

# Plumbing Plans and Specifications









PLUMBING  
PLANS AND  
SPECIFICATIONS

By

J. J. COSGROVE



Author of

“PRINCIPLES AND PRACTICE OF PLUMBING”

“SEWAGE PURIFICATION AND DISPOSAL”

“HISTORY OF SANITATION”

“WROUGHT PIPE DRAINAGE SYSTEMS”

“PLUMBING ESTIMATES AND CONTRACTS”

“DESIGN OF TURKISH BATHS”



Published by

Standard Sanitary Mfg. Co.

Pittsburgh, U. S. A.

TH 6225  
.67

COPYRIGHT BY  
STANDARD SANITARY MFG. CO.  
PITTSBURGH, PA.  
1910



10-14885

© Cl A 268029

## P R E F A C E



AN EXPERIENCE of many years in the various branches of plumbing practice has brought home to the author the real need for a work on plumbing plans and specifications which will point out to those having the designing of plumbing systems; how to indicate materials and fixtures on plans; how to prepare full and complete working plans and details; how to write a satisfactory specification, and last, but not least, just what plumbing work is required in different classes of buildings. ‘Plumbing Plans and Specifications’ is the result of that experience.

The book is divided into four parts. The first part is devoted to a presentation of symbols which it is urged to adopt. This is more important than it may seem. If ten different plans, from as many different offices, be examined, the chances are that in no two of them will the symbols be alike. Further, plans prepared in the same office at different times, or by different draughtsmen at the same time, often have unlike symbols. That is rather confusing to those who must interpret the plans, and in the interest of simplicity and uniformity some standards should be adopted.

Part two explains how to prepare plumbing plans and make up detail drawings of plumbing work. It is the combining of the symbols into a complete intelligible whole, just as letters are formed into words, words into sentences and sentences into paragraphs.

The third part takes up the matter of specifications, and as nothing is so good as a concrete example for explaining a point, a full working specification is reproduced, which can be used as a form, and modified or altered to suit

all cases. Following the specification are some explanatory notes and helpful suggestions for those who have the writing to do. After pointing out how to write specifications, the various clauses and conditions are analyzed, to show their real significance and meaning.

Even though an architect understands how to draw plumbing plans, he is often at a loss to know what nature of plumbing work is necessary from an architectural standpoint for various classes of buildings. In order that this information will be available in the future, part four discusses the requirements for buildings of various types and shows examples of each class of building.

This book is supplemental to "Principles and Practice of Plumbing," which explains how work should be done. "Plumbing Plans and Specifications" explains how to indicate the work on plans and describes it in specifications. It is obvious, however, that nobody can properly plan work or write an intelligent specification without first knowing how the work should be performed.

J. J. COSGROVE

Philadelphia, Pa.,  
June 15, 1910.



## PUBLISHER'S NOTE



IN THE publisher's note, printed in the various books which preceded this one, we endeavored to make clear our connection with the publication of technical works on plumbing and sanitation, and for the benefit of the readers of this volume, we herewith repeat the story of our relation as Publisher's and Manufacturer's.

The primary object of our organization is, as universally known, to manufacture and market "Standard" Plumbing Fixtures, Brass Goods, and other products made in our factories. In the development of an organization to accomplish this result, there has been established an Advertising and Publishing Department of no small proportions, and "Plumbing Plans and Specifications" is a part of the work of this department.

One of the most widely known productions of the Publishing Department is the monthly magazine, "Modern Sanitation," which was established in June, 1904. From this came the publication, first in serial form and later as books, of "Principles and Practice of Plumbing," "Sewage Purification and Disposal," "History of Sanitation," "Wrought Pipe Drainage Systems," "Plumbing Estimates and Contracts" and "Plumbing Plans and Specifications." These books are all the work of the same author, Mr. J. J. Cosgrove, who is recognized as one of the leading authorities on the questions upon which he writes.

Mr. Cosgrove's first work was "Principles and Practice of Plumbing." This book has been phenomenally successful and has been adopted as a text book in more than 30 of the largest universities and colleges in the United States.

Several of his other works are similarly used either in the form of text books or as books which students in plumbing and architecture are advised to read.

In "Principles and Practice of Plumbing," "Sewage Purification and Disposal," "History of Sanitation," "Wrought Pipe Drainage Systems," "Plumbing Estimates and Contracts" and "Plumbing Plans and Specifications," we feel that the literature of the craft has been enriched in an enduring manner and that we have fully justified our appearance in the field of publishers as amply as we have our standing as manufacturers of a world wide known and used product.

**Standard Sanitary Mfg. Co.**

Pittsburgh, U. S. A.

Publishing Department.

# TABLE OF CONTENTS



	PAGE
Plumbing Plans.....	1
Symbols for Plumbing Plans.....	1
Usual Type of Plumbing Plan.....	25
Improved Type of Plumbing Plans.....	33
Plumbing Details.....	45
Drawing Plumbing Plans.....	55
Plumbing Specifications.....	61
Example of a Plumbing Specification.....	65
Suggestions for Specification-Writing.....	85
Analysis of Specifications.....	101
Planning Plumbing Work.....	123
Planning the Plumbing for Residences.....	127
Planning the Plumbing in Apartment Houses .....	147
Planning the Plumbing for School Buildings.....	157
Planning the Plumbing in Y. M. C. A. Buildings.....	171
Planning the Plumbing for Courthouses.....	183
Planning the Plumbing for Hotel Buildings.....	193
Planning the Plumbing for Club Buildings.....	205
Planning the Plumbing for Churches.....	215
Planning the Plumbing for Libraries.....	219
Planning the Plumbing for Fire Engine Houses.....	220
Planning the Plumbing for Factory Buildings.....	222
Planning the Plumbing for Office Buildings.....	224
Planning the Plumbing for Railway Stations.....	225
Planning the Plumbing for Printing Offices.....	227
Public Bath Houses.....	229
Public Playgrounds.....	238
Plumbing Work in Theatres, Hospitals and Prisons.....	243
Planning Public Convenience Stations.....	255

# LIST OF ILLUSTRATIONS

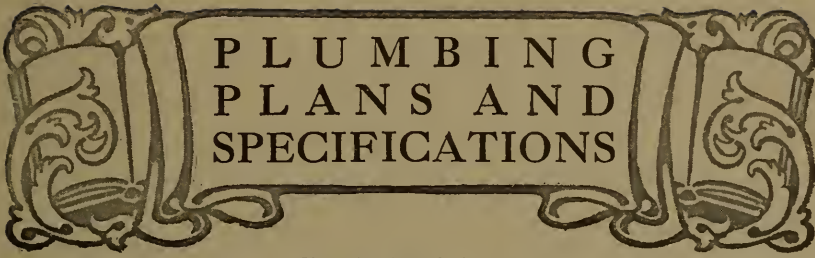


FIG.	PAGE	FIG.	PAGE
1	Symbol for Cast Iron Pipe	4	
2	Symbol for Wrought Pipe	4	
3	Symbol for Lead Pipe....	6	
4	Symbols for Water Pipes..	7	
5	One-Line Symbols for Valves.....	7	
6	Top View of Valve.....	8	
7	Side View of Globe Valve	8	
8	Side View of Angle Valve..	8	
9	Gate Valve, Side View...	9	
10	Plan of T-handle Stop Cock.....	9	
11	Side View of T-handle Stop Cock.....	9	
12	Plain View of Lever-handle Stop Cock.....	10	
13	Side View of Lever-handle Stop Cock.....	10	
14	Symbol for Faucet.....	10	
15	End View of Faucet.....	10	
16	Top View of Faucet.....	10	
17	Plan View of Drain Trap..	10	
18	Side Symbol for Drain Trap.....	11	
19	Symbols for Soil Pipes on Plan.....	11	
20	Plan Symbols for Water Supply Risers.....	11	
21	Symbols for Floor Drain..	12	
22	Symbol for Siphon Trap..	12	
23	Symbol for Non-siphon Trap.....	12	
24	Symbol for a Suction Tank	13	
25	Symbol for House Tank...	14	
26	Symbol for Meter.....	14	
27	Plan Symbol for Water Heater.....	14	
28	Elevation Symbol for Water Heater.....	15	
29	Symbol for Hot Water Tank.....	15	
30	Symbol for Plan of Pump	15	
31	Symbol for Elevation of Pump.....	15	
32	Plan Symbol for Bath Tub	16	
33	Elevation Symbol for Bath Tub.....	16	
34	Plan Symbol for Lavatory	16	
35	Elevation Symbol for Lavatory.....	16	
36	Plan Symbol for Water Closet.....	17	
37	End Symbol for Water Closet.....	17	
38	Side Symbol for Water Closet.....	17	
39	Plan Symbol for Shower..	17	
40	Elevation Symbol for Shower.....	17	
41	Plan Symbol for Needle Shower and Spray Bath.....	18	
42	Elevation Symbol for Needle Shower and Spray Bath.....	18	
43	Plan Symbol for Sink.....	19	
44	Elevation Symbol for Sink	19	
45	Plan Symbol for Slop Sink	19	
46	Elevation Symbol for Slop Sink.....	20	
47	Plan Symbol for Urinal..	20	
48	Elevation Symbol for Urinal.....	20	
49	Plan Symbol for Sitz Bath	21	
50	Elevation Symbol for Sitz Bath.....	21	

FIG.		PAGE
51	Plan Symbol for Foot Bath	21
52	Elevation Symbol for Foot Bath.....	21
53	Elevation Symbol for Child's Bath.....	22
54	Plan Symbol for Bidet....	22
55	Elevation Symbol for Bidet. ....	22
56	Plan Symbol for Laundry Tray.....	23
57	Elevation Symbol for Laundry Tray.....	23
58	Plan Symbol for Drinking Fountain.....	23
59	Elevation Symbol for Drinking Fountain....	23
60	Plan Symbol for Bubble Fountain.....	24
61	Elevation Symbol for Bubble Fountain.....	24
62	Usual Type First Floor Plan.....	26
63	Usual Type Second Floor Plan.....	28
64	Usual Type Third Floor Plan.....	30
65	Usual Type Conventional Plumbing Elevation..	31
66	Improved Type Ground Floor Plumbing Plan..	39
67	Improved Type First, Second and Third Floor Plans.....	41
68	Improved Type Fourth Floor Plumbing Plan..	43
69	Detail of Soil and Vent Stack.....	46
70	Plan Detail of Bathrooms	47
71	Detail Elevation of Lead Work in Bathrooms..	48
72	Detail of Connections to Water Pipes in Bathrooms.....	49
73	Detail of Water Pipes in Bathrooms.....	50
74	Plan Detail of Water Tank	51
75	Elevation Detail of House Tank.....	52
76	Elevation Detail of Manifold Headers.....	53

FIG.		PAGE
77	End Detail of Manifold...	54
78	One-quarter Inch Scale Drawing of Bathroom	58
79	One-eighth Inch Scale Drawing of Bathroom	59
80	First Floor Plan of Private House.....	137
81	Second Floor Plan of Private House.....	139
82	Cellar Plan of Residence..	141
83	First Floor Plan of Residence.....	143
84	Second Floor Plan of Residence.....	145
85	Basement Plan of Apartment House.....	149
86	First Floor Plan of Apartment House.....	151
87	Second and Third Floor Plan of Apartment House.....	153
88	Fourth Floor Plan of Apartment House.....	155
89	First Floor Plan of School	167
90	Typical Floor Plan of School Building.....	169
91	Basement Plan of Y. M. C. A. Building.....	173
92	First Floor Plan of Y. M. C. A. Building.....	175
93	Second Floor Plan of Y. M. C. A. Building.....	177
94	Third Floor Plan of Y. M. C. A. Building.....	179
95	Fourth Floor Plan of Y. M. C. A. Building.....	181
96	Basement Plan of Courthouse.....	185
97	First Floor Plan of Courthouse.....	187
98	Second Floor Plan of Courthouse.....	189
99	Plumbing Details for Courthouses.....	191
100	First Floor Plan of Hotel..	195
101	Second Floor Plan of Hotel	197
102	Upper Floor Plan of Hotel.....	199
103	Novel Floor Plan of Hotel Building.....	201

FIG.	PAGE	FIG.	PAGE
104	First Floor of Club Building..... 208	115	Typical Swimming Pool Scene, Public Playground..... 248
105	Second Floor of Club Building..... 209	116	Shower Baths Before Entering Swimming Pool 249
106	Third Floor of Club Building..... 211	117	An Outdoor Gymnasium.. 250
107	Fourth and Fifth Floors of Club Building..... 213	118	Typical Wading Pool Scene, Children's Playground..... 251
108	Detail of Form Sink for Press Room..... 228	119	Typical Drinking Fountain Scene..... 252
109	Model Wash House Interior at Whitevale, England..... 235	120	Front Elevation of Above-ground Convenience Station ..... 259
110	Basement Plan of Public Wash House and Baths..... 237	121	Rear Elevation of Above-ground Convenience Station ..... 261
111	First Floor Plan of Public Wash House and Baths..... 239	122	Plan of Above-ground Public Convenience Station..... 263
112	Second Floor Plan of Public Wash House and Baths..... 241	123	Elevation of an Underground Convenience Station ..... 265
113	Layout of Typical Small Public Playground.... 245	124	Plan of an Underground Convenience Station.. 266
114	Plan of Recreation Building, Public Playground..... 247		



PLUMBING  
PLANS AND  
SPECIFICATIONS

PART I

PLUMBING PLANS



CHAPTER I

SYMBOLS FOR PLUMBING PLANS



INTRODUCTORY



THE contract for plumbing work in a building usually stipulates that the work shall be done according to the plans and specifications. This condition makes the plans and specifications as much a part of the contract as though they were embodied in the indenture itself, and in order that no after dispute shall arise as to the true intent and meaning of the work to be performed, or material to be provided, the plans and specifications should be so complete and full that they will cover every requirement; and so clear, concise and plain that they can be readily understood by a person of average intelligence having a reasonable knowledge of the plumbing business. In order to prepare a good plan and write the specifications, it is necessary for the designer to understand plumb-

ing practice in all its phases. Further, he must have a full knowledge of the various materials and fixtures suitable for this branch of building, together with their advantages and limitations. It is assumed that he is familiar with the various systems in vogue and can properly proportion drainage systems, water supply and other pipes, systems and apparatus, used in plumbing.

The advantages of having well-prepared plumbing plans and specifications are sevenfold. There are many men of financial responsibility engaged in the plumbing business who do not possess sufficient skill and knowledge to properly lay out a system; and, unless the plans are full and complete, and the specifications explicit, these men cannot intelligently estimate on the work; consequently, they will either refuse to figure the cost or will estimate so high as to be out of the contest. If, on the other hand, the plans and specifications are so well prepared that nothing is left to conjecture which can be shown, described, or explained, the architect and owner will have the benefit of responsible competition and will secure a better installation; for it is to be presumed that a person skilled in laying out plumbing systems and writing the specifications will prepare a better and more nearly complete layout than will a contractor who seldom is called upon to lay out his own work, and then only on small installations. Furthermore, by carefully studying the plans and then laying out the plumbing work on separate sheets, the very best runs, with the use of the least possible material, can be planned with a considerable saving in



the cost of the installation; and so fully can the work be laid out that there will be a noticeable absence of the vexatious "extras" which every good architect tries to avoid. This in turn rebounds to the credit of the architect, whose best means of advertising is through pleased and satisfied clients.

Another valuable feature of full and complete plumbing plans lies in their usefulness for future reference in case of alterations or repairs to the plumbing work in the building.

**Indicating Plumbing Work on Plans.**—Conventional characters or symbols must be used to indicate plumbing work and fixtures on plans, just as symbols and lines are used to indicate doors, windows, steps, partitions and other structural details on architectural drawings. At the present time there is no uniformity in this respect, and the lack of standards often leads to serious confusion. For instance, if plans from ten different offices are examined, the chances are that on no two of them will the symbols be alike. Further, plans prepared in the same office at different times, or one set of plans on which different draughtsmen have been working, will often show as many different symbols for a water closet or lavatory, as there were workmen engaged on the drawings. That is rather confusing to plumbers who must take off quantities from the plans; for, oftentimes the symbols used are so strange, and bear so little resemblance to the fixtures or apparatus, that some of them are overlooked by the estimator.

In the following pages some simple, easily made, yet at the same time characteristic symbols



Fig. 1  
Symbol for  
Cast-Iron Pipe

are suggested as standards for use in architectural offices. Their general adoption will not only be appreciated by plumbers, but will simplify and make more definite and certain the preparing of plumbing plans.

There are various kinds of pipe used in a plumbing installation, and it is necessary for the estimator and contractor to be able to distinguish between them at a glance. For this reason, the drainage system is drawn in an entirely different manner than the water-supply system; and the difference can likewise be distinguished between cast-iron and wrought pipe.

Cast-iron soil pipe is indicated on drawings by means of two lines, as shown in Fig. 1, with hubs at 5-foot intervals, and at fittings. The distance between the lines need not be drawn to scale, as that would sometimes bring the lines too close together, and it is found better in practice to draw them out of proportion, when neces-



Fig. 2  
Symbol for  
Wrought Pipe

sary, in order that they will stand out strong in the illustration. The sizes can then be marked alongside of the pipes, beginning where the drain enters the building. Once the size has been indicated, that size is supposed to continue until a smaller size is marked.

Wrought-iron or steel pipe is indicated by means of two parallel lines, as in the case of cast-iron pipe, but with the difference, that hubs are omitted at 5-foot intervals and fittings or joints are indicated only where a branch connection or a bend in the pipe is to be made. Wrought pipe for water-supply is never shown in double lines on the plans or general drawings, so that when double-line wrought pipe is marked, drainage work is always understood. On detail drawings, however, showing runs of water pipe, the double line method is used, that being the better one for the purpose. Wrought pipe, such as used for drainage work is shown in Fig. 2. By comparing the Y fitting with the similar fitting on cast-iron pipe, shown in Fig. 1, the difference between the symbols for a cast-iron soil fitting and a recessed drainage fitting will be readily seen.

Lead pipe is indicated by means of two parallel lines bent to fit any position or follow any direction. The junction of one lead pipe with another, at an angle, is indicated by a branch joint, as at *a*, *a*, Fig. 3; and where a lead pipe is connected to a brass ferrule or solder nipple, that fact is indicated by a wiped solder joint. Sometimes branches are connected together, as at *b*, without indicating a solder joint.

Water supply pipes on plans and general drawings are shown by means of single lines made solid, dotted, dashed or crossed, so as to indicate the different uses. For instance, if there were hot and cold, fresh and salt water to be supplied to a seaside hotel, the various pipes, together with circulation pipes, pump pipes, or any other kind that it

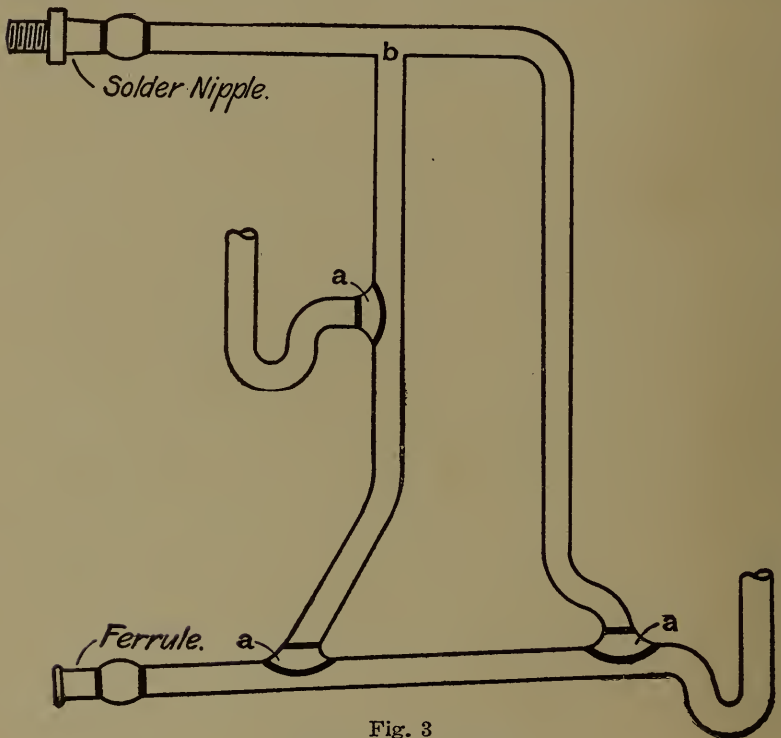


Fig. 3  
Symbol for Lead Pipe

might be necessary to show, could be indicated by lines similar to those shown in Fig. 4. Whatever symbols were used for this purpose, however, should be indicated on the plans with the key to explain their meaning, substantially as shown in the illustration. The lines shown in the illustration

need not be used as a matter of necessity, but any arbitrary lines will do so long as there is a key furnished to explain their uses.

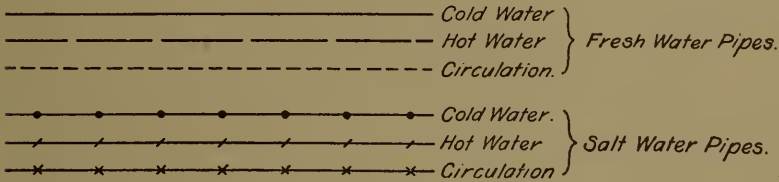


Fig. 4  
Symbols for Water Pipes

Characters will be found useful on water pipes showing where valves are to be placed, and this necessitates a set of symbols to indicate the various kinds of valves on solid or dotted line drawings. The side view of a globe valve for one-line pipe symbols, can be made as shown at (a) in Fig. 5, and the side view of a gate valve can be made as shown at (b). Having symbols to indicate the two principal kinds of valves will often be found convenient, as not only the location but likewise the kind of valve can frequently be shown. The plan view of either a gate valve, or a globe valve would be made as shown at (c). Looking down on a

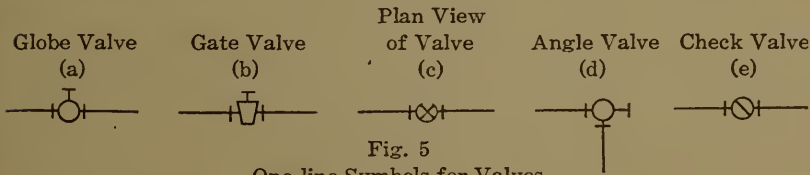


Fig. 5  
One-line Symbols for Valves

valve, there is nothing to distinguish one kind from another. When necessary to differentiate, however, the side view of the respective valves can be shown in plan. Angle valves are made as at (d).

Check valves are not frequently required, but when they are may be drawn as shown at (e). As the top view of a check valve would not differ much from the side view, for the sake of simplicity, the one symbol may be used in either position.

In making detail drawings of water-supply pipes, double-line pipes are shown, and the valves, of course must correspond, the simple line-drawing symbols not being suitable for this purpose. Further, in making up a detail drawing, some valves might be shown in an upright position, while others will be shown turned on their sides; and different symbols must be provided for each case.



Fig. 6  
Top View of  
Valve



Fig. 7  
Side View of  
Globe Valve



Fig. 8  
Side of  
Angle Valve

The top view of a valve, or the way it would look if turned on its side, is shown in Fig. 6.

This symbol merely indicates, conventionally, a valve of some description without giving any clue to its kind or make, it might be either a gate valve, or a globe valve, but would not answer for an angle valve, which would be rounded off on one end. All that is usually considered necessary in making detail drawings is to locate the various valves and show their uses, leaving to the specifications to state whether they shall be globe or gate valves, and the kind and quality. When possible however

it is advisable to use the correct symbol to show the kind of valve to be used. To this end it is necessary to have symbols for detail drawings, showing all types of cocks and valves. The side view of a globe valve is conventionally shown in Fig. 7. This shows the way the valve would look standing upright when screwed onto a pipe. An angle valve, which combines the double function of a valve and an elbow, is shown in Fig. 8. This valve may be shown in its present upright position; turned on its back so that one outlet will point up; or turned so that the side outlet will point down.

A check-valve would look like the side view of a globe valve with the stuffing-box, wheel, and



Fig. 9  
Gate Valve  
Side View



Fig. 10  
Plan of T-Handle  
Stop Cock

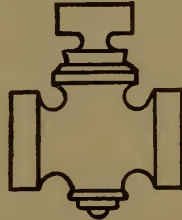


Fig. 11  
Side View T-Handle  
Stop Cock

valve-stem left off. The side view of a gate valve would be drawn as indicated in Fig. 9. If placed on its side, the symbol for a gate valve would be the same as for that of a globe valve. In addition to valves, stop cocks are sometimes used in the water supply systems to buildings, and conventional symbols are necessary to show both the T-handle and lever handle cocks. Tee handle stop cocks are shown in plan as indicated in Fig. 10, while a side view is shown in Fig. 11.

The symbols for lever-handle cocks, differ but little from those of T-handle, the chief difference being in the shape of the handles. The top view of a lever-handle stop cock is shown in Fig. 12, and the side view is shown in Fig. 13.



Fig. 12  
Plan View of  
Lever-Handle Stop Cock



Fig. 13  
Side View of  
Lever-Handle Stop Cock

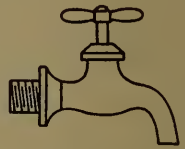


Fig. 14  
Symbol for  
Faucet

As a matter of fact the symbols used to represent either a T-handle or a lever handle stop cock, might be used to indicate stop-and-waste cocks of the same pattern. The only way to learn definitely what grade, quality and make of cocks or valves are to be used, is to consult the specifications. The symbols show only that cocks and valves are to be used, and then approximate locations. It is left for the specifications to supply all remaining information.



Fig. 15  
End View  
of Faucet



Fig. 16  
Top View  
of Faucet



Fig. 17  
Plan View of  
Drain Trap

The conventional way of indicating the side view of a faucet is shown in Fig. 14. This shows a compression type of faucet, but may be used to represent any kind or make. The end elevation of



a faucet is shown in Fig. 15, and a top, or plan view in Fig. 16.

About the only fittings for the drainage system, which require symbols, are the drain traps, and the yard or floor drains. Ordinary fittings for cast-iron



Fig. 18

Side Symbol for  
Drain Trap

pipe, such as Tees, Y's and Ty's, are so familiar to all draughtsmen, that they can be reproduced from memory.



Fig. 19

Symbols for Soil and  
Vent Stacks on Plans

Drain traps, with two cleanout plugs, are indicated in plan as shown in Fig. 17. When the trap has but one cleanout opening, the double circle with the square inside, to the left, which is on the outlet end of the trap, is omitted. The symbol thus changed indicates the plan view of a rain-leader, or other drain trap, having but one cleanout opening. Fig. 18 shows in elevation a trap with two cleanout openings.

As in the case just explained, if a trap with a single cleanout opening is to be shown, the hub and cleanout plug to the left are omitted.

Where stacks of soil, waste and vent pipes pass up through a building, they are indicated on the plans by means of heavy circles, as shown in Fig. 19,

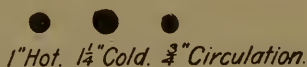


Fig. 20

Plan Symbols for  
Water Supply Risers

and the size and kind of pipe are marked on the drawing. Water-supply pipes are indicated by solid disks, as shown in Fig. 20, and the size and kind of pipe are marked alongside as in the case of

soil, waste and vent pipes. The location of yard, area, cellar or other floor drains is shown, as indicated in Fig. 21. If made of masonry, the catch-basin for such drains should be detailed. If stock fittings are to be used the particular kind should be specified.

A trap is used in connection with each fixture or set of fixtures, and its presence should always be shown on the drawings. Generally, the syphon trap is used in connection with the two-pipe system of plumbing, and the non-syphon trap with the one-pipe systems. There is nothing, however, to prevent the non-syphon trap being used in connection with two-pipe drainage systems, and, so the

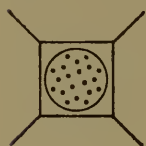


Fig. 21  
Symbol for  
Floor Drain



Fig. 22  
Symbol for  
Siphon Trap



Fig. 23  
Symbol for  
Non-Siphon Trap

kind of trap to be used can be told at a glance, symbols are required for both syphons and non-syphon traps.

Syphon traps are made as shown in Fig. 22, or the outlet leg may be turned down to form either a  $\frac{3}{4}$ -S-trap, or a full S-Trap. Non-syphon traps are indicated as shown in Fig. 23, by means of an enlarged drum, into which the inlet and outlet pipes are connected. Instead of a full S-trap, as shown in the symbol, a half S-trap can be indicated by extending the outlet pipe back to the wall. The syphon trap is used in connection with the two-pipe

system of installation, and must be back vented from some point near the outlet. Non-syphon traps are generally used with the one-pipe system of plumbing and do not require to be back vented.

**Indicating Plumbing Apparatus on Plans.**—In marking plumbing apparatus, such as pumps, tanks, filters, meters, heaters and manifolds, on plans, the chief requirement is to locate them in their right places and see that they are drawn to scale so that they will show the proportionate spaces they will occupy in the building. Square, or rectangular, suction or house tanks can be indicated by means of a rectangle

or square, drawn to scale, and showing the connections to the tank. The method of indicating a suction tank, supported on I-beams, is shown in Fig. 24.

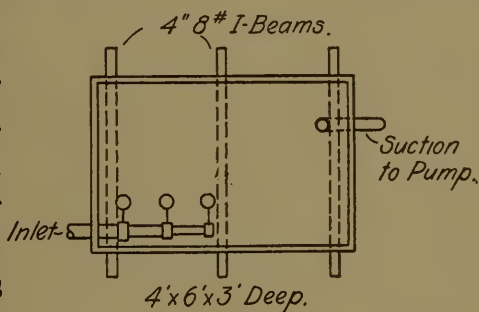


Fig. 24  
Symbol for a  
Suction Tank

The four lines bounding the rectangle merely define the size of the tank, and the name, dimensions and other data may be marked within it or alongside. In detailing a tank and its connections, of course, a more complete drawing would be necessary. A conventional plan drawing of a circular house tank is shown in Fig. 25. It is merely indicated in its proportionate size by two concentric circles and is shown resting on two I-beams, which in turn are supported by the two walls of the building which form an angle at that

point. Meters are generally shown as indicated in Fig. 26 and with a bi-pass around them. If, where the work is to be installed, the water authorities will not permit a bi-pass around the meter, a second

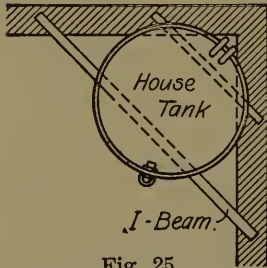


Fig. 25  
Symbol for House Tank

meter is put in the bi-pass in all large buildings, and the bi-pass omitted entirely in others. House filters are shown as a circle or double concentric circle, fitted up with a bi-pass. If a circle were substituted for the symbol

of a meter in Fig. 26 the illustration would pass very well for a filter connection. The method of indicating a water heater, in plan, is shown in Fig. 27. Usually this symbol is drawn alongside of a large circle which represents the hot-water tank, and pipes are shown connecting the two

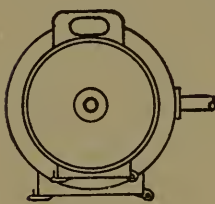


Fig. 27  
Plan Symbol for  
a Water Heater

parts of the heating outfit together. In detail drawings, the heater is shown, in elevation, as illustrated in Fig. 28. If a hot-water tank which is to be heated by a water heater, is intended to be suspended from the floor beams in a horizontal position, it may be indicated as shown in Fig. 29, but without the steam coil which is represented by dotted lines. If, on the other hand, the water is to be heated by means of steam circulating through

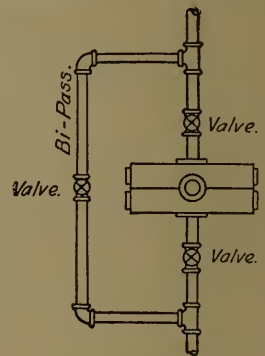


Fig. 26  
Symbol for Meter

a steam coil, the coil is indicated by means of dotted lines, as shown in the illustration. In either case bands may be shown supporting the tank from the overhead beams, or details may be made showing

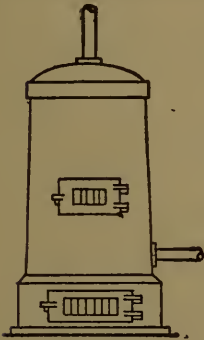


Fig. 28  
Elevation Symbol for  
a Water Heater

ing the form of hangers or rests to be used. Pumps may be shown conventionally in plan, as in Fig. 30, and in elevation as in Fig. 31. The symbols illustrated in the foregoing paragraphs need not be closely followed, but any designs or symbols which

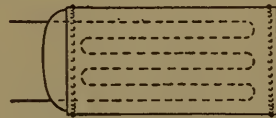


Fig. 29  
Symbol for  
Hot-Water Tank

will represent the apparatus they stand for, with the least expenditure of labor, consistent with good work, will answer. Nevertheless, in the interest of uniformity and simplicity, it will be found desirable in practice to follow the general outline of the symbols indicated. They have long been tried in

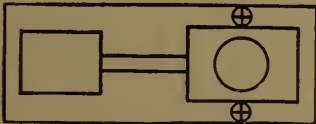


Fig. 30  
Symbol for Plan of Pump

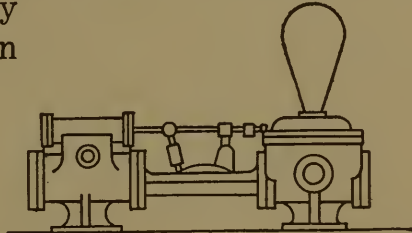


Fig. 31  
Symbol for Elevation of Pump

the drafting room, and are known to be simple, practicable and easy to make.

**Indicating Plumbing Fixtures on Plans.**—The symbols used on drawings to represent plumbing fixtures, bear a close resemblance to the outline of

the fixtures represented, so that they can be distinguished from other fittings or apparatus in the building, and so the kind of fixture can be told at a glance. If special fixtures are to be used, or if for



Fig. 32  
Plan Symbol for Bath Tub



Fig. 33  
Elevation Symbol for Bath Tub

any reason the symbols cannot be made to represent clearly the fixtures they stand for, the name of the fixtures, or letters which will indicate what they are, should be added to the symbol to avoid ambiguity. It should be remembered that the object is not to make illustrations of the various fittings, fixtures, and apparatus, but only mechanical drawings which will indicate with sufficient clearness what they represent, so that no uncertainty will arise as to what they stand for. It will be

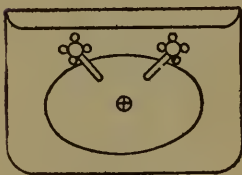


Fig. 34  
Plan Symbol for  
Lavatory

noticed that straight lines and circles are used as much as possible in the symbols herein employed, so that

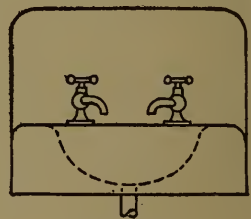


Fig. 35  
Elevation Symbol  
for Lavatory

any draftsman, with T-square, triangle and compass, can easily make any of them. It is good practice to draw the fixtures to scale on the plans, having each in its relative position, so the spaces

they will occupy and their relation to one another will be apparent. By drawing fixtures to scale, it

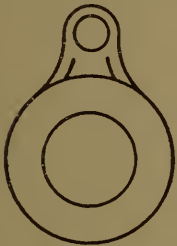


Fig. 36

Plan Symbol for  
Water Closet



Fig. 37

End Symbol for  
Water Closet

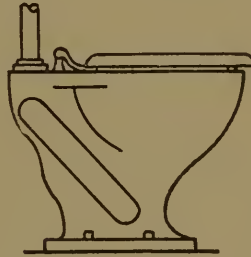


Fig. 38

Side Symbol for  
Water Closet

will be seen whether a group of fixtures can be installed in the space allotted to them. If not, they can be rearranged before inking them in on the drawings. The method of indicating a bath tub on plan is shown in Fig. 32. This symbol is so like the familiar outline of a bath tub that what it represents is suggested instantly to the mind. In Fig. 33 is shown the method of indicating a bath tub in elevation, and the likeness is so striking that there is no danger of mistaking what the lines stand for.

Lavatories are drawn in plan as shown in Fig. 34. The oval opening in the center of the rectangle, together with the two cocks sticking over the edge of the slab, so as to discharge into

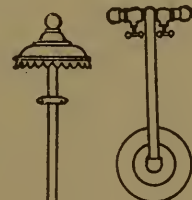


Fig. 39  
Plan

Symbol for  
Shower

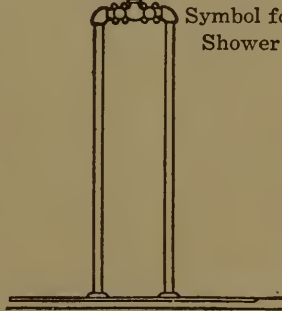


Fig. 40

Elevation Symbol for Shower

the bowl, leave no doubt as to the object of this symbol. The method of indicating the lavatory in elevation is shown in Fig. 35, where the outline of the bowl, and the cocks above it, tell unmistakably what these lines stand for.

Water closets are conventionally shown in plan as illustrated in Fig. 36, and in front elevation as shown in Fig. 37. The side view of a closet is illustrated in Fig. 38. These

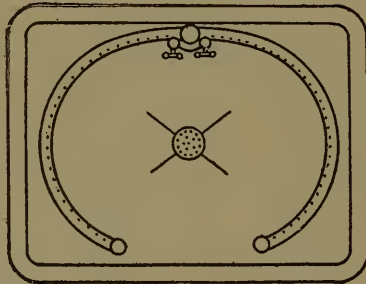


Fig. 41  
Plan Symbol for Needle,  
Shower and Spray Bath

three symbols may be used to represent any type of water closet. Shower baths are indicated in plan by the symbol shown in Fig. 39. In elevation, the illustration shown in Fig. 39 may be used. If, however, a shower bath is to be used in connection with a receptor, the outline of a receptor may be shown on Fig. 39 and the shower set over a receptor in Fig. 40. When used in combination with a bath tub, the two symbols, that for a shower, and the one for the bath tub can be combined.

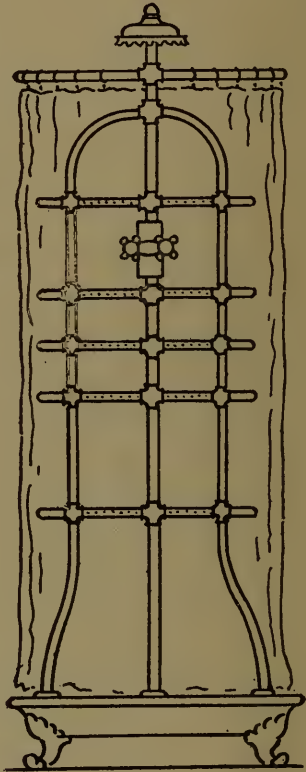


Fig. 42  
Elevation Symbol for Needle,  
Shower and Spray Bath



There are various designs of needle, shower and spray baths, but one conventional set of symbols will answer for all. When a fixture of this description is to be set over a receptor, it may be shown on the plans as indicated in Fig. 41.

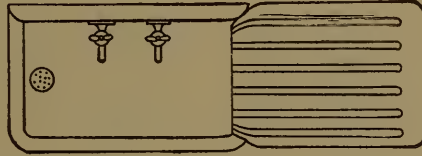


Fig. 43  
Plan Symbol for Sink

The elevation of a needle, shower and

spray bath may be shown as illustrated in Fig. 42, except when it is to be set in a stall, in which case

the curtain ring and curtains may be omitted and the side walls of the stalls shown. If a fixture of this description is to be installed without a receptor, the lines indicating this part of the

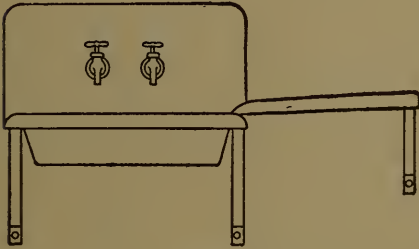


Fig. 44  
Elevation Symbol for Sink

combination can be omitted from the drawings and

the floor beneath shown sloping to where the drain is located.

Once a symbol has been adopted in architectural practice it can be changed and modified at any time to adopt it to new or changed conditions, and still bear sufficient resemblance to the original to be

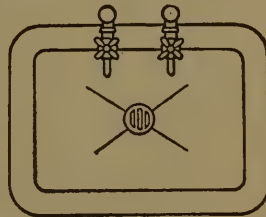


Fig. 45  
Plan Symbol for Slop Sink

distinguishable and represent the fixture or apparatus it is intended to indicate. These remarks will apply equally to all of the symbols suggested.

It is often better to follow the main features of the symbol, changing it to suit the place or conditions, than to follow slavishly the design presented.

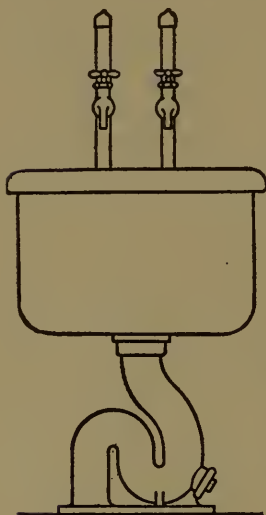


Fig. 46  
Elevation Symbol for  
Slop Sink

such cases the symbol can be modified to meet the new conditions. To show a sink in elevation, the

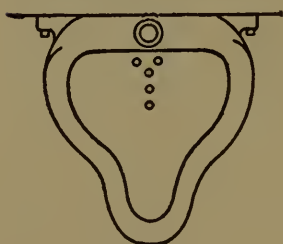


Fig. 47  
Plan Symbol for Urinal

Sinks may be shown with or without drip boards. When they are to have drip boards, they may be drawn in plan, as shown in Fig. 43. If without drip boards, the lines indicating the drip board may be omitted and the end of the sink now covered by the drip board may be finished on the drawing like the opposite end of the sink. Sometimes sinks are placed in an angle of the room, and a drip board turned around the angle, at other times sinks are set in re-

cesses. In any symbol illustrated in Fig. 44 may be used. As in the case of the plan view, the drip board may be omitted when the sink is to be installed without one.



Fig. 48  
Elevation Symbol  
for Urinal

Slop sinks vary greatly in design, but they may all be conventionally indicated in plan, as shown in

Fig. 45, while the elevation of a slop sink may be illustrated as in Fig. 46. If necessary, however, to detail the fixtures in a group of which a slop sink forms one, the supplies, and flush tank, if there be



Fig. 49  
Plan Symbol for  
Sitz Bath

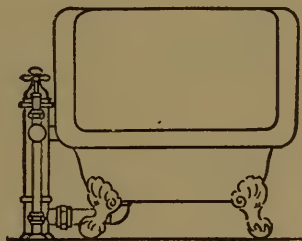


Fig. 50  
Elevation Symbol for  
Sitz Bath

one, should be shown, and pipe should be included in the detail.

When stall urinals with water flowing down the back slab are to be installed they can be indicated on the plans by drawing in the stall slabs and showing the floor slabs with gutter at the back and drain grooves leading into the gutter. In elevation



Fig. 51  
Plan Symbol for  
Foot Bath

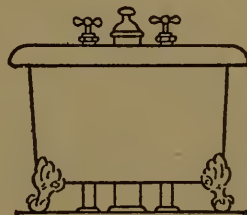


Fig. 52  
Elevation Symbol for  
Foot Bath

all that is necessary to show are the stalls, with the perforated pipe or other spraying device at the back. Of course, stall urinals will be detailed, unless stock goods are used, when they may be suf-

ficiently described in the specifications by referring to the catalogue where they are listed. Ordinary urinal bowls, may be shown in plan as illustrated in Fig. 47. In elevation they may be indicated as

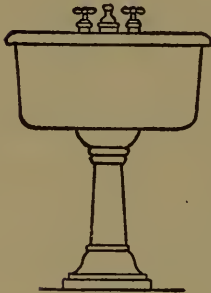


Fig. 53  
Elevation Symbol  
for Child's Bath

shown in Fig. 48. Sitz baths are a frequent bath room fixture, so that symbols must be used to designate them. The plan view of a sitz bath may be seen in Fig. 49, and an elevation of the same fixture in Fig. 50. The plan view of a sitz bath looks so much like the plan view of a foot bath, that it is well to mark each symbol with the name of the fixture, by placing the lettering in

the respective illustrations.

The symbol for the plan of a foot bath can be seen in Fig. 51, and a symbol for the elevation of the same fixture may be seen in Fig. 52.

