# SCIENTIFIC AMERICAN

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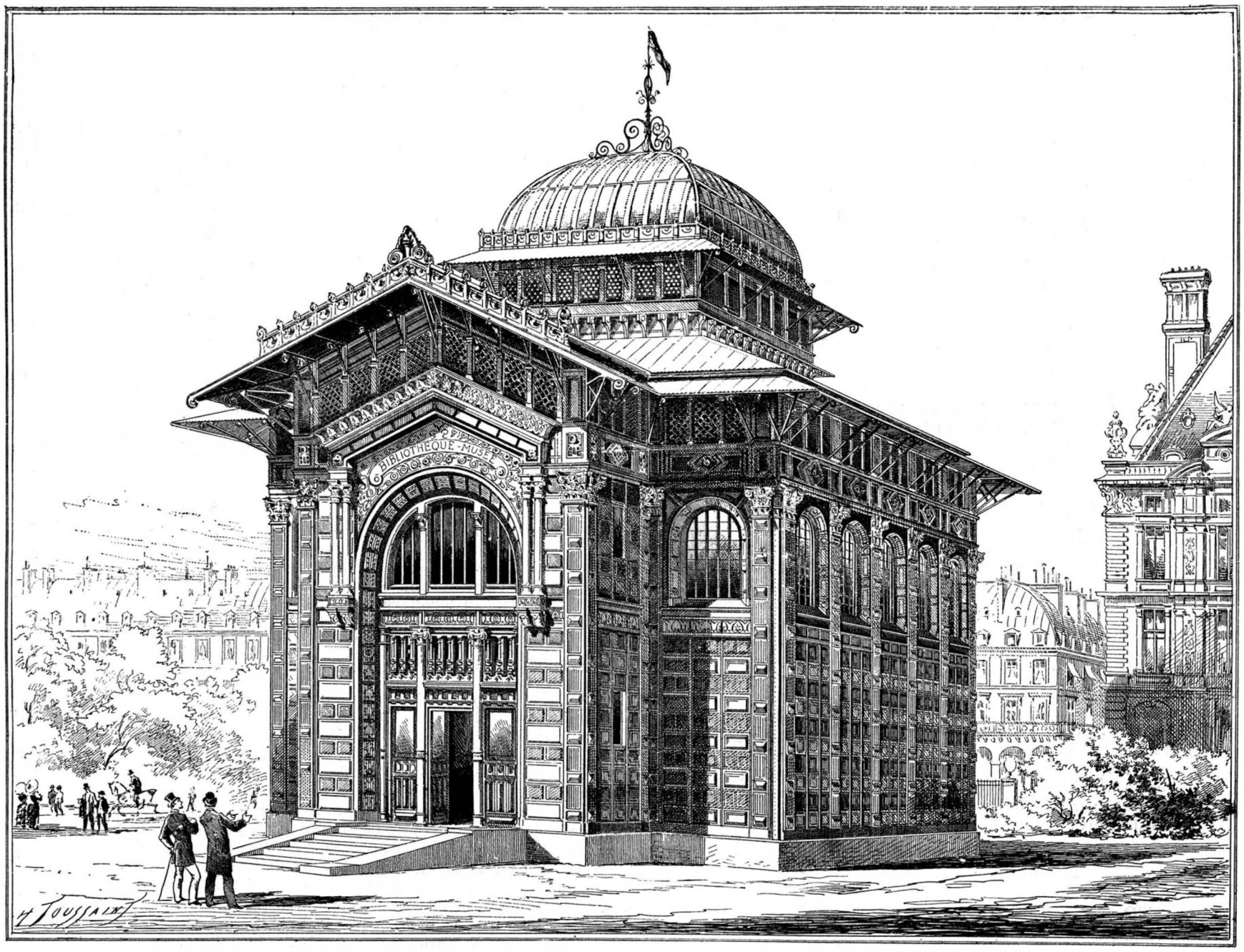


**DESIGN FOR A LIBRARY BUILDING—M. H. PICQ, ARCHITECT.**—*From La Construction Moderne.*

# Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors,

No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

NEW YORK, SEPTEMBER, 1887.


THE

# Scientific American,

## ARCHITECTS AND BUILDERS EDITION.

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### CONTENTS

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

(Illustrated articles are marked with an asterisk.)



### CONCERNING AGENTS.

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**MUNN & CO., Publishers,**
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## SPECIFICATIONS AND ESTIMATE FOR A TWELVE HUNDRED DOLLAR COTTAGE—COLORED PLATE, SEPTEMBER, 1887.

### 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 mentioned in the specifications and set forth in the drawings, to the true intent and meaning of the said drawings and specifications, without any extra charge whatsoever.

The drawings, taken in connection with this specification, are intended to provide for the completion of the entire carpenter work, mason work, tinning, painting, etc., as well as everything mentioned in this specification.

*Quality.*—All the material used to be of good quality, free from all defects impairing its strength or durability.

All timber, except where otherwise specified, to be of good, well seasoned hemlock.

*Sizes.*—Girders to be 4″×8″, flush with top of beams; sills to be 2″×8″; plates and interties, 4″×4″; posts to be 4″×4″; first and second floor beams, 2″×8″, all 16″ on centers; collar beams, 2″×4″; rafters, 2″×5″; hip and valley rafters, 2″×8″; 24″ on centers; all studding, 2″×4″; 16″ on centers; bearing strip, 1¼″×6″; ridges, 1″×8″.

*Framing.*—All studding placed 16″ on centers. All door and window studs to be doubled, bridged once on each floor. Partition studs to rest on partitions below, where possible, and not on the floor beams. Spike a 2″×4″ beam to side of girder for floor beams to rest on and spiked well thereto. All headers and trimmers to be doubled, all beams under partitions running parallel with the same to be doubled; the entire frame to be mortised and tenoned and pinned together. Sills to be halved at corners and well spiked together. Studs to run from sill to plate and to be notched out 1¼″×6″, and ribbon well spiked in for second tier of beams to rest on.

*Flooring.*—First and second story floors to be laid with narrow spruce flooring, well driven together and nailed to each and every beam.

*Siding.*—Cover entire building, except where otherwise shown in the drawings, with sound knotted, narrow novelty boards, nailed every 16″, and set nails for putty. Do all necessary furring. Shingle the vertical sides where shown with XXX 18″ pine shingles, laid not more than 5″ to the weather. All vertical shingles to be laid in straight lines and style shown on plans.

*Roof.*—The roof is to be lathed with 1″×2″ spruce lath; valley and gutters to be lined with the best I C charcoal tin; all joints to be carefully soldered. Do all necessary flashing around chimneys, dormers, porches, etc, also counterflash all chimneys and junctions. Shingle the entire roof with 18″ pine shingles, not more than 5½″ to the weather. Furnish and put up where required 3″ tin leaders, connected with cistern where directed.

*Piazza.*—The sills and bearing timbers for porches to be 3″×6″, floor beams 2″×6″, placed 20″ from centers, notched into the sill and well nailed; the floors to be 1″ thick, 4½″ wide, laid in white lead and blind nailed. Steps to have 1¼″ treads and ⅞ risers; the roof to be sheathed and tinned; columns, plates, balusters, ceiling, etc., to be white pine, worked and trimmed as per details. The piazza to be ceiled on the under side, part raked and part on level, with 3″ beaded ceiling, ⅞ thick, beams 2″×4″. Front steps to be built as shown on plan, with 1¼″ strings and steps, ⅞″ risers. Use two rough strings between face strings.

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

*Exterior.*—The water table, corner boards, cornice, window frames, bay windows, porches, and all other exterior ornamental work to be made of the best quality of white pine, in accordance with the drawings and details.

*Windows and Door Frames.*—Window frames to be made for 1½″ double hung sash, with 1¼″ pulley and hanging stiles; 2″ sills and ⅞ sub-sills; 2″ axle pulleys, stops, etc., all complete. Small cellar frames to be made with rabbeted frames, cased inside and hung at top with 3″ narrow butts and proper fastenings. Hanging stiles to all windows will be 4½″ wide. Door frames to be made of 1¼″×4½″ outside casings.

*Sashes.*—All sashes, except cellar, to be 1¼″ thick, dimensions and the number of lights as shown in the drawings; to be glazed with second quality French single thick 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 plans.

*Doors.*—The front doors to be 1½″ thick, moulded as per plans, with two panels of plain glass hung with 4½″ cast loose butts, fastened with 4½″ mortise lock, night latch attachment, brass face, white porcelain furniture and escutcheons. Closet doors 1¼″ thick, paneled and moulded one side, hung with 3½″ cast butts, fastened with 5″ reverse bevel rim lock, white porcelain furniture, etc. The back door to be 1½″ thick, secured with mortise lock and two 4″ barrel bolts, placed one above and one below the lock. All other doors, not otherwise specified, to be 1½″ thick, double faced, with mortise locks, furniture to match that heretofore specified When setting jamb all doors must be hinge and lock blocked.

*Stairs.*—Build the stairs as shown on the plans, from first to second story, with 1¼″ treads, ⅞″ risers, and 1¼″ strings, to be put up in the best manner, the steps to be wedged with glue and supported on strong carriage timbers. Newels, balusters, and hand rails to be made of ash as per details Cellar stairs to be rough spruce plank steps housed into strings. Fur off all soffits of stairs complete for lathing.

*Trimmings.*—The architraves for all doors and windows throughout the house to be made 4″ wide, plain face. The bases to be 6″ wide with ⅞″×1″ moulding on top; all to be of well seasoned merchantable white pine; the base moulding to continue around doors and windows.

*Pantries and Closets.*—Kitchen pantry to be fitted with shelves on two sides as shown. The bed room closets will be fitted with one shelf and wardrobe hooks underneath.

*Cellar Door.*—Put up outside cellar door as shown, of narrow beaded ceiling, put together with wrought nails, hung and locked complete.

*Cutting.*—Do all necessary cutting for plumber. Furnish and put up all necessary boards for plumber to screw his work to.

*Hang Shelf.*—Put up hang shelf in cellar where directed, of wide ceiling and good strong hangers, 2′ 6″ wide ×8′ long.

*Privy.*—Build privy 4′ 6″×4′ 6″ square, and 6′ 6″ high, to be built of sound pine boards. Roof to be covered with boards, door to be hung with 6″ T hinges and fastened with thumb latch. Put a button on inside to hold door when desired. Fit up with pine seats, with lids hinged over holes.

*Back Stoop and Steps.*—The inclosed back stoop shown on plan to be built of sound pine boards well nailed to a frame, composed of 2″×4″ wall strips planed, roof covered with tin. Steps to same are to be made of 1¼″ pine plank (planed).

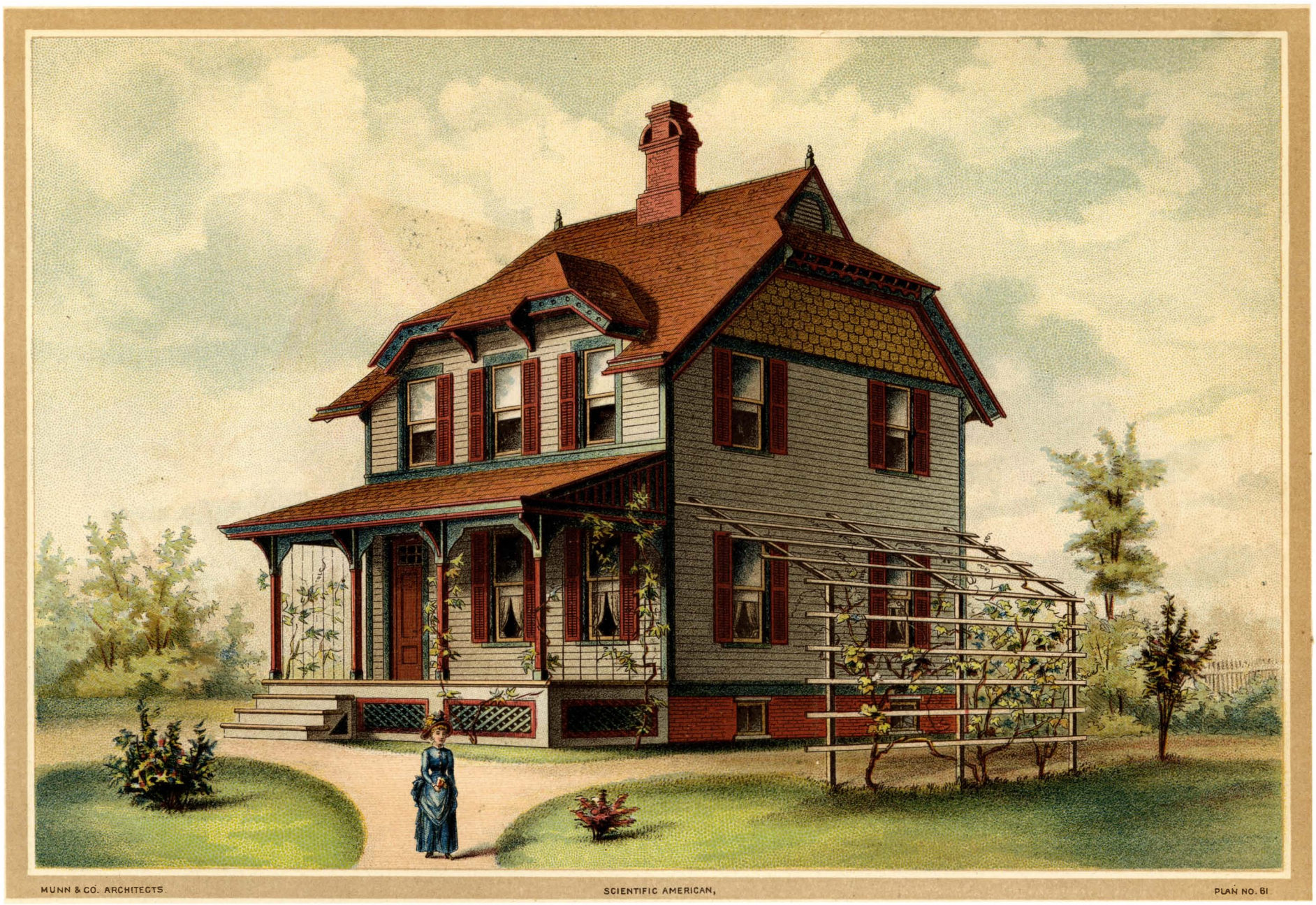
The stoop and porch floors to be 1″ thick, 4½″ wide, laid in white lead and blind nailed. Steps to have 1¼″ treads and ⅞ risers. The roof to be ceiled and tinned. Columns, plates, ceiling, etc., to be white pine, worked and trimmed as per details. The piazza to be ceiled on the under side, part raked and part on level, with 3″ beaded ceiling ⅞ thick, beams 2″×4″.

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

*Exterior.*—The water table, corner boards, cornice, window frames, porches, and all other exterior ornamental work to be made of good quality of white pine, in accordance with the drawings and details.

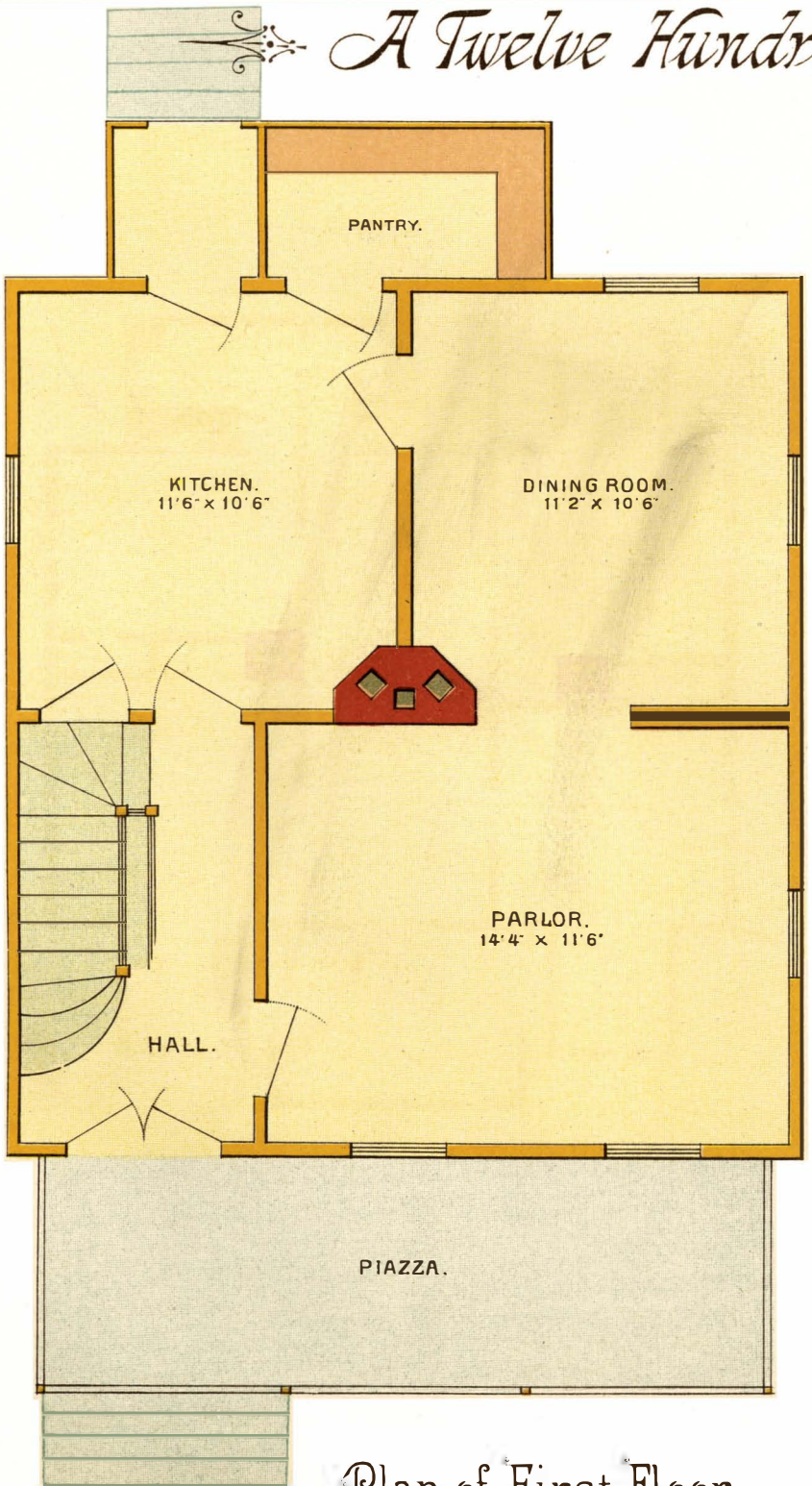
### PAINTING.

Paint the entire house inside and out, including blinds and chimneys, two coats of good ready mixed paints of such colors as may be selected. All sap and knots to be shellacked before priming is done. Putty up all nail holes, etc., complete. Paint all tin work two coats of

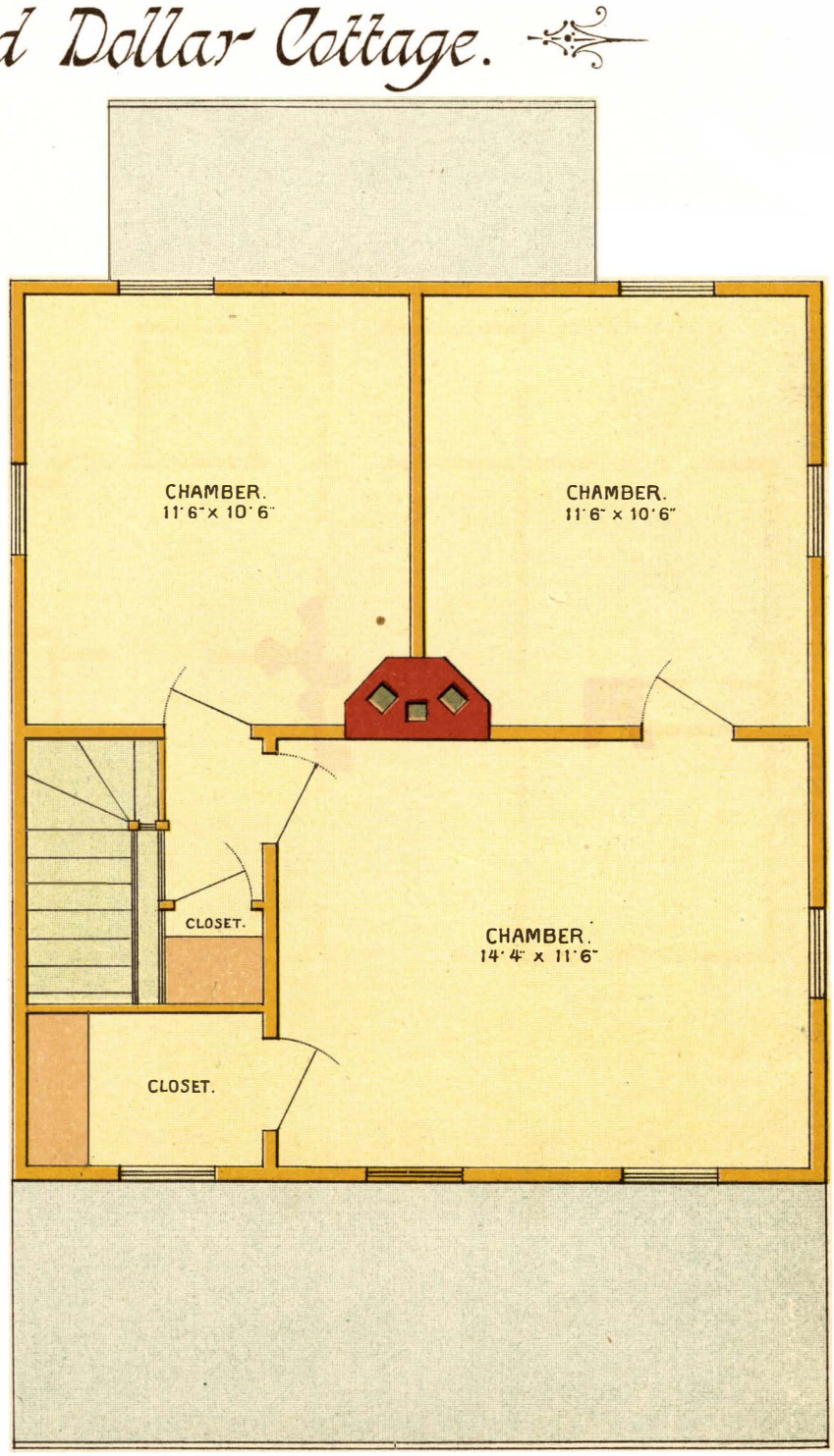


MUNN & CO. ARCHITECTS. SCIENTIFIC AMERICAN, PLAN NO. 61

# A Twelve Hundred Dollar Cottage.




Plan of First Floor.




Plan of Second Floor.



SCHUMACHER & ETTLINGER, NEW YORK.

Prince's metallic mineral paint. Also paint privy same as house.

MASON'S SPECIFICATIONS.

*Excavations.*—Proper excavations, of depth as shown on plans, or the cellar proper, to be about 4½′ deep. All piers and foundations 2′ 6″ deep. Stoop foundations 2′ 6″ deep. Earth and rubbish to be removed where directed. All water that may accumulate during the excavation, from any cause whatever, to be removed at once by the contractor, and the premises kept dry. Also excavate for privy. Size and depth as directed by owner.

*Stonework.*—The cellar walls to be of good sized stones, those generally used in the vicinity, 16″ thick, to the full height of cellar, which will be 7′ in the clear, and to be laid, as shown, in cement and lime mortar, with sharp sand. The stone laid binding, the outside where exposed to view to be pointed with cement mortar and cut joints. The inside to be pointed flush and smooth. All angles and corners to be perfectly plumb and the walls level on top.

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

*Cellar Steps, etc.*—Furnish and set bluestone sills to all cellar windows. Furnish and set bluestone steps where shown, with brick risers and stone cheeks and copings.

*Chimney Flues, etc.*—Build chimney as shown on plans, of good hard burnt brick. The joints of all flues struck smooth and capped with bluestone caps, 3″ thick, with holes cut in.

*Plastering.*—The entire house to be lathed and plastered. All to be regular two coat work and all skin finish, and all done in a good and workmanlike manner, using good materials. The mortar to lie at least one week before using. All the ceilings to be hard finished.

MASON'S ESTIMATE.

| | |
|---|---|
| 78 yards excavating, at 25 cts. per yd..... | $19 50 |
| 8,600 brick for foundation, at $15 per M, laid. | 129 00 |
| Cellar steps, complete ..... | 20 00 |
| Chimney, complete ..... | 60 00 |
| 5 cellar window sills..... | 4 00 |
| Brick piers..... | 20 00. |
| 300 yds. plastering, at 40 cts. per yd..... | 120 00 |

CARPENTER'S ESTIMATE.

| | | | | |
|---|---|---|---|---|
| 1 | 4″ ×8″×24′ = | 64 | feet. | |
| 2 | 3″ ×8″×22′ = | 88 | " | |
| 2 | 3″ ×8″×24′ = | 96 | " | |
| 2 | 4″ ×4″×24′ = | 64 | " | |
| 2 | 4″ ×4″×22′ = | 59 | " | |
| 28 | 2″ ×8″×22′ = | 821 | " | |
| 13 | 2″ ×8″×20′ = | 324 | " | |
| 2 | 2″ ×8″×16′ = | 42 | " | |
| 6 | 4″ ×4″×16′ = | 126 | " | |
| 24 | 2″ ×5″×16′ = | 320 | " | |
| 1 | 3″ ×6″×20′ = | 30 | " | |
| 2 | 3″ ×6″×14′ = | 42 | " | |
| 200 | 2″ ×4″×16′ = | 2,067 | " | |
| 2 | 1¼″×6″×24′ = | 30 | " | = 4,173 ft., at $14 per M. $58 42 |
| 1,400 ft. narrow novelty siding, at $32 per M.. | | | | 44 80 |
| 180 ft. 4½″ floor piazza and stoop floor, at $35 per M..... | | | | 6 30 |
| 320 ft. wide ceiling inclosing back stoop, at $30 per M..... | | | | 9 60 |
| 175 ft. piazza ceiling, at $35 per M..... | | | | 6 12 |
| Back and front steps ready to put up.. | | | | 8 00 |
| Columns, lattice, brackets, etc., for piazza, ready to put up..... | | | | 22 00 |
| Cornice, complete to put up, for back stoop and pantry ..... | | | | 6 00 |
| 50 ft. water table, at 3 cts. per ft. .. ..... | | | | 1 50 |
| 125 ft. main cornice, at 20 cts. per ft.... ... | | | | 25 00 |
| Brackets, etc., for cornices and gables.. | | | | 6 00 |
| Corner boards and bands ..... | | | | 4 00 |
| Outside cellar door, complete..... | | | | 4 00 |
| 1,300 ft. floor, at $25 per M. ..... | | | | 32 50 |
| 275 1×2 shingle lath, at 4½ cts .. ..... | | | | 12 37 |
| 9,000 18″ pine shingles, at $4 50 per M.... .... | | | | 40 50 |
| 5 cellar windows, complete..... | | | | 6 25 |
| 1 small window for pantry, complete..... | | | | 1 50 |
| 14 1st and 2d story windows, complete, $6.50 each ..... | | | | 91 00 |
| Front doors, complete, with frame and trimmings..... | | | | 15 00 |
| Sliding door..... | | | | 10 00 |
| 11 doors, complete, $4.50 each..... | | | | 49 50 |
| 250 ft surbase, at 3 cts. per ft..... | | | | 7 50 |
| 4 small shelves..... | | | | 3 00 |
| Stairs, complete ..... | | | | 40 00 |
| Shelving closets. ..... | | | | 5 00 |
| Nails..... | | | | 15 00 |
| Privy, complete..... | | | | 10 00 |
| Labor for putting up work..... | | | | 200 00 |
| Painting..... | | | | 80 00 |
| Total..... | | | | $1,193 06 |

**SPECIFICATIONS, ESTIMATE, AND BILL OF MATERIALS FOR A SOUTHERN RESIDENCE OF MODERATE COST, SHOWN IN COLORED PLATE, SEPTEMBER, 1887.**

The estimate on this house without cellar and without plumbing, furnace, etc., is $3,941.68; with cellar, plumbing, and furnace, $5,500.

GENERAL DESCRIPTION.

The building will be one story and breast work, with foundation under the whole house. First story 10′; second story 9′ and 8′ 6″ breast work. The first story will be hard finished on two coats brown mortar.

Foundation walls of brick 12″ thick. The frame will be of yellow pine, sheathed with yellow pine boards, and resin sized felting, sided with narrow bevel siding ⅝″ thick; shingled in the gables and sides where shown with cypress shingles, ornamental pattern. Cypress shingle roof.

Interior finish of yellow pine, finished off natural color of wood or stained; first floor laid with yellow pine and resin sized building paper.

CARPENTER WORK.

*Frame.*—The frame to be of sound yellow pine timber, of the following sizes; sills 3″ × 8″; posts 4″ × 8″; plates 4″ × 6″; ties and girts 4″ × 6″; those over bays to be 4″ × 8″; principal partition caps 4″ × 6″; others 4″ × 4″ and 3″ × 4″.

*Beams*—Beams first story 2″ × 10″, 16″ on centers; second story 2″ × 10″, 16″ on centers. Headers and trimmers 4″ by depth of beams.

*Rafters.*—Rafters 2″ × 8″, 2′ on centers; collars to every pair of rafters 2″ × 6″.

*Veranda.*—Veranda rafters 2″ × 6″, 2′ on centers; sills and principals 4″ × 7″; beams 2″ × 7″, 2′ on centers; plates 3″ × 8″.

*Hips, etc.*—Hips, ridges, and valleys 3″ thick by depth of miters.

*Braces.*—Long braces 4″ × 4″; door and window studs 3″ × 4″ joist. All studs in principal bearing partition 3″ × 4″, other studs 2″ × 4″, all placed 16″ on centers.

*Partitions.*—All to be properly framed and braced, pinned and spiked, raised in position on foundation, true, level, and plumb.

*Bridging.*—Bridge all spans of beams of 10′ and over with 2″ × 3″ cross bridging, well spiked in place. Take care to have all studs stand directly over the ones below wherever practicable. Studs in bearing partitions to run through to girders or partition caps. Lap all beams over full width of bearings. Securely anchor all partitions at angles.

*Windows.*—All windows to be as indicated by the plans. Make and properly set.

*Frames.*—All other sash to have accessible pocket frames, with 2″ noiseless pulleys; 2″ timber sills; 1¼″ false sills; pulley and hanging stiles. Frames to have a quarter round placed in the sash grooves top and bottom, to stop the sash about 3″ from bottom and top.

*Sash.*—All sash to be of clear, seasoned yellow pine, lipped and moulded 1½″ thick, divided for glass as shown and to be double hung to iron balance weights, with best braided hemp sash cord. All to be fastened with bronze bell tip Ives sash locks.

*Glass.*—The glass for all windows will be filled with polished plate double thick French sheet glass for large lights and single thick for small ones. The front door will have rolled cathedral glass. Provide and hang complete. Inside Venetian cypress blinds of best make to all windows.

EXTERIOR FINISH.

*Inclosing.*—The exterior sides of frame, except the roofs, will be covered with thicknessed yellow pine box boards not more than 10″ wide, laid close and securely nailed to all bearings. Cover all the above sheathing boards with a good quality of tough resin sized sheathing paper, lapping each course at least 2″; placed under all outside casings and corner boards.

*Siding.*—Cover exterior walls where indicated from water table upward to shingle line with clear bevel siding free from knots, shakes and sap, to lie not more than 4″ to the weather. Said siding to be resawn from 1¼″ plank; secured on in most thorough manner with galvanized iron clapboard nails, with all joints carefully made and cut against all corner boards and hanging stiles.

*Shingles.*—In the gables and sides lay cypress shingles of ornamental patterns, all as indicated.

*Water Tables, etc.*—Form all water tables, outside casings, belt courses, and cornices as indicated, for which working drawings are furnished to exactly accord with scale drawings. Corner and angle boards will be 1¼″ thick; water table ⅞″ with 2″ cap moulding. Neat window caps as shown.

*Roofs.*—All roofs to be covered with best cypress shingles, laid three thick on 1¼″ × 2″ yellow pine shingle lath. Shingle lath to be strongly spiked to each rafter and the shingles carefully and well nailed on; joints broken to ⅓ width of shingles.

*Gutters.*—Form gutters in main roof cornices in best manner with 1 X charcoal tin, previously painted both sides before laying with Prince's metallic paint. The form for said gutter to be carefully laid to insure a good run for water to the several outlets, and to drain dry; outlets fitted with strong metallic strainers.

*Flashing.*—Do all necessary flashing around chimneys and wherever required to make a complete job, and line all valleys in best manner with I X charcoal tin, previously painted both sides before laying with Prince's metallic paint.

*Leaders.*—Put up where indicated from gutters galvanized iron leaders 3″ and 4″ in diameter, as required, with expansion tops.

*Veranda.* — Build the verandas and balconies as shown.

*Floors.* — Floors to be laid with clear 1⅛″ × 4½″ tongued and grooved yellow pine flooring, joints leaded and blind nailed. The outer edges of flooring to be rounded and to have cove and fascia.

*Columns.*—Turned columns to be 8″×8″, made of yellow pine (clear). Moulded rails 4″×5″ for upper and 3½″×4″ for lower. Balusters 3″×3″, square and turned. Cornices moulded, which is drawn to ¾″ scale as shown on details. Ceil overhead with yellow pine ceiling ⅞″×2½″, blind nailed. Mould around the angles with a neat moulding 2″×2″. Support the verandas on 12″×12″ brick piers.

Lay the roofs of best cypress shingles as required for main roofs; put on in best manner. Form deep gutters in veranda, inclining to the outlet, each to empty through 3″ galvanized iron expansion top leader on the ground. Gutter outlets to have strong metallic strainers, as provided for main roofs.

INTERIOR WORK.

Before laying any floors, carefully test and bring to a perfect level all beams, especially under sliding doors.

*Floors.*—Lay the entire first and second floors with thicknessed yellow pine plank not more than 5″ wide, laid horizontal and firmly nailed to all bearings.

*Trimming.*—The casings for all doors, windows, and other openings in first story will be made of perfectly clear and seasoned yellow pine, moulded to design ⅞″ × 6½″, cut against corner and base blocks at angles as required. The corner blocks will be turned to a neat design, and the base blocks will remain plain. The casings will extend to the floor for windows as well as doors, with panel backs under each window. Base for all the principal rooms and hall ⅞″×8″, including the shoe and top moulding, to match the casing. The base moulding will continue up and over the casings. Closet base 5″ wide, casings 3½″. Put down yellow pine saddles to all the doors of suitable widths; rubber stops to be placed behind all doors requiring them. The trimmings in pantry and back hall to be plain 5″ wide, 6″ base, with wall moulding.

*Bath Room.*—Fit up the bath room in a neat and workmanlike manner, of dry and clear materials as required. Ceil the sides with ½″×2½″ yellow pine to a height of 4′ 0″ and cap with neat mouldings, the floors being laid with yellow pine as before required.

*Drain Board.*—Fit on drain board for sink.

*Doors.*—All doors to be of the size and design required by the plans, made of clear seasoned yellow pine well framed, paneled and moulded All the single doors will have five panels in each, while the large folding doors and the double doors will be made to match with raised panels and neat flush moulding. The front doors as shown with the fan light glazed with plain glass. Doors to have raised panels and neat flush moulding. The jambs will be 1″ thick throughout, with neatly moulded stop of a width to form rabbet. Provide and put up rough jambs to all openings for mason to plaster to, only setting the jambs when all the walls are dry.

*Pantry.*—Fit up pantry in thorough manner, of select shelving hand smoothed. The counter shelf will be 20″ wide; all others 12″. Place the shelving at suitable distances, one above the other, to the height of door casing, where run a continuous shelf all around the upper part.

*Closets.*—Fit up all other closets in the usual manner, putting clothes hook strips neatly moulded, and hook with Goodwin clothes hooks in the minor rooms and ornamental bronzed iron hooks of approved pattern for the principal rooms.

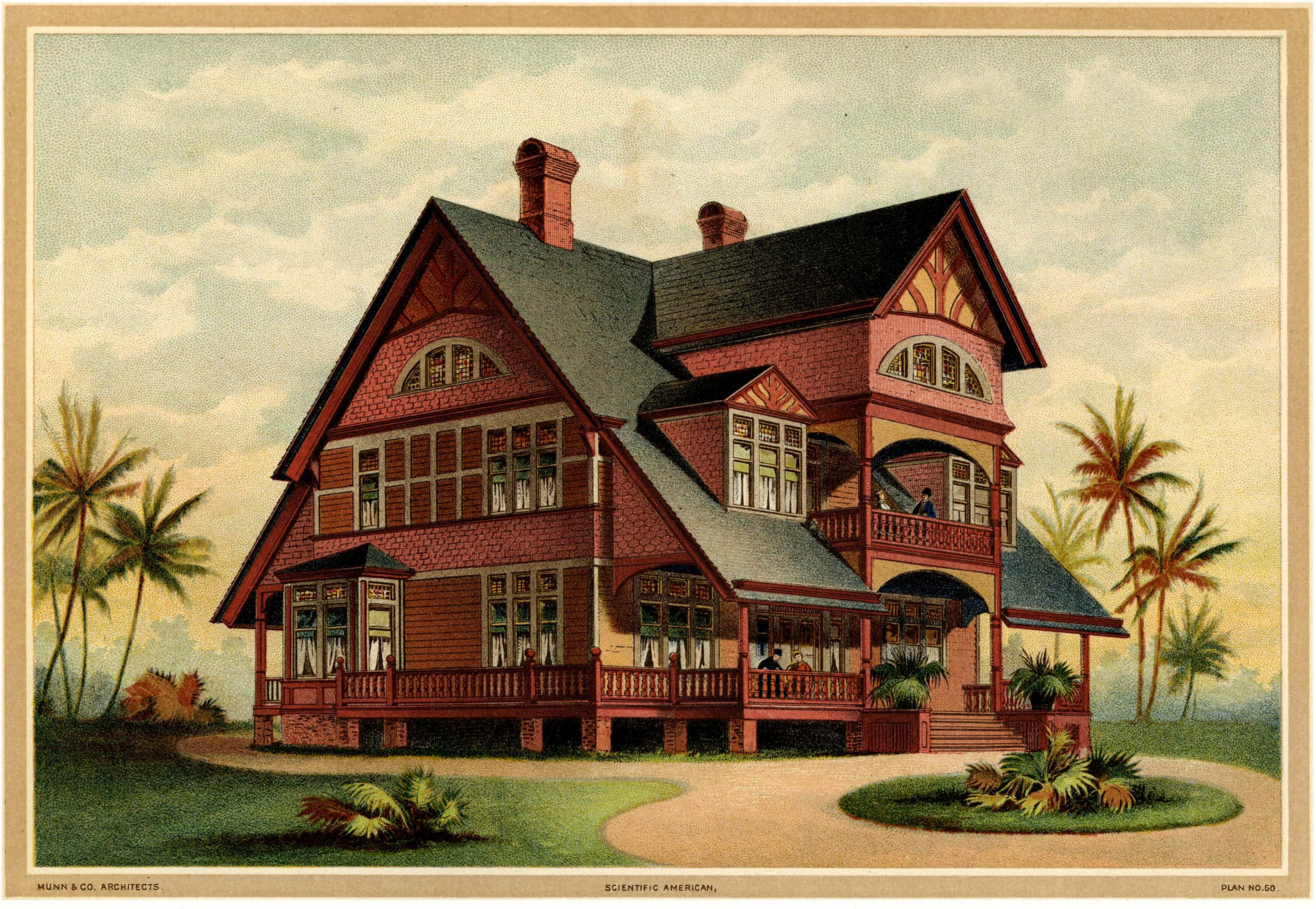
*Hardware.*—The principal part of first story to have 4½″ brass face mortise locks, closet doors reverse bevel rim, jet and bronze knobs, lacquered butts, front doors 6″ mortise lock night latch attachments. Second story to have nickel plated and white porcelain furniture and plain cast butts. All windows to have bronze sash locks All hanging closets to be furnished with double wardrobe hooks. Furnish and set all necessary closet catches, buttons, etc., complete.

*Vents.*—Cover all vent holes in foundation walls with ¼″ mesh galvanized iron wire, well tacked to frames set in the brick walls.

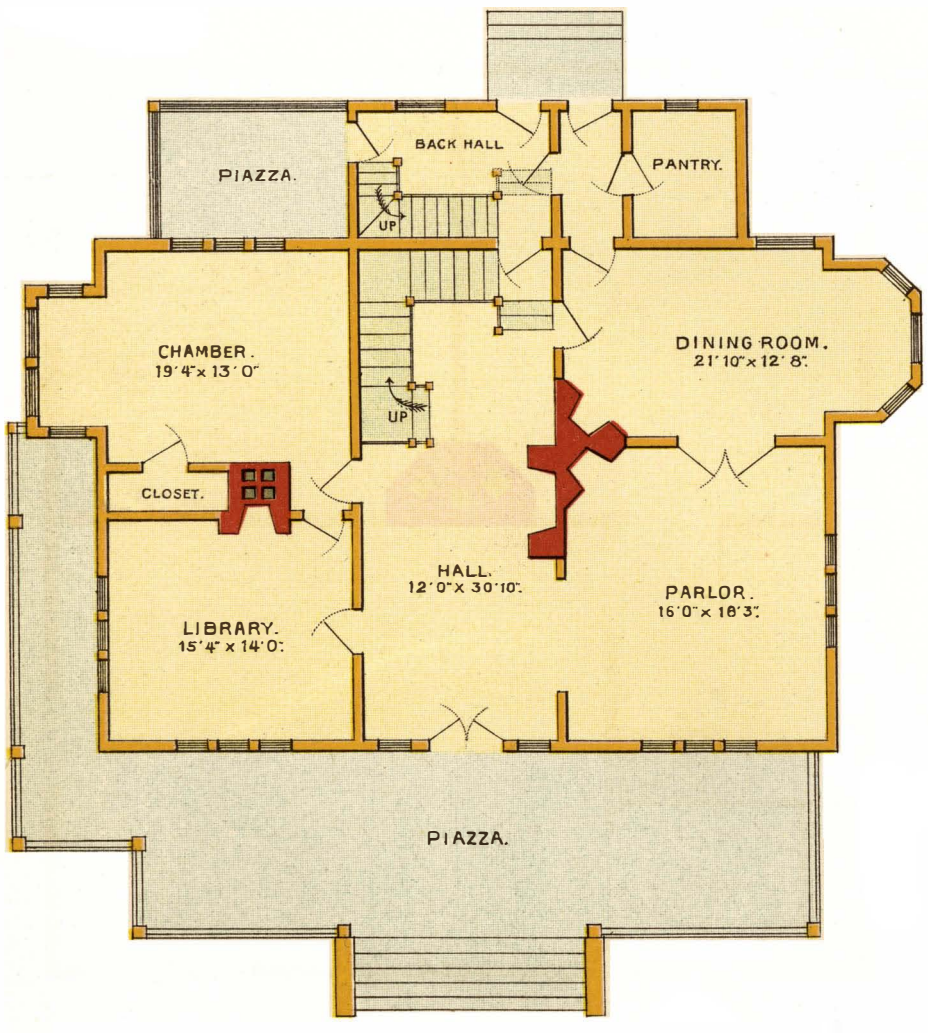
*Mantels and Grates.*—The owner will furnish all mantels and grates. Take from catalogues of the manufacturers, but the contractor will furnish all necessary materials for setting same.

MASON WORK.

The contractor will stake out position of building as




# A Southern Residence of Moderate Cost.




Plan of First Floor.


Plan of Second Floor.

directed, with all necessary stakes indicating the outlines of building, taking care to secure correct lengths, widths, and true angles.

*Excavation.*—Do all necessary excavating for trenches to walls, piers, chimneys, and for all other work requiring it, at least 2′ 6″ deep. Deposit the soil in a separate heap. Grade the surplus earth around the building and grounds under the direction of the owner.

*Trench Walls.*—Make the trenches 6″ wider on each side than the walls.

*Brick Walls.*—Build all the walls from bottom of trench to 3′ 6″ above the natural grade, of good hard burnt brick, laid in course headers every seventh course. These walls started on solid concrete footing; this also applied for all piers and chimney foundations. Chimneys and piers built of same quality of brick as foundations, the best selected for chimneys where exposed to view. The whole outside of these brick walls to be cemented from bottom to top with strong Rosendale cement to prevent the water from coming through.

*Chimneys.*—Build upon solid concrete footings the chimney stacks, as shown, with flues as indicated, to be built up perfectly solid and true, with joints thoroughly filled. Joints struck and pointed up outside and in. Plaster tightly around all openings. Make all necessary provision for grates. Chimneys at least 1″ in clear of all framework. Cap with 3″ bluestone caps with holes cut in.

*Mortar.*—All brickwork to be laid up in mortar composed of lime 1 part, and clear, sharp sand mixed in proportion, with ⅛ cement added to the time of using.

*Bluestone.*—Place flagging the length of steps before the steps leading from all veranda entrances 3″ thick 4′ wide.

*Fireplaces.*—Lay the hearths with ornamental tiles bedded in cement, joints filled in.

*Arches.*—Turn arches to all fireplaces on iron chimney bars, and trimmer arches under the hearths.

*Plastering, Filling-in.*—Fill in above all sills, ties, and girts; partition caps 8″ high, with brick and mortar to prevent mice from passing up walls or partitions.

*Lath.*—Lath with best spuce lath all walls, partitions, and stairways, ceiling, and closets, of the first and second stories. Laths set thickness of a lath apart. Not more than eight laths to a break on ceilings and twelve on sides, securely nailed to all bearings.

*Plaster.*—All the above lathing to be plastered with a scratch coat, brown coat, and hard finish. Plastering to go down to floor in all cases, and to be worked close to all grounds.

*Cornices.*—Run neat cornices in parlors, hall, dining room and other principal rooms, first story and second story hall.

*Mortar.*—Plaster to be composed of first finishing lime and clean, sharp sand, with a plentiful mixture of fresh long goats' hair. All the work to be true and plumb and rendered hard by troweling, care being taken to avoid spots and blisters and other defects.

*Center Pieces.*—Center pieces in all the principal rooms, first story and second story hall. Average cost, $2.50 each, exclusive of setting. Selected by owner. Plasterer to patch up and repair after artisans and leave all perfect. This contract does not include cellar.

*Painting* — All the exterior woodwork usually painted to be painted two good coats of best Atlantic white lead and linseed oil paint. All knots and sap to be well shellacked before priming. 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 interior will be wood filled with Wheeler wood filler, then two good coats of hard oil finish. The first and second stories, and main stairs and balusters and rails will be rubbed down to a smooth surface. All the doors, saddles, hearth borders, will be oiled. All sash and outside doors must be painted on top and bottom. The painting must follow immediately after the carpenters.

ESTIMATE FOR MATERIALS.

| | | | |
|---|---|---|---|
| 2 | pieces | 3″× 8″×23′= | 92 feet. |
| 4 | " | 3″× 8″×32′= | 256 " |
| 1 | " | 3″× 8″×25′= | 50 " |
| 1 | " | 3″× 8″×16′= | 32 " |
| 1 | " | 3″× 8″×20′= | 40 " |
| 1 | " | 3″× 8″×18′= | 36 " |
| 1 | " | 3″× 8″×24′= | 48 " |
| 3 | " | 3″× 8″×22′= | 132 " |
| 1 | " | 3″× 8″×26′= | 52 " |
| 4 | " | 3″× 8″×12′= | 96 " |
| 41 | " | 2″×10″×17′= | 1,148 " |
| 6 | " | 2″×10″×23′= | 234 " |
| 50 | " | 2″×10″×16′= | 1,333 " |
| 44 | " | 2″×10″×13′= | 953 " |
| 20 | " | 2″×10″×20′= | 680 " |
| 16 | " | 2″×10″×25′= | 661 " |
| 13 | " | 2″×10″×12′= | 260 " |
| 34 | " | 2″×10″×32′= | 1,836 " |
| 7 | " | 2″×10″×18′= | 210 " |
| 3 | pieces | 2″×10″×12′= | 60 feet. |
| 1 | " | 4″×10″×22′= | 73 " |
| 2 | " | 4″×10″×16′= | 126 " |
| 4 | " | 4″×10″×12′= | 160 " |
| 2 | " | 4″× 6″×22′= | 88 " |
| 8 | " | 4″× 6″×21′= | 336 " |
| 2 | " | 4″× 6″×28′= | 112 " |
| 2 | " | 4″× 6″×20′= | 80 " |
| 2 | " | 4″× 6″×14′= | 56 " |
| 20 | " | 4″× 6″×16′= | 640 " |
| 1 | " | 4″× 6″×17′= | 34 " |
| 1 | " | 4″× 6″×13′= | 26 " |
| 1 | " | 4″× 6″×30′= | 60 " |
| 2 | " | 4″× 6″×18′= | 72 " |
| 1 | " | 4″× 6″×25′= | 50 " |
| 1 | " | 3″× 8″×30′= | 60 " |
| 1 | " | 3″× 8″×14′= | 28 " |
| 1 | " | 3″× 8″×18′= | 36 " |
| 1 | " | 3″× 8″×28′= | 56 " |
| 14 | " | 2″× 8″×21′= | 392 " |
| 47 | " | 2″× 8″×16′= | 1,002 " |
| 27 | " | 2″× 8″×26′= | 936 " |
| 24 | " | 2″× 8″×20′= | 648 " |
| 1 | " | 2″× 8″×30′= | 40 " |
| 1 | " | 2″× 8″×24′= | 32 " |
| 2 | " | 2″× 8″×25′= | 65 " |
| 5 | " | 2″× 8″×14′= | 93 " |
| 5 | " | 2″× 8″×13′= | 87 " |
| 2 | " | 4″× 8″×22′= | 117 " |
| 800 | " | 3″× 4″×12′= | 9,600 " |
| | | | 23,314 " |

| | | |
|---|---|---|
| 23,314 | feet timber, yellow pine, at $20 per M... | $466 28 |
| 1,600 | " weather boards, at $30 per M..... | 48 00 |
| 5,000 | 6×18 cypress shingles, at $10 per M..... | 50 00 |
| 340 | feet verges and cornice, milled out, at 28 cts. per ft .. .... ..... ..... | 95 20 |
| 400 | " small cornices, at 20 cts. per ft..... | 80 00 |
| 15,000 | 6×24 cypress shingles, at $12 per M..... | 180 00 |
| 1,000 | 1×2 shingle lath and furring, at 4 cents each..... | 40 00 |
| 6 | 8×8 turned columns, at $2.25 each..... | 13 50 |
| 5 | 8×8 short turned heads, at $1.50 each.... | 7 50 |
| 1 | square column..... .. | 1 50 |
| 80 | feet piazza rail, worked, at 20 cts. per ft.. | 16 00 |
| 20 | " of rail for back piazza, at 15 cts. per ft | 3 00 |
| 22 | ' balcony rail, at 20 cts. per ft.... ..... | 4 40 |
| 112 | 3×3 turned balusters, at 20 cts each..... | 22 40 |
| 6 | filling circles for piazza and balcony..... | 15 00 |
| | All gable filling.. ..... ..... ..... | 12 00 |
| 220 | feet water table, fascia, etc., at 7 cents per ft. .. ..... | 15 40 |
| 1,000 | ' piazza ceiling, at 3 cts per ft..... .. | 30 00 |
| 1,000 | " piazza floor, at 4 cts. per ft.... ..... | 40 00 |
| | Front stoop, ready to put up.... ..... | 8 00 |
| | Back stoop, ready to put up..... ..... | 5 00 |
| 600 | lineal feet 1¼×6 strips, at 4 cts. per ft.... | 24 00 |
| 450 | square feet tin, at 7 cts. per sq. ft..... | 31 50 |
| 125 | feet tin leader, at 12 cts. per ft..... | 15 00 |
| 4 | brackets for back piazza, at 50 cts. each.. | 2 00 |
| 4,500 | feet floor inside, at 3 cts. per ft .... ..... | 135 00 |
| 27 | first story window frames, blinds and sash and trimmings complete, at $8.50 each.. | 229 50 |
| 20 | second story window frames, blinds and sash and trimmings complete, at $8 each | 160 00 |
| 4 | frames and sash for loft, at $12 each..... | 48 00 |
| 16 | first story doors and trimmings complete, at $7 each..... | 112 00 |
| 9 | second story doors and trimmings complete, at $6.50 each ..... ..... | 58 50 |
| 2 | stairs put up complete. ..... | 150 00 |
| 450 | feet surbase, at 4 cts. per ft..... .... | 18 00 |
| | Prepared material for fitting bath room.. | 12 00 |
| | Prepared material for 6 closets and pantry..... ..... | 18 00 |
| | Labor in putting up work..... | 800 00 |
| | Nails and incidentals..... | 75 00 |
| | | $3,041 68 |
| | Painting work..... | 200 00 |
| | Mason work..... | 700 00 |
| | | $3,941 68 |

### Use of Gas Tar.

I have noticed in "Notes and Queries," occasionally, inquiries as to how to thin gas tar so as to use it as paint, and I have been surprised that spirits of turpentine and gasoline should be recommended. I have never been able to mix turpentine and gas tar (from Philadelphia gas works), and gasoline I consider dangerous, and so volatile that it needs to be added frequently or the tar gets too thick.

For over twenty-five years I have used gas tar for painting tin roofs, and the best thing for thinning tar is oil, and where it can be had I prefer resin oil, which can be procured in any city. It is cheap and as durable as the tar, which animal and linseed oil are not, but the kind of oil makes no difference excepting for the cost. Tin is not injured by it.

Chas. R. Webb.

Philadelphia, Aug., 1887.

### Gardens at Railway Stations.

There are few more encouraging signs of progress in horticulture than the spirited way in which the growth of beautiful flowers for embellishing railway stations is being taken up by many of the employes of the railway companies. Country stations are generally dull and dreary; therefore an object like the one under notice should receive the highest encouragement, and that for many reasons. I was never so impressed as when, a short time ago, having to wait some time for a train, I walked up and down the platform, admiring and inhaling the sweet perfume of roses, pansies, and pinks.

In the midst of these flowers there came to mind recollections of stone gardening so common at some stations—broken red bricks, whitewashed flints, and other incongruities, arranged where, if nothing better could be provided, green turf would be preferable.

At the present time a pretty line, from beginning to end, is the branch running from East Grinstead to Brighton. The high level of East Grinstead Station does not permit of much being done, but one can catch a glimpse of the station master's garden, which adjoins. It is neat and simple, the useful as well as the ornamental being visible in the shape of good crops of vegetables and plenty of roses and pansies. The railway slopes round the station buildings are furnished with shrubs and flowers, a most pleasing contrast to the dreary waste of refuse generally seen.

On the low level large rose bushes are to be seen on the walls. Gloire de Dijon had over 100 flowers expanded at one time. Reluctantly we leave this and go on to the next station, Kingscote The traveler little expects the vision of beauty awaiting his arrival. This station can claim to be one of the best anywhere to be found. The company gives prizes for the prettiest stations on their lines, and last year Kingscote took first; but, not content to rest upon his well-earned laurels, Mr. Ward, the station master, has again produced a display difficult to equal, much more to beat. He possesses a little glass house, erected at his own cost, and tended during his spare time. In this house are wintered many of the plants that now help to make such a gorgeous display.

Beneath the covered portion of the platform, on both sides of the door, are two large groups, 1,200 pot plants being used in the arrangement. Pelargoniums were in profusion, noticeable being Henri Jacoby, the color even more effective in the subdued light. Ivy leaved pelargoniums suspended from the roof were very nice; also the fuchsias, among which were good, well-flowered specimens of the fine old F. fulgens. Old tree roots made excellent receptacles for hardy ferns and stonecrop.

The little borders along the back of the open part of the platforms were perfect pictures, produced, not by elaborate bedding out, but by the culture of good old fashioned flowers. Pansies had been one mass of flower, and the plants, though apparently somewhat exhausted, will soon be reinvigorated by the rich top dressing that has been given them. Pinks, especially Mrs. Sinkins, were strong, healthy, and full of flower. Pinks are worth growing if only for the nice color of their foliage, which is much prettier than some of the sickly variegations sometimes met with. Behind the borders is a little wooden fence, which will soon be draped with roses. There are many fine blooms, and two bushes of the old moss rose had individual flowers larger than we have ever seen in gardens.

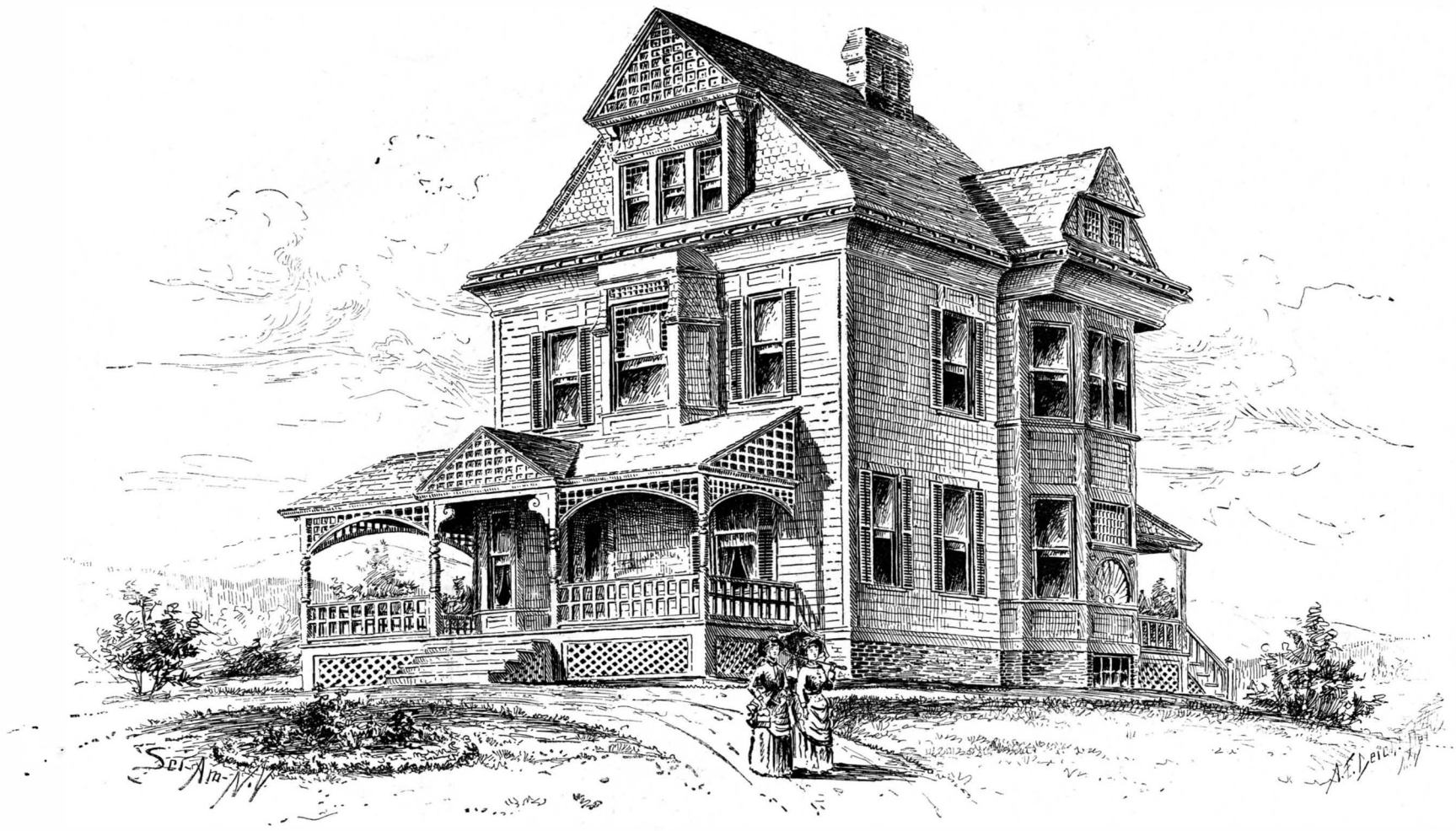
Those who use this station must feel they owe a debt of gratitude to a man who voluntarily provides them with such a treat, and that at no small expense to himself. At the next station, West Hoathley, all was blank. True, there was a small glass house at the back, but the occupants appeared dead. We hope the station master may become imbued with some of the enthusiasm so conspicuous among his fellow workers.

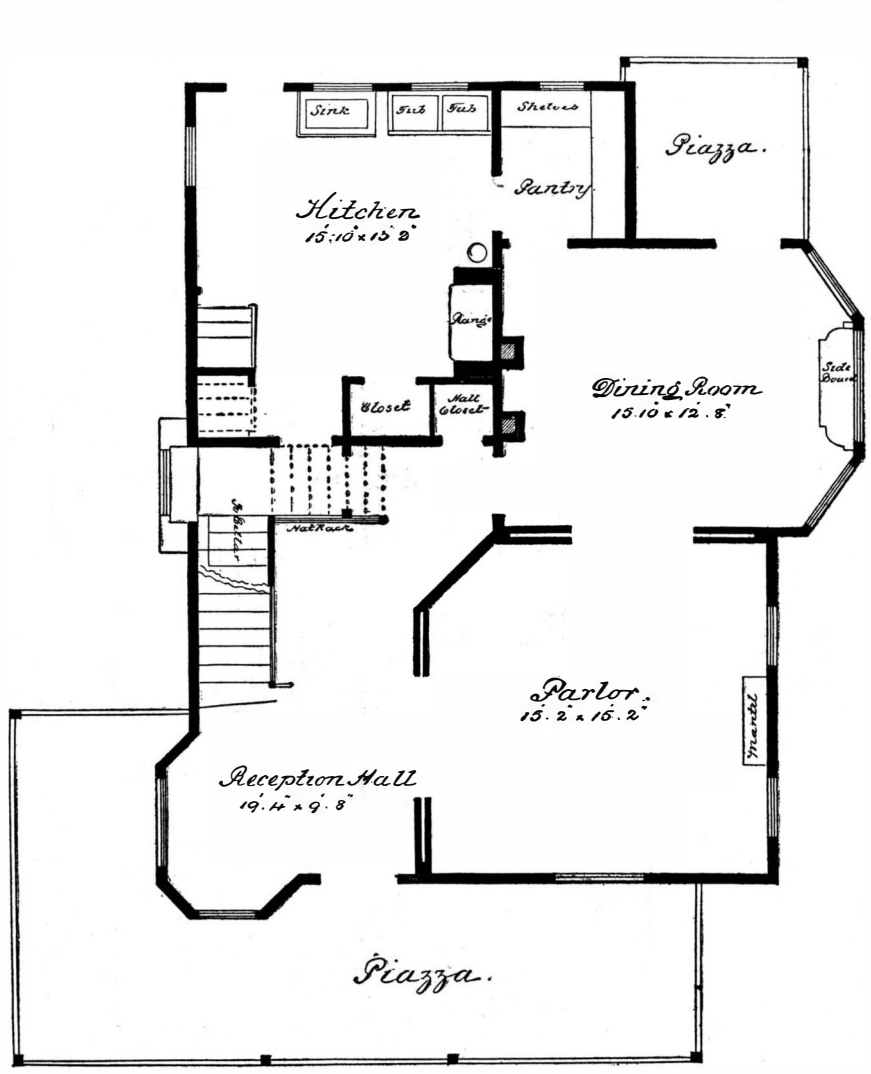
At Horstead Keynes we were again in the land of plenty. Roses, pinks, and pansies were at their best. Here and all along the remainder of the line a mistake has been made by planting laurel and privet to form a hedge in front of the fence, which will ultimately preclude the possibility of growing flowers. A little forethought, and this might have been avoided.

Sheffield Park was brightened by roses, pinks, antirrhinums, and sweet Williams. At Newick and Chailey, roses were very good, while beneath the covered way a small rockery had been constructed from the natural sandstone of the district and planted with hardy ferns and London pride, which looked nice and fresh.

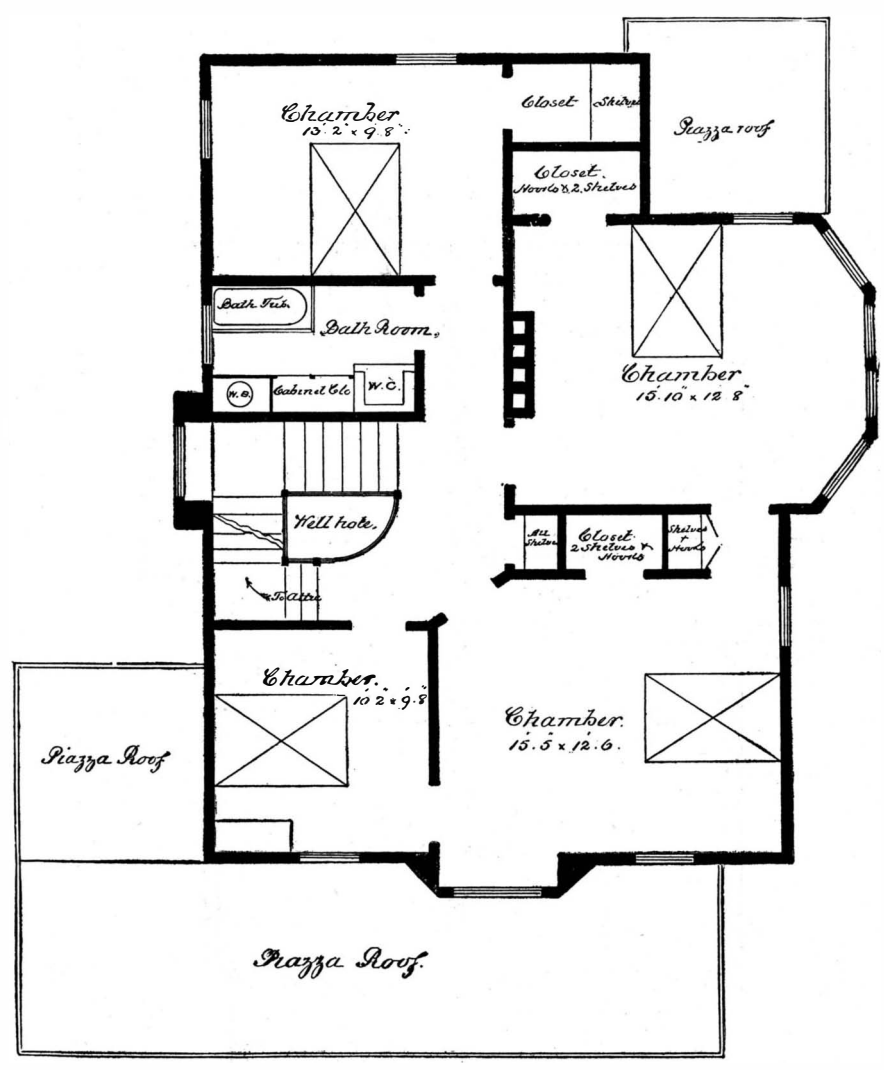
As one gets nearer Brighton, Flora seems to have been less profuse in her gifts, but about Lewes Station there are plenty of trees, and between there and Falmer were banks literally draped with ivy and having a beautiful effect. Other banks were clothed with St. John's wort.

London Road, which is really a part of Brighton, had a large bed of Canterbury bells in full summer beauty, but, utterly regardless, the train steamed away into the seaside metropolis, and ended the pleasantest and prettiest journey ever made by rail.—*A. Herrington, the Garden.*






PLAN OF FIRST STORY.




PLAN OF SECOND STORY.

## A $5,000 DWELLING.

### A $5,000 DWELLING.

This house has a front 28 ft. over all; side 38 ft. over all. The floor plans show the size of rooms.

Height of stories (measured in the clear): Cellar, 7 ft.; first story, 9 ft. 6 in.; second story, 9 ft.; attic, 8 ft.

*Materials.*—Foundation, 18 inch stone wall; first and second stories clapboarded with 5 in. clapboards; roof black slate.

*Cost.*—This house has been built near this city, complete with all the modern improvements, furnace excepted, for $5,000. If the attic is not furnished, simply floored, it would make a saving of about $150.

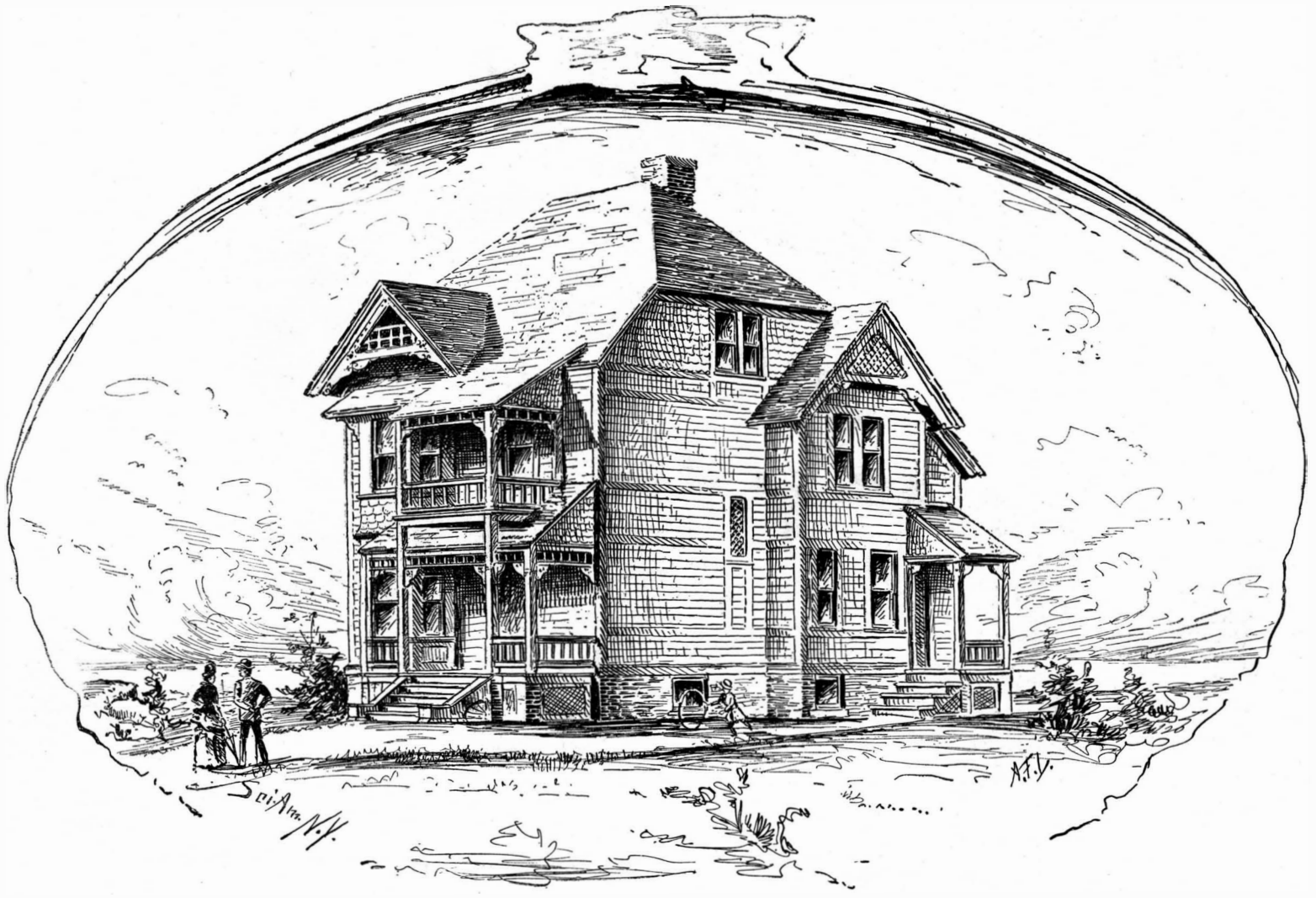
There is a cellar under the whole house, with cemented bottom. Double folding doors connect the parlor, dining room, and hall. A back stairway leads from kitchen to platform of main stairs. The position of the stairway affords convenient access from kitchen to second story.

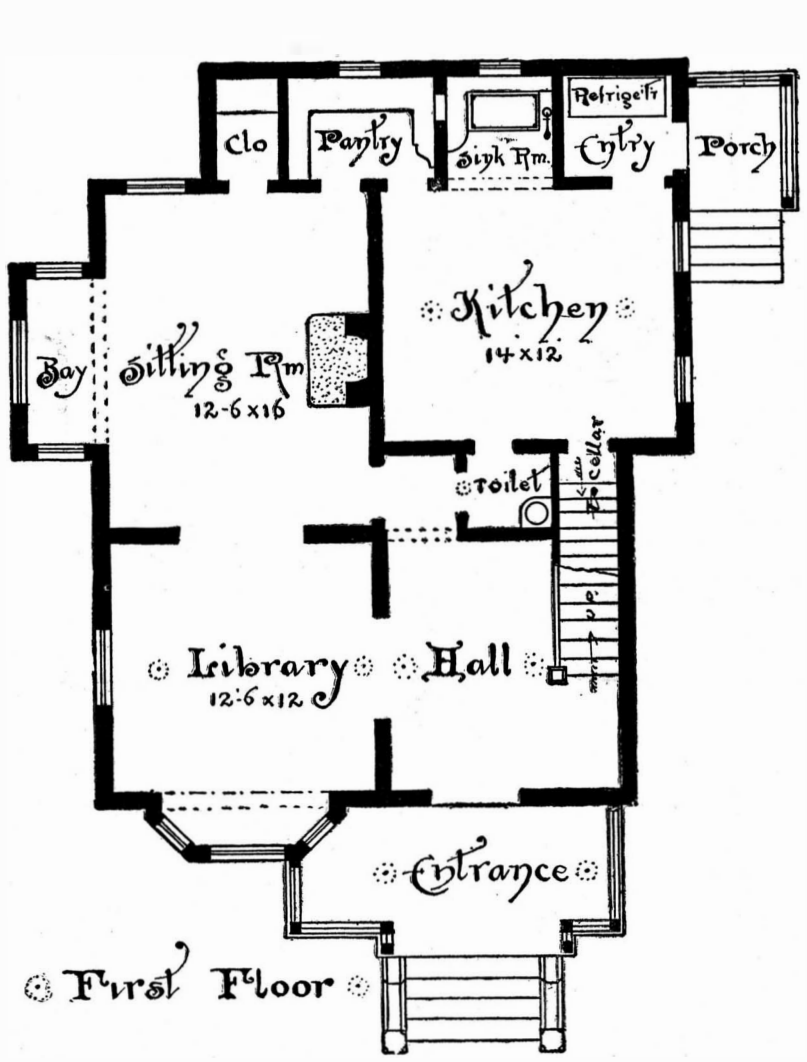
Further information can be had by addressing Munn & Co., architects, at this office.

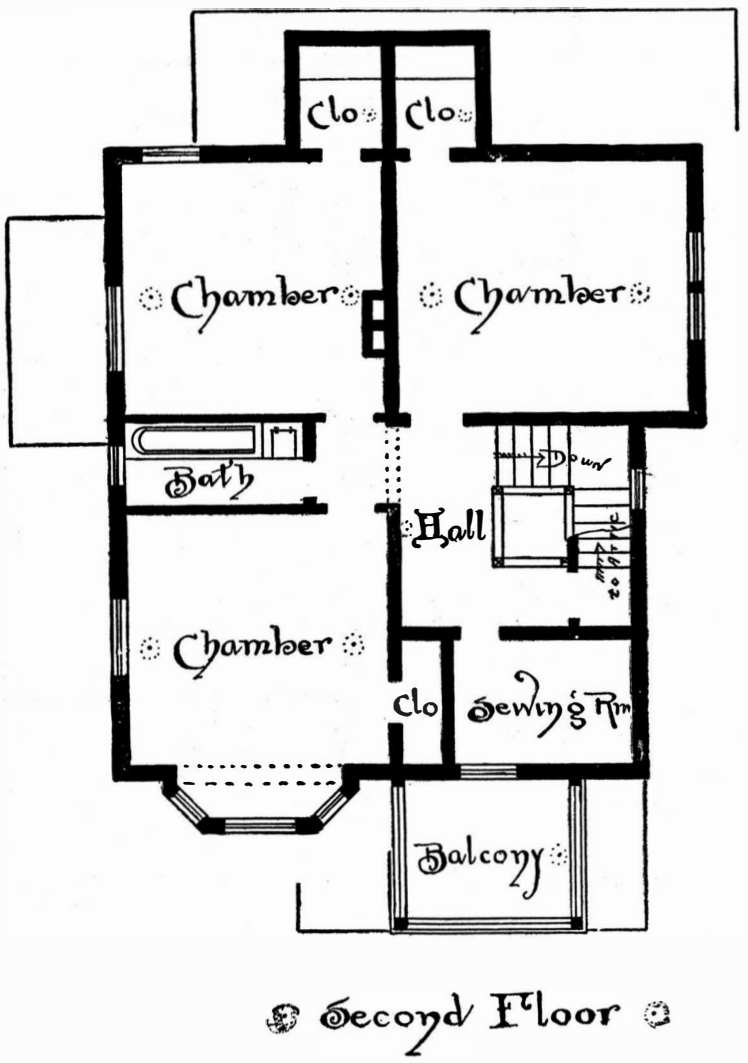
### Removal of a Dividing Wall.

A new method for supporting walls has been inaugurated by Architect Frederick Baumann, of Chicago. It became necessary to take out the first story of a dividing wall in a double store building, supporting the wall with iron beams, the ends resting on iron columns. Instead of using screw and needles, as is usual in such cases, the architect conceived the idea of removing the wall from the line of the ceiling to a little below the floor line, for a distance of 126 ft., in nine equal spans, and inserting the columns without any temporary support.

This was done by first cutting through the wall where the column was to be set; then a firm foundation was secured through placing a curved cast iron bearing plate in the wall below. Upon this were placed two footing plates, with steel wedges between. The column was then placed on the footing plates, and a stone cap placed upon the column, and the space between this and the wall above filled with brick set in Portland cement. After allowing this to stand for a day, the steel wedges were driven up until the column formed a substantial support. After all the columns were set in this way, the iron I beams upon which the wall was to rest were introduced. This was done by cutting half through the wall on one side, placing the beams, and then placing those on the opposite side in the same manner. The work was perfectly successful, and no settlement of any kind occurred, though each column supports a weight of over 110 tons. It was observed, however, that the utmost care and the constant watchfulness of the architect were necessary, as the entire operation was a delicate one from an engineering standpoint, the slightest neglect or mistake, especially in keying, being liable to lead to serious results. Mr. Baumann's method will doubtless be followed generally where the same work is to be accomplished, namely, the substitution of the columns for the lower part of a dividing or outside wall. From this demonstration it would seem that the plan may be adopted for buildings of almost any height, at a great saving in time and cost.—*Inland Architect.*






## A THIRTY-FIVE HUNDRED DOLLAR COTTAGE.

### A $3,500 COTTAGE.

The accompanying sketch represents a small but conveniently arranged frame cottage of seven rooms, designed by Geo. H. Blanden, architect, Springfield, Mass.

There are three rooms on the first floor, three on the second, one bed room in the attic, also a room in the attic for storage.

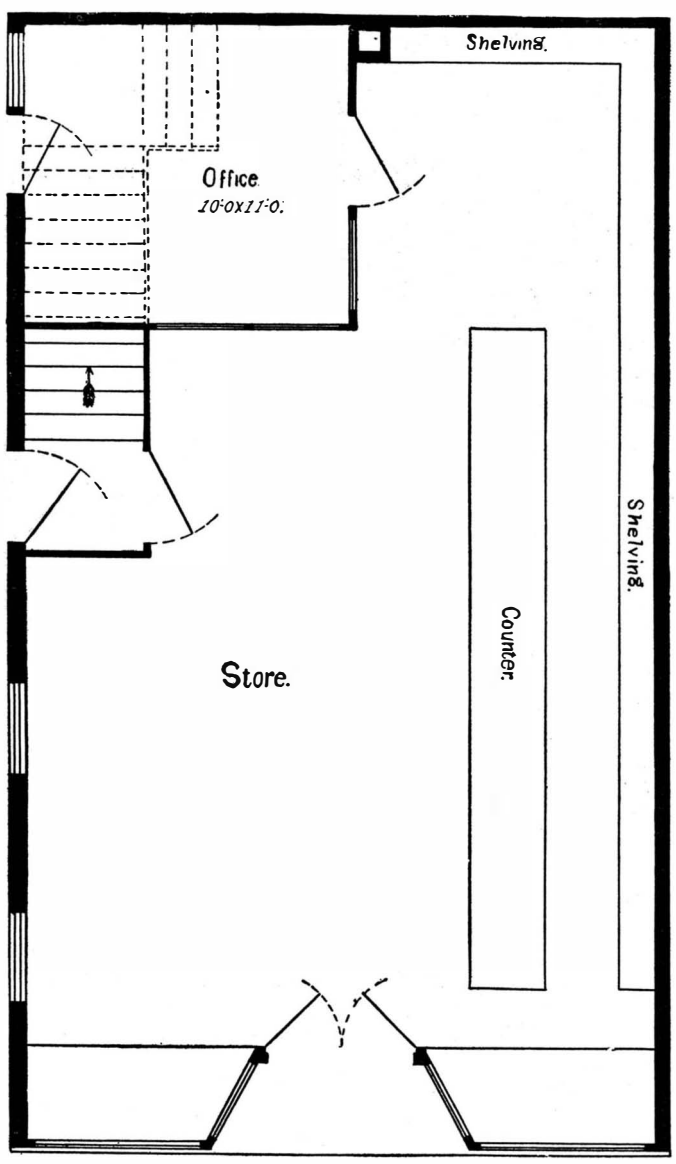
The foundation is of brick, nine inches thick, with an air space. The exterior walls are of frame, 2×4 inch studding, covered with hemlock boards, paper, and with exterior finish of extra spruce clapboards and bands of cut shingles.

The interior finish is mill-worked white pine, painted, except the stair case, which will be ash finished in oil.

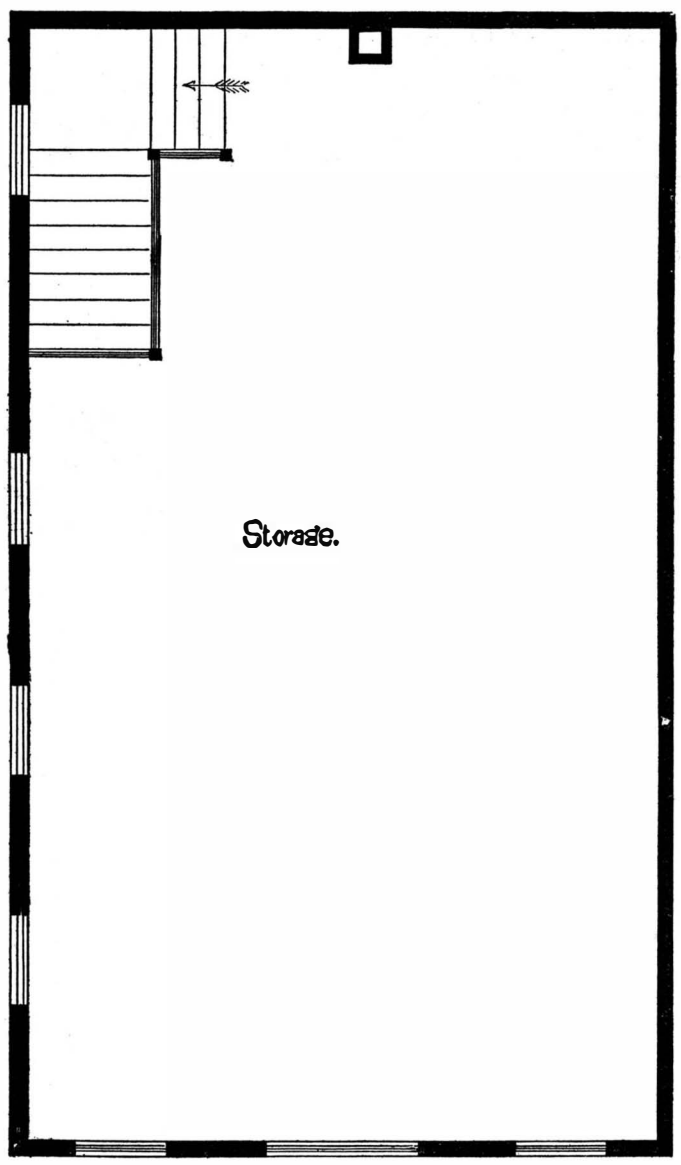
The cottage will cost $3,500.

### Plate Glass.

The history of the business of insuring plate glass against breakage furnishes some curious statistics, as well as a good deal of information of value to architects and builders. It seems, from the Boston *Transcript*, that notwithstanding the insignificant appearance of its business streets in comparison with those of New York or Chicago, Boston possesses more plate glass, in proportion to its population, than any other city in the country, and the insurance companies find much employment there. At present, most of the insurance on glass is done by two companies, the Lloyd's Plate Glass Insurance Company and the Metropolitan Plate Glass Insurance Company, both of New York. The premium is a small percentage on the value of the glass —about two or two and one-half, we believe—and three-quarters of all the plates in Boston are said to be covered. It is estimated that there is one break a year in every eight windows insured, so that the premium does not seem unreasonably high. Losses are settled by the replacing of the glass, instead of a payment of money, and disputes are thus avoided, while the owner of the building and his tenants are spared the trouble of attending to the matter for themselves. In Boston, about one plate a day represents the loss to the companies, and the breakages occur from an almost infinite variety of causes. The usual cause is, naturally, stone throwing of boys or men in the streets; and out of one thousand breakages, about three hundred are due to this. According to the statistics of the Lloyd's company for 1885, the most active glass breakers, next to stone throwing boys, are burglars, who broke in that year about ten per cent. of all the sheets in Boston which the company had to pay for. Pistol shots produce




FIRST FLOOR PLAN.




SECOND FLOOR PLAN.

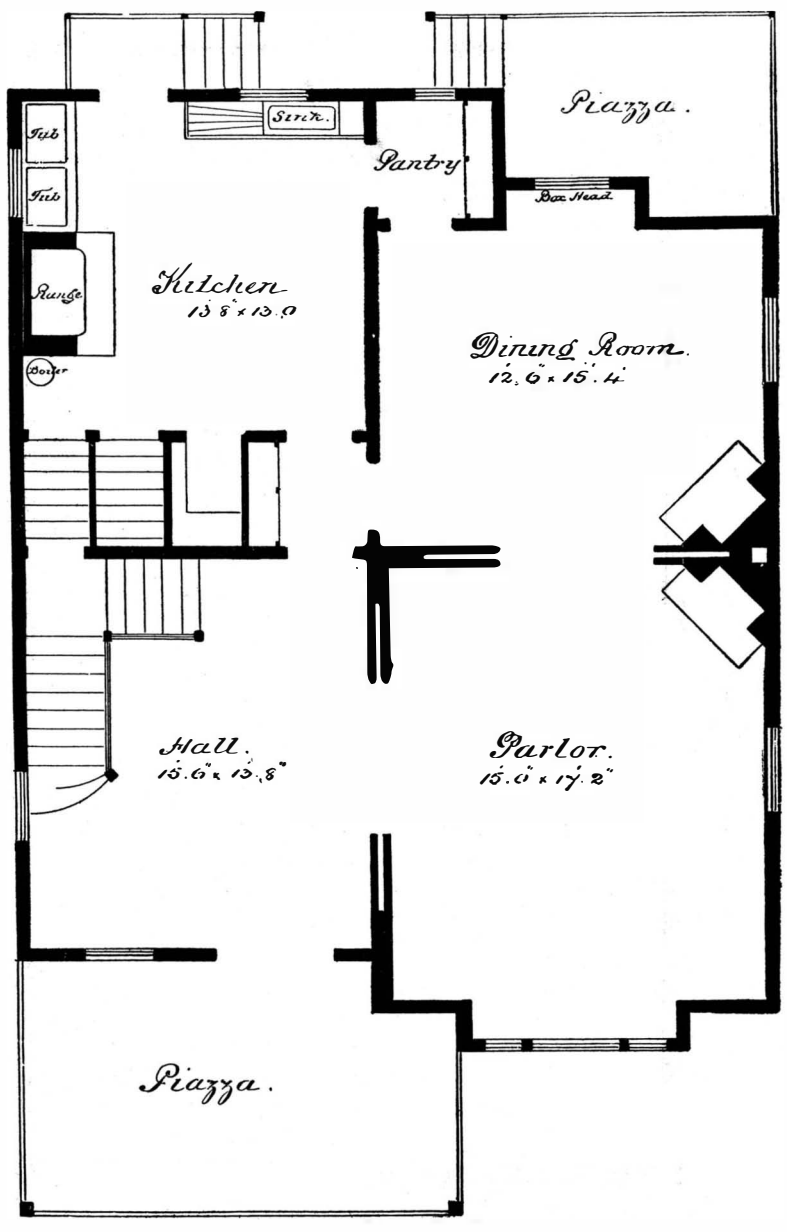
## A COUNTRY STORE COSTING $2,000.

many breakages, and, even in quiet Boston, about one plate is broken by a bullet for every four broken by stones. Next to missiles of various sorts, the wind is the greatest enemy of plate glass, many lights being blown in by tempests, while many more are broken by the slamming of doors and blinds. Much less pains is taken to protect large lights in Boston than in New York, rolling shutters, so common in New York, being rare in Boston but the premium rates are the same in both places, and perhaps the miscellaneous causes of destruction, which are accountable for thirteen per cent. of the breakages, are more active in New York One of the heaviest losses of the kind that we remember occurred in the latter city some years ago, where a large number of plates of different sizes, intended, we believe, for the front windows of the first story of a hotel, had been taken out of their boxes, and were placed against the wall of one of the rooms, ready for setting. The glaziers were at work, and one of them, looking for the particular light which he wanted next, found it in the interior of the stack, close to the wall. He tried to pull it out sideways, and in doing so tipped the rest of the plates forward. The whole mass fell to the floor with a crash, breaking every plate, and causing a loss of about five thousand dollars.—*Amer. Architect.*

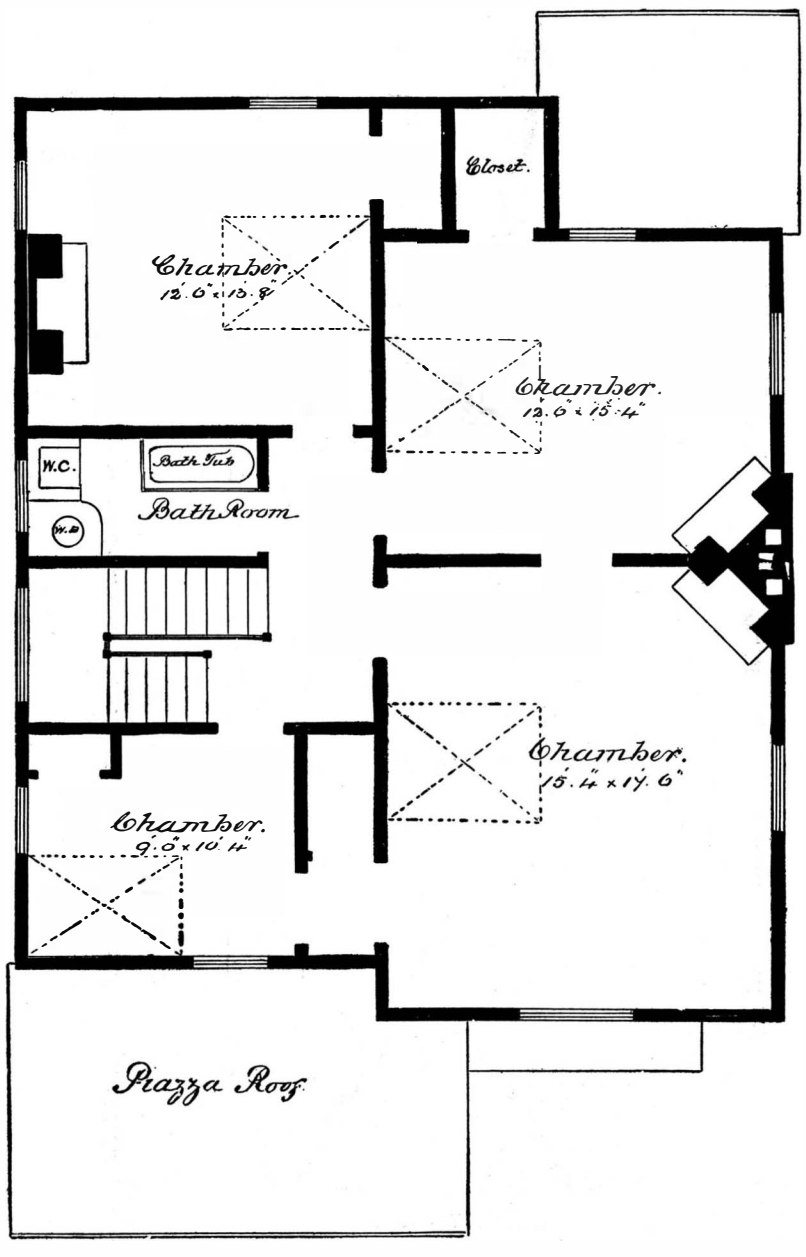
### A COUNTRY STORE COSTING $2,000.

This building has front 22 ft. over all. Width of side over all, 38 ft. Height of stories (measured in the clear) is: First story, 10 ft. 6 in.; second story, 9 ft. 6 in.

*Materials.*—Foundation, 12 inch brick wall; first and second stories, clapboards; gables, shingles; roof, black slate. Has lately been erected near this city at a cost of $2,000, complete, without store fittings. Further information may be had at this office.




First Floor Plan.




Second Floor Plan.

## A RESIDENCE COSTING $4,000.

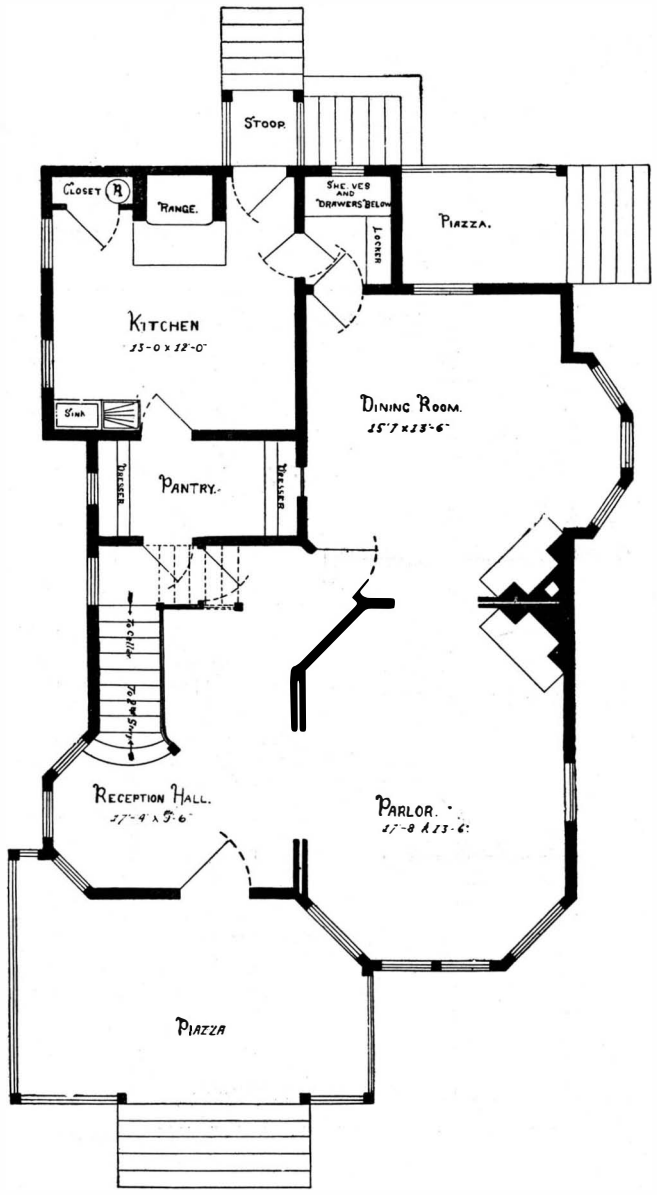
### A RESIDENCE COSTING $4,000.

We give a perspective and floor plans. The building has a front of 30 ft. Side over all, 36 ft. The floor plans show the sizes of the rooms. The height of stories (measured in the clear) is as follows: Cellar, 7 ft.; first story, 9 ft. 6 in.; second story, 9 ft.; attic, 8 ft.

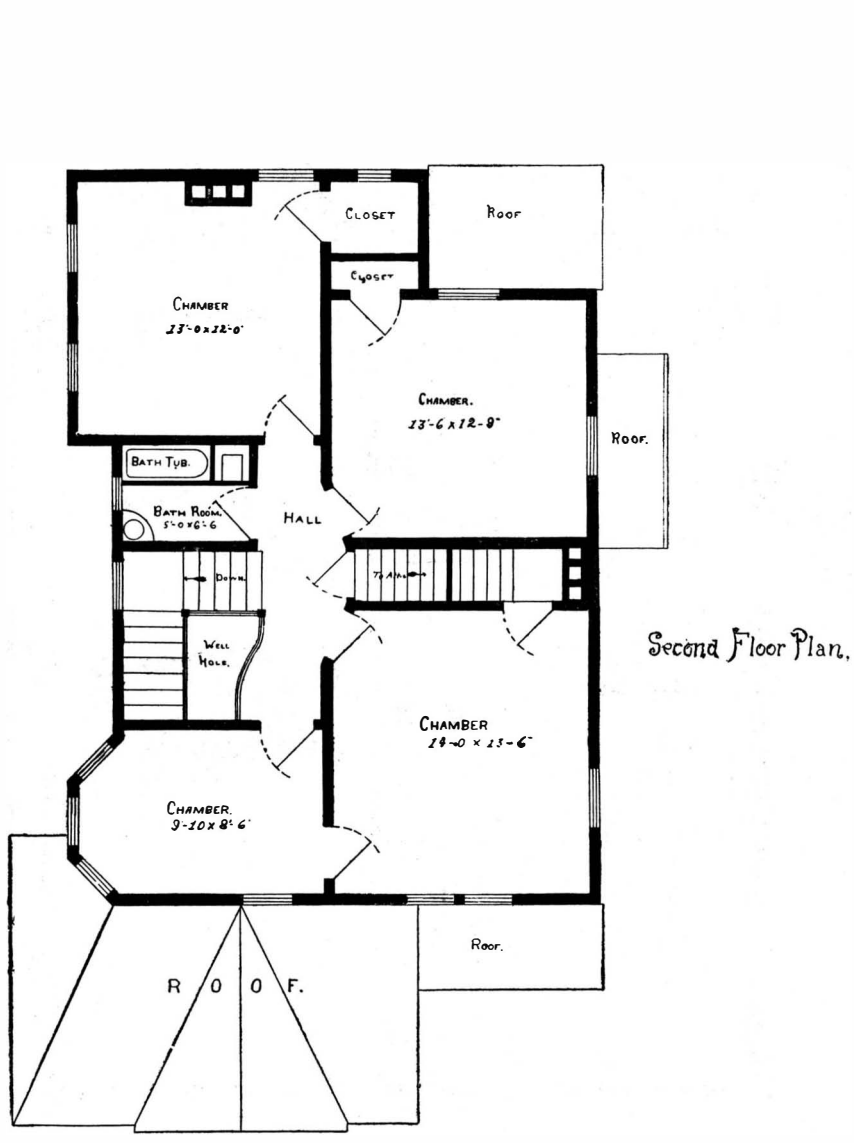
*Materials.*—Foundation, 18 inch stone wall; first story, clapboards; second story, shingles; roof, black slate.

*Cost.*—Complete, all modern improvements included, except furnace, $4,000. If the attic is not finished, simply floored, there would be a saving of about $150. The cellar extends under the whole house, with cemented bottom. Double folding doors connect the parlor, dining room, and hall. A back stairway leads from kitchen to platform of main stairs. The position of the stairway affords convenient access from kitchen to second story

Further information can be had by addressing Munn & Co., architects, 361 Broadway, New York. Plans, details, specifications, etc., for any of the buildings illustrated in this work may be obtained on very moderate terms, as above.




First Floor Plan.




Second Floor Plan.

## A DWELLING COSTING $4,200.

### A DWELLING COSTING $4,200.

We give a perspective of a house now nearly completed, near New York. It has a front of 24 ft., width over all 29 ft. 6 in., side not including veranda 40 ft. The floor plans give the sizes of rooms.

Height of stories (measured in the clear): Cellar, 7 ft.; first story, 9 ft. 6 in.; second story, 9 ft.; attic, 8 ft.

*Materials.*—Foundation, 16 inch stone wall; first story, clapboards; second story, clapboards; roof, black slate.

*Cost.*—$4,200, complete, except heater and range.

*Special Features.*—Cellar under the whole house, with cemented bottom. Double folding doors connect the parlor, dining room, and hall.

If the attic is left unfinished, simply floored, there will be a saving of about $150.

### Removing Grease from Boilers.

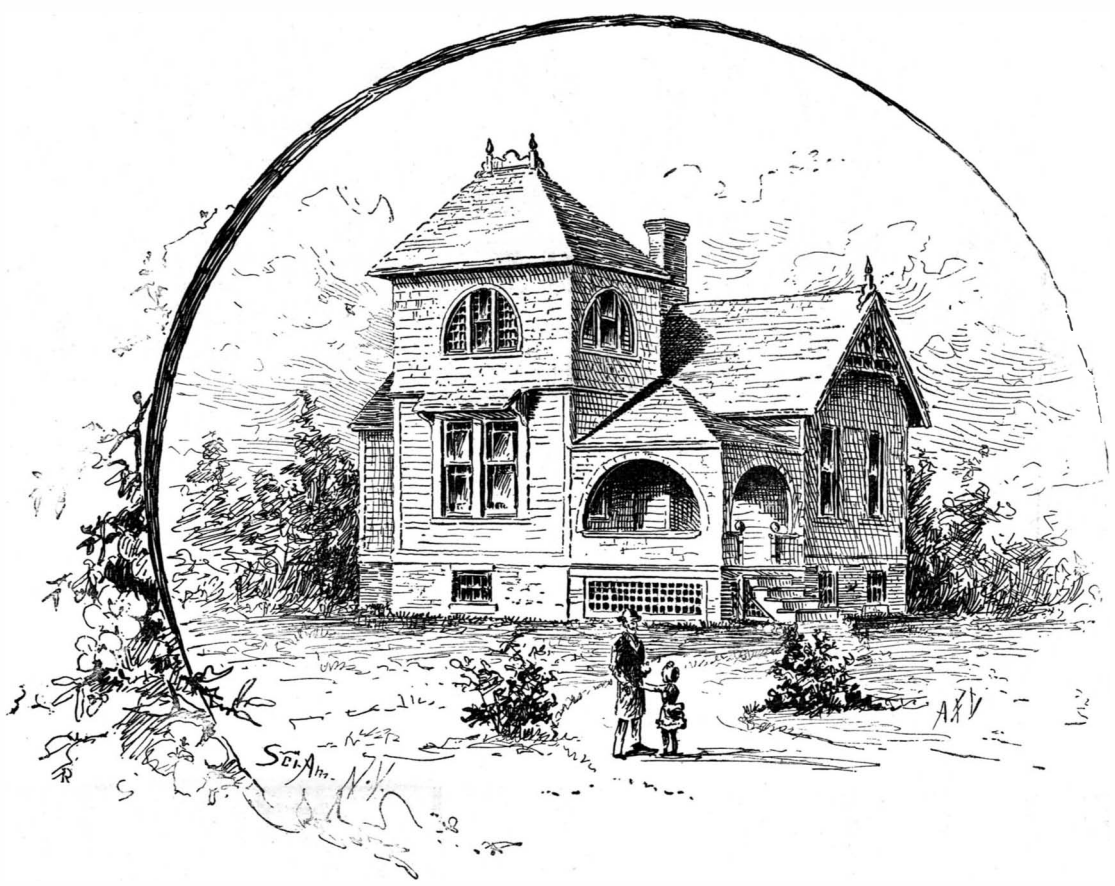
It is a very simple matter to clean out a boiler which has become greased upon the inside, if one knows how to go about it. *Grease* is insoluble in water. *Soap* is very soluble. Grease and soda combined form soap, which is easily blown out of the boiler. Therefore the easiest and simplest way to clean out a boiler which has become fouled up with grease is to dissolve a few pounds of soda ash or sal soda, from 10 to 25 pounds, in water, put it into the boiler, fill up with water, and build just a little fire, little more than enough to boil the water, raise say 3 to 5 pounds of steam, and let it run this way for a day or two. If enough soda was used, the boiler will be found, if blown off now, quite free from the adherent grease. It will only need to be washed out well to be in good condition. If there is any grease left, it is evidence that not enough soda was used, or that the boiling process might be continued for a greater length of time, and the operation should be repeated.

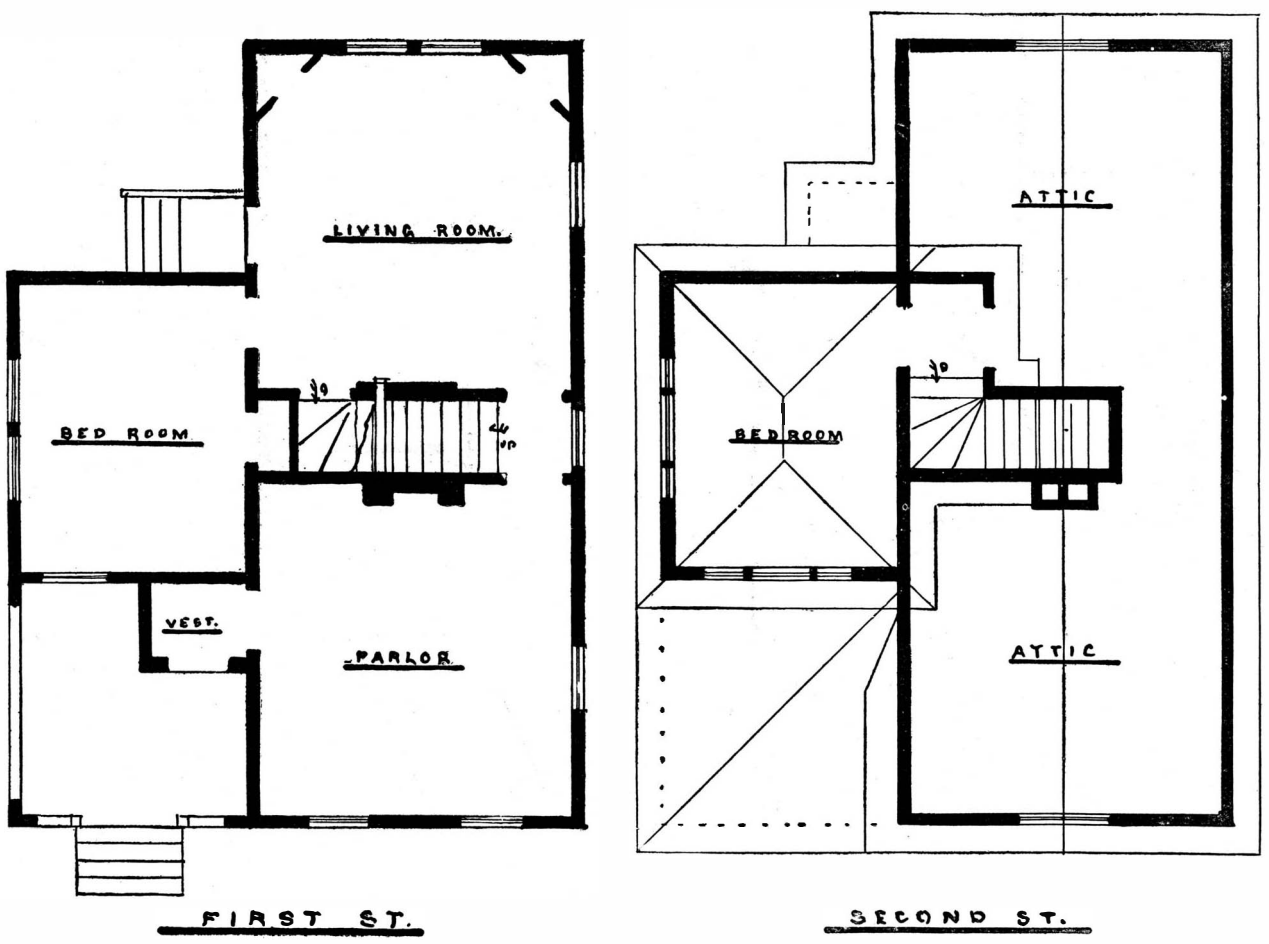
### Of Food Economy before the American Association.

Professor Richards, of Boston, Massachusetts, gave a description of the cooking schools in that State. They found that such knowledge was best inculcated when the girls were taught at from 12 to 14 years of age. These lessons frequently resulted in such changes of cooking in the homes of the girls as manifested beneficial results in the manners, dispositions, and morals of the family. She advocated industrial cooking schools in connection with the public schools.

### AN $1,800 COTTAGE.

Our illustrations show a design for a cottage sent to us by Mr. Geo. R. Madden, of West New Brighton, N. Y. It will be seen from the floor plans, drawn ⅛ inch to the foot, that the house has a front of 24 ft. All the rooms are of good size. Height of first story 9 ft. 6 in. in the clear, second story 8 ft. Cost $1,800. This does not include furnace and modern improvements.






AN $1,800 COTTAGE.

### Practical Use of Marble.

BY ARTHUR LEE.

The marbles of the whole world are to day at the disposal of the architect. The practical question for his consideration is where and how to use them.

In northern climates the use of marble is almost entirely confined to indoor purposes. The beauty of the colored marbles does not appear until they are polished, and no marble will retain a polished surface for long under exposure to the weather. As a general rule, therefore, marble is unfit for outside work. The principal exception is that of the hardest Sicilian marble. The beauty of this stone is not dependent upon its retention of a polished surface, and if due care is exercised upon its selection it will bear exposure very well. The best Sicilian for outdoor purposes is of a perfectly even texture and color, so hard as to emit a clear ringing sound when struck, and of highly crystalline formation. Veined Sicilian should never be used in situations in which it will be exposed to the weather. A decided vein marks the line where disintegration will commence.

To make the most and the best of veined and colored marble, a great deal depends upon the way in which a block is cut. It should be so sawn that the figure is displayed to advantage. These marbles are, however, usually employed in thin sawn slabs, and a buyer has little difficulty in finding that which best pleases his taste. With Sicilian and statuary, which are frequently required in masses and in block, the selection becomes more difficult.

Never select blocks in bright sunshine. The best time is on a cloudy day after a shower of rain, and early in the morning. If a block can be 'looked into" at all, it will be then. In selecting blocks of statuary, a sharp lookout should be kept for yellow spots or veins; they are less likely to be noticed than black ones, which are more easily discovered. Much of the statuary imported from Italy is unfit for sculpture at all. It is very white, with a bright sparkling crystal and a taking appearance; but it crumbles under the chisel, is of a soft sugary substance, and very quickly decays. The best blocks are hard and close grained, and if of uniform tint are none the worse for a slightly yellowish cast. They work evenly under the chisel, and are not too transparent.

The best white marbles of Italy are eminently suited for sculpture. In no other material is it possible for the conception of the artist to be reproduced in permanent form with such satisfactory result. The hardness of these marbles and the fineness of their grain give effect to the most delicate touches of the chisel. The purity of white marble is in itself an aid to the grace and beauty of the composition. It has one distinct advantage over bronze or any material which requires to be cast. The last touches in marble are those of the artist himself. In all cast work they are perforce those of the founder and his men. Polished marble will not harmonize with a material which presents a rough surface. It does well with glazed tiles, burnished metal, and polished woodwork. It is very suitable for the ornamentation of fireplaces. For this purpose an unpolished stone is apt to become dirty, and the employment of wood is attended with danger. In all situations in which bare stone is left to be touched or brushed against, marble is the only material to be tolerated. It is not enough for the architect to see samples of the marbles which he means to employ. He should be careful to inquire into the soundness of the material, and of the size of the blocks which can be procured. He should also see samples which are of sufficient size to give a good idea of color and effect. Some marbles may be obtained in which color and texture are fairly average throughout large slabs or blocks. In others there is an entire difference in the space of a few inches.

Some marbles are only to be obtained in small blocks, and it is useless to specify them for situations in which single pieces of large size are required. Some marbles are so full of earth cracks and vents that they are quite unsuitable for any work in which they are required to give support, as, for instance, in the matter of columns. It is not long since that the columns of a new church built in Paris were constructed of a marble which was unfit for this particular purpose. The result was that even before the building was completed weakness was exhibited in the shape of several formidable cracks in the columns, and in the end the whole of the work was taken down and rebuilt. A vast amount of trouble and disappointment may be saved by a little inquiry before a specification is decided upon.

It will be found that the adoption of this step will almost always result in a very considerable saving of cost. Of two marbles which produce a similar effect, the one may cost in working three times as much as the other. In some situations it may be an advantage to build up intricate mouldings out of thin slabs. Working out of the solid may mean the spoiling of a design or a cost which becomes prohibitive. The selection of the marbles with which different parts of a design are to be carried out is of more consequence in the matter of cost than appears at first sight. Other factors being equal, it is well for the stone which is most easily manipulated to be employed in those portions of a design in which there is most work. Too frequently the consideration of these matters is left until after a plan is made and a specification prepared. In such cases money is thrown away which might have been usefully employed in another direction, the work is altogether abandoned, or the inquiries which should have been made first are made last, at an expense of time and trouble which might have been easily saved.

The harder marbles afford excellent material for the construction of steps and staircases. A flight of marble steps is not only beautiful in appearance, but it is calculated to withstand an enormous amount of wear and tear. In selecting marble for this purpose, it should be remembered that the effect of a flight of steps depends upon the regularity and evenness of the lines and the simple alternation of light and shade in the tread and riser. Colored marbles with strong markings or veins are not suitable. The self-colored marbles or one of the dull gray varieties should be employed. The even color of Sicilian, Correblanchien, and of Istrian marbles makes them especially useful for this purpose. The effect which should be produced by a fine flight of steps is ruined by the employment of a marble in which the veins run obliquely and distort the horizontal lines, or in which waves of color disturb the effect of simple breadth of light and shade. These remarks apply equally to moulded work. Heavily veined marble destroys all the beauty of the lines of mouldings.

As far as possible, work of this description should be carried out in plain black, white, or gray. Generally, finished work in marble is polished. The effect of reflection from a highly polished surface should be carefully borne in mind, otherwise it will be found that some members of a moulding will be completely obliterated in certain lights.

The variegated marbles should be reserved for flat surface decoration. Due care should be taken that the size of the panel or slab is sufficient to display the variety of the markings. If this is not done, half the beauty of the marble will be lost. In small panels, a marble which has close, fine markings should alone be used. The only exception to the general rule as to the employment of veined or variegated marbles is in the case of columns. The smooth cylindrical face of a column shows off the beauty of the markings as well as, or better than, a flat surface. If the column is fluted, the objection to these marbles again returns in full force.

Marble may be most usefully employed for the paving of halls and passages, and of rooms in which much traffic is expected. A floor of marble mosaic is one of the most beautiful and at the same time one of the most durable which it is possible to construct. Marble tile floors are very common in churches and public buildings in Continental Europe. Their cost as compared with tiles made of clay has operated against their employment in England. Modern machinery and competition have now removed this obstacle, and marble tiles can be obtained which very little, if at all, exceed the cost of the ordinary encaustic tiles. If a clay tile pavement which has been much used is examined, it will be found that each tile is worn more or less hollow in the center. A similar traffic over marble tiles produces scarcely perceptible results.

Some most useful rules with respect to the employment of marble have been laid down by Mr. T. Graham Jackson. They are as follows:

"1. Decorative carving in marble—as, for instance, in cornices, capitals, and friezes, where high relief and bold design are required—should be severe and conventional. Naturalism is forbidden by the stubbornness of the material except in the highest subjects, such as the human figure, which repays the expense of labor, or else in very low reliefs, where the labor of execution is reduced within moderate limits.

"2. Sculpture should be in white marble, or if in alabaster, only in such as is free from veins or stains of color.

"3. Moulded architectural features, such as vases, bands, strings, cornices, architraves, and abaci, should be either in white or some uniform color, without markings or veins.

"4. Variegated marbles should be used only for panels or columns, or, in other words, on plain, smooth surfaces, either flat or curved, so as to display the beauty of their markings to the utmost, without interfering with any of the structural lines of the architecture.

"5. Colored marbles should be used with moderation, too great a variety being avoided, and those of the quieter and more harmonious tones preferred for general use.

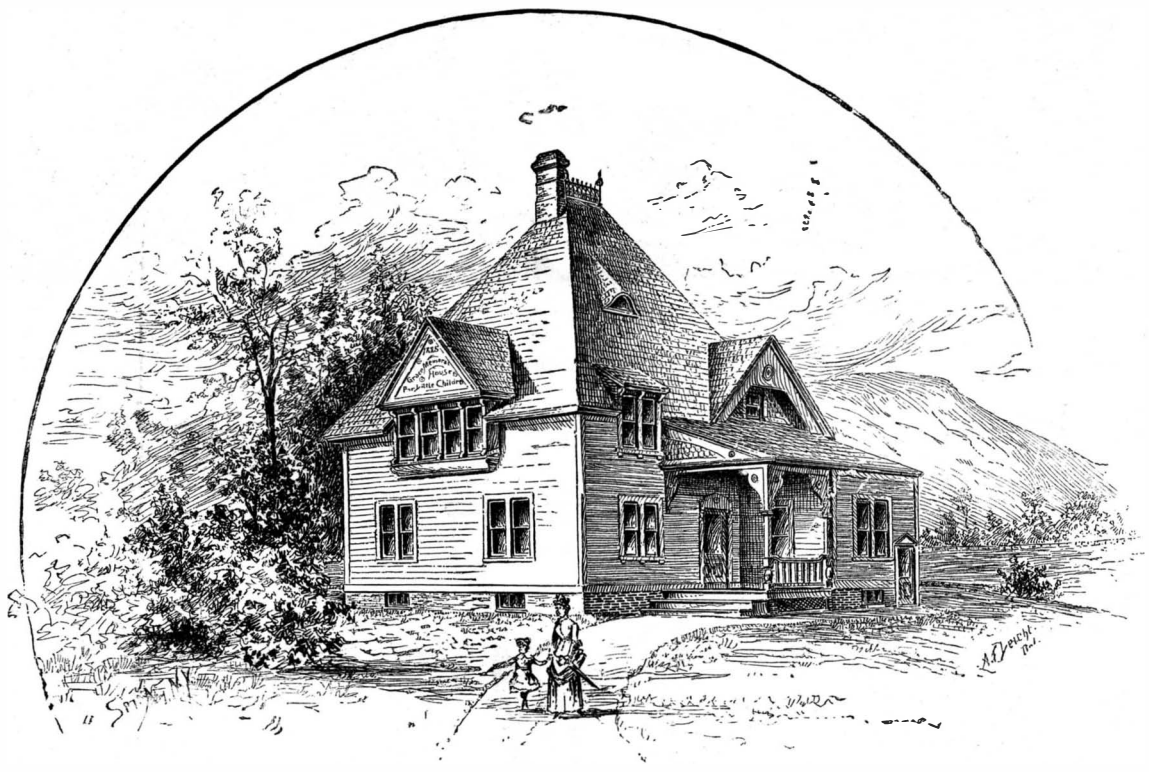
"6. Strong contrasts of color on a large scale are dangerous, and generally incline to vulgarity.

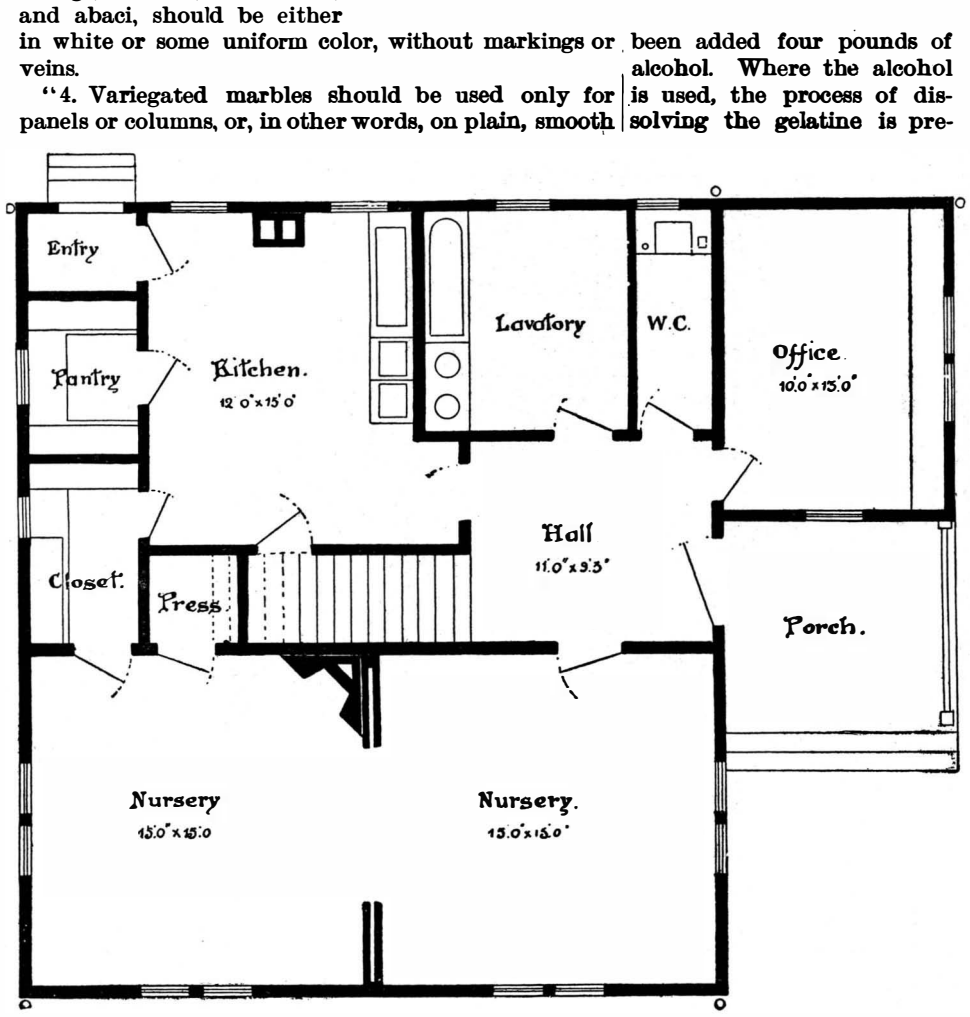
"7. Strong contrasts on a small scale, as in mosaics and inlaid work, are necessary.

"8. Stone and marble should be kept apart as much as possible."—*Building News.*

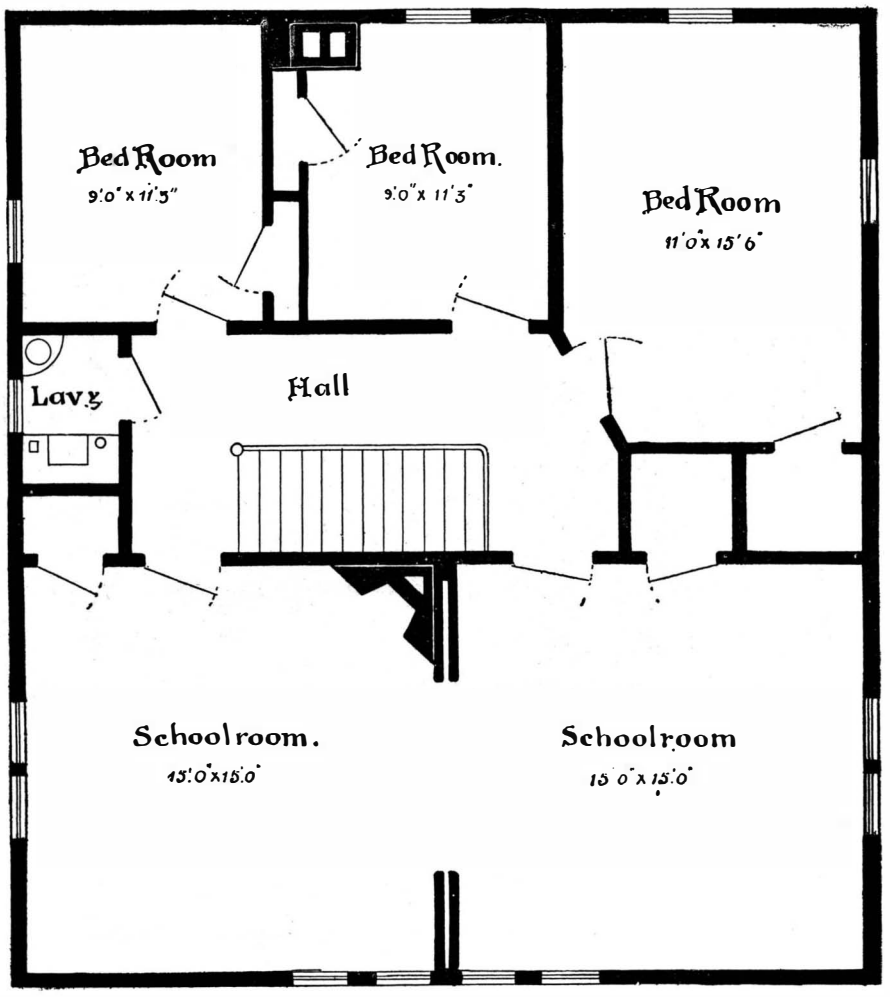
### A SCHOOL HOUSE AND NURSERY.

We give illustrations of the Grace Memorial House, at Providence, R. I., a building designed for the special accommodation and instruction of young children. Edward I. Nickerson, Providence, architect. The estimated cost is $4,000.






Ground Floor.




Second Floor.

GRACE MEMORIAL HOUSE, PROVIDENCE, R. I.

### A New Composition.

This is a new composition designed for use in the production of all manner of moulded objects of a useful and ornamental character.

The composition is made by taking ten pounds of commercial gelatine and dissolving it in about thirty pounds of water, to which, by preference, there has been added four pounds of alcohol. Where the alcohol is used, the process of dissolving the gelatine is preferably carried on in a close steam-tight vessel by the aid of heat. Dried raw untanned depilated animal skins, by preference rabbit skins, which have been cut into fine bits or strips, or reduced to shreds, are next taken and placed in about thirty pounds of hot water and thoroughly cooked and digested in a steam kettle until the water is evaporated from them and they are left in a soft, gelatinous mass. The reduced skins are then added to the hot solution of gelatine and thoroughly stirred therein, the solution being kept hot and well agitated in a steam kettle or digester. To this hot solution of gelatine and reduced skins are added about two pounds of Venetian turpentine, two pounds of linseed oil, and six pounds of resin or equivalent gum, and the mixture is then brought to the boiling point and kept at this temperature while being thoroughly stirred and agitated until all the foam and froth, which will arise therefrom, settles and disappears and the ingredients are fully combined and admixed, care being taken to prevent the boiling mass from running over during the operation.

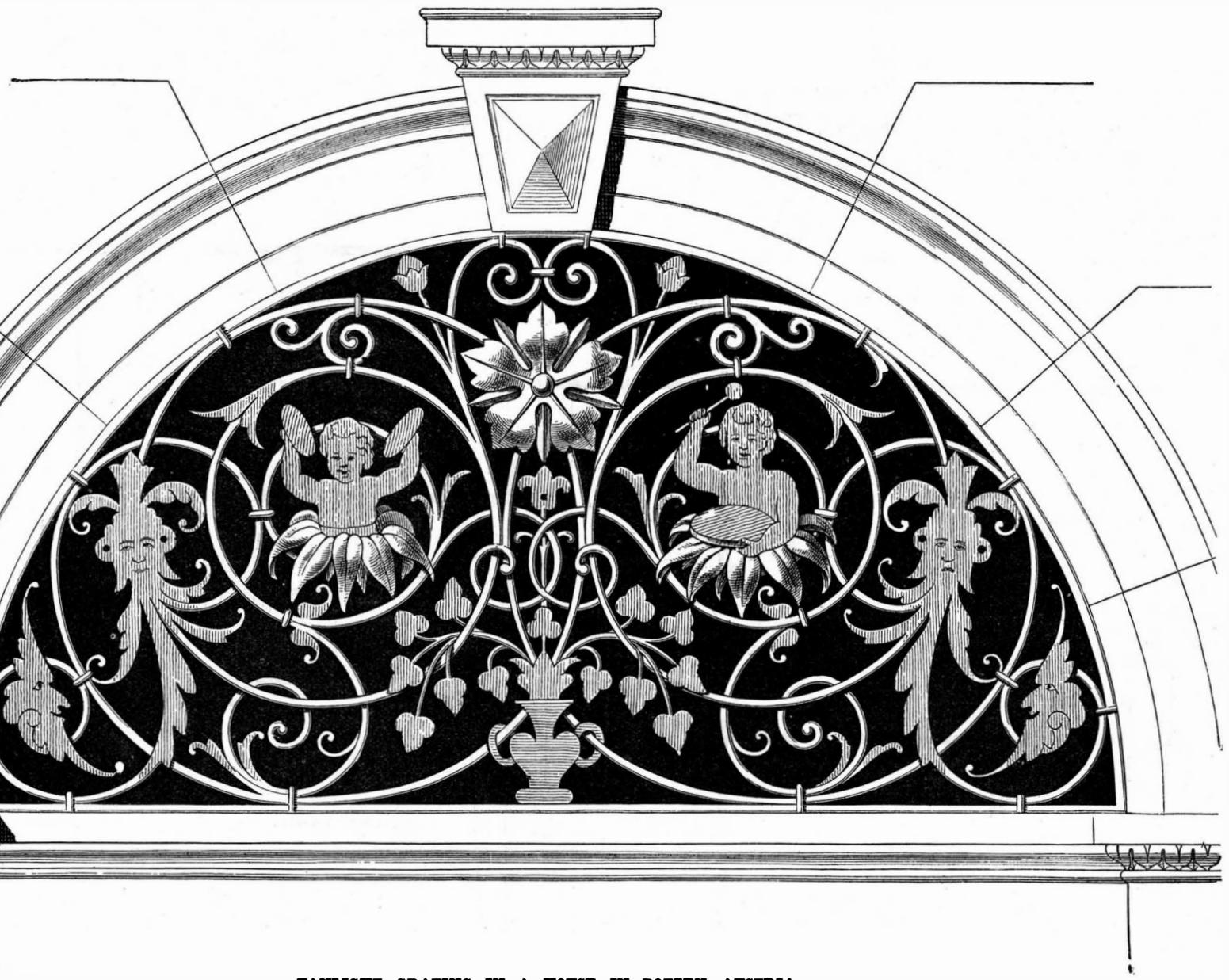
When the compound is properly prepared, twenty pounds of paper pulp are added, and the mixture is beaten by means of dashers or other appliances for the purpose until the whole is reduced to a slimy mass of uniform consistency; and, finally, to this viscid mass there is added sufficient pulverized alabaster or marble dust or equivalent pulverulent mineral matter to bring it to about the consistency of soft putty, the thorough admixture and incorporation of the pulverulent substance in the mass being produced by kneading it and working it as dough with the hands or by means of any known mechanical devices for the purpose. The plastic composition thus obtained may then be laid in a thin coat upon a sheet or web of fibrous material or textile fabric and carried between two metallic compressing rollers, one or both of which are either plain or engraved or embossed with any desired pattern, which will operate to firmly unite the composition to the fibrous web, or it may be moulded in suitable moulds into useful and ornamental figures and shapes of all varieties.

When formed in plain sheets, the sheets may be placed under dies which shall operate by pressure thereon to emboss the surface with any desired pattern. The sheets, plates, or objects thus formed of the plastic composition are finally allowed to dry and harden, and will then be both waterproof and fireproof. The hardening process is usually completed under ordinary atmospheric influence within twenty four hours.

The product is said to be admirably adapted as a covering for walls in the place of paper, and its application to the purposes of decorative art admits of infinite variety and modification.

TO DISTINGUISH IRON FROM STEEL.—By breaking and comparing crystallized surface, steel will show a homogeneous, granular surface; iron will show a streaky or fibrous surface.

ORNAMENTAL PANEL OF A GOTHIC ALTAR IN THE CHURCH OF ST. EGIDIEN, IN BARTFELD, HUNGARY.



FANLIGHT GRATING IN A HOUSE IN BOTZEN, AUSTRIA.

## SUGGESTIONS IN DECORATIVE ART.

### The Ideal House of the Future.

There is no doubt that the ideal house of the future, whether large or small, will be in the country, and that this massing together of humanity to be found now in our great cities will come to be considered simply barbarous. Even for the rich, who can claim fullest space the city, with its undercurrent of crowded, festering, noisome life, holds contamination; while for the poor themselves, what word is strong enough to express the degradation of the word home that is theirs!

Nor is it possible, even under the most favorable circumstances, to count "flats" or apartments as anything more than the travesty of comfort in its best sense. Ruskin is right when he denies to cities any possibility of the best development for human life; and though they have their uses, and we could ill dispense with many good things to which they have given birth, they are responsible for such hideous evils that one longs at moments to see them, their pride and their magnificence, and "the bitter cry of outcast" life in their midst, engulfed like those lost cities of old.

The home spirit is strong in many a city flat, and consecrates many a stately mansion as well as the narrowest tenement; but the true home must be in the country, quite accessible, it may be, from the city, but always owning certain indispensable and inalienable characteristics. The house that has not its own bit of land, its own possibilities in the way of garden or orchard, even if that orchard sum up as only one old apple tree, has not the right to the title "comfortable." Building associations all over the country are making building possible for even very limited incomes, and these associations are supplemented by work from our architects that gives us every form of inexpensive design, and proves that beauty and cheapness can go hand in hand.—*Cosmopolitan.*

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THE cause of single and double rainbows is due to the combined reflection and refraction of the sun's rays from drops of rain. The rain must be on the side away from the observer. The position of the rainbow depends on the height of the sun, and rain drops at different definite elevations can produce the effect, so that double or triple rainbows are possible.

### A SEASHORE OR BEACH HOUSE.

We give from *Building* a very pretty sketch for a seashore residence. It is picturesque, roomy, has a spacious piazza, and presents several other attractive features. The cost for such a dwelling would be about ten thousand dollars.

### Exhibition of Building Materials, Brussels.

A leading feature in the programme of the Belgian Society of Engineers and Manufacturers is the holding of special exhibitions, of which, besides the loan collection of M. De Lesseps' plans and models of the Suez and Panama canals, four have already taken place, viz., iron and steel permanent way for railways and tramways; methods of illumination, retrospective and actual; India-rubber and its applications; and telephonic apparatus. These have been held in the society's hall, forming part of the Brussels Bourse; and lectures connected with the subject of exhibition or individual exhibits have been given on Friday evenings. Such has been the interest attaching to these exhibitions, that latterly they have been open to the public at a small fee.

The fifth exhibition, which remained open until the 19th June, was devoted to building materials found or made in Belgium, but excluding the metals, and has drawn together a large number of materials a few of which merit notice on account of their interesting character or novelty. The Belgian marbles, which are largely exported to England for mantel pieces, are well represented, the Societe Anonyme de Merbes-le-Chateau sending no fewer than twenty specimens. It may be mentioned, incidentally, that it is chiefly the red varieties, of which the Rouge Royal is a type, that are known in England; but the black with white veins also merit attention.

Specimens of the principal Belgian marbles, prepared like microscope subjects for studying the origin and structure of the Devonian limestones, have been lent by the director of the Brussels Natural History Museum. They are only one-tenth of a millimeter thick, and have been prepared by grinding one face perfectly true and smooth, and cementing a glass plate to it, the other side being ground down to the desired thickness, and also protected by a glass plate. Placed in vertical frames, the specimens may be examined, with the aid of the magnifying glass, by looking through them toward the natural or an artificial light.

The floor shown by Damman and Cassard consists of shallow concrete arches turned between light rolled iron or steel joists, the concrete having internal dovetails left in its upper surface, which is made flat, and completely covers the joists. Over this surface liquid asphalt is poured, and while it is still hot the pieces of wood forming the *parqueterie* are bedded in it. Grooves are made in their longitudinal lower edges, two of them forming together an internal dovetail, so that when the asphalt sets it securely clamps the wood down to the concrete. The floor thus produced is solid and noiseless, while at the same time being sound proof, damp proof, and practically fire proof. A modification of the above, in which the *parqueterie* pieces are connected with asphalt to tiles having a conical hole in the middle of each, has been laid down at the Hotel de Ville, the Palais de Justice, and the Palais de la Nation, Brussels.

The Societe Anonyme des Fours de Laeken makes hollow slabs of plaster of Paris for filling up the space between two rolled joists. The Societe Anonyme des Deux Nethes accomplishes the same object with *hourdis*, or slabs made of burnt clay, hollowed out in the direction of their length, and provided with longitudinal ribs or feathers for strength. Leon Champagne et Cie make for this purpose *voussettes*, or hollow bricks approaching in form to that of the wedge, which they claim to be quite as efficient and less costly.

Picha Freres. of Ghent, strengthen all their articles made of cement with a stout iron wire framework inserted in the middle during their formation. Renette et Cie, of Ghent, sink wells in sandy soils with the aid of hollow cylinders composed of concrete, coated and lined with cement, which not only prevent accidents due to earth falling in while sinking, but also secure a pure supply by intercepting surface water. In sinking a well, the ground is first leveled, and then the bottom ring, having its lower edge splayed out and beveled, so as to sink easily and make a way for the rest, is laid upon the surface. The earth inside is then excavated, when the ring sinks by its own weight. When its top is level with the surface, another ring is added; and the socket joint is cemented, so as to be water tight. This process is continued until water is reached, when a special dome-shaped ring with aperture is placed on the top, without, however, being cemented, in case it should afterward be found necessary to deepen the well.

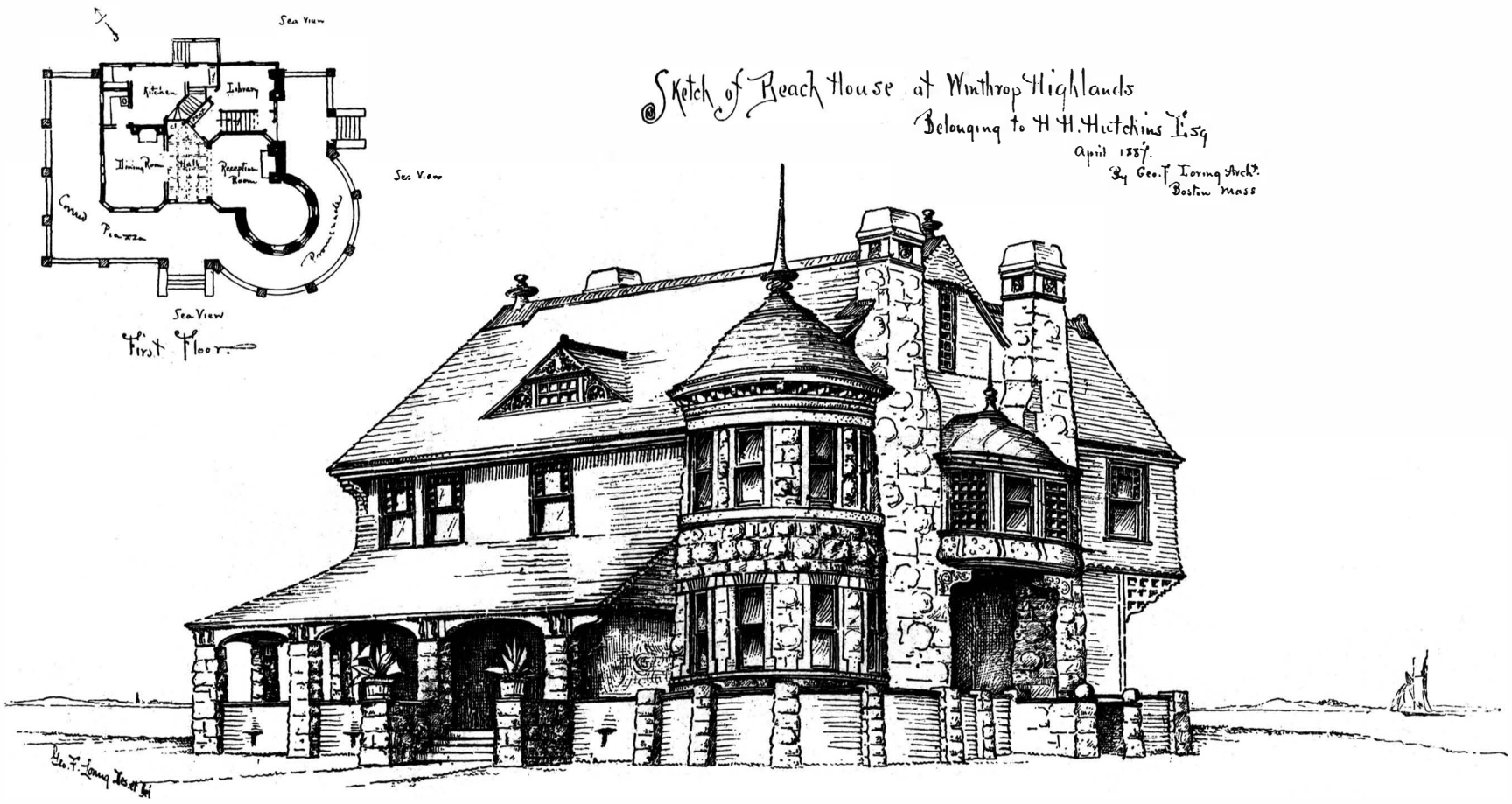
A new roofing substance is shown by E. Perret, of Vilvorde, in his "unalterable cloth" for superseding the so-called bitumenized felt, which soon becomes disintegrated under a hot sun. The flax tissue is impregnated and coated with a bitumen derived from petroleum, to which are added small quantities of natural bitumen, resin, and chalk; and the upper side is sanded to prevent adhesion when the cloth is rolled up. The cloth is laid on battens, or on the rafters, which may be 12 or 15 inches apart, the lower portion of a sloping roof being covered first with a continuous length. Another length is then laid above, with a 3 inch lap, and so on till the roof is covered, the upper length being folded over the ridge. The cloth is held down by washers of the same secured by zinc nails, and requires no coat of tar or other substance.

A new drying oil for house painters, to take the place, at half the cost, of linseed oil, driers, and turpentine, is prepared from petroleum by Rave, Annez et Cie. Besides the lower cost, the special advantage is that the oil dries so quickly that several coats may be applied in a day—a matter of great importance when a temporary structure is required in a hurry. It is asserted that the oil will unite chemically with all paints except white lead, which may be replaced by zinc white, and chrome yellow, for which Naples yellow may be substituted. It is also claimed that this is the only oil that may without difficulty be laid on cement and combine with it, and through which tarred or bitumenized surfaces will not show.—*Jour. Soc. of Arts.*



### Chimneys of the Ancients.

It has by some been considered doubtful whether the Greeks and Romans, during the period of their greatest eminence for architectural productions, had any chimneys in their dwelling houses; but as Homer, Aristophanes, Virgil, and Appian are supposed to mention or make allusion to them, it has been inferred by other writers that they were not wholly unknown to those ancient builders. The oldest certain account of the use of chimneys is stated to be 1347, and it is conjectured they were invented in Italy. Smoke-jacks, which must have been invented subsequently to chimneys, are supposed to be of German origin; and, from a painting which is known to be older than 1350, it is supposed they were in use before that period. In the houses discovered at Herculaneum and Pompeii, there are, it is said, no chimneys; but they appear all to have been warmed by means of flues and a subterraneous furnace. Stoves and flues, it is thought probable, were introduced about the time of Nero. Seneca relates that, in his time, there were invented certain tubes, which were placed in the walls, by which the heat of the fire was made to circulate and warm equally the upper and lower apartments. These observations have been quoted as proofs that chimneys were unknown at those periods, but have they not a contrary tendency? It appears more probable that a chimney should furnish the idea for such stoves than the use of stoves should be known before chimneys. In the Old Testament there are several allusions to furnaces for the smelting of iron and other metals, which would appear to leave no doubt of the use of chimneys being known at a very early period, especially to the Egyptians (see Gen. xvii. 15, Deut. xx. 4, and Ezekiel xx 22). In Nehemiah, the towers of the furnaces are spoken of. In the First Book of Samuel, xxx. 30, a city is called the smoking furnace (Chor Ashan), probably from the number of chimneys erected in it. The Arabic root renders the word "round;" they were, no doubt, built in the form of a round tower of lofty height, like some of the chimneys of manufactories at the present day.—*Seth Smith.*




A SEA-SIDE DWELLING.

### Preservation of Wood by Lime.

I have for many years been in the habit of preparing home-grown timber of the inferior sorts of fir—Scotch, spruce, and silver—by steeping it in a tank (that is, a hole dug in clay or peat, which was fairly water tight) in a saturated solution of lime. Its effect on the sap wood is to so harden it and fill the pores that it perfectly resists the attacks of the little wood-boring beetle, and makes it, in fact, equally as durable as the made wood. I have a mill which was lofted with Scotch fir prepared in this way in 1850, and it is in perfect preservation The timber is packed as closely as it will lie in the tank, water is let in, and unslaked lime is thrown on the top and well stirred about. There is no danger that the solution will not find its way to everything in the tank. I leave the wood in the solution from two to three months, by the end of which time an inch board will be fully permeated by it. Joists and beams would, of course, take a longer time for saturation; but in practice we find that the protection afforded by two to three months' steeping is sufficient if the scantlings are cut to the sizes at which they are to be used.—*Field.*

### TENEMENT HOUSES OF MODERATE COST.

We give herewith illustrations of some tenement houses of pleasing appearance and moderate cost at Kansas City, for which we are indebted to the *Northwestern Architect.* We estimate the cost of these houses, in this vicinity, at $20,000 for the three. These buildings occupy a frontage of about 100 ft. by 50 ft.

## Vermont Marbles.

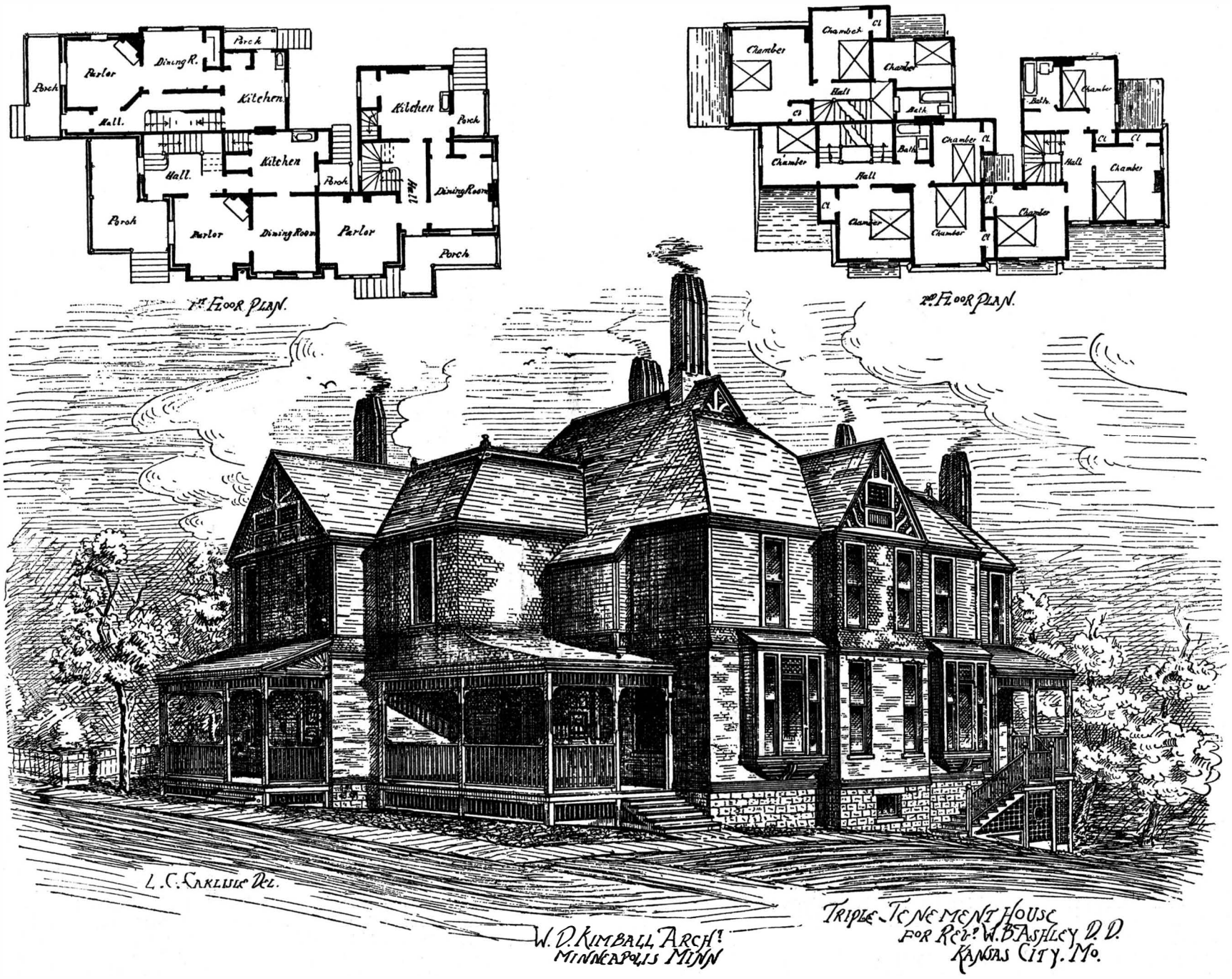
BY ARTHUR LEE.

The rise and progress of the marble trade in the United States of America has been of a most extraordinary character. The first marble quarry in the country was opened in Vermont in 1785. Shortly before the year 1800, works were erected for the sawing of marble at Marbledale, near New Milford, Connecticut. It is said that the first tombstone made out of American marble was erected in 1790, and was the work of one Jonas Stewart, a marble cutter of Dorset. An examination of the headstones in the graveyard at New Milford proves that the oldest of them are of sandstone from the Connecticut Valley, and of slate. Those of marble is mottled and veined in a manner peculiar to itself. Some of it is dark, with a ground of deep blue, with nearly black veins. Another variety is nearly white with clouded veins. Both descriptions are sound, and take a good polish. Quarrying operations were commenced in 1836, although they were not pursued with much spirit until some years later. The quarries are well situated, above the railroad and mills, so that blocks are readily transported. The falls of the Otter are made use of as a motive power to drive the saws, the polishing beds in the finishing shops, and the drills in the quarry. It was here that the first successful channeling machine was employed. These machines are now in operation all over the States. It is calculated that since 1863 over five millions of square feet have been cut by them. The channeler is a locomotive machine which runs on steel rails placed on the quarry floor. The gang of cutters forming the drill is composed of five steel bars, 7 ft. to 15 ft. long, sharpened at the ends, and securely clamped together. The center cutter is the longest, and the two outside cutters are the shortest, so that the five form a kind of stepped

opportunities for the extraction of large blocks. A small town has been built near the falls for the accommodation of the workers.

At Rutland, a pure white marble is found. There are several quarries in the neighborhood of the town, and the marble bears a high reputation. There are quaries of clouded and veined white, and of dove color as well as statuary. The marble is found on the western slop of a range of low hills running north and south. The thickness of the beds worked varies from 50 ft. to 120 ft. They are inclined at an angle which averages about 45°.

Quarrying operations were commenced in the year 1838, and a few years later trade in "Rutland marble" had become firmly established. The deposits proved to be abundant and of sound quality, and were sources of large profits to the proprietors. The marble industry of Rutland has been a prosperous one, and at the present time it is calculated that some 2,000 men find employment in the quarries, mills, and workshops. Rutland statuary is said to be too soft for ordinary purposes. This complaint may possibly arise from the




### TENEMENT HOUSES OF MODERATE COST.

somewhat later date are of marble, and have been evidently worked by hand from the rough block. Those bearing a date soon after the beginning of the present century have been cut on one or both sides with a saw. The date of the first working of American marble is, therefore, fixed with tolerable certainty, and it is evident that a trade which has now assumed enormous proportions has been built up in less than a century.

Marble is now used for building purposes in the States on a scale which may astonish the architects of the Old World. In New York it is superseding the brown freestone or sandstone of which such a great part of the city is built. The great bulk of the trade centers in Vermont. In that State the quarries are worked with every mechanical means which the ingenuity of man has been able to devise. In the year 1882 it was calculated that the capital invested in the production of American marble in the States of Vermont, Massachusetts, Connecticut, New York, Pennsylvania, Maryland, and Tennessee was £2,500,000 sterling, two thirds of which was invested in quarries and one third in mills and machinery. The number of workmen engaged was 6,00 ), and the annual production amounted to 2,200,000 cubic feet, valued at £900,000.

The principal workings in Vermont are at Sutherland Falls, Rutland, and Dorset. The Sutherland Falls arrangement away from the center. As the machine runs backward and forward over the rails the cutters deliver their strokes at the rate of 150 per minute. Deep, narrow furrows are cut into the solid stones, and long parallel blocks are thus formed. Close after the channeler runs the gadding machine. This drills circular holes along the bottom and sides of the blocks, into which wedges are introduced, and the stone is split from the bed. The Wardwell channeling machine, which is most commonly in use, cuts a continuous groove at the rate of 75 to 150 square feet per day, thus doing the work which could be done by 50 to 100 men by the old hand process. The expense of working the machine is about £2 per day. The advantages gained by use of the machines are therefore obvious. The diamond gadder does its work at the rate of about 180 ft. per day as against 12 ft. by hand labor. Three men are required for each channeler and two for each gadder. As a consequence of this mode of getting the stone, the quarry appears like a hollow cube cut into a hill. The sides are nearly perpendicular walls, and the bottom is a marble floor over an acre in extent. Across this floor the channeling machines work.

Sutherland Falls marble is much used for building purposes. The spire of Grace Church, New York, is built of it. The formation of the beds gives great fact that the principal supply has hitherto been produced from the upper layers. It is now claimed that the lower layers have produced a statuary which is of a much better texture than any formerly worked. At the State House in Montpelier there is a statue of Ethan Allen of heroic size; this is the work of Larkin J. Mead, and is sculptured out of Rutland marble. The marble is certainly not so easy to work as that of Italy; it is what is called "plucky"—that is, given to breaking away before the chisel, unless great care is used.

The sand blast was first employed for the cutting of marble at some marble works in West Rutland in 1875–76. A contract was taken by which 254,000 lettered headstones, having dimensions of 3 ft. in length, 10 in. in width, and 4 in. in thickness, were placed in the national cemeteries at an expense to the government of about £173,000. The monuments were for the purpose of marking the graves of soldiers, and the application of the sand blast for the purpose of cutting the inscriptions enabled the work to be so cheaply done. Letters and figures of chilled iron were placed on the stone to be cut, and the blast was then turned on; the portions of the stone unprotected by the iron were eaten away by the force of the blast, and the inscriptions were left standing in relief. By this me-

thod the name, company, regiment, and rank of a soldier could be put upon a stone in less than five minutes of time.

Between Rutland and Sutherland Falls there is found the quarry of the Columbian Marble Company. This marble is almost black, but with a mottled surface; it is much used for mantelpieces and monuments.

At Pittsford there are three beds or veins of marble which run through the town north and south. The east bed is of the same character as Sutherland Falls marble, of which bed it is probably a continuation; the middle bed is separated from the easterly one by about 200 ft. of limestone rock. This bed is about 400 feet wide, and contains marble of all shades, ranging from white to dark blue. Marble from the Pittsford quarries has been used in the construction of several large buildings at Boston—notably the Continental building, Commonwealth hotel, and the Blackstone National Bank building.

About a mile to the south of Pittsford some marble is quarried known as "Florence marble." It is dark blue in color, mottled and veined. The quarries were first opened in 1880, and the production rapidly assumed large proportions. In 1884 it was calculated that the output was nearly 10,000 tons.

Another dark, dove-colored marble is found at Brandon. Several quarries have been opened near this town, but only one is now in active operation.

At Middlebury there are extensive deposits of white marble, which some years ago were very largely worked. Little in this way has been done of late, as the marble, although of good color, has proved to be so generally unsound that the working of it has not been remunerative.

The first attempt to manufacture marble upon a large scale which was made in the States originated in Middlebury. In a history of this town by Judge Swift, there is an interesting quotation from a pamphlet written by Professor Frederick Hall, and published as long ago as 1821, which is as follows:

"Proceeding down the creek on the western side, after passing two sawmills, two grist mills, a clothier's works, and some other establishments of minor importance, you come to the marble factory.

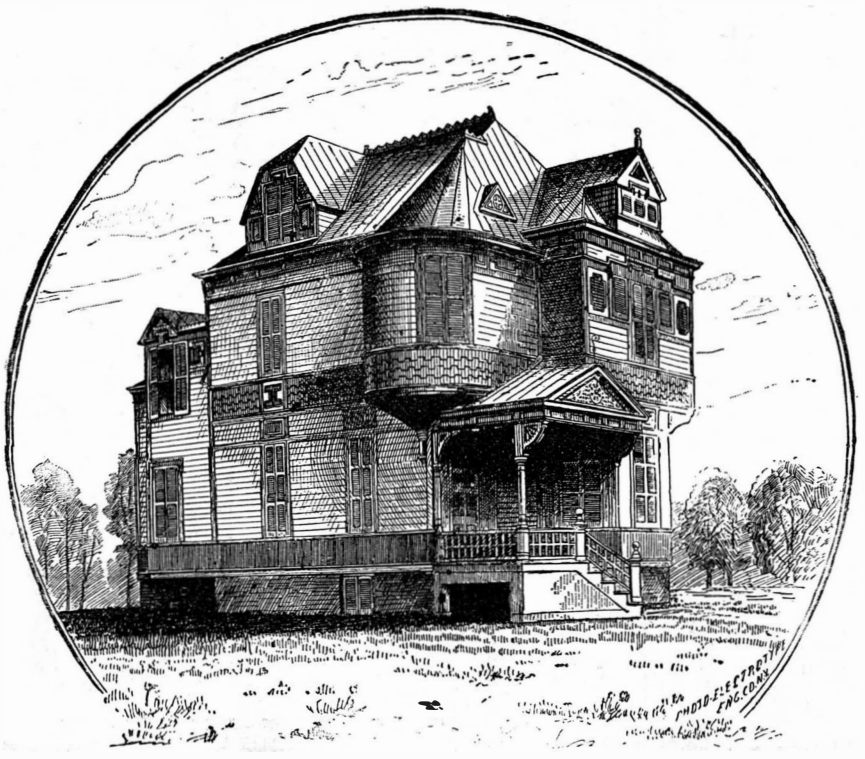
The marble of this village, which is now wrought on a large scale, and is extensively approved over the country, was discovered by Eben W. Judd, the present proprietor, as early as 1802. A building on a limited plan was erected, and machinery for sawing the marble was thus put in operation. In 1806 a new and commodious building, two stories high, and destined to comprise sixty saws to be moved by water, was erected. In 1808 this enlarged establishment went into operation, and has continued to the present day.

"The saws are made of soft iron without teeth, and are similar in form to those which are used for sawing marble by hand in the large cities in Europe The marble until lately has been obtained chiefly from a quarry situated within a few feet of the mill. It is raised from its bed partly by means of wedges, but principally by blasting. The marble, after being sawed into slabs, is manufactured into tombstones, curriers' tables, panels, mantelpieces, hearths, window and door caps and sills, sideboards, sinks, and various other kinds of furniture. These articles are transported to Montreal, Quebec, Boston, New York, and even Georgia The machinery has sawn annually from five to ten thousand feet since the year 1808."

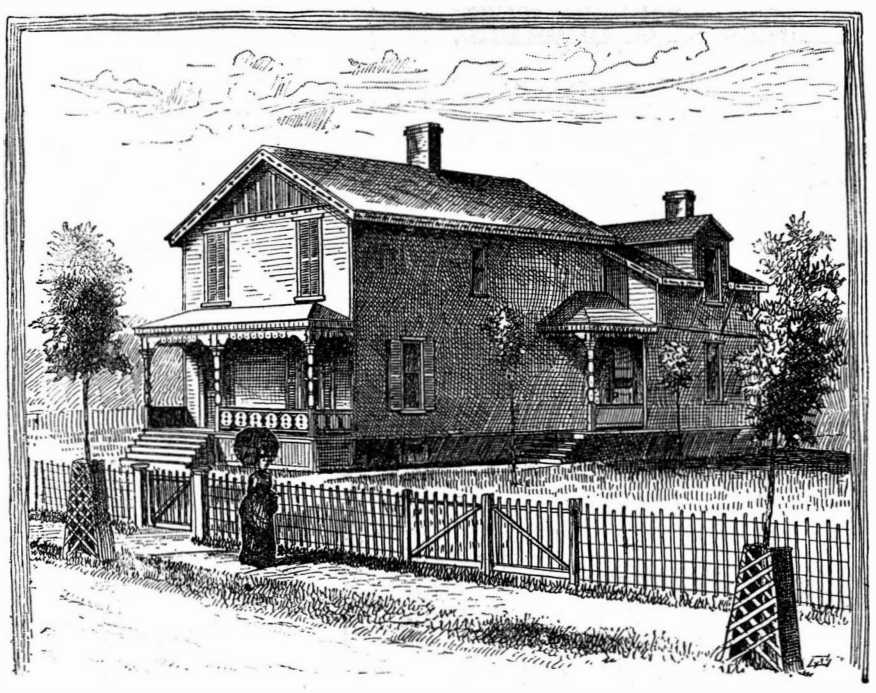
At Larrabee's Point, in Shoreham, Addison County, there are deposits of black marble which closely approach Kilkenny marble in appearance. The quarries are not now in active operation, but several polished chimney pieces made of it are to be found in some of the older houses in the neighborhood. At one time it appears to have been in much favor.

La Motte marble is another black marble of similar character, but more fossilized. It is found near the west shore of the island of La Motte in Lake Champlain. It is in considerable demand for the making of flooring tiles, and finds some employment for monumental purposes.

At Swanton, in Franklin County, there is found a dove-colored marble, which was much used for gravestones down to the year 1850. In that year the work-



No. 1.



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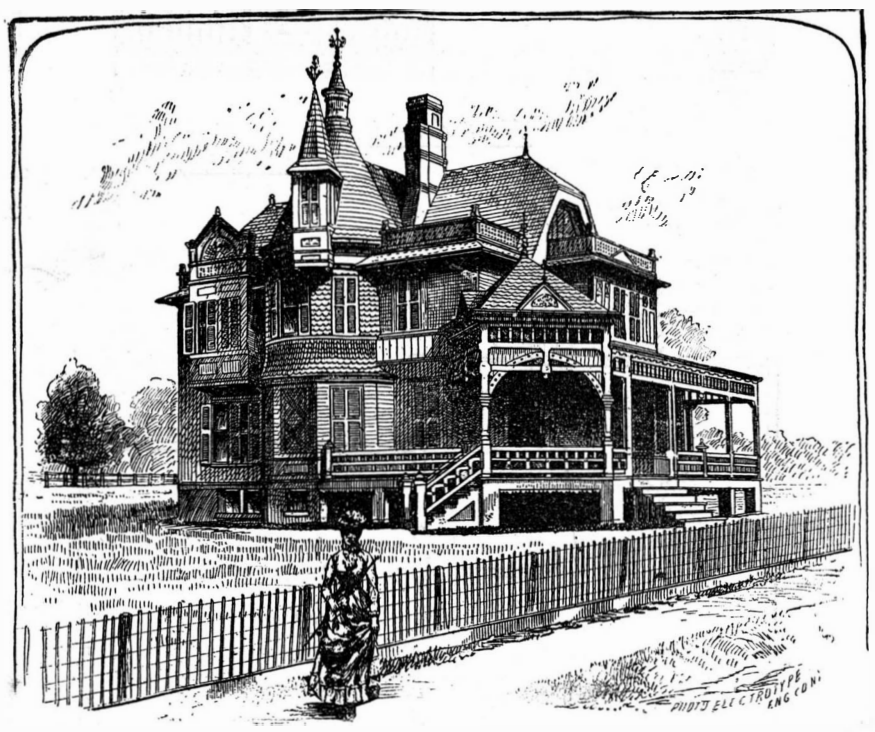


No. 3.

**EXAMPLES OF SUBURBAN HOUSES AT HAMILTON HEIGHTS, FORT HAMILTON, N. Y.**

sawing plant was in full swing, the harder layers of stone were worked, and the sawn marble found a ready market In 1840, before the introduction of Italian and Rutland marble, the demand for Dorset marble was beyond the supply.

What is known as Vermont Italian marble is worked up the mountain at East Dorset. This marble is almost exclusively used for monumental and decorative purposes. The production reaches an annual average of over 30,000 cubic feet.

A quarry known as the Freedley Quarry, situated a little further to the north, has been worked since 1820, and is still producing a white marble, much used for building purposes. The quarry is high up in the mountain, and the blocks are sent down by means of an inclined railroad. The annual production of the Freedley quarry averages 40,000 cubic feet.—*Building News.*

### SUBURBAN HOUSES.

We give from the *Real Estate and Builders' Monthly* three designs for dwellings of moderate cost. No. 1 may be erected in this vicinity for about $4,200; No. 2 will cost about $3,200, and No. 3, $5,200.

### Snow Sheds on the Cascade Mountains.

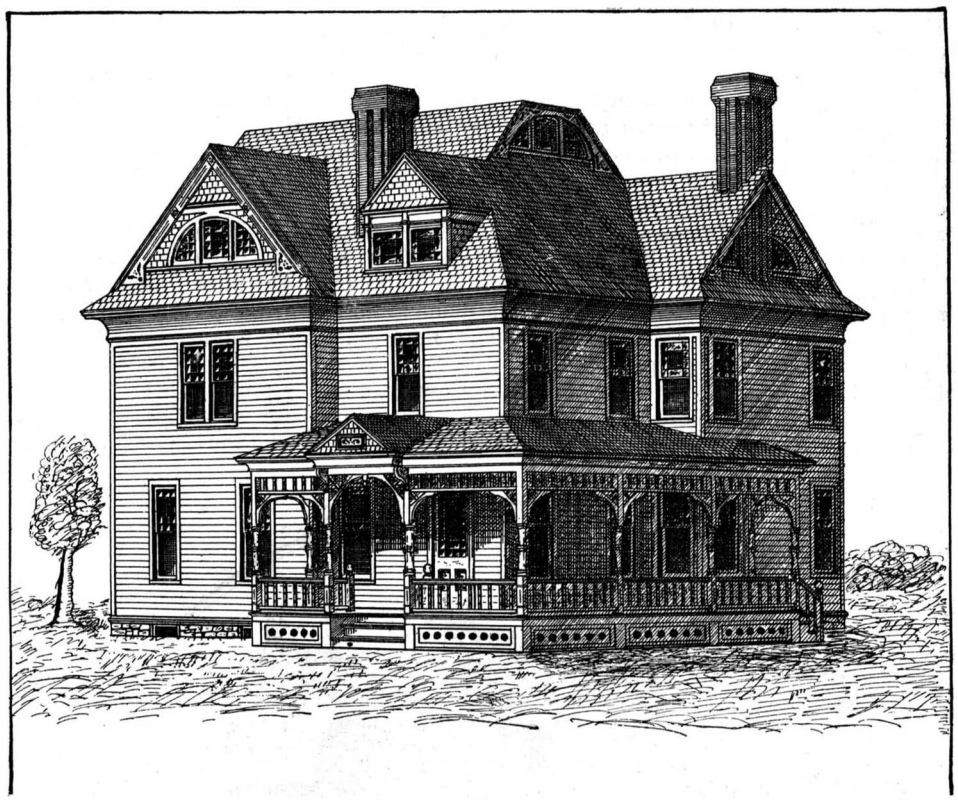
A short time ago there appeared a statement to the effect that the Northern Pacific Railroad would have to snow-shed about forty miles of its line, to protect it during the winter months. This is erroneous. The length of the mountain grades and switchback entire (the only portion of the line where sheds will be required) is but 20 miles, and only a portion of this will require snow sheds. We are informed by division engineer Huson that the entire amount of snow sheds required on the Cascade division will not exceed eight miles. Statements have also appeared in various papers as to the probability of blockades upon this portion of the road in the future. A comparison with the Central Pacific Railroad may be of interest in this connection. On the latter road, through Blue Canyon and Emigrant Gap, there are 30 miles of continuous snow sheds, and the snow falls to the depth of twenty-four feet. The greatest depth upon the grade of the switchback last winter (which was unusually severe) was less than fifteen feet. With the road in operation, plows running continually to prevent the snow from accumulating upon the track, and the protection afforded by the sheds to be erected, the chances for blockades are slight. When the big tunnel is completed next year, and the seven miles of switchback line are dispensed with, the probability of blockades will be still more remote.—*Ellensburg (Wash. Ter.) Leader.*

### AN OHIO DWELLING.

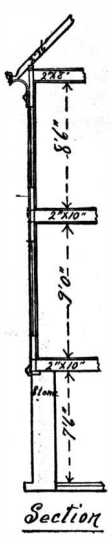
We give the plans, elevations, and perspective view of an eight room house, the estimated cost of which is about $5,000 in this vicinity. W. C. Bartell, architect, Tiffin, Ohio. The estimates include hardwood mantels for library, dining room, and sitting room, and Jackson ventilating grates for each. The plumbing consists of bath tub, water closet, and wash bowl in bath room, and washbowl in space between kitchen and hall, and boiler connected to range in kitchen. A sideboard in dining room, hardwood finish on first floor, and pine finish on second floor, and to be first class throughout.

#### The Corner Finish.

A correspondent of the *American Architect* says: The Buffalo architects have adopted one usage which is not entirely unknown about Boston, though there seems to be a feeling here that it is not practicable. Every one knows how troublesome it is to satisfactorily arrange the corner boards of a clapboarded house. A regular pilaster finish, such as looks so well with a colonial design, is not always desirable or possible, and an ordinary corner board is apt to unpleasantly mark the angles of the house just where the architect would wish to keep them as unobtrusive as possible. In much of the more recent Buffalo work this difficulty is obviated by simply omitting the corner boards entirely. The corner is flashed with zinc against the boarding and the clapboards are run out to the edge and mitered, or cross-lapped like shingles. In either case, the corner is perfectly tight against the weather. There is a house on North Street, just beyond Delaware Avenue, which well illustrates this usage, and is besides so successful in its color that it is worth while to notice it a little in detail. The lower story is in a rather dark red brick. The second story is clapboarded and portions of the gables are shingled, both surfaces being stained a rich, warm brown. The upper portion of the front gable is filled with rough plaster, stuck over with bits of opaque glass, and left a light gray tone. The roof is covered with blue slate. The outside finish is painted a dull Venetian red in the lower story, the architraves, etc., above being a very dark green, the sashes red, and the inside blinds white. The general effect is charming, just enough brightness about the windows to relieve the general sober colors, and with only the difference in texture between clapboards and shingles to mark the two upper stories. Dark tones for house painting seem to be the rule in Buffalo.

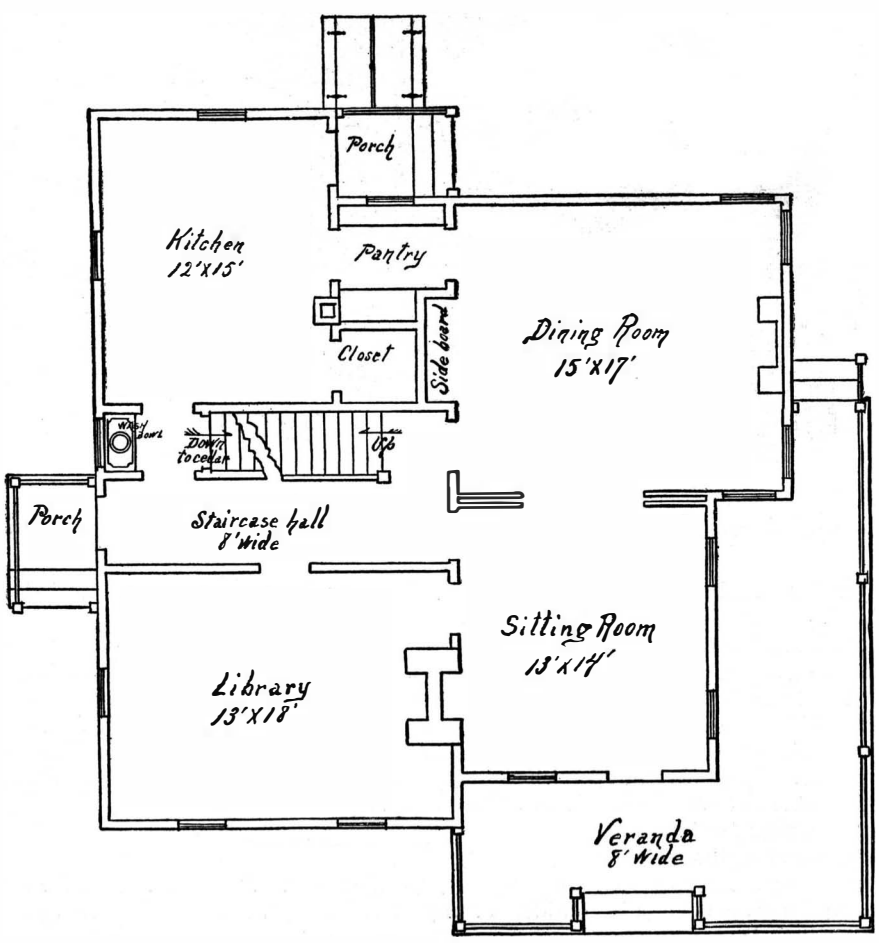



Front Elevation Scale ¼" to the ft.

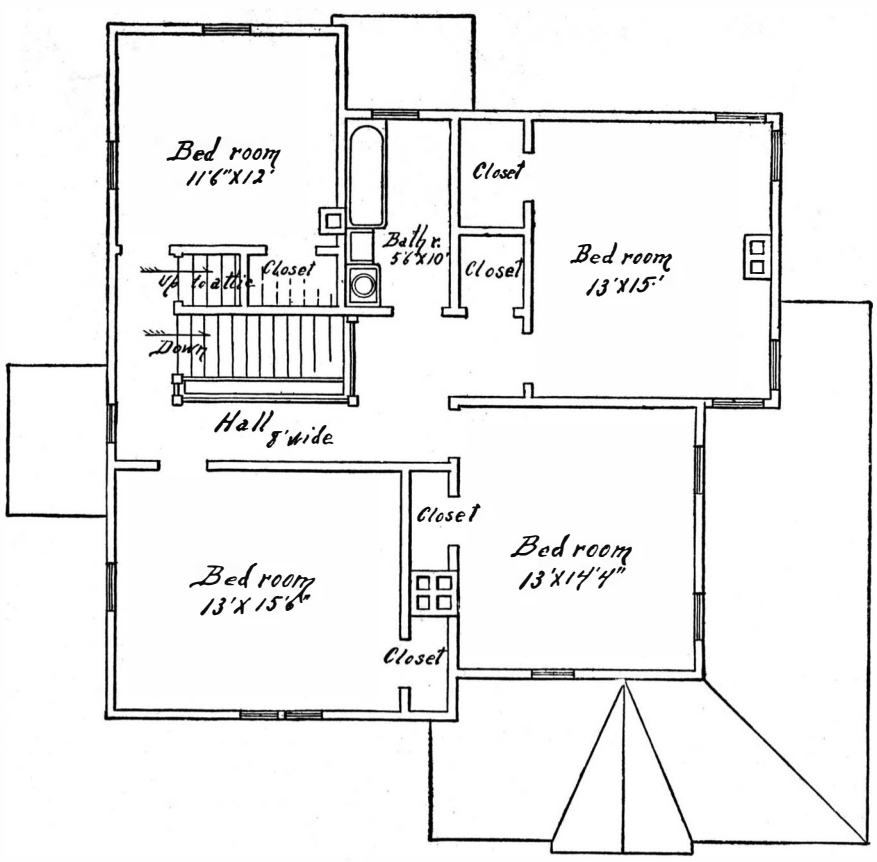



Section


Side Elevation (Right) Scale ¼" to the ft.




First Floor Plan




Second Floor Plan

**AN OHIO DWELLING.**

### Granite.

True granite in its most ordinary form is one of the most easily described and certainly recognized of all rocks. It is a granular, crystalline aggregate of the three minerals feldspar, mica, and quartz. Its name is sometimes said to be derived from its granular structure, but Jameson derives it from "geranites," a term used by Pliny to designate a particular kind of stone. Ordinary granite varies according to the composition of feldspar and mica composing it, according to the relative proportions of those minerals to each other and to the quartz, and according to the size of the crystals and the state of aggregation of the several constituents. The feldspar of granite may be either orthoclase or potash feldspar, frequently flesh colored, but sometimes white; albite or soda feldspar, generally dead white; an intermixture of these two minerals; or, lastly, a feldspar containing both potash and soda, which may be called soda orthoclase or potash albite, as the case may be. Other varieties of feldspar, except, perhaps, in some instances oligoclase, are never found in granite as constituents of the mass. The mica of granite varies greatly in color and luster, being sometimes dark, coppery brown, passing into black, sometimes green, sometimes golden yellow, and sometimes a pure silvery white. Whether its chemical constitution be equally various is, perhaps, hardly yet sufficiently ascertained. The quartz is commonly colorless or white, but sometimes dark gray or brown. The proportions of the three constituents vary indefinitely, with this limitation—that the feldspar is always an essential ingredient, and never forms less than a third, rarely less than half, the mass, and generally a still larger proportion. Sometimes the mica, sometimes the quartz, becomes so minute as to be barely perceptible. The state of aggregation of the mass varies also greatly, some granites being very close and fine grained, others largely and coarsely crystalline. The colors of the rock are generally either red, gray, or white; the first when the feldspar is fresh colored, the latter when it is pure white, the intermediate gray tints depending chiefly on the abundance and color of the mica, but sometimes on that of the quartz. Large and distinct crystals of feldspar sometimes occur disseminated at intervals through the mass, giving the rock a porphyritic texture. It is then called porphyritic granite. Other minerals besides the three mentioned above sometimes occur in granite. Among these are hornblende, actinolite, tourmaline, schorlchlorite, and steatite. When hornblende is abundant in rock, and the mica becomes scarce or altogether disappears, it becomes a syenite.—*J. B. Jukes.*

### DESIGN FOR A BANK BUILDING.

We give the front elevation of the new Third National Bank building at Knoxville, Tenn., built for Mr. Frank McNulty, Baumann Brothers, architects.

The building is constructed of Tennessee marble, has an open timber roof, plate and art stained glass in front, tile floor; interior finish is of oak, fitted with latest improved bank fixtures.

The cost was ten thousand dollars. It is a very attractive and elegant design.

### Brick Dust Cement.

According to a statement of Mr. Miles, a well-known engineer, it is a fact peculiar to Spanish countries that ordinary brick dust, made from hard burned, finely pulverized bricks, and mixed with common lime and sand, is universally and successfully employed as a substitute for hydraulic cement. Mr. Miles says that during an engineering experience of some six years in Cuba, his opportunities were ample for testing its merits, and he found it in all respects superior to the best Rosendale hydraulic cement for culverts, drains, tanks, or cisterns, and even for roofs. In an experiment to test the strength of this product, it was found that a block of it, one-half inch in thickness, without sand, and after an immersion in water for four months, bore, without crushing, crumbling, or splitting, a pressure of fifteen pounds per square inch. It is thought that, by the addition of pulverizing mills to brick yards, to utilize the waste and broken bricks, a profitable manufacture might be carried on.

A BELL, for which the claim is advanced that it is the largest in the world, has just been christened at Berlin by the Archbishop of Cologne, in the presence of the civil and military authorities of the district. It is hung in the cathedral, and is called the "Emperor Bell." It received the name of "Gloriosa" at the christening.

### THE PIETSCH HOUSE TRAP.

We illustrate herewith several views of the sewer gas trap devised by Mr. Herman Pietsch, of 360 Fulton Street, Brooklyn, N. Y., which has lately attracted considerable attention on account of the favorable report upon it made by the Brooklyn health board. The

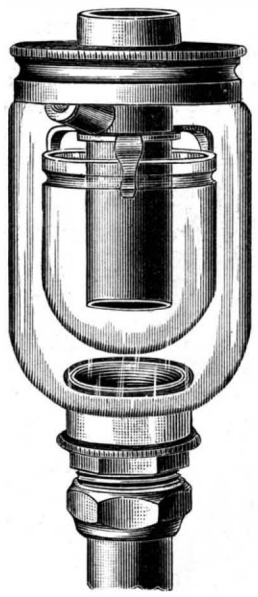


Fig. 1.

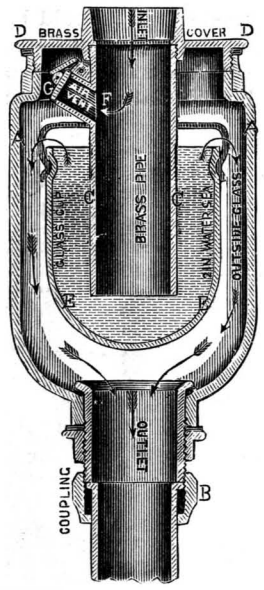



Fig. 2.

Fig. 3.

device has been known and used for several years, and has made a good record for itself in respect to the special claims made for it by the inventor on the score of cleanliness, effectiveness of its sealing quality, and its positive protection against siphoning, which last named is one of the most serious obstacles to the effective operation of sewer traps in general.

Of the cuts, Fig. 1 represents an exterior view and Fig. 2 a vertical section of the trap. It is usually constructed of glass (save the metal cover), so that its condition may be inspected from time to time without the necessity of removing it for that purpose. It is specially designed by the inventor for use in connection with wash basins, bath tubs, kitchen and pantry sinks.

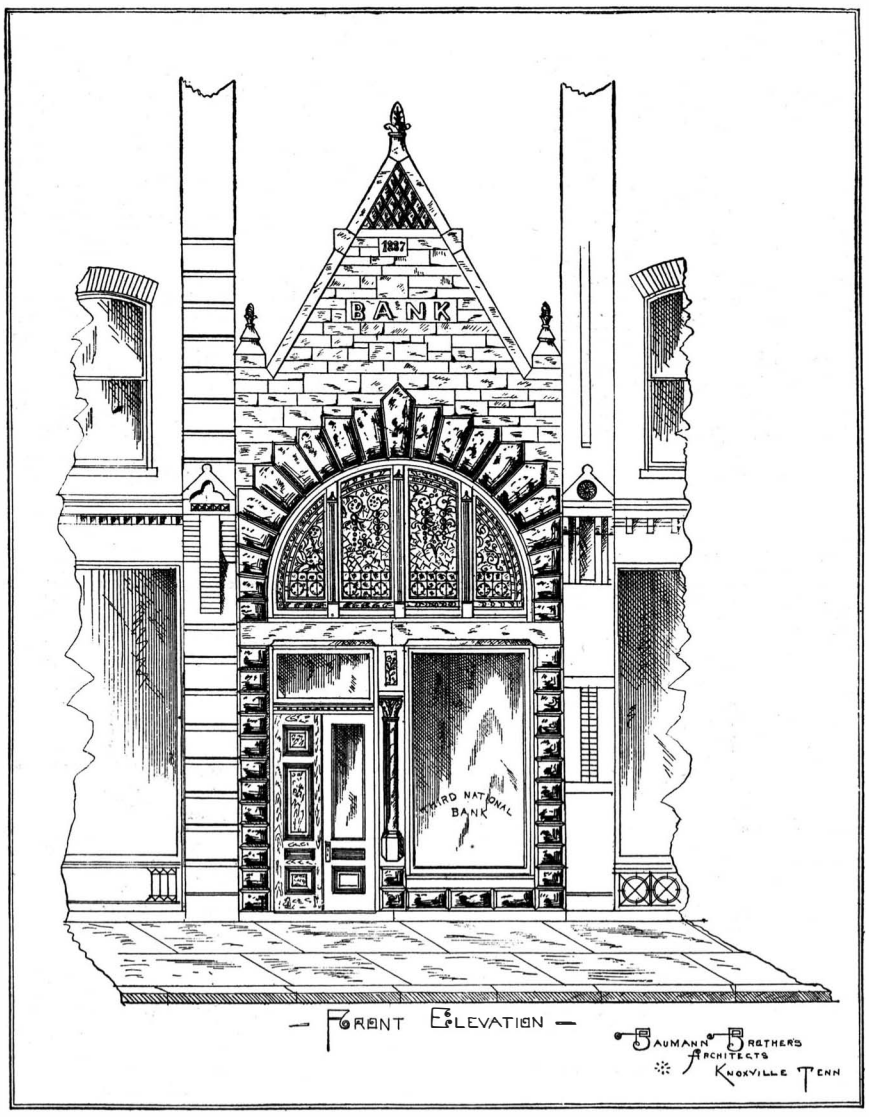
Referring to Fig. 2, the trap will be seen to consist of an outer vessel of cylindrical form, provided above with a brass or metal cap, through the center of which the inlet pipe passes. This inlet pipe is provided with a female screw coupling to screw directly upon the outlet pipes of the wash basin, etc., and provided below with a neck, to which, with the aid of a proper coupling, the outlet pipe leading to the sewer is attached. Inside of the outer cylindrical cup is a smaller one, suspended within it by means of metal clamps, and into which, almost reaching its bottom, the inlet pipe from the fixture to which it is attached is made to project. From the side of this inlet pipe a small tube projects, just above the inner bowl. This is provided with a gate or cover, held in place by a double hinge, operating automatically.

The operation of the device is substantially as follows: The waste water enters the trap through the inlet pipe, discharging itself into the inner cup, overflowing from this into the annular space between the outer and inner vessels, and then passing off through the outlet pipe to the house drain. The course of the waste water is indicated by arrows in the sectional cut, Fig. 2. The shape of the apparatus is such that siphonage will be rendered difficult; but to guard against the possibility of such an accident, the valve in the inlet pipe, before referred to, is provided. So soon as any notable difference of pressure is manifest from the sudden injection of water into another trap on the same line, the hinged cover opens, and air enters, producing an immediate equilibrium of pressure.

Fig. 3 represents a form of the apparatus made of metal, and intended more particularly for use in connection with bath and wash tubs. The body of this variety of trap is of tinned malleable iron, and the arm on top is of brass, working on a swivel, with a lock nut under the cover, whereby the trap can be placed at any desired angle.

The maker presents a large array of claims to excellence for this device, from which we cull the more important: The closeness of the trap to the utensil; the readiness with which it may be removed from the utensil by uncoupling; its cleanliness, derived from its scouring qualities; the small amount of water needed for cleansing; the impossibility of any sewer pressure to force any gas through the water seal, and, as a corollary to this, the impossibility of the loss of the seal by siphonage or evaporation.

The Pietsch trap, as above noted, has been tested lately by the Brooklyn health authorities, who made a very flattering report upon its merits, and, as a consequence, it is now entered on the list of traps which are permitted to be introduced in plumbing work in that city. The judges of the American Institute exhibition likewise awarded it the medal of superiority in the class to which it belongs, for the years 1883, 1884, 1885, and 1886.




DESIGN FOR A BANK BUILDING.

### Excavating in Frozen Ground.

It is often necessary to make excavations for pipes in very cold weather, under which conditions the operation is difficult. The trouble due to frost can only be remedied by thawing out the surface.

The *Elettricita* says that quicklime has been tried with success. The surface where the excavation is to begin is covered with alternate layers of lime and snow. The lime becomes slaked, and heats the soil so effectually that after ten or fifteen hours it can be dug up with the greatest ease, even where the cold is excessive. Where there is no snow, water can be used.

THE Master Builders' Association of Boston have bought the edifice Nos. 164 to 170 Devonshire Street, in which their rooms are located, paying for the same the amount of $250,000. The building is a four-story granite structure. The association proposes to add two or three stories more to its height as soon as the leases now existing expire, and then make it a first-class office building, with opportunity of enlarged accommodations for themselves. The property adjoins the Equitable Life Insurance Company's building, and runs through from Devonshire to Federal Streets, covering 6,662 feet.

### Caen Stone.

The general character given of the Caen stone is that all the beds are of the same quality, and all equally adapted for building purposes; but evidently, from the information which I collected on the spot, and subsequently in London, there are modifications in each bed, as may be reasonably supposed, and as experience teaches us in the quarries of other oolitic stones in Bath and Portland. Various veins traverse the beds in all directions, and have a white appearance. This white substance is equally hard with the stone itself, and if a stone be laid with its bed parallel with the direction of these veins, it is of little consequence, but they, of course, indicate a certain unsoundness or division in that part; and if the stone be laid with this vein in a vertical direction, the block will run the chance of being fractured by a weight, or, if near the surface, it probably may admit the wet. These veins are not like those in the Bath stones, which are hard, consisting of crystallized carbonate of lime, and running always in a vertical or inclined direction, and not liable to separation. In general, it is considered that the blocks of Caen stone may be placed in construction in any direction, except when the white veins are perceptible. It is said that the most experienced eye can hardly detect the different qualities of the stone in the block when once they have been removed from the quarry, as the action of the quarryman's tool on the surface hardly offers any indication, and there is no appreciable difference in the appearance of the granular formation.—*T. L. Donaldson.*

### A COTTAGE AT CAMBRIDGE, MASS.

This cottage is to be erected in Cambridge, Mass., for C. B. Moller, Esq. The designs, which are by Mr. C. H. McClare, architect, Cambridge, Mass., represent a house of modern design, conveniently arranged, which it is estimated can be built for four thousand five hundred dollars.

The vestibule is roomy and convenient, and is an advantage to any house, making it warm in winter and cool in summer. The hall is large, with an alcove window, and is used for a reception room, and is connected with parlor by double sliding doors, and with dining room and kitchen by swing doors.

The parlor and dining room are connected by sliding doors, and each has wood mantels and hard-coal grates. The kitchen is large and convenient, with entrance to dining room through pantry. The second floor is reached by stairs from the hall, and contains four chambers with large closets to each, and large bath room, which is directly over the sink in the kitchen, which keeps the water confined to one corner of the house, thereby saving expense in plumbing. The attic contains two large bedrooms and large closets, and is well lighted.

The foundation is of rough stone, twenty inches thick to grade line and eight inch brick to sill.

The frame is of spruce, sheathed with hemlock boards, overlaid with resin sized paper. The outside finish is of white pine, with spruce siding to belt cornice, and plain shingles above, with cut shingles in front gable. The roofs covered with good sawn shingles stained before laying.

The inside finish on first floor (except kitchen) to be of whitewood, cherry-stained and varnished. The kitchen and chambers to be of pine, painted in lead and oil.

Floors in kitchen and bath room of three inch hard pine (rift grain), all other rooms good quality spruce three to four inch wide.

Outside painting to be as follows: Roof, creosote; front gable, dark yellow; shingles above belt course, raw sienna; siding, dark gray; all exterior cornices and trimmings, dark olive green.

### To Obtain One's Bearings with a Watch.

A correspondent of *La Nature* points out the following simple method of obtaining one's bearings with a watch. Turn your back to the sun, then take out your watch and place the small hand in the direction of the shadow made by your body. Then imagine a line starting from the center of the dial of the watch and passing through midday. The bisectrix of the angle formed by this line and the small hand gives the north.

### LOVE-LIES-BLEEDING.

(AMARANTHUS CAUDATUS GIBBOSUS.)

There are few annuals that give a better return for judicious care and attention than the many members of this highly ornamental genus, and more especially the forms of the kind represented in the accompanying illustration. We rarely see the amaranthuses developed as they should be, and this, we believe, is not so much the fault of the soil or the season as of the grower, who treats these choice annuals the same as others of a hardier nature. A. caudatus and the variety Gibbosus

speciosus, and a few others, if properly treated and allowed to fully develop their stems, are capable of forming pyramids five or six feet in height, hung round with the long, graceful, tail-like racemes of bright-colored stems, flowers, etc. It is waste of time to plant them so many inches apart, as the plants will not have room to develop in such close quarters. When grown in vases or isolated in light, rich soil, the peculiar character of these plants is brought out in a very striking way. They may also be used with good effect in sub-tropical beds, in company with castor oil plants, solanums, wigandias, etc.—*K., the Garden.*



### Wood Carpet.

The manufacture of wood carpet is a developing industry in Chicago. There are but four wood carpet factories in the United States—one in Philadelphia, two in Chicago, and one in Racine, Wis. For several years after parquetry flooring was introduced into the United States, John W. Boughton, of Philadelphia, and L. Benedict, of Chicago, divided the wood carpet business of the entire country between them. Mr. Benedict now has a carpet factory in connection with his basket works at 40 Green Street, between Erie and Chicago Avenue, Chicago. He uses oak, maple and ash largely, though the finer woods, such as walnut, cherry, mahogany, rosewood and ebony, are worked into the finer makes. Of oak alone about 200,000 feet a year is consumed. Ash and maple are next in amount of consumption.

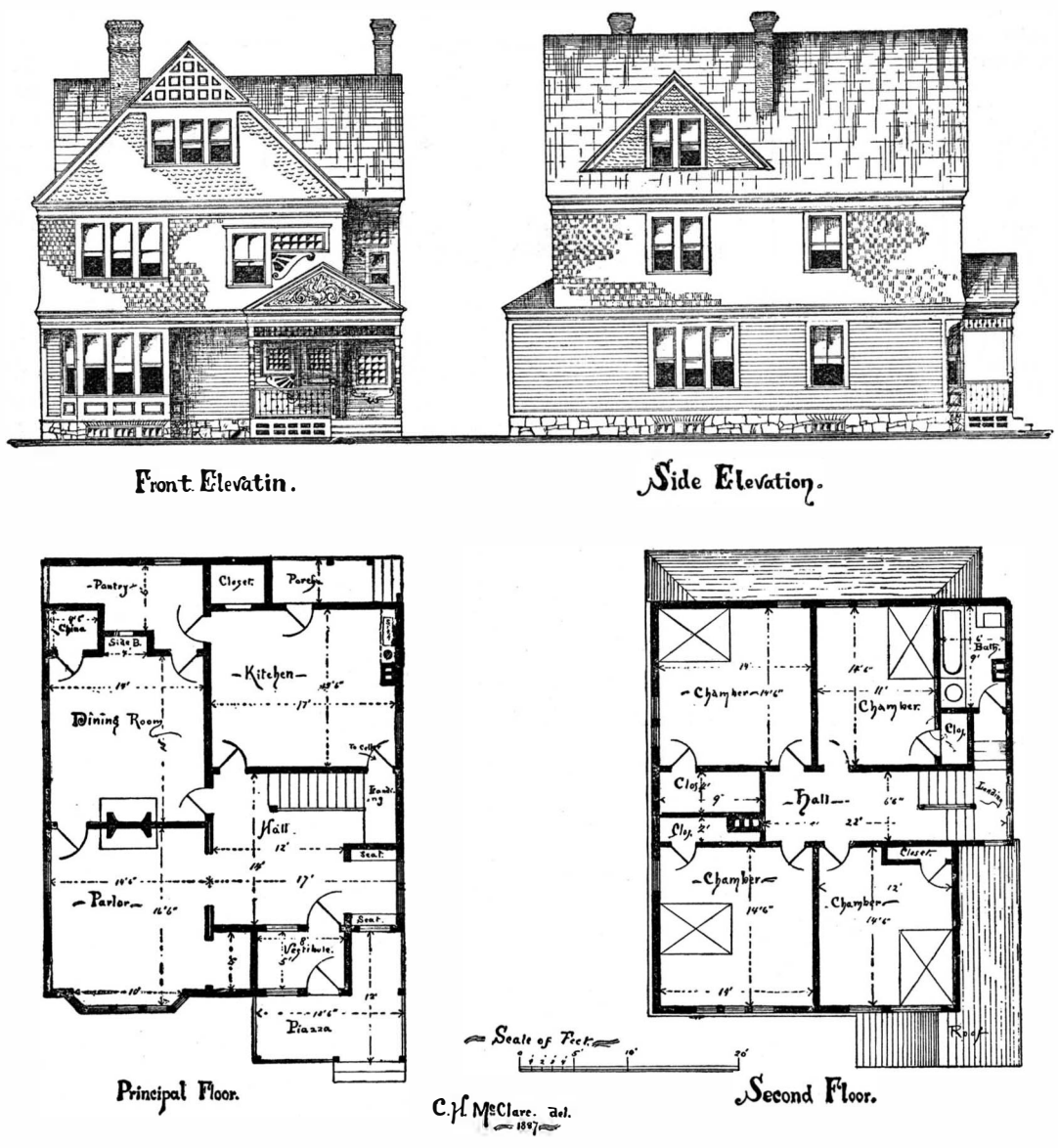
The use of wood carpet is constantly on the increase, and there is scarcely any limit to the prospects for it. This kind of floor covering can be made so as to sell as cheaply as a good quality of ingrain, or it can be so wrought with costly woods as to sell at $1 or more a foot. Good oak, ash, and maple carpet can be sold at between eighty and ninety cents a yard. Finished in oil, it is good enough for any ordinary use. For wainscoting and ceiling it is admirably adapted.

The process of making wood carpet is comparatively simple, though the work must be done with exactitude. Carefully adjusted saws strip the lumber into the desired thickness and width, the latter differing according to the work required. The stuff is then subjected to the saws that cut it out in proper shape for inlaying, to form the fabric and figure of the carpet. This must be done with much particularity, as each of the multiform pieces must exactly fit. The arrangement of the pieces and the gluing of them is done by lads, and looks like slow work, but yards are thus woven with fair celerity. Canvas is glued on one side to give strength to the fabric. The carpet is then subjected to sand paper, and is finally finished with hard oil. The designing of wood carpet is tedious and expensive. Sometimes the manufacturer devises and works out a pattern at great expense, only to find that it does not suit the popular taste, and must be thrown aside. The popularity of woods also fluctuates, as it does in interior finish. Plain white oak carpet is now very salable, because it is cheap, finishes well, and is of lasting quality.—*N. W. Lumberman.*

### The Chimney Top.

A long experience in burning wood fuel in both heating and cooking stoves has brought out a danger point in its combustion that may throw light on some of the unexplained fires that from time to time occur in both city and country, and especially in the country. Being much annoyed by rain running down inside the flue, writes "Observer" in the St. Louis *Miller*, I procured a sheet iron cap for one flue and a fire clay T cap for the other. After that time I was every now and then troubled with the flues being on fire, and in several instances the roof took fire outside. After a long experience of this kind the iron cap was removed, and no fires have been in that flue or on the roof of that building.

This led to a close watch over the other building, which had the stove pipe enter into a fire clay pipe flue of six feet, ending in a T top on the outside. The fire clay flue rises through an attic. The frequency of fires led to a very careful examination into all the associated conditions. Thus I find that the colder the weather is, there is not only increased conbustion, but increased condensation of the elements of the wood carried up in the smoke, and, striking against the top cap, is retarded in its emission, and water and a tarry substance containing an inflammable oil is thrown back down the flue, and gathers on the top and around the openings of the top, often dropping on the roof. This substance is easily ignited, and the flue, the top, and the matter on the roof all burn with great force, and is a source of great and constant danger. I have tried burning zinc, sulphur, salts, etc., but all fail. Direct draught, no obstruction by caps, and frequent cleanings are the only preventives of the danger. The soot, of itself, has little or no inflammability.—*Fireman's Herald.*




A COTTAGE AT CAMBRIDGE, MASS.

### AN AMERICAN COTTAGE IN LONDON.

Among the notable attractions of the American Exhibition now open in London is a shingled cottage, of which we give a drawing from the London *Building News*.

Those of our readers who remember the various examples of English country dwellings we have published will readily understand how very novel and peculiar the American cottage must appear to the British eye. But it is satisfactory to know that our English cousins seem to approve the building, and its erection in London is likely to have beneficial results

The cottage shown can be built here for about $4,500.

### Industries and Handicrafts in Central Africa.

Handicrafts and domestic industries are neither numerous nor noteworthy in this part of the globe, yet a few deserve mention.

The upper Nile boats are curious specimens of naval architecture. They have no ribs, but the planks are laid one on another, and large nails are driven diagonally from both sides. They are calked with rags from the inside, and the seams are not payed with pitch; hence many leaks occur through rats pulling out the rags.

The only agricultural implement in the Bari country is a sort of shoe, shaped exactly like the ace of spades, fixed to a handle about 9 ft. long; this is pushed before the culturist as he walks, cutting the roots of the grass, and just scuffling the surface of the ground. The Fatiko hoe is similar to that used in the Bari country, but instead of being mounted in the same way, it is fixed to a short handle in such a manner that the hoe is nearly at right angles with the handle. This makes a very powerful instrument, digging into the soil for considerable depth.

In the Cazembe's country the people play on a kind of rude piano, call *marimba*.

Throughout Usmao the baobab (*Adansonia digitata*) flourishes remarkably. From its bark the people make very strong, pliable rope. In Ugara some of the streams are spanned by grass bridges, called *usisa*.

Palm oil is largely prepared in Uguha; and in localities producing china clay there are large pottery works. Rua and Manyuema turn out artistic ironwork and the famous grass or palm fiber cloth. Cotton cloth is also made at several places, and various woods and barks are utilized for particular purposes—one kind for canoes, another for spear shafts, a third for mortars, a fourth for pestles. Matting and baskets of many kinds, wooden bowls, dishes, and drums, are largely manufactured. There are also blacksmiths and coppersmiths, but most of their metal wares are procured from the Warua. They have a species of cymbal imported from this tribe, made of iron, in the shape of the letter U, and sounded by a piece of stick with a head of India-rubber.

The weapons of the Masai are spears (*omberi*), shields (*elongo*), swords (*ollalem*), clubs (*ologuma*), bows and arrows (*oluiandai, orseiyet, ombaia*), and knives (*ossirere*). They cut their own clubs from the roots of hard trees. The shield is made of ox skin, of oval shape, about 4 ft. 6 in. long, and 2 ft. wide in the middle. The hoes are made of "ebony." Formerly their spears and swords were made of hard wood, but now they import metal heads from their neighbors, to whom they are also indebted for the small metallic ornaments worn by the women, having no iron in their country, and no knowledge of working it. Their spear blades are 18 in. long and 5 in. or 6 in. wide.

In Mambwe's country, on Lake Tanganyika, much iron ore is smelted. The kilns are larger than those used by the Ajawa and Manganja. They stand about 9 ft. high, and are ft. in diameter at the base and 3 ft. at the top, and are built of clay plaster 4 in. to 6 in. thick. They will contain nearly half a ton of iron ore. Charcoal is used for smelting.

The Walunga are not behind other lake tribes in their industries. Excellent pottery, as well as baskets, is made in the country, and their millstones are built into a sort of solid table in one piece, with a pit or receptacle for the meal. Cotton cloth, too, is made in almost every village.

In Kairrondo the spears are long, and have short blades. The shields are made of buffalo hide, and are about 5 ft. high and 3 ft. wide. Neither swords nor knives are in use. The natives navigate the lake (Victoria Nyanza), their boats being made of planks sewn or pegged together, and sometimes provided with a sail made of *basuti*, a colored stuff imported from the coast.

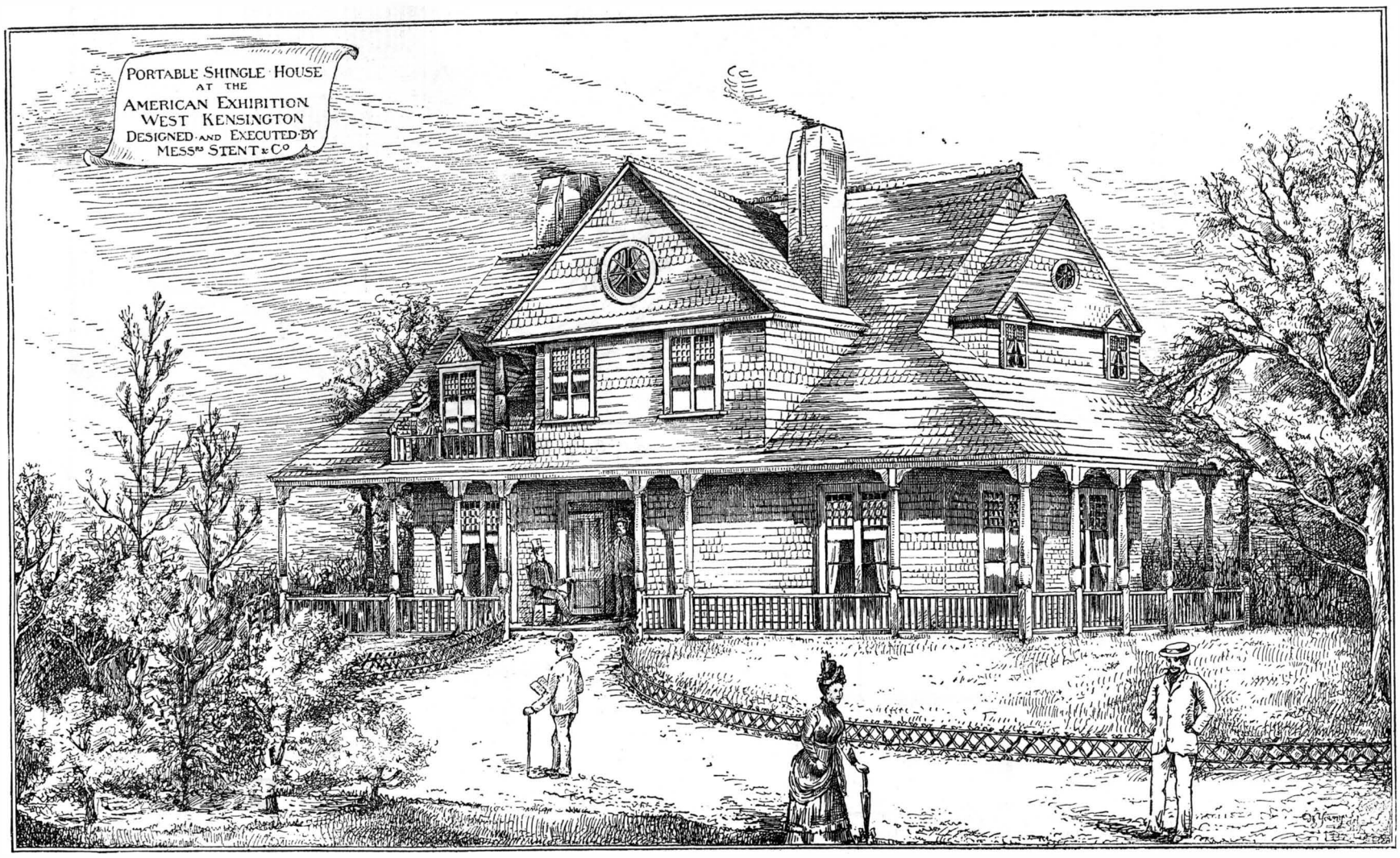
There are blacksmiths in Ukara who manufacture hoes, axes, and spears. Cooking pots of clay and wickerwork baskets are likewise produced.

The Waganda are celebrated for their basket-work. Baskets are even used as vessels to drink from, one great shallow basket being the family drinking cup. From the inner tissue of banana stems they make napkins and pocket handkerchiefs.

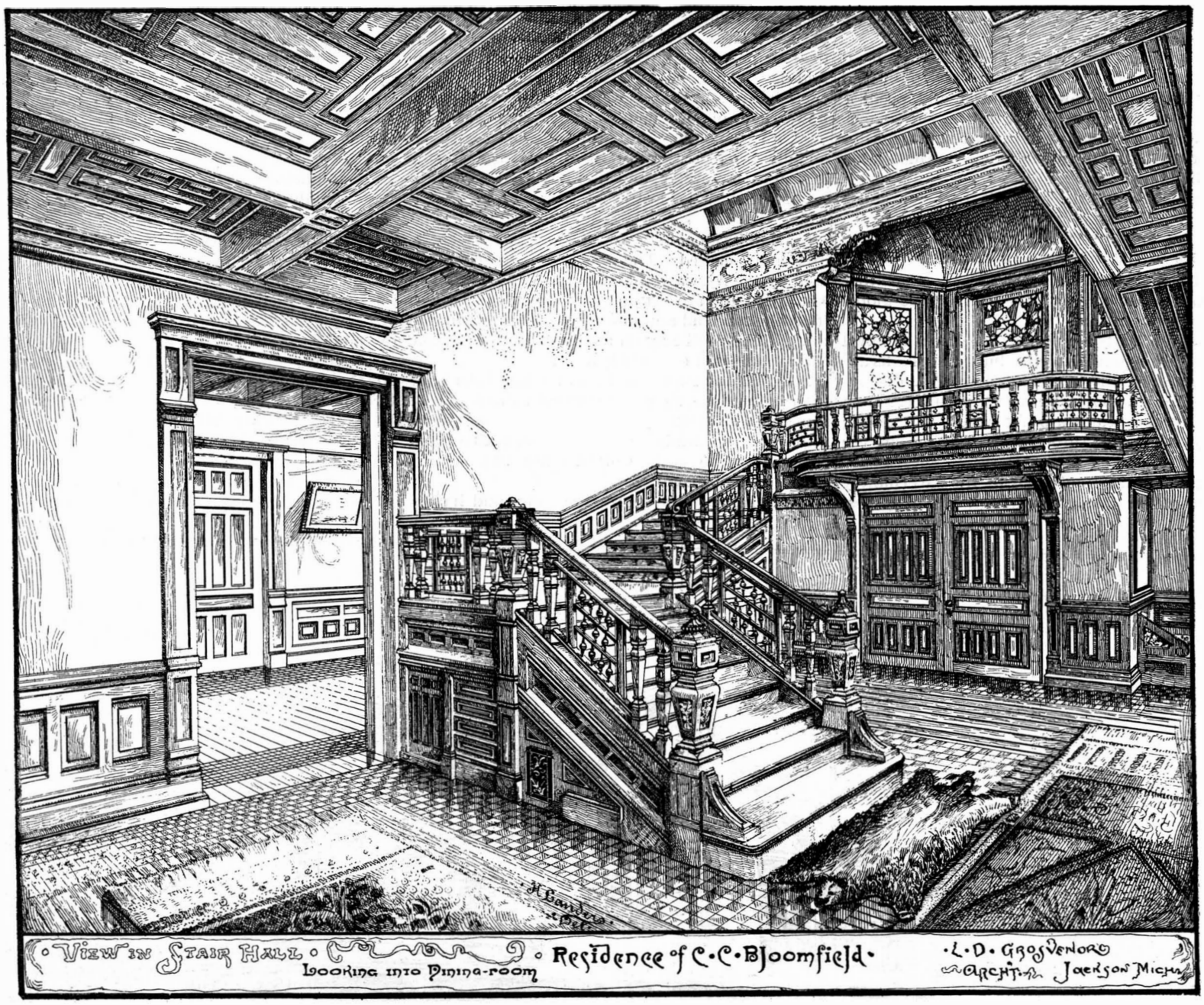
The granaries of some tribes on Lake Tanganyika deserve notice. They are built on posts, with floors raised about 3 ft. from the ground, 4 ft. to 12 ft. in diameter, and the largest 20 ft. high, without including the roof. Those for old corn are plastered over, and have a small hole under the eaves for access, which is reached by a notched trunk used as a ladder. Those for fresh corn are made of 11 ft. canes about 2 in. apart, with hoops of the same material every 2 ft. or 3 ft., thus allowing the air to pass through freely.

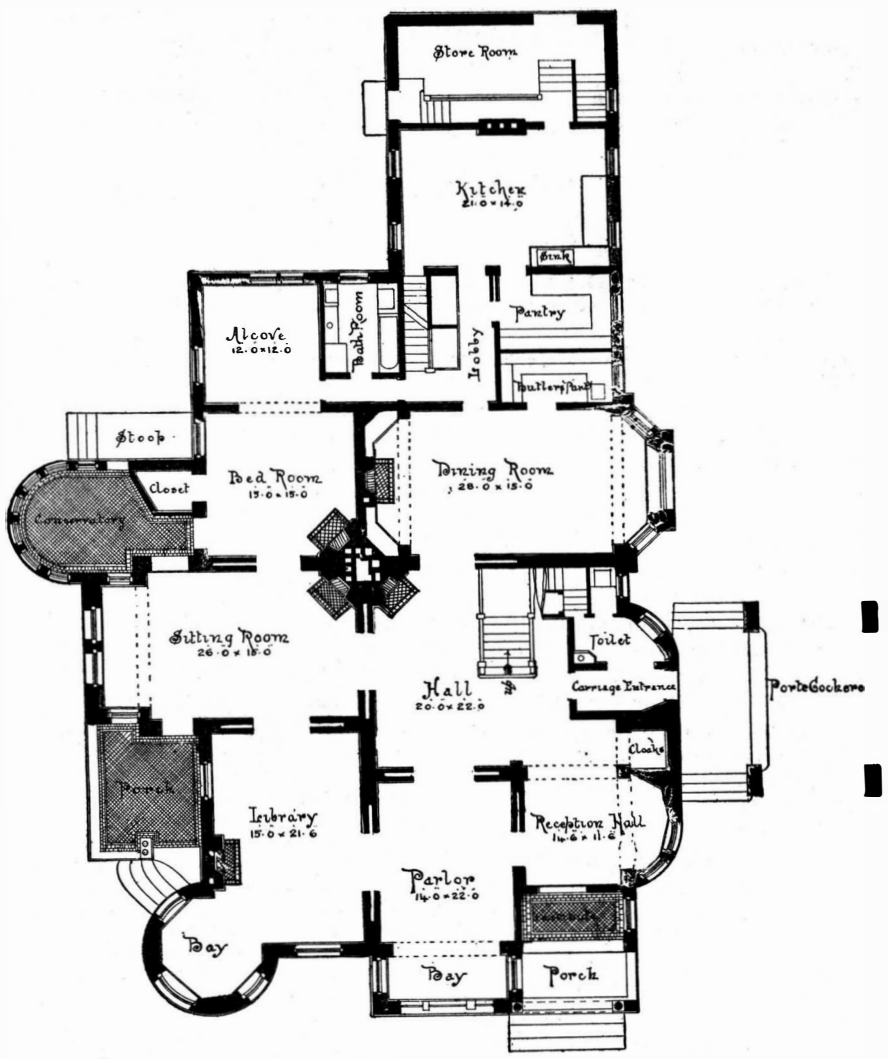
The fictile arts in the neighborhood of Tanganyika have reached a high stage of development. The process adopted is as follows: First, rough clay and water for one pot are beaten with a pestle like that used for corn, till they form a perfectly homogeneous mass. This is put on a flat stone, or in the bottom of another pot, and hollowed in the center by a slap of the hand. The workman (or rather woman) then shapes the vessel roughly by the hands kept constantly wet, smooths out the finger marks with a corn cob, polishes it all over with bits of gourd and flat wood, and ornaments it with a sharp pointed stick. After drying for four or five hours in a shady place, it is stiff enough to receive the bottom, which is worked in from another piece of clay. A pot capable of holding two and a half to three gallons occupies about forty-five minutes in manufacture. The shapes are very graceful and true, reminding one of the Pompeian amphora. The vessels are used for holding palm oil.

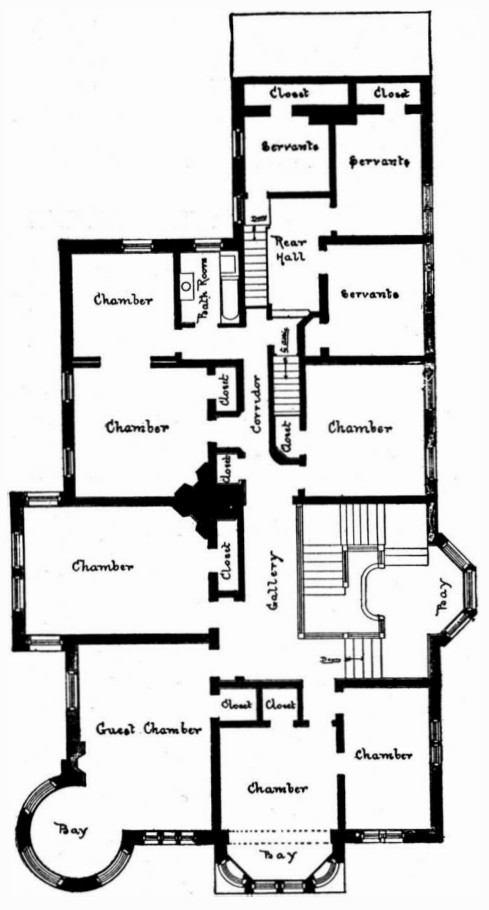
On the road between Dar es Salaam and the Nyassa country rubber vines abound, and, apparently, are but little affected, except in the immediate neighborhood of the villages, by the reckless mode of tapping employed. In many parts a native can still gather three pounds of rubber daily. Another staple of the district is copal, which is found in many parts. It seems that this fossil resin exists, even in the richest diggings, only in patches, as though it had been produced by isolated trees. The natives appear nowhere to work the country systematically, but to sink test holes, and, on finding traces of the resin in any part, to work that thoroughly. The resin now found underground, usually in red, sandy soil, is undoubtedly the produce of the same species of tree as still exists in these jungles, which now yields an inferior sort of resin; the difference between the two being the consequence of age and a chemical or molecular change effected by time. The copal tree grows throughout the Uzamaro country, and is by no means confined to the sea coast, but is even more abundant inland, beyond the first coast ridge, not, however, after the limestone formations appear.



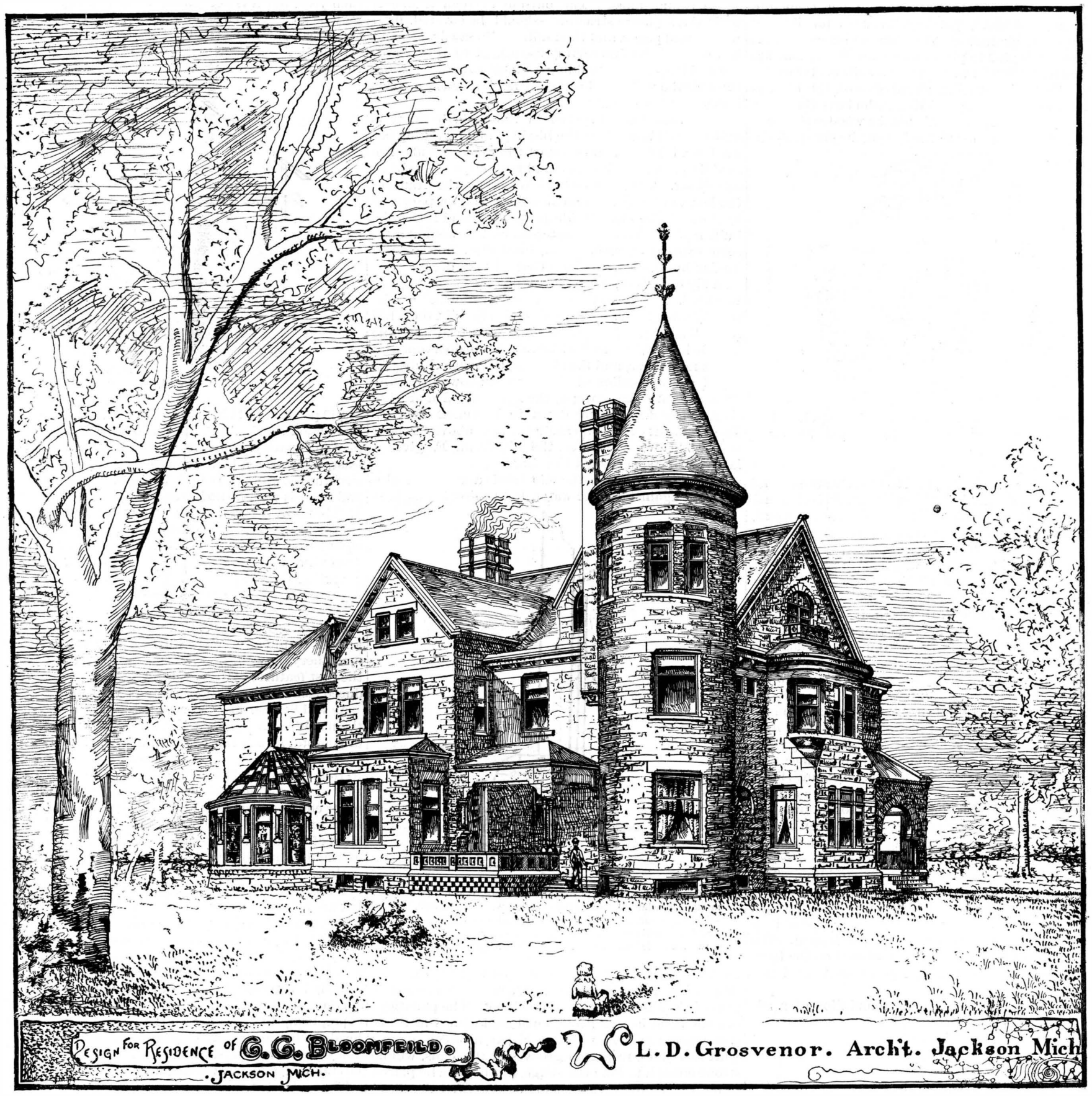

THE YANKEE COTTAGE NOW AT THE AMERICAN EXHIBITION, LONDON.




**RESIDENCE OF C. C. BLOOMFIELD, ESQ., JACKSON, MICH.**




### Winter Palaces.

Dr. B. W. Richardson, in a recent number of the *Asclepiad*, advocates the establishment of a series of winter palaces of health. Dr. Richardson's proposal is to erect in suitable localities a series of palatial residences of quadrangular form inclosing a large area of ground, covered in with glass, and filled with playgrounds tennis courts, sub-tropical gardens, and everything that can contribute to health and recreation of invalids who require protection from inclement seasons. The author sketches out one of these palaces of health on a certain scale. Fifty substantially built residences of two stories, to surround a square inclosure or gardens, accessible by four grand entrances. The two stories or flats would form one hundred residences, each 60 feet deep, 25 feet wide, and fitted with every convenience for the invalid, every room to be maintained at an equable temperature. Four galleries or terraces would be formed on the roofs, covered by glass, and laid out in flower beds, each gallery 20 yards in width and 100 yards in length, making a promenade of a quarter of a mile. The inclosure would be also covered by a roof of glass forming an inner garden, resembling the Crystal Palace. A library, reading room, concert room, theater, gymnasium, and baths would complete the idea, making it possible for the most delicate invalid to spend the severest winter months within its precincts. The suggestion of the palace of health or winter palace has been noticed with approval by the *Lancet*, which regards it as a "practicable idea," affording good work for the medical profession and encouraging native labor. The idea of Dr. Richardson has occurred to others, and has found partial embodiments in our winter gardens. The suggestion to inclose an area of park-like land, with residences on the flat system, is a vast improvement upon our hospital plan with its cooped-up yards and inter-pavilion spaces. That a large area of ground can be covered with iron and glass, and rendered equable in temperature during the winter months, and genial to the senses, has already been proved by the aerial fabric reared on the Surrey hills at Sydenham, which for more than thirty years has given pleasure to millions. The temperature maintained under this great glass roof is remarkable even in severe weather, as may be gathered by the gigantic ferns and palms that luxuriate at the tropical end of the palace. This building then affords a unique instance of an articulated structure of iron and glass that has withstood atmospheric influence in an exposed situation, and which in its proportions, grouping, and outline, despite adverse criticism, is a picturesque object in the landscape. Two of the primary conditions of health are light and sunshine, and if these elements can be abundantly provided with as little obstruction as possible, one of the great problems in the maintenance of health and vigor will be solved, and we shall have removed one of the chief difficulties in the construction of dwellings of the hospital class.—*Building News.*

[Rural New-Yorker.]

## SILO BUILDING.

The silo experience of the past three years has been marked by somewhat radical changes, not only in cutting and storing the crop, but in the structure of the silo. The demand has been for a cheap silo, "a poor man's" silo, and as a result the wooden silo has come into use as a makeshift, possibly, between no silo and one of durable character. The stone or concrete silo is a structure adapted to places where sand and stone are dirt cheap; while the wooden silo is suitable for everywhere. The only question about silos of this kind is how long will they last; and those who have them say, "We have not yet found out." That a wooden silo must be a popular form arises not only from its cheapness in

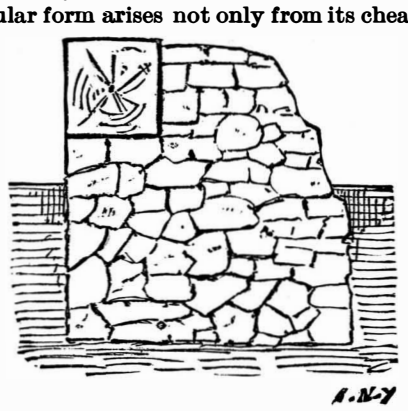


Fig. 1.

building, but from the ease with which it can be built, and its adaptation to all sections of country where stones are at a premium.

While the wooden silo may be quickly built, it must at the same time be strong, and to that end the up and down studding should be not less than 2×10 inch stuff. When the silo is being filled the lateral pressure is great, and the studding should be put not over 16 inches apart, especially if the silo has a depth of 16 feet, which is now the general rule. The frame of this structure may be wholly of 2×8 or 10 inch stuff, or it may have six or eight inch square sills, and frame bents of square six or eight inch timber, filling in between them with studding, firmly fastening them to the sills and plates.

It is always best to have the bottom of the silage pit—the floor—on solid earth, and so a good way is to build a low stone wall, firmly bedding the sill into the inside face, as at Fig. 1.

It must be borne in mind that the silo must be made air and water tight, and so this wall may be filled in so that the bottom or the floor of the silo shall come above the surface, or it may have a grout surface. As a usual thing, the soil itself makes a good enough floor. All it needs is to be pounded down firmly, come up a few inches on the inside lining of the silo, so that the air cannot work under. This is readily seen in the illustration, Fig. 2, which also shows the method of lining the silo with tarred paper and two thicknesses of inch boards nailed to a 2×10 inch studding. This makes a solid air and frost proof wall, and is easily constructed, and will last for at least several years. The first lining of boards is of rough lumber, and it is then papered with tarred board, well lapped. The second lining of boards should be surfaced on the front face, and put on with a half lap, as seen, and this makes an air-proof wall.

As it is very necessary that the foundation of a silo

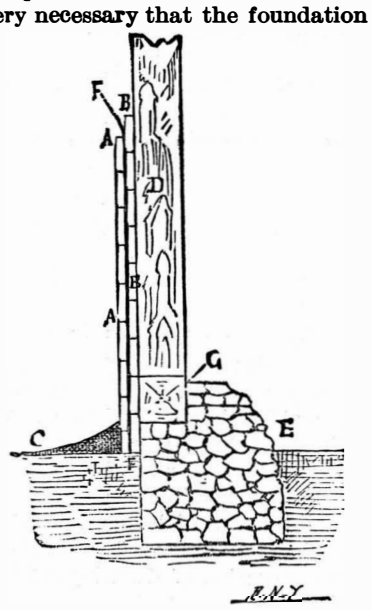



Fig. 2.

D, 2×10 inch studding, toe-nailed to sill, G. E, stone wall. G, sill bedded into wall. A and B, lining of the silo of inch boards. F, tarred paper between them. C, bottom of silo, coming up on the sides against lining board, A.

shall not spread, the method seen in Fig. 3 shows another excellent way, and the illustration plainly tells the manner of construction.

The matter of the frame settled the way of making the wall air-tight and durable is to be considered; and as good a plan for a cheap silo, and one which promises greater durability than boards or paper, is to dispense with the inside lining board, A, Fig. 2, and also the paper, and to lath and plaster the silo. The walls are first stripped up with lath on the board, B, about 16 inches apart and are then lathed in the regular way, and plastered with water lime cement, instead of white lime mortar, and smoothed up. This makes a cheap but durable wall, and one which the moisture of the silage cannot affect. The outside of such a silo—if built as a separate structure—should be covered, first, with tarred paper, and then siding. No sawdust should be used, as it is of no earthly use except to draw moisture and help rot the building. Silage cannot be frozen through the walls, and certainly not if a dead air space is made as described.

When room can be spared in the main barn, it is quite as well to sacrifice the big bay, and by taking out the floor, let the silo frame start from the ground. The studding can then be much lighter, but need to be as closely set. They can be backed against the frame of the barn, and will need no outside ceiling or paper, as the barn itself is its outside protection, and it may be built as described, or plastered, and I would, after some experience, recommend the latter, unless some kind of lumber can be found that will not decay.

In my own barn, which has a basement, the big bay was used. This gives me silos 18 feet deep, which can be readily filled from above, as the barn is built on a hill side. The doors of the silos open into the feeding stable from below. While feeding from the top, doors open on to the main floor, and the silage falls down a chute. At Fig. 4 a cross section of the barn is shown: *a* is the driveway into the barn; *b*, the floor; *c* and *d* are the silos, 16 feet deep, going down to basement floor, E. The doors out of the silo are seen, two above the floor and two below. A floor on the big beam, F, gives a large storing space above the silos.

If built out of doors, the silo needs a roof and also drainage against surface water, but protection against

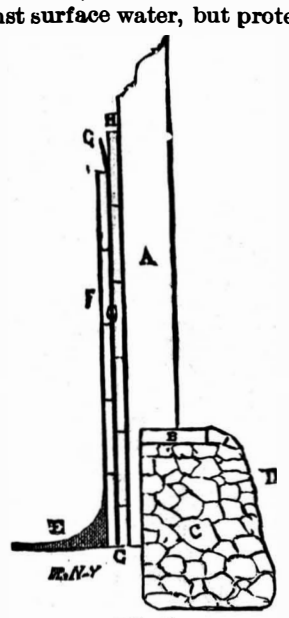



Fig. 3.

A, 2×10 inch studding cut with shoulder to fit wall. B, plank bedded into mortar into which to toe-nail the studding, A. C, stone wall. D, outside bank of earth. E, floor of silo of pounded clay or concrete mortar. F, inside lining of silo, inch lumber, surfaced. G, tarred paper, between double lining. H, inside lining of rough inch lumber.

frost is not needed, as a mass of from 50 to 400 tons of silage at 80° is its own protection, a fact that was amply proved in Wisconsin the past winter. The partitions in a silo must be well made, but I am inclined to think that where the silo is not over 14 feet in width, planks with two edges, resting in grooves at the ends, will be strong enough to hold the silage, for they can be placed in position as the silage is being cut in. After the silage has settled and becomes matted together, there would not be pressure enough to throw them over as our silo or pit is being fed out. When pit No. 2 is being fed out, the partition can be taken down a plank at a time. If this is not thought sufficient, then a row of 2×4 inch scantling can be set up with tarred paper on each side, over which siding can be put, leaving an air space between, and making a durable separation. A doorway can be cut through, and instead of doors, strips of boards can be put crosswise on both sides of the doorway as the filling progresses, and can be as easily removed when the feeding takes place.

The matter of preservation of the woodwork is of much importance. When the studdings go down to the ground, it is best to fill in between them to the depth of a foot or more with concrete made of four or five parts of sand to one of cement. This, if made thin, will act as a preservative of the wood, and exclude moisture. The facing of the silo can be either painted with a heavy coat of ironclad paint, a wash of two parts of kerosene and one of linseed oil, or a paste made of water lime cement put on with a whitewash brush—as many coats as the owner may desire. The second season, while the silo stands empty, there will be a considerable shrinkage of the inside boards, which the cement will tightly close.

It has been suggested that the wooden frame and an inside lining of boards, and then a course of hard brick up the interior, and over this a coat of cement, will be the coming silo, and with readily available lumber it could probably be built for about $1 per ton of storage capacity. I have in mind one silo that was built as described on 2×10 inch studding, and lined up with one thickness of boards. On this was put tarred paper, well lapped, and the silo was then filled, and the silage kept finely. Of course, the paper must be renewed each year, but it is not out of season to say that this may be a desirable inside lining for the silo, and on a small scale might be tried.

As Maj. Alvord has said, "Silos may be built with the usual building material, and may cost from 10 cents

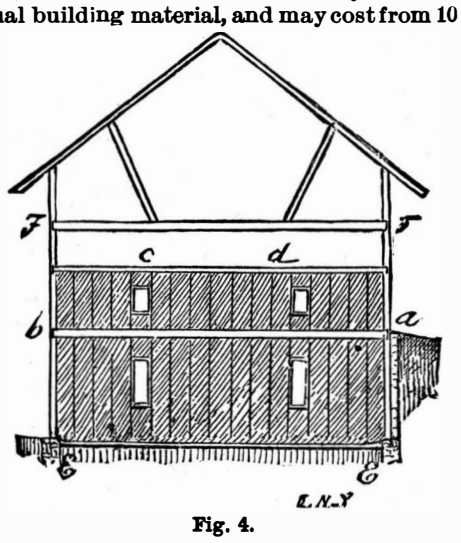



Fig. 4.

to $10 per ton, but cheaply built silos have been found to do good service." A No. 1 silo may be built for $1 per ton capacity, and will be found, for a few years at least, to answer all the requirements of a solid stone structure costing away up into the hundreds of dollars, and for this we have no less authority than Prof. Henry, of Wisconsin, who says about stone silos, "Don't build stone silos under any circumstances. Air gets to silage right through stone walls. Build of wood, with a good dead air space"

John Gould.

Portage Co., Ohio.

## PEDESTAL TENONER.

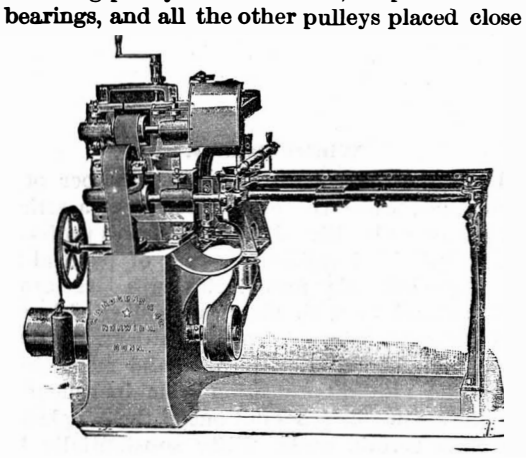
Messrs. C. B. Rogers & Co., of Norwich, Conn., the well known manufacturers of all kinds of wood-working machinery, have in this new machine embodied all of the best features of former styles of tenoners, and introduced some new and thoroughly practical ideas.

As will be seen in the cut, all the working parts of the machine are supported on a heavy iron frame, cast in pedestal form, and to which, at either side, are attached the boxes for the main countershaft. Attached to this column, and cast with it, is an arm with V track that supports one end of the carriage or table, the other end being supported by a smooth way attached to an extension of the foot or base. With this arrangement of the way the operator is enabled to follow the carriage right up, until the work has passed the cope cutters.

The cutter heads with straight cutters set for a draw cut are attached to heavy steel spindles, running in self-oiling connected boxes, to which are also hung the cope heads, the whole being gibbed to the upright.

By an ingenious arrangement, the heads are raised and lowered independently of each other, or may be adjusted together to any desired height above the carriage without altering their relative positions. The copes, being hung on the same yoke with the tenoning heads, when once set, require no further attention. They are, however, provided with both horizontal and lateral independent adjustment.

The pulleys on the cutter head spindles, as well as the main driving pulley on the counter, are placed between the bearings, and all the other pulleys placed close to



the bearings, adding much to the stability and capacity of the machine.

The arrangement of this machine is such that every necessary adjustment may be made from the operator's position in front of the carriage.

This tenoner is furnished with double head to work tenon six inches long at one cut, or single heads to cut three inches, and with one or two copes as desired.

We would advise any one desiring wood-working machinery to send for one of the new and very complete catalogues issued by this firm, which they will be glad to forward to any address.

### STABLES WITH HORIZONTAL FLOORS.

The construction of our stables or stalls for the accommodation of our large domestic animals is not always such as it should be. To prevent the saturation of the flooring and the decomposition of the bedding, it has been the custom for a long time to pave the floor itself and to give to this pavement a certain inclination to accelerate the flow of water. According to this system, the pavements in the stalls often show an inclination of from three to six centimeters per meter, and often even more than this. It is to this fault that must be attributed the malformation of our cattle, the irregularity in the members, the weakness in the joints, the rapid deterioration of the limbs, and the general degradation of the race. The permanent dampness of the bedding affects the soundness of the feet of horses. The ammoniacal gases with which the atmosphere is saturated affects the eyesight and the respiratory organs. Fig. 3 offers a striking example of the sad effects pointed out. This represents a cavalry officer's charger of good breeding, but "over at the knees" and low at the withers, that is to say, deformed, and this, too, brought about by the inclination in the floor of the stable in which he was reared.

The problem of how properly to construct the floors of stables and stalls has fortunately been solved by Col. Basserie, a former member of the first committee on steeds. This system consists in an apparatus for drainage made of cast kennel stone, and sunk in the floor in a cement which is impervious to liquid. The drain is formed by being sunk under the surface, and having sides of kennel stone and a cast cover or lid. This cover has a slight longitudinal concavity smaller than the size of the shoe of the smallest horse, and having, furthermore, a series of apertures at the lowest point, made as small as possible, to enable the free flow of the water, and still made of such a size as not to catch or retain in any possible way the heel of the shoe. This type of strainer enables the liquid to flow into the drain, which can be readily cleaned, as the cover, being hinged, is readily removable. The separate drains of each stall connect with a main drain which passes along the end of the stalls, and this connects with a receiving cistern. Such, briefly, is the type of the stable Basserie.

The advantages are very evident. Fig. 3, we have seen, shows an animal badly put up. Fig. 1 represents the same officer on another horse, which, although no better bred than the other, still shows much better traits, in that he was put on a horizontal floor before his growth was completed. The difference between the two types is very striking.

Already applied in over forty departments in France, the Basserie system is very highly thought of. Fig. 2 represents the interior of a stable having a horizontal floor and hygienic drainage, built according to this system at Mans, for the section general of the fourth corps of the army. A similar system should be adopted in all our cavalry stables.—*L'Illustration.*

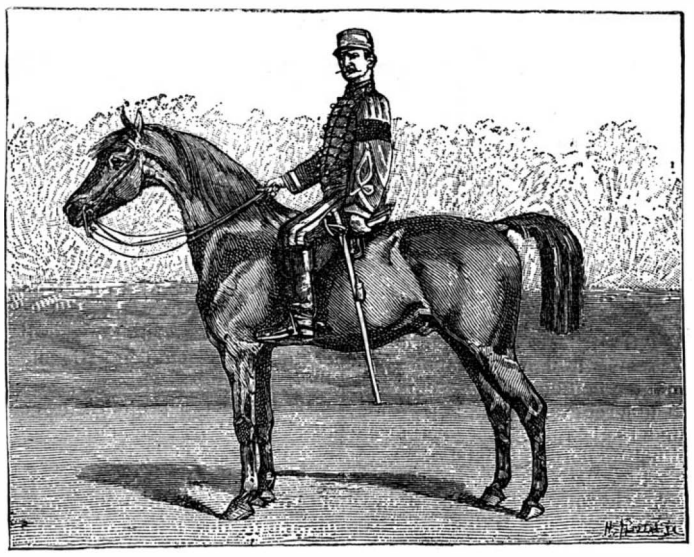


Fig. 1.—A HORSE IN GOOD CONDITION.

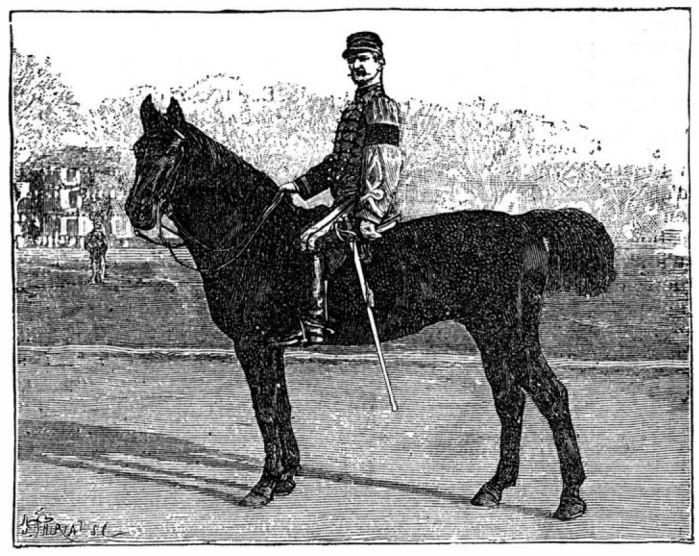


Fig. 3.—BAD EFFECTS OF INCLINED FLOORS.

### The Pyramids.

One of the leading granite men of the country, who has made a personal inspection of the pyramids of Egypt, says:

"There were blocks of stone in the pyramids which weigh three or four times as much as the obelisk. I saw a stone whose estimated weight was 880 tons. The builders of the pyramids counted human labor lightly. They had great masses of subjects upon whom to draw, and most of their work was done by sheer manual labor and force.

"There are stones in the pyramids thirty feet long which fit so closely together that you may run a penknife over the surface without discovering the break between them. They are not laid with mortar either. There is no machinery so perfect that it will make two surfaces thirty feet in length which will meet together in unison as these stones in the pyramids meet. They were undoubtedly rubbed back and forth upon each other until the surfaces were assimilated to each other."

### Moulders' Sand.

The region around Albany, N. Y., furnishes the largest part of the moulding sand used in the United States. It is found in deposits from one and one-half to two and one-half feet deep, for four or five miles back from the river on the west side of the Hudson, as far south as Coxsackie, and on both sides of the Mohawk up as far as Schenectady. There are three grades, brass and stove castings using the finest, and bridge girders etc., the coarsest. Along the Mohawk it is shipped in bulk in cars, elsewhere mostly in canal boats and schooners; $500 per acre is often paid for the privilege of taking the sand from the land. In dry seasons it can be dug and shipped at once, but its quality is better when it is piled up and left over one winter.

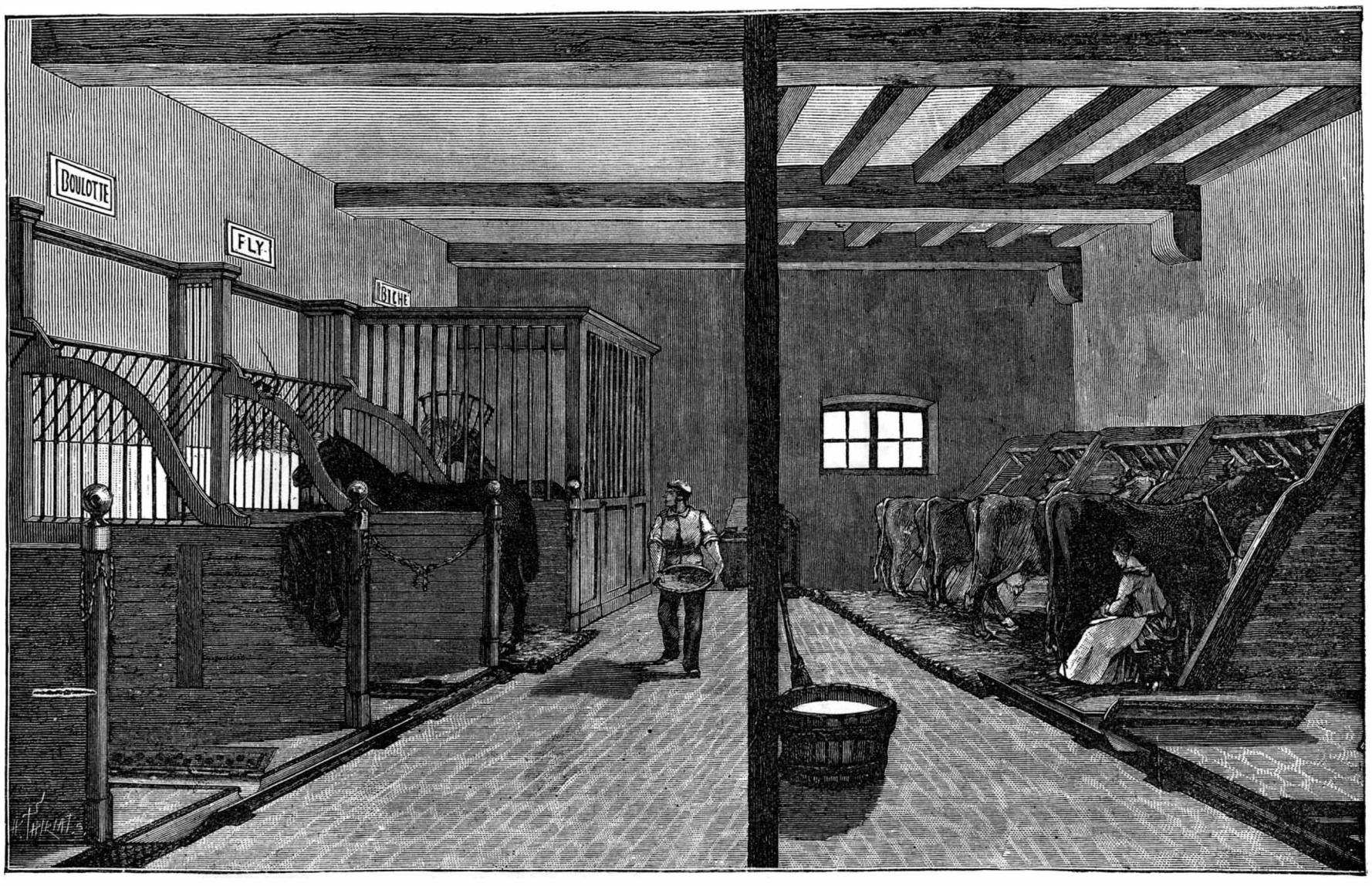



Fig. 2.—STABLE WITH HORIZONTAL FLOORS AND HYGIENIC DRAINAGE.

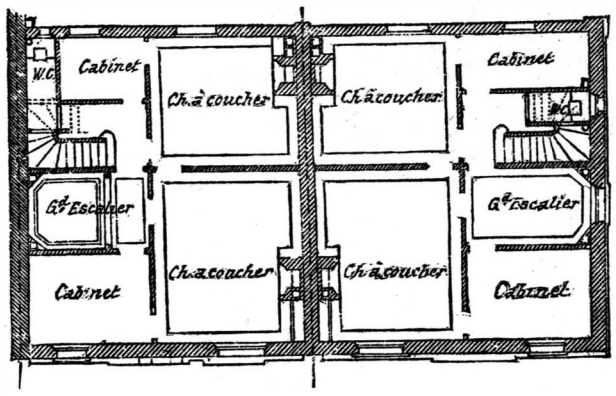
### SMALL CITY DWELLINGS, PARIS.

We give illustrations from *La Construction Moderne* of a couple of small Parisian dwellings, showing the prevailing style. These are comfortable little houses. The pair could be built here for eleven thousand dollars well finished.

### Measurement of Masonry.

L. D. W., of Waverly, N. Y., submits a difficult question to answer. He states that a dispute lies between a certain party and a mason as to how rough rubble or foundation masonry is to be measured; whether any allowance is to be made for corners, or whether the calculation of the work done is to be based upon the total outside dimensions.

The custom differs in different places. Should the dispute go to a jury, the verdict, I believe, in absence of a definite understanding or written contract, would be given to the mason in accordance with the custom of the locality in which the work is done.




SMALL CITY HOUSES, PARIS—$11,000.

The custom in this city and also in Philadelphia is to measure all foundation stone and "dimension stone" by the cubic foot, and all sills, lintels, base courses, water tables, and ashlar by the foot superficial and by the foot lineal, but that does not seem to be an equitable arrangement.

Now, it seems to me that where all openings are deducted, and the work is paid for by the cubic foot of actual masonry, an additional price per superficial foot should be allowed for turning corners, and that this measurement should be as many feet upon each external face of the corner as there were feet in the thickness of each wall forming the corner. On the other hand, if no deductions are made for openings, no allowance should be made for turning corners.

No one can settle a dispute in which there was no definite understanding between the parties involved. My advice to L. D. W. is to figure out the actual cubic contents of the stone work, deducting, of course, all the openings, and allow the mason for turning the corners the same price as is paid for face work to rubble masonry per superficial foot. Thus for each corner it would be twice the height of the rubble wall multiplied by the thickness of the wall, when both walls are of the same depth; but should one wall be thicker than the other, then the height of the thickest wall multiplied by its thickness plus the height of the other wall multiplied by its thickness will give the true area required. Some arrangement of that kind ought to be made, for it is certainly more expensive to turn a corner than to lay a wall straight away.

Supposing there were no openings to deduct in the problem given, the actual amount of masonry would be 2,331¾ cu. ft., and the amount to be paid to the mason on the front wall extra for the two corners would be:

$$\left.\begin{matrix} 9 \times 2 \times 2 = 36 \\ 9 \times 1\tfrac{1}{2} \times 2 = 27 \end{matrix}\right\} = 63$$

sq. ft., and the allowance on the trench wall corners would be:

$$2\tfrac{1}{2} \times 2 \times 2 = 10 + 10 = 20$$

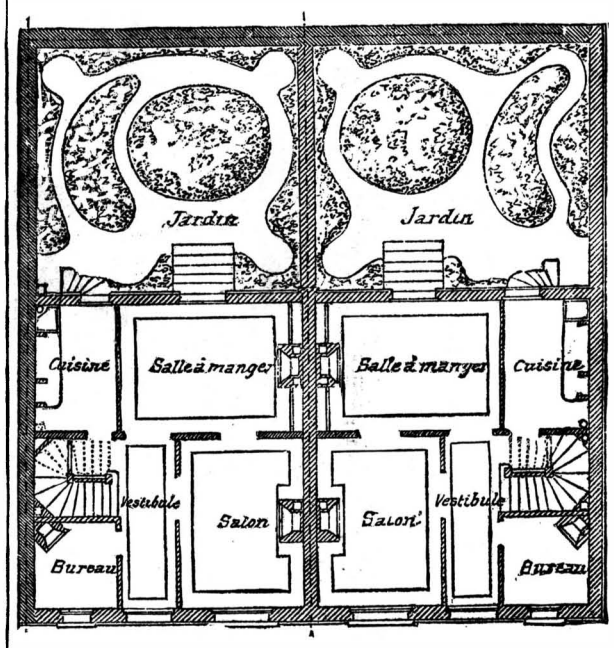
83 sq. ft.

Total allowance, 83 sq. ft. at the face work price to rubble masonry.—*C. P. K.*

### Failure of Concrete Dock Works.

A matter of the highest possible importance and interest to all connected with the construction and management of harbors has been brought to light at Aberdeen. Two years since, the Aberdeen Harbor Commissioners opened a graving dock. The dock was formed of Portland cement concrete, the steps being lined with granite ashlar. A few months ago it was noticed that the concrete entrance walls, which are not lined with granite, had become swollen, and that the surface had begun to show cracks. Investigation as to the cause was at once made, and Mr. W. Smith, the harbor engineer, suspecting that chemical action was inducing the mischief, conferred with Professor Brazier, of Aberdeen University, who analyzed briquettes of the Portland cement used in the construction of the graving dock, and also samples of the concrete taken from the entrance walls of the dock. From the analysis made it appeared that the action of the sea water on the Portland cement itself, as well as on the cement in the concrete, caused an expansion and softening of the cement in consequence of the deposit of magnesia from the sea water, and also led to the formation of carbonate of lime by the union of the carbonic acid contained in the sea water with the lime in the cement. This somewhat startling discovery must necessarily receive great attention.

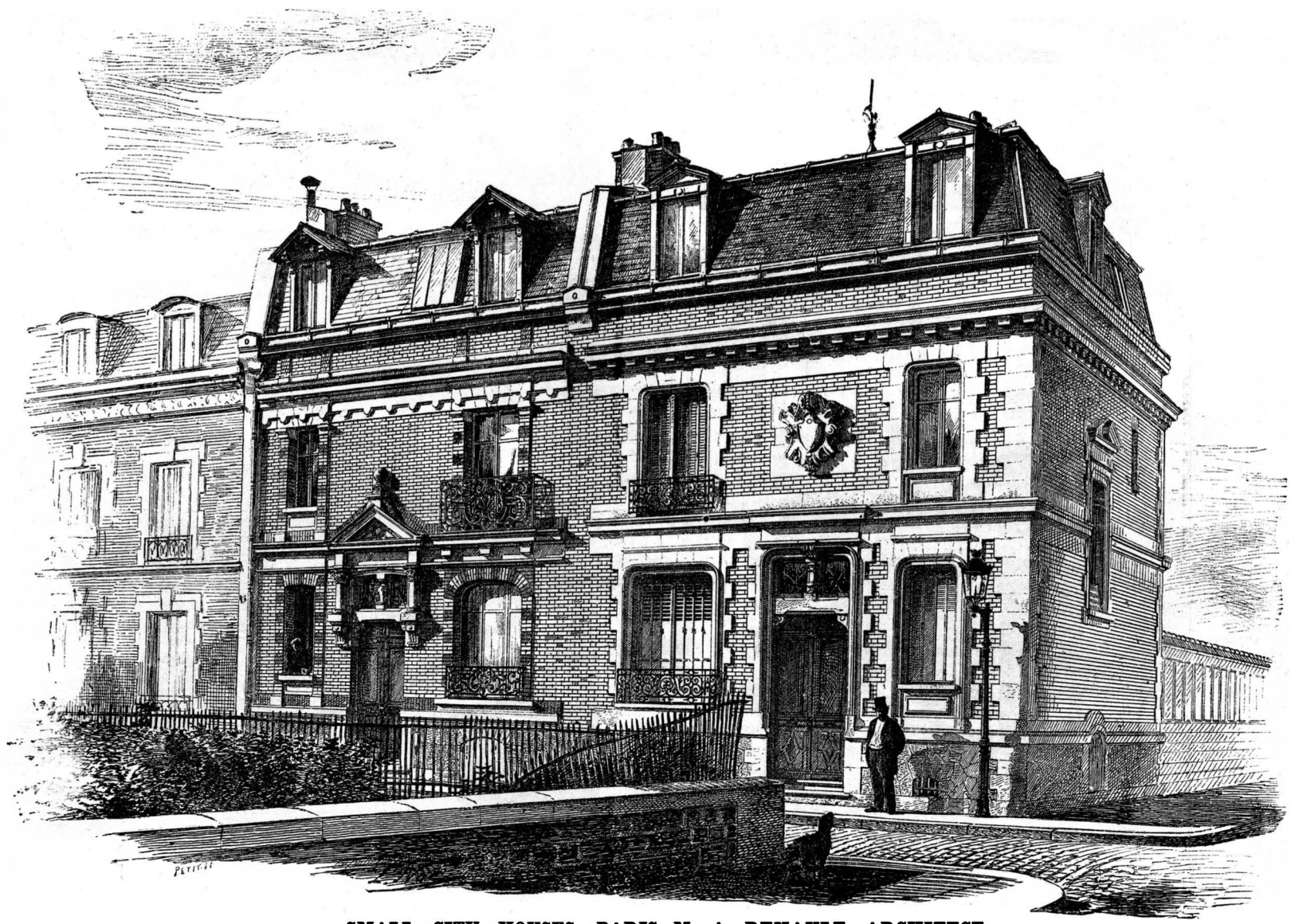
Within the past quarter of a century a great number of sea works have been formed of Portland cement concrete. At Aberdeen itself there is a breakwater of nearly a thousand feet entirely formed of concrete. In various ways it has required patching since its construction fifteen years ago, but the idea that its defects were due to chemical action did not occur to the harbor engineer till last year. He then mentioned the matter in a paper communicated to the Institute of Civil Engineers, the paper being printed in the first part of the Transactions of the Institute for 1886-87. The remarkable point in regard to the graving dock at Aberdeen is the rapidity of the chemical action of the sea water upon it as compared with the length of time that similar action has had opportunity of taking effect on sea works. We understand the greater effect is ascribed to the fact that the pressure of the water in the dock is much heavier than is the pressure of the water on the sea works. In the former case the pressure is from five to eleven pounds per square inch; in the latter it must be very light, except when the




SMALL CITY HOUSES, PARIS—$11,000.

waves drive heavily against the works. Till the present time there does not appear to have been any investigation as to the chemical action of sea water upon concrete.

Now that science has been called in, and has made the discovery that concrete must give way before the sea, it will be the task of chemists to look out for some countervailing substance which shall prevent the decay that seems to be inevitable. It is something that science has shown the danger that is being run. It will redound more to the honor of scientific men if they can indicate the means by which the impending calamity can be avoided. The subject came before the Harbor Board of Aberdeen recently, and they resolved to hold a meeting of the whole board in committee to consider the matter.—*Dundee Advertiser.*

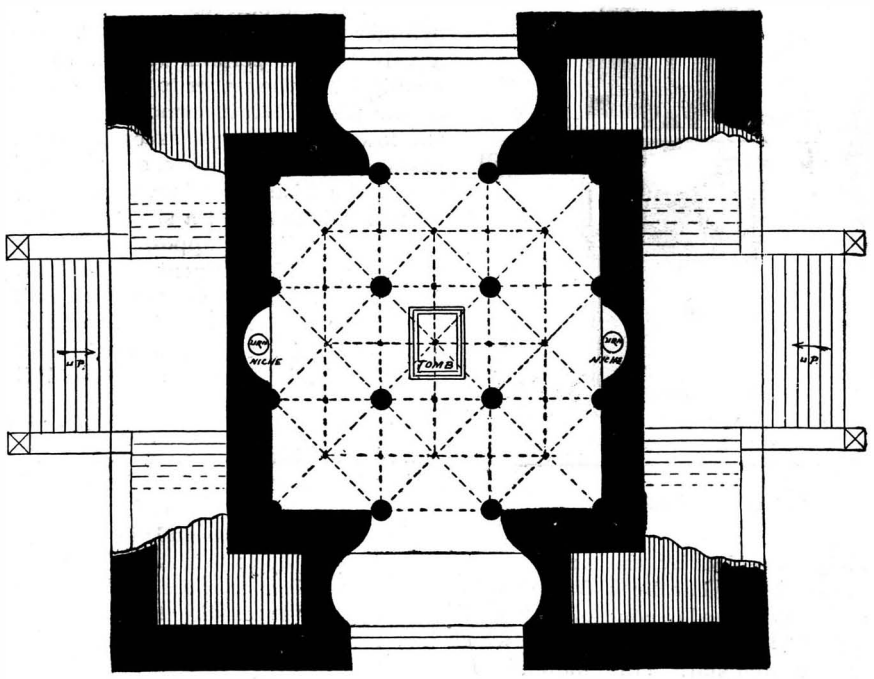


SMALL CITY HOUSES, PARIS—M. A. RENAULT, ARCHITECT.

### MALE'S DESIGN FOR THE GRANT MONUMENT.

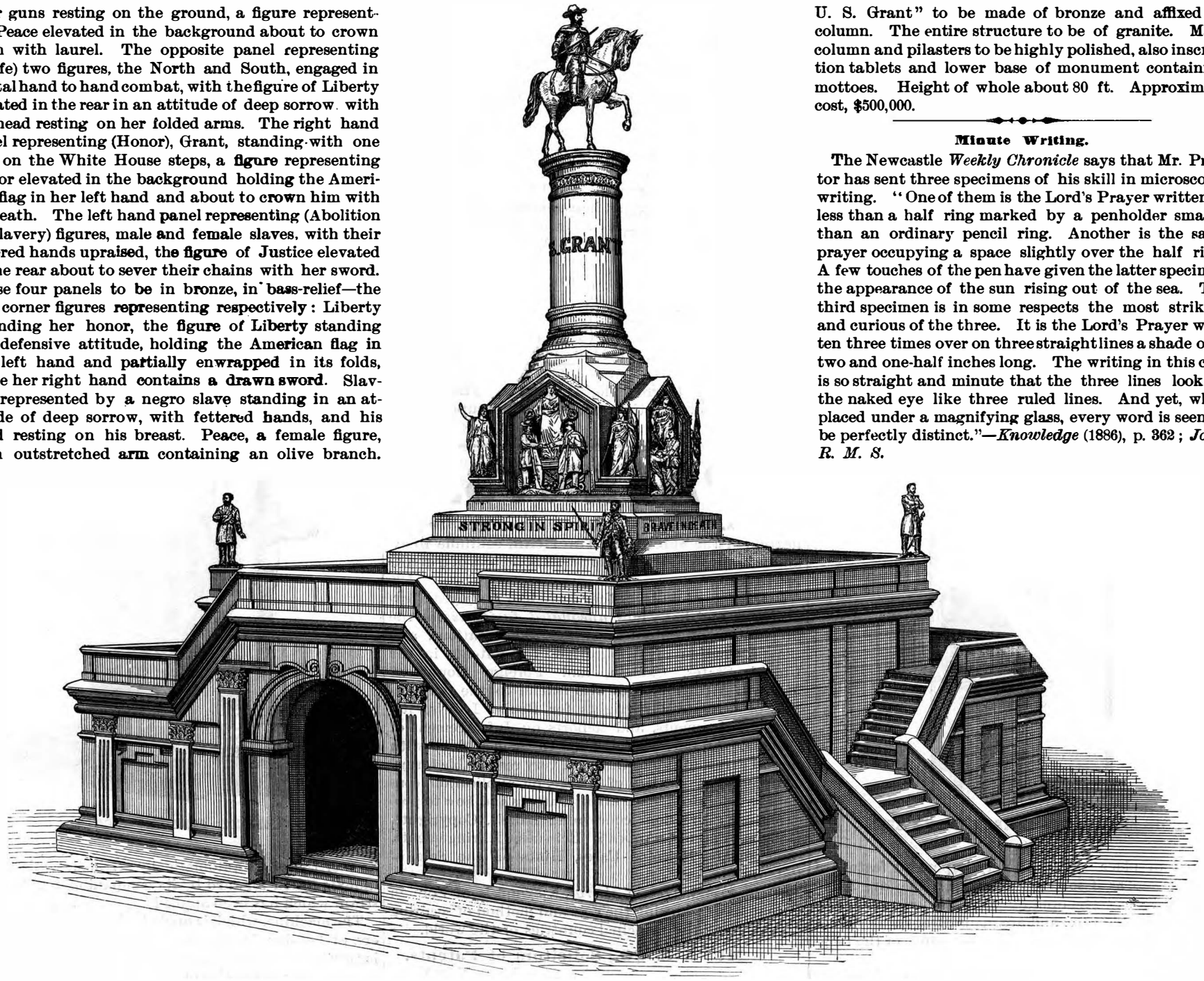
We present herewith drawings of the elegant design by H. A. Male, Albany, N. Y., for the Grant monument, to be erected in Riverside Park, New York. The following is a description:

*Mausoleum.*—Outside dimensions, 60′×60′; inside dimensions, 30′×30′, containing the sarcophagus, to which we have access through two large arched entrances opposite each other, sarcophagus and surmounting figure (an angel with palm leaves) to be made of white marble. Ceiling of mausoleum to be rib-arched and supported by pillars, as shown by plan. The monument proper to be reached by opposite terraces, three in number, as shown by drawing. An equestrian figure of Gen. Grant, with drawn sword, surmounts the whole. At the base of the column we have four arched panels containing figures representing, first (Eternal Friendship), two soldiers, representing the North and South, standing with clasped hands with their guns resting on the ground, a figure representing Peace elevated in the background about to crown them with laurel. The opposite panel representing (Strife) two figures, the North and South, engaged in mortal hand to hand combat, with the figure of Liberty elevated in the rear in an attitude of deep sorrow with her head resting on her folded arms. The right hand panel representing (Honor), Grant, standing with one foot on the White House steps, a figure representing Honor elevated in the background holding the American flag in her left hand and about to crown him with a wreath. The left hand panel representing (Abolition of Slavery) figures, male and female slaves, with their fettered hands upraised, the figure of Justice elevated in the rear about to sever their chains with her sword. These four panels to be in bronze, in bass-relief—the four corner figures representing respectively: Liberty defending her honor, the figure of Liberty standing in a defensive attitude, holding the American flag in her left hand and partially enwrapped in its folds, while her right hand contains a drawn sword. Slavery, represented by a negro slave standing in an attitude of deep sorrow, with fettered hands, and his head resting on his breast. Peace, a female figure, with outstretched arm containing an olive branch. Prosperity, represented by a female figure supporting the horn of plenty in her left hand, with her face and right hand raised toward heaven in an attitude of prayer, thanking the Lord for his grace and goodness. On each of the four corners of the second terrace we have more figures, representing Grant as a scholar, with a book in his hand, absorbed in study; as a colonel before his regiment, standing in an attitude of attention, with folded arms waiting for the bugle call; as a general, in a commanding attitude, his right hand grasping a drawn sword, with his left hand on the scabbard; as a statesman, respresenting Grant holding a roll of parchment in his left hand, about to deliver an address. These figures to be in bronze also. On each four sides of the lower base of monument there will be an inscription as follows: 1st. "Strong in spirit." 2d. "Steadfast in friendship." 3d. "Patient in suffering." 4th. "Brave in death." These mottoes to be concaved on surface of base, the letters "Gen. U. S. Grant" to be made of bronze and affixed to column. The entire structure to be of granite. Main column and pilasters to be highly polished, also inscription tablets and lower base of monument containing mottoes. Height of whole about 80 ft. Approximate cost, $500,000.




PLAN.

Figure on Front




DESIGN FOR GRANT MONUMENT, RIVERSIDE PARK, NEW YORK—BY H. A. MALE.

### Minute Writing.

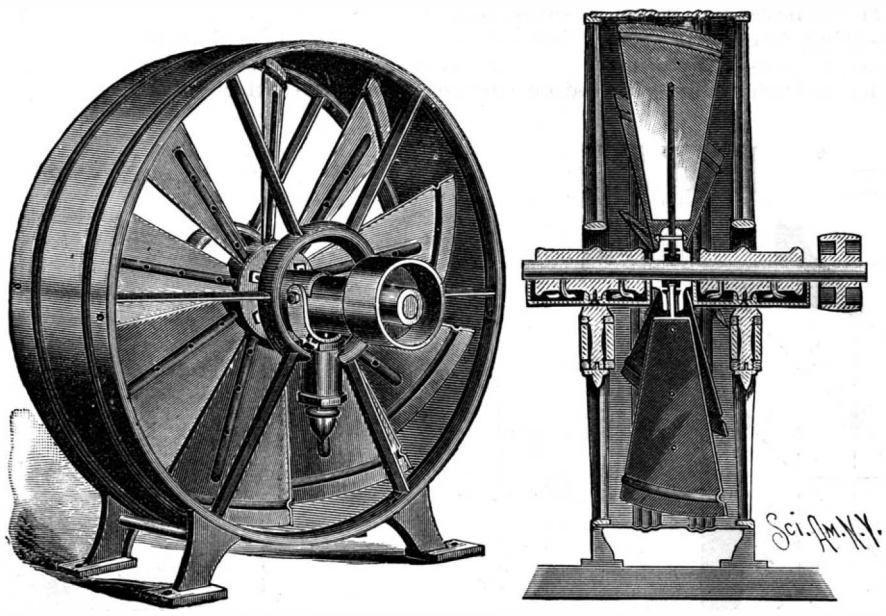
The Newcastle *Weekly Chronicle* says that Mr. Proctor has sent three specimens of his skill in microscopic writing. "One of them is the Lord's Prayer written in less than a half ring marked by a penholder smaller than an ordinary pencil ring. Another is the same prayer occupying a space slightly over the half ring. A few touches of the pen have given the latter specimen the appearance of the sun rising out of the sea. The third specimen is in some respects the most striking and curious of the three. It is the Lord's Prayer written three times over on three straight lines a shade over two and one-half inches long. The writing in this case is so straight and minute that the three lines look to the naked eye like three ruled lines. And yet, when placed under a magnifying glass, every word is seen to be perfectly distinct."—*Knowledge* (1886), p. 362; *Jour. R. M. S.*

### AN IMPROVED VENTILATING FAN.

The illustrations herewith show a ventilating fan, and means for adjusting the hub thereof, by which the blades can be readily fixed at any desired angle of inclination, by simply loosening three nuts on bolts passing through the hub, thus increasing or diminishing the capacity of fan and power required. The hub is divided in two vertical sections, with opposing integral rings having a series of recesses, and a series of triangular projections with angular spaces between them, an annular recess separating the ring and projection of each section. When the two sections are united upon an axle, the flat surfaces of the triangular projections and the ring come in contact, forming a close joint, and a series of irregular openings in the edge, formed by the registering angular spaces. When the hub is slid upon the shaft, the fan rods are entered in the irregular openings, a groove in the rod being made to engage a concavity in the ring. The fans may then be given any desired inclination by turning the rods more or less to the right or left, when they will be held by the engagement of the lower portion of the rods with the ring, the two sections of the hub, when the rods have been placed in position, being held in positive, yet detachable, connection by a series of bolts.

These fans are so made as to be convenient for pipe connection, and a change of air current is readily effected by simply loosening the three nuts on bolts passing through the hub, and changing the inclination of the fan blades. The style of fan herewith shown can be placed either horizontally or vertically, the "feet" being such as can be attached overhead, on the side of buildings or partitions, or upon the floor.

For further particulars touching this invention, address the patentee and manufacturer, Mr. George P. Clark, of Windsor Locks, Conn.



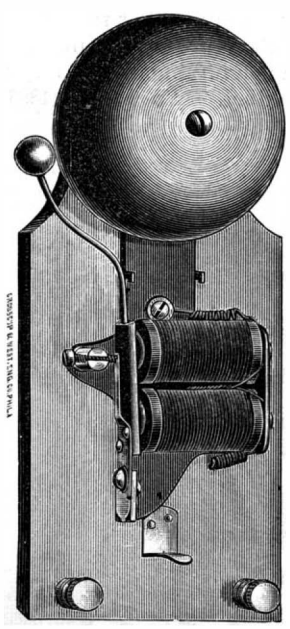

CLARK'S ADJUSTABLE HUB VENTILATING FAN.

### THE SHAW & GEARY IRON FRAME BELLS.

We illustrate a new style of electric alarm bell into whose construction several features of good construction enter. The makers have been quick to recognize the weak points of ordinary bells, and have effectually remedied the defects incidental thereto in the one we now are describing.

From motives of cheapness, the frames of bells have hitherto been frequently constructed of cast iron. As this is acted on by an electric current, it acquires by induction a certain amount of permanent or residual magnetism; in electrical parlance, it becomes polarized and interferes with the action of the bell. The movements of the latter become weak and sluggish, and the addition of more battery does little to aid in overcoming the trouble. In the Shaw & Geary bell the iron parts are all made of the best Norway iron, a brand of world-wide fame for its softness and purity, and which cannot become polarized to any perceptible extent. Thus their iron frame does not at all affect the working of the bell.

The contact points are made of platinum and are riveted in place. This is a very important feature of construction, as if soldered or screwed they are liable to work loose. The binding posts are long enough to receive a double wire, and are made after the design of the English binding post. The resistance of the magnet is 3¼ ohms.



THE SHAW & GEARY IRON FRAME BELL.

The manufacturers' address is Shaw & Geary, 53 North Seventh Street, Philadelphia, Pa.

### The "Alderly" and "Penn" Old Method Roofing Plates.

Much attention has, within the last few years, been aroused upon the subject of the quality of sheet tin used for roofing. Many complaints have been made as to the quality of the iron and the thickness of the coating. It was made a source of complaint that modern manufacturing methods had brought about the production of an inferior, light-coated plate.

A return to the older processes was demanded, or, at least, a production of as good material as was then on the market. The manufacturers of the above brands have met this demand. They have introduced plates probably superior to anything yet produced, and whose qualities are so accurately specified by the makers that the purchaser knows exactly what he is buying. Thus the "Penn" plate is guaranteed to contain 40 lb. of tin in every box of 20×28 sheets. The sheets are guaranteed perfectly square and flat. This introduces an element of economy, as there is no waste of metal on account of untrue shape. Special shears have been adopted in the factory in order to secure this quality. They are also guaranteed to hold all the coating possible for any plate to hold, to last longer on a roof than any other old style plate, and to be perfectly assorted. The "Alderly" brand possesses all the merits of the "Penn" plate, except that it is not so heavily coated.

Gummey, Spering, Ingram & Co., 1023 Market St., Philadelphia, Pa., are the agents for these plates.

### Gladstone Bricks.

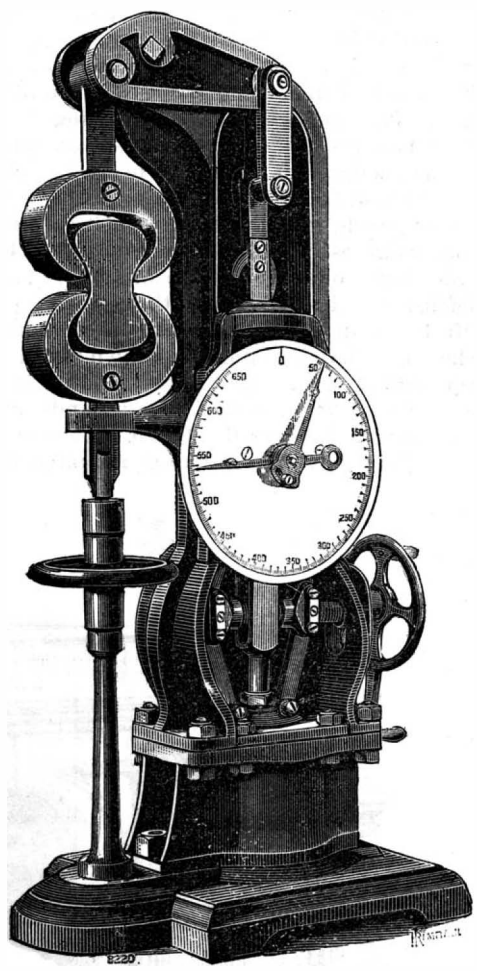
Brick for the new court house being erected in Pemberton Square, Boston, comes from the yards of W. E. Gladstone & Son, Hawarden, Wales. Delivered in Boston, they cost $45.50 per 1,000. They are packed in barrels, each barrel containing only twenty-seven bricks, 9×4⅜×3¼ inches each in size. On the top and bottom of the brick there are groves 6¾×1¾ inches in size, 1 inch deep, designed to hold firmly the mortar when pressed into it. These products of an ex-premier's brick yard are warranted not to change in any manner with age, save to grow slightly darker. The process which is followed in their manufacture occupies thirty days.



### CEMENT TESTING MACHINE.

The condition often imposed in cement testing, viz., that the strain shall be applied at a certain specified rate, necessitates a more regular application of the load than can be obtained by hand. In order to gain this end, various expedients have been adopted, such as using water or sand as the weight and allowing it to flow through an orifice into a vessel fitted to a lever. In more recent machines a weighted lever has been allowed to descend gradually by means of a cataract cylinder, so as to increase the leverage until the specimen broke, or a spring has first been weighted by a vessel of shot, and then the shot has been allowed to run out, relieving the spring and allowing it to exert a steadily increasing tension on the test piece. In Porter's cement testing machine, which we illustrate herewith, both a cataract and a spring are used, but the arrangement is entirely different from either of those mentioned above. On the base of the apparatus is a vertical oil cylinder having a piston in it. There is a valve which permits the oil to flow readily from the upper to the lower side of the piston, but it cannot return from the lower to the upper except through a passage commanded by a cock. On the top of the piston rod is a sliding frame on which is mounted a strong compression spring with its opposite end taking against a solid abutment. The sliding frame is also connected to the beam at the top of the machine by a tension spring, and the lengths of the two springs are so arranged that when one is loaded the other is relaxed, and *vice versa*.

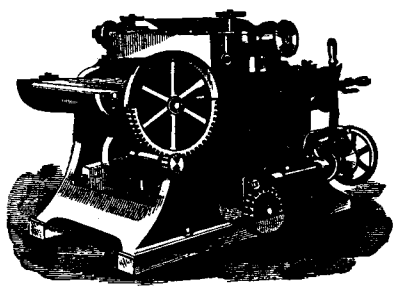
Before a test is made, the piston, piston rod, and sliding frame are all raised together by means of toggle levers and a screw. These levers are pivoted to the cylinder at the bottom, and at the top bear against but are not connected to the frame. After the frame has been raised, the levers are screwed back, the oil in the cylinder meanwhile resisting the force of the spring, which has been compressed by the rise of the sliding frame. The sample briquette of concrete is then placed in the jaws, and the screw below them tightened to bring the index, which is connected by rack and pinion to the sliding frame, to zero. The valve is then opened, and the compressed spring forces down the piston at a regular speed. The extension of this spring produces an equal elongation of the tension spring which connects the sliding frame to the beam, and thus the strain is transmitted with a uniform increase to the sample until the latter breaks. When this occurs, the flow of the oil is automatically arrested, while a loose index, pushed forward by its companion, registers the strain which has been applied.



CEMENT TESTING MACHINE.

The machine, which is made by Messrs Elliott Brothers, of London, is small and compact, and by its aid a large number of tests can be made in a short time. It is arranged for briquettes of one square inch in section.—*Engineering.*

## WOODWORKING MACHINERY.



Improved Chain Bed Planer.

E. & F. GLEASON, Manufacturers, 250 Susquehanna Ave., Philadelphia, Pa.

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**THE "IDEAL"**

PATENT TILE-LINED BATH-TUB.

Perfection of Cleanliness and Durability.

SHARPLESS & WATTS, Patentees,

BAKER BUILDING,

**1524 CHESTNUT ST., PHILADELPHIA.**

Send for Illustrated Circular and References.

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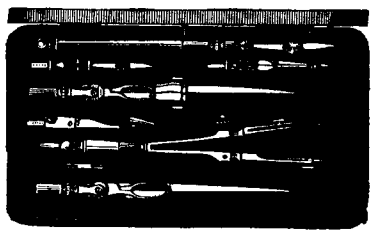
## L. MANASSE,

IMPORTER AND MANUFACTURER,

**88 Madison Street, Chicago, Ill.**



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**Drawing Tools, Papers, Tapes, Chains, Colors, Inks, etc.**

**Improved LEVELS for Builders and Tiling.**

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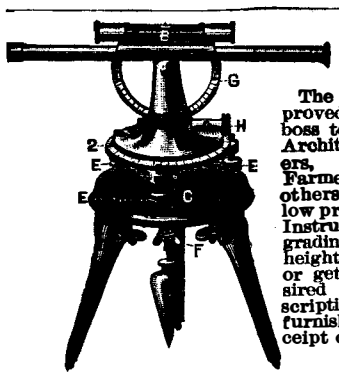

The latest improved, *i. e.*, the boss to Engineers, Architects, Builders, Contractors, Farmers, and all others requiring a low price Leveling Instrument for grading, measuring heights, squaring, or getting any desired angle. Descriptive circulars furnished on receipt of stamp.

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## ORNAMENTAL BRICK

Brick and Terra-Cotta furnished from any design.
Bricks for Arches ground to suit any radius.
Equal in Quality and Color to Philadelphia Brick.

**JAMES H. BEGGS & CO.,**
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Mention this paper.

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## RUTHERFORD'S METALLIC PAINT

**WARRANTED NOT TO**

FADE, SCALE, OR CRACK.

**REQUIRES NO DRYER.**

**RUTHERFORD & BARCLAY, Manufacturers,**

**305 Chestnut St., Philadelphia.**

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## ANOTHER STEP IN ADVANCE!

Our Mr. Merchant having returned from England, July 25th, 1887, it will no doubt interest Architects, Builders, and Roofers to learn that his visit has resulted in the following arrangement with the makers of our guaranteed Roofing Plates.

In future every box of **"Gilbertson's Old Method"** and **"Camaret"** will be stamped with the average net weight on each box, as follows:

**"Gilbertson's Old Method" Roofing Plates.**

| | | | | | |
|---|---|---|---|---|---|
| IC | 14x20 | 120 lbs. | IC | 20x28 | 240 lbs. |
| IX | 14x20 | 148 " | IX | 20x28 | 296 " |

**"Camaret" Roofing Plates.**

| | | | | | |
|---|---|---|---|---|---|
| IC | 14x20 | 110 lbs. | IC | 20x28 | 220 lbs. |
| IX | 14x20 | 138 " | IX | 20x28 | 276 " |

The arrangement is also now in force that **no wasters of either of the above brands** will be sold to any one in England, nor will they be shipped to the United States.

**MERCHANT & CO.,**

Philadelphia, Chicago, New York, London.

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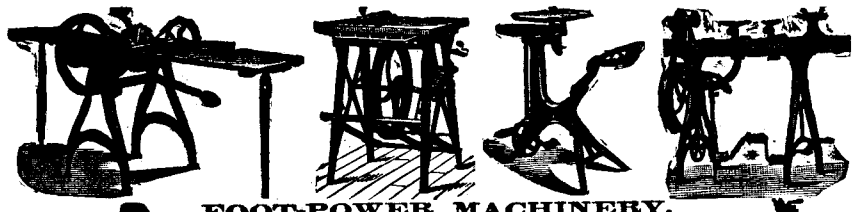

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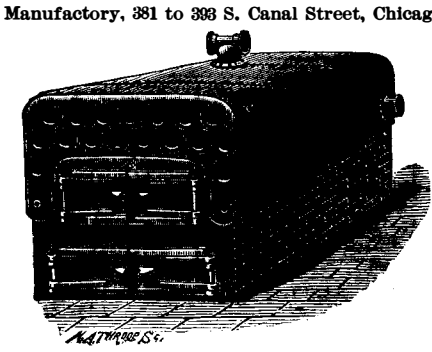

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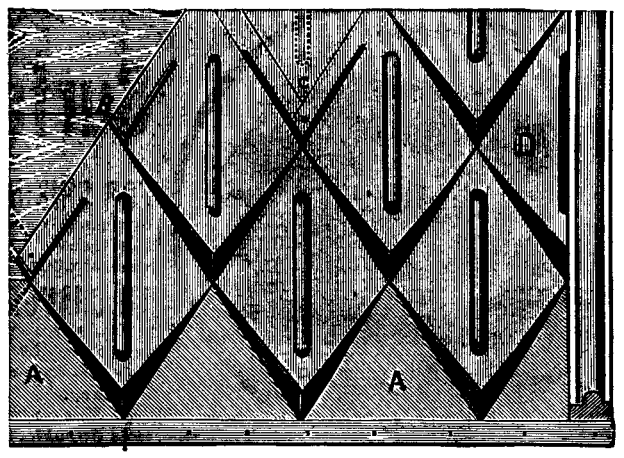


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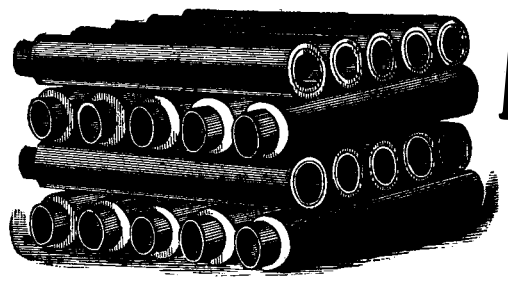

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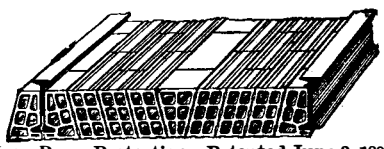

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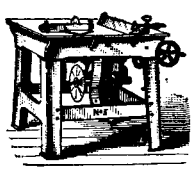

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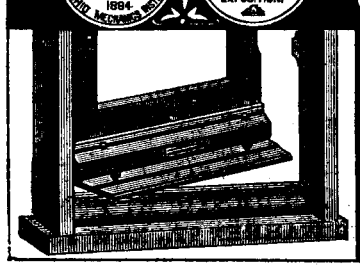


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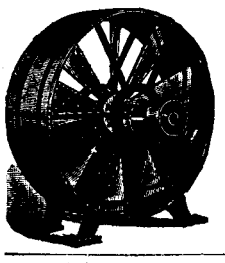

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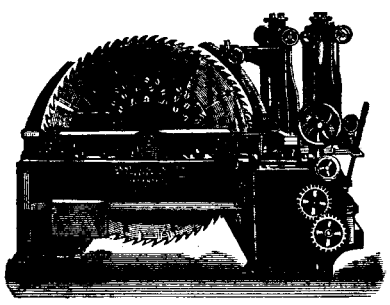

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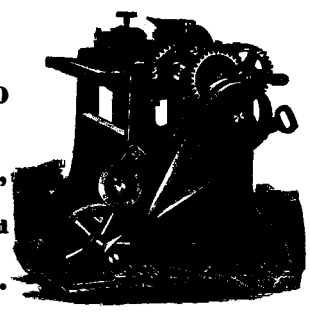

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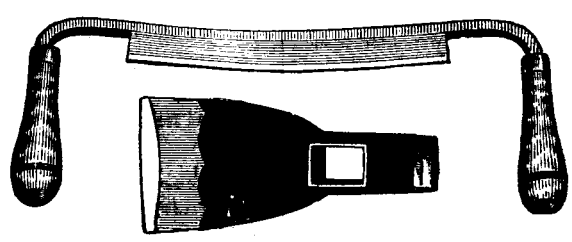

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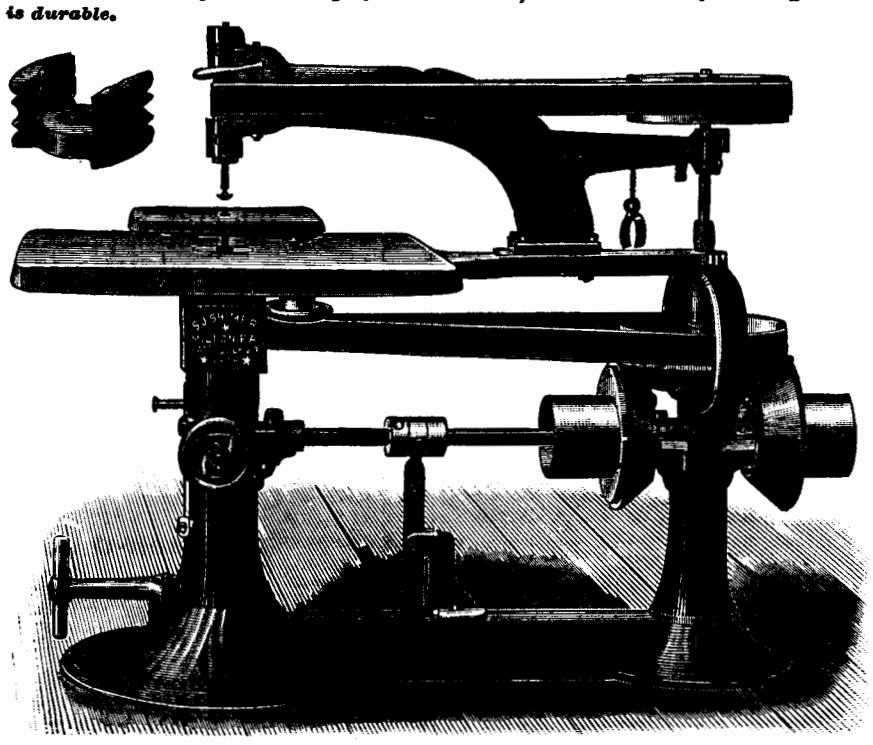

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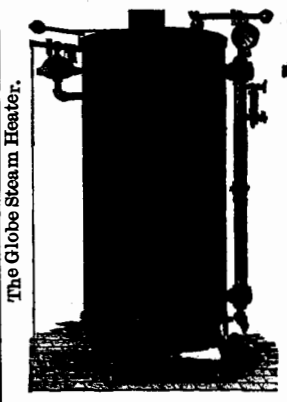

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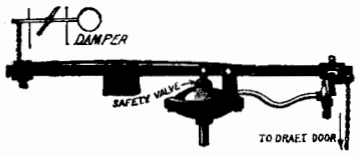


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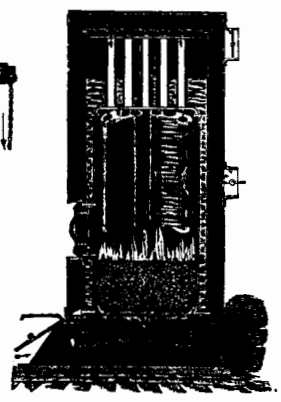

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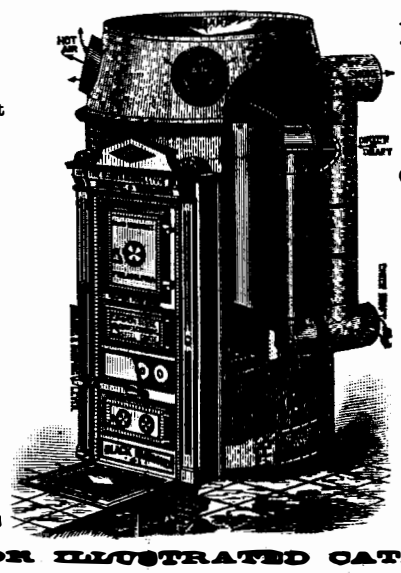

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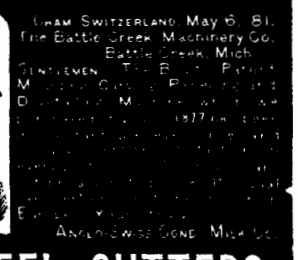

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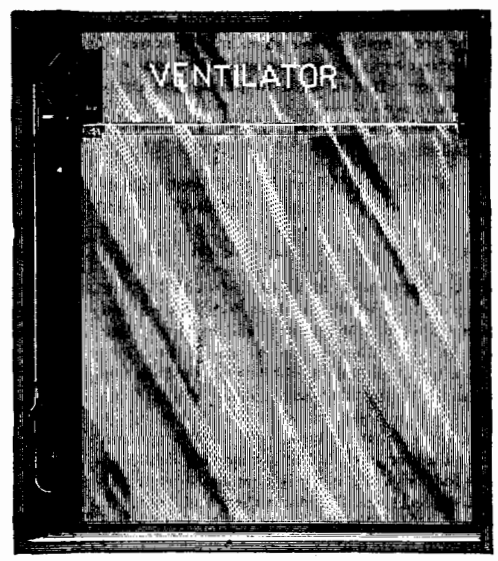


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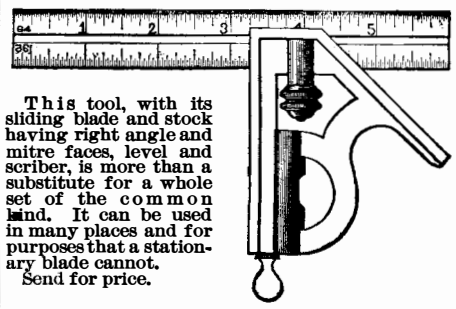

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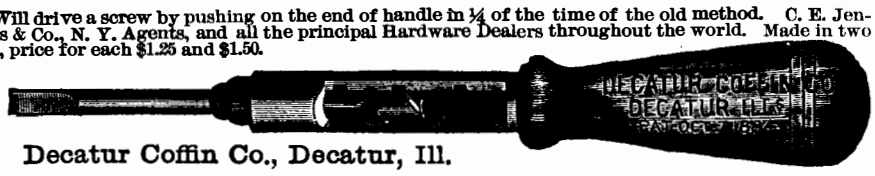


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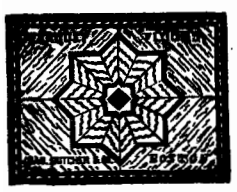

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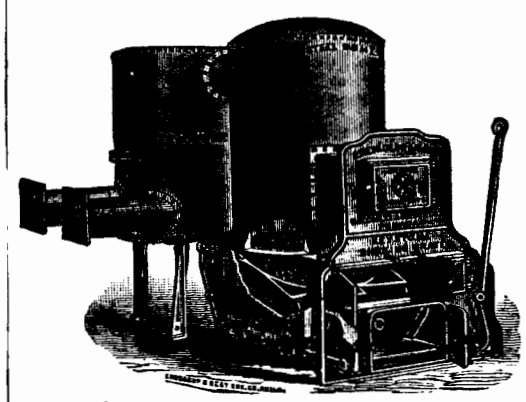

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HINTS TO CORRESPONDENTS.

**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.

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(1) G. F. M. F., of North Sydney, Cape Breton, Canada, sends a diagram of a church, and says the speaker can only be heard distinctly in the first four or five rows of pews. Outside of that it is only a sort of a confused muttering, and wishes to know how it can be remedied. A. The real difficulty is that the proportions are not adapted to the harmonious propagation of sound. We advise raising the floor one foot higher, or lowering the ceiling one foot, whichever will prove the least expensive. The dimensions of the church are 65 feet long, 45 feet wide, and 21 feet high. If the room is made 20 feet high, it ought to give fairly satisfactory results.

(2) C. T. F., of Kansas City, Mo., asks: (1) How much stronger would a concrete wall 2 feet thick be over one 1 foot thick? A. It depends upon the kind of strains to which the wall will be submitted. If built to resist a crushing strain or a tensile strain separately, the 2 foot wall will be just twice the strength of the 1 foot wall, because the strength is proportional to the sectional area. If, however, a portion of a concrete wall is to be used as a lintel or as a beam, the strength will vary as the square of the depth times its breadth divided by its length. 2. No. 3. The chemical change which takes place in the "setting" of lime concrete is of a more complicated nature than is generally known. According the theory of M. Vicat, the hydraulicity of a cement is due to a composition formed when limestone is in the presence of argillaceous material. That this composition is a double silicate of alumina and lime, which in the act of hydration causes the setting of hydraulic cements. Most chemists agree in admitting that the hardening of cements is due to hydration, but differ as to the manner in which it is brought about and the consequent intermediate reactions. See Henry Reid on concretes 4. Portland cement is an artificial product. The ingredients are chalk and the mud of the river Medway, England. The chalk used contains about 7½ per cent. of clay. The mud contains about 70 per cent. of alumina and iron to 30 per cent. silica. Eight or nine parts of chalk with two parts of mud are passed through a crushing mill, into which is let a supply of water, which carries off the crushed particles into a large vat. The sediment settles down and becomes solid. The surface water is run off or evaporates. The mixture is then spread out on a drying floor to a depth of about six inches, and is dried by coking ovens below. The dried cement is mixed with crushed coke and burnt at a very high temperature. The cement is burnt to a point of almost vitrification. This excessive burning is a distinctive feature of all Portland cements. It is afterward crushed between two iron wheels and then ground between two sandstone millstones. This completes the actual manufacture. For shipment it is packed in three-bushel casks. 5. The best roofing material for a flat roof that is to be walked upon is a brick pavement laid in cement, where the roof timbers and side walls are strong enough to carry the load involved, or, in the absence of that, a flat board roof covered with first-class building felt, and carefully asphalted with rock asphaltum by the Wooton process.

(3) S. A. L., of Moorestown, Burlington County, N. J., complains of the intolerable heat of the summer, and of his own house attic particularly, and wants to know the most approved method of ventilating the house, to keep it cool in summer and warm in winter. A. This problem could not be solved without plans and sectional elevations of his house to show how the rooms were situated with reference to each other and the house itself to the points of the compass; but, without attempting to ventilate his house, a simple expedient may be resorted to that will make his attic warm in winter and cool in summer. 1st. Sheathe the rafters with planed and matched boards, and fill the space between them and the roofing boards with mineral wool. Also in the gable ends of the attic insert louvered windows that are storm proof, and provided with movable shutters.

(4) Dr. J. W. H., of Ludlow, Mass., wishes to know how old outside unpainted brick walls can be treated to improve their appearance. A. 1st. Employ a mason to go over the whole wall and rub its surface down with rather soft brick, that will, in a large measure, remove weather stains. Then mix Indian red with turpentine and a little varnish and apply it while hot with a brush to the wall surface. When dry the brickwork will have a dull, uniform red color. Indian red is ground hematite ore.

(5) F. H. B. writes: I have some office windows which my predecessor had frosted. How may I remove the frosting? A. Only by grinding and repolishing, which would be very expensive. If it is ordinary paint, you can remove it with a strong solution of caustic potash.

(6) J. T. G. asks how to get daylight into a room having a large window space, there being a blank brick wall about five feet distant from the side of building. A. The common method of illuminating such rooms as you describe is to place outside of a window a mirror arranged at an angle of 45 degrees, which will receive the light from the sky and throw it into the room.

(7) E. H. C. asks our advice how he may become a civil engineer. A. If you can associate yourself in some capacity with a first-class civil engineer, so that you might study and practice with him, we think it would be your best course. You might, however, enter some of our technical schools, and take a course in civil engineering. If you wish to pursue the study alone, you might send to some of the technical schools for their prospectus, and pursue the course laid down for their students.

(8) W. W. asks: What is the best material to mix with gas tar to form a durable waterproof coating for tin, shingle, or paper roof? A. Boil the tar with lime, stir in powdered slate, and then apply.

(9) J. H. B. asks: 1. Is not properly secured cistern or rain water the best for drinking and cooking purposes? A. We do not consider that cistern water in its best condition is equal to water drawn from sand or rock beds, but is no doubt better than the water of many wells. 2. Is there any danger arising from the use of water in brass or copper vessels? A. Brass and copper vessels that are kept scrupulously clean are suitable for cooking in or holding water for drinking. Brass pipe for conveying water is now much used, and is not considered more dangerous than lead pipe. 3. What effect, if any, has the rubber pipe upon water secured through it, such as our lawn and sidewalk hose? A. Rubber hose has no deleterious effect upon water. 4. Where is the best water found when exposed to the sun and air, and standing in open vessels—at the top or bottom of the vessel? A. We do not know that there is any difference in the quality of water drawn from the top or bottom of an open vessel, provided both vessel and water are clean.

(*Continued on page* x.)

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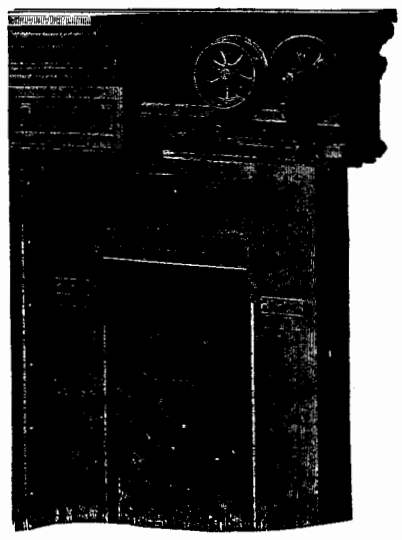

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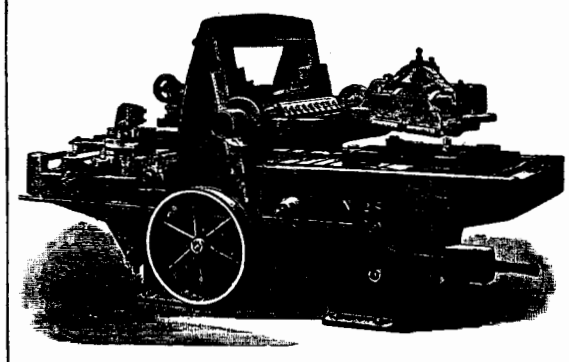

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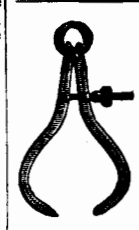

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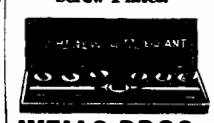

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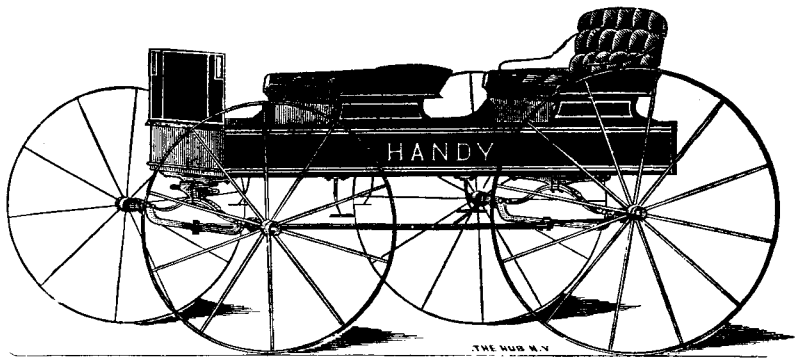


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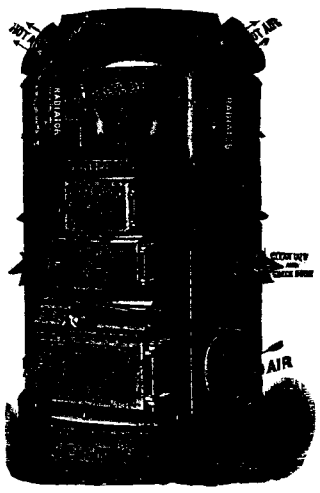

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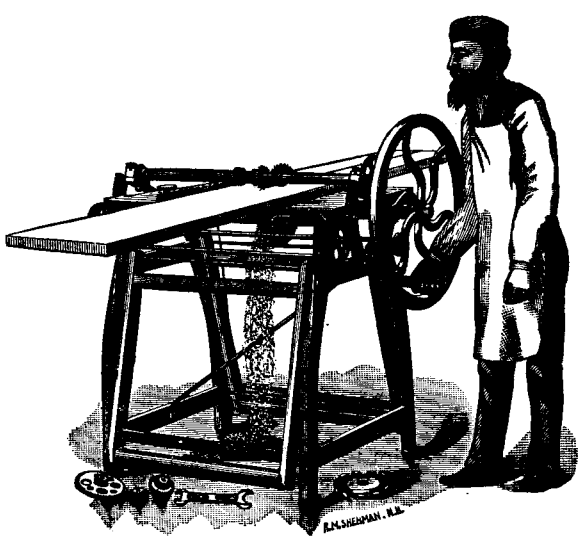

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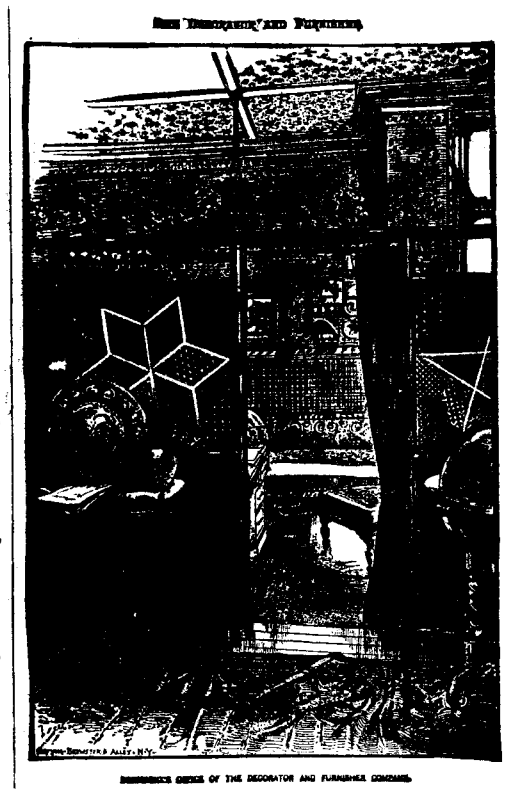

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# Notes and Queries.

(*Continued from page* vi.)

(10) B. asks: What is the greatest speed ever attained by an ice boat, and if it attains a greater speed than the rate at which the wind blows at the time it is propelled? What explanation can be given for the fact that boat goes faster than the wind? A. With a twenty mile per hour breeze ice boats have run, on fine ice, at the rate of 70 miles an hour. If you squeeze a suitable wedge between thumb and finger, you will find the wedge to move further and faster during the squeeze than the fingers that impart the movement. On the same principle the ice boat, which is the wedge, may be driven three times or more faster than the propelling wind, when the latter acts against the inclined side or sail of the boat. If the wind were directly abaft, the boat would not go quite so fast as the wind.

(11) J. W. L. asks what material white clay pipes are made of. A. The clay pipes are mostly imported, and are largely made in England. It is probable that suitable clay for this purpose is found among the clay beds of New Jersey, but this is used chiefly in the potteries. Pipe clay is of about the same quality as that used for the manufacture of pottery. To burn white, the clay should be free from iron.

(12) A. McK. asks (1) how to lay thin veneers on lumber one-eighth inch thick. A. A good manner of laying veneers on thin work is by clamping with screw clamps or weights between two planks dressed flat, with paper each side of the veneer parts to prevent sticking. 2. A receipt for making a good liquid glue. A. Liquid glue—4 ounces hard glue, 16 ounces acetic acid; dissolve by soaking and heating. Spaulding's glue is supposed to be ordinary glue dissolved in good, strong vinegar. Another way is to add a little pyroligneous acid to a thick solution of glue and water.

(13) C. F. S. asks: Which is the better way to set a small circular rip saw (14 in.)—so that it will just reach through the stuff, or lower the table that it will move perpendicularly? Which method requires the most power? A. A saw cuts easier across the grain. Cutting at the top of the saw is lengthwise of the grain of the wood, and cuts harder and of course takes more power. Saws cut easier or with less power with the top of the table as near the center as possible, or so that the flange that holds the saw just clears the stuff to be sawed. This is the practice with the makers of frames. Sometimes the tables are made to raise for some special purpose—not for the saving of power.

(14) E. Le D. asks how to clean nickel plated goods, so as to keep them bright? I have an Albo carbon cluster light (gas) in nickel, and I suppose the heat keeps it dull. A. Too much polishing with powder will soon destroy the nickel plating. Wipe thoroughly with a cloth moistened with kerosene oil as often as necessary. Occasionally add a little whiting or chalk to the cloths. If any parts are not burnished that require to be cleaned, a small brush with chalk and soap water will make the work quite clean.

(15) P. R. R. asks: With what white substance can I cover a draughting board that I may easily erase the black pencil lines after the drawing has been copied or used? A. For this purpose paint the board with three or four coats of white lead ground in Japan. Rub each coat down after it is thoroughly dry with powdered pumice stone and water.

(16) E. E. H. asks: 1. What is the best method of varnishing slate table tops which have been ornamented by painting on them a design in oil colors? What varnish is used, and how applied? If with a brush, how can the strokes of the brush be prevented from showing? If dipped, give particulars? A. Use a soft camel's hair brush and cover the table with a coat of heavy body varnish, such as can be purchased of any paint house. 2. A receipt for ebonizing liquid. I have used nut galls and acetate of iron, formerly with good results, but lately the iron acetate will not produce the black. A. The majority of the receipts given include acetate of iron in some form or other. The following is one entirely free from iron salts, and may be found desirable: First sponge the wood with a solution chlorhydrate of aniline in water, to which a little copper chloride has been added. When dry, repeat with a solution of potassium bichromate. Do this two or three times.

(17) F. A. P. asks: How long will galvanized cast iron stand exposed to the weather (such as an iron fence) without signs of rust? A. If the iron is perfectly galvanized, it will last for a long time. If the union of the zinc and iron is imperfect, rust will appear very soon.

(18) F. W. C. asks: Will a 3 inch pipe 50 rods long supply sufficient water for 2 rams, one using a 1 inch feed pipe, one a 2 inch feed pipe? A. What head is there on the 3 inch pipe, or how high is the reservoir which receives the water from brook above that which supplies the ram? If this is eight feet or more, 3 inch pipe is sufficient.

(19) S. R. R.—To sand wood: Paint the wood with a thick paint and dust the sand on through a sieve fixed to a small tin box in which the sand is placed.

(20) W. E. W. says: I have a 56 in. circular saw that has not been used in over a year (a smaller one used in place), one side of which is very rusty. What will take off the rust and make it bright? I cannot sell it as it is, but could if I can get off the rust? A. If kerosene will not remove the rust, try spirits turpentine and rottenstone. If the rust is deep, it must be ground out with emery. To preserve the concentric polish mount it on an arbor and rotate it, using emery and oil on a pine or other soft wood stick.

(21) D. McR.—Your drain system needs ventilating. The *blind well*, if air tight, does not make room for the water that is suddenly plunged into the pipes. This makes a pressure which breaks the seal of the weakest trap. Make an air vent at the well, if there is no trap between the sink and the well. If there is a trap in the main, then a vent pipe leading from the top of the main vertical pipe to the roof will be requisite to prevent the blowing of the trap seals.

(22) W. H. B. asks: 1. How much greater area of cross section should an iron lightning rod have than a copper one, to give the same conducting power? A. The sectional area of the iron rod should be six times as great as that of copper to secure the same conductivity. 2. With roof surface of 1,000 square feet, copper rod one-half inch square, and a wet clay soil, how far ought I to continue the rod underground, through a bed of charcoal 1 foot deep and 1 foot wide, to give a proper ground connection? A. Carry the rod down till you strike soil that is permanently damp.

(23) G. H. E. asks: Why are not dry gas meters used in place of wet ones? A. The dry meter is now the standard meter used by the great gas companies. The wet meter requires much care, and is liable to freeze in cold weather.

(24) R. V., architect, of Mobile, Ala., questions the accuracy of the rule given in answer to J. D. G. in the July number in regard to the breaking weight of white pine timber. A. The values deduced by the rule are, in the main, correct, erring, if any, on the safe side. The rule generally followed by architects is as follows: The safe load in pounds for a beam supported at both ends, with its load uniformly distributed, is equal to 2 × breadth (inches) × depth squared (inches) × a constant divided by the length of the clear span in feet. The constant is the safe load for a unit beam, one inch square and one foot span, loaded at the center. For white pine the constant is 80. Practically, however, a proper allowance should be made to insure the beam against too great a deflection. Where the deflection is not to exceed one-thirtieth of an inch per foot of span, the above formula ought to read with like conditions. For white pine, viz.: Safe, uniformly distributed load $= \frac{8 \times \text{breadth} \times \text{cube of depth} \times 82}{5 \times \text{square of depth}}$.

(25) L. McN. asks for a receipt for making an infusible cement that will stand a great heat without crumbling or falling off, as I want to line a hot blast gas furnace with it. Also a receipt for making crucibles that will stand the intense heat of the hot blast gas furnace. I would like the cement to be non-conducting. A. A good fireproof cement is given in answer to query 58, on page 28 of the SCIENTIFIC AMERICAN, of January 13, 1883. The black lead or graphite crucibles will be found most suitable for your wants. The composition of these is 52·6 per cent. of carbon, 45·4 of earthy matter, and 2·08 of water. The earthy matter used is fire clay.

(26) F. W. R. asks how to calculate the pressure of water through an iron stand pipe 20 feet high, 2 inches in diameter, water flowing in at the top and discharging at the bottom through an orifice of a quarter of an inch in diameter. Should the pressure be increased or diminished if the stand pipe were reduced to 10 feet high and diameter increased to 4 inches? A. The pressure is determined by the height or head maintained in the stand pipe. The diameter, or flow into or out of, does not affect the pressure. The pressure is 0·4335 pound per square inch for each foot of height or head of water.

(27) O. W. asks the receipt for making cement pavement. A. Cement pavements may be made with Portland cement, broken stone, and sand. If for foot walks, 3 inches in depth of small broken stone may be rammed evenly upon the earth bottom. Mix Portland cement and water to the consistence of cream and pour over the surface, spreading with a stiff broom. When hard, spread with fine gravel mixed with cement and water 1½ to 2 inches deep. Then a coat 1 inch deep of sharp clean sand (such as is used for making mortar), mixed with equal parts of Portland cement, with enough water to make the mass like mortar. Lay evenly and smooth. This will set strong enough to walk upon in from one to two days. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 33.

(28) W. H. C. asks (1) how to obtain a bright, glossy polish on a black walnut counter. A. A good black walnut polish is prepared by taking pulverized asphaltum, and put it in a jar or bottle, pour over it about twice its bulk of turpentine or benzol, put in a warm place, and shake occasionally. When dissolved, strain and apply it to the wood with a cloth or stiff brush. Should it prove too dark, dilute with turpentine or benzol. If desired to bring out the grain more, apply a mixture of boiled oil and turpentine. When the oil is dry, polish the wood with a mixture of 2 parts shellac varnish, boiled oil one part; shake well before using. Apply with a cloth, and rub briskly. 2. Also a bright, glossy polish for a Georgia pine floor. A. For the pine, use white bleached shellac, 3 ounces; white gum benzoin, 1 ounce; gum sandarac, ½ ounce; spirits of wine or naphtha, 1 pint; dissolve. 3. Also a cheap amber color paint to paint the ceiling, which will readily wash off. A. For amber color paint: Mix French yellow in boiled oil, adding sufficient red lead or litharge to produce the desired shade.

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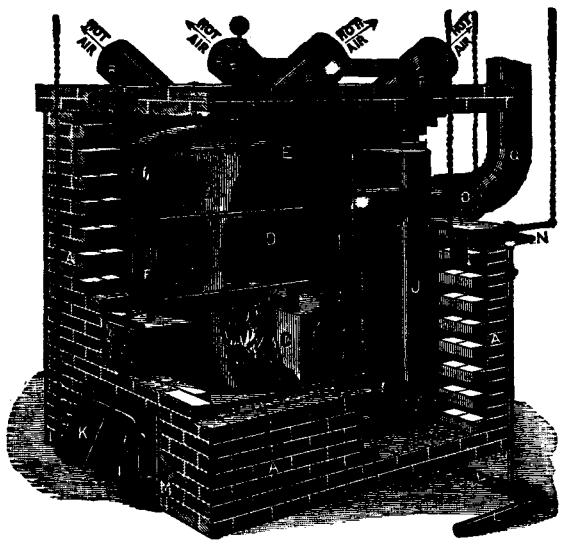


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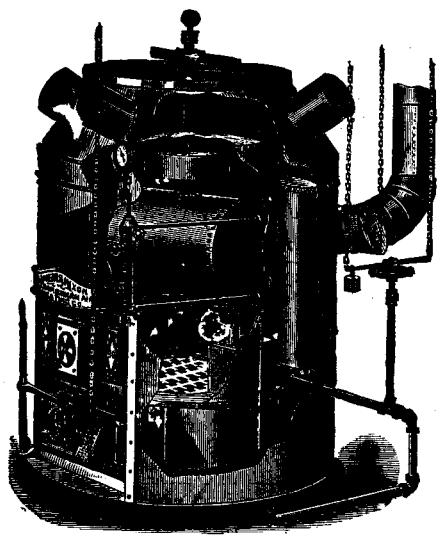

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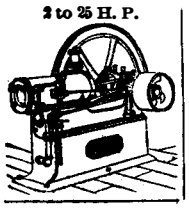

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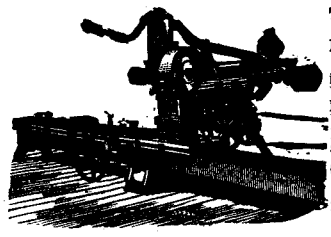

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