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Building Superintendence and Contracts

85 Illustrations

By

EDITORIAL STAFF

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BUILDING SUPERINTENDENCE

CONTRACTS

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PREFACE

The volumes of the International Library of Technology are made up of Instruction Papers, or Sections, comprising the various courses of instruction for students of the International Correspondence Schools. The original manuscripts are prepared by persons thoroughly qualified both technically and by experience to write with authority, and in many cases they are regularly employed elsewhere in practical work as experts. The manuscripts are then carefully edited to make them suitable for correspondence instruction. The Instruction Papers are written clearly and in the simplest language possible, so as to make them readily understood by all students. Necessary technical expressions are clearly explained when introduced.

The great majority of our students wish to prepare themselves for advancement in their vocations or to qualify for more congenial occupations. Usually they are employed and able to devote only a few hours a day to study. Therefore every effort must be made to give them practical and accurate information in clear and concise form and to make this information include all of the essentials but none of the non-essentials. To make the text clear, illustrations are used freely. These illustrations are especially made by our own Illustrating Department in order to adapt them fully to the requirements of the text.

In the table of contents that immediately follows are given the titles of the Sections included in this volume, and under each title are listed the main topics discussed.

INTERNATIONAL TEXTBOOK COMPANY

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CONTENTS

NOTE.—This volume is made up of a number of separate parts, or sections, as indicated by their titles, and the page numbers of each usually begin with 1. In this list of contents the titles of the parts are given in the order in which they appear in the book, and under each title is a full synopsis of the subjects treated.

BUILDING SUPERINTENDENCE
PART 2

BUILDING SUPERINTENDENCE, PART 3

CONTRACTS

BUILDING SUPERINTENDENCE
(PART 1)

SUPERVISION AND SUPERINTENDENCE

INTRODUCTION

1. In modern practice, the busy architect cannot spend his entire time on the work, or as a rule even visit the building frequently enough for sufficient inspection; therefore, in work of importance, a superintendent that is thoroughly versed in building construction is employed, who spends all of his time at the building or a sufficient amount of it to insure that the work and materials are according to the drawings and specifications. The superintendent is paid by the owner, but is under the direction of the architect. The architect exercises only a general and periodic supervision over the work, sufficient to insure the proper carrying out of his designs and specifications. On works of magnitude covering considerable area and where a great many workmen are employed, two or more superintendents may be necessary, and one of them may also perform the duties of the clerk of the works. Or, as the services of a surveyor are necessary on works of importance to give the levels for water-tables, string-courses, floors, and the like, and as these services are required only periodically, his duties might be combined with those of the clerk of the works or one of the superintendents, provided, of course, that the capabilities of the surveyor permitted, and the circumstances demanded it.

2. Proper supervision and superintendence are very important, both to the architect and to the owner; hence, the architect should use extreme caution in selecting his superintendent and should supervise and record the work carefully, so that vigilance and thoroughness shall be assured. In France, the architect can be held liable for any defective work or material during a period of 10 years following the completion of the structure. In all countries the legal responsibility of the architect for such work seems at least open to question, although the weight of opinion is undoubtedly against such responsibility where the architect has evidently done his duty.

DUTIES AND RELATIONS

THE ARCHITECT

3. The **architect** is a person that occupies the position of both artistic and constructive building adviser to his client, acts as intermediary between the builder and the owner, and, in order to render ideas intelligible to both client and contractors, prepares preliminary sketches, final drawings, detail drawings, and specifications. He also executes the contract (usually by filling out a printed form) between the owner and the contractor, and if he is an architect with only a limited practice, he will superintend the work himself; but, if doing an extensive business, he will employ a superintendent or a clerk of the works or both, and will himself exercise a general supervision only.

4. From time to time, as provided in the contract and specification, the architect also issues certificates, on the receipt of which the owner is expected, and is usually bound by the contract, to make the required payments to the contractor.

In order to assist in getting out these certificates, the architect should obtain from the contractor, when he submits his proposal, a schedule giving the unit prices for the various kinds of work and material included and the daily wages to be paid to the different craftsmen, as used in figuring his proposal. The contractor should also be required by the specification to furnish the architect at these certificate periods (usually at the end of each month) with an estimate of the value of the work done during the previous period.

5. In England, the architect often performs the duties of what is called the *building surveyor*, and in this capacity he examines and reports on buildings as to their value, safety, sanitary condition, necessary repairs, and the like. These same duties may also be performed by a builder or some similar professional man. The building surveyor should not be confused with the *quantity surveyor*. The latter is licensed by the government, and prepares the bill of quantities from the drawings and specifications from which the contractors make their bids.

THE SUPERINTENDENT

6. The **building superintendent**, as has already been stated, is a person that is thoroughly versed in building construction, and is under the direction of the architect, being paid by the owner. His duties are to see that the work and materials to be incorporated in the structure are strictly according to the drawings and the specifications.

As stated before, the superintendent may spend all his time at the building or, on less important work, he may spend only a sufficient amount of time to properly inspect the work. A set of drawings to which the superintendent may refer at any time should always be kept at the building.

On a large building, however, the contractor should be required to maintain an office, where the drawings shall be kept, and a table on which these drawings can be spread, in a good light, should also be provided. A telephone should be located in this office so that the superintendent, the clerk of the works, or the architect himself may communicate with the architect's office or the offices of the various contractors connected with the work.

Report to JOHN W. SCOTT, Architect

812 FRANKLIN STREET, SCRANTON, PA.

Progress of Work on *Residence* at: *1015 Vine St.*

FOR WEEK ENDING *August 25th* 190*6*

WORKMEN	NUMBER OF WORKMEN						TOTAL MEN	VALUE OF			
Trade	Mon.	Tue.	Wed.	Thur.	Fri.	Sat.		Rate Per Hr.	Labor	Material	Hours Lost
Masons	6	6	6	6	6	6	36	40	$115.20	$277.60	
Stone Cutters	2	2	2	2	2	2	12	45	$43.20	$21.50	
Stone Laborers	3	3	3	3	3	3	18	24	$34.56		
Stone Carvers											
Bricklayers	1	1	1	1	1	1	6	50	$24.00	$41.00	
Terra-Cotta Men											
Plasterers											
Plumbers				2	2	2	6	38	$18.24	$12.50	
Gas-Fitters											
Slaters											
Tinners											
Tile Setters											
Carpenters											
Joiners											
Wood Carvers											
Painters											
Decorators											
Electricians											
Glaziers											
Engineers											
Blacksmiths											
Iron Setters											
Riggers											
Apprentices											
Excavators	2	2	2				6	20	$12.00		
						Total	84		$247.20	$352.60	

WEATHER	Days	EXTRA WORK WITH VALUE	Value
	Monday	*7 cubic yds. Extra Excavation in rear.*	
	Tuesday		$2.45
	Wednesday		
	Thursday		
Shower about 10 A.M.	Friday	*3 cubic yds. Extra Masonry rear.*	$10.70
Shower about 4 P.M.	Saturday		
		Value	$12.65

Total Value of Labor	$247.20
Total Value of Material	352.60
Value of Material on Ground not used	150.00
Value of Extra Work	12.65
Total Value of Work and Material	762.45
Total Number of Hours Worked	
Total Number of Hours Lost	

Drawings Received	Drawings Needed
Sheets 1 to 18 Extra Blue Print of Survey	*Fireplace Details*

Remarks and Amounts of Different Work Done

Excavation	*180 cubic yards*
Stone Work	*108 cubic yards*
Brick Work	*7000*
Extra Excavation	*7 cubic yards*
" Masonry	*3 cubic yards*

Remarks

Material on ground
15 bags of cement
5000 ft. hemlock
3000 brick, common
5 barrels of lime
6 loads of quarry stone
3 " " ashlar

Signed *John Smith, Supt.*

FIG. 1

7. Records.—The superintendent should keep a personal record of the work from day to day. If he also fills the position of clerk of the works (in which case he would spend all his time at the building), he should be required to make a weekly report by using a blank form similar to that shown in Fig. 1, which has been filled out as in actual practice.

8. System of Supervision.—To formulate rules to be observed in the superintendence of building construction that would be applicable to all cases would be a very difficult matter. Each problem of construction must be considered separately, and a system of inspection should be decided on to suit each particular portion of the work. It is necessary, however, to lay down a fixed plan to follow in superintending, in order to give proper notice to the innumerable points in construction that require immediate attention. A fact well demonstrated by experience is that improper work once finished is not always easily changed, and if ordered to be changed or replaced by other work, will generally give rise to disputes and dissatisfaction, and may often cause expensive alterations; all of which could have been obviated by attending to the defects or mistakes at the proper time.

9. Drawings.—The superintendent should carefully study the drawings and specifications, in order to become as familiar with them as possible and to form a thorough understanding of the projected building, its surroundings, and the materials that are to enter into its construction. He must not, however, trust blindly to the accuracy of the drawings, for mistakes are liable to occur, no matter how carefully the drawings have been made or how thoroughly they have been checked in the drafting room. For this reason, he should check all measurements and satisfy himself as to their accuracy before allowing the work to be laid out or erected.

10. Salary and Character.—The superintendent should be paid a good salary, so as to raise him above the many temptations that are liable to beset him. He should be strictly honest and watchful in the performance of his duties, should possess a knowledge of building operations, materials, market prices, and the like, and should be able to read any drawings likely to be submitted to him.

11. Order for Material.—The superintendent should never order any material or furnish measurements, otherwise he will place himself in the position of the contractor's agent and thus jeopardize the owner's interests. The contractor himself should always lay out his own work, take all necessary measurements, and order all material.

12. Condemning Work.—The superintendent should never attempt to reach subcontractors except through the principal contractor. Should the work of a subcontractor be done in such a manner as to justify condemning it, the superintendent should notify the contractor in writing to make alterations. If the notice is not complied with within a reasonable time, the principal contractor should be served with a second written notice, and if he should refuse or neglect to make the change within a specified time (generally 3 days), the architect should be notified. Full information of the case should be given to the architect, so that he may advise the owner as to his action in the matter, for under such circumstances and at the end of this period, if the contractor has done nothing, the usual contract empowers the owner to hire other labor to do the work properly and to deduct the cost from the amount afterwards to be paid to that contractor.

13. Alterations or Delays.—Should any alterations in the work be required, or should it become necessary to press forwards the execution of some particular part of the work, a letter to that effect sent to the principal contractor is generally sufficient. In case of non-compliance, a remedy similar to that given in Art. **12** should be provided by contract.

14. Disputes.—Whenever possible, the superintendent should avoid disputes in regard to the work; but in deciding such, he should be sure that he is right and then state his decision and stick to it. In fact, he should establish his authority at the beginning, for once established, there will be comparatively little trouble in maintaining it throughout the work.

15. Inspection.—It is imperative that the superintendent should inspect all the work at each visit, and not leave any part of it for some future time. He should ascertain what each workman is doing and should see that it is being done properly, and on his next visit to the building he should find out whether the work in progress at the time of the previous visit has been acceptably done. By following up the work in this way, it will be, comparatively speaking, an easy matter to detect any poor or improper work. The superintendent should endeavor to establish a standard by which each kind of work may be judged, that is, a uniform standard of practice in executing the work, so that the architect or the superintendent and the builder may better understand each other. The superintendent should have the power to obtain the removal of an incompetent workman.

16. Material.—A good practice is to examine and pass on all materials as soon as possible after they arrive at the building site. If any defective materials are discovered, they should if possible be marked and placed to one side, so that there can be no mistake as to what are rejected or any liability of their being used in the structure. To further insure the last result, the superintendent should see that the damaged or rejected materials are immediately removed from the premises.

If the superintendent is satisfied that a certain piece of concrete floor contains poor or reworked material he should order the removal of both improper work and material at once and see that his orders are carried out. He should not trust to the statements of the workmen, who very often, rather than replace the work, will try to convince him that the material is as called for and that it is freshly made.

Sometimes, when a particular brand of some material, such as cement, is called for in the specification, the contractor, for reasons of his own, may say that the brand cannot be obtained in the local market, and that in order to get it, the work must be delayed; and then, as a substitute, offer another brand "just as good." In such a case, the superintendent should know whether the brand specified can be obtained; if it cannot, he should satisfy himself as to whether the suggested substitute is as good as that specified. If the architect knows what materials can be had in the local market and prepares his specifications accordingly, or if ample time is given for ordering materials that cannot be obtained in the local market, no such questions as the foregoing should arise.

17. Relation to Owner.—The superintendent should remember that he is working for the owner's interests, and should therefore not be led into making any concessions to the contractor that would be injurious to the owner. At the same time, he should be perfectly just and reasonable in passing on any of the work or material or in deciding a disputed point.

18. Interpretation of Specifications.—The superintendent's tact and good judgment will often be in demand for settling disputes in regard to the interpretation of such phrases in the specification as "in a good and substantial manner," or "in a workmanlike manner." In such cases, while being just, he should lean more toward severity than toward leniency, as liberality is usually taken advantage of. The architect, however, should never use these general phrases in writing a specification, but should substitute for them exact language that cannot be misunderstood. The loose method of writing specifications is common but should be avoided.

19. Subcontractor.—Much may be said, and many theories advanced, in favor of making one contractor solely responsible for all the work, or of dividing the work among two or more of the trades and in that way dividing the responsibility. It is a well-known fact, however, that work divided among a number of men on the same job, although generally productive of well-executed work, is seldom completed without serious debates arising as to who should do certain pieces of work, or, if done wrong, who is guilty; in short, one will shift the responsibility on another in the effort to save himself.

Perhaps the best plan, therefore, is that of giving the entire work to one man and making him directly responsible to the owner for every part of it. Then, in the event of mistakes, bad work, or the like, there is only one man to look to for its correction.

20. Disagreement.—Any question of right or authority, or any disagreement pertaining to the work, which is likely to impede its proper execution should be referred to the architect for arbitration or adjustment, and his decision shall be final and binding on all parties concerned.

21. Notices and Orders.—The superintendent should make it a rule when notifying the contractors relative to imperfect work, material, delays, and the like, to *write* all communications and retain a copy of each letter. These copies serve as a record of orders and notices given, and reduce the possibility of misunderstanding and dispute as to whether certain work or material was or was not condemned, the date when it was condemned, etc.

22. Written Orders.—Very frequently, when visiting the building while in course of construction, the owner discovers some material or construction that is not in accordance with his preconceived idea, and he at once orders the contractor to make certain changes that may involve more or less work and material.

Instead of doing this, the owner should consult the architect, who will issue a written order to the contractor for any particular change and instruct the clerk of the works or the superintendent to make a record of the work omitted or extra work done, as the case may be. This compels the orders to follow the proper channels and provides the usual records of the entire transaction; moreover, the owner is better protected by this requirement against overcharge or omissions of credits due him for work that may be left out.

In order to avoid such misconceptions by the owner with regard to the drawings, etc., the architect should endeavor to have all matter pertaining to the work—the different features that are indicated on the drawings and called for in the specifications—fully explained to the owner, provided the latter is a person inexperienced in building construction, taking particular note of his preferences in regard to all features of the work. Considerable time spent in this way before the work is commenced will undoubtedly save much subsequent trouble and annoyance.

THE CLERK OF THE WORKS

23. In Great Britain and her Colonies, the **clerk of the works** is both superintendent and keeper of the records, and is continually at the building. In the United States, as has been explained, he may be the keeper of records only, or both, as in English practice.

24. Records.—The keeping of records comprises the making of daily and exact memoranda of regular and extra work done, the number of workmen at work, the state of the weather, drawings on hand and drawings required, besides any other information that may be of service to the architect. These records are usually made on a printed form prepared for that purpose, and should not cover more than one week's time. See Fig. 1. These are delivered to the architect at the end of each week, and are filed in his office, where they may be referred to at any time to enlighten him as to the progress of the work, drawings furnished or needed, and other matters of importance.

25. Values.—The values of the different items of labor and materials listed may be figured approximately by the clerk of the works, using the schedule mentioned in Art. 4 as a basis; or these values might be omitted and figured at the office, only the number of men and the amount of work done being recorded.

The estimates of values would not be required except as a check if the contract stipulated that the payment for the building be made in a number of instalments, at certain periods of the work, instead of in monthly payments amounting to a certain percentage of the value of the work done during the previous month.

PRACTICAL SUPERINTENDING

26. Having given the customary methods followed in supervising, superintending, and recording the erection of a modern structure, the superintending of an actual building recently erected (see Figs. 2, 3, 4, and 5) will now be taken up. The work will be considered in the order in which it is usually done, pointing out the common errors, imperfections, or omissions likely to be met with and the best way to forestall or detect them.

PRELIMINARY OPERATIONS

27. Site and Survey.—The plot being in a city and 80 ft. × 160 ft., the problem of placing the house is not so difficult, nor is it governed by so many considerations as that of a country house, where the grounds may include many acres. In either case, the lot should be laid out by a surveyor, his drawing showing the elevations of the corners of the lot and any other points necessary to determine the grades. Sometimes, sections are taken through different parts of the lot, or, where the property is very large, a contour map is made. The position of the house is determined from these drawings, the consideration of views, the position of neighboring houses, the nature of the soil, distance from road, and like matters.

If the property is in the country, or if the plot located in the city is large, and the owner can afford it, a landscape architect should be employed to lay out the paths, roads, trees, shrubbery, etc., and to properly grade the property. He should work in connection with the architect and under

Fig. 2

FIG. 3

Fig. 4


FIG. 5

his direction. Many architecturally beautiful buildings are badly placed on the grounds, and every city has examples of well-designed residences with disappointing settings. Much of the pleasing effect of a building depends on its setting, and this fact should be carefully considered by the architect.

The surveyor having plotted his survey, showing the levels of a sufficient number of points on the property to enable the architect or the landscape architect to figure the final grade (which may then be transferred to the elevations), the architect begins on the drawings of the building, considering in connection with the designing of the basement and first story, the location of outside door steps, areas, etc., with reference to the final grade. Both the original and the final grades are usually shown on the elevations, in order that the contractor may know the amount of filling and cutting that will have to be done.

A plan should be furnished to the contractor and superintendent by the surveyor, showing the location of the house on finished grounds, with all necessary levels of corners, etc. marked thereon.

28. Sounding and Excavation.—Previous to locating the building or even after it has been located, it may be desired to obtain the depth of soil to a substratum of rock, which is at or above the footing level, or to learn the nature of the different strata where rock is not expected. In the former case, the soundings may be taken with a long crowbar and a drilling hammer, as indicated in Fig. 6. These drillings should be taken at points located on

FIG. 6

the survey or points related to the surveyor's points, and the results noted in a field book. Where it is possible to reach the rock at all points, this memorandum will give data from which the amount of excavation of rock and soil may be easily figured.

Where rock is not likely to be encountered and the nature of the subsoil is to be ascertained, boring is usually resorted

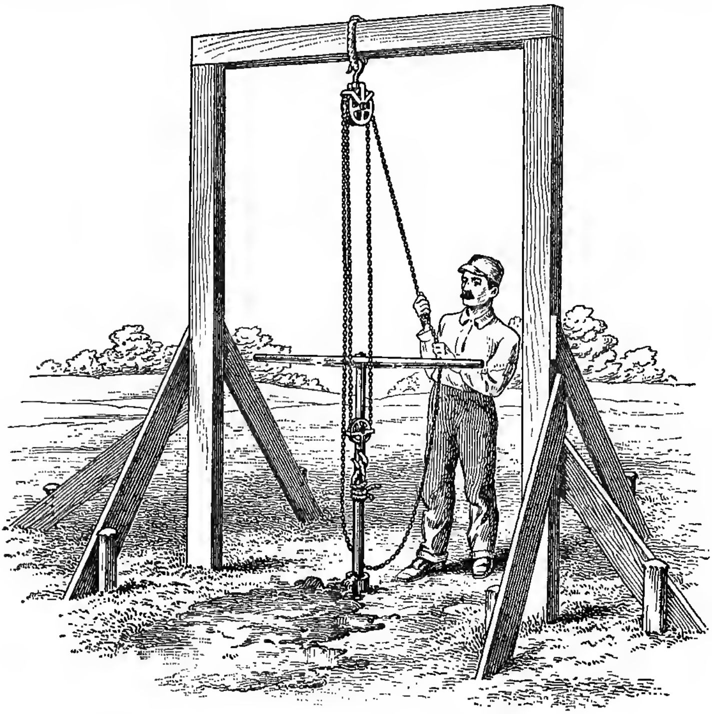


Fig. 7

to, or trial pits are dug at different points. The former method is probably better and cheaper, and is accomplished by means of a carpenters' auger about 2 feet in length and from 2 to 4 inches in diameter, which is sunk either inside a driven iron pipe or entirely free, being turned by two men at the ends of the long handle. Using the iron pipe is the better method, as the material is retained and delivered at the upper end of the pipe in the order of the underlying strata; and if a record is kept of the different materials as delivered, noting the depth at which each kind begins and ends, a very good idea of the different layers of soil beneath will be obtained.

As the largest carpenters' auger is only about 2 feet long, a special auger with extension rods (made for this purpose) should be procured. An acceptable substitute for this auger may be obtained by having a blacksmith weld an extension on the longest carpenters' bit to be had, and making a number of extension rods with sockets and setscrews to fasten at junctions.

The auger may be removed from the ground by means of a chain hoist and temporary derrick, similar to that indicated in Fig. 7.

29. Very frequently, wet ground or free water is found to exist below the top soil, even in elevated places, although no indication of it may appear on the surface. This is usually due to natural depressions in the surface of the rock or compact subsoil, as shown in Fig. 8. This water should be drained from the site if possible, but the existence of damp or wet soil a foot or two below the foundation of the ordinary building when the soil over it is firm is not a serious condition, provided the cellar bottom is well concreted and the foundation walls are built with a suitable damp course. If, however, wet clay overlays the rock, it is not advisable to build on it, for soils of this nature are treacherous; the rock also being wet, the superimposed

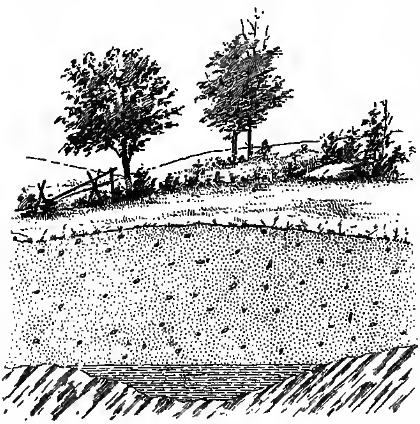
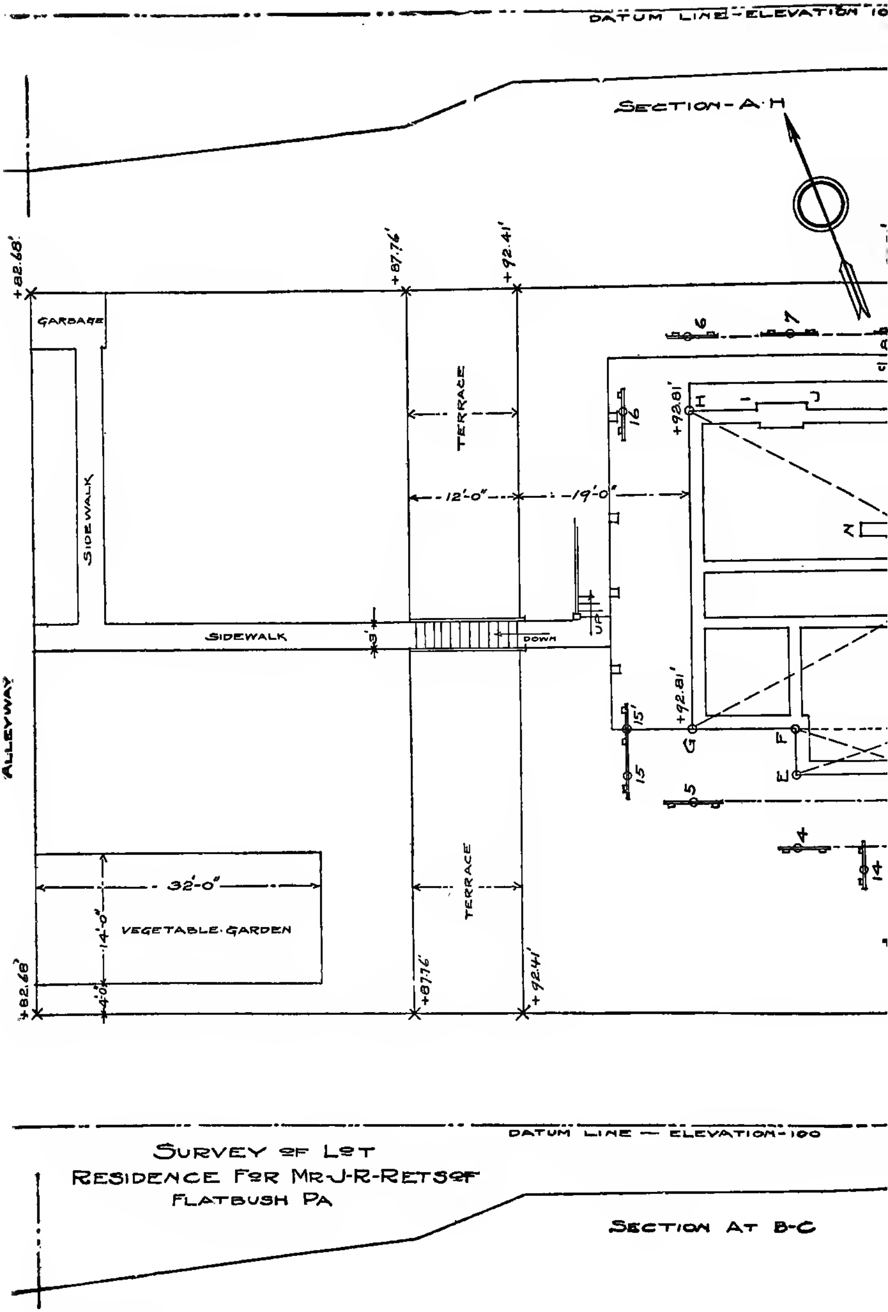


FIG. 8



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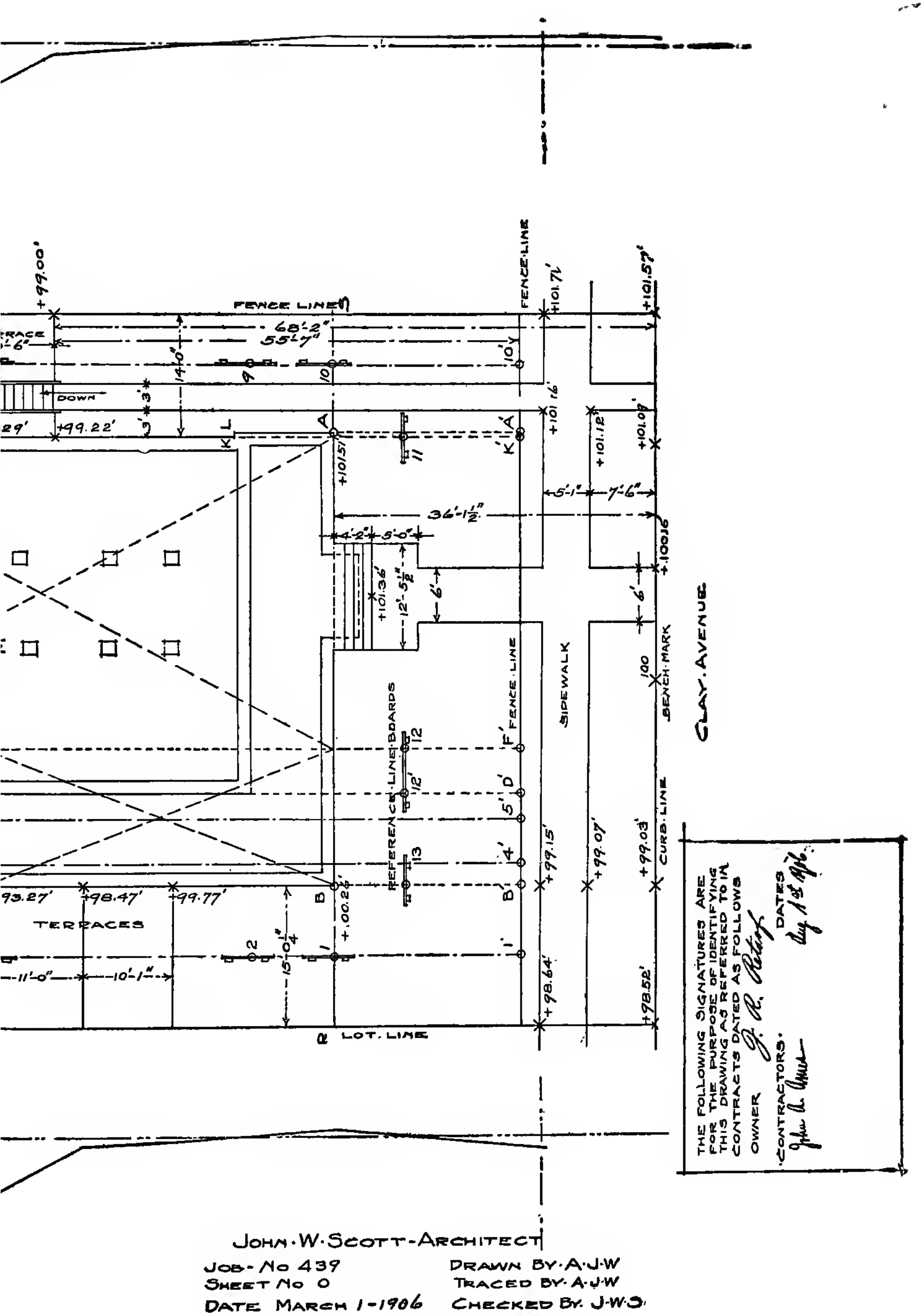
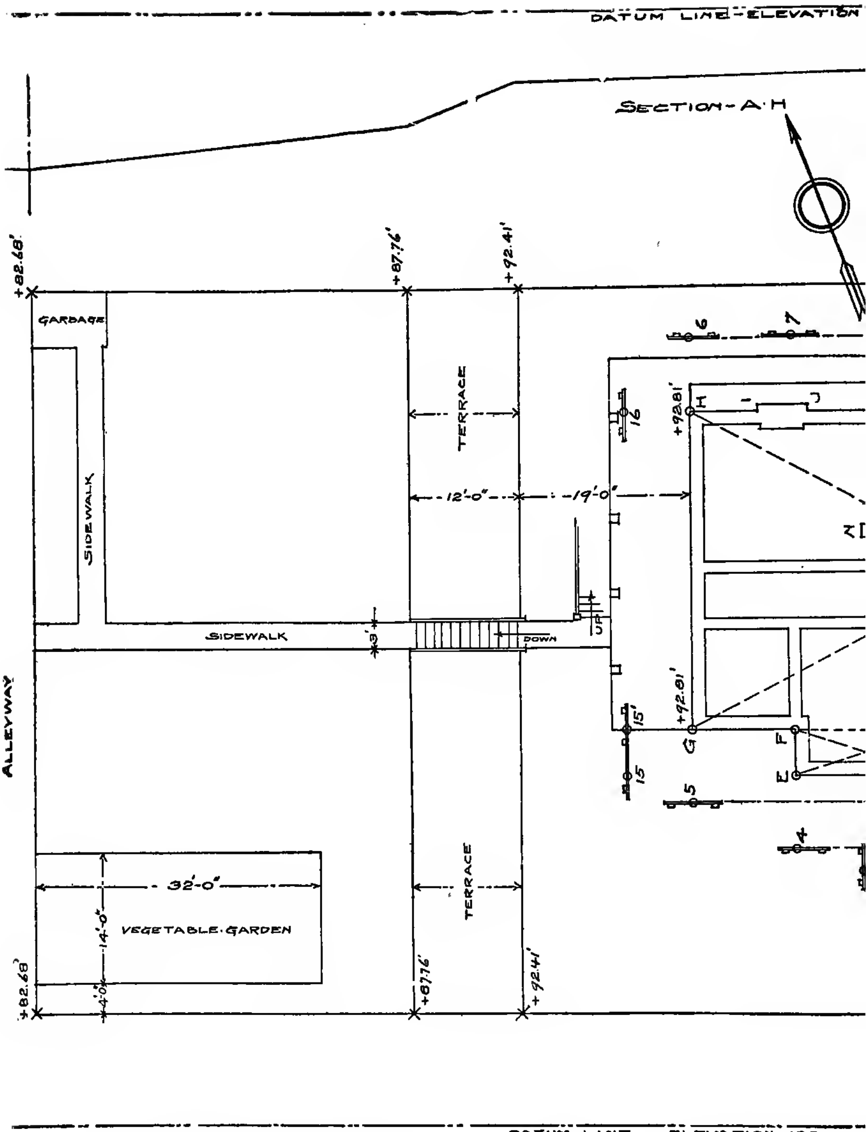
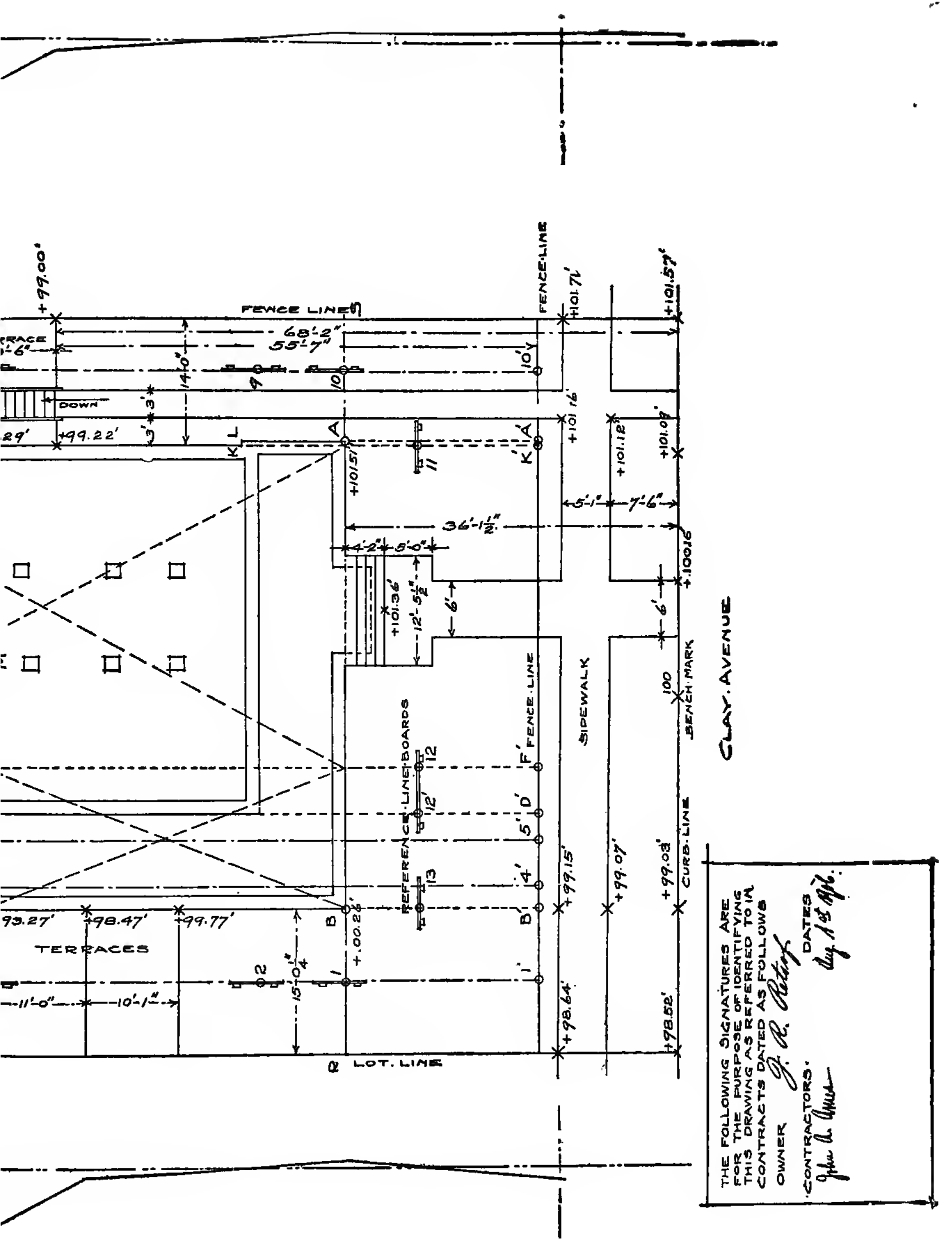

FENCE LINE
68'-2"
55'-7"
14'-0"
DOWN
+99.22'
+99.00'
+101.71'
+101.57'
+101.16'
+101.12'
+101.08'
+101.51
36'-1½"
5'-1"
7'-6"
4'-2"
5'-0"
+101.36'
12'-5½"
6'
+100.16
FENCE LINE
SIDEWALK
BENCH MARK
100
CLAY AVENUE
REFERENCE LINE BOARDS
CURB LINE
+99.15'
+99.07'
+99.03'
+98.47'
+99.77'
TERRACES
+00.24'
15'-0¼"
11'-0"
10'-1"
+98.64'
+98.52'
LOT LINE
THE FOLLOWING SIGNATURES ARE FOR THE PURPOSE OF IDENTIFYING THIS DRAWING AS REFERRED TO IN CONTRACTS DATED AS FOLLOWS
OWNER
CONTRACTORS
DATES
JOHN·W·SCOTT-ARCHITECT
JOB- NO 439
SHEET NO 0
DATE MARCH 1-1906
DRAWN BY·A·J·W
TRACED BY·A·J·W
CHECKED BY. J·W·S



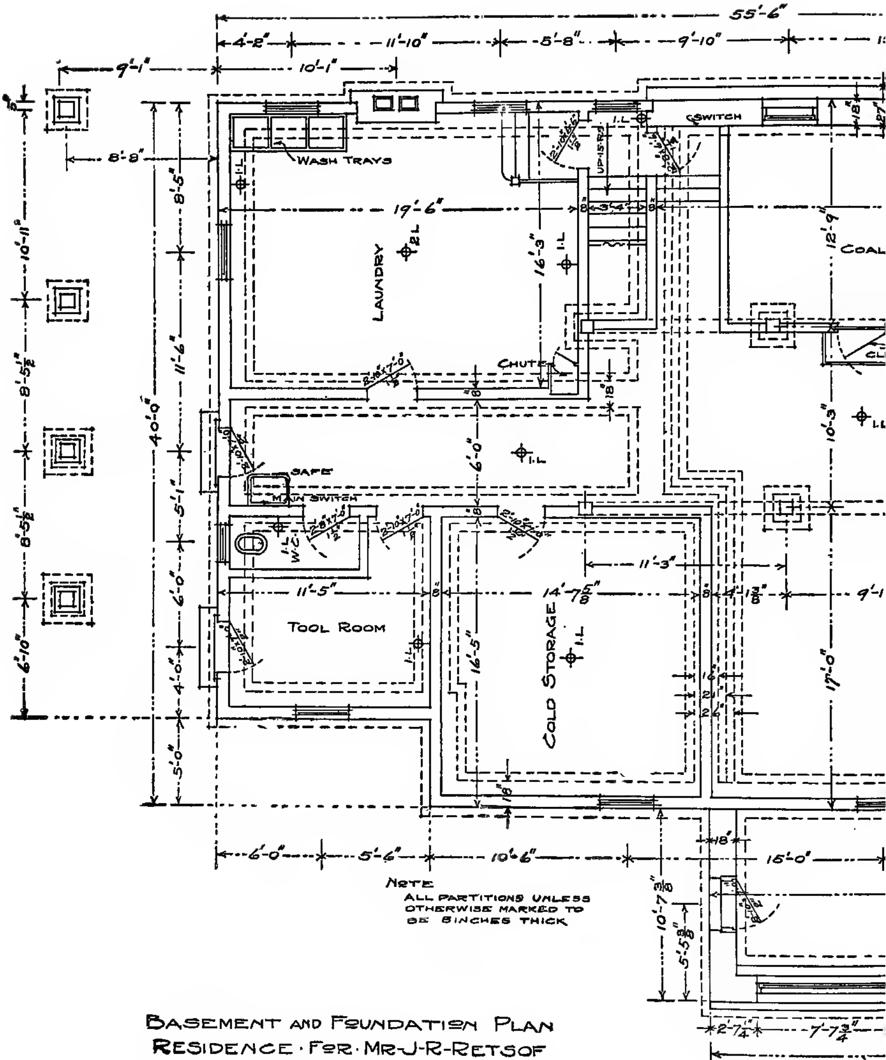
SURVEY OF LOT
RESIDENCE FOR MR-J-R-RETSOF
FLATBUSH PA

I L T 454—1092A



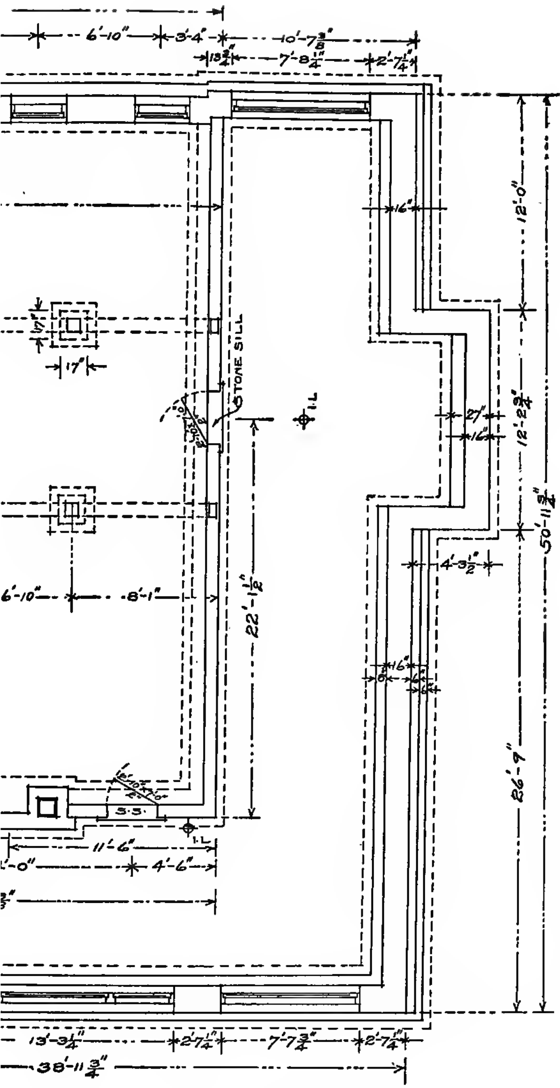
JOHN·W·SCOTT-ARCHITECT

JOB-No 439 DRAWN BY·A·J·W
SHEET No 0 TRACED BY·A·J·W
DATE MARCH 1-1906 CHECKED BY. J·W·S.



BASEMENT AND FOUNDATION PLAN
RESIDENCE · FOR · MR-J-R-RETSOF
FLATBUSH PA

ILT 454—1092A



THE FOLLOWING SIGNATURES ARE FOR THE PURPOSE OF IDENTIFYING THIS DRAWING AS REFERRED TO IN CONTRACTS DATED AS FOLLOWS:

OWNER *J. R. Retsof*

CONTRACTORS	DATES
John A. Ames	*Aug. 1st 1906.*
A. L. Jones	*Aug 10th 1906*
A. Hughes	*Aug. 15, 06*
M. Morris	*" 27, 06.*

JOHN · W · SCOTT - ARCHITECT

JOB - NO. 437	DRAWN BY · A.J.W
SHEET NO 1	TRACED · BY · L.A.O.
DATE · MARCH 2-1906	CHECKED · BY · R.W.S.

weight gives the clay a tendency to slide, the water on the rock acting as a lubricant.

The nature of the subsoil on which the foundations are to rest being ascertained and the bearing power figured, the foundations are proportioned accordingly. Where the nature of the strata is known approximately, the usual contract calls for excavation to the depths shown on the drawings, irrespective of the nature of the strata, and rock may or may not be encountered.

A schedule should be submitted by the contractors with their proposals (see Art. 4), giving the unit charges for the excavation of different materials, so that extra cost for additional excavation found necessary may be figured thereby. This schedule also provides a basis from which to figure rebates to the owner for saving excavation, where good foundation is found at an available depth less than shown on the drawings.

The excavation and foundation may, however, be done and paid for by the cubic yard, and the balance of the work by contract. Where the excavation is also done by contract, it is only necessary for the architect to ascertain, by the methods just given or from former experience in the same locality, from near-by excavations, the suitability of the strata at the depth desired to carry the weight of the building, and then plan the foundations accordingly.

FIRST VISIT

30. The superintendent is furnished with a print of the survey and a full set of the drawings and specifications, with which he proceeds to make himself thoroughly familiar. The contractor is also furnished with a complete set of the drawings and specifications, and arrangements are made with the superintendent to oversee the staking out of the building. On the appointed day, the contractor and superintendent meet on the ground and the staking out of the building is soon accomplished.

In Fig. 9 is shown the survey from which, in connection with the foundation and basement plan, Fig. 10, the contractor obtains all necessary data to lay out the foundation walls and piers. The survey, Fig. 9, also shows the final grades with the levels of the various points. The temporary stakes locating the corners of the building, as shown at *A*, *B*, *C*, *D*, etc. in the survey, are already in place, but will only be used as a check.

A carpenter and a mason accompany the contractor, to assist in laying out the work, and carry between them a hatchet, a bundle of stakes, a plumb-bob, a 100-foot steel tape divided into feet and inches (not feet and tenths), and a builders' transit. The superintendent also ascertains that thirty pieces of studding with sharpened ends, each 4 or 5 feet long, together with about one-half that number of pieces of rough hemlock sheathing boards 5 to 8 feet long, have been previously delivered on the premises. As the work is laid out, the part each of these is to play will be readily seen. Before following the contractor and superintendent further in laying out the work, a few explanations will be made of various methods in use in this connection.

31. To Turn Right Angles.—An architect with an extensive practice usually has a builders' transit and steel tape that may be used by the superintendent in checking the laying out of the work. On small or unimportant work, where a transit is unnecessary, the rule commonly known as the "**3-4-5 rule**" (explained later) may be used for checking the accuracy of the right angles.

Assume that the line *R S*, Fig. 9, has been located parallel to the street by measuring equal distances on adjoining sides from the front-lot line *A B*, which has already been located and laid off by the surveyor from dimensions given on the plan. The next problem then is to turn the right angles at *A* and *B* and prolong the sides of the building to the rear corners. Instead of turning the right angle at *A*, turn it at the point where the line through *K* cuts *A B*, the projections at *L* and *I J* being located afterwards by means of a carpenters' square.

To turn the right angle by the 3-4-5 rule at the points just mentioned, proceed as follows: Suppose that it is desired to turn a right angle at the stake *a*, Fig. 11. The front line *R S*, Fig. 9, being already established, first measure off 3 feet from *a* in the direction of *b*, on this line, placing a temporary stake *b* with a tack at the proper point. Nails are then driven into both stakes *a* and *b* alongside of tacks, as shown in detail at (*d*), in such a way that when the tape ring is placed over the nail the end of the ring will be directly over the tacks, thus insuring a correct measurement. Two tapes are placed with their rings over the nails at *a* and *b* and stretched toward *c*. They are then adjusted so that the 4-foot point on *a c* will coincide with the 5-foot point on *b c*. This point of intersection being found, a stake is driven and

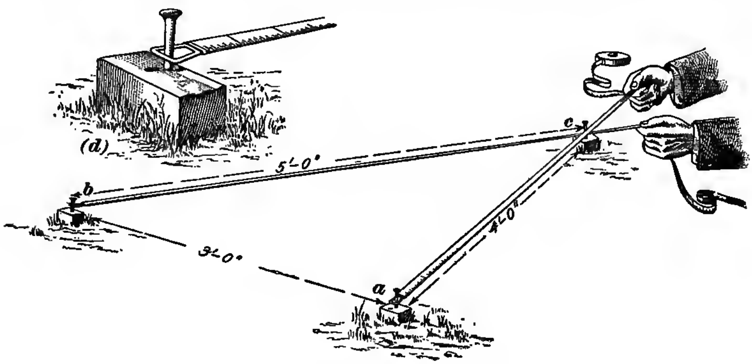


FIG. 11

a nail located therein as shown, thus locating a line *a c* at right angles to *a b* and forming the right triangle *a c b*.

The method of using a transit for laying out foundation walls, as accomplished by the contractor for the building under consideration, will be given later. After the work has been laid out in this way or with a transit, it may be checked by measuring the diagonals of the rectangles, as indicated in Fig. 9. If the angles are correct, the diagonals will be equal.

32. Leveling.—For buildings that are large or of some importance, an engineers' level should be used to establish the levels; but for small buildings, a long straightedge and a carpenters' spirit level may be used by "leveling up" from corner to corner or point to point by means of intermediate temporary stakes, stones, etc., the straightedge being placed on the stakes, etc., and the level on the straightedge.

A *bench mark*, or *datum point*, should be established where it will be easily accessible and of reasonable permanency. The top of the stone curb in front of the building, as shown in Fig. 9, is often taken for this purpose. The level of this mark being known, other points, such as that of the water-table, walls, etc., may be leveled from it at any time.

For a brick or stone building, where the heights of courses are figured, they should be laid off on a rod (made of thoroughly seasoned wood), beginning at the water-table top or some other datum line. The height of joints may then be tested by this rod from time to time and at different points as the building progresses, thus insuring that the courses are correct for height and level.

The reference-line boards are sometimes placed with their tops on the proposed level of the finish of the foundation wall (where possible), the mason referring to them from time to time. This method saves the contractor the trouble of obtaining levels from the bench mark, but as the line boards are liable to be disturbed, it is not likely to give correct results and cannot be recommended.

The wall levels at floors, etc. should be tested with straightedge and spirit level, and the superintendent should see that the top and bottom edges of the straightedge are exactly parallel; if they are not, levels obtained by it will be incorrect.

The levels, as indicated in Fig. 9, are usually given in feet and decimal parts of a foot, above or below an assumed reference level. In this case, the reference level is located on the curb, and its elevation is assumed to be 100. It is called bench mark in Fig. 9. Tables are usually given in architects' or superintendents' handbooks by means of which these values may be expressed in feet and inches.

If any levels more than 100 feet below the bench mark, or reference level, given in this case were required, they would be designated as negative (−) values, all values above zero or datum level being marked positive (+).

33. Measurements.—In taking measurements to lay out several distances on the same line, the tape should be held with the ring end at the starting point and the measurements taken off successively, the tape being unrolled as each measurement is made. This is much more accurate than the common method of taking each measurement separately.

34. Staking Out.—Staking out the building is the duty of the contractor, and if the building is of sufficient importance to warrant the employment of an engineer, the contractor should be required by the specification to do so. The architect or his superintendent merely verifies the correctness of the work as laid out, and gives the contractor any information desired, but should in no way assume any responsibility.

35. As stated in Art. **30**, the contractor, his two assistants, and the superintendent are on the ground ready to lay out the work; and, as mentioned, the building is to be located on the lot in the position indicated by the temporary stakes A, B, C, D, E, F, etc., Fig. 9, the owner having given his approval. These stakes having been driven for some time, however, as stated before, the superintendent directs that the work be laid out entirely independent of them, and according to the survey, Fig. 9, and the foundation plan, Fig. 10. The drawing used by the surveyor is similar to Fig. 9, but does not contain the lines inserted to show the method of laying out the walls.

The contractor first locates A' and B' on the front lot or fence line according to the measurements given in Fig. 9 (A' and B' bearing the same relation to the north and south lot lines that A and B do), and then, also, D', F', and K' by referring to the proper measurements on the foundation plan. Now, having driven stakes with a nail in each at all of these points, the contractor sets up his transit over each in turn, and after turning his telescope on the front line of the property, so that the vertical cross-hair bisects all the nail heads, he turns, horizontally, an angle of 90° and locates the stakes at *11*, *16*, *12′*, *15*, *13*, *14*, *12*, and *15′* with line and distance indicated by a nail driven in top of each one, keeping them 8 feet from the outside wall line in every case. Having placed these stakes, the contractor returns to the front lot line and locates *1′*, *4′*, *5′*, and *10′*, by means of which, in the same manner as just described, he locates the stakes at *1*, *2*, *3*, *3′*, *4*, *5*, *6*, *7*, *8*, *8′*, *9*, and *10*, which are also kept 8 feet from the wall line. After all the stakes are driven and the nails are accurately located, the superintendent having signified his approval thereof, the carpenter and mason erect reference line boards, similar to that shown in Fig. 12, over stakes as indicated in Fig. 9, and the contractor

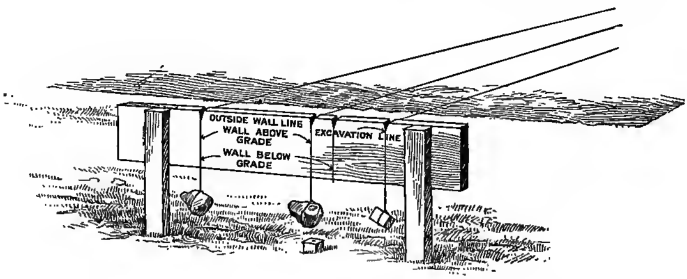


FIG. 12

by plumbing down to the nail in each stake locates and marks with a notch and appropriate lettering on the boards the lines for all walls.

The lines located by this method are for the outside of walls only; those for the inside and for the excavation may be found by simply measuring over on the line board, as indicated in Fig. 12. The piers in the front part of the cellar may be located by measuring in from the side lines. The inside walls are located in the same way where it is impossible to fix their position by means of the line boards. When the masons begin work, lines will be stretched between the line boards and thus serve as guides.

36. By referring to the foundation plan and elevations, it will be seen that the foundation wall is stepped on both front and sides, and that the greatest total projection of footing beyond the outside face of the wall at the grade line is 18 inches in front, 15 inches on the north side, and 10 inches on the south side. To the rear of the terraces on the north and south sides and on the west, the projections decrease to 6 inches. In order that room may be left for pointing, the superintendent should see that the excavation is at least 18 inches larger on the front and the north side to terrace and 12 inches larger elsewhere than the outline of the foundation above grade, cords being stretched between line boards to bring the excavation to these lines.

37. Excavated and Building Materials.—The sod on the proposed site of the building being of good quality, the superintendent (being so authorized by the specification) directs that it shall be cut from the ground in strips 16 inches wide and, in lengths of from 4 to 6 feet, rolled up and piled at the rear of the lot for use in sodding after the grading is done.

The top soil, loam, and gravel should then be placed in separate spoil banks, or heaps, away from the building and at a point that will be convenient when the material is required for grading. The excavated materials should not be nearer the edge of the excavation than 8 feet, so as to allow room for lines, the erection of scaffolding and space for mortar troughs, stone, etc.

While it is very important to place the excavated materials at a point that will be as convenient as possible when they are wanted again, care should be taken as to where they are deposited. For instance, a common occurrence is to find the earth as shoveled from the excavation heaped up to a considerable height without any regard to the position of the exterior piers or trenches. This is very poor practice, for when the time comes to excavate for these, this pile of dirt as well as the undisturbed earth beneath it must be dug out, thus necessitating extra expense and loss of time that could have been prevented had the excavated materials been disposed of properly in the first place.

All material delivered at the property, such as lumber, stone, bricks, etc., should be piled where it may be easily obtained and where it will not interfere with subsequent operations, as, for instance, digging trenches for piers, sewer line, etc., mortar mixing, stone dressing, etc.

38. Frequency of Visits.—It should not be inferred that the first visit, second visit, and so on, at intervals of several days, as described in this Section, would be sufficient for an undertaking of magnitude. Such work would require daily visits on the part of the architect or superintendent, and a clerk of the works, with an office established on the premises, would also be necessary. For ordinary buildings, however, the superintendent usually visits the works once or twice a week, according to the importance of the structure and the amount of supervision desired and paid for by the owner. For example, in the building of a small country house it would be unnecessary and unreasonable to expect the architect or his superintendent to visit the work every day, but, on the other hand, the erection of a large public library, for instance, would evidently require careful daily supervision, for which compensation must be provided.

39. Everything being in readiness for the excavation to begin on the following day, as promised by the contractor, the superintendent leaves for his office, where he should again check up the work just completed and make very sure that all has been correctly laid out. A mistake at this time, if not discovered, will often lead to serious trouble later.

SECOND VISIT

40. Preparation.—Before accompanying the superintendent on his second visit, it may be well to learn what he has done during the 10 days that have elapsed since his first visit to the building site, at which time the work was laid out.

As suggested, he first checked the work, to assure himself of its correctness, and finding that everything was properly done, he proceeded to examine all the drawings, checking the figures carefully and memorizing the plans and specifications as thoroughly as possible. In this connection he became familiar with the structural parts of the work, and anticipated possible additions, changes in construction, omissions, and results of the same. He also brought these matters to the attention of the architect and learned his wishes in regard to the same, so as to be prepared to make a decision without delay, should any question along this line arise in regard to the work.

During the 10 days past, then, the superintendent has devoted all his available time to the study of the drawings and specifications, and now feels thoroughly informed and competent to answer any questions about the work.

Besides those already given, Figs. 13 to 38, inclusive, —which are to be found throughout this Section—comprise all the general drawings that are now in the hands of the superintendent, and which include everything but the details, which are usually gotten out later, as needed. At this point, and before taking up the second and succeeding visits, it would be well to study these drawings, in connection with reading the specifications (found in *Building Superintendence*, Part 3), until thoroughly familiar with the material and workmanship that is to go into the proposed building, and thus place oneself as much as possible in the position of the superintendent.

41. Examination of Materials.—Allowing the contractor 1 week or 10 days to have all necessary implements, etc. on the ground and to get the excavation nearly done, the superintendent visits the premises and finds a large force of laborers at work and the excavation almost completed. Looking around, the superintendent should see that the sod, top soil, loam, and gravel have been placed in separate heaps in their proper places, as previously directed. One great pile of rough quarry stone, another pile of ashlar, and a third pile from the appearance of which should contain some three thousand common bricks, to be used for the chimney, a large quantity of rough plank, sand, cement, lime, and other material are also found on the ground. Carpenters are engaged erecting a shed at the front of the plot for the storage of the lime, cement, etc.

The superintendent should now examine the sand, which, after it is compressed in the hand, should not cake nor cling together, thus indicating that it contains very little loam, or, in a word, is *clean*. He should also notice that it does not discolor the hands, which is another test for the presence of loam, and he may further examine its quality with a microscope, which will reveal the relative amounts of loam and sand. This sand, being clean and sharp, will require less cement than if it were finer or contained a greater amount of loam or other inferior substances. The coarser grades are preferable to other kinds, and sand obtained from quartz sand pits or crushed granite screenings from a stone crusher is undoubtedly the best. The coarser grades of sand are used for rough stonework or common brickwork, while the finer sand is used for pressed brick and ashlar. The sand should be screened to remove the coarser gravel, which is deposited in one end of the cellar for future use in preparing concrete and for filling trenches, etc.

The superintendent observes that the cellar bottom and the footing trenches are covered in several places with a few inches of water, due to rain during the previous night. He directs that the footing trenches be bailed out before any masonwork is done, and makes arrangements to have sewer connection placed so as to drain the cellar bottom. This connection should be made to conform to requirements of the plumbing specifications, and after the cellar drainage is no longer required the house sewer may be connected to it.

42. Testing Cement.—There being considerable cement on the work, the superintendent should first ascertain that the brands specified are there and that the material is dry and in good condition.

Many methods are resorted to in determining the properties of cements, their resistance to the action of the atmosphere and water, their fineness, and their compressive and breaking strengths. There is a wide diversity of opinion as to the best methods of testing cement, and this question has been under discussion for many years, the results being given in a number of works on masonry and construction. In engineering work of magnitude, such as masonry bridges, abutments, retaining walls, drains, etc., very rigid specifications are drafted to cover the tests for this particular material, and a time test varying from 1 week to 1 month or more is insisted on, the contractor being required to have the cement delivered on the ground a sufficient length of time previous to that fixed for the laying of foundations to permit the tests to be made. The manufacturers of cement very often publish tables compiled by some eminent engineer that set forth the properties of their material, which may or may not be accepted; engineers and architects, however, generally prefer to make their own tests. In work where a great deal depends on the construction and bonding of the walls, rather than on the strength of the cement, a slight variation will be of little consequence, provided the cement is of some recognized brand that has withstood the test of market competition.

The tests recommended by The American Society for Testing Materials, though quite elaborate for an architect, are considered the best. For all work not of great importance, much simpler tests are used and are also sufficient. A great many architects and engineers consider tests to obtain the fineness, weight, hardness in setting in water and air, and apparent texture, sufficiently exacting for a well-known and accepted brand of cement. More elaborate tests should be made in a laboratory by a skilled testing engineer.

43. It will hardly be necessary to dwell on the various methods employed by engineers in testing cement, as an explanation of these may be found in the reports of The American Society for Testing Materials. The superintendent, however, should know how to test the cement at the work in as short a space of time as possible. Very frequently he finds the cement on the ground one day, while the actual work of wall construction is to commence the next or even the same day. If, on looking over the ground during his tour, he finds that a large quantity of cement has been delivered and that there are four brands of it, representing the product of as many manufacturers, the cement should be passed on. Should there be any brand on the ground not called for in the specifications, or a brand the quality of which the superintendent is in doubt about, he should test it. In a case of this kind the following simple test might be applied: After looking over a sample of each kind of cement and finding that sample No. 1 is very fine, No. 2 slightly coarser, No. 3 about the same as No. 2, and No. 4 about as fine as No. 1, he then mixes a stiff mortar in the proportion of one part cement to one of sand of each kind of cement furnished, and forms of each kind two "briquets," or cakes, from 2 to 3 inches in diameter and $\frac{1}{2}$ inch thick. These are spread out on a board and exposed to the sun for about 1 hour, or until they become firm enough to handle, after which he immerses one sample of each in water for about 2 hours. Care is taken to mark each sample so that the different varieties may be easily distinguished. After the required time has elapsed, the superintendent examines the samples. Suppose he finds that sample No. 1 had become quite hard in both the air and water, fine in texture, and resisted the tensile strain exerted by pulling it apart with the hands before breaking, and that the fracture was then clean with sharp edges; this proves that sample No. 1 sets well in the air and under water, and for this reason the cement is suitable for masonry below grade. He then finds that sample No. 2 left in the air has become very hard, in fact, harder but coarser than No. 1, but he also finds that sample No. 2 placed in the water has crumbled into a heap, indicating that though the action of this cement in the air was very encouraging, it is entirely unsuitable for use in positions where the mortar is to be depended on to resist water. Sample No. 3, air set, is soft, fine in texture, and crumbles at the edges; it breaks very easily, and on being pulled apart, it separates into small pieces. This sample in water is no better, showing that it is a slow-setting cement, and though in time it might attain a hardness equal to the other, it is not desirable for the work. Sample No. 4, air set, and the other in the water, are both very hard and fine, and resist the breaking tests very well. The No. 4 sample is Portland cement, to be used for pointing, etc., and is accepted. The Vicat cement, which is specified and which will be used for the setting of ashlar and brickwork, being tested in a similar manner, is found suitable and is accepted.

44. The color of cement varies from light or dark grays to brown or yellow grays, according to the grinding and the locality of the quarry from which the stone is taken. The Portland cements are usually a grayish drab, and the Rosendale, more yellow and brown. The dry cement should be uniform in color and entirely free from streaks, which indicate impurities or imperfect grinding.

The superintendent should not be induced to accept cement on the recommendation of the masons or the contractor, nor accept their tests, which very often are worthless. Masons have been known to declare that cement when placed on the tongue should have a biting taste, the intensity of the bite indicating the strength of it; then, again, many say that it should be of a certain yellowish tinge and have a soft greasy feeling when allowed to run through the fingers, and so on. Such tests are useless, and are offered through ignorance or with the idea of deceiving the superintendent.

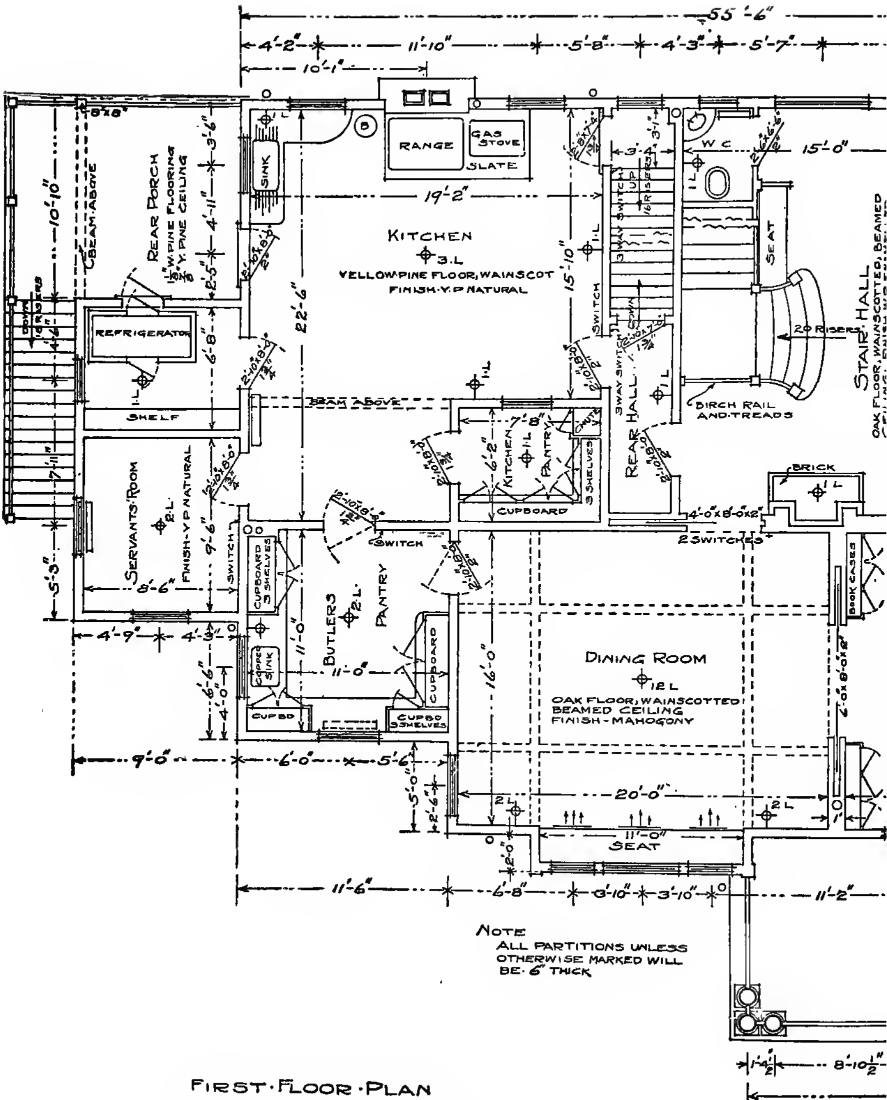
A few cement barrels are broken open, and in one or two instances the cement is found to have partly set, or caked, around the edges. In this instance the superintendent should either order the barrels removed or caution the contractor to use none but the free cement. Cement very often becomes hard around the edge of the barrel and should not be used, although the balance of the cement in the barrel is in good condition.

The cement delivered in bags should be looked over to see that none of it is caked, and it should be stored in a dry place. Dishonest contractors have at times substituted a cheaper grade of cement for that specified, delivering it in the proper bags in order to deceive the superintendent.

45. Lime.—Limes may be said to be either *common* or *hydraulic*, according to the amount of silica, alumina, etc. they contain. **Fat lime** is a common lime containing less than 5 to 6 per cent. of impurities and is the most suitable for mortar making. Such lime is made from limestones and marbles. It slakes rapidly, hardens very slowly in air, and not at all in water. Lime having a percentage of impurities above 6 per cent., does not augment in bulk to any great extent when slaked with water, and is called **poor** or **meager lime.** This lime is less used for mortar than the fat lime, being utilized principally for fertilizing purposes.

Lime becomes **hydraulic** when it contains 15 per cent. or more of finely powdered silica and alumina; it slakes slowly and quietly, and hardens under water, hence it is adapted for use in damp situations.

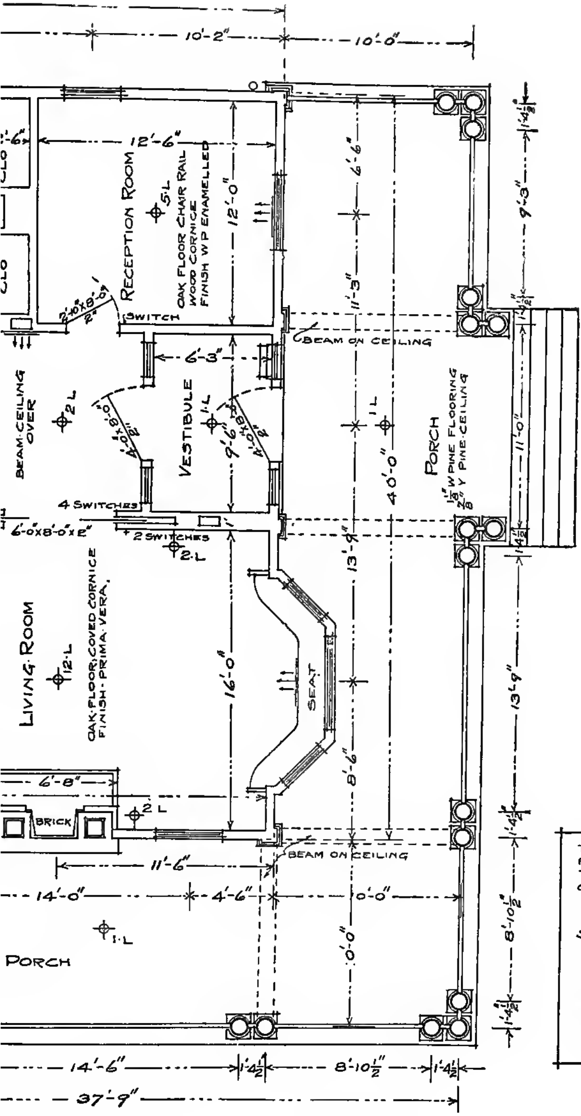
46. Inspection of Lime.—On the occasion of the superintendent's second visit, after completing his tests of cement for the time being, he should proceed to test the lime that is to be used in the mortar for brickwork. He should observe that there are several brands of lime on the premises, and in glancing over the barrels may discover that two or three of them have burst, and the lime, as far as can be seen, is powdered; the barrels are opened and the lime is examined and found for the most part to have crumbled, indicating that it has become *air slaked.* A few lumps taken at random are immersed in water and do not slake; the barrels from which these are taken are then ordered from the premises as being unfit for use, although the lime may have been of excellent quality when the barrels were filled. A sound barrel is next broken open and a few lumps of the lime are immersed in water; two or three of the lumps begin to slake immediately, but the others remain inert for some time and then slake slowly, leaving a hard center, or core, indicating that these lumps are *underburnt*, which, if allowed to be mixed in the mortar, would continue to slake slowly and swell, thereby causing the mortar to



NOTE
ALL PARTITIONS UNLESS OTHERWISE MARKED WILL BE 6" THICK

FIRST·FLOOR·PLAN
RESIDENCE FOR MR-J-R-RETSOF
FLATBUSH·PA

ILT 454—1092A



The following signatures are for the purpose of identifying this drawing as referred to in contracts dated as follows

Owner J. R. Retsof

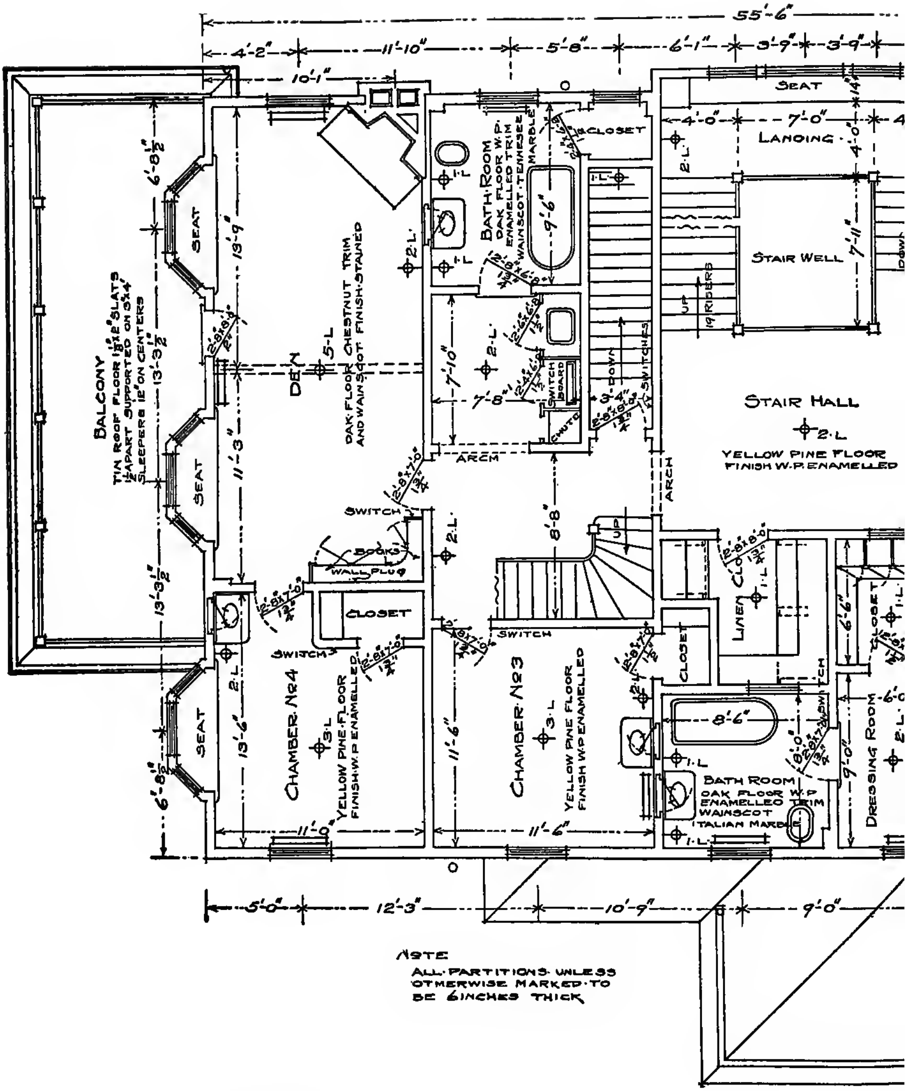
Signatures	Dates
John W. Ames	Aug. 1st 1906
A. L. Jones	Aug 10th 1906
C. J. James.	Aug. 30. '06.
A. Hughes	Aug 15. 06
M. Morris	" 27, '06.

John·W Scott· Architect

Job - No 437 Drawn - By R.W.S.

Sheet - No 2 Traced· By· A.J.W.

Date March-3-1906 Checked By. R.W.S.



SECOND · FLOOR · PLAN
RESIDENCE - FOR - J-R-RETSOF
FLATBUSH - PA.

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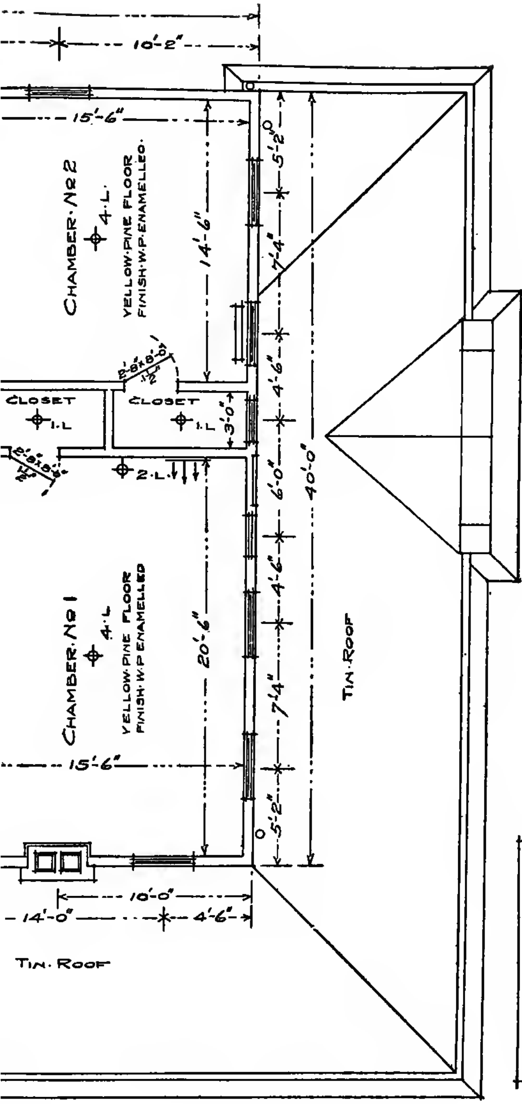


THE FOLLOWING SIGNATURES ARE FOR THE PURPOSE OF IDENTIFYING THIS DRAWING AS REFERRED TO IN CONTRACTS DATED AS FOLLOWS·

OWNER J. R. Retsof

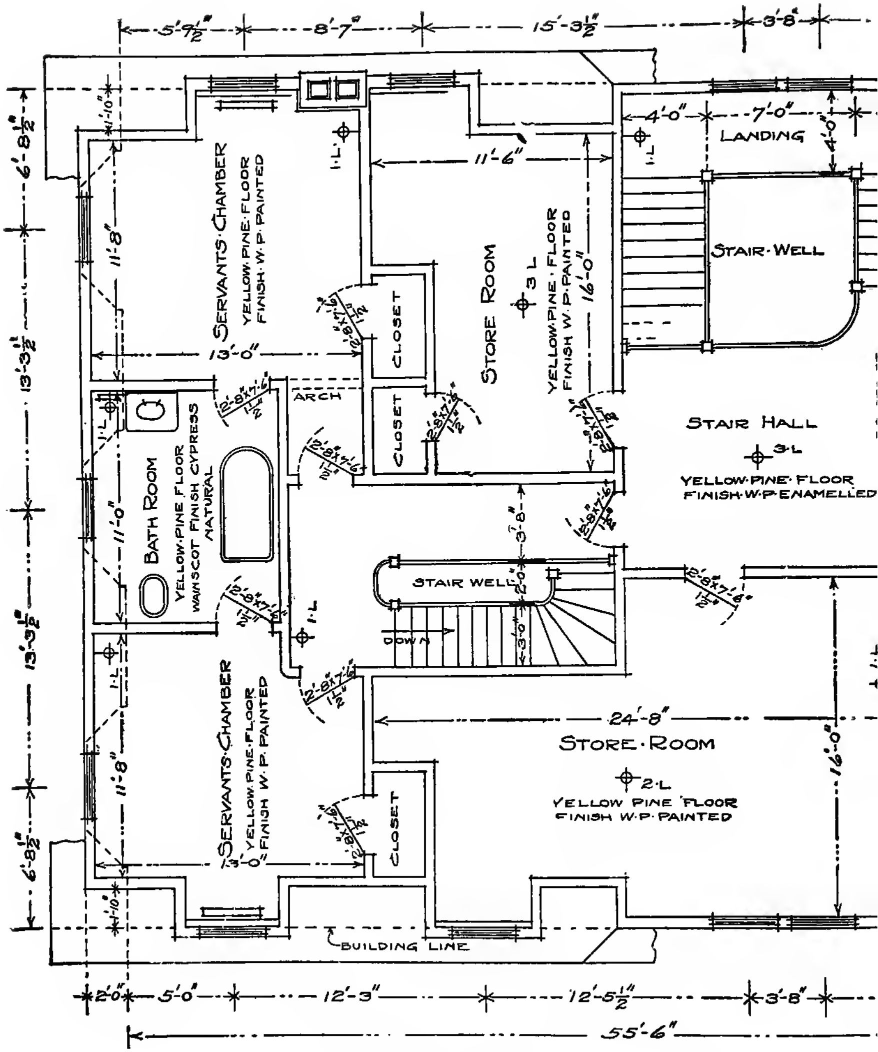
SIGNATURES	DATES
John A. Ames	Aug. 1st 1906
A. L. Jones	Aug 10th 1906
O. J. James.	Aug. 30, '06.
A Hughie	Aug. 15. 06
M. Morris	" 24. '06.