The elevation of a foot bath bears some resemblance to the end view of a bath tub, but is not

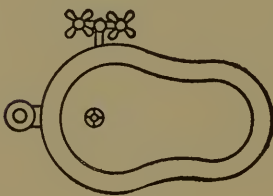


Fig. 54  
Plan Symbol for Bidet

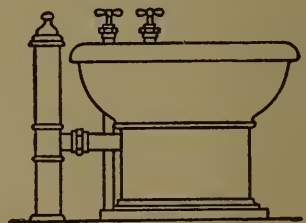


Fig. 55  
Elevation Symbol for Bidet

so rounded on the bottom. However, if there is cause to believe at any time that there is danger of confusion or ambiguity, the foot bath had better be marked with letters stating what it is. A child's

bath tub cannot be distinguished in plan from a foot bath, so the one symbol will answer for the two fixtures. The name of the fixture, however, should be printed on the symbol in each case.

A child's bath may be shown in elevation as indicated in Fig. 53. There is not much likelihood of this fixture being mistaken for anything else. Bidets are shown in plan by



Fig. 56  
Plan Symbol for  
Laundry Tray

the symbol illustrated in Fig. 54, and in side elevation by the symbol shown in Fig. 55. If an end elevation is to be shown, the side elevation may be shortened to one-half the length, and the supply fittings shown at the side, instead of the waste fitting, indicated in the illustration. Single laundry tubs



Fig. 58  
Plan Symbol for  
Drinking Fountain

are seldom shown, but, when they are, may be indicated in plan as illustrated in Fig. 56, and in elevation as shown in Fig. 57. Batteries of tubs are indicated by drawing the number of symbols required, side by side.

Drinking fountains may be either the ordinary type set against a wall and supplied with water through a faucet, or bubble drinking fountains.



Fig. 57  
Elevation Symbol  
for Laundry Tray

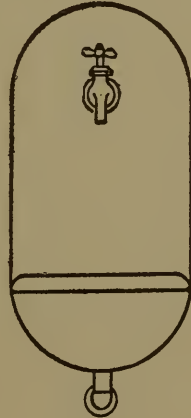


Fig. 59  
Elevation Symbol for  
Drinking Fountain

The manner of showing an ordinary drinking fountain, in plan, is indicated in Fig. 58, and an elevation of the same type of fixture is shown in Fig. 59. Bubble drinking fountains are shown, in plan, as indicated in Fig. 60, and the elevation is indicated as shown in Fig. 61.

The foregoing symbols, while they might not cover every form of device entering into plumbing practice, nevertheless are sufficiently complete for general use. If at any time a symbol is required to represent a new type of fixture, or form of device, it can be made as in the foregoing examples, by drawing an outline of the figure to be represented, bearing in mind that the drawing must be simple, without unnecessary curved lines, and easy to make by any draftsman.



Fig. 60  
Plan Symbol  
for Bubble  
Fountain



Fig. 61  
Elevation Symbol  
for Bubble  
Fountain


The general adoption by architects of the symbols herein suggested will be found beneficial in many ways. There is no good reason why standard symbols should not be used to indicate plumbing work, the same as for indicating stairs, doors, windows and other details of building plans. At the present time, however, no uniformity of practice exists among draftsmen, and the result is that plans turned out by the various offices differ so in their plumbing symbols, and the methods used for indicating plumbing work, that they lead to much confusion in the plumbing trade.

A decorative horizontal banner with ornate scrollwork and flourishes on both ends. In the center, the text "CHAPTER II" is written in a simple, serif, all-caps font within a rectangular frame.

## CHAPTER II

### USUAL TYPE OF PLUMBING PLAN



A large, decorative initial letter 'L' enclosed in an ornate, scrollwork frame. The letter is bold and serifed.**L**AYOUT of Plumbing Systems.—At the present time, the location of the plumbing fixtures throughout the various floors of a proposed building is all that is shown to guide the plumber in the usual set of plumbing plans. In cities having plumbing codes, progress is carried a little further, and, to comply with the requirements of the building department, a conventional set of drawings is prepared showing, in a general way, the layout of the drainage system. No effort is made in these drawings to show the water-supply pipes, or details of installation for groups of fixtures, nor is the layout of the drainage system all that could be desired. This part of the work is looked upon usually as a routine necessity, and anything which will be accepted by the building department is considered good enough for the purpose. The building department, on the other hand, can only require the filing of plans showing a sanitary installation equal to the standard they set, and which is the lowest

Plumbing Plans and Specifications

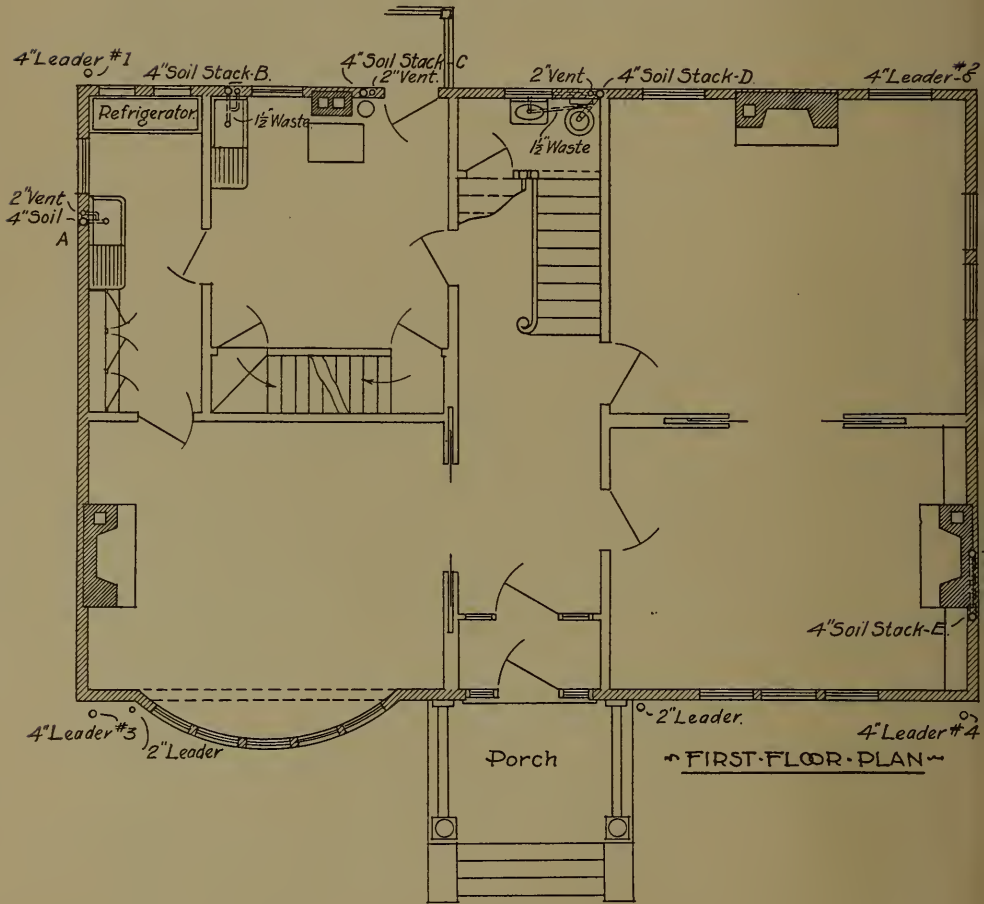


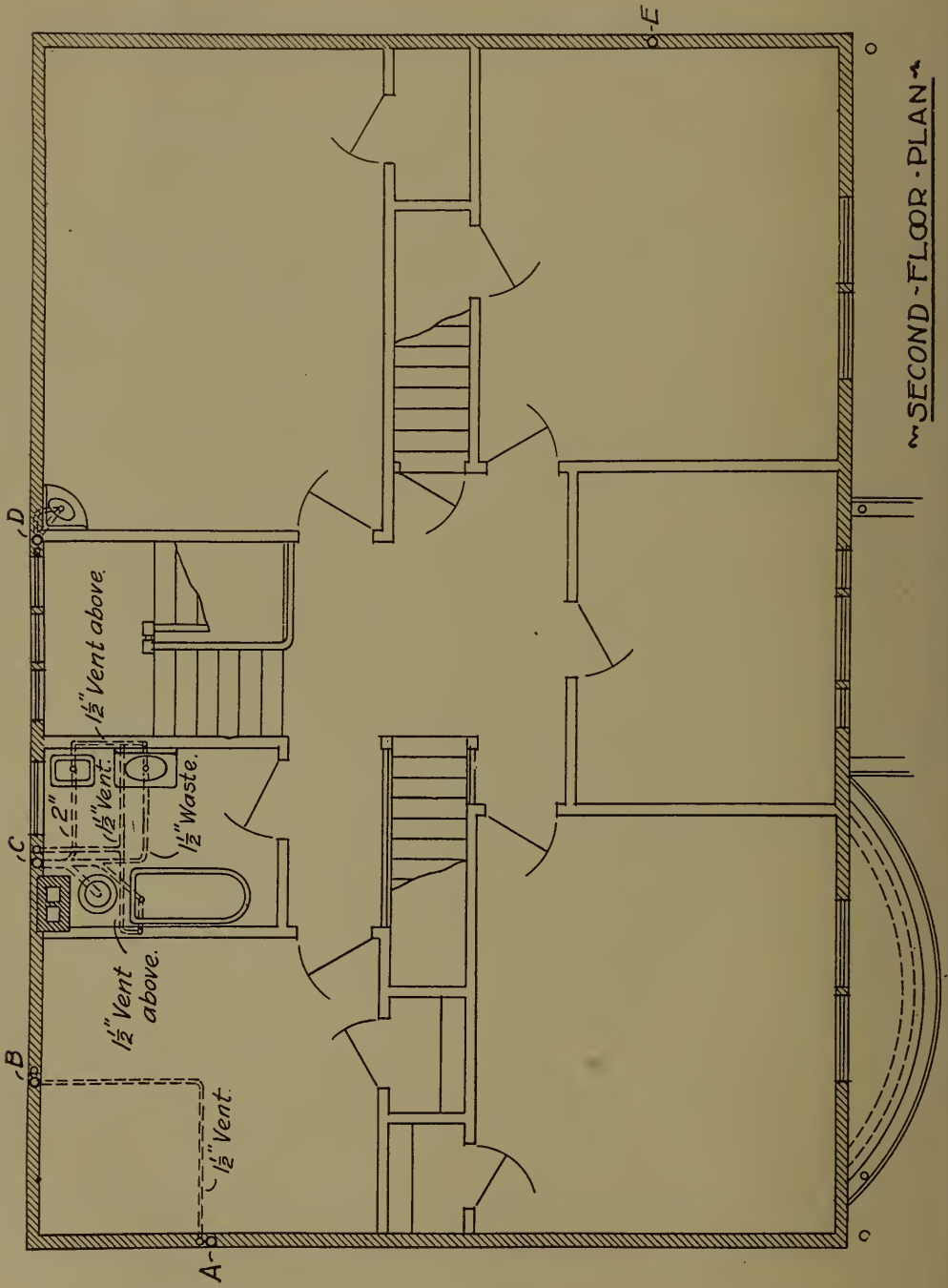
Fig. 62  
Showing Usual Type of Plumbing Plan



permissible. The niceties of design and economy of material are no more their concern than is the plainness or beauty of the walls of a building, so long as they are of the required strength and thickness. It follows, therefore, that the plan of a plumbing installation does not have to be of the best in order to be approved by the building department, and having received their approval does not signify that improvement cannot be made in the layout, time and material cannot be saved, and that a fuller, more complete, and much clearer, plan and specification cannot be prepared than the one submitted.

It is as necessary to prepare a separate plumbing plan as it is to make a set of drawings to show the heating plant, elevators or refrigeration system, and it would be just as logical to merely indicate the elevator shafts without showing details of the cars and enclosures as to simply indicate the location of the plumbing fixtures. No undertaking of any importance can be satisfactorily and economically carried out, without first working the undertaking out thoroughly in the office, and preparing plans, and details to show and describe fully the various requirements; and plumbing work is no exception from that general law.

**Example of the Usual Plumbing Plans.**—The usual plumbing plan prepared as a guide for the estimator and contractor, consists, in addition to the floor plans showing the location of the various fixtures, of a conventional elevation, trying to show in a general way the principal features of the in-

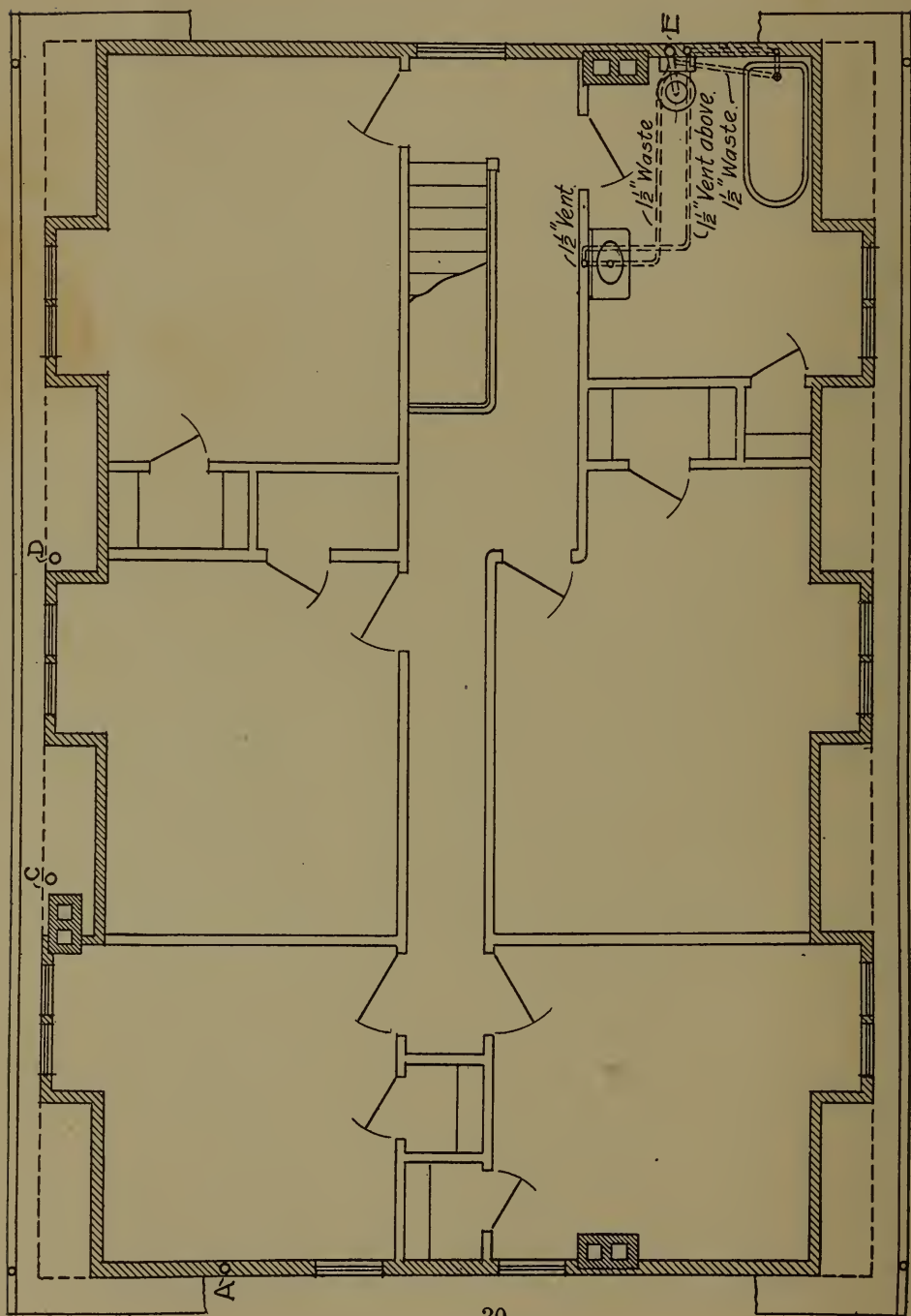


SECOND-FLOOR-PLAN

Fig. 63

stallation. In order to show all the fixtures, however, they, as well as the entire drainage systems, are indicated as being on the one plane, regardless of the fact that they are actually located in different parts of the building. An example of a conventional set of plans, showing the layout of plumbing fixtures on the first, second and third floors, is illustrated in Figs. 62, 63 and 64, and shown in the sectional elevation, Fig. 65. These drawings may be accepted as fairly representative of plans used in practice and prepared by a sanitary engineer, or an architect, and show the incomplete and unsatisfactory method of planning the plumbing in buildings. By examining the elevation, Fig. 65, carefully it will be seen how impossible it is to gain a clear idea of the actual layout and run of the several pipes, and how worse than useless to attempt to find the quantity of material required by scaling the drawing, or arriving at a correct estimate of the kind and number of fittings by counting them. Furthermore, there is nothing on the set of drawings to indicate that water supply is a feature of the plumbing installation or that would enable the plumber to estimate the quantity of piping or labor of installing same; so far, then, as being a guide to the estimator is concerned, or as showing unmistakably how the work is to be installed, this sectional drawing is utterly worthless, and might just as well have been omitted. For the purpose of filing with the Department of Health it might prove satisfactory, as indicating that all fixtures are trapped and vented and otherwise conform to the requirements of the code. But even such points

Plumbing Plans and Specifications



THIRD-FLOOR-PLAN

Fig. 64

Plumbing Plans and Specifications

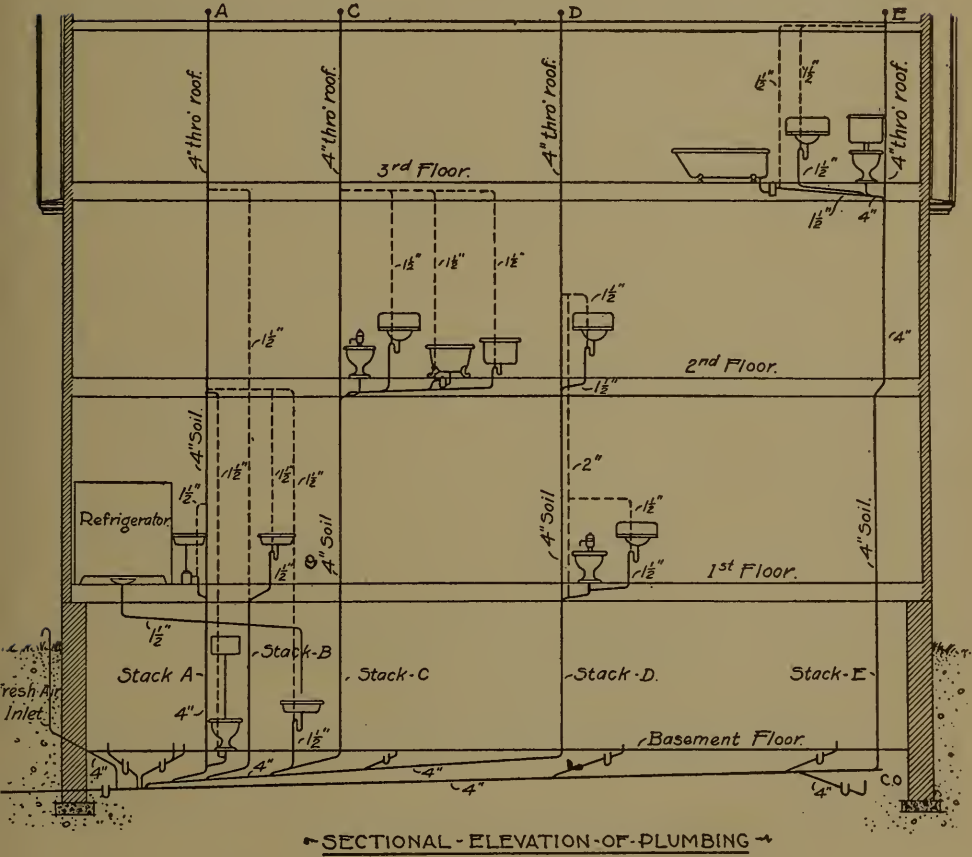
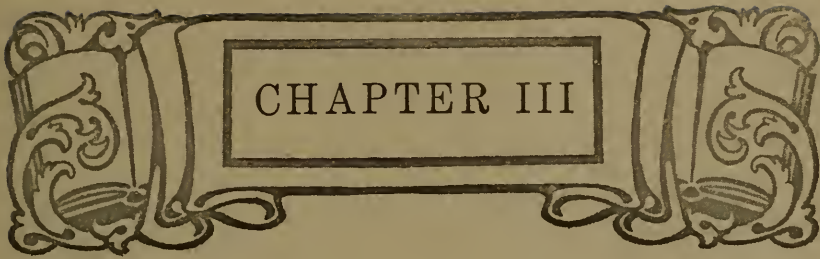


Fig. 65  
Showing Usual Sectional Elevation of Plumbing

can better be shown by detail drawings, and the actual working drawings for the estimator and contractor can likewise be used for filing with the building department. Usually, plans of the foregoing description have a cellar or basement floor plan showing more or less clearly the various runs of pipe included in the house drain. In so far they do not differ much from the improved type of plumbing plans about to be described, for which reason the cellar plan of the foregoing set was omitted.





## CHAPTER III

### IMPROVED TYPE OF PLUMBING PLANS



**I**N the improved method of showing plumbing work on plans, the old method followed in designing the superstructure of the building, is adopted. That is, general plans are prepared showing the layout and relation of the various parts, and special drawings are prepared to show details of various parts of the work. A full and complete set of drawings of a plumbing installation consists of the various floor plans from subbasement to roof, and one or more details showing the elevation of different lines. If the layout of two or more floors are alike, one print will suffice for these several floors, that fact being conspicuously printed on the sheet. Each floor plan should show clearly not only the rising lines of soil, waste and vent pipes, but the hot, cold and circulation risers as well, and where pipes are offset or cross under a floor that fact may be indicated by dotted lines. In preparing plumbing plans, it is not necessary to make as full and complete a set of drawings as for

the general set of plans, for the plumbing plans will be interpreted in connection with the general plans and need be only an outline drawing showing the various walls and partitions, together with the location of elevator machinery, boilers, heating apparatus, refrigeration plant and other like machinery in the cellar and subbasement, so that plumbing pipes will not be placed in locations where they would interfere with the installation of other apparatus.

For cottages or other small buildings where the plumbing work is comparatively simple, the plumbing layout can be marked on the general plans without necessitating too many lines.

**Detail Drawings.**—Wherever a number of plumbing fixtures are grouped together in a building, the various soil, waste, vent and supply pipes will cross and recross one another in various directions. If the location of the stacks, rising lines of supply pipes and fixtures is alone indicated, the work of arranging the pipes will devolve upon the workman who installs them. In complete plans, however, the arrangement, point and manner of crossing of the various pipes, the kind of fittings to use and the manner of supporting the stacks are studied out in the office, and details made showing the roughing-in of the various groups. Details of crooked stacks which require offsetting; the grouping of pump, suction tank, meters and filters in the basement; house tanks and connections on the roof; manifold connections for water supply, and all other parts of the drainage system, should be stud-



ied out in the office, the various proportions ascertained and the complete data worked up into large size details to serve as a guide in estimating on the work and installing the system.

In order to make clear the requirements in this direction a set of plumbing plans and details, from practice, is here reproduced, both as a guide to others in preparing plumbing plans, and to show, by contrast with the usual method now generally followed, how much more full complete and satisfactory is the new method here recommended, over the old method with its incomplete data and conventional elevation.

## EXAMPLE OF NEW METHOD PLUMBING PLANS

**Floor Plans.**—An example of new method plumbing plans is given in the three following illustrations. The building illustrated, which is a hotel in Cuba, is selected because it is simple and the various points about the work can be better explained than if the work were more complicated. There are many things about the work, however, which cannot be commended, but, in order to comply with the plumbing code of Havana, or the requirements of the owner, they had to be incorporated or omitted, as the case may be. For instance, all the sewage from the entire building discharges into a *fosa moura*, which is a sort of septic tank, patterned after Louis Moura's Automatic Scavenger. Had this receptacle been omitted and the

sewage discharged direct into the public sewer, the installation would have been simpler and better.

Examining the plumbing work in detail, it will be observed that, by keeping in mind the symbols used to indicate plumbing, every part of the installation is made perfectly clear. The drainage system, it will be noted in Fig. 66, is made of cast-iron hub-and-spigot pipe, which is represented by two parallel lines, and the hubs marked at suitable intervals. Observe, also, the directness with which all the branches are run, and how they all converge toward the outlet to the main drain. Where rising stacks are to be installed, they are indicated by circles, and the size and designation of the stacks are marked. Designating stacks by letter, as A, B, C, or by numbers, will be found convenient for reference at any time, and for detailing, as will be explained later on. The locations of cleanouts are clearly indicated, as are the number and location of floor drains. Altogether, the horizontal part of the drainage system is so fully laid out that an estimator can easily scale the drawings and find out what quantity of each size of pipe will be required for this part of the work, and by counting can determine the number and kind of fittings that will be required. There is no basement or cellar below this ground floor, so that the drain pipes are buried in the earth. If located above ground, supports would be shown in their proper places. Rain leaders are not indicated on the drawings because they discharge separately on the surface of the ground or into another system of drains.

After the drainage system is marked on the plan, if the building be a large one, where a large quantity of water will be used, the sizes of the various branches and of the main drain should be calculated and marked alongside of the pipes. In ordinary cottage buildings, or other moderate sized dwellings, 3-inch stacks of soil pipe may be used, and 3-inch main drains, where rain water is excluded. If, however, the rain leaders are connected to the drainage system, the main drain should be 4-inches in diameter.

Before laying out the ground work it is, of course, necessary to locate the points where the stacks of soil and waste pipe will be installed. This will be done by finding the most out of the way places in which the stacks can be run to the various toilet or bath rooms, where at the same time they will be convenient for roughing-in the fixtures, and locating them in such places. If there is some latitude in this respect, that is, if the stack of soil pipe can be run equally well in one of several places, that location should be selected, which will permit of best arrangement of fixtures with the least expenditure of time and material. Having the rising points of the various stacks, the plumbing layout should be drawn to give the various drains the most direct runs possible. In drawing the drain pipes it should be remembered to have the hubs of the pipes on the up-grade ends of the lengths.

When the drainage system is marked on plans, there ends, usually, all effort to show the plumbing system. The water supply, which is of equal, if

not greater, importance than the drainage system from an engineering standpoint, is so seldom shown that it might be stated as never being included. Indeed, it is only when plumbing plans are prepared by a sanitary engineer that the water supply systems are indicated. The object of plumbing plans, however, is to show fully what materials are to be furnished and what labor performed, and that cannot be satisfactorily done if the greater part of the work is omitted from the plans and dismissed from the specifications with the brief statement that "each fixture will be supplied with cold water or with hot and cold water, as required." To obtain satisfactory results on a big installation, not only must the system to be adopted be fully studied out and marked on drawings, but the sizes of the various pipes should be carefully calculated, so that they will be sufficiently large for their several purposes. In the present instance, the hot water must be drawn from the hot water faucet at each fixture when the faucet is opened. That necessitates a circulation pipe, and for convenience in installing the system, as well as to have the entire system controlled from a central point, manifold headers are installed and each set of risers is piped direct from the manifolds. In order that each pipe may be distinguished from the others and traced from beginning to end, the hot, cold and circulation pipes are indicated by different kinds of lines, and the key to each may be found marked on the bottom of the drawing. The service pipe can be traced from where it enters the building, through the filter, meters, and into the suction

# Plumbing Plans and Specifications

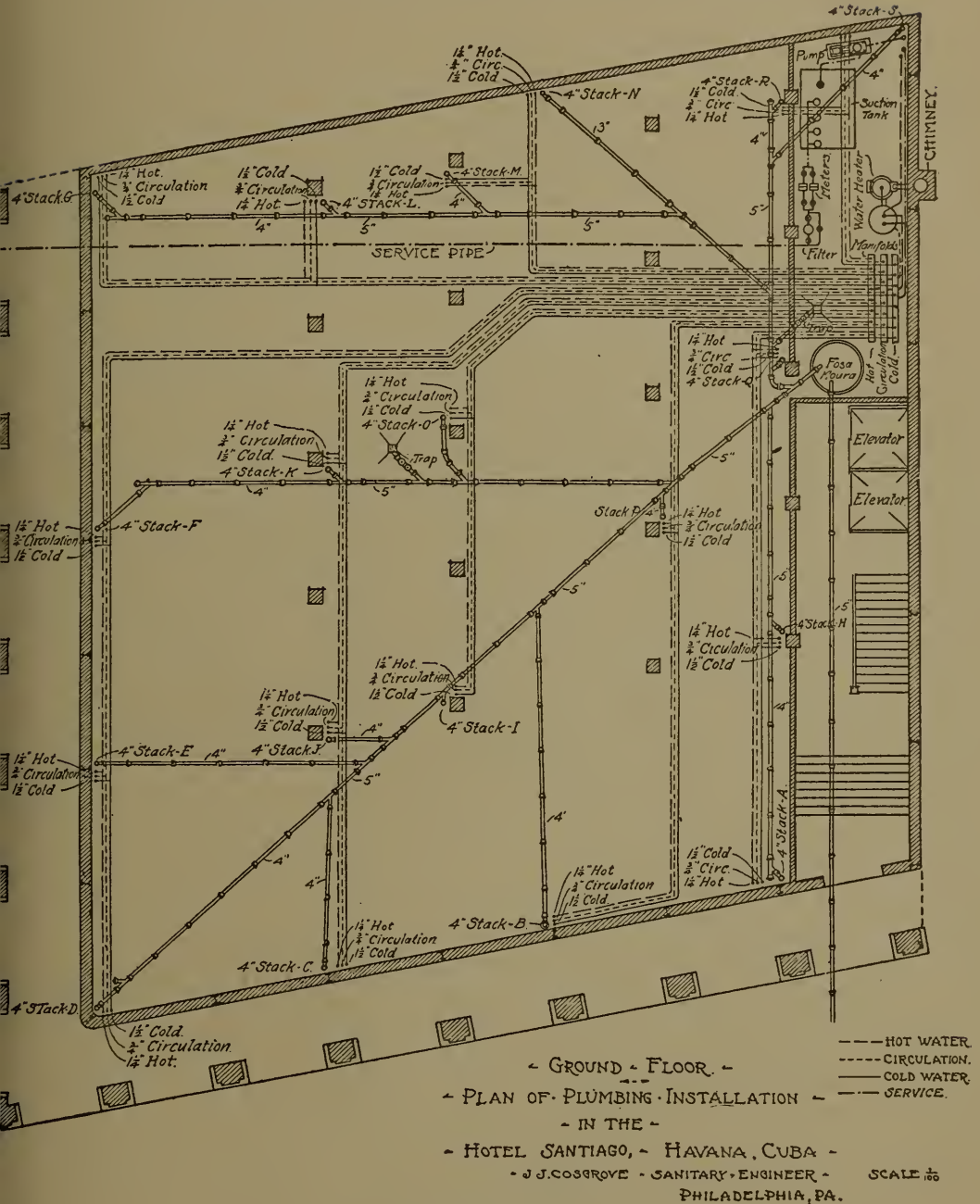
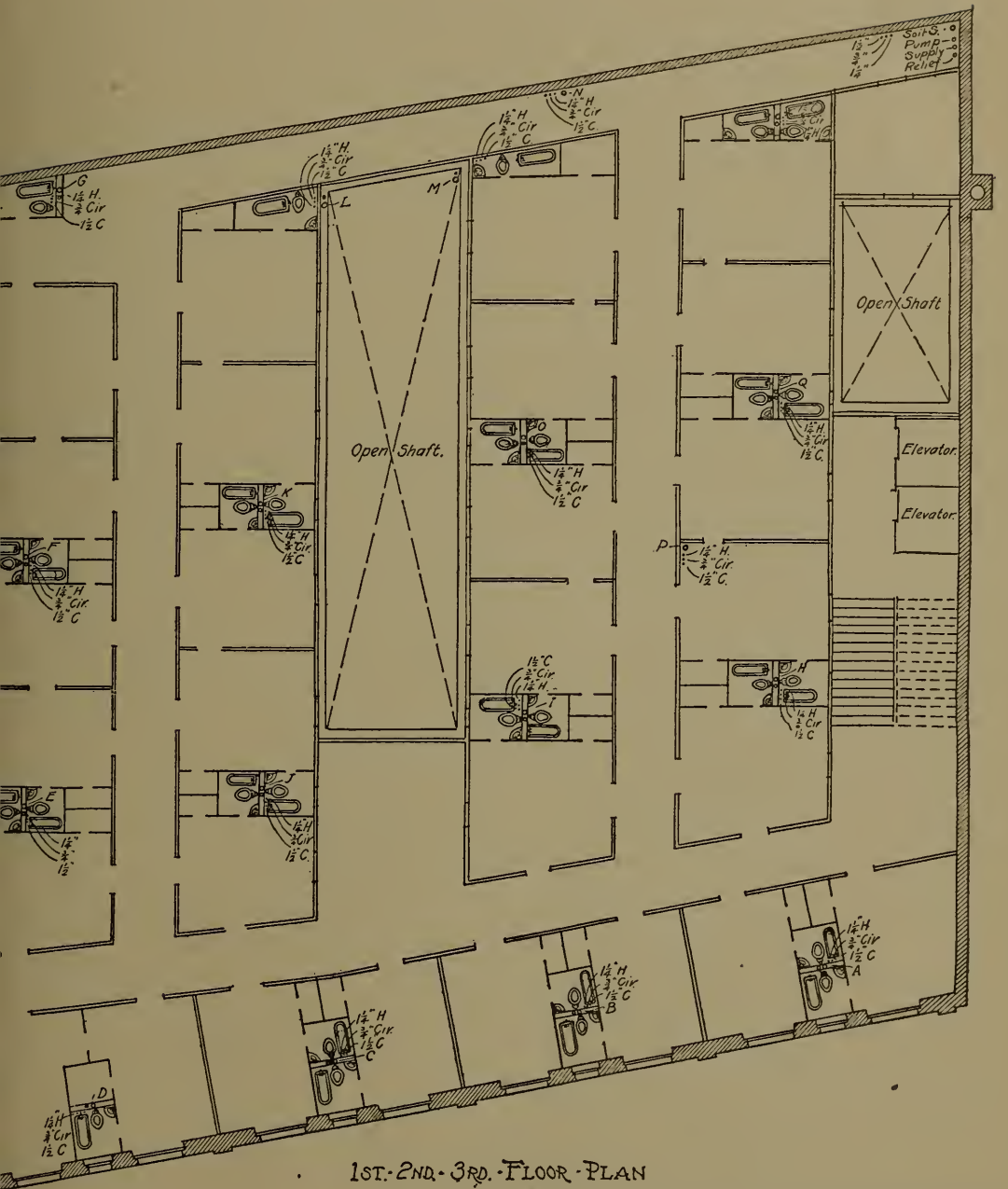


Fig. 66  
 A New Method Ground Floor Plan  
 39

tank. From the suction tank it can be traced through the pump to the pump riser to tank on roof. In short, so fully are the water pipes marked on the plan that, by scaling them, an estimator can determine the exact amount of each size of pipe and the number and kind of fitting which will be required for the horizontal runs, and can calculate quite accurately the amount of work required to install them. Besides the drainage system and water pipes, the water filter, water meters, suction tank, pump, water heater and hot water tank are shown in their respective places on the drawing. It might be well to point out here that manifold headers would not be used under all conditions and in different types of buildings than the one under consideration. Conditions might be such that instead of separate connections to each rising line from a manifold header large mains might be run instead, and branches taken off from the mains for the different riser connections. After the runs of the various water pipes are marked on the drawing, their sizes should be calculated, regardless of the system of piping used, so they will be ample for their several purposes. At the same time the size and kind of service connection must be taken into consideration and determined upon. If the service pipe will be over 2 inches in diameter, the matter should be taken up with the water company to see if a special fitting will be inserted in the water main, or whether a multiple connection with the equivalent of water taps in the main will have to be resorted to. Having determined, the connection can be fully covered in the specifications.

Plumbing Plans and Specifications



1ST. 2ND. 3RD. FLOOR PLAN

HOTEL SANTIAGO, HAVANA CUBA - J. COSGROVE, SANITARY ENGR - PHILADELPHIA, PA.

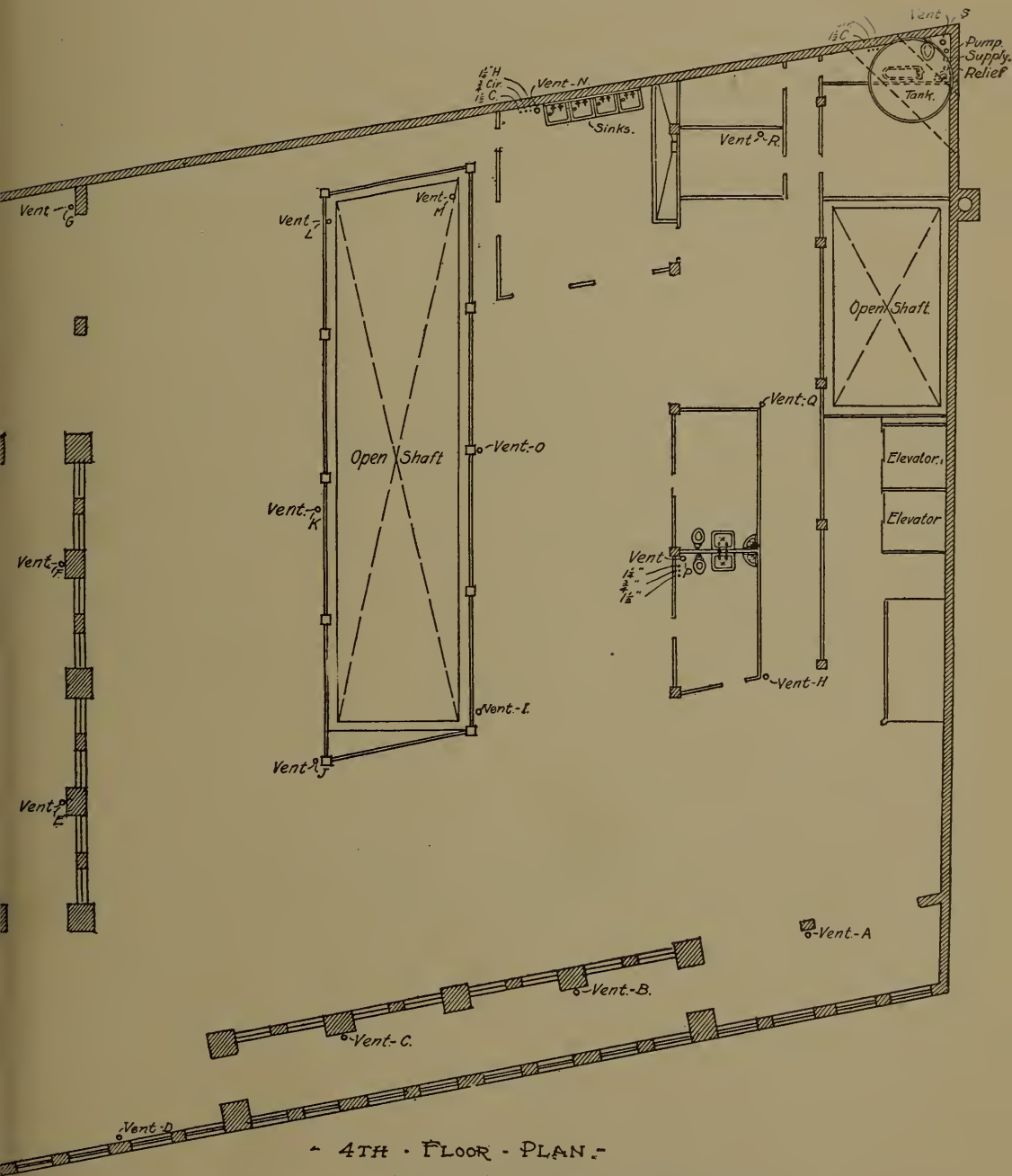
Fig. 67

New Method Upper-floor Plan

The first, second and third floor plans for this building are all similar, so that one sheet, Fig. 67, answers for the three floors. All that is indicated in this sheet, outside of the fixtures, are the location of the various soil, waste and vent stacks and the hot-water and cold-water and circulation risers. It is useless to try to indicate the layout of pipes for toilet rooms or bath rooms on the general floor plan, so the best practice to follow is the method here recommended of simply showing the arrangement of the various fixtures, and show the method of running the pipes to them on a separate detail drawing. It will be observed that no effort was made to fill in the plans completely, such as showing doors and other structural details that have no relation whatever to the plumbing work, but that simply an outline drawing was made, showing the location of the various walls and partitions, particularly those forming the rooms where plumbing fixtures are located. Between the two adjoining bath rooms it will be observed that extra wide partitions are shown, so that all the soil, waste and vent pipes can be concealed therein. There is no good reason for defacing a building by running exposed a network of plumbing pipes, or by providing boxes with removable covers for their reception. Once the drainage system, in buildings of moderate height, is made tight, if constructed of suitable materials, it will remain so and can be enclosed between the walls of a partition and plastered over. The supply pipes, however, should be exposed, or accessible. So it is that in the plan under discussion the soil, waste and vent stacks are



Plumbing Plans and Specifications



4TH FLOOR PLAN

HOTEL SANTIAGO, HAVANA, CUBA

J. J. COSGROVE, SANITARY ENGR.

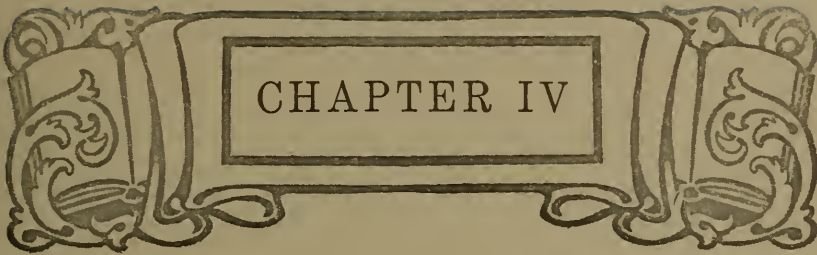
PHILADELPHIA, PA.

Fig. 68  
New Method Roof Plan

shown concealed inside of partitions while the supply pipes are run in one of the bath rooms at the head of the tub.

The fourth floor of this building, Fig. 68, is partly roof garden, or open-air-dining-room. In the covered portions the location of stacks of soil, waste and vent pipes, rising lines of hot water, cold water and circulation pipes, and the kind and location of fixtures are shown. In the open part of the floor or roof the locations of vent pipes are indicated. In addition to the usual materials and fixtures shown on this plan, the house tank is shown in dotted lines in one angle of the building in the location it will occupy above the roof of that portion of the structure.





## PLUMBING DETAILS



### EXAMPLES OF NEW METHOD PLUMBING DETAILS



IF, instead of trying to show all the vertical stacks, branches and fixtures in a building on one conventional elevation, as in the former method shown in Fig. 65, a separate detail of each stack of soil pipe be made, or each stack that differs sufficiently from the other stacks to make a separate detail advisable, a clear, complete layout of the work will be had. For instance, take stack D, on the plan of the ground floor, Fig. 66. Every foot of pipe and each fitting in the horizontal drains can be counted up to the point where the stack connects into the horizontal drain. If, now, a detail of that stack, such as shown in Fig. 69, be made, the pipe, fittings, lead, oakum and hangers required to complete the stack through the roof can be easily ascertained. Owing to the layout of the various bathrooms, the detail of this stack will answer for all other stacks within the building, with the exception that the other stacks for outside tiers

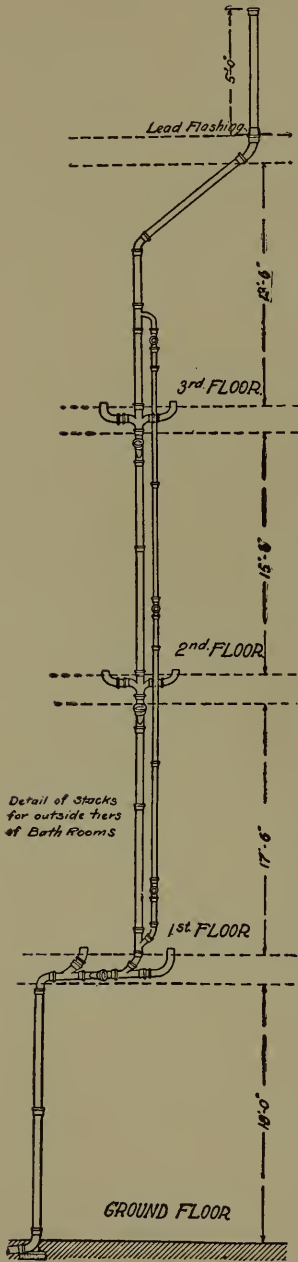


Fig. 69  
Detail of Soil and Vent Stack

of bathrooms will not require the offset on the third floor of the building and the stacks for inside tiers of bathrooms will not require offsets either above the third floors or between the ceiling space of the first floor. This latter offset is made necessary for the outside tiers of bathrooms by reason of an arcade extending around two sides of the building and immediately under where the tiers of bathrooms are located. In designing the plumbing for a building the various stacks which differ from one another should be drawn out in detail, as indicated in the illustration and marked as Detail of Stack A, B, or whatever line it is meant to represent. That is the reason it is convenient to letter the various rising lines, so that they can easily be traced by referring to the corresponding detail of the line.

In some installations the roughing-in for the toilet rooms on various floors can be shown in connection with the vertical stack, but owing to bathrooms being located on opposite sides

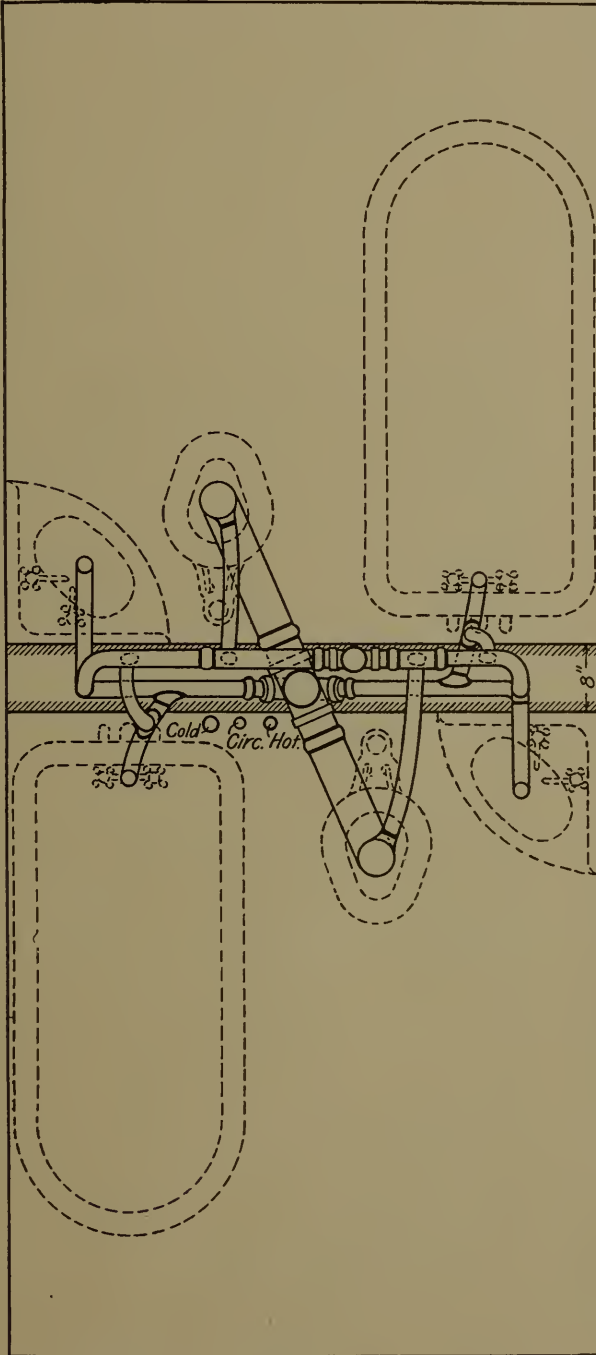


Fig. 70  
Detail Plan of Bathrooms  
47

of this stack, such a detail would not be practicable.

The way the horizontal piping on the ground floor and the vertical stacks are to be run has now been shown, but no indication has yet been made

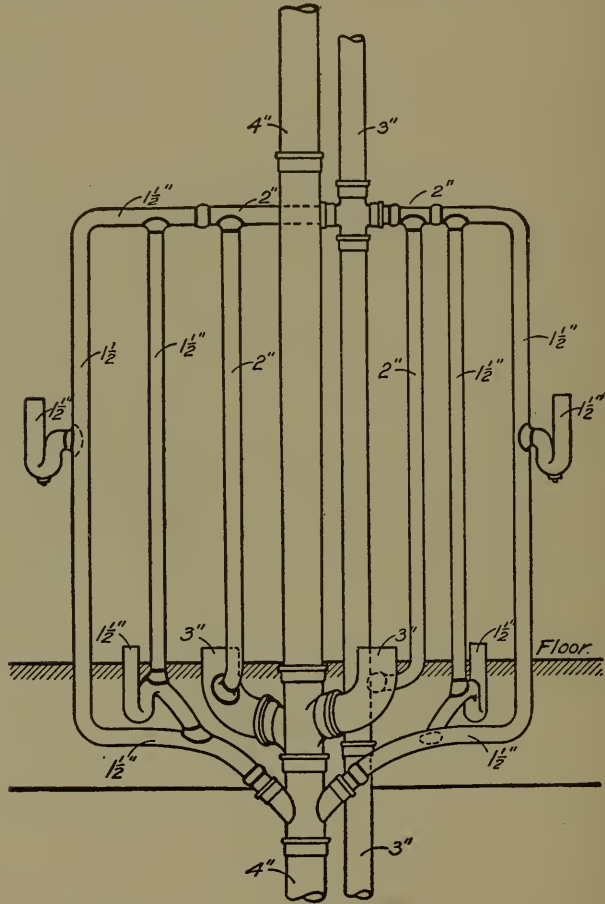


Fig. 71

Detail Elevation of Lead Work in Bath Rooms

of how the roughing-in of the bathrooms is to be done, and without which there would be an incompleteness of the plumbing details. The roughing-in of the bathrooms is shown in plan in Fig. 70, and

in elevation in Fig. 71. These two drawings complete the details of the drainage system, and, by scaling them, the materials required can be accurately determined and the work necessary to install the materials estimated.

Up to the present time only the drainage pipes have been shown above the ground floor plan. The fixtures are all to be supplied with hot and cold water, however, and some indication must be given the prospective estimator and contractor how these pipes are to be run. The rising lines of hot water, cold water and the circulation pipes are indicated on the various floor plans, and the supplies to the various bathrooms are taken off as shown in the detail, Fig. 72. A cross fitting is placed both in the hot water and in the cold water pipes and turned so that one branch can pass through the partition to supply water to the adjoining bathroom, while the other branch supplies water to the bathroom in which the risers are located. Escutcheons are provided where the pipes pass through the wall or ceiling, and the supply to each bathroom is controlled by means of an angle valve. The layout of

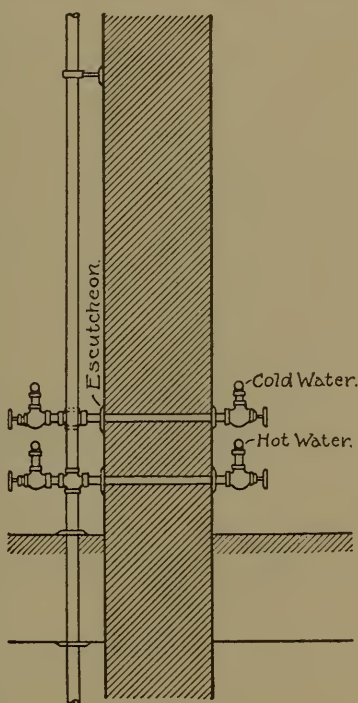


Fig. 72  
Detail of Connections to Water  
Pipes in Bathrooms

water pipes in the bathrooms is shown in Fig. 73, which completes the details of water supply pipes so fully and completely that they can be traced from where the main enters the building to where they end at the several fixtures.

The drainage system and water supply pipes are not the only parts of the plumbing system

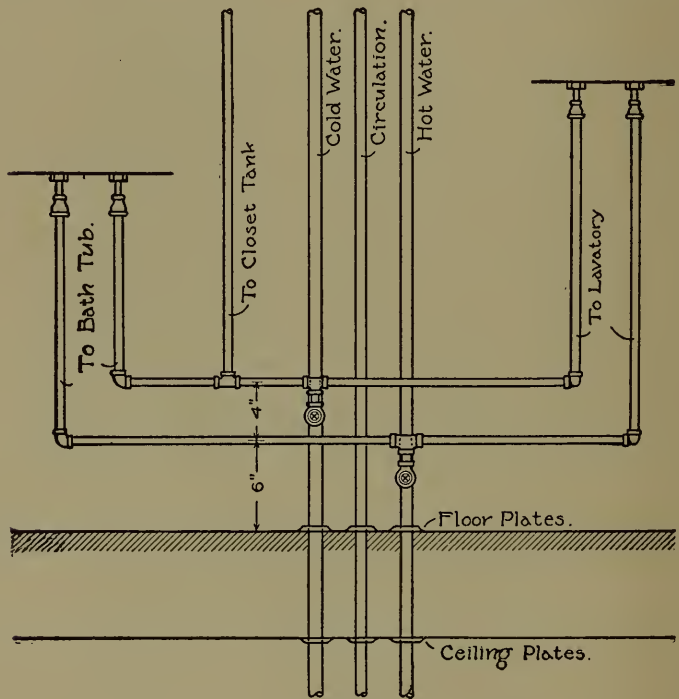


Fig. 73

Detail of Water Pipes in Bathrooms

which require detailing, however. The connections to the house tank and various other apparatus should be shown also. Connections and fittings for the house tank in the present example are shown in plan in Fig. 74 and in sectional elevation in Fig. 75. Before the tank can be detailed, the size of



tank required must be calculated, as well as the size of pipe required for the pump. Having determined the size of tank, the size, weight and length of beams required for its support must be carefully worked out, so there will be no danger of the tank failing on account of its poor support. The condition and thickness of the walls on which

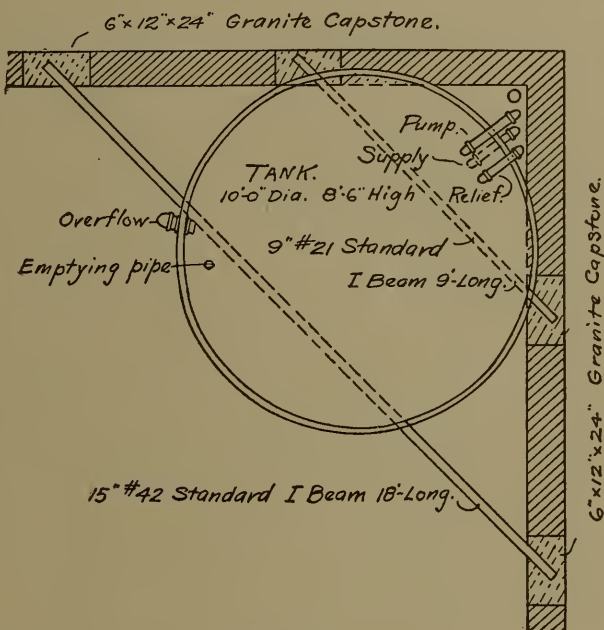


Fig. 74  
Plan Detail of Water Tank

the tank will rest must further be taken into account, and the exposure to winds as well as the wind pressure will enter into the load that must be supported in addition to the dead weight of tank and water. When the data required is all worked out, the various sizes and dimensions can be marked on the details. In many buildings which require a

specially large water supply, special provision must be made for supporting the house tank.

If the water supply is for a factory, or other type of low building, not many stories in height, a special tower for the support of the water tank may be erected in the yard, or a stand pipe may be built for the purpose. In other kinds of buildings, extra thick walls may be required to support the tank, or instead, reinforcing abutments, steel frame

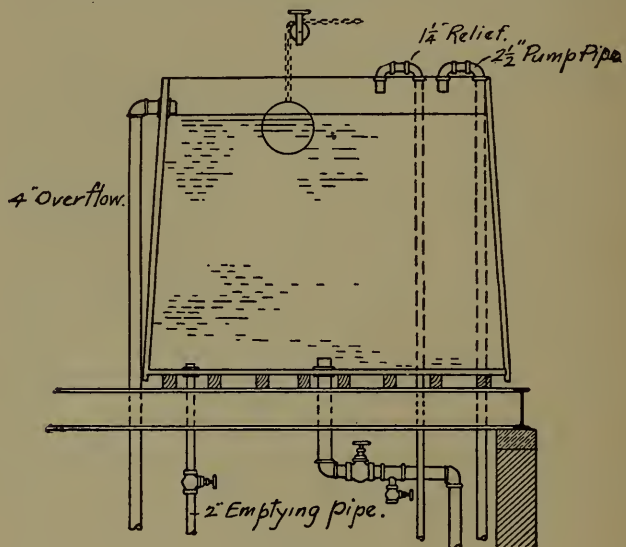


Fig. 75

Elevation Detail of House Tank

work or some other form of device may be resorted to. In some cases a rectangular tower of masonry is made part of the structure, having been designed especially as a support for the house tank.

In Fig. 76 is shown in elevation a view of the manifold headers, the hot, cold and circulation water supply connections, valves, drain pipes and hot water and circulation connections to the hot

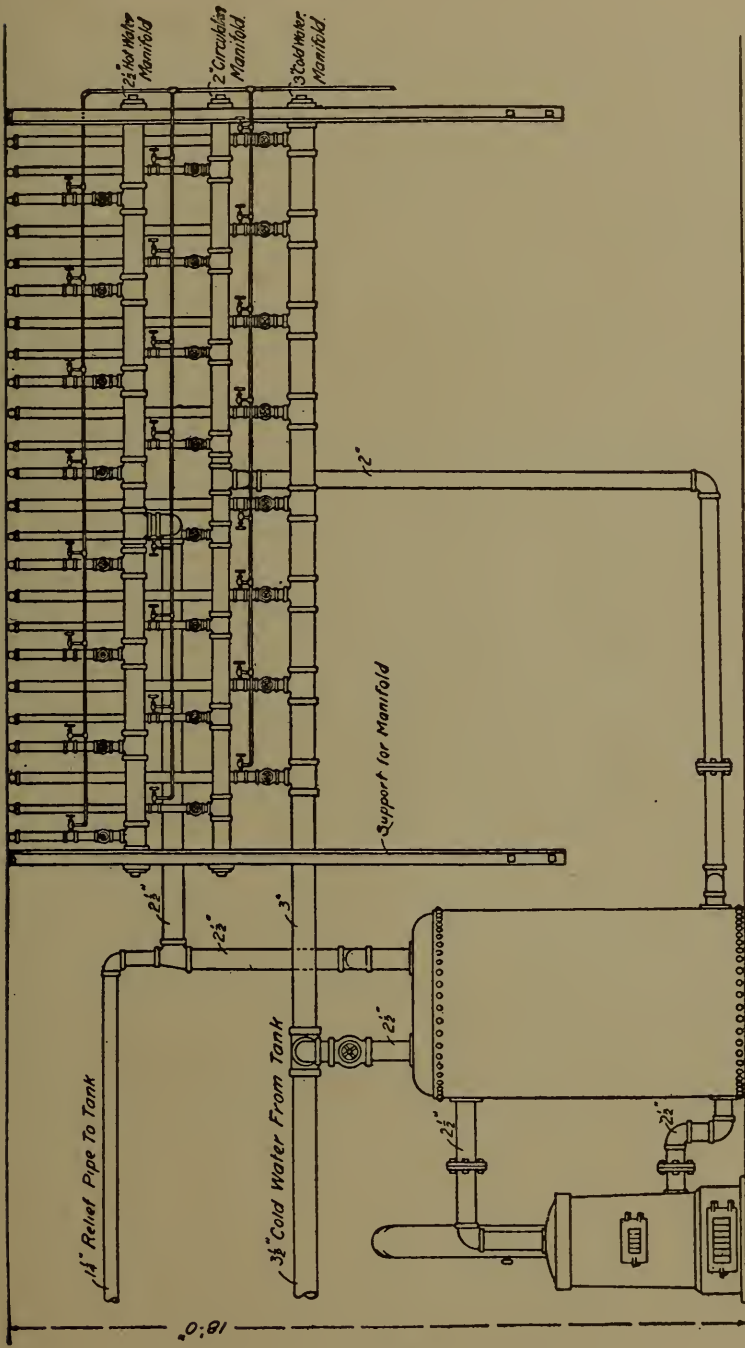


Fig. 76  
Front Elevation Detail of Manifolds

water tank. In Fig. 77 will be found an end elevation of the manifold headers and the various connections. The pump connections, suction tanks, meters and filter are so clearly shown on the plans and so fully covered in the specifications that details are not required for them, although, ordinarily, details would be desirable. In the case of the plans under discussion comparatively few details were necessary, chiefly owing to the fact that the bath rooms are practically duplicates of one another so that one set of details answered for the entire building. In other buildings, however, where there are numerous groups of fixtures each differing from the others, a complete set of details, covering the drainage, vent, hot and cold water pipes should be prepared for each group. It might be possible in some cases to combine the water-supply details, and drainage-pipe details for each group on one set of drawings. When, however, that would complicate the detail to such an extent that it would lack in clearness, the better plan would be to make separate details of both the water supply and the drainage work, as was done in the present example.

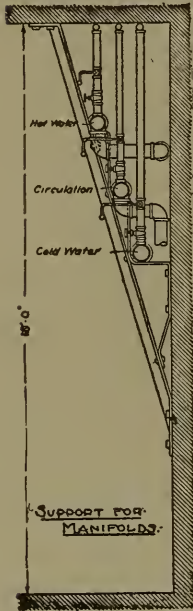
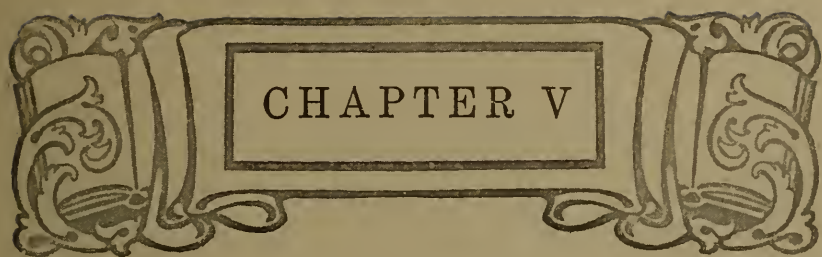


Fig. 77  
End Detail of  
Manifold

of drawings. When, however, that would complicate the detail to such an extent that it would lack in clearness, the better plan would be to make separate details of both the water supply and the drainage work, as was done in the present example.



## CHAPTER V

### DRAWING PLUMBING PLANS



**B**EFORE a designer can satisfactorily plan the plumbing for a building, he must know fully how plumbing work should be done, and be perfectly familiar with the principals and practice of the calling. It stands to reason that a success cannot be made of the effort, if he does not know how or where the pipes should be run, cannot figure or otherwise determine their several capacities, and does not understand the principles of operation of the numerous devices used in plumbing. He should keep posted on new improvements as they are placed on the market, and be able to judge accurately of their value from the principles on which they are constructed and the function they are to fulfill; and, in the matter of fixtures, he should be informed, so that he can select the right kind for the several different classes of buildings.

The idea of plumbing plans and details, is to work out everything in the office, and put it on paper in such a clear and simple manner that an ordinary workman can follow it without effort, yet at the same time so fully, that nothing will be

omitted or overlooked by the estimator and contractor.

**Framing for Plumbing Pipes.**—The runs of all pipes both large and small, should be fully laid out, before work is commenced on a building, so that as the carpenters proceed with the framing of a building, they can frame around where pipes will be located, and leave spaces for the lead roughing in the toilet and bath rooms, following details furnished by the architect. This is a matter entirely overlooked in frame buildings, with the result that in every bathroom, cutting and framing must be done to accommodate the soil and waste pipes, after the building is practically finished. A little care and forethought on the part of the designer in furnishing details of the framing around the bathrooms for the carpenter would obviate all after hacking and hewing, and be not only more economical but likewise more satisfactory all around.

The importance of making provision for the plumbing pipes become almost a necessity in reinforced concrete buildings, for, if openings are not left where pipes have to pass from floor to floor, the cutting necessitated will not only increase the cost of running the stacks from 50% to 75% but is liable furthermore to weaken the structure by cutting through some of the reinforcing rods. The aim of the designer therefore should be to study out before hand, just where each run and stack of pipe will be located, then furnish details for the carpenter or mason as the case might be, to guide him in making provision for the pipes.

**Arranging Fixtures in the Bathroom.**—Before the location of stacks can be accurately determined, it will be found necessary to lay out in the several bathrooms just where each fixture will be placed. Ordinarily this is done by drawing in with pencil a tentative arrangement, then if not satisfactory, rearranging them and trying again, keeping at that practice until a satisfactory arrangement is secured. A quicker and much easier method is to make a set of fixture symbols, drawn to the scale of the plan, color them with india ink, and with these little movable pieces quickly shift them from place to place until the right arrangement is found, then draw in permanently on the plans. Little templates of this kind, for the three usual fixtures in a bathroom, water closet, bath tub, and lavatory, can easily be made in  $\frac{1}{4}$ -inch and  $\frac{1}{8}$ -inch scales, and be kept handy for ready use at anytime.

**Scale Drawings of Bathrooms.**—The symbols given in a preceding chapter are intended principally for scales of  $\frac{1}{4}$ -inch or larger. The general outline of the fixtures can be used for drawings to scale as low as  $\frac{1}{8}$ -inch per foot, but much of the detail will have to be omitted in such cases. In order that the difference may be seen comparatively, two plans of a bathroom are here reproduced, one, Fig. 78, being drawn to  $\frac{1}{4}$ -inch scale, and the other, Fig. 79, drawn to  $\frac{1}{8}$ -inch scale. It will be observed that the only difference between the symbols used in the two drawings lies in the fact that at the smaller scale the trimmings have been omitted from the bath tub and lavatory.

Plumbing Plans and Specifications

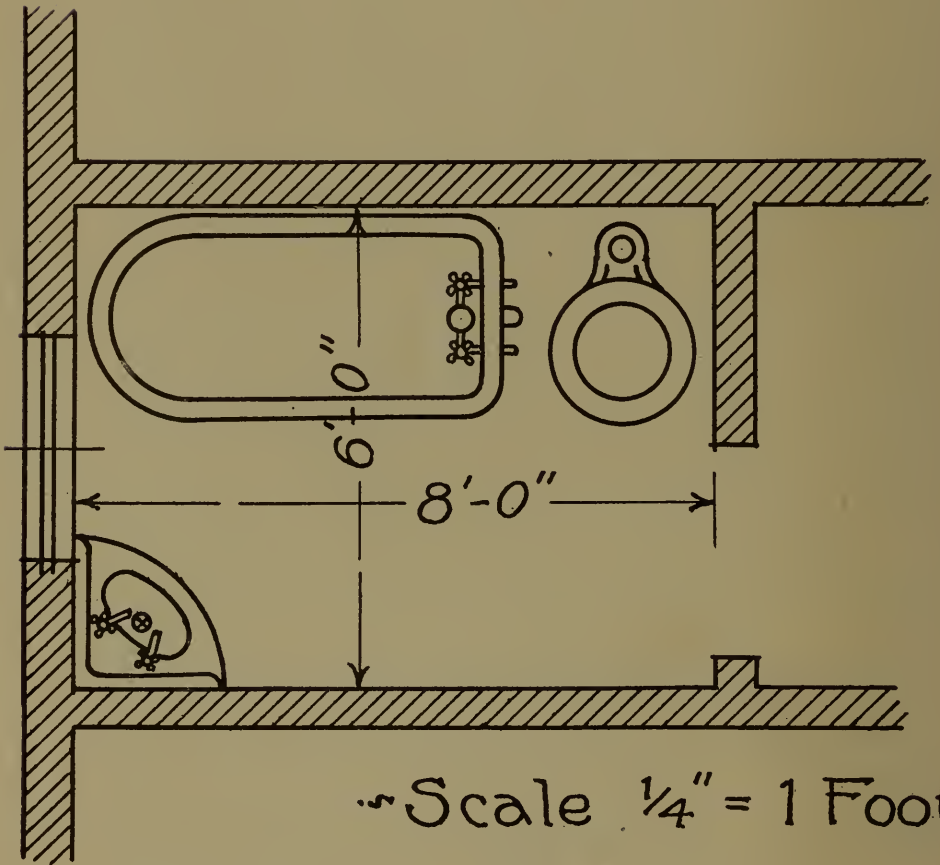


Fig 78  
 $\frac{1}{4}$ -Scale Drawing of Bathroom



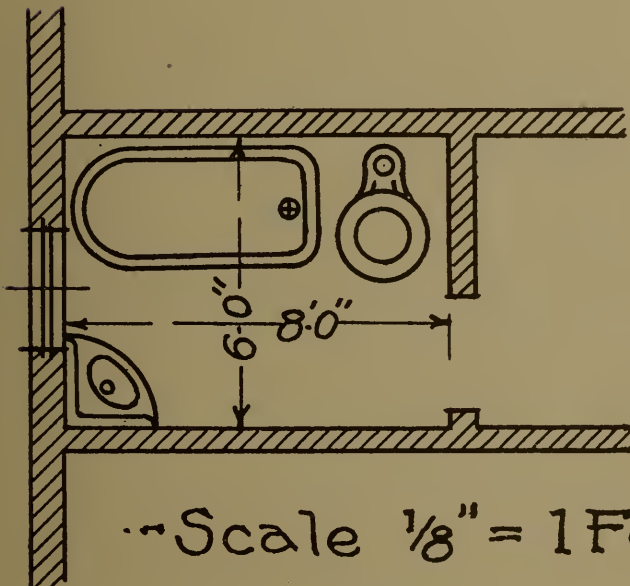
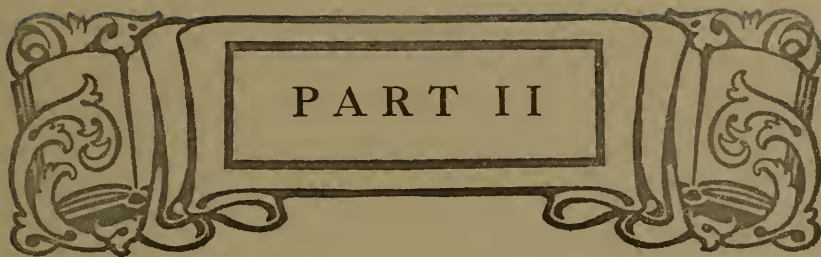


Fig. 79  
 $\frac{1}{8}$ -Scale Drawing of Bathroom

**Photographic Prints for the Contractor.**—For estimating, the contractor will require a full and complete set of drawings made to scale. For use as a guide installing the work however, all that is necessary is something to show the layout and runs of the various stacks and branches, and the location and arrangement of various fixtures. This information of course can be had from the plans, but large scale drawings are inconvenient to handle in a building, and soon become worn and the lines obliterated by use. A better practice is to provide the foreman with photographic prints of the tracings, which need not be larger than 8x10 inches for a building of the largest size. These prints can be fastened to a board, or easily rolled up and carried in the pocket, while the cost of making them is less than that for full size blue prints.





## PLUMBING SPECIFICATIONS



### CHAPTER VI



#### WRITING PLUMBING SPECIFICATIONS



**F**UNCTION of Specifications.—Plumbing plans show only the quantity, extent and layout of the work, but give no indication as to the character of the goods to be used or the quality or make of the fixtures; consequently a description or specification must accompany the plans to make clear the requirements not shown or indicated. For instance, where water-closets are shown on plans, in the absence of an express description of what kind of closet is to be used, any fixture, from the cheapest hopper to the most expensive syphon jet, would comply with the requirements.

In the case of the foregoing plans of a hotel, used as an example, there is nothing on the drawings to show the location of the ground work, or grade at which the pipes will be run. The symbols show that cast-iron hub and spigot pipe is to be

used, but give no indication as to its weight or grade, whether coated or uncoated, or how the lengths will be made tight. Nothing is shown either on the plans or details which will throw any light upon the manner in which pipes, both the horizontal drains buried in the ground and the vertical stacks of soil, waste and vent pipes, will be supported; how they will be made tight where they pass through the roof; what means will be employed to connect lead pipe to the cast-iron stacks; the manner or kind of yard drains to use, and whether the drainage system is to be water and gas tight. A "fosa moura" is shown, but there is nothing to indicate what it is made of, how constructed, or by what contractor the work will be performed.

By referring to the following specifications, which were prepared to accompany the plans, all these points are made clear, and by studying the layout on the plans, carefully, in connection with the specifications, it will be found that there is no question which can arise regarding the system of drain pipes or water supply that is not answered in the specifications. That is the crucial test in specification writing. If there is any uncertainty as to what material will be required to install the plumbing system, or any doubt as to the quality of materials or method of installing the work, something is lacking either on the drawings or in the specifications, and the layout should be studied until the lacking element is discovered and incorporated where it belongs.

The layout of pipes in the bathrooms shows unmistakably the two-pipe system of plumbing with syphon traps, and indicates in what manner the several pipes are to be run; also, their several sizes. There is nothing on the drawings to show what weight of lead pipe will be used, how the joints shall be made and how the closets and slop sinks will be connected to the drainage system. These several points, however, are fully covered in the specifications, so that, so far as the drainage system is concerned, there is nothing which an estimator or contractor cannot learn by a reference to the plans and specifications, and nothing is left to be done "according to the direction of the architect," a provision which cannot intelligently be estimated on.

It will be observed that, while the water-supply pipes can be traced on the plans from where the service pipe enters the building to where the various fixture branches are connected to the fixtures, there is nothing on the drawings to indicate whether the pipes and fittings shall be iron, copper, brass or nickel-steel; what weight of pipes shall be used; how the joints shall be made; where the pipes on the ground floor will be located; what sizes shall be used; how they will be supported and at what grades. Meters and a filter are shown, but the kinds or makes are not indicated. The suction tank is outlined, but whether of wood, iron or other material cannot be learned from the plans, nor can the size, capacity and make of pump, hot-water tank or water heater. Valves are indicated, but the kind of valves to use cannot be ascertained

from the plans, nor can the kind of house tank to be used on the roof be fully told from the details, although a fair idea may be obtained. All this information which is lacking in the drawings should be incorporated in the specifications, and in the following example of specifications which accompanied the plans, these points are fully covered, as may be seen by a careful reading. The fact cannot be too forcibly pointed out that a contractor estimates only on what is shown on the drawings or mentioned in the specifications. He is justified in believing that the one who laid out the plumbing plans and wrote the specifications was competent, knew what he wanted, and had incorporated everything in his drawings and specifications; and if anything which might be considered essential to the work be omitted, he is justified in believing that the omission was intentional, and in estimating accordingly.

If, however, there is an indication either in the plans or specifications which leads the estimator to believe that something was intended, although not fully mentioned, he is put upon inquiry, and should make sure before proceeding with his tender. The architect, on the other hand, when called upon to verbally explain something in either the drawings or specifications which is not clear, or which when construed together do not explain the point, must know that something is lacking and should correct the plans and specifications to make clear the lacking or ambiguous requirements.

## EXAMPLE OF A PLUMBING SPECIFICATION



### SPECIFICATIONS

For the Plumbing Installation in the Hotel Santiago, Located  
in the City of Havana, on the Island of Cuba



### GENERAL CONDITIONS

**Interpretation of Plans and Specifications.**—The following specifications are intended to describe the material required and the work to be performed installing the plumbing work in the Hotel Santiago, Havana, Cuba. The specifications are intended to be interpreted in conjunction with a set of drawings hereto attached, and if anything is shown on the drawings that is not mentioned in the specifications, or is mentioned in the specifications but not shown in the drawings, it is to be included in the work the same as though both mentioned in the specifications and shown in the drawings. Furthermore, any material or labor obviously required to complete the work shall be included in these specifications as fully as though mentioned in the specifications and shown on the plans, and such work and material shall be of the same grade or quality as the parts actually shown and specified.

**Drawings.**—The drawings shall consist of three separate sheets showing the floor plans of the building, and another sheet showing details of the installation. The drawings shall be numbered consecutively from one to four, and shall, together

with the specifications, be signed for identification by the owner of the building and the plumbing contractor. Sheet No. 1 is a plan of the ground floor of the building, showing the general arrangement of the supply pipes, pumps, meters, suction tank, water-heating apparatus and the house drain. Sheet No. 2 is a plan of the first, second and third floors, showing the general arrangement of the fixtures in the several bathrooms, and indicating the location of various hot-water, cold-water, circulation pipes, and the soil, waste and vent stacks. Sheet No. 3 is a plan of the fourth or top floor, showing the location of the various kitchen and scullery fixtures, and the general arrangement of the toilet rooms, as well as the location of the supply, waste, soil and vent lines. Sheet No. 4\* shows the details of various parts of the plumbing installation.

The locations of fixtures on the ground floor are not shown on sheet No. 1, but are shown on the architect's drawings, which must be read in connection with the plumbing plans.

**Permits and Plumbing Laws.**—The plumbing contractor shall pay for and secure all permits to open streets, connect with the public sewer, connect to the water supply or perform any other work or operation connected with his contract and for which a fee is exacted; he shall also pay for tapping the water main, and shall comply with all municipal or general laws in the city of Havana or of the Island of Cuba, which bear upon or affect

\*The separate details illustrated in Chapter III were all included on Sheet 4.



his work; and, in so far as they are applicable to the plumbing work in the Hotel Santiago, the laws and regulations governing the sanitary installations of plumbing, known as Decree No. 255, is made part of this specification.

**Number and Location of Fixtures.**—There shall be a total of 282 fixtures throughout the building, located where shown on the plans. They shall be distributed on the various floors as follows:

Ground floor	{	2 urinals	}	For public use
		2 water-closets		
		1 lavatory		
		1 urinal	}	For private use
		1 water-closet		
		1 lavatory		
		2 meters	}	For general service
		1 filter		
		1 suction tank		
		1 pump		
		1 hot water tank		
		1 water heater		
		—		
		15 Total		

First floor	{	28 bath tubs	}	Second floor	{	28 bath tubs
		28 lavatories				28 lavatories
		28 water-closets				28 water-closets
		—				—
		84 Total				84 Total

Third floor	{	28 bath tubs	}	Fourth floor	{	1 group of 4 sinks
		28 lavatories				2 slop sinks
		28 water-closets				1 bath tub
		—				3 lavatories
		84 Total				3 water-closets
						1 grease trap
						1 house tank
						—
						15 Total

**Superintendence and Inspection.**—The contractor shall give the work his personal superintendence from time to time, and shall keep on the premises a foreman who will be authorized to represent him during his absence. The owner, or his representative, the architect, also the sanitary officer for the city of Havana, shall have access to the work and material at all hours during the work-day for the purpose of examination or inspection, and no work shall be concealed from sight until it has been passed upon by the sanitary inspector. The materials for this installation shall be strictly as called for in the specifications, and the work shall be put together exactly as shown on the plans and detail drawings. If there is any doubt in the contractor's mind as to how certain work shall be done, detail drawings will be furnished him as a guide. All exposed screw piping must be put together so as to conceal the threads, and tool marks will not be permitted on any exposed material, fixtures or fittings.

**Beginning and Termination of Work.**—The contractor shall begin work on the installation of the plumbing within a reasonable time after signing the contract, and shall cooperate with the other contractors so as not to delay the completion of the building.

**Changes from the Plans.**—No material deviation from the plans and specification shall be made in the installation of the work without the written consent of the owner or architect. The owner, however, shall have the privilege of ordering ad-

ditional work from time to time without in any way affecting the validity of the plans, specifications or contract. The value of the work so ordered shall in each case be agreed upon beforehand, and shall be stipulated in the written order, which shall constitute the contractor's authority for proceeding with the work. Should an alteration from the original plan reduce the amount of labor or material, the value of such saving shall be decided upon by the owner and contractor and the amount stipulated in the written order, as before stated.

## THE DRAINAGE SYSTEM

**Excavating.**—The contractor shall dig all trenches, pits or cisterns required for the execution of his work, and, when the installation has been passed by the sanitary inspector; all trenches and other openings shall be refilled and left in as good condition as before they were opened. The contractor shall be responsible for all damage or injury arising from accidents caused by negligence or carelessness in not properly safeguarding his work.

**Material for Drainage System.**—The contractor shall provide all pipe, fittings, supports, packings and lead for the drainage system, and shall install it according to the layout shown on the drawings. The pipes shall all be of cast iron of the hub-and-spigot pattern, sound, cylindrical and smooth, free from sand holes, cracks or other defects, and covered on the inside and outside with a coating of asphaltum. All pipes buried in the ground shall be of the grade known to commerce

---

Plumbing Plans and Specifications

---

as extra heavy, and all vertical stacks of soil, waste and vent pipe shall be of the grade known to commerce as standard.

Standard and extra-heavy cast-iron pipe shall not be less than the following weights per lineal foot:

Inside diameter of pipe	Average weight per lineal foot, including hubs	
	Standard	Extra heavy
2 inches	3½	5½ pounds
3 “	4½	9½ “
4 “	6½	13 “
5 “	8½	17 “
6 “	10½	20 “

All fittings shall be coated on the inside and outside with asphaltum, and shall correspond in weight to the pipes with which they are connected. The entire horizontal portion of the house drain shown on the ground-floor plan shall be buried in the earth below the floor.

**Fall of Drains.**—All pipes in the house-drainage system shall be laid at grade to produce throughout a uniform velocity. Pipes of the several diameters shall be laid at grades not less than those specified in the following table:

Diameter of pipe	Fall per foot
2 inches	$\frac{3}{8}$ inch
3 “	$\frac{2}{5}$ “
4 “	$\frac{3}{10}$ “
5 “	$\frac{1}{4}$ “
6 “	$\frac{1}{3}$ “

**Joints for Cast-Iron Pipe.**—All joints in the cast-iron pipe shall be made water-tight with picked oakum and pure pig lead, well calked into the hubs. One pound of lead shall be used at each joint for each inch in diameter of the pipe.

**Cleanouts.**—A cleanout branch shall be provided in the house drain wherever indicated on the plans, and a cleanout plug shall be calked into such fittings. All cleanouts shall have iron bodies with brass screw plugs threaded with standard pipe threads, and shall have a square or hexagonal nut on the top at least  $1\frac{1}{8}$  inches square and 1-inch high. The plugs, when finally screwed into the ferrule, shall be made up with graphite in the joints.

**Support for Cast-Iron Pipe.**—Cast-iron pipe which is buried in the ground shall have a firm bearing along its entire length on undisturbed earth. In case the trenches have been dug below the proper grades, the pipes shall be supported every 10 feet on bricks, firmly bedded on undisturbed earth. The vertical stack of soil, waste and vent pipes throughout the building shall be securely fastened to the walls and floors at each tier of beams by means of Netherland split-ring hangers. At the foot of each rising line of cast-iron pipe a brick or concrete foundation shall be provided for the stack to rest on.

**Floor Drains.**—There shall be furnished and set in the pump room and in the patio, where shown on the ground-floor plan, a 3-inch Mueller floor drain and backwater trap combined, properly connected to the house drain.

**Connections to Cast-Iron Pipe.**—Connections between lead pipe and cast-iron pipe shall be made by means of brass ferrules and wiped-solder joints. The ferrules shall be bell shaped, at least  $\frac{1}{8}$ -inch thick, 4 inches long, and shall be securely calked into the hubs of the cast-iron pipe or fittings.

All connections to the horizontal house drain shall be made by means of Y fittings, and changes in the direction of the pipe shall be made with  $\frac{1}{6}$ ,  $\frac{1}{8}$  or long-sweep  $\frac{1}{4}$  bends. On the vertical stack, connection may be made with TY branches. T branches will be permitted only on vent pipes.

**Traps.**—Each fixture in the building shall be separately trapped with a  $\frac{1}{2}$ -S syphon trap placed as close as possible to the fixture. All traps, with the exception of the water-closet traps, shall be vented by special  $1\frac{1}{2}$ -inch vent pipes connected to the trap near the crown and the other end connected to a vent stack extending through the roof, or connecting to the soil stack above the highest fixture. Each water-closet shall be vented through a 2-inch pipe connecting the lead bend below the floor to the vent stack. The vent pipe for each group of fixtures shall be connected to the vent stack at a point above the outlet of the highest fixture in the group. The group of sinks in the kitchen shall be provided with one Tucker, size 3, painted, cast-iron, water-cooled grease trap, properly connected to the waste pipe, and the chilling chamber connected to the cold water supply to the sinks.

**System of Piping.**—The drainage system shall be what is known as the 2-pipe system, which shall consist of a special vent stack accompanying each soil or waste stack. The vent stack shall be connected to the soil or waste stack by means of a Y fitting below the lowest fixture discharging into the stack, and may be connected to the soil or waste stack above the highest fixture discharging into it, or it may extend separately through the roof. All soil and waste stacks shall be extended 5 feet above the roof.

**Flashings.**—Where soil, waste, vent or supply pipes pass through the roof of the building, the joints shall be made tight by means of 8-pound sheet lead flashings, which shall extend at least 6 inches on all sides of the pipe, and shall be made water-tight where they come in contact with the roof.

**Fosa Moura.**—The plumbing contractor shall furnish all material and labor to build, where shown on the plan, a “maximum” “fosa moura” according to the requirements of the Havana Sanitary Code. The fosa moura shall be circular in form, 8 feet in diameter, 6 feet 6 inches deep, and shall have walls and bottom of brick, the walls 8 inches thick and the bottom 4 inches thick. The walls and bottom of the fosa moura shall be made water-tight by means of a coating of Portland cement mortar 1-inch thick mixed in the proportion of one of cement to two of sand. The top of the fosa moura shall be arched over with bricks laid in cement mortar, or shall have a deck of rein-

forced concrete, with a 20-inch diameter air-tight manhole and cover securely set in place.

**Lead Pipe.**—The use of lead pipe shall be restricted to the short branches of soil, waste and vent pipes required for the roughing-in of the bathrooms. No lead pipe smaller in diameter than  $1\frac{1}{2}$ -inches shall be used, and all pipe shall be equal to the grade known to commerce as D and shall be of the following weights:  $1\frac{1}{2}$ -inch pipe, 3 pounds per foot; 2-inch pipe, 4 pounds per foot; 3-inch pipe, 6 pounds per foot, and 4-inch pipe, 8 pounds per foot. Lead bends for closets and slop sinks, or straight connections where bends are not used, will be provided with corrugations to compensate for shrinkage or settlement of stacks or building. All connections between lead pipes or between lead pipe and brass ferrules shall be made by means of solder wiped joints.

**Tests.**—The entire drainage system within the building shall be tested by the plumbing contractor in the presence of the sanitary inspector of the city of Havana. Two tests shall be applied to the system; the first shall be a water test and shall be applied by closing all outlets below the roof and filling the drain, stacks and branches, until the water overflows from the vent pipes above the roof. All leaks or defects shall be made perfectly sound and tight and the work shall not be passed until the entire system remains full of water for two hours without leaking.

After the fixtures are all set and the traps sealed with water, a smoke test shall be applied,



and any defects or leaks disclosed by this test shall in like manner be made tight and strong. All tests shall be made by and at the expense of the plumbing contractor.

**· Closet and Slop-Sink Floor Connections.**—All water-closets and slop-sinks shall be provided with flexible metal-to-metal brass floor flanges, which shall be securely soldered to the lead bends. The adjusting threads of the flange, where they come together, shall be well lubricated with Dixon's Graphite.

## WATER SUPPLY

The water-supply system throughout the building shall be of galvanized wrought pipe with galvanized malleable beaded fittings. All water pipes shall be exposed and shall be neatly run in straight lines spaced about 3 inches from center to center, and the joints shall be made up at the fittings so no threads will show. All galvanized pipe shall be supported about every 10 feet by Fee and Mason split-ring hangers, which shall be galvanized to correspond with the pipe and fittings. Before the work is accepted, all exposed pipes must be cleaned and left entirely free from tool or other marks.

**Service Pipe and Meters.**—The contractors shall have inserted in the water main, in the street where indicated on the ground floor plan, eight (8) three-quarter inch ( $\frac{3}{4}$ " ) taps. Each tap shall be connected by means of a tail-piece and 3 feet of *a a a* lead pipe to an eight-branch  $1\frac{1}{2}$ -inch multiple connection.

From this connection, extend a service of  $1\frac{1}{2}$ -inch galvanized-iron pipe to the inside of the building, thence to and along the ceiling of the ground floor to the pump room. Connect the service pipe in the pump room to a water-filter, and to two Crown, Nash or Hersey Water Meters; each meter shall be so controlled by gate valves that it can be cut out of service without interrupting the flow to the other meter or shutting off the supply from the suction tank. From the meters, extend the  $1\frac{1}{2}$ -inch pipe to the suction tank, and terminate it with four 1-inch ball cocks arranged to shut off the water when the suction tank is full.

**Suction Tank.**—The suction tank shall be of steel plates  $\frac{5}{16}$ -inch thick, double riveted at the seams and well calked to make the joints perfectly water-tight. The tank shall be 10 feet long, 8 feet wide, 6 feet deep and shall be supported on four  $9\frac{3}{4}$ -pound 5-inch standard I beams, each 8 feet long, to raise the tank from the floor. The beams and tank shall be well painted with two coats of black varnish or asphaltum, and the top of the tank shall be covered with a wire screen of fine mesh to prevent the entrance of vermin, and decked over with 2-inch planks well matched to make it dirt proof. A hinged manhole about 2 feet square shall be provided in the top. The outlet from the suction tank shall be at the bottom near the pump end of the tank, as shown on the plan. It shall consist of a  $2\frac{1}{2}$ -inch tapped flange riveted to the tank plate. A brass wire strainer shall protect the suction inlet. The inlet to the tank shall be 2 inches in dia-

meter and shall be reinforced by a flange on the outside of the opening, but the flange need not be tapped.

**Water Filter.**—The filter shall be a New York, of the pressure type, manufactured by the New York Continental Jewell Filtration Company, 5 feet in diameter, 6 feet high and possessing a capacity of 3,000 U. S. gallons per hour. The filter shall be provided with an automatic coagulating apparatus, and fitted with a by-pass so unfiltered water can be delivered direct to the suction tank.

**House Pump.**—Furnish and fit up, alongside of the suction tank, one size 3-A Quimby screw pump having a capacity of 1,800 gallons of water per hour against a head of 100 feet. The pump shall be direct-connected to a 3 horsepower direct-current motor of the General-Electric, Crocker-Wheeler or Sprague type, and shall be provided with an automatic switch and starting device to turn on the current when water in the house tank reaches a certain level and stop the motor when the tank is full. Provide a brick or concrete foundation for the pump 2 feet 6 inches wide by 5 feet 6 inches long, capped with a flagstone of granite or bluestone, with bolts set in to secure the pump. The pump shall be set on a matting of felt to deaden any sound due to vibration. Connect the suction end of the pump to the outlet of the suction tank with a 2½-inch galvanized wrought pipe, and extend a 2½-inch galvanized wrought pipe from the pump to the house tank on roof.

**House Tank.**—Furnish and fit up on the roof of the building where shown on plan, one wooden house tank 10 feet in diameter by 8 feet 6 inches deep, made of 2-inch cypress, cedar or white pine. Cover the tank with a copper screen of fine mesh to exclude mosquitoes and with a dust-proof wooden cover. Provide a hinged manhole 2 feet square through the cover.

The tank shall rest on pine timbers spaced about 12 inches apart and running crosswise with the flooring of the tank. The entire weight of the tank shall be supported on two steel beams furnished by the plumbing contractor. These beams shall be, respectively: one 15-inch 42-pound standard I beam 18 feet long, and one 9-inch 21-pound standard I beam 9 feet long. The two beams shall be tied together with two  $\frac{3}{8}$ -inch tie rods, and shall rest on four bluestone or granite templets 6 inches by 12 inches by 24 inches, provided by the plumbing contractor. The house tank shall be provided with an overflow pipe 4 inches in diameter, and a  $2\frac{1}{2}$ -inch emptying pipe discharging onto the roof; a pump pipe and expansion pipe shall empty into the tank, which shall be connected to a  $3\frac{1}{2}$ -inch galvanized wrought pipe to supply the building.

**Supply to Building.**—The  $3\frac{1}{2}$ -inch house supply pipe shall be extended from the house tank to the pump room, where, by means of a  $3\frac{1}{2}$  by 3 by  $2\frac{1}{2}$ -inch T, a  $2\frac{1}{2}$ -inch branch shall be taken to the hot-water tank, to supply the building with hot water, and the 3-inch run shall extend in full size to the cold-water manifold. The  $2\frac{1}{2}$ -inch hot-water pipe

from the hot-water tank shall extend in full size to the hot-water manifold, and a  $1\frac{1}{4}$ -inch branch from the pipe directly above the hot-water tank shall be extended to the house tank on the roof to act as a relief pipe for the system.

There shall be three sets of manifolds: hot, cold and circulation, from which all supplies in the building shall be controlled. Each manifold shall control eight sets of pipes run along the ceiling, as shown on the ground floor plan and in detail on sheet 4. These manifolds shall be provided with drip pipes and valves so that any one line can be shut off and drained without affecting the other lines.

The supply pipes throughout the building shall be of the following sizes: distributing mains for cold water,  $1\frac{1}{2}$ -inches in diameter; distributing mains for hot water,  $1\frac{1}{4}$ -inches in diameter; circulation pipes,  $\frac{3}{4}$ -inch in diameter. Distributor branches in bathrooms shall be  $\frac{3}{4}$ -inch in diameter; branches to the bath tubs,  $\frac{3}{4}$ -inch in diameter; branches to lavatories,  $\frac{1}{2}$ -inch in diameter; branches to closet tanks,  $\frac{1}{2}$ -inch in diameter. All exposed piping within the bathrooms shall be of galvanized pipe, well cleaned and polished, free from tool marks and made up into fittings so no part of the male threads on the pipes will show. The horizontal mains on the ground floor shall be graded from the risers to the manifold headers so the pipes will have a fall toward the headers of about  $\frac{1}{2}$ -inch in 10 feet.

**System of Valving.**—In the pump room, there shall be a  $1\frac{1}{2}$ -inch gate valve on the water-service

pipe on the street side of the filter, one on each branch to the meters, and another on each discharge branch from the meters. A  $2\frac{1}{2}$ -inch gate valve shall be interposed between the suction tank and the pump, and a  $1\frac{1}{2}$ -inch gate valve shall be placed in a tee in the suction pipe on the tank side of the  $2\frac{1}{2}$ -inch valve, to serve as an emptying cock. On the house-tank side of the pump, a  $2\frac{1}{2}$ -inch gate valve shall be placed in the pump pipe, and in the branch of a T immediately above the valve there shall be a  $\frac{1}{2}$ -inch angle valve for emptying the pump pipe.

In connection with the house tank on the roof, there shall be a  $3\frac{1}{2}$ -inch gate valve on the house-supply pipe with a vent pipe from a T extending above the surface of the water in the tank. A  $2\frac{1}{2}$ -inch gate valve shall be provided in the emptying pipe from the tank. A  $2\frac{1}{2}$ -inch gate valve shall be provided in the cold-water supply to the hot-water tank and another in the hot-water branch to the hot-water manifold. A 3-inch gate valve shall be provided in the branch controlling the cold-water manifold. Each distributing main from the cold-water manifold shall have a  $1\frac{1}{2}$ -inch gate valve for shutting off the water, and immediately above the gate valve from a  $\frac{3}{8}$ -inch branch T there shall be a  $\frac{3}{8}$ -inch angle valve connected to a drip pipe. The hot-water distributing mains and the circulating pipe shall be fitted with valves in the same manner, except that the gate valves on the hot-water pipe shall be  $1\frac{1}{4}$ -inch and the valves on the circulation pipes  $\frac{3}{4}$ -inch diameter. All valves on the manifold headers shall be provided with brass tags stamped

to indicate the line of pipe they control. A 1½-inch ground-key cock shall be used in connection with the heating apparatus for emptying the tank and heater.

The supply to each bathroom shall be controlled by an angle valve placed on both the hot and cold water distributing branches. The several fixtures in the bathrooms shall not be separately valved.

All valves shall be heavy pattern, brass body, of Crane, Fairbanks or Jenkins Bros. make. Gate valves shall be double-seated valves and angle valves shall have soft seats.

**Hot-Water and Circulation Pipes.**—Each hot-water riser throughout the building shall be accompanied by a corresponding circulation pipe, ¾-inch in diameter, which shall be connected to the hot-water riser by means of a return bend on the top floor of the building. The hot-water riser, also the circulation riser, shall be supported only at the second floor of the building, so the ends will be free to expand up and down.

**Water-Heating Apparatus.**—The contractor shall provide and set up where shown on the plans, one steel hot-water tank 48 inches in diameter and 8 feet high, made of ⅝-inch steel plates double riveted, the seams calked perfectly water tight, and guaranteed to withstand a pressure of 300 pounds per square inch. The tank shall be connected by means of a 2½-inch flow and return pipe to a cast-iron Ideal, Yale or Sunray water heater containing 6 square feet of grate surface and hav-

ing a smoke flue of 10 inches diameter. The tank shall stand upright alongside the heater and both shall rest on a cement base especially provided for the purpose. Cover the hot-water tank with  $1\frac{1}{4}$ -inches of asbestos plaster smoothly troweled on over a band of expanded metal.

**Smoke Flue or Chimney.**—The owner shall provide a chimney flue lined with flue lining which shall be cylindrical in form and 10 inches in diameter. If the linings are square in section, they shall measure 10 inches on the inside.

**Test of Water-Supply System.**—The entire water-supply system throughout the building shall be subjected to a hydraulic pressure of 100 pounds to the square inch, at which pressure the pipe fittings and joints must be perfectly tight.

**Prices for Extra Work.**—Each estimator shall include in his tender a schedule of prices for labor, for various sizes of soil pipe, waste pipe, water pipe, cocks, valves and for other materials. Also a schedule of prices for the various fixtures and trimmings specified, that he will furnish the goods for in case extra fixtures are required, or that will be deducted from the cost of the contract in case any fixtures or materials are omitted. It is understood however that in case the extra work, or the reduction of work exceeds five per cent. of the amount of the contract, the prices stated may be superseded by a special written agreement stating the work to be performed and the prices to be paid therefore. Should the owner and contractor fail to agree as to the amount to be added to or de-



ducted from the contract for changes from the original plans and specifications, a written agreement will be entered into as required, but without the amount to be added to, or deducted from, the contract being stated; and if the owner and contractor continue to disagree, the matter in dispute shall be decided by arbitration, as provided for in the following section.

**Arbitration.**—In case the owner and contractor fail to agree as to the price to be paid for changes to or alterations from the plans and specifications, or a dispute should arise as to any other terms of the specifications and contract, the matter shall be referred to a Board of Arbitration consisting of three persons. One of the board shall be selected by the owner, one by the contractor, and the two so chosen shall select the third. The decision of any two of the board shall be final and binding on both parties, and each party, the owner and the contractor, shall pay one-half the costs of the arbitration trial.

**Insurance.**—The owner during the progress of the work shall keep it insured against loss or damage by fire so as to cover all work installed in the building or materials stored on the premises; and the policy shall be made payable to the plumbing contractor, proportionately with the other contractors, as the interests might appear.

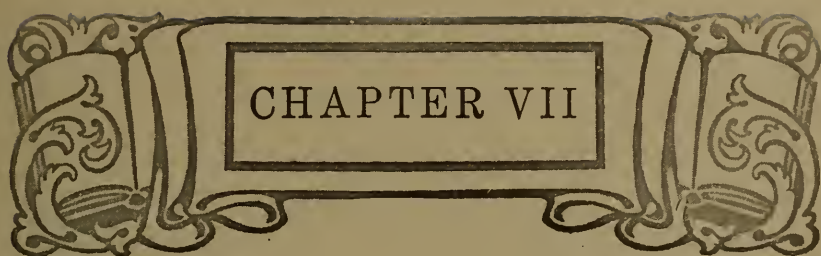
## FIXTURES

In specifying the fixtures for a building it is customary to copy the descriptions given in the

catalogue of the goods to be used, adding or making such alterations as may be deemed advisable. In the present specifications, descriptions of the fixtures are omitted, and only one example given to show the form usually followed.

**Water Closets.**—The closets throughout shall be Design A 2 (Standard) Vitrite porcelain design “A” low tank center outlet twin syphon jet bowl, with 2-inch nickel-plated brass flush connection, Plate P 951 quarter sawed oak saddle seat and panel cover, Plate P 940 porcelain enameled in and out tank with square front and flat top, with water pressure regulator and low push button, nickel-plated brass wall supply pipe with china index compression stop, flexible metal-to-metal floor connection, bolts, nuts and washers complete.






## CHAPTER VII

### SUGGESTIONS FOR SPECIFICATION WRITING



IVISIONS and Subdivisions.—A printed form of specification cannot well be prepared for plumbing work. Of course, a printed form with blank spaces could be prepared, but, owing to the fact that no two installations are alike, a printed form to be applicable to all would be so cumbersome and contain so many unnecessary clauses and conditions that it would lead to confusion and, in case of a disagreement, probably cause injustice or hardship to one of the contracting parties. Even for simple installations a satisfactory blank form of specification cannot be prepared, for a specification is simply a straight-forward, simple statement of what material is to be supplied and what work is to be performed. If a blank form is prepared and made flexible enough to cover any and all installations the composite form of the specification will be had at the expense of clearness and simplicity. When a contract is to be entered into, or a specification is to be prepared, the better

way is to consider carefully what each party to the agreement will be required to do, then, in all fairness, reduce that agreement to a formal writing. It is not only easier to prepare a written specification than to satisfactorily fill out the blank spaces of a printed form, but for all concerned it is safer.

In preparing a specification, by observing a few simple rules, the task can be reduced to a simplicity that is surprising. The chief aims of the specification are clearness and completeness; and these two requirements, coupled with conciseness, can be best secured by dividing the specifications into the four principal divisions: General Conditions; Drainage System; Water Supply; Fixtures, and treating each of these general subjects separately. The work will be still further simplified by subdividing the principal subjects into their various subheadings. A simple expedient which will be found useful at all times when preparing specifications is to have a list of titles of the various conditions that must be observed, or fixtures which might be required in a building, checking off the items as they are specified, or those that are not required. This list can be added to from time to time as new items are encountered in different types of buildings, until finally a full and complete list of the various subjects that must be considered in the planning of plumbing and writing the specifications will be incorporated in the schedule. Such memoranda will be found useful not only in writing the specification, but likewise in preparing the drawings and will prevent any item being forgot-

---

## Plumbing Plans and Specifications

---

ten. A form containing a partial list of items, which can be added to from time to time, follows :

### GENERAL CONDITIONS

Interpretation of plans and specifications	Guarantees
Drawings	Arbitration
Permits and plumbing laws	Extras
Number and location of fixtures	Protection of work
Superintendence and inspection	Responsibility for damage
Beginning and termination of work	Insurance
Changes from plans	Removing condemned goods
Removal of rubbish	Abandonment of work
Temporary water-closet	Temporary water supply
	Cutting and repairing
	Ambiguity
	Prices for extra work
	Payments

### DRAINAGE SYSTEM

Excavating	Flashings
The house sewer	System of piping
Material for drainage system	Lead pipe
Soil pipe joints	Traps
Location of drains	Closet and slop-sink floor connections
Falls for drains	Tests
Cleanouts	Safe wastes
Supports for drainage system	Refrigerator wastes
Main drain trap	Grease traps
Fresh-air inlet	Blow-off tanks
Floor drains	Mechanical discharge systems
Yard and area drains	Septic tank
Rain leaders	Filter beds
Subsoil drainage	Contact beds
Tide-water traps	Disposal fields
Connections between iron and lead pipe	Stall drains

### WATER SUPPLY

Wells	Distributing manifolds
Reservoirs	Air chamber
Cisterns	Hot-water tank
Standpipes	Water heater
Windmills	Smoke pipe
Hydraulic rams	Hot-water pipes
Water-softening apparatus	Circulation pipes
Water-supply pipes	Expansion loops or joints
Pressure regulators	Covering pipes and tanks
Service pipe	Temperature regulators
Meters	Safety valves
Filters	System of valving
Suction tank	Drip pipes
House pump	Fire lines
House tank	Ice-water pipes
Street sprinklers	Salt-water pipes
House supply	Rain-water pipes

### FIXTURES

Water-closets	Laundry tubs
Bath tubs	Kitchen and scullery sinks
Shower baths	Urinals
Lavatories	Drinking fountains
Hospital lavatories	Bathroom scales
Sitz baths	Bathroom furnishings
Foot baths	Hydrotherapeutic apparatus
Bidets	Swimming pools
Child's bath	Manicure tables and basins
Slop sinks	Operating tables
Hospital slop sinks	
Pantry sinks	

The foregoing schedule does not include everything which is liable to be required in all types of buildings, but the items will suggest anything which is not named. For instance, Fire Lines does not mention outside fire hydrants, such as would

be required for a country institution, but the item recalls the necessity for fire protection, and should suggest to an imaginative mind the necessity for hydrants. In like manner the item water-heater would suggest to the mind the apparatus to be used for this purpose, whether a coal water-heater or steam coil.

When writing a plumbing specification, a good plan is to take up one of the subdivisions at a time and state all that is to be said about that particular subject before leaving it and taking up another. Never confuse two or more subjects and jump from one to the other, first stating something about one, then flying off to a second, back to the first and then off to a third. For example, if specifying the water-supply pipe for a building, treat the subject as though there would be no valves in the system, then having disposed of the water-supply pipes, take up the matter of valving under the title "System of Valving," and state explicitly the kind of valves to be used, and where each valve shall be placed. If this system is followed, confusion will be avoided both in writing and in interpreting the specifications. To make this point clear, a paragraph is here quoted from an imaginary specification, so that it can be analyzed to point out what to do to make a specification simple, concise and clear.

## WATER SUPPLY

"WATER MAIN.—From the water main in Broad Street run a 1½-inch extra-heavy galvanized-iron service pipe into the cellar through the front foundation wall. Coat this pipe with a heavy covering of pitch tar, or paint to prevent cor-

rosion. Secure and pay for a  $1\frac{1}{4}$ -inch tapping to the water main. Connect the galvanized service pipe to the corporation cock with a  $1\frac{1}{4}$ -inch double extra-strong lead pipe and brass solder nipple connections. Locate a ground-key stop cock and a cast-iron curb box at the curb. Bury the service pipe line at least 3 feet below the ground and finish with  $1\frac{1}{4}$ -inch plugged T-fitting inside of cellar wall. At the house side of the T-fitting screw a  $1\frac{1}{2}$ -inch brass body gate valve with an emptying cock on the house side of the valve. On the house side of this emptying cock place a  $1\frac{1}{2}$ -inch No Leak pressure-regulating valve. Attach a suitable pressure gauge on the house side of the pressure-regulating valve and set the valve so that it will hold up 40 pounds per square inch pressure in the building, independent of the street variations. From the street side of the pressure-regulating valve take off a  $\frac{3}{4}$ -inch galvanized iron pipe connection, run same to supply a  $\frac{3}{4}$ -inch hose cock, to be located where directed by the architect for lawn-sprinkling purposes, and place a  $\frac{3}{4}$ -inch roundway ground key stop and waste cock on this line in the cellar. Continue from the pressure-regulating valve with a  $1\frac{1}{4}$ -inch galvanized iron water pipe to the several risers. Leave a plugged T-fitting where directed by the architect to supply a steam boiler in the future."

The foregoing imaginary specification is faulty in many ways. In the first place, it starts in to describe the run of the pipe, then swings to the kind of pipe to be used, goes back to the run, then switches off into covering the pipe. Making another start, it takes up permits and payments for tapping, follows with description of method and materials for connection, then jumps to the location of a stop cock and box. Back it goes to the run and depth of the pipe, and again comes back to valves and drip cocks. Next comes a pressure-reducing apparatus, then a pressure gauge, followed by adjustment of the pressure regulator. Back



goes the specification to the run of the pipe, which is left indefinite; next to stop cock, then off to the run of pipe again. Such a specification is not only hard to write and difficult to follow, but is lacking in clearness, simplicity and conciseness. Besides the defects pointed out, the specification is open to the further objection that in parts it is indefinite. A  $\frac{3}{4}$ -inch iron pipe is to be run to supply a  $\frac{3}{4}$ -inch hose bibb "to be located where directed by the architect." That is an uncertainty which can always be avoided by deciding definitely at the time the specifications are written at what point the hose bibb, or whatever other part it may be, will be located, and incorporating the information in the specifications. Not having been stated in the specifications or shown on the plans, the estimator will have to allow the greatest possible run in order to protect himself, and an additional allowance for time in waiting for a decision or hunting the architect for information. In like manner, the location of the outlet for the boiler could and should have been determined upon and the location shown on the plans.

Much of the confusion in specifications of this character can be avoided by showing the water-supply system on the plans. When this is done, the runs and sizes can be marked thereon and can then be omitted from the specifications. If this be done in the fore-going example, it will simplify matters to such an extent that the kind of pipe, connection to the main, valves and pressure-reducing outfit are all that will have had to be covered separately by the specification; the securing of per-

mits and payment for permits and taps having been taken care of in the general condition, "Permits and Plumbing Laws." The whole section describing the run of the service pipe and connections can then be specified in something like the following manner:

**Service Pipe.**—The contractor shall have inserted in the water main, in the street indicated on the basement plan, one  $1\frac{1}{4}$ -inch tap, which shall be connected to the service pipe by means of 3 feet of double extra-strong lead pipe. All that portion of the service pipe buried in the earth shall have one heavy coat of pitch, tar or paint.

The sentence in the description of the water supply that "the water-supply system throughout the building shall be of galvanized wrought pipe with galvanized malleable fittings" sufficiently takes care of the material of the service pipe, so that would not have to be touched upon again, and under the title "System of Valving" the statement "there shall be a  $1\frac{1}{2}$ -inch roundway stop cock, fitted with a long handle, located inside a cast-iron extension curb box at the curb, and a  $1\frac{1}{2}$ -inch gate valve with a  $\frac{3}{8}$ -inch drip valve, located just inside the foundation wall," would take care of the curb cock and valves, and at the same time give more definite information about these points. The pressure regulator is an apparatus, and, with the accompanying pressure gauge, should be separately treated under the subheading of "Pressure Regulator." It will thus be seen that, by uprooting the several tangled subjects and placing each in its

proper place, the description becomes not only simpler and easier to write, but clearer and easier to understand. To prepare a good plan and write a satisfactory specification the designer must be perfectly familiar with the various materials which will enter into the work. The object is to get the very best installation at the least possible cost, and to do so he must know the various grades of goods and be familiar with the various improvements in faucets, valves and apparatus, so that he can select the best suited to the purpose in each case and not be driven to the expedient of specifying the best and most expensive goods for installations when regular stock goods would answer the purpose as well. The designer should be so well posted in the various goods and know so well which are best for each case that he can specify the exact goods wanted. In doing so it is better to select two or three similar grades of goods, any of which will be acceptable, and specify that the material called for shall be one of the makes mentioned, than to call for one make of goods as a standard, or something "equally good." For instance, it is better to state that "all valves used in connection with the water supply shall be Fairbank's, Crane's or Jenkins Brothers's soft seat heavy pattern cast-brass globe valves with wooden handles," than to say the "valves shall all be Jenkins Brothers's soft seat heavy pattern cast-brass globe valves, with wooden wheels, or equally good." In the first case, the designer knows the quality of the three makes specified and, while allowing opportunity for fair competition, assures himself that in any event a

satisfactory make of valve will be used. In the second case the door is opened for the substitution of inferior, light-weight or otherwise unsatisfactory goods, without the benefit of competition, or, on the other hand, stifles competition, for the clause "or equally good" leaves it in the designer's power to object that no valve submitted is equally good, thereby insisting on having Jenkins Brothers's valves used. To protect himself, therefore, a careful estimator will take that into consideration and figure on that make of goods, while other contractors may estimate on the goods specified as a standard, depending later on substituting "equally good" valves if permitted. That is a form of specification often used where favorites are intended to get the work. Any outsider securing the contract would have to install the standard goods specified, while favorites can rely on substituting the "equally good." When a fair, impartial specification is desired the alternative of two or more equal grades of goods is the better plan to follow. The best plan in specifying fixtures for ordinary work is to call for one make of goods without alternative. All estimators are then put upon the same footing and figure on an equally good installation. In very large installations the best plan is to select two makes of goods of similar quality, and specify them as alternatives. In selecting the fixtures however care must be exercised to see that the goods are exactly of the same quality, not specifying them because they look alike and are of the same list price. For instance, one make of closet might be almost noiseless in action, while another very simi-

lar in appearance and of the same price would be extremely noisy. It stands to reason that in such a case equal grades of goods would not be selected.

In specifying fixtures and special apparatus, such as pumps, filters and hydraulic rams, some articles are so much better suited than others to the installation under consideration that there should be no hesitancy in specifying them without reserve. Manufacturers who place upon the market a line of goods of such excellence that they command public confidence are entitled to have their goods mentioned as the only ones acceptable when in the estimation of the designer they are the best for the purpose. Some hesitate to do this for fear of being charged with favoritism, and make the error of specifying certain fixtures, "or equally good." If, however, in the judgment of the designer, fixtures of a certain character are what he believes suitable for a certain installation, he should specify them by catalogue number and without alternative. His client, in placing the work in his hands, has signified perfect confidence in his judgment and integrity, and these he should exercise to the best of his ability. Having specified certain goods, for the reason that they are the best for that purpose, no alteration or substitution should be permitted. This is not to be interpreted as meaning that new materials and apparatus are not to be given a trial, for if such a principal were followed there would be no progress in sanitary matters. What is meant is, that the plumbing in a building having once been planned and specified to the best of a designer's ability, not to change

the drawings or specifications to try something new just then being floated on the market. If the new article promises well, keep it in mind and, if so inclined, try it in the next installation where it will be suitable. By this method the new goods will be in mind when making the drawings and writing the specifications, which can be prepared accordingly. By following this plan there will be no danger of mixing up the specifications by altering them and thus open the door for vexatious extras.

The chief fault of most plumbing specifications lies in the fact that they are indefinite, and leave the contracting plumber to work out problems which should have been settled by the designer and the solution inserted in the plans and specifications. For instance, in a specification recently prepared by a sanitary engineer the following paragraph was incorporated:

*“Ample Water Supply to Fixtures: All water closets and other plumbing fixtures must be provided with an ample supply of water for proper flushing and to keep them in a cleanly condition.”*

Instead of requiring “an ample supply to all fixtures,” the designer should be more specific. He is in possession of data as to the source and pressure of water, and from this knowledge should calculate the sizes of pipes, both mains and fixture branches. Having calculated and specified the various sizes of pipe he knows that the fixtures will have ample supplies, and relieves the contractor of the responsibility of calculating the sizes and doing work which rightly belongs to the designer. The main thing is to be specific. For instance, in-

stead of requiring an ample supply of water to fixtures, state that the supply to lavatories shall be  $\frac{1}{2}$ -inch, to bath tubs  $\frac{3}{4}$ -inch, and to closet  $\frac{1}{2}$ -inch, or whatever other sizes the conditions warrant.

In the same specification also appeared the following paragraph:

*“Expansion:* Due allowance shall be made for the expansion of horizontal and vertical hot and circulation pipes throughout the building, and precaution taken against damage therefrom.”

That is a very vague and indefinite statement to estimate on, and again places upon the contractor the burden of devising satisfactory means. The proper way is to calculate at what points expansion loops will be required, then mark the locations on the plans, show details of them, and cover in the specifications what cannot be shown in the drawings. At all events, the designer should do his own work, not pass it along to the contractor.

To briefly sum up, if specifications are to insure a good, full and complete installation, without extras, and are to provide for fair competition, taken in connection with the plans, they must be complete and clear. If they are incomplete, vague, indefinite, ambiguous or capable of more than one construction, the door is opened to favoritism, disputes, high prices and charges for extra work.

To insure fair competition the specifications must be worded so the bidders will estimate on exactly the same things; nothing should be left to the discretion of the architect, and the contractor should not be required to assume any risks for unknown conditions incident to the work.

A condition which appears in most specifications and which is a condition of weakness, as it does not insure what it calls for, is the clause that "all work and material shall be first class in every respect"; and the sooner the truth about the matter is realized the better for all concerned.

The architect or designer gets no better work and material than he specifically shows and calls for, if he shows a poorly planned and badly laid out system with inadequate water main and other defects of design, the contractor has complied with his contract when he has installed the work accordingly, although it is not a first class job, nor can he be made make it first class under the terms of his contract.

• On the other hand, if the work is well proportioned, properly laid out, the right kind of materials specified and the plumber required to put the work together in such a manner that no tool marks or other abrasions will show, then the architect will secure a first class job, although the words were not mentioned in the specifications. This all comes back to the point that it is the man who lays-out and designs the work who determines the quality. If the planning is not first class, nothing the plumbers or contractors can possibly do will bring it within that class. Sometimes an architect specifies that "all goods shall be the best of the several kinds", then calls for a certain fixture without specifying whether it shall be an A quality, B quality or C quality. Under the terms of such a specification a fixture of either grade would fill the requirement, *provided it was one of the best of that*



*class.* For instance, if a porcelain tub were called for under such a clause, a B or C tub would fill the bill, provided it was the best B or C tub that could be procured. Such a specification is loose in the extreme. It should state specifically whether A, B or C goods are wanted. In the absence of such a statement different contractors, according to the lights, will figure on the different grades.

**Specifying Goods According to Standards.**—A very good way of specifying materials, when it can be done, is according to certain standards laid down in the specifications. Such a method permits of the widest possible competition while at the same time assuring a standard of goods equal to that called for. It must be borne in mind, however, that under such a specification a more rigid inspection of the goods will be necessary than when they are specified from the stock of a well-known and high-grade manufacturer's catalogue, for irresponsible makers are liable to take a chance on goods which to a casual inspection seem up to the standard, but do not bear a close examination. Such pipe is among the materials which are specified according to standards, and even though the sizes, weights and other properties of soil pipe are generally specified, many manufacturers ship goods that are far from being up to the standards. Extra heavy soil pipe often has considerable below the specified weights, while in other cases it is far from being "sound cylindrical and smooth, free from sand holes and other defects." In large buildings, where many fixtures are to be used,

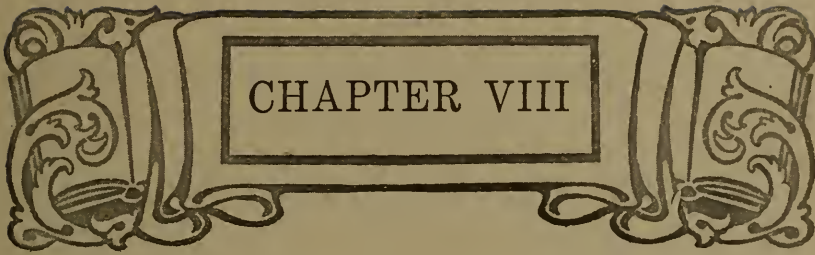
drawings can be made of them if special designs are wanted, or a specification can be made up from a fixture which has already been found satisfactory in use.

A good example of specifying according to standards may be cited in the case of floor connections for water closets and slop sinks. Metal-to-metal connections are now becoming rapidly adopted in practice, likewise flexible bends for connecting water closets and slop sinks to drainage systems. To have to select certain types of floor connections or lead bends for each installation is a difficult matter, and the best way is to specify according to standards. A provision for floor connections which is applicable to all approved floor flanges may be written as follows:

**Closet and Slop Sink Floor Connections.**—Closets and slop sinks shall be connected to the drainage system by means of adjustable, flexible, metal-to-metal floor flanges. The use of putty, paste, cement or gaskets of any kind in the drainage system is absolutely prohibited.

A section like the following will insure the use of expansion and settlement fittings which will prevent damage to the system or fixtures:

**Lead Connections for Closet and Slop Sinks.**—Each water closet and slop sink shall be connected to the drainage system with at least 3 inches of lead pipe intervening between the floor flange and the soil pipe. This lead pipe shall be corrugated with at least two corrugations to make it flexible so it will give under shrinkage or settlement without damage to fixtures.



## ANALYSIS OF SPECIFICATIONS



### INTERPRETATION OF PLANS AND SPECIFICATIONS

**T**HERE are many paragraphs in specifications, particularly under the heading of "General Conditions," which might seem unnecessary. There is nothing which enters into the wording of a specification, however, which is not an important part of that document, and does not serve a useful purpose, as the following analysis will show. Specifications usually start out with a paragraph to the effect that the plans and specifications are to be construed together, and that anything shown on the drawings but not mentioned in the specifications, or anything mentioned in the specifications but not shown on the drawings, shall be included in the work as though fully shown and mentioned in both the plans and specifications. This at first thought might seem an unreasonable requirement, but it is far from being so. The conventional symbols used to designate plumbing work, fixtures or apparatus on drawings might not always be clearly

indicated, may be so confused by other lines as not to be recognizable, or might be omitted altogether, in any of which cases they would not be seen or recognized by the estimator. If, however, in the specifications specific mention is made of these materials, apparatus or fixtures, he is put upon inquiry, and can find out if such goods are to be included. If he fails or neglects to do so it is at his own risk. If, on the other hand, the work, fixtures or apparatus are clearly shown on the drawings but not mentioned in the specifications, here again he is put upon inquiry, and neglects to find out at his own cost.

A further condition of this section usually is that any material or labor obviously required to complete the work shall be included in the specifications as fully as though mentioned in the specifications and shown on the plans. This paragraph is intended, however, to include such necessary materials only as screws, bolts, brackets, etc., without which the fixtures could not be secured in place, and must not be mistaken to include materials which are necessary to the complete work but which might be supplied by some other contractor. For instance, the marble stalls for urinals, compartments for water closets and wainscoting in toilet rooms are sometimes included in the plumbing specifications, and at other times in the specifications for marble work. If mention of these stalls and compartments is omitted from the plumbing specification, and nothing on the plans indicates that this material is to be furnished by the plumber, it cannot reasonably be considered part of his con-

tract, although shown on the plans and obviously necessary to the completion of the plumbing work. The reason for this is that marble is not distinctly a plumbing material, and, therefore, the estimator is not put upon inquiry if the matter is not in some way, on plans or in specifications, indicated as belonging to the plumbing contract. The same may be said of the kitchen range, which sometimes, but not usually, is furnished by the plumbing contractor. To put the estimator on inquiry, the work or materials shown must be distinctly plumbing work or materials, and not work and materials which are sometimes made part of a plumbing contract. He is justified in believing, when no mention is made in his specification of the latter class of goods and work, that he is not to estimate on them. Materials and work obviously necessary to complete the plumbing work can only be stretched to cover little details belonging to fixtures or work already specified, but cannot be extended to include entirely new fixtures or separate lines of pipes. For instance, it would be obviously necessary to make tight the joints around vent pipes where they are extended through the roof, and the flashing of pipes at this point would be part of the plumbing work; but escutcheons and sleeves are not necessary where pipes pass through walls and ceilings, and would not be required unless specified. It might be well to add that while it would be necessary for the plumbing contractor to make tight the joints where vent pipes are extended through the roofs, in the absence of a city ordinance, or a clause in the specifications directing how they shall be

made tight and the weight and quality of materials to use, he is justified in suiting his own views on that point.

**Description of Drawings.**—To prevent the accidental or intentional substitution of plans instead of those estimated on, and on which the estimate and contract are based, it is a good, safe practice to describe the drawings in the specifications and for the owner and contractor, or the architect and contractor, to sign them for identification. In case of after-disputes, if the case goes to court, matters are thus simplified by having as a signed part of the contract and record the plans and specifications on which the contract is based. In some specifications a clause is inserted reciting that the plans and specifications are the property of the architect and must be returned to the architect before final payment will be made. This claim of the architects of ownership of the plans and specifications has been repeatedly denied by the courts, but, outside of the legal status of the case, the logical view would seem to indicate that the plans and specifications forming as they do part of the plumbing contract, as such belong exclusively to the plumbing contractor, which he should preserve for his own protection; and to ask or insist on him returning the drawings and specifications is as unreasonable as to require him to surrender his written contract of which they form part. The clause is such a senseless one, and of so little account to the architect, that it is as well omitted.

**Permits and Plumbing Laws.**—Permits are usually required and fees exacted for opening streets, connecting to street sewers, and tapping water mains; and, so the question by whom the expenses will be borne cannot later arise, a clause is usually inserted in every plumbing specification explicitly stating that the plumbing contractor shall pay for and secure all permits. In the same section a clause is inserted making the plumbing laws and regulations of the city in which the work is to be performed part of the contract, in so far that the contractor must observe all such laws and regulations and install the work in conformity with them. This clause closes the doors on “extras” due to the fact that some work or material is not acceptable to the plumbing department, for the plumber, who should keep posted as to the requirements of the health and building departments, is supposed to have been aware of any difference between the plans and specifications, as prepared, and the plumbing laws, and to have covered himself accordingly by estimating on the method entailing the greater expense.

**Number and Location of Fixtures.**—In the specifications it is well to specify in tabular form the number of each kind of fixture that will be installed in the building and the floors on which they will be installed. This tabular statement has reference to the number of fixtures and not their kinds, which are treated in separate paragraphs. It is well, likewise, to state the number of apparatus, such as pumps, meters and filters, that will be re-

quired, so that the number of every kind of fixture and apparatus to be used can be seen at a glance. This table serves as a check for the estimator, so he will not be likely to overlook any of the expensive items entering into his work. It is assumed, of course, that he will check up the number of fixtures specified with those shown on the plans, and if any discrepancy is found to bring the matter immediately to the attention of the architect. It might be well to add in this place that when a discrepancy between the plans and specifications is brought to the attention of an architect he should make the correction immediately and notify all who have estimated on the work, so that they can take the correction into consideration and estimate on an equal basis with those who take off their items after the correction is made. In like manner, if the drawings or specifications are so incomplete or ambiguous that verbal information is required to explain them, the plans and specifications should be amended or corrected, and notice sent to all who have estimated on the work. It is desirable that the architect check up his own work to see that the number of fixtures shown on the drawings and called for in the specifications tally, for if they do not, in order to protect themselves, the contractors will have to estimate on the highest quantity called for. The architect should make sure that his drawings and the quantities stated in his specifications are correct, and he will not then be forced to place in his specifications the humiliating statement that he is not responsible for the quantities stated. If anybody is supposed or ought to know what mater-



ial and fixtures are going in a building it is the architect, and when he expresses himself as having no confidence in his own work others cannot be expected to have confidence in it.

A concise way of showing the number of fixtures in a building in a convenient tabular form, so the fixtures on the various floors can easily be checked, is shown in the following table:

NUMBER AND LOCATION OF FIXTURES

Location of Fixtures	Water Closets	Lava- tories	Bath- tubs	Sinks	Laundry Tubs
Basement.....					
First floor.....					
Second floor.....					
Third floor.....					
Fourth floor.....					
Fifth floor.....					
Sixth floor.....					
Seventh floor.....					
Totals.....					

The items in such a table can be extended to include every type of fixture to be used within the building and the number of stories can be increased to any extent.

By using such a table the probability of overlooking any of the fixtures is reduced to the minimum.

**Superintendence and Inspection.**—To facilitate the work of installation it is necessary to have some one present at all times with authority to act for the plumbing contractor. This may be the journeyman doing the work on small jobs, or a spe-

cial foreman on large installations; but whoever it may be should be vested with sufficient authority to act in the stead of the contractor in any of the ordinary problems which arise for consideration from time to time as the work progresses.

In the absence of a plumbing law to the contrary, or a clause in the specifications preventing such a course, the plumber, as soon as his work is completed, can cover it, thus concealing any defects from sight. To prevent such practice, a clause should be inserted in every specification stating that no work shall be concealed from sight until passed by the architect, his representative or whoever has charge of the work.

**Beginning and Termination of Work.**—In writing specifications, it is well to take into consideration both the time and point of beginning work, how it shall be proceeded with and when completed. In many large cities, contractors of no financial responsibility secure work on a tempting bid, with no intention of proceeding with the work for the price, but intend, by holding back the completion of the building, to force a larger sum from the owner than would be required by a responsible concern to do the work, besides having their bills guaranteed for them. Sometimes they are bought off at a good round figure by the owner, who is glad to be rid of them at any price.

To prevent such practice, the specification should declare when work on the contract shall begin, how progress, and when terminate, with the relief to be afforded the owner in case the con-

tractor fails to fulfil the terms of the contract. Such a section may be worded something like the following :

“The contractor shall begin work on the installation of the plumbing within three days after signing the contract, and shall proceed with his work in such manner as not to hinder the other workmen or delay the completion of the building. By the time the building is ready for lathing (if a frame building), or by the time the floor arches are in (if a steel frame building), the rough plumbing, consisting of the drainage system in the basement, all the stacks of soil, waste and vent pipes, all supply pipes, and the lead roughing for toilet and bath rooms shall be in place and tested. The fixtures in the various toilet and bath rooms shall all be set in place and connected ready for use within six days after the respective rooms are ready for the plumbing fixtures to be set.”

“If at any time the contractor gets behind with his work and fails or refuses to put on a sufficient force of men to catch up with the other contractors, or if at any time he shall neglect or refuse to proceed with his work for two consecutive days, the owner, after two days' notice, may consider the work abandoned and purchase all necessary material and employ all necessary labor to complete the work according to the terms of the contract. If after completing all work there be a balance in favor of the contractor, the same shall be paid to him; whereas if there be a deficit, the contractor shall refund the amount.”

Usually, with such a clause in the specifications, the two days' notice is sufficient to induce a contractor to proceed with his work.

It is well to specify explicitly where the work of installation will begin. For instance, a very good practice that applies equally to all types of building is to have the house sewer, including the main drain trap and fresh-air inlet, also the water service, installed under a separate contract before the work is commenced on the superstructure of the building. By this arrangement all the trenching can be done at one time, both for the foundation walls and the service and drainage pipes, thus avoiding the inconvenience of having the street opened while the superstructure is being erected. Furthermore, the sewer provides means for draining the cellar, and the service pipe furnishes water for building purposes. When this practice is followed there is no work to be done in the street and no permits to secure and pay for, so that the specifications relating to permits may be omitted and a paragraph something like the following inserted:

“The house sewer, fresh-air inlet and service pipes are already installed to the inside of the foundation wall. Beginning at that point the contractor shall furnish all materials and labor to complete the plumbing work according to the plans and specifications.”

**Changes from Plans.**—The aim of some contractors, once they start work on a contract, is to have some change made from the plan as originally drawn, so the contract cannot be lived up to, and

the work then becomes a sort of day affair for which they can charge whatever they please. To guard against such individuals, as well as to be prepared for any emergency, it is well to insert a clause in the specifications stating just what effect a change from the original plans will have on both parties to the contract, and reciting what forms will be observed in case it is found necessary to deviate from the work as originally planned. It is well to always require that the contractor shall have a written order authorizing him to do extra work, without which any claims for extras will be ignored and payment for such claims refused, and the means for determining the cost of extra work should be specified in case of a disagreement between the contractor and owner or architect should arise. A good provision is to specify that in case of a disagreement between the contractor and owner, or contractor and architect, as the case might be, a third person who should also be named shall decide; or else, that the cost shall be determined by arbitration, if an arbitration clause has been incorporated in the specifications.

**Verbal Instructions About Plans and Specifications.**—Whenever, in the course of estimating, it becomes necessary for a contractor to resort to the architect to explain or make clear some provision in the drawings or specifications, such correction should be made immediately upon giving the explanation so the contractor will be justified in depending on the verbal instructions the architect gives him. For instance, the labor of excavating

for the plumbing pipes is sometimes specified in the general specifications as part of the mason's work, and in the plumbing specifications as part of the plumber's work. Likewise, the cutting and patching throughout the building is sometimes included in both the carpenter's and the plumber's specifications.

If, in such a case, the plumbing contractor asks for information as to who shall do the digging, cutting and repairing, and is told that such work will be done by the mason and carpenter contractors respectively, but no change is made in the plumbing specifications by crossing out the section making it the plumber's duty to do such work, the plumbing contractor, to protect his own interests, must estimate on doing the work. as he can be held to perform it in case he signs a contract to furnish all materials and perform all labor according to the plans and specifications. The only course for the architect to pursue in such a case is to decide immediately the matter is called to his attention, and cross the provision or requirement out of one specification, leaving it in the specification where it rightly belongs.

**Prices for Extra Work.**—Much trouble and many after-disputes can be avoided in large operations by requiring in the bid a table of prices, which can be agreed upon beforehand, to be paid for extra work, or to be deducted for work or fixtures which are omitted. In making up the schedule of prices, the plumber can charge his regular rate of wages for his workmen when sent out on jobbing

work, and can deduct the time that would be required to do certain work at the regular rate of wages price. The object is not to deprive the contractor of his just profits, but to furnish a basis for the ordering of extra work, for it is extra work instead of omissions which is more often ordered. The cost of fixtures can likewise be listed with a fair and reasonable margin of profit.

**Arbitration.**—A clause is sometimes incorporated in the specification stipulating that in case of disagreement between the parties to the contract that the matter shall be decided by arbitration. In such cases it is generally provided that three arbitrators shall decide the points in dispute; that each party to the contract shall select one arbitrator and the two arbitrators so selected shall choose the third, and the decision of the three so chosen shall be final. If plumbing plans and specifications were always rightly prepared there would be no opportunity for disagreements to arise, but, as in the absence of proper drawings and description, many designers resort to catch clauses or salvation clauses to protect themselves from their own ignorance or stupidity, an arbitration clause will be found a protection to the contractor, as the arbitrators deciding the case will exercise sound business judgment, unfettered by the rules of legal procedure which hedge around a case in court, and their decision can be depended on to be a just one. It might be well to add that, in the case of trial by arbitration, the finding of the arbitrators will be held final in court, so practically there is no appeal from their

judgment. A further advantage of arbitration is the fact that the case can be settled without loss of time, as would be the case in court.

**Salvation Clauses.**—When a clause to the effect that “The work shall be under the general supervision of the architect, whose decision as to the true intent and meaning of the drawings and specifications will be final and conclusive,” or any other salvation clause of like purport, appears in a specification, it is a written confession that the person who prepared the plans and specifications in question did not understand his business, knew his limitations, and is trying to protect his ignorance by hedging himself around with a number of clauses which, in matters of dispute, vest him with unlimited arbitrary authority to decide the case in his own favor, regardless of the merits or justice of the case. If plans are properly prepared and specifications capably written there will be no question as to their true intent and meaning; if they are not clear and explicit, it is the construction put upon them by the reader, not the writer, which should be final and conclusive. The designer in preparing his drawings and specifications knows, or ought to know, what he wants to show and describe. Having this knowledge and ample time at his disposal, he is supposed to have made a record of his desires. If through ignorance or lack of ability he fails in his effort, he alone is the one who should stand responsible for the failure. Such designers, however, usually try to shift the responsibility to the contractor by reserving to themselves unlimited arbi-



trary power, concealed in innocent-looking salvation clauses similar to the one quoted. When an estimator is given a set of drawings and a specification on which to base his estimate for work, he is justified in believing that the architect or engineer has expressed himself fully and clearly in his work. He cannot read the designer's mind to learn what was intended, but must base his estimate upon his interpretation of the drawings and specifications furnished him. If the designer had one thing in mind, but unable to express it, has conveyed an entirely different impression, or has left much unsaid and undrawn which he had planned in his mind to show and state, the contractor should not be called upon to include such work and material in the contract as fully as though shown by the plans and described in the specifications, but this he can be made to do under the salvation clauses of ignorant or dishonest architects or engineers.

**Guaranteeing Work and Materials.**—A section requiring that the contractor guarantees his work against defects in workmanship and materials for a period of two years from the date of completion is sometimes incorporated in a specification. Such a condition, however, is better left out. With the exception of a very few grades of fixtures no materials entering into the makeup of a plumbing installation are guaranteed. Care is exercised to send out only goods which are sound, flawless and in good merchantable condition, but if after the lapse of several months, or weeks, for that matter, the goods fail for any reason, it is at the owner's

expense. As the materials which the architect specifies are not guaranteed, the insertion of a clause in a specification requiring the plumber to guarantee other people's wares imposes upon him the duty of an insurer of goods, and if the contractor be a responsible one he will allow in his estimate a sufficient amount to cover any possible damage, however remote, which might occur during the two years he is responsible for the plumbing. Irresponsible contractors might ignore the clause, having no intention of living up to it, but in that case the responsible contractor is put at a disadvantage and might lose the work to an indifferent and irresponsible one on account of the guarantee. At its best such a clause is an additional expense to the owner. With the merchantable goods now on the market the repairs due to defective materials in the two years succeeding completion of a contract will be so slight that they will cost the owner much less than a responsible contractor will exact for guaranteeing the work for that length of time. He has to figure on possibilities to protect himself, while the owner would have to pay only for actual repairs.

**Payments.**—It is well to state in the specifications the plan of payment. Where the terms of payment are not stated, many contractors are frightened off from big work by the fear that a large amount of their working-capital will be indefinitely tied up in the building. The terms of payment are of as much importance to a careful contractor as is the ownership of the buildings, or

who is to superintend the installation; and he is entitled to know this important fact before submitting his bid. Another important consideration to bear in mind is the fact that when everything appertaining to the contract is stated in the specifications, a simple line accepting the offer of the contractor "to furnish all labor and material according to the plans and specifications," for a certain amount, closes the contract without further formality. It does also when the terms of payment are not stated in the specifications, but in such case the contractor is not entitled to payment until the work is entirely completed and accepted. Of course, that right of the owner to have the work completed before payment can be waived, and usually is waived, but the uncertainty as to terms often deters a responsible concern from estimating on work.

On small installations, payments are usually made in three different stages of the work. The first payment is usually made when the roughing-in is completed, and the amount is based on the net cost of the work to the plumber, less a certain percentage, usually 10 per cent., held back until the final payment, as a protection to the owner in case the contractor refuses or is unable to proceed with his contract. The second payment is usually made when all fixtures and finishing materials are delivered on the premises, and the final payment when the work is satisfactorily completed and accepted.

In large installations the work is usually paid for monthly, on certificates from the architect, who

deducts 10 per cent. from each monthly payment, which is reserved for the final payment.

**Temporary Closet Accommodations.**—Some toilet facilities are necessary for the workmen while engaged in erecting the building, and temporary closet accommodations are always provided for in the specifications for large installations, unless the temporary accommodations have been provided for before the plumbing contract is let. Ordinarily one water closet or its equivalent in a range closet will be sufficient for each fifteen men engaged on the building. The location and manner of connecting the temporary closets to the drainage system are so much a matter peculiar to each installation that no further information regarding them can be given.

**Reading Elements Into Specifications.**—Architects often unreasonably assume that because they have specified certain work to be installed, without stating in detail how the work is to be done, but have inserted a salvation clause to the effect that “all work must be done to the satisfaction of the architect,” materials not shown on the plans or called for in the specifications, either specifically, or by implication as obviously necessary to the completion of the work, must be provided to fulfil the contract. Such a position is unwarranted and unreasonable. Under the salvation clause mentioned, any work actually specified can be made to conform to the architect’s satisfaction, provided the unusual is not exacted.

For instance, if extra heavy soil pipe be specified for the vertical stacks of soil, waste and vent pipes which are shown run exposed, and nothing is said as to what make of soil pipe shall be used, any merchantable grade of pipe will comply with the requirements of the specifications. Of course, there is a vast difference in appearance between different makes of soil pipe. The product of some manufacturers is straight, smooth and of the very best workmanship, while that of other manufacturers is rough and not of such good quality.

It is customary in writing plumbing specifications to state that the pipe "shall be sound, cylindrical and smooth, free from sand holes, cracks and other defects," but in the absence of any such clause the architect would not be justified in condemning work and requiring the substitution of a better quality of pipe or the filing and sandpapering of that already in, because it is exposed and he wants the work to present a smooth, attractive appearance. If any such unusual requirement was in the architect's mind, and was to be enforced, it should have been stated in the specifications, and if it was not, any good quality of pipe would comply with the wording of the specifications. Further, no salvation clause can read materials into a specification that are not specifically or by implication called for. To illustrate: in the foregoing example of soil, waste and vent stacks, if thimbles are not shown on the drawing nor called for in the specifications where the pipes pass through walls and partitions, nor escutcheons required at floors, ceilings and walls, such materials would not be re-

quired according to the correct interpretation of the plans and specifications, and to insist on them being installed as part of a contract, on the ground that the work must be done to the satisfaction of the architect, is reading an element into the plans and specifications which does not really exist; and is an injustice to the contractor as well as dishonest in the architect or engineer. The rule is that any work called for or materials specified must conform to the standard for such work. Interpreting a salvation clause strictly as it should be interpreted gives that much and no more authority to the architect. Insisting that the work specified conform to his satisfaction does not give the architect power to insist on work not specified, and require that it be up to the standard of the work actually specified.

Honesty and fair dealing must obtain between architect and contractor, if both are to be satisfied and successful in their respective callings. If the plumbing contractor is constantly trying to misconstrue provisions in the specifications into some advantage to himself, it will not be long before his name will be dropped from the roll of eligibles in the various architects' offices. The architect, on the other hand, if he exact more than his plans and specifications call for, on the ground that he will withhold payment until his unreasonable demands are complied with, will soon find that contractors have learned his work is not worth having and will refuse to estimate on his contract.

When such a state of affairs comes about the architect will find himself in the position of a

couple of big institutions in the country where, for fear they will secure the work, all contractors double the cost of the estimate and add from 50 to 100 per cent. for profit. It is needless to say that the institutions spoken of pay for their plumbing work more than double what a like amount and quality would cost fair-dealing individuals.

**Specifying Weights of Pipes.**—There are no standard weights for pipes established by law for the grades known as strong, extra strong, heavy, extra heavy and standard, and while the weights corresponding to the grades are generally established by agreement among manufacturers, there is nothing to prevent manufacturers outside of the association, or even those within, manufacturing a lighter grade of pipe and designating it by the usual trade name; consequently, when specifying lead, iron, brass or other kind of pipe, it is well to not only specify it by the trade name for that weight, but to append a table of weights to which the pipe must conform.

**Weights and Quality of Brass Goods.**—There is no uniformity in the manufacture of brass goods used in plumbing, and no official or government standards to which they must conform, so in order to insure a proper grade of brass work being supplied, not only the weights, but likewise the quality of brass, should be specified.

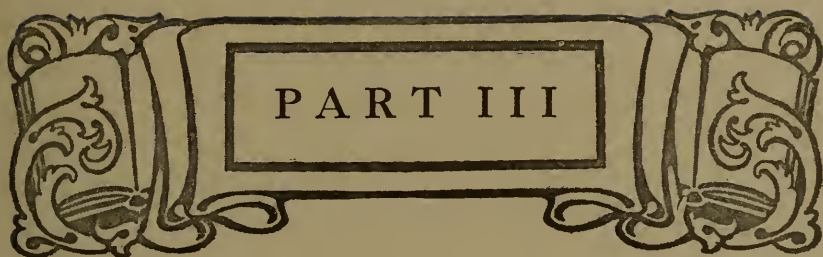
**Testing the Drainage Pipes.**—In the absence of a plumbing law requiring that the drainage system be tested before being passed by the inspector, it is not necessary for the contractor to test the

work unless expressly called for in the specifications. For this reason a clause should be inserted in every specification requiring the contractor to test the entire drainage system in the presence of the architect or his representative, and specifying how many tests shall be applied and how they shall be made.

**Connections to Drains.**—In the absence of drawings showing the kind of fittings to be used, in cities where there are no plumbing codes, almost any branch from saddle hubs to T fittings may be used, unless Y branches are called for in the specifications. For this reason it is well to specify just what kind of fittings will, and what will not, be allowed in the work, and likewise state, if not already shown, the distance from doors, windows and other openings that vent pipes must end.







## PLANNING PLUMBING WORK



### CHAPTER IX

#### REQUIREMENTS FOR VARIOUS TYPES OF BUILDINGS



##### GENERAL REQUIREMENTS

**E**VEN though a designer knows what symbols to use, how to indicate plumbing work on plans, how to lay out the work, write the specifications and superintend the installation, he will sometimes be at a loss to know just what kinds and number of plumbing fixtures will be required in buildings of different classes. Very few architects are called upon during their business careers to build a prison, library, church, hotel, public comfort station, hospital, sanitarium, school, court house, Y. M. C. A. building, theater, or like structures; yet, if commissioned to do so, must be able to rise to the occasion. Numerous works can be had teaching them the principles of design, and architectural papers are full of good examples of the

different classes of buildings; but nowhere can there be found an authoritative work analyzing the requirements and pointing out just what is desirable in the way of plumbing in buildings designed for different purposes. In this section, therefore, an effort is made to supply this much-needed information. Examples of the various classes of buildings are shown, but no effort is made to indicate the layout of the plumbing systems. Instead, only the architectural requirements in the way of plumbing appliances are considered, and any plumbing plans or details incorporated are more in the nature of incidental matter thrown in for whatever value they may possess.

It is assumed that if the designer knows just what plumbing fixtures and appliances are required in a certain type of building he either knows, or can learn from the preceding chapters of this work, how to indicate them on the plans.

Wherever people live or congregate for a period of time, toilet accommodations must be provided for their comfort. For instance, temporary grand stands for viewing parades, likewise ball grounds and stadia for the holding of field games, must all have plumbing fixtures for the accommodation of the patrons of the games or sport, even though they are assembled there only for a short time; while buildings where people reside must likewise be well supplied with sanitary conveniences; and each class of structure will possess conditions peculiar to itself and present problems which differ more or less from the others.

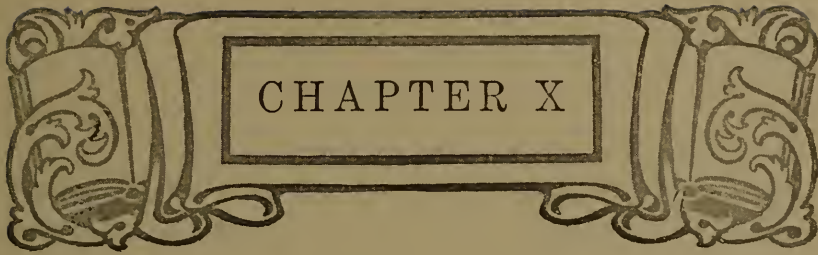
The first consideration when designing the plumbing for any class of structure is to find the source of water, and learn where and how the sewage will be disposed.

If no system of sewage is available, the method of treating and the place of final disposal of the sewage must be worked out before the plumbing work within the building can be intelligently designed. If, on the other hand, a system of sewers is available, the depth of the main sewer in the street must be ascertained to see if there is sufficient fall for a gravity discharge or whether sub-sewer ejectors will be required for the basement and sub-basement floors of the building.

No less important is the source, quality and pressure of the water supply. If a pure filtered water can be had from street mains, under sufficient pressure to supply all fixtures in the building, the problem simmers down to proportioning the sizes of supply pipes, securing an adequate main from the street and laying out a suitable and economical system of pipes. Should the water be hard, however, the question of softening must be considered, if hard water is undesirable. If, again, the water is from a surface source, and unfiltered, whether delivered through city mains or impounded for the particular building, filtration should unquestionably be resorted to, and the question of what method to employ would naturally follow. For country institutions the securing of a water supply is sometimes a difficult problem, and the method of elevating and storing the water must likewise be carefully considered. When the out-

side problems of sewer and water supply are fully worked out, and planned up to the foundation walls of the building, the real work of planning the plumbing work within commences, and the different problems will be considered under the classes of buildings to which they belong.





## CHAPTER X

### PLANNING THE PLUMBING FOR RESIDENCES



OF ALL classes of buildings the home is the most important. Here the family spends most of its time, and no detail which will conduce to its convenience or comfort should be omitted. Of all details which enter into the building of a home, nothing adds so much to the comfort and welfare of the inmates as plenty of water. This necessity for plenty of running water in residences is reflected by the tendency of the times toward a bath room in connection with each sleeping-room or in connection with each suite of rooms. Where lack of space or other considerations prevent the installment of a bath room in connection with each bedroom, one bath room is made to serve two or more rooms, and in the more moderate-priced houses one bath room is made to serve for the whole family.

Where bath rooms are not provided in connection with sleeping-rooms, provision is made, where cost permits, for running water in every bedroom. With a lavatory in each sleeping-room or in a dress-

ing-room adjoining the sleeping-room, one bath room can be made to serve very nicely for the whole family, provided there are toilet accommodations in the servants' quarters. When considering the cost of installing stationary lavatories in the various sleeping-rooms, it should be borne in mind that, if stationary lavatories are not provided, portable basins, pitchers and wash stands will be required in the furnishing of the bedrooms; and, unless the runs of pipe are particularly long and difficult, stationary lavatories will generally be found the cheaper of the two methods.

Where only one bath room is provided for a family, a good plan is to locate the water closet in a small compartment adjoining the bath room and accessible from either the bath room or the hall. By this arrangement the closet will be accessible while the bath room is in use, and, conversely, the bath room will be accessible when the closet compartment is occupied.

This requirement of separate bath-room and water-closet compartments is not necessary where there are two or more family water closets in the building, and, on account of space, it cannot always be had in buildings where there is only one bath room. The layout is worth bearing in mind, however, for use in places where it can be applied.

**Bath-Room Fixtures.**—The question of what fixtures to put in a bath room is one which generally can be answered only by the owner of the building, and no doubt will be settled by his wife. Women, as a rule, take a particular pride in this

part of the home, and have their own opinions of what it should contain. Of course, there will be the three usual fixtures—closet, lavatory and bath tub. If there is a shower, also, it is a concession to the male part of the family, for comparatively few women like a shower bath. If a shower is to be part of the equipment, the designer has choice of a variety of designs, from the simple shower above the bath tub to a complete needle shower and spray bath set over a receptor. It may be possible that the owner wishes hydroelectric baths or light baths in addition to the usual outfit, in which case provision must be made for the apparatus.

Bidets or bidet attachments to water closets may be part of the equipment desired by some owners, while foot baths or sitz baths might be desired by others. It is well when taking up the matter of fixtures with the owner to call attention to the various kinds of fixtures and explain their various uses. Oftentimes fixtures are omitted for the only reason that the owner is not aware that such appliances are made, or, if he knows, is not familiar with their uses.

Urinals are seldom used in private houses nor is there a demand for them. Ordinarily a water closet will serve the purpose far better and with much less offense. When installed, urinals are generally placed in a compartment adjoining a billiard room or some other part of the house where men congregate.

No less important than the kind and number of bath room fixtures, is the size and quality. If comfort is to be had while taking a bath, the archi-

tect must see that the fixture is large enough so the bather will not have to fold up in order to get inside; and that along with its other dimensions, it is deep enough, up to the overflow, so that the user will be at least partly submerged. Bathtubs range in size from  $4\frac{1}{2}$  feet to 6 feet, and it is safe to say that nothing less than a  $5\frac{1}{2}$ -foot tub should be installed in a private house. The bath room likewise should be large and roomy. There is no comfort in using a fixture in a narrow, cramped room, where the bather cannot move his arms without fear of bumping elbows or knocking something onto the floor. A bath room with a floor space of from 50 to 60 square feet is a fair size for an ordinary building, while for more pretentious houses they may run as high as 100 square feet or more.

**Slop Sinks.**—In the ordinary small dwelling-house there is no crying need for slop sinks, but in great rambling country homes or large city residences slop sinks scattered throughout the building on the various floors will save their cost in wear and tear on other fixtures which otherwise would become damaged by pails and other vessels used for drawing water and emptying slops. Besides, if slop sinks are not convenient on the several floors servants are liable to use lavatories, bath tubs or like fixtures in their stead, a practice which would be anything but commendable. When slop sinks are installed they may be located in closets or small rooms which serve the purpose of containing the pails, brooms, mops and other articles required by the servants in cleaning the rooms.



**Nursery.**—For the large house which contains a nursery it is well to bear in mind that there are children's fixtures which may be fitted up in a child's bath room located conveniently near. The child's closet is only 12 inches in height, and made in proportion, while the child's bath tub is set on a pedestal intended to raise the fixture a convenient height, 30 to 33 inches, for the nurses to bathe the children without discomfort. So far no lavatory has been designed for children, but they can be made on demand and are only awaiting the order. No doubt low-down fixtures designed in proportion to their height would find a ready field not only in nurseries but in foundling asylums, schools and other places where a large number of small children are housed.

**Kitchen Fixtures.**—A kitchen sink with a suitable drain board is the only real kitchen fixture if the hot water tank is omitted. Of course, in some kitchens the laundry tubs are likewise located there, but laundry tubs belong properly to a separate compartment—the laundry. If an ice box is to be located in the kitchen or pantry, provision should be made for carrying off the drip; but outside of such fixtures no other provision need be made in the kitchen of a residence.

**Pantry Sinks.**—If the house has a pantry, a pantry sink will be found desirable. This may be of any material, but porcelain or copper is preferred, with high goose-neck pantry cocks. Usually the cold-water pantry cocks have hose ends for attaching so-called "filters." The little reversible

strainers attached to them, however, fall far short of being filters. Indeed, they are more in the nature of incubators where innumerable colonies of bacteria are cultivated, and the water is better drawn direct from the cock without passing through the strainer.

**Laundry Fixtures.**—In the moderate-priced homes, the laundry trays are located either in the kitchen or in the basement, and much may be said in favor of each location. If the laundry is located in the cellar it necessitates an extra stove for boiling the clothes and imposes extra work on the servant carrying the clothes down to wash and up again to hang out, to say nothing of the extra steps that must be taken answering rings at the door bells. Further, it makes inconvenient the servant's work, for she cannot well do her washing and at the same time tend to the meals which are cooking. On the other hand, if the laundry is located in the cellar and well partitioned off, there is less danger of the steam and odor permeating the living-rooms.

In the larger, more expensive homes a separate laundry, located on the ground floor, adjoining the kitchen, will be found desirable. This will afford light, air and easy access to the yard to hang out clothes, as well as a direct means of approach to the outside doors, and supervision of the kitchen. The completely equipped laundry will have three laundry trays, a washing-machine, either power or hand; centrifugal wringer or separator for removing the free water from clothes; a clothes drier and

a gas-heated hand mangle. Provision should be made in the yard for drying clothes in the open air during favorable weather, the driers being reserved only for stormy days. Of course, an iron stove, which can be used also for boiling clothes, and the usual ironing horses and other portable pieces will likewise be required, but the latter partake more of the nature of furnishings than fixtures.

So far no manufacturer of plumbing goods has had sufficient enterprise to adapt an ordinary portable washing machine, such as are sold by hardware stores, and are run by water motor or electric motor, to an ordinary laundry tray. This is a matter which could easily be done, and there is a large field awaiting such a fixture.

**Hot Water for Residences.**—In planning the hot-water supply for residences, the possibility of an adequate and economical supply without the usual hot-water tank and range waterback should not be overlooked. In residences where gas is used for cooking purposes, hot water for domestic use may likewise be heated at small cost by means of a Ruud type of water heater. Very little fuel is required by the pilot light, which is all the fuel used when water is not being drawn, while at the same time an inexhaustible supply of hot water is constantly at hand. In addition to the Ruud type of heaters there are apparatus which heat water instantaneously with gas but are available only for a few fixtures. These heaters may be had at low cost, will prove very satisfactory in many of the cheaper residences where a permanent supply of

water is out of the question, and will be found equally serviceable for heating water at summer homes and camps. When desirable, alcohol, kerosene or gasoline may be used as a fuel instead of gas.

**Filter.**—Every residence supplied with water from a surface source, which is not filtered, should be provided with a germ-proof filter of suitable size to sterilize all water entering the premises. Filters are not so costly that they would be dispensed with on that account, and if the owners of residences had explained to them the value and protection to health afforded by this means it is safe to say that not 10 per cent. of them would be without one. As the filter is located in the cellar, where it is not often seen, it is liable to be overlooked unless mentioned by the architect.

**Doctors' and Dentists' Homes.**—A doctor's home differs from an ordinary home only when his office is located there. Under such conditions the doctor's office may well be located in one wing of the building, isolated from the home proper. Just what will be required by a doctor will depend on his practice and the extent to which he wants to go in fitting up his office. If surgical operations are to be conducted a more elaborate equipment will be necessary than for a general practitioner. At all events, a disinfecting-room containing a shower bath should be part of every office suite, so that the doctor can thoroughly disinfect his clothes and person, after being exposed to contagion, before entering his home proper. If surgical cases are to

be operated upon, in addition to the floor drain and running water for the operating table a hospital slop sink and hospital lavatory with foot valves will be found convenient. Usually, however, the physician has his own opinion of what is wanted and all that is necessary is to follow instructions. At all events, the best plan would be to consult him.

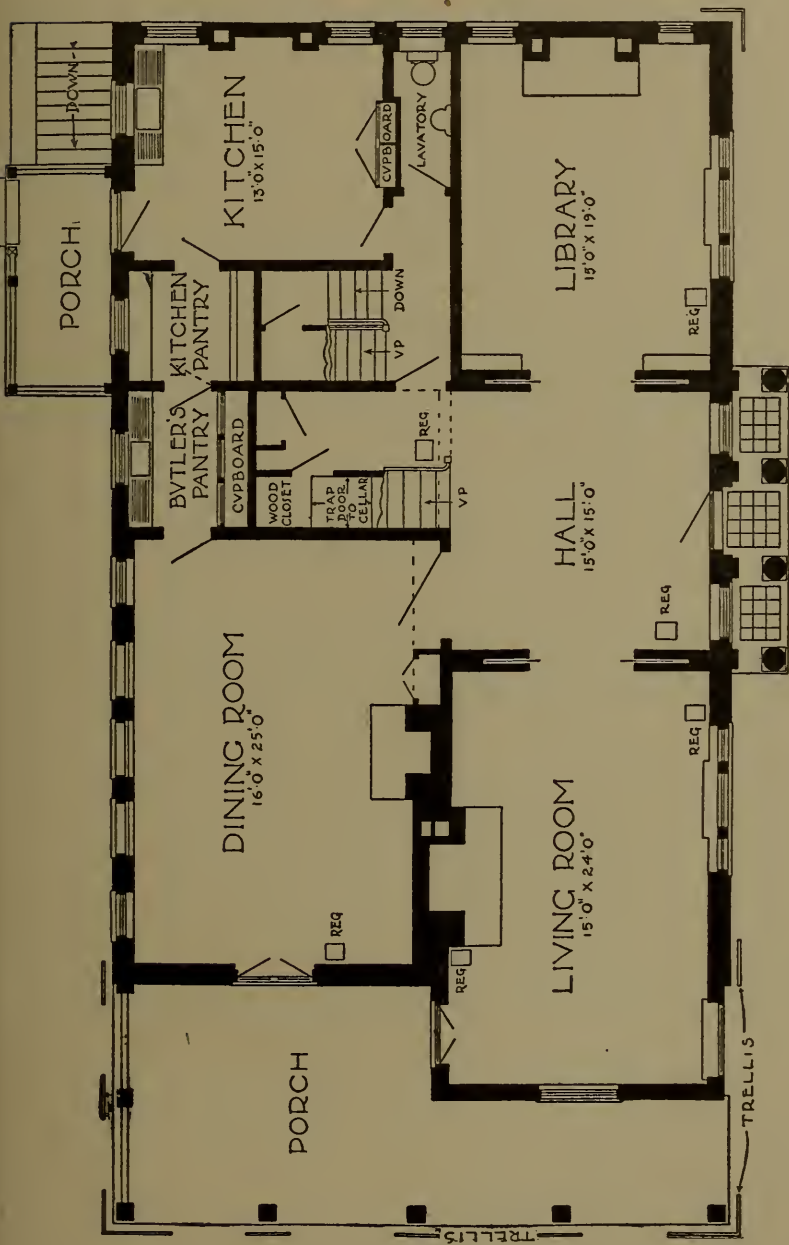
In a dentist's office little is needed in the way of plumbing outside of a lavatory and water and waste attachment to the cuspidor at the side of the operating-table. If the drilling-machine used is to be operated by a water motor an outlet will likewise be required for that purpose.

**Noiseless Plumbing in Residences.**—A very disagreeable feature of plumbing work in the home is the noise due to the operation of plumbing fixtures. In many residences the operation of the water closet in the bath room can be heard all over the building. Such noise, however, is unnecessary and can be avoided by intelligent design of the system and judicious selection of fixtures. Among the many closet combinations carried by the various manufacturers, each manufacturer has some one fixture which is less noisy than the rest, and for that reason is more suitable than the other fixtures for residence work. It is well to be acquainted with the various closets of the manufacturers so that when a noiseless one is wanted it can be specified by catalogue plate and number. But even when the closet is noiseless in operation, noiseless plumbing is not assured unless the supply and waste

pipes are likewise proportioned to their several uses. If the supply pipes are too small there will be a disagreeable hissing sound when water is being drawn, not only at closet fixtures but at other points in the building. Further, if the pressure is high and properly designed faucets or suitable air chambers are not provided there will be a pounding noise when a faucet is closed, due to water hammer. These sources of trouble can be eliminated by using slow-closing faucets and large-size supply pipes to the various fixtures.

The noise of water from closet fixtures flowing through the soil pipe can be decreased in volume by using 3-inch soil pipes in the partitions, and the remaining noise can be almost entirely done away with by filling the space around the pipe and between the laths and plaster of the partition with some non-sound-conducting substance. Finally, the partitions around a bath room should be sound proofed, and, so far as possible, doors for bath rooms should be used through which but little sound will pass.

**Turkish Baths in the Home.**—In addition to the usual bath rooms a Turkish bath, or sweat room, will be found an additional source of health and comfort in the home. The inducing of a copious perspiration is the chief function of a Turkish bath, all other operations being secondary thereto. Consequently, if a small compartment be fitted up so that it can be heated to a high temperature, the first part of the bath, the sweating process, will be provided for, and the wash, shower and plunge



PLAN OF FIRST FLOOR  
 A. B. HARLOW'S HOUSE,  
 SEWICKLEY, PA.  
 ALDEN & HARLOW ARCHITECTS  
 PITTSBURGH PA.

Fig. 80  
 First Floor Plan of Private House

following can be had in the usual bath-room fixtures.

It is not a difficult or expensive matter to provide a Turkish bath in private houses, and, considering their value, and the fact that those who can afford it resort to the public baths, it is surprising that more of the expensive houses are not thus equipped. Large country homes in particular could have fitted up, at small expense, bathing compartments which would rival or exceed the private baths of ancient Rome.

## EXAMPLES OF RESIDENCE PLUMBING

The first-floor plan of a residence is shown in Fig. 80. In this building a separate laundry is provided in the basement, so that the sink is the only plumbing fixture in the kitchen. A pantry sink is provided in the butler's pantry, adjoining the dining-room, and toilet accommodations, consisting of lavatory and water closet, are provided for the servants in a toilet compartment adjoining the kitchen but accessible only from the hall. A window in this compartment serves to ventilate the room and insure a constant change of air.

The second floor of the same building is shown in Fig. 81. This plan is interesting in that it points out very forcibly the extent to which bath rooms are provided in modern homes. Of the five sleeping rooms on this floor four of them are direct connected to bath rooms, and a bath room is accessible to the remaining bedroom by traversing a



Plumbing Plans and Specifications

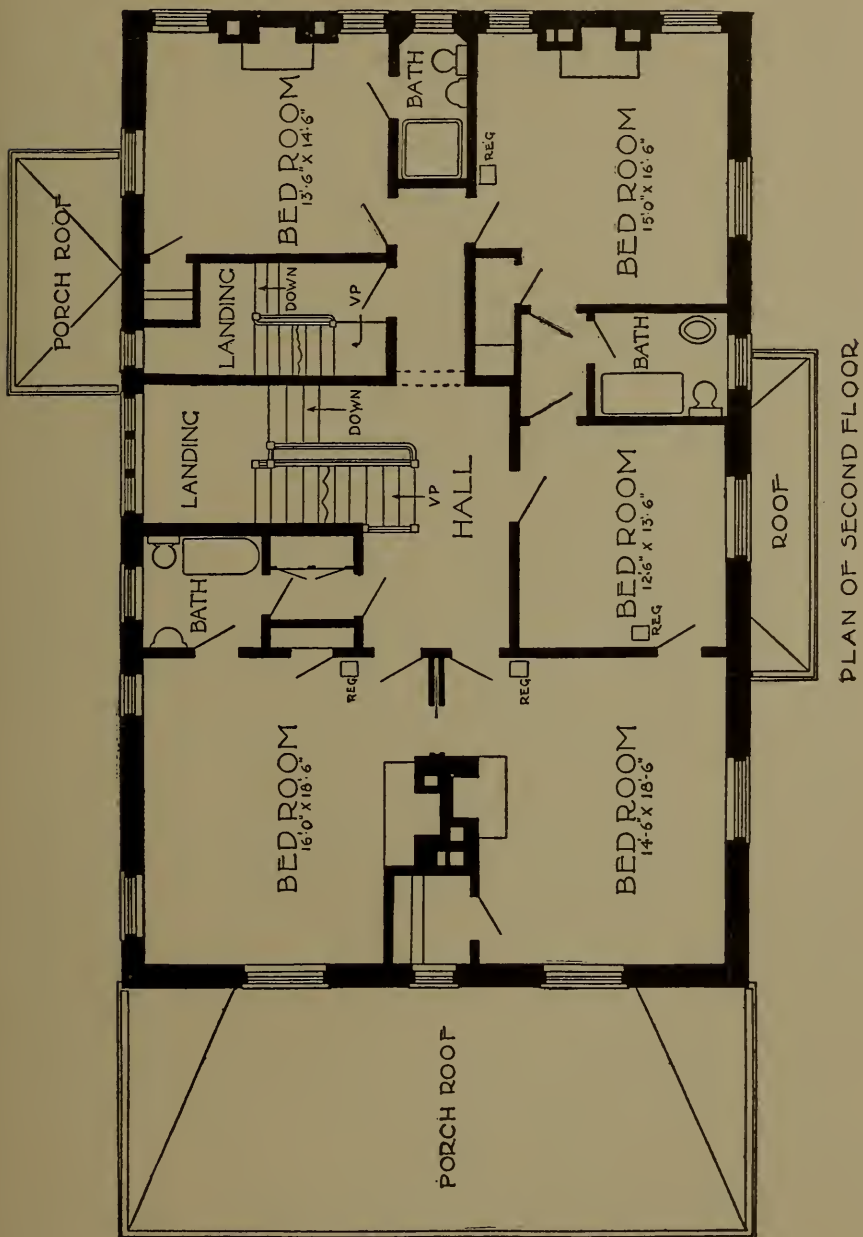


Fig. 81

Second Floor Plan of Private House

few steps across the hall. As the two bedrooms to the left of this illustration are made communicating it might almost be said that each bed room is direct connected to a bath room.

If so many bath rooms are found desirable in a building built as compact as this one, where a centrally located toilet room could be reached from any bedroom in a few steps, how much more necessary are they in large, rambling structures, with numerous wings and long corridors, that would have to be traversed by guests or family to avail themselves of its advantages if only one bath room were provided! There is nothing in a home probably that conduces so much to the comfort of the inmates as a communicating bath room, where the morning dip can be taken immediately upon rising without running the gauntlet of all the inmates and servants to reach the tub; and the first aim of an architect should be to make the home comfortable.

Sometimes less money is available for plumbing in the house, and the problem is to secure the greatest number of conveniences for the least outlay. This has been well accomplished in the three following plans of a Colonial home of moderate cost. The basement plan, Fig. 82, shows the general layout of the water supply and drainage system, but the cellar contains no fixtures except the water heater.

The first floor of this building is shown in Fig. 83. This floor is noticeable more for the absence of plumbing fixtures than anything else; still, at the same time, there are enough for all require-

Plumbing Plans and Specifications

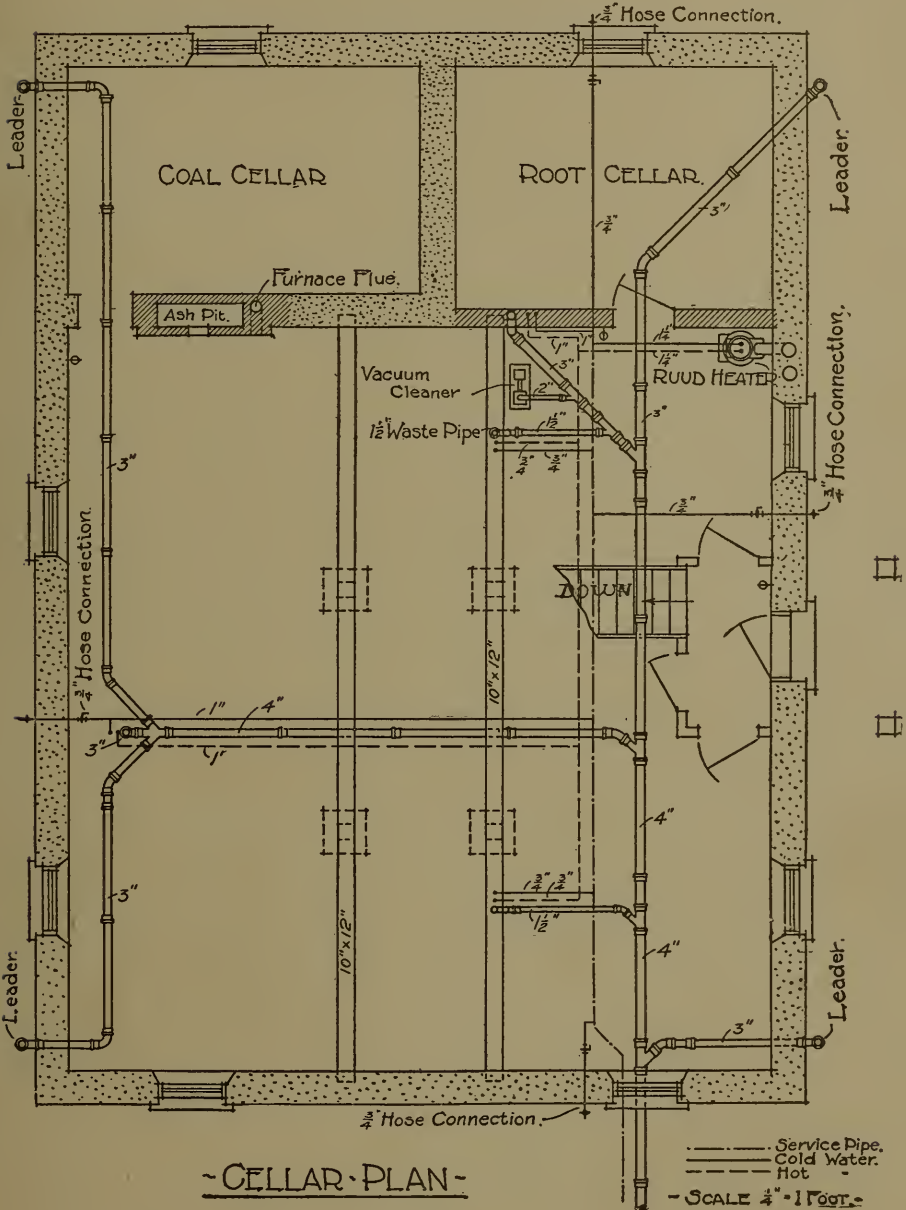


Fig. 82  
Cellar Plan of Residence

ments. The kitchen in this instance is used as a laundry, and a set of two laundry tubs is provided adjoining the sink. These tubs have ash tops which, when down, serve as table space for the servant.

The plumbing features of this building are mostly contained on the second floor, shown in Fig. 84. Here, in addition to the bath room, which is common to all the inmates, each bedroom has a lavatory. These lavatories are so located that they are not visible in the bedrooms, take up but little space where they are, and being located back to back one set of pipes serves for each pair, so that the cost need be but little more than the fixtures. Fixtures can be purchased for any price, from twelve dollars upward, so that stationary lavatories, with all their conveniences, can be had in sleeping-rooms for but little more than the cost of portable wash basins, and for far less than the basin, pitcher and stand.

Owing to the fact that two of the closets where the basins are located are inside rooms they are deprived of the benefits of natural light and ventilation through windows. To offset this disadvantage the lavatories in these two rooms are located alongside of the doors, so that, so far as sanitary considerations are concerned, they may be considered as though set outside of the partitions in the sleeping-rooms, where there is both light and ventilation.

A feature incorporated in this building, but too often omitted from buildings whose owners could well afford the cost, is the housekeeper's bath room adjoining her sleeping-room. Cleanliness begins

Plumbing Plans and Specifications

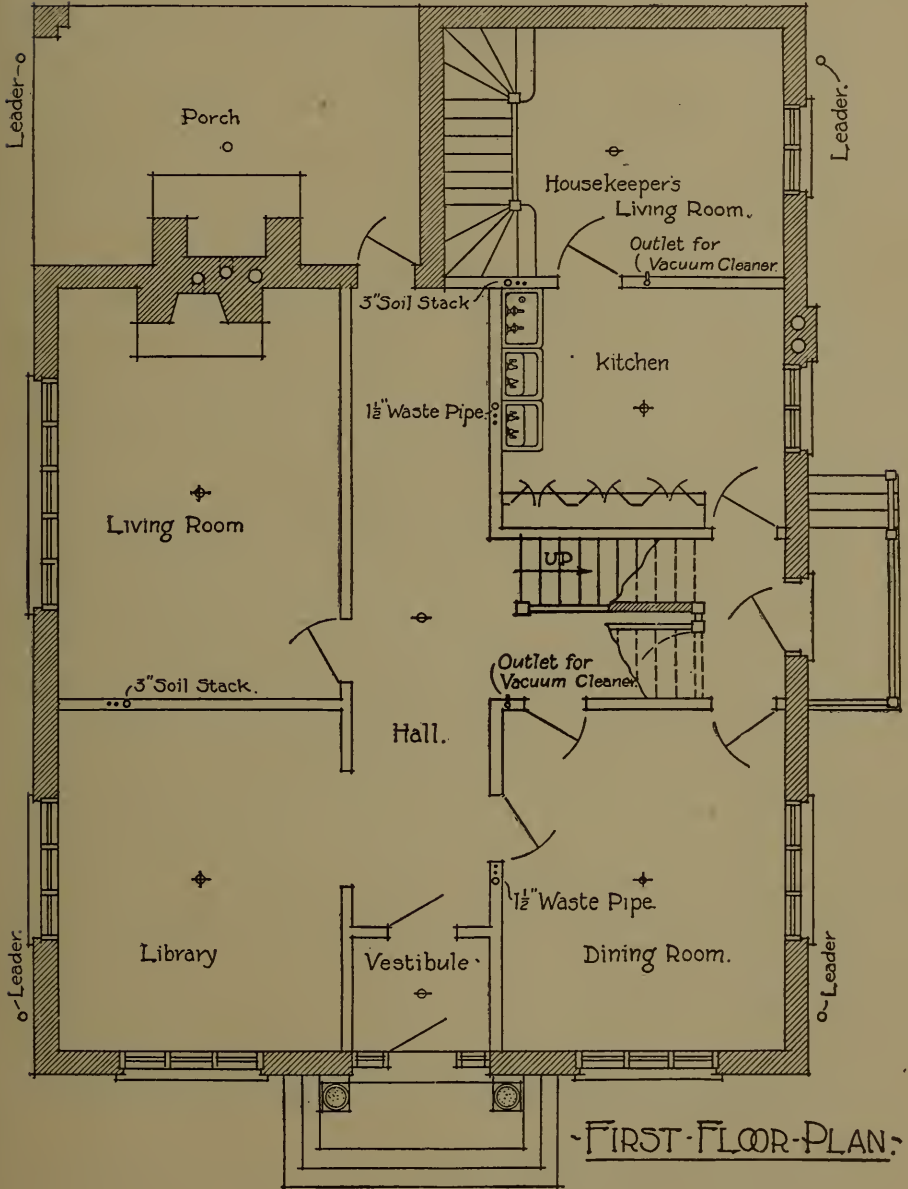


Fig. 83

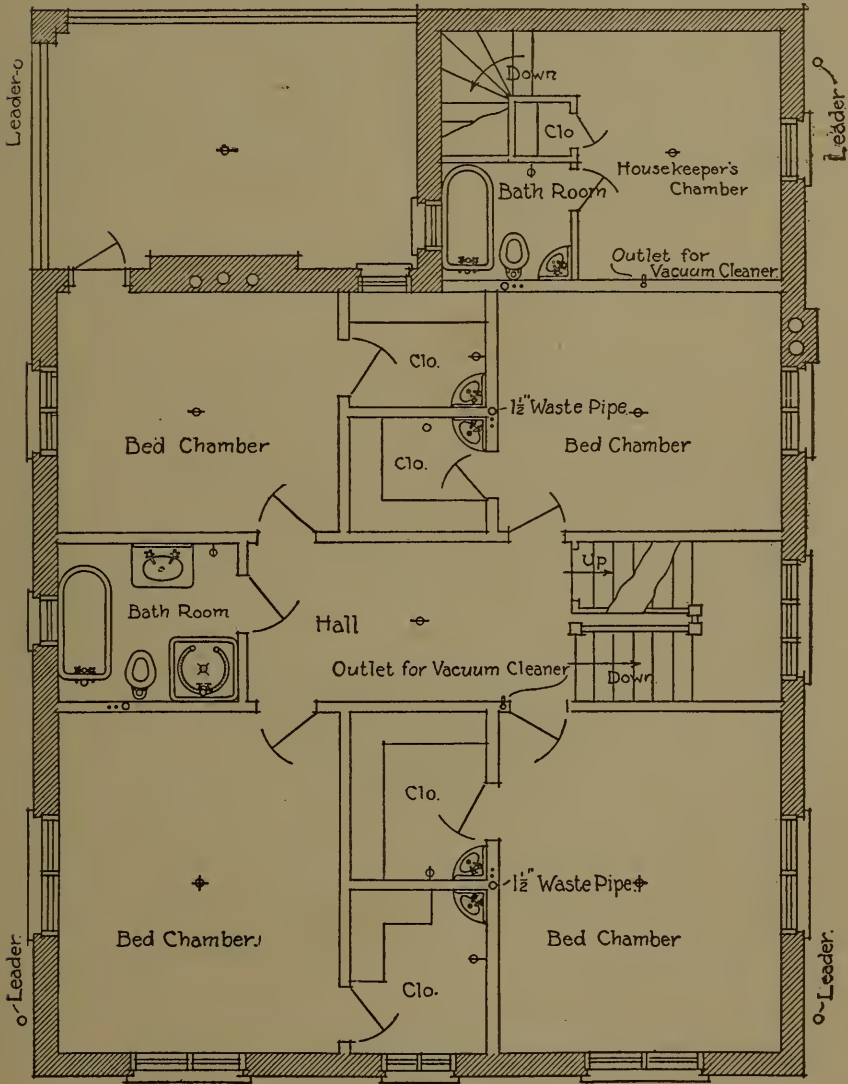
First Floor Plan of Residence

with the person, and if the housekeeper has no means of keeping clean it cannot be expected that she will be overscrupulous about the food she prepares or the building she looks after. The best way, then, to insure a good clean home and wholesome meals is to start with the housekeeper's quarters and see that they possess all the sanitary advantages of the rest of the house. That, together with a living room for her, will go a long way toward solving the so-called help problem, not to mention the satisfaction it should give the owner.

In the layout of fixtures for the bath room a better arrangement would have been to locate the water closet in a separate compartment adjoining the bath room and accessible either from the bath room or the hall. To do so, however, would have necessitated cutting up that part of the floor to a considerable extent, and would have spoiled one of the sleeping-rooms, unless the building were made larger. In short, it could be done only by sacrificing a room, or enlarging the building at great expense, which it did not warrant. If desired, an emergency closet could be put in the cellar, but, with a lavatory in every bedroom in the building, a separate closet would hardly be necessary, although it would be desirable.

Vacuum outfits for cleaning buildings cannot properly be considered plumbing work, but, as they are a sanitary feature of buildings, and have not as yet been given the consideration they merit in planning the home, it will not be amiss to mention them here. They are, comparatively, so inexpensive and require so little piping that it would seem

Plumbing Plans and Specifications



SECOND FLOOR PLAN:

Fig. 84

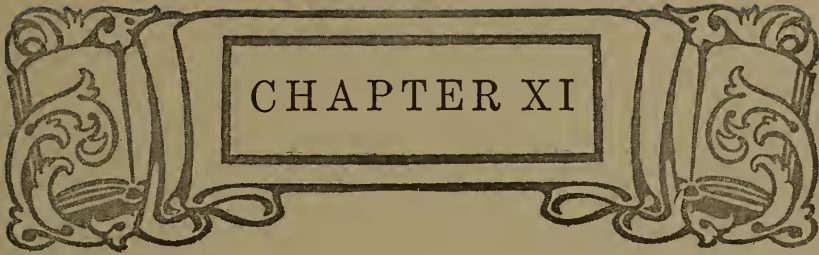
Second Floor Plan of Residence

they should be incorporated in every residence, not to mention other classes of buildings, and the cost of operation is correspondingly small.

In the building under consideration a vacuum pump is shown on the cellar plan, and the four outlets for attaching hose are marked on the first and second floor plans.







## APARTMENT HOUSE



### PLANNING THE PLUMBING IN APARTMENT HOUSES

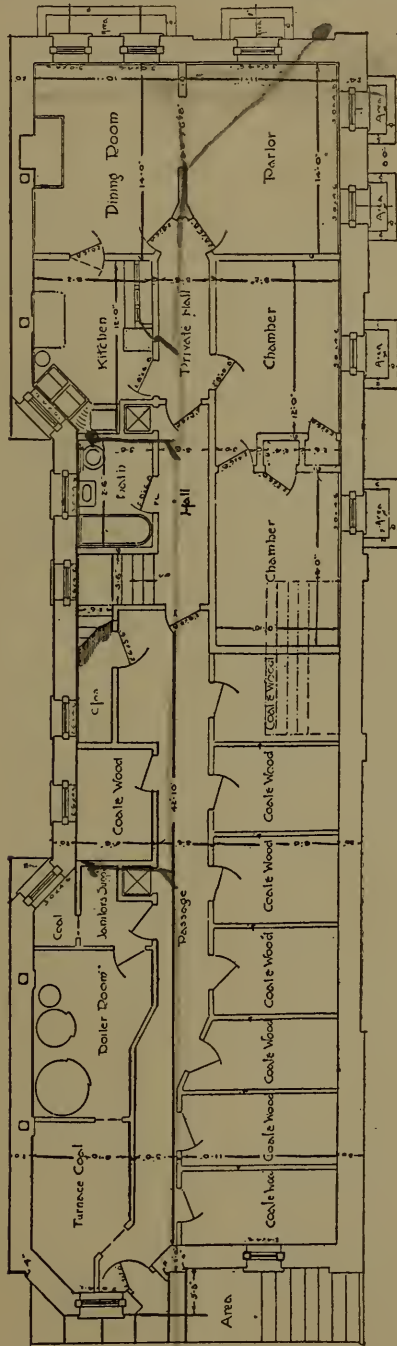
**I**N THIS work the term "apartment house" is used to designate all classes of buildings where many housekeeping apartments are gathered together under one roof; not in its more narrow sense of a suite of rooms without facilities for cooking.

There is great variety in the design of plumbing in apartment houses, which differ from the cold-water flat of the cheaper buildings to the most expensive suites of rooms, sometimes occupying two floors of the building, but isolated from all other apartments and provided with all the sanitary advantages of the better class of private houses. Whatever the class of building, however, there are certain requirements common to them all, and the real differences between the cheapest and most expensive will be found to consist more in the cost and number of fixtures than in the kinds. As an apartment house is merely an aggregation of private liv-

ing apartments gathered together under one roof, it stands to reason that each apartment must have the kitchen, laundry and bath-room fixtures common to a private house. These the moderate-sized apartments have, while in addition thereto expensive apartments have butler's pantry, bath room in connection with each room or suite of rooms and servants' bath, just as in the better class of residences. In some apartments a separate laundry is provided in the basement or attic for the use of all the tenants. In such cases the usual set of two or three laundry trays may be omitted from the various apartments, but one tub should be provided in each for the lighter washing inseparable from all households.

In the general laundry, unless the landlord furnishes fuel for boiling the clothes, provision should be made, if gas is used, so that each tenant will have to supply his own fuel, and provision should be made, in addition to outdoor lines, for drying clothes during inclement weather.

In planning the plumbing in an apartment house, for economical reasons, the fixtures should be grouped together as much as possible to minimize the sets of vertical pipes that will have to be extended up through the building. For instance, by placing the kitchens over one another, and likewise the bath rooms in the same relative position on the several floors, one set of pipes will serve for each tier of fixtures. If, however, the bath rooms and kitchens can be placed adjoining each other one set of pipes will serve for both the kitchens and bath rooms. Carrying the principle still further, if the



BASEMENT PLAN

Fig. 85

Basement Plan of Apartment House

kitchen fixtures in two adjoining flats can be set against the bath-room partition, or adjoining it, and at the same time back to back or end to end against the partition separating the kitchens, one set of pipes can be made to serve for the four tiers of fixtures, thereby keeping down considerably the cost of the plumbing installation. Oftentimes such an arrangement is not consistent with the layout of the rooms, but the possibility of such a plan should be kept in mind.

The hot-water supply for apartment buildings may be furnished from a central plant, located in the boiler room, as is usual in the better class of buildings; or, each apartment may supply its own water from a water back in the range, and store it in an individual tank. This latter method is commonly resorted to in cheaper classes of buildings where the operating expenses are to be kept down. It is more expensive to install, however, amounting in some cases to several times the cost of a central plant.

What has been said in the chapter on residence plumbing will apply equally to apartment work. This is particularly true of noisy plumbing, which it is as desirable to avoid in apartment houses as in private homes. Indeed, the two classes of buildings do not differ from each other in principle. They both are residences, only in one case they are detached while in the other they are assembled under one roof. About the only feature of apartment work which differs from residence work is the requirement for a stack of refrigerator wastes to carry off the drip from the ice-chests.

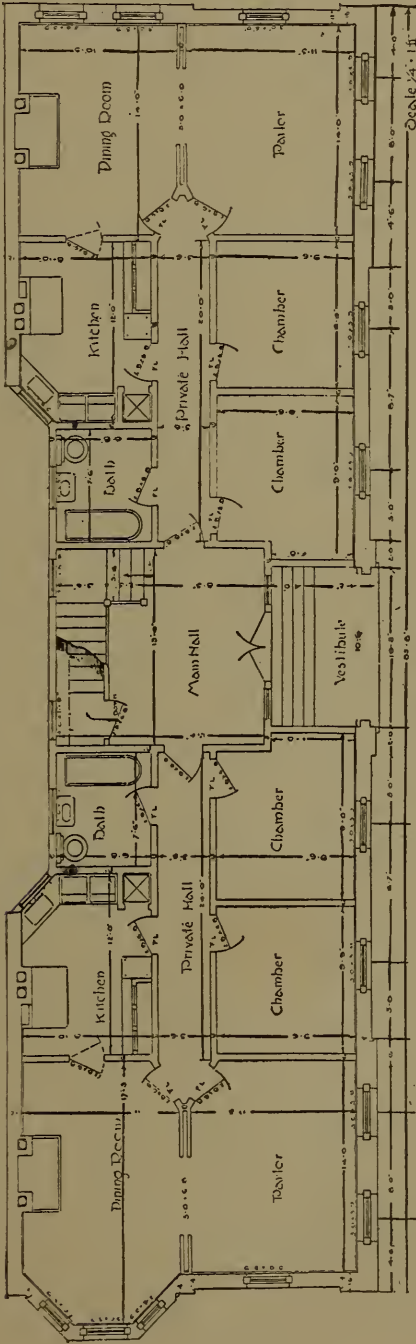


Fig. 86  
First Floor Plan of Apartment House

**Example of Apartment House Plans.**—In Fig. 85 is shown the basement-floor plan of a moderate-priced apartment house. One end of the basement is occupied by the janitor's quarters, which, on account of the grade of the street, are above ground. In the janitor's apartment will be found a kitchen and a bath room as fully equipped as in any other part of the building. In the other end of the building is located the water-heating apparatus in the boiler room adjoining the coal bin. As would be inferred from that fact, the building throughout is supplied with hot water from this source.

The main, or first floor, plan is shown in Fig. 86. The building, which stands on a corner, is divided in the center by the vestibule and main hall, so that one apartment occupies each end of the structure and is isolated from all other apartments, thereby insuring privacy.

The second and third floor plans are shown in Fig. 87 and the fourth-floor plan is shown in Fig. 88. It will be noticed that at the end of the dressers in the several kitchens, ice chests are indicated, and drip pans connected to refrigerator waste pipes are provided for each ice box. The bath rooms are each equipped with a full set of fixtures—bath tub, water closet and lavatory—and the kitchen contains a sink and set of two laundry trays. If a separate laundry were provided in the cellar one of these laundry trays could be omitted from each kitchen.

A feature of this building which will bear examination is the grouping of fixtures close together. It will be observed that eight-inch partitions are provided between the bath rooms and kitchens, and

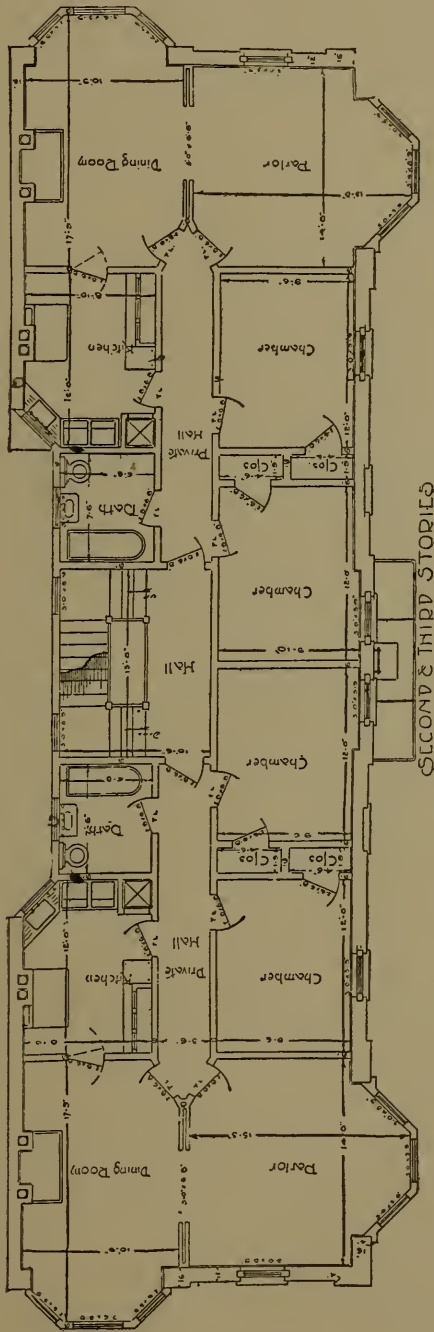


Fig. 87  
Second and Third Floor Plans of an Apartment House

in these partitions the soil and vent stacks for each tier of apartments are run. By so grouping the fixtures one set of risers is made to do for each half of the building, so that only two soil and vent stacks are required for the entire installation.

**Overflows for Apartment-House Fixtures.**— In fitting up the plumbing in apartment houses, or in designing the layout and writing the specifications, one special provision is necessary that is not of so much importance in residence work. This special requirement is the providing of overflow pipes for each fixture or set of fixtures, particularly if the fixtures are provided with stoppers. Take a set of laundry trays, for instance. If clothes were put to soak over night, and one of the faucets did not shut off tight, the fixtures would fill and overflow, perhaps creating considerable damage to the ceilings below, and at all events causing quite a nuisance to tenants on lower floors. For this reason, it is customary to require laundry trays fitted with overflow pipes, and in some cases the kitchen sinks are likewise required to be fitted with overflows.

**Miscellaneous Apparatus for Apartment Houses.**— Unless the water supply in the city where an apartment house is to be built is perfectly pure and wholesome, a sanitary filter should form part of the plumbing equipment to sterilize the water before delivering it to the tenants. Meters will likewise generally be required, and should be kept in mind by the designer, because either the owner will consider it cheaper to buy water by meter rates or

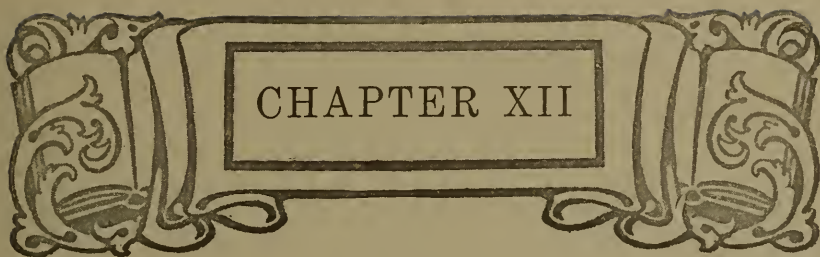




the Water Board will insist on the building being metered, so that almost invariably a meter will be required. Sometimes water will not reach to the upper floor of an apartment house and a house tank must be provided. This in turn necessitates the installation of a pump for filling the tank, and the designer must keep in mind the various pumps at his choice, such as hot-air pumps, electric operated pumps or steam pumps, the conditions governing the case determining the choice.

Yard and area drains must not be forgotten, nor leader pipes when they are permitted to discharge into the sewer. Likewise a trapped and water supplied sink is generally required in the basement to take the drip from the ice boxes.





## SCHOOL BUILDINGS



### PLANNING THE PLUMBING FOR SCHOOL BUILDINGS

**G**ENERAL Considerations.—Of all classes of buildings in which plumbing fixtures are installed, in no class is the work so poorly planned, with such disregard for the fundamental principles of sanitation, as in the school buildings throughout the United States, outside of a few of the principal cities. Where will there be found a public building—such as hospital, sanitarium, office building, hotel or like structure—equipped with primitive outbuildings, the Smead system, latrines or range troughs? Yet many of the school buildings to-day are equipped with just such obsolete systems. That is not as it should be, and, no doubt, if the entire matter were left in the hands of the architect in charge, the standard of work would soon be raised. There is no good reason why the plumbing work in schools should not be of the very best type, reflecting the latest in sanitary design. Children are sent to school to learn not only the lessons taught by

text books, but, by mixing with other children and observing mechanical installations in buildings, they are supposed to unconsciously pick up much that otherwise would not be learned. They gain the first impression of sanitary devices from the plumbing equipment in the school building. That being true, and first impressions lasting, to create a right impression the installation should be the very best. If it is dirty, disgustingly filthy, and in a poorly lighted, ill-ventilated apartment, it creates a feeling of loathing whenever the child is forced to avail himself of its advantages, and dreading to touch the devices, he is not overscrupulous as to the manner of using them. On the other hand, if the toilet accommodations are clean and white, located in bright, cheerful rooms which are scrupulously clean and well ventilated, the most pronounced vandal among them would not feel inclined to deface any portion of the room or equipment. It follows, therefore, that for educational as well as for sanitary reasons the very best plumbing should be placed in school buildings.

## PRIMARY AND INTERMEDIATE SCHOOLS

**Water-Closet Accommodations.**—In planning primary and intermediate school buildings, the practice of grouping all toilet accommodations together in one place, which is usually located in the basement of the buildings, has become firmly rooted in school design. Within recent years, however, there is indication of a desire to break away from that set practice, and the more advanced architects,

who make a study of school design, are placing separate toilet rooms on each floor of the building in the grammar schools, so that students from the several floors will have separate accommodations; while in the primary schools, for pupils under fourteen years of age, the toilet accommodations for each classroom are located in separate and individual toilet rooms adjoining the classrooms. In the latter case, urinals are dispensed with, the same as in the home, and, indeed, the toilet room resembles to a great extent the toilet accommodations in a private house, with which the children are supposed to be familiar.

In the children's toilet rooms children's closets 12 inches in height may very satisfactorily be used, while in the more advanced schools, of course, regular standard-size closets will be installed.

**Number of Fixtures Required.**—There are no standard rules in the United States for apportioning toilet fixtures in schools. So far as can be derived from plumbing equipments now in satisfactory operation, about one water closet and one and one-half urinal are provided for each fifty male students, or fraction thereof, and one and one-half water closet for each fifty girls in the school. In cases where separate water-closet compartments adjoining classrooms are provided, one water closet for twenty-five students, either male or female, will be found the greatest possible limit, and one to twenty would probably be more nearly right.

In Great Britain a certain number of fixtures are required for schools of different sizes. These

---

Plumbing Plans and Specifications

---

will be found listed in tabular form in Table I. In this table lineal feet of urinal trough have been converted into individual urinals. In the original table 8 feet of urinal trough is required for each hundred boys.

The numbers given in the table will be found perfectly safe and may be followed in any locality:

**TABLE I**  
NUMBER OF TOILET FIXTURES FOR SCHOOLS

Number of Children	Kind and Number of Fixtures			
	Water Closets			Urinals
	Girls	Boys	Infants	Boys
Under 30 children.....	2	1	2	2
“ 50 “ .....	2	2	3	3
“ 70 “ .....	4	2	3	4
“ 100 “ .....	5	3	4	5
“ 150 “ .....	6	3	5	7
“ 200 “ .....	8	4	6	10
“ 300 “ .....	12	5	8	15

**Ventilation of Toilet Rooms.**—It goes without saying that any toilet room, whether in a school-house or other building, in which a number of water closets are grouped together, should be well ventilated. In case the water closets are of a siphon type, or of any other design which contains a large volume of water and but little soiling surface, ventilation of the room will be all that is necessary, the vent registers being located immediately back of the closets. If washout closets are used, on the other hand, and it might be added, emphatically, that they should not be, each closet

should be separately vented through a local vent, having at least eight square inches of surface, connected to a shaft having a positive draft insured by mechanical means. If for any reason the toilet room is so located that the air is heavy and ventilation consequently sluggish, or if it is approached by descending a few steps into the room, each closet, of whatever type, should be separately vented with a local vent. In many cases it is better to vent the closets than to vent the room through registers located back of the closets; but as a rule, it is better to vent the closet compartments used by girls, than to vent the closets by means of local vents.

**Teachers' Room.**—In addition to the general toilet accommodations for the students, each floor, or each classroom, should be provided with a retiring-room and toilet accommodations for the teachers. This is a provision too often overlooked in the design of school buildings, although it is as necessary as toilet accommodations for the children.

**Infirmary.**—A provision which should be made in all school buildings—in fact, which should be required wherever a large number of people congregate—is a room set aside as an infirmary and equipped with the fixtures necessary for emergency cases. For instance, there should be a lavatory, a water closet, bath tub and possibly a hospital slop sink. While this provision has been neglected to a great extent in the past it is more than likely that the action of a few of the Eastern cities, notably Boston, in providing medical supervision

of the schools,\* will be followed throughout the United States when the benefits derived from the system become known. In Boston, at the present time, a nurse is in charge of the physical welfare of the children in each school, to assist in testing the sight, hearing and other senses of the pupils, with a view of correcting any infirmity which might prevent their applying themselves to their studies as they should. In addition the nurses are always on the lookout to detect premonitory symptoms of contagious diseases like measles, mumps, whooping-cough and fevers.

In order that the nurse will have the proper facilities and a suitable place to conduct her examinations in, an infirmary will be found indispensable in schools which contemplate medical supervision. Even where there is no medical supervision an infirmary containing the fixtures enumerated and a couch to lie on should be provided.

Fainting fits and other weaknesses are not uncommon where a number of children are gathered together, and a suitable place should be provided for the treatment of the patient in such cases.

**Shower Baths.**—Installing shower baths in school buildings has become such a settled practice at the present time that but few school buildings can be found, particularly in the poorer quarters in some cities, which are not equipped with showers, and lockers for the holding of clothes while the children are having a bath. This practice is

---

\*Argentina, Belgium, Bulgaria, England, France, Japan, Sweden and Switzerland make national provision for the medical inspection of school children. In America and Germany it has not yet become universal, only certain of the cities having taken up the work.



found so satisfactory that it will become more firmly rooted with time, until no architect would think of designing a public school without including shower baths. This becomes the more necessary now that gymnasiums and playgrounds where athletic sports are conducted are becoming part of every well-equipped school building. After a game of basketball, football or a half hour in the gymnasium a shower bath is almost indispensable to the exercisers.

**Swimming-Pools.**—The teaching of swimming is being considered seriously by school authorities throughout the country, as it has been for many years by educational authorities in Great Britain and Europe, where swimming-pools in school buildings are by no means scarce. In this country, likewise, swimming-pools have been provided in school buildings in some cities, where they are in the nature of an experiment, and no doubt the benefits derived will cause their spread to other localities. In inland cities, where natural bodies of water are lacking in which children could learn to swim, the providing of swimming-pools in the school buildings should be seriously considered by the designing architect. Where natural water courses are available the provision is not so necessary, although it would seem as though the art of swimming should be taught in all schools.

**Kitchens in Schools.**—In schools where cooking is taught a room fitted up as a kitchen, with sinks for drawing water and cleansing dishes, ranges for cooking food and heating water, tables

and all the usual fixtures, will be required. But there is another reason why kitchens will be required in schools of the future.

At the present time it is safe to say that two per cent. of the children attending school are hungry. This not only causes mental inefficiency, for nobody can work or study to the best advantage while tortured by the gnawing of hunger, but it is furthermore one of the causes of crime. Why, then, should not public schools serve a wholesome noonday lunch to the pupils, even though the practice would seem revolutionary and socialistic? In cities where cooking is part of the curriculum the municipal government does not hesitate to provide foodstuffs for the students to cook, and eat if they see fit; then why should the school authorities refuse to provide a like or even a greater amount for underfed school-children?

The same good end would be attained in either case and the necessity would justify the expenditure. At all events, the architects in large cities will do well to keep in mind the possibility of kitchens being necessary in school buildings. Since the foregoing paragraphs were written London, England, has taken up the subject of feeding school-children, as may be seen by the footnote.\*

---

#### \* SCHOOL LUNCHES TAX ITEM

##### LONDON COUNTY COUNCIL TO SUPPORT FEEDING OF NEEDY CHILDREN

LONDON, January 2.—Steps are to be taken by the London county council to place the cost of feeding necessitous school-children on the rates.

Urgent appeals were made by Lord Mayor Sir George Truscott, R. A. Robinson, chairman of the London county council, and other influential persons for subscriptions to the voluntary funds. The response has, however, been inadequate, and the funds now in hand, it is anticipated, will not be sufficient to feed the children until the county council resumes work again after the Christmas holidays.

---

## Plumbing Plans and Specifications

---

At the meeting of the London educational committee a sub-committee's report will be presented recommending that representations be made to the board of education that an order for the power to levy a rate should be issued. It is intended that the power to take the necessary funds—estimated at \$50,000—from the rates should be used only if there is a shortage of money during the recess.

The education (provision of meals) act gives powers where voluntary contributions are insufficient to spend money from the rates for the provision of meals within the limit of a half-penny rate.

**Drinking-Fountains.**—Drinking fountains of a sanitary type, which require no cups, should be liberally provided for school-children. The ordinary drinking-fountain, with one cup for the use of all children, is unsanitary in the extreme and goes a great way toward making epidemic cases of diphtheria, mumps and whooping-cough, not to mention the possibility of communicating the bacilli of tuberculosis from lip to lip. In a school building children coming from all parts of the school district mingle together for a few hours, then separate, and if one child is affected with a communicable disease, great danger exists of its spreading to others, thence to the whole district.

As water is a well-known channel of infection, and drinking-cups a convenient mode of infecting the water or communicating a disease by direct contact, the use of drinking-cups, or fountains which require the use of them, should give way to the sanitary drinking-fountain.

**Advanced Schools and Colleges.**—In the advanced schools and colleges many of the requirements for primary schools may be dispensed with. For instance, swimming-pools and showers will not be necessary unless forming part of the gymnasium outfit. Further, kitchens may well be dispensed with, and the toilet accommodations can be grouped

together in toilet rooms, forming tiers on the several floors. Outside of these exceptions what has already been said about primary schools will apply almost equally to advanced schools.

Fire lines will be found desirable in all school buildings of whatever grade, and in college buildings special plumbing fixtures are required in the various departments, such as in the chemical laboratory. Some of these fixtures will have to be lined with lead, with the seams burned instead of soldered. When designing plumbing for such purposes, however, the best way is to consult with the professors of the different departments and learn their various requirements.

## EXAMPLES OF PLUMBING IN SCHOOLHOUSES

In Fig. 89 is shown the floor plan of a school building fitted with separate girls' and boys' rooms communicating with each classroom. In addition to the children's toilet rooms one is provided for the teachers also, which is accessible from the main hall. It will be observed that to reach the toilet rooms the pupils have to pass through a wardrobe. By this arrangement any embarrassment due to self consciousness is relieved, and at the same time, owing to the two doors which sound will have to pass through, it is pretty well deadened. It might seem unnecessary to point out that in planning work on this order noiseless combinations should be specified so that the original noise will be reduced to the minimum.

Plumbing Plans and Specifications

- A BOOK STORAGE
- B BOYS TOILET
- C " WARDROBE
- D GIRLS TOILET

JOSSELYN & TAYLOR CO ARCHTS  
CEDAR RAPIDS IA

- E " WARDROBE
- F TEACHERS TOILET
- V VESTIBULE
- ◆ LIGHTS

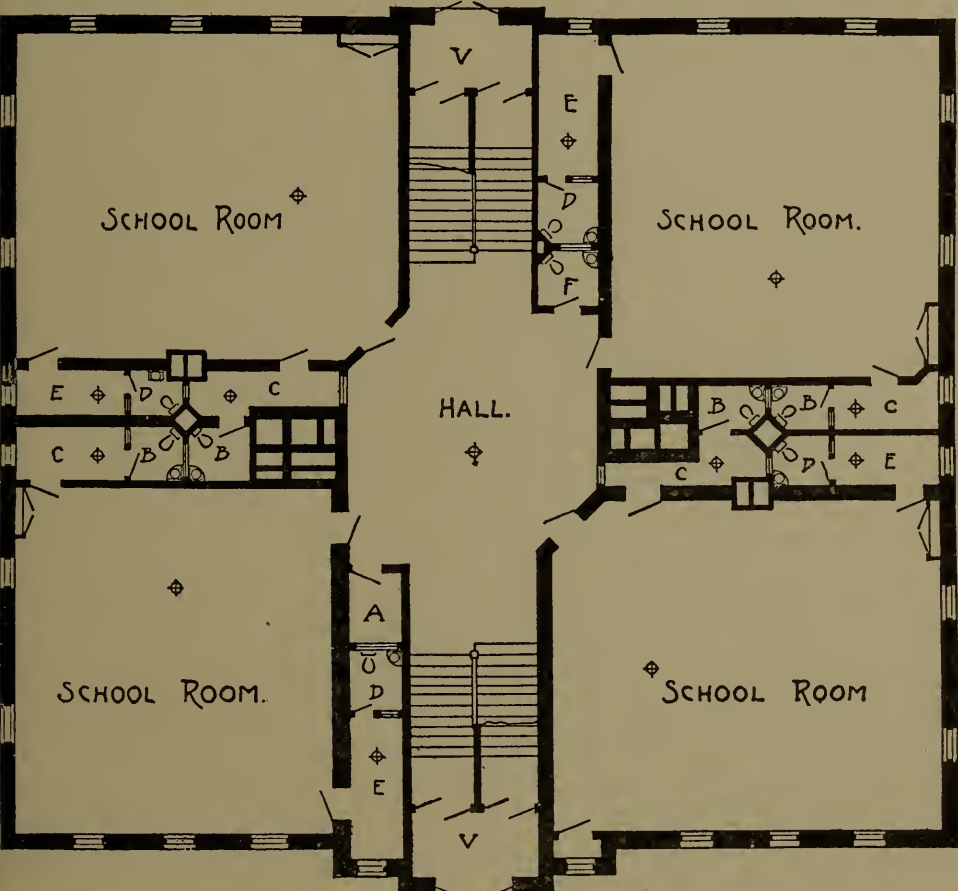


Fig. 89  
FIRST FLOOR PLAN OF ADAMS SCHOOL  
CEDAR RAPIDS IA.

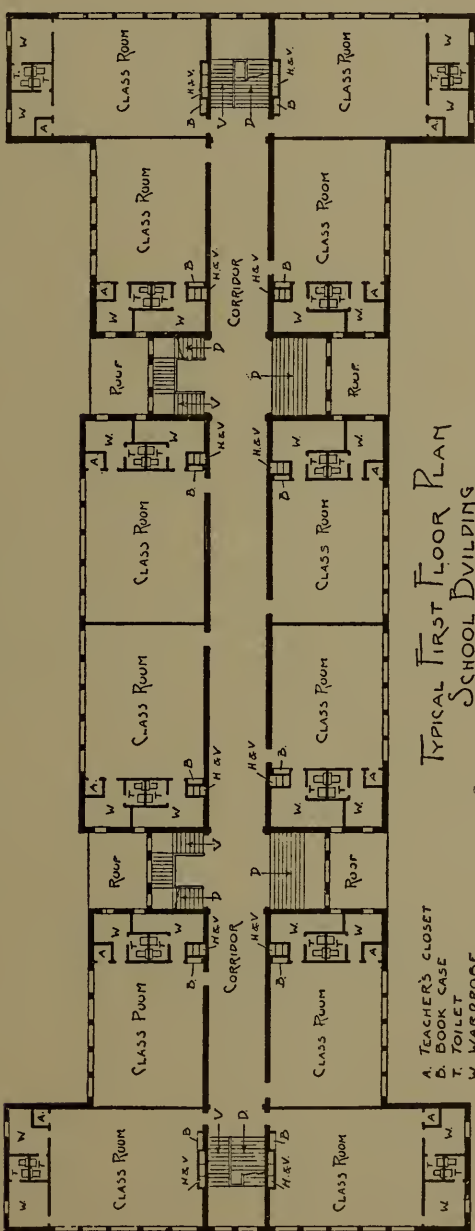
SHOWING ALTERATIONS IN CLOSETS AND WARDROBES  
TO FIT BUILDING FOR TOILET SYSTEM ATTACHED TO EACH SCHOOL ROOM

There are no urinals used in this system of school plumbing, but the boys' closets are fitted with self-raising seats which remain up when not in use. In the lower grades low closets, 12 inches high, may be used.

Ventilation is necessary in installments of this kind, and in the present case is obtained by means of local vents connected to the shafts against which the closets are backed. These shafts are heated with steam coils to insure a positive draft.

Owing to the fact that this building was an alteration the water closets could not be placed in rooms having windows opening to the outer air. This objection has been overcome, however, in the typical floor plan illustrated in Fig. 90, which shows the arrangement favored by the schoolboard of Cedar Rapids, Iowa, where the method was first tried out. The schools in which this system is used are all grammar or grade schools, taking pupils up to fourteen years of age, and the system for such schools can be pronounced a success. It is conducive to better morals, discipline and sanitation, and the pupils can be trained in the proper use of plumbing fixtures if they do not get that training at home. It cuts out a source of moral contamination that exists in the congregate-closet system, where a score or more children can meet at any time to learn all sorts of evil as well as do damage and commit nuisance with little fear of detection.

On the whole, the sanitary arrangements for young school children should be as clean, bright, attractive and perfect as they and the surround-



TYPICAL FIRST FLOOR PLAN  
SCHOOL BUILDING

SHOWING ARRANGEMENT OF WARDROBES  
WITH TOILET SYSTEM ATTACHED TO EACH SCHOOL ROOM.

A. TEACHER'S CLOSET  
B. BOOK CASE  
T. TOILET  
W. WARDROBE  
H&V. HEAT AND  
VENTILATION

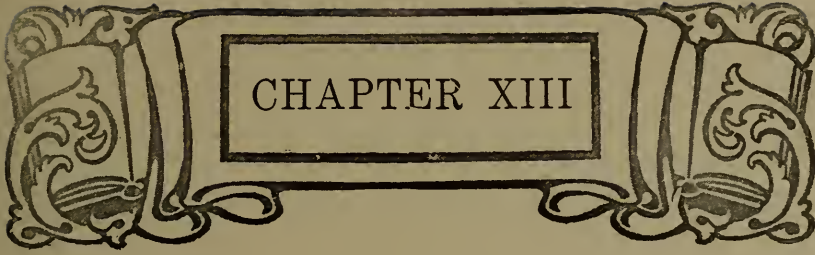
JOSSELYN & TAYLOR CO ARCHTS  
SEAR RAPIDS IA

Fig. 90

ings can be made. There is no logic or sense in the old argument that children will destroy good fixtures. It is only the dirty, filthy and ugly that children destroy; they kill snakes, lizards, toads, other reptiles, but never destroy pretty flowers, delicate china ware or pretty pictures. But even though there was a latent vandalism in childhood to guard against, why not provide elevating instead of degrading fixtures and rooms, then put in a matron in the girls' toilet and monitor in the boys' to see that no damage is done? Hotels, steam-ships, railroad stations and large department stores find it necessary to place the toilet rooms for grown-up people in charge of overseers, why should more care and intelligence be expected of children? The logical thing to do is to provide the very best which will tend to elevate the children, then put somebody in charge so they can do no harm.







## Y. M. C. A. BUILDINGS



### PLANNING THE PLUMBING IN Y. M. C. A. BUILDINGS



AS Young Men's Christian Association buildings grew in number they increased in importance, so that at the present time they occupy a distinct place in architecture, which entitles them to be considered in a class by themselves. This is due partly to the fact that they combine under one roof some of the distinctive features of several classes of buildings. For instance, athletics being one of the features of the association, these buildings have gymnasiums, swimming-pools, showers and all the accessories which belong to an athletic club.

The social side of the members is encouraged by means of bowling-alleys, reading-rooms, club rooms and association halls. The educational function of the association is made easy by the provision for class rooms, school rooms and assembly rooms, while the hotel feature is to be found in rooms for lodgers, which are rented, without meals,

to men. The serving of meals has never been a feature of Young Men's Christian Association work so far, although there seems a tendency in that direction in some quarters at the present time; consequently something in the way of a restaurant or dining-room and kitchen must be provided for in the buildings where meals are to be served, and a kitchen where meals can be prepared for banquets should be provided in all buildings of this class.

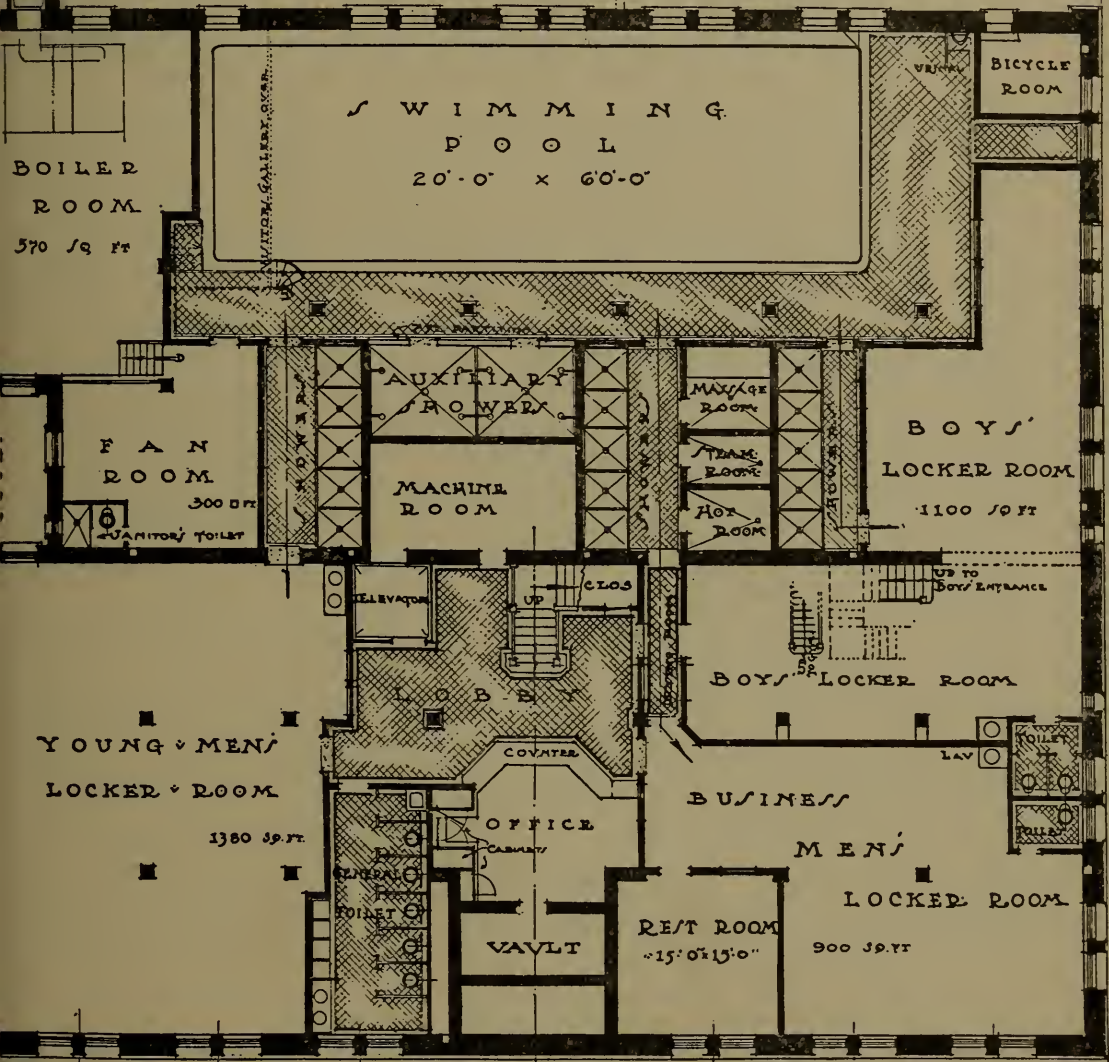
Turkish baths usually form part of the general bathing facilities in such buildings and will be found incorporated in most of the plans.

It is but reasonable to suppose that a building which combines so many different features must contain a great deal of plumbing work, and such is the case. In the basement, where the swimming-pool is generally located, will be found a number of shower baths, so that the bathers can cleanse their persons before plunging into the pool of water. Close by the showers will usually be found the Turkish bath rooms, with their various combinations of dry-heat and vapor-heat compartments, electric baths, light baths, and all the various other appliances which belong to the department of bathing.

A general toilet room will usually be found on this floor, as well as separate toilets and lavatories of a less general nature, an engineers' or janitors' toilet room, and a boiler room in which is located the heating apparatus for supplying hot water not only to the building proper but also to the swimming pool.

Plumbing Plans and Specifications

· · · B V I L D I N G · F O R · T H E · Y O U N G · M E N ' S · C H R I S T I A N · A S S O C I A T I O N · ·  
 · · · J A C K S O N V I L L E , F L O R I D A · · · H · J · K L U T H E · A R C H I T E C T · ·  
 ○ C O A L   R O O M   ○ U N D E R   A L L E Y



· P L A N · F O R · B A S E M E N T ·  
 · S C A L E  $\frac{1}{8}$ " = 1'-0" ·

Fig. 91

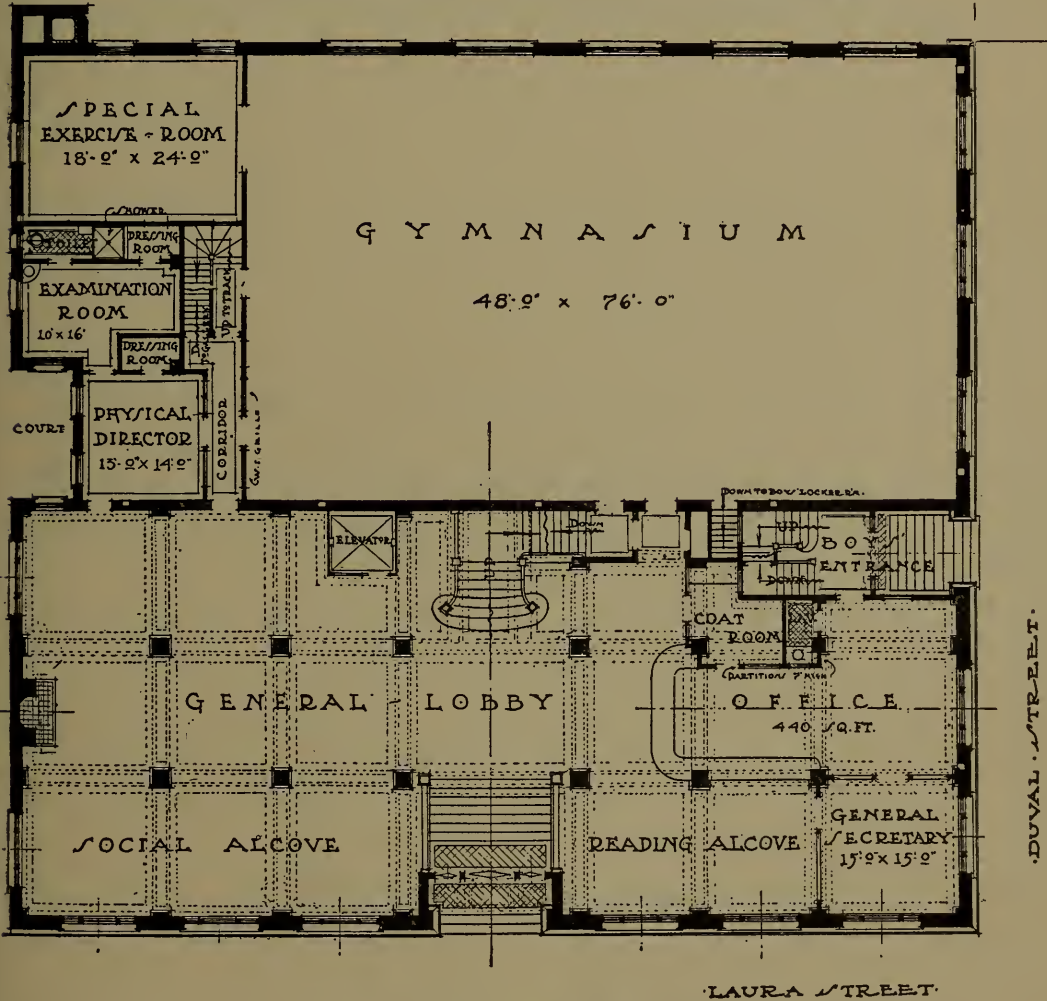
Usually the first story of the building contains the least plumbing of any of the floors. This is because the first story is generally occupied by the main lobby, office, gymnasium and a few department headquarters, which do away with the necessity for any great number of plumbing fixtures. A drinking fountain of sanitary type will be found desirable for this floor, as it likewise will for each floor of the building, and fire lines should not be overlooked when preparing the plumbing plan and writing the specifications.

The second story of the building generally contains an assembly room, which may be used for lectures, exhibits, class recitations and various other purposes. In order that concert and like entertainments may be given, a couple of dressing rooms, each containing a lavatory, will not be amiss. A kitchen on this floor, communicating with the assembly room, will be found convenient in case of banquets or other celebrations in the building.

Above the second floor, unless some of this space is required for association work, the building is partitioned off into sleeping rooms, to be rented to lodgers, the same as rooms in a hotel. This necessitates providing washing, bathing and toilet facilities on such floors of the building as are given over to this purpose. Usually the washing accommodations are grouped together in one room, where all the lodgers repair for a wash. When there is sufficient money available, however, to pay for the extra work, separate lavatories in each room will be found more desirable, and the increased price

Plumbing Plans and Specifications

BUILDING FOR THE YOUNG MEN'S CHRISTIAN ASSOCIATION  
 JACKSONVILLE, FLORIDA H. J. KLUTHO ARCHITECT



PLAN FOR FIRST FLOOR

SCALE 1/8" = 1 FT

Fig. 92

which can be charged for rooms with running water will soon repay the original outlay. The bathing facilities on the various floors of Young Men's Christian Association buildings usually consist of shower baths. However, where female help is employed to keep the building clean, the maids' toilet should be as fully equipped as the bath room in a private house, and should contain an ordinary bath tub instead of a shower bath. It is well, likewise, to provide at least one bath tub on each floor of the building, for the benefit of those who would prefer a tubbing to a shower.

It goes without saying that all water used in a building of this character should be filtered and that the supply pipes should be well proportioned, so that a copious flow of water can be had at all times at all fixtures without the annoyance of one faucet robbing another.

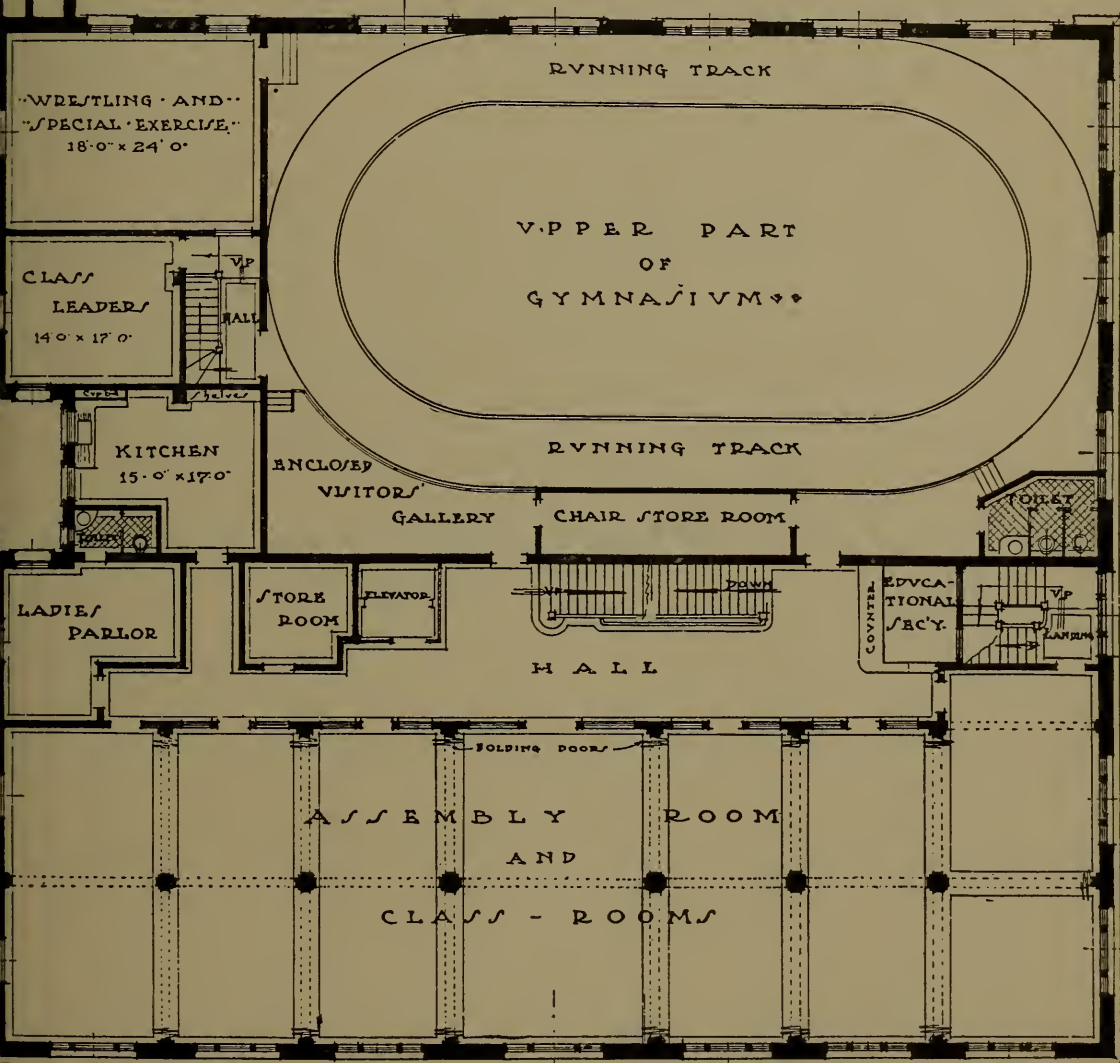
The plans for a Young Men's Christian Association building may be seen in the five accompanying illustrations. In Fig. 91 is shown the basement floor, which contains the Turkish baths, swimming pool, general toilet room and a battery of showers, besides some scattered toilet rooms. This floor may be considered as having most of the plumbing features belonging to an athletic club.

The first floor plan is shown in Fig. 92. This floor contains, besides the general lobby, general office and gymnasium, a special exercise room, examination room and physical director's office, and a few scattered toilet rooms.

The layout of the second floor is shown in Fig. 93, a toilet room off the visitors' gallery, another

Plumbing Plans and Specifications

BUILDING FOR THE YOUNG MEN'S CHRISTIAN ASSOCIATION  
 JACKSONVILLE, FLORIDA ... H. J. KLUTHO ARCHITECT



PLAN FOR SECOND FLOOR

Fig. 93

opening off from the ladies' parlor and a kitchen sink being all the plumbing installed on this floor.

In Fig. 94 is shown a plan of the third floor. The only fixtures on this floor are the sink in the dark room and a general toilet room for the use of the occupants of this floor.

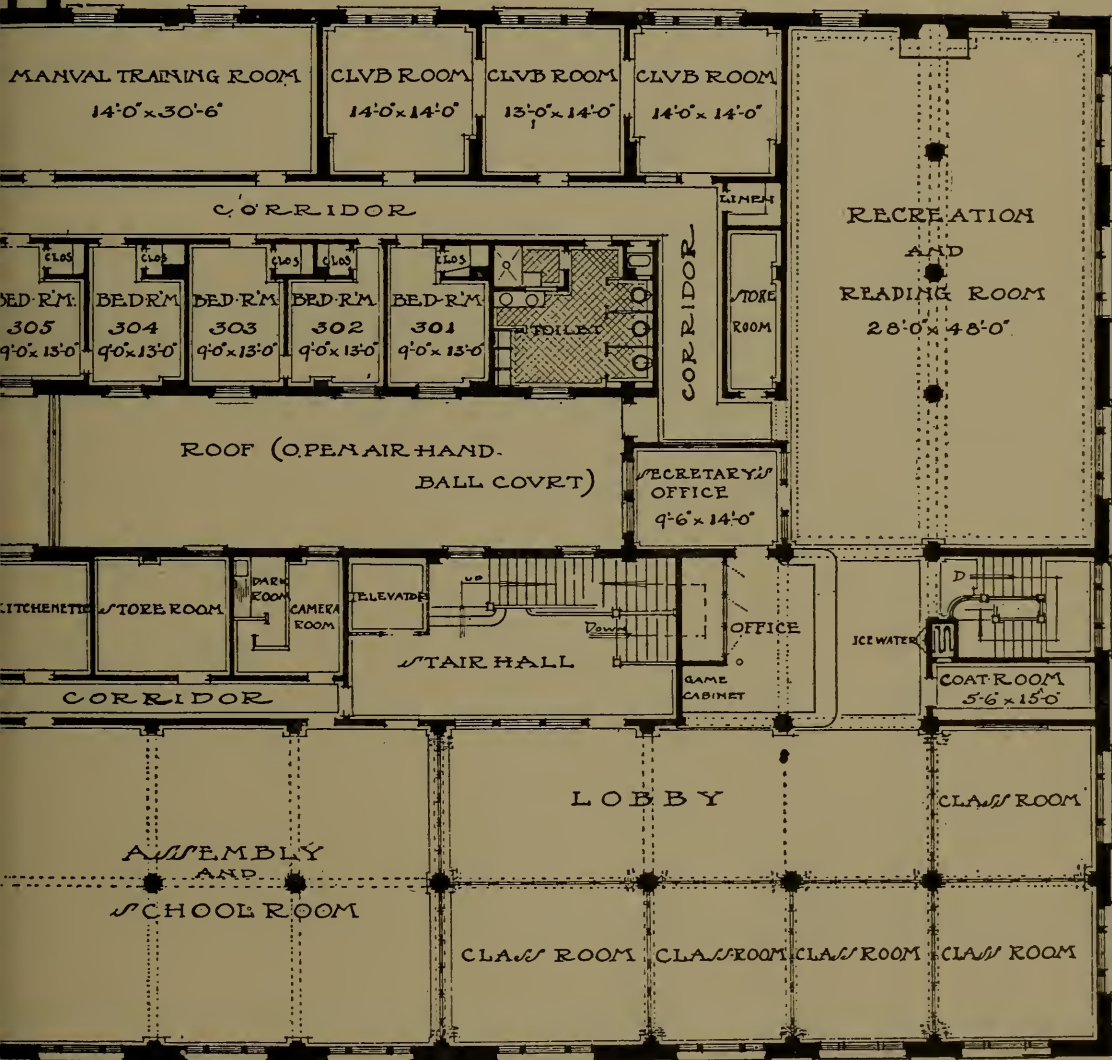
The fourth, fifth and sixth floors are shown in Fig. 95. These floors are designed for use as dormitories and contain no fixtures outside of the maids' toilet, the general toilet room and a private toilet room communicating with rooms 417 and 418. As was previously remarked, lavatories in the various sleeping rooms on these floors would add greatly to the convenience and comfort of the inmates, and at a cost but slightly greater than that of portable basins and stands. On the other hand, while the original outlay would be more, the increased revenue from rooms provided with running water would soon balance the account, leaving a net income from the investment. A good feature of the plan under consideration is the providing of private toilet rooms in connection with bedrooms. As in hotel buildings, it would be well in Y. M. C. A. buildings to provide a certain percentage of the sleeping rooms with private baths.

It would seem that in large Y. M. C. A. buildings, where several floors are given up to rooms for lodging, that the bed linen, towels and other articles requiring washing would warrant the establishing of a laundry as part of the plumbing or mechanical installation. This would seem the logical thing to do, in view of the fact that the necessary power is available and everything con-



Plumbing Plans and Specifications

·B·V·I·L·D·I·N·G·F·O·R·T·H·E·Y·O·U·N·G·M·E·N·C·H·R·I·S·T·I·A·N·A·S·S·O·C·I·A·T·I·O·N·  
 ·J·A·C·K·S·O·M·E·R·V·I·L·L·E·;·F·L·O·R·I·D·A·  
 ·H·;·J·K·L·U·T·H·O·A·R·C·H·I·T·E·C·T·



·P·L·A·N·F·O·R·T·H·I·R·D·F·L·O·O·R·

·B·O·Y·S·D·E·P·A·R·T·M·E·N·T·

Fig. 94

venient for operating the laundry. A further consideration would be the fact that besides the money saved on the household linen the personal washing of the roomers would help swell the revenue from this branch or department.

In Y. M. C. A. buildings where manual training is to be taught special provision will have to be made in fitting up the shop rooms, the plumbing work required depending a great deal on the extent to which the association wishes to carry on the work of training. If trades are to be taught, and plumbing is to be one of the trades, it would be well to have testing troughs connected with the soil pipe and supplied with running water so that the various apparatus used in plumbing can be tested and tried. Further, it would be well to have outlets to which work of the students could be connected, when finished, so they would see how the work held up under pressure.

In like manner, in the chemical laboratory special provision will have to be made for students of chemistry, running water, waste connections and gas outlets being required at the laboratory tables. Lead lined sinks are sometimes required for this purpose, when acids are to be used that would attack and destroy other materials, and when lead sinks are used, it is better to have the corners burned than soldered, as acids often destroy solder when they do not injure lead. The best thing to do when trades are to be taught in Y. M. C. A. buildings, is to consult with the instructors who will have charge of the various departments as to their several requirements, and then make pro-

Plumbing Plans and Specifications

BUILDING FOR THE YOUNG MEN'S CHRISTIAN ASSOCIATION  
 JACKSONVILLE, FLORIDA. H. J. KLVTHO ARCHITECT



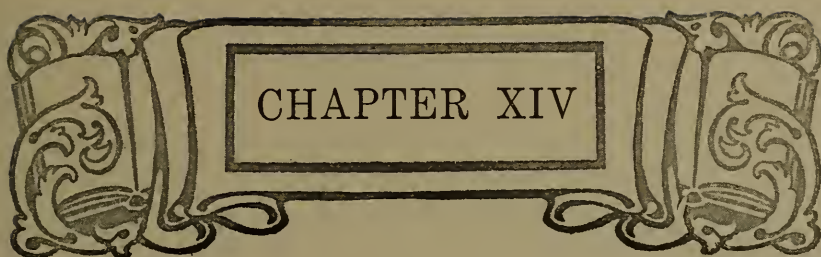
PLAN FOR FOURTH FLOOR

Fig. 95

vision accordingly. One requirement, however, which may well be borne in mind, is lockers and wash room for the workers. When the students finish work at the lathe, moulding sand, wiping solder, or sheet metal bench, they will want to wash, and change their work clothes for street attire, and this cannot be conveniently done without lockers for their use and lavatories with hot water convenient for the purpose.

A dark room for photographic purposes will be found a desirable feature of a Y. M. C. A. building for amateur work, even though photography is not one of the studies taught in the courses, and the dark room should be fully equipped with sinks supplied with running water.





## COURTHOUSES



### PLANNING PLUMBING FOR COURT HOUSES

**I**N CONSIDERING the plumbing for court houses, a type of building is selected similar to the thousands which will be required in the numerous counties of the various States which have their county seats in cities of moderate size.

Buildings of this kind are used, not only for court proceedings, but likewise, in many cases, as places of public assemblage, where political speeches, concerts, lectures and other entertainments are held. To accommodate such meetings, a large assembly room, with a raised platform to serve as a stage, is generally provided, and a couple of retiring rooms, one on each side of the platform, which may be used as dressing rooms, will be found desirable. In each of these retiring rooms a lavatory should be installed for the benefit of those taking part in entertainments and requiring the use of a dressing room.

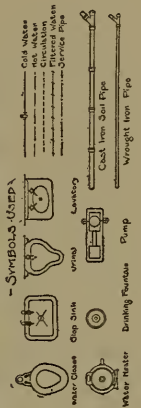
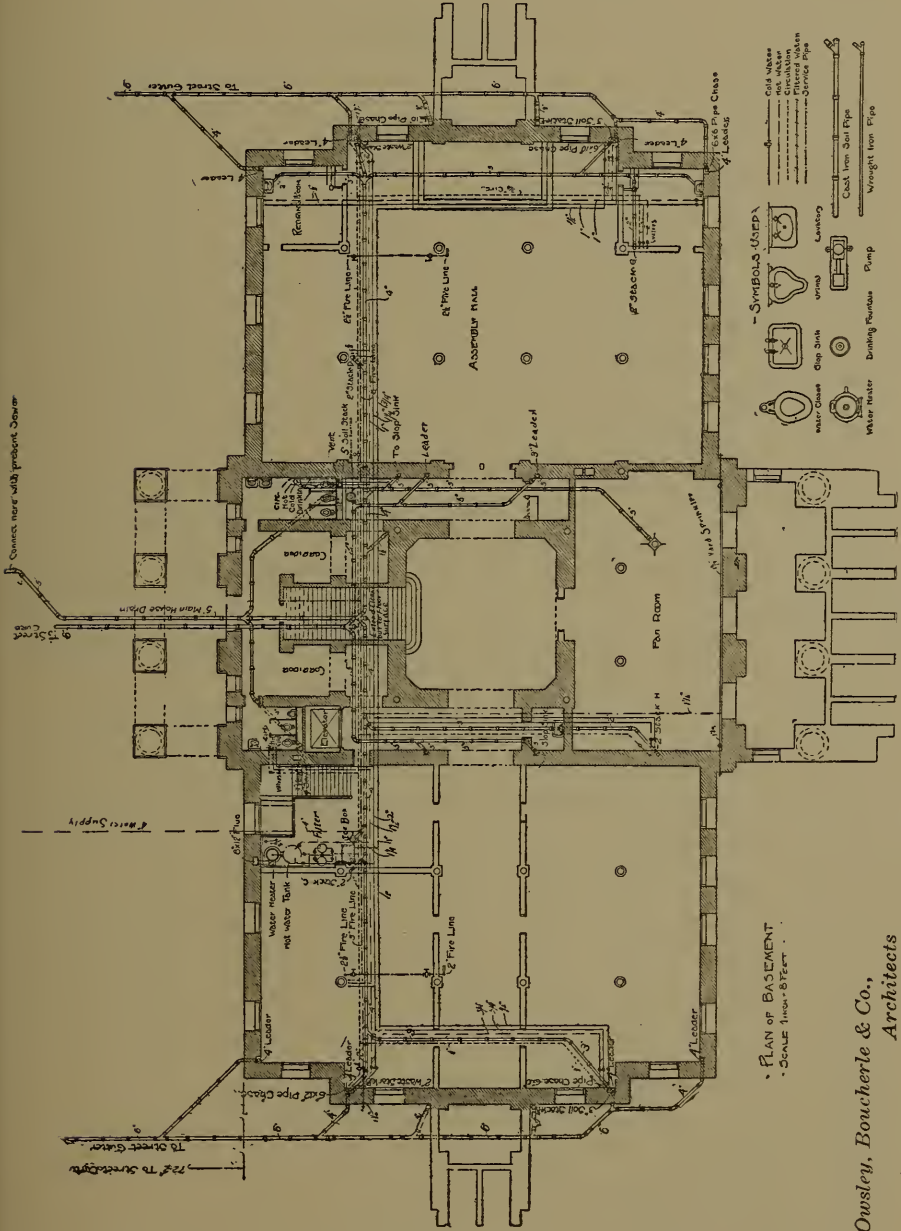
On court days, as well as on other occasions, a great many people resort to the court house and a general toilet room should be provided for their use. In addition to the general toilet room, semi-private toilet accommodations should be provided on each floor of the building for the use of clerks and other employees, while the judges' rooms and jury rooms should each have a private toilet compartment communicating with it for the exclusive use of the occupants of that room.

Throughout the building, on the various floors, will be located the various offices of the county officials, and these parts of the building partake of the nature of an office building to such an extent that a lavatory should be provided in each single office room or suite of rooms.

No building of this character would be complete without drinking fountains being provided on the several floors, and the drinking fountains should be supplied only with sterile drinking water which has been well filtered on the premises, unless the public water supply has already been filtered and is otherwise wholesome. The drinking water may likewise be cooled by passing through a coil located in an ice box.

Fire lines should be liberally provided in all kinds of public buildings where people assemble in large numbers, and numerous lengths of hose should be disposed at convenient points so as to be readily accessible in case of fire. In order that there will be an adequate and uninterrupted supply of water in case of fire, the water-supply should be

# Plumbing Plans and Specifications



PLAN OF BASEMENT  
SCALE 1/4" = 1'-0"

*Owsley, Boucherle & Co.,  
Architects*

Fig. 96  
Basement Plan of Courthouse

well proportioned and a large main extended into the building from the street.

Slop sinks will be found indispensable in a court house, and one should be provided on each floor of the building. They may well be located in a closet set aside for the janitor.

In some court houses, such, for instance, as are quite a distance from the police station or jail, it might be found advisable to construct a cell or room for the safe keeping of prisoners when not attending court. When such is the case the cell should be provided with a water closet and lavatory for the accommodation of the prisoners.

Hot-water supply will be found desirable in a court house, the same as in other kinds of office buildings, so a heater and tank should be provided for this purpose.

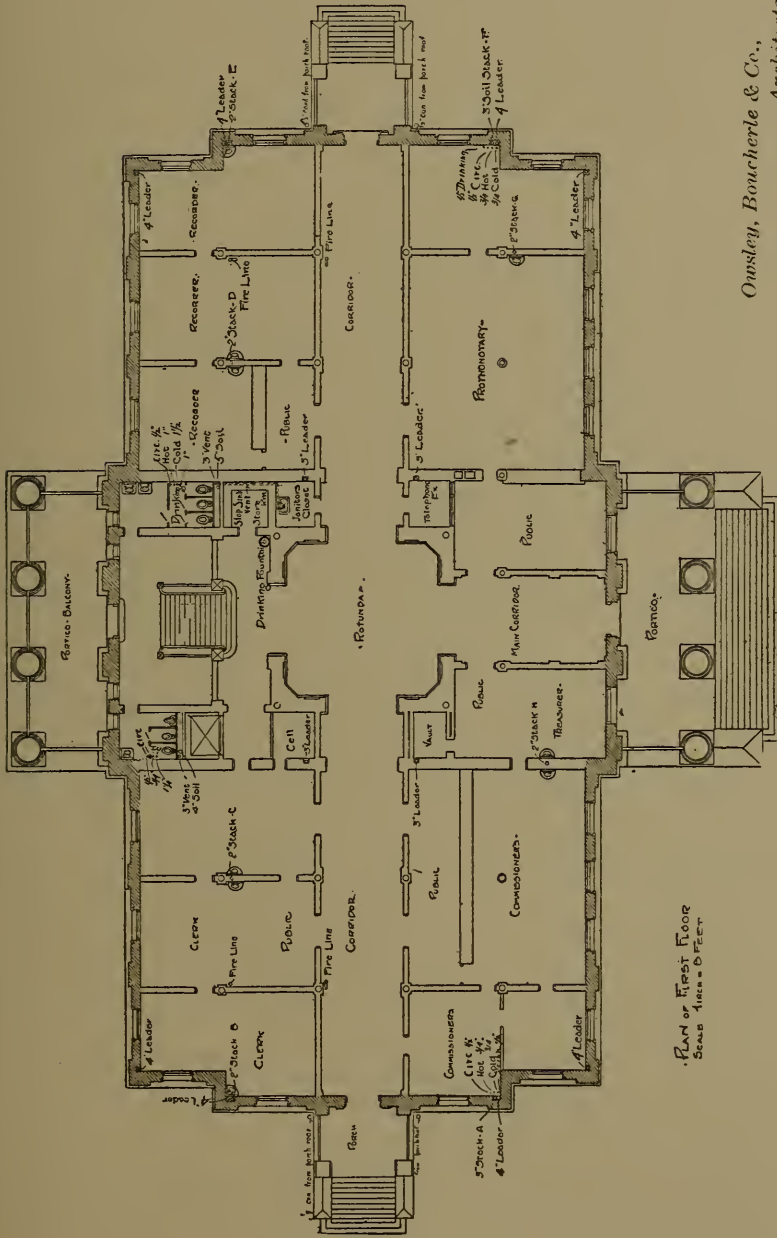
The plumbing layout for the basement floor of a court house is shown in Fig. 96. In this installation the rain water could not be discharged into the sewers, so it is conducted through separate rain-water systems to the curb, where it discharges into the street gutter.

On this floor is located an assembly room, with two retiring or dressing rooms, in each of which is a lavatory. Besides these lavatories there are in different parts of the basement two general toilet rooms—one for men and the other for women—a drinking fountain, a slop sink, fire lines, hot, cold and circulation pipes, water heater, hot-water tank, filters and water cooler.

A plan of the first floor of the building is shown in Fig. 97. This floor contains besides the two toilet



Plumbing Plans and Specifications



Omsley, Boucherle & Co.,  
Architects

Fig. 97  
First Floor Plan of Courthouse

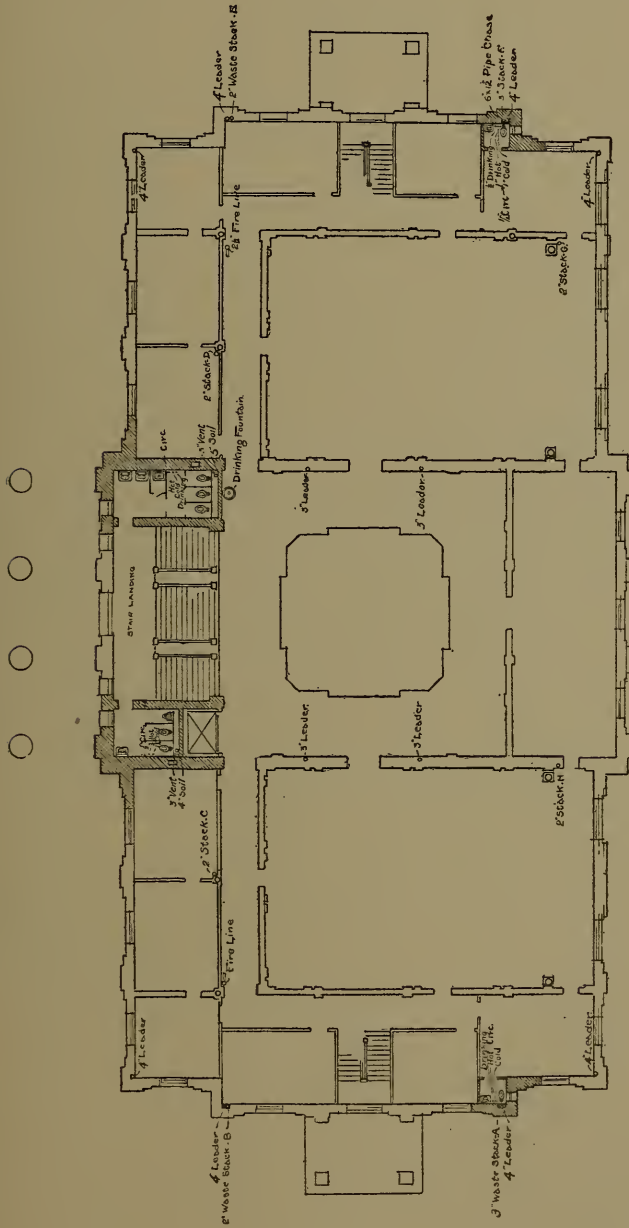
PLAN OF FIRST FLOOR  
SCALE 1/8" = 1'-0"

rooms, one for men and one for women, a janitor's closet containing a slop sink, a drinking fountain, lavatories scattered throughout the various offices and stand pipes or fire lines with hose reels and hose.

It might be well to point out that the plans for a court house shown in this work are not the architectural plans of the building, but only the plumbing plans to be used in connection with the architectural plans, from which the outlines of the plumbing plans were traced. The original plans are much fuller and more complete in detail as well as in measurements, all of which were omitted from the plumbing plan as having no bearing on the matter.

In Fig. 98 is shown a plan of the second floor of the building; it will be observed that the judges' rooms, adjoining the court rooms, are each provided with a private toilet room, and each lavatory is supplied not only with hot and cold water but likewise with cooled drinking water. Outside of the judges' toilet rooms there are no plumbing fixtures on this floor except the drinking fountain and two general toilet rooms. It will be observed, however, that in the women's toilet compartment there is a closet compartment containing the slop sink for this floor, there being no other convenient place to locate it. The fire lines extend to this floor and are provided with hose reels and hose, and outlets have been left in the various office rooms through which stacks pass for the future connection of lavatories.

Plumbing Plans and Specifications



PLAN OF SECOND FLOOR  
SCALE 1/8" = 1'-0"

Owslett, Boucherle & Co.,  
Architects

Fig. 98  
Second Floor Plan of Courthouse

The third floor of the building is a duplicate of the second floor, so far as the plumbing work is concerned, for which reason it is omitted from this work.

This completes, so far as the architectural requirements in the way of plumbing are concerned, the floor plans for a court-house building. A plumbing plan would not be complete, however, without details of the various parts and groups of fixtures. Space will not permit showing them all, but one sheet of details, which will indicate the requirements along this line, is illustrated in Fig. 99.

This sheet of details, at the extreme left, shows the way the main toilet room stack is to be run. It will be well to compare this detail with the one shown in Fig. 69, which shows the detail of a soil and vent stack in a hotel building. In the detail Fig. 69, it will be noticed that nothing but the bare stacks are shown. That was because on account of there being two bath rooms, one on each side of the stacks, it was found much simpler and clearer to show the stacks only in one detail, and the plan and elevation of the roughing-in for the bath rooms in two separate details, Figs. 70 and 71. In the present example, on the other hand, the work was of such a nature that one detail served for both the vertical stacks and horizontal branches, and shows them in their proper relation to each other. When this method can be followed it is the better one to adopt, but the entire layout cannot always be shown in one detail. When such is the case, the designer should make as many drawings as are necessary to show fully how the work is to be done, for that really is the object of plans and details.

# Plumbing Plans and Specifications

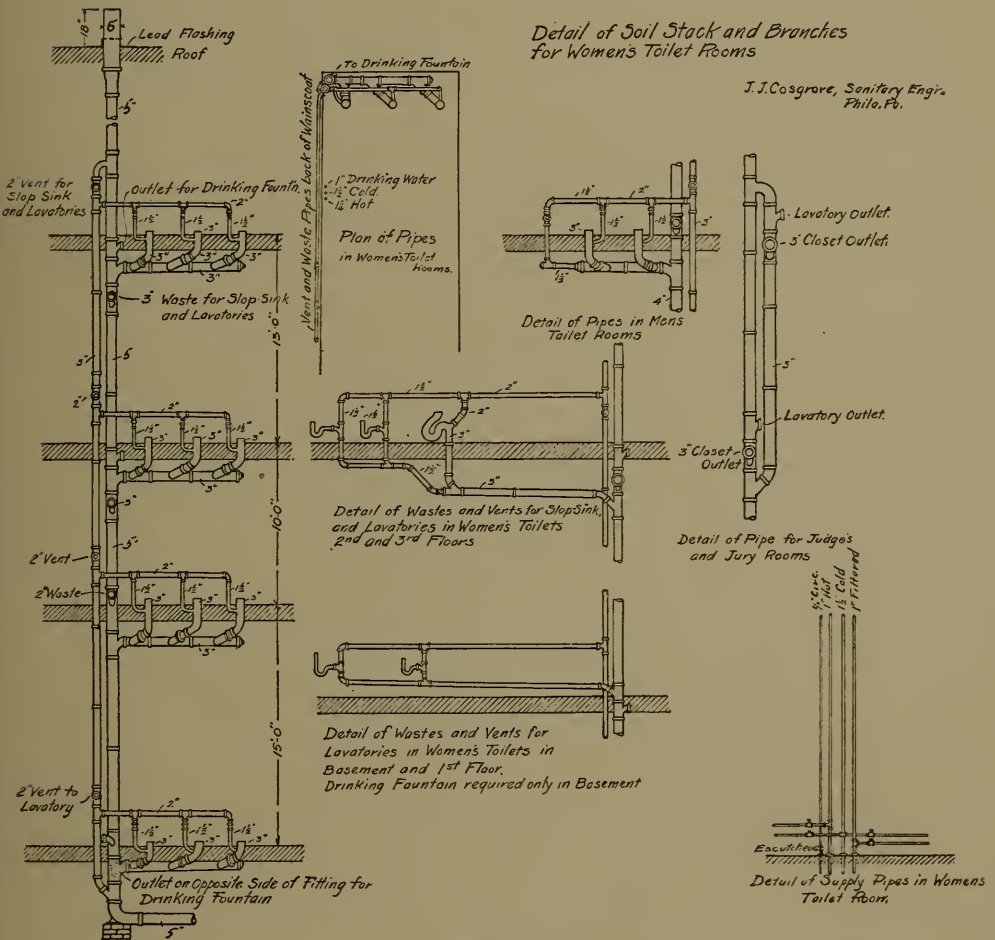
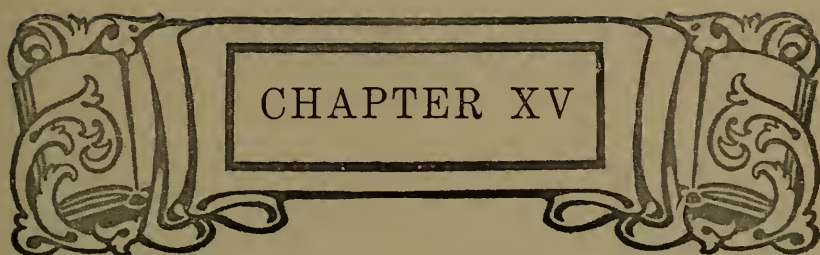


Fig. 99  
Plumbing Details for Courthouse

In the present example, all the work could not be shown on the one detail, for there were fixtures to be provided for outside of those shown in the groups. In order to show how the pipe for those other fixtures was to run, it was necessary to make the three additional details shown in the center of the sheet. The plan view shows the run of pipe to the closets, the slop sink and lavatories, and the outlet in the stacks for the drinking fountains in the corridors. The second detail shows the elevation of waste and vent pipes for the slop sink and lavatories on the second and third floors, while the bottom detail shows how the waste and vent pipes are to be run to the lavatories on the first floor. As these details are all drawn to scale, the estimator can take his quantities direct from them, while the plumber when installing the work will save a great deal of time by not having to study out how the pipes are to be run and where located. Doubt and uncertainty take up as much of the plumbers' time on complicated work as does the actual time of installing the pipe; for, it must be remembered, it is the function of the workman to do work as planned, not to plan the work, and when the designer has failed the plumber must not be blamed for requiring time.

Another feature of the details that may well be observed, is the sizes of pipes, both water and drainage, where they are shown. That is the real object of plumbing plans. To show fully and completely by numerous drawings just how the various pipes are to be run, and to show likewise the exact size of each piece of pipe.



## CHAPTER XV

### PLANNING THE PLUMBING FOR HOTEL BUILDINGS



**I**N PLANNING the plumbing for a large hotel, certain conditions must be considered, many of which are common to all types of semi-public buildings in which many people are housed and fed under one management.

In buildings where many people are fed, ample provision must be made for cooking the meals, and this necessitates large and numerous sinks, supplied with hot and cold water, located in the kitchen, bakery and scullery rooms. In the bakery, in addition to hot and cold water, ice water must be provided for use in mixing pastry, and in the scullery room separate sinks should be provided for the preparation of vegetables, and at which the table dishes and cooking-utensils are to be washed.

Large quantities of grease, accumulated in the preparation of foods and washing of dishes, are emptied into hotel sinks, and to prevent the grease from obstructing the house drains provision should be made to intercept it before it reaches the drains.

A large number of employees, both male and female, are required in the preparation and serving of meals, washing of dishes and laundering of linen, and toilet accommodations must be provided for their use. Further, floor drains should be provided in all of the workrooms and in the connecting corridors, to facilitate the cleaning of floors, unavoidably soiled by so large a force of help.

Butler pantry sinks should be provided in serving-rooms adjoining dining-rooms, and a bar and back bar in the café, fitted up complete with hot and cold water, ice water and waste connections.

As the guests of a hotel are to be lodged as well as fed, facilities must be provided for washing and bathing of the guests. The number and quality of the bath rooms usually depend upon the class of the hotel. In the best class of hostelries a separate bath room containing lavatory, water closet, bath tub or shower, and sometimes bath tub and shower, is provided in connection with each room or suite of rooms, while in the cheaper hotels bath rooms are provided only in connection with certain of the more expensive suites and the toilet accommodations on each floor are for the common use of all the guests. In rooms which are not connected with bath rooms, lavatories with hot and cold water are provided in all the better class of hotels.

To care for the comfort of the guests and keep the rooms and corridors clean, a number of servants are necessary, and bathing and toilet facilities must be provided for them on the dormitory floor of the building. Also, slop sinks should be





provided on each floor of the hotel to facilitate the work of cleaning the rooms on the several floors.

A laundry is indispensable in a first-class hotel, and besides the usual machine washers, a battery of stationary tubs should be fitted up in every complete laundry.

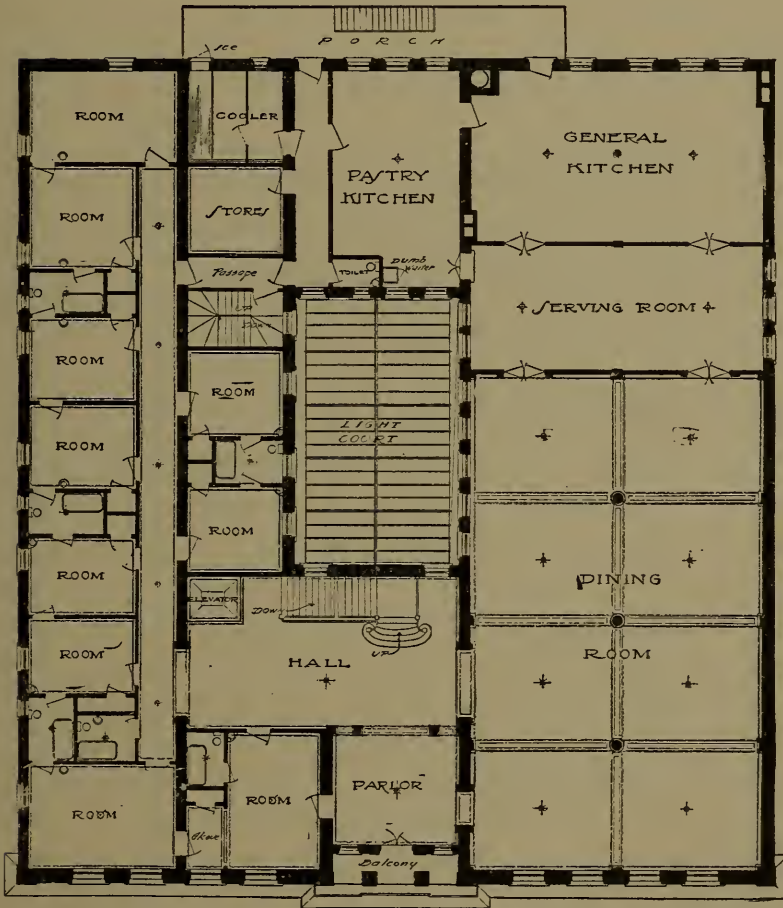
There are certain provisions of a semi-public nature that must be made in a hotel, which are unnecessary in most other types of buildings. A large toilet room for the accommodation of guests and patrons of the hotel is a necessity, and a barber shop is almost indispensable. Hotel barber shops are sometimes fitted up with bath rooms, while in more pretentious hostelries Turkish and Russian bath parlors are provided.

Drinking-fountains should be fitted up in the lobby of the hotels, and all water used throughout the entire establishment should be sterilized by filtration.

In tall hotel buildings, in which it is necessary to supply the building with water from a house tank, two pumps should be provided, so in case one pump breaks down the other can be used to fill the tank while the broken one is being repaired.

In extremely tall buildings, twenty or more stories in height, a house tank should be provided for each ten stories, so as to avoid the excessive pressure on the lower floors that would result from the use of but one house tank located on the roof of the building. Instead of providing tanks at different elevations, pressure-reducing valves can be used in their stead. It must be born in mind, however, that a pressure-reducing valve only relieves

Plumbing Plans and Specifications



SECOND FLOOR PLAN HOTEL LE RAY WATERTOWN, N.Y. *D.D. Kieff, Archt*

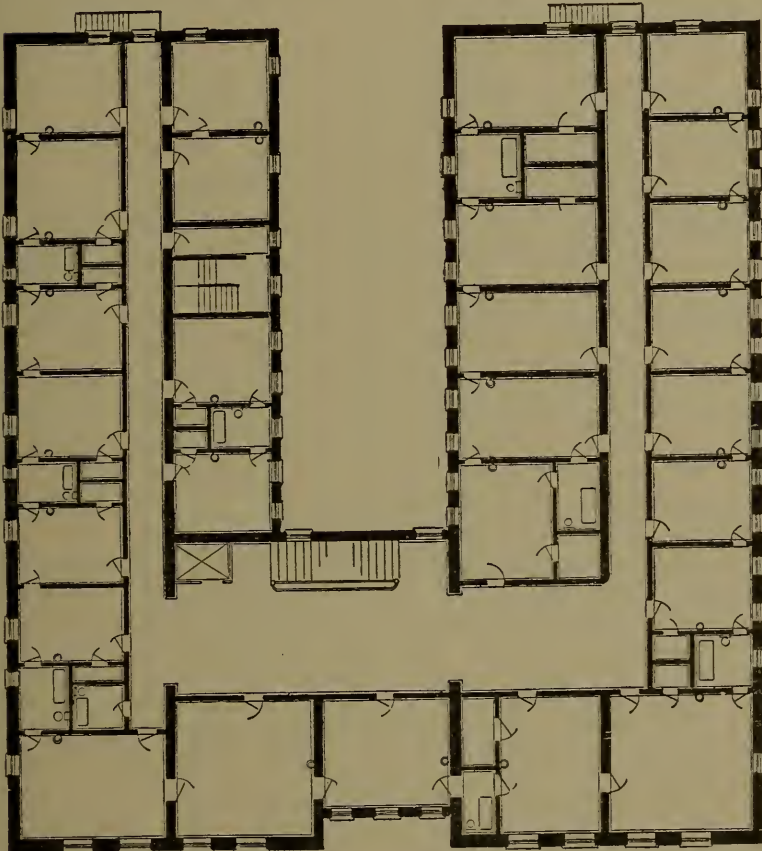
Fig. 101  
Second Floor Plan of Hotel

the system of pressure when all the faucets on the low-pressure side are closed; when a faucet is opened the water will flow with a pressure due to the head or water measuring from the tank. If the building is very high and pressure-reducing valves are used there will be more splashing when water is being drawn than when tanks at different elevations are provided.

A further condition to be considered is capacity for storage for at least one day's supply of water. This provision is to guard against a water famine caused by shutting off the water from the street mains for repairs or for other causes.

When storage of the entire daily supply of water on the roof would cause a greater weight than should be permitted, or would require more roof space than is available, part of the water can be stored in suction tanks located in the basement or cellar.

A feature which is generally overlooked in planning the water supply for hotel buildings is the advisability of providing a supply of ice-cold drinking water to every guest room. In view of the fact that hotels are always provided with a mechanical refrigeration system the providing of a supply of ice-cold water becomes very simple and economical, and a continuous circulation can be maintained throughout the ice-water system by means of a small rotary pump. The water should first be filtered, then cooled, after which it may be circulated through the distributing mains to the various ice-water faucets, then back again to the cooling coils.



3<sup>rd</sup>, 4<sup>th</sup> & 5<sup>th</sup> FLOOR PLAN HOTEL LE RAY WATERTOWN, N.Y. *D.D. Kieff, Archt.*

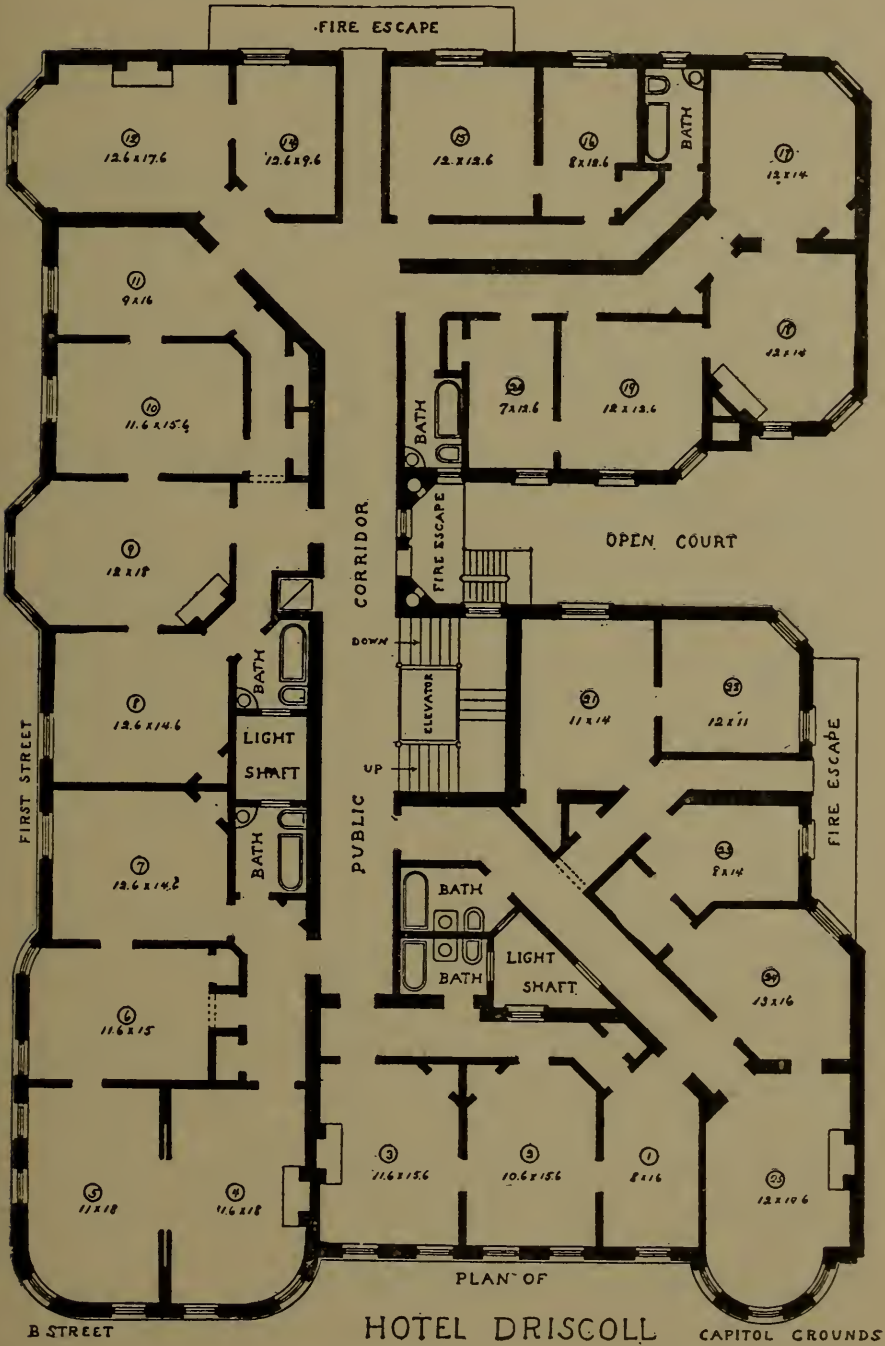
Fig. 102  
Upper Floor Plan of Hotel

In proportioning the hot water and cold water supply for the building, the size of pipes should be carefully calculated, to guard against the annoyance experienced in many first-class hotels of the faucets on the lower floors of the building robbing those on the higher floors.

Another consideration which should be kept in mind in limestone regions is the fact that hard water is very objectionable for washing and bathing, and that the entire water supply for a building can be softened, at no cost to the management when the saving of fuel effected by the use of soft water is considered and to that is added the saving of soap, labor and scouring preparations. The softening of water in a large establishment will be found to more than pay for the process, besides giving the guests the additional comfort and convenience of an improved water. Not only hotels but hospitals, sanitariums, asylums and like institutions can have the water supply softened with profit to the management and pleasure to the inmates.

Fire lines will be found desirable in hotel buildings, whether fireproof or combustible, and should be part of every well-equipped hotel water-supply system. In country, seashore or other suburban hotels, in addition to the fire lines within the building, there should be fire hydrants on the grounds outside, so that flames can be fought from without when the interior is inaccessible. In seashore resorts the question of salt-water baths is one that will have to be considered, and at other country and summer or winter hotels, water supply and

Plumbing Plans and Specifications



A. Goenner, Architect

Fig. 103  
Novel Floor Plan of Hotel Building

sewage purification will be among the plumbing features which will require consideration.

An objectionable practice commonly followed in hotel design, but which should be changed for a more satisfactory method, is the installing of self-closing basin cocks at the lavatories. Very few patrons of a hotel care to wash in a basin which has been used by thousands before them, particularly when their preference under all conditions is to wash in running water; but, even in the very best hotels, they are confronted with a type of basin cock which makes any alternative but to wash in the basin almost impossible.

Another point which should be considered is the placing of combination cocks at lavatories. Usually the hot water in hotels is so extremely hot that it cannot be used without tempering it with cold water, and this cannot be done when washing at an open faucet unless a combination cock is used.

## EXAMPLE OF A HOTEL BUILDING

The first floor plan of a small hotel building is shown in Fig. 100. It will be noted that two stores are included in the first floor plan and are part of the building, so that they will have to be considered when laying out the plumbing work. Every store building should have a toilet room containing a water closet and lavatory and, outside of the toilet room, a sink will be found convenient.



The public or general toilet room for the hotel is located in the basement of the building and is not shown in the illustrations here reproduced. A small toilet room is likewise provided on the first floor, adjoining and accessible from the barroom. The barroom is fitted up complete with all necessary waste and supply connections, and a drinking-fountain may well be located in the lobby. In hotels where ice-water is supplied through pipes to the drinking-fountain and the various rooms a branch may be run likewise to the bar.

In Fig. 101 is shown the second floor of the building. On this floor are located the kitchen, serving room, pantry and main dining room, which necessitates the installation of considerable plumbing work. In addition to the usual kitchen, pantry and serving-room fixtures there is a toilet room for servants on this floor, accessible only from a passageway.

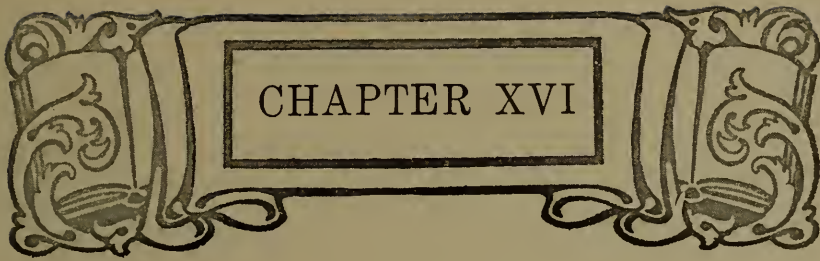
Each sleeping room on the second floor has a stationary lavatory supplied with hot and cold water. In addition each room, with the exception of one, adjoins a bath room, so that the rooms can be let either with or without bath. Besides the liberal provision made for washing and bathing on this floor there is a general bath room, accessible from the hall, for the benefit of the guests who have no private bath rooms.

On account of lavatories having been provided in all the sleeping rooms they have been omitted from the bath rooms, which contain only a water closet and a bath tub. Notwithstanding that fact,

this floor of the building is well supplied with plumbing fixtures.

The third, fourth and fifth floors of the building, shown in Fig. 102, are given over entirely to sleeping rooms. Here, as on the floor below, stationary lavatories with hot and cold water are provided in each of the sleeping rooms, and, in addition, one-half the sleeping rooms are adjoining bath rooms, with which they may be let. In the same location as on the second floor a general bath room is provided on each of the three upper floors for the convenience of the guests having no bath rooms.

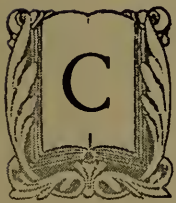
The floor plan of a small hotel building, which provides in a very unique and satisfactory way for the toilet accommodations of the guests, is shown in Fig. 103. In this building there is a separate bath room for each three rooms, which may be let en suite, or separately, the bath room communicating directly with a private hall and being equally accessible from all rooms. Such an arrangement would prove eminently satisfactory for the numerous hotels in the various smaller cities throughout the country, a semi-private bath room being much more inviting than a public one. Of course, in a case of this kind, it would be advisable to have separate lavatories in each of the sleeping rooms, the same as in other hotel and club buildings.



## CLUB BUILDINGS



### PLANNING THE PLUMBING FOR CLUB BUILDINGS



**COUNTRY CLUBS.**—Club buildings are peculiar unto themselves, inasmuch as they may partake of the features or functions of several different classes of buildings, each case depending entirely on what interest in common brought the members together and made possible the building of a club. For instance, there are country clubs, city clubs, athletic clubs; and the plumbing installations in these three classes of buildings will differ from one another, at the same time having some features in common.

Country clubs are usually intended as places to spend the day, but seldom are they designed with the view of accommodating members over night. On this account there are no sleeping rooms or bath rooms outside of those required for the accommodation of the employees of the club. Meals are always served at country-club buildings, so that a fully equipped kitchen and a well-appointed laun-

dry are necessary for the proper fulfilment of this function. Toilet accommodations must be provided for the members, and as women are usually welcome when accompanied by male escorts, separate toilet accommodations must be provided for the women guests of the club. Golf, tennis, bowling and other games are usually features of outdoor life, and in order to remove the grime and perspiration resulting from such pursuits refreshing shower baths should be provided. For the accommodation of the women guests, separate showers should likewise be provided, as well as a bath tub for those who object to the shower or would prefer a tubbing.

In cases where country clubs are built remote from a city, and accommodations are provided for lodging the members, bathing facilities ought to be provided in connection with each room, the same as in first-class hotel buildings.

Country clubs are generally situated remote from public sewers and water supplies, so that means must be provided to secure a plentiful and wholesome supply of water and dispose of the resulting sewage.

**City Clubs.**—City clubs—that is, the various social clubs established in cities—partake very closely of the nature of hotel buildings, in which members of the club, only, are extended the privileges of the house. Indeed, a fully equipped city club could easily be converted into a hotel by changing some of the private dining rooms into sleeping apartments.

A well-appointed club building has toilet rooms on the various public floors, the same as in hotel buildings. It must have a fully equipped kitchen, a well-equipped laundry, toilet accommodations for the servants, barber shop, and bath rooms adjoining the sleeping rooms on dormitory floors. Here the necessity for bath rooms in connection with sleeping rooms is almost imperative. Members who can afford to live at a first-class club can well afford the extra cost of a bath room, and as the club is the member's home his own private apartment absolutely needs a toilet room.

In addition to the other sanitary features of a club building a Turkish bath will always prove desirable to the members, besides being a source of revenue to the management.

## EXAMPLE OF A CLUB BUILDING

The first-floor plan for a city-club building is shown in Fig. 104. There is but little plumbing work required on this floor; a main toilet room, the work necessary to fit up a bar in the barroom and, possibly, a drinking-fountain are all that will usually be required. In case there are bowling alleys in the basement shower baths might likewise be located adjoining a dressing room on this floor, although they may equally well be placed on the floor below, convenient to the alleys, so that members can have a shower after playing.

The second-floor plan of the building is shown in Fig. 105. A good provision in a building of this

Plumbing Plans and Specifications

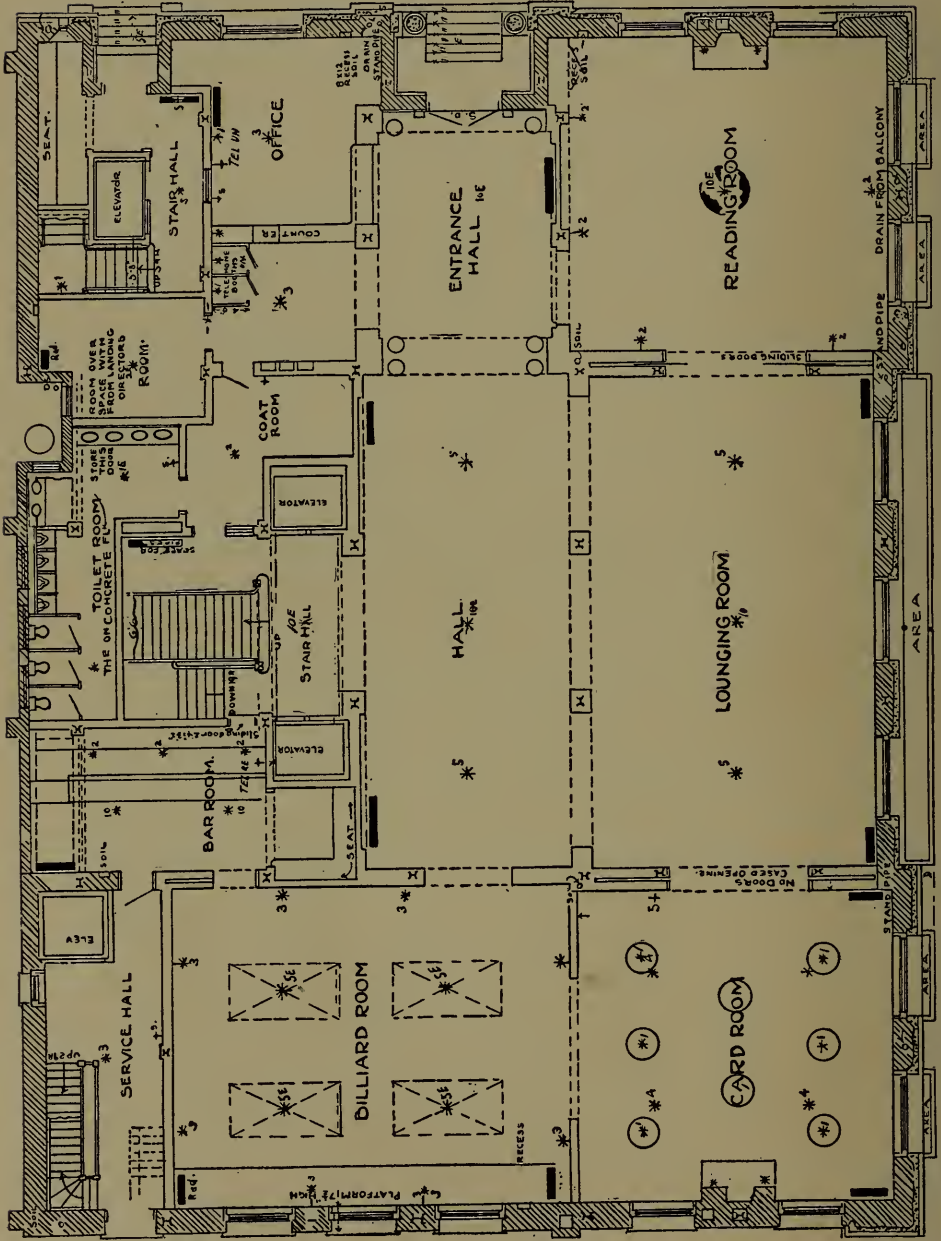
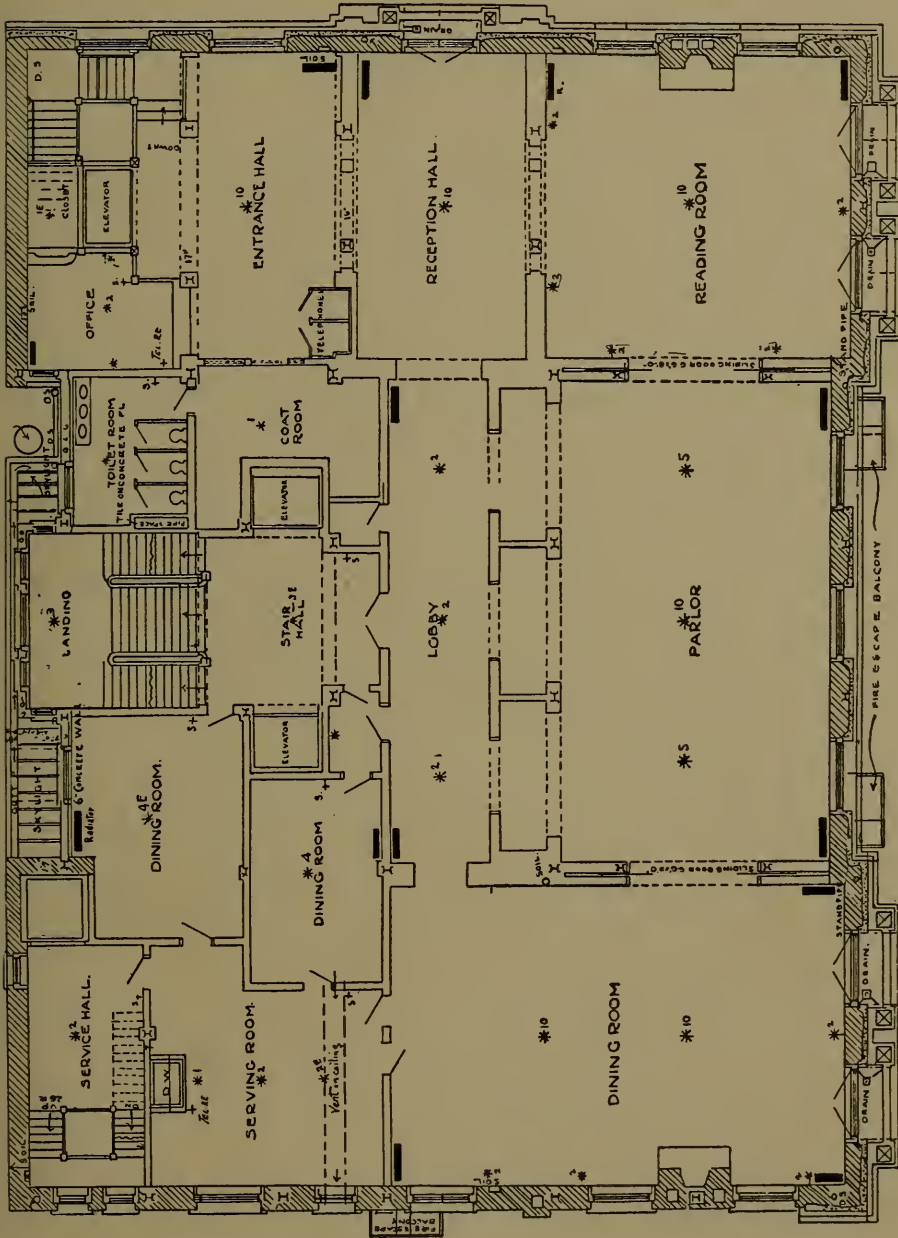


Fig. 104 CALIFORNIA CLUB, John Parkinson, Architect



SECOND FLOOR OF CLUB BUILDING CALIFORNIA CLUB, John Parkinson, Architect

kind is to fit up a toilet room for women on this floor in addition to the one for men. This is not necessary if women are always to be excluded from the building, but there are but few clubs in which there are not occasional ladies' days, when the doors are thrown open to the wives, daughters and acquaintances of the members, and some provision should be made for such occasions.

If the dining-rooms are to be situated on this floor a kitchen sink with drip board will be found very convenient in the serving-room. Slop sinks will likewise be found serviceable on all floors of the building.

In Fig. 106 is shown the third floor of the building. On account of the kitchen being located on this floor the plumbing work here amounts to a considerable item. In addition to the plumbing work required in a fully equipped kitchen of this character there is a general toilet room on this floor and a servants' room for the use of the help.

The dormitory floors of the building are shown in Fig. 107, which illustrates the fourth and fifth-floor plans of the building. On these two floors are installed the greatest number of plumbing fixtures in the building.

Each sleeping room, as may be seen by the illustration, has a bath room adjoining. In addition to the usual hot and cold water, ice water may be served here through pipes, the same as in hotel buildings, and besides the regular plumbing installation fire lines will be found advisable in club buildings.



Plumbing Plans and Specifications

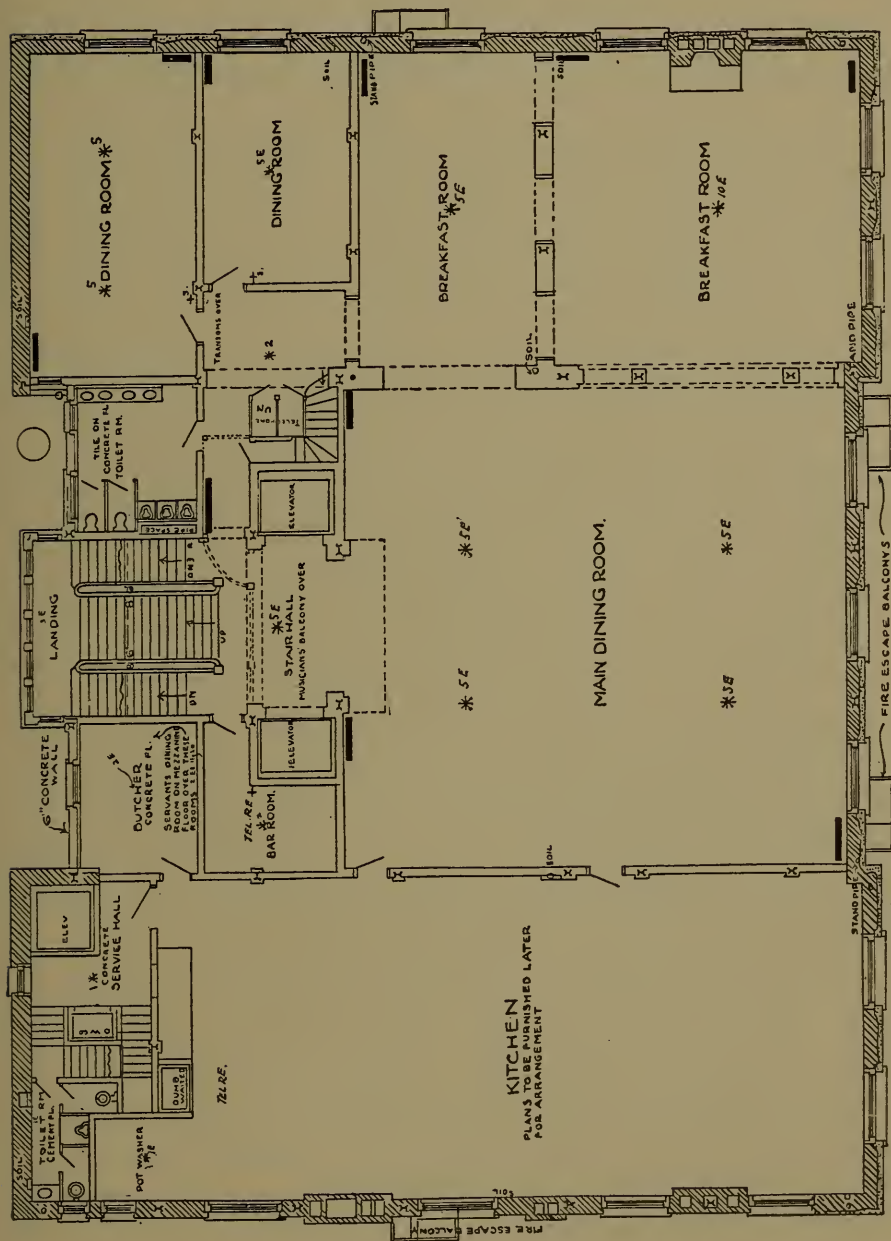


Fig. 106 CALIFORNIA CLUB, John Parkinson, Architect

Fig. 106

THIRD FLOOR OF CLUB BUILDING

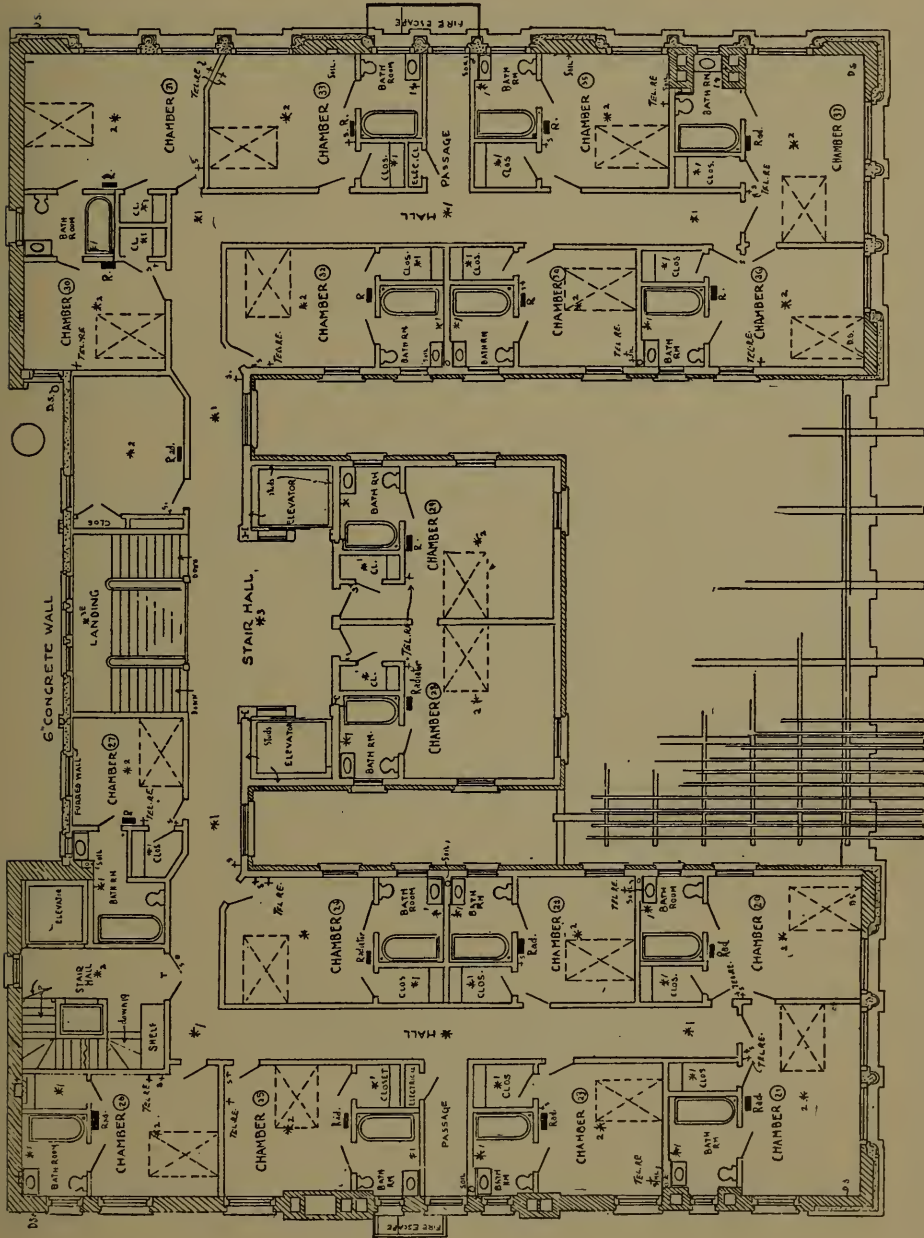
**Athletic Clubs.**—Athletic clubs differ but little from the usual city club, outside of those parts of the building set aside for athletics. A large swimming pool is part of every well-equipped athletic club, and showers must be provided near by for the members to wash in before entering the pool. The pool will usually be located in the basement, and here, likewise, will be found the Turkish bath rooms.

On the second or some upper floor of the building will be located the gymnasium, boxing, wrestling and fencing rooms, and convenient to them should be the dressing rooms, with lockers, and the shower room adjoining the dressing room. Smokers, at which vaudeville entertainments are given, are usually a feature of athletic clubs, and a couple of dressing rooms near the stage in the gymnasium will be found necessary. In these rooms there should be lavatories, and if no other provision is made in the building for women, a water closet should be provided adjoining one of the dressing rooms for the use of women performers.

The athletic club resembles in many of its features a Y. M. C. A. building, yet there are so many differences that it resembles more a composite of a Y. M. C. A. building and an ordinary city club.

In none of the buildings mentioned so far has the matter of rain leaders, yard and area drains been mentioned, although, of course, in all buildings provision must be made for conducting away the rain water so it will not create a nuisance, while yards and areas which are paved must have some provision made for drainage.

Plumbing Plans and Specifications

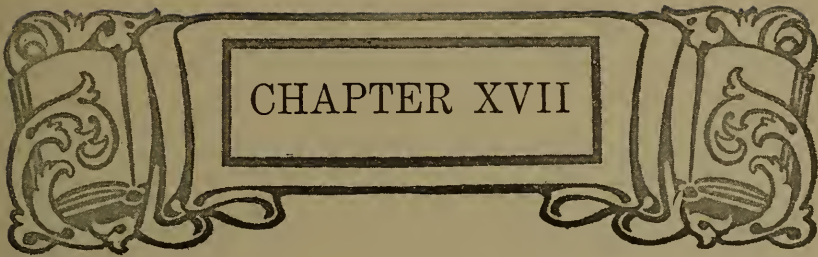


FOURTH AND FIFTH FLOORS OF CLUB BUILDING Fig. 107 CALIFORNIA CLUB, John Parkinson, Architect

In cities where separate systems of sewers are provided, one for storm water and the other for sewage, two systems of drainage will be required in buildings; one for the rain water and the other for sewage. On the other hand, where the combined system of sewers is in use, the storm water from rain leaders, yard and area drains can discharge freely with the house drain.

Whether the combined or separate system of sewers is used, rain leaders will be required, and, generally speaking, it will be better in cold climates to locate them inside of the building, where they will be protected from the frost, and be less liable to freeze up and burst. When located inside, however, to allow for the constant expansion and contraction of the pipes due to changes of temperature, each leader should be connected to the roof gutter by means of a short piece of lead pipe having circumferential corrugations to allow the expansion and contraction without injury to the leader or roofing.





## CHURCHES



### PLANNING THE PLUMBING FOR CHURCHES

**T**HE sanitation of churches is usually neglected. Perhaps on account of the limited use to which this class of building is put it has been deemed unnecessary, up to the present time, for any special provision to be made for the comfort and convenience of the congregation. There is no reason, however, why churches should be treated any differently in this respect than any other building where a large number of people congregate for a short period of time. Where such conditions obtain there should be a retiring room for women, with toilet accommodations adjoining, and a suitable toilet room should likewise be provided for the men.

In view of the fact that church services, Sunday school, lectures and other church functions seldom last over an hour, as liberal toilet accommodations are not necessary as would be required for a school building, factory or any place where the

meetings last longer. Perhaps, everything considered, an allowance of one water closet for each seventy-five women, or fraction of that number, in the congregation, and a like allowance of one urinal and one water closet for every hundred men, or fraction of that number, in the congregation, would prove sufficient. At all events, this feature of church sanitation has been too long neglected, and later designs should not be found lacking in this respect. Of course, each toilet room would be provided with a lavatory, as is customary in all toilet rooms.

In addition to the general toilet rooms there should be a private toilet room for the officiating clergyman or priest, suitably located adjoining his private room.

The foregoing requirements are common to churches of all denominations. There are other requirements, however, which are peculiar to certain churches, while still others are matters of convenience, which may be included in or omitted from churches of any denomination.

In Baptist churches, for instance, or other churches where immersion is practiced, a tank for baptizing is an important part of the plumbing installation. In such churches the tank may be built under the rostrum and slides placed in front so that they can be removed during the ritual of immersion to enable the congregation to witness the ceremony. Tanks for this purpose are usually of large dimensions, 8 to 10 feet long, 5 to 7 feet wide, with steps at one end leading down to the bottom. The tank may be made of wood lined with sheet lead,

as is the more common practice, or it may be made of cement, concrete or bricks, and lined with glazed tile. In either case provision must be made for heating the water to take off the chill when in use so the people who are baptized will not suffer too severe a shock from the cold water or run the risk of becoming chilled and contracting a cold. A dressing room, fitted with a lavatory, will be found desirable, if not actually necessary, for the disrobing and robing of those who are to be immersed.

In churches of many denominations sociables and suppers given for charity are matters of such common occurrence that in designing such a building those entertainment functions should be taken into account and a suitable kitchen provided with sinks, range and hot and cold filtered water.

In some churches water motors are used for pumping the organ, and when such is the case suitable outlets, both in the drainage system and in the water supply pipes, should be provided.

Drinking fountains would not be amiss in church buildings and they may be located in some sheltered nook in the outer nave, in which case one would be sufficient, or separate drinking fountains may be located in the women's and men's rooms. In either event some type of sanitary fountain would be found preferable.

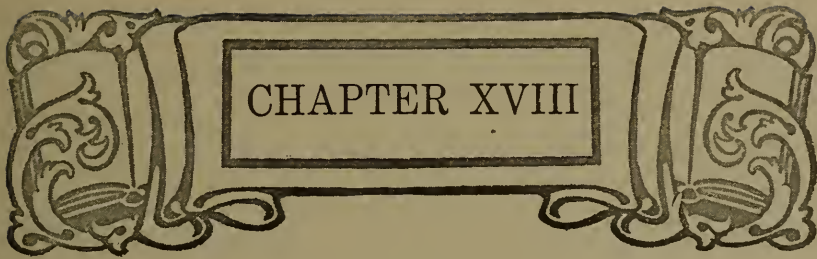
A sanitary provision which should not be overlooked in churches is the installation of a vacuum cleaner to keep the church free from dust. Many of the seats in churches have upholstered cushions, while the aisles are covered with runners. These

become charged with dust brought in by people and from infiltration during the week, so that when stirred up by walking, and stirring about in the seats, affects the lungs and is anything but pleasant or sanitary. A good vacuum cleaning outfit would rid the church of the dirt and dust on Saturdays, leaving it in good condition for the Sunday services. Brooms and dusters are of no use for this purpose, as they but stir up the fine and more irritating particles, which, later, settle again ready for further mischief.

A good ventilation system is equally desirable in church buildings. Where many people congregate, as they do in church, the air becomes vitiated unless a constant supply of pure, fresh air is constantly forced in from outside. The air used for this purpose should further be passed through an air filter or an air washer to remove all particles of dirt, soot and dust.








## CHAPTER XVIII

### PLANNING THE PLUMBING FOR VARIOUS STRUCTURES



#### PLANNING THE PLUMBING FOR LIBRARIES

HE library is another class of buildings in which the public is wholly ignored, so far as toilet accommodations are concerned. Why this should be is hard to determine, but the fact remains that in comparatively few library buildings throughout the country have any sanitary provisions been made for the visiting public. That is not as it should be. Wherever a building of a semi-public nature is erected some provision should be made for the accommodation of the public which is invited by the opening of its doors. The public toilet accommodations for the ordinary library building need not be large or extensive, as a large number of people seldom congregate there—a couple of water closets in the women's toilet room and one or two water closets and a urinal in the men's compartment are about all that will ordinarily be required.

In addition to the public toilet rooms a drinking fountain will be found desirable in all public libraries, and private toilet accommodations should be provided for the employees of the building.

## PLANNING THE PLUMBING FOR FIRE-ENGINE HOUSES

There is not much plumbing work in a fire-engine house, but what little there is differs so from the work in other classes of buildings that it will stand explaining in detail.

The plumbing work in fire-engine houses may be considered as belonging to three distinct divisions. First, there are the fixtures for the comfort and convenience of the firemen; second, plumbing work required by the horses, and, third, the plumbing work necessitated by the fire-fighting apparatus.

As the men sleep on the second floor of the building all the usual comforts and conveniences in the way of bath tubs, shower baths, lavatories and water closets should be provided that would be found in any well-equipped club. In a certain sense the fire-engine house is a club where the men live and sleep, and the necessary toilet accommodations must be provided for their comfort. A good shower bath, or a needle shower and spray bath, will be found a welcome addition to the equipment. When the men return from fighting flames they are covered with perspiration from their own exertions and grime from the soot and ashes of the fire, and a good hot shower bath will be found not

only grateful but quicker and easier for them to take than the regular tubbing. Of course, a plentiful supply of hot water will be necessary in a fire-engine house, and in addition to the shower bath there should be a regular bath tub. If there are over fifteen men attached to a house there should be a couple of bath tubs and water closets for their use. Enough lavatories should likewise be provided so that men will not have to stand around waiting for one another to get through washing.

For the horses, stall drains connected to the drainage system will be required, and besides the usual drinking troughs for the horses, outlets must be provided for attaching the hose so that the floors and apparatus can be cleaned. Floor drains will be required in the apparatus room so that water can be freely splashed on the floor without collecting in pools.

In fire-engine houses where steam engines are kept a water heater will be required in the basement to keep up the temperature of water in the steam engine to near the boiling point. While standing idle waiting for a call the fire engine is kindled ready to apply the torch and set the furnace going. If the water were allowed to cool, however, there would be no head of steam when a fire was reached. To overcome this difficulty a stationary boiler or water heater is provided in the basement of the engine house, and the flow and return pipes are connected to the engine by means of flexible or automatic connections so that water from the boiler will circulate freely through the fire engine, thus keeping the temperature almost

at the steaming point and ready at a moment's notice for the start to a fire.

## PLANNING THE PLUMBING FOR FACTORY BUILDINGS

Manufacturing buildings differ so from one another in what is required in the way of water supply and waste connections for the industrial purposes to which they will be put that no rules can be laid down which will be applicable to all. The only suggestion of any value is to see that the quality of water is suitable for the purpose. Many industries require a hard water for use in their processes, while the greater number must have soft water, and all factories prefer soft water for boiler feed. The best thing to do when designing a building for industrial purposes is to consult with the superintendent or manager of the plant as to his requirements.

So far as the comfort and convenience of the employees are concerned all factory buildings are very much alike and not any of them require a great amount of plumbing. Of the small amount that is required a supply of drinking water will be found in the front rank, and it will be found a matter of policy to filter all water used at the drinking fountains. Outside of the drinking fountains all that will be required are separate toilet rooms for the men and women and another toilet room for the office help. Ordinarily it will be found that one water closet and one urinal for each twenty male employees, or part of that number,

and one water closet for each twenty female employees, or part of that number, is the smallest possible allowance. The closets should be grouped on each floor of tall buildings, or at least on each alternate floor of the building. In low factory buildings, not over two stories in height but spread out over a large area, the toilet accommodations are better scattered throughout the premises at convenient points. A good arrangement is to have the water closets in a separate compartment adjoining the locker room and have the lavatories located in the locker room. The number of lavatories will generally depend upon the generosity of the management, but one lavatory to ten employees is about the average allowance. In factories where the work is particularly dirty, as well as in many other establishments where the management can be made to see the value of cleanliness, shower baths are provided for the employees. These need not be expensive affairs and may be set in one large shower room with sloping cement floor. Such shower buildings are provided at the main shaft of many mines in the anthracite region.

It might seem unnecessary to remark that a retiring room adjoining the women's toilet and wash room, and furnished with sanitary cots, should be provided in all factories employing women. Accidents and sickness are not of infrequent occurrence in such places, and common decency, if not humanity, should dictate that some place besides the floor of the factory be provided for the unfortunates.

Factory buildings, of course, will be well equipped with fire lines and sprinkler systems, but that part of the installation is more in the nature of fire protection and cannot be considered as belonging to the sanitary equipment.

## PLANNING THE PLUMBING FOR OFFICE BUILDINGS

The plumbing work in office buildings is generally a simple matter, being merely a repetition of the installation on one floor above another. In large office buildings, however, the plumbing work is one of the most important items from a financial standpoint, and in many cases there are special features to be provided for, which take the work out of the simple class.

Ordinarily the plumbing work for office buildings consists of a women's toilet room and a men's toilet room on each floor of the building; also a slop sink on each floor of the building, located either in a janitor's closet or in one of the toilet rooms. In the better class of office buildings separate lavatories, supplied with hot and cold water, are provided in each office or suite of offices in the building. No doubt, in the course of time, a private toilet room will be considered necessary in every large office suite, for the use of the head of the concern. There is no reason why a private toilet room, complete in every respect, should not be provided in such cases, in addition to the general or public toilet accommodations on each floor.

Drinking fountains are common to some office buildings, where one is located on each floor and supplied with purified water from a filter.

In very tall buildings, which are carried a corresponding distance below street level, subsurface sewage ejectors will be necessary to care for the sewage from the floors located below the street-sewer level. For the convenience of the engineers and firemen a fully equipped toilet room should be provided near the engine room, and a shower bath would add greatly to the comfort of these employees.

In many large office buildings barber shops are provided for on one of the floors, and here all necessary fixtures should be installed. Likewise restaurants are sometimes a feature of office buildings, in which cases the kitchens and serving rooms should be fully equipped.

Provision of living rooms is made for the janitor's family in some office buildings. The living apartments are usually located on the top floor, and, of course, should be fully equipped with plumbing fixtures.

## PLANNING THE PLUMBING FOR RAILWAY STATIONS

**Suburban Stations.**—The suburban stations of a railway company generally possess two distinct functions—that is, the lower floor of the building, which usually is two stories in height, is given over to the official business of the company and the convenience and comfort of the traveling public, while

the second floor of the building is fitted up as a home for the station agent's family. On the first floor of the building a toilet room for men, another for women, a slop sink for janitor service—which may be located in one of the toilet rooms or in the janitor's closet adjoining—and a drinking fountain usually complete the sanitary equipment. On the second floor of the building a bath room and kitchen, the same as in a private house or apartment, will complete the plumbing work for this class of buildings.

**Terminal Stations.**—Terminal stations, also way stations in large cities and at junctions, are of greater importance than suburban stations, and naturally have more extensive plumbing installations. On the main floors of such buildings retiring rooms for women adjoining toilet rooms are necessary, and corresponding toilet rooms are required for men. In the men's toilet rooms most of the fixtures will be free, while for the use of others a small fee may be charged, which will include soap and the use of a towel. Slop sinks will be found necessary on all floors of the building, and drinking fountains will be required on all the public floors.

A barber shop is operated in all large station buildings, and in planning the work provision must be made for the barber fixtures. Likewise a lunch counter and dining room form part of a fully equipped passenger station, which necessitates the fitting up of a complete kitchen, serving room and waiters' locker room with toilets. The engineers



and firemen must not be overlooked when planning the plumbing work and a fully equipped toilet room containing a shower should be provided for them.

The upper floors of terminal stations are generally given over to offices, so that this part of the station may be considered as an office building and fitted up in the same manner as would an ordinary office building.

## PLANNING THE PLUMBING FOR PRINTING OFFICES

The only special provisions required for a printing office, outside of the usual fixtures common to all office buildings, are water supply and waste connections to each linotype and monotype machine; large sinks, supplied with hot and cold water, where small forms and other articles common to printing plants can be washed, and a special form sink where type forms can be cleaned.

A form sink is best made of wood, dove-tailed together at the corners, and should be set on the floor in the press room, so that forms which are very heavy will not have to be lifted very high. The form sink should be supplied with hot and cold water through a combination cock having a hose connection, so that water of any desired temperature can be played on the form through a short piece of hose. A form sink of this description, which has given good service and general satisfaction, is shown in Fig. 108. The sink is here illustrated only as a suggestion, to be modified in form or size to suit any requirement. It will be found,

however, that seldom will a larger form be found necessary.

Compressed air is likewise required for many purposes around a large printing plant. It is used in connection with the feeding of presses, and is one of the agencies used in the operation of a mono-

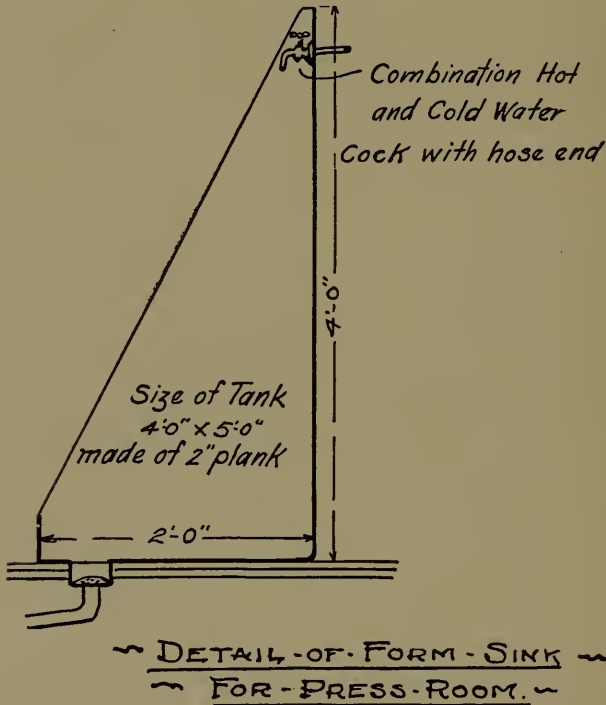
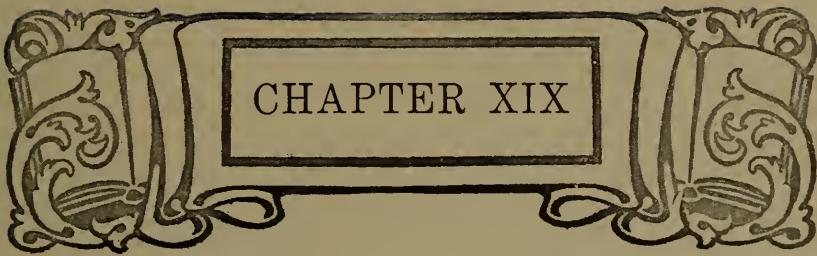


Fig. 108


type or linotype machine. Water will generally be required to cool the cylinders of air compressors, and waste connections will be required to carry off the waste water when such is the case, while, in small plants, where water is plentiful, water-operated compressors might be used for compressing the air.



## CHAPTER XIX

### PUBLIC BATH HOUSES



 NECESSITY for Bath Houses.—The benefits of public bath houses are so numerous and the advantages to a community arising from a well-planned system of such buildings are so well known that further comment would seem unnecessary outside of pointing out the extent to which public baths are patronized. In Boston, for example, where much thought and care are given to baths, over five hundred thousand people bathe annually. In Glasgow, Scotland, 