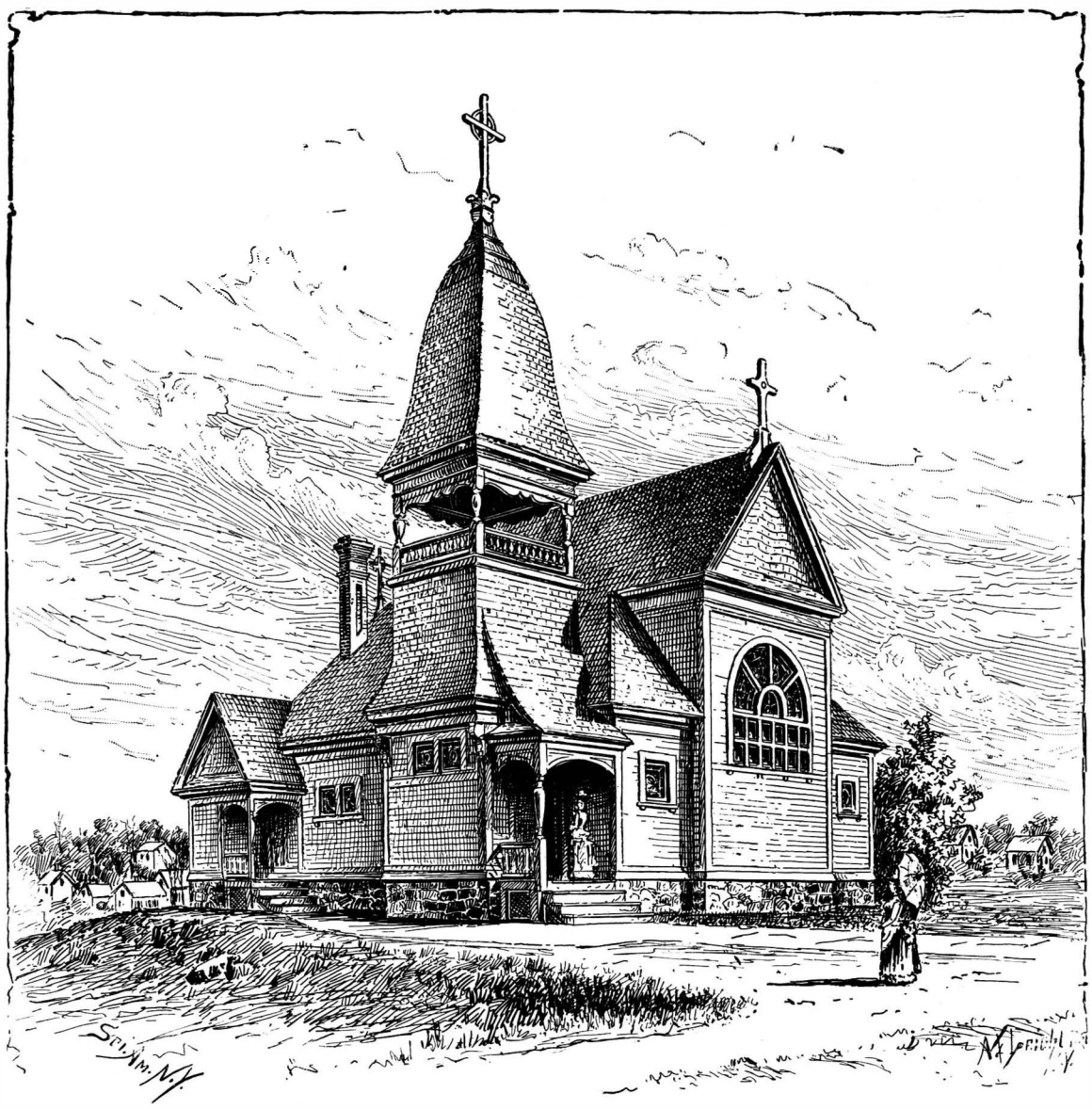
Chancel Arch. — The chancel arch to have stucco mouldings run around the corners of same, and left true, clean, and smooth. In the angle of wall and ceiling of chancel run a plain moulding stucco cornice, 8 in. down on walls by 12 in. out or up on ceiling. The plasterer to clean out and sweep out the mortar and plasterer's rubbish from the building as soon as his work is done, and to cover the glass in windows that are glazed, to prevent spattering of mortar thereon, and to protect walls from frost.

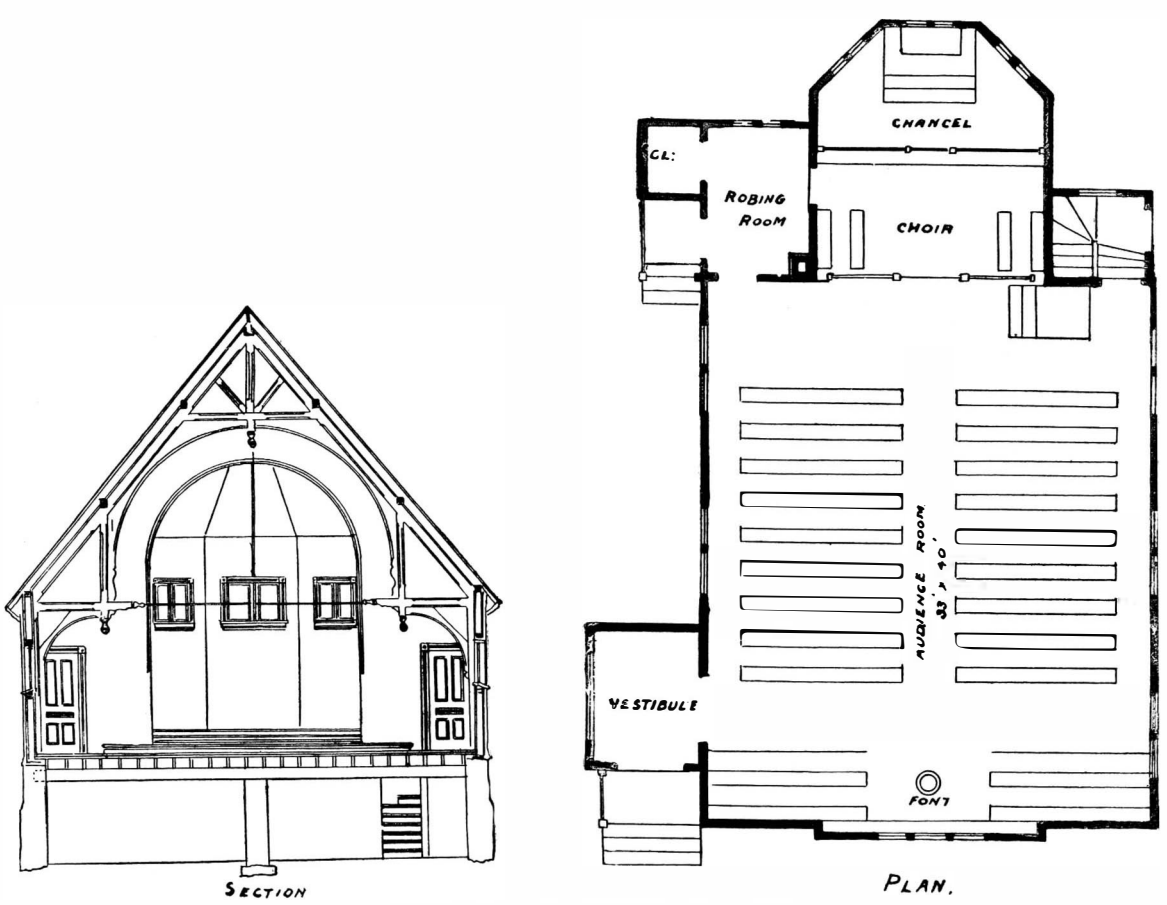
Interior Finish. — The interior of building to be finished in clear, dry seasoned and kiln dried white pine. The architraves around doors and windows to be ⅞ in. thick by 6 in. wide, with turned angle blocks at the top corners. The stool casings to be moulded with moulded apron under same. The base boards to be ⅞ in. thick by 10 in. wide, with a ⅞ in. by 3 in. moulding top of same. The surbase moulding around the walls of auditorium and chancel to be ⅞ in. thick by 6 in. wide, with moulded edges and faces. At all external corners, between base and surbase, put in turned white pine corners 1¾ in. in diameter, with 2¾ in. turned heads at both ends. Thresholds to be clear Southern hard pine ¾ in. thick.

Floors.—Furnish and lay down the top floor of all rooms fine, clear, dry seasoned and kiln dried matched ⅞ in. Southern hard pine of the best quality, to be blind nailed into every floor joist, and the joints planed off level and smooth. The flooring of chancel to be raised up one step high at each break shown on floor plan, and the front edge of step moulded with a cove under same.

Doors.—The inside doors to be made from clear white pine, of the sizes and forms shown on plans, to be 1¾ in. thick, with moulded panels, to be hung to frames with stout 5 in. by 5 in. japanned and nickel tipped butts, and trimmed with lock, latch, and plain brass 2¼ in. knob. There will be no door between the robing room and chancel, the opening to be cased up same as other doors, but without rabbet in the jamb.

Finally.—All work to be done in a good and workmanlike manner. All the mouldings to be sandpapered clean and smooth, and the back edges jointed smooth.





A CHURCH OF MODERATE COST.

THE new "*Cement de Paris*," says *Construction Moderne*, which, it is claimed, besides being water proof, has other important points of superiority, is made by pulverizing the stone while roasting in the kiln, instead of afterward, as is the case with common lime.

A $3,000 RESIDENCE.

This cottage, designed by D. S. Hopkins, architect, Grand Rapids, Mich., is built of wood. Stone foundations. Cellar under entire house, with brick partitions in same. The frame is sheathed with matched pine, and paper lined throughout. First story is inclosed with 4 in. pine siding, second story shingled with best fancy cut pine shingles. Roofs are covered with the best pine shingles. The house is to be painted in three bright harmonious colors.

The interior shows rooms all of good size, and conveniently arranged. The first floor principal rooms are thrown together with sliding doors. Front hall is large. Stairs of good width and easy run. The kitchen is large and is provided with all conveniences, closet, etc., with stairs to cellar and second floor. The second story principal rooms are all of good size and provided with closets. Bath room is convenient and well ventilated. The front rooms have a bay projection, which extends up to roof, and makes a very pleasing feature on the exterior, and also gives a very pleasant attic room, large enough for a billiard room or for any other uses, as desired. The heating of this dwelling was designed for furnace, and has but one chimney on that account. Another chimney could be provided for, when stove heating is desired. The inside finish is neat and plain. Pilaster style of finish, all pine finished in natural wood or painted, as preferred. This house all complete, including plumbing (without heating), is estimated to cost three thousand dolars.

Maple Flooring.

"Maple flooring," the New York gentleman remarked, "does not receive the attention in our market that it deserves. The architects are decidedly hard headed. Of all men, they should be progressive and up to the times, but they linger by the way in a provoking manner. They have been used to yellow pine flooring, and yellow pine flooring it must be to the end of the law. Now as between the two kinds of flooring, maple and yellow pine, I consider maple much superior in most cases. Especially when trucks are run over the floor, or it is otherwise subject to heavy work, maple leads so far that yellow pine is nowhere. Keep a maple floor damp, and the heavier the business done on it, the harder the boards become. The wear there is in it is simply astonishing. The architects, however, seem to care little for that. They go on, on, in the same old rut. If the use of maple for flooring were an experiment, there might be some excuse for this pigheadedness, but it is no experiment. It has been tried and not found wanting in a single respect."—*Northwestern Lumberman.*

FULL plans and specifications for any of the various buildings illustrated in this work may be obtained, on very moderate terms, at this office. These include churches, schools, dwellings, enlargements, extensions, wings, etc. The two volumes for the past year, which may be purchased for $3, contain nearly 200 elevations and many plans. Address Munn & Co., 361 Broadway, Architects and Builders Edition SCIENTIFIC AMERICAN.

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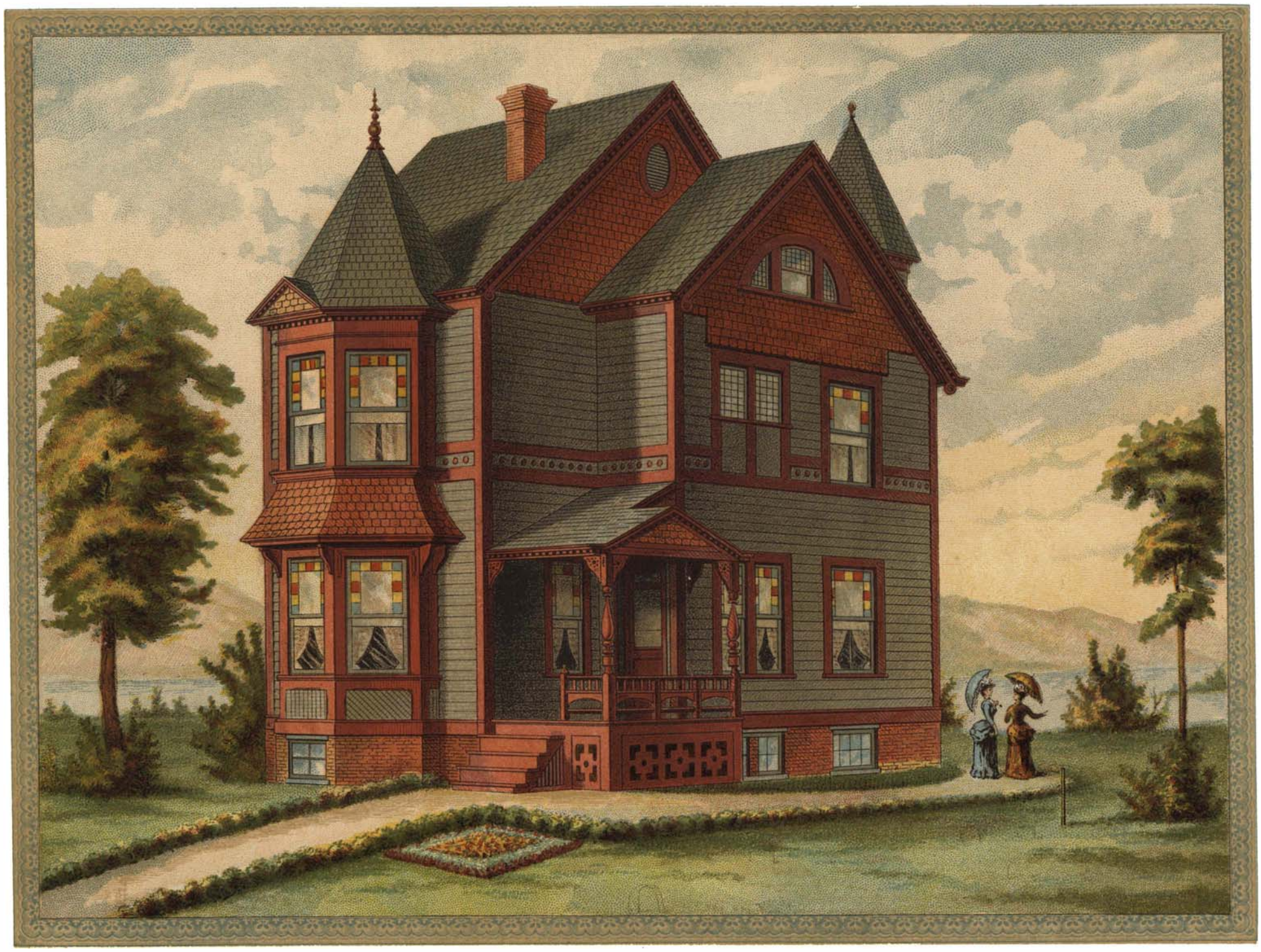
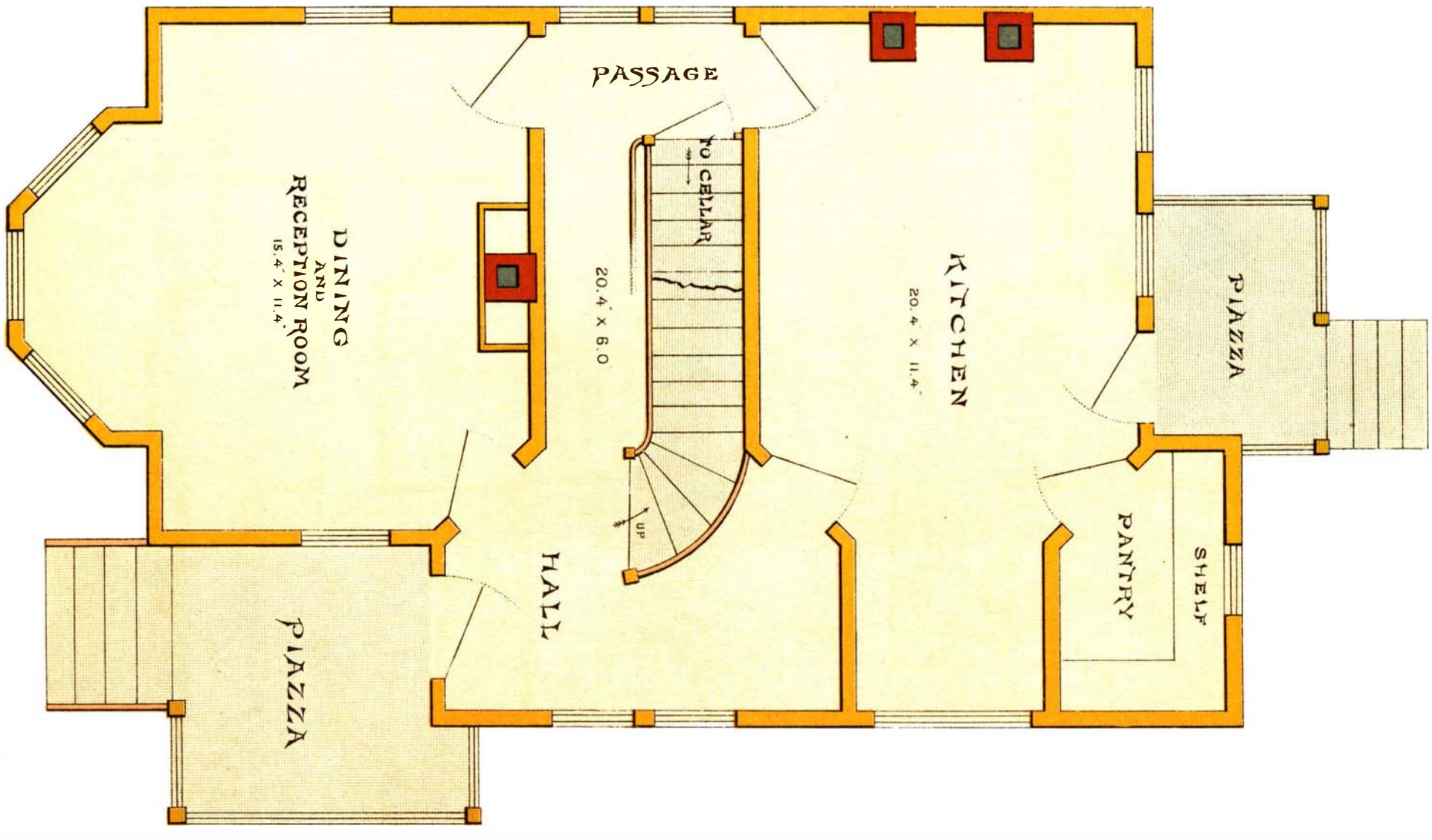


A COTTAGE OF MODERATE COST INTENDED FOR FUTURE ENLARGEMENT.