JOHN-W-SCOTT-ARCHITECT

JOB – No 437 DRAWN-BY-R.W.S

SHEET-No. 3 TRACED-BY-A.J.W.

DATE MARCH 4 1906 CHECKED BY R.W.S.



NOTE
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THIRD·FLOOR·PLAN
RESIDENCE FOR J·R·RETSOF
FLATBUSH·PA

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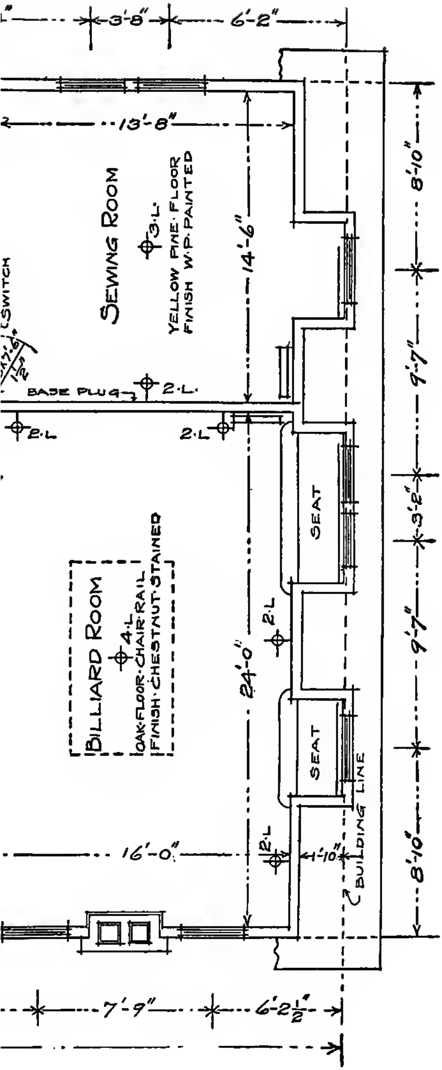

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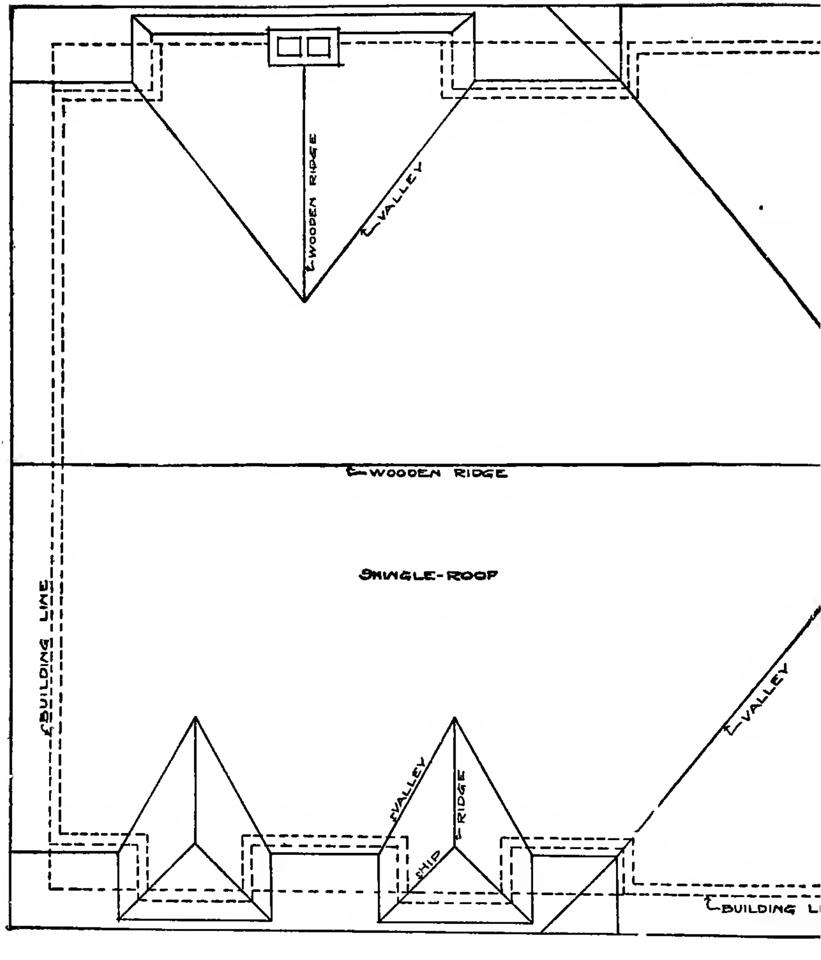
OWNER J. R. Retsof

SIGNATURES	DATES
John A. Ames	Aug. 1st 1906
A. L. Jones	Aug. 10th 1906
O. J. James.	Aug. 30. 06.
A. Hughes	Aug. 15. 06
M. Morris	" 22. 06.

…N-W-SCOTT-ARCHITECT

…37	DRAWN · BY · A·J·W·
…4	TRACED · BY · L·A·O·
…RCH 5·1906	CHECKED·BY·R·W·S·



ROOF PLAN
RESIDENCE-FOR J-R-RETSOF
FLATBUSH-PA.

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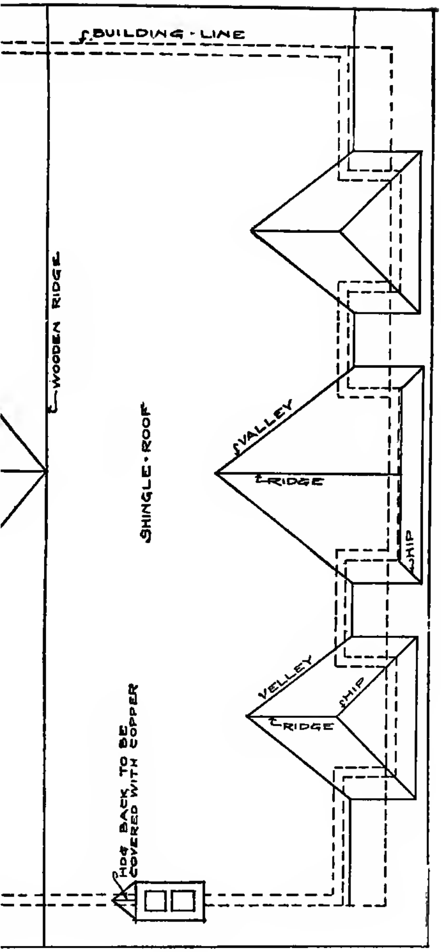

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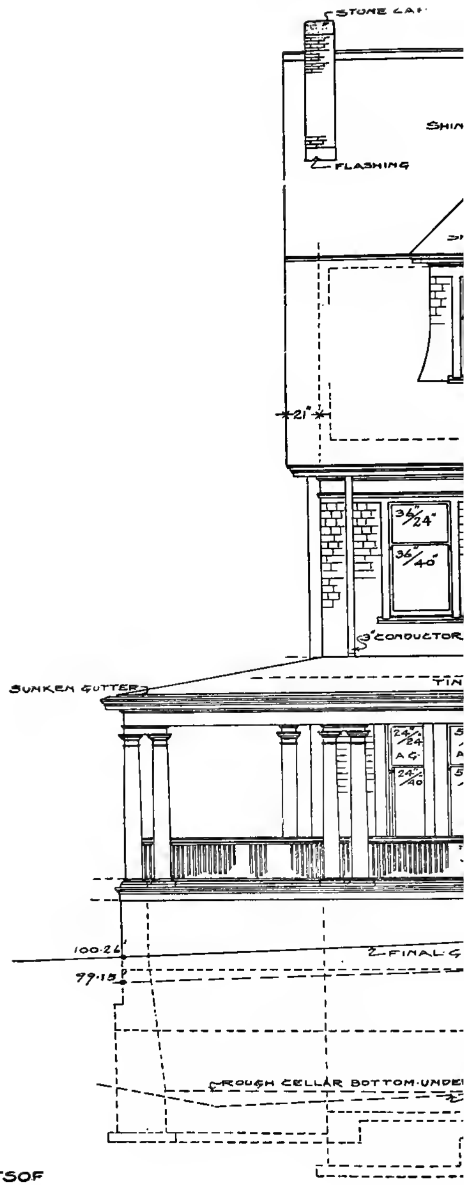
OWNER *J. R. Retsof*

SIGNATURES	DATED
John A. Ames	*Aug. 1st 1906.*
C. J. James.	*Aug. 30. '06.*
M. Morris	*" 22. '06.*

JOHN · W · SCOTT · ARCHITECT

- No 437	DRAWN BY · A.J.W.
ET No 5	TRACED BY A.J.W
E MARCH · 6 · 1906	CHECKED BY R.W.S.



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OWNER J. R. Retsof

CONTRACTORS	DATES
John R. Ames	Aug. 1st 1906.
O. J. James.	Aug 30. '06.
M. Morrie	" 22, '06.

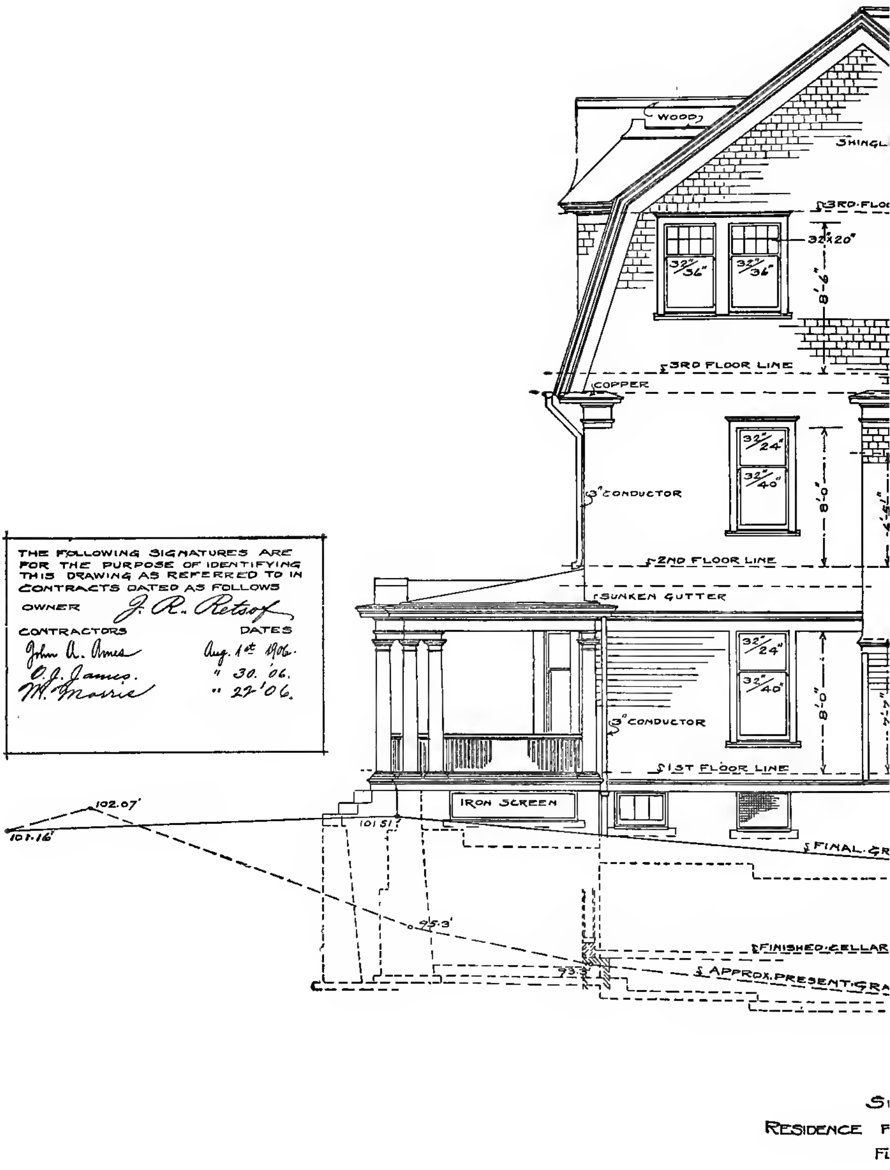
FRONT - ELEVATION

RESIDENCE FOR MR- J- R- RETSOF

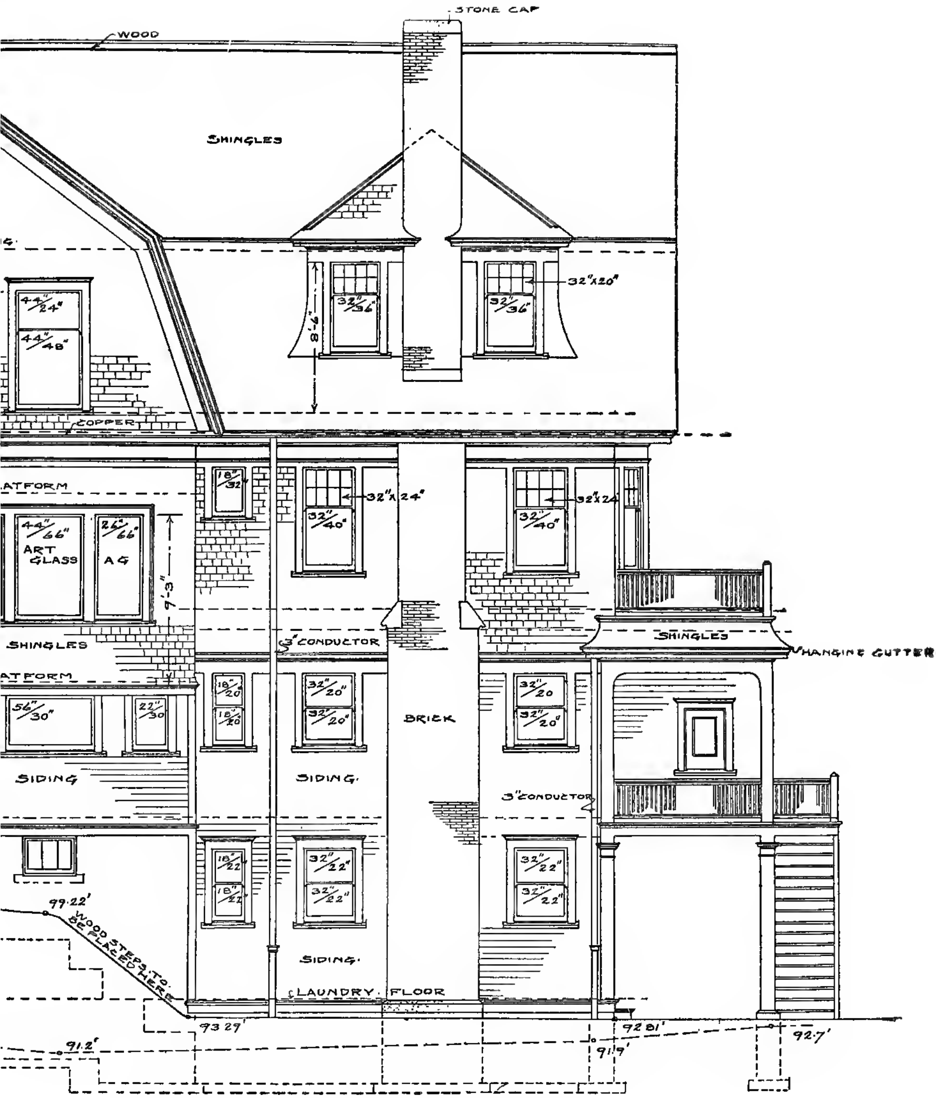
FLATBUSH • PA

ILT 454—1092A


STONE CAP
WOOD
SHINGLES
SHINGLES
SHINGLES
30'-20"
26"x20"
30"x20"
26"/36"
30"/36"
8'-6"
21"
3RD FLOOR LINE
HANGING GUTTER
FALSE WINDOW
36"/24"
36"/40"
24"/24"
SHINGLES
8'-0"
3" CONDUCTOR
2ND FLOOR LINE
A G
PLATE GLASS
44"/24"
44"/40"
BLUE STONE
101.51'
101.16'
GRADE OF SIDEWALK
PRESENT GRADE
JOHN · W · SCOTT · ARCHITECT
JOB · NO · 437
SHEET · NO · 6 ·
DATE – MARCH 8 1906
DRAWN – BY · A · J · W ·
TRACED – BY · L · A · O ·
CHECKED – BY · R · W · S ·



ILT 454—1092A

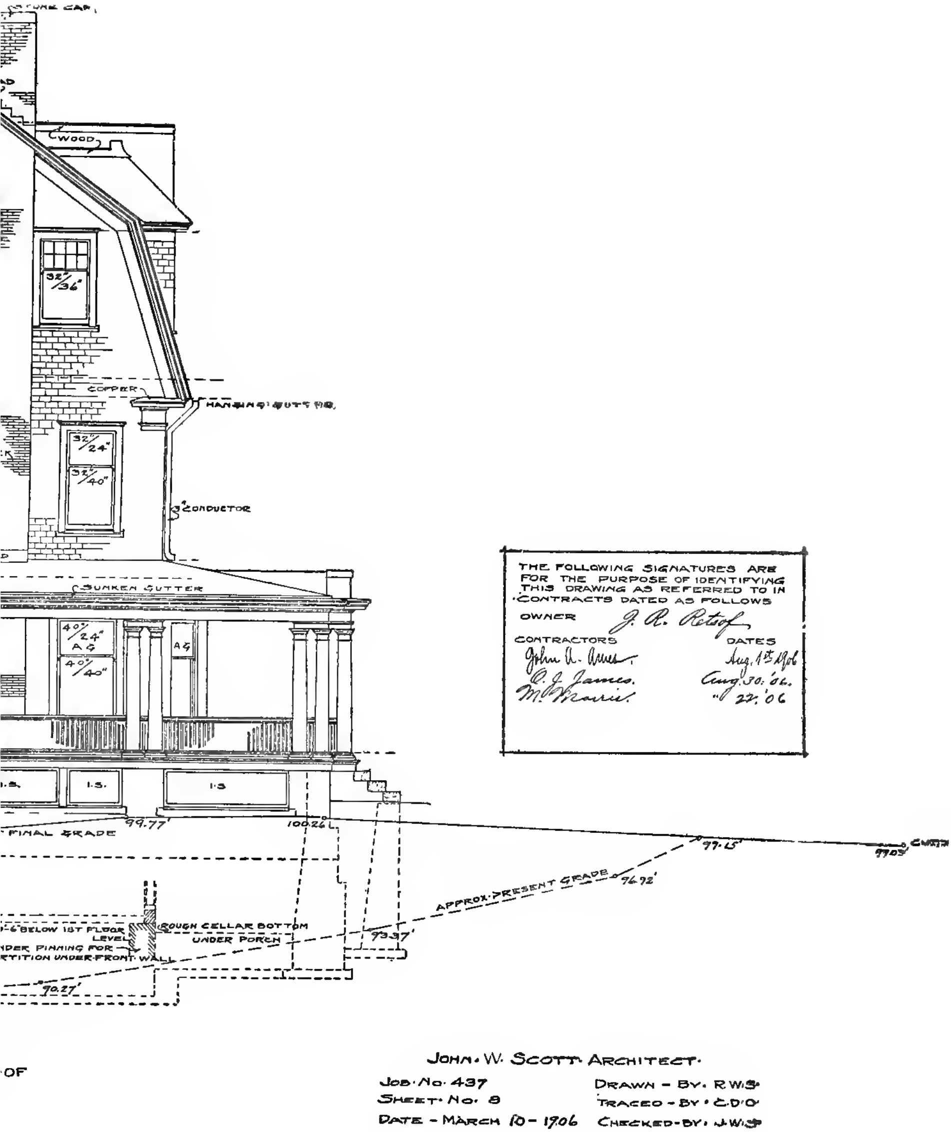


LEVATION
R- J- R- RETSOF
H: PA

JOHN: W. SCOTT: ARCHITECT

JOB No 437	DRAWN - BY A.J.W.
SHEET No 7	TRACED - BY. C.D.O
DATE - MARCH - 9 - 1906	CHECKED - BY R.W.S.

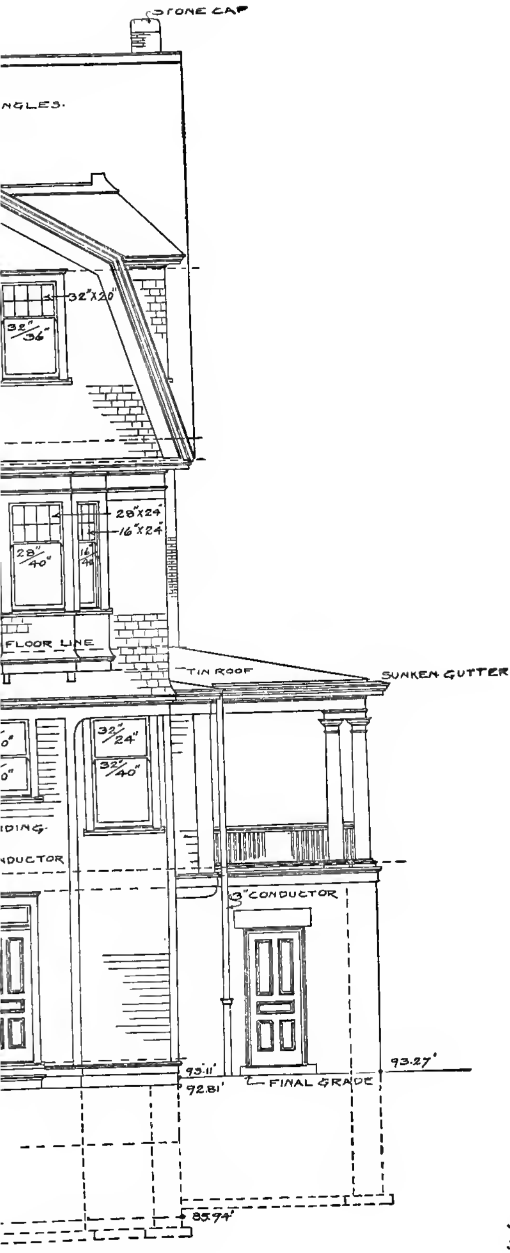
I L T 454—1092A


WOOD
COPPER
HANGING GUTTER
3" CONDUCTOR
SUNKEN GUTTER
FINAL GRADE
APPROX. PRESENT GRADE
ROUGH CELLAR BOTTOM UNDER PORCH
THE FOLLOWING SIGNATURES ARE FOR THE PURPOSE OF IDENTIFYING THIS DRAWING AS REFERRED TO IN CONTRACTS DATED AS FOLLOWS
OWNER J. R. Retsof
CONTRACTORS
DATES
John A. Ames Aug. 1st 1906
O. J. James Aug. 30. '06.
M. Maris " 22. '06
JOHN W. SCOTT ARCHITECT.
JOB NO. 437
SHEET NO. 8
DATE - MARCH 10 - 1906
DRAWN - BY. R.W.S.
TRACED - BY. C.D.O.
CHECKED - BY. J.W.S.

OF

Rear Elevation
Residence for Mr. J. R. Retsof
Flatbush, Pa

I L T 454—1092A

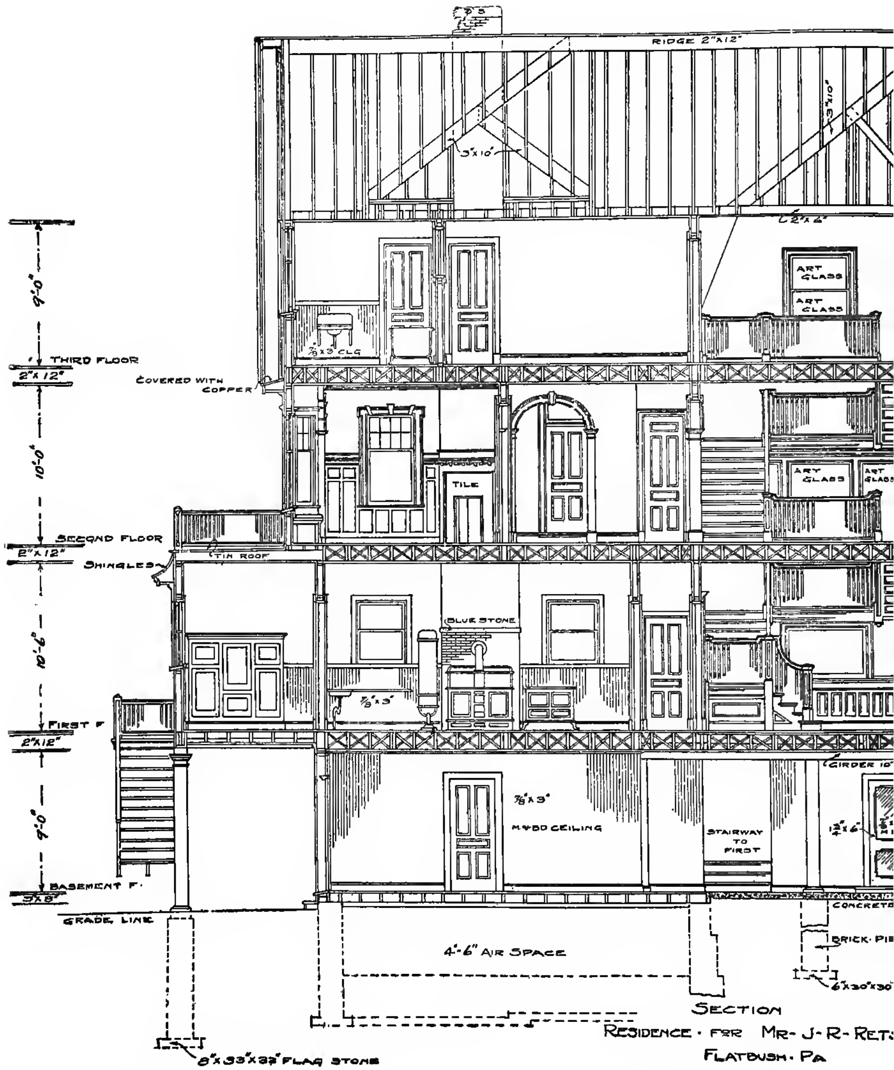


THE FOLLOWING SIGNATURES ARE FOR THE PURPOSE OF IDENTIFYING THIS DRAWING AS REFERRED TO IN CONTRACTS DATED AS FOLLOWS

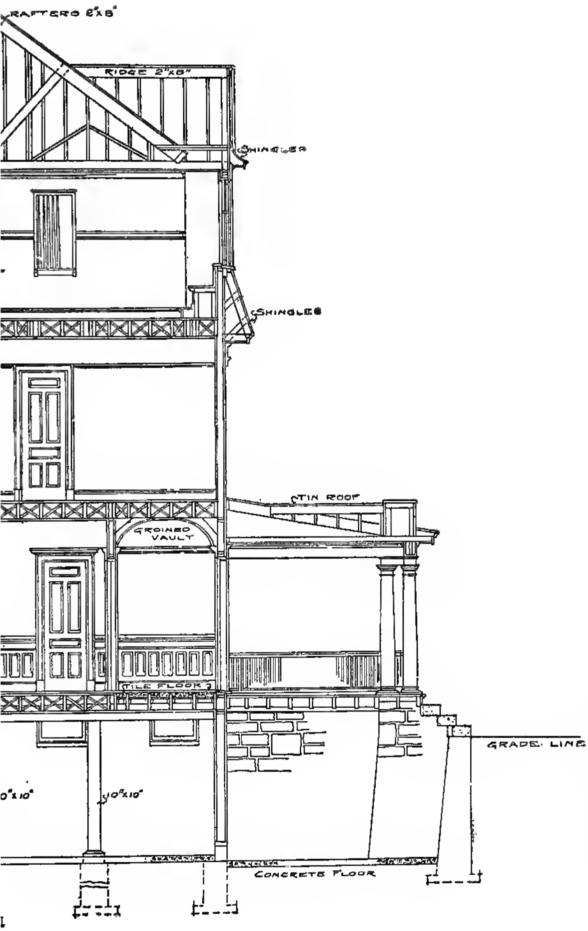
OWNER *J. R. Retsof*	
CONTRACTORS	DATES
John A. Ames	*Aug. 1st 1906.*
C. J. James	*" 30, '06.*
M. Morris	*" 22, '06.*

JOHN. W. SCOTT. ARCHITECT

JOB. NO. 437 — DRAWN — BY. A. J. W.
SHEET. NO. 9 — TRACED — BY. L. A. O.
DATE — MARCH 15-1906 — CHECKED — BY. R. W. B.



I L T 454—1092A



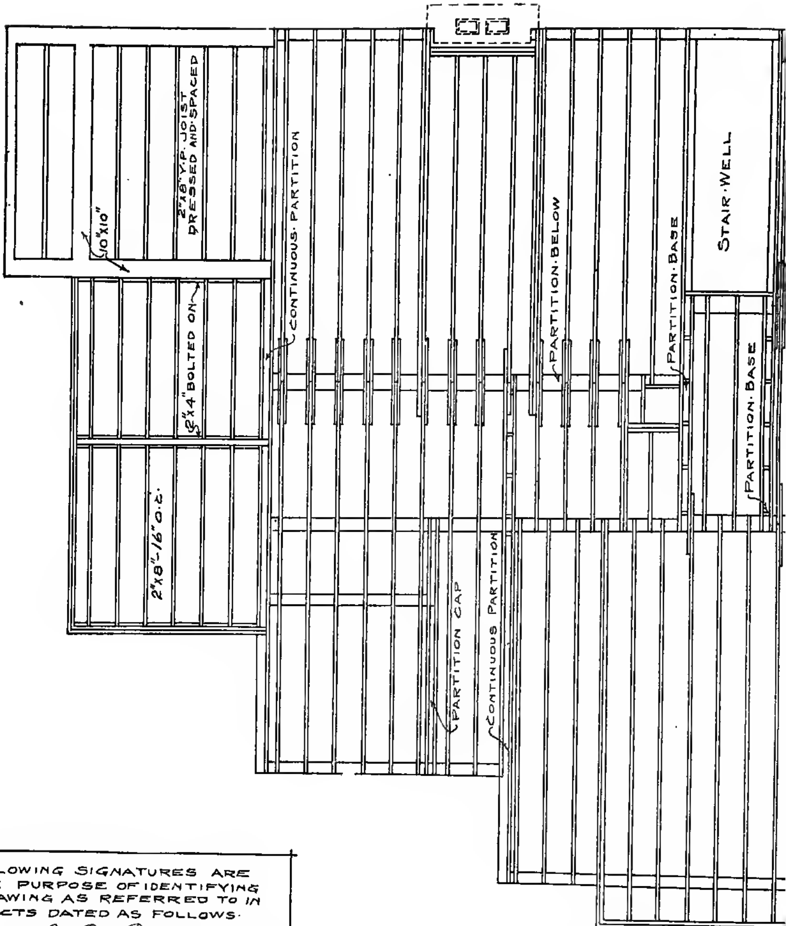
THE FOLLOWING SIGNATURES ARE FOR THE PURPOSE OF IDENTIFYING THIS DRAWING AS REFERRED TO IN CONTRACTS, DATED AS FOLLOWS.

OWNER J. R. Retsof

CONTRACTORS.	DATES
John A. Ames	Aug. 1st 1906.
John Smith	" 25. 06.
A. L. Jones	Aug 10th 1906
A. Hughes	" 15. 06
M. Morris	" 22. 06.

JOHN. W. SCOTT. ARCHITECT.

JOB No. 437	DRAWN – BY. A.J.W
SHEET. No 10	TRACED – BY A.J.W
DATE – MARCH 15-1906	CHECKED. BY R.W.S.



THE FOLLOWING SIGNATURES ARE FOR THE PURPOSE OF IDENTIFYING THIS DRAWING AS REFERRED TO IN CONTRACTS DATED AS FOLLOWS.

OWNER *J. R. Retsof*

CONTRACTORS. DATES

John A. Ames *Aug. 1st 1906.*

NOTE

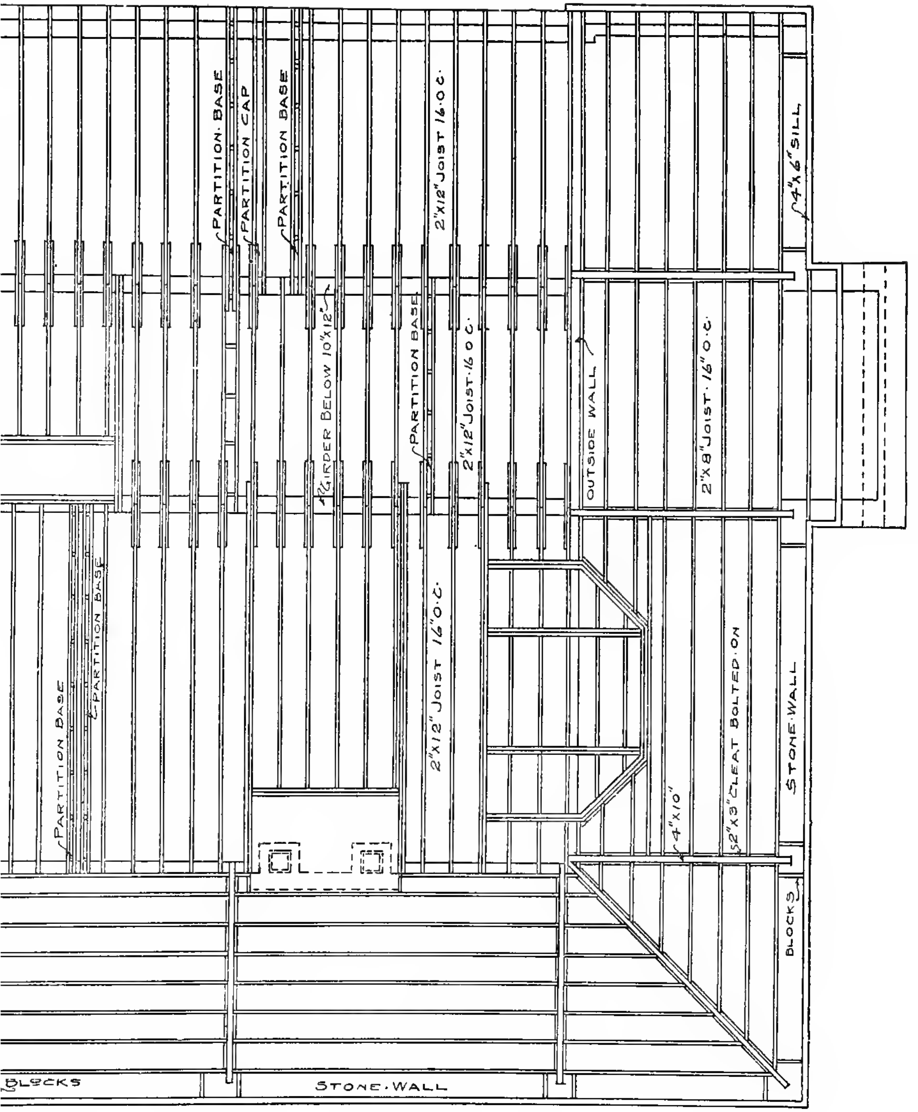
BRIDGE FLOOR JOISTS ONCE IN EVERY 8 FOOT SPAN

PLACE ONE ROW OF DIAGONAL BRIDGING BETWEEN STUDDING OF ALL PARTITIONS

FIRST FLOOR FRAMING PLAN

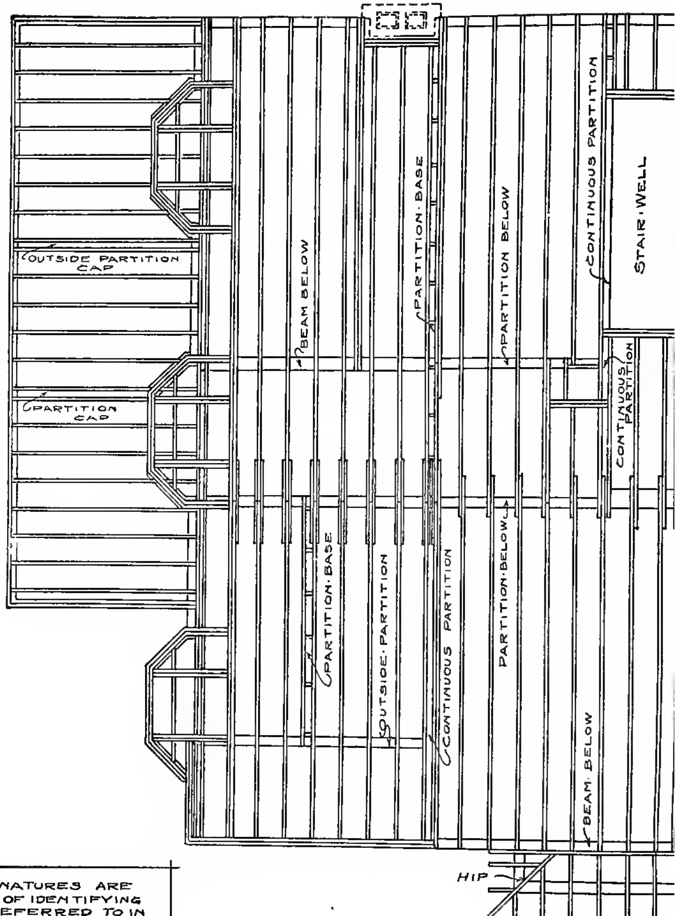
RESIDENCE FOR MR. J. R. RETSOF

FLATBUSH, PA.



JOHN W. SCOTT ARCHITECT

JOB NO 437	DRAWN - BY A.J.W
SHEET NO 11	TRACED - BY A.J.W
DATE - MARCH 16 - 1906	CHECKED - BY R.W.S.



THE FOLLOWING SIGNATURES ARE FOR THE PURPOSE OF IDENTIFYING THIS DRAWING AS REFERRED TO IN CONTRACTS DATED AS FOLLOWS

OWNER *J. R. Retsof*

CONTRACTORS *John A. Ames*

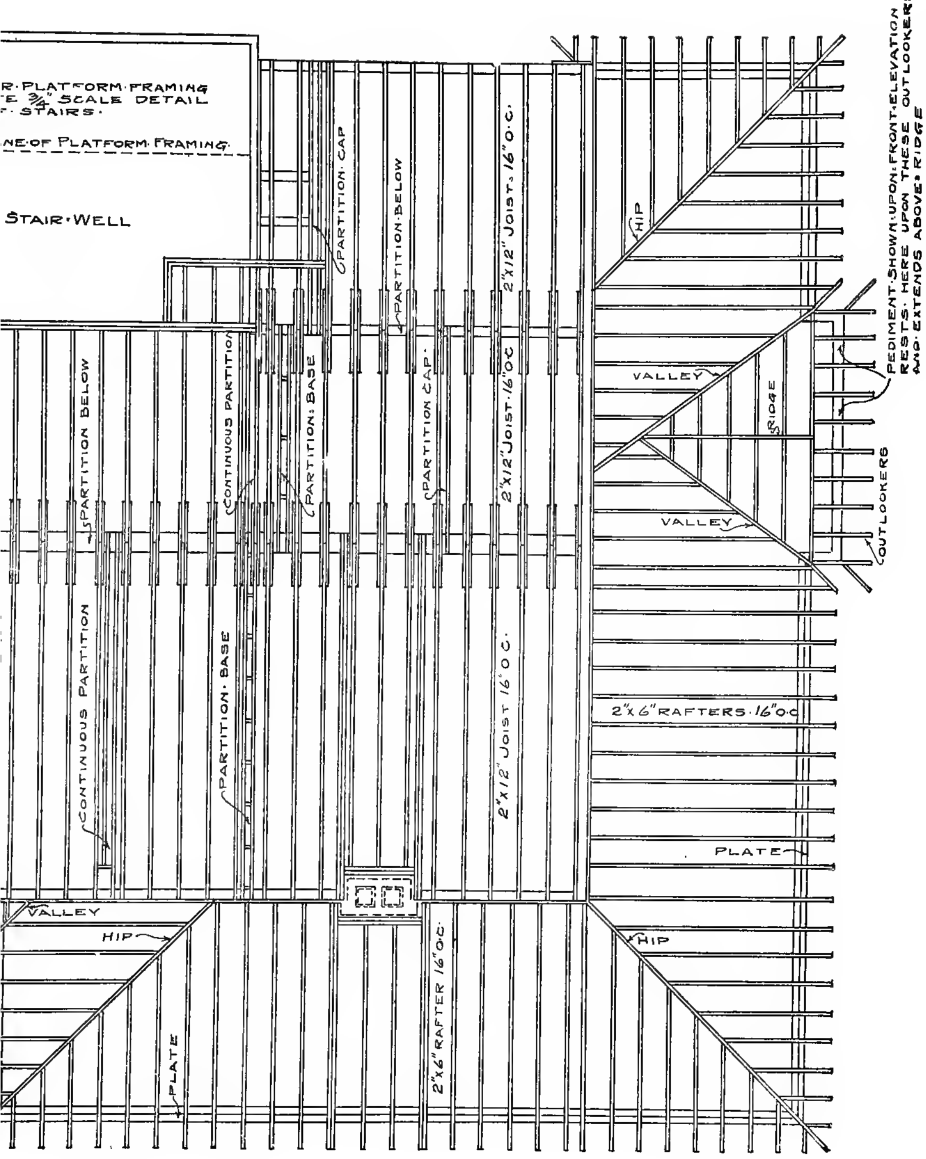
DATES *Aug. 1st 1906.*

NOTE

BRIDGE · FLOOR · JOISTS · ONCE · IN EVERY · 8 FOOT · SPAN

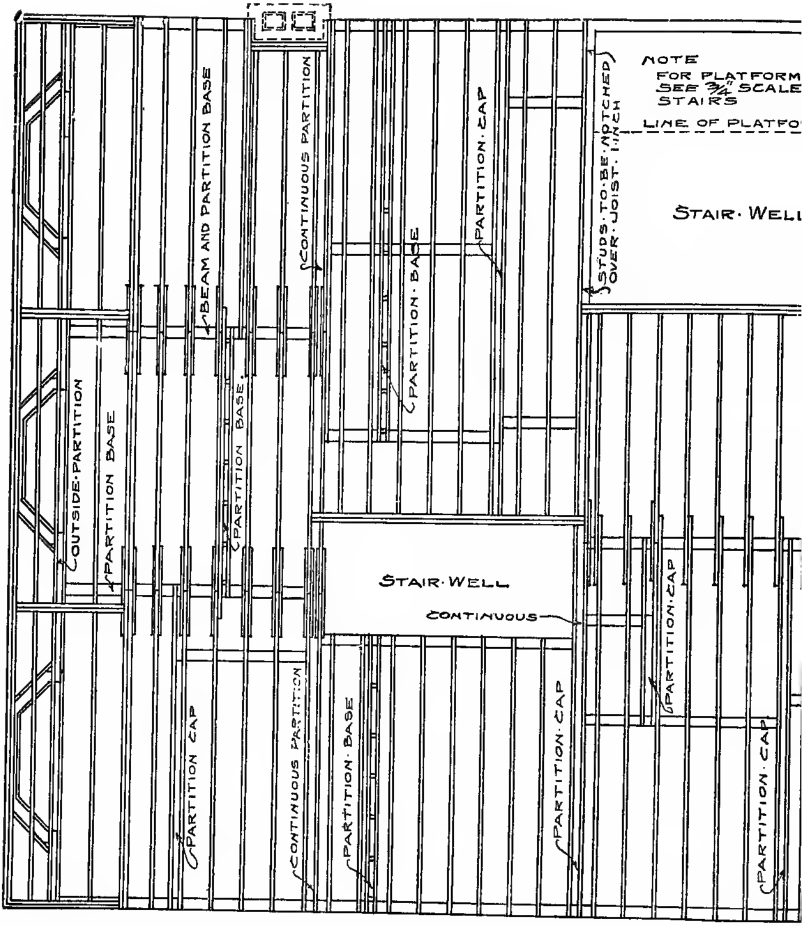
PLACE · ONE · ROW · OF · DIAGONAL BRIDGING BETWEEN STUDDING OF · ALL · PARTITIONS

SECOND · FLOOR · FRAMING · PLAN
RESIDENCE · FOR · MR · J · R · RETSOF
FLATBUSH · PA ·



JOHN· W SCOTT ARCHITECT

JOB NO· 437 DRAWN – BY· A·J·W
SHEET NO· 12 TRACED – BY· A·J·W
DATE – MARCH 17-1906 CHECKED-BY· R·W·S·



NOTE

BRIDGE · FLOOR · JOISTS · ONCE · IN · EVERY · 8 FOOT · SPAN ·

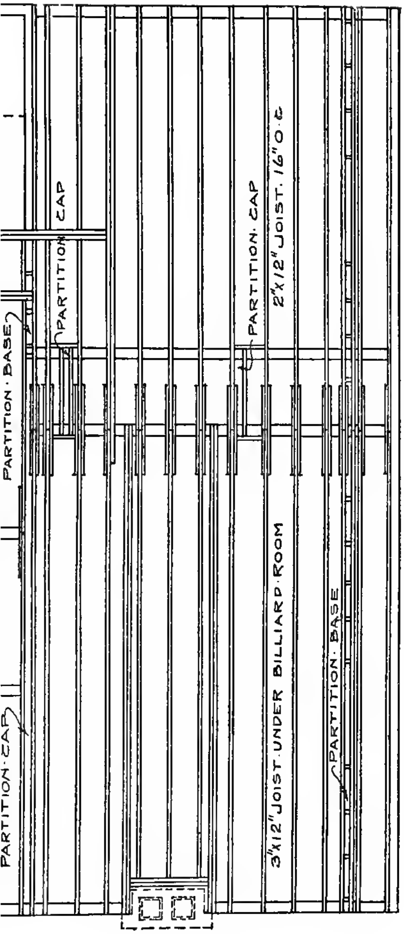
PLACE · ONE · ROW · OF · DIAGONAL BRIDGING · BETWEEN · STUDDING · OF · ALL · PARTITIONS

THIRD · FLOOR · FRAMING · PLAN

RESIDENCE FOR MR - J - R - RETSOF

FLATBUSH · PA

I L T 454—1092A



THE FOLLOWING SIGNATURES ARE FOR THE PURPOSE OF IDENTIFYING THIS DRAWING AS REFERRED TO IN CONTRACTS DATED AS FOLLOWS

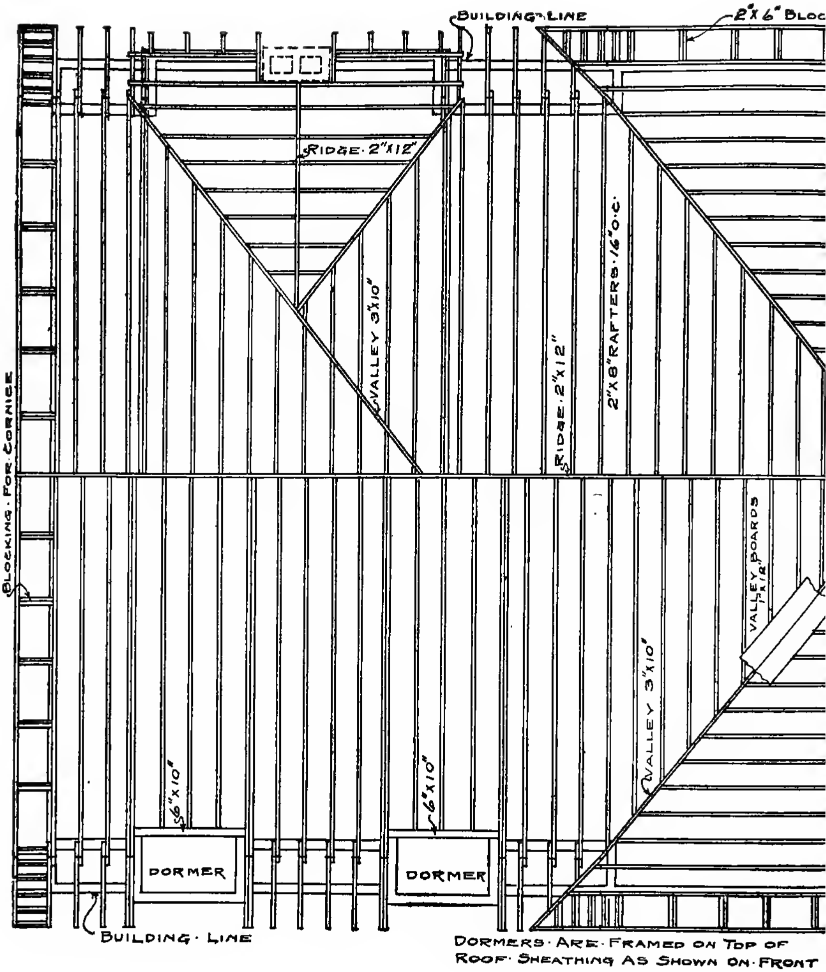
OWNER J. R. Retsof

CONTRACTORS DATES

John A. Ames Aug. 1st 1906

JOHN W SCOTT·ARCHITECT

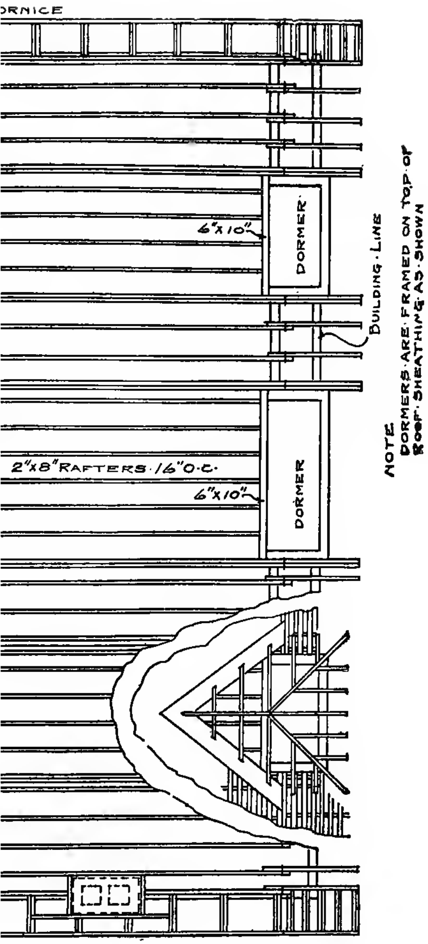
lo· 437	DRAWN - BY· A·J·W
T· No 13	TRACED - BY · A· J·W
- MARCH 17 - 1906	CHECKED-BY· R·W·S



ROOF·FRAMING·PLAN
RESIDENCE FOR MR-J-R-RETSOF
FLATBUSH·PA

JO
SH
DA

I L T 454—1092A



THE FOLLOWING SIGNATURES ARE FOR THE PURPOSE OF IDENTIFYING THIS DRAWING AS REFERRED TO IN CONTRACTS DATED AS FOLLOWS.

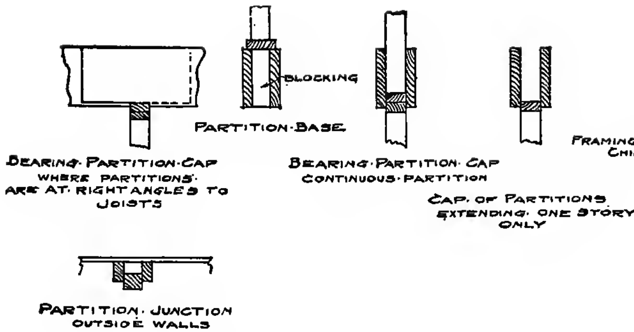
OWNER J. R. Retinf

CONTRACTORS — DATES

John A. Ames — Aug. 1st 1906.

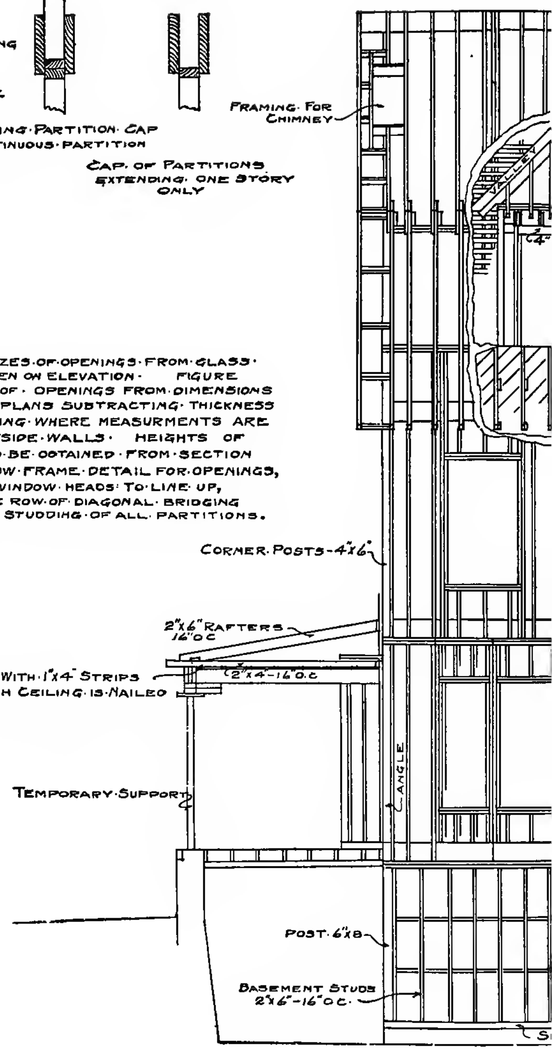
W· SCOTT· ARCHITECT

7	DRAWN — BY· A·J·W·
/4	TRACED BY A·J·W
CH 18-1906	CHECKED·BY··R·W·S



NOTE

FIGURE· SIZES·OF·OPENINGS·FROM·GLASS· SIZES·GIVEN ON ELEVATION· FIGURE POSITION·OF· OPENINGS FROM·DIMENSIONS GIVEN·ON·PLANS SUBTRACTING·THICKNESS OF SHEATHING·WHERE MEASURMENTS ARE FROM·OUTSIDE·WALLS· HEIGHTS OF STORYS·TO·BE·OBTAINED·FROM·SECTION SEE ·WINDOW·FRAME·DETAIL FOR·OPENINGS, DOOR· AND·WINDOW· HEADS· TO·LINE·UP, PLACE·ONE ROW·OF·DIAGONAL·BRIDGING BETWEEN STUDDING·OF·ALL·PARTITIONS.

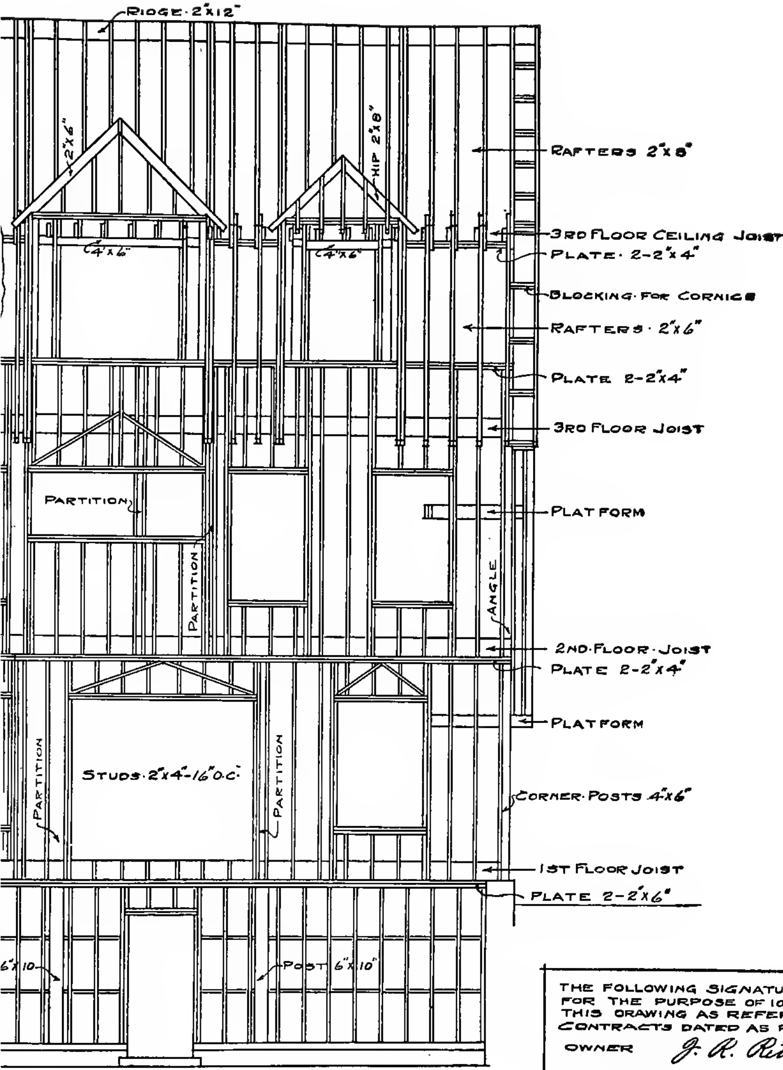


Re

JOHN· W· SCOTT· ARCHITECT·

JOB·NO·437	DRAWN – BY·A·J·W·
SHEET·NO·15·	TRACED – BY·L·A·O·
DATE – MARCH·19–1906	CHECKED–BY·R·W·S·

I L T 454—1092A



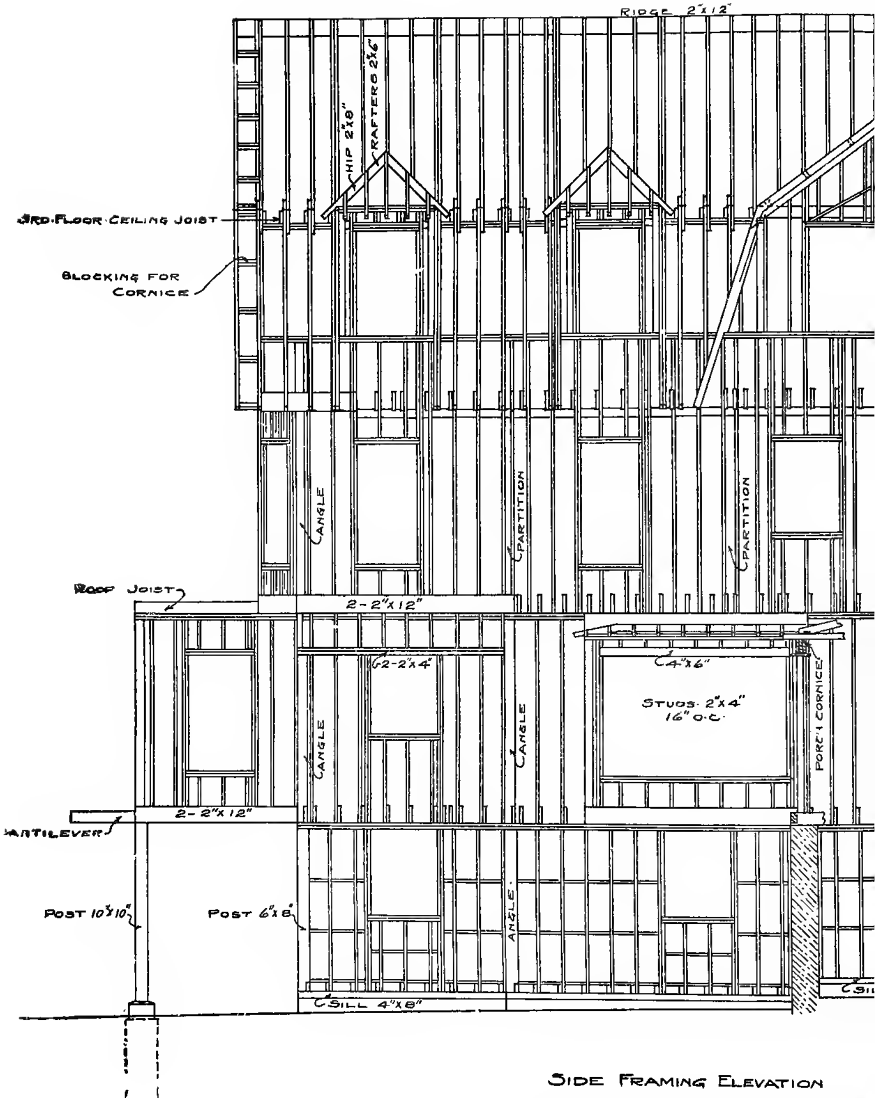
AMING ELEVATION
FOR MR-J-R-RETSOF
LATBUSH PA

THE FOLLOWING SIGNATURES ARE FOR THE PURPOSE OF IDENTIFYING THIS DRAWING AS REFERRED TO IN CONTRACTS DATED AS FOLLOWS·

OWNER *J. R. Retsof*

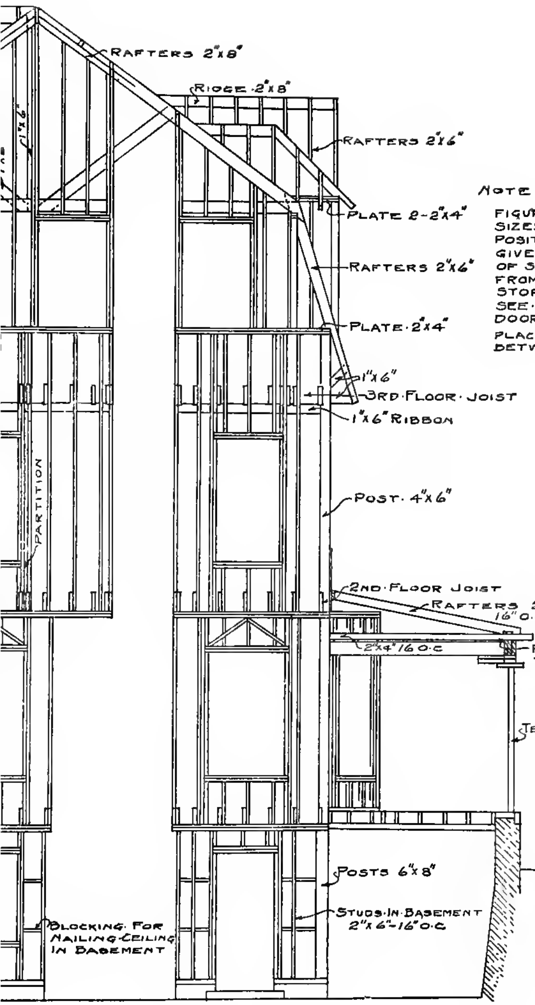
CONTRACTORS — DATES

John A. Ames — *Aug. 1st 1906.*



SIDE FRAMING ELEVATION
RESIDENCE FOR MR. J. R. RETSO[N]
FLATBUSH · PA

I L T 454—1092A



NOTE

FIGURE SIZES OF OPENINGS FROM GLASS SIZES GIVEN ON ELEVATION. FIGURE POSITION OF OPENINGS FROM DIMENSIONS GIVEN ON PLANS SUBTRACTING THICKNESS OF SHEATHING WHERE MEASURMENTS ARE FROM OUTSIDE WALLS. HEIGHTS OF STORYS TO BE OBTAINED FROM SECTIONS. SEE WINDOW FRAME DETAILS FOR OPENINGS. DOOR AND WINDOW HEADS TO LINE UP. PLACE ONE ROW OF DIAGONAL BRIDGING BETWEEN STUDDING OF ALL PARTITIONS

THE FOLLOWING SIGNATURES ARE FOR THE PURPOSE OF IDENTIFYING THIS DRAWING AS REFERRED TO IN CONTRACTS DATED AS FOLLOWS.

OWNER *J. R. Retsof*

CONTRACTORS *John A. Ames* DATES. *Aug. 1st 1906.*

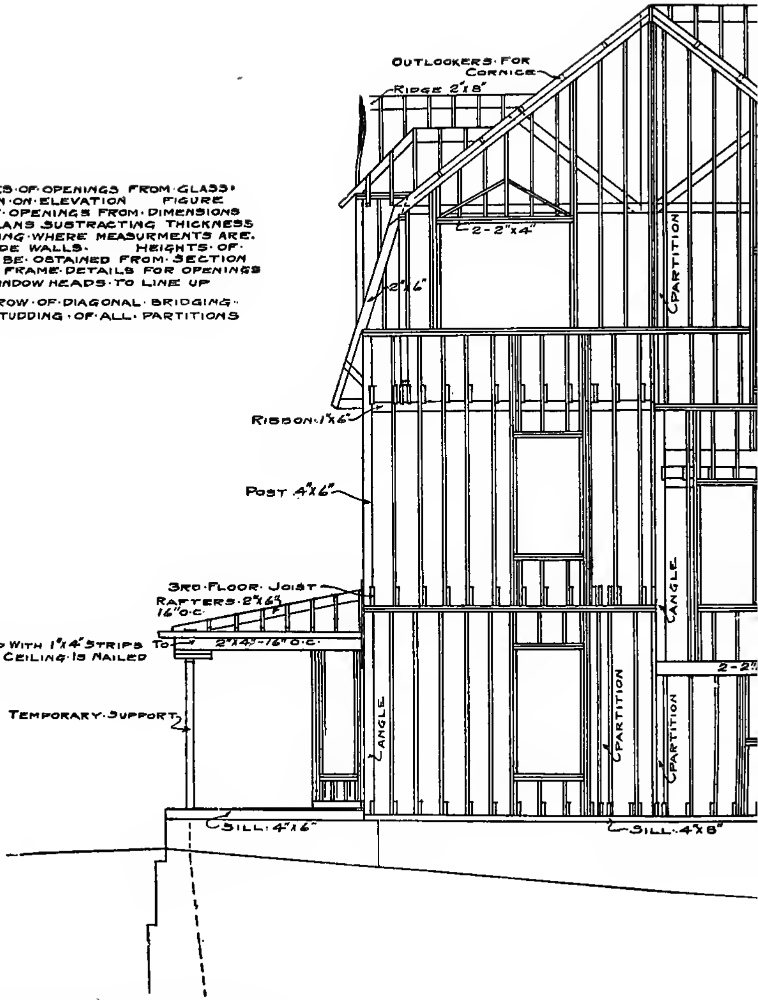
JOHN. W. SCOTT. ARCHITECT

JOB. NO. 437	DRAWN — BY. A.J.W.
SHEET NO. 16	TRACED — BY. L.A.O.
DATE - MARCH 20 - 1906	CHECKED BY. R.W.S.

NOTE.

FIGURE SIZES OF OPENINGS FROM GLASS SIZES GIVEN ON ELEVATION. FIGURE POSITION OF OPENINGS FROM DIMENSIONS GIVEN ON PLANS SUBTRACTING THICKNESS OF SHEATHING WHERE MEASURMENTS ARE FROM OUTSIDE WALLS. HEIGHTS OF STORYS TO BE OBTAINED FROM SECTION. SEE WINDOW FRAME DETAILS FOR OPENINGS. DOOR AND WINDOW HEADS TO LINE UP.

PLACE ONE ROW OF DIAGONAL BRIDGING BETWEEN STUDDING OF ALL PARTITIONS.



THE FOLLOWING SIGNATURES ARE FOR THE PURPOSE OF IDENTIFYING THIS DRAWING AS REFERRED TO IN CONTRACTS DATED AS FOLLOWS.

OWNER *J. R. Retsof*

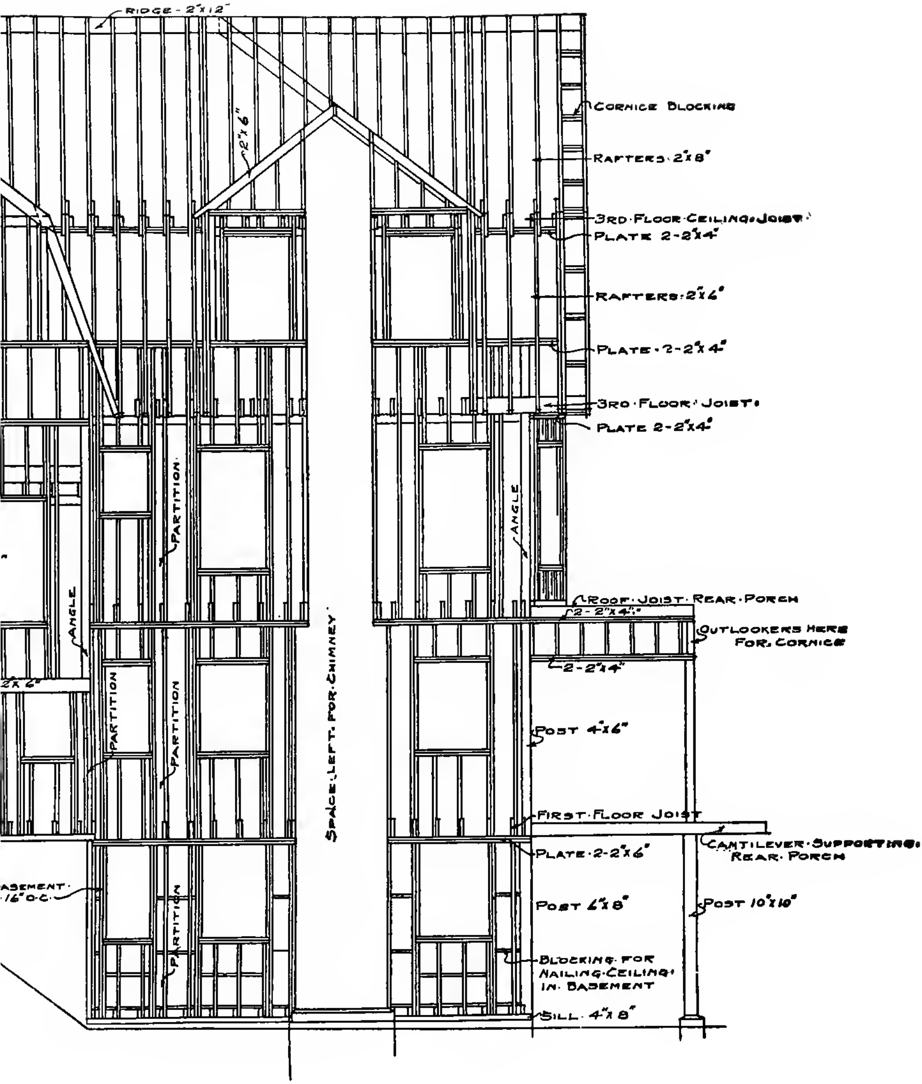
CONTRACTORS *John A. Ames* DATES *Aug. 1st 1906.*

SIDE • FRAMING

RESIDENCE • FOR • M

FLATBUS

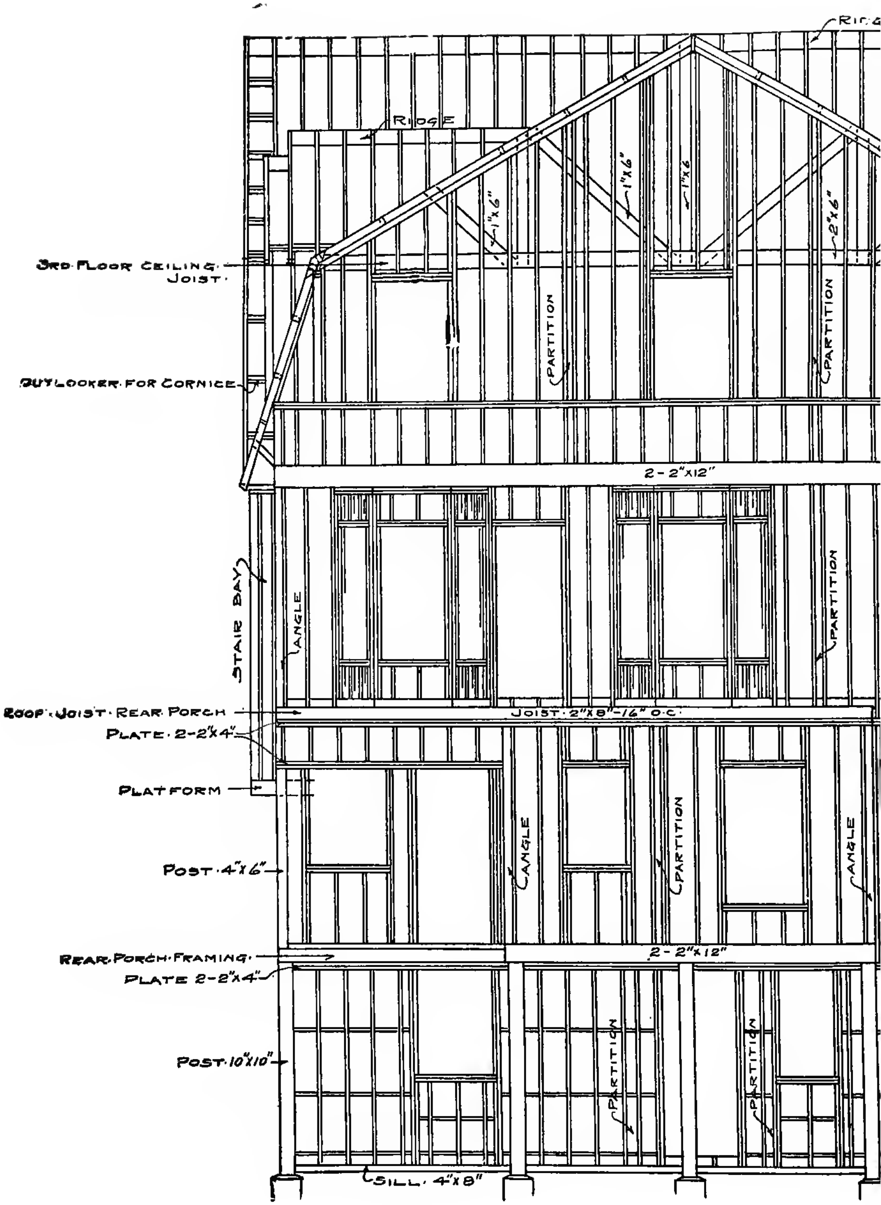
I L T 454—1092A



ETSOF

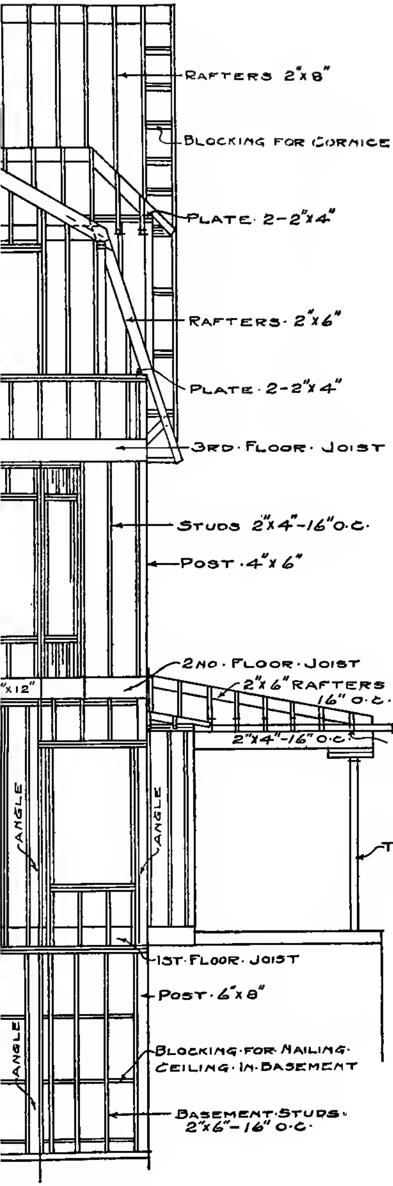
JOHN · W · SCOTT · ARCHITECT ·

JOB · NO · 437 DRAWN — BY A·J·W
SHEET · NO · 17 TRACED — BY · L·A·O
DATE - MARCH 21 - 1906 CHECKED · BY · R·W·S·



REAR · FRAMING ELEVATION
RESIDENCE FOR MR- J- R- RE
FLATBUSH · PA·

1 L T 454—1092A



NOTE

FIGURE SIZES OF OPENINGS FROM GLASS SIZES GIVEN ON ELEVATION. FIGURE POSITION OF OPENINGS FROM DIMENSIONS GIVEN ON PLANS SUBTRACTING THICKNESS OF SHEATHING WHERE MEASURMENTS ARE FROM OUTSIDE WALLS. HEIGHTS OF STORYS TO BE OBTAINED FROM SECTION. SEE WINDOW FRAME DETAIL FOR OPENINGS DOOR AND WINDOW HEADS TO LINE UP PLACE ONE ROW OF DIAGONAL BRIDGING BETWEEN STUDDING OF ALL PARTITIONS

THE FOLLOWING SIGNATURES ARE FOR THE PURPOSE OF IDENTIFYING THIS DRAWING AS REFERRED TO IN CONTRACTS DATED AS FOLLOWS.

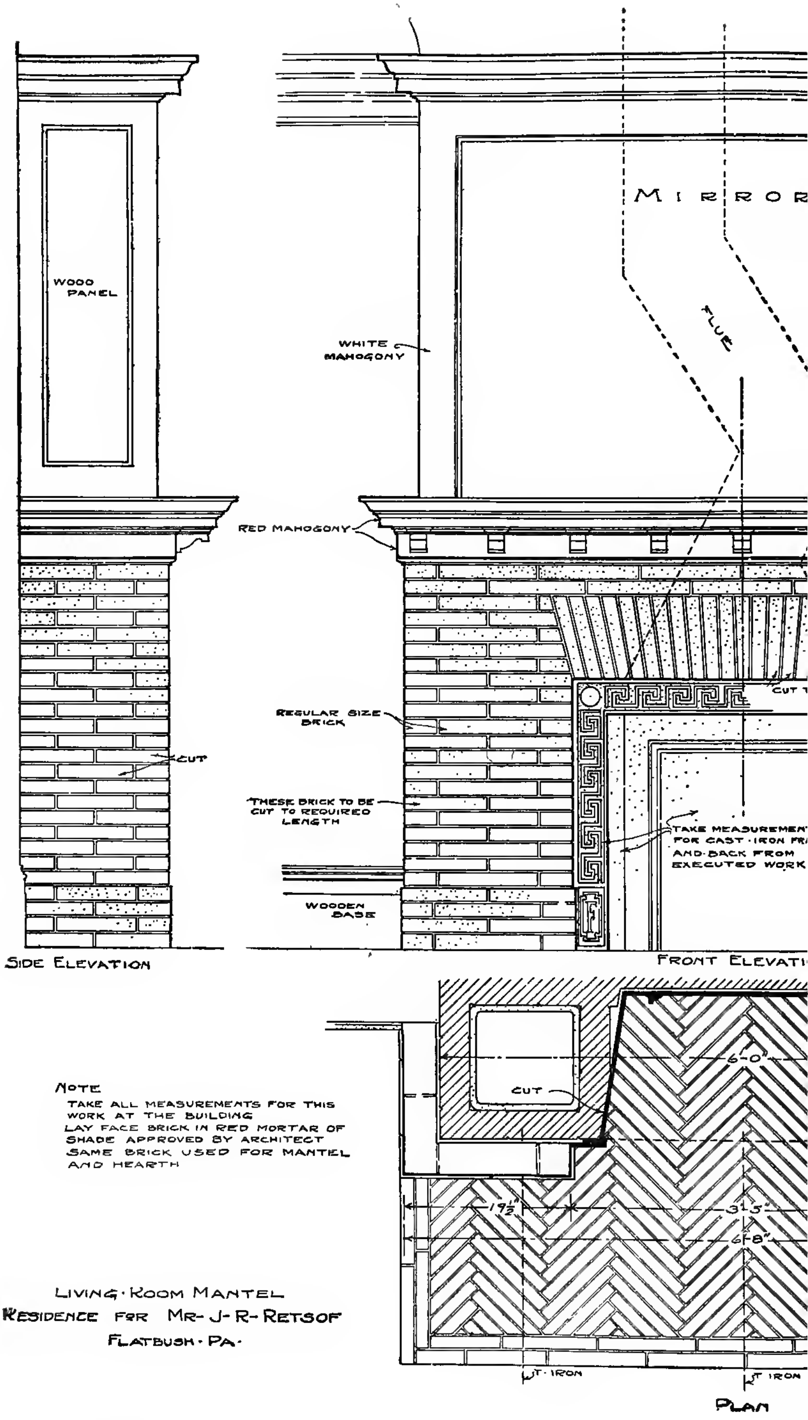
OWNER J. R. Retsof

CONTRACTORS John A. Ames

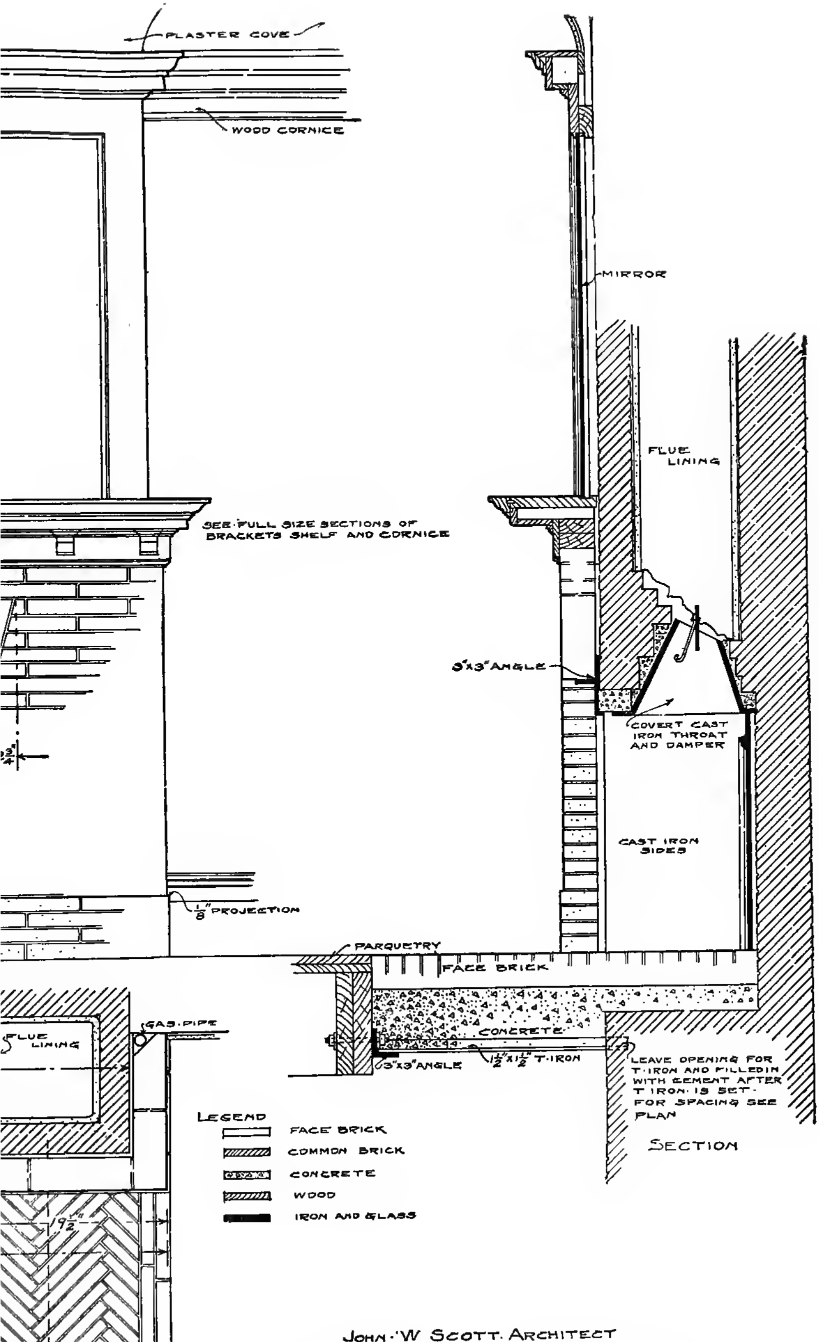
DATES Aug. 1st 1906.

JOHN W. SCOTT ARCHITECT

JOB NO. 437	DRAWN – BY A.J.W.
SHEET NO. 18	TRACED – BY L.A.O.
DATE – MARCH 22 – 1906	CHECKED – BY R.W.S.



I L T 454—1092A

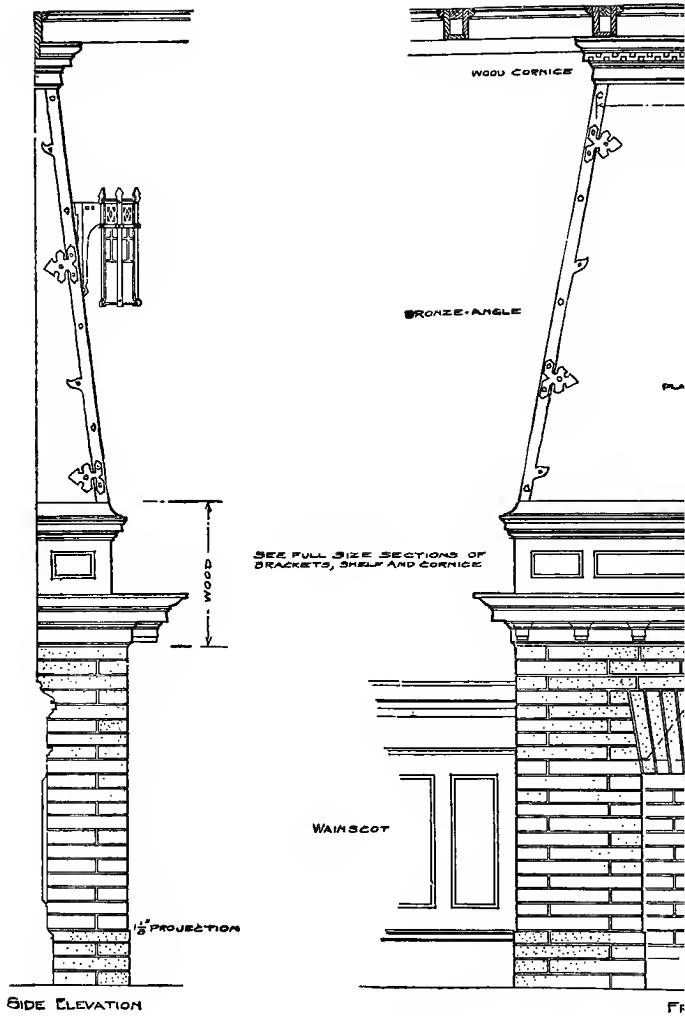


JOHN W SCOTT ARCHITECT

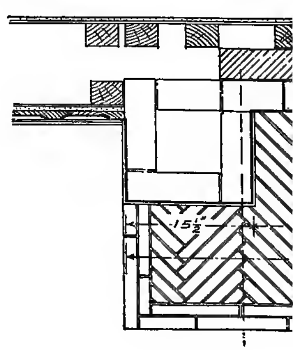
JOB NO 437 — DRAWN BY A.J.W

SHEET NO 42 — TRACED BY L.A.O

DATE - JUNE 2ND 1906 — CHECKED BY R.W.S.



SIDE ELEVATION

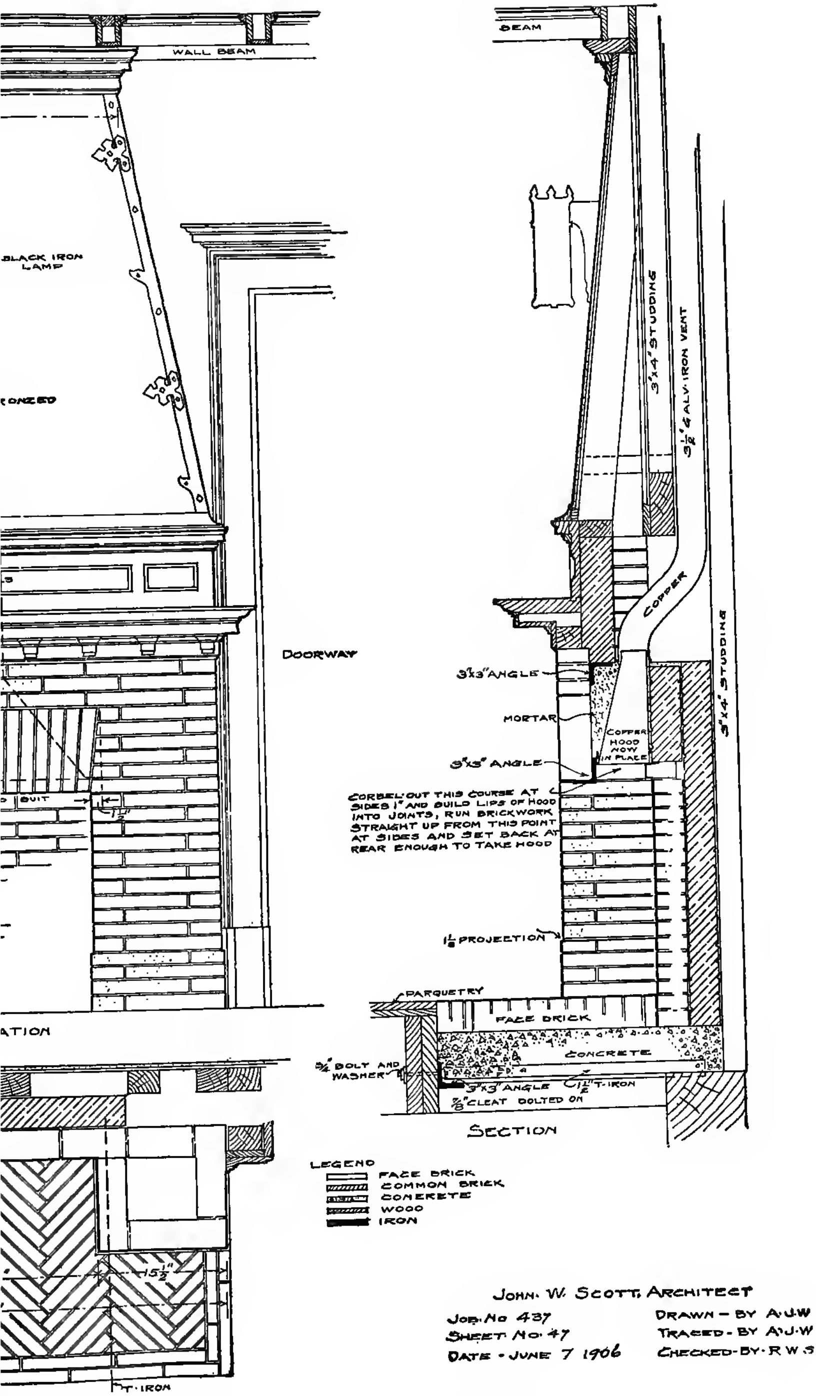


NOTE

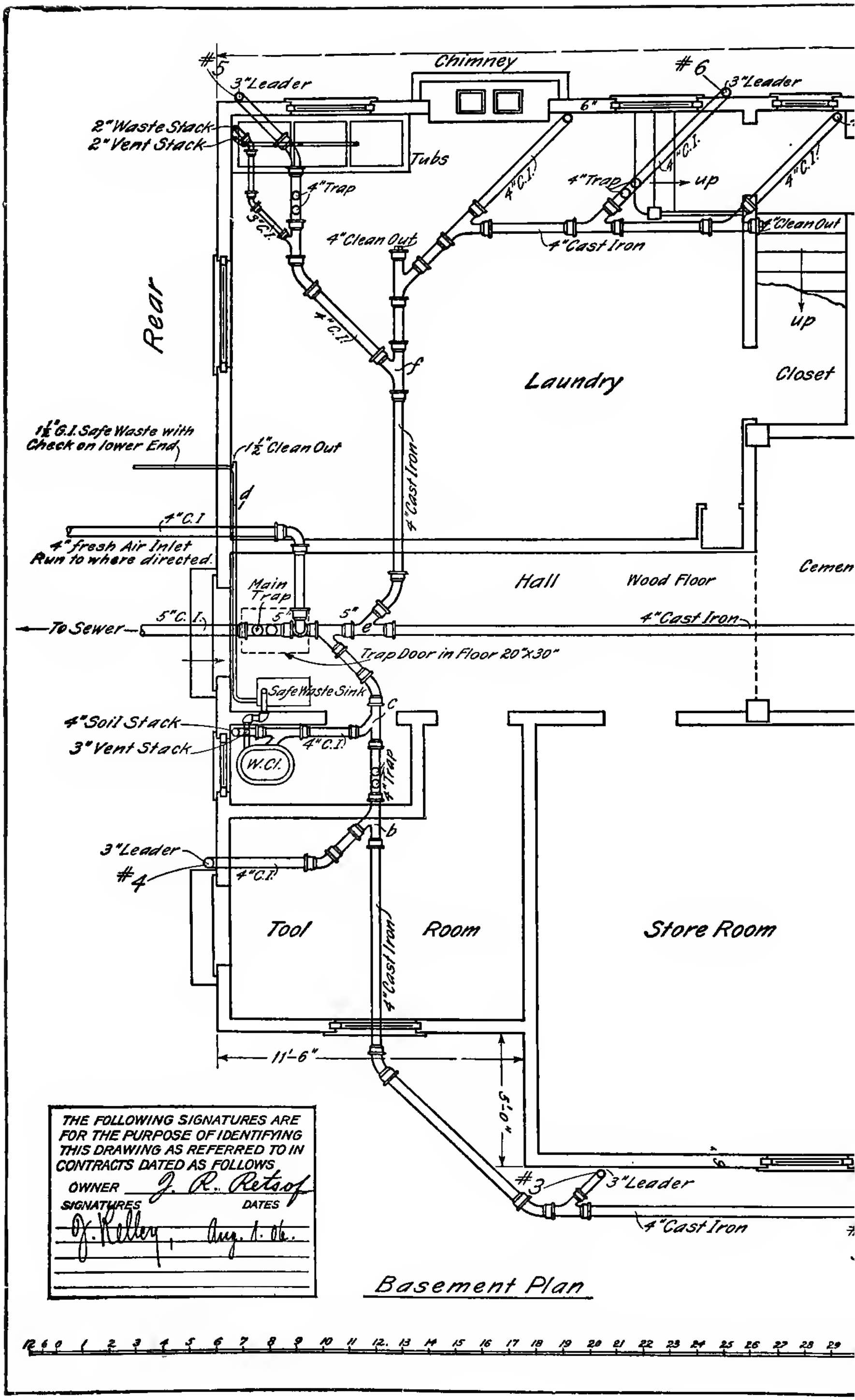
TAKE ALL MEASUREMENTS FOR THIS WORK AT THE BUILDING
LAY FACE BRICK IN RED MORTAR OF SHADE APPROVED BY ARCHITECT
SAME BRICK USED FOR MANTEL HEARTH AND BACK

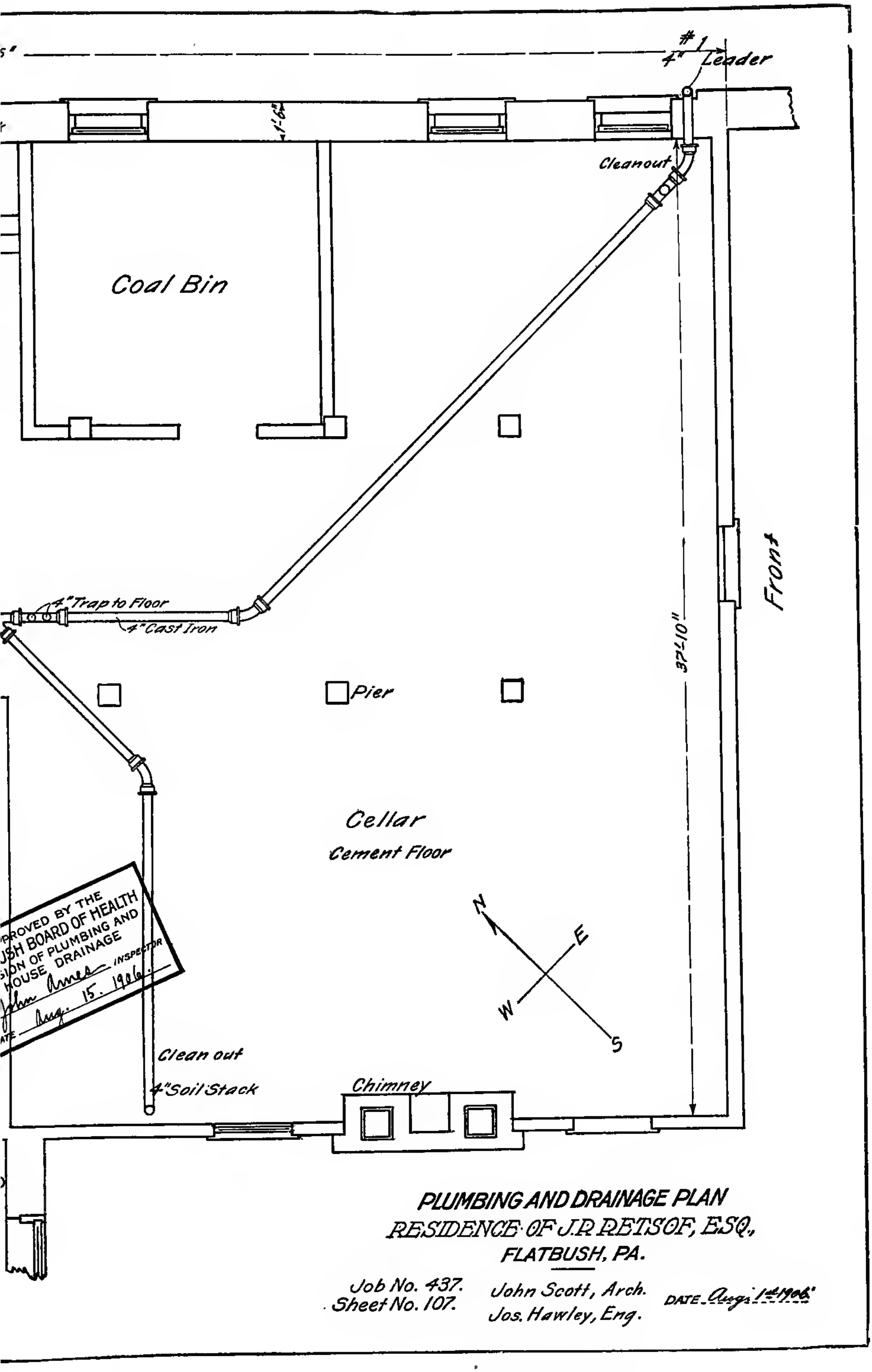
STAIR-HALL MANTEL
RESIDENCE FOR MR-J-R-RETSOF
FLATBUSH PA.

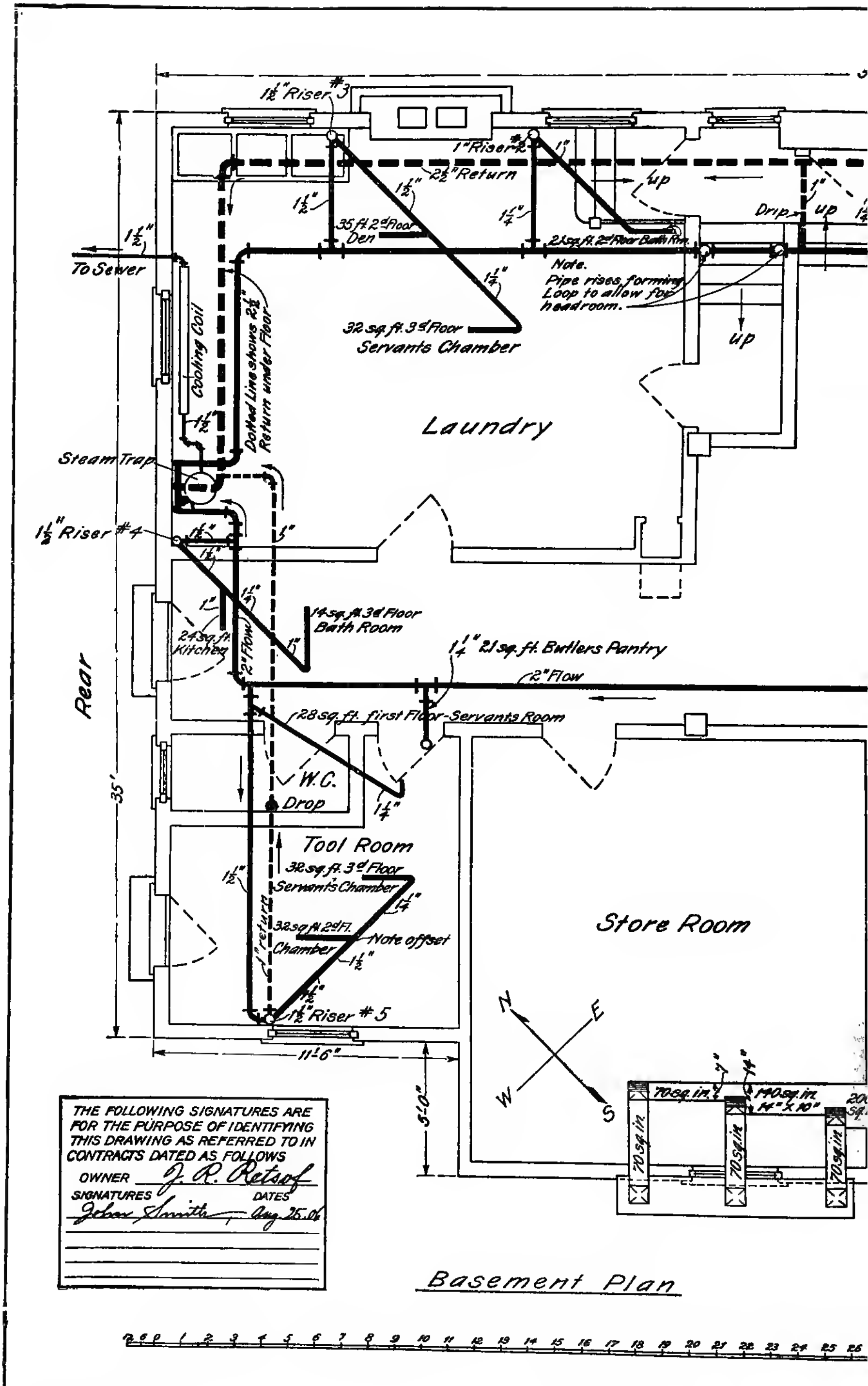
I L T 454—1092A

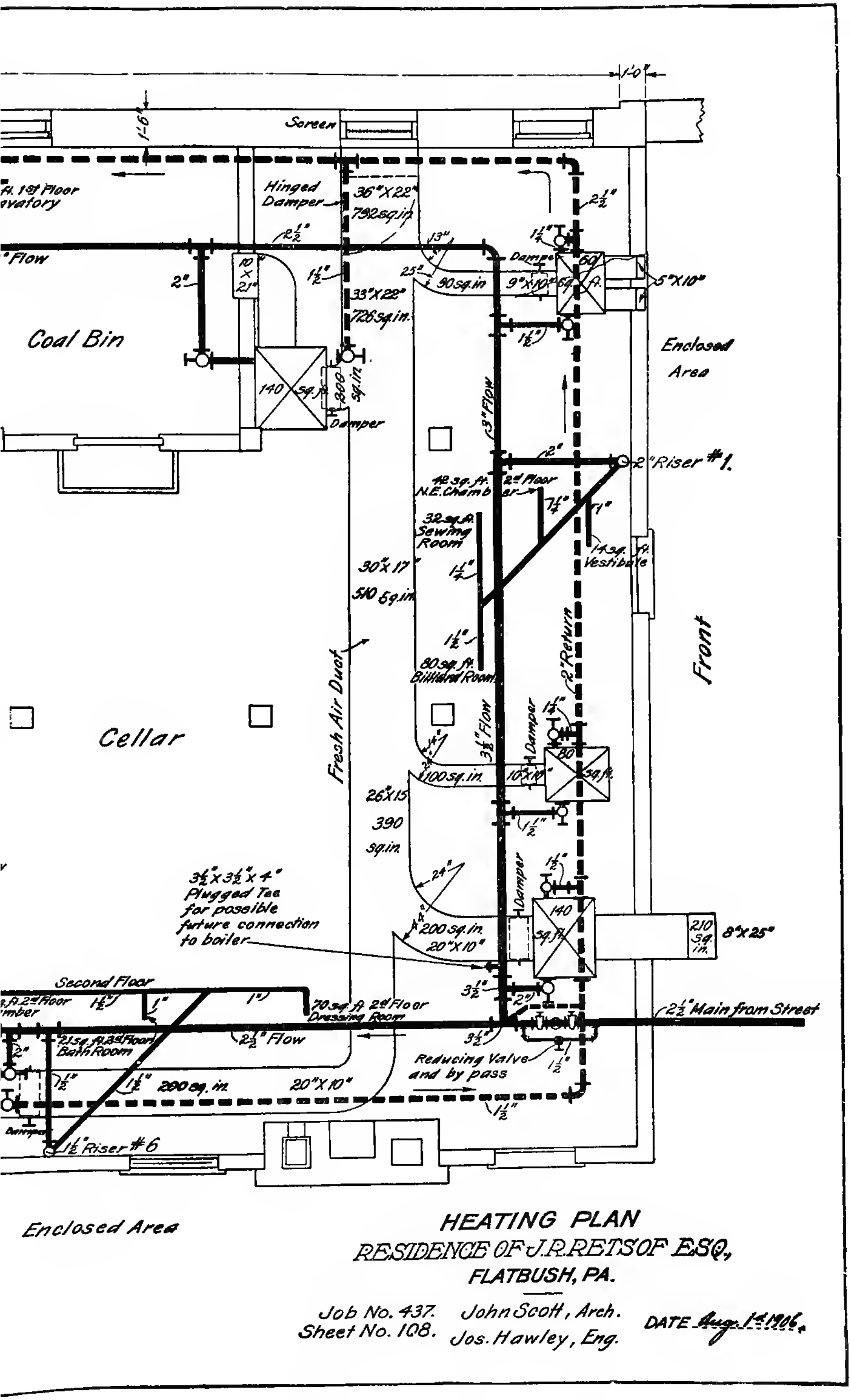


WALL BEAM
BEAM
BLACK IRON LAMP
RONZED
DOORWAY
3'x4" STUDDING
$3\frac{1}{2}$" GALV. IRON VENT
COPPER
3"x3" ANGLE
MORTAR
COPPER HOOD NOW IN PLACE
3"x3" ANGLE
CORBEL OUT THIS COURSE AT SIDES 1" AND BUILD LIPS OF HOOD INTO JOINTS, RUN BRICKWORK STRAIGHT UP FROM THIS POINT AT SIDES AND SET BACK AT REAR ENOUGH TO TAKE HOOD
3"x4" STUDDING
$1\frac{1}{8}$ PROJECTION
PARQUETRY
FACE BRICK
CONCRETE
ATION
3/4" BOLT AND WASHER
3"x3" ANGLE
$1\frac{1}{2}$" T-IRON
7/8" CLEAT BOLTED ON
SECTION
LEGEND
FACE BRICK
COMMON BRICK
CONCRETE
WOOD
IRON
$15\frac{1}{2}$"
T-IRON
JOHN. W. SCOTT, ARCHITECT
JOB. NO 437
SHEET NO. 47
DATE - JUNE 7 1906
DRAWN - BY A.J.W
TRACED - BY A.J.W
CHECKED - BY - R W S

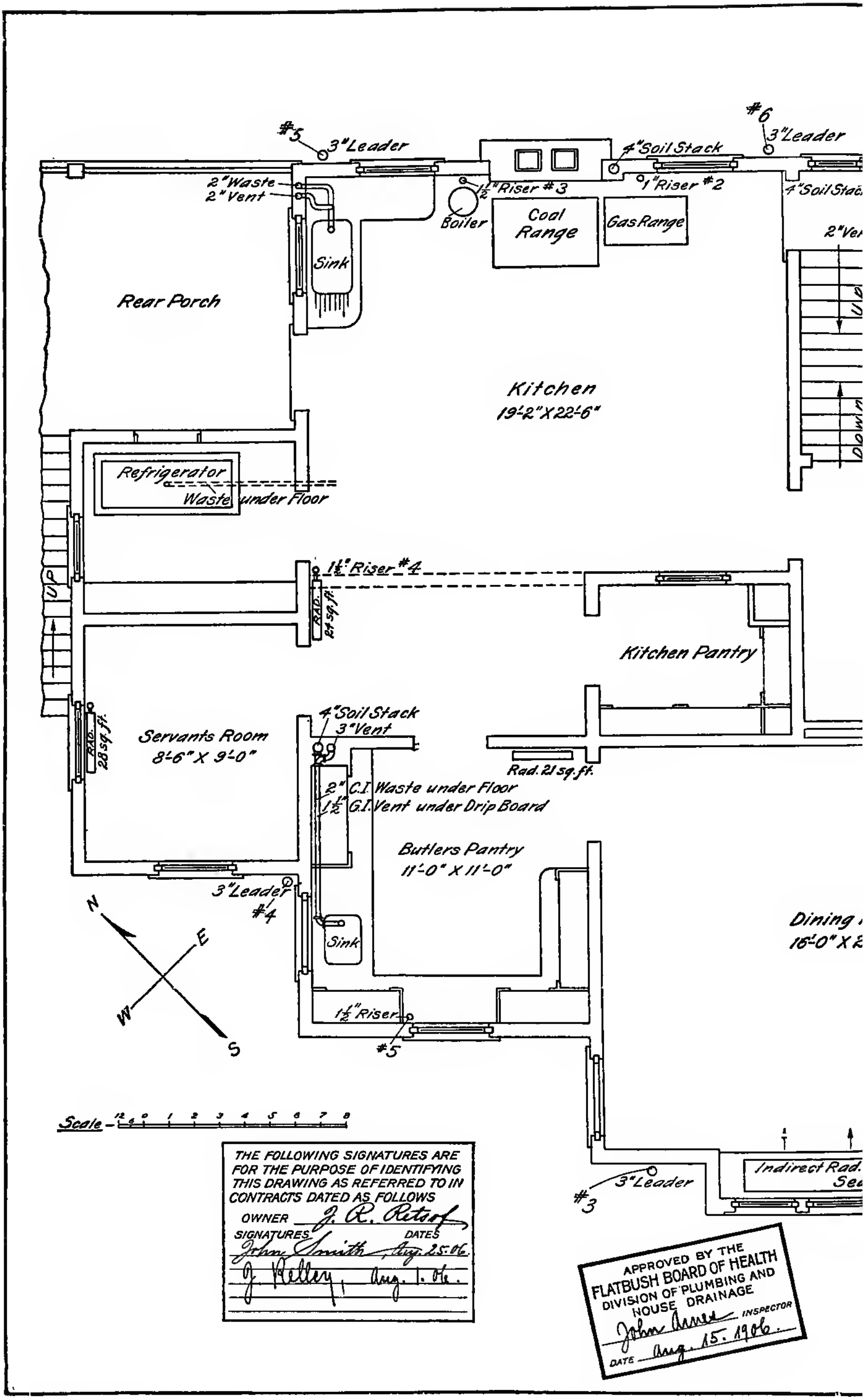

Chimney
#5
3" Leader
#6
3" Leader
2" Waste Stack
2" Vent Stack
Tubs
6"
4" Trap
3" C.I.
4" C.I.
4" Trap
up
4" Clean Out
4" Cast Iron
4" Clean Out
Rear
4" C.I.
f
Laundry
Closet
up
1½" G.I. Safe Waste with Check on lower End
1½" Clean Out
d
4" Cast Iron
4" C.I.
4" fresh Air Inlet Run to where directed.
Main Trap
Hall
Wood Floor
Cemen
5"
5" C.I.
5"
e
4" Cast Iron
To Sewer
Trap Door in Floor 20"x30"
Safe Waste Sink
c
4" Soil Stack
3" Vent Stack
4" C.I.
W.Cl.
4" Trap
b
3" Leader
#4
4" C.I.
Tool
Room
Store Room
4" Cast Iron
11'-6"
5'-0"
#3
3" Leader
4" Cast Iron
THE FOLLOWING SIGNATURES ARE FOR THE PURPOSE OF IDENTIFYING THIS DRAWING AS REFERRED TO IN CONTRACTS DATED AS FOLLOWS
OWNER J. R. Retsof
SIGNATURES
DATES
J. Kelley, Aug. 1. 06.
Basement Plan


#1
4" Leader
1'-6"
Cleanout
Coal Bin
4" Trap to Floor
4" Cast Iron
Pier
37'-10"
Front
Cellar
Cement Floor
N
E
W
S
Clean out
4" Soil Stack
Chimney
PROVED BY THE
SH BOARD OF HEALTH
SION OF PLUMBING AND
HOUSE DRAINAGE
John Ames INSPECTOR
Aug. 15. 1906.
PLUMBING AND DRAINAGE PLAN
RESIDENCE OF J.R. RETSOF, ESQ.
FLATBUSH, PA.
Job No. 437.
Sheet No. 107.
John Scott, Arch.
Jos. Hawley, Eng.
DATE Aug. 1st 1906


1½" Riser #3
1" Riser #2
2½" Return
Up
Drip
35 ft. 2d Floor Den
21 sq. ft. 2d Floor Bath Rm.
To Sewer
Note.
Pipe rises forming Loop to allow for headroom.
32 sq. ft. 3d Floor Servants Chamber
Cooling Coil
Dotted Line shows 2½ Return under Floor
Laundry
Steam Trap
1½" Riser #4
14 sq. ft. 3d Floor Bath Room
24 sq. ft. Kitchen
2" Flow
1¼" 21 sq. ft. Butlers Pantry
2" Flow
Rear
28 sq. ft. first Floor-Servants Room
W.C.
Drop
35'
Tool Room
32 sq. ft. 3d Floor Servants Chamber
32 sq. ft. 2d Fl. Chamber
Note offset
1" return
1½" Riser #5
Store Room
11'-6"
5'-0"
N
E
W
S
70 sq. in.
140 sq. in. 14" x 10"
THE FOLLOWING SIGNATURES ARE FOR THE PURPOSE OF IDENTIFYING THIS DRAWING AS REFERRED TO IN CONTRACTS DATED AS FOLLOWS
OWNER J. R. Retsof
SIGNATURES DATES
John Smith Aug. 25. 06
Basement Plan



Screen
1'-6"
1'-0"
Hinged Damper
36"X22"
792 sq.in.
33"X22"
726 sq.in.
Coal Bin
140 sq.ft.
300 sq.in.
Damper
90 sq.in.
9"X10"
60 sq.ft.
5"X10"
Enclosed Area
3" Flow
2" Riser #1
42 sq.ft. 2d Floor N.E. Chamber
32 sq.ft. Sewing Room
14 sq.ft. Vestibule
30"x17"
510 sq.in.
80 sq.ft. Billiard Room
2" Return
Front
Fresh Air Duct
Cellar
3½" Flow
100 sq.in.
10"X10"
80 sq.ft.
26"X15
390 sq.in.
3½"x3½"x4" Plugged Tee for possible future connection to boiler
200 sq.in.
20"X10"
140 sq.ft.
210 sq.in.
8"x25"
Second Floor
70 sq.ft. 2d Floor Dressing Room
21 sq.ft. 3d Floor Bath Room
2½" Flow
290 sq.in.
20"X10"
2½" Main from Street
Reducing Valve and by pass
1½" Riser #6
Enclosed Area
HEATING PLAN
RESIDENCE OF J.R.RETSOF ESQ,
FLATBUSH, PA.
Job No. 437.
Sheet No. 108.
John Scott, Arch.
Jos. Hawley, Eng.
DATE Aug. 1st 1906.



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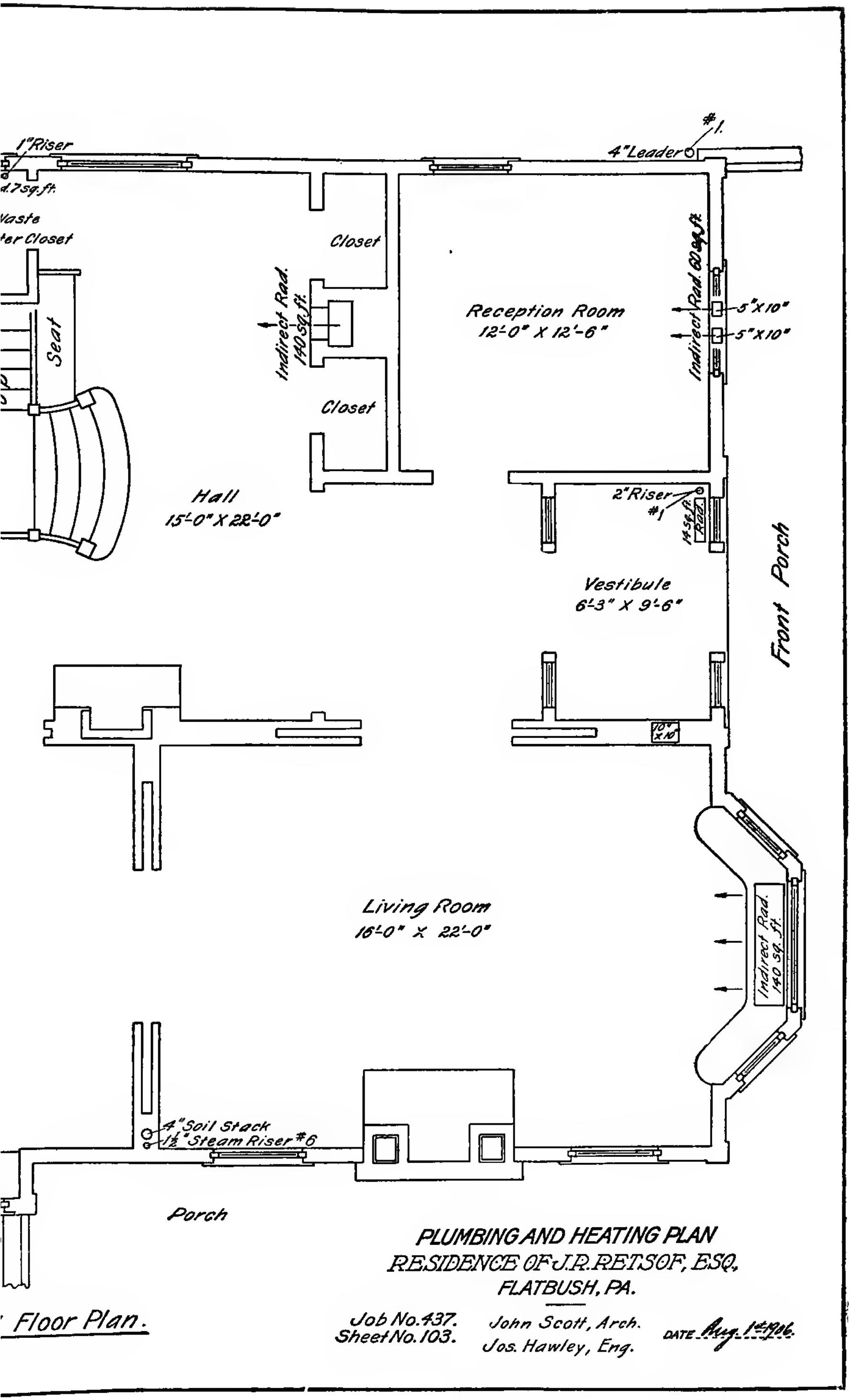
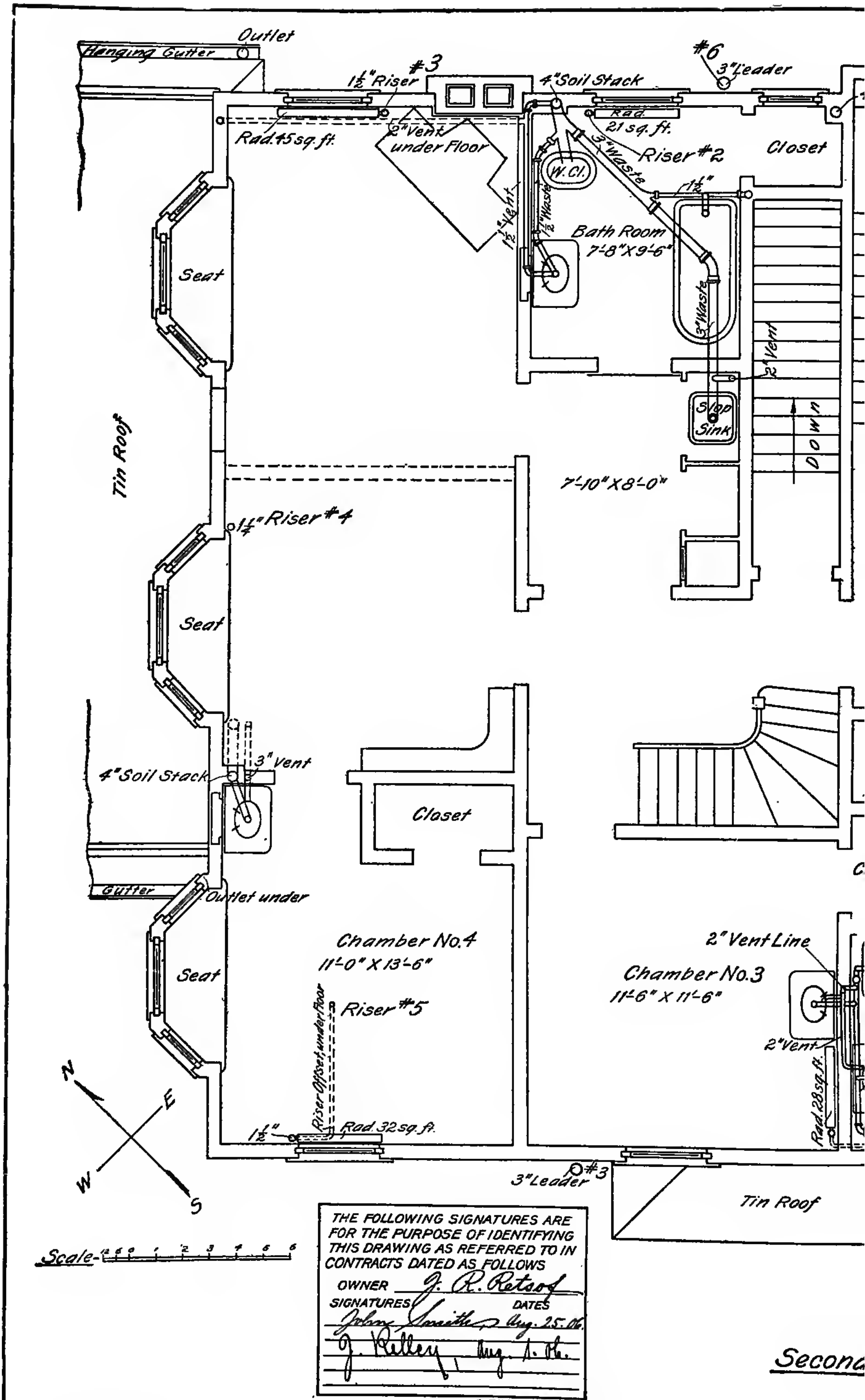
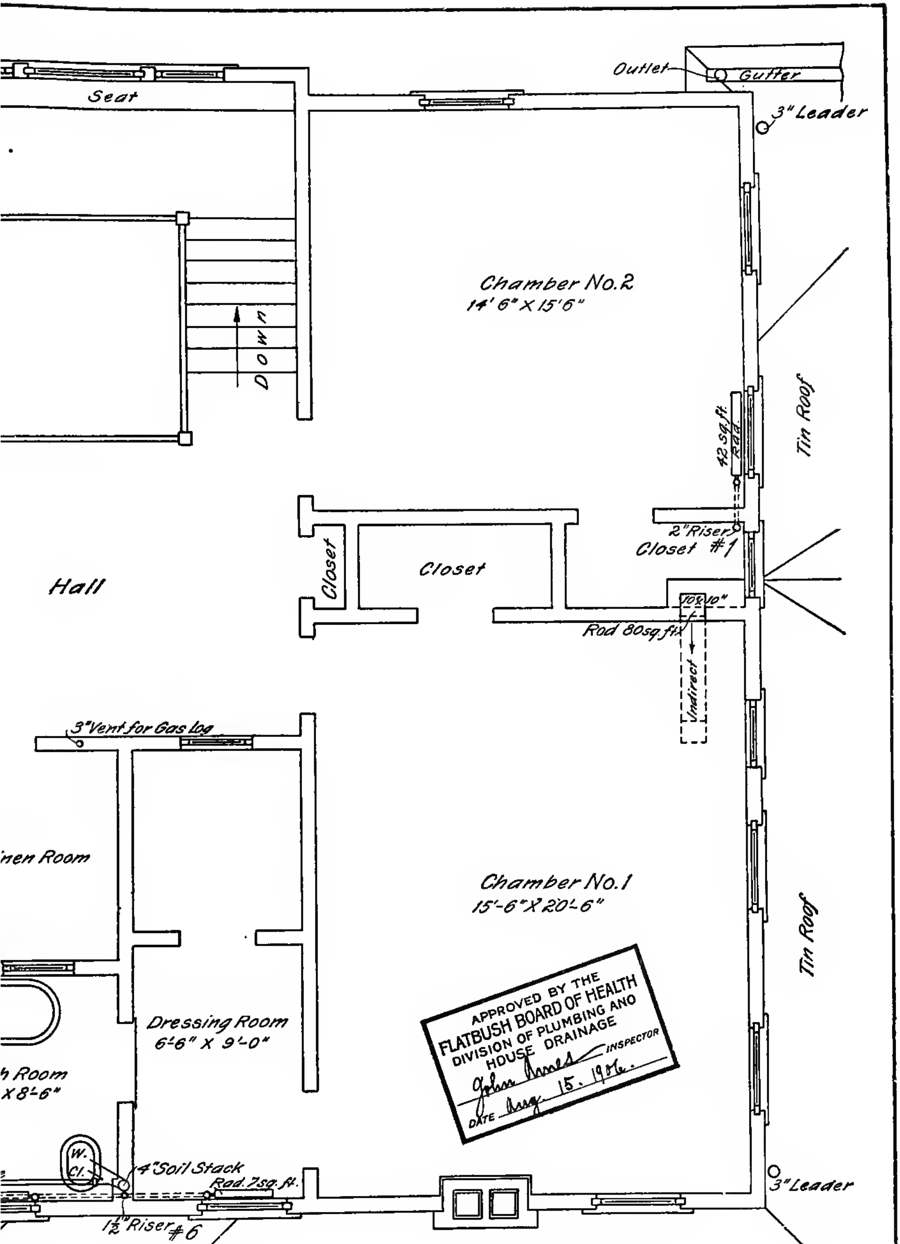

1"Riser
d.7sq.ft.
Vaste
ter Closet
Seat
Closet
Indirect Rad. 140 sq.ft.
Closet
#1.
4"Leader
Reception Room
12'-0" X 12'-6"
Indirect Rad. 60 sq.ft.
5"x10"
5"x10"
Hall
15'-0" X 22'-0"
2"Riser
#1
14 sq.ft. Rad.
Vestibule
6'-3" X 9'-6"
Front Porch
10" x 10"
Living Room
16'-0" X 22'-0"
Indirect Rad. 140 sq.ft.
4"Soil Stack
1½"Steam Riser #6
Porch
r Floor Plan.
PLUMBING AND HEATING PLAN
RESIDENCE OF J.R.RETSOF, ESQ.
FLATBUSH, PA.
Job No.437.
Sheet No.103.
John Scott, Arch.
Jos. Hawley, Eng.
DATE Aug. 1st 1906.



Outlet
Hanging Gutter
#3
1½" Riser
Rad. 45 sq. ft.
2" Vent under Floor
4" Soil Stack
#6
3" Leader
Rad. 21 sq. ft.
3" Waste
Riser #2
Closet
W. Cl.
1½"
1½" Vent
1½" Waste
Bath Room
7'-8" X 9'-6"
3" Waste
2" Vent
Slop Sink
Down
Seat
Tin Roof
7'-10" X 8'-0"
1¼" Riser #4
Seat
4" Soil Stack
3" Vent
Closet
Gutter
Outlet under
Seat
Chamber No. 4
11'-0" X 13'-6"
Riser #5
Riser Offset under Floor
1½"
Rad. 32 sq. ft.
2" Vent Line
Chamber No. 3
11'-6" X 11'-6"
2" Vent
Rad. 28 sq. ft.
N
E
W
S
3" Leader
#3
Tin Roof
Scale-
THE FOLLOWING SIGNATURES ARE FOR THE PURPOSE OF IDENTIFYING THIS DRAWING AS REFERRED TO IN CONTRACTS DATED AS FOLLOWS
OWNER J. R. Retsof
SIGNATURES
DATES
John Smith Aug. 25. 06.
J. Kelley Aug. 1. 06.
Second



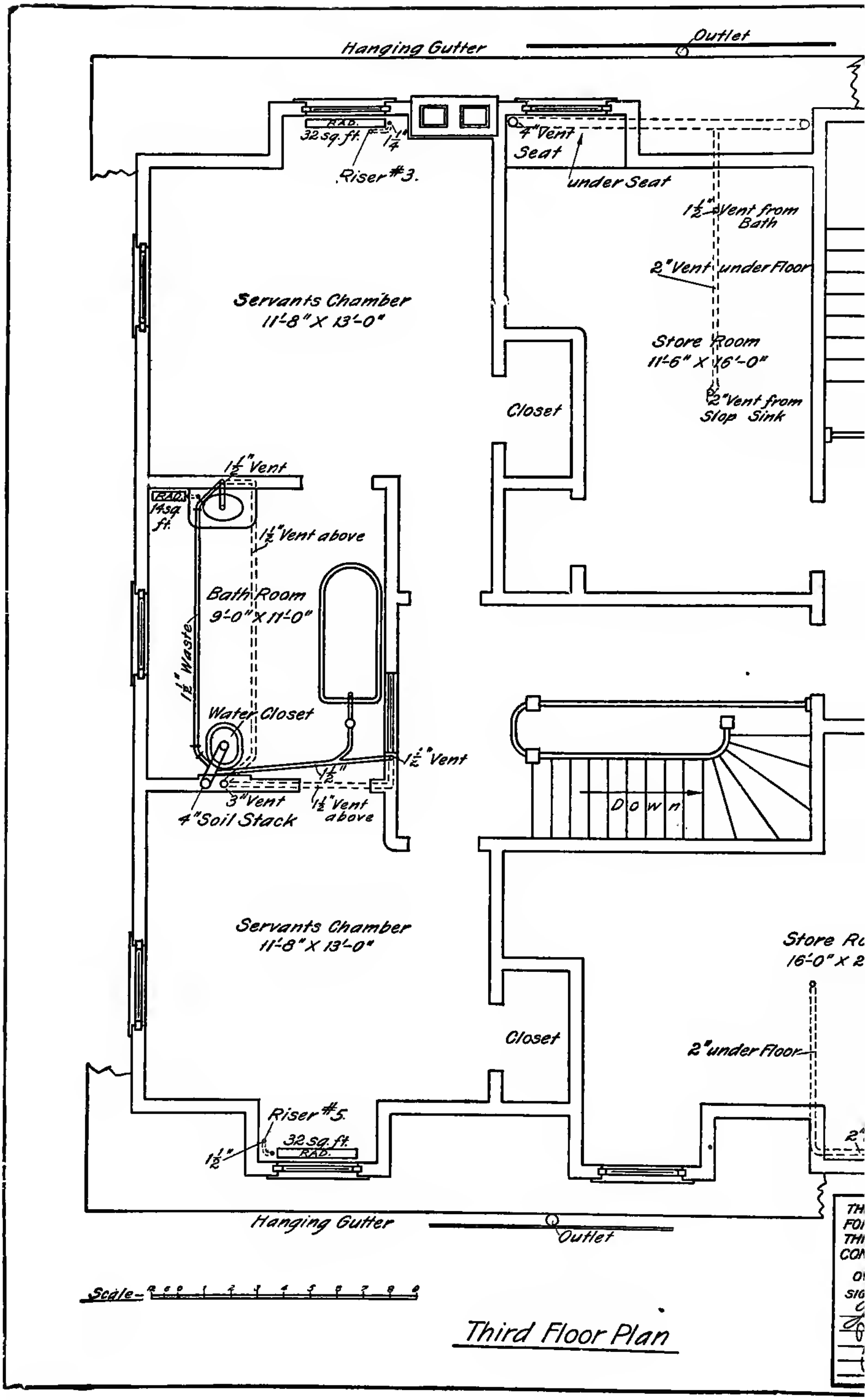
PLUMBING AND HEATING PLAN
RESIDENCE OF J.R.RETSOF, ESQ.,
FLATBUSH, PA.

Job No. 437.
Sheet No. 104.

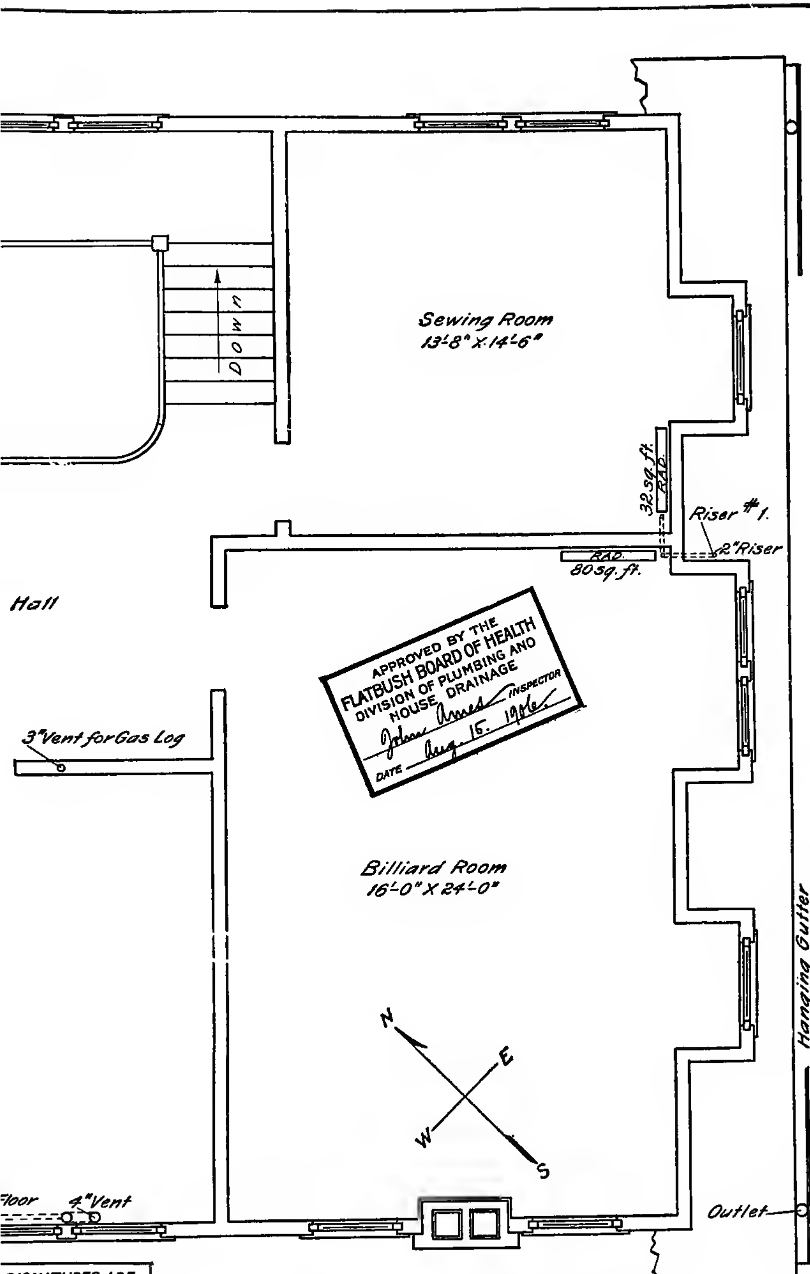
John Scott, Arch.
Jos. Hawley, Eng.

DATE Aug. 1st 1906.

Plan.



Third Floor Plan



SIGNATURES ARE
...SE OF IDENTIFYING
...S REFERRED TO IN
...D AS FOLLOWS
R. Retsof
DATES
...th, Aug. 25. 06.
Aug. 1. 06.

PLUMBING AND HEATING PLAN

RESIDENCE OF J.R. RETSOF, ESQ.,

FLATBUSH, PA.

Job No. 437.
Sheet No. 105.

John Scott, Arch.
Jos. Hawley, Eng.

DATE Aug. 1. 1906.

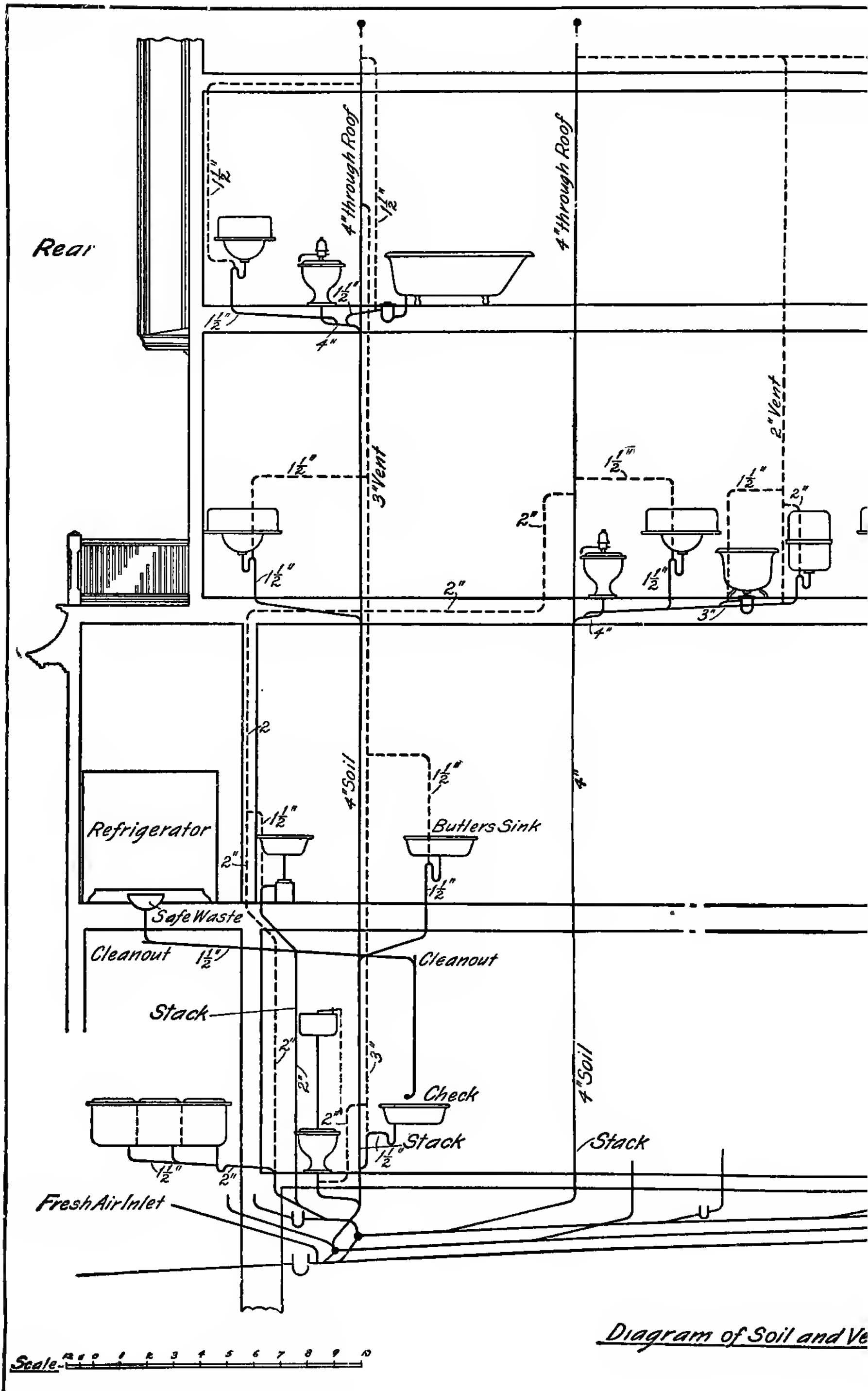
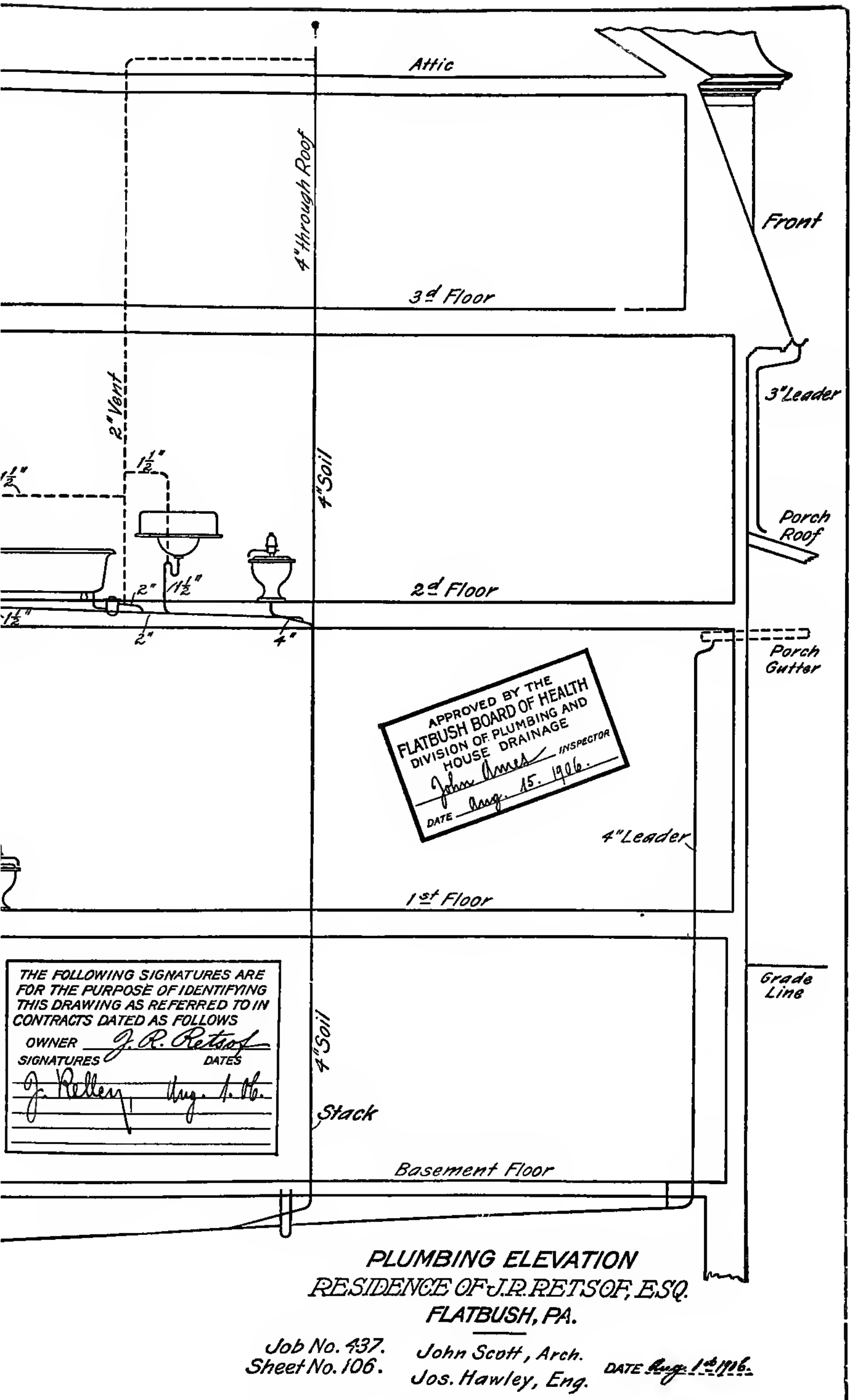


Diagram of Soil and Ve


Attic
4" Through Roof
Front
3d Floor
2" Vent
1½"
4" Soil
3" Leader
Porch Roof
2d Floor
2"
1½"
4"
Porch Gutter
APPROVED BY THE FLATBUSH BOARD OF HEALTH DIVISION OF PLUMBING AND HOUSE DRAINAGE
John Ames INSPECTOR
DATE Aug. 15. 1906.
4" Leader
1st Floor
Grade Line
THE FOLLOWING SIGNATURES ARE FOR THE PURPOSE OF IDENTIFYING THIS DRAWING AS REFERRED TO IN CONTRACTS DATED AS FOLLOWS
OWNER J. R. Retsof
SIGNATURES DATES
J. Kelley Aug. 1. 06.
4" Soil
Stack
Basement Floor
PLUMBING ELEVATION
RESIDENCE OF J.R. RETSOF, ESQ.
FLATBUSH, PA.
Job No. 437.
Sheet No. 106.
John Scott, Arch.
Jos. Hawley, Eng.
DATE Aug. 1st 1906.

crack. This lime, then, is entirely unfit for use, and should be condemned and ordered off the ground.

Overburnt lime is even worse than underburnt, for the lumps, being hard, resist the action of the water and do not slake readily, the slaking process commencing slowly and a great deal of time being consumed in the process. Any lime that is overburnt should be rejected.

On opening a barrel of first-class lime and immersing several lumps in water, it will be seen that the slaking process commences almost immediately; the action, due to the oxygen of the water combining with the lime in slaking, gives forth a hissing sound, and a warm white vapor arises, resulting in a creamy unctuous mixture with no residue. This lime, then, is satisfactory, and may be used with an admixture of cement in making mortar for brick walls in the cellar and such places where dampness is liable to occur; or, without the cement, above grade, although the admixture of a small percentage of cement throughout is best if the extra expense is allowable.

47. The hydraulic properties of some particular brand of lime may be unknown, and if it is desired to ascertain whether this lime is hydraulic and suitable for use in damp situations or under water, a test should be made. The following test, though very simple, should be sufficient under ordinary circumstances: A stiff mortar mixed in the proportion of one part of lime paste to two parts of clean sharp sand, thoroughly incorporated by continual working until all streaks disappear, should be formed into a cake, as was done with the cement, and immersed in water. After at least 24 hours, if the cake has hardened perceptibly, the lime may be reasonably inferred to be hydraulic.

48. Excavation.—The superintendent now turns his attention to the excavation and examines the vertical earth banks, to see whether they are liable to crumble or slide inwards at any point, due to excessive dryness or wetness. At the high point, *A*, Fig. 9, he finds the first 3 feet below the surface to be compact firm loam, and all below it to the trenches good blue clay, there being no tendency here or at any other point to slide or crumble.

Nearly all soils in a vertical bank, unless very dry, will retain their shapes unless disturbed or acted on by frost or moisture. The earth, acted on in this way, assumes its angle of repose, which varies according to the nature of the soil itself—usually about 30°. In excavating earth to any great depth, when the excavations are to be left open for a long time, the bank should be held in place by means of *sheet piling*, or the sides of the excavation should be dressed down to a slope of at least 60°.

49. Ordinary clay, or kaolin, strata in an embankment are a constant menace, as they are liable to act as a lubricant. Under such conditions, the bank is likely to slide in, thereby causing a great deal of unnecessary work, unless provision is made to avert it. In the case under consideration, the earth in the excavation is a firm loam above with strata of a clayey nature below to the bottom of the excavation. At the southwest corner, *G*, Fig. 9, the soil is found to be constantly wet, indicating the existence of a spring in the immediate neighborhood. This ground looks treacherous to build on, especially on account of the wet clay; for this reason, the superintendent directs the contractor to dig trenches down to solid rock, which is found at a distance averaging about 2 feet below the line of the finished cellar bottom. The soil changes gradually from hard, blue clay to a coarse gravel in the rock depression, which is quite wet. On excavating to clear the rock, a small stream of water is found flowing over the rock from the south, which indicates that it probably comes from a spring on the high ground adjoining. In this case, the flow of water should be diverted, so that the foundation wall may be kept dry. To do this, it will be necessary to excavate to the rock at a point several feet outside of the foundation wall in the direction from which the water comes, and by means of a dry drain divert the water from the foundation, delivering it in a pit filled partly with large stones at some point in the rear of the lot, where it will become distributed throughout the surrounding soil. The foundation wall may then be carried down to solid rock. This wall, however, except the footing course, should be laid dry, with large, sound, flat stones, to the level of the adjacent footings, and from here it should be laid in mortar. The piece of wall that is laid dry will prevent any moisture that may find its way to the base, from working up into the wall. In one place in the trenches, the superintendent finds a small clump of soft rock, some 10 inches high and 3 feet long, that has not been leveled nor even shelved to receive the wall. He immediately calls the foreman-mason's attention to this point, and on being asked why such work was allowed to be done, the foreman replied that he considered it unnecessary to cut out the rock, as it was near the level of the cellar floor, that it would be all right to make it serve as a footing course.

Now it can be readily seen that if this were allowed to remain, any surface water finding its way down to this rock would follow it and enter the cellar. The superintendent should order the wall above the rock taken down and rebuilt, the rock, which is found to lie in seams, is easily pried out with a crowbar until the required level for the footing course is reached.

50. The broken-stone trenches at the wall footings will be connected by means of dry drains with the dry cesspool already mentioned, so that any moisture that may work toward the walls will follow these drains to the cesspool and be absorbed by the surrounding soil, thus insuring a dry cellar.

Now, as the specifications do not require the contractor to carry the walls down below the level of the footing course, nor to construct the dry drains and the cesspool just mentioned, the owner will be required to pay him extra for this work. According to a schedule handed in with his proposal, the contractor has agreed to do any extra rubble masonry in lime mortar for $3.50 per cubic yard, and with this as a basis, he finally agrees to put in the dry wall for

$2.75 per yard, the stones to be large, with a reasonable number of them carried clear through the wall. On figuring up the extent of the wall from the rock bottom to the bottom of the footings, it is found that 3 cubic yards of wall will be required, which at $2.75 per yard will amount to $8.25.

A special contract is drawn up and signed by both parties, and a note is made on the cellar plan and in the superintendent's field book. It is agreed that the payment shall be made not later than 10 days after the final acceptance of the work by the architect and the owner.

51. The excavation for the pit and dry drains from footings and spring are next measured, in order that the proper charge may be estimated. By measurement, the bottom of the drain at the pit was found to be 4 feet 2 inches below the natural surface grade. After measuring at several other points along the drains, it was found that a fair average of the depth of the earth above bed rock was 3 feet 6 inches; taking this as the depth, 18 feet as the length of the extra trench, and making the trench 2 feet wide, to allow a workman sufficient room, the total amount of excavation will be

$$\frac{3.5 \times 18 \times 2}{27} = 4.66 \text{ cubic yards}$$

The price of extra earth excavation as stated in the schedule handed in with contract is 40 cents per cubic yard; therefore, 4.66 cubic yards will cost $4.66 \times 40 = \$1.86$. The excavation of 3 cubic yards for the cesspool, at the same price, will cost $1.20. A charge of 25 cents per cubic yard is agreed on for placing broken stone in the bottom of the drain and cesspool and refilling with earth, thus adding $1.91 to the $1.86 and the $1.20, making the total extra charge $4.97.

52. It was not found necessary to excavate into the rock at any point except at about the center of the excavation, where a small ledge of rock projected above the cellar bottom; and, on measuring the exposed portion and 1 foot below the cellar bottom by means of a straightedge, level, and rule, it was found to contain, approximately, 4 cubic yards. As this is also extra work, the contractor should receive extra compensation for it. On again referring to the schedule, the price for excavation of this kind is found to be $1.25 per cubic yard, and as there are 4 cubic yards, the extra charge for this work will be $5.

To cover this work, a special agreement is drawn up, similar to that provided for the work of extra excavation and wall construction. A brief specification or written order stating what is to be done is also written in each case and sent to the contractor, a copy of which is kept by the architect. Such letters are very important and should never be omitted. The order for the necessary dry drains and cesspool is also obtained, and the agreement made in a similar manner. The superintendent makes a note of this extra work in his field book, which may be produced, if necessary, when the time arrives for a settlement. These preliminary matters being satisfactorily adjusted, the contractor may proceed with the work.

53. Rock Excavation.—The rock excavation being too small an amount to warrant the use of steam or compressed-air drills, and too extensive for wedging, hand drills will have to be resorted to. The small holes are driven by one man with a small jumper and a hand hammer; the larger and deeper holes require three men, two with sledge hammers and one holding the jumper, which he lifts up slightly and turns at each stroke of the hammer to keep the hole round and prevent the jumper from jamming. A small amount of water is poured into the hole at intervals to wet the pulverized stone; this is cleaned out several times in the course of sinking, and when the hole has reached a sufficient depth, the pulverized stone and water is removed by means of a rod having a valve or a spoon-shaped piece on the end. The hole is then cleaned out with a rod or stiff wire having straw or rags wrapped around the end.

After throwing in some fine dry sand or some such material to absorb the remaining moisture, the hole is ready for the charge. Coarse gunpowder or dynamite is generally used for the charge, the latter being preferable where the rock is to be shattered, on account of its great strength and also its comparative safety in handling and storing.

The size of the cartridge depends on the depth of the hole, the amount of rock to be blown out, and the nature of the rock itself, harder rock very often requiring less force than rock of a softer nature. Where a comparatively small amount of rock is to be excavated, the charge is generally set off by means of a fuse cut to a sufficient length to allow the workmen to reach a place of safety before the explosion occurs; but if dynamite is used as the explosive, the charge is fired by electricity, the cartridge being secured to the end of the wires, which are strung along to a suitable distance to insure safety, and the charge being exploded by means of a button or plunger handle.

Electricity is used almost exclusively where a great deal of blasting is to be done. The holes are drilled during the morning hours and the charge is inserted and connected up with the battery to be set off at once, generally at the noon hour when the men have quit work for lunch; the same procedure is gone through with in the afternoon, and the blasts are all set off at the quitting hour. Where a great deal of rock is to be excavated to a reasonable depth, it is worked to a face, and the holes are sunk at a distance back and parallel to the face; in this way the rock may be excavated with economy, and will also be of greater value for building purposes.

When rock excavation is done on a large scale, steam or compressed-air drilling machines are used, the work being done with greater rapidity and economy. Rock excavation in the larger cities is done by men who follow that business entirely, being licensed and placed under a penalty for non-compliance with the local ordinances or for carelessness.

54. Quarry Stone.—After completing arrangements for the blasting of rock and special work in trenches, etc., as previously described, the superintendent examines the quarry stone delivered, and finds that it is for the most part sound and of sufficient size. With an admonition to the contractor to allow no shaky or unsound stone to be used anywhere in the buildings and to see that all stones are laid with a good flat bed, he passes on to inspect the footing stones and finds that they are flat, sound, and up to the requirements. Some pieces found to be only 5 inches thick are condemned as the specifications require that they shall be at least 6 inches thick. The superintendent orders these stones to be broken up for use in the walls or removed from the premises; the remainder of the footing stones are found to conform to the specifications. The footing stones should be laid on the undisturbed earth, and if the earth in the trenches has been disturbed, all loose earth must be removed to obtain a firm bed, even should an extra course of stonework be necessary.

55. Ashlar.—The part of the ashlar facing and dimensioned material delivered is next inspected, and with few exceptions, is found to be clear, sound, and free from seams or other defects. Sand holes, or pits, very often occur in sandstones, the color of the stone varying to some extent; single pieces are often found having two shades of color. On sounding the pieces of ashlar with a hammer, the superintendent may discover that some pieces, which look in every way as good as the rest, give forth a dull sound, indicating that they contain hidden seams that are liable to open after the stones have been set; these stones he orders to be removed immediately. Sound stones should have a clear ring when tapped with the hammer. The same method may be employed in testing granite and sandstone for copings, steps, etc. Good granite should be free from black or white lumps, generally of quartz, called *knots*, and also from seams or discolorations. Sandstone should be free from discoloration, which generally appears in streaks, and from decided laminations. Limestone should be examined for pittings and dark spots. Generally speaking, a newly fractured piece of stone should show bright, sharp, and in most cases crystalline. A reasonable period of time should be given after the stone is quarried, and before it is set, to allow for the evaporation of *quarry sap* or natural moisture in the stone. Sandstones, limestones, etc. can be prepared and finished at the works by the use of saw planers, cutters, and grinders, but granite, trap rock, or similar hard stones must be finished for the most part by hand.

The architect on large works should see that a copy of the working drawings, having every dimensioned stone designated by some distinctive mark, is furnished to the foreman setter by the stone contractor or quarryman, and each stone should have a corresponding mark on it. The clerk of the works should examine the marks as the stones are delivered on the ground, and should see that they are placed in such a manner as to avoid rehandling as much as possible when wanted.

Molded work should be examined very carefully, as it is often patched at the works. These patches are difficult to discover when the stone has been dusted well. They may be disclosed, however, by wiping the suspected piece with a damp cloth.

56. Bricks.—The bricks are next examined by striking two of them together. If they give forth a clear ringing sound and the corners do not break off easily, they may be considered good and in compliance with the specifications. Some may be of a light color, called *salmon brick*, indicating that they are underburnt; others of a purplish tinge, giving forth a metallic ring when two are struck together, are overburnt, and should not be used, except, perhaps, as *bats* in the body of the wall. Excessive burning generally reduces the size of the bricks and often distorts them. The contractor should be notified to remove from the premises the underburnt brick and all the overburnt that are distorted, and he should be cautioned to get a better quality for the balance of the work, under penalty of having the entire lot condemned. Where good work is desired, bricks should be examined to see that the surfaces are true and "out of wind."

57. Openings for Pipes.—At this time, the superintendent, in company with the mason, foreman, and the plumber, should go over the location of openings to be left in walls or footings for house drain and leader connections to same, and for gas and water piping. They will use the general drawing shown in Fig. 33. This work is often neglected, with the result that the openings must be cut through the walls after they have set, which is liable to damage the wall and incurs needless expense and delay.

Before leaving, the superintendent examines the excavation for the area under porch to see if it has been carried 6 inches below the level of the cellar proper. He finds this has been done, but that a pile of excavated earth has been left at one point, which he orders removed at once.

58. System in Inspecting.—The superintendent should have a systematic method of making his inspections. For example, on the second visit he would probably find it best, first to examine all work outside of the excavations, such as care of adjoining property, lines, etc.; then the excavation itself, examining the nature of the soil on which the footings are to rest; and finally the materials delivered on the premises. Following some such plan as this, the superintendent, before going to the building, should make a complete list in his memorandum book of matters to be examined on that visit, checking them off as each item is passed on.

THIRD VISIT

59. Foundations.—The superintendent finds on the occasion of his third visit that the foundation walls have been started, a short section being built varying in height above the footing course from 2 to 5 feet; he examines the lines stretched between the line boards to see that they are in the proper notches, and then sights along the partly built wall to ascertain if it is built to the lines; finding it to be properly done, he enters the excavation.

The masons are busily engaged in one corner setting footing stones, and the superintendent finds that this is a good opportunity to observe how they are being laid. He observes that the stones are good, sound, and of sufficient size, and stands on each stone in turn and tries to rock it; one stone rocks perceptibly, indicating that it is either unfit as a footing stone or improperly laid. The stone is ordered taken out, and is found to be slightly rounded on the under side, also sufficient cement mortar had not been used in bedding it. The masons are instructed to scoop out the gravel bed to conform to the shape of the stone and to form a generous bed of cement mortar. The stone is then replaced and is found to bed firmly.

Another method for bedding footing stones very often resorted to, but not so good as the method here specified, is this: Sand or gravel is heaped around the stones and water is poured on it, generally by means of a hose. The water, settling under the stones and following the open crevices, carries the grains of sand or gravel with it, filling the voids and interstices between the stones and the earth beds, and in this way forming new beds to conform to the uneven surface of the stones.

60. Damp-Proofing.—It very often happens that damp or wet soil is encountered in excavations for buildings, and many methods are adopted to keep the cellar walls dry and prevent the entrance of surface water. Under ordinary circumstances, gravel filling and a porous tile drain along the outside of footings are sufficient to carry off the water, but when the soil is wet, a damp-proof course of some substance that is impervious to water is applied to the outer surface of the foundation wall. Asphalt is perhaps the best-known substance for the purpose, and when applied hot—the walls below grade being plastered over with cement mortar to even up the surface and then coated with the asphalt—a water-tight job will result that under ordinary conditions will last for an indefinite length of time. Alternating layers of asphalt and tarred felt are often laid in the walls, when being built, to prevent the moisture from working up through the wall. These layers are placed just above the footings and just above the grade line. Many other methods are employed in damp-proofing, but that work is discussed in another Section.

Damp cellars, however, are usually an inexcusable condition, and should not be allowed to occur under any circumstance, as they are likely to cause an unhealthful condition in the house. In cold weather such houses are hard to warm, and in summer they are damp and the air has a stale, musty odor. Damp cellars result from spring or surface water penetrating the foundation walls or concrete of the cellar bottom. Water soaking through the foundation walls may be prevented by damp-proofing, as already described, but when a running stream of spring water finds its way across the building beneath the concrete bottom, it should be confined in a close drain and never carried through an open drain. The open drain would offer the same objection as though it were omitted entirely. Where the earth in the cellar bottom is generally wet, a series of porous tile drains should be laid beneath the floor connecting with a trunk drain, which in turn should be carried to some convenient place on the premises to discharge into a dry cesspool, or some such collecting basin, where the water may soak through into the soil below. See Arts. **49**, **50**, and **51**.

The area under the porch, indicated on the basement plan, Fig. 10, besides giving additional room for storage, etc., serves as a protection to the cellar proper against dampness from the earth bank at front. The damp-proofing is not applied until the walls are completed, but the superintendent is careful to see that the outer surface of the wall is plastered with cement mortar, as the work progresses, where it would be impossible for the mason to get at it when the wall was higher. Where possible, however, this plastering should be left until the wall is completed to grade.

61. Walls.—The superintendent observes that a portion of the foundations for partition walls in the basement is level with the earth floor and that a few feet of brick underpinning or dwarf walls has been built. He also notices that one of the chimney bases has been started. He looks to see whether the brick and mortar being used are good, whether the brickwork is being properly bonded, and whether the joints are being properly struck, or, in other words, made by holding the trowel in a diagonal position so that the joints will be weathered against possible water or dust.

The superintendent judges all satisfactory and passes on. He next examines the foundation wall proper, a portion of which has been built, and finds that it is well done, the masons having tied the wall thoroughly with frequent bond stones running through the wall and kept the bed joints approximately level. He also notices that the masons are using the mortar generously, that it is of good quality, and that the joints are well filled and pointed.

Some of the ashlar has been delivered on the premises, but none built into the wall as yet. On examination, a number of pieces are discovered so cut that they cannot be laid on their natural bed; these are marked condemned and ordered removed. A number of pieces are also found which are either out of square, have yellow streaks or patches on their surface, or do not match in shade the sample submitted by the contractor; these are also marked and ordered removed. The cut-stone door and window sills and north chimney base are also found on the premises. They are examined for flaws, discoloration, and chipped edges, but all are found in good condition and of uniform color.

The superintendent next examines the mixing of the mortar, and finds it being mixed in clean boxes and in the proper proportions. The materials entering into it have been previously tested and found satisfactory, with the exception of several barrels of lime and cement, which were condemned and removed. He directs that a sufficient amount of lime be slaked and stored in barrels for at least 2 weeks, to be used in making mortar to lay up the outside chimneys and for pointing the ashlar.

A trick practiced by some irresponsible builders at this stage of the work where a portion, at least, of the excavation is in rock, is this: Very frequently, when the rock shows a good vertical face, the excavating is not carried far enough to admit of the foundation wall being built to its full thickness; the rock is faced, as it were, instead, and, unless the superintendent has been fortunate enough to make the discovery in time, no indication of the sham work will appear, unless, perhaps, at some future time when the wall may fall away below the top of the rock, due to the action of water keeping it constantly saturated, or due to a great superimposed weight; or, the wall may fall away gradually or collapse suddenly to the possible risk of human life and damage to the building, as shown in Fig. 39. A deception of this kind may be detected in the following manner: The

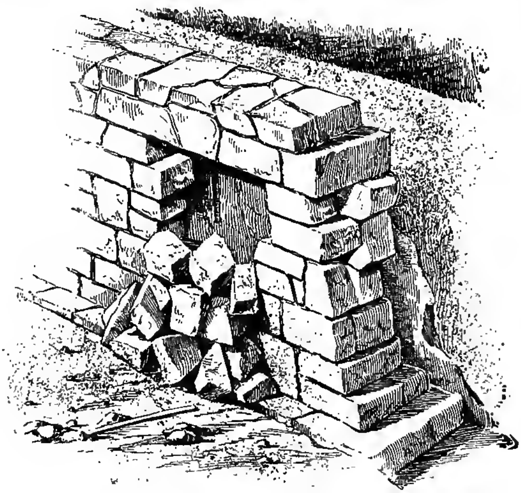


FIG. 39

superintendent should procure a steel rod about 5 or 6 feet long and from $\frac{3}{16}$ to $\frac{3}{8}$ inch in diameter. If the wall is properly built to a line on the outside, the rod may be easily driven down to the required depth. If the rod strikes solid rock at more than one trial before reaching the footings, the wall should be ordered taken down, and no doubt the discovery will be made that the wall is faced as shown in Fig. 39; or the wall may be built against the face of the rock without any intervening space, which is almost as bad. In cases of this kind, the only remedy is to take down the wall to the bottom and remove the rock sufficiently to leave a space of at least 8 inches outside the wall to allow for pointing the joints, and afterwards fill the space with gravel or broken stone; where the proper amount of space is left, however, when the excavation is made, there is no danger of such work being done, and proper superintendence at this time will prevent any such trouble.

Another common occurrence is to build the wall to one face only, that is, to a line on the inside or cellar side of the wall, allowing the stones to project out beyond the outer face of the wall as they will; the reasons for doing this are very readily understood. This method not only saves a considerable amount of stone dressing, but also a great deal of time in lining up the wall, as well as saving the labor of pointing on the outside. When work is done in this way, the earth bank, if of loose material, will, when it settles, tend to force the joints in the wall by the leverage on the projecting stones, and, again, the projecting rock forms ledges inviting the water to penetrate the joints, which cannot be well pointed to prevent its entrance

It might be well to mention here that due precaution should be taken to see that the pointing of the outside of walls is properly done; workmen as a rule seem to shirk this part of the work, preferring to expend their skill in making the inner and actually less important surface appear well to the eye.

62. Mortar.—The lime to be used in mortar should never be slaked on the bare ground surrounded by a ring of sand, as is often done in rural districts. A rectangular box of plank should be constructed for the purpose, and should be made about 4 ft. × 7 ft., this size being large enough for slaking and working one barrel of lime. Most mason contractors have well-constructed mixing boxes and carry them about from place to place. Should it be required to mix the mortar in quantities requiring more than one barrel of lime or cement at a time, the boxes may be increased in size to suit the conditions.

The superintendent should assure himself that the sand, lime, cement, etc. are mixed in the proper proportions. In mixing the mortar, the workmen or foreman should be instructed to put a portion of the water in the box before adding the lime, the balance being added as rapidly as possible by bucketfuls, or by means of a hose. The best method is to provide a barrel that is large enough to hold a sufficient quantity of water for the complete slaking of one barrel of lime; the barrel may be refilled by a hose while one batch of mortar is being prepared, and in that way sufficient water will be at hand when it is required for the next barrel of lime. If the lime has partly slaked and water is then added, the process of slaking will be stopped and the lime is liable to become chilled, a granular paste resulting. If this paste is used in wall plaster, it will cause the surface to chip off, due to the small particles of lime slaking on the wall.

The quality of the lime paste would be helped very materially if the box were covered while the lime is going through the slaking process, for lime in slaking generates considerable heat and vapor, which, if confined in the manner described, will tend to reduce the mass to a smooth paste free from lumps or grit. The slaked lime should be allowed to stand as long as circumstances will permit before adding the sand, which, when added, should be in a proportion of not more that two parts to one of lime paste. Lime mortar, if covered over, may be allowed to stand for several days before using.

For cement mortar, the superintendent should see that the sand and cement are well mixed in the dry state before any water is added. Of course it would be impracticable to make a cement mortar by reducing the cement to a paste (neat cement mortar) and then adding the sand, for the cement would begin to set before the sand could be added. The proportions of cement and sand are usually measured by shovelfuls, barrelfuls, or wheelbarrowfuls, the first being objectionable, for the reason that in making mortar in the proportion of three of sand to one of cement, the foreman-mason will, as a rule, put a small weak man shoveling the cement and three large strapping fellows shoveling sand, with a result that is obvious to any one. Again, the cement should not be added to the lime mortar until the mortar is to be used, as the cement will begin to set as soon as made wet. The presence of streaks of lime or cement in the mortar indicates that the mass has not been thoroughly mixed. Lime paste, if protected from the atmosphere, will remain practically unchanged for months. Machine-made mortar is the best for all purposes, as the ingredients mixed in that way are more thoroughly incorporated than is possible by means of the hoe and shovel.

Cement mortar or concrete is frequently mixed on a sheet-iron platform, which enables the workmen to place and mix the different ingredients more easily and expeditiously than in a box. The sand and cement are thoroughly mixed dry and then formed in a ring into which the water is placed, the mixture is then made as rapidly as possible, and if concrete is to be made, the stone is added.

63. Concrete.—Although no concrete will be laid at this stage of the work, the methods employed in preparing it and the proportions of its ingredients might better be taken up now, while mortar and allied subjects are being explained, so that this class of work may be kept together for convenience in referring to it.

According to the specifications covering this work, the concrete for the cellar floor is to be prepared as follows: (1) Body of the work: Portland cement, one part; sand, two parts; and four parts of clean broken stone of a size to pass through a 1-inch ring. (2) Top dressing, or finishing coat, of Portland cement and white sand, in equal parts, measured dry. Care should be taken to see that the sand and cement are well mixed in a dry state, after which it is formed into a ring and water added. When this is thoroughly mixed, the broken stone is added, being first washed with water from a hose, to remove any dust, etc. and to facilitate the work of mixing.

Where a great deal of concrete work is to be done, machine mixers are generally employed as a matter of economy. The method of laying the concrete will be explained when the building has advanced in construction to the stage when concrete should be laid.

FOURTH VISIT

64. The specifications require that no filling shall be done outside the cellar walls for three days after the walls are built. The reason for embodying such a clause in the specifications was to give the superintendent due opportunity to inspect the outside face of the wall, to see that the stones were properly laid and pointed, and to allow the mortar to partly dry out. If this clause had not been provided and the contractor wished to cover up the poor work, the filling would in all likelihood have been done as the walls were built, and the superintendent would be unable to see what had been done.

The superintendent now inspects the walls—part of which by this time have been built up to the grade of the lawns and leveled to receive the ashlar facing. He examines the lines and satisfies himself that they are at right angles to each other, that the dimensions are correct, and that the top of the rubble wall is finished to the required level, which should make proper allowance for sodding, etc. He also finds the piers at the rear and in the basement ready for bluestone bases. He checks the position of these piers, and finds them correctly placed and their tops at the proper levels.

On looking over the interior of the building, the superintendent finds that all the dwarf walls are finished and the south chimney is up to within a few feet of the first-floor line. The openings for boiler flue and its clean-out door and the clean-out door for fireplace flue above have been properly placed in the south chimney, and the smoke-pipe opening has been left for a laundry stove in the north chimney.

The superintendent next refers to the steam-heating drawing, Fig. 34, General Drawings, and in company with the steam-heat contractor, who has met him at the works by appointment, and the foreman-mason, goes over the position of all openings to be left for steam piping, the masons having been previously directed to keep back the construction of the walls near points where pipes are to pass through until given directions as to the exact position of holes to be left.

A number of puddles of water are standing in the cellar bottom, and on examination it is found that the sewer connection has not yet been run inside the building as was previously directed (see Art. 41).

The superintendent makes a memorandum in his notebook to see the plumber and tell him to put this connection in immediately, so that the cellar bottom may be kept dry. The temporary connection of this cesspool was not specified, and the superintendent has previously explained the matter to the owner and obtained a written order to the plumber for this work. He has sent the order to the plumber and expected to find the work in place. This connection should be trapped and terminated with a temporarily connected cast-iron cesspool.

65. Fireclay.—Fireclay is a pure variety of clay containing hydrated silicate of alumina, silica, and water. The clay is mixed with sand and water, molded into the required shapes, and burnt at a white heat; this product is called *fire-brick.* With an addition of about 40 per cent. of sawdust or some other combustible material before burning, the product is called *porous terra cotta*, or *terra-cotta lumber.* Pipes are made from this material in a variety of sizes and shapes, but usually round. They should be straight, sound, and of a uniform thickness in cross-section. These pipes are usually glazed with salt, which is put on before burning and then fused in. Pipes for the purpose of sewerage or other uses where a tight job is required should be formed with a socket at one end and a spigot at the other, and when fitted together should show a circular space, or ring, of at least ½ inch clear all around between the two.

66. Laying Pipes.—The work of laying earthen pipes for the house sewer should be carefully done, and the superintendent should pay a reasonable amount of attention to see that the bed of the trench is made smooth and with a uniform pitch. If the trench is cut through rock, the bottom should be covered with a layer of sand about 6 inches deep, and in any case the soil is scooped out for the hub or socket.

The pipe should be laid so that its entire length will have a bearing on solid ground, and the pitch of the pipe should be obtained from hub to hub; mortar is then placed around the bottom half of the socket, and the top half of the spigot and the pipes are set in. The mortar should be pressed back into the joint to fill all crevices, and then the scraper drawn ahead, as shown in Fig. 40.

The scraper may be made in different ways, but the one shown in the figure is very simple and serves the purpose very well. A circular piece of wood with a leather or sheet-rubber edge tacked on is attached to a handle, and as each

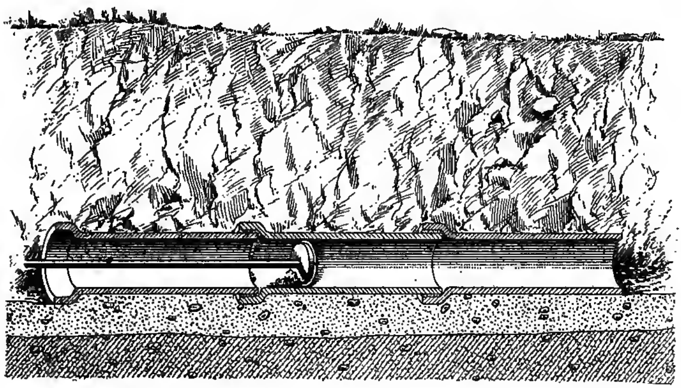


Fig. 40

length of pipe is laid, the scraper is drawn ahead, taking any mortar with it that may have entered through the joint.

As soon as three or four lengths of pipe are laid, they should be covered with boards or protected in some other manner until they are inspected by the superintendent, after which the filling in may be done with any degree of rapidity desired.

Where the drain is to be laid through soil composed of muck or other treacherous material, the piping should be laid in a bed of concrete from 6 to 8 inches thick.

The inside of the hubs and the outside of the spigots of earthen pipes should be unglazed, as this surface gives a better contact for mortar and consequently a better joint.

An improvement on the ordinary cement joint is to calk the joint with oakum before putting in the cement. This makes a water-tight joint and insures a uniform ring of cement. Joints in earthenware pipes are sometimes made with asphalt, after being first calked with oakum. This joint is more flexible than the cement.

Earthenware pipes should not be used where there is any cistern or well near by at a lower level, nor should the drain be placed so near the surface as to be exposed to frost.

Porous or agricultural drain pipes are laid in much the same way as just described. The pipes are made in various forms and sizes, and usually without hubs. They are often laid on rough planks in the trenches, in order to prevent settlement or dislocation. The ends are simply butted, leaving about $\frac{1}{8}$ inch between, and the joints are covered with a strip of oilcloth or asphalted felt, to prevent the entrance of earth into the drains. The filling over these pipes generally consists of gravel, sand, broken stone, or similar material, so that the water may find its way to the piping, through which it percolates and is carried off.

67. End of Fourth Visit.—Before leaving the premises, the superintendent makes an inspection of the materials delivered since the last visit. He finds about ten thousand additional bricks, a large pile of sand, a considerable additional amount of bluestone ashlar, and a couple of barrels of rock asphalt, together with a pot for melting and swabs for applying the same. These being found satisfactory, he leaves for the office.

FIFTH VISIT

68. A short time only elapses between the fourth and fifth visits, and the masonry is now found to be nearly completed. On looking over the ashlar, however, some joints are found that are not scraped out as specified (to leave sufficient key for pointing). The mason has also neglected to leave the joints open under the window sills, so as to prevent cracking of sills in case of slight settlement due to compression of joints. These matters are pointed out to the foreman-mason, who promises to remedy them at once.

The superintendent further discovers that the masons have been laying some of the wall carelessly, not using sufficient mortar and filling spaces with scraps and litter from the ground. This practice of scraping up trowelfuls of small fragments of stone, brick, and dirt from the ground or scaffold for filling the interstices between the wall stones, and then covering them up with mortar is very common among masons, and one that is very detrimental to the strength of the wall. A wall built in this way is not nearly so strong as one in which the crevices are first filled with mortar, a spall of suitable size fitted in, pressed or hammered down, and then covered over with mortar, putting in more spalls if necessary to bring all to a uniform level. No two pieces of stone in a wall built with mortar should be laid without having a cementing layer between, in this way bonding all well together.

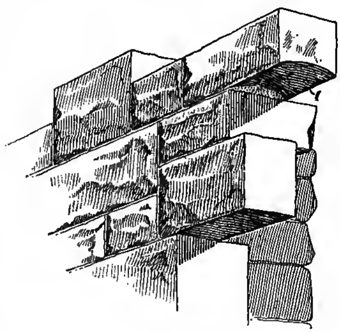


Fig. 41

Another point to be guarded against is the practice of disregarding the lines through negligence or carelessness and getting the wall out of alinement and afterwards bringing it up to the line, thereby causing a depression or other such fault, which at a glance betrays the existence of poor workmanship. No stones having a concave bed as shown at *a*, Fig. 41, should be allowed in any part of the work, for, in settling, the weight above is liable to break the thin edge.

69. Settlement in Masonry Walls.—A very important point in connection with masonry construction is the settlement of walls, piers, etc., due to the mortar joints being compressed by the superimposed weight. If walls are built having sections varying in height to any great extent, this matter of settlement will become an all-important one. It is very readily understood that a wall 20 feet high will settle considerably less than a similar wall 50 feet high. This application of the laws of gravitation should be kept in mind in the setting of stone lintels, sills, mullions, and columns. For instance, if a mullion stone or one-piece column is set in a window, the jambs of which opening are constructed of a large number of stones, and no provision is made for a thick mortar joint top and bottom, the weight of the wall above is liable to crack the mullion or column, as the case may be; or, if they are strong enough to withstand the weight, the sills on which they rest are liable to be broken, due to the maximum compression of the numerous joints of the jamb and the minimum compression at the mullion or column. A clear space of ½ inch, if possible, should be left under all sills and other stones in like position, bedding them in mortar only on the ends, to be underpinned and pointed at completion of the work. If this precaution is taken, the likelihood of their being broken is lessened considerably. Stonework laid with joints of different widths would be objectionable on account of the unsightly appearance it would present. Lime-and-cement mortar for the higher walls, and cement mortar for the lower walls, used with the view of their construction in settlement, would be objectionable on account of the difference in color of the mortar and the judgment required as to the proportions of lime, cement, etc. that is needed in the mortar to produce the desired result. It is claimed that lime-mortar joints will be compressed from one-eighth to one-quarter of their thickness, according to the weight imposed on them. To obviate excessive settlement, the superintendent should see that the requisite number of through stones are built in at proper intervals and that suitable long stones are built in at all external angles of the walls as far as practicable.

70. Refilling.—The superintendent, having examined the outside of walls and found them well coated with asphalt, to grade, and that broken stone is filled in at the base of footings, notifies the foreman-mason that the filling in may be done, at the same time cautioning him not to use any clay for the purpose, as clay when packed against the foundation will hold the surface water and tend to keep the foundation wall damp. Broken stone and spalls are specified for all filling against masonry walls, and is to be tamped down at every foot in height up to within 1 foot of grade. The object of using gravel or broken stone, as spoken of before, is to allow the water to percolate through to the bottom of the footings and be carried away by the drain to the cesspool. Puddling clay and sand are very often used for filling against walls, but where good coarse gravel is to be had in abundance, it should be used in preference to any other material. All these points being settled, the superintendent proceeds on his tour of inspection.

71. Placing Cellar Windows.—Looking over the walls of the building, the superintendent finds that they are for the most part built up to water-table height. All but two window frames have been set in position, and the carpenter on the ground for this work informs the superintendent that the frames are set according to the dimensions on the plan, having checked the position of the stone sill as set by the mason and taken care to properly set and level up the frame correctly. It is very important that the mason set the stone sills correctly, in order that the windows may be located according to the dimensions marked on the plans. Sometimes the setting of the frames is entrusted to the mason, and the carpenter very often discovers afterwards, perhaps too late to correct the error, that the cellar windows have not been properly centered, which, if the windows are to be centered over each other, will necessitate moving the frames above and crowding the windows to one side or the other of the rooms, thereby sacrificing symmetry on the interior in order to preserve vertical alinement on the exterior. If the work is properly started, and all openings properly centered in the cellar walls at the outset, the centering of windows above will be a very simple matter.

The superintendent also finds that all the cellar-window frames have a plank sill under the frame sill as specified, except in the area wall, where a stone sill extends clear through the wall. The plank sill gives a good nailing surface for the sill of the frame. The superintendent examines the window frames just placed in position ready to be built in, and notes that the iron anchors specified, are being used to fasten them to the stonework, and that they are thoroughly painted.

72. Lumber.—A pile of lumber has been delivered on the premises and the carpenters are sizing the joists for the first floor. It is clear that this part of the material will be ready for erection when required. The superintendent inspects the lumber, and with a few exceptions finds it straight and sound; the defective pieces are shaky, and have barky edges, and a couple of pieces are slightly affected with dry rot; these are marked with a piece of surveyors' red chalk as condemned, and are ordered removed from the premises.

73. Derricks.—In the masonwork for the building under consideration, the size of the individual stones used and the height of the walls do not necessitate the use of a derrick. For large work, however, where the walls are high and the stones large and heavy, derricks are necessary. Although, strictly speaking, it is the business of the contractor, the superintendent should satisfy himself that no accidents to life or material are liable to occur by the possible breaking of a boom or a worn-out rope, or, that the smoke from the boiler of the derrick engine will not damage the finished work or adjoining property. He should examine the guy lines, which are generally of steel-wire rope, to see that they are sound and also that they are properly anchored. A good-size tree is perhaps the best anchor for this purpose, and if the tree is to be preserved, it should be protected from the guy line by pieces of wood, ordinary barrel staves being often used for the purpose. If, however, there are no trees in the vicinity of the derrick, a pit about 5 feet deep should be dug in the ground, a heavy log or timber put in, and, after the line is made fast, the hole filled with large pieces of quarry stone.

74. End of Fifth Visit.—Before leaving the premises, the superintendent goes into the cellar to see if the sewer connection that he ordered installed some time ago has been put in. He finds the cast-iron cesspool in place and the cellar drained thereto and thoroughly dried out. He orders that a piece of sacking be placed over the cesspool, to prevent the entrance of small stones, dirt, etc., and then departs.

SIXTH VISIT

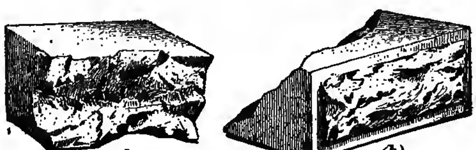
75. On reaching the premises, the superintendent finds that the stone walls, the dwarf brick walls in the basement, and in fact all the masonry work up to the first-floor level, except the north chimney and the concrete floor in basement, are finished. The latter is not to be finished until the building is under cover.

In passing around the building and critically examining the exterior walls, he discovers that a large piece has been broken from one of the stone sills. This sill is ordered removed and replaced. If this sill had been protected with a piece of board as soon as it was set in position, the contractor would have saved the expense of tearing down the abutting wall, etc. The foreman is cautioned to cover all the projecting stonework with boards, to protect them from falling pieces of stone or other material. The stone steps at the front should also be protected with boarding.

The matter of protecting finished work of all kinds is something that the superintendent should watch and enforce as rigidly as possible, as the contractor's negligence in this matter will often make it necessary to accept patched or repaired work, in order to avoid the delay and great inconvenience that would result if the damaged work were torn out and replaced. The contractor realizes this, and sometimes counts on it when he is careless in this matter. The superintendent should therefore keep him strictly to the provisions of the specification referring to defective or damaged work.

It might be well to mention here that boards made from Georgia pine, hemlock, or woods of a similar nature, containing a large amount of resinous sap, should not be used, for the action of the sun is likely to drive out the sap and discolor the stonework that is to be protected. White pine is perhaps the best wood for this purpose.

76. Ashlar.—A tour of the walls is made by the superintendent, and the backing and ashlar as well as the mortar are critically examined. The superintendent in his journey around the walls discovers a piece of ashlar in the top course of the wall, which when first looked at appeared all right,



(a) (b)

FIG. 42

but afterwards proved to have a deep concave depression at the back, as shown in Fig. 42 (*a*). The bed of this stone is only 6 inches and cannot be more than 4 inches at the center, owing to the depression; it is therefore condemned and ordered removed. Another form of defective stone is shown in Fig. 42 (*b*). Although the lower bed may be large enough, the upper thin corner is weak and not up to the requirements, the specifications stating distinctly that the stone shall be from 6 to 10 inches deep in the wall. The object of specifying ashlar to be furnished in two thicknesses and to be laid in alternate courses is for the purpose of obtaining a bond with the backing, which is not possible unless galvanized-iron anchors are used throughout, when ashlar of uniform thickness is used.

77. Anchors.—The ashlar having a wide bed, very few anchors will be necessary except where very high stones are used, and any stone more than 12 inches in height must be anchored. The anchors are usually made of flat pieces of galvanized strap iron, about 1 inch wide, and from $\frac{1}{16}$ to $\frac{3}{16}$ inch in thickness; a good anchor is $\frac{1}{8}$ inch thick. They are turned up about 2 inches on the inner end and down about 1 inch on the outer, or ashlar, end; which end of the anchor is fitted into a hole drilled in the top of the stone. The thinner the ashlar used, the more anchors will be required, and, for fronts of marble or other expensive stones where the ashlar is sometimes as thin as 2 inches, every piece should be anchored to the backing.

The outside chimney has not been built, and the superintendent directs that no work be done on this until the studding is in place, in order that the brickwork may be tied to the wooden walls by strap anchors built into the brickwork and fastened to the studding, which is kept 3 inches from the brickwork.

78. End of Sixth Visit.—The bluestone bases for posts in the cellar have been delivered on the premises, and on examination are found satisfactory. The superintendent directs that they be set at once, in order that they may be ready for the carpenters on the following day. These bases have set in the center of their top $\frac{3}{4}$-inch iron pins, which are leaded into the stonework and inserted in the bases of the wooden posts.

Before leaving the premises, the superintendent follows his usual practice of looking over material delivered since his last visit, and finds considerable framing lumber piled up, namely, all the 10″ × 10″ yellow-pine posts for the cellar and quite a number of 2″ × 12″ joists cut and ready for the framing of the first floor, which the carpenter will start on the following day. The 4″ × 8″ sill is ready for placing on the wall, with ends half checked for angles. On examination, the lumber is found to be first class, except for a few pieces of studding that are badly checked; these are marked with red chalk by the superintendent and ordered removed from the premises. Such orders should always be written in duplicate, the superintendent retaining a copy, which is made by means of a piece of carbon paper slipped beneath the sheet on which he writes, thus duplicating the order on the sheet below.

79. Before taking up the seventh visit, Figs. 22 to 29, inclusive, comprising the framing drawings, should be carefully looked over, especial attention being paid to the framing of the first floor. The different framing elevations and plans should also be compared, particularly noting the position of partitions and how supported, the method of spacing joists, framing for fireplace hearths, stair wells, etc. Arts. **80** to **92**, inclusive, should also be carefully read.

INSPECTION OF LUMBER

80. Classification of Lumber.—The *inspection* and *classification* of lumber, or its valuation according to the uses to which it may be put in house building or elsewhere, is for the most part a matter of judgment. In every locality, however, there are certain methods of classification adopted by the lumber exchanges and associations that are well to know in dealing with this matter. Too much space would be required to give the rules of inspection in each state or locality, so that those of only three lumber centers will be given—the Maine inspection for the East, the Baltimore inspection for the South, and the Saginaw inspection for the West. These will serve to give a general idea of the terms used by dealers in the grading of their lumber, and will enable specifications or proposals making use of such classifications to be read intelligently, although the terms here given for classification are not generally used.

MAINE INSPECTION

81. Pine.—No. 1 pine is entirely dispensed with, and the first quality recognized is called No. 2.

No. 2 pine may be of any length or width, provided, however, that short lengths and narrows must be good; the shorter and narrower the board, the better is the quality required. A board 12 feet long and 5 or 6 inches wide must be entirely free from knots and sap, and must be straight in grain. Larger boards must be nearly free from knots, sap, and shakes.

No. 3 pine must be free from shakes, but a few knots or a little sap will not condemn it. The size of the board goes far to determine the quality; very small pieces otherwise up to grade would be classed as No. 4.

No. 4 pine is a small board usually free from knots, but with some sap. If large boards are put in this number, it is because one-quarter or one-third of the piece is shaky, although the remainder may be good.

The market also recognizes two kinds of shipping boards, designated "Shippers"; viz., smooth and common. *Smooth shippers* are boards without shake or case knots, or any large knots. *Common shippers* are boards coarse and knotty, 8 inches and upwards in width, and 12 feet and upwards in length. (These are sometimes manufactured under special orders, when they may be 9 inches, 10 inches, or even greater widths.) In this grade, splits, red streaks, or very shaky boards are objectionable.

Narrows is the term of the next grade below common shippers, and consists of boards too small for shippers. These must not be very coarse and must be suitable for floor boards.

Poor fours consist of sappy, shaky, and knotty boards, not suited to be classed in any of the foregoing descriptions.

Scoots are the lowest grade; rotten boards and all others not admissible in other grades are surveyed as scoots.

The market also handles what is termed *sapling pine* or *gang boards*. These are usually manufactured in gang mills, the survey as to quality being about the same as the balance of the grades described, except as to designation, the twos, threes, and fours being put together under the one term *planers*. The shippers, narrows, poor fours, and scoots are surveyed as described in those heads.

82. Spruce.—Spruce is known in the two qualities of *merchantable* and *scoots*. The scoots comprise boards that are cross-grained or rotten. In surveying, the grades are divided into two qualities; viz., *floor boards* and *coarse*. The floor boards must be nearly free from knots; all others are considered coarse.

BALTIMORE INSPECTION

83. Rules.—The following rules for the inspection of lumber were adopted by the lumber exchange of Baltimore.

In the inspection of hardwood lumber, it is essential that the inspector use his best judgment, based on the following rules laid down for his guidance:

The standard knot must be a sound one, and not exceeding $1\frac{1}{4}$ inches in diameter. Splits are to be considered as defects, and usually reduce the piece to a lower grade. Mill culls are never regarded as marketable, and any cull that will not work to the use for which the size is applicable, without wasting more than one-half, is a mill cull. The standard lengths are 12, 14, and 16 feet, but 15 per cent. of 10-foot lengths may be allowed.

In black walnut and cherry, 10-foot lengths are considered as standard, and 15 per cent. of 8-foot lengths may be admitted in the first and second grades.

All badly manufactured lumber should be reduced in grade, and that for newels must be inspected with a view to the adaptability of the piece for the intended use, as in many cases it cannot be utilized for other purposes. They shall be cut outside of the heart to square the following sizes: 5, 6, 7, 8, 9, 10, and 12 inches when seasoned. The lengths must be 4 feet or the multiples thereof.

All rotten, shivered, and shaky ends shall be cut off in measurement when the board or plank will make 8-, 10-, or 14-foot lengths, clear of the bad end, and be classed in the grade the part will make, except culls, which shall be counted full in all cases.

Face cracks in all cases will reduce the stock one grade; if badly face-cracked, so that one-half of the board or plank cannot be used without waste, then it shall not be counted.

The inspector in all cases is to keep a separate tally of each size and quality. All boards and planks should be measured and graded on the inferior side.

The recognized standard thicknesses shall be 1, $1\frac{1}{4}$, $1\frac{1}{2}$, 2, $2\frac{1}{2}$, 3, 4, and 5 inches in all classes of hardwoods, and in all cases the board or plank shall be of full thickness, parallel in width, and have square edges and square ends.

All tapering pieces of lumber shall be measured one-third the distance from the narrow end, when 12 inches and over in width at the center; when less than 12 inches wide at the center, they must be measured at the narrow end.

Worm-holes are to be considered one of the most serious defects in hardwood lumber.

All inspectors of hardwood under these rules shall mark the quality on the lumber so inspected, when required. Lumber inspectors are required to use due care in handling and marking lumber, that the stock is not damaged in any way or its fitness for use impaired by careless handling or marking.

84. Black Walnut.—Black walnut shall be inspected in three grades—firsts, seconds, and culls.

Firsts shall not be less than 7 inches wide, and must be free from defects, but at 10 inches wide will admit of defects equal to 2 inches of sap on the edges. Defects may increase with the width, but not such as to cause waste when used for first-class work.

Seconds shall not be less than 6 inches wide, and at 6 inches may have one knot. Defects may increase proportionately with the width. Sap on the face side shall be measured out.

Culls shall include all lumber not up to the standard of seconds. Mill culls to be excluded from this grade.

85. Poplar or Whitewood.—Inspection grades of poplar or whitewood shall be known as firsts, seconds, and culls.

Firsts shall not be less than 10 inches wide, and at this width shall be free from all defects; at 12 inches wide

2 inches of white sap, and at 16 inches wide, 4 inches of white sap, shall be allowed; proportionate increase of sap to be allowed according to the width. In lieu of the sap, one standard knot shall be allowed for each 4 inches of sap.

Seconds shall not be less than 6 inches wide, and must be clear up to 8 inches. When over 8 inches they may have two sound knots not exceeding $1\frac{1}{4}$ inches in diameter, and 2 inches of white sap. At 10 inches, defects equal to 3 inches of white sap or two sound knots $1\frac{1}{4}$ inches in diameter are admissible. Defects may increase with the width, but two-thirds of the entire piece must be suitable for use in first-class work, without waste.

Culls shall comprise all widths and sizes not up to the standard of second grade. Lumber usually designated as mill culls is not included in this grade.

For poplar, regular marketable thicknesses shall be $\frac{5}{8}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, 2, $2\frac{1}{2}$, 3, and 4 inches; $\frac{1}{2}$, $\frac{3}{4}$, $1\frac{3}{4}$, 5, and 6 inches and up are classed as special sizes. When squared, the sizes in inches shall be 3×3, 4×4, 5×5, 6×6, 7×7, 8×8, 9×9, 10×10, etc. All square stuff to be cut clear of the heart, clear in quality, and cut large enough to hold sizes when seasoned. Such as are not designated as prime shall be graded as seconds or culls.

86. Ash.—The inspection grades of ash shall consist of firsts, seconds, and culls.

Firsts shall not be less than 8 inches wide, and free from all defects. Sap shall not be considered a defect, if bright and sound.

Seconds shall not be less than 6 inches wide, and at 8 inches may have two standard knots; must also be free from heart, dry rot, dote, and worm-holes.

Culls shall include all grades not up to the standard of seconds.

87. Oak.—The inspection of oak is the same as ash, except timber, in which sound knots, and heart not showing on the outside, shall not be considered defects. For birch, beech, maple, elm, and hickory, the same inspection as for ash. In first-grade hickory, 6 inches in width and 8 feet in length shall be allowed. Quartered oak shall be inspected as firsts, seconds, and culls.

Firsts shall be 5 inches and over wide, and clear of all defects. At 10 inches wide will admit of defects equal to 2 inches of sap on the edges. Defects may increase with the width, but not such as to cause waste when used for first-class work. Gum spots are excluded from this grade.

Seconds must be 6 or more inches in width; will admit of two standard knots; sap on the face side to be measured out. Defects may increase with the width in proportion. Small proportion of gum spots will be allowed, but in no case shall they be of such a character or quantity as to seriously damage the piece.

Culls shall include all not up to the standard of firsts and seconds.

88. Cherry, Ash, and Walnut.—Counter tops of cherry, ash, and walnut shall be 12 feet long and over; 17 inches wide and over; 1, $1\frac{1}{4}$, $1\frac{1}{2}$, and 2 inches thick, and must be clear of all defects.

Cherry, ash, and walnut strips 6 inches wide and under, when in separate lots, shall be counted as firsts, seconds, and culls.

Firsts shall have one face and two edges clear. Sap on face side of ash, when bright, to be counted.

Seconds will admit of two standard knots or sap, which on face side of cherry and walnut shall be counted out.

Culls.—All not up to the standard of seconds shall be designated as culls.

Cherry strips shall be 6 feet long and over.

SAGINAW INSPECTION

89. "Clear."—*First clear* is not less than 8 inches in width, and is free from imperfections, the term *clear* implying freedom from defects.

Second clear is not less than 8 inches in width, at which it must be so nearly perfect as to fall but a trifle short of first clear. As the width increases, a larger range of defects may be allowed, so that at 12 inches wide, a piece may have two knots of 1-inch diameter, or two narrow saps on one side; at 16 inches wide, especially if the piece is more than 1 inch thick, two knots may be allowed, or one knot and one sap not over $1\frac{1}{2}$ inches in width. At 20 inches in width, the two knots may be larger, or the saps may increase to $1\frac{1}{2}$ inches.

Third clear is supposed to admit of three defects, but up to 10 inches, knots should not exceed $\frac{3}{4}$ inch in diameter, or the sap should not exceed $\frac{3}{4}$ inch on one side. With increasing width, knots may increase to three in number, not over 1 inch each, or sap equal to $1\frac{1}{2}$ inches in width on two edges of one side; with narrower saps, a small knot showing on the face side might be allowed; but, as a rule, the three upper grades demand one perfect face.

In the Saginaw and some other markets, the term *good* is used in designating the upper grades, and purchases are sometimes made in *good*, *select*, *fine common*, *common*, and *culls;* but unless these terms are specified, the quality *good* in common use will include not only the three upper grades, but also the next grade below, or selects.

90. "Selects."—*Selects* is a term that allows of four defects in a piece of lumber. Four knots not over 1 inch in diameter, according to the size of the piece, or two saps on one side, which in pieces 12 inches wide should not exceed 3 inches in the aggregate, or embrace more than one-quarter the sap side, the heart side being the face. With increasing width, the proportion of sap may increase; or, with narrow saps, the face side may have some knots. The general description of this grade, however, is of a class of lumber that has defects of such a character that, while condemning it for the three uppers, yet should be marked as suited for many or most uses to which the three uppers may be put.

Fine common, sometimes known as *select common*, or *select box*, or merely *box*, is a grade of lumber suitable for finishing purposes, yet having too much sap on one side, or too many knots on the other, to admit its entry to the grade of selects. Fine common is usually taken from the lumber cut next to the outside of the log—sometimes known as sap boards—the general character of which is to give one face side, while the other is largely covered with sap, which, if properly piled to dry without mold, is adapted to a large proportion of the finer work where one side only is exposed to view. With this point in mind, the inspector will allow knots in this grade proportioned to the size of the piece. If the sap is narrow, the face may have one or two small knots, but, except in wide lumber, the rule is observed "one side a face." Pieces below 8 inches in width are seldom accepted in this grade, and at that width the defect is in sap, which may embrace not more than one-third the sap side and must not run out to the face side; or a board of that width may have a good sap side nearly, if not wholly, clear of knots and with two small knots on the heart side. In larger pieces, a board or plank having too many defects for the grade of selects, and yet approaching almost to the requirements of that grade, is included in the fine common. A board 16 inches wide, 1 inch thick, with five knots not over 1 inch, and having no other defect, would be classed with fine common. The same piece, if 1½ or 2 inches thick, would probably be classed as selects by most inspectors. Shaky lumber is not admitted in this or the upper grades.

91. "Strips."—*Strips, first clear*, are 6 inches wide, 1 inch thick, free from all imperfections, and are known as clapboard or siding strips. The term *siding strips* should not be confounded with *sidings*, lumber cut from one side of a log, in distinction from the stock, or lumber cut from the square log.

Strips, second clear, are 6 inches wide, 1 inch thick, and may have two small sound knots; or, if there are no knots, then sap equal to 1 inch in width on one edge of one side may be allowed.

Strips, third clear, are 6 inches wide, 1 inch thick, and may have three small sound knots, and on one side in addition, sap equal to 2 inches in width. All strips in these three grades must be free from rot, split, or shake.

Strips, Flooring, and Fencing.—The terms *strips, flooring,* and *fencing* include all strips not as good as third clear, yet free from rot and split. Flooring strips must be of full thickness and width, except where a narrower width is desired, when they may be of the uniform width of 3, 4, or 5 inches. All knots in flooring strips must be sound. Fencing strips include all coarse-grade strips not good enough for flooring and above the grade of culls, or strips not up to the standard thickness, and their inspection is less rigid than the other grades.

Common.—The term *common* includes all boards, plank, scantling, strips, joists, timber, and lumber not otherwise defined that do not come up to the select-box grade, but are of a generally sound character, well manufactured, of full thickness, and free from large loose knots and bad shakes. Scantling joists and timber must be free from knots or imperfections that involve or weaken the piece for substantial building purposes. Pieces containing worm-holes and small sap streaks, which do not materially damage the piece for the uses in which it is usually employed, belong to this grade. One straight split not more than one-quarter the length of the board may be allowed. No lumber under 10 feet in length is considered as merchantable in this or the better grades.

92. Shipping Culls.—Lumber badly sawed or containing unsound knots, or knots that affect the strength of the piece, black or moldy sap, and unsound hearts is included in the class called *shipping culls*, the pieces being available for coarse use; all other lumber not up to the grade of common is also included in this grade. Anything poorer than shipping culls is not recognized in any market. Saginaw lumber is always manufactured in 12-, 14-, and 16-foot lengths (with an exceptional log of other lengths) in all grades, except dimension stuff, where lengths are cut to suit the sizes demanded, but the sidings from such logs are usually cut off to the 12-, 14-, and 16-foot standards. The thicknesses of the Saginaw lumber as usually cut are 1, $1\frac{1}{4}$, $1\frac{1}{2}$, and 2 inches: but with some, 3 inches in coarse plank, or in extra nice stock, for thick uppers or deals. All lumber is manufactured in parallel widths, and many mills employ cut-off tables for reducing all lengths to uniformity. The coarser grades are usually cut 1 inch thick, the better grades being almost invariably $1\frac{1}{2}$ and 2 inches in thickness.

SEVENTH VISIT

93. Superintendence of the Framing.—For the sake of facilitating the consideration of this work, the house will be assumed as being completely framed, although, practically, this would allow entirely too much time to elapse between the sixth and seventh visits without superintendence.

94. Inspecting Material.—In framing the outside walls of this building, a modified form of balloon frame, or, more properly speaking, a combination of balloon and braced framing, has been used. The complete framing plans are assumed to have been furnished, and the superintendent directs his attention to the inspection of the lumber to see that the several sizes specified have been furnished and that the quality is up to the standard required by the specifications.

In order to inspect lumber properly, the superintendent should have a knowledge of the distinguishing characteristics of each of the various woods specified and should know them at a glance. The difference in texture of the grain and the color and the odor peculiar to each are generally sufficiently marked to enable him to do this. When measuring lumber for the purpose of determining whether the proper sizes have been furnished, it should be borne in mind that as lumber shrinks to a certain extent in drying, the sizes will decrease accordingly; for instance, a 12-inch floor joist will seldom measure more than $11\frac{3}{4}$ inches. Spruce sometimes shrinks even more than this. Crooked or warped pieces of timber should be condemned at once, as well as pieces showing shakes, especially those occurring along the annual rings, which are very noticeable in average hemlock timber. Longitudinal cracks that do not extend through the thickness often occur in spruce timber of large dimensions, but are caused by shrinkage or rapid drying and do not seriously impair its strength; but if they occur in a thin piece of timber, as, for instance, a floor joist 2 inches in thickness, and extend through it, the timber should be condemned, as it is liable to fail along this line. Any timber showing dry rot, unless the affected part can be cut off, should be condemned at once. After the superintendent has inspected the lumber and satisfied himself that all of it is up to the requirements of the specifications, his attention should be directed to the fitting together and erection of the work.

95. Sills, Posts, Joists, Sheathing, Etc.—The first operation consists of laying the sills, which should be of sufficient cross-section to allow for possible cutting and notching. In this case the sills are 4 in. $\times$ 8 in., allowing the anchor bolts to be set back clear of the ashlar facing; the bottom side is to be painted, and the sills bedded in a good layer of cement mortar. The sills should be leveled up by inserting pieces of slate under them until all are brought to a uniform level. The corners are to be halved together. The sill is laid on its broad side and back a distance from the face of the wall equivalent to the thickness of the sheathing. As the main sill is to be anchored to the walls by means of iron bolts built into the walls, holes are bored through the sills to correspond with the spacing of the bolts, and, after the sills are set in position, nuts are tightened up at the time the sill is being leveled. Before the sills are set, the superintendent should see that they are painted and that a good bed of mortar is spread under them.

The corner posts are erected, plumbed, and braced, after which the studding, plate, and ribbons are set in place. The superintendent should see that the posts and studding are plumb, and he should also see that the plates, ribbons, etc. are perfectly level and at the proper heights.

The floor joists are now set in position, the roof framing erected, and, after all the framing for windows and doors is put in, the building is covered with sheathing as shown below the dormer in Fig. 26. This work should also be carefully watched, so that no joint occurs between studs, and that the boards are well driven together and secured with the requisite number of nails. All the framing is well spiked together, and in this case, as the sheathing is to be put on diagonally, braces will not be necessary. If, however, the sheathing boards were put on horizontally, diagonal braces should be placed in the angles.

96. Bracing, Etc.—Where necessary, long angle braces are generally used in balloon framing, but pieces of timber tenoned into the sill, or plate, and post, and secured with oak pins are perhaps of more value in stiffening a frame, and serve the same purpose. If the long brace is used, the superintendent should see that the studs are cut only enough to allow the brace to come flush with the outside face. He should also see that the requisite number of nails is used at each bearing. The rafters are braced by means of collar beams, and the floor joists are braced and stiffened by means of "bridging," which is built in in rows about 6 feet apart and run in a line across the floor of the building. The bridging is put in as soon as practicable after the laying of the floor joists and before the partitions are set. The partitions are to have "diagonal" bridging; this forms a good fire-stop and stiffens the partition against the results of shrinkage, etc.

97. Floor Framing.—In setting the floor joists, the superintendent should see that they have a full bearing on the sill—in this case extending within $\frac{1}{2}$ inch of the sheathing boards and solidly bedding on the wall, so there may be no danger of settlement (see Fig. 43). The girders under the first floor are of 10″ × 12″ yellow pine, and their ends are supported on 6″ × 10″ posts. The joists are tied together over this girder by wooden fish-plates. The inner ends of the first-story joists are supported by these girders, as shown in Fig. 46, and their wall ends are carried as shown in Fig. 43. The plate and girders being in place, the framing of these joists is the next carpenter work to be done. The space beneath the floor joists of the basement is ventilated by means of ducts in the laundry chimney and in the outside wall.

Floor joists are specified to be laid with their crowning or cambered edge upwards—by *crowning edge* is meant the edge that shows the highest at the center of the joists—so that when a load is imposed, the floor will become level instead of sagging, as would be the case if the joists were laid with the camber downwards. This proceeding, however, is only

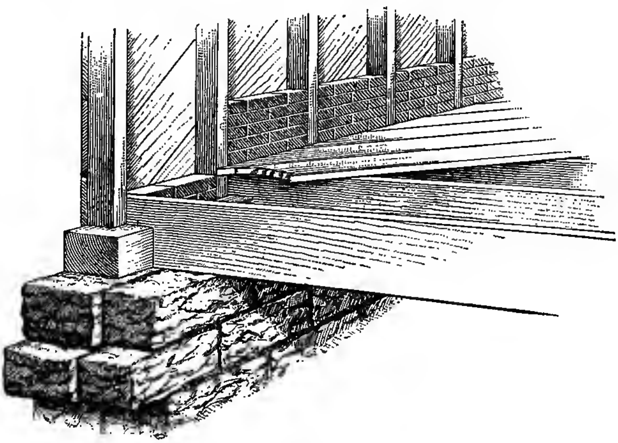


FIG. 43

necessary where joists have a long span; on short spans, the upper edges should be dressed level. The joists being spaced the requisite distance apart (16 inches), a level is applied from joist to joist, the joists being notched out on the bed side or a piece of slate or wood inserted beneath, as may be necessary, thus bringing the entire floor to a uniform level. The bridging is then cut in and nailed at both ends before the floors are loaded, and, after the joists have been tied together where they butt over the girder or bearing partitions, are spiked to the bearing and studding where they rest on a sill. The superintendent should follow this work conscientiously, to make sure that the floor is perfectly level throughout. The specifications require that the joists shall extend to within ½ inch of the space of the inside line of the sheathing. Floor joists are cut on the sill in a number of ways, each builder having his own ideas as to which method is best. Unless the specifications are drafted to cover this work, the architect is likely to be at the mercy of the builder and have the efficiency of the floor joists greatly reduced by excessive cutting or notching. In the building under consideration, the joists are specified to rest on the wall, being cut out 4 inches deep to fit over the sill. See Fig. 43.

An evil to be guarded against by the watchfulness of the superintendent is that of allowing the joists to rest on the inner edge of a stone wall without having a full bearing on the wooden sill, for if the stone works loose, or falls out altogether after the building has been completed, the joist will drop down to the sill and thereby cause a depression in the floor above. Another point to observe in laying floor joists is to have the tail-beams properly framed to the headers around chimneys and stair openings. Where the specifications require that the tail-beams shall be hung in steel bracket hangers of an approved make, the setting of the hangers should be followed closely to see that the tops (if they hang from the top of the header) are let in flush, and if otherwise hung, that they are properly spaced and set, and that the tail-beams are closely butted and spiked to the header, as shown in Fig. 44. In this building, the tail-beams are framed into the header, and the superintendent should see that this work is properly done.

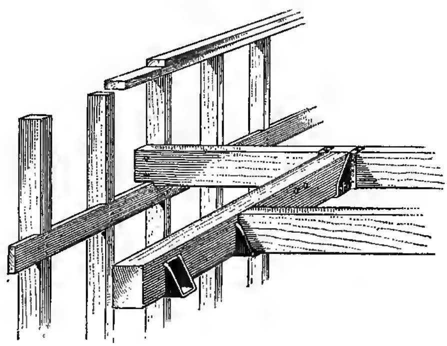


FIG. 44

As the work progresses, the superintendent should verify all measurements to satisfy himself that the openings for doors and windows are of the proper size and properly located. A mistake made at this stage of the work in the centering of openings will be a difficult matter to rectify, to say nothing of the annoyance it will cause. Frequently, mistakes are made in locating the openings in floor framing for the chimneys and stair wells. Special attention should be given this framing to insure a proper clearance for the chimneys, which clearance should never be less than 3 inches where only 4 inches of brickwork intervenes between the flue and the outside of the chimney. Attention should also be given to stair wells to see that sufficient headroom and width are provided. The framing of bay windows should be examined to see that it agrees with the framing plans.

98. Partitions.—A common but erroneous custom is to place the joists in a building without any regard to the location of partitions. In consequence, a partition is often located midway between joists, as shown in Fig. 45 (*a*). Another poor way of supporting a partition is shown at (*b*). In this case there is liable to be settlement due to sagging

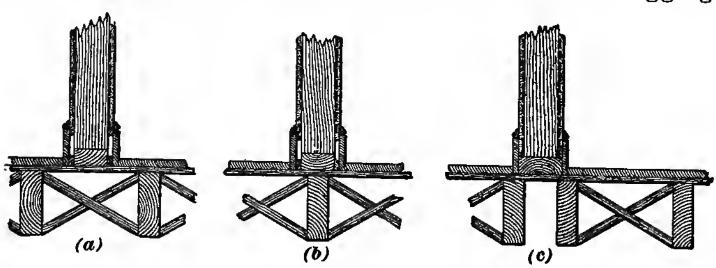


FIG. 45

of the floor between the joists; in both cases, a suitable nailing for the finished flooring is not provided, and in time the flooring will sag and work loose. The method shown at (*c*) is the best, for the partition above has proper support, and a good bearing is offered for nailing the finished floor. It will be noticed at (*c*) that the sill, being made of such a width as to line with the plastering, serves as a ground, and the baseboard may be nailed directly to it. This is the method shown in the framing drawings for this building. The superintendent should see that the studs are doubled at all openings for windows and doors, and that the rough heads and jambs are put in so as to leave sufficient room for inserting the frames. He should also examine the angles between partitions and between ceilings and partitions to see that the framing is done so as to provide proper nailing for lath, as explained later.

The specifications require that all partitions shall be trussed over openings 4 feet or more in width; this clause would apply to the framing over the arched openings between the principal rooms, front door, and the large windows in the exterior walls. Where there is no weight above the opening, even a 4-foot opening might have the truss omitted.

The method of trussing is set forth on the section and elevations, and the superintendent should see that timber of the proper dimension is used and that the joints are well framed together and spiked. The door and arch openings in the interior partitions should be carefully laid out and their position checked by the superintendent. He should watch carefully the setting of sliding-door partitions, see that these partitions are lined with $\frac{5}{8}'' \times 3''$ matched white-pine boards, varnished on both sides, and that the hanging timbers and brackets for the sliding-door hangers are set perfectly straight and level, so that the doors when set will work perfectly true. The importance of having this work accurately set in place is very often overlooked, and the mistake is discovered only when the door is being hung; the only remedy then being to remove the trim on one side, and tear down laths and plaster enough to allow the guide, or hanging timber, to be reset properly.

When it is required to run vertical lines of pipes through a partition, the sill and plate of the partition should be cut by the carpenter, but no more than required to allow the pipe to pass should be cut.

In well-constructed houses, provision should always be made to prevent or check as much as possible the spread of flames in the event of fire. Several methods are employed, but that of using brick for the purpose is perhaps the cheapest and best; by this means, rats and mice are also prevented from going from room to room, and from floor to floor, through the partition. This is called nogging.

The spaces enclosed between studs from floor to floor constitute a series of air spaces, or flues, through which the flames can quickly communicate with the floors above, and, in balloon frames especially, the fire may break out in the attic, when it originated perhaps in the cellar. The superintendent should see that all spaces between the ends of floor joists at wall plates are filled in with three or four courses of brick laid in mortar, as shown in Fig. 43. Sometimes this brick plugging is carried up the entire height of partition and walls, serving the purpose of deadening, as well as a fire-stop. A better but more expensive method of placing this nogging is to fill the entire space between the top of the stone wall and the under side of the flooring with brick. A simple expedient, which will also retard the spread of fire and which is comparatively inexpensive, is to paint all the framing lumber with a good coat of lime wash or fire-retarding paint.

99. Roof Framing.—The framing of the roof should be watched to see that the ceiling joists are properly supported by vertical and diagonal suspenders as specified (see Fig. 2). The cuts of rafters at plate, hips, valleys, and ridges should be carefully examined to see that they are true and will make a clean tight joint. The valley rafters should have doubled stud supports inserted wherever possible, and the heights of hips and ridge from the attic floor should be checked to see that they correspond with dimensions given.

The projection of rafters or outlookers to form cornices should be checked with full-size detail section, which is simply an enlargement of the section shown in Fig. 21. This detail as well as others involving the particular points of the work may be had by the superintendent for reference on demand from the foreman-carpenter.

The location of dormers and framing for the passage of chimneys should also be checked. The studding forming cheeks of the dormers should be notched over the rafters and spiked to the sides of the same, and should extend to the floor, to prevent the trimmers from sagging. The hips, valleys, and ridges should be examined to see that they are perfectly straight and free from waves, which are sure to occur if the rafters are cut too long. If possible, the superintendent should master the use of the steel square, in order that he may understand clearly the methods used in obtaining the different cuts for rafters, hips, etc. As the valleys are to be formed with two $1\frac{1}{4}'' \times 9''$ boards, the carpenters should place $1'' \times 12''$ cleats between the rafters along the outside edge of the valleys so as to provide proper nailing surface for the ends of the shingle laths.

100. Concealed Piping.—The plans show the position of all hot-air ducts running through partitions, and as the dimensions of each are marked on the drawings, the spacing of the studs forming the pocket for them is a very simple matter to determine. The superintendent, however, should take particular notice as to what timbers are in the way, and should exercise his judgment in shifting the location of the ducts so as to avoid as much as possible the cutting of the timbers. These remarks may also apply to the location of other service lines in the partitions. The superintendent should also see that the joints in the hot-air ducts are properly fitted, that the air space required is left around them. It is better to carry the ducts up through closets where such a thing is possible, in which event they should be cased.

Of the plumbing work, none but the rough work or that of setting the service lines in place need be done. The superintendence of this work, with a special regard to the quality of the materials and workmanship, will be explained later; but at this time their position, with reference to running through partitions, should be looked after, to make sure that no hubs nor connections will appear beyond the finished plaster, and that no timbers are cut by the plumber, who, according to the specifications, is required to notify the carpenter when such cutting is necessary. The superintendent should see that all such cutting is carefully and not unnecessarily done.

In putting in gas- and water-supply pipes, the same precautions should be taken to prevent cutting the floor timbers anywhere beyond a point 2 feet from the bearings, and, as a 1-inch underfloor is laid over the joists on the first floor, the running lines may be put in on top of the joists and the floor butted against them.

The superintendent should see that the conduits for electric wiring are put in at the proper places, that the main group of risers is placed in an accessible position, and that suitable support is provided for the metal clips used to secure the conduits, and, in setting junction boxes and terminal outlets, that they are in the proper position and securely fastened before any lathing or plastering is done. The general inspection of this work is fully explained later.

The setting in place of speaking tubes should also be followed to see that the proper number are put in, that the joints are well fitted together, and that they are placed in a position to preclude the possibility of being injured during the progress of the work to follow. They should also be properly secured with metal straps or clips, not staples, and the height and position of the outlets should be checked, so that no alteration will be necessary afterwards.

101. Porch Framing.—Porch framing is done according to the framing drawings and a large scale detail section, which latter is not given herewith but should be in the hands of the foreman-carpenter, and should be examined by the superintendent to check the pitch of the floor, the projection of ceiling joists to form outlookers, the spacing of joists, rafters, and furring, and also the height of the cornice soffit from the floor. In fact, he should see that the work corresponds in every detail with the drawings. The columns are not yet delivered, and the cornice and roof are temporarily supported by studding, which should be securely blocked at base and top to prevent any danger of their being displaced.

102. Brickwork.—The north chimney is up to the second floor, and is faced in the laundry and the kitchen with pressed brick. The superintendent examines the work to see that it is well anchored to the studding, as specified, and built with plumb angles and uniform joints. He then examines the flues to see that they are lined with terra-cotta flue lining 9 in. × 13 in. in size, and that the openings for smoke pipes are left in the laundry and the kitchen, with 6-inch-diameter galvanized-iron thimbles built in, at the proper heights, ready at the proper heights for the insertion of the smoke pipes.

The pressed-brick facing of the chimney in the laundry extends to the ceiling, while that in the kitchen stops at a height of 6 feet above the floor, and being projected ½ inch farther than the common brick above it, finishes flush with the plaster, which is to be ½ inch thick on the common brick. The mortar used in laying the body of the brickwork is lime and cement, and where used for pressed brick is stained as directed.

The south chimney is up to about midway between the first and second floors, and is found to be built according to the drawings and specifications, except in respect to the support of the hearth of the fireplace, which is found to be built with a supporting brick arch instead of as detailed (see Fig. 30). The superintendent orders the arch taken down, and writes the contractor a letter confirming the verbal order for this correction.

The hearth in the main hall is in process of construction, and as there is no chimney in connection with this fireplace (it being for a gas log, the fumes from which are taken out by means of a copper duct), the hearth is supported by a concrete slab, which is reinforced with 1½-inch **T** irons and supported on the 10″ × 10″ girder and a 3″ × 3″ **L** iron bolted to the header (see Fig. 46). The wooden center is in place, and the workmen are about to throw in the concrete. The

L irons and **T** irons are found to be of the proper size and

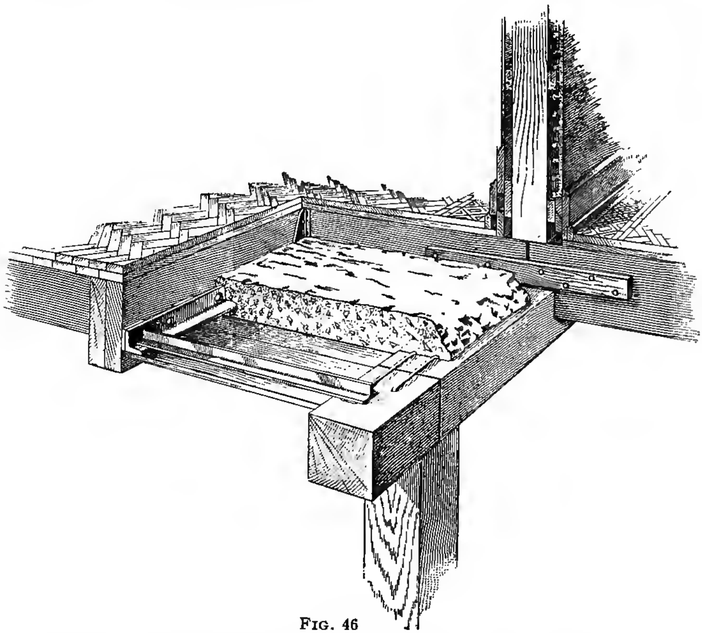


Fig. 46

thoroughly painted with oxide-of-iron paint. The total depth of the concrete is $5\frac{1}{2}$ inches, leaving $4\frac{1}{2}$ inches to the top of

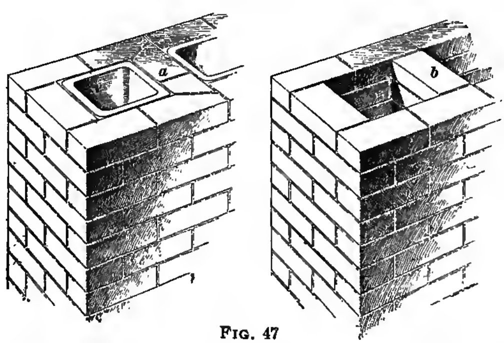


Fig. 47

the finished floor for the brick hearth, which allows about $\frac{1}{2}$ inch for the cement bedding of the brick. See Fig. 30.

The wooden centering is shown in Fig. 46, and is fastened from below.

The superintendent also examines the withes between the flues of the chimneys, to see that they are being properly bonded into the body of the work, as shown at *a*, Fig. 47, and not merely set in as shown at *b*. The first figure shows the flue lining in place, while the second figure shows the flue before the lining is slipped in.

103. Laying Concrete.—The concrete floor is being laid in the basement, and the greater portion of it has been placed. It appears to be well rammed and is on a good bottom; but while the superintendent is there a barrow of concrete is dumped from the floor above and is then spread in place. He immediately inquires of the foreman as to whether this has been practiced for any time, and on being informed that this was only the third barrow that had been placed in this way, the others being carried into the cellar, he directs that the former method be resumed and that hereafter none of this material be placed from a height. Concrete dropped in this manner separates the aggregate from the cement and sand and impairs the resulting concrete.

Concrete should be well rammed, as ramming increases its density and strength, but the operation should not be continued too long, as it will lessen its strength on account of the interruption of the setting process.

The top coat is to be composed of white sand and Portland cement in equal bulk, measured in a dry state before mixing. The concrete top is left rough, to form a good key for the topping, and it should be dampened before the top coat is applied in order that the water may not be absorbed from the mortar and thus impair its strength and setting qualities. This cement coat is troweled to a smooth surface; great care should be exercised in carrying out this work to refrain from troweling too long, for the same reasons given in connection with the ramming of the concrete. In order that the shrinkage due to the setting may not occur too rapidly, the surface of the topping should be kept damp for a time by means of wet straw. After completion, the floor should be carefully protected with boards, etc. until thoroughly set.

The new material found on the premises, consisting of sheathing, flooring, laths, and shingles, are found satisfactory, and the seventh visit may be considered at an end.

BUILDING SUPERINTENDENCE

(PART 2)

PRACTICAL SUPERINTENDING

(Continued)

EIGHTH VISIT

1. On his eighth visit to the building, the superintendent finds that the exterior carpenter work is almost completed, as the carpenters have bent all their energies since his last visit to finishing the outside, but that practically nothing has been accomplished on the interior. The roof is completed, and with the exception of a portion of the rear gable, the side walls are entirely shingled. The siding is nearly all in place, also the base and the trim of doors and windows. The front and the rear porches are completed and ready for the tin roofs. The foreman informs the superintendent that the lathers are ready to begin their work on the following Monday. They cannot start lathing, however, until the plumber's "roughing in," the water pipes, hot-air ducts, steam pipes, and electric conduits are in place, and on examination and consultation with the foreman of these trades, the superintendent learns that all this work except a couple of the hot-air ducts is completed. The tinner promises to have these ducts placed by the beginning of the following week, and the superintendent therefore orders the mason contractor to arrange to have the lathers start at once, beginning work at some point not in the vicinity of the hot-air ducts just mentioned.

On examining the exterior of the building, the superintendent finds that several pieces of the siding abutting the north chimney are not tightly jointed against the brickwork. He orders that this defective work be removed and replaced with proper work. The flashing here is satisfactory, and also the draft-line joint specified between the ashlar stonework and the corner board abutting. Passing on around the building, the work, with the exception of some careless mitering on the cornice of the rear porch, is found to be first class.

With the exception of the omission of the entasis on the pilasters beneath the outside cornice and against the wall, raised grain on another, and the faulty interpretation of the echinus molding of the column caps, the front-porch work is satisfactory. The first two points are ordered corrected, but the latter is passed, as the mistake is not serious and the caps are very acceptable as made. The superintendent notices that the porch floor between the steps and the door and the stone steps themselves are not properly protected from damage liable to occur in carrying materials in and out of the building; he orders this corrected at once. Some priming that has been neglected is also ordered done.

2. **Roof Construction, Shingling, Etc.**—While the foregoing work of setting plumbing, supply, and waste lines was being carried on and the outside finish of the building was rapidly progressing, the laying of the shingles on the roof was being especially hurried so that the plastering might be started without unnecessary delay as soon as the lathing was completed.

In constructing the roof, a $1\frac{1}{4}'' \times 9''$ board is laid along the eaves, valleys, and about chimneys, in order to form a good foundation for the copper flashing. The shingle laths are 1 in. $\times$ 2 in., spaced $4\frac{3}{4}$ inches on centers. The head-lap of shingles is specified to be $1\frac{3}{4}$ inches, and as there will be three additional laps, the exposure of each shingle to the weather, as shown at *a*, Fig. 1, will be $\frac{16 - 1\frac{3}{4}}{3} = 4\frac{3}{4}$ inches. The head-lap is shown at *b*.

It will be noticed that the shingle laths are centered under the butts of each row of shingles, thus giving proper nailing space for each. The upper end of each shingle overlaps the lath only $\frac{3}{4}$ inch, so that each one has a firm bearing. The space between the lath is $2\frac{3}{4}$ inches, which is ample for ventilation. Shingles less than 3 inches in width should not be used, and a space of about $\frac{1}{8}$ inch should be left between shingles in the same course; this allows the water to run away quickly and therefore accelerates the drying.

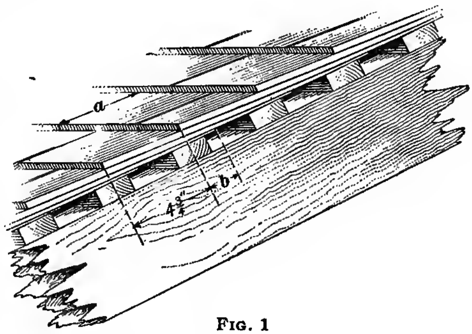


FIG. 1

3. The laying of shingles or slates (in this case shingles) begins at the gutter with a double row. They are set to a line, with a projection of at least 1 inch over the mold, and are raised above the sheathing by a cleat, which permits a circulation of air beneath the shingles, thus drying them out more quickly after a rain than if no cleat were used, as, for instance, in the case of the 9-inch board mentioned in Art. **2.** The gauge, or weather, of the shingles are marked off to the top of the roof as the courses are laid, a chalk line or a gauge being used for the purpose. The specifications require that "All shingles for covering of roofs shall be of the best quality Washington red cedar, 16 inches long and not less than 3 inches wide, secured with at least two fourpenny galvanized-steel wire nails, driven near the outer edges to prevent curling, the shingles to be dipped one-half their length in Cabot's creosote shingle stain of an approved tint," and stacked up until dry before being laid.

Although the brand of shingles specified should be sufficient, it would be well for the superintendent to inspect them. The shingles should be entirely free from knots and cross-grain and of approximately uniform width. The wider shingles should be reserved for finishing hips and valleys where cutting is necessary.

Felt paper is sometimes used for underlaying the shingles, where laid on close sheathing, but cannot be recommended; it may be used with slates, however, for where they are exposed, as in an unfinished attic, the warm air of the building will condense on the cold surface of the slate and, by dripping, possibly cause considerable damage to the plastering of the rooms below. Snow guards made of copper wire are usually inserted at intervals of 1 foot in each course where the roof pitches are steep.

4. Leaders, Gutters, Etc.—The specifications require that all leaders shall be round in section, with their sides crimped or corrugated, and of the sizes shown. The detail drawings furnished call for wrought-copper straps, and the superintendent should see that the details have been followed. He should also see that the leaders are properly connected to the gutters with 5-pound lead tubes, and that the openings into the gutter are protected by copper-wire ball screens.

The superintendent carefully examines the gutters, flashing, counterflashing, and "hog backs" of chimneys, and finds all properly done except some joints of brickwork of the south chimney, into which counterflashing had not been properly cemented. While on the roof he examines the chimney caps and finds one of them cracked; this is ordered removed and replaced by a sound one.

5. Staging.—Although usually the contractor's affair entirely, the superintendent would do well to see that the quality of the material used for the staging and the method of erecting it are the best. The material should be strong, and each stage should be well supported with a sufficient number of stays or braces. Sometimes, studding is used for *putlogs,* that is, the short pieces of timber at right angles to and supporting the floor of the scaffolding. Where this is the case, particular attention should be given to see that sound material only is employed, for a large knot in the center of a putlog may endanger the lives of many workmen.

A common form of staging consists of long studs or rough spars set into barrels, which are then filled with quarry stone or earth. The uprights, if too short, are lashed or butted and nailed together to increase their length. Putlogs, generally of rough sheathing stock, are nailed to each upright and to a cleat secured to the building; over this the staging of plank is laid. A simpler and perhaps better and safer form of staging consists of portable brackets secured to the frame with setscrews, over which planks are laid, as shown in Fig. 2.

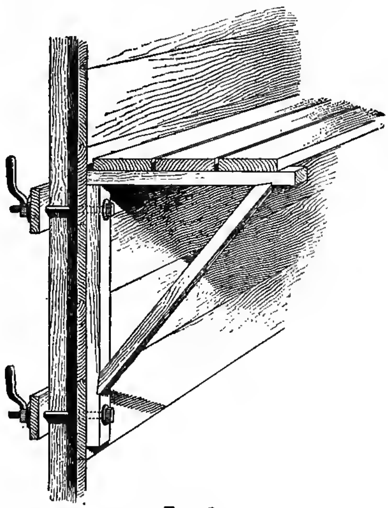


FIG. 2

6. Rough Flooring. On entering the building, the superintendent finds that rough hemlock flooring is laid in every room in the first story except the kitchen, refrigerator room, pantries, and servants' dining room, which are covered with yellow-pine flooring. The second floor and nearly all of the third floor are also covered with yellow pine, and being of good quality, it is passed by the superintendent.

The rough flooring of 1″ × 6″ surfaced-and-matched hemlock is laid after the plumbing and gas pipes, electric wires, etc. have been placed. This rough flooring is laid diagonally across the floor joists and is well fitted around all rising lines. Openings must be left where required by the plumber and the electrician for facilitating the erection of their work, and as the running lines of gas pipes and electric wires will be laid along the top of the floor joists, the rough flooring will have to be fitted against them. The superintendent should see that this work is properly done, that the floor is laid up to the sheathing, and that the joints are made on the joists only, and not between them.

Where partitions are parallel with joists and run through two stories, the joists should be spaced on each side of the partition to form a bearing for the flooring close up to the partition. Where the partition runs only one story, the joists at the base should be spaced so as to take the base of the partition and also furnish nailing space for the floor above, as described in *Building Superintendence*, Part 1.

7. Siding and Exterior Trim.—Siding and shingles cover the faces of this building. The siding extends to the line of the second floor, and is laid over roofing felt. Although siding is cheaper than shingles, it does not make as warm a wall covering, because, owing to the overlapping of the shingles, there are three thicknesses of wood at all points on a surface covered with shingles, while there is only one thickness of wood on a surface covered with siding.

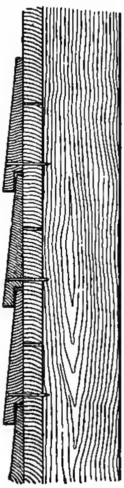


Fig. 3

Siding is made of cedar, poplar, redwood, or white pine, and is from 4 to 6 inches wide. It is usually laid with an inch lap, and is nailed near the butt of each siding. The joints should be carefully butted and well soaked with white lead. Short lengths should be avoided as much as possible. The method of nailing ordinary bevel siding makes no allowance for shrinkage, as the nail passes through the butt of the outer siding and the upper edge of the under siding. A rabbeted, or novelty, siding, such as is shown in Fig. 3, is sometimes used, and as this is nailed through only one piece, the wood can shrink without any danger of splitting. This siding is carried in stock in some localities, but as a rule would have to be specially run.

The trim of doors, windows, etc. must be according to the drawings, and should be examined to see that it is set true.

The flashing of the head-casing of windows should be examined; also the jointing of shingles and siding against the corner boards, the trim of windows, doors, etc.

8. **Finished Flooring.**—The yellow-pine flooring laid in the kitchen, pantry, servants' dining room, and on the second and third floors should be protected as much as possible. Nails are occasionally dropped on the floor by the carpenters, and if these are stepped on, they are sure to mar the surface of the floor. The spitting of tobacco juice is another source of trouble, causing stains that are hard to eradicate. The superintendent should insist on the floors being covered with canvas or in some other way when the plastering is being done, so as to protect them from any plaster that may be dropped.

If these floors are to be carpeted, such stains and small indentations do no serious harm; if, however, the floor is to be varnished, shellacked, or waxed, it is almost indispensable to first lay rough hemlock flooring, and then, after the plastering is done, put down the finished flooring. In this way the rough floors take all the wear and tear during plastering and do away with the necessity for the precautions just mentioned.

The oak parquet floors that are to be laid in the hall, reception room, living room, and dining room in the first story are under a separate contract, and will be laid on building paper with a lap of at least 2 inches. The building paper gives a better contact between the two floors, as the under floor is liable to be somewhat uneven, and also prevents dust from sifting through from the cellar and coal bins.

Bathroom floors in the second story are raised above the level of the regular floor. The regular joists in the south bathroom are floored and covered with sheet copper, forming safes to catch any water that may occur from leakage. These safes are connected by piping to a safe waste sink in the basement, so that water from leakage, besides giving warning that the plumbing work is in need of repair, will be safely conducted to the drainage system and thus prevent damage to the ceiling of the living room directly underneath.

The floor of the south bathroom is to be tiled, and a brick filling is inserted between the beams, as indicated in Fig. 4. The wainscot for both bathrooms on this floor is also to be of tile; this should be applied to cement mortar on metal laths, as shown in the illustration. The tiling is a separate contract and will not be found specified. This plan is frequently

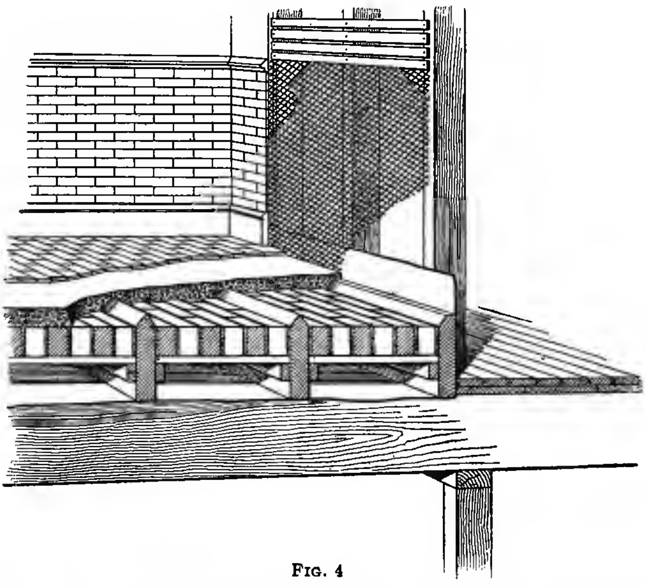


FIG. 4

followed, as the owner may have personal preferences as to tile, and it allows him plenty of time to make his selections.

The superintendent should examine the wooden floors for uneven butt joints, pieces not well driven up, etc.

9. Lathing and Grounds.—Before leaving the premises, the superintendent goes through the interior of the building to examine the lathing and the grounds for wainscoting, wooden and plaster cornices, beamed ceilings, etc., and having previously checked the location of all the light outlets, he should now see that all the outlet boxes are securely fastened and project from the lathing the exact amount that will bring them into the proper relation to the surface of the plaster.

Wooden laths should be of a uniform thickness, and free from loose sappy knots, sap, or bark edges. They should be spaced not over $\frac{1}{4}$ inch apart for patent plaster, such as King's Windsor cement or Adamant wall plaster, and from $\frac{1}{4}$ to $\frac{3}{8}$ inch for ordinary plaster. For the best work, it is often required to break joints in each course; but for ordinary good work, the joints should be broken every sixth or eighth course.

If the laths are too near together, the mortar cannot be sufficiently pressed into the joints, and therefore will not

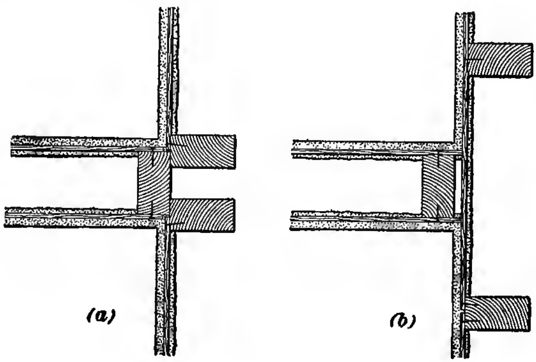


FIG. 5

key. On the contrary, if the laths are too far apart and the mortar is quite soft, the key will drop off from its own weight. Care should be taken to see that the laths are nailed to every bearing, that no laths are allowed to fall short of the bearing at the ends, and that the studding is grouped at angles as shown in Fig. 5 (*a*), thus giving proper nailing surface for lath ends on both partitions. Laths should never be allowed to run back of an abutting partition, as shown at (*b*). Where partitions are parallel with joists, nailing space at their heads for laths should be provided, either by spacing the joists as indicated in Fig. 6 (*a*) or by a cleat, as shown at (*b*). All of these precautions are taken with a view of preventing loosely fastened plaster, which will be liable to crack and fall off when pressed on or struck with a hammer in putting up trim.

In laying laths from one side of a room to another, it very often happens that a narrow space is left. This space is generally covered with laths set vertically, for the sole purpose of simplifying the work. Work of this kind should not

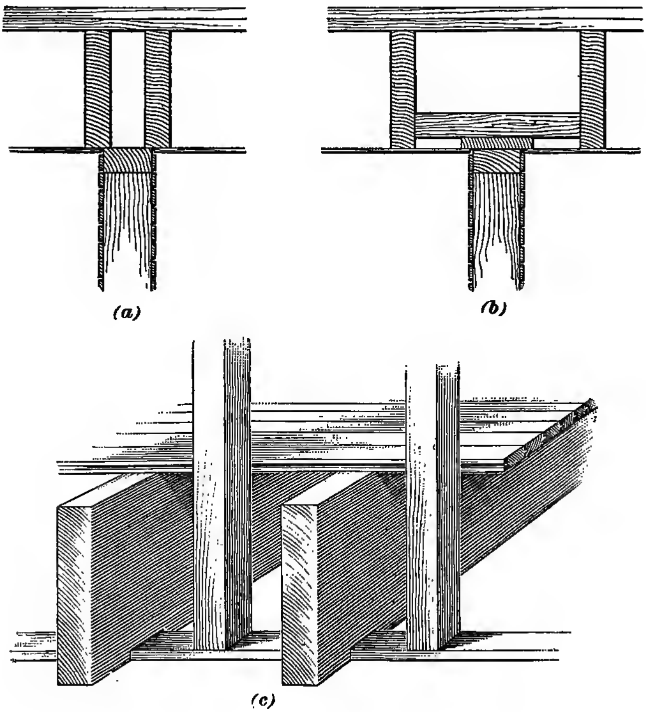


FIG. 6

be allowed, as cracks will surely appear on the line formed by changing the direction of the laths. In a very narrow space, say from 4 to 6 inches wide, the laths may be put on diagonally. Any wooden lath split in nailing should be removed and replaced by a sound piece.

The nails used for lathing should be not less than fourpenny. For ceilings and for good work, the nails should be galvanized, although copper and zinc nails are sometimes used. Cut nails should always be specified.

Where partitions are not held up by a partition under the floor below, they are usually supported on flooring; or, if the expense is permissible, by heavy wrought-iron straps fastened by lagscrews to bottoms of the joists, as shown in Fig. 6 (*c*). By this method, the partition is least affected by shrinkage in the depth of the joists.

10. When the furring and partitions have been properly set and lined up, the setting of grounds is a comparatively easy task. Their thickness should be looked after, however, as this determines the thickness of the plaster to be put on. All grounds should be well nailed, for a loose piece in shrinking is liable to pull the plaster away from the laths. The edges of grounds should be beveled toward the back where possible, thus forming a key for the plaster. The full-sized details should be consulted in checking the location of the grounds, as their position is always regulated with relation to wainscot, rails, base, etc.

Grounds for door and window trim and for baseboards should extend to within at least $\frac{3}{8}$ inch of the edge of the finished piece, to prevent it from curling up. Where ceiling joists are furred down in order to get a truer surface, the furring strips should be as narrow as practicable, so as to cut off no more of the plaster key than necessary. Where the furring runs at right angles to the joists in the foregoing case, it should not be less than $1\frac{1}{8}$ inches deep, in order to allow sufficient room for the plaster key under the bottoms of joists.

The grounds in one of the rooms on the second floor are found to be only $\frac{5}{8}$ inch thick, whereas all grounds are specified to be $\frac{7}{8}$ inch thick. These undersized grounds are ordered torn off and replaced.

11. End of Eighth Visit.—The superintendent then leaves the building and, after examining some sand, lime, and about one thousand Roman pressed brick for hall and sitting-room mantels and finding all satisfactory, returns to the office.

Having now reached the point where the visits would occur too frequently for convenience in writing their description, the superintendence of sheet-metal work, plastering, plumbing, heating, electric wiring, joinery, painting, etc. will be taken up and explained as near as possible in the order in which they follow one another during the construction of the building.

SUPERINTENDENCE OF SHEET-METAL WORK

12. Valleys.—The valleys are to be of 16-ounce copper, 20 inches wide, and the sheets are to be securely lapped and soldered. The copper for the valley should be accurately placed, so that there will always be 10 inches on each side of the center of the gutter, and the edges should be securely nailed in place. The copper should be examined to see that it is of the proper thickness, the superintendent having a

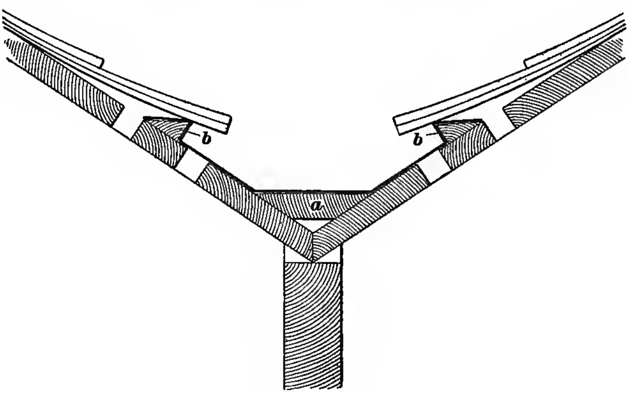


FIG. 7

small sample of 16-ounce copper in his pocket with which he compares that used in the gutter.

All valleys are to have filling and tilting strips, as shown in section in Fig. 7, the filling strip being at *a* and the tilting strips at *b*, *b*. The width of the valley between shingles should be at least 5 inches. Sheet-copper, sheet-lead, and sheet-zinc weights are generally accepted as rated by the manufacturer.

13. Flashing and Counterflashing.—The flashings against dormer cheeks are to be of sheet copper, 7 in. × 10 in. in size, and built in with the shingles in the same manner as for the chimney, except that the counterflashing is omitted, the vertical shingles lapping over the built-in flashing.

The lowest lead shingle flashing laps the base flashing in a manner similar to that shown at *b*, Fig. 8, so that any

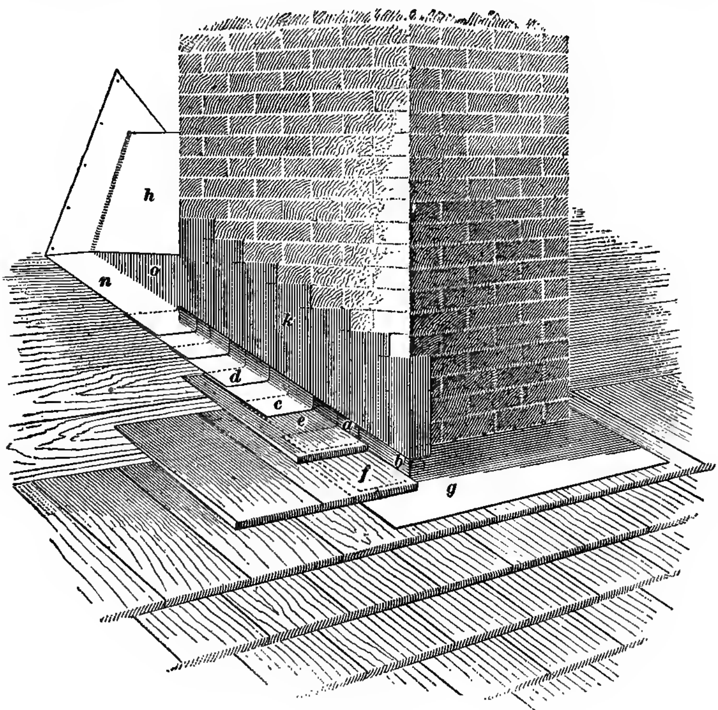


Fig. 8

water that may work beneath the shingles will follow down to the base flashing *g* and be discharged on the surface of the first row of shingles over which the base flashing laps.

Fig. 8 illustrates the best method of flashing and counterflashing a chimney. First, the base flashing *g* is laid over the row of shingles next to the chimney; then, the flashing shingles *b*, *a*, *c*, and *d* are laid as shown, *b* being first laid under the shingle *f* and over the flashing *g*. When the row in which shingle *f* is laid is completed, the flashing shingle *a* is laid over *f* and under shingle *e*. This operation is repeated until the flashing is all in, the last flashing shingle going under the copper of the hogback *o*.

The hogback should have a vertical face beginning at the foot of the valley, as this will prevent water from shooting under the shingles, which would occur if the pitch *h* were continued to the roof surface. The outer edge *n* of the hogback flashing should have a roll under it in order to pitch it slightly toward *o* and thus prevent any water that might work under from getting off the flashing.

All of the shingles being in place, the counter, or step, flashings *k* are next placed as indicated, or, preferably, have already been built in by the bricklayer when the chimney was in course of construction. They should extend not less than 1 inch into the joints of the brickwork and should be well calked and cemented in place. The counterflashing at *k* is of sheet lead, and that at *g* of copper.

14. Fig. 9 illustrates the method by which the flashing of the north chimney should be accomplished. The flashing shingles *b*, *c*, *d*, and *e* are placed in a similar manner to those shown in Fig. 8, except that they are turned against the brickwork only about $\frac{3}{4}$ inch, and when the carpenter places a shingle as at *a*, he shoves the copper shingle flashing underneath and against the side of the shingle, which he then pushes tightly against the brickwork before nailing. After the shingling is all done, the crack between the flashing and the brickwork is thoroughly calked with red lead or slater's cement. Where the stone corbel occurs, a sheet-lead flashing as shown at *g* should be placed, with its outer edge *f* calked into a groove in the stone. The projecting belt course is flashed and counterflashed as shown, and the siding below this course is flashed in a manner similar to that shown for shingles.

The flashing against the window casing is accomplished in the same manner as that just explained, but here the flashing can be securely nailed to the casing and the red-lead or slater's cement calking will not be required. The head-casing of windows has a strip of tin extending up under the siding or

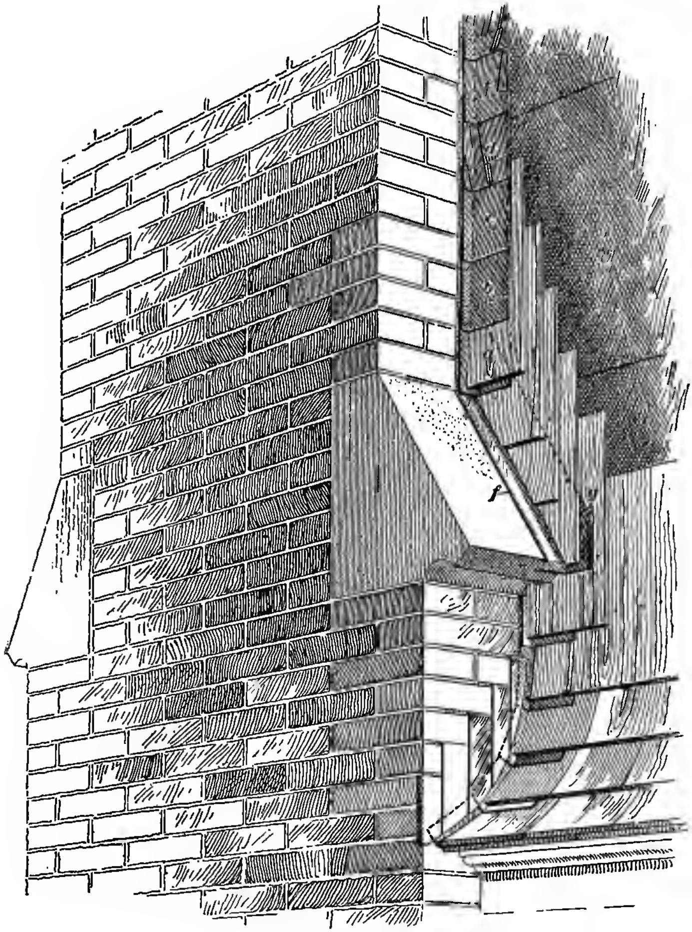


FIG. 9

shingles and out over the edge of the cap. The roof of the stair bay window is covered with copper, which should run at least 3 inches up under the shingles. This point should also be watched in connection with the porch and dining-room bay roofs.

15. Gutters and Leaders.—An examination of the gutters should be made to see that they are properly graded and secured, and that they are not set either too far below or in front of the crown molding. If they are set too far out, the rain is liable to blow over and behind the gutter; and if too low, to overshoot it in running from the roof. Connections between the gutters and leaders should be neatly and securely made, and copper-wire baskets must be placed in the openings. The leaders should also be inspected to see that they are plumb, securely fastened, and tightly and neatly joined to cast-iron pipe at their bases.

16. Porch and Bay Roofs.—The superintendent should see that the tin is stamped with one of the three names specified, and also that no nails are driven through tin or copper joints, but that all sheets are fastened to the sheathing with tin or copper cleats. Seams should also be examined in order to ascertain that they are well and neatly soldered. The edges of tin and copper roofs at the crown molding should be turned over a band of galvanized strap iron, as indicated at *a*, Fig. 10, and where tin or copper is turned up under shingles, the butts of the shingles should be kept about 1 inch above the surface of the roof, in order to lessen the danger of water working up under them by capillary attraction.

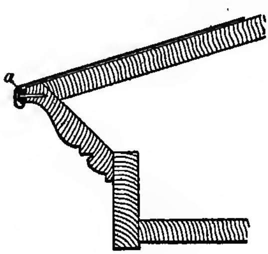


FIG. 10

A tin roof should be painted as soon as possible after being laid, and if the surface is too oily to receive paint, it should first be washed with strong soap and water. Allowing the tin to remain unpainted until slightly rusted is a common practice, and cannot be condemned too strongly. Care should be taken that the sheathing is dry before tin is laid, and also that the under side of the tin is painted. Copper roofs are allowed to oxidize and form a "patina" on the surface, which protects the metal, and is not unattractive in color.

The "dutchman" referred to in the specifications is a strip of tin that is slipped under the lap and bent over the top of the seam and then soldered over a nail that has been previously driven through both the seam and the strip. This method is sometimes used as an expedient to keep down a raising seam, but should not be permitted, as the strip is liable to become loosened from the nail head and thus allow water to follow down the nail and find its way beneath the tin.

SUPERINTENDENCE OF PLASTERING

17. Temporary Heating.—If the building is to be plastered during freezing weather, some provision should be made to furnish temporary heat to help dry the mortar. If the building is to be heated by steam, hot water, or hot air, the heating contractor should furnish, set up, and connect in each room temporary radiators or registers of a size requisite to heat the rooms to a temperature of 70°, the owner agreeing to pay the heating contractor, for example say $3 over and above the contract price, for the temporary connection of each radiator or register. The owner might agree to maintain a competent man for operating the heating plant, and to furnish all necessary fuel required during the period agreed on between himself and the heating contractor. In the case under consideration, the steam heat is to be supplied from the street mains of the steam-heating company, and the owner is to pay for the installation of any temporary radiation required.

In small country dwellings with no regular heating system, stoves or fire-pots are employed for the purpose of drying mortar, but this method of forced drying is objectionable. Of the two methods, that with fire-pots is undoubtedly the better, but, if used, the pots should be set in boxes filled with sand and situated in the center of the room. The fire-pot should be taken out into the open air when the fire is started, as the smoke from the burning wood will discolor the walls and cover them with a greasy film of soot. After the wood has burned sufficiently to ignite the coal or coke and has ceased to give off smoke, the fire-pot may be brought into the building and deposited in the box of sand. The firepot and method of carrying it are shown in Fig. 11. These fires should be constantly attended to by a man employed for that purpose, and the expense so incurred, as well as that of furnishing fuel, should be paid by the owner, unless otherwise provided for in the specifications or agreed on between the owner and the contractor.

Fig. 11

18. Plastering Mortar.—The mortar to be used for the scratch and brown coats of plaster should be mixed at least 2 weeks before being used, and should be stacked in the rough until this time arrives. Mixing the mortar a suitable time before using it enables the lime to slake thoroughly, so that when the mortar is tempered the result will be a fine homogeneous mass. Mortar should be mixed in the open air, and in winter should be protected from rain, snow, and frost; it should never be mixed in the cellar, as the moisture of the mortar will cause the floor joists and other timbers to swell.

While the mortar is being mixed, the superintendent should see that the proper lime and sand are used; the lime should be well burned and should slake thoroughly when covered with water. If underburnt lime is used, "cores," or imperfectly burned pieces of lime, will be scattered throughout the mass and may not slake until after the mortar is applied to the walls, when they will expand and cause what are known as "chip cracks" or "blisters." The sand mixed with the lime to make mortar should be thoroughly inspected so as to be sure that it is clean and contains neither lumps nor loose particles of clay.

The superintendent should see that the mortar contains the requisite amount of hair, which is about $1\frac{1}{4}$ pounds to a bushel of lime for the scratch coat, and $\frac{3}{4}$ pound for the brown coat. In applying the plaster to the walls, sufficient force must be used to secure strong clinches, or, in other words, the mortar must be squeezed through the joints between the laths so as to bend over on the inside. It is very important, especially in two-coat work, to see that the brown coat is well leveled up and true to a line on all angles and corners, for the white finishing, or skim coat, is merely a thin veneer of plaster and cannot be depended on for truing up the wall surfaces. The scratch coat should be leveled up and trued in the angle, and if three-coat work is called for, as in this case, it should be scratched to a rough surface with a wooden comb made of pointed laths nailed together in a row.

19. Screeds.—After the scratch coat has set hard, **screeds**, or strips of mortar, should be run along all margins and down the angles or corners. A long straightedge is applied, and the screeds are worked until a perfectly true surface is obtained; intermediate screeds are put in, especially on large surfaces, the number of course depending on the length of the straightedge. For the best work, a spirit level or a plumb-bob is applied to the straightedge, and by this means a perfect job will result. After the screeds are sufficiently dry, the body of the brown coat is filled in and worked to the plane of the screeds. The screeds in all corners and on angles should be plumbed. In rooms having a plaster cornice, the brown mortar should be scored to a rough surface along the margin of the ceiling and side walls to afford a good key for the extra weight of plaster, and at this point it should be observed that both brown coats are carried down to the floor.

20. Bracketing.—If a heavy cornice is to be put on, wooden or metal bracketing, or cradling, of the same general outline as the cornice should be provided. If wooden brackets are used, as at *a*, *a*, Fig. 12 (*a*), a strip *b* is first nailed along the floor joists above, and the brackets are set to it, in that way getting them in a straight line; a cord stretched across the studs is sufficient to bring the bottom of the brackets into alinement. This strip is put on only where the ceiling is to be cross-furred with the furring strips *c*, and if no furring strips are to be used on the ceiling, the brackets are notched over *b*, as shown at (*b*), or the strip may be omitted entirely. In the setting of cradling and all such

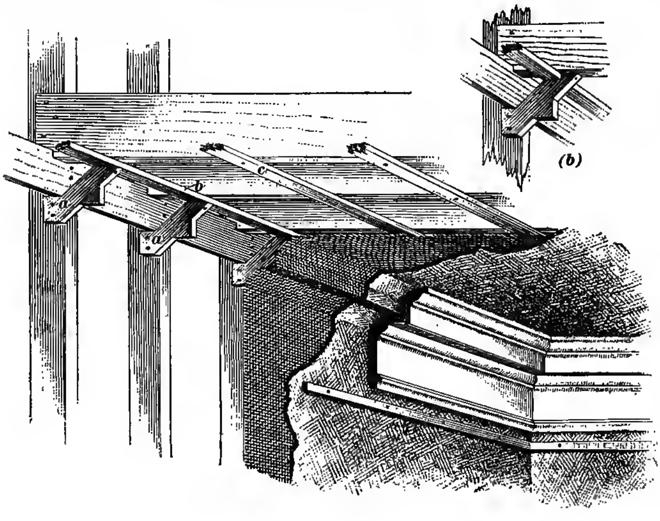


FIG. 12

work, the superintendent should see that sound lumber is used and that all parts are set to a true line and well nailed in place. In shaping the rough brackets just described, the plaster should not be thicker than 1 inch at any point, except perhaps on acute angles or some such position where it is unavoidable.

21. White Finishing.—After the plaster cornices are finished, the white finishing, or skim coat, is applied. This coat consists of pure lime, which should be slaked, strained through a fine sieve to remove any grit or unslaked particles of lime, and allowed to stand in a covered trough or in barrels for at least a week before being used. After standing for a few days, the hydrated lime should be of the consistency of white lead, or firm enough to be carried on a shovel. Washed sea sand and water are then added by the helper, who tempers the mixture to a soft paste. The material is supplied to the plasterers in this form, and they mix it on the mortar board with plaster of Paris and water, tempering it until reduced to the required consistency.

In using this plaster, a good workman will exercise great care that all his tools and the mortar board are perfectly clean; sometimes, a careless man will use a rusty trowel, or perhaps the helper, in filling his hod, will use a shovel that has been employed for some other purpose. The superintendent should follow this work carefully to see that the plaster is applied in such a manner as to hide all brown mortar, scratching down all uneven surfaces of the brown coat if necessary. He should also see that no iron nails or other metal work that are apt to rust are left in a position to discolor the plaster, as the white skim coat should show a perfectly smooth and unblemished surface at completion.

Another and a very important point to be looked after by the superintendent is that of fires, if the plastering is being done in cold weather. Particular care should be taken with the fires while the white finishing coat is damp, for any dust arising from shaking or poking the fires is sure to settle on the walls and do irreparable damage. The fires should be kept as nearly in the center of the room as possible, for if brought too near the wall, the white finishing coat will dry out too quickly, and in doing so the plaster will crack into innumerable shapes and become marked like an alligator skin. These markings may also be caused by the addition of too much plaster of Paris. Where the markings are numerous, the plaster should be cut out and replaced.

On account of dust, as before mentioned, the fire-pots should be used only as a last resort, steam or furnace heat being used where possible. To dry out the plaster thoroughly is very important. The heat should be as uniform as possible, and the temperature of the rooms should not be allowed to drop greatly during the night. At the same time that heat is steadily supplied, the superintendent should see that proper ventilation is obtained, as heat without ventilation is almost useless. Warm, sunny, dry weather, when all the windows may be left open, is the ideal condition for plaster drying, principally because of the circulation of air throughout the building, which carries off the moisture expelled by the heat. The scratch and brown coats should be thoroughly dry before the succeeding coats are applied, and frosted plaster should always be removed as soon as discovered.

22. Brackets, Centers, and Lighting.—In setting plaster brackets, care should be taken that they are set at the proper height above the floor and that they are plumb and "out of wind" with the wall surface. In setting centers, the superintendent should see that they are placed in the center of the ceiling, which, of course, is previously found by the gas-fitter or the electrician and checked by the superintendent. To find the center of a room is a comparatively easy matter, yet it is often neglected or carelessly done by gas-fitters and plasterers. The intersection of two strings stretched from the corners of the room and crossing it diagonally will mark the center.

Where improved or patent plasters are specified, the superintendent will only be required to see that the proper materials are used and that they are mixed according to the instructions of the manufacturers. The superintendent should prevent, as far as possible, the use of reworked mortar, or mortar that has become partly set.

Where the light is poor, the superintendent should have the carpenter contractor insert glass sash in the nearest windows, as it is difficult to do good work with poor light. The usual custom is to cover the window openings with muslin, and in hallways or large rooms where walls are remote from windows this does not permit sufficient light to enter.

Fig. 13

23. Mantels.—In the main hall and the living room on the first floor there are pressed-brick mantels. The one in the living room has a facing of Roman brick formed on the rough brick chimney, and is built as illustrated in *Building Superintendence*, Part 1. The hearth is made of brick, similar to that of the fireplace, laid in herring-bone pattern. The superintendent should see that the angles are plumb, the joints uniform, the facing tied to the chimney, and that the arch and herring-bone pattern are correctly worked out and at the proper levels. He should also see that the iron angle bar is placed under the flat arch and that the hearth is constructed as indicated. Fig. 13 is a photographic reproduction of the completed mantel.

The mantel in the hall is an independent piece of brickwork, and is constructed as already illustrated in *Building Superintendence*, Part 1. A sheet-copper hood is placed as shown, and is connected by a vent flue extending through the roof to carry off the products of combustion from the gas log. Both of these fireplaces being for gas logs, the superintendent, besides watching the general construction and dimensions, should be very careful to see that the gas pipes are properly placed and provided with cocks located in the floor and connected to the central supply. Fig. 14 illustrates the completed mantel in the hall. It will be noted that a slight change was made in the straps at angles above the shelf. The lantern over this mantel is fitted with a 16-candlepower lamp, and is controlled by a switch located near the closet door in the stairway hall. The metal strips shown at angles of the hood must be firmly fastened in place, and it will be necessary to see that plasterers make a very true job of these angles so that the metal strips will have a snug fit.

The mantel in the den is of simple design, and is to be fitted with a gas log that is vented into the near-by chimney. The shelf of the mantel is a continuation of the wainscot cap, with the angle rounded where cap and shelf join each other, so that they meet at a right angle instead of an obtuse angle. The superintendent should see that this and the other joints

Fig. 14

FIG. 15

Fig. 16

where the wainscot joins the mantel are tightly and neatly made. The lining of this fireplace is to be of cast iron, and the studding behind it is to be thoroughly protected with tin. Figs. 15 and 16 are illustrations of the den after completion, showing mantel, bookcase, bay windows, etc.

SUPERINTENDENCE OF PLUMBING AND GAS-FITTING

24. Piping.—The next work of importance on the premises, and in fact the work requiring the most critical supervision in regard to material and workmanship, is that of putting in the waste, vent, and supply pipes to the various plumbing fixtures. All lead pipes should be inspected to ascertain whether they are of the proper weight per foot. The end of each coil is generally stamped with a letter or number denoting the weight; for that reason the pipe should be inspected before it is cut for use.

It is a well-known fact that water, especially soft water, containing certain foreign matter, will attack lead pipe, and if the water is under heavy pressure there is a possibility of the pipe bursting, unless of extra thickness. Where good work is of prime importance, it is best to use seam less drawn brass tubing, tinned inside and out. In the case under consideration, the main water-supply pipe, including hot-water piping, is to be of galvanized iron, and all the fittings for the supply pipes are to be of malleable iron, beaded.

The superintendent should examine all the material critically and follow the work of fitting it together, to see that the joints are set in red lead, and that the system is provided with all the valves and fittings requisite and is graded to an outlet as specified. Where brass or copper pipe without an outer plating of some other metal is used, it should be coated with shellac to prevent discoloration, which is sure to occur unless some preventive is applied. Wrought-iron pipe is used extensively and various coatings of more or less merit are applied, such as ordinary lead-oxide paint, enamel or asphalt paint, and metal plating. Galvanized-iron pipe is perhaps the most common, and is undoubtedly the best for water pipes that are not likely to be attacked by water containing acids.

INSPECTION OF MATERIALS

25. Lead and Tin Pipe.—All materials should be inspected when received and before they are accepted. *Lead pipe* should be soft and pliable. Examine for kinks, bruises, and punctures caused by rough handling during shipment, and for weight per foot. In other respects, lead pipe is usually placed on the market in good condition and requires no further inspection.

Tin-lined lead pipe should have its interior surface examined, if possible, to see if it *is* tin-lined. Shave off the end of the pipe square and clean, and ascertain the thickness of the tin lining by breathing on the highly polished end. The breath will discolor the surface of the lead with a thin blue coating, and the tin will remain bright. The thickness of the tin lining will thus become visible.

Block-tin pipe, like lead pipe, is generally accepted as reliable in the form placed on the market. Pure block tin may be detected by a peculiar crackling noise it makes when being bent at ordinary temperatures.

26. Brass and Copper Tubing.—*Seamless brass tubing* should have an equal thickness all around, and should be slightly annealed to prevent its being too brittle for working.

In *brazed brass* and *copper tubing*, the brazed seam should be examined carefully. This seam should be uniformly loaded with hard solder and thoroughly *sweated.* If possible, examine both the inside and the outside of the seam. The best and strongest form of brazed seam is *dovetailed.* Lap- or butt-brazed seams are liable to warp in the process of brazing, and are not very strong.

27. Iron Pipe.—The *galvanized-iron pipe* on the market is usually accepted as good. Sometimes, however, it is partly choked by the zinc used in the process of galvanizing.

This may be detected by rolling a marble a size smaller than the pipe through its entire length, or, if possible, by looking through it. The quality of the galvanizing may be observed by bending the pipe at an ordinary temperature to an easy curve. If the galvanizing is good, it will remain intact. Galvanized-iron pipes are likely to be quite brittle, but this brittleness does not seem to affect the durability of the pipe. The ductility of galvanized-iron pipes is less than that of black iron, and sometimes is so low that if the pipe is bent successfully, it cannot be bent back without breaking.

In *wrought-iron pipe* (*black*), the welded seam that runs the whole length of the pipe should be examined. A good welded seam is scarcely visible, and the external and internal surfaces of the pipe should be smooth. The pipes should be straight and the threads should be clean cut.

28. Drain and Soil Pipes.—*Cast-iron drain* and *soil pipes* should be examined for sand holes in the metal or splits in the pipe. A fracture can be detected by tapping the pipe with a chisel or a small hammer. If the pipe is sound, it will emit a clear ring when struck, and if cracked, it will give a dull, harsh sound. Sometimes, the *core* will shift when a pipe is being cast, particularly if the pipe is cast horizontally, in which case the core is liable to rise. This will cause the metal to be thicker at the bottom than at the top of the pipe. Irregularities in thickness can be detected by the different sounds produced at various points when rapped with a hammer.

Earthen drain pipes are liable to warp and twist in firing. They should be examined for an equal caliber, smooth-glazed internal and external surfaces, and particularly for cracks around the back of the socket and irregularities within the socket. Pipes having broken or crooked sockets should be rejected.

29. Pipe Fittings.—*Fittings* for *wrought-iron* and *brass pipes* should be inspected for sand holes and flaws, and it should be seen that the screw threads are deep and full. All screwed fittings should be reinforced with a heavy bead cast on the edge.

Fittings for *cast-iron drain pipes* should be examined for sand holes, splits, and other flaws, and for lumps and other obstructions to the free flow of sewage through them.

Fittings for *earthen pipes* should be examined for irregularities in cross-section, or caliber, cracks, protruding pieces of salt glaze, abrupt turns, etc. The sockets should be examined to see that they are round and of proper depth.

INSPECTION OF WORK

30. Leaks.—In the best work, provision is made for carrying off water from leaky joints, possible bursts in the pipes, or water of condensation. A casing, or tubing, of sheet metal, generally of zinc or light sheet copper, is used; the joints of the tubing are fitted together around the pipe fittings, and the tubing discharges into a sink. The importance of putting in this casing is evident, for a leak under the floor or in some inaccessible position may cause more damage to frescoes or other decoration than the original cost of the tubing.

Perhaps it is hardly necessary to state that only the most skilled mechanics should be allowed to do the work of plumbing and gas-fitting, for no other work on the whole job can be more easily skimped when the superintendent is not constantly on hand; and as he will have many other things to attend to on the premises, it is imperative that skilled, as well as honest, conscientious workmen be commissioned to do the work.

There is no doubt that the superintendent, under ordinary circumstances, will have to rely on the honesty of the workmen, but he should devote all attention possible to see that the proper fittings are put in, that they are properly connected, and that the lines are properly spaced apart and supported by straps, hooks, or tacks, as the case may be, being governed of course by the specification, which should be very explicit in regard to the plumbing work.

The plumber should give due notice to the carpenter to put in boards for the support of running lines of pipes between joists, finished pipe boards where exposed to view, and for all cutting of timbers or other woodwork in and about the premises.

The superintendent should examine the sheet-copper safes under the south bathroom floor and third-floor bathroom to see that they are well soldered and have the proper pitch to outlets. See Fig. 4.

31. Joints in Cast-Iron Pipes.—All joints between lead waste or vent pipes and cast-iron pipes should be made with heavy brass ferrules calked into the hub of the iron pipe and secured to the lead pipe by means of a wiped solder joint. In common practice, the lead pipe is simply dressed

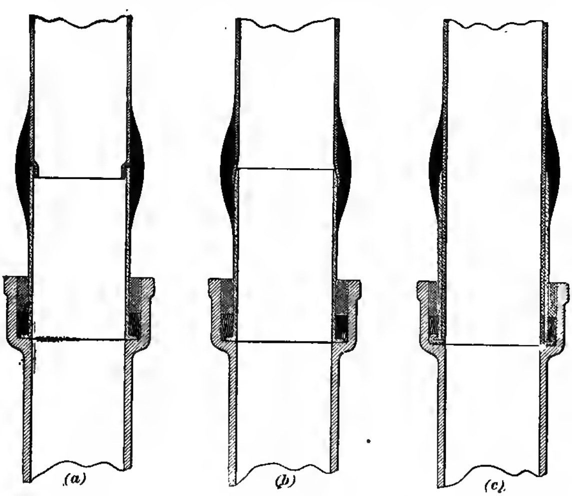


FIG. 17

down and fitted into the end of the ferrule, as shown in Fig. 17 (*a*), or slightly flared, as shown at (*b*), the latter being perhaps the better of the two, though there are objections to both methods, as the molten solder is liable to work into the joint and form an obstruction for solid matter to accumulate against. The best method is to use a ferrule just large enough to allow the lead pipe to be slipped through it, as shown at (*c*), and then secure the lead pipe to the ferrule with a wiped solder joint.

In Fig. 18 is shown the method of flashing about soil and vent pipes where they are extended through a roof. At *a* is

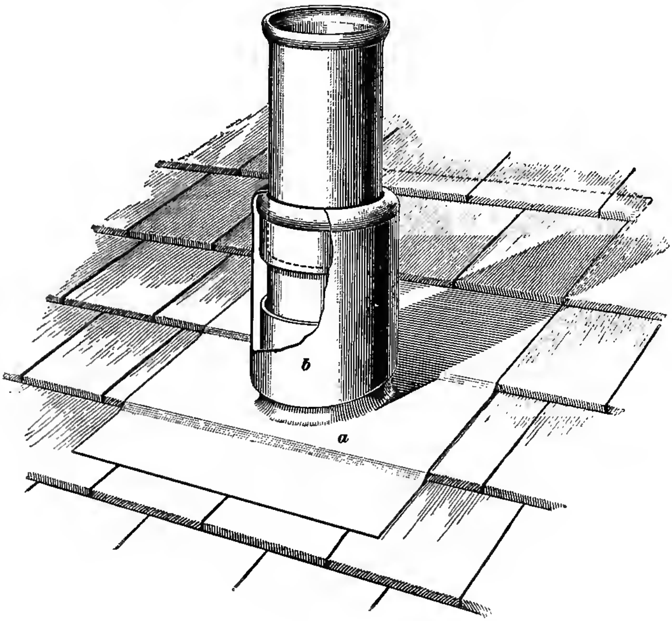


FIG. 18

shown the flashing, which is made of copper, and extends under the shingles. The apron flashing, which is made of sheet lead, is shown at *b*, and is calked into the hub as indicated.

32. Grease Traps.—In the use of kitchen and pantry sinks, a great deal of grease passes off with the waste water. This fatty matter is in the form of small globules that harden as soon as they become chilled. These particles of grease accumulate on the inside of the waste pipe, and if there is any obstruction to the flow of water, the pipe is liable to become choked. To obviate this, **grease traps** are placed on the waste pipe from kitchen, scullery, and pantry sinks. The trap known as a *chilling-grease trap* is the best for this purpose. One of these traps, connected to the waste pipe from the kitchen and pantry sink, will be found of great value and will amply repay the first cost of instalment.

33. Fixtures.—Having in hand the specifications that give the name of the manufacturer, the plate number in catalogs, and a general description of each fixture, the superintendent should compare the fixtures as delivered and see that all are as specified. In first-class work, the object always to be kept in view is to have *open plumbing work;* that is, to so arrange all piping and fittings above the floor that they are in full view and readily accessible. No cased-in fixtures should be allowed where good plumbing is required.

34. Water Closets.—The setting of water closets should be carefully watched to see that the floor flange joint is so made that there will be no chance for the escape of gas. There are a great many methods of making this joint; a common and cheap one is to place the base of the closet in a bed of putty and secure the closet flange to the floor by means of screws. In another common, but better, method, the bend is soldered to a brass floor flange, and the closet is bedded and bolted to it on a rubber or hemp and red-lead gasket.

The putty joint just mentioned should not be allowed by the superintendent. The brass floor flange soldered to lead bend with a gasket is acceptable, but there are still better joints than this. There is a joint made with a specially formed brass screw flange cemented to the base of the closet, which screws into a brass ring soldered to the lead bend. Whatever form is used, the superintendent should examine its construction carefully and satisfy himself as to its ultimate tightness and durability.

The flushometers used are similar to that shown in Fig. 19. They are not suitable for a pressure of less than 10 pounds, however. The closets should be tested to see that they flush generously, the volume of water to be not less than 5 gallons at each flush. This may be tested by coloring the water in the bowl with ink or some other coloring matter and then flushing the bowl; if the colored water is entirely replaced by clear water, the closet may be considered properly flushed.

Fig. 19

If a closet is to have a local vent, it should be made into a horn or horns cast on the closet bowl. If a back-vent is used, it should be made from the top of the lead bend beneath the floor. The porcelain horns on bowls with rubber- or lead-pipe connection for local vents cannot be recommended, as the horns are liable to be broken off and the rubber connections will dry out and crack open or break.

35. Bathtubs and Lavatories.—The bathtubs should be inspected to see that the enamel is not chipped, that they are labeled as described in the catalog, and, when set, that the overflow pipe is open; also, that waste and supplies are at the proper end, as indicated in the plan, and that the cocks are in good condition. A bathtrap with screw clean-out countersunk in the floor should be used.

An examination should be made of the lavatories to see that the enamel is in perfect condition and that they are labeled to indicate their class. The manufacturer usually has three classes of enamelware, designated as A, B, and C, according to the number of imperfections they contain. The faucets should also be examined to see that they work properly and that they are of the type specified.

The nickel work of lavatories, tubs, etc. should be coated with vaseline where it is exposed to any great amount of dampness, and if necessary should also be properly protected from damage by wrapping in muslin.

36. Sinks and Laundry Tubs.—All sinks should be examined for the flaws already described and to see that they correspond with the specifications. The kitchen sink is to have a grease trap, and the superintendent should assure himself that it is properly installed. The laundry tubs are to be fitted with a strong ash frame and a suitable place for fastening a wringer. The tubs are to be rigidly fastened to the wall. All these points should be carefully watched by the superintendent.

The sheet block tin that is to be placed about the pantry sink must be neatly worked around the sink and turned up against the wall. The chain stays for rubber stoppers at lavatories and sinks must be well made and securely fastened to the slabs, so that there will be no danger of their pulling away or breaking.

37. System.—All offsets and branches in the waste and vent lines throughout are to made with obtuse-angled bends and **Y** branches. The various groups of fixtures are each to have a separate rising line of water supply controlled by a stop-cock in the cellar, and are to be pitched to low points and provided with drain cocks, so that the lines may be entirely emptied when desired. Connections are to be made in the basement for hydrant, water supply to the heating apparatus, and for faucets, and each connection is to be independent of the other and controlled by a separate stop-cock. Each stop-cock controlling a branch should be tagged to show what fixtures it controls.

The make and quality of all stop-cocks, faucets, valves, and connections being covered by the specifications, the superintendent will determine whether the proper materials have been furnished, that the system is properly arranged to give direct and efficient service, and that the workmanship is up to the required standard. The superintendent should also see that the water-service pipe from the main into the building is well coated with R. I. W. paint as specified. This paint is to protect the pipe from the corrosive action of the moisture in the soil.

38. Tests.—As soon as the waste and vent pipes with their traps and connections are in position, and before any fixtures are attached, all openings must be closed. In lead pipes, the ends are merely pinched together and soldered, and the openings in iron pipes are closed by means of plugs, screw clamps, or some such device. After this, the system is tested by the water test, the entire system being filled with water and examined for leaks. All being found tight, the fixtures are set and the *smoke* or *peppermint test* is next applied.

At one time the peppermint test was very common, but it is not now used as extensively as formerly. This test consists in filling the traps with water and then pouring a quantity of oil of peppermint into the pipe where it extends above the roof. The peppermint is followed by a quantity of hot water, after which the roof opening is sealed and the inspection of the lines commenced. If the odor of peppermint is detected anywhere about the building, the plumber will have to search until the leak or leaks are located, and after making repairs or putting in a new length of pipe or a fitting, the same procedure has to be repeated, very often necessitating two or three tests before the work is found tight.

A simpler, and no doubt better, test is that of employing a testing machine in which smoke is the testing medium. Some such contrivance is to be found in every first-class plumber's shop, and is essentially a machine to blow smoke into the drainage system. Oily waste is used as fuel, which, on being ignited, emits a dense pungent smoke. This is pumped into the piping system through stout rubber hose. The presence of a leaky or imperfectly calked joint, a sand hole, or a crack in the pipes or fittings is very readily detected by the smoke issuing from it. In this way, the leak may be located at once, and the trouble of going over the entire system, depending on smell to locate the defect, is avoided. The value of this method of testing is very readily seen.

39. Gas-Fitting.—The plumber is required by the specification to furnish and pay for the tapping of the street main and the installation of the service pipe from the main to the meter inside of the wall; the gas company is to set the meter on a substantial shelf solidly supported. The plumber's work on the gas commences at the meter, on the outlet, or house, side of which a lead pipe with brass coupling is provided. He connects the house main with this coupling, and puts on a stop-cock as near the meter as practicable. There should also be a stop-cock on the inlet, or street, side of the meter.

The gas to be used in this building is for heating and cooking purposes only, and the superintendent should see that each branch has its stop-cock and that it is tagged to indicate the fixture controlled. These stop-cocks enable the plumber to shut off the gas from a fixture to be repaired without interfering with the use of the others. Gas piping is usually tested by plugging all openings and pumping air into the system until about 10 pounds pressure is indicated on the pressure gauge, which is temporarily connected to the piping. If the piping is well connected and sound, this pressure should be maintained for about 20 minutes. The superintendent should make certain that all piping is pitched to some low point where the water of condensation that collects in the pipes may be withdrawn, and that the piping between the meter and the main is thoroughly painted with R. I. W. paint as specified.

SUPERINTENDENCE OF HEATING WORK

40. Heating.—The building under consideration is to be heated by city steam, that is, the steam will be supplied from the steam-heating company's main in the street. The steam-heating company usually installs the piping from the main to a point just inside of the wall, but in this case the owner pays for this work and also for the installation by them of the gate valve. There will be placed on the house side of the gate valve a pressure-reducing valve and a pressure gauge. The main from this point with branches should be placed as shown on the plan, *Building Superintendence*, Part 1, and the superintendent should see that the pipes are pitched properly, that the hangers are of a neat substantial pattern and placed at frequent intervals, that the fittings are substantial and flawless, that no screw unions are employed, and that flange unions are used where the pipe is over 2 inches in diameter.

The pitch of returns, the relief of stacks at the base, and the plumbing of vertical lines should be carefully inspected. The placing of the steam trap and the cooling coil should be checked with the plan and specification, and the connection of this drain to the sewer should be made outside of the main drain trap. This method of delivering the water of condensation from the steam system is usually required by the Boards of Health of most cities, for, where the condensation is connected inside of the main drain trap at any point of the house sewer, the water, being sometimes at a high temperature in spite of the cooling coil, is liable to damage the cast-iron piping at the joints through contraction and expansion due to the great changes in the temperature of the water passing through.

41. Radiation.—The indirect radiation should be examined to see that it is substantially supported and that it is of the specified amount. The galvanized-iron boxes and ducts should have neat and substantial joints, and where the boxes are large, they should be reinforced with strap iron, the strap being hidden in the laps at the angles.

The direct radiation should be checked as to position, style, and footage, and where the floor is to be carpeted, a floor board on which to place the radiator should be provided.

42. Valves.—Steam and air valves should be examined to see that they are of the makes specified, and, in the case of steam valves, that they shut the steam off completely when seated and do not leak about the stem.

43. Pipe Covering.—Pipe covering should be neatly placed about the pipes and the joints made tight with asbestos cement. The covering is fastened in place with lacquered brass straps placed about 18 inches apart.

44. Testing the Heating System.—When the piping and radiation is all in place, the steam is turned on and a pressure of 2 pounds is obtained by adjusting the reducing valve. The radiators throughout the building are then examined and are all found hot, which shows that the circulation is good. The pressure is then increased to 10 pounds, and the system thoroughly examined at all points for leaks. This pressure should be maintained for at least $\frac{1}{2}$ hour. In case the circulation is found defective or leaks manifest themselves, the contractor is required by the specifications to make the changes necessary to correct these matters.

SUPERINTENDENCE OF ELECTRIC WIRING

45. Before the electric work is started the superintendent should procure a copy of the latest rules issued by the National Board of Fire Underwriters, called the "National Electrical Code," and make himself familiar with their requirements. This is very important, as the work in this instance, as well as in all first-class work, is to be done according to these rules, and a certificate must be obtained from the board when all is completed.

46. System of Lighting.—The system to be used in the wiring of this building is what is called the *three-wire system*. The contractor will run three wires from the main switch placed in the rear of the basement to the cut-out cabinet placed in the upper rear hall where marked in the plan. From this cabinet, the various circuits will be run in two wires with not more than twelve lamps on each circuit, as this is all that the Underwriters' rules allow.

47. Wire.—The makes of wire that are to be allowed are specified, and the superintendent should assure himself that one of the grades specified is used and that there is no wire smaller than No. 14 Brown & Sharpe gauge. Wire larger than No. 8 Brown & Sharpe gauge is specified to be stranded, as one wire of that size would be too stiff to handle.

No joints should be allowed in concealed wires, but if a joint is absolutely necessary, a junction box should be provided at that point so that the joint may be reached.

48. Switches.—The position and style of switches should be checked with requirements of the specifications, and they should be examined closely to see that they are set with plumb sides; a switch set inaccurately and close to door or window trim looks bad, as the discrepancy between the vertical lines of the one and the oblique lines of the other are apparent at once.

The finish of the face plates must match that of other hardware in the room, and where solid metal is used the position of the lights controlled are sometimes designated by engraving on the plate.

49. Conduits.—No conduit less than $\frac{5}{8}$ inch internal diameter should be allowed. The supports should be rigid and placed at frequent intervals and the conduit must be permanently grounded, so that if there is a short circuit the ground will provide a sure channel to the earth for the current until it is shut off.

Powdered soapstone should be blown into the pipe before the "fishing" is done, and every precaution should be taken to prevent the cutting of the interior enameled coating or the puncturing of the tubing. The joints are to be made with red lead, and the outlets should be securely corked until the "fishing" is begun, which is usually after the plastering is completed.

The boxes for outlets and switches must be securely placed, and each outlet box must have a spud to which the chandeliers or brackets can be screwed. (When gas is used, the fixtures are fastened to the gas outlets and these spuds may be omitted.) The inner ends of conduits at boxes should have metal bushings with rounded edge, which prevents the danger of the insulation stripping from the wires when fishing is being done. The superintendent should see that the conduit is kept well away from gas and other piping in order to avoid the danger of short-circuiting.

50. Cut-Out Cabinet.—The cut-out cabinet should be examined to see that its construction conforms to the Underwriters' rules and that each switch is tagged to indicate the circuit it controls. The main switch is placed in the basement where shown in the plan, and should be incased in a neat cabinet; both this cabinet and the cut-out cabinet should be lined with asbestos and fitted with lock and key.

The meter, which is to be furnished and set by the electric-light company, will be placed near the main switch.

51. Cutting.—The superintendent should see that all cutting of walls, joists, etc. is done in a careful manner, and, where he deems it necessary, should insist on such work being done by carpenters, masons, or bricklayers, as the case may require, and not by the electricians themselves.

52. Certificate.—As specified, the work is to be accepted by the owner on the presentation of a certificate obtained from the Underwriters' Association, which employs a superintendent to inspect work being done. Work done according to the rules of this Association will obtain much lower insurance rates than work not accepted by their superintendent.

The regular superintendent, however, should not assume that his attention is not necessary in this connection and trust to the Underwriters' representative; he should assure himself that all is being properly done as specified and according to the rules of the Underwriters' Association.

53. Lighting Fixtures.—As noted in the specification, the furnishing and setting of the lighting fixtures are to be done under a separate contract, and, except by special arrangement, the superintendent will have nothing to do with them or their erection.

54. Electric Bells.—The push buttons should be properly placed and should also match the other hardware. When completed, the superintendent should test the system and see that the annunciator drops are working properly and that the bells emit a clear, loud ring. The shelf for batteries should be of the required thickness, securely supported, and placed in an easily accessible position.

55. Speaking Tubes.—The speaking tubes should be inspected so as to be sure that they are well jointed, airtight, and securely fastened in place, and that the whistles are in good working order. These tubes should be located as specified, and the tubing should have a good coat of varnish.

SUPERINTENDENCE OF THE JOINERY

56. On the interior of the building, workmen have started to put in the door frames and other interior finishing woodwork. This work from now on, although not as important as the construction part, will require strict attention on the part of the superintendent to see that no poor material is used, that no bad work is covered before he has examined and passed on it, and also that all doors and standing trim are set plumb, all horizontal lines, such as wainscots, bases, etc., are set perfectly level, and that all joints are neatly made and closely fitted together. He should visit the shop where the doors and other interior woodwork are being made, so as to satisfy himself that the proper amount of care and attention is given to minor details, such as building of cores for veneered doors, gluing up, wedging, mortising, etc.

EXAMINATION OF STOCK

57. The stock should be examined for defects, such as sap, knots, etc., and any piece found that does not conform to the requirements should be condemned at once. In regard to the dryness of the stock, if it does not appear to be thoroughly seasoned, and seems to contain more moisture than it should—that is, 10 per cent. by weight—the superintendent should select a few samples about 6 inches long, cut from the center of the board or molding, and proceed to test them. Each piece should be carefully weighed on any convenient scales, and the exact weight marked on each sample. After drying them in an oven for 3 or 4 hours, they should be immediately weighed on the same scales before any moisture can be absorbed from the atmosphere, and the difference in weight noted. The percentage of moisture may then be found by dividing the difference between the two weights found by the weight of the material when dry. Thus, if a sample weighs 66 ounces at first and 60 ounces after being dried, the percentage of moisture contained in the sample before drying would then be $(66 - 60) \div 60 = 10$ per cent. Wood containing this amount of moisture or less would be accepted, provided, of course, it were up to the requirements in other respects. A percentage greater than 10, however, would be sufficient cause for condemning it, although it might be otherwise perfect.

Although, in general practice, the specifications simply state that the wood for interior trim shall be kiln dried, it does not necessarily follow that the wood is thoroughly dry when erected in the building; for it is a well-known fact that kiln-dried wood will absorb atmospheric moisture rapidly if exposed to the weather or stored in a damp place, thereby defeating the object to be attained by placing it in a kiln, the wood returning to a condition very little better than ordinary yard stock.

Rough framing lumber, however, or even finishing lumber, to be used on the exterior of the building or where it is not likely to dry out rapidly, may be considered sufficiently seasoned when it contains as much as 15 per cent. of moisture. From the foregoing remarks, it may be readily concluded that the best method of specifying finishing lumber is that of applying the weight test to determine the amount of moisture contained.

INSPECTING THE WORK

58. At this time, the superintendent should again read the specifications through, and if any work has been neglected or condemned work left standing, either unaltered or repaired, he should make a note of each and have them attended to before the time arrives for painting or otherwise finishing the interior. He should also compare all work with the detail drawings as it is erected or set in place, and allow no bad work to become too far advanced to be readily altered or taken down and replaced. He should see that the false jambs for doors are blocked away from the stud framing, and that suitable blocks, sized for the position, and not chips, are used; that the jambs are set plumb, in alinement with the partition, and that the head-casing is perfectly level. He should also check the size of the opening to assure himself that a door of the proper size may be put in as required by the drawings. It is best to check the size of the finished openings at this stage of the work, for if a mistake is not discovered until later, the trim may have to be removed to remedy the fault.

59. Doors.—Unless shown in the plans, the swing of the doors should be determined, and even if they are shown, the workmen cannot always be depended on to set them in the right way. The superintendent should see that the doors are hung on the proper edge of the jamb, so that when hung and swung open they will not strike against a gas bracket or open across a hallway or into a closet. In general, doors should be so hung as to swing into the rooms and not out into halls or corridors, except, perhaps, outside doors. In the case of bedrooms, the door should be hung so that the bed is not visible when the door is partly open. The same principle should be borne in mind in hanging bathroom doors. Closet doors should be hung to swing into the room, and in a manner to reflect the light from the inner side of the door into the closet, or else so that the light from the windows may shine directly into the closet.

60. Finish of Surface.—Another part of the work that is sure to be carelessly done or neglected altogether is that of smoothing down the interior woodwork. This applies mainly to bases, trim, etc., as the shop-made work, such as doors, sash, wainscoting, etc., is generally smoothed off before being put together or at least before leaving the shop.

Raised grain, planer marks, and soiled spots or finger marks from handling, are the most common causes that require the work to be smoothed or sandpapered. Moldings with small members should be smoothed with sandpaper, while a smoothing plane should be used on flat surfaces and this followed by sandpaper. It is often best, especially when the harder woods are smoothed down, to use a steel scraper or glass for the purpose; especially is this done where a shaggy knot or curly grain is encountered that may be injured, even by the finest set smoothing plane.

61. Molding and Trim.—The price of molding and interior trim varies according to the size, and when other than stock molding is required, an additional price to that of the molding itself will be charged for the labor of making a new knife and changing the cutters in the machine. Such moldings or trim are termed *special*, and add materially to the cost of the building, especially if a great variety is used. In ordinary low-cost dwellings, special moldings and trim are seldom used. The most common forms of moldings that are recognized by architects and builders as stock moldings are shown in Fig. 20, and are named as follows: (*a*) represents ogee crown moldings; (*b*), coves; (*c*), base moldings for columns etc.; (*d*), bed, or stop, moldings; (*e*), raised panel moldings; (*f*), flush panel moldings; (*g*), band moldings, sometimes used as base moldings; (*h*), astragal; (*i*), quarter

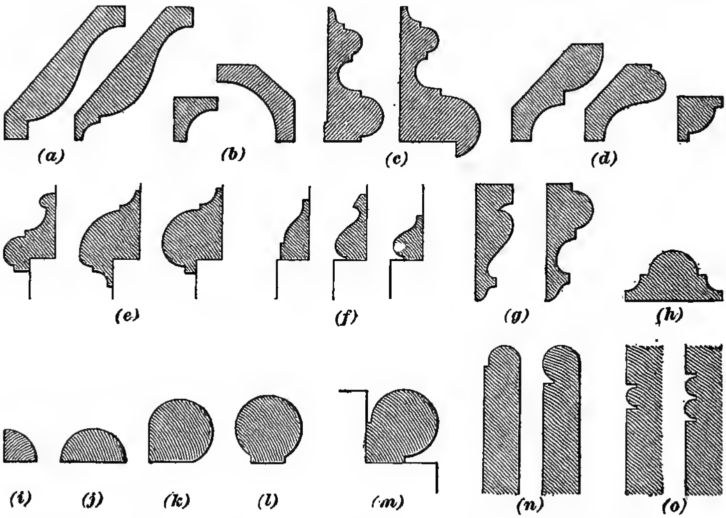


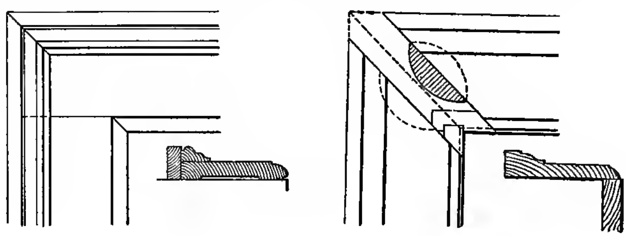
Fig. 20

round; (*j*), half round; (*k*), three-quarter round; (*l*), full round; (*m*), three-quarter bead; (*n*), bead; (*o*), single- and double-center beds. Other stock molds may be obtained, but those shown in the figure are most common.

The superintendent should see that the moldings of trim, etc. conform to the full-size details and that joints in same are well made.

62. Finished Size of Material.—The superintendent should know the finished size of material, that is, the size after being run through the planer. This applies principally to moldings, as the piece from which the moldings are made loses $\frac{1}{8}$ inch in dressing both sides and $\frac{1}{16}$ inch more when run through the molding machine; a stock 1-inch molding, therefore, will measure only $\frac{13}{16}$ inch. The same may be said of finished boards or trim, as they are reduced in size in the planer, but are charged for as though of full dimensions. Boards or plank surfaced on one side will measure $\frac{1}{16}$ inch less, and when surfaced on both sides $\frac{1}{8}$ inch less than the sizes charged for.

63. Standing Trim.—The next work to be done after the jambs are set is that of putting in the *standing trim*, or finish, which consists of baseboards, wainscoting, architraves, etc. The superintendent should see that the baseboards and other trim have been painted on the back before they are set in position, to conform to the requirements of the specification, and, in setting them, see that no bad joints are made, no moldings spliced, except on long horizontal runs, and



(a) (b)

FIG. 21

that as few nails as possible are used on exposed surfaces of woodwork that are to have natural finish.

In jointing the corners of back-band molded architraves, as specified for part of this building, and the mitered architraves, the work should be inspected to see that it is properly done. In Fig. 21 (*a*) is shown the proper way to joint a back-band trim of that particular form. The fillet mold should be mitered, the flat or fascia section butt-jointed, and the back band mitered. For a mitered trim, a hardwood tongue, or spline, should be inserted as shown at (*b*), the grain of the spline running at right angles to the miter cut. The groove for the spline is cut in the shop or mill with a circular saw. A joint made in this way, if the wood is reasonably dry, will hold together well. Long, mitered joints, sometimes used in trimming around doors and windows, should be avoided as much as possible, as it is difficult to prevent the opening of the joint due to shrinkage of the material.

64. Stairs.—While the standing trim is being set in place, and before the wainscot is put in, the work on the stairs should be under way.

In general practice at the present day, the stairs are usually figured out for rise, tread, run, and headroom in the drafting room and drawn accurately on the plans, and this preliminary layout is generally supplemented by detail drawings. Stair building has become a distinct trade, and very few carpenters, except those in out-of-the-way places, build their own stairs, as the work can be done cheaper and better by men who make a specialty of that work. Mistakes or poor workmanship, however, are always possible, and this work will have to be looked after by the superintendent with as much care and attention as any other. Very often an error is made in the framing of the well, the trimmer possibly being put in 6 inches or a foot out of place. This slight difference in the location of the trimmer may reduce the headroom to such an extent that a tall person will strike his head against the ceiling at this point.

To remedy a mistake of this kind will require much extra work and cause considerable delay. The trimmer may have to be cut out, the flooring removed across the building, and a new trimmer, as well as a header, put in. When the trouble cannot be easily remedied, the architect may have to modify the design of the stairs, and his ingenuity will be taxed to the utmost to fit the work to the new condition. Counting from the head of the flight, thirteen risers will usually give sufficient headroom.

It is often necessary, especially in long flights, to reinforce the stringers with "carriage timbers," and these, with the other timber framing of platforms and landings, should be well framed and spiked together.

Winders in stairs are at best simply a makeshift arrangement and should be avoided whenever possible. Of course, in order to reach the floor above by an easy ascent, stairs are often built in a position that necessitates the use of winders. In such cases, the winder treads on the line of travel should be the same width as the regular treads.

65. Stair Measurements.—The stair builder should verify all measurements at the building, the distance from floor to floor especially, as the heights of ceilings seldom measure exactly what they are figured on the drawings, varying from 1 to 2 inches either way. The stair builder measures off this height on a rod and divides it into spaces corresponding in number with the risers in the staircase. If the measurements given on the drawing for the height of stories is trusted, and the stringers cut to fit the height thus taken, a stairway resembling those shown in Fig. 22 may result.

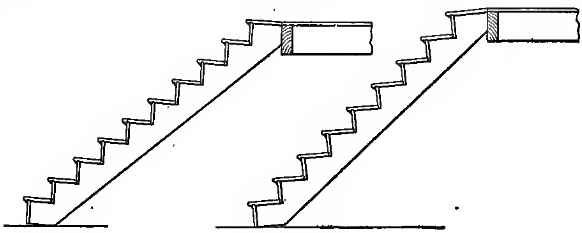


FIG. 22

Another important point in laying out stairs is that of having all risers of a uniform height, for any change in height, although not apparent to the eye, will be discovered by traveling up or down. For instance, take a staircase having two runs, or flights, with a platform between, in which the risers of the upper run are $\frac{1}{2}$ inch higher than those below. Now a person in ascending this staircase rapidly, will be checked, as it were, as soon as the higher risers are reached, and will be likely to trip.

The stairway to be built in this case is as already shown by the drawings in *Building Superintendence*, Part 1, and the finished work is illustrated by the photographic reproduction in Fig. 23.

66. Points to be Observed in Stair Building.—Special attention should be given to the wedging of the treads

Fig. 23

and risers, as well as their mortising and tenoning, where they are housed into the stringers. By doing this work carefully, and using stock that is of the best quality and properly seasoned, the stairway should hold for years and be entirely free from any crunching of the treads. The dovetailing of the balusters should also be watched to see that the cut runs through the tread and is not merely let into it, and also that the baluster fits the cut snugly and is nailed in place to prevent its becoming loose. The newel posts and rails should be carefully set, and care should be taken to have the newels plumb and square with the stringer or set at the proper angle as required by the drawings. It should be seen that the balusters are made according to the detail drawings, and that the rails, where they are jointed to ramps or easements, are well fitted, bolted together, and matched in color. Any piece of rail not *out of wind* should be condemned. As soon as the staircases are built and the newels, rails, and balusters are set, they must be protected from paint, plaster, etc. until the painter is ready to apply the stain, varnish filler, or paint, as the case may be.

Building paper the full width of the stair should be laid over treads and risers from floor to floor to protect them, being secured in place with laths or light boards. Pieces of this paper or cloths should also be used to protect the rails and newels.

67. Preparing for Tiling.—The specifications require that the carpenter shall make preparation for the floor and wall tiling in the north bathroom on the second floor and for the tiling of the vestibule floor. This does not properly come under the head of joinery, but, as the work is to be done by the mantel contractor, its superintendence should be considered at this stage of the work. When the interior finish is being set in place and after the rough part of the plumbing work has been set up, the mason should prepare the cement bed for the floor tile and the backing for the wainscot. The tiling specifications require that the bed for the floor tile shall be laid by the mason with cement concrete and finished to a point $\frac{3}{4}$ inch below the level of the finished floor, and leveled up with Portland-cement mortar. The first coat of mortar for the plaster backing in the side walls is made the same as the scratch coat for outside plastering. The second, or finishing, coat, which should be brought up flush with the grounds, is the same as the second coat for outside plastering. All these surfaces must be leveled up and brought to a smooth uniform surface. This work completed, the tiler's work may start.

68. Tiling.—The carpenter prepares the floors by first nailing cleats along the sides of the floor joists and laying on these cleats, between the joists, a flooring of matched boards; over the boards, one course of brick is laid in good cement mortar, or, instead of brick, ash, concrete is used. The joists are to be chamfered to an edge on top. (See Fig. 4.) The tile is to be set in cement mortar.

The superintendent's inspection of this work will be a comparatively easy matter. His attention should be directed mainly to see that the preparation for the tiling is properly done, that the quality and kind of materials are furnished and set as required by the specifications, that the wainscot comes on a line with the plaster above, and that the joints are of a uniform width.

69. Finished Floors.—Before the upper floor is laid, the superintendent should see that the rough floors throughout the building are cleared of all rubbish and swept clean. The rough floor should then be repaired and patched around all plumbing pipe lines or elsewhere until no openings in the flooring appear anywhere. A layer of building paper with a lap of at least 3 inches is then laid over the entire first floor, except the kitchen, kitchen pantry, servants' dining room, butler's pantry, etc., and the finished floors are laid over this. The paper is used as an insulation against cold and dust.

The specifications require that all joints are to be made over bearings and shall break in every course. The boards around all hearths, registers, etc. are to miter on the corners, and are to be rabbeted or tongued to fit the flooring. The carpenter is to lay two thicknesses of waterproof felt paper over all floors as soon as they are planed down and smoothed, as a protection when plastering, etc., and should be held responsible for the care of all floors, including the parquetry, until the painter starts the work of finishing them.

The superintendent should see that all the flooring stock is uniform in quality and up to the requirements of the specifications and that neat joints are made. For finished,

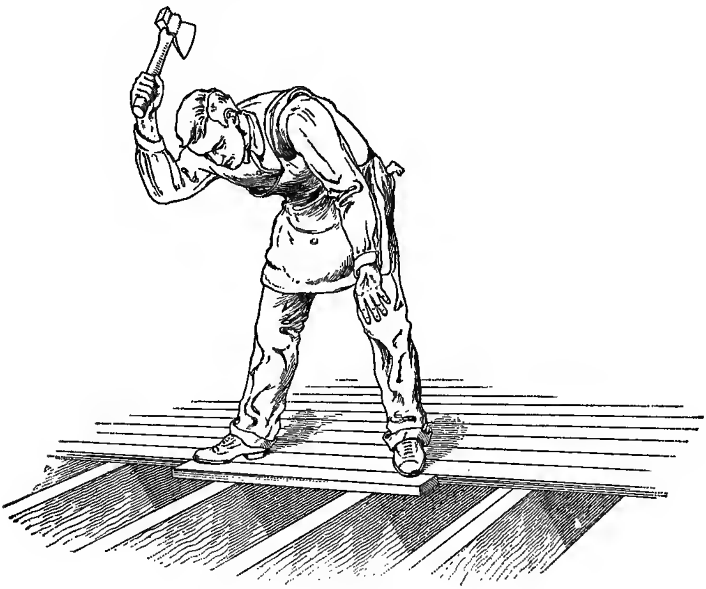


FIG. 24

or upper, floors, a piece of wood somewhat thicker than the flooring, as shown in Fig. 24, should be used for driving up the boards, so that the edges will not be injured. Nails should not be driven home with a hammer, but with a nail set. If a floor board cannot be driven up easily, it should not be used at all; for, in driving, the tongue or groove may become split and perhaps break off at some future time.

70. Built-In Furnishings.—As scale and full-size detail drawings are furnished for pantry cupboards, seats, bookcases, and all such furnishings of the various rooms, the work of the superintendent will be greatly simplified, and his attention need only be confined to the proper execution and erection of the work and to seeing that the drawings have been carefully followed.

The drip boards for the pantry and kitchen sinks should be grooved for the purpose of draining, and these boards should be set at a slight pitch toward the sink. The pipe boards previously mentioned should be neatly fitted against other woodwork and against floors, ceilings, etc., and secured in place with brass or electroplated screws. The wainscoting in the third-floor bathroom and the kitchen is of matched and V'd boards, and the superintendent should see that this wainscoting is well driven up and fitted with a cap as shown in the full-sized detail.

71. Windows.—The window sash should be looked over carefully to see that they run smoothly and are properly balanced, and the superintendent should also check the dimensions of the different members of the sash and frame to assure himself that they correspond with the specifications and full-sized details. The glass is to be furnished by the owner, but the superintendent should go over each light, so as to be certain that it is without flaws, bubbles, or cracks.

72. Other Appurtenances.—A clothes chute is provided, extending from the rear hall on the second floor to the kitchen pantry on the first floor and to the laundry in the basement, tight-fitting doors being provided at each end to prevent odors escaping from the contents.

The mantels and seats are set in place by the carpenter contractor, and the fitting of this work to that already in position so that they agree with details is all that the superintendent will be required to look after.

The setting of the bookcases should be watched to see that they are properly constructed according to details, well fitted to the wall, and that the shelves are set level and the doors properly glazed and hung.

Fig. 25

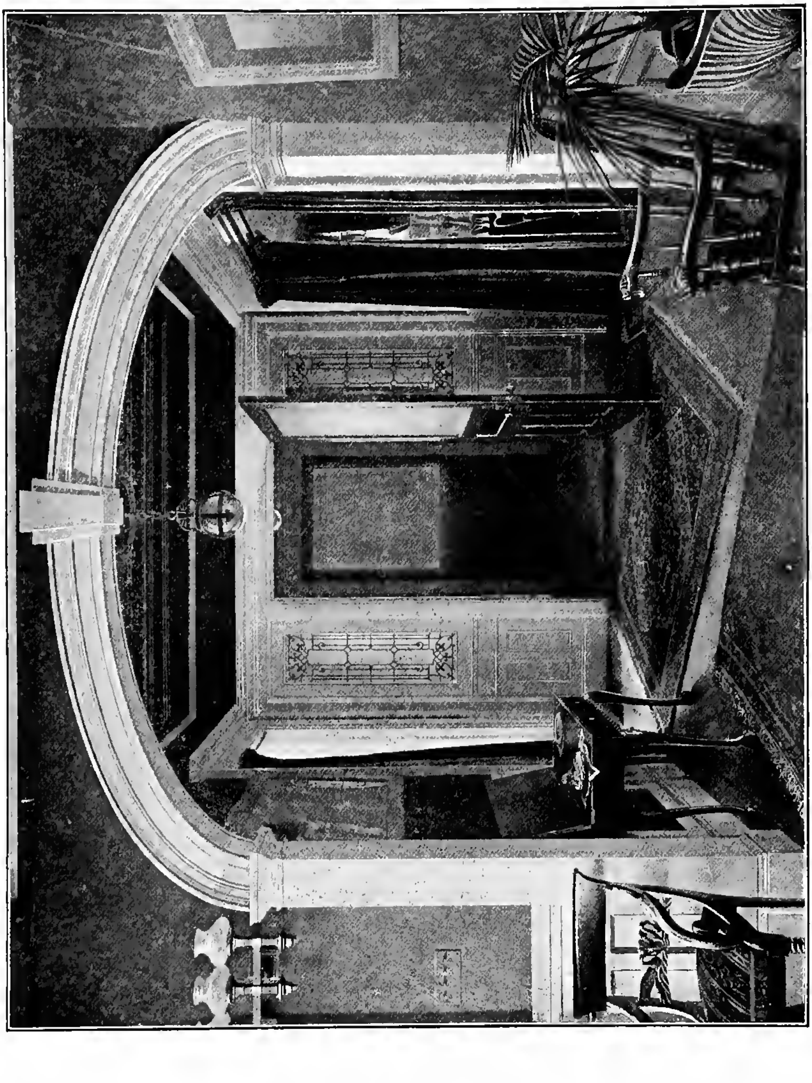


FIG 26

Fig. 27

Fig. 28

The placing of picture moldings should be looked after to see that they are perfectly level, and instead of trusting to the eye they should be tested by measuring from the floor.

The superintendent should go over the work carefully and assure himself that all the small details of construction or finish in and about the buildings have been attended to, examining each room in turn. Among other things, he should see that all doors are properly fitted and hung, and that all woodwork required by the electricians to protect or cover their work is set in position; also, that all doors throughout are provided with bumpers, either screwed to the floor or baseboard, as he may direct. These bumpers are to be supplied by the owner and applied by the contractor. Figs. 25, 26, 27, and 28 show photographic reproductions of the rear stairway, the archway in the lower hall, and the bays of the living room and dining room, respectively.

HARDWARE

73. Quality of Hardware.—As the hardware manufactured by different concerns varies greatly in quality, while the names of the parts are the same, it is always best to specify the locks and other hardware of some manufacturer, giving his name and the catalog name and number of the article, unless provision is made in the specifications stipulating that the contractor shall allow a certain amount for the finishing hardware, in which event the architect or owner may select the style of hardware desired; or, the hardware may be furnished by the owner and applied by the contractor, as is the case in this building. If either of these methods is adopted, mistakes will be avoided and a uniform grade of goods obtained.

If the specifications in this instance called for the hardware of one manufacturer with the catalog name and number given, the superintendent would only see that the hardware specified is furnished, and this he may easily determine by providing himself with the catalog or by a personal inspection of the goods at the manufacturer's warerooms. In addition to this, he should see that all hardware of the finish specified for the several rooms is furnished. The locks on all principal doors should be placed at a uniform distance from the floor to the center of the hub, or spindle. This distance varies from 2 feet 9 inches to 3 feet, according to custom and the height of lock rail or panel above the floor.

He should see that the face and striking plates are neatly cut into the door and jambs, that all butts are set in flush with door and jambs, and are leveled up as nearly as possible with panels top and bottom, and that the door is hung to swing clear of the architrave or plinth blocks. He should also see that all windows are provided with sash locks, lifts, etc.; that all cupboard, closet, and wardrobe doors are provided with the requisite locks, butts, etc.; that all drawers, etc. are provided with pulls; that all annunciators, bells, push buttons, and speaking-tube plates, etc. furnished by the electrician are properly located in the places designated; and that all closets, cupboards, wardrobes, etc. are provided with suitable hooks; and that all the hardware throughout is put on with screws to match.

74. Rough Hardware.—Usually, the first hardware to be applied is that for the windows, and it consists of weights, sash pulleys, and cord. The sash pulleys are often put on the window frames at the factory, and generally so with stock frames, but in the best work they are put on at the building. They must be weighed before being hung, and the size of the weights should be proportioned as follows: the weight of the two for the upper sash combined should exceed the weight of the sash by about $\frac{1}{2}$ pound, and those for the lower sash should weigh about $\frac{1}{2}$ pound less than the sash. The other finishing hardware is applied after the first coats and before the last coat of paint or varnish is laid.

75. Finished Hardware.—The superintendent should bear in mind that the maker's name on a piece of hardware is not always sufficient, as most manufacturers make several grades of the same pattern, and, unless he is qualified to distinguish between them, he may be imposed on. Another point to look after is that of the hardware finish. He should be able to distinguish between lacquered or plated hardware and the solid metal. Scratching a piece of hardware on the back with a penknife or a file is usually sufficient to discover whether it is lacquered or plated. The weight and color also will help to a certain extent; for example, a solid bronze door knob should be quite heavy, but a spun metal one would be very much lighter.

After all the hardware has been put on, the superintendent should go over the entire building and satisfy himself that all the doors swing properly, that they fit the jambs tightly, without binding, and that all sashes, drawers, cupboard doors, etc. work freely. Being satisfied that everything is in good working order, and that no planing of doors, adjusting of window stops, or such work is necessary, the painter is allowed to proceed with his work. Some architects specify that the locks, sash lifts, drawer pulls, etc. are to be fitted by the carpenter, then removed, and, after the painter has finished all but the last coat, again put in place; this is to avoid the smearing or discoloring of the hardware by the painter.

SUPERINTENDENCE OF THE PAINTING

EXTERIOR MATERIALS AND WORKMANSHIP

76. Preparation.—The superintendent should see that the woodwork is in proper condition before any painting is allowed to be done. The surfaces should be smooth, free from frost, moisture, dust, or dirt, and all knots should be thoroughly shellacked. After the priming coat is on and before the second coat is applied, all nail holes, small cracks, etc. must be puttied, care being exercised to color the putty to match the paint.

Any ironwork that is to be painted must be thoroughly cleaned of rust, scale, etc. before any paint is applied; and tin roofs, if greasy, should be washed with soap and water before painting.

77. Materials.—The various materials that go to make up the paints, varnishes, stains, etc. used in this work are to be the best of their various kinds, and every precaution should be taken to insure that only the best is used. If there is any doubt as to the purity of the white lead or linseed oil to be used, they should be submitted to some reputable chemist for analysis. The color and odor may ordinarily be a good test for linseed oil, the superintendent comparing the contents of a sample vial of pure oil that he carries in his pocket with some of the oil at the building. By pouring the latter into a similar vial carried for the purpose, he may then easily and accurately compare the odor and color of the two. The usual adulterants are petroleum, cottonseed, rosin, and fish oils.

No reducers, except turpentine and linseed oil, should be allowed to be used on the job. Turpentine is sometimes adulterated with kerosene, headlight, or other petroleum oils. Turpentine containing such oils will leave a greasy stain on white paper, and a drop on a watch crystal will reflect prismatic colors in the direct rays of the sun. Putty that contains any other oil than linseed oil should not be allowed on the work, as this is a common cause for spots over nail heads.

The superintendent should be very careful to see that varnishes, stains, and enamels are used without reducing if so required by directions on labels; or, if allowed, then only in proper proportion. All varnish should be brought to the building in sealed cans, and this should be insisted on and carefully watched. If the superintendent finds the varnish delivered in this condition, he then simply assures himself that the printed directions on the packages are carried out. Probably he can best attain his purpose by examining the materials from time to time and assuring himself that the painter has no oil other than linseed oil, and that this is pure. Besides this, the painter should have on the job only turpentine, a small amount of grain alcohol (not wood alcohol) for shellacs, and the necessary color pigments, white lead, zinc white, brushes, etc. Fish oil, kerosene, gasoline, wood alcohol, or unspecified brands of material should not be allowed on the premises.

78. Priming.—When all the woodwork is found in proper condition, the priming may be done. For the greater part of the work, the priming is done from time to time when the woodwork is ready, some of it before the work leaves the shop. Window frames, columns, balusters, sash, etc. should be primed in this way.

In order that the priming coat may soak in well and serve as a good filler, it should not be too thick. After the priming is all done and before the second coat is applied, the work should be carefully puttied so as to prepare it for the next coat. The superintendent should not hesitate to condemn any primed work sent from the shop that was not properly surfaced before being painted.

79. Workmanship.—The painter should follow the grain of the wood in making the brush strokes, and should work carefully into quirks and corners. Brush marks accurately parallel with the grain and the length of the piece of wood add greatly to the appearance of the work when finished. The smoothness of the paint surface is greatly dependent on the cleanness of the surface before the paint is applied, and the superintendent should see that the painters brush off the surface before applying each coat.

The blistering of paint is caused in a number of ways; probably the most common cause is pitch in the wood, although painting on a frosty or damp surface will have a similar effect. In stormy, foggy, or frosty weather, the superintendent should watch this matter carefully. Too much oil will also have a tendency to cause blisters; too little oil will cause the paint to powder when dry. Varnish mixed with the paint will give a glossy surface; so also will boiled linseed oil. Each coat should be permitted to dry thoroughly before the following coat is put on.

INTERIOR MATERIAL AND WORKMANSHIP

80. Preparation.—The preparation of the woodwork for interior painting is governed by the same considerations as for exterior work.

81. Staining.—As specified, the painter is to stain the dens, dining room, and billiard room to match the samples submitted. These samples are handed over to the superintendent, and he sees that the stains correspond.

82. Varnishing.—The rooms that are finished natural and those that are stained have a certain number of varnish coats. The superintendent should see that the required number is applied, and, where they are to be rubbed down, that this is thoroughly and evenly done. Provision should also be made to keep dust from raising in the rooms while the varnishing is in process, and the temperature should be maintained in the neighborhood of 70°; too low a temperature will retard the flow of the varnish and necessitate thinning it, while too high a temperature will cause it to flow too freely.

83. Paints and Enamels.—The paint surfaces should be examined to see that the brushing is neatly done and that the specified number of coats is applied. Where enamel is used, the coat directly under the enamel coats should be of zinc white and white lead, as an all white-lead coat is liable to color the white enamel yellow. The rubbing specified for enamel coats is for the purpose of removing the gloss and obtaining a dull surface. As the painter is likely to do this work carelessly, leaving some spots only partly rubbed, the superintendent should take care that it is done evenly. No pumice stone and water should be used except on the last coat, as the powdered pumice will mix with the varnish or enamel of the following coat and impair its smoothness.

84. Floors.—The oak floors are to have a coat of paste filler followed by two coats of floor varnish. Two coats of wax are then applied, which must be well rubbed with a weighted brush or cloth. Care should be taken to have the floor perfectly clean before the filler is put on.

85. Painting of Walls.—The plaster walls in the vestibule and in several of the rooms are to be painted, and the superintendent must see that they are properly sized after the first coat of paint is applied. This size should contain some ingredients that will prevent it from spoiling, carbolic acid and cloves being used for that purpose. If it is possible to avoid doing so, plaster walls should not be painted until they are thoroughly dried and all shrinkage that may take place in timbers has occurred. The size used in this case is only for a filler, and two coats of paint might be substituted.

86. Mantels and Radiators.—The woodwork of mantels is specially finished as specified, that in the living room being stained a dark mahogany, while that in the stair hall is to be finished in imitation of bronze. The architect is to give special directions for this work.

The radiators and steam mains are specified to be painted one coat of red lead followed by two coats of aluminum or gold bronze, as directed.

87. Glazing.—The glazing of sash, etc., if to be done at the building, is usually included in the painter's contract. Such is the case in this instance, the carpenter delivering the sash at the building and placing them in a convenient position; he also marks the location in the building on each sash, so that the painter may easily distinguish which ones are to have plain sheet glass, which plate glass, and which leaded or other metallic set glass. For glass having wooden stops instead of putty, however, the painter will furnish the carpenter with the glass, and the carpenter is to place the glass and put on the stops. The leaded-glass sash are to be sent to the leaded-glass manufacturer and returned by him with the glass set in place, all at the expense of the general contractor.

The plate glass should be examined for bubbles and flaws, and the common glass for excessive distortion, bubbles, and flaws. The common glass, owing to its method of manufacture, will slightly distort objects viewed through it, but should not do so to a noticeable extent. The leaded glass should be examined for the same general defects and for broken lights.

CONCLUSION

88. Grading and Terracing.—The "spoil banks" that were reserved for use in final grading are now drawn on. As the stakes indicate the grades and levels, a diagram being furnished by the surveyor, no important problems are likely to arise in this work. The superintendent should allow as little clay as possible to be used, and after the various levels and terrace slopes have been laid out, the earth tamped down, etc., should see that the top soil is spread out uniformly in the required thickness and brought to a smooth surface, tamped down, and raked over to receive the sodding.

The finishing touches are being given to the building by the painter and the work generally is about completed. The superintendent should make a final tour of all the work and make notes of any defective painting, stains on masonry, unfinished work, or in fact any small details that may be readily fixed up, and see that they are remedied. As nothing further is to be done on the premises by the superintendent after he has attended to all the foregoing small details, his duties may be considered at an end.

89. The specifications used in the erection of the building considered in this Section and *Building Superintendence*, Part 1, are given in *Building Superintendence*, Part 3, the General Drawings that accompanied the specifications being found in Part 1.

BUILDING SUPERINTENDENCE

(PART 3)

SPECIFICATIONS

1. Introduction.—The following specifications were used in connection with the erection of the building illustrated in Figs. 2, 3, 4, and 5, *Building Superintendence*, Part 1, and shown on the general drawings of that Section.

The signatures of the owner and the contractor appearing on the last sheets of these specifications are for the purpose of identifying them as the documents mentioned in the contracts. The addenda appearing at the end of the general specifications—that is, the specifications for excavation, masonwork, and carpentry—describe changes and additions to material that the owner considered desirable after the specifications had been written, but before the contract had been made.

It will be noted that the work and material is described under seven specifications, each of which would call for a separate contract. Sometimes, it is all described in one specification and covered by one contract; this is the more expensive method but is considered to be the better as there is one head to the work and therefore no opportunity for the dividing or shifting of responsibility by one contractor on another, as is often done where there are many separate contracts.

The trade articles mentioned in these specifications are those that were used for this particular building, and it should not be inferred that they are better than many other equally good articles now on the markei.

TITLE PAGE

No. 500.
W. No. 1,946.

SPECIFICATIONS

of material and workmanship for the Excavation, Masonwork, and Carpenter Work for a residence to be erected in Flatbush, Pa., for J. R. Retsof, Esq., owner.

Prepared by

JOHN W. SCOTT, Architect,
812 Franklin Street,
Scranton, Pa.

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This work to be carried out in conformity with the accompanying drawings and under the superintendence of the Architect or his Representative.

The specifications are usually folded twice in such a way that a title printed on the back of the last sheet or cover comes in the center of the last fold, thus enabling the subject of the specification to be learned without unfolding it.

INDEX OF ARTICLES

78. Stairs and mantels
79. Hardware
80. Painting, glass, and glazing
81. Lower-hall closets
82. Kitchen cabinet
83. Butler's pantry
84. Kitchen pantry
85. Bedroom closets
86. Linen room
87. Stair-hall closet
88. Dens and billiard rooms
89. Storeroom in attic
90. Outside shutters
91. Basement walls
92. Cross-furring
93. Pockets in floors
94. Leaded glass
95. Wainscoting

GENERAL CONDITIONS

INSTRUCTION TO BIDDERS

2. The work on this building will be under separate contracts as follows:

General contract . . .	Excavation Masonwork Carpenter work
Painting	Painting and varnishing
Plastering	Plastering and cement work
Heating	Steam piping, radiators, etc.
Plumbing	Plumbing complete
Sheet metal	Tinning, sheet-copper leaders, etc.
Electrical work . . .	Electric wiring and bellwork.

All specialties, materials, or apparatus specified are selected as best adapted to their respective requirements; should any bidder wish to suggest any changes, he must state them in his proposal with proper reasons for such suggested changes. No alterations from materials, etc. specified will be allowed after the contract is let.

THE ARCHITECT AND THE CONTRACTOR

3. Access.—The contractor shall furnish suitable and safe means of access for the superintendent or architect to all parts of the work.

4. Boiler, Etc.—The location of any hoisting apparatus, fire-pot, boiler, etc. shall be approved by the architect.

5. Improper Work.—Any work or material not in conformity with the drawings and specifications must be removed, at the expense of the contractor, upon a written order from the architect or his superintendent, and made to conform to the drawings and specifications.

6. Disputes.—In disputes between contractors, or between contractors and owner, the architect is to be the arbitrator, and his decision shall be final in the matter.

7. Rubbish.—The architect shall have power to order the removal of rubbish that may accumulate from time to time, if he considers its removal necessary.

8. Samples.—Samples of all materials and specimens of finish proposed to be used in the work must be submitted to the architect, and his approval obtained in writing. Only materials equal to such approved samples shall be used in the building.

9. Tests.—Any test of cement, stone, steel, or other material desired by the architect must be made under his direction, at the contractor's expense.

10. Extra Work.—No extra work shall be paid for except upon the production of a written order from the owner, authorizing the same. The owner will not be liable for any extra work not ordered in this way.

11. Subbidders.—The general contractor and other contractors must submit to the architect a list of their subbidders, and only such as are approved in writing by the architect shall be permitted to do any contract work on the building. The general contractor will be held responsible for all the work of the subcontractors under him.

12. Schedule.—A schedule of the quantities and prices on which the contract is based shall be furnished by the contractor for the use of the architect in making out certificates.

13. Statements.—Statements showing in detail the amount of work and material furnished by the contractor for the proper period must be submitted when applications for certificates are made. The architect will issue certificates for all payments on the works, and no payment shall be made until certificate for same has been issued.

14. Settlement.—The contractor, when the work is completed, shall notify the architect that he is ready for a settlement, so that the architect, owner, or others interested may make any statements they wish or submit any bills before the architect issues his final certificate.

THE CONTRACTOR AND THE LAW

15. Laws.—All work on this building must be done in accordance with the requirements of the building, sanitary, and other laws in force in the locality in which the building is to be erected, and such laws are hereby made a part of this specification, the same as if written in full herein.

16. Permits.—The contractor must give to the proper authorities all requisite notices relative to work in his charge, and he must obtain and pay for all permits, licenses, etc., that may be required by the law and gas, water, or lighting corporations.

17. Damage, Etc.—The general contractor shall maintain all necessary guards, railings, watchmen, lights, etc., and shall build temporary sidewalks, roofed passages, etc., that may be required to protect the public.

Each contractor will be responsible for loss of life, damage to adjoining property or to the work of other contractors, caused by himself or his agents, and will also be responsible for the loss of any of his tools or apparatus.

THE CONTRACTOR AND THE OWNER

18. Proposals.—Proposals should be submitted on blank forms furnished by the architect, and the architect or owner reserves the right to reject any or all bids.

19. Defects.—The contractor will be responsible for, and must make good at his own expense, any defects, settlements, damages, or injury to the work, arising from improper work or material, which may appear within 1 year after the work is accepted.

20. Certificates.—Any certificate issued, money paid, or occupancy of the building by the owner will not imply the acceptance of work or materials not according to the drawings or specifications, and any such improper work must be replaced within the time of the guarantee mentioned.

21. Insurance.—The owner will insure all work paid for by him against damage caused by fire; but all work unpaid for, together with contractor's tools, scaffolding, materials, etc. in the building, shall be entirely at the contractor's risk.

THE CONTRACT, DRAWINGS, AND SPECIFICATIONS, AND THE CONTRACTOR AND ARCHITECT

22. Checking.—The general contractor shall verify all lines, levels, and dimensions shown on survey or on the drawings, and will be held responsible for the correctness of the setting out of the work. He will follow dimensions rather than the scale.

23. Drawings and Specifications.—The drawings and specifications are to be considered as cooperative, and any work shown on the drawings but not described in the specifications, or vice versa, or any work obviously necessary to complete the work within the limits of the drawings and specifications, is to be considered as part of the contract, and is to be executed without extra charge in the same manner as the balance of the work. The figured dimensions shall always be taken in preference to the scale.

24. Return of Drawings.—The drawings and specifications are the property of the architect, and are to be returned to him on the completion of the building; but necessary copies may be obtained by the contractor at any time for legal or similar purposes in connection with this building.

25. Details.—Detail drawings will be furnished by the architect for all work for which such drawings may be necessary. The contractor must apply for such drawings at least 2 weeks before they will be needed. Any work that the contractor may do without these details will be done at his risk, and if not according to the intention of the architect, must be removed.

26. Changing Details.—If any of the detail drawings show more expensive work than that indicated on the drawings on which the bids were made or described in the specifications, the contractor must give the architect notice to correct them. If the contractor does not so notify the architect, he hereby agrees to carry out the work as detailed without extra charge.

27. Changing Figures.—The contractor must not change figures or otherwise alter the drawings, but must report all errors or discrepancies that he may discover to the architect for correction, before doing any work in which these errors are involved.

28. Drawings at Building.—The superintendent or the clerk of the works must keep a complete set of drawings in the office at the building, and any drawings removed for use on the work must be returned to the office at quitting time.

29. Site Conditions.—The general contractor must check measurements, lines, levels, and dimensions with relation to the lot, proposed building, and conditions of the site and abutting properties, and must figure on doing everything necessary to carry out his contract in full. He alone shall be responsible for the correctness of the laying out of the work and any ill consequences or errors in this respect arising from his neglect.

30. Delay.—Each contractor must do his work promptly and at the proper time, so as not to delay other tradesmen.

31. Water Supply.—The general contractor must provide for an adequate supply of water for building purposes during the entire progress of the work.

32. Temporary Heat.—The owner will furnish the temporary heat required to dry out the plaster, etc.

33. Telephone.—The general contractor shall maintain a telephone at the works for the use of the architect and his assistants.

34. Supervision.—Contractor or contractors will give their work their personal supervision, both on the building and in the shop.

35. Foreman.—The general contractor shall employ a competent foreman to be on the work at all times. Any workmen who are incompetent must be removed at the request of the architect.

36. Protection.—The general contractor must protect both his own work and all the other work and material incorporated in or delivered to the building, and must pay for any damage to same, due to negligence in this respect. Any requests of the superintendent to have work or material protected must be complied with.

THE ARCHITECT AND THE OWNER

37. Architect Not Agent.—The architect is the adviser of the owner and represents him on this work; but he is not the owner's agent in the legal sense of the word, except where he may be given special authority by the owner.

EXCAVATION

38. Excavating and Grading.—The contractor shall excavate such portions of the plot that are to be occupied by the building, where the present level is above the cellar bottom. The front area of the cellar, as far back as the retaining wall, is to be carefully filled in and flushed with water, and carefully leveled to a line 5 inches below the finished floor level. The rear portion of the area is to be cut and filled as required, and brought to a uniform level 4 feet 6 inches below the top of the outer stone wall. (See Sheet No. 10.)

39. Trenches for Walls and Piers.—The contractor shall trench for the walls and piers to the depth shown on the elevations, or to such further depth as may be required to obtain a firm and solid bottom, at extra compensation figured by the schedule submitted with the proposal. The trenches are to extend not less than 6 inches beyond the face of the footings of the walls and piers, so that the work can be well pointed on the outer surface.

40. Top Soil.—The top soil is to be removed to where it will be outside of the cellar area, and the sod is to be neatly cut and carefully laid to one side, together with the top soil, for future use.

41. Filling.—The area under the front porch is to be cut and filled, as required, to a level 6 inches below the rough cellar bottom under the main part of the building. Where filling is required, it must be flushed and brought to a uniform level.

42. Surplus Material.—The surplus excavated material accumulating in the interior of the building is to be deposited where directed on the adjacent lot before the walls are raised above the basement floor levels.

43. Broken-Stone Filling.—The trenches on the outside of the walls are to be left open for 3 days after the walls have been brought up to the finished grade level. The trenches shall then be filled to within 1 foot of the final grade, and thoroughly tamped at each foot in height, with clean broken stone and spalls that may have accumulated during the construction of the walls.

The excavation and filling are to be conducted in such a manner that the cellar will be left free and open and in a proper condition for building operations. On the completion of the building, the grounds shall be neatly graded to the levels indicated, finishing off with the top soil that has been saved, and made ready for sodding.

MASONRY

44. Footings.—The footings under the main and partition walls shall be constructed of large flat stones selected from the rubble material. The footings shall not be less than 6 nor more than 8 inches in thickness. The edges of the stone are to be laid close together with joints not exceeding $1\frac{1}{2}$ inches at the most, and are to be laid to a line on both sides.

The footing courses are to be laid and bedded in cement mortar and are to be well tamped in position; the vertical joints are to be solidly filled with cement mortar. Special care must be taken in setting the footing courses, so that they will be properly brought to a firm and solid bearing.

45. Rubble Work.—The exterior and interior walls of the basement of the building, porch walls below grade, and pier foundations are to be constructed of first-class rubble masonry, well and thoroughly bonded throughout. All stones are to be good quarried stock with level beds, and must be laid in cement mortar and to a line on both sides. The walls are to be plumb and level as required at the various stages, and wooden sills are to be properly bedded and bolted on top of same by means of $\frac{1}{2}$-inch anchor bolts built into walls.

46. Ashlar.—Where the walls are exposed above the finished grade line, they shall be faced with hammer-dressed squared bluestone ashlar. The stone shall be of a shade to match the sample submitted to the architect by the contractor, and shall be in heights of 4, 8, and 12 inches. All exposed work is to be left with open joints on the exterior face, and all joints are to be neatly key-pointed with colored mortar, and washed down at completion. The squared ashlar is to be laid with joints not exceeding $\frac{3}{8}$ inch in thickness, to be raked out $\frac{3}{4}$ inch from the face line. The balance of the rubble work in the rear of the building and the interior face of all walls are to be neatly trowel-pointed as the work is erected. Margins shall be cut on the angles of stone walls where the frame walls abut same. Cellar frames are to be anchored to walls by galvanized-iron strap anchors. The mason will build stone corbels in wall or brick piers where necessary to carry pipe stacks.

47. Cut Stone.—The cellar windows shall have $5'' \times 8''$ bluestone sills cut with wash on top. The exposed edge is to be rock-faced, neatly pitched to a line, and is to be properly bedded in place. The openings in porch walls are to have sills 5 in. $\times$ 18 in., with rock-faced edges, and cut with wash. The rear door to porch area is to have a sill 7 in. $\times$ 18 in., with clean-cut edge and washed top, also a lintel 8 in. $\times$ 12 in., with rock-faced edge and face. The front steps are to be of clean-cut Nicholson bluestone of selected stock and carefully set in position, each step being in one piece.

The kitchen chimney is to have clean-cut Nicholson bluestone base and offset blocks. This chimney, also the parlor chimney, is to have a clean-cut bluestone cap in one piece with holes cut through for flues.

The doors leading from the cellar to the area under the porch are to have stone sills 5 in. $\times$ 10 in., neatly cut to line on inner edge. The exposed edge and upper face are to be neat and clean cut.

The rear-porch and interior post piers are to have clean-cut bluestone bases, beveled on top, carefully set in place, and are to have a hole drilled in center of same for $\frac{3}{4}$-inch dowel-pin. All bluestone must be equal to the sample submitted, and must be of best quality, from the Nicholson quarries. The outside of all masonry walls, from footings to grade line, shall have a coat of cement mortar followed by two good coats of pure asphalt. This contractor will do all necessary cutting of his work for other contractors.

48. Brickwork.—The interior post piers and the chimneys throughout are to be constructed of hard-burned brick, well and solidly laid in cement mortar and properly bonded. The brickwork, where exposed, is to be laid in red mortar, neatly key-pointed. The fireplaces are to be built as indicated on the drawings, the brick to be furnished by the owner and placed by the contractor. The living-room fireplaces are to be lined with cast-iron linings furnished and placed by the owner.

49. Nogging.—The top of the wall plates between the floor joists are to be filled in with brick up to within $\frac{1}{2}$ inch of the top of the joists, and also for a distance of five courses above the top of the joists, between the studs, solidly laid in mortar and trowel-pointed. All interior partitions, where possible, shall be filled between joists in the same manner.

50. Openings.—Leave all necessary openings where shown and directed for the passage of water pipes, soil pipes, and steam pipes. The mason contractor will consult with the superintendent in regard to this before any footing stones are laid.

51. Mortar.—The mortar for the rubble walls and piers is to be composed of one part of Portland cement and three parts of clean, sharp, coarse sand properly mixed together. The mortar for brick-work is to be of the same mixture as that already specified for stone, with just sufficient lime added to make it pasty. The mortar for the brickwork and ashlar above the ground line is to be composed of one part of good fresh wood-burned lime (the lime to be in the form of lime putty at least 2 weeks old), one part of Vicat Portland cement, and four parts of clean sharp sand. The mortar for the exposed portions of the wall is to be colored with Clinton mortar stain. The cement used may be Saylor's, Vulcanite, Giant, or Lehigh Portland.

52. Flue Linings.—All flues are to be lined with terra-cotta linings from the base to the chimney caps.

53. Hearths and Tiling.—The fireplace hearths of living room and hall are to be constructed of a concrete slab reinforced with $1\frac{1}{2}$-inch T iron (see Sheet No. 47). The hearth in the den is to be of concrete filled between joists. The tiling of the den mantel will be furnished and set by the owner.

54. Wooden Sills.—Three-inch plank sills shall be built in window openings in cellar walls to be level on the top with the stone sills; these plank sills will be supplied by the carpenter and will be properly bedded in place by the mason. The finished sill will be nailed to this plank sill.

55. Privy.—The contractor shall excavate where directed a pit for a privy 6 ft. × 3 ft. × 4 ft. deep, over which the carpenter shall erect a frame shanty for the use of the workmen.

56. Chimney Breasts.—The chimney breast in kitchen shall be faced with pressed brick to a height of 6 feet, and shall be neatly laid in colored mortar. Strap anchors shall be fastened to the adjacent wall studs every 2 feet and built into the chimneys so as to anchor the brickwork. The kitchen and laundry flues are to have 6-inch diameter galvanized-iron thimbles of such length as to extend from face of plaster to inside of flue lining. The boiler flue is to have a similar thimble 12 inches in diameter, also a cast-iron clean-out door at base of flue as shown.

57. Brick Underpinning.—The frame walls in basement shall have brick dwarf walls 8 inches thick and four courses high, on which shall be bedded the 4″ × 8″ wooden sills.

CARPENTRY AND JOINERY

58. Framing.—All framing is to be done as shown on framing drawings and as specified.

Sills shall be 4 in. × 8 in., half checked at corners and bedded in cement on top of walls. The entire sill is to be painted with R. I. W. paint. The sills are to be anchored to walls every 6 feet with $\frac{1}{2}$-inch iron bolts.

Sills on dwarf walls under basement floors shall be 3 in. × 8 in., bedded on walls, the entire sill to be painted with R. I. W. paint.

Cellar joists, 3 in. × 8 in., set at 16-inch centers.

First-. second-, and third-floor joists shall be 2 in. × 12 in., set at 16-inch centers; 3 in. × 12 in., set at 16-inch centers, under billiard room—third floor.

Basement studs for walls and partitions, 2 in. × 6 in., set at 16-inch centers; corner posts, 6 in. × 8 in., with a 2″ × 6″ piece spiked on.

Plates of basement walls shall be 2 in. × 6 in., doubled and well spiked together.

Wall and partition studs above basement shall be 4 in. × 4 in., set at 16-inch centers.

All studs are to be doubled at door and window openings, and openings over 4 feet in width are to be trussed.

Interties, 1 in. × 4 in., checked into studs and well nailed.

Plates, two 2 in. × 4 in., doubled and spiked together.

Corner posts, 4 in. × 6 in., with 2 in. × 4 in. spiked on.

Ashlering, 2 in. × 4 in., set at 16-inch centers.

Ceiling joists, 2 in. × 6 in., set at 16-inch centers.

Rafters, 2 in. × 8 in., set at 16-inch centers.

Ridge plates, 2 in. × 12 in., beveled to slope of roof.

Valley rafters, 3 in. × 10 in.

This contractor will do necessary cutting of woodwork for other contractors.

59. Ceiling Joists.—Ceiling joists are to be suspended by vertical and diagonal suspenders 1 in. × 6 in., securely spiked, both to the rafters and to the ceiling joists. The roof is to be firmly and rigidly put together. Insert necessary supports for the valley rafters at available points over the partitions thereunder.

60. Wall Sheathing.—Outside walls shall be sheathed with 1″ × 12″ boards, run diagonally at an angle of 45°, and well nailed to each stud. Butt joints are to be cut on the center line of studs. All framing is to be firm and solid hemlock, free from large or loose knots and shakes, and must be well seasoned.

61. Posts and Joists.—Cellar posts shall be 10″ × 10″ planed Georgia pine, with $\frac{1}{2}$-inch chamfer taken off at angles and $\frac{3}{4}$-inch iron dowel-pins at foot. Cellar beams will be of 10″ × 12″ Georgia pine; connections over posts shall be secured with two iron dogs on top. Beams shall be secured to upper ends of posts with two $\frac{3}{8}$-inch iron dowel-pins. The top of the cellar beams shall be level with the sill on the stone walls, so that the floor joists will notch into the upper edge of the beams and sill to a depth of 4 inches. This notching is to be neatly executed. Where the joints occur over the beams, they are to be butt-jointed and 1″ × 6″ cleats nailed on one side to tie the joists lengthwise. The joists are to extend to within $\frac{1}{2}$ inch of the inside of the sheathing.

62. Roofing.—The rafters are to be covered with 1″ × 2″ shingle lath spaced $4\frac{3}{4}$ inches apart, over which shall be laid the very best quality of Washington red cedar shingles, 16 inches long, laid with $1\frac{3}{4}$ inches head lap. The shiugles are to be dipped in chemical stain of approved color. The hips of dormers are to be finished with what is known as "Boston" hips; the shingles at the valleys are to be neatly trimmed, and the ridges are to be finished with rolled cap and ridge boards firmly secured. The roof is to be carefully framed for the passage of the brick chimney stacks, and also for the roof dormers. Place tilting fillets, as detailed, in valleys and at eaves. Valley boards to be 1 in. × 12 in.

The roof dormers are to be framed with 2″ × 4″ studs. The rafter framing at dormers is to be so arranged that the ceiling joists will be continuous and pass through to the dormer walls. (See Sheet No. 15.) Valleys are to have filling strip as detailed.

63. Floor Framing.—The floors are to be properly framed for brick chimney stacks, hearths, stairways, and other necessary openings. The trimmer joists are to have steel hangers for the suspension of the headers. All header and trimmer joists are to be doubled, and the tail-joists framed into the headers in an approved manner. Floor joists that support partitions are to be doubled (see framing plans). The floors of the bay windows are to be properly framed together with doubled lookouts secured to a doubled joist at least one space from face of wall. (See Sheet No. 12.) All joists are to be placed with their camber upwards.

64. Cross-Bridging.—Three rows of cross-bridging 2 in. × 3 in. are to be run from front to rear of building on all floors. The bridging shall be well nailed to the joists and spiked. Three rows of block bridging 1 in. × 6 in. are to be run in between the third-floor ceiling joists, and well fitted and nailed in position.

65. Partition Framing.—The studs at sliding doors are to be 3 in. × 4 in., set flatwise at 16-inch centers. The head of the door shall be formed of a 3″ × 6″ piece set on edge, and truss bracing shall be formed over same to carry the weight overhead. Where continuous partitions occur, the joists must be spiked to each side of the partition. (See Sheet No. 15.) Openings marked "arch" are to be formed with $1\frac{1}{4}$-inch ribs. The stud partitions, except outside walls above basement, are to have one row of zigzag blocking 2 in. × 4 in. aud 2 in. × 3 in. to suit the thickness of partition. The blocking must be well spiked to the studs.

66. Porch Framing.—The header joists of the front porch are to be 4 in. × 10 in., fascia joists 4 in. × 6 in., and the regular joists 2 in. × 8 in., set at 16-inch centers. The joists are to be supported by 2″ × 3″ cleats, bolted to the 4″ × 10″ headers, and securely spiked. The roof joists are to be 2 in. × 6 in., set at 16-inch centers; ceiling joists, 2 in. × 4 in., set at 16-inch centers, with 1″ × 4″ cleats securely nailed to same, to which the ceiling is secured (see Side Framing plan). Porch plates are to be 6 in × 10 in., properly framed, and cleated to receive the finished casings. The rear porch is to have 10″ × 10″ lookout joists, into which shall be framed 2″ × 8″ dressed floor joists. The other work on the rear porch will be similar to the corresponding work on the front porch. The porch floors are to be covered with $1\frac{1}{4}$″ × 3″ first-quality clear white-pine tongued-and-grooved flooring, carefully laid with white lead in the joints. The ceilings of front and rear porches are to be covered with a good sound grade of white pine $\frac{7}{8}$ in. × 3 in., matched and beaded, and hand-smoothed. The floor of the rear porch shall be planed on the under side. The butt joints must be tight and face-nailed. The rear-porch posts are to have a solid core and are to be constructed from a good solid quality of $1\frac{1}{8}$-inch white pine, tongued and grooved at angles. The front-porch columns shall be of the best-quality clear-stock white pine (made according to Koll's patent), as manufactured by the Hartman Brothers Manufacturing Company, Mt. Vernon, New York. The roofs of the porches are to be covered with 1″ × 4″ matched hemlock flooring, well and solidly laid and well nailed to the rafters. All exposed overhung surfaces of floors are to be insulated with mineral wool and ceiled the same as specified for porches.

67. Siding.—The entire surface of the outer studded walls, including the basement walls adjacent to the front-porch area, are to be covered with Watson's 20-pound roofing felt, properly lapped and neatly butted against all angle casings. The basement and first-story walls are to be covered with 5-inch beveled siding, laid with 1-inch lap, neatly fitted and well nailed to each stud; the balance of the wall surfaces are to be covered with best quality Washington red cedar shingles, laid with 3-inch lap, neatly fitted, and well nailed in place.

68. Flooring.—The first floor throughout, except the kitchen, pantries, rear hall, servants' room, and refrigerator room is to have a subfloor of 1″ × 6″ matched hemlock, laid diagonally at an angle of 45°, properly laid and leveled to receive a parquet floor. The floor joists where this floor is not laid are to be furred and covered with $\frac{7}{8}$″ × 3″ quarter-sawed first-quality Georgia pine flooring. The rear basement and the second and third floors are to be covered with $\frac{7}{8}$″ × 3″ first-quality Carolina pine; except floors of dens, which are to be of best-quality quarter-sawed $\frac{7}{8}$″ × 3″ oak, planed and surfaced.

All flooring is to be closely laid, blind-nailed to each joist, and butt joints where not flush are to be surfaced as the work proceeds. The rough flooring is to be covered with an approved two-ply building paper lapped not less than 3 inches.

69. Bathroom Floors.—The two bathrooms on the second floor shall have raised floors laid on 2″ × 6″ joists, set 16 inches on centers over regular joists, and shall be covered with tile flooring as by separate contract. This contractor shall build rough floor between these joists, ready for tiler. The bathroom adjacent to the dressing room shall have a floor laid on top of the regular joists, which shall be covered with a copper lining or safe by the plumbing contractor. The other bathroom will not require the under floor. The wall studs shall be furred where necessary to cover plumbing pipes.

70. Doors.—The door in the stone wall to area under the porch is to have a 3″ × 8″ Georgia pine frame rabbeted to suit the thickness of the door, and is to have a $\frac{3}{16}$-inch bead on the jamb side of the rabbet. This door frame shall also have $\frac{3}{8}$″ × 4″ wrought-iron dowel-pins for attachment to the stone sills, two to each jamb, and shall also have suitable strap anchors to secure the frame back into the masonry. The doors in frame walls of basement and rear kitchen door, are to have frames of $1\frac{3}{4}$-inch white pine. The refrigerator door is to be constructed with bevel jambs. The door frames throughout the basement are to be $1\frac{3}{4}$ inches, checked on the back edges to receive wall lining, and are to have $\frac{3}{4}'' \times 2\frac{1}{4}''$ beaded-and-molded stops let into the jambs.

The interior doors above the basement, except the kitchen door, are to have $1\frac{1}{4}$-inch jambs and heads. The jambs are to be grooved $\frac{3}{16}$ inch on the face, to receive the door stops. The door stops are to be made in accordance with details; the stops to be well nailed to the jambs.

The door frames shall be carefully set and securely blocked and nailed to the false jambs, care being taken that the jambs are solidly blocked where the hinges occur. The doors up to 7 feet in height are to be framed in five panels, those over 7 feet are to be framed in six panels, and where the doors are over 3 feet in width there shall be three panels in the width thereof. All doors are to be of the size and thickness marked on the drawings. The framing is to have ogee molding run on the stiles and rails and is to be neatly coped. The panels are to be flat finish. The front-entrance and vestibule doors, the doors in first-story stair hall, living room, and dining room are to be veneered. The veneer shall be $\frac{1}{4}$ inch thick, and the core shall be built up of $\frac{7}{8}$-inch strips. The panels shall be built up in three thicknesses. The sliding doors are to have a projecting band $\frac{5}{16}$ inch thick around the margins of the doors, as detailed. The doors are to be first class in every respect. The front-entrance, vestibule, stair-hall, first-floor, and dining-room doors are to be veneered with mahogany. The living-room doors are to be veneered with prima-vera or white mahogany. The balance of the doors throughout the first floor are to be of No. 1 clear white pine, free from sap, knots, and shakes, and to be hand-smoothed. The doors of the basement, and second and third floors are to be of No. 2 white pine, free from sap, large and loose knots, and shakes. The materials of the doors are to be thoroughly seasoned, and put together in a first-class manner.

All doors are to be well and solidly framed, with mortises and tenons, and well glued together. Doors 7 feet in height are to have two hinges; doors over 7 feet in height are to have three hinges. The side lights in the vestibule are to be framed and paneled, as shown, and are to be made of first-quality white pine.

71. Sliding Doors.—Sliding-door pockets are to be lined with $\frac{5}{8}'' \times 3''$ matched white pine securely nailed in place. The jambs of these sliding doors are to be $\frac{7}{8}$ inch thick, finished with molded stops. The jambs facing the dining room are to be of veneered mahogany.

72. Refrigerator Door.—The refrigerator door shall be constructed with bevel framing, insulated with suitable material.

73. Windows.—The cellar window frames to be $2\frac{3}{4}'' \times 8''$ rabbeted for sash, and are to be anchored to the wall with galvanized-iron strap anchors. The sash are to be $1\frac{3}{4}$ inches thick and hinged to the jambs. All double-sash windows throughout the building are to have box frames and double-hung sash, pulley stiles $1\frac{1}{4}$ inches thick, and blind stops $\frac{7}{8}$ inch thick. The parting strips are to project $\frac{5}{8}$ inch beyond the face of the pulley stile. All sharp arrises are to be taken off with the plane; sash stops are to be $\frac{5}{8}$ inch thick, beaded at junction with sash, and are to have thumb mold on the inner edge. Sash stops are to be secured with Taplin's adjustable washers and screws. All frames are to have $\frac{7}{8}$-inch plaster grounds extending from the face of the pulley stile to 1 inch over studs. The plaster grounds shall be beveled on the outer edge to form a key for plaster. Sills are to be 2 inches thick, and the subsill, $1\frac{1}{4}$ inches thick. The sills are to receive a good coat of white lead before being nailed to the subsill. All yokes shall be $1\frac{1}{8}$ inches thick, and all sash $1\frac{3}{4}$ inches thick. Meeting rails shall be $1\frac{5}{8}$ inches thick. The meeting rails of the lower sash are to be grooved for the glass; the other rails are to be rabbeted. The upper rails for the upper sash are to be the same width as the stiles. The sash shall be mortised, tenoned, and glued together, the meeting rails being dovetailed, and all to have $\frac{3}{16}$-inch steel sash barb pins. The upper sash shall be made with molded horns. All sash are to be well fitted in their respective frames after the sash have been finished. The window frames throughout are to be made of good sound white pine, free from large and loose knots and sap. The sash are to be of the best clear-stock white pine, all thoroughly seasoned.

The frames are to be properly protected while the work is being carried on. Special care is to be taken to have the window frames properly leveled and plumbed; properly brace same where necessary. The frames for single sash are to be made of $1\frac{1}{2}$-inch jambs rabbeted for sash with 2-inch sills. The sash in the first-story stair hall is to be fixed sash. All other single sash are to be pivoted.

74. Exterior Finish.—The exterior finish throughout, including molded bands, angle boards, cornices, dormers and porches, etc., is to be executed according to general drawings and details. The corner boards where siding occurs are to be $1\frac{1}{4}$ inches thick. All exterior finish is to be of a good sound grade of white pine, except where otherwise specified. The frames underneath the porch are to be constructed of $3'' \times 6''$ cypress rabbeted on the inside for sash, the same as other cellar frames, and perforated steel plates, which will be supplied by the owner, shall be fastened to outside of frames. The cellar window for fresh-air inlet is to have a 2-inch pine frame, to which shall be attached heavy galvanized-iron wire netting of $\frac{1}{2}$-inch mesh.

The balustrades in the front- and rear-porch railings are to be constructed of $1\frac{1}{4}'' \times 2''$ square-edged strips, set at 3-inch centers.

The bay windows are to be constructed as shown. A base 6 inches high by $1\frac{1}{4}$ inches thick shall be continued around at porch floors.

Construct a sunken gutter in the front and in the side-porch roofs, the bed of which is to be properly graded to outlet.

75. Plaster Jambs and Grounds.—The doorways throughout are to have $\frac{7}{8}$-inch false jambs gauged in width to the plaster line, set true and out of wind, and securely nailed to the studding, care being taken that they are solidly blocked to the studs where the hinges occur.

Plaster grounds, $\frac{7}{8}$ in. $\times$ 2 in., surfaced on the face and beveled on the edges, are to be attached to the studs for base and wainscoting, the grounds to be set true to line and level and beveled on edges to form keys.

76. Interior Trim.—The kitchen pantries and refrigerator room are to be wainscoted to the height of the window sills with $\frac{7}{8}'' \times 2\frac{1}{2}''$ matched-and-beaded cypress, set on a base 6 inches high and $1\frac{1}{8}$ inches thick. The top of the wainscot shall be finished with a plain band cap 3 inches wide and $1\frac{1}{8}$ inches thick. Door and window casings are to be $1\frac{1}{8}$ inches, molded with back band, as detailed. Wooden cornices are to be as shown in the full-size details.

The bathroom on the third floor shall be wainscoted 4 feet high, and the trim of this room shall be identical with that of the kitchen. The wainscot for second-floor bathrooms shall be of marble, and will be under a separate contract.

All the wooden walls and ceilings in the basement are to be faced with narrow matched-and-beaded Carolina pine, except in the coal room, which shall be lined upon the exterior only, and backed with Watson's building felt. The ceiling of the coal room shall also be backed with Watson's felt. All angles between wooden walls aud wooden ceilings are to be filled with $\frac{1}{2}$-inch quarter round. The doors and windows in kitchen, pantry, and rear hall are to have plain $1\frac{1}{8}$-inch molded casings of cypress, as by details. The doors and windows throughout the balance of the first floor are to have molded casings with back bands and finished on the head with cornice. The second floor throughout, except closets, which will have plain casings, shall have plain molded casings and back bands, and the doors and windows on the third story are to have plain molded casings without back band.

77. Trim, Base, Seats, Etc.—The windows in reception room, living room, and dining room are to have panel breasts below sills. All other windows throughout are to have apron finish, molded in accordance with details. The principal rooms on the first floor shall have a base comprised of base, subbase, and shoe; the latter shall be $1\frac{1}{8}$ inches thick, and the base, over all, shall be 10 inches in height. The second floor shall have a plain base and molding 8 inches high and $1\frac{1}{8}$ inches thick. The attic and all other rooms and closets shall have plain molded base 6 inches high and $1\frac{1}{8}$ inches thick. The dining-room and hall ceilings shall be paneled with box beams as shown, and in accordance with the details, that of hall to be of thoroughly seasoned white poplar free from defects of any kind.

The living room and the dining room shall have panel seats. The finish of the dining room shall be veneered with red mahogany. The finish of the living room shall be of white mahogany. The balance of the finish on the first floor and the trim throughout the rest of the building, except where otherwise specified, shall be of a good sound grade of white pine, all hand-smoothed and finished in first-class shape. Place $\frac{7}{8}'' \times 4''$ chair rail in billiard room, molded as by detail. The bay windows on the second floor shall have paneled seats, with fronts made to open.

The door casings throughout the first and second floors shall have base blocks. The sinks are to have $1\frac{3}{8}$-inch framed tops made of selected white pine. The kitchen and dining-room pantries and the various closets throughout are to have cabinets and shelving, as shown in drawings, and made in accordance with details. The cabinets are to be of selected white-pine stock with framed-and-paneled fronts. The bedroom closets are to have molded-edge hook plates set $5\frac{1}{2}$ feet above the floor, and a shelf of a good sound grade of white pine on top of the hook strip. The carpenter shall be required to do all necessary cutting and fitting required by the other mechanics, and fit up all necessary boards for pipes and fixtures and case up the vertical pipes where required. He shall also construct bookcases according to details in living room and den where shown on plans, the wood and finish to be similar to that of the rest in the respective rooms.

78. Stairs and Mantels.—Construct the main and second-floor stairs throughout, as shown, with $1\frac{1}{4}$-inch string and treads and $\frac{7}{8}$-inch risers. The main stairway is to be open-string, to have the face string molded, and to have $2'' \times 2''$ turned balusters. The soffit of stairs is to be paneled as per detail. All newels are to be box pattern and made in accordance with drawings. The main stairway is to have birch treads, newels, and rails; the balance of the stairway shall be of selected white pine. Other stairways are to be of selected No. 1 yellow pine kept clean for natural finish. The platform of main stairway is to be constructed of narrow matched birch glued together. Construct paneled seat in window recess as shown. Mantels in hall, living room, and den are to be constructed as shown on details. Brick tiling, bronze angles, and lining are to be furnished and set by the owner.

79. Hardware.—Hardware for all doors and windows (except the sash weights, which are to be supplied by the contractor), together with the hardware for pantry and other cabinets and drawers is to be supplied by the owner, but shall be attached by the contractor. All doors throughout are to have mortise locks.

80. Painting, Glass, and Glazing.—The priming and painting throughout will be executed by the owner, who will also furnish and set the glass in the sash. The contractor shall notify the owner when the window frames and sash are ready for priming, so that it can be done before they are delivered on the premises.

ADDENDA

October 6, 190

Addenda to specifications relative to Joinery Work in a residence for J. R. Retsof, Esq., Flatbush, Pa.

81. Lower-Hall Closets.—The stair-hall closets on the first floor shall each have a molded cleat for clothes hooks, set $5\frac{1}{2}$ feet above the floor, and a shelf on the long side of the closet.

82. Kitchen Cabinet.—The kitchen shall have a cabinet 5 feet wide with shelves, paneled doors below, open space over table top, and a series of shelves reaching to ceiling and enclosed with glass doors. The cabinet shall have a neat cornice mold at ceiling angle.

83. Butler's Pantry.—The cupboard on the east side of pantry is to have a series of drawers below counter shelf, three of which are to be 30 inches wide and 2 inches deep, in the clear; above the drawer there shall be shelves enclosed with glass doors to ceiling.

The cupboard on the south wall adjacent to the foregoing shall have shelves and paneled doors under the counter shelf, with a series of shelves above enclosed with glass doors to ceiling. The adjacent cupboard on the south wall, and over the sink, is to be similar to it.

The counter shelf below these two cupboards on the south wall is to have a series of drawers underneath.

The cupboard in the west side of pantry shall be constructed similar to the one on the east side of pantry.

84. Kitchen Pantry.—The cupboard on the east wall of the kitchen pantry shall have a series of drawers under the counter shelf and shelves above the counter shelf. The shelving shall be enclosed to ceiling with solid paneled doors.

The cupboard on the south side of the pantry shall have shelving above and below the counter shelf, and shall be enclosed above and below counter shelf with solid paneled doors.

85. Bedroom Closets.—The closet in chamber No. 2, second floor, shall have counter shelf with drawers underneath.

Four of the closets shall each have a shoe shelf placed where directed.

In the closet of chamber No. 1, second floor, place additional shelf with hook plate all around.

The bathroom closets, second floor, are to have a series of drawers under the counter shelf, and one shelf over the counter shelf.

86. Linen Room.—The linen-room shelves are to extend to the ceiling. The closet adjacent to north bathroom is to have a hook plate around same.

87. Stair-Hall Closet.—The stair-hall closet is to have three drawers below a counter shelf and shelves above.

88. Den and Billiard Room.—The den and billiard room are to be finished in chestnut.

89. Storeroom in Attic.—The north storeroom in the attic is to have three rows of shelving 30 inches wide on the east wall, and a hook plate all around the room. The edge of each shelf is to have a ledge on same.

90. Outside Shutters.—The bedroom windows in the front and south sides of the building, and those of third floor rear, are to have outside shutters.

91. Basement Walls.—The wooden walls of the basement are to be lined with matched-and-**V**'*d* Carolina pine ceiling, instead of matched and beaded as before specified.

92. Cross-Furring.—The ceilings throughout the first and second stories are to be cross-furred with strips 1 in. × 2 in., set at 12-inch centers.

93. Pockets in Floors.—Form the necessary pockets in the floors where desired (for access to pipes). The pockets are to be secured in place with screws.

94. Leaded Glass.—The contractor shall send sash to and from glass manufacturer and pay all transportation charges thereon.

95. Wainscoting.—Wainscot first-floor stairway, hall, vestibule, den, and dining room, as indicated on section and as by full-size details.

DATE August 1st 1906

SIGNATURES
CONTRACTOR or CONTRACTORS John A. Ames
OWNER or OWNERS J. R. Retiof
WITNESSES Geo. Brown
Harry White

TITLE PAGE

No. 501.
W. No. 1,946.

SPECIFICATION

of materials and workmanship for the Plastering in a residence situated in Flatbush, Pa., for J. R. Retsof, Esq., owner.

Prepared by
JOHN W. SCOTT, Architect,
812 Franklin Street,
Scranton, Pa.

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This work is to be carried out in conformity with the accompanying drawings and under the superintendence of the Architect or his Representative.

INDEX OF ARTICLES

GENERAL

96. Arts. **2, 3, 5, 6, 7, 9, 10, 12, 13, 14, 17, 18, 19, 20, 21, 23, 24, 25, 26, 27, 28, 30, 31, 32, 34, 35,** and **36** of the General Conditions* of the General Specifications are hereby made a part of this specification.

97. Lathing.—The frame walls and ceilings throughout the first, second, and third floors are to be lathed with good dry hemlock laths free from loose and resinous knots, sap, or rot. The joints are to be broken every 15 inches in the height.

Proper care is to be taken that uniform spacing is observed between the edges of the laths, such spacing being a full $\frac{1}{4}$ inch The lath are to be attached with cut nails. All lath are to be butt-jointed—not lapped—and are to be double-nailed at butts.

98. Plastering.—The walls, ceilings, and beams, where furred in the rooms and halls throughout the first, second, and third floors, shall be plastered three good coats—scratch, brown, and hard-finish white coat. The chimney breasts throughout the building shall receive two good coats of plastering—brown and hard-finish white coat. The arch work shall be neatly executed and run true to curves, as by detail.

All bedroom closets are to be finished in two-coat work.

The plastering throughout shall be executed with the best wood-burned lime and clean sharp sand, with proper proportions of hair, plaster of Paris, and other materials to make strictly first-class work.

All walls must be carefully worked to the plaster grounds, and made straight and plumb. Not less than two coats of the plastering must extend to the floor behind the base and wainscoting.

After all the mechanics are finished, the plasterer is to make all necessary repairs and leave the work in a finished and neat condition.

99. Cement Work.—The floor area of the front section of the basement shall be carefully tamped, after which it shall receive a layer of cement concrete 4 inches thick.

The concrete is to be composed of one part of cement, two parts of clean sharp sand, and four parts of clean broken stone; the stone is to

*In practice, each specification being under separate cover, these general conditions would be included in this specification and would be preceding matter here given.

be broken small enough to pass through a 2-inch ring. The ingredients are to be mixed together dry, and sufficient water added, by spraying, to form a thick paste, and then all is to be thoroughly mixed, dumped, and tamped into place immediately after mixing. The finished surface is to be 1 inch in thickness, and is to be composed of cement and white sand in equal parts. The surface of the floors shall be carefully floated down level and straight, and troweled down smooth.

The cement used may be Saylor's, Vulcanite, Giant, or Lehigh Portland.

100. Finally.—The contractor shall be required, at the completion of his contract, to clear away all rubbish that has accumulated and been caused by his operations, both inside and outside of the building. During the execution of his work he must keep the building in a clean and tidy condition.

The contractor shall be required to furnish all materials and workmanship necessary to duly complete the work herein specified, in accordance with a fair and reasonable interpretation of the drawings and specifications, without extra charge except in case of additions to or alterations from the present design.

DATE August 15th 1906

SIGNATURES

CONTRACTOR or CONTRACTORS A. Hughes

OWNER or OWNERS J. R. Retsof

WITNESSES Geo. Brown

Harry White

TITLE PAGE

No. 505.
W. No. 1,946.

SPECIFICATION

of materials and workmanship for the Painting and Varnishing in a residence situated in Flatbush, Pa., for J. R. Retsof, Esq., owner.

Prepared by
JOHN W. SCOTT, Architect,
812 Franklin Street,
Scranton, Pa.

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The work is to be carried out in conformity with the accompanying drawings and under the superintendence of the Architect or his Representative.

INDEX OF ARTICLES

GENERAL

101. Arts. **2, 3, 5, 6, 7, 8, 9, 10, 12, 13, 14, 17, 18, 20, 21, 23, 24, 30, 32, 34, 35,** and **36** of the General Conditions* of the General Specifications are hereby made a part of this specification.

These specifications and the accompanying drawings shall together constitute instruction for the guidance of the painting contractor, and no deviation will be allowed except on written approval of the owner.

Whenever the word ''contractor'' appears in these specifications, it is intended to mean the painting contractor.

Whenever the words ''approved'' or ''as approved'' shall appear in this specification, referring to the quality of material or to the manner in which work shall be done, it shall be understood to mean the approval of the architect or his authorized representative.

This contractor and his foreman shall familiarize themselves with the progress of the work of the other contractors, and shall consult with them from time to time and cooperate, so as to prevent friction and delays.

This contractor shall guarantee all work done under this contract as to the material, operation, and finish for a period of 6 months, beginning with date of completion, and shall repair any original defects that may arise during said period.

102. Requirements.—These specifications apply to each and every part of the work herein specified, and are intended to provide for all material and labor described, inferred, or found necessary to carry out the evident intent of this specification. Small details not

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*In practice, each specification being under separate cover, these general conditions would be included in this specification and would be preceding matter here given.

usually specified but necessary to make a good job must be carried out as if specified.

All the materials used in this work must be the best of their several kinds, and varnish must be delivered upon the building in sealed packages. All the varnish used on this work shall be the product of the Boston Varnish Company.

All work must be properly prepared for painting or varnishing. All knots and sappy spots must be thoroughly covered with shellac; no damp or frosty surfaces shall be painted until dried; and after priming or staining, painted or stained work must be carefully puttied. Columns, balusters, sash, etc. shall be thoroughly primed before leaving the shop, and care shall be taken to thoroughly soak all end wood where painted with white lead and oil.

EXTERIOR

103. The exterior of this building, except the shingles, shall be painted two colors in three good coats of pure linseed oil and Atlantic white lead, tinted as approved and to match samples submitted by the contractor. The shingles shall be dipped 10 inches in linseed oil and turpentine mixed in the proportion of three parts of linseed oil to one part of turpentine.

104. Tin Roofs.—Paint the tin roofs of porches and dining-room bay with three good coats of Princess Metallic Paint. These roofs should be painted immediately after being laid, and if greasy should first be washed with strong soap and water and then dried, preparatory to painting.

105. Porch Floors.—The porch floors and grating of deck over rear porch are to have four coats of white lead and oil, tinted as directed.

INTERIOR

106. Living Room.—The prima-vera woodwork of this room is to be finished natural. It shall be first filled with one coat of white shellac rubbed down with fine sandpaper, and then followed with three coats of Boston Varnish Company's Shipoleum, the first two coats being rubbed down with fine sandpaper and the last coat with pumice stone and oil. Rub the last coat to an egg-shell gloss.

107. Dining Room.—Stain as by directions and sample submitted, and follow with three coats of varnish treated the same as is specified for living room.

108. Reception Room.—Prime with white lead and oil, and follow with one coat of shellac; follow these coats with four more, the first and the second of zinc white and oil, rubbed down with fine sandpaper. Follow these with undercoat and top coat of Boston Varnish Company's white *enamelite*. Both of these coats are to be rubbed—the final coat to an egg-shell gloss with pumice stone and water, and the under coat with curled hair.

109. Stair Hall.—The woodwork in stair hall shall be finished in the same manner as is specified for the reception room, with the exception of stairway treads, hand rail, and beams of ceiling, which shall be stained to match submitted samples and varnished same as specified for living room.

110. Shelving.—All shelving of closets shall have three good coats of varnish—top and bottom and face.

111. Varnishing for Miscellaneous Rooms.—Kitchen, pantries, servants' dining room, refrigerator room, laundry, toolroom, and wooden partitions and ceiling in cellar shall have a coat of filler, followed by three coats of varnish; the last coat shall be a flatted varnish.

112. Den and Billiard Room.—The den and billiard room are to be stained and filled similar to the submitted sample, followed by three coats of varnish, treated as specified for the living room.

113. Bedrooms, Bathrooms, and Closets.—The bedrooms, bathrooms, and closets shall be painted as specified for the reception room.

114. Walls.—The walls and ceilings of bathrooms, kitchen, servants' dining room, refrigerator room, pantries and rear-stairway hallways are to be painted with three coats of zinc white and oil, tinted as directed. These walls must be sized with good glue size after the first coat of paint. Walls and ceilings of vestibule are to be painted to imitate metal as approved.

115. Piping, Etc.—Exposed soil piping shall be painted three good coats of lead and oil, tinted as directed. Exposed water and gas piping shall be bronzed as directed. The boiler in kitchen shall have three coats of lead and oil. The soil piping under cellar floor is to be painted two good coats of Toch Brothers' R. I. W. paint before placing.

116. Ironwork.—Sheet-iron grilles under porch and all galvanized-iron boxes and ducts in basement shall be painted two good coats of lead and oil.

117. Mantels.—The mantel shelf and hood in stair hall shall be finished in imitation of bronze, as directed by the architect. The mantel in living room shall have shelf and mirror frame stained as directed.

118. Floors.—The oak floors of the main hall, reception room, living room, den, and dining room are to have a coat of paste filler followed by two coats of Johnson's prepared wax, well rubbed in; the last coat shall be polished with a piece of soft carpet under a weighted brush.

The floors in kitchen, servants' dining room, and butler's pantries are to have three coats of shellac.

The floor of billiard room is to be stained, and followed with two coats of varnish.

119. Stonework and Brickwork.—The stone walls in the area under the porch, brick dwarf walls, and south chimney in cellar are to be painted with two coats of cold-water paint.

120. Glass and Glazing.—All glass in first and second stories shall be the best American polished plate glass; that in attic and basement, double-thick American glass, of best quality except where lights are marked to be leaded glass. The leaded glass will be a separate contract. All other glass shall be furnished and placed by the contractor.

DATE August 12th 1906.

SIGNATURES

CONTRACTOR or CONTRACTORS M. Morris

OWNER or OWNERS J. R. Retsof

WITNESSES Geo. Brown

Harry White

TITLE PAGE

No. 506.
W. No. 1,946.

SPECIFICATION

of materials and workmanship for the Electric Wiring in a residence situated in Flatbush, Pa., for J. R. Retsof, Esq., owner.

Prepared by
JOHN W. SCOTT, Architect,
812 Franklin Street,
Scranton, Pa.

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The work is to be carried out in conformity with the accompanying drawings and under the superintendence of the Architect or his Representative.

INDEX OF ARTICLES

GENERAL

121. Arts. **2, 5, 6, 8, 9, 10, 12, 13, 14, 15, 16, 17, 18, 20, 21, 23, 24, 25, 26, 27, 28, 30, 34, 35,** and **36** of the General Conditions* of the General Specifications are hereby made a part of this specification.

These specifications and the accompanying drawings taken together shall constitute the directions for the installation of the electric-light wiring, and no modification shall be made unless such modification is previously approved in writing by the owner.

Wherever the word ''contractor'' appears in these specifications, it is intended to mean the contractor for the before-mentioned electric-wiring and conduit installation.

The contractor and his foreman shall familiarize themselves with the work of the other subcontractors, and shall consult with other contractors on the works and cooperate, so as to prevent friction and bad arrangement.

122. Requirements.—These specifications apply to each and every part of the work hereinafter specified, and are intended to provide that all material described or found necessary, shall be new, free from defects, and of the makes specified; and also for all labor requisite and necessary for putting up and completing all the electric lighting, conduits and outlets, cut-out box, switches, switchboard, wiring, fuses, cables, etc. Small details not usually specified but necessary for proper installation and finishing shall be included as if mentioned.

All electric-light wiring and conduits shall be complete from back of main switchboard to all outlets, with lights, capacity and snap switches, as called for in attached summary and shown on plans.

Outlets shall be left ready for connection of lighting fixtures.

* In practice, each specification being under separate cover, these general conditions would be included in this specification and would be preceding matter here given.

123. System of Lighting.—The current will be supplied from the city service plant. A branch wire from the street main shall be extended to the main switch in the basement of the building.

The feeders shall be three-wire, the middle wire haviug a capacity equal to the sum of the two outside wires, and the cross-section shall be based on the use of 115-volt $\frac{1}{2}$-ampere lamps. The loss in electromotive force shall not exceed 3 per cent., figured for the two-wire system, when all lights are burning at full-load capacity.

All branch circuits shall be two-wire system, not smaller than No. 14 B. & S. gauge wires, separately insulated, and covered with tape, or braid, and then bound together with tape and braided, forming parallel duplex wire, run in one conduit on the loop system, with snap switches placed where indicated in plans.

Each circuit must be brought to the cut-out box as indicated in plans, and connected with a double-pole cut-out as hereinafter specified.

No circuit shall serve more than 600 watts, except by permission of the Underwriters having control, and all lamp circuits shall be figured on the basis of not more than 600 watts capacity, 100 feet in length.

124. Feeder.—From the main switchboard extend a three-wire feeder in conduits to the cut-out box in second story. The feeder shall terminate at the main switch, with proper terminals, and each cut-out cabinet shall also be fitted with terminals for well-soldered connections.

125. Meter.—Provide meter loops at main switchboard. The loops shall be left unbroken ready for future connection, as the meter is not included in this contract.

126. Switchboard.—Erect where directed in the basement a cabinet similar to that specified for cut-out cabinet, on which shall be mounted the main switch and link fuses. Switches shall be full capacity for all lights burning, with allowances required by Underwriters' rules.

127. Cut-Out Cabinet.—There will be one cut-out cabinet, or box, located as indicated, in the rear hall, second floor, to control all lights.

This cut-out box shall be of the double-box pattern, the outer box being made of hardwood set as shown on plan and cased as detailed. The inner box shall be made of $\frac{1}{2}$-inch marbleized slate, enclosing the cut-out box-panel board, which shall also be of marbleized slate, forming a 3-inch wide gutter between inner and outer boxes on bottom, sides, and top, which shall be made fireproof with asbestos. The holes in walls of inner box shall be neatly bored and edges rounded off.

The electric-wiring contractor shall also provide, finish, and place the trim and doors, together with approved hardware. The trim shall match the surrounding woodwork, and the doors shall be lined with marbleized slate. Provide and attach tags for each cut-out, indicating lights that it controls.

The panel board shall be of marbleized slate with three bus-bars. The bus-bars shall be of ample carrying capacity for full load (when all circuits are using full allowance) without undue heating above normal temperature of the room.

Each branch circuit shall be arranged in proper order, connected to the bus-bars by neat connectors, fitted with G. E. cartridge fuses, and two-pole knife-blade switch of 15 amperes carrying capacity.

All copper shall be of 98-per-cent. conductivity, and shall be polished and lacquered with bare contacts.

Tablet board and box must be of form to suit the location "as may be approved" and the feeder branches shall have neat terminals in box with cartridge fuses on each pole.

128. Joints.—The splicing of concealed wires will not be permitted, and joints or splices in feeders must be avoided unless found to be absolutely necessary, in which case they must be well spliced, soldered, taped, and wrapped on the outside with pure rubber, etc.; they shall also be provided with proper junction boxes in the conduit, which shall be porcelain-lined and fitted with neat brass or bronze covers.

129. Circuits.—The circuits shall be run in in such a manner that there will be no crossing of tubing except where absolutely necessary, and the circuits shall be continuous from outlet to outlet. No electric tubing is to come in contact with pipes unless the tubing is provided with proper insulation of asbestos covering at least 1 inch thick.

130. Conduits.—The conduits shall be iron-armored insulated conduit, finished inside and out with waterproof enamel coating as may be approved.

No conduit tubing shall be less than $\frac{5}{8}$-inch internal diameter, and all tubing shall be one size larger than the combined area of the insulation and wires to be drawn through them.

All conduits shall be installed complete before proceeding to draw in the wires, which must not be done until the plastering is finished.

The conduits shall be rigidly fastened in place with metal hooks, clamps, or clips, independent of other piping in the building.

Conduits must have metal permanently and effectually grounded, and the lines must be continuous from outlet to outlet, with junction boxes inserted wherever necessary to facilitate the easy drawing in or withdrawing of wires. Powdered soapstone must be blown through conduits previous to the insertion of the wires.

All conduits shall be installed so as to make them practically moisture- and gas-proof, the joints being made with red lead and screw fittings.

All bends shall be made with standard elbows, and the tubing shall be so run as to cause but little cutting of the building or interference with other work.

131. Outlet Boxes.—At each and every outlet and switch there shall be placed a square iron outlet box and cover of the Bossert, Fountain, or similar pattern, as may be approved. Each box shall be of ample area for the connections of fixtures or switches, and where no gas outlets are provided, the boxes must be arranged with a spud to which brackets or chandeliers can be attached.

Make proper provision for support of fixtures by securely fastening outlets to walls and ceilings. This must be carefully done and any such work insecurely fastened will not be accepted.

The conduit where entering boxes shall be threaded and secured to the box with locknut and nipple insulator of the Erickson or similar pattern, as may be approved.

All boxes, tubing, and fittings shall be treated both inside and outside with waterproof paint or enamel.

132. Wire.—The best grade of rubber-insulated copper wire of one of the following makes shall be used, viz: Habershaw red core, Grimshaw, Bishop, Okonite, or Roebling white core, of heavy insulation not less than $\frac{3}{64}$ wall double braided. No wire smaller than No. 14 B. & S. gauge shall be used. All wires No. 8 B. & S. and larger shall be stranded. Wires shall be of sizes conforming to rules and requirements of the National Board of Fire Underwriters.

133. Switches.—In addition to switches specified on the tablet boards, provide push-button switches where indicated in plans in each story, using switches of not less than 10-ampere capacity. The style of switches shall be the flush type, set in approved iron boxes and of the latest pattern of either the Anchor, Hart, Carter, or General Electric switches, with face plates electroplated to match the surrounding hardware.

Where two or more switches are grouped, they shall be mounted on one face plate and engraved with names indicating what they control. No push buttons for bells, gas lighting, or the like shall be attached to the same plate with switches controlling lighting.

134. Fixtures.—The setting and connecting of lighting fixtures, such as chandeliers, brackets, or drop lights, are not included in this contract. The fixtures will be furnished and set by the owner.

135. Cutting.—This contractor shall do all cutting and repairing necessary for the proper installation of this work, including the cutting and repairing of chases and recesses in brick walls. No changes in construction shall be made without first consulting the architect or his representative and receiving consent. All cutting shall be done by mechanics regularly employed in doing that particular kind of work.

136. Inspection.—All material and workmanship must be of the best quality, in strict accordance with specifications, and must conform to the latest rules and requirements of the National Board of Fire Underwriters and the local City Departments in charge. When the work is completed and ready for inspection, the contractor shall arrange for the certificates of approval from the proper parties. These must be submitted to the architect when making application for final certificate.

137. Switches and Lights They Control.—The list of switches, location, and the lights controlled by them is given in the following table:

Story	No.	Control and Location
Basement	1 three-way	Two drop lights in front part of cellar; switch placed at foot of cellar steps.
First floor	1	Chandelier in reception room; switch placed near door to hall.
	4 grouped	Two front-porch lights, vestibule ceiling light, and ceiling light in hall; switches placed just inside of vestibule door.
	1 1 three-way 1	One mantel lamp, two side lights in stairway hall, and three side lights on platform; switches placed in stairway hall.
	2 grouped	Library fixture and side lights in living room; switches placed near door to hall.
	2 grouped	Dining-room fixtures and side lights in dining room; switches placed near door to hall.
	1 three-way	Two drop lights in front part of cellar; switch placed at head of cellar stairs, also controlled by switch at foot of cellar stairs.

Story	No.	Control and Location
First floor (*Continued*)	1	Pendant in kitchen; switch placed near door to rear hall.
	1	Pendant in butler's pantry; switch placed near door to kitchen.
	1	Pendant in servants' room; switch placed near door to kitchen.
	1 three-way	Bracket on rear stairway; switch placed at foot of stairway.
Second floor	1	Pendant in stairway hall.
	1 three-way	Brackets on first stairway platform.
	1 three-way	Brackets on second stairway platform. Switches placed near door to medicine closet.
	1	Pendant in chamber No. 2; switch placed near door to hall.
	1	Pendant in chamber No. 1; switch placed near door to hall.
	1	Pendant in dressing room; switch placed near door to chamber.
	1	Brackets in private bath; switch placed near door to dressing room.
	1	Pendant in chamber No. 3; switch placed near door to hall.
	1	Pendant in chamber No. 4; switch placed near closet door.
	1	Pendant in den; switch placed near door to hall.
	1 three-way	Bracket on rear stairway landing; switch placed at head of first-floor stairs.
	1	Wall receptacle and plug in den, over book-case.
Third floor	1	Library fixture in sewing room; switch placed near door to hall.
	2	Pendants and side lights in billiard room; switch placed near door to hall.
	1	Pendant in stairway hall.
	1 three-way	Brackets on second stairway platform; switches placed near door to billiard room.
	1	Base plug and receptacle in sewing room.

138. Outlets.—The list of outlets arranged in tabular form is as follows:

List of Outlets	Ceiling Outlets	Brackets	Number of Lights	Switches
Basement	6		7	1
		6	6	0
First story	12		43	10
		15	23	7
Second story	8		27	7
		12	19	4
		Den wall receptacle 1	1	1
Small closet	flexible cords 4			
Third story	5		15	3
		Sewing room wall receplacle 1		1
		14	21	2
Totals	35	49	162	36

139. Electric Bells.—Place electroplated push buttons to match other hardware at front and kitchen doors, in private bathroom, sewing room, and billiard room where directed, and connect by best copper wire insulated with waxed cotton to approved bell and annunciator in kitchen. Also, place floor button in this circuit where directed in dining room. The annunciator is to have six drop indicators designated by name, one for each of the buttons just mentioned. A button will also be placed in bedroom No. 1, connected to bell in servants' room and including batteries in its circuit. This circuit shall include three sal-ammoniac batteries, which shall be placed in the cellar where directed by the architect. The batteries shall be supported on a neat aud substantial shelf not less than $\frac{7}{8}$ inch thick.

140. Speaking Tubes.—The contractor shall install speaking tubes from kitchen to chamber No. 1 and to private bath. This tubing must be of bright tin and securely fastened in place, with all joints tightly soldered, giving an air-tight tube from whistle to whistle. The exterior of this tube shall have a good coat of varnish, and the whistles and mouthpieces shall be of a pattern approved by the architect.

DATE August 10th 1906.

SIGNATURES

CONTRACTOR or CONTRACTORS A. L. Jones

OWNER or OWNERS J. R. Retsof

WITNESSES Geo. Brown

Harry White

TITLE PAGE

No. 504.
W. No. 1,946

SPECIFICATION

of materials and workmanship for the Sheet-Metal Work in a residence situated in Flatbush, Pa., for J. R. Retsof, Esq., owner.

Prepared by
JOHN W. SCOTT, Architect,
812 Franklin Street,
Scranton, Pa.

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This work is to be carried out in conformity with the accompanying drawings and under the superintendence of the Architect or his Representative.

INDEX OF ARTICLES

GENERAL

141. Arts. **2, 3, 5, 6, 7, 8, 9, 10, 12, 13, 14, 17, 18, 19, 20, 21, 23, 24, 25, 26, 30, 34, 35,** and **36** of the General Conditions* of the General Specifications are hereby made a part of this specification.

142. Porch Roofs.—The contractor shall cover the front-porch roof and the rear-porch roof and bay-window roof with best quality 14″ × 20″ terne plates, using six cleats to the sheet laid. No nails are to be driven through the sheets. One cleat is to be secured at each corner to both sheets. All the seams are to be well-made lock-seams, thoroughly sweated with half-and-half solder, using rosin as the flux. The tin may be either Meurer's, McClure's, or Griffiths's heaviest-coated best-quality iron sheets. The edges of the roof all around are to be furnished with a band of strap iron, over which the tinwork shall be bent and locked. This strap iron is to be put on in the form of a drip to hold the sheets down. The strap iron shall be 1½ inches wide by No. 24 gauge, galvanized, and nailed not more than 4 inches apart.

No "dutchman" is to be used on the job; only perfect work will be accepted.

143. Flat Roof Over Stair Hall.—The flat roof over the stair hall is to be covered with 16-ounce soft-rolled copper, and the seams are to be securely locked and strongly soldered with half-and-half solder. The edges of the seams are to be properly tinned before being locked and soldered. The outer edge is to be held down and locked over a drip formed of 1½-inch by 24-gauge galvanized strap iron, as previously specified. The contractor shall furnish and lay underneath all sheet-metal work one layer of approved rosin-sized building paper. All tinwork is to be painted on the under side with two coats of red oxide paint. All tin is to be stamped with the name of the brand.

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* In practice, each specification being under separate cover, these general conditions would be included in this specification and would be preceding matter here given.

144. Main Gutters.—The main-roof gutters are to be 5-inch double-bead half-round gutters made of 16-ounce cold-rolled copper; the joints are to be strougly riveted together and thoroughly sweated with half-and-half solder. The gutter hangers are to be Berger's malleable-iron galvanized gutter hangers of the heaviest pattern.

145. Porch Gutters.—The rear-porch gutter is to be 4-inch double-bead 16-ounçe cold-rolled copper, fitted up as previously specified for main roof, and hung with the aforesaid Berger hangers. Hangers are to be placed not more than 3 feet apart.

The gutter for the front porch is to be a sunken gutter, lined with the same quality of tin as the roof. Special care must be taken in soldering the seams of the gutter.

146. Gutter Tubes.—All gutter tubes for tin roofs are to be made of 5-pound lead, properly funnel-mouthed.

147. Valleys.—All valleys are to be 16-ounce soft-rolled copper 20 inches wide, with lapped and soldered joints. The valleys are to be securely nailed in place with 1-inch flathead nails. All flank and cheek flashings of dormers, etc. are to be 16-ounce soft-rolled copper, the size of the sheets being not less than 7 in. $\times$ 10 in., and larger where necessary.

At the base of each dormer window furnish and securely install in place a suitable 16-ounce soft-copper flashing, running at least 4 inches on the slope and 3 inches upstand.

148. Chimney Flashings.—Flash around the chimneys above the roof with 16-ounce soft-rolled copper. Place a 4-pound lead counterflashing down the raking sides of the chimneys, making it a step flashing. The lead shall be laid into the joints of the brickwork at least 1 inch, shall have a bead at the back, and shall be securely calked into the reglets with lead bats placed not more than 6 inches apart. All reglets are to be pointed with pure Portland cement, securely packed in. Where the chimneys intersect the projections from the general wall line, and in other places where rain is liable to enter the structure, suitable flashings of 16-ounce sheet copper are to be used. Hogbacks are to be provided at the back of each chimney.

149. Gable Returns.—The returns of the gables and cornice projections on rear are to be covered and flashed with 16-ounce soft-rolled copper. The edges are to be secured with strap-iron drips, as previously specified.

150. Window-Cap Flashing.—Window-cap flashings are to be securely attached in place by the contractor as directed by the architect over the head-casing of each window. The caps are to be thoroughly painted on both sides with two coats of red oxide paint and neatly and securely nailed in position. The caps are to be of the same quality tin as the roofs and are to be of sufficient dimensions to insure their being thoroughly water-tight.

151. Leaders.—Furnish and fit up where shown on plans and elevations, roof leaders of the sizes shown. Each leader is to be made of 16-ounce cold-rolled planished copper, round in general form, and corrugated. Corrugated copper bends are to be used where offsets are required to connect to the gutters or pass around cornices or other obstructions. The connections of leaders to gutters are to be funnel-shaped, increasing the leader area 50 per cent. All gutter openings are to be provided with strong copper-wire ball screens, the wire being $\frac{1}{10}$ inch in diameter.

The contractor shall connect each copper leader at the base to the cast-iron pipe, using a copper flange soldered to the leader and a cement joint. The alinement of the copper leaders and the iron sections at the base is to be perfectly straight and plumb. The plumbing contractor will furnish and fit up the aforesaid iron sections, leaving a hub on top for the leader connection. All leaders are to be securely fastened to the walls with approved 16-ounce cold-rolled copper straps and brass screws.

152. Hall-Mantel Copper Hood.—Place a sheet-copper hood in hall mantel as shown, and connect the hood to a galvanized-iron duct extending through the roof.

153. Painting.—The contractor shall scrape off all rosin and dirt from the sheet-metal work before painting is done. The owner will paint the roofs when the contractor has finished.

The tinners must exercise great care in laying the sheets, to avoid scratching the paint on the under side. To protect the upper surfaces of the sheets, the mechanics will be required to wear soft slippers, and every precaution must be taken to protect the surface of the roof from damage.

The contractor will be required to cut his own reglets for flashing in the brickwork.

154. Finally.—The contractor will be required at the completion of his contract to clear away all rubbish, both inside and outside of the building, that has accumulated and been caused by his operations. During the progress of his work he must keep the roof in a clean, tidy, and safe condition. Special precaution must be taken to prevent water from getting under the tin. He will be required to furnish all materials and workmanship necessary to duly complete the work herein specified to the entire satisfaction of the architect or his representative, whether every item is specified or not, without extra charge, except in case of additions to or alterations from the present design, in which case he will require the written order of the owner. Preparations for the work are to commence as soon as the contract shall have been made and signed by the contracting parties, and the erection of the work is to commence as soon as practicable.

DATE August 30th 1906.

SIGNATURES

CONTRACTOR or CONTRACTORS O. J. James.

OWNER or OWNERS J. R. Retsof

WITNESSES Geo. Brown

Harry White

TITLE PAGE

No. 502.
W. No. 1,946.

SPECIFICATION

of materials and workmanship for the installation of a Steam-Heating System in a residence situated in Flatbush, Pa., for J. R. Retsof, Esq., owner.

Prepared by
JOHN W. SCOTT, Architect,
812 Franklin Street,
Scranton, Pa.

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The work is to be carried out in conformity with the accompanying drawings and under the superintendence of the Architect, his Engineer, or Representative.

INDEX OF ARTICLES

GENERAL

155. Arts. **2, 5, 6, 7, 8, 9, 10, 12, 13, 14, 17, 18, 19, 20, 21, 23, 24, 25, 27, 28, 30, 32, 34, 35,** and **36** of the General Conditions* of the General Specifications are hereby made a part of this specification.

DRAWINGS

156. These specifications should be read in conjunction with the following set of four drawings:

Drawing No. 108: A plan of the basement, showing the location of the main and risers.

Drawing No. 103: The first-floor plan, showing the location of radiators, risers, and registers.

Drawing No. 104: The second-floor plan, showing the location of radiators, risers, and registers.

Drawing No. 105: The third-floor plan, showing the location of radiators and risers.

DESCRIPTION OF THE HEATING SYSTEM

157. The system proposed to be installed is a combination direct and indirect heating system. A service main is to be extended from the steam main in Clay Avenue to the inside of the cellar wall by the owner. The water of condensation, after passing through a trap and cooling coil, shall be discharged into the house sewer on the

*In practice, each specification being under separate cover, these general conditions would be included in this specification and would be preceding matter here given.

sewer side of the trap. The house sewer shall empty into the main sewer in Costello Court.

The entire system is to be arranged and constructed so that it will work perfectly in every respect with the city steam, and is to be piped and valved in such a manner that a steam boiler can be installed and connected up to the proposed system at any time without making changes. A suitable **T** pointing toward the probable location of the steam boiler shall be left in the return main in the laundry. The installation, as far as possible, is to be a one-pipe system. All the radiators are to have one-pipe connections except the indirects, which are to have two-pipe connections.

MATERIALS

158. Pipes.—All steam and return pipes must be of the best-quality standard wrought iron.

159. Fittings.—All fittings must be strong cast-iron steam-pipe fittings of an approved make. Screw unions will not be allowed on the work; right-and-left connections will be required on pipes 2 inches or smaller. Larger connections must be approved faced flange unions.

160. Hangers.—All steam-pipe hangers are to be of malleable iron of the Blake or other make approved by the engineer.

161. Pipe Covering.—All steam mains and branches in the cellar are to be covered with 45-per-cent. magnesia sectional pipe covering securely fastened with lacquered brass bands.

SERVICE PIPE

162. The owner will furnish and pay for a $2\frac{1}{2}$-inch wrought-iron service-pipe connection from Clay Avenue to a point inside the cellar wall, and will furnish a $2\frac{1}{2}$-inch gate valve on the pipe inside the cellar wall. The owner's work will terminate here. The contractor shall place a bleeder pipe connected to the condensation main on the house side of the valve, and continue the $2\frac{1}{2}$-inch pipe to the ceiling in the basement. Place a $2\frac{1}{2}$-inch reducing valve on the line. The reducing valve will be furnished by the owner, and the contractor is to cart and fit it up.

On the house side of the pressure-reducing valve, place a suitable steam gauge, and set the reducing valve so as to reduce the pressure in the heating system to about 2 pounds, as indicated by the gauge.

COOLING COIL AND TRAP

163. The owner will furnish, and the contractor shall cart and fit up where directed in the laundry, a steam trap of sufficient size to take care of the water of condensation. Connect this trap to a cooling coil containing not less than 100 square feet. Connect the steam trap and cooling coil so that the water of condensation shall discharge into the sewer on the sewer side of the main drain trap. The cooling coil is to be furnished by the contractor, who will be required to make all necessary connections. Properly valve the connections and by-pass the trap.

MAINS

164. The sizes of the mains are shown in the plans. They must be carefully graded from the reducing valve, with a pitch of not less than $\frac{1}{2}$ inch in 10 feet. Where the 2-inch main passes through the stairway from the laundry, the pipe must loop up, in order to make headroom in the stairway. Take a 1-inch relief pipe from the low point in the main and connect it to the return main from the indirect radiation. At a point shown on the steam main, place a $3\frac{1}{2}'' \times 3\frac{1}{2}'' \times 4''$ **T**, with the 4-inch opening plugged but otherwise left ready for future connection to a steam boiler. The hangers for the steam main are to be located at proper intervals to insure a strong durable support.

The return main for the indirect radiation is to be run around the basement wall, as indicated in the plans. Connect same to trap in the laundry. The return is to be supported on the basement wall with suitable pipe supports securely fastened to the wall with expansion bolts. The arrangement of the entire piping is to be such as to allow for expansion and contraction.

INDIRECT RADIATION

165. The contractor shall furnish and fit up complete in the basement the following cast-iron indirect Excelsior radiators:

	Square Feet
First Floor:	
Dining room	120
Living room	140
Reception room	60
Staircase hall	140
Second Floor:	
South chamber	80
Total	540

The indirect stacks are to be securely fastened to the floorbeams at the ceiling of the basement with strong wrought-iron hangers.

Provide each indirect radiator with a Jenkins disk gate valve, on both the steam and the return pipes. Provide each indirect radiator with suitable automatic air valve of approved make.

The indirect stacks are to be encased on all sides with No. 22 galvanized iron, put together so that the radiators will be accessible for repairs. The air space above each radiator is to be 12 inches and the space below, 10 inches. The casings are to be fitted close to the radiator on all sides.

166. Hot-Air Ducts.—The hot-air ducts are to be of the sizes shown in the plans, and are to be made of No. 26 galvanized iron.

167. Cold-Air Ducts.—The cold air to the indirect radiators is to be taken from the outside of the building, on the north, through a No. 22 galvanized-iron square pipe, the size of which is given in the plans. These ducts are to be well riveted and soldered. Place a wrought-iron damper in each branch, to regulate the supply of air separately to each indirect stack; also, place a slide damper in the main duct at the inlet. Securely hang with strong appropriate hangers all the sheet-metal ducts and flues from the floorbeams. Make all changes in direction by means of easy bends or curves.

168. Registers: First Floor.—Provide and fit up registers of an approved design through which the hot air can pass from the indirect stacks to the rooms to be heated. Fasten the registers securely and neatly to the walls above the baseboard where shown on drawings.

Place in the front of the window seats in the dining room and living room, on the first floor, suitable long narrow registers of the proper size to fit the space. Each of these registers shall have openings of not less than 250 square inches. In the staircase hall, place a side-wall register having openings of not less than 250 square inches. In the reception room, where shown, place a side-wall register having openings of not less than 120 square inches.

169. Registers: Second Floor.—In the south chamber of the second floor, where shown, place a register containing openings of not less than 120 square inches. The finish and design of the registers will be selected by the owner. All registers are to be valve registers.

170. Fire-Protection.—All woodwork that comes within 2 inches of the hot-air pipe or register boxes must be carefully protected from fire by covering it with asbestos. The floor and joists over the indirect stacks must be protected with asbestos covered with tin, and the whole work must be protected and finished in accordance with the rules of the Bureau of Buildings.

DIRECT RADIATION

171. First Floor.—Furnish and fit up complete where shown in the first-floor plan, the following Chautauqua plain radiation, made by the United States Radiator Company:

	Square Feet
Butler's pantry	21
Servants' room	28
Hall lavatory	7
Kitchen	24
Total	80

172. Second Floor.—Place on the second floor, where shown, the following Fowler & Wolfe wall radiation, securely fastened to the walls with strong approved malleable-iron hook plates:

	Square Feet
North bathroom	21
Den	45
Chamber No. 4	32
Chamber No. 3	28
Chamber No. 2	42
South bathroom	21
Dressing room	7
Total	196

173. Third Floor.—Place on the third floor, where shown, the following Chautauqua plain radiation, made by the United States Radiator Company:

	Square Feet
Billiard room	80
Sewing room	32
Servants' chamber (north)	32
Servants' chamber (south)	32
Bathroom	14
Total	190

174. Valves and Air Vents for Direct Radiation. All radiators are to have heavy malleable-iron screwed nipples. All radiators are to be furnished with Jenkins's improved angle radiator valves, nickel-plated, with wooden handles. Finish rough, with ground joints and coupling connections to each radiator.

All direct radiators are to be provided with the Allen automatic air vents or other make approved by the engineer.

175. Floor Boards.—This contractor shall provide and set in five rooms of the third floor $1\frac{1}{8}$-inch quartered-oak floor boards, finished to match floors, as directed by the architect. The edges and angles are to be rounded.

176. Risers and Branches.—All branches leading to the riser pipes with the exception of the branch leading to riser No. 5 through the butler's pantry, are to be taken from the top of the steam main at an angle of 45°, and are to be properly graded so that the condensation will flow back into the steam main. All direct radiation is to be connected up on the one-pipe plan and properly relieved at the base of the riser where required. All risers passing through the floors or ceiling must be provided with suitable approved floor and ceiling plates.

177. Painting and Bronzing.—The owner will do all painting and bronzing required on the heating system, except the cellar work. The contractor will be required to varnish with one coat of Japan black all steam and condensation pipes and apparatus that are in the cellar, and are under the cellar floor, except sheet-metal work and pipe covering.

178. Cutting.—All necessary cutting of holes for the steam fitters will be done by the owner. The contractor will be required to do all excavating and filling in required for the performance of his contract.

179. Test.—The contractor shall test the entire heating system for tightness with a 10-pound steam pressure, and shall test for circulation with a $\frac{1}{2}$-pound steam pressure in the main. The tests are to be made in the presence and under the supervision of the engineer, architect, or their representative. The contractor will be required to exercise every care to insure a noiseless system, and during the process of installing he shall, together with the engineer, carefully review the conditions of the work so as to obtain the desired result.

180. Guarantee.—The contractor shall guarantee his work in every particular; that when complete it will be free from mechanical defects and noiseless in operation, and that after the apparatus is accepted by the owner, if any part thereof fails to accomplish the guarantee herein contained by reason of defects in material or workmanship, he will remedy such defect at his own cost within a reasonable time after being notified. The term "defect" as used here must not be construed to mean such imperfections as would naturally follow improper treatment, accident, or the ordinary wear and tear of use, but are intended to cover imperfections not easily discovered when work is being installed, such as sand holes, flaws, improperly pitched pipe lines, etc., that discover themselves after the system has been in use for a time.

DATE August 25th 1906.

SIGNATURES

CONTRACTOR or CONTRACTORS John Smith

OWNER or OWNERS J. R. Retsof

WITNESSES Geo. Brown

Harry White

TITLE PAGE

No. 503.
W. No. 1,946.

SPECIFICATION

of materials and workmanship for the Plumbing in a residence situated in Flatbush, Pa., J. R. Retsof, Esq., owner.

Prepared by

JOHN W. SCOTT, Architect,
812 Franklin Street,
Scranton, Pa.

- - - - - - -

The work is to be carried out in conformity with the accompanying drawings, and under the superintendence of the Architect or his Representative.

INDEX OF ARTICLES

GENERAL

181. Arts. **2, 5, 6, 8, 9, 10, 12, 13, 14, 15, 16, 17, 18, 20, 21, 23, 24, 27, 28, 30, 34, 35,** and **36** of the General Conditions* of the General Specifications are hereby made a part of this specification.

DRAWINGS

182. The plumbing drawings consist of the following sheets:

Drawing No. 107: A plan of the plumbing of the cellar and underground drainage.

Drawing No. 103: A plan of the plumbing on the first floor.

Drawing No. 104: A plan of the plumbing on the second floor.

Drawing No. 105: A plan of the plumbing on the third floor.

Drawing No. 106: An elevation of the plumbing system.

All necessary general and detailed drawings will be furnished, and the work must be done in strict accordance therewith.

GENERAL DESCRIPTION OF THE PLUMBING SYSTEM

183. The gas supply shall be taken from a 4-inch gas main in Clay Avenue. The water supply shall be taken from a 4-inch water main also in Clay Avenue. The drainage shall discharge into a 12-inch sewer in Costello Court.

*In practice, each specification being under separate cover, these general conditions would be included in this specification and would be preceding matter here given.

PLUMBING FIXTURES

184. Servants' Closet.—Furnish and fit up complete where shown in basement one plain substantial siphon-jet closet with strong oak seat hinged to the bowl, and a strong durable overhead tank, lined with 16-ounce copper and fitted with strong approved high-pressure ball-cock. The flush pipe is to be nickel-plated brass at least $\frac{1}{16}$ inch thick. This contractor shall also, as an alternative, bid to furnish the closet with a Kenney flushometer valve as directed, the supply pipe to be of galvanized iron.

185. Safe-Waste Sink.—Furnish and fit up complete where shown in cellar, one $20'' \times 14'' \times 6''$ plain cast-iron safe-waste sink, supported on cast-iron legs and wasted through $1\frac{1}{2}$-inch cast-iron trap and pipe made in one casting and extending to the floor (see catalog of A. Y. McDonald Manufacturing Company, Dubuque, Iowa). Back vent this trap with galvanized-iron pipe. Supply water to this sink through a $\frac{1}{2}$-inch finished-brass compression and hose bib with stuffingbox.

186. Laundry Tubs.—Furnish and fit up complete where shown in basement, one set of three Mott's Colonial wash tubs, Plate 908 R, of best-quality solid earthenware, glazed natural yellow and free from cracks and flaws of any description. The tubs are to be fitted with a suitable strong ash frame, and attachments for wringer are to be provided; the tub cocks are to be over the tubs. The tubs shall waste through a 2-inch brass waste pipe and trap into the base of a 2-inch vent line, and shall be supplied with hot and cold water through a $\frac{3}{4}$-inch galvanized-iron pipe and nickel-plated flanged Fuller cocks. The standards for the tubs are to be strong, heavy, bronzed cast iron, and the tubs are to be rigidly attached to the walls.

187. Butler's Pantry Sink.—Furnish and fit up where shown in butler's pantry, one strong tinned-copper square-pattern butler's pantry sink having rounded corners and flat bottom and provided with a substantial wooden casing. The copper is to be at least 16 ounces. Waste this sink through a $1\frac{1}{2}$-inch nickel-plated brass trap properly back-vented. Supply the sink with hot and cold water through a suitable nickel-plated brass double pantry cock, and provide the sink with a rubber plug and strong nickel-plated brass chain.

The drain board and the woodwork around the sink to a height of 12 inches are to be covered with pure block tin $\frac{1}{16}$ inch thick, and neatly worked in place so that the nails will not be visible. This block-tin work is to be done in as neat a manner as possible. It must fit the wood snugly and smoothly and be perfect when completed.

188. Kitchen Sink.—Furnish and fit up where shown in kitchen, one Mott's Colonial sink (Plate 831 R) 36 in. × 23 in., with natural buff glaze. Support the sink on a strong iron frame rigidly secured to the wall at the back and resting on two neat bronzed-iron legs in front. Provide the sink with a back 18 inches high and patent ash drain boards hinged with telescope leg. Waste this sink through a 2-inch approved cast-iron porcelain-lined grease trap and 2-inch waste pipe. Back vent the trap with $1\frac{1}{2}$-inch pipe. Supply the sink with hot and cold water through $\frac{3}{4}$-inch pipe and $\frac{3}{4}$-inch nickel-plated Fuller cocks, the cold-water cock being threaded for hose.

189. Reception Hall.—Furnish and fit up in the closet under the stairs off from the reception hall, one first-class approved Hajoca plain vitreous-china siphon-jet water closet, with properly countersunk seat strongly made of selected solid mahogany and hinged to the bowl. Flush this closet through a nickel-plated Kenney flushometer.

190. Wash Basin.—Furnish and fit up where shown in the reception-hall closet, one Regal porcelain corner lavatory, as shown in Plate 151 L, Haines, Jones, & Cadbury Company's catalog. The lavatory is to be of the best quality vitreous china, class A, and 20 inches on the side. Secure the slab rigidly to the wall with suitable supports. Waste this basin through a $1\frac{1}{2}$-inch nickel-plated brass trap and waste pipe to the wall. Supply the basin through $\frac{1}{2}$-inch nickel-plated brass supply pipes for hot and cold water. Use Hajoca basin cocks with china name plates marked "Hot" and "Cold."

191. Second-Floor Toilets.—Furnish and fit up where shown, two Hajoca siphon-jet water closets, the same as specified for reception hall. Flush these closets through Kenney nickel-plated brass flushometer valves and regulating cocks. Each closet is to be provided with a strongly made solid-mahogany countersunk seat attached to bowl, the same as specified for reception-hall closet.

Furnish and fit up complete, where shown, two Standard porcelain-enameled cast-iron bathtubs of first-class quality, as shown in Plate 53 S of the Standard Manufacturing Company's catalog S. The tubs must be free from cracks, flaws, or other imperfections, $5\frac{1}{2}$ feet long inside, with 4-inch roll rim, and must bear guarantee against crazing and other defects. The exterior finish is to be two coats of ivory-white enamel, with gold bands. These tubs must be perfect in every respect. Waste them through suitable brass traps with 4-inch nickel-plated brass screw-cap flush with the floor.

192. Wash Basins.—In each bathroom and in bed chambers Nos. 3 and 4, furnish and fit up complete Regal porcelain lavatories, as shown in Plate 143 L, Haines, Jones, & Cadbury Company's catalog.

Waste each basin through $1\frac{1}{2}$-inch nickel-plated brass trap to the wall. The slab of each basin is to be 30 in. × 22 in., the quality is to be Class A, and they must be perfect in every respect. The basin shall be decorated with a neat straight line, clean-cut moldings, and perfect glaze; each basin is to be provided with Regal porcelain legs and Fuller basin cocks with porcelain name plates marked "Hot" and "Cold."

In bed chamber No. 4, furnish and fit up complete one solid porcelain right-hand corner basin with back and end. The slab is to be 30 in. × 22 in., and of the same general type and quality as the Regal basin previously specified for the toilet rooms. Use one porcelain leg for this basin. Waste the basin through a standing waste properly trapped, and supply with hot and cold water through Fuller basin cocks with china name plates marked "Hot" and "Cold."

193. Slop Sinks.—Furnish and fit up where shown on second floor, one 22″ × 18″ × 12″ roll-rim Mott's Colonial slop sink, as shown in Plate 812 R, with bronzed-iron trap standard, nickel-plated strainer, and 18-inch back. Supply this with hot and cold water through a nickel-plated compression double faucet. The trap standard is to be a half **S** trap.

194. Servants' Bathroom.—Furnish and fit up where shown, one cast-iron enameled 5′ 6″ bath of the ordinary plain pattern, with plain plug and chain and combination cock inside the bath, the same as shown in Plate 19 S, Standard Manufacturing Company's catalog S, the tub to be without exterior finish. Furnish and fit up in servants' bathroom one porcelain-enameled flat-back iron basin in one piece, with nickel-plated Fuller cocks, rubber plug and chain, nickel-plated trap, and brackets complete. Furnish and fit up in servants' bathroom one plain durable siphon-jet water closet, with plain-oak low-down copper-lined flush tank, as directed. The seat to be of oak and attached to the bowl.

195. Kitchen Range.—The kitchen range will be furnished by the owner. The gas range will be furnished by the owner. The plumbing contractor will be required to make connections with brass piping, between these ranges and the kitchen boiler.

196. Kitchen Boiler.—The contractor shall furnish and fit up in the kitchen, where shown, one 60-gallon galvanized-iron extra-heavy best-quality range boiler tested to 250 pounds.

197. Refrigerator.—The refrigerator will be furnished and set in position by the owner. A copper pan 1 foot square of 16-ounce copper with $1\frac{1}{2}$-inch upstand is to be located under the refrigerator outlet and is to be connected with $1\frac{1}{2}$-inch lead pipe and brass strainer at the floor line. The plumber will be required to connect this by means of 1-inch galvanized-iron pipe with the safe-waste sink in the cellar, providing a check-valve on the mouth of the safe-waste pipe over the sink, and clean-outs wherever necessary to insert rods for cleaning-out purposes.

DRAINAGE SYSTEM

198. Main House Sewer.—The contractor shall furnish and lay in a straight line between the rear of the building and the sewer, in Costello Court, a 6-inch salt-glazed vitrified sewer pipe. This pipe must be laid on a solid natural bottom. The joints are to be made with Portland cement and clean sharp sand in the proportions of one and one. The lines must be laid perfectly true, and the interior swept out clean as it is laid. Place the main-drain trap under the cellar floor just inside of the rear wall. Take off a 4-inch fresh-air inlet from the house side of the main-drain trap and run it through the rear wall, terminating it above the grade line where directed with a suitable vent cap. All the drainage work shown in the cellar plan is to be extra-heavy cast iron with calked joints, and must be supported on natural earth bottom. A hatchway shall be left in the wooden floor for access to the space underneath. Brass screw-cap clean-outs must be placed at all points on the drainage and waste-pipe system where it is necessary to obtain access to any line. The base of each soil stack must be supported solidly on a brick pier, to be built by the owner for that purpose. The drain, soil, waste, and vent stacks having a diameter greater than 2 inches are to be extra-heavy cast-iron pipe with strong calked joints. Those having a smaller diameter are to be galvanized-iron pipe and must have easy-sweep flush fittings; no wrought-iron pipe is to be used under the cellar floor. All the vents and branches on the drainage and ventilation system are to be easy-sweep flush fittings. All vent stacks less than 4 inches in diameter that pass through the roof must be increased in diameter at such a place and in such a manner as required by the city ordinance. All soil, waste, and vent stacks are to be rigidly secured with wall hooks or other approved fastenings. All lead branches to closets or other fixtures are to be connected to the cast-iron pipe with heavy brass ferrules and wiped joints; all lead pipe used on the drainage system is to be equal to 7-pound sheet lead in thickness; all nickel-plated waste pipes are to be connected to lead branches with wiped joints concealed by heavy nickel-plated brass flanges; the vent pipes intersecting the roof are to be flashed with 6-pound sheet lead. The location and the proper height of vent pipes will be directed on the job. The top of each vent pipe to have approved woven-wire ball screens. All the waste connections and vent connections exposed to view under the fixtures are to be nickel-plated brass, except as otherwise specified, and are to be provided with suitable brass floor and wall plates.

199. Leaders.—The leaders from the roof down to a point about 4 feet above the ground, or where directed, will be furnished and installed by the sheet-metal contractor. The plumber shall continue the extra-heavy cast-iron leader drain up to and above the ground to receive these leaders, leaving them plumb and neat and in true alinement for the leaders. The leader traps are to be located under the cellar floor, where shown, and are to be provided with brass screw-cap clean-outs, flush with top of cement floor. The leader drains outside of the building are to be of cast iron.

WATER-SUPPLY SYSTEM

200. Main Line.—From the main in Clay Avenue run a $1\frac{1}{2}$-inch extra-heavy galvanized-iron service pipe into the cellar through the front wall. Cover this pipe with a heavy coat of R. I. W. paint to prevent corrosion. Obtain and pay for a $1\frac{1}{4}$-inch tap in the street main. Connect the corporation cock to the galvanized service pipe with $1\frac{1}{4}$-inch **A A A** lead pipe and brass solder-nipple connections. Place a stop-cock and a curb box at the curb. Run the service-pipe line at least 5 feet below the ground, and finish with a $1\frac{1}{4}$-inch plugged **T** inside the cellar. On the house side of the **T**, place a $1\frac{1}{2}$-inch gate valve with a drip cock on the house side of the valve, On the house side of this drip cock, place a $1\frac{1}{2}$-inch Kieley pressure-reducing valve. Place a suitable pressure gauge on the house side of the pressure-reducing valve, and set the valve so that it will hold up 30 pounds of pressure in the building independent of street variations. On the street side of the pressure-reducing valve, take off a $\frac{3}{4}$-inch galvanized-iron pipe, and run same to supply a $\frac{3}{4}$-inch hose bib, to be located where directed, for lawn-sprinkling purposes. Place a $\frac{3}{4}$-inch roundway stop-and-waste cock on this line in the cellar. Continue from the pressure-reducing valve with a $1\frac{1}{2}$-inch galvanized-iron water main to the several risers. Leave a plugged **T** where directed, to supply a steam boiler in the future. Run a 1-inch branch to the laundry tubs, a $\frac{1}{2}$-inch branch to the safe-waste sink, a $\frac{3}{4}$-inch branch to the butler's-pantry sink, a $1\frac{1}{4}$-inch branch to the reception-hall lavatory, a $1\frac{1}{4}$-inch branch to each toilet room containing flushometer valves. Take off $\frac{3}{4}$-inch branches to all baths and $\frac{1}{2}$-inch branches to all basins. Place a gate valve on the branch to each toilet room, and a drip cock on the house side of each gate valve. Place a gate valve or roundway stop-and-waste cock where directed on all branch lines, from both the hot- and the cold-main distributing lines, so as to control any fixture or set of fixtures without shutting off any other part. Tag each valve, to designate what it controls. Run all the pipes in the cellar along the ceiling neatly and rigidly, supporting them with suitable tinned pipe straps secured with screws. Use beaded malleable-iron fittings all through the job for water supply—all the threads to be clean cut. Grade all cellar pipes down to the several drip cocks, and make provisions to drain all the pipes easily.

201. Safes.—Lay a 14-ounce soft-rolled copper pan under the entire floor of the bathroom over the dining room, making an upstand all around the back of the baseboard. Properly lock all seams, and solder same water-tight. Run a $1\frac{1}{4}$-inch waste pipe from the second-floor safe to the laundry ceiling over sink. Test these safes by filling them with water after roughing in is all done.

BOILER CONNECTIONS

202. Set the boiler where directed on a strong galvanized-iron stand. Connect the boiler to waterback of the coal range with 1-inch semiannealed brass tubing, and to the gas range with $\frac{3}{4}$-inch semiannealed brass tubing. Leave a plugged T at the top and another at the bottom of the boiler, for future connection to a steam water heater. From the top of the boiler, run a 1-inch hot-water distributing line, branching off to the bathroom over the dining room, and return with a $\frac{1}{2}$-inch circulation pipe. Connect the circulation pipe to the bottom of the boiler with $\frac{3}{4}$-inch pipe, and place a swing check and a stop-cock on the line where directed. From the 1-inch hot-water distributing main at the kitchen ceiling, run a $\frac{3}{4}$-inch branch up to the bathroom on the third floor, and return with $\frac{1}{2}$-inch pipe, which shall join the $\frac{3}{4}$-inch circulation pipe from the bathroom over the dining room. Place a stop-cock on both the hot and circulation branches to control both bathrooms. From the top of the boiler, run a $\frac{3}{4}$-inch hot-water pipe to supply the bathroom over the kitchen. This hot-water supply shall not be provided with a circulation pipe. Run a $\frac{1}{2}$-inch hot-water supply pipe without circulation along the cellar ceiling to the stairway hall basin. Place a gate valve on the cold-water supply above the kitchen boiler, and a gate valve on each main line running from it. Run a $\frac{3}{4}$-inch sediment pipe from the kitchen boiler to the safe waste sink in the cellar. On top of the kitchen boiler, place a $\frac{1}{2}$-inch safety valve of approved make and of the spring-pop pattern. Discharge the waste from the safety valve into the sediment pipe and load the safety valve to blow off at 40 pounds.

All the pipes for supplying both hot and cold water throughout the entire building are to be best-quality galvanized iron, except where specified otherwise. All the fittings are to be strong, malleable-iron galvanized beaded fittings for iron pipe, or brass beaded fittings for brass pipe.

Galvanized-iron ring-plate hangers are to be used where the pipes run along finished ceilings or against finished walls. All hot- and cold-water pipes exposed to view under the fixtures are to be of nickel-plated brass, iron-pipe size, finishing at the floor or walls, as the case may be, with heavy nickel-plated brass flanges. All hot-water pipes are to be graded so as to pitch back to the boiler, and are to be provided where necessary with drip cocks, so that every pipe can be easily emptied.

GAS PIPING

203. From the 4-inch gas main on Clay Avenue, run a $1\frac{1}{2}$-inch gas service pipe in through the front cellar wall. Place a $1\frac{1}{2}$-inch gate valve just inside the wall, and another at the curb, within an iron extension curb box. Grade this service pipe back to the main, if possible; if not, place a drip cock and pocket inside the cellar wall. Protect the service pipe with a heavy coat of R. I. W. paint, and fill in the trench carefully to protect this coat. The contractor will be required to furnish and pay for the tapping of the gas main and the connection. He shall obtain and set the gas meter. Connect up this meter with $1\frac{1}{2}$-inch D lead pipe. Run a $1\frac{1}{2}$-inch gas pipe from the meter to a point beyond the connections to the gas logs. Then continue with $1\frac{1}{4}$-inch pipe to the gas range in the kitchen, and connect up the range and the gas water heater complete. Run a $\frac{3}{4}$-inch gas pipe to the gas log in the reception hall, and connect to the log complete as directed. The log will be furnished by the owner. There will be no gas used for lighting purposes in the building. Leave a $\frac{3}{4}$-inch plugged T at the cellar ceiling, where directed, for a laundry stove. Each branch is to have stop-cock and is to be tagged.

FINALLY

204. The city ordinances must be respected in all work; all cast-iron pipes are to be extra heavy, and all junctions of the same are to be made with oakum and molten lead calked flush with the face of a hub. The weights of the pipes must accord with the city ordinances; all the soldered joints are to be wiped; all pipes are to be supported in the firmest manner with appropriate hangers, bands, or other fastenings, to be approved by the sanitary engineer, so as to insure strong, neat, and secure work. All pipes must be of uniform thickness and free from all imperfections; the entire soil, waste, and vent system is to be tested by the water-pressure test in the presence of the plumbing inspector and the sanitary engineer at the expense of the contractor; the whole work is to be again tested, after it is completed, by the smoke test in the presence of said inspector and engineer at the expense of the contractor. The owner will furnish and fit up all the necessary pipe boards and planking for the pipes and fixtures. The plumber will be required to pay for all permits and furnish all materials, tools, and labor necessary to duly complete his work, and shall leave the same in a finished condition. This contractor shall do all cutting and repairing necessary for the proper installation of this work, including the cutting of chases and recesses in brick walls. No changes in construction shall be made without first consulting the architect or his representative and receiving consent in writing. All cutting shall be done by mechanics regularly employed to do that particular kind of work.

DATE *August 1st* 19*06*.

SIGNATURES

CONTRACTOR or CONTRACTORS *J. Kelley*

OWNER or OWNERS *J. R. Retzof*

WITNESSES *Geo. Brown*

Harry White

CONTRACTS

Serial 1090 — Edition 1

BUILDING CONTRACTS

INTRODUCTION

1. Scope of Subject.—The parties to a building contract are usually the builder, the owner, and the architect, although in some cases the architect is not a party. Building contracts are nearly always between the owner and the builder, with the architect as advisor and arbitrator. In this Section, contracts will be explained and discussed in such a manner that a practical knowledge of the business relations that exist between the several parties to a building operation will be acquired, and the relative positions of these parties in the eyes of the law will be comprehended.

CHARACTER OF THE AGREEMENT

NATURE OF A CONTRACT

2. Definition.—A **contract** is a formal agreement between two parties for doing or not doing some definite thing. It is very clearly defined by Woolsey ("Introduction to International Law") as, "One of the highest acts of human free will, binding itself in regard to the future, and surrendering the right to change a certain expressed intention, so that it becomes morally and jurally a wrong to act otherwise; it is the act of two parties, in which each, or one of the two, conveys power over himself to the other, in the consideration of something done or to be done by the other."

In the strictest sense, a contract is an agreement enforcible by law—an agreement based on sufficient consideration, and in such a form, and made under such circumstances, that a breach of it is good cause for action by law. It is this sense of validity before the law that distinguishes a contract from a simple agreement, the parties to which are not bound in such a formal way and are not amenable to one another for its fulfilment.

3. Parties to a Contract.—In the execution of every building operation of any size and importance, there are at least three persons interested—the *owner*, the *builder*, or *contractor*, and the *architect*. The owner is the person vitally interested, because it is his money that is being expended, and it is natural that he should want to receive the best material and workmanship consistent with the size and quality of the building to be erected and the amount of money to be expended. The builder, who is party to the contract, agrees to accomplish certain results for a stipulated amount of money, and in deciding the extent of his responsibility toward the owner, may be tempted to interpret the contract to best suit his own interests. The architect is employed by the owner as an expert adviser in matters of building, and is the judge that decides for the owner whether the builder is doing his duty and fulfilling his contract.

Though all men are deemed honest unless proved otherwise, it may readily be seen that a dishonest builder might, unless some valid agreement existed, make considerable trouble for the owner. The builder is even more at the mercy of a dishonest owner, for he might be led into a building operation that would require the expenditure of considerable time and money, and then, after the work is completed, he would be unable to collect the amount of his bill. This would more than likely put him to the additional expense of long and wearisome litigation, which, though the courts sustained his claim, might cause bankruptcy before he could recover it.

Even though each of the parties should be perfectly honest and inclined to deal fairly with each other, it is necessary to have a contract that will stipulate the terms of the agreement in a perfectly clear and concise manner—drawn up, agreed to, and signed by each party concerned—so that each, over his own signature, will have defined for him his responsibilities and duties in the transaction.

4. Classes of Contracts.—Contracts may be divided into three classes: *written*, *oral* (or, as it is sometimes called, *parol*, or *verbal*), and *implied contracts.*

A **written contract** is one wherein the terms of the agreement are written or printed, and signed by the contracting parties.

An **oral, or verbal, contract** is one in which the parties concerned agree verbally (usually in the presence of witnesses) to transact or perform certain things.

An **implied contract** is one that is *understood* to exist, through the very nature of things, between two parties without any previous written or verbal agreement. For instance, one person employs another to perform a certain piece of work and thereby implies an obligation for reasonable remuneration to the person that performs the work; or a person accepts the benefits accruing from the performance of such work, and thereby implies an obligation to have satisfactorily performed the labor for which he was paid.

Most contracts embody at least two of the foregoing conditions, for the reason that it is almost impossible to fully cover all the terms of an agreement in a written or an oral contract, and much must be implied if a successful performance of the work is understood.

5. Written Contracts.—A written contract is usually regarded, though incorrectly, as more binding than either of the others. Its preference over the other forms lies in the fact that the statements of the agreement are in black and white, and, being signed by the parties concerned, cannot well be refuted; and since a certain amount of formality is required in order to draw up a written contract, the law regards the document as the finished and definite conclusion of all the preceding negotiations of the contracting parties and as fully expressing the understanding between them in regard to the terms of the agreement.

That verbal agreements are regarded in such an unfavorable light by the law is probably due to the fact that witnesses and parties to a verbal agreement, as a rule, when called on in court to testify, utterly fail to agree in their statements as to what really was said on the specified occasion. The court is, therefore, inclined to accept and hold paramount any document that will explain, in any degree, the real understanding between the contracting parties. Hence it is, that even a note in the memorandum book of one of the parties concerned, or in a book of a third and disinterested party, as to the terms of the agreement, will be looked on with favor by the court, and will usually be held, should it prove to be genuine memoranda, as testimony of importance above that of a witness to the verbal transaction.

6. Oral Contracts.—It must not be thought that, in the absence of written documents, verbal contracts or agreements can be broken with impunity by either party, for such is not the case, as it is the custom of the courts in matters of this kind to endeavor to ascertain through witnesses and from circumstances the real understanding existing between the parties to such a contract, and to deal fairly with them, commensurate with the testimony and evidence given.

7. Implied Contracts.—Where the owner of a building stands by and sees certain improvements made, or labor performed, from which he will derive benefit, he implies a contract for the work, and is in duty bound to pay a commensurate price for the same, unless there is some stipulation to the contrary in a definite contract, or where there is some written document, previously made, that in some way nullifies this implied contract. For instance, the written contract may set forth that "No payments shall be made for extra work done by the contractor unless authorized in writing, by the owner," or "by the architect." In this case, if the contractor does any extra work for which he has no written order, he does it at his own risk, and would have no action against the owner in court.

In order to make clear the extent of an implied contract, the following illustration is of interest: A plumber was subcontractor to a builder during the erection of a house; the builder was subsequently discharged by the owner for drunkenness, but the plumber went on with his work, under the observation, and in some instances under the direct orders, of the owner. Having finished his work, the plumber looked to the owner for payment, which was refused on the ground that the builder had already been paid for the work. The plumber brought suit for the amount due him, and, though it was proved in court that the builder had been paid enough on the building to cover the plumber's claim, the court recommended that, if the evidence warranted it, the jury should oblige the owner to pay the plumber for at least such work as he had done subsequent to the builder's discharge. This view of the case was taken by the court on the ground that "Where one stands in silence and sees work done, or materials furnished for work done upon premises belonging to him, of which he accepts the benefit, a promise to pay the value thereof may properly be inferred."

8. Competitions: Contract by Tender.—Where designs or plans are submitted in compliance with the terms of a circular or printed notice, setting forth an invitation for such designs or plans and offering some inducement for same, it is regarded and has been declared by the courts to be a contract. In order that the validity of such a proposal be made certain, its terms should be set forth clearly and distinctly, and the person accepting the terms should comply with them strictly and to the letter. Proposals of this kind are advertised by committees or individuals, who call for competitive drawings of some public or private building. The submission of plans or designs in strict compliance with the terms of the advertisement constitutes a contract that is upheld by law, provided the advertisement is issued by persons of proper authority and responsibility.

Should a committee call for architectural designs that are to comply with certain conditions or requirements, and by subsequent notice modify these conditions to such an extent as to make worthless certain plans partially prepared by one of the competing architects, said architect would be able to recover the cost of such preparation. But if he had not commenced the designs until after the modified circular of advertisement had been issued, the later program would take precedence over the first and be held as embodying the terms of the contract.

Should the committee set forth conditions that would be impossible for an architect to fulfil in the design of any one building (such as a demand for certain accommodations that could not be provided for the stipulated sum of money), the architect should get the vote of the committee as to which requirement—cost or accommodation—takes precedence and which he is to disregard. The opinion of any one member of the committee is not sufficient, and only the joint decision of the entire committee should be accepted. Therefore, in issuing circular invitations for proposals or competitive drawings, great care should be taken to state in clear terms just what is wanted and required, and equal care should be exercised by any one complying with the terms, for not only has the law but little relief for persons that do not know how to express their ideas, but it also extends little hope to those that cannot understand a clear statement and misconstrue the intent of the published requirements.

THE CONTRACTING PARTIES

9. Formal Contracts.—A **formal contract** consists of a direct and pertinent proposal from the one party and an unconditional acceptance by the other. Such a contract may be made by a letter proposing certain terms, and duly accepted by a letter in reply, or the more usual form of a written agreement, setting forth in full the requirements of the one party and the unconditional acceptance of them by the other, and signed by both parties. In all formal contracts, the terms must embody every condition that is to be complied with, and should be so explicitly stated as to be clearly understood by the contracting parties, so that there may be no misunderstanding between them in regard to the performance of the one party and the demands of, and consideration to be paid by, the other.

10. **Contracting With Corporations.**—An agreement entered into with a corporation differs very materially from one contracted with an individual. Almost any contract (provided it is not immoral) is binding on an individual, provided the intention is well defined and understood and a consideration is to be made for its fulfilment. Such, however, is not the case with a corporation. It behooves the person about to make a contract with a corporation to inquire into the scope of its charter, and to ascertain the limit of its powers to make such contract and the authority of its officers who are to negotiate the contract. In England, a contract requires the seal of the corporation in addition to the signatures of the proper officials in order to insure its validity, and such was formerly the case in the United States, though in many of the states the signatures of the proper officers are generally considered sufficient, provided they have the required authority through their charters and by-laws. In fact, courts in so many of the states have taken this view that it is more than likely, should similar cases arise in the other states, the courts would hold the same opinion. Irrespective of the matter of the seal, however, it is of vital importance in making a contract with a corporation to ascertain whether the persons representing the corporation are invested with the proper authority to make such a contract and that the corporation is bound to recognize it. There is no redress, and no action will be sustained, if the person entering into a contract with a corporation has, through his own neglect to obtain such information, entered into a contract with officials lacking the proper authority, and at variance with the charters and by-laws of the corporation.

11. **Public Contracts.**—In entering into a contract with a public body, even when the officials representing such

a body are duly authorized, it is imperative to make the contract with due formality, or it will not be legal. For instance, it has been held in several states that the county was not bound by a contract entered into by the county commissioners unless the commissioners were convened in a regular meeting of the board. A contract entered into informally, even within the legal authority of the officials, is insufficient.

When a contract is made with a public corporation for work to be performed under the supervision of a committee, such as a town committee, the contractor should ascertain whether the contract is made through the concurrence of a majority of the committee. Not only does this apply to an original contract, but also to any alterations to be made in one already entered into.

The contractor, in other ways, runs many more risks in dealing with corporations than he does with individuals, for a mechanic's lien is without effect against any public building, such as a schoolhouse, jail, court house, or town hall; and even aside from state, county, and town corporations, no such lien can be maintained against the property of a corporation operating for the accommodation of the public, such as railroad stations, ferry houses, etc.

Again, a public corporation is sometimes exempt from fulfilling its contract. An instance of this occurred in New York, when a contract was made for a public building. The erection, however, was postponed, and the contractors brought suit to force the fulfilment of the contract, but, though the contract was drawn with due formality and was perfectly legal, the court of appeals decided that a state could not be compelled by a contractor to erect a building, and that his only redress, provided the state broke the agreement and he himself was not in default, was a claim for damages, which must be made in the form of a petition to the state legislature.

12. False Representation.—Through lack of caution on his part, a contractor frequently finds that he has made an agreement with persons that, though they have represented themselves as authorized to execute the contract, have no such legal authority. The corporation, therefore, refuses to pay the contractor his consideration, and he has no action against that body, though he may possibly recover damages from the persons that caused him to enter into the contract under false representations. It is, therefore, a good plan and a safeguard to both parties to have this matter clearly defined before the agreement is signed. It is, in fact, sometimes a matter of doubt whether the members of a committee who sign their names to a contract for building, to be paid for by a public corporation, do not sometimes, through the wording of the agreement or the manner of signing it, make themselves each personally liable for the amount of the contract.

13. The Lowest Bidder.—It is the common supposition that the award of a contract must be made to the lowest bidder, unless there is a statement in the tender for bids that stipulates that the parties making the tender "reserve the right to reject any or all bids." This is not the case, however, as no such stipulation is required, and the parties making the tender can omit such a clause without being bound to prefer the lowest bidder. The laws of some states and many public and private corporations require that bids shall be asked for all work involving an expenditure above a certain amount, and the proposal of the lowest bidder accepted. This being the case, the officials making the contract are bound to award it to the lowest bidder. When the stipulation is made in the tender calling for bids on certain work, that "the contract shall be awarded to the lowest responsible bidder," the discretion allowed the parties making the tender is so great in regard to what they may consider as constituting the "responsibility" of the bidder, that the law virtually admits that they may award the contract to whomsoever they may see fit, so long as they have decided truly in their own minds which party is the lowest *responsible* bidder.

The extent to which parties may be held in awarding a contract by the statement in the tender, that the award shall be made to the "lowest bidder," is well set forth in the confirmation of a decision by the Supreme Court of Pennsylvania. A case arose in Pittsburg, where the water committee awarded a contract for some mains to a party that was $5,000 higher than the lowest bidder. The lowest bidders having complied with all the terms of the tender and furnished the proper bond, felt that they were entitled to the contract, and applied for a mandamus in order to compel the committee to award the contract to them. The committee, in reply to the court's inquiry to ascertain if the mandamus should be granted, stated "that it was within their full knowledge and belief, that on a previous occasion the said firm had by some means or other attempted and did perpetrate a gross deceit and wrong on them, in surreptitiously departing from the specifications for a certain contract for the construction of boilers for the new waterworks, by striking therefrom, without the knowledge or consent of the said committee, the word *mud-drum;* also, that it was within the knowledge of some, if not all, of the members of the water committee, that the senior member of the firm was a man of intemperate habits, whose character for sobriety was not such as would warrant the committee in giving said firm a responsible contract; that the senior member also had attempted to bribe the mechanical engineer of the waterworks, who was the inspecting officer of said contract." They further stated that the firm was otherwise disqualified for the proper fulfilment of the requirements of the proposed contract. The report of the commissioner appointed in the case to take testimony showed that the said firm was the lowest bidder, and from a pecuniary standpoint was responsible; and while, in the opinion of the commissioner, the committee fully believed that the statements made were true, it was found that inquiry on the part of the committee would have shown that none of the three accusations made, as to attempted deceit, intemperance on the part of the senior member, and bribery of the engineer, was substantiated. Notwithstanding this, the court held that the committee's action could not be changed.

The Supreme Court, in the confirmation of the lower court's decision, said: "The learned judge who, as the mouth-piece of the court to which this case was submitted, delivers the opinion, finds that the facts stated in the petition are true, and that the allegations contained in the answer, as above set forth, are wholly without foundation, but that, notwithstanding this, the committee fully believed that what was asserted in the answer was true. We must take this opinion of the court as to the belief of the respondents to be correct; nevertheless, it does somewhat surprise us, that this body of men, intrusted with so important a duty, should have rested so contentedly under a delusion which a little inquiry in the right direction would have dissipated, and thus save a handsome sum of money to the city treasury." In regard to the word *responsible* the court held that it means something more than pecuniary ability, and further stating the case said, "In a contract such as the one in controversy, the work must be promptly, faithfully, and well done; it must, or ought to be, conscientious work; to do such work requires prompt, skilful, and conscientious men. A dishonest contractor may impose work upon the city in spite of the utmost caution of the superintending engineer, apparently good, and even capable of bearing its duty for a time, which in the end may prove to be a total failure, and worse than useless. Granted that from such a contractor pecuniary damages may be recovered by an action at law, this at best is but a last resort, that often produces more vexation than profit—a mere patch upon a bad job—an exceedingly meager compensation, at best, for the delay and incalculable damage resulting from the want of a competent supply of water. The city requires honest work, not lawsuits. Were we to accept the interpretation insisted upon by the relators, the difference of a single dollar, in a bid for the most important contract, might determine the question in favor of some unskilful rogue, as against an upright and skilful mechanic. Again we know that, as a rule, cheap work and cheap workmen are but convertible terms for poor work and poor workmen, and if the city, for the mere sake of cheapness, must put up with this, it is indeed a most unfortunate position. It is settled beyond controversy, that where the complaint is against a person or body that has a discretionary or deliberate function to exercise, and that person or body has exercised that function, according to the best of his or its judgment, 'the writ of mandamus will not be granted to compel the undoing of what has been done."

Bidders for public work under the statute that work shall be given to the lowest bidder, must comply strictly with the terms of the tender if they expect their proposal to be accepted or even considered as the lowest bid.

THE SIGNATURE

14. What a Signature Implies.—Since a contract is a mutual agreement between two or more parties, it becomes essential to its legality that there should be available proof of the fact that the contracting parties thoroughly understand it in the same way and willingly assent to the obligations incurred by the conditions—in other words, that the parties are of one mind. Therefore, when the signatures of all the contracting parties are affixed to the document setting forth the terms of the contract, they are deemed by law as evidence of this mutual agreement and understanding, and impart validity to the document.

A signature may be the inscribed name by which a party is known; or in case he cannot write, his mark, or cross, will be regarded as legal, provided it is witnessed and his name is written near it in the customary way and by a duly authorized party. It has been held, however, that a signature "by mark" is *not* valid if made by the other party to the contract for the one signing the contract by mark.

There are cases where it is not necessary that a person should sign a contract in order to be bound by its conditions. For instance, a person is mentioned in a contract as one of the signers, and he is also to act as an attorney for another party to the same contract. If he signs only as attorney for the other person and does not sign on his own account, he is nevertheless a party to its fulfilment, the same as though he had signed it in his own name. It has been held in court, that since he must have read the document before signing it as attorney, and must have seen that he was personally mentioned as one of the signers, by failing to make any remonstrance against it and by accepting its benefits, he assented to its terms and became a party to its fulfilment, the same as though he had signed it in his own name. It is reasonable, therefore, to suppose that any person knowing the terms of a contract and being aware that he is personally interested in it who stands by without resistance or remonstrance and sees it drawn up and afterwards accepts the benefits recurring from such agreement, will be held responsible by law and will have no excuse on the ground that his actual signature is not on it.

If the signature of a person appears on a contract as a party to that contract, the law assumes that the signer is able to read and is familiar with the contents of the document. It is not necessary in the first instance to prove that the contract was willingly signed, that an opportunity was afforded to read the document, and that no means were used to prevent the signer from reading it. Such proof is necessary only if there is allegation to the contrary.

If a party to a contract is unable to read or write, and his signature to the document is made by mark, there must be a subscribing witness, and then the law assumes that the contents of the contract were made known to him, and will not excuse him from its obligations unless he can prove that its contents were not read or explained to him or that he signed under compulsion.

Where the contract is in a language not understood by him, the signer occupies the same position with regard to the law, as just stated, where he cannot read or write. If the question arises, it must be proved that the contract was translated to the signer with sufficient clearness to give him a fair understanding of its terms, and that no deception was practiced or misrepresentations made.

Therefore, before signing, the party about to affix his signature should read the contract over carefully, in all its parts; not only should he read any printed matters that may be embodied in it, but he should consider carefully any script that may be interlined between the printed substances, as writing is held by the courts to take preference over printed statements, and where there is any inconsistency existing between the two, the written portion controls, as more attention is usually paid by the contracting parties to the written matter. No party, however, is excusable on the plea that he did not read the printed form. Such a case was tried in the District of Columbia. The party, on having the written part of an agreement read to him, ordered his signature to be placed on the instrument, without reading or having read to him the printed substance of the agreement. As it was proved that he could read, and had an opportunity to do so, it was held by the court that he was responsible for the agreement in the terms and to the purport of the entire document.

15. Unsigned Agreements.—A contract signed by one party and then delivered to the other is binding on the one who signs the agreement, whether the other party signs it or not. Such a case was decided in the Supreme Court of New York. A party receiving an unsigned agreement by messenger affixed his signature, and on handing it to the messenger remarked that he would not be bound by it unless certain things were done. He afterwards wrote to the other party to the agreement that he refused to be bound by it, and withdrew. The court held, notwithstanding the fact that it was not signed by the other party, that the party who had signed it was bound, and that parol evidence of conditions qualifying the delivery was not admissible.

THE CONSIDERATION

16. Compensation.—Every agreement, unless under seal, must have some specified consideration, or payment for services rendered, stipulated in its terms in order to make it valid; for, although a contract may be properly executed and signed in the presence of witnesses, yet, if there is no consideration mentioned—that is, no remuneration to the party for performing labor or for furnishing material—the contract will not be legal and cannot be enforced in law. The remuneration may be money, labor, or materials, but there must be some statement to show that neither party is furnishing goods nor working without recompense from the other. In cases involving the enforcement of a contract, an effort is often made to prove that the entire agreement, or a portion of it, or some supplementary agreement, was without promise of consideration or remuneration and therefore of no force; and if the court takes this view of the matter, the contract cannot be enforced.

This is such an important item in assuring the validity of a contract or agreement that it is wise to commence every agreement, even if involving only a small amount, in somewhat the following manner:

"*For the consideration hereafter to be mentioned*__________ *A*__________ *promises and agrees to deliver certain goods* (*or do certain work*) *for*__________ *B*__________." The consideration should then be specified in detail elsewhere in the agreement.

The amount of the consideration matters little, for if a man is so unwise as to agree to build a house for a party in consideration of the sum of $1, the court will hold him to his contract, though he might be ever so much inclined to withdraw from such an unprofitable agreement.

17. Sealed Contracts.—Sealed contracts constitute an exception to the foregoing rule; for, in the language of the law, a seal "imports a consideration." Therefore, a seal placed in a legal manner after each signature on a contract will take the place of the stipulated consideration and make binding all the promises contained in the contract, admitting no opportunity on either side to renounce these promises, or any part of them, even where no consideration is mentioned.

Formerly, the seal consisted of a drop of sealing wax, on which there was impressed the peculiar signature of the party concerned; or, in some cases, merely the end of his thumb was applied to the soft wax, and its imprint acted as a signet. In these days, however, the private seal is usually a piece of red paper affixed to the document with mucilage, and even this formality is not required in some states, which consider a blot of ink an adequate seal.

It can therefore be readily seen that it is always best to have the signatures to a contract under seal, as in this case there would be no possible opportunity for dispute in regard to the consideration by the parties, as in affixing their seals to the agreement they mutually consent to its terms, irrespective of a consideration.

18. Entire and Divisible Contracts.—All contracts may be divided in two classes, *entire* and *divisible*. **Entire contracts** are those that provide that a certain complete performance shall be paid for on its entire accomplishment, while a **divisible contract** is one that is complete in its several parts, the proportionate cost being paid in several instalments. In the entire agreement, the party performing the contract is not entitled to payment until it is completed, while in the divisible contract he may collect part payment at the completion of each stipulated part. A good example of a divisible contract is one that provides for the building of twenty houses at so much for each house. In this case, the contractor would be entitled to receive payment for any number he had finished, whether the entire twenty were completed or only one. A contract, therefore, that consists of an agreement by one party to perform certain work, complete in itself, and of an obligation by a second party to pay so much for the work, will not allow the first party to collect any portion of the entire consideration before the work is completed; and, should he fail to complete his portion of the contract, he would be unable to collect *anything* for work done or material furnished, provided his failure to accomplish it was not due to any interference by the second party or by law or by the "act of God." If, however, the agreement should stipulate that payments be made at stated periods, as the work reached certain designated stages, a court may decide that owing to the terms of the agreement the contract becomes a divisible one, and that the builder or contractor can claim payment for such portion as may be completed, even should he fail to carry on the work to completion; but in all probability the courts of the different states would decide differently on this question of divisibility of contract, as it is frequently a difficult one to settle. As a building contract is divided more or less into a number of separate clauses and stipulations, relating to separate parts of the building, quality of material, workmanship, etc., it might be held in some courts that it is a divisible contract and that the contractor has a right to recover for labor performed and material furnished, on a portion of the contract.

THE ACCEPTANCE

19 Accepting a Contract.—Much uncertainty exists as to how soon a proposal should be accepted, and the courts have spent much time on cases involving this question. In one case, a person wrote to another offering employment and requesting a prompt reply. The offer was accepted by the person to whom it was made on the day following its receipt, and the letter of acceptance was handed to a boy to mail. The boy neglected to mail it until 2 days later. In the meantime, the person offering the employment had secured some one else to fill the place. In the suit that followed to compel the employer to keep to his proposal, it was held by the court that the time that elapsed between the offer and the acceptance was too long, and the proposal did not hold.

In the state of New Jersey, it has been held that where the offer specifies that it is open until a certain date, an acceptance on that date is binding, unless the offer has been withdrawn previous to the acceptance.

Where the acceptance is made by letter, the question frequently arises as to whether it may be considered as taking place, and consequently the contract closed, at the time it is mailed by the party making it or not until it is received by the proposer. English law considers the acceptance made and the contract closed from the moment the letter of acceptance is delivered into the hands of the messenger that is to take it to the party making the proposal. This view seems to be held also in the states of New York, New Jersey, New Hampshire, Illinois, and Mississippi, but may be held differently in other states. The courts of Massachusetts, as well as the federal courts, hold that the contract is not binding until the acceptance is received by the party making the proposal. The posting of a letter of acceptance is usually considered as equivalent to its delivery to a messenger and binds the contract, even though it is not received by the other party. There are, however, exceptions to this, for, in one case where there was no proof that the postage had been paid, the New York Supreme Court decided that the acceptance was not complete. It should be remembered that the courts, in dealing with such uncertain questions as the foregoing, are usually governed by circumstances and the intention of the parties concerned rather than by abstract law principles and rulings.

The decisions of the courts in regard to telegraphic acceptances are quite varied, and, strange to say, are in some cases in opposition to their decisions in regard to acceptance by letter. The federal courts have held that an acceptance by telegram is binding the moment it is placed in the hands of a telegraph company for transmission; while, in acceptances by letter, as previously stated, they hold that it is not binding until received by the proposing party. Again, the New York courts hold that an acceptance by telegram is not binding until it is received, while, in regard to letter acceptances, they have decided in the same state that the acceptance is binding at the time it is posted.

20. Extent of Obligation.—All courts hold that bids must be accepted or rejected unconditionally. If a person in accepting a bid bases his acceptance on any conditions differing from, or contingent on, some change of the original proposal, the bidder is not bound by it, and may refuse to sign the contract; and, even should he remain silent, thus apparently accepting the bid, he cannot be held to it; and though the party made a subsequent unconditional acceptance, the contract would not be binding. Such conditional acceptances are of common occurrence among architects and others, who, on receiving bids for the performance of work, will write to the favored bidder that his proposal is accepted, on the condition that he will sign a satisfactory contract. Such an acceptance is not binding, and the bidder could withdraw his proposal if he saw fit and could not be held responsible.

In the acceptance of a proposal, the price named is often found to be a little less than the price asked by the contractor for doing the work; whether this is unintentional or whether it is a trick of unscrupulous parties, the fact remains that an acceptance in this way is not only in no way binding on the contractor, but actually releases him from his original offer. The assumption of the courts in regard to acceptances or proposals is clearly expressed by an Illinois court as follows: "A proposal to accept an offer on terms varying from those proposed amounts to a rejection of the offer, and a substitution in its place of a counter proposition, which cannot become a contract until consented to by the first proposer. The original offer thereby loses its validity, and is no longer pending between the parties, and it becomes an open proposition again only when renewed by the party who first made it; hence, the party who submitted the counter proposition cannot, without the consent of the other, withdraw or abandon the same, and then accept the original offer, which he had once virtually rejected."

21. General Conditions.—The architect usually prefaces the detailed specifications with matter covering all the

general conditions that are to be complied with by the contractor. (See *Specification Writing*.) This portion of the specification includes all general stipulations concerning terms of payments, time of completion, compliance with building ordinances, the obtaining of permits for water, blocking street and sidewalk, etc., together with other stipulations of minor importance. The contractor in bidding on the work accepts all the specifications, including the general-condition clauses, and on the acceptance of his proposal, he becomes bound in contract to all the terms of the specifications.

It is sometimes advantageous for an owner to accept unconditionally and promptly an especially favorable bid without the risk of a conditional acceptance, which would give the contractor a chance to withdraw. The owner in such a case runs no risk if proper general conditions have been embodied in the specifications, as a contract thus made is perfectly valid, and the builder in subsequently signing a formal contract that contains additional stipulations regarding insurance, time of payment, etc., usually does so with advantage to himself. Should the specifications not embody adequate general conditions, however, and the bid be accepted unconditionally, such a contract is equally valid, but the contractor can be held only for such stipulations as are mentioned in the specification. If the time of completion is omitted, the court will decide that a reasonable time is understood, though the legal idea of "a reasonable time" is likely to be at variance with that of the owner, much to the latter's dissatisfaction. Other terms of still greater importance may be found to have been omitted from the insufficient general conditions in the specifications, which will cause the owner much trouble and annoyance.

22. The Position of the Architect.—The architect sometimes oversteps his authority by accepting a proposal without duly consulting and being authorized by the owner. The extent of the architect's power in this direction, where the specification does not make exact and specific statements in regard to it, has not yet been determined by law, and the zealous architect that accepts a bid in behalf of his client without consulting him or obtaining his indorsement to same is likely to be placed in an awkward position should the owner refuse to accept the proposition.

Therefore, if the owner is desirous that the architect should be empowered to accept immediately, at the time at which it is made, any proposal that would be to the owner's interest, he should authorize him in writing to do so, either giving him full power or limiting him to such an extent as he may see fit. Probably the safest and most satisfactory way of taking care of this matter is for the architect and owner to draw up an agreement by which the architect is empowered to accept or reject proposals, but only when such letters of acceptance or rejection are indorsed in writing by the owner. In such case, the general conditions of the specification should also state that the ordering of extras and the acceptance or rejection of proposals are to be in writing, either by the owner or by the architect, with the written indorsement of the owner.

The authority of the architect to accept bids and proposals is of vital importance to the contractor, who is liable to discover, too late, that he has made his contract through a person unauthorized by the owner. Therefore, in all cases where the slightest doubt exists, the contractor should ascertain *at once* that it is the owner's intention that the architect should be so empowered and that the architect's acceptance will have the owner's subsequent approval. In accepting a bid for the owner, the architect should exercise due caution in the wording of the acceptance, so that he may not himself become involved in its obligations, and his letter should plainly show that he is acting solely as agent for the owner by stating that "Being duly authorized by Mr. A. B. (owner), I hereby accept in his behalf your proposal"; or, "Through the instructions of Mr. A. B. (owner), I am authorized to accept for him your offer," accompanying the letter with the written authorization of the owner. Some specifications call for the ordering of extra work and the acceptance or rejection of bids by the owner only.

23. Withdrawing or Modifying a Proposal.—Although somewhat a matter of doubt, the general rule in regard to the withdrawal or the modification of a proposal is, that until accepted the proposal remains a proposal only, and may, up to the time of its acceptance, be withdrawn or modified. In the case of a proposal sent by letter, there is no doubt that the offer is open until the letter is received, and if the person making the offer can telegraph his withdrawal so that it will reach the proper person before the original proposal, the offer is nullified, and the parties interested in it are in the same relation as they were before the offer was made. But it has been held that if a person *receives* a proposal and immediately sends an answer accepting it, the offer stands valid, even though the party making the offer has despatched another letter in the attempt to withdraw it.

24. Delivering a Contract.—The formality with which the contract is delivered is of little importance, for if it is left at the place of business of the party concerned, the delivery is deemed complete, unless otherwise stated in the contract itself. A court in Illinois has held that one copy of a contract between the owner and the builder, being left in the care of the architect, had, to all intent and purpose, been delivered, and was binding on both parties.

Where several copies of a contract exist that are supposed to be alike in their terms and statements, but that as a matter of fact differ one from another, either party complying with the terms of the agreement in his possession is responsible only for the terms of his own copy.

MODIFICATION OF CONTRACT

25. Modifying Contracts.—Though formal contracts are generally made with due consideration and carefulness, and are looked on by the law as binding and enforcible on both parties, still it is human nature to be fickle and changeable in mind, and unforeseen events may transpire that will change the aspect of affairs entirely; hence, it becomes necessary to provide that an agreement may be changed or modified in some manner, if so desired by both parties. This result may be accomplished either by *agreement* or by *waiver*. Where modifications in a contract are desired, such changes may be made by a mutual agreement between the contracting parties. This amendment, or modifying agreement, whether made at the time at which the formal contract is drawn up or later, has equal force with the original contract and is considered together with it. Many courts have held that such an agreement is valid, even when verbally made, unless there is a stipulation in the more formal agreement that no change or modification shall be made in the original contract unless in writing.

However, where the contract to be modified is with a corporation (especially if a public corporation), caution must be observed to see that all such changes and modifications are made with due formality; unless this is done, the contractor may have cause to regret his carelessness.

26. Sealed Contracts.—Since a contract under seal is regarded by the courts to be a more formidable instrument than a simple contract, owing to the formality with which it is executed, most courts are more severe in regard to any change or modification in a sealed contract, as shown by the following opinion of the court: "While a simple contract reduced to writing may be varied or changed in any way by a subsequent verbal agreement, it is otherwise as to contracts under seal, which cannot be varied by a mere parol contract, whether in writing or not, since such a contract is inferior to the original." Hence, as nearly all formal contracts, whether of corporations or individuals, are under seal, it is evident that great caution should be used, and that no attempt should be made to modify any such contract otherwise than in writing and with all the formality that attended the execution of the original document. Courts have held that "a sealed contract cannot be rescinded or released by a parol agreement." It is admissible, however, according to a decision given in the state of Illinois, to subsequently agree verbally to pay an additional price for the same work as is stipulated in the written agreement, which agreement will remain valid in all particulars, except as to the price mentioned in the original document.

A contract that is not under seal may sometimes be changed or modified by an *implied agreement;* that is, should a man by his actions declare certain intentions, which vary from the original contract, and should these intentions be accepted by the other party, also provided there was no stipulation in the contract that required "that all changes from the original agreement should be made in writing," a court may hold that the implied agreement to change the original contract was the mind and intention of both parties and was therefore binding. Even when there is a clause in the original contract excluding any change by verbal or implied agreements, the court will, under some circumstances, uphold such changes, provided the intention of both parties can be proved beyond doubt to have been agreeable to such a change.

27. Liability of Owner.—That "silence gives consent" does not always hold good in law; in fact, very frequently the opposite is true, and such a view is usually taken by the courts in cases where it is held that the contract or portions of it have been waived by implication. If an owner should observe, in silence, deviations from the contract, it does not necessarily follow that he must accept or pay for such changes. In the first place, he may not be an expert in building matters, and again he may not fully realize the importance of such changes, though, if it could be proved that he favored such changes and assented to them, knowing that there would be additional cost attached thereto, the chances are that the court would hold him responsible. In regard to this, a Pennsylvania court held that "it is no excuse for non-performance, that the employer looked on while the work was in progress, unless there be evidence from which his assent may be implied."

28. Invalidation.—Many contractors are of the erroneous opinion that where there have been a number of changes and modifications from the original contract, that such changes and modifications invalidate it, and they are privileged to ignore the original agreement in regard to price and may demand day-rate wages for the work. Such, however, is not the case, and all courts of justice will endeavor to obtain evidence to show what portions of the original contract remain intact and have not been mutually waived, and will enforce those portions accordingly. Where it is impossible, owing to the complications arising from numerous waivers and changes, to ascertain the terms of the original agreement, and in what relation they exist in regard to the actual work done, the court will endeavor to ascertain the reasonable cost of the work and material and award the contractor his claim on that basis, holding that, "when the original plans, on which the contract was founded, have, by mutual consent, been so substantially and materially departed from as to amount to a constructive abandonment of its terms and specifications, the case should be regarded as one of general employment, with an implied obligation by the owner to pay what the work and material are reasonably worth."

CARRYING OUT THE AGREEMENT

DEPARTURE FROM THE CONTRACT

29. Substantial Fulfilment.—Departure from a contract may be through either carelessness or wilfulness. The decision that a New York court has rendered in regard to such departure is well stated in a report as follows: "Parties to building contracts should be exact in the fulfilment of their agreements, even to the smallest particulars; and if they wilfully or carelessly depart from any one of them, they should incur the penalty, however severe it may be. But if a party, while acting in good faith, and with a determination to do all that he has contracted to do, unintentionally, and without any negligence, happens in some trifling matter to vary or depart from the terms of the contract, the law is not so severe and exacting as to deprive him of all compensation;

it ever regards the substantial rights of the parties, but overlooks trivial and unimportant matters."

To just what extent the court will hold a person for such deviations from a contract is somewhat undeterminable. It is, however, a foregone conclusion that the party will be held to the substantial fulfilment of his contract, the court deciding just what is meant by "substantial fulfilment."

The following case will show the position that the court took in regard to an unavoidable deviation in a contract for a block of stores. During the erection of the stores, the contractors discovered that the city had given them the wrong grade for the sidewalk, thus raising the stores about 8 inches too high. They notified the architect and a representative of the owner, who made no objection at the time. A balance on the payment due on the final certificate given by the architect was refused because of the mistake in the setting of the building. The case was carried to the Supreme Court, which decided in favor of the contractors as follows: "As there has been no wilful departure from the terms of a building contract, nor any omission in essential parts, and the laborer has honestly and faithfully performed the contract in all its material and essential features, he will not be held to have forfeited his right to remuneration by reasons of mere technical, inadvertent, and unimportant omissions or defects. * * * A substantial compliance with the contract is all that is required to entitle the builder to his reward."

30. Determining the Responsibility.—Deviations from the agreement due to the contractor's non-compliance with the specifications or drawing are often held to be the direct cause of poor or insufficient construction, resulting in damage to the building and loss to the owner. Where such is the case, it often becomes the court's duty to fix the responsibility, which, should the damage prove to have been due to the deviations from the contract, will very likely be placed on the contractor, even though there were no objections to them by the owner.

The following is an illustration of such a case: A contractor bound by an agreement, supplemented by plans and specifications. erected, or partly erected, a frame church; it was nearly completed when a severe gale blew it down. Subsequently, the contractor entered suit for the money due him; the owner held that certain deviations were made from the contract that were undoubtedly the cause of the damage, but he had, however, made no previous objections to the changes. The architect brought evidence to prove that the manner of construction in question, and from which the deviations had been made, was shown on the drawings, though there was no mention of it in the specifications. The evidence of the witnesses was rather unsatisfactory, as they differed in regard to the relative merits of the two constructions, also in their interpretation of the plans. The jury was instructed by the judge as follows: "If the contractors departed slightly from the plans, specifications, and drawings, and yet if such a departure did not diminish the strength of the building, nor contribute to its being blown down, such departure does not deprive them of their right to recover in this action, as the contract appears by the evidence to have been otherwise complied with." The decision was reversed, however, by the Supreme Court of Illinois, which said: "This position is untenable. The contractors had no right to depart from the working plans made part of the contract. If they did so, it was at their peril, and they would become guarantors as to the strength and safety of the structure. * * * The drawings were made part of the agreement. The contractors could only discharge themselves from liability by constructing the building in accordance therewith, unless a deviation was mutually agreed upon."

ABANDONMENT OF CONTRACT

31. Reasons for Abandonment.—The abandonment of a contract occurs through the neglect of one or both of the parties to carry on the work for which they contracted. It may occur through the builder being unable to carry on the work or the owner refusing to longer be a party to the agreement; or it may be that the interference of the law or some irresistible power prevented the fulfilment of the agreement. In any case, where the terms of the contract are well defined and have not been mystified by many changes and modifications, the court will endeavor to enforce them or such ones as may still be binding.

Should the work, when partly completed, be abandoned by the contractor without cause or without the consent of the owner, and should the builder refuse to proceed with it, the courts will not allow him a claim. He would not only be unable to recover a reasonable price for the completed work, but would be liable to the owner for damages.

If, however, the owner accepted the abandoned work and derived benefit therefrom by proceeding to complete the agreement under another contractor, the courts would be likely to hold that, on the completion of the work and the final payment to the second contractor, the first contractor would be able to recover the balance, if any, existing between cost of the work as done under the second contract and the amount of the original contract, deducting, of course, any damages that the owner might have sustained by delays caused by the abandonment of the work.

32. Responsibility of Owner.—The owner instead of the contractor is often at fault in carrying out the agreement, and in such a case the builder usually has no cause to complain of his treatment by the law. Where the owner is delinquent in the fulfilment of his agreement, the contractor may present his case to the court in two ways: (1) He may hold that the contract is still in force and claim compensation at the contract rates for the work that has been done, together with a claim for damages that resulted to him, due to loss of profit on account of the owner's delinquency; or (2) he may claim that the contract has been abrogated, or annulled, and require reasonable payment for his work and materials furnished. Though he has either of these paths to pursue in prosecuting his case, the law clearly states that he cannot present evidence applicable to both, but must accept one or the other and hold to it. He should be governed as to his choice by the circumstances surrounding his claim and the advice of his counsel.

In regard to a case where a contractor was prevented by the owner from proceeding with the contract, the New York Court of Appeals plainly stated the two grounds upon either of which a contractor could take his stand in presenting his claim. The opinion that was held by this court is as follows: "Where performance is prevented by one party to a contract, who terminates the agreement against the will of the other party, the latter may either sue for breach of contract, and recover as damages the profits he would have made if allowed to complete the work; or he may waive the contract, and bring his action on the common count for work and labor generally, and recover what the work done is actually worth; but in this case he cannot recover his profits on the unexecuted part of the work."

The owner may abandon his contract by failing to live up to his agreement or he may prevent the contractor from carrying out the work and fulfilling the agreement. Such a case as this was decided in Indiana. The owner of a building in course of construction having failed to pay the instalments on the work at the several periods when they were due according to the contract, was sued for damages by the contractor, who claimed that he had to abandon the work because of the non-payment of the instalments. The court's opinion in the matter was somewhat to the effect that if the owner had really prevented the contractor from fulfilling the agreement, then he should be able to recover as damages the profits that would have accrued to him, provided he had completed the job; but that the mere non-payment of instalments due on the contract before the work was finished did not constitute such prevention.

There are numerous other instances where it has been held that the contractor was unable to fulfil his part of the agreement on account of the owner failing in some way, either avoidable or unavoidable, to live up to the contract. In all such cases, where it can be proved that the contractor was willing and ready to comply with his part of the agreement and was prevented by the owner from doing so, the courts seem to hold the opinion that he is entitled to recover not only for the actual work done but also for any profit that he would have received on the completion of the contract. For instance, should certain ironwork be ready for a building at the stipulated time, and should the building, which was not in a condition to receive it, burn down, the parties furnishing the ironwork would undoubtedly be able to recover the contract price, less the cost of erection; for they had completed their agreement as far as it was possible and within their power, further completion being impossible, owing to the failure of the owner to have his building ready in time.

33. Death of Either Party.—The death of the contractor ends the contract unless some provision is made in the agreement by which his heirs or executors become responsible for its completion, and the court in Missouri has decided that no lien can be taken out against the building for work or materials thereafter furnished under the contract. The contractor seems in this case to have the advantage, as the death of the owner does not affect the contract, because it is binding against his estate.

Where the contracting parties wish to guard against any of the foregoing contingencies, all that is required is the insertion of a clause in the contract that will convey their mutual intent and meaning in regard to the matter considered, and the court will see that it is enforced irrespective of general principles and precedent.

34. Abandonment Not Always Justified.—Before taking so serious a step as to abandon a contract, the contractor should be sure of his position and determine whether he is justified in such a proceeding, for, as expressed by the Supreme Court of Missouri, "A mere breach of contract does not entitle the other party to stop work and recover for unperformed work. He might stop work and recover for what he has already done, but not for what remained to be done. To recover for that, he must have been prevented from going on by the unauthorized interference of the other party. The measure of damages on the contract, in such cases, is the contract price, less what it would cost to complete the work."

35. Forfeiting of Contract.—It sometimes occurs that one of the parties of a contract may find it impossible to fulfil the terms of the agreement owing to the conduct of the other party. In such a case, he should notify the other party immediately, declaring his unwillingness to be bound by the contract, or at least by certain stipulations in it; if he fails to do this promptly, it may be held that by his silence he waived his right to do so. For instance, a contractor may have been unreasonably delayed and interfered with by the owner's demands requiring a number of changes, or by the owner's withholding his decision on certain important questions, which prevented the contractor from proceeding with the work and completing it in the specified time. This being the case, the contractor is entitled to rescind the agreement, but he should do so at the time, or it may be held that he has waived his right to do so.

Instead of the owner being at fault, the contractor may fail to have the building finished at the stipulated time. This might give the owner the power to rescind the contract, but he should exercise this right at once; for should he fail to do so, and permit the contractor to proceed with the work, it would very probably be held that he had waived his right, and all that he could claim would be damages for injury due to the delay caused by the failure of the contractor to complete the agreement at the specified time, as provided in the contract.

Before entering on an agreement, the contractor should ascertain whether the plans and specifications call for work that can actually be constructed and whether the conditions are such that they can be carried to completion. Anything that is not clear to him from the plans or specifications should be explained to his satisfaction by the architect;

otherwise, if he should find, after signing the contract, that he cannot in any possible way carry out the work as shown, the court will very likely hold that he, being a responsible builder, should have known whether the plans could be carried out and that he was bound by the contract.

36. Reinstating Contracts.—Any contract that has been declared forfeited under the terms of the agreement may be reinstated by the mutual consent of the parties concerned, in which case they will no longer be governed by the annulment.

FRAUDULENT CONTRACTS

37. Statutes of Frauds and Limitations.—In the several states, there are codes of special laws known as the "Statutes of Frauds and Limitations." The particular clause in these statutes of interest to those engaged in building operations is here quoted from the statutes of Maine and reads as follows: "No action shall be maintained upon any agreement that is not to be performed within 1 year from the making thereof." That is to say, no contract shall be valid (unless in writing) that calls for an accomplishment of certain things that cannot be fulfilled within 1 year from the date of making the contract. The decision of a New Hampshire court is interesting in that it held that if the performance of the contract could be accomplished within 1 year (even though it was improbable that it would), the contract was not within the statutes and did not have to be in writing. The language of the court in this case was: "The Statute (of Frauds) does not apply to any contract, unless by its express terms, or by reasonable construction, it is not to be performed—that is, is incapable in any event of being performed—within 1 year from the time it was made. If by its terms, or by reasonable construction, the contract can be fully performed within 1 year, although it can only be done by the occurrence of some contingency by no means likely to happen, such as the death of some party or persons referred to in the contract, the statute has no application, and no writing is necessary.

If the agreement can be fully performed by either of the parties within 1 year, and it is so performed, the agreement of the other party is not within the statute, though it may be impossible to perform it within 1 year."

A case once arose in New York where the question involved was as to whether the terms of a verbal agreement prevented the possibility of the contract being completed in 1 year. The contract was made about 15 months before the date on which it was verbally agreed that the building should be completed. Some misunderstanding in regard to the agreement arose, and, in the suit that followed, the defendant claimed that the contract was invalid under the "Statute of Frauds." The claim was, however, denied by the Supreme Court, which rendered the following decision: "The agreement set forth in the declaration in this case is not for the building of a house after the expiration of 1 year, but is to be performed at the farthest within 15 months. There is nothing in the agreement prohibiting the defendant from completing the contract within 6 months, or a shorter period. Suppose he had done so, and sued the plaintiff for compensation for his labor and materials found, would it have been permitted to the plaintiff to have said that the contract was not to be performed within 1 year, and therefore it was not obligatory on him? Most clearly not. And if obligatory on one party, it is equally so on the other. The defendant might have performed the contract within 1 year, and it is therefore not within the statutes."

38. Fraudulent Contracts.—It is generally supposed that where a man has signed a contract he is held responsible and there is no escaping its conditions. However, if it can be proved that fraud was used in gaining his signature or that he was wilfully deceived in some manner, the court will deal fairly with him, and, as far as possible, will usually prevent the fraudulent party from gaining an advantage; for the court fully realizes that no matter how carefully a man may conduct his business transactions, no amount of care will protect him against frauds. The court, however, will have little patience with any one that, through carelessness, allows himself to be imposed on. Even in cases where no fraud is intended and a mistake exists, if it can be proved that no usual amount of care could guard against it, the law will make an effort to correct the mistake and release the innocent parties if it can be done without dealing unjustly with the other parties, who may have been more careful.

When a party, before commencing the work, discovers that he has entered into a contract that misrepresents the amount of labor he is to perform or materials he is to furnish, he should, in order to avoid trouble, notify the other parties immediately that he repudiates the contract. If he should proceed with and perform the work, knowing that the amount to be done had been misrepresented to him, he would be unable to obtain more than the contract price. Where a stipulation in a contract, such as the time of completion, is misrepresented, or a mistake in the statement has been made, it has also been held that the balance of the contract remains intact, and that only such parts as are affected by the erroneous stipulations are invalidated. *A contract made on Sunday is invalid.*

COMPLETION OF THE CONTRACT

ACCEPTANCE OF THE WORK

39. Completion of Work.—The last, or final, stage in the fulfilment of a contract is the completion and acceptance of the work, which is often fraught with more misunderstanding and dispute than any other portion of the transaction.

Most contracts stipulate that the work shall not be deemed as completed until it has been accepted by some designated party, which is usually either the architect or the owner. If the architect accepts the work, he should furnish a certificate to the builder to that effect. Should the owner be the one who accepts the work, he should do so in writing. In some cases, it is required that both the architect and the owner should accept the work. It is well to stipulate in the contract that all work shall be subject to the approval or satisfaction of the specified architect or architects. This clause is valuable in that it leaves all unsettled matters in regard to workmanship and materials to the architect's decision and sustains his authority as a final judge. If his judgment has been given in good faith, and with an intention to deal fairly with both his client and the contractor, there will be no necessity for subjecting the controversy to settlement by arbitration or trial by jury, for the court nearly always accepts the opinions and decisions of an honest and conscientious architect.

Where it has been stipulated in the agreement that "the work shall not be considered complete until certified to by the architect," most courts will hold (though there are exceptions to this rule) that the contractor must present a certificate from the architect before he will be able to claim that the contract has been completed. Even though the contract especially stipulated that the architect's certificate was to be binding and conclusive on both parties, such is not always the case; for, if it can be proved that the architect fraudulently or unscrupulously withheld it, or, in failing to grant it, was not acting according to his best judgment and was prejudiced against the builder, intending to oppress him, the court may hold that the architect's certificate is not necessary to the completion of the contract.

The architect is always subordinate to the contract. He cannot cause work to be done at variance with the stipulations in the contract; neither will his certificate for work that does not fulfil the requirements of the agreement be valid, and, though he has the power by the terms of the agreement to reject or accept all work as he may see fit, he is not authorized to reject any work that is done according to the agreement nor accept any work that is not.

The usual certificate is a blank filled out by the architect, which states that, in the opinion of the architect, the contractor is entitled to so much money for work done since the last certificate issued or since the beginning of the work. The certificate usually calls for about 90 per cent. of the estimated value of the work done during the previous period, and also states that it is an expression of opinion and does not imply legal responsibility. This certificate might well state also that its issuance does not imply the acceptance of any work not in accordance with plans and specifications.

40. Accepting the Work.—The acceptance of work by either the architect or the owner is not always a waiver of the defects that may exist in it; though it may sometimes be implied from the owner's conduct, where the defects have been obvious and he has made no objections to them, that he accepts the work. But, should the defects be concealed, neither the owner's virtual nor formal acceptance will prevent him from recovering on the ground that the contract was not completed. In regard to this, the following view is generally taken by the courts: "Notwithstanding acceptance, virtual or formal, unless expressly made in full discharge of the contract, if the work or materials are not as contracted for, the owner may recover damages sustained in consequence."

A case involving this principle occurred in Georgia about the year 1854. It seems that a contractor undertook certain work for the trustees of a university. The contract was made in regard to some repairs and the remodeling of a certain building, and required that the contractor should "remove certain walls and put in such pillars as might be necessary to support the ceilings"; also, that the work should be completed "in a neat and workmanlike style." The repairs and alterations had been completed and virtually accepted by the trustees, who were present during the time the work progressed and had made no objections to it. About 18 months afterwards, one of the wooden girders put in according to the contract failed, and this so injured a portion of the ceiling that extensive repairs were necessary. In the suit instituted by the trustees for damages, testimony was introduced by the defendants to the effect that several days previous to the accident a leak had been discovered in the roof, and that the leakage so increased the weight on the girder as to cause it to fail. The plaintiffs proved, however, that the chestnut girder was of a brashy nature and knotty, and further expert evidence was introduced to prove that it was of insufficient strength and that the ceiling should have been supported by several more posts.

41. The Right to Recover.—The lower courts decided in favor of the defendants in the foregoing case, but the decision was reversed by the Supreme Court, which held "that the fact that the plaintiffs received the work, and paid for it, does not affect their right to recover in the slightest degree; it is not a circumstance to be considered against that right. They are entitled to recover, unless they, at the time of the acceptance, knowing of the defective and neglected work, and of the non-compliance by the defendants with their contract in all respects, expressly waived a performance of the contract, and agreed to pay the stipulated prices, notwithstanding; all of which must be made affirmatively to appear by the defendants, to be available to them as a defense. * * * The evidence in this case falls very far short of this. Was the attention of the plaintiffs called to the fact that an important girder was brashy, knotty, and entirely incapable of supporting the weight resting on it? * * * Their attention was not called to it, and they could not see and examine the girder for themselves, for it was concealed from their view by the floor on one side and the overhead ceiling on the other."

One of the claims of the defendants was that the insufficiency of the pillars was self-evident, and that the plaintiffs must have observed the defect. In reply to this, the court said: "True, they could see the number of pillars, but they were not informed as to the number necessary. The defendants undertook specially, in their contract, to put in 'such pillars as might be necessary to support the ceiling'; they were to judge, and to judge correctly, at their peril. * * * The idea that they (the plaintiffs) were waiving any of their rights under the contract, never entered their minds; * * * they accepted the work because they believed that the defendants had complied."

42. Occupancy or Possession.—There is a general understanding among builders that if the owner moves into or occupies the building constructed under the contract, an acceptance of the work is implied. Such, however, is not always the case, as many decisions of the courts show. Even should he pay the contractor in full without demanding the architect's certificate or otherwise formally accepting the building, it could be held that no implied acceptance was meant.

In a case where a contractor had failed to comply with some material part of the contract, the parties for whom the work was done moved into the building and refused to pay the balance due the contractor; the contractor entered suit on the ground that the parties, by occupying the building, virtually accepted the work. The New York Court of Appeals, however, held "that if a contractor has neglected, and refuses, to complete his contract in a material point, it does not follow that the owner waives its performance by taking possession of, and occupying, the building in its defective condition." The court also said: "An owner is not put to so absurd an alternative as either to lose and abandon his building, worth perhaps $10,000, or to occupy it at the peril of paying for work not performed, or of waiving thereby the performance of any substantial covenant of the contractor." The New York courts also hold that "the occupancy of a building is not a waiver of the plain requirements of the contract."

PENALTIES AND PREMIUMS

43. Liquidated Damages.—The owner is often put to considerable inconvenience, and in some cases needless expense or loss, by the delinquency of the contractor to have the work finished at the stipulated time. For instance, it may be that the parties are having the building erected for their own occupancy, and that the lease on the property that they are occupying expires about the same date as that on which the contractor is to have the new building completed;

or it may be that the building is to be rented to tenants that expect to occupy it by a certain date, and have made arrangements accordingly. Hence, it is evident that the owner or owners may be placed in a very awkward position and perhaps compelled to sustain considerable financial loss, entirely due to default of the contractor in not having the work completed on time.

To guard against such a contingency, it is usual to provide in the contract, that the person doing the work shall pay a certain sum of money per day to the owner for each and every day beyond the stipulated time of completion that the work may remain unfinished. All contracts usually specify that this stipulated sum of money or forfeiture shall not be regarded as a penalty, but is to be considered as **liquidated damages** (liquidated damages simply meaning damages that are fixed by the terms of the contract, as opposed to unliquidated damages, which are decided on subsequently by jury or other means). The Supreme Court of Alabama, in regard to such forfeitures, says: "The court must ascertain whether the true intention of the parties was to afford fair and reasonable compensation for the loss sustained, in which case it is a real penalty, which can be apportioned to the actual loss sustained; or liquidated damages, which must be suffered without regard to actual injury resulting from failure to keep the contract. The tendency of the law is to regard the stipulations as a penalty, rather than as liquidated damages, and, if there is any doubt as to the intention of the parties, it will be so construed; and even if the stipulation is for payment of a sum in gross in case of failure to perform, the sum stated will still be considered as a penalty." It would seem from this decision that there is a difference expressed between a penalty and a forfeiture for liquidated damages. A penalty is regarded merely as a sum to be forfeited, out of which the actual damages are to be taken; while by liquidated damages is meant a sum usually agreed to by the contracting parties as the amount to be considered as actual damage. The purpose in regarding the forfeiture as liquidated damages is to avoid subsequent dispute as to the amount of the real loss suffered by the owner; and it is commonly thought, where expressly stipulated that the forfeiture is to be considered as liquidated damages, that the courts would not interfere to invalidate the valuation that the parties had mutually agreed to in the contract.

44. Just Compensation.—Many of the highest courts in the land, however, look on all time forfeitures as mere penalties out of which the actually ascertained damages are to be taken, whether they are stipulated as liquidated damages or not. In such decisions, the owner is entitled to only such a sum as would fairly represent the loss he had sustained, and no unreasonable forfeiture could be collected.

Should it be proved that the owner endeavored to make profit out of a forfeiture clause, even though the forfeiture each day was qualified by the phrase that it was to be considered not as a penalty but as liquidated damages, it is more than probable that the court would not uphold him, and would decide, as previously stated, that all he was justly entitled to would be damages amounting to the actual loss he sustained by the default of the contractor. This was decisively settled by the Supreme Court of Michigan, which formulated the following rule: "The principle at which the law aims in awarding damages is that of just compensation for the injury sustained; and the parties will not be permitted by express stipulations to set this principle aside."

Even should there be no stipulation in the contract to the effect that the contractor was to forfeit a certain sum as liquidated damages for each and every day the work should remain unfinished beyond the specified time, the owner would be able to recover, as damages, any loss that he could prove to have actually existed through the default of the contractor.

45. Forfeiture Clause in Contracts.—The following assumed case will illustrate to what extent the contractor is responsible in regard to the forfeiture clause in contracts. An owner contracts with a party for the erection of a summer cottage and stipulates in the contract a reasonable forfeiture, to be paid by the contractor, provided it is not completed by a certain date, thinking that in this manner he will stimulate the builder to an extra effort. The builder fails to have the cottage done on time, and suit is entered by the owner for the amount of the forfeiture, which is out of all proportion with the importance of the job. The court will very likely hold that he can recover only the day rent of the cottage for each and every day over the specified time, provided the delay has not been serious; and if the time of completion has so far exceeded that specified that the owner has been compelled to abandon the cottage for the summer, the court will more than likely award him damages to the amount that would be required to rent a similar cottage for the season. Again, it may be that the building is to be rented, and for every day over the time specified that the builder fails to have it completed the owner is out just so much rent; in that case, the court will award him the amount that he has lost in rents, with any other loss he may have sustained through invalidated leases with the tenants. Therefore, since it is very generally accepted by the courts that in any case only just damages can be recovered, the best thing that the owner or architect can do in stipulating the terms of the contract, where it is important that the work should be completed by a specified time, is to carefully estimate, as nearly as possible, the actual damage that will occur from the non-completion of the contract, and to add to this a reasonable margin for unforeseen contingencies. This amount should be obtained in a sum of so much a day, and should be inserted in the contract as a forfeiture clause for liquidated damages; then, were disputes to arise, this forfeiture clause would be upheld by the law if the amount was reasonably correct.

46. Unfinished Work.—The stipulation providing that a forfeiture shall be paid for delay in the completion of the building is of some advantage to the contractor; though, at first sight, it might not appear so. This advantage is due to the fact that, as a stipulation is made in regard to the forfeiture of a sum of money for each day that the work shall have been delayed beyond the contract time, and such a forfeiture is agreed to by the builder in signing the contract, the owner must necessarily waive his right to rescind the contract on the ground that the work was not completed on time. If, however, no such forfeiture clause exists, the failure of the contractor to have the building finished in the specified time is a breach of the agreement, and the owner may rescind the contract. Thus, the builder, or contractor, loses his final payment for the unfinished portion of the work. Should the owner, however, fail to notify the contractor of the termination of the agreement on the day specified for the completion of the work and allow him to proceed with the job, he cannot do so subsequently, as he has waived his right in this direction. The courts have ruled, in regard to this, that "when the owner permits the contractor to continue work after the expiration of the time within which the work was to be completed, he waives the right to rescind the contract on that ground, but does not thereby waive such damages as he may have sustained by reason of the delay."

47. Reasonable Time.—When no specified time for the completion of the work has been provided in the contract, it might be supposed that the contractor could delay his work indefinitely; such, however, is not the case, for a **reasonable time** is always presumed to be understood, though just what constitutes a reasonable time is somewhat uncertain and will depend on the jury before which the case is tried. If would not be safe, therefore, where there is no time stipulation in an agreement, for a contractor to delay very considerably the completion of the work; for, should the owner's patience fail, and he bring suit, the jury is likely to decide that the contractor had been allowed more than a reasonable time for the performance of the work, and the owner could recover damages for the delay over the time held by the jury as being reasonable.

Should the owner waive the stipulation in regard to the time of completion, or his claim for damages due to the delay, or any other stipulation or clause, it must not be thought that the other provisions in the contract are waived, or that the contract is invalidated thereby. Such is not the case, and it may be expressly stated that the waiver of one stipulation of a contract does not affect the others.

48. Delays.—It is not unusual for the contractor that has agreed to have the work completed by a certain date to be delayed, and thus prevented from complying with the contract, through the fault of other contractors or of the owner. Where the delay has been caused by the default of other contractors, it seems to be held, as a rule, that the contract is subjected to implied modifications in regard to the time limit, an extension of the time equal to the delay caused by the other's fault being allowed to the principal contractor. This is substantially the same as was held in Illinois when the court stated: "Where one contracts to do certain work in such a way as not to delay other contractors, and to have it done on a certain day, and, by delays of other contractors, is unable to commence it until near the time of completion, he is still held to the contract, except as to time of completion, and for unnecessary delay on his part will be liable to his employers for damages."

Should the delay be caused through the fault of the owner, the contractor will not only be entitled to an extension of the time limit, but should he on the same account be put to additional expense, he will be able to hold the owner for such, unless the contract provides that the owner shall have the power to postpone or delay the work as he may see fit. When, however, the contractor finds that the owner or the other contractors are causing him delay and additional expense, he should notify the owner to that effect immediately, so that the owner can take steps to prevent the delay, or so enjoin the other contractors that they will remove the cause of the complaint, and hence the additional expense to the complainant.

49. Non-Fulfilment of Contract.—The owner, on finding that the work is not progressing rapidly enough, due to neglect or inability on the part of the contractor, may, on giving due and proper notice to that effect, employ other parties to finish the contract, and in due justice to himself may, in order that he will not lose the advantage of the contract, pay these parties out of the contract price or charge the cost to the original contractor. Carefully written contracts usually provide in some manner for this contingency and make special provision in regard to the terms and circumstances that will authorize the owner to take such a step. The rights of the contracting parties in regard to this are clearly expressed in the following decision of the Supreme Court of Illinois: "If one party induces the other to believe that he has withdrawn from the contract, the other need not wait for the day of performance before making new arrangements, nor does he lose his remedy against the delinquent party by providing at once against losses likely to arise against such delinquencies."

The owner, in taking the work out of the delinquent contractor's hands and completing it himself, or through another contractor, must see that it is done within a reasonable expense. In fact, since the original contractor has to pay for the subsequent work, his money is really being used, and the owner should guard it as he would his own, avoiding extravagant or wasteful expenditures; for, should it be proved that he was careless in this respect and attempted to charge an unreasonable sum against the original contractor, the courts would not uphold him. If the owner choses, he may complete the building by day work, or he may make arrangements with another contractor to do so at a reasonable price; but he must keep a careful account of the actual expenditures, and charge nothing else against the original contractor.

Should the owner, after rescinding the contract according to the provisions in it, or on good and sufficient reasons, find that some of the original contractor's work is defective, he may make good such work, and charge the expenditures to the cost of completing the building. If there are materials on the site of the new building furnished by the original contractor, and these materials are good in every respect and substantially as specified or contracted for, the owner is bound to use them in completing the work, and thus avoid charging the original contractor the cost of such materials, which may be of less or no value on other work.

In well-drawn contracts, however, provision is generally made that where the contract is forfeited and materials are left on the ground by the original contractor, they shall be used at the discretion of the owner or the architect.

Even where the contract has granted them the authority, the owner, and the architect as well, should carefully consider the circumstances and all the stipulations relating thereto before taking so serious a step as the forfeiture of a contract. Where no provision has been made in a contract with regard to the contingency of its forfeiture, the owner or the architect, as the case may be, should, when there is good reason to do so, notify the contractor that he has forfeited his right to complete the contract. The owner should also endeavor to show an intention of finishing the work according to the terms of the contract, at a minimum cost to the original contractor, and protect his interest in every possible way.

50. Terminating a Contract.—An architect was once authorized in a contract to terminate it if he should see fit; the contractor applied to court for a decision as to whether the architect had a right, under the circumstances, to forfeit the contract. The architect held that he had the right to declare the contract forfeited under the terms of the agreement; but the court decided that the contractor had the privilege to apply to the court for its decision as to whether the architect was justified in terminating the contract.

The termination of the contract and the completion of the work by the owner or his representative somewhat changes the position of the architect. In a case where a subcontractor had entered suit and the work was being finished by other parties designated by the owner, who had rescinded the original contract, a New York court held that the certificate of the architect, which was required under the original contract before payment would be made, was not required, as the owner was now his own contractor.

51. Premiums.—Premiums are sometimes offered where the work is of special importance, and are stipulated in the contract as being payable to the contractor at so much a day for each and every day that he shall have the work finished before the specified time. Such a clause is sometimes included with a liquidated-damages clause. Where such premiums are stipulated in the contract and the owner in some way unreasonably delays the work, thus preventing the contractor from completing it before the specified time and depriving him of the premium, the courts have held that he can recover, provided he can prove that he would have finished before the specified time if the owner had not interfered.

The difficulty, however, in such cases is in determining just how long before the stipulated time the contractor would have finished if the owner had not interfered. This at best is mere guesswork, and depends on the circumstances surrounding the case. Where the stipulated premium amounts to a considerable sum of money for each day gained, the importance of correctly determining the exact number of days may readily be seen. For instance, in one case the stipulated premium was $500 a day for each and every day the contractor should have the work completed before the specified time; the owner interfered, and the contractor entered suit, claiming that without such interference he would have gained considerable premium. The court decided that he could have finished 30 days before the stipulated time and awarded him the $15,000 due him.

EXTRA WORK

52. Extra Work: Verbal Understanding.—In a case brought before the Superior Court of Massachusetts, where the written contract stipulated that no extra work would be paid for unless ordered in writing, and where the contractor had done extra work on verbal orders and been refused payment, the court held that "attempts of parties to tie up by contract their freedom of dealing with each other are futile. The contract is a fact to be taken into account in interpreting the subsequent conduct of the plaintiff and defendant, no doubt, but it cannot be assumed, as a matter of law, that the contract governed all that was done until it was renounced in so many words, because the parties had a right to renounce it in any way, and by any modes of expression they saw fit." In expressing the foregoing decision, the court was undoubtedly governed by the facts of the case, which were that most of the work was done after the original contract was practically completed, and the extra work, which was done during the completion of the original contract, had been verbally agreed to and payment had been promised for the same. Hence, in this case, the point to decide was not so much the setting aside of the stipulations requiring all extra work to be ordered in writing as it was whether the stipulations in the original agreement applied to subsequent and apparently independent work.

A similar case came before the Federal Court, where suit was entered by a contractor to recover payment for extra work, which the government had refused because the contract stipulated that no extra work should be paid for unless agreed on in writing. The court held that such a clause was inserted by the government in order to limit the powers of the architect and the superintendent, and did not bind the parties in such a manner as to avoid a verbal or implied agreement for extra work. The judge further stated: "Courts cannot transmute a contract into a statute of frauds, nor attach to the agreement of the parties the irrevocable mandatory attributes of a statutory provision. A provision in a written contract declaring that no claim for extra work shall be made unless it was required and agreed upon in writing, is merely a condition, which may be waived by a subsequent oral agreement." Also, "Where a public agent requests a departure from an express contract, and the change ordered is of such a nature that he may reasonably suppose that no additional expense will be caused thereby, the contractor is bound to speak, or he will be deemed to have consented to make the substitution at the contract rate. But where the change is of such a nature that it must necessarily involve additional cost, no such notification is necessary, and the contractor will recover reasonable compensation."

It would not be safe, however, to omit the clause in the contract that provides that "no extra work shall be paid for unless ordered in writing," for many courts have held that such a clause cannot be broken with impunity; and where it can be proved that the real intention of the parties concerned was that all such orders for extra work should be made with due formality, the contract is valid and will be upheld by the court.

53. Extra Work: Written Agreement.—Often there is found in the contract two apparently contradictory clauses: one that implies that no extra work shall be paid for unless ordered in writing, and another that states that the engineer or the architect shall have power to direct additions to, or alterations in, the work. The court has decided, however, that in such cases the latter clause does not in any manner affect the validity of the first. A New York court refused to admit evidence where the contract provided that "no extra work shall be paid for if not ordered in writing," unless the parties could furnish the written orders for such work.

In emergencies, where the safety of the building is at stake, and the architect or the engineer may deem it necessary to verbally order extra work done to eliminate such danger, the contractor would more than likely be able to recover payment for the extra work, even though there was a stipulation in the contract that written orders would be required for all extra work. In order to illustrate in what light such a condition of affairs is held by a court, the following may be of interest: A county commission in Indiana appointed a supervising engineer to superintend the erection of a certain bridge to be built under contract. During its erection, the superintendent thought it advisable to do the work in such a manner that a considerable amount of extra masonry and filling was required. The contractor being unable to collect for the extra work entered suit. The county commission claimed that the county could only be bound by the contract, and were responsible for nothing outside of it. The case was carried to the Supreme Court, which based its decision on the statutes applying to the erection and repair of bridges, which set forth that "for the erection of any such bridge, the said board shall appoint one or more discreet persons as superintendents thereof," and further authorized that the superintendent should have the power to receive proposals, let contracts to the lowest responsible bidder, and require surety for the performance of the agreement. On this, the court found that "it is thus seen that the superintendent has power to let contracts for the construction of bridges, and to superintend the work. We think that this makes the superintendent the agent of the county for the purpose of the construction of the bridge or bridges, and that he may bind the county by requiring work to be done beyond that contemplated by the contract. Such authority in the superintendent is necessary for the county, in order that the structure may turn out to be substantial and lasting; and it is proper, in order that the contractor employed to perform the extra work may have a remedy therefor. If it should be foreseen by the superintendent, after the letting of the contract, that the work performed or contemplated by it would be insufficient or defective, the county might be greatly the loser if he could not require such additional work as would make it substantial and permanent, and bind the county therefor." It should be distinctly remembered, however, that unless the contract expressly stipulates that an architect has power to order additional work, the owner will not be held responsible for payment for such work, unless, as stated in the preceding paragraphs, it is absolutely necessary for the safety of the building and well being of the owner. In such a case, the court, if passing favorably on the question at all, will very likely do so on the basis that the architect acted as the owner's agent, and as such had authority in an emergency to order such extra work to save the owner from loss, and hence the owner would be required to pay for such work.

54. Advantage of Observing Extra-Work Clause. All parties concerned would be better off if the contract that expressly states that there shall be no extra work done unless ordered in writing were lived up to, for if such a stipulation is once broken, carelessness in this respect is likely to become the rule rather than the exception during the whole of the building operation, and when the settlement comes to be made there is trouble for both the owner and the contractor. It may readily be understood how, during a large building operation, where there is looseness in carrying out the contract stipulations for extra-work orders, there may be numerous misunderstandings in regard to the various verbal orders given. These misunderstandings frequently arise from the fact that, in the hurry and bustle of a modern building operation, the average contractor is likely to interpret the slightest wish or action of the owner as implying an order for extra work, and as the operation proceeds, the careless owner continues to express his wishes for the most trivial variations, not realizing that the possibly unscrupulous contractor is carefully keeping account of all such suggestions and figuring on collecting a good price for them as orders for extra work. Thus, a contract, when broken in whole or in part, is difficult to enforce again. In making the final settlement, the owner is often inclined to admit that certain of the verbal orders were valid, but to claim that others were not, because of no written order being furnished. This very contradictory condition of affairs is obviously unjust, and would be looked on with disfavor by any court, which would be likely to decide, as in a New York case, that "a written contract may be waived, either in whole or in part, by parol, and after it has been thus waived by one of the parties, neither he nor any one acting under him can reinstate it."

55. Estimating Charges for Extra Work.—In estimating the amount to charge for extra work, contractors are likely to base their estimate at day wages; hence, it would be well to stipulate in the contract either that all extra work shall be paid for at contract prices or furnish some schedule on which the charge for extra work may be based. When the extra work is of the same nature as that specified in the contract, the usual custom is to itemize the estimate from which the contract has been made up and to charge all extra work accordingly. Usually when this is done the itemized schedule of prices for labor and materials is affixed to the contract and agreed to by the parties concerned as the basis on which all extra work is to be charged.

In a like matter to that in which extra work is ordered, omissions are sometimes made from the work required by the original contract. Where this is done, the amount of the deduction to be made from the contract price, on account of the omitted work, should be immediately agreed on with the contractor, and he, in deciding what will be a fair price to allow, must be governed by any stipulation bearing on the subject in the contract, and must also, if he wishes to deal honestly with himself, take into consideration any cost that may be caused by such omissions, which should be deducted from the allowance to be made to the owner.

Where no stipulation in regard to allowances for work omitted is made in the agreement, the views of the courts are very changeable as to whether the owner is entitled to any deduction. One court has handed down an opinion that "the defendant (meaning the owner) had a right to demand the very work specified, and if it accepted anything less as sufficient for the purpose named, has no right to insist that a rebatement should be made for that reason"; whereas, another court has held that "the owner is entitled to a reasonable compensation for work which has, by his desire, been omitted." It is evident, then, that all parties concerned would be better off if stipulations were made in the agreement in regard to deductions to be made from the contract price for work omitted, and on what schedule the prices by which the value of such work is to be estimated.

56. Decision as to Estimating.—A case often comes before the court that requires a decision as to how work shall be estimated. In such cases, the court is generally guided by the local custom in figuring such work, provided that this custom is well established among people engaged in building operations, generally understood by them, and reasonable in its results.

The Supreme Court of Missouri is agreeable to the custom that provides that in estimating for the laying of *stonework*, the door and window openings shall be measured as solid, and the corners measured twice. This same view is held in Maryland, with the further provision in regard to curved work, that it should be measured at one and one-half times its actual length. However, on account of the widely differing customs that sometimes exist in the same state, too much dependence should not be placed on the legal validity of any one of them.

57. Plaster Work.—A New York court once admitted evidence to prove that the custom among plasterers in Buffalo was to charge for the entire surface of the walls, without making any deductions for the window and door openings, cornices, or baseboards. A Pennsylvania court took another view of such work by saying: "A custom of plasterers to charge half the size of the window openings, at the price agreed on for the work and materials, is unreasonable and bad."

58. Brickwork.—Where brickwork was to be paid for by the thousand "in the wall," disagreements have arisen as to the method of counting the number of bricks, and, though the custom of allowing from twenty to twenty-two new bricks to a cubic foot of wall, or to a superficial foot of 12-inch wall, is well established among masons and bricklayers, the Supreme Court of Tennessee, in deciding such a case, would not admit it as evidence, and seemed to favor the actual count of the number of bricks used.

59. Excavating.—Before a contractor makes an agreement to do "earth excavation" at so much a cubic yard, he should always ascertain the nature of the soil, as otherwise he may discover when too late that the bulk of it is through hard pan, which will cost much more to move than ordinary earth, and which he did not figure on. If he should appeal to the court in an attempt to collect payment for the greater amount of work involved, he would more than likely find that his claim would not be sustained. Such a case was settled by the New York Court of Appeals, which decided that "earth excavation" included hard pan. A similar case arose in which an unfortunate contractor, who, having failed to examine the nature of the soil carefully, agreed to excavate and back fill a ditch at what would have been a very low figure even for earth. The contractor subsequently found that considerable of the excavation was in hard pan, and in some places rock. He commenced suit for the extra cost of the excavation, but the court would not admit evidence to prove the additional cost of the excavation, and said "it was the duty of the contractor to have ascertained the nature of the soil before entering into the contract; ordinary intelligence would have enabled him to do so."

60. Using Sand From Premises.—Sometimes a stipulation in the contract provides that "sand taken from the premises shall be used in the masonry." A New York court decided in a case of this kind, where the work was found defective on completion, due to the unsuitableness of the sand used, that the owner had no redress, though there was nothing in the report of the court to determine whether or not the contractor had notified the owner while the work was under way that the sand was not suitable. A good policy on the part of a contractor, however, would be to notify the owner in a similar case.

61. Quality of Materials.—It is not unusual to find in contracts that the quality of many of the materials to be used is not specifically stated. A New York court has decided that it is implied that they shall be of fair quality, or at least that they shall be sufficient and adequate. The decision of the court, as published in a law journal, is as follows:

"In every contract for the furnishing of the materials, and the performance of the work, in the absence of special provisions, there is an implied agreement on the part of the party who is to perform the work, and furnish the materials, that they shall not be of an insufficient and inferior description and value, and that the work shall not be totally inadequate to answer the purpose for which it was undertaken to be performed; and, though the agreement was that a specific sum should be paid for the work and materials, the claim may be reduced by showing that the work and materials were of an insufficient description and value, or it may be wholly defeated by showing that they were totally inadequate to answer the purpose for which they were to be furnished."

In regard to the stipulations in a Colorado specification that the "best lumber" should be used in a building, the Supreme Court decided that it meant the best that was ordinarily used in constructing buildings in that locality.

62. Old Materials.—A New York court, in regard to the ownership of old materials, said: "If the owner of land covered by houses, enters into a contract for the erection of other buildings on the same land, and does not provide for the use of the materials of the old building in the new, or does not remove them before the contractor takes possession under his contract, he will waive the right to them, and they will belong to the contractor."

63. Estimating Quantities.—The architect sometimes, though it is not usual for him to do so, prepares a bill of quantities of the material and labor that will be required in the construction of a proposed work. The contractor, however, should look with caution on such an estimate, even though the architect should assent to its correctness, and should verify for himself any such bill of quantities, unless, of course, the contract is simply for the execution of such a bill of material, instead of the erection of the building complete; for should the contractor base his agreement on this bill of quantities and afterwards find that the actual amount of material and labor required exceeded the estimate, he would very likely find that nothing could be recovered through the courts.

Even in England, where the profession of "quantity surveying" is practised to a considerable extent and independent of the architect, the courts have held time and time again that no such estimate of the work was a guarantee, and that neither the quantity surveyor, architect, nor owner was responsible for its correctness. Hence, it would seem that there is no necessity for the architect to prepare any such bill of material, as the courts seem to be of the opinion that builders as a rule understand their business and are capable of making their own estimates, and should be responsible for them, provided the extent of the work is clearly stated to them by the architect or the owner through the plans and specifications prepared for the building.

RESPONSIBILITY AND RISK

BUILDER'S RESPONSIBILITY

64. Safety of Building During Construction.—The responsibility for the safety of a building during its construction usually devolves on the contractor, as has been decided in numerous cases. In a case where a contractor had entered into an agreement to raise a house and build under it another story, the building, while the work was progressing, fell and injured the adjoining property. The owner of the adjoining house entered suit for damages against the owner of the house undergoing alterations, but was defeated. The court held that the contractor was alone responsible, and said: "The distinction on which all such cases turn is this: If the person employed to do the work carries on an independent employment, and acts in pursuance of a contract with his employer, by which he has agreed to do the work on certain specified terms, in a particular manner, and for a specified price, then the employer is not liable. The power of directing and controlling the work is parted with by the employer, and is given to the contractor." There are exceptions to this rule, however, where the courts have placed the blame on the owner; such a case was decided by the Supreme Court of Massachusetts. It seems, in this particular case, that a mason contracted to build a party wall. At the time the work was done there was freezing weather, and when the wall had progressed as high as the fourth story and the floorbeams were in place, the weather moderated, causing the mortar to thaw. The wall, thus softened, fell and damaged an adjacent building. In the suit that followed, the owner of the wall claimed that the contractors were alone responsible. Evidence was introduced tending to prove that the wall had not been properly braced, although it had been accepted by the architect as far as it had progressed, and also that the strength of the wall had been impaired by flues that were built in at the request of the owner of the adjoining property. The court, however, refuted the claim of the owner, that the contractor was alone responsible, by saying: "The general rule of law is that the person who, for his own purposes, brings on his land, and collects and keeps there, anything likely to do mischief if it escapes, must keep it at his peril; and if he does not do so is prima facie,* answerable for all the damage which is the natural consequence of its escape. This rule has been applied to dangerous animals, cesspools, to reservoirs, and to accumulations of snow and ice upon a building, by reason of the form of its roof."

Courts have generally held that where the fault or injury was due to the negligence of a subcontractor, the principal contractor was responsible.

If the contract provides that the building is to be erected according to certain plans and specifications, and the contractor agrees to such a stipulation, with the result that the building, when erected, is faulty and unsafe, courts have

* In law, a prima-facie case is one that is established by sufficient evidence, and can be overthrown only by rebutting evidence adduced by the other side—a case consisting of evidence sufficient to go to the jury; that is to say, one that raises a presumption of fact, and hence will justify a verdict, though it may not require one.

decided that the contractor cannot be held responsible if he has fulfilled the contract and carefully carried out the drawings and specifications. On the other hand, should he change the construction or deviate from the drawings or specifications, he is held responsible for the safety of the building.

65. Insurance.—The average contractor is called on to run numerous risks from fire, etc., which, if realized, would more than likely bankrupt him beyond any possibility of recovery. If the building should burn down or be subjected to destruction by any other unforeseen agency during the progress of construction, it is generally held that the contractor is responsible, and is bound by the stipulations in the contract, though the contract sometimes provides that should the contractor be delayed by such agencies as fire, water, cyclones, etc., an extension of time will be granted.

Hence, the duty of the builder, toward both himself and the owner, is to guard against such contingencies by taking out the proper insurance on the building. The Uniform Contract requires that the owner shall maintain the insurance necessary to cover the work and material incorporated in the building, and material upon the ground. The law is quite strict with contractors that have been so unfortunate as to have the building destroyed for which they contracted, and usually holds that they must finish the building according to the terms of the contract, no matter how severe it may be on them. When a building has been destroyed by some unforeseen agency, the courts have sometimes held that the builder was released from his contract by the "act of God," that is, by some power beyond human control. Such a case occurred in Connecticut, where a contractor had agreed to build a schoolhouse; it was nearly completed and $1,000 had been paid on account when it was struck by lightning and burned. The committee with which the contract had been made asked the contractor to commence rebuilding, and offered to extend the time of completing, which was nearly up when the fire occurred. The contractor, however, refused, saying that he had been released from the contract by an act of God. The decision of the Supreme Court was against this, however, and held that he was not released.

66. Responsibility for Accidents.—The following rule of the Supreme Court of Illinois in a similar case, where the building under erection was blown down once and fell down the second time, caused, according to the contractors, by unforeseen defects in the soil, is interesting and explains itself: "If a party enters into an absolute contract, without any qualifications or exceptions, and receives from the party with whom he contracts the consideration of such an engagement, he must abide by the contract, and either do the act, or pay the damages; his liability arises from his own direct and positive undertaking. * * * If the covenant be within the range of possibility, however absurd or improbable the idea of execution may be, it will be upheld; as where one covenants it shall rain tomorrow. * * * To bring the case within the rule of dispensation, it must appear that the thing to be done cannot by any means be accomplished; for, if it be only improbable, or out of the power of the obligor, it is not deemed in law impossible. * * * No matter how harsh and apparently unjust in its operation the rule may occasionally be, it cannot be denied that it has its foundation in good sense and inflexible honesty. He who agrees to do an act should do it unless absolutely impossible. He should provide against contingencies in his contract. Where one of two innocent persons must sustain a loss, the law casts it on him who has agreed to sustain it, or rather, the law leaves it where the agreement of the parties has put it." The court further said, in reciting the case, "If a party for a sufficient consideration agrees to erect and complete a building on a particular spot, and to find all the materials and do all the labor, he must erect and complete it, because he has agreed to do so. No matter what the expense, he must provide such a substructure as will sustain the building on the spot, until it is completed, and delivered to the owner. * * * If the difficulties are apparent on the surface, he must overcome them. If they are not, but become apparent by excavation, or the shrinking of the building, the rule is the same. * * * The cases make no distinction between accidents that could be foreseen when the contract was entered into, and those that could not have been foreseen; between accident by the fault of the contractor, and those where he is without fault; they all rest on the simple principle. Such is the agreement, clear and unqualified, and it must be performed, no matter what the cost, if performance be not absolutely impossible. * * * The whole defense was properly overruled, because it did not show the performance of the contract impossible, or any lawful excuse for non-performance of the contract."

ARCHITECT'S AND OWNER'S RESPONSIBILITY

67. Suits for Liability.—In the American Institute of Architects' and the National Association of Builders' official form of contract, given in full at the end of this Section, there will be noticed in Art. I a stipulation that the architect is "acting for the purpose of this contract as agent of the said owner." In case of suit for liability that might be entered against the owner by persons injured while working on the building, this clause is likely (and especially so under the laws of some states) to cause trouble; for a shrewd lawyer might trace every occurrence about a building as emanating directly through the orders of the architect, who, acting as agent, makes the owner responsible for such occurrences; and hence the particular one that led to the injury of the plaintiff.

Such a calamity may be guarded against by some such clause as is given in the first form of contract hereinafter referred to. This clause places the responsibility for liabilities on the contractor, and reads as follows: "The contractor shall furnish all transportation, scaffolding, apparatus, ways, works, machinery, and plant requisite for the execution of this contract, and shall be solely answerable for the safe, proper, and lawful construction, maintenance, and use of the same; he shall cover and protect his work from damages, and all injury of the same, before the completion of this contract, shall be made good by him; and shall be solely answerable for all damage or delay to the owner or his property, to other contractors or other employes of the owner, to neighboring premises, or to any person or property, due to the improper, illegal, or negligent conduct of the contractor, or of his subcontractors, employes, or agents, in or about the said building or the execution of the work covered by this contract or any extra work undertaken as herinafter provided."

The architect is thus relieved of his position as agent in all cases that might place the responsibility for liabilities on his client by that portion of the clause in the same contract which reads: "Neither the architect nor any person employed by him shall have any control or direction over the progress of the work, excepting the power of rejecting it, nor any control or superintendence over the scaffolding, apparatus, ways, works, machinery, or plant, the sole responsibility for which shall rest with the contractor; and further, the architect shall not be deemed the agent of the owner for any purpose whatsoever, except as the owner may in fact give him a special and express authority."

Since most first-class builders have their liabilities insured, they would have no incentive to throw such responsibilities on the owner; but in order that the owner may be secure against any legal action by injured employes, the best plan would be to insert such clauses as are just given.

68. Architect's Responsibility for Work Not Conforming to the Specifications.—There is considerable difference of opinion shown in the decisions of the courts as to the legal responsibility of the architect for work that is not according to the drawings and the specifications. The consensus of opinion seems to be in favor of holding the contractor responsible for exactly complying with the drawings and specifications, and that the architect be held responsible for a reasonable degree of professional knowledge and skill, and that he devote a greater amount of care and attention to his employer's affairs than to smiliar work of his own.

The following decision by a New York chief justice, in an important case, states clearly what seems a very fair conception of the duties of the architect as the agent of the owner and his responsibility for work not executed according to the drawings and specifications: "The counsel would not contend that the architect is an insurer of the perfection of the masonwork, the carpenter work, the plumbing, etc. He is bound only to exercise reasonable care and to use reasonable powers of observation and detection in the supervision of the structure. * * * An architect is no more a mere overseer, or foreman, or watchman, than he is a guarantor of a flawless building; and the only question that can arise in a case where general performance of duty is shown, is whether, considering all the circumstances and peculiar facts involved, he has or has not been guilty of negligence. This is a question of fact, and not of law."

69. Architect's Responsibility for Defective Drawings or Specifications.—Where the architect has shown beams or columns on his drawings that are too weak to carry the loads placed on them, and the building tumbles down as a result, he would probably be held legally responsible. The weight of legal opinion seems to be in favor of making him liable for the consequences of what can be proved to be lack of ordinary professional skill and care in preparing the plans and specifications.

70. Importance of Insuring.—Where the rules of the insurance companies permit, the owner should insure his own and also the risks of all the contractors engaged on the work, which, in case of loss by fire, will be paid according to the particular interests of the parties engaged. See Art. XI, Form 3. Should the laws of the insurance companies not allow them to issue a policy in the names of more than one person, the builder should be required to insure to the full amount of his interest; and, since they are likely to neglect doing so for the sake of the financial saving, the architect should demand this policy and see that it is all that is required, retaining it in his hands for safe keeping.

The importance of a stipulation to this effect is evident; for if the builder should neglect to insure, and if the partly erected building should burn down, he would, in many cases, be thrown into bankruptcy and the owner would be compelled to finish the contract with the assignee or some other contractor.

71. Mechanic's Lien.—A **mechanic's lien** is a lien on real property, given by statutes in most of the United States, to mechanics and material men, for the price and value of improvements supplied by them. With reference to buildings, it is a lien given to mechanics and material men as security for their claims for work done or materials furnished, for and about the erection or alteration of the buildings.

A mechanic or a material man has no right to retain possession of a building until his debt is paid; he has a mere right to sue out and enforce his lien, and thus charge the property with the payment of his particular debt in preference to other debts, so far as the statute confers such preference, if all the requisites of the statute have been observed.

There can be no mechanic's lien unless the work done or materials furnished were done or furnished under or by virtue of a contract with the owner of the property, or some agent duly appointed by him. The contract need not be in writing, except when required by statute, and it need not contain any express stipulation for a lien, as the lien is given by statute independent of the terms of a contract. If the material man sells his materials with no understanding as to the purpose to which they are to be put, he can assert no lien on the building in which they are placed. It is only when the materials are furnished for a purpose mentioned in the statute that a lien is acquired.

The statutes or most states require that a notice be given of the lien, and docketed among the proper public records so as to give notice to the world of its existence.

In the majority of the states, the lien begins from the date of commencement of the building; in some states, the lien commences when the labor or material is furnished to the building.

The duration of a mechanic's lien is, in all states, a matter of statutory regulation. In some states, the lien continues until the expiration of a definite period, usually 6 months, from the performance of the work, or the furnishings of the materials. If a formal claim is filed before the expiration of this period, the lien is continued for a period varying from 2 to 5 years.

In some states, the architect that draws the plans and superintends the construction of a building has a valid lien for his services. In other states, distinction is made between an architect that draws plans for a building only and one that superintends its erection, the latter being held to be entitled to a lien, but in some states no architect is entitled to a lien.

The mode for enforcing the lien is usually a matter of statutory provision. In some states this is done by a foreclosure of a mortgage, others require the filing of a bill in chancery, while other states authorize the issuance of an attachment. Whatever may be the proceeding prescribed, the person whose property is sought to be charged with the lien is given the opportunity to interpose any defense he may have.

LEGAL MEANING OF WORDS

72. "Commencement" and "Erection."—A question sometimes arises as to when a building is properly *commenced;* whether it is when the batter boards are set, when the excavation is started, or when the first footing stone is laid. The New Jersey Supreme Court held the opinion in two cases that a building was commenced when the excavation was begun.

The direct meaning of the word *erection* is somewhat obscure, and while it is a word much used in contracts and specifications, there seems to be a great difference of opinion in regard to what may be inferred by the phrase *upon the erection of.* Some hold that it means the completion of the building or structure; others claim that something else is meant. A case in Illinois called for a decision from the Supreme Court as to when a building should be considered as being erected. The court decided that the building in question be considered as erected, although it had no roof on and not one gable or chimney was built; the flooring had not been laid, but the materials for the roof, floor, and windows had been delivered on the ground. In Indiana, the court held that a house had been erected wherein the plastering had not yet been done and some of the windows had not been placed; and most of the states in which such cases have arisen have held the opinion that a building was erected where the walls were up and the materials with which to complete it were on the site.

73. "As Directed."—The expression *as directed*, as pertaining to its use in specifications in connection with the manner in which work shall be done, was passed on by the Supreme Court of Missouri during a controversy as to whose directions were meant, and was held to imply those of the owner. All controversy on this score can be avoided by stating whose direction is intended, the owner's or the architect's.

74. "Not Less."—The phrase *not less*, which is much used in specifications, hence forming a term in the agreement, seems to be rather unnecessary in most cases, and is liable to cause trouble. It is principally used in making some such stipulation as this: "The cellar shall be excavated to a depth of not less than 10 feet." A stipulation like this was made in a contract for the erection of a building in the state of New York. After the contractor had excavated to the required depth, the nature of the soil demanded further excavation in the footing trenches, and in consequence the cellar wall had to be extended. In the suit brought by the contractor to recover the cost of the extra work, the Supreme Court decided that it was due him. In all cases of this kind, the court will carefully consider the meaning of the contract to determine whether the contractor really intended to bind himself to do the work beyond the given dimensions should the architect, in the execution of the work, deem it advisable, owing to conditions unforeseen.

75. "More or Less."—A contract will sometimes stipulate that a certain amount of material *more or less* shall be furnished. A New York court held that the term as used implied the delivery and acceptance of just the actual amount of material required for the work, and that the term as used did not mean any definite quantity.

76. Other Phrases.—In most formal contracts, it is usual to refer to the specifications that constitute part of the agreement as the *specifications hereto annexed.* The courts hold that it is not necessary that the specifications should be actually attached to the formal contract; for so long as the particular specification referred to in the contract can be proved as the one meant, that is all that is legally required. Also, if the phrase, *the specifications signed herewith*, is used in the formal contract, it is not actually required that they should be signed, provided the ones intended in the formal contract can be identified without such signatures. It undoubtedly would be advisable, however, to sign all specifications, and even plans, so that there may be no controversy in regard to the ones designated in the formal contract.

FORMS OF CONTRACT

77. Specimen Contracts.—The preceding pages have been devoted to points of law likely to be raised in respect to contracts, the study of which will enable one, when called on to become a party to a contract, to do so intelligently.

The two forms of contract that are now given in full are representative and legally correct. The first form is very complete, provisions being made in it to cover every contingency that is likely to arise in an important building operation, and which long experience in building transactions has demonstrated should be guarded against. The second form is more brief, and not so complete in the extent of the ground covered, but is the one that is generally used.

This contract is the official contract of the American Institute of Architects and National Association of Builders, and is known as "The Uniform Contract." It is used in the printed form, which is obtainable at nearly all stationery-supply stores. It has been carefully compiled by a joint committee of the Institute and Association, and is subject to such change and modification each year as may be deemed necessary to make it more complete or binding.

78. Building Contract.—The text of the ordinary building contract herein first referred to follows:

BUILDING CONTRACT

between____________________of__________________
hereinafter called the Owner, and____________________
of____________________hereinafter called the Contractor, made
at______________the__________day of__________19____

The respective parties hereto, each in consideration of the agreements of the other herein set forth, agree each with the other as follows:

THE CONTRACTOR'S AGREEMENT

The Contractor, his heirs or assigns, agrees to__________________
____
according to certain plans and specifications prepared by____________
____________of________________Architect. Said plans and specifications, together with this contract, of which they are to be deemed a part, are to be construed together, so that any work shown on the plans, though not mentioned in the specifications, or vice versa, or any provision of the contract not repeated in the plans or specifications, or vice versa, is to be executed by the Contractor as a part of this contract. Figured dimensions are to prevail over scale measurements. All things which in the opinion of the Architect may fairly be inferred from the plans and specifications, are to be executed by the Contractor as a part of this contract. If complete drawings of details have not yet been made, the same, when made and conforming to said plans and specifications, are to constitute a part of this contract, the Architect being the sole judge as to whether said detailed drawings conform to said plans and specifications. All the plans and drawings received by the Contractor at any time during the continuance of this contract are at its termination to be returned to the Architect.

All material and work, where the quantity, dimensions, and quality are not shown on the plans or specified in the specifications, are to be furnished in sufficient quantity and of sufficient dimensions for the proper execution of the work as determined by the Architect, and the quality and workmanship are to be the best throughout and satisfactory to the Architect.

The Contractor is to take out at his own expense all necessary permits from the municipal or other public authorities, to give all the notices required by law or municipal ordinance, and to pay all fees and charges incident to the due and lawful prosecution of the work covered by this contract.

If this contract involves excavation or masonwork, the Contractor is to execute the same without encroaching upon adjoining public or private property, and shall procure for the Owner the certificate of some competent surveyor, to be selected by the Owner, that there has been no such encroachment; unless the plans themselves provide for such encroachment, in which case the Contractor shall be relieved from all responsibility as to the correct location of the walls and foundations in this respect.

The Contractor shall devote his time and personal superintendence to the execution of this contract, and shall employ a competent foreman, who shall at all times be present while any work is being done under this contract at the building.

The entire work and all its parts, including material, workmanship, and rate of progress, shall be satisfactory to the Architect. All materials rejected by the Architect, whether worked or unworked, and whether affixed to the building or not, shall be removed from the premises (and for that purpose taken down if already attached to the building) at the request of the Architect; and all work condemned by the Architect, as in any way unsound or as not conforming to the terms of this contract, shall be taken down forthwith and rebuilt by the Contractor in accordance with the contract and in a manner satisfactory to the Architect. The Contractor shall dismiss any of his employes if the Architect considers said employes incompetent or careless and so informs the Contractor.

The Contractor shall clear away all dirt and rubbish caused by his operations as often as requested by the Architect or Owner, and shall leave the premises at the termination of this contract free from such dirt and rubbish and in a neat and clean condition.

The Contractor shall prosecute the work speedily and continuously

____

____

and the entire work covered by this contract shall be finished by the ____________ day of ____________ 19____ The damages for default are fixed at ____________ dollars for every day thereafter that the said work shall remain unfinished.

The Contractor shall make good all defects, omissions, and violations of the terms of this contract whensoever discovered, during the progress of the work or afterwards, notwithstanding any payments that may have been made, or any certificates that may have been given, or any possession or acceptance of the work by the Owner, and shall be responsible for any damages that may be caused in making good said defects, omissions, or violations.

The Contractor shall comply with all the laws, ordinances, and regulations for the time being in force in the city or town where the building is situated and relating to the building or other work included in this contract, and shall satisfy all the requirements of the Inspectors (if there be such).

The Contractor shall furnish all transportation, scaffolding, apparatus, ways, works, machinery, and plant requisite for the execution of this contract, and shall be solely answerable for the safe, proper, and lawful construction, maintenance, and use of the same; he shall cover and protect his work from damage, and all injury to the same, before the completion of this contract, shall be made good by him; and shall be solely answerable for all damage or delay to the Owner or his property, to other Contractors or employes of the Owner, to neighboring premises, or to any person or property, due to the improper, illegal, or negligent conduct of the Contractor, or of his subcontractors, employes, or agents, in or about the said building or the execution of the work covered by this contract or any extra work undertaken as hereinafter provided.

The Contractor shall have sole charge and possession of the work covered by this contract until the termination thereof; but shall permit the Owner and the Architect and any person employed by either of them to visit, enter, and inspect the said work at all times and places during the progress thereof, and shall provide safe and proper facilities for such inspection.

The Contractor shall permit other contractors or employes of the Owner to prosecute their work, and shall render them all necessary assistance.

THE OWNER'S AGREEMENT

The Owner, his heirs, or assigns agree to pay the Contractor in monthly sums amounting to 90 per cent. of the value of the work done during the previous month. These payments shall be made upon the presentation of certificates from the Architect; provided, however, that none of the foregoing payments shall be due or payable unless the Contractor shall deliver to the Owner the written certificate of some competent surveyor, to be selected by the Owner, that there has been no encroachment upon adjoining public or private property and unless the property is free from all lien for debts due, or claimed to be due, the Contractor, and satisfactory evidence thereof furnished (if requested) to the Owner by the Contractor; also with the understanding that making of any of these payments does not imply the acceptance of any work not in accordance with the drawings and specifications.

ALTERATIONS AND EXTRAS

The Architect may, in writing, and from time to time, order the Contractor to make any changes in the work which do not increase the cost to the Owner or affect the time of completion. In case said changes make the work less expensive to the Contractor, a proportional deduction shall be made from the contract price above specified. In no case shall any change be made in the work which shall increase the cost of the work to the Owner, or involve any extension of time, without his express and special consent; and, if the Contractor shall proceed to execute such change without first obtaining such consent, he shall be concluded against making an extra charge for the said change or any claim for further time.

In case of any change ordered by the Architect as aforesaid, or in case any other changes in the work are made by the mutual consent of the parties hereto, whether affecting the contract price or not, or the time of completion or not, all and singular the other provisions of this contract shall remain in force, and apply to the contract as thus altered.

ORDERS FOR PAYMENTS

If any orders are accepted by the Owner (and it is understood that he shall be under no obligation to accept any), such acceptances shall be conditional on the due performance by the Contractor of all and singular the provisions of this contract, and subject to alterations as aforesaid.

THE ARCHITECT

The Architect mentioned in this contract is understood to be ________________________________ of ______________ or such other Architect as the Owner may hereafter select; any change to be notified to the Contractor in writing.

The Architect shall have authority to enter and inspect the work at all times, to reject all material (whether set up or not) and to condemn all work which in his opinion is not in conformity with the provisions of this contract, and to do all the things hereinbefore set forth as within his powers. Neither the Architect nor any person employed by him shall have any control or direction over the progress of the work, excepting the power of rejecting it, nor any control or superintendence over the scaffolding, apparatus, ways, works, machinery, or plant, the sole responsibility for which shall rest with the Contractor; and neither of them shall have power to order extras or alterations, except as above provided, or any authority other than that expressly set forth in this contract. The Architect shall not be deemed the agent of the Owner for any purpose whatsoever, except as the Owner may in fact give him a special and express authority.

MISCELLANEOUS PROVISIONS

No payment of money under this contract, nor any acceptance or possession taken of the work done by the Contractor, nor any certificate given, shall be evidence of the performance of this contract or be construed as a waiver of any of its provisions by the Owner; nor shall any waiver of any breach of this contract be held to be a waiver of any other or subsequent breach.

If, in the opinion of the Architect, the Contractor is obstructed or delayed in the prosecution or completion of the work by the neglect, delay, or default of any other contractor, or by any damage which may happen thereto by fire, or by the unusual action of the elements, or by the abandonment of the work by the employes in a general strike, then the Contractor shall be entitled to such extension of the time specified above for the completion of the work as the Architect shall in writing certify; provided, however, that claim is made by the Contractor at the time and in writing.

If at any time before the completion of this contract the Contractor becomes bankrupt or insolvent, or makes an assignment for the benefit of creditors, or assigns this contract or sublets any part of it without the consent of the Owner first obtained in writing, or becomes incapable of completing the contract, or shall at any time for six days refuse or neglect to proceed with the contract work in the manner herein agreed to the satisfaction of the Architect, then the owner may at once terminate this contract by a written notice delivered to the Contractor in person or at his usual place of business, and proceed to complete the work with other mechanics or contractors, and account to the Contractor or his legal representatives as follows: The Owner shall be credited with all payments theretofore made by him to the Contractor, with the entire cost of completing the work with said other mechanics and contractors, and with all damages by delay or otherwise, caused by the default of the Contractor, including reasonable expenses of counsel. If the contract price exceeds the total amount of these credits, the excess shall be paid to the Contractor or his legal representatives. In case orders accepted by the Owner are outstanding, the holders thereof shall be entitled to such excess in preference to the Contractor or his legal representatives. If, however, the total amount of the said credits exceeds the contract price, the excess shall be due from the Contractor to the Owner. In such accounting, the Owner shall not be held to obtain the lowest figure for the work of completing the contract; but all sums actually paid by him for such completion shall be credited to him.

All material delivered at the building by or on account of the Contractor, and intended to be incorporated with the building, shall become the property of the Owner as delivered; but the Contractor may repossess himself of any surplus left at the completion of the contract. All scaffolding, apparatus, ways, works, machinery, and plant brought upon the premises by the Contractor, or used by him, shall remain his property, but in case of default and a completion of the contract work by the Owner, the latter shall be entitled to use the said scaffolding, apparatus, ways, works, machinery, and plant without cost or liability for depreciation or injury by use.

If the Owner does not make the payments herein provided as and when the same shall become due aud payable he shall be liable to the Contractor for interest on the same; and if such default continues for a period of ten days, the Contractor may, by a written notice delivered to the Owner in person or at his usual place of business, terminate this contract. But the acceptance of any money under this contract subsequent to such defaults shall operate as a waiver thereof and of the right to terminate this contract by reason thereof.

The Owner shall keep the building and the material on the premises insured against fire in such companies as he shall select, for the benefit of himself or any mortgagee and of any and all contractors on the building who shall request such insurance in writing. The expense of said insurance shall be borne by the Owner; but he shall not be responsible for carrying too little insurance, unless the Contractor has requested him in writing to insure in a certain specified amount, and the Owner has neglected to do so for an unreasonable length of time. In the event of a fire, the insurance shall be divided between the Owner and any mortgagee and those contractors for whose benefit the insurance was taken out, as their interests may appear; and the parties hereto shall respectively proceed to the completion of this contract.

All disputes arising out of this contract or the performance or breach thereof shall be settled by mutual agreement or in a court of law or equity before a single justice, auditor, or special master, and no claim shall be made for a trial by jury on the whole case or special issues.

In witness whereof, we, the said ________________________________
and the said ____
hereto set our hands and seals this __________ day of __________ 19____

79. Uniform Contract.—The so-called "Uniform Contract" adopted by the American Institute of Architects and the National Association of Builders is a printed instrument with spaces left for filling in the specific details peculiar to each case, as shown in Form 1. The lines left blank for the names of the contractor and owner are ample for the name and address of either party when it consists of a firm or long-titled corporation. The lines near the bottom of Form 1 are for a list of the work included by the contract for the building to be erected, together with its location.

Form 2 is printed on the second page of the "Uniform Contract" and continues the terms of the agreement down to Art. VIII. In Art. VI, five lines are left for the dates at which various portions of the building shall be completed; and six additional lines are left blank to insert provisions for contingencies of delay, such as strikes, interference of other contractor, severe weather, etc.

Form 3 constitutes the third page of the "Uniform Contract" and contains, in Art. IX, space for the gross amount of the contract to be written in; under which are provided blank lines whereon to state the number, amount, and time of payment of each instalment of the contract price. Art. XI provides the insurance clause and leaves spaces for special conditions of insurance if such are required. Then follows the space for the signatures of the contracting parties, while under the words "In presence of" is placed the signature of a witness, who is usually, though not necessarily, the architect.

The contract is folded twice, after it has been signed, and on the outside of the fourth page is a blank form that, when filled out, gives information regarding the document, as shown in Form 4. This is not necessarily a part of the document, but it is simply an indorsement or title by which the contract may be recognized without unfolding it.

THE UNIFORM CONTRACT.

FORM OF CONTRACT
ADOPTED AND RECOMMENDED FOR GENERAL USE
BY THE
AMERICAN INSTITUTE OF ARCHITECTS
AND THE
NATIONAL ASSOCIATION OF BUILDERS.

____
ARCHITECTS

This Agreement, made the ____________________ day of ________________ in the year one thousand nine hundred and ____________

by and between ____

____ party of the first part

(hereinafter designated the Contractor), and ____________________________

____ party of the second part

(hereinafter designated the owner),

Witnesseth that the Contractor, in consideration of the fulfillment of the agreements herein made by the Owner, agrees with the said Owner, as follows:

ARTICLE I. The Contractor under the direction and to the satisfaction of

____ Architects,

acting for the purposes of this contract as agents of the said Owner, shall and will provide all the materials and perform all the work mentioned in the specifications and shown on the drawings prepared by the said Architects for the ____________________________

which drawings and specifications are identified by the signatures of the parties hereto.

ART. II. The Architects shall furnish to the Contractor, such further drawings or explanations as may be necessary to detail and illustrate the work to be done, and the Contractor shall conform to the same as part of this contract so far as they may be consistent with the original drawings and specifications referred to and identified, as provided in Art. 1.

It is mutually understood and agreed that all drawings and specifications are and remain the property of the Architects.

FORM 1

ART. III. No alterations shall be made in the work shown or described by the drawings and specifications, except upon a written order of the Architects, and when so made, the value of the work added or omitted shall be computed by the Architects, and the amount so ascertained shall be added to or deducted from the contract price. In the case of dissent from such award by either party hereto, the valuation of the work added or omitted shall be referred to three (3) disinterested arbitrators, one to be appointed by each of the parties to this contract, and the third by the two thus chosen; the decision of any two of whom shall be final and binding, and each of the parties hereto shall pay one-half of the expenses of such reference.

ART. IV. The Contractor shall provide sufficient, safe and proper facilities at all times for the inspection of the work by the Architects or their authorized representatives. He shall, within twenty-four hours after receiving written notice from the Architects to that effect, proceed to remove from the grounds or building all materials condemned by them, whether worked or unworked, and to take down all portions of the work which the Architects shall by like written notice condemn as unsound or improper, or as in any way failing to conform to the drawings and specifications.

ART. V. Should the Contractor at any time refuse or neglect to supply a sufficiency of properly skilled workmen, or of materials of the proper quality, or fail in any respect to prosecute the work with promptness and diligence, or fail in the performance of any of the agreements herein contained, such refusal, neglect or failure being certified by the Architects, the Owner shall be at liberty, after ______ days written notice to the Contractor, to provide any such labor or materials, and to deduct the cost thereof from any money then due or thereafer to become due to the Contractor under this contract; and if the Architects shall certify that such refusal, neglect or failure is sufficient ground for such action, the Owner shall also be at liberty to terminate the employment of the Contractor for the said work and to enter upon the premises and take possession, for the purpose of completing the work comprehended under this contract, of all materials, tools and appliances thereon, and to employ any other person or persons to finish the work and to provide the materials therefor; and in case of such discontinuance of the employment of the Contractor he shall not be entitled to receive any further payment under this contract until the said work shall be wholly finished, at which time, if the unpaid balance of the amount to be paid under this contract shall exceed the expense incurred by the Owner in finishing the work, such excess shall be paid by the owner to the Contractor, but if such expense shall exceed such unpaid balance, the Contractor shall pay the difference to the Owner. The expense incurred by the Owner as herein provided, either for furnishing materials or for finishing the work, and any damage incurred through such default, shall be audited and certified by the Architects, whose certificate thereof shall be conclusive upon the parties.

ART. VI. The Contractor shall complete the several portions, and the whole of the work comprehended in this Agreement by and at the time or times hereinafter stated ______

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provided that ______

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ART. VII. Should the Contractor be obstructed or delayed in the prosecution or completion of his work by the act, neglect, delay or default of the Owner, or the Architects, or of any other contractor employed by the Owner upon the work, or by any damage which may happen by fire, lightning, earthquake or cyclone, or by the abandonment of the work by the employees through no default of the Contractor, then the time herein fixed for the completion of the work shall be extended for a period equivalent to the time lost by reason of any or all the causes aforesaid; but no such allowance shall be made unless a claim therefor is presented in writing to the Architects within twenty-four hours of the occurrence of such delay. The duration of such extension shall be certified to by the Architects, but appeal from their decision may be made to arbitration, as provided in Art. III of this contract.

ART. VIII. The Owner agrees to provide all labor and materials not included in this contract in such manner as not to delay the material progress of the work, and in the event of failure so to do, thereby causing loss to the Contractor, agrees that he will reimburse the Contractor for such loss; and the Contractor agrees that if he shall delay the material progress of the work so as to cause any damage for which the Owner shall become liable (as above stated), then he shall make good to the Owner any such damage. The amount of such loss or damage to either party hereto shall, in every case, be fixed and determined by the Architects or by arbitration, as provided in Art. III of this contract.

FORM 2

ART. IX. It is hereby mutually agreed between the parties hereto that the sum to be paid by the Owner to the Contractor for said work and materials shall be $ ______________________

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subject to additions and deductions as hereinbefore provided, and that such sum shall be paid in current funds by the Owner to the Contractor in installments as follows:

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The final payment shall be made within______________ days after this contract is fulfilled.

All payments shall be made upon written certificates of the Architects to the effect that such payments have become due.

If at any time there shall be evidence of any lien or claim for which, if established, the Owner or the said premises might become liable, and which is chargable to the Contractor, the Owner shall have the right to retain out of any payment then due or thereafter to become due an amount sufficient to completely indemnify him against such lien or claim. Should there prove to be any such claim after all payments are made, the Contractor shall refund to the Owner all moneys that the latter may be compelled to pay in discharging any lien on said premises made obligatory in consequence of the Contractors default.

ART. X. It is further mutually agreed between the parties hereto that no certificate given or payment made under this contract, except the final certificate or final payment, shall be conclusive evidence of the performance of this contract, either wholly or in part, and that no payment shall be construed to be an acceptance of defective work or improper materials.

ART. XI. The Owner shall during the progress of the work maintain full insurance on said work, in his own name and in the name of the Contractor, against loss or damage by fire. The policies shall cover all work incorporated in the building, and all materials for the same in or about the premises, and shall be made payable to the parties hereto, as their interest may appear.

____

____

____

____

____

____

ART. XII. The said parties for themselves, their heirs, executors, administrators and assigns, do hereby agree to the full performance of the covenants herein contained.

In Witness Whereof, the parties to these presents have hereunto set their hands and seals, the day and year first above written.

In presence of

______________________________ (SEAL)

______________________________ (SEAL)

______________________________ (SEAL)

______________________________ (SEAL)

FORM 3

THE UNIFORM CONTRACT.

FORM OF CONTRACT

ADOPTED AND RECOMMENDED FOR GENERAL USE BY THE

AMERICAN INSTITUTE OF ARCHITECTS

AND THE

NATIONAL ASSOCIATION OF BUILDERS.

AGREEMENT

BETWEEN

_______________ *Contractor*

AND

_______________ *Owner*

FOR

____

AT

____

____

DATED

_______________ *190*__

ARCHITECTS,

____

____

AMOUNT OF CONTRACT,

$_______________

FORM 4

CONTRACTOR'S BOND

80. Bonding of Contractor.—In large and important work, the contractor is often required by the owner to furnish a bond to protect him (the owner) against the failure of the contractor to finish the work according to the contract. In case the contractor should become bankrupt before the completion of the work and be compelled to relinquish the contract, the person or corporation who had gone his surety would be compelled either to employ some other contractor to carry out the contract or to hand over to the owner the amount of the bond, which amount would be figured to be sufficient to enable the owner to employ another contractor to finish the building or work. Forms 5, 6, and 7 show the pages of an application blank for such a bond. This is filled out by the contractor or contracting company, as the case may be, and if all is satisfactory and proper, indemnity is offered by the contractor or the company that issues the bond. The bond is issued by the bonding company. A copy of such a document is shown in Forms 8, 9, and 10, and is filled out to show about what is required. Form 11 shows the title, which appears on the outside when the bond is folded.

It will be noticed that this blank is for an incorporated construction company, another bond blank similar in form being used where the principal is an individual.

CONTRACTOR'S APPLICATION
Form 721, 5m-1-28-06
Revised 7-07

SURETY DEPARTMENT
Contract Division

Bond No. ______________

Application No. ______________

Form of Bond ______________

The Colonial Title Guaranty Company

of Boston, Penna.

Applicants must give full and explicit data under the following heads, and must supply copies of Specifications and Contract for filing with this application. When the contract involves construction, plans or drawings must accompany the application, and will be promptly returned after examination of same. As these requirements are essential to the proper preparation of the bond and the Company's judgment of the case, care in complying with requirements will expedite the issuance of the bond.

1 Full name of applicant ______________
(individual, firm, or corporation)

2 Business address ______________
(street, city, and state)

3 Residence ______________
(street, city, and state)

____

4 Name and title of officers duly authorized to sign contracts and other sealed papers binding upon the company (if incorporate) ______________

____

____

5 Amount of bond required, $ ______________

6 To whom given? Give full name. If to a corporation, give exact corporate title and names of officers required to sign corporate instruments, also the business address of individual, firm, or corporation

____

____

7 Nature of contract ______________

____

____

8 How long must work be kept in repair after completion? ______________

____

9 Contract price ______________

10 If contract price is per unit of measure, give also probable total of contract

Total of contract, $ ______________

11 Applicants must, whenever possible, furnish names and addresses of other bidders, with amount of their respective bids.

	(Name)	(Address)	(Bid)
(Highest)			
(Lowest)			

12 Date work is to be commenced ______________

13 Date work is to be completed ______________

14 Penalty for non-completion at above date ______________

15 Premium for completion before above date ______________

16 Payments ______________

____

17 Percentage reserved from payments until completion ____________________

18 Have you ever applied for a contract bond to this or any other company? Ans. ____________________

19 If so, state name of company, the date, and whether accepted or declined. Ans. ____________________

____

20 If declined, state reasons ____________________

21 Mention experience in line of work to be undertaken ____________________

____

22 Number of other contracts now on hand ____________________

23 Amount of each contract ____________________

24 When will they be completed? ____________________

25 Name of surety company which issued bond on above ____________________

26

STATEMENT OF ASSETS AND LIABILITIES

Cash in bank			Borrowed or due on stocks, bonds, etc.		
Stocks, bonds, etc., market value			Capital stock paid (if any)		
Real estate (title in applicant's name)			Borrowed or due on real estate		
Parcel No. 1			Parcel No. 1		
" " 2			" " 2		
" " 3			" " 3		
" " 4			" " 4		
Plant consisting of			Encumbrance on plant		
Stock of supplies					
Notes receivable			Notes payable		
Accounts receivable			Accounts payable		
Other assets			Other liabilities		
TOTAL ASSETS			TOTAL LIABILITIES		

27 Amount of liability as endorser or surety for others, $ ____________________

28 Amount of Employer's Liability Insurance carried (give names of companies). $ ____________________

____

29 If a firm, mention individual property holdings, real and personal, not included in above statement, and any encumbrance

____

____

30 What indemnity do you offer to induce the company to execute this bond? ____________________

____

31

IF A COPARTNERSHIP ANSWER THESE QUESTIONS:

Names of all individuals composing same. Please write names and addresses plainly.

NAME	POST-OFFICE ADDRESS
Has any member of the firm ever failed in business?	

IF A CORPORATION ANSWER THESE QUESTIONS:

In what State incorporated ____________ When incorporated ____________

Principal office ____________

Authorized capital ____________ Subscribed capital ____________ Paid-up capital ____________

President ____________ Vice-President ____________

Secretary ____________ Treasurer ____________

REFERENCES

NAME	BUSINESS	POST-OFFICE ADDRESS

In consideration of THE COLONIAL TITLE GUARANTY COMPANY OF BOSTON, PENNA., becoming surety on the bond herein applied for, the undersigned ____________ does hereby covenant and agree to pay in advance the premium or fees hereafter agreed upon, *namely*, $ ____________ for *bid bond* (the same to be credited on the premium for the contract bond); ____________ dollars for the first year thereof and ____________ dollars annually thereafter until it shall serve upon said Company at its home office, in the city of Boston, Pennsylvania, competent written evidence of its discharge from such suretyship and all liability by reason thereof; and the undersigned does hereby bind itself, its heirs, executors, administrators, successors, and assigns to indemnify said THE COLONIAL TITLE GUARANTY COMPANY OF BOSTON, PENNA., against all loss, costs, damages, charges, and expenses, whatever, resulting from any of its acts, default, or neglect that said THE COLONIAL TITLE GUARANTY COMPANY OF BOSTON, PENNA., may sustain or incur by reason of its having executed said bond or any continuation thereof. And the undersigned does further agree, in the event of its being unable to complete or carry on the aforementioned contract, to assign, and does hereby assign such plant as the undersigned may own, or have upon said work to said THE COLONIAL TITLE GUARANTY COMPANY OF BOSTON, PENNA. The undersigned hereby further agrees, for itself, its successors, and assigns, to accept the vouchers or other evidence of any loss paid by said THE COLONIAL TITLE GUARANTY COMPANY OF BOSTON, PENNA., under the aforesaid obligation, together with vouchers or other evidence of payment, of all costs and expenses whatever incurred by said THE COLONIAL TITLE GUARANTY COMPANY OF BOSTON, PENNA., in adjusting such loss or in completing said contract, as conclusive evidence against it, its heirs, executors, administrators, successors, and assigns of the fact and extent of its liability under said obligation to said THE COLONIAL TITLE GUARANTY COMPANY OF BOSTON, PENNA.

And the undersigned does further agree in the event of any breach or default on its part in any of the provisions of the contract hereinbefore mentioned, that THE COLONIAL TITLE GUARANTY COMPANY OF BOSTON, PENNA., as surety upon the aforesaid bond shall be subrogated to all its rights and properties as principal in said contract, and that deferred payments and any and all moneys and properties that may be due and payable to it at the time of such default or that may thereafter become due and payable to it on account of said contract, shall be credited upon any claim that may be made upon THE COLONIAL TITLE GUARANTY COMPANY OF BOSTON, PENNA., under the bond above mentioned.

These covenants shall be binding not only upon the undersigned, jointly and severally, but as well upon the respective heirs, executors, administrators, successors, and assigns.

Dated at ____________ this ____________ day of ____________ 19____

____
Applicant

____________ By ____________
Witness

____
(Title if applicant be a corporation)

STATEMENT OF AGENT

Personal knowledge of applicant, reputed ability and experience ____________

Premium agreed upon ____________

Impress upon the applicant the necessity of full and explicit answers to the various questions. At time of forwarding to home office, make note of features not covered by replies and supply the information asked for at as early a date as possible. *See that the application is properly signed and the signatures witnessed.* Secure copy of Contract and Specifications for file with this application. *Attention to these various features will insure prompt action.*

SURETY DEPARTMENT
Contract Division

BOND NO. 825

The Colonial Title Guaranty Company

of Boston, Penna.

Know all Men by these Presents:

That The Scranton Construction Company

a corporation organized under the laws of the Commonwealth of Pennsylvania (hereinafter called the Principal), and **The Colonial Title Guaranty Company, of Boston, Penna.,** a corporation created and existing under the laws of the Commonwealth of Pennsylvania, and whose principal office is located in the city of Boston, Commonwealth of Pennsylvania (hereinafter called the Surety), are held and firmly bound unto John Jones

(hereinafter called the Obligee), in the full and just sum of $10,000.00 Ten Thousand Dollars, lawful money of the United States, to the payment of which sum, well and truly to be made, the said Principal binds itself, its successors and assigns, and the said Surety binds itself, its successors and assigns jointly and severally, firmly by these presents.

Signed, sealed and delivered this 1st day of Jan A. D. 1906.

Whereas, said Principal has entered into a certain written contract with the Obligee, to perform the excavation, mason work, carpenter work, and painting necessary for the erection of a single dwelling house in the city of Boston upon lot at the northeast corner of A street and B avenue. All work to be according to drawings and specifications prepared by John A. Adams, Architect, which drawings and specifications are identified by the information given above and by the signatures of the principal and obligee attached thereto. The consideration in the written contract for this work being $20,000.00.

FORM 8

Now, Therefore, The condition of the foregoing obligation is such that if the said Principal shall well and truly indemnify and save harmless the said Obligee from any pecuniary loss resulting from the breach of any of the terms, covenants, and conditions of the said contract on the part of the said Principal to be performed, then this obligation shall be void; otherwise to remain in full force and effect in law: PROVIDED, however, that this bond is issued subject to the following conditions and provisions:

First.—That no liability shall attach to the Surety hereunder unless, in the event of any default on the part of the Principal in the performance of any of the terms, covenants, or conditions of the said contract, the Obligee shall promptly and immediately upon knowledge thereof, and in any event not later than thirty days after the occurrence of such default, deliver to the Surety at its office in the City of Boston, Penna., written notice thereof with a statement of the principal facts showing such default and the date thereof; nor unless the said Obligee shall deliver written notice to the Surety at its office aforesaid before making to the Principal the final payment provided for under the contract herein referred to.

Second.—That in case of such default on the part of the Principal, the Surety shall have the right, if it so desire, to assume and complete or procure the completion of said contract; and in case of such default, the Surety shall be subrogated and entitled to all the rights and properties of the Principal arising out of the said contract and otherwise, including all securities and indemnities theretofore received by the Obligee and all deferred payments, retained percentages and credits, due to the Principal at the time of such default, or to become due thereafter by the terms and dates of the contract

Third.—That in no event shall the Surety be liable for a greater sum than the penalty of this bond, or subject to any suit, action, or other proceeding thereon that is instituted later than the 31st day of December A. D. 1906.

Fourth.—That in no event shall the Surety be liable for any damage resulting from, or for the construction or repair of any work damaged or destroyed by an act of God, or the public enemies, or mobs, or riots, or civil commotion, or by employes leaving the work being done under the said contract on account of so-called "strikes" or labor difficulties.

FORM 9

In Testimony Whereof, the said Principal has caused these presents to be sealed with its corporate seal, attested by the signature of its duly authorized officers, and the said Surety has caused these presents to be sealed with its corporate seal, attested by the signatures of its __________ President and its ____________________ Secretary the day and year first above written.

Signed, sealed and delivered
in the presence of

John Smith
Albert Jones

____

John A. Walker
President

Attest: Edward Ames
Secretary

The Colonial Title Guaranty Company of Boston, Penna.

William A. Blank
President

Attest: E. G. Baker
Secretary

FORM 10

No.

The Colonial Title Guaranty Company

OF BOSTON, PENNA.

CONTRACT BOND

$ 10,000

ON BEHALF OF

The Scranton Construction Co.

TO

John Jones

Date Jan. 18 1906

Expires July 18 1906

Form 11