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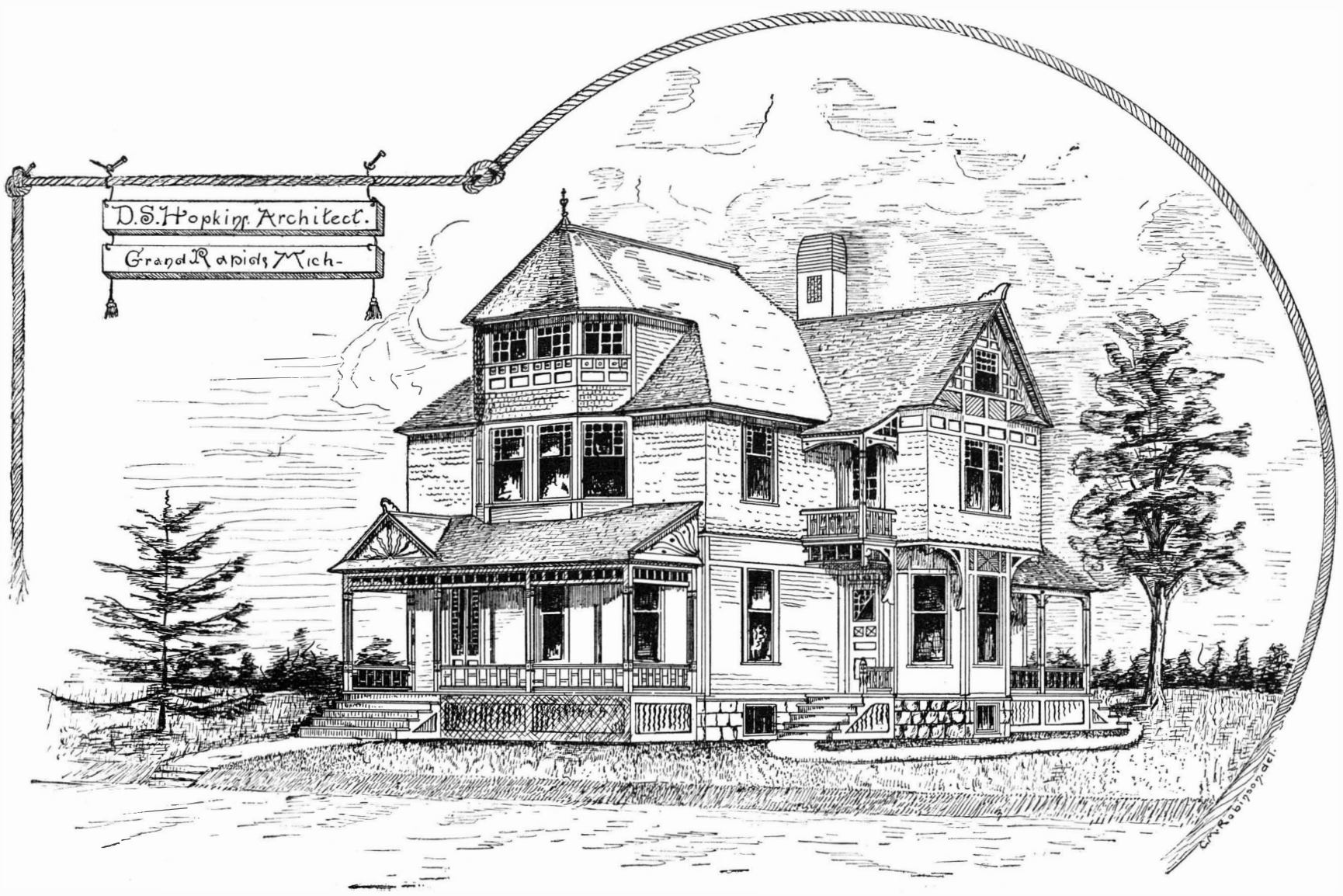

A THREE THOUSAND DOLLAR RESIDENCE.

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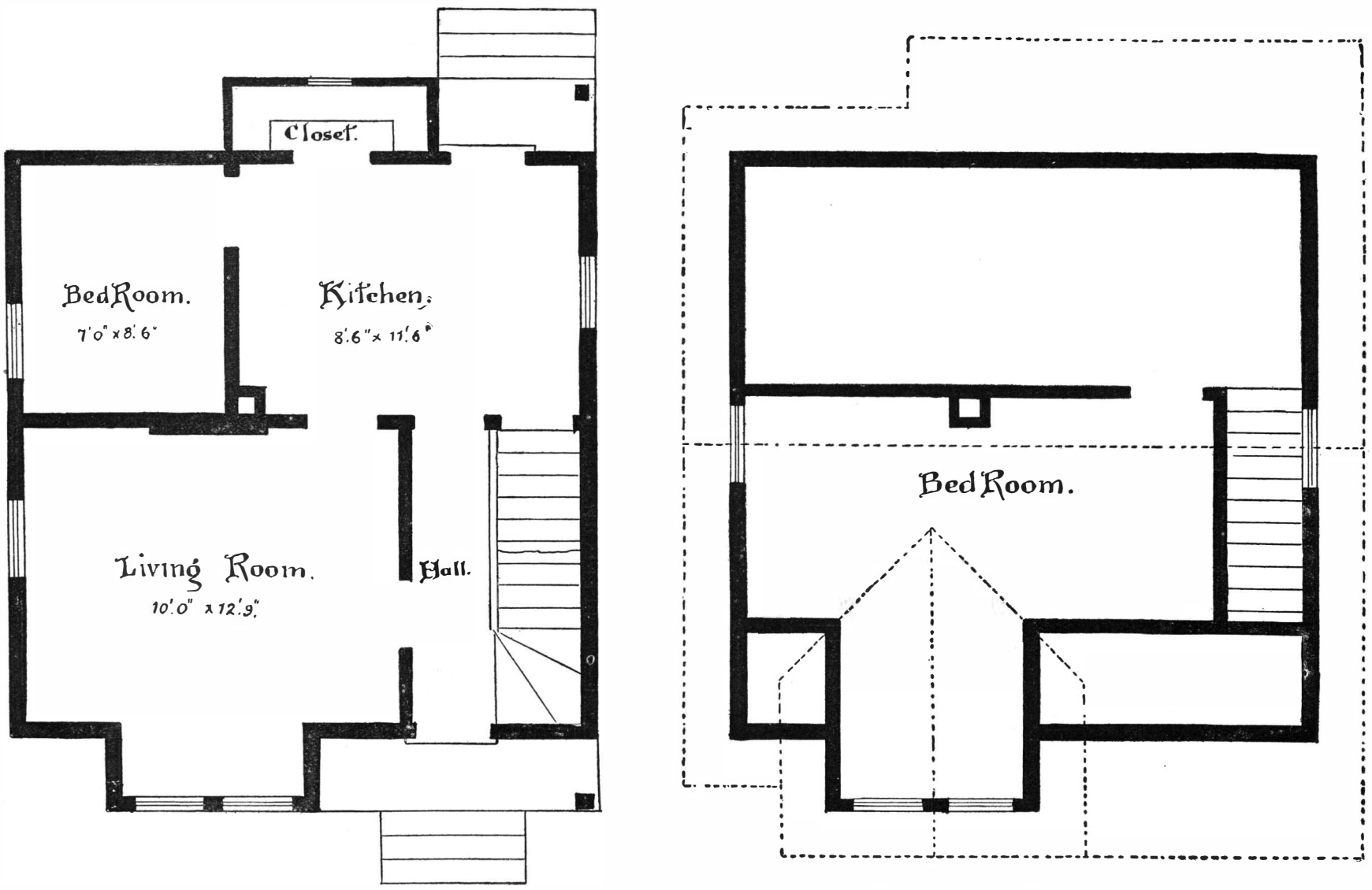
Front Elevation.

Side Elevation.



First Floor Plan

Chamber Plan.

A ONE THOUSAND DOLLAR COTTAGE.

[For description see page 91.]

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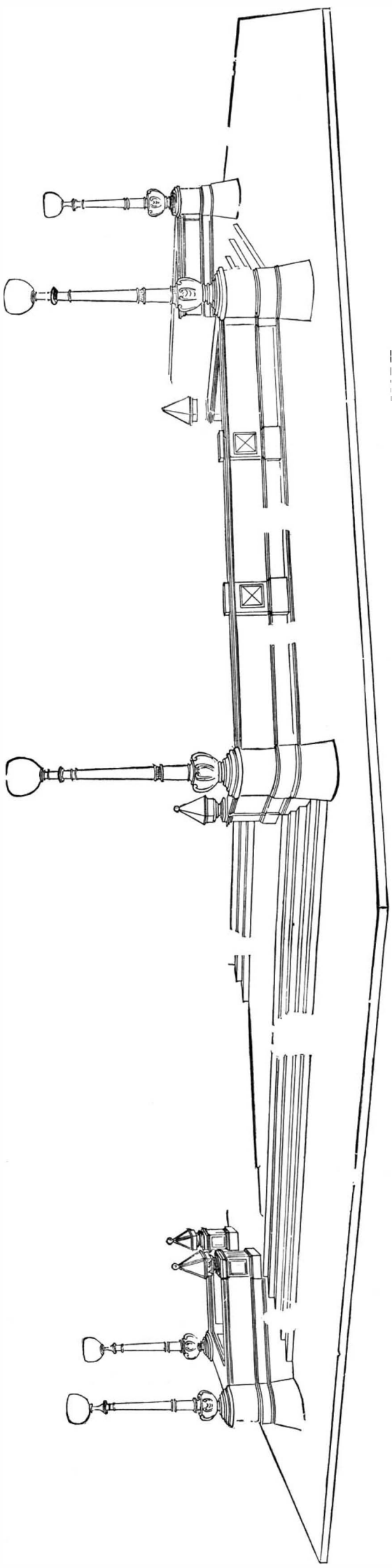
A MONUMENT TO THE MEMORY OF GENERAL GRANT.

DESIGNED AND DRAWN BY JOSEPH A. STARK, ARCHITECT, 12 CHAMBERS STREET, N. Y.

The illustrations show a composition of a truly monumental character. The proportions of the structure are very fine, and work up to an impressive whole The design is a symmetrical one, and the perspective view is equally effective from all sides. At the same time, the



MONUMENT TO GEN. GRANT.—DESIGNED BY JOSEPH A. STARK, ARCHITECT, NEW YORK.

actual dimensions are not excessive, and the cost is such that the entire work, including all statuary and sculptured relief work, can be carried out in a perfect manner for the sum of $250,000. This sum would cover the employment of choice materials throughout; of rich and rare marbles for the columns, pedestals, and interior wainscoting of the pavilion and crypt. Ten pieces of bronze statuary are included, of one and one-half life size; also four bass-relief battle pieces for the pedestal of General Grant, and eight medallion heads of leading men famous in the history of the war. These are intended for the four main pillars of the pavilion and crypt.

The general material of the structure is intended to be a warm-colored limestone; steps and terrace paving of marble tiles. Candelabra, pedestal ornaments, arch spandrel pieces, and the winding laurel leaf ornament around the four columns are intended for bronze.

The pyramidal dome is of stone, richly ornamented with a bronze gutter, and apex for the crowning figure, "Union Triumphant." The domed ceiling of the pavilion is intended of segmental section, treated with marble mosaic. The arcaded frieze is specially introduced in the design to light up this ceiling. It is no mere ornament.

The idea of the design is, withal, a very simple one. It is this simplicity and directness of the thought which is the secret of the dignified grace and grandeur of this composition.

It is a monument of glorification to a man, and it is also his tomb. The statue of the General stands on an appropriate pedestal in the center of a square pavilion. The pavilion is raised above the ground on a terrace of ornamental outline, to which steps lead from three sides. The terrace is about 80 feet square. The pavilion is 25 feet square. It is pierced on its four sides by circular arches, 15 feet span and 25 feet high. Above the arches is the arcaded frieze to light up the domed pavilion ceiling. The four corners of the pavilion are ornamented and emphasized by rich detached columns on pedestals, from which large reclining scrolls descend. These finish with a pedestal, on which is placed an appropriate statue. These four statues might be Victory, Defeat, Peace, and War. The object of the scrolls is to give architectural base and emphasis to the pavilion, and also to connect closely with the monument proper all the other sculptural works. The columns are crowned by a cornice and pedestals on which are placed statuary groups representing the four arms, infantry, cavalry, artillery, and the navy. The pavilion is roofed with a pyramid in stone, richly designed and finished with a crowned figure, "Union Triumphant." The total height of the monument from the ground level to top of apex statue is about 70 feet.

The style of design is severe modern Renaissance, richly treated, which is the only style of architecture appropriate.

Under the monument the crypt is arranged. It is reached by stone stairs, where shown on the plans. The crypt is a square vaulted chamber, with the sarcophagus in the center. It has four circular niches to give additional space for placing trophies and mementoes of the war, and for visitors' seats. The crypt is intended to be lined with choice marbles, and to have a mosaic vaulted ceiling. Provision is made for daylight to enter through the ceiling.

Here is a monument of meritorious design, of adequate dimensions, and of rich and tasteful treatment in its architectural and sculptural features.

In its radiance of marble, bronze, and gold, it would be a worthy tribute to our great hero. The structure can be erected complete in an opulent style for the sum of $250,000.

This does not say that General Grant does not deserve a million monuments. It simply says that a million is not necessary to produce a monument worthy the man and the occasion. It is difficult to see how even a million dollars will produce something more truly monumental, appropriate, or complete.

The author of the design, Mr. Joseph A. Stark, architect, of No. 12 Chambers Street, N. Y., will be pleased to show the original drawings and give any further desired information.

Shingles in Modern Architecture.

Those who have watched the tendency, or, we may say, the evolution, of style in wooden suburban and country houses, must have noticed the gradual disappearance of the monotonous and uninteresting clapboard, with its uncompromising horizontal lines.

The cry is, "The clapboard must go," and it is going. But what is replacing it? The answer is instantaneous—the shingle. With the many ingenious methods of laying shingles, the greatest variety of effect can be obtained without cutting them at all.

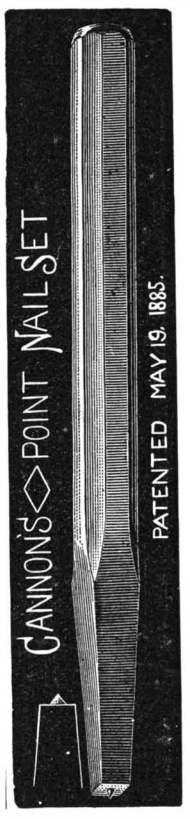
But now comes the important question of coloring. At first paint was used, but the dull monotony of masses of color covering the grain of the wood has now almost universally given way before the modern creosote stains. Many attempts have been made to imitate the effect of stains without using creosote, but they have been sad failures, as other oils do not penetrate the wood and bring out the grain in relief. A test was recently made at the request of well known architects of Boston, by a prominent chemist, of all the materials sold under the name of "stains." The result was that he pronounced "Cabot's Creosote Stains" among the best of them all.

These creosote stains have already been so long in use that the preserving properties of the creosote have begun to show their value on houses in all parts of the United States.

There are no more picturesque houses in New England than many of the shingled villas and cottages of recent date, and we cannot avoid the conviction that much of their beautiful harmony of color with design is due to the almost universal use of the stains above mentioned.

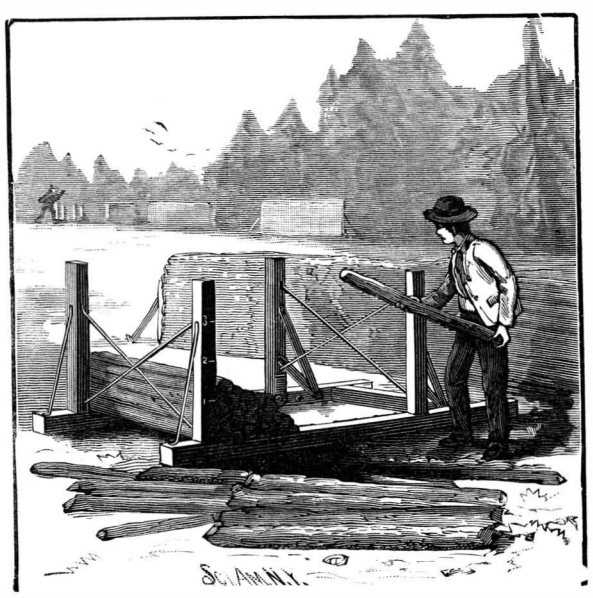
CANNON'S DIAMOND POINT NAIL SET.

The accompanying illustration shows an ordinary nail set, the efficiency of which has been vastly increased by a specially hardened diamond-shaped point or tit formed on its end. It is evident that the slightest blow of the hammer will cause this point to catch in the head of the nail, and thereby prevent the set from slipping. This will save in many cases valuable pieces of work from injury, as the set will surely follow a nail through any piece of stuff without slipping off. These sets are made from the best quality tool steel; the points are thoroughly tempered, and will not break off. This essential improvement is manufactured by the Edward Storm Spring Company (Limited), of Poughkeepsie, N. Y., to whom all communications should be addressed.



ADJUSTABLE WOOD MEASURING RACK.

By means of this device, wood may be measured by the cord or fractional parts of a cord, as occasion may require. The sill frame consists of two longitudinally ranging timbers, connected by cross bars. Near one end of the timbers are fixed uprights, braced to each other and to the timbers. To the inner faces of the sills are screwed a series of headed pins, the first one being exactly one foot from the inner face of the end posts, and the others being spaced one foot apart. Two posts, braced together by rods, are adapted to stand on the sills, and to the inside face of each post is attached, by coach screws, a metal plate provided with a hook at its lower end, adapted to engage with the shank of one of the headed screw pins of the sills. Attached to such post is a brace with two arms, and formed at its lower end with a notch to engage the pins on the sills. The metal plates and braces are slotted for the passage of the screws, so that the movable frame may be quickly and easily set perfectly plumb, whichever opposite pair of the sill pins may be engaged by the hooked plates. The posts are exactly four feet high, and one is marked by cross lines one foot apart. It is apparent that, to measure a cord, the frame is moved to the eighth set of pins and the wood is piled to the tops of the posts. To measure half a cord, the hooks are engaged with the fourth pins. By adjusting the hooks to the first pair of pins, and filling the wood in between the end posts up to the first cross line on the post, a single foot of wood can be measured, or up to the second line for two feet, and so on. Thus a cord or any fractional part can be readily measured. To disengage the frame, it is only necessary to tilt it forward toward the fixed posts, when it may be shifted to any point along the sill frame.



BROUGHTON'S ADJUSTABLE WOOD MEASURING RACK.

This invention has been patented by Mr. Horace L. Broughton, whose address is P. O. box 320, Marblehead, Mass.

THE German colliery owners are about to prohibit blasting with black powder in fiery mines; also the use of naked lights in every part of the workings, as well as a mixed system of safety lamps.

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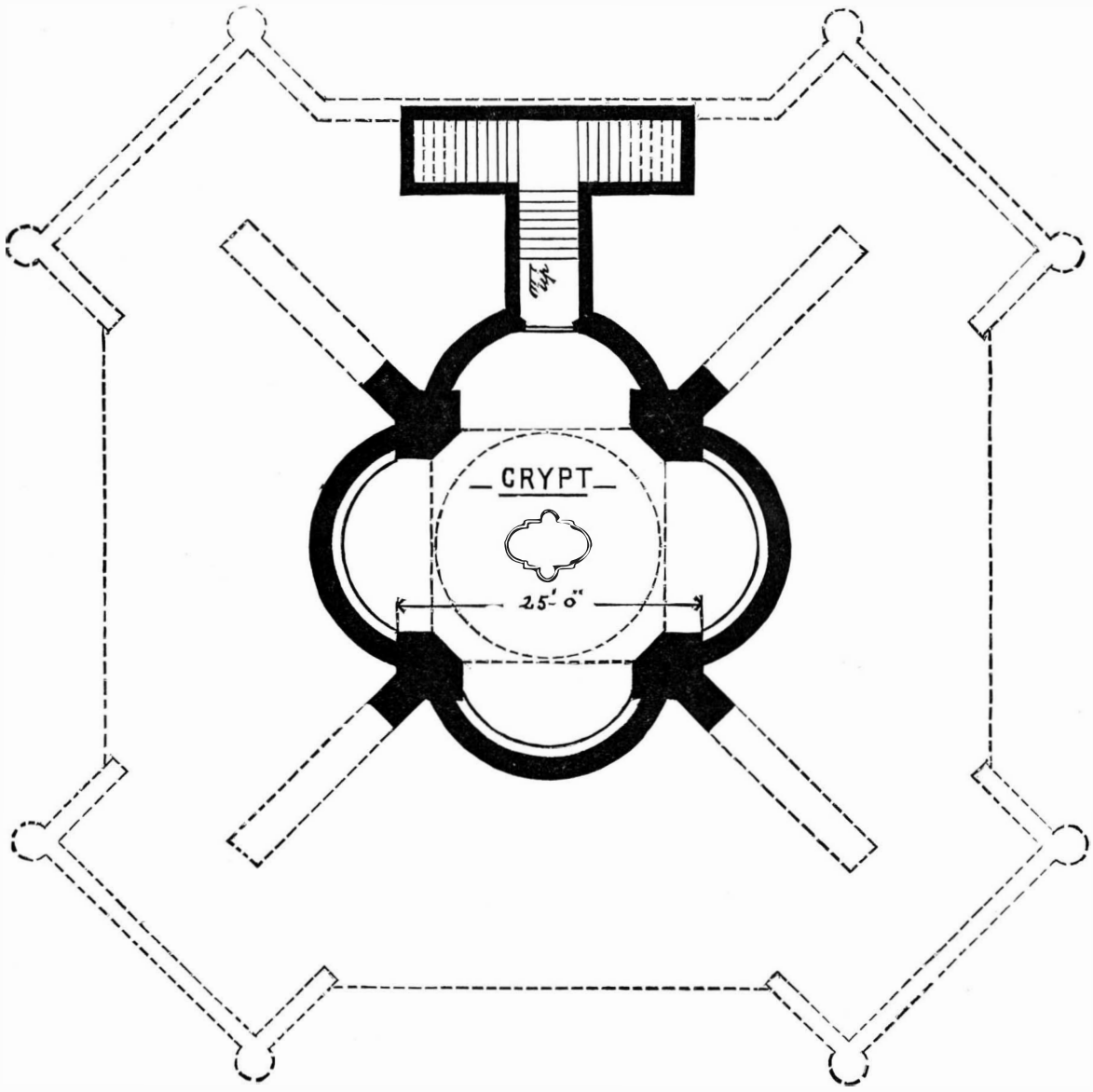
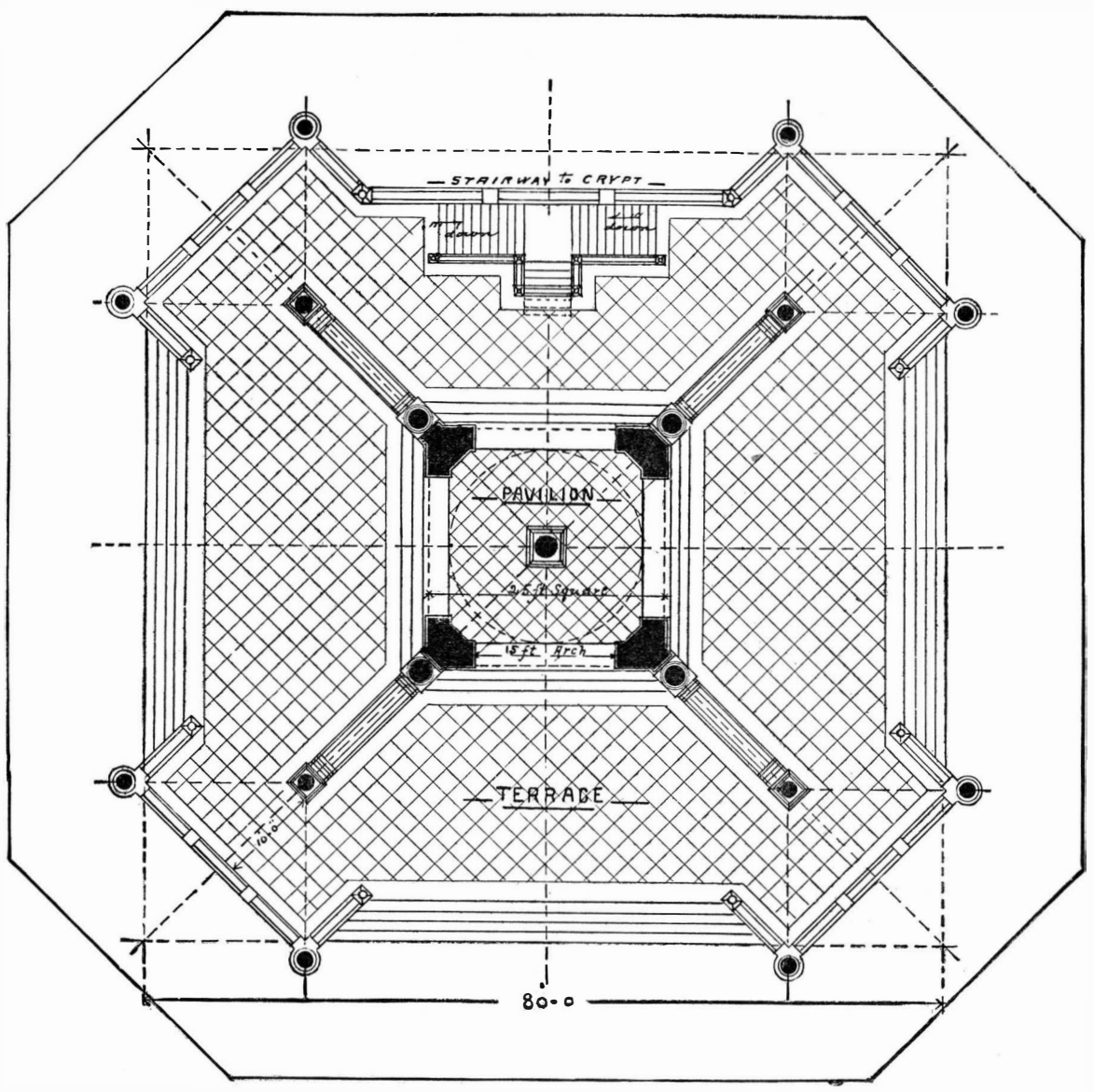


PLAN OF CRYPT AND OF FOUNDATIONS



PLAN OF MONUMENT.

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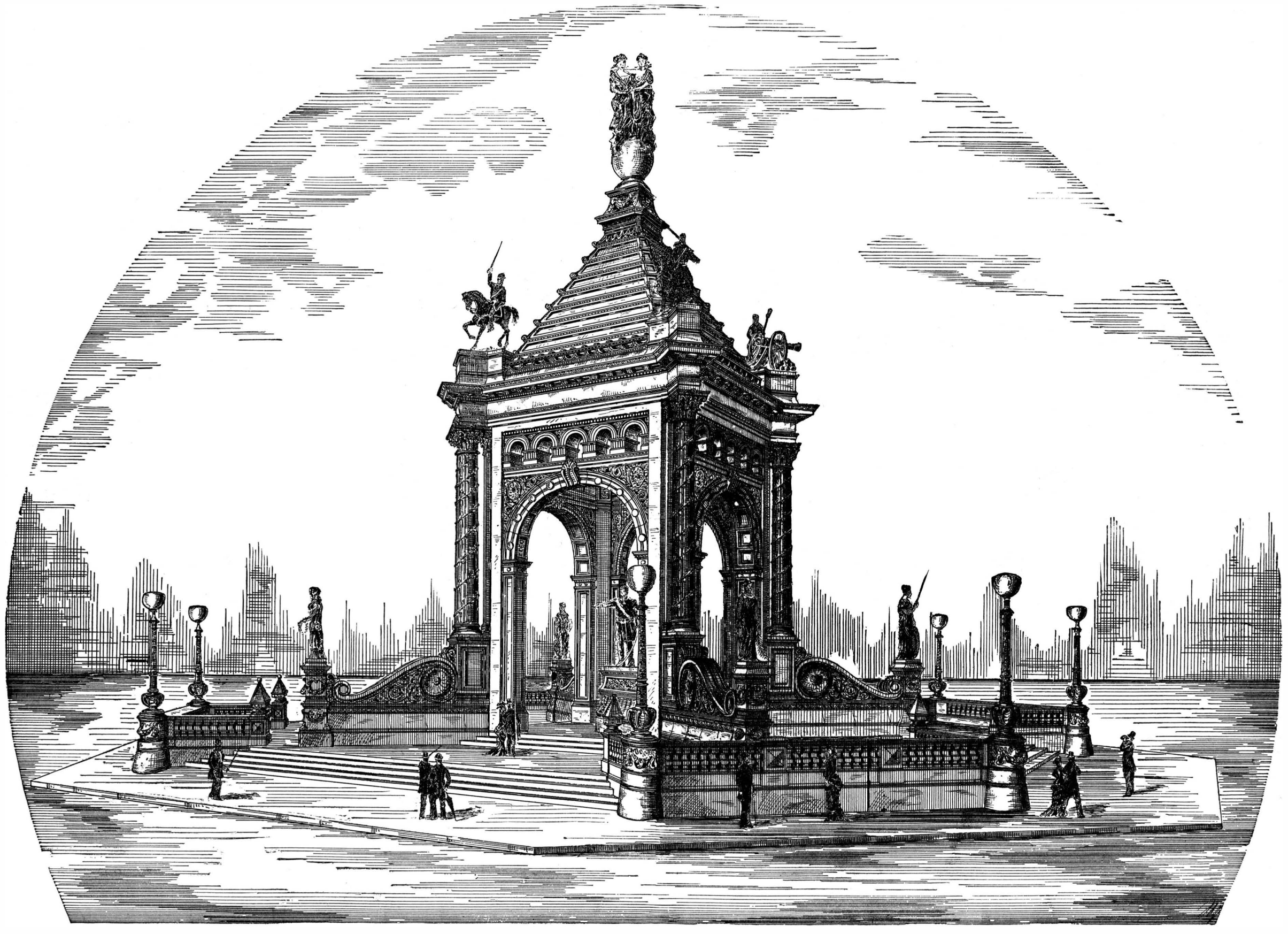

DESIGNED AND DRAWN BY JOSEPH A STARK. ARCHITECT, 12 CHAMBERS ST. N.Y.

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PICTURESQUE SUMMER HOTEL.

The illustrations presented in this issue for a suburban hotel, by Mr. Geo. Edw. Harding, architect, No. 40 Exchange Place, N. Y., exhibit a novel departure from the hitherto stereotyped lines of similar structures.

Its strong, salient angle, accentuated by the prominent tower and chimney, with its receding wings, artistically broken by the square stone tower and twin gables, combines effective architectural grouping with a simple style of treatment which pleases by its varying outline of plan and sky lines.

The first story and square tower throughout is constructed of random rubble masonry, while the upper portion is sheathed with creosote-stained shingles, cut to patterns, and roofed with hand-split oak shingles, laid "in and out," of natural color, giving a most picturesque appearance without apparent effort.

In the plans it will be noticed that the executive offices, while convenient for guests, are still central for commanding the various dependent departments and their general service.

The music room, grand parlor, and dining room are *en suite*, which affords opportunity for evening dances, amateur theatricals, or concerts, with the verandas in convenient proximity. The feature of an open loggia for dining in pleasant weather, with a band piazza above, is novel, and, we should think, a delightful arrangement for its patrons.

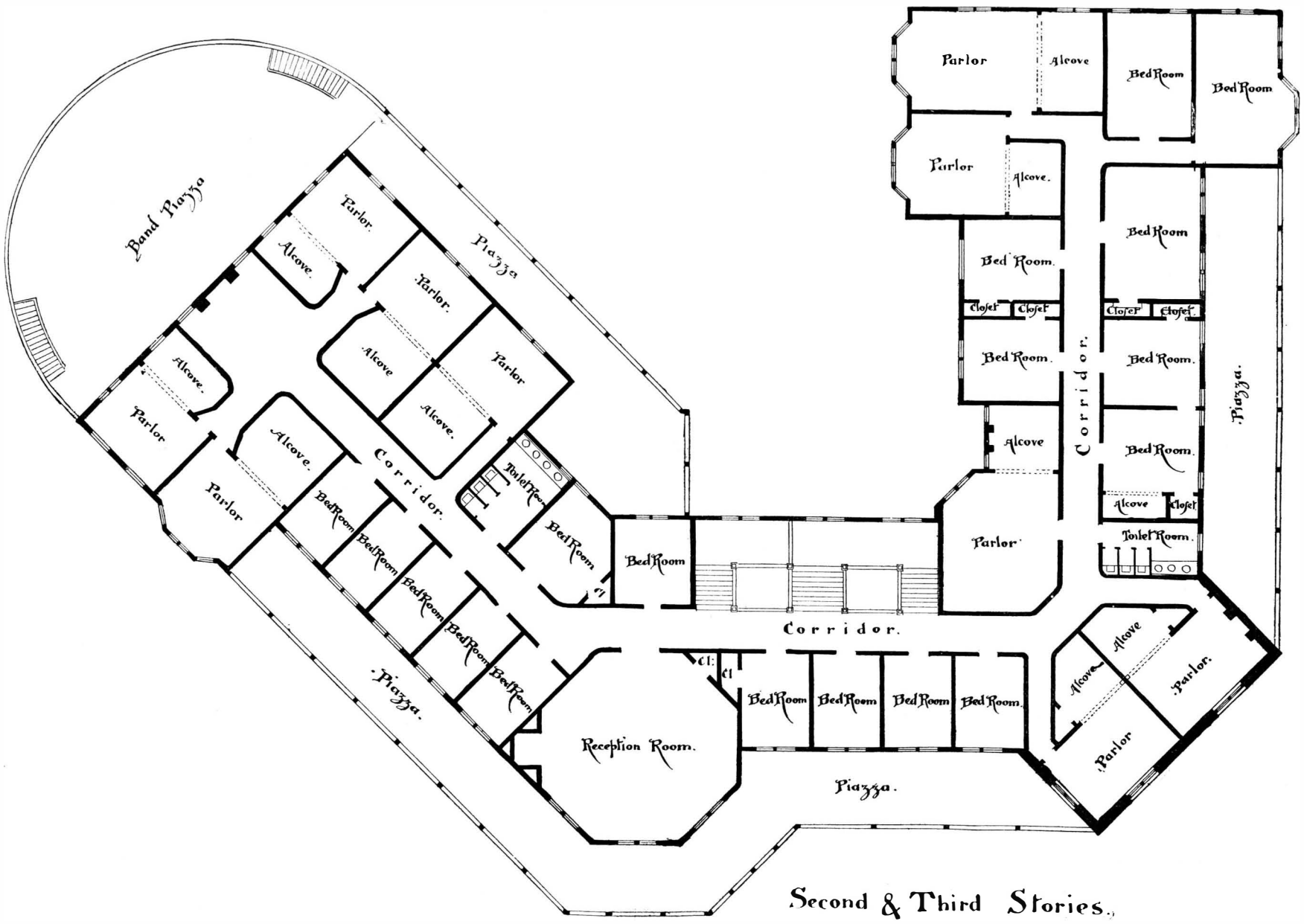
The chambers and corridors are superior in their resulting light and ventilation, while success is assured by the peculiar plan of arrangement, which strongly commends itself for sites where the land or water scape affords interesting views from varying points.

The floors are of comb-grained Georgia pine, and the trim is of stained ash and natural cherry, no painting being allowed inside or out.

The plaster is cathedral finish, the mortar being also stained by blending the desired colors when mixing in the bed. The mantels are of buff terra cotta, moulded in flat relief, with brick linings of similar tone.

Peculiar features in the culinary department are an old fashioned brick oven, such as our forefathers were accustomed to have their baking done in, and an open, wide grate, 7 ft. long by 2½ ft. high, in front of which all the roasted fowls are revolved by a "turnspit," operated by a smoke jack in the flue above, which would seem to prove that some of the old methods of cooking deserve imitation even in the present days of French cooks.

The present design is about being erected in the vicinity of this city, at a cost of $48,000.



DESIGN FOR A SUMMER HOTEL.

The Use of Mortar During Frost.

Some time ago the police authorities of Berlin issued an order forbidding the construction of brickwork should the temperature fall to or below 2 degrees R. (26 degrees Fahrenheit). This order being based on the supposition that mortar freezes at that temperature, and does not set, Herr Krause, architect, of Stropp, sent a communication to the *Baugewerke-Zeitung*, in which he publishes his experiences, which by no means seem to bear out the necessity for issuing the order. We give a *resume* of Herr Krause's remarks, as well as of the opinions of some other German architects upon the matter. Herr Krause states that in the winter of 1856 he was compelled to erect a small building during a very heavy, sharp frost, the temperature being down to from 4 degrees to 8 degrees R. (23 degrees to 14 degrees Fahrenheit). As bricks and sand were frozen, his workmen had great trouble in properly setting the bricks, the mortar freezing under their hands. It would have been too expensive to warm all the materials previously. He, therefore, had the lime slaked in small quantities, mixed the mortar hot, and had the brickwork liberally pointed. He fully expected to find the mortar perished in the spring. But he was greatly mistaken, for the work was as firm as if it had stood for several years. In 1880 he had to take the same building down, when the mortar was found so firm that the bricks broke and could be cleaned only with difficulty. Herr Krause subsequently had other pointing done at several degrees of frost, and always found that, if lime mortar had been subjected to frost for about ten days, it had set as firmly as mortar made in the summer in as many months. The architect in question says that, if it freezes, and the frost continues for some time, it is much firmer than when applied in the height of the summer. It is different when a sudden thaw sets in after a sharp frost.

Herr Krause had executed, during an alteration, a wall ten meters high and three meters wide, with three windows placed over each other, and joined to an old brick wall, when suddenly a thaw set in. The wall settled about six centimeters, and bulged out, so that he had great trouble in preventing it from collapsing. A sudden frost, however, made it firm again. After twenty years the wall is as good as ever, and there are no cracks. In that case, however, he had omitted to use unslaked lime, employing only hot water. The bricks had been stored in a heated room. Herr Krause has come to the conclusion that continued frost had the contrary effect upon mortar to what is generally supposed.

Herr A. Klemm, architect, of Stuttgart, expresses the same opinion in a communication which he sends to the *Deutsche Bauzeitung*, in which he says that in the winter of 1848–49 the works required for altering and fitting up the Prussian House of Deputies had to be carried out during a most severe frost. Notwithstanding this fact, the brickwork, executed with freshly slaked hydraulic lime, was found to be so firm in 1867, when alterations had to be made, that in some portions wedges had to be used in breaking it up. Herr Klemm adds that in his country (Wurtemberg) it is the general opinion that frost not only does not injure the brickwork, nor the plastering, but it improves its quality. The frost, however, should continue for some time. Herr Klemm expresses surprise that doubts could be entertained on the subject.

A Berlin firm of builders, Herren Ende & Bockmann, writing on the same subject to the *Deutsche Bauzeitung*, state that, in the autumn of 1864, they had orders to erect a warehouse, near Unter den Linden, during the winter. They were at first indisposed to undertake such work in that season; but circumstances demanded speed, and building operations were continued during the frost. They fully expected to find the brickwork faulty in places when the spring came, and had made up their minds that they would have to replace some of it. They were agreeably surprised to find the brickwork perfectly sound; in fact, it seemed to have set exceptionally well. Since that time the above Berlin firm of builders have not hesitated to continue bricklayer's work as long as they could; that is to say, as long as the water did not freeze on the bricks or the mortar in the pans. It should be added that the lime mortar used at Berlin is said to be of exceptionally good quality.—*The Builder*.

To Bleach Oils.

To bleach oils, 1 lb. permanganate of potash is dissolved in 3 gals. water, and to the deep violet solution 30 lb. of the oil to be bleached are gradually added, and the mass thoroughly stirred as often as possible during the next 48 hours. Then 2 gals. water and 5 lb. ordinary hydrochloric acid of about 19–21° Be. are added and incorporated with the mass by energetic stirring, whereupon it is left to stand for several days, when the sour water is siphoned off, and the remaining oil carefully washed with several hot waters, until every trace of acid is removed; finally, it is filtered through charcoal. Besides olive oil, linseed, poppy, palm, and fish oils may be treated in this way.

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DESIGN FOR A SUMMER HOTEL.—GEORGE E. HARDING, ARCHITECT, NEW YORK.

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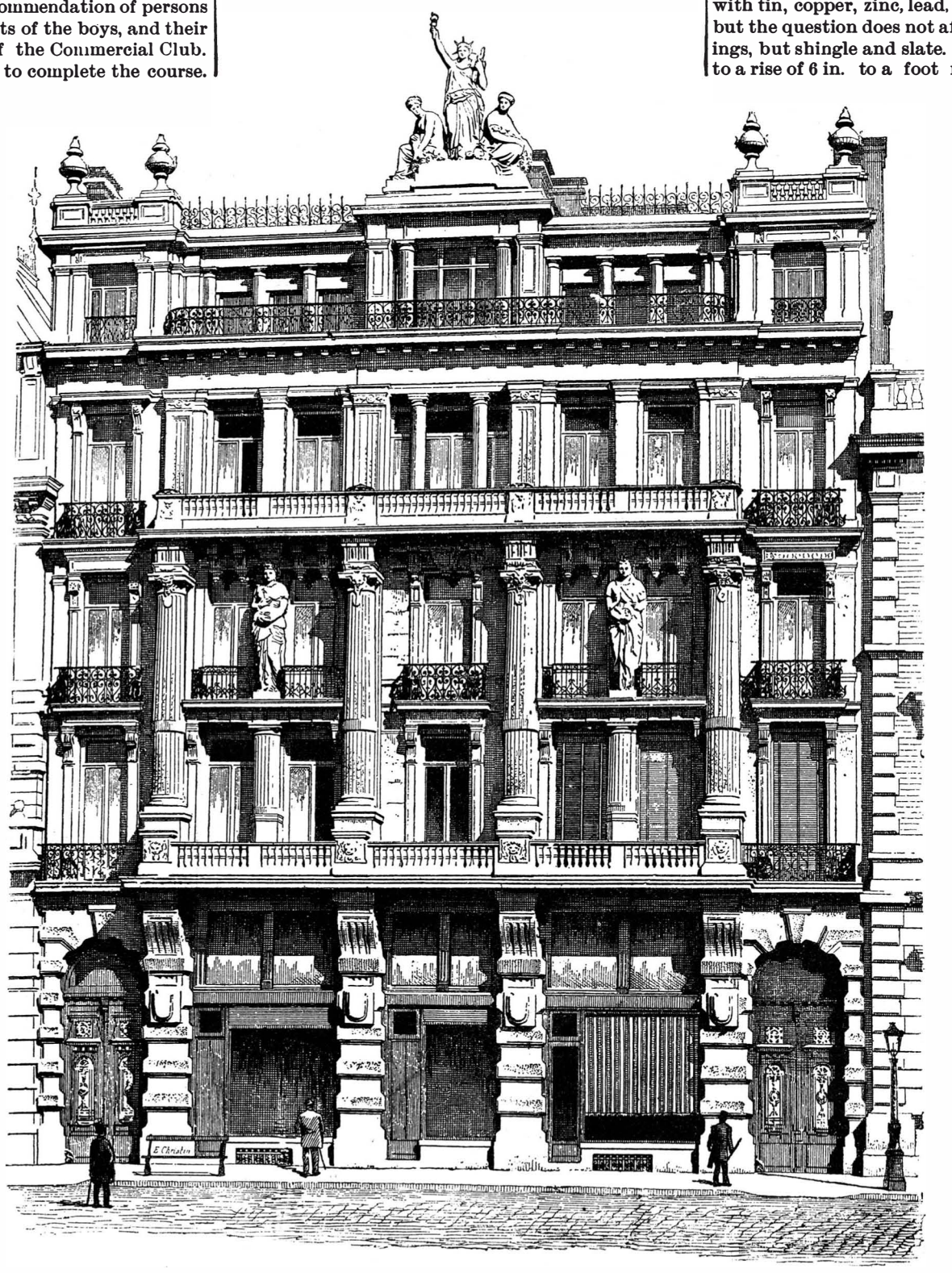
A BUSINESS HOUSE AND RESIDENCE.

Brussels has long been regarded as one of the most beautiful cities of Europe. Her public edifices are grand and imposing, betokening the influence of an elevated architectural standard, the influence of which is also seen in many a private structure. We give an example of a recently erected combined business house and private residence, on the Boulevard Anspach, which is worthy of notice for its substantial as well as ornate character. Our engraving is from a drawing by von J. Engelhorn in *Architektonische Rundschau.*



A RESIDENCE AND BUSINESS HOUSE, BOULEVARD ANSPACH, BRUSSELS.

The Chicago Manual Training School.

The Manual Training School is not conducted on a free principle. A tuition fee is charged for each student. With the exception of twenty pupils admitted this year, the fee is paid individually. These twenty were received upon recommendation of persons competent to judge of the merits of the boys, and their tuition is paid by members of the Commercial Club. Three years' study is necessary to complete the course. Of the seventy-two who entered the first junior class, twenty-seven remained to graduate. Ninety-eight entered the junior class last September. Four of this number have since dropped out. The boys who enter are from the ages of 14 to 15. None under 14 is admitted. No candidates are accepted who cannot pass a satisfactory examination in reading, writing, spelling, geography, English composition, and arithmetic. A boy must have, too, a certificate of good moral character from some responsible person. The penalty of any impropriety in conduct is dismissal. Latin, French, descriptive geometry, and higher algebra are taught. The first manual work a boy does when he begins the course is in the wood room. There he learns various branches of the carpenter's trade, joinery, wood turning, and pattern making. He learns not only the use of tools, but their proper care. Each boy furnishes his own kit and has his own tool drawer. Extra tools are supplied if needed, but the student is made responsible for them. Recently the boys were at work on picture frames, tables, hammer handles, and the wood parts of other tools. In the second year the pupil is put in the foundry and blacksmith shop. No better hammers and screw drivers can be found in Chicago than are made by the lads. The most expert workman can turn out no smoother pieces of casting than some they show. In the senior year the students get into the machine shop. By that time they are able to make and put together a steam engine. Three were constructed in the school last year, and three will be made this.

The work of making an engine begins in the drawing room. Every stroke of the pencil is made by actual measurement, even to the drawing of a bolt head. The scholars draw the plans for the patterns, and then make the patterns. In the machine shop the busts of Stephenson, the engineer, and James Watt, begrimed with the soot of labor, look down upon the busy workers. The boys will soon try their skill in constructing an ornamental iron gate for the Michigan Avenue entrance of the building, for which drawings are now being made in the school.

The wood room contains thirty-nine cabinet makers' benches, twenty-four speed lathes, a circular saw, scroll saw, a boring machine, planer, grindstone, shoot plane, bench lathe, and general tools sufficient for the use of ninety-six boys. In the foundry are two furnaces, crucibles, troughs, flasks, trowels, rammers, sieves, and other apparatus, so that sixty-six boys can work at once. In the forge room they can get smut on their faces together, too, at the same time. There are twenty-four forges, twenty-three anvils, one emery wheel, one shears, three vises, one blower, two exhaust fans, tongs, sledges, hammers, fullers, and all the other tools required to transform clean skinned youths into the sootiest of blacksmiths.

The machine shop has seven 12 inch, 6 foot bed engine lathes. There is also an engine lathe with a 16 inch swing and 8 foot bed. There are two speed lathes, a planer with 6 foot bed, shaper, drill, grindstone, fifteen benches, fifteen vises, chucks, boring bars, taps, dies, chisels, files, and other tools—enough for thirty-two amateur machinists.

A visitor can pass through every room in the building and find no idlers. All are absorbed in the work they have in hand, and scarcely raise their eyes. "The fact that their attention is so riveted on what they are doing," said Mr. Belfield, "shows the cultivation of a most important faculty of the mind—the power of concentration. This attention, too, is not enforced, but is voluntary and unremitting. The boy who goes through a three years' course here not only attains intellectual development, but he gains comprehension of essential branches of knowledge far superior to those of the high school pupil. The training school is by no means a manufacturing establishment. The product of the school is not intended to be perfect pieces of machinery and polished furniture, but polished, perfect boys. It practically demonstrates, also, the dignity of labor. So thorough is the training here, that graduates who desire to pursue a higher grade of education are admitted, on recommendation of the director, without examination and free of conditions to several of the colleges and universities of mechanics and engineering in the United States.

"Prof. R. H. Thurston of Sibley College, Cornell University, wrote to me recently that if we could send him as good specimens of boy development as we have already forwarded, they'd be glad to get them. The professor of mechanical engineering at Perdue University, Lafayette, Ind., also wrote to me about one of our graduates who is there: 'If you can send us any more boys like this one,' he says, 'we shall be mighty glad to get them.' I believe we have struck the key note for the practical education of boys in the system of the Manual Training School. It embodies at once the education of the hand to skill and the brain to directive intelligence. There come the boys down to lunch. Their dining room is in the basement. They have made all the tables themselves."

Water-Tight Roofs.

The question is often asked, What is the proper pitch for a roof to shed water and snow? In discussing the question we need only go into the merits of the case so far as it relates to a condition of flatness or it approaches a level. Generally builders claim that less than what is known as a fifth pitch cannot be successfully shingled or slated with any guarantee of safety. As is well known, any pitch or incline may be covered with tin, copper, zinc, lead, or iron, and be made tight, but the question does not affect the use of metal coverings, but shingle and slate. One-quarter pitch is equal to a rise of 6 in. to a foot run, and one-fifth pitch is equal to 4⅞ in. rise to one foot run. The first may be considered entirely safe for slate, and the second for shingle. Upon a comparison of a large number of roofs in different parts of the globe, a roof of one-quarter pitch is the correct one for the climate of the Western and Northwestern States. From the fact that slate cannot be as closely nailed as shingle, for fear of breakage, the joints are left more or less open, and therefore they must be laid steeper than shingle. A good rule to be observed in laying a shingle roof is to give the rafters a sufficient pitch, so that the butt of a shingle will be at least 6 in. below the thin edge. By experiment it will be observed that in a quarter pitch roof the butt is 7¼ in. below the thin edge for a standard 16 in. shingle, and 6 in. in a one-fifth pitch. The same rule may be observed in a slate roof, only the pitch, as we have said, should be not less than quarter.

The *pitch* is the distance across the building from eaves to eaves, divided into as many parts as desired; when divided into four parts, the roof is termed ¼ pitch, as the height from the level of the eaves to the apex of the roof should be equal to ¼ of the distance from eaves to eaves. The manner of obtaining ⅛ pitch is the same, except the subdivision should be in five equal parts.

The cause of leaky flat shingle roofs is the backing up of the rain or moisture beyond the thin edge of the shingle, under the butts of the next uppermost; that is, supposing that the shingles are well laid, lapped and nailed. Another feature connected with flat or comparatively flat shingle roofs must be considered, and that is, the inability of the shingle on account of its flatness to quickly shed rain and moisture and to become dry within a reasonably short period of time. This state of continuous dampness, except when directly affected by the sun's rays, generates seeds of dry rot that eventually sap the life of the wood and soon end the usefulness and substantiality of the shingle.—*Hill's Builder.*

Old Iron.

A most remarkable feature in trade just now is the large export of old iron to the United States. In January, two years ago, we sent 856 tons of old iron to the United States; in January, last year, we sent 3,271 tons; but last month we sent 21,667 tons of old iron to the United States. This enormous increase in the export of "scrap" iron means much; it means that the United States is using all its own and has to buy large additional quantities, and it indicates the fact that the users of iron here will have to use more pig iron in place of the scrap.—*Newcastle Chronicle.*

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AN ENGLISH HOME.

We give an elevation from the *Building News* of a house at West Wickham, built chiefly of brick, and at an estimated cost of ten thousand dollars. There are several features in this elevation that may prove interesting and suggestive to those who are looking for house plans.

A ONE THOUSAND DOLLAR COTTAGE.

DESIGNED BY B. J. SCHWEITZER, ARCHITECT.

SPECIFICATION.

MASON WORK.

Cellar.—To be excavated under the entire house, 3 feet deep. Build a stone wall, 18 in. thick, up to the surface level, laid in good mortar. Above the surface build an 8 in. hard brick wall, 3 ft. 6 in. high, all laid in good mortar. Point up the stone and brick walls and leave complete for the frame.

Piers.—Build three brick piers in the cellar to support the girders. Also build piers of brick for the front and rear stoops.

Chimneys.—Build an 8 in. flue chimney, of hard bricks, laid in good mortar, as indicated on plan. Thoroughly strike all joints with cement complete. Top out the chimney as shown, and finish it with an iron cap. Provide all rooms with stove pipe holes and thimbles.

Lathing and Plastering.—Lath all walls and ceilings on first floor with spruce lath, and plaster two good coats of mortar and hard finish complete.

Privy.—Build vault as required.

CARPENTER WORK.

From front to rear, put in girders 4 in. × 8 in. of hemlock; sills, 4 in. × 6 in., halved at all angles; corner posts, 4 in. × 6 in., 13 ft. long; interties, 4 in. × 6 in., mortised into corner posts; plate, 4 in. × 4 in.; first and second floor beams, 2 in. × 8 in., placed 16 in. from centers; rafters, 2 in. × 6 in., placed 20 in. from centers; wall strips, 2 in. × 4 in., placed 16 in. from centers; sills for stoop, 3 in. × 4 in., and beams 3 in. × 4 in. All timber to be of the best quality hemlock. Bridge the floors and spike together the entire frame.

Sheathing.—Cover the house from sill to plate with hemlock boards, well nailed.

Paper.—Over the rough boards put on resin sized sheathing paper, and lap all joints.

Siding.—Cover the house from sill to plate with narrow lap siding, free from bad knots and sap.

Outside Trim, all of White Pine.—Water table, 1¼ in. rabbeted; corner boards, 1¼ × 5 in, with angle beads; bands, 1¼ in. × 6 in., rabbeted; cornice, 7 in.; moulded verge boards, 1¼ in. × 8 in. chamfered. Bay trim, 1¼ in. stuff, panels sunk with flush mouldings. Shingle the gables with regular 6 in. sawed white pine shingles, 6 in. to the weather. Shingle all the roofs with merchantable white pine shingles, laid 5½ in. to the weather over shingle lath.

Gutters.—Build ample troughs at the eaves, and tin them with best I. C. tin.

Stoop.—Posts 6 in. chamfered, cross pieces same, floors covered with 1¼ in. white pine, with white lead in the grooves. Steps are as shown, of best white pine, risers ⅞ in. and treads 1¼ in.

Leaders.—Provide 3 in. leaders for the house from the gutters to the ground.

Windows.—All sash 1½ in. thick, glazed with good American sheet glass. The large panes are to be double thick. Furnish all with the "Ives" sash fasteners, and furnish all with pulleys, weights, and cord.

Blinds.—All windows are to have outside blinds 1¼ in thick, hung on N. Y. wrought iron hinges in pairs, and all are to have fasteners.

Doors.—Outside doors 1¾ in. flush moulded panels, and transom over the top. Furnish with heavy mortise lock, black knob and good furniture. All other doors, except closet doors, 1½ in. thick, four paneled, flush moulded. All closet doors 1¼ in., four paneled. Furnish all 1½ in. doors with mortise locks, and all 1¼ in. doors with rim locks. All are to be hung on loose joint butts. Saddles are to be of hardwood, jambs ⅞ in. with stop beads. All doors are to be of best white pine.

Floors.—Cover all floors with 4½ in. × ⅞ in. white pine flooring, in usual manner.

Inside.—Trim all plain with turned corner block. Windows to have stools and aprons. Base, 6 in., beveled top and beaded sides. All of good white pine.

Closet.—Provide the kitchen closet with five rows of shelves.

Stairs.—All as per plan, risers ⅞ in., strings 1¼ in., and treads 1¼ in., all good white pine, thoroughly wedged and glued together in the best manner.

Mantel Shelf and Brackets.—The parlor or living room is to have a neat 1¼ in. beaded shelf, supported on neat wooden brackets with beaded face. All not to cost more than $3 complete.

Privy.—Size to be 4 ft 6 in. × 4 ft. 6 in., built in same manner as house. Provide seats, stench pipe, and cleaning trap, also door and small window, all complete.

Painting.—Paint all metal work with Brandon metallic paint, two coats. Paint all outside woodwork, except shingles on roof, two best coats of white lead in L. I. oil. Paint or stain the inside, and varnish with best No. 2 "Elastica" finishes all complete, two coats.

Finally.—The entire work must be completed in a faithful and workmanlike manner. All materials to be of good merchantable quality.

A LAND slide in the mountains above Chico, Cal., the other day laid bare broad streaks of white quartz which carries, apparently, a very large percentage of gold.

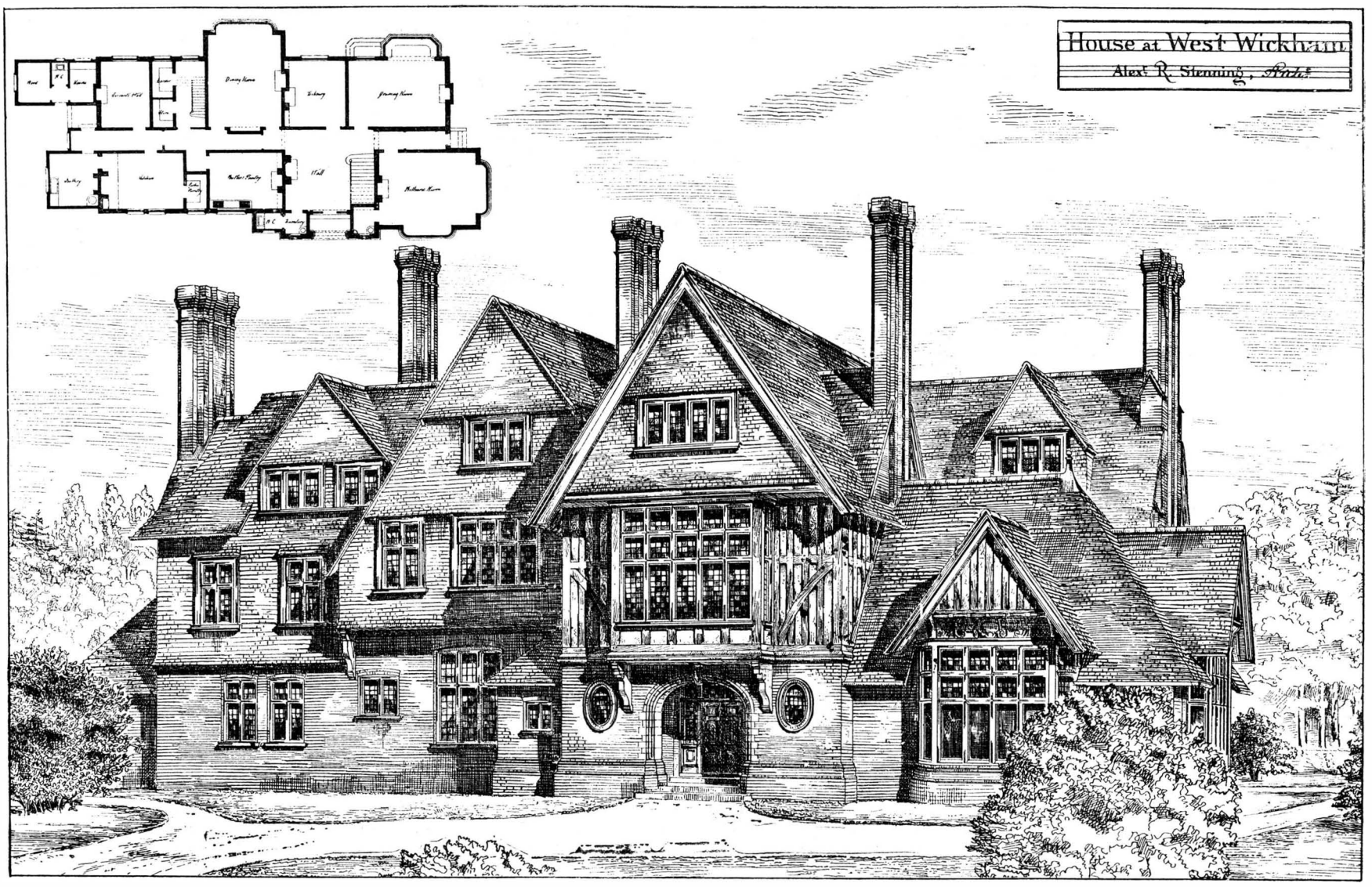
A Quick Lawn.

Mr. William Saunders, of the department of agriculture, at Washington, recommends timothy for making a quick growing green covering for a lawn.

As is well known, the finer grasses, like June grass, *poa pratenses*, and fine bent grass, *agrostis vulgaris*, are very slow in making a firm, thick sod, and are often badly held back while young by rank growing weeds. Some who want a green covering for newly made lawns as early as possible sow some oats or millet, keeping them closely cut the first summer, but these grasses, though better than nothing, and better than weeds, are too coarse and quite unlike an ideal lawn grass. Timothy, while not fit for a permanent lawn grass, is quick to grow and of good color the first year, and makes a far better appearance than the coarser grains, like oats or millet. It dies in a few years from the close clipping it gets, leaving the lawn in possession of its permanent occupants.—*N. E Farmer.*

THE CATHEDRAL, MEXICO.

In the city of Mexico, all the main thoroughfares converge on the great Plaza de Armas, or Main Square. Most of the public buildings are here located. On the north side of the square stands the magnificent cathedral, which occupies the ancient site of the heathen Aztec temple or pyramid. The cathedral was begun in 1573, and completed by the Spaniards in 1657, at an immense cost, the expense of the walls alone being two millions of dollars. The building is in the form of a Greek cross, 426 ft. long and 203 ft. wide, with two naves and three aisles, twenty side chapels, and a magnificent altar supported by marble columns and surrounded by a tumbago ovallos balustrade, with sixty-two statues of the same, composed of rich gold, silver, and copper alloy, serving as candelabra. There is an elaborately carved chair, also inclosed by tumbago railings, weighing twenty-six tons, and valued at one million five hundred thousand dollars. The Doric style prevails in the interior. Renaissance on the exterior, which is adorned by a fine dome and two open towers 218 ft. high. Our engraving, from *La Ilustracion Espanola*, presents an interior view of the great nave, and gives an idea of the magnificent architecture of this remarkable edifice.



AN ENGLISH COUNTRY HOUSE.

A NEW vermin exterminator is prepared by saturating wheat or other grain with a solution of strychnia in water, the grain afterward being coated with a solution of simple sirup and arsenic, a small quantity of oil of rhodium being afterward applied. It is doubtful whether this poisoned grain could be legally sold in this country; and whether or no, it should be carefully avoided.

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Heating by the Combination of Warm Air and Steam.

The problem of successfully heating large buildings such as churches, chapels, public halls, and other buildings of the same class, is one of great interest and importance, but often of much difficulty. With the rapid changes in temperature peculiar to our climate, it is not easy to provide a system which, while being economical, shall allow of a building being maintained at the exact degree of heat required. The reason for this is not difficult to understand when it is considered that under the usual systems of heating it requires some considerable time for the building to become warm, and secondly, that it demands the outlay of the full capacity of the boiler, whether the thermometer stands at 60° or zero. The immediate result of a cold wave in such cases is that, in order to obtain something like comfort, and to heat the building as quickly as possible, the furnace is raised to a red heat. The effect of this is obvious to any person acquainted with heaters; the joints become loose and the products of combustion escape into the room, rendering the atmosphere stifling with dust and gas, and causing much discomfort to the occupants.

A system was much needed which, succinctly stated, should be powerful enough to warm a large building quickly and economically, and at the same time give facilities for rapidly reducing it as might be required. Such a system is that of the firm of Wier & Nixon, of No. 1410 North Street, Philadelphia, Pa. Here we have a heater which gives two separate means of heating—one by hot air and the other by steam. The effect is three-fold in its advantages; first, it permits of very rapid warming; secondly, it allows of the hot air being used by itself when the weather is moderately warm, and is thus very economical; and lastly, it utilizes the whole of the heat from the fuel, and substantially prevents all waste.

The apparatus are made in six sizes, both brick set and portable. In the back half of the fire chamber is a water back, against which the fire rests, and just above, standing upon two water legs across the center of the fire and in the middle of the combustion chamber, is a cylindrical boiler, and above it a steam drum. All these parts are incased by a steel dome, and are devoted entirely to the production of steam. On the outside of the dome, in conjunction with the fire cylinder, the hot air is generated. Check draughts are provided, and are worked automatically by boiler pressure. The whole construction is eminently well calculated to prevent waste and give great power.

The manufacturers have by this system successfully dealt with cases of extreme difficulty, and have rendered many buildings warm and comfortable which under all systems previously tried were cold and cheerless. They offer every facility for the examination of their system, and those who need heaters will do well to avail themselves of it.

IMPROVED PEDESTAL JOINTER.

The buzz planer or jointer is a machine so widely known and universally employed that a description of its many advantages and uses is unnecessary. Certain it is that it forms one of the most important factors in a woodworking establishment, and on account of the variety of work that may be done on it, has justly attained the position of a standard tool, which will always remain a great favorite among operators.

The machine illustrated in the annexed engraving is one of entirely new design, by the well known firm of Goodell & Waters, of Philadelphia. It has been very carefully contrived, with the view of combining in construction the advantages of simplicity, accuracy, and economy, and has the special improvement in the method of raising and lowering the tables by link motion, to adjust for different thicknesses of cut, which is considered by the manufacturers the best in use. Then there is little or no chance for oil or grit to wear the links: and the joints are close and accurately fitted, so that it is almost impossible for any foreign matter to get in those parts. When filing or adjusting the knives, one of the tables may be raised up entirely clear of the cutter head, leaving free access for the operator to accomplish his work.

These machines are made in four sizes, to work twelve, sixteen, twenty, and twenty-four inches wide respectively, as may be required. Every detail in construction receives particular attention, and a thoroughly first class tool is the result. For prices and further particulars, we refer our readers to the manufacturers, Goodell & Waters, Philadelphia, Pa.

THE WAINWRIGHT EXHAUST FEED WATER HEATERS.

Below we give a brief description of the Wainwright exhaust feed water heaters.

In Fig. 1 the water enters the heater through left-hand opening, fills the settling chamber and shell, and is there heated to a temperature of from 200 degrees to 210 degrees by contact with the corrugated copper tubes filled with steam, and escapes through upper right-hand opening. The exhaust enters at the base, thence through the corrugated tubes, and out at the top.

In heater Fig. 2, the water enters at lower left-hand inlet, and, after filling settling chamber, passes up through pipe into the corrugated copper tubes, acquiring a complete circulation by flowing up and down same before passing to boiler through upper right-hand outlet. This complete circulation of the water is effected by return bend castings in connection with the tube plates, thus forcing the water to pass through each tube separately. The exhaust enters through top of heater, surrounds the tubes filled with water, passing out at base, or *vice versa*.

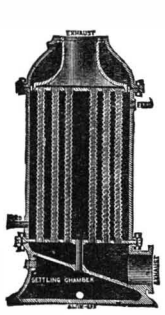


Fig. 1.

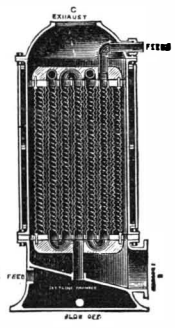


Fig. 2.

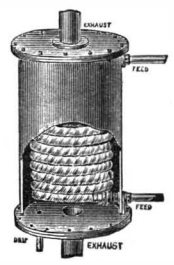


Fig. 3.

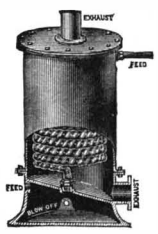


Fig. 4.

Fig. 3 shows another style of heater, with coil of corrugated copper tubing. The water is fed into the coil at lower right-hand inlet, and passes to boiler through upper right-hand outlet. The exhaust enters at the bottom of the heater, and escapes through the top, or *vice versa*.

In Fig. 4 the principle is the same as in Fig. 3, a settling chamber being added to receive all mud and sediment that may be in suspension in the water, and which may be blown out. The water enters at lower left-hand opening, fills the settling chamber, then passes up through corrugated copper coil, and is fed to boiler through upper right-hand outlet. The exhaust enters shell at right-hand side in the base, surrounds the corrugated coil, and escapes through cover, or *vice versa*. The superiority of corrugated tubing over plain is clearly shown in these heaters, increased heating surface being gained, and all annoyance from expansion and contraction being removed, it being absorbed in the corrugations, and thus danger from leakage is obviated.

The Wainwright Manufacturing Co., 65 and 67 Oliver Street, Boston, Mass., manufacture these goods, among their other specialties, their selling agent in this city being F. B. Aspinwall, at No. 93 Liberty Street. In Philadelphia and Pittsburg, their agents are Fairbanks & Co.

Artistic Coloring of Houses.

Among the beautiful houses which have been built during the past season at our fashionable summer resorts, that of Miss Jones, at Newport, R. I., which was designed by Peabody & Stearns, of Boston, attracts a great deal of notice.

The first story is of gray stone, and on the suggestion of Mr. Coleman (the celebrated artist), the shingled walls and roof are stained with No. 16 Dexter Brothers' English Shingle Stain," which is a perfect imitation of an old, weather-beaten shingle.

The effect of the whole house is charming. It has a look of age and comfort. It is rare that a house in its first season looks as if it had lived a long while; but the color and the grace of its architecture gives this house the whole appearance of an old Newport residence. At Bar Harbor, Mt. Desert, Mr. William Ralph Emerson has designed a club house for the fortunate summer residents, and it is now nearing completion. The design is novel, and so full of artistic feeling that any one would know that it was the work of an artist, even if Mr. Emerson's name had not been mentioned.

The outside walls are stained with this same stain to represent the weather beaten shingle, while the roof is stained with a moss green stain. The trimmings and window frames are painted an ivory white.

During the past few years the whole coloring of the outside of houses has changed.

The old idea that shingles must be painted so that the grain of the wood could not be seen gave no opportunity to the architect to make an artistic effect of color. Indeed, a great deal of the staining of shingles has been disappointing because poor, cheap stains containing benzine or water have been used. These cheap stains will wash off and streak the other parts of a house, or the colors will fade out.

There is no economy in using cheap stains, and the architects are specifying Dexter's English shingle stains, as these stains are made of the very best materials.

Acoustic Hints.

In regard to the acoustic properties of the building at North Clarendon, Pa., referred to by a correspondent, I would say:

1st. The conditions necessary for a full reply are not given.

2d. It is necessary to know the plan of the floor joists in the ceiling.

3d. Of what material are the side walls composed?

4th. When the room is comparatively vacant, can echoes be heard of sounds delivered from either end of the room? But I will answer provisionally.

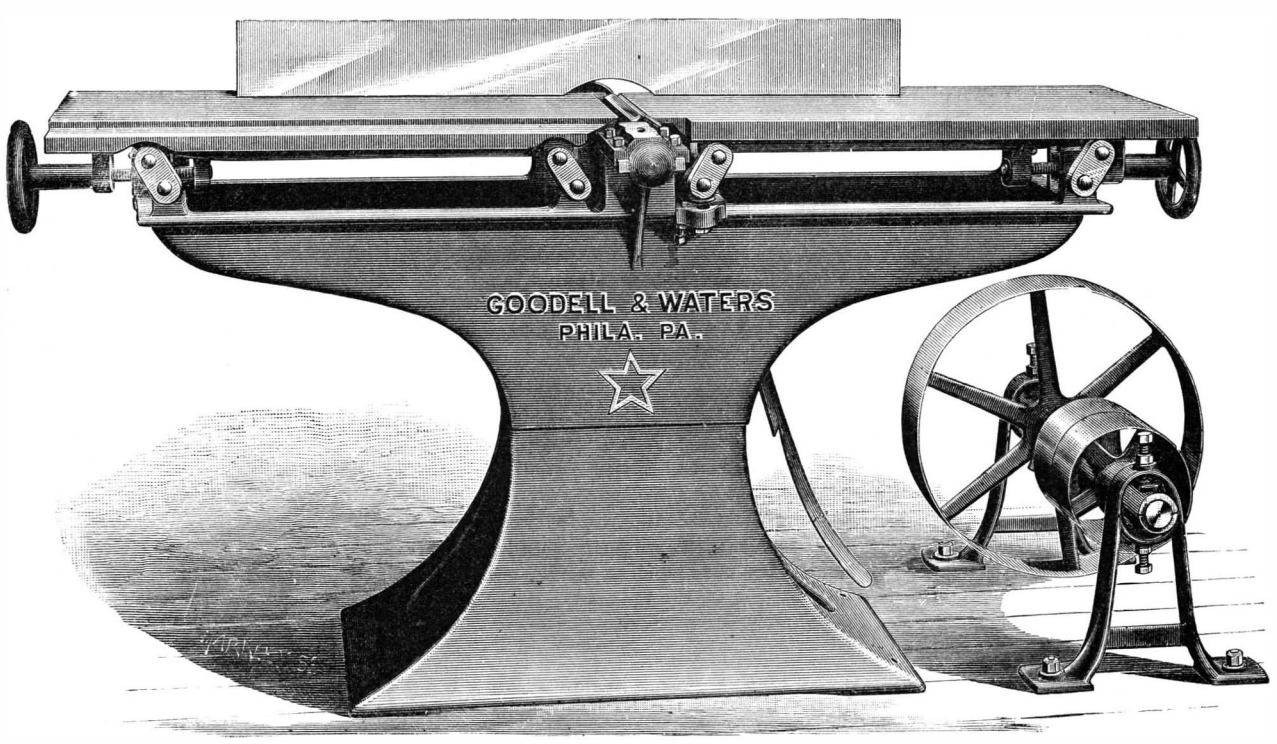
The building is 120 feet long by 42 feet wide, height not given. If speaking cannot be heard distinctly by a person in the back part of the room, it may be owing to the returned reflection of the sound waves from the cross joists or stringers, as some one has said to him.

Wires will be of no avail unless the room is properly ceiled. They cannot destroy the interference of sound waves from the reflection of the beams. The principle upon which the action of the wires is based is the phenomena of interference, by which unequal, non-coexistent vibrations are modified and harmonized. It is possible to add one sound to that of another in such a series of vibrations as to produce silence. It is also possible to have these vibrations so intercepted as to clear the sounds transmitted of their confused murmurs, and it is this result the stringing of wires will produce when properly arranged.

But from the indistinctness of hearing complained of, I think what is needed is more resonance. This can be accomplished by ceiling the exposed joists with accurately tongued matched boards of seasoned pine, glued in the tongue and groove. They should be thin sheeting and narrow. A plastered ceiling would produce positively bad results.

The walls of the room ought not to be plastered. Pine sheeting is good, Portland and Rosendale cement better still. Fear of too much resonance need not be felt, because a great crowd of people will subdue all echoes if the seats gradually rise from front to rear.

K.



IMPROVED PEDESTAL JOINTER.

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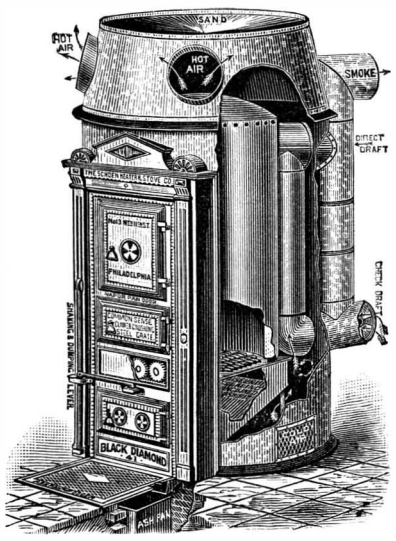
IMPROVED FURNACE.

Inventions are constantly being made which contribute to the convenience and comfort of the modern dwelling. Among the more recent ones may be mentioned the Black Diamond Furnace, as patented and manufactured by the Schoen Heater and Stove Co., of 13 North 11th Street, Philadelphia, Pa.

The general construction of these furnaces embodies all the principles of successful warm air heating. They have self-cleaning radiators, with direct and indirect dranght, and being made of steel plate, with riveted joints, they are perfectly gas tight.

The grate is of peculiar construction, consisting of



THE BLACK DIAMOND FURNACE.

square steel bars passing through a series of pointed teeth of cast iron. These bars are operated by one lever, which controls the shake and dump of the fire. The grate surface is reversible, and all parts of the grate interchangeable. and require no fitting. No bolts or screws are used in the entire arrangement.

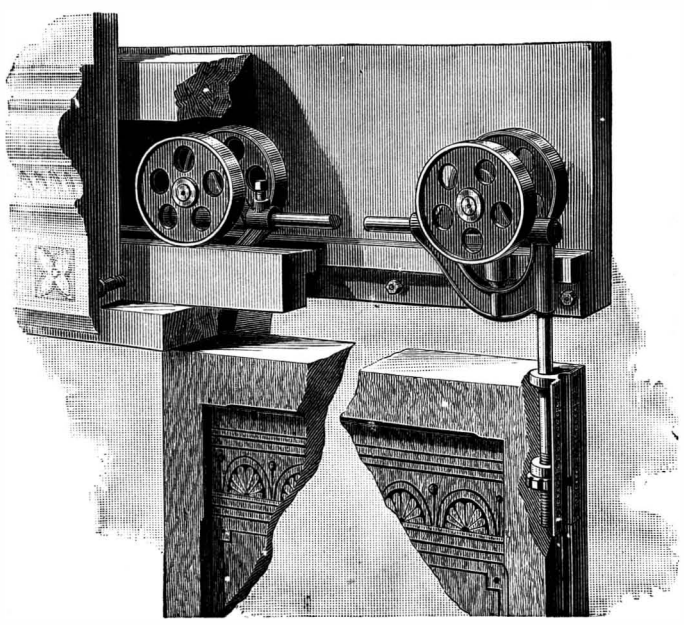
The self-cleaning ash pit is the most important improvement, and consists of an inclined bottom, which throws the ashes and clinkers forward into a pan which is placed in front of the furnace, below the floor level.

The considerable advantages and conveniences of this arrangement may be summed up as follows: Greater radiating surface is provided, the heat of the underneath side of the fire being utilized; a sure prevention from fire caused by hot ashes dropping from the furnace is effected; a perfect draught is insured by always having a clear grate surface, and generally there is a great saving of labor, dirt, and annoyance.

SLIDING DOOR HANGERS.

The inconvenience arising from badly hung sliding doors is often so great that many builders will employ the ordinary hinged door in preference, notwithstanding the considerable space in the room which they render useless. Foremost among these disadvantages are the cutting of the carpet, a projecting floor rail, and the manner in which the door is liable to stick, especially in the case of the heavier ones.

All these objections may be easily overcome by suspending the door on an efficient hanger. Of these devices a large variety, of more or less merit, are before



SLIDING DOOR HANGER.

the public. Of these not one exceeds in usefulness those made by E C. Stearns & Co., of Syracuse, N. Y., under the title of "Warner's patent door hangers." They are simple in construction, economical, and are largely used throughout the country. The accompanying cut illustrates the general construction of the hanger, which is well designed to permit of easy adjustment by means of ratchet nuts, lowering or raising the door when necessitated by any settlement of the building, to clear a carpet, or for other purposes. The hangers are entirely hidden from view, and, being thoroughly made and lined with anti-friction metal, they are noiseless, and, what is of great importance, balance a door so accurately that it may be moved with the greatest ease.

The Cincinnati (O.) Corrugating Co.

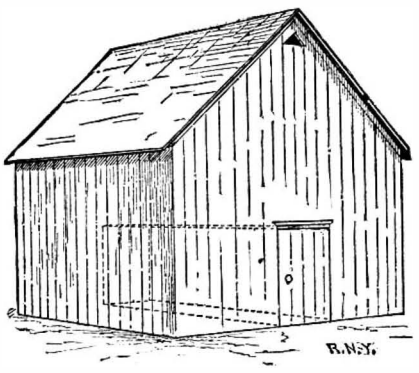
have for years used as their brand the word "Superior," and claim they bend every energy to the maintenance of the verity of their brand.

This is done by the closest attention to the minutest details—every sheet of iron being carefully inspected before painting, when even the smallest "pin-hole" compels rejection; by using the most improved machinery, all driven by steam power; by using none but the best metallic paint, thoroughly reground in pure linseed oil; by carrying the largest stocks of sheet iron in the United States, thus filling all orders promptly; by furnishing inquirers at once with detailed estimates.

They are abreast with the march of improvement, and only solicit a trial when you are in need of anything in their line.

AN ICE HOUSE.

The building is 12 x 16 feet on the ground, with 12 foot posts and studding 2 x 6 inches, 12 feet long, and covered with novelty boards, lined with hemlock, and the intermediate space filled with sawdust from the ground to nearly the top of the rafters. Through the center, the 12 foot way, I built a passage four feet wide, six feet high, with a partition on each side of four inch joists, covered and filled with sawdust, with three inch plank, four feet long across the top, for flooring. The door opening into the room is six inches thick, packed with sawdust and built like a refrigerator door, fitting tightly. In the rear of the passage I have a tank built into the ground for holding water and cans; immediately over the door an aperture, 2 x 4 inches, opens from the room into a ventilator of the same size, pass-



ing up along the inside of the building and opening at a small open window nearly at the peak of the roof, which keeps the room free from all foul and disagreeable odors This arrangement leaves for ice a space 6 x 12 feet on each side of the room, and six feet high, above which the whole building is packed as full as it can be conveniently, and covered with sawdust or hay. The house is filled at the rear. By keeping the door closed as much as possible, the temperature within the room can be kept as low as 48 all the time, and as no warm air gets to the water, it seldom has to be changed. The ice need not be disturbed until the middle of July, and then not much is wasted at a time. Meat, butter and eggs can be placed upon a shelf out of the way and kept as well as in a refrigerator.—*Rural New-Yorker.*

Plans and Specifications.

Should any of our readers desire to procure plans and specifications for buildings, whether churches, schools, dwellings stores, carriage houses, barns, etc.; or if they desire plans made for alterations, enlargements, or additions of any kind, to existing buildings; erection of porches, bay windows, extensions, wings, etc.; they are reminded that all business of the kind will receive prompt attention at this office, on very moderate terms. Address Munn & Co., 361 Broadway, office of SCIENTIFIC AMERICAN, Architects and Builders Edition.

IMPROVED TENT.

The accompanying engraving illustrates a tent which is the invention of Mr. Merritt P. McKoon, of El Cajon, San Diego Co., California. As the doorway is placed at the center of one side, the trunks or cots can be placed crosswise of the tent, and near the ends and end poles, thereby economizing room in the center of the tent, where it is most desired. This middle room can thus be occupied by table, chest, chairs, etc. The half diamond shaped ends form valuable "stow-away" places, or they can be curtained to form separate apartments when necessary. The center or point seam on each end is rope bound and brass linked over end pole iron spikes at the top of the tent, while the lower end of this rope is left loose for about 20 inches beyond the tent, to bracket over tent pin tightly or loosely at will, as dry or wet weather requires. This anchors the tent firmly and solidly, and insures its standing during the most severe gale. The angular roofing or awning over the doorway is of great value, as either one or both of the door flaps can be attached to the sides of the awning at pleasure, so as to obstruct the entrance of sun, rain, or wind when desired. A most agreeable shelter is provided. The tent presents a neat and most attractive appearance, and is as well

adapted for lawn or sea shore use as for actual hard camping service.

HOT WATER APPARATUS FOR WARMING DWELLINGS.

In this climate there are few subjects of more importance than the proper method of warming dwellings, and there is none that receives so little attention from those most directly interested, viz., those occupy the house.

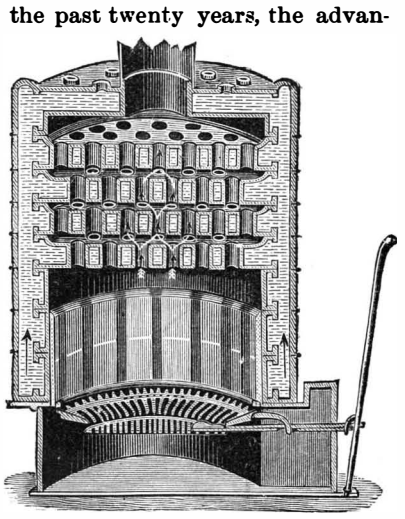
Hot water is now recognized as one of the best methods of warming dwellings, and, in the opinion of many, possesses a number of advantages over both steam and furnace. Among the apparatus for heating with hot water, the Gurney Hot Water Heater, which we illustrate in this connection, is justly considered one of the best. Originally manufactured and introduced in Canada, it has lately, under the energetic management of John A. Fish, been widely introduced into this country, and is meeting with a ready sale, and gives general satisfaction wherever used.

By reference to the engraving, showing sectional view, it will be seen that this heater has several novel features, and among these are the improved shaking and sliding grate, ironstone lining to fire pot, open water way, combustion chamber, and quincunx fire tubes.

The advantages may be briefly stated as follows: Hot water radiators will heat with a low fire, while with steam radiators no heat is given off until steam is generated, the amount of fuel consumed in first raising steam being practically wasted as far as heating the building is concerned; a saving of from fifteen to twenty-five per cent. in consumption of fuel; equality of temperature throughout all parts of the building; simplicity of the apparatus, an ordinary domestic being competent to take charge of it; durability—there being no pressure or strain on it, there is no wear or tear; the apparatus being open to the atmosphere, is perfectly safe, and entirely dispenses with the use of safety valves.

Then in addition the apparatus is easily cleaned both vertically and horizontally; and as the outside cannot be heated to more than 190°, there is no likelihood of fire taking place from the contact or proximity of combustible materials with the exterior.

Any time during the past twenty years, the advantages of hot water have been readily admitted on all hands, the practical method of application being the only thing questioned. So general is this admission of its superiority, that in greenhouses its use is practically universal, as it is recognized that, while steam heat is greatly inferior to hot water, hot air is greatly destructive to plant life. These facts should be full of significance to people of intelligence, familiar with the laws of health, and anxious to conform thereto.



SECTIONAL VIEW OF HOT WATER HEATER.

The Gurney Hot Water Heater, whose general offices are at 239 Franklin St., Boston, is recognized as one of the best heaters in the field, and those of our readers who are interested should write to John A Fish, Esq., the managing director, for illustrated catalogue fully explaining this system.

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THE GREAT NAVE, CATHEDRAL OF MEXICO.—[From a Photograph.]

[For description see page 91.]

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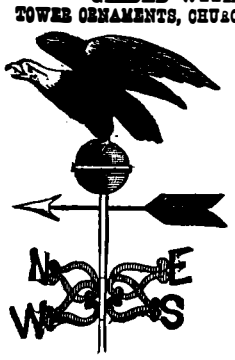

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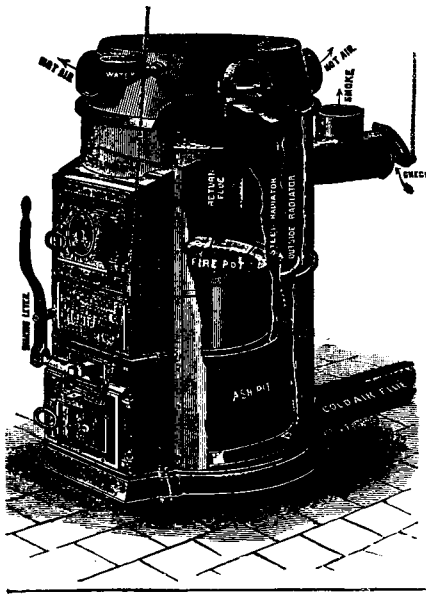
The Excelsior Steel Furnace



Is perfectly gas-tight, is practically self-cleaning, is an economical and powerful heater, is made very strong, heavy and durable, has an extra large and heavy ash-pit.

Has a sectional gas-burning firepot, has two grates, one for shaking and the other for dumping. Has two steel-plate radiators, has a deflecting plate for distributing the warm air. Has the best vapor pan yet devised.

Supplies an abundance of pure and warm air, has every modern improvement, costs practically nothing for repairs, is the only sanitary heater made,

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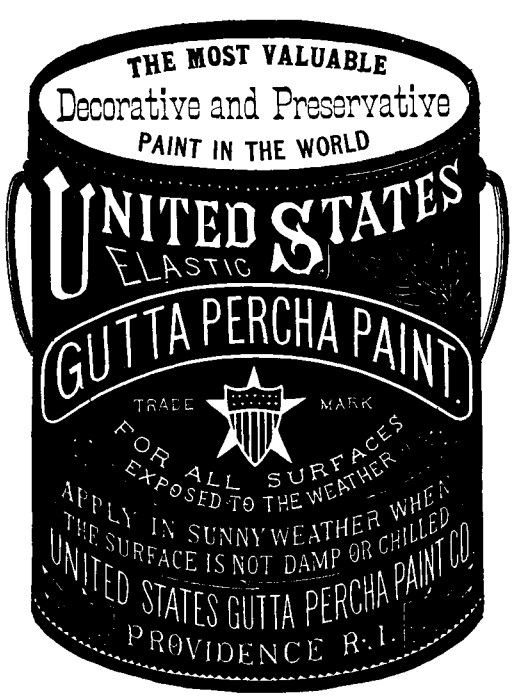
It sends the heat where wanted. It protects the woodwork near from fire. It is a great saving in fuel. It prevents water and gas pipes from freezing. It prevents the condensation of steam. Fire and water have no effect on them. *They do not powder down, char, nor crack.* They are cleanly in application. They are neat and regular in appearance. They are applied to pipes without the use of paste or cement of any kind.



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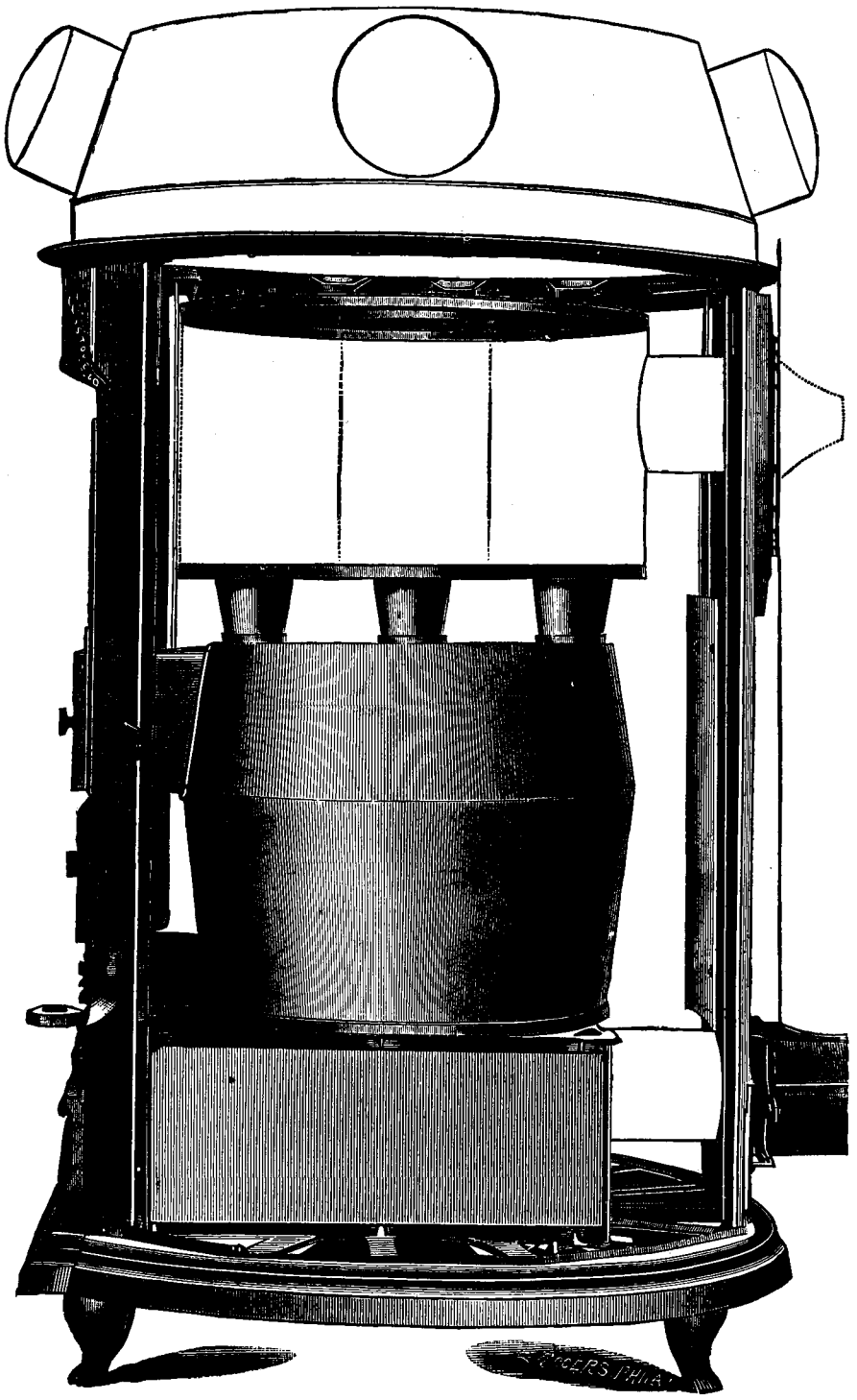

Solar Iron Clad.

This is a Cast Iron Casing, lined with tin or galvanized iron, to prevent direct radiation of heat in cellar; four loose panels lift out, so as to give access to furnace for repairs or renewal, if necessary, without disturbing the Hot Air Pipes; it has sliding panels for feed door and smoke pipe to allow for expansion; it has also a dust flue and flue door for Damper. We claim this to be the most complete, durable, and convenient cold case made, equal in efficiency to Brick set, with much less room required and less expensive, besides the facility for access for repairs, without requiring, as in a brick set, so large a space to work in. It is much superior to the ordinary sheet iron casing, both for durability and efficiency. It is not necessary to remove the casing or Hot Air Pipe to clean out, or repair, or even renew or change the heater.

The Leibrandt & McDowell Stove Co.,

PHILADELPHIA and BALTIMORE.

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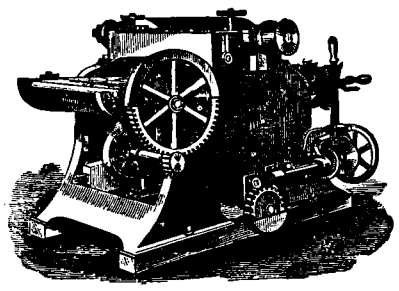

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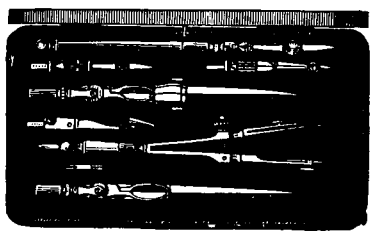

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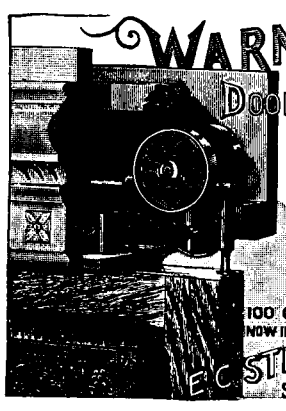

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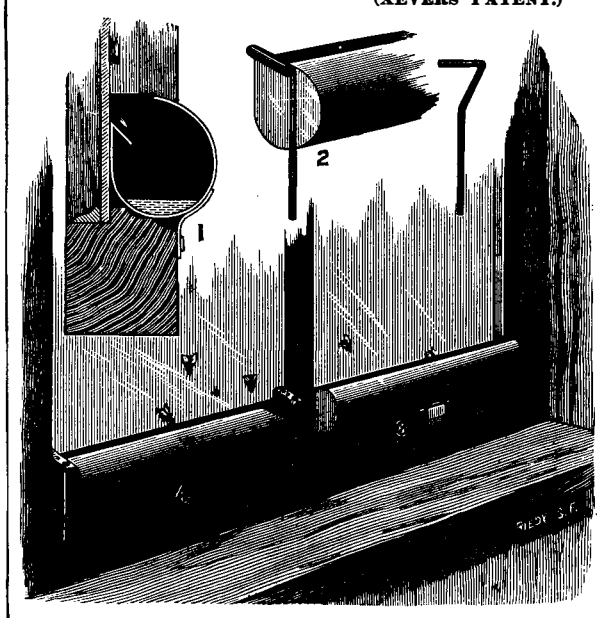

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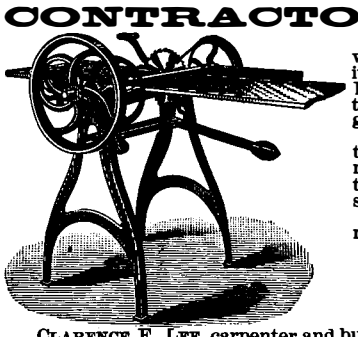

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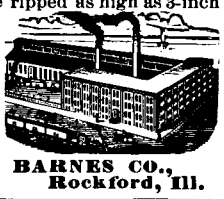

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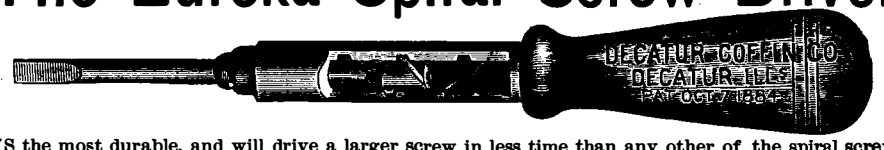

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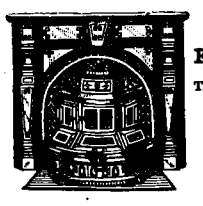

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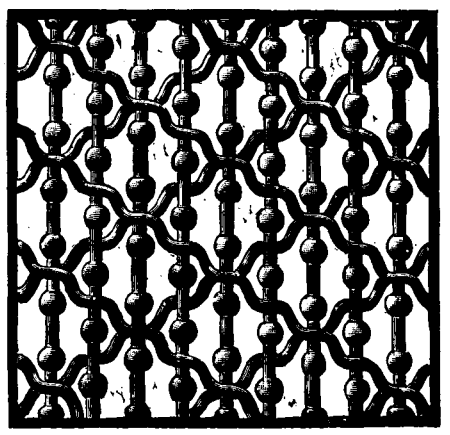

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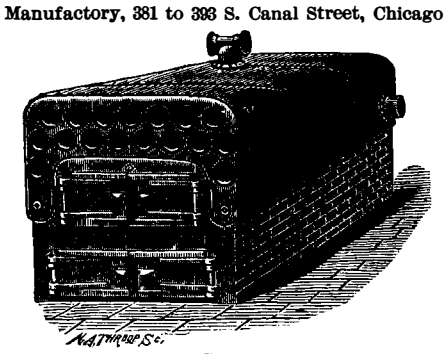

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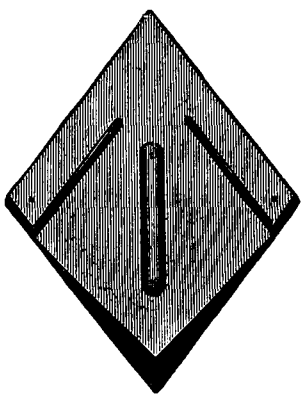

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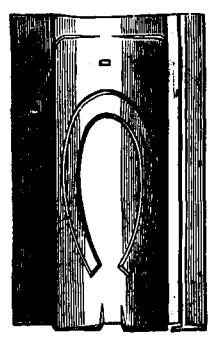

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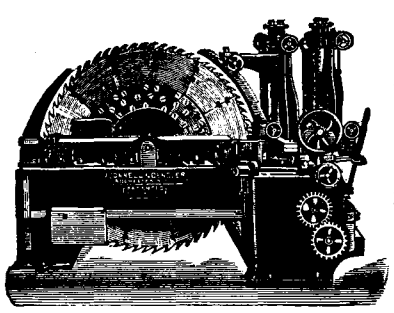

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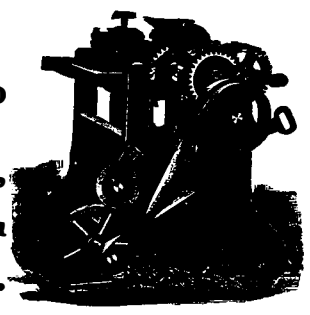

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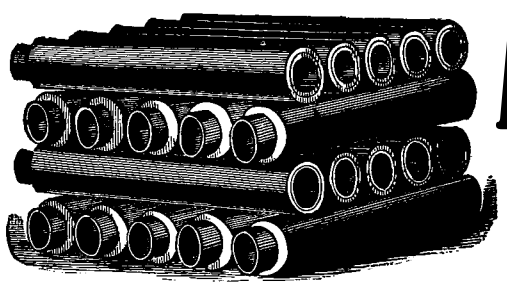

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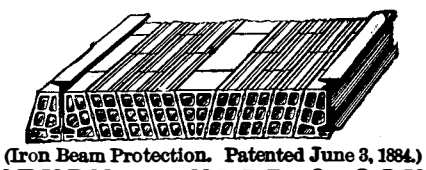

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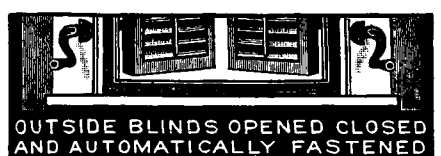

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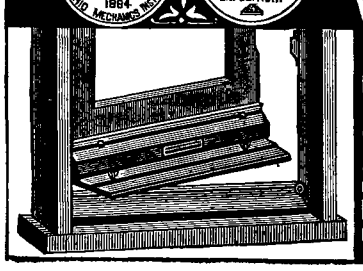

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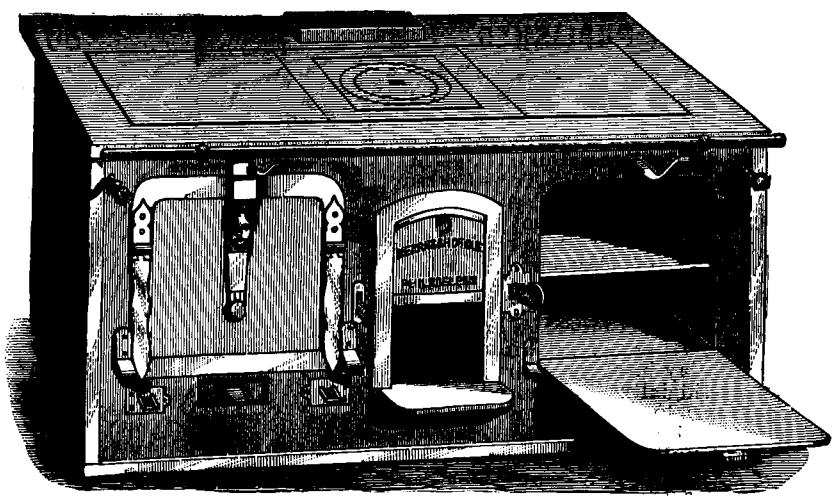

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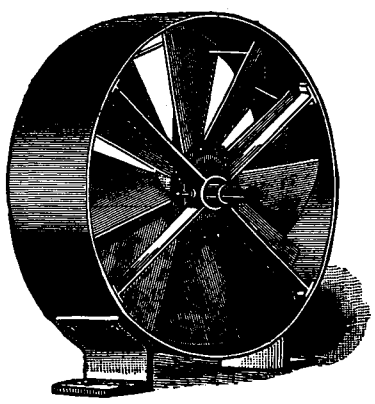

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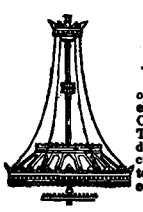

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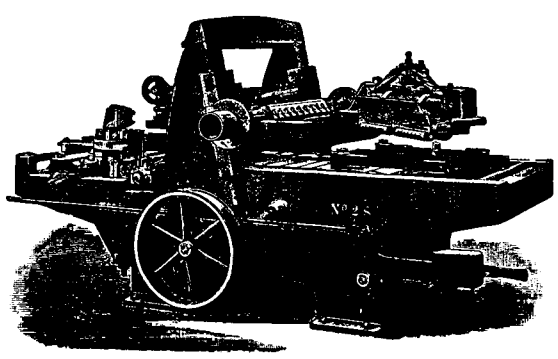

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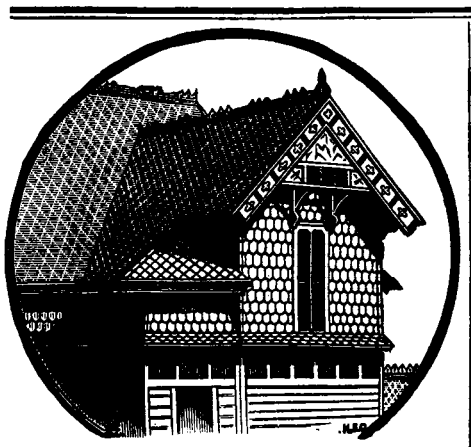

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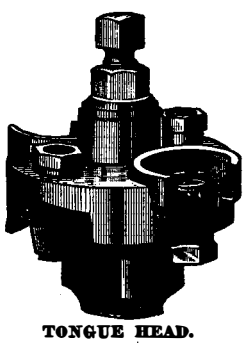

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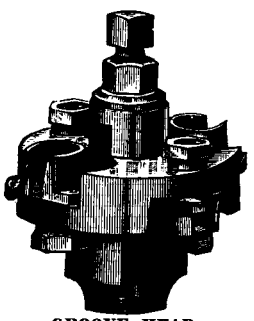

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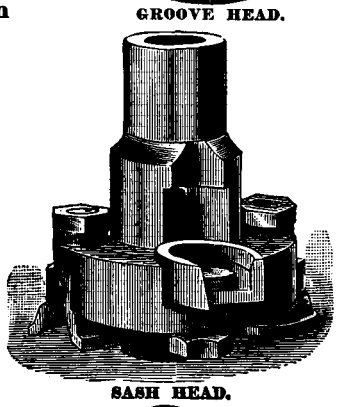

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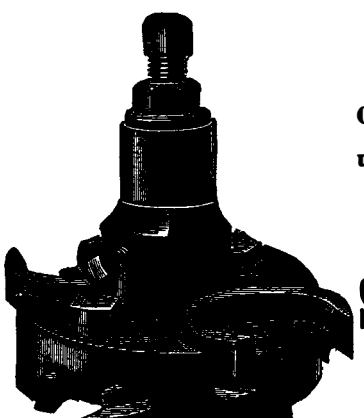

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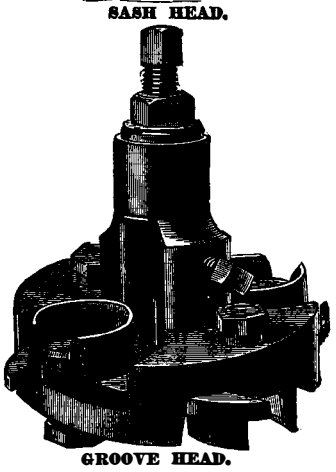

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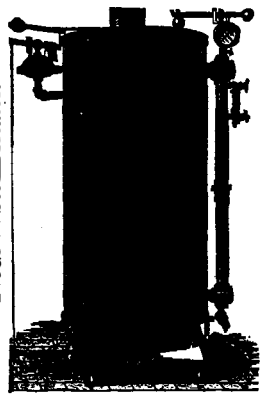

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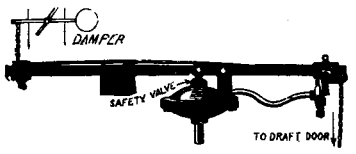

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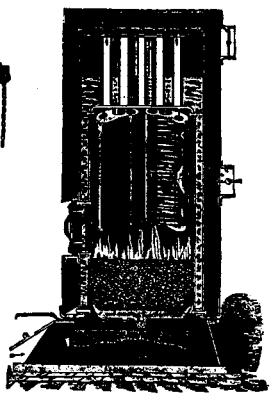

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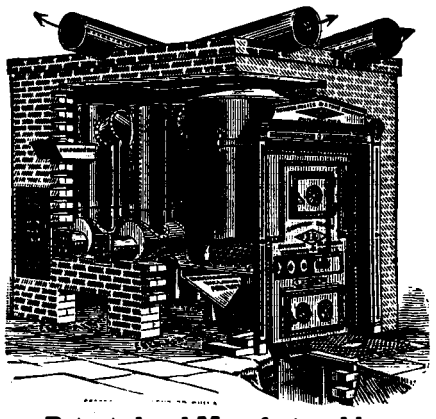

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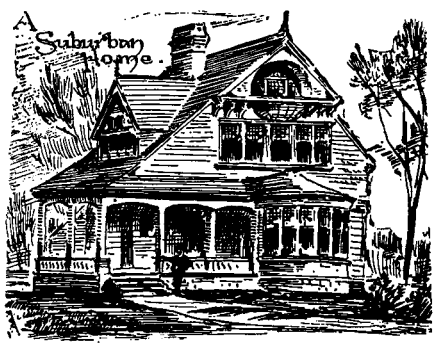

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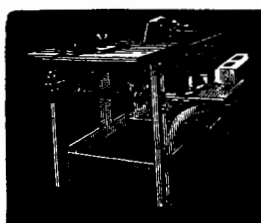

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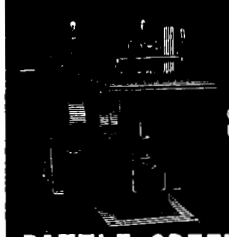

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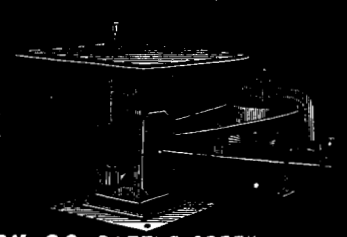

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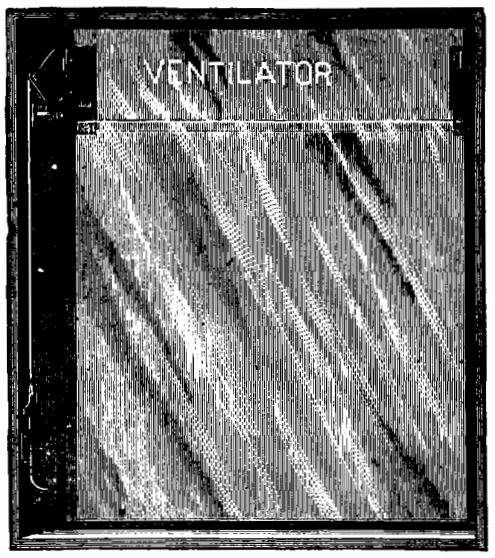

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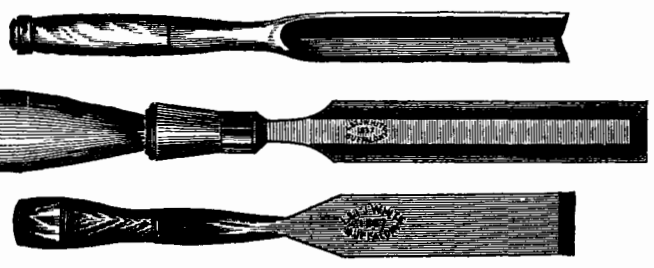

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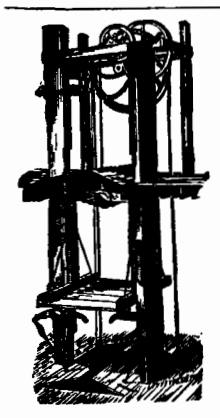

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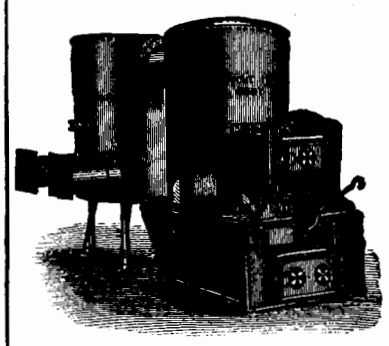

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Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.
Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(1) J. C. K. says: I want to know the best way to build and line a water tank, for taking water from the roof, and to supply the house for running bath tubs and water closets. A. The tank should be built of clear pine, 1¼ in. thick at least. The corners dovetailed together, or nailed to a strong frame. The sides and ends to be well braced to resist pressure of water. Line with tinned copper, not lead. The cost of either is about the same, but copper is more durable.

(2) A. J. M. says: I would like to know if there is any good reason why a good gum hose would not take the place of a lead pipe used to flush a water closet where the supply comes from a reservoir. A. For a short time it would probably answer, but for such a purpose, the best is poor enough. Therefore, it would be unwise and unsafe to use anything less durable than lead pipe.

(3) E. W. asks: What kind of shade trees could you recommend to plant in altitude of 6,000 feet, with a severe winter and a very hot summer? A. Cottonwood trees flourish best in such altitudes and climate.

(4) L. J. M., of Milan, Mo., asks what would be the best preparation for a cement to apply to a clay wall, for cistern or well. The question is ambiguous. If the well or cistern is laid with stones and bedded in puddled clay, the only cementing material to apply is puddled clay. If, however, the well or cistern has been excavated in clay soil, the best cement to bed the brick or stone lining with would be any good hydraulic cement, such as the La Salle cement, of Illinois, or Fort Scott, Kansas, which are near at hand. One of the best plans would be to build the wall of the well or cistern with a lining of Beton concrete, and cover the interior face with a thin coat of hydraulic cement.

(5) T. S. says: Please give the process of engraving, and of what materials the plates are made from which the detail sheet is printed. A. The plates are produced by photography on plates of sheet zinc.

(6) N. P. K. wants a receipt for taking varnish off of furniture. A. Use a solution of about 3 pounds common washing soda to a gallon of water. Apply this to the work with a common paint brush, and after allowing it to stand for a short time the varnish can be removed with an ordinary stiff scrubbing brush.

(7) J. M. asks how to polish bullocks' horns. A. First scrape with glass to take off any roughness, then use pumicestone powder with a piece of cloth wetted until a smooth face is obtained. Next polish with rottenstone and linseed oil, and finish with a piece of clean linen rag. The more rubbing with the rottenstone and oil, the better the polish.

(8) G. A. B. asks: Would not cypress be a far better wood to use for stringers and ties for street car tracks than either white or yellow pine? A. No. Cypress is more durable in damp places than pine and is stronger, but it has the serious disadvantage of springing in its length, which renders it unfit for car track stringers, although some varieties are free from this objection, and could be used for the purpose. The cost of cypress is about one-third higher than pine, which is in itself a drawback to its use.

(9) J. B. asks: 1. A recipe for polishing gun stocks, in which neither varnish nor shellac appears, as they are not allowed. A. Mix boiled linseed oil and turpentine, equal parts, for a polish. Rub the gun stock with a piece of paraffine or clear beeswax. Then rub the stock with a few drops of the polish on a woolen cloth to a smooth surface, and brighten with a dry cloth. 2. How can lead be silvered? A. By electro-plating, making the anode about three times that required for German silver, and the battery power strong, but not too intense. Let there be a good deal of free cyanide in solution.

(10) D. A. D. and S. H. ask for the recipe for a blackboard preparation. A. Take ½ gallon shellac varnish, 5 ounces lampblack, 3 ounces powdered iron ore or emery; if too thick, thin with alcohol. Give three coats of the composition, allowing each to dry before putting on the next; the first may be of shellac and lampblack alone.

(11) J. C. M. asks how kerosene oil can be made a red color. A. Use the extract of alkanet root, sold under the trade name of alkanine, or make your own extract and color with that.

(12) G. S. asks what is good to put in a tumbling barrel to polish brass and zinc, and how is oxidizing done on brass? A. Sawdust and pulverized charcoal are used. Also leather skivings and charcoal. Oxidize brass by exposing for a few minutes to the fumes of sulphur in a close box.

(13) R. S. asks: Is water compressible? For a long time liquids were regarded as being incompressible, but since then researches have been made on this subject by several physicists, and their results have shown that liquids are really compressible. In Ganot's Physics, in the chapter on Hydrostatics will be found an interesting account of the method of determining the compressibility of a liquid by means of an apparatus called a piezometer. Water experiences a compression of 0·00005 part of its original volume. The compressibility of sea water is only about 0·000044; it is not materially denser, even at great depths; thus at the depth of a mile its density would only be about one one-hundred-and-thirtieth greater. For water and mercury it was also found that within certain limits the decrease of volume is proportional to the pressure.

(14) W. M. S. asks how to make liquid glue. A. Take a wide mouthed bottle, and dissolve in it 8 ounces best glue in ½ pint water, by setting it in a vessel of water, and heating until dissolved. Then add slowly 2½ ounces strong nitric acid 36° Baume, stirring all the while. Effervescence takes place, with generation of fumes. When all the acid has been added, the liquid is allowed to cool. Keep it well corked, and it will be ready for use at any time.

(15) W. H. C. asks: 1. Can water be said to belong to the mineral kingdom? A. It is treated as a mineral by authorities on the subject when occurring in the earth. It forms the larger proportion of the human body, and then cannot be so considered. It may be termed of intermediate nature. 2. Can the reflections of a red dress in a mirror be called red? A. Reflection is only changing the direction of a ray of light or color, and has nothing to do with its make-up. The pictures seen in a glass are spoken of as of the colors they reflect.

(16) C. R. asks: 1. How can I make cotton cloth, such as American drill, calico, etc., waterproof without painting, or having to spread anything on it that would damage its texture or softness? A. See the articles on this subject contained in Scientific American Supplement, Nos. 58 and 317. 2. There is a freezing mixture composed of sal-ammonia, saltpeter, and common soda. Can you give me the formula? A. Take 8 parts of sulphate of soda, 5 parts each of sal-ammonia and saltpeter. When about to use, add double the weight of all the ingredients in water.

(17) B. & G. ask: Is there any preparation which will prevent flies and other insects from lighting on and specking windows, etc.? A. Make a strong infusion by boiling smartweed for a few minutes in water. When cold apply it to the glass, and for twenty-four hours it is quite effectual in keeping away flies and insects.

(18) J. O. S. asks: How can I polish or varnish piano legs that have become dingy? A. To do such work well is laborious. Clean and smooth the surface well with rotten stone on a wet woolen rag, and follow with vigorous work with a chamois skin. Then to 2 ounces of melted white or yellow wax add 4 ounces turpentine, and give a good covering coat.

(19) J. W. H. writes: If a wheel, say an undershot one, is placed in a stream running from a reservoir, what portion of the water that works it can it be made to pump back into the reservoir from a pool below, say at a depth of 15 feet from the surface of the water in the reservoir? A. From 40 to 50 per cent into its own reservoir.

(20) H. C. asks if there is at present any practical plan for heating house furnaces by crude coal oil. A. Experiments and trials have been made in this line, but so far the odor has been a most objectionable feature, while the management and watchfulness required is more than an offset to any supposed economy.

(21) J. W. H.—The best form of chimney is round, and about 20 times the diameter in height for large chimneys, and from 30 to 40 times the diameter for small chimneys. Chimneys should be adapted in size and height to correspond with the volume of heated products of combustion. There is a little work by Armstrong that will give you the figures, "Chimneys for Furnaces, Fireplaces, and Steam Boilers," 50 cents, which we can furnish.

(22) J. P. P.—It is extremely doubtful if you can rip 1½ pine and hard wood with a 6 or 8 inch saw with any speed or comfort. You will find it hard work to cut half through by foot power. You can rabbet with a wide saw or a wabble saw. We can recommend "Art Furniture Designs," 4to, $3.00; Eastlake's "Hints on Household Taste," 8vo, $3.00, which we can furnish.

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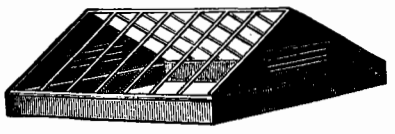

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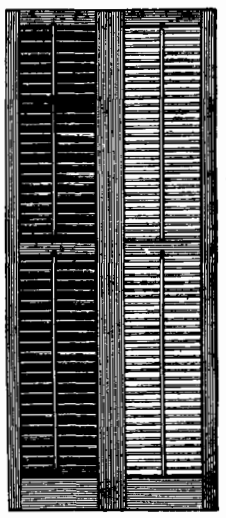

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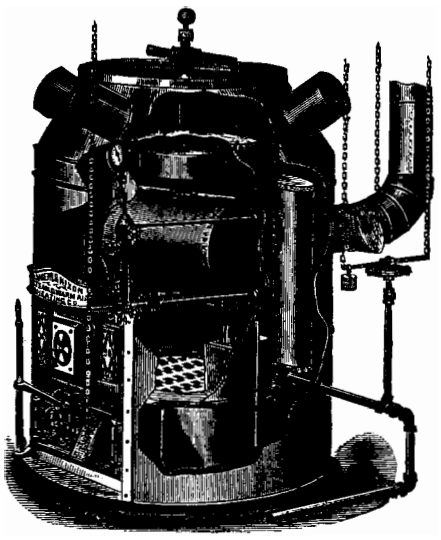

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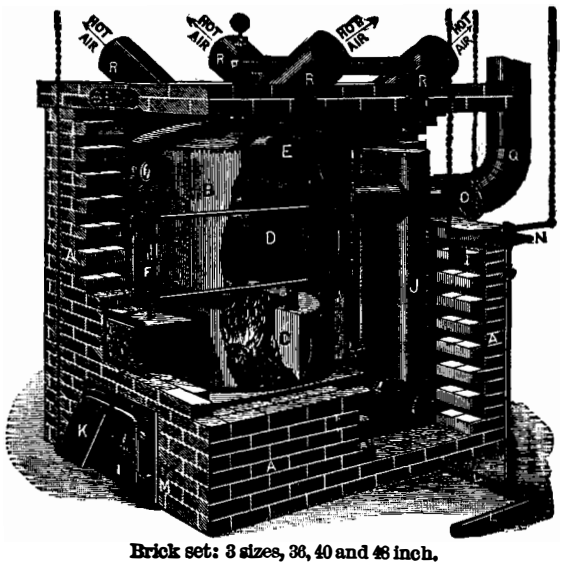

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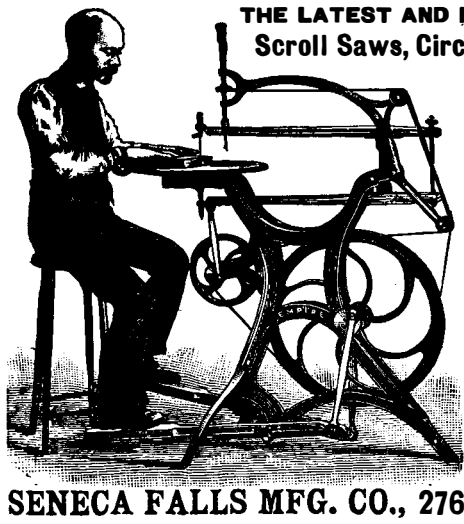

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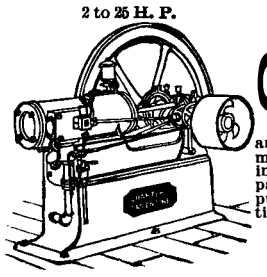

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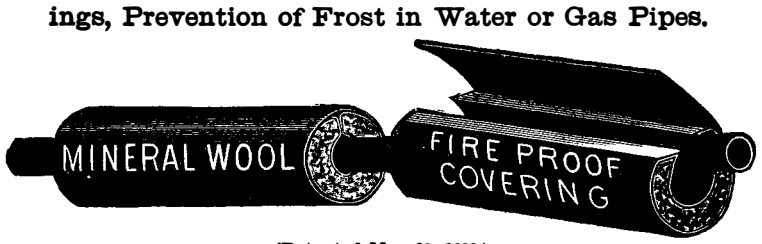

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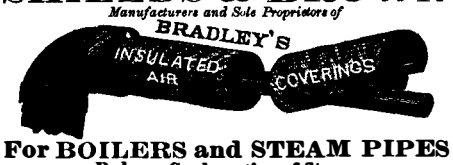

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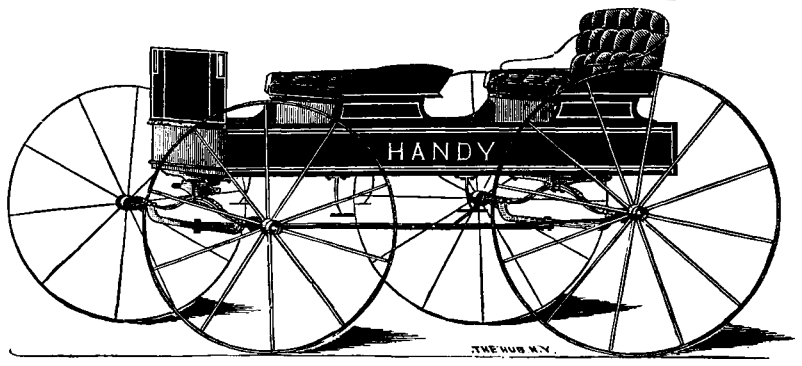

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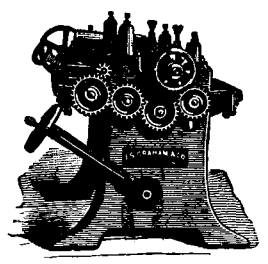

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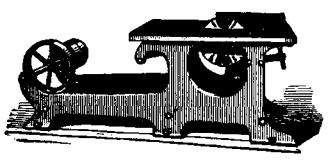

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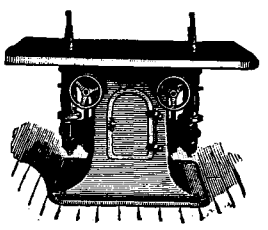

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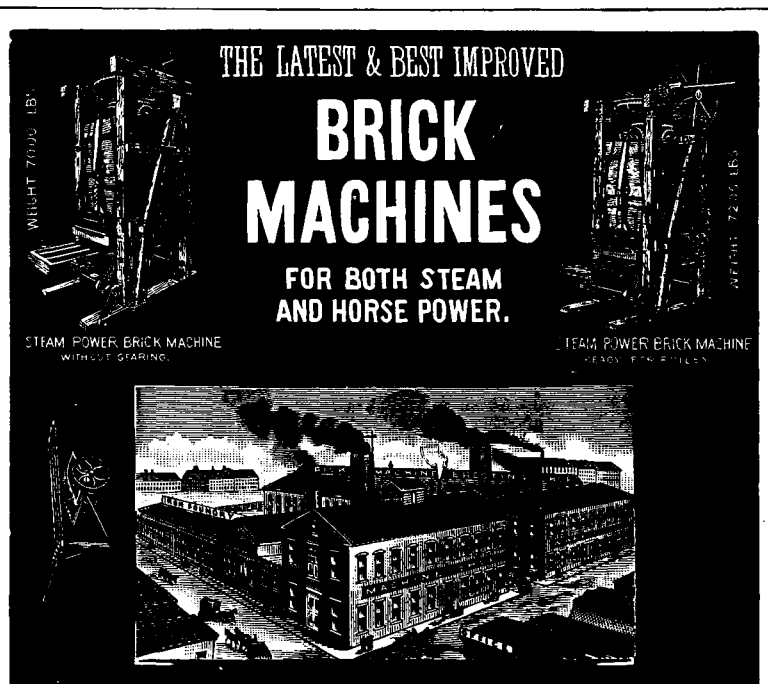

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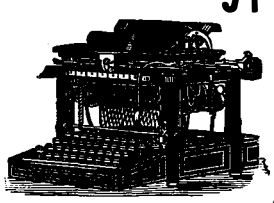

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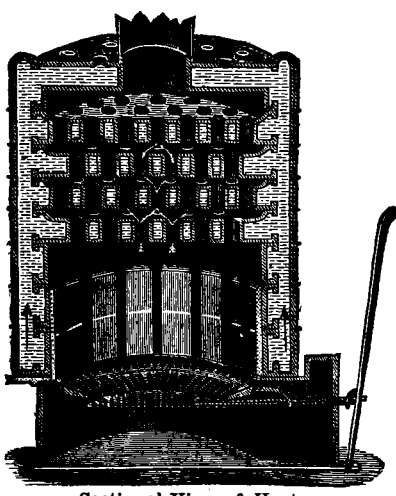

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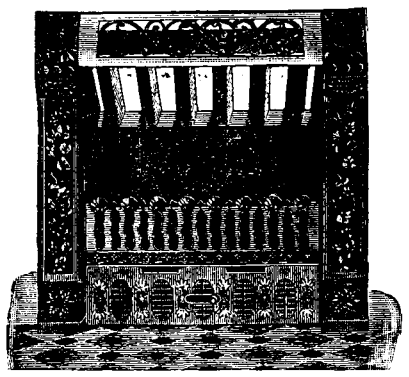

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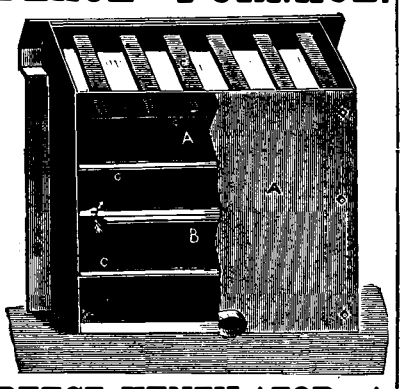

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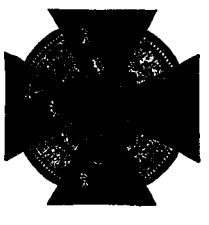

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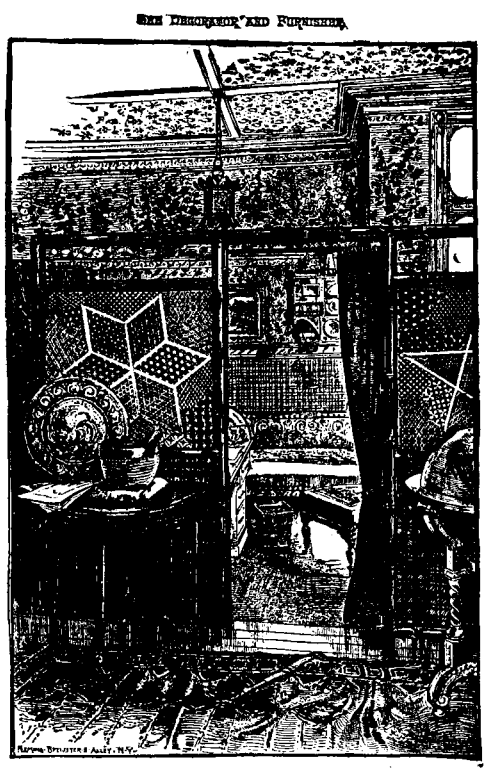

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Wainwright Mfg. Co ..... cover iii

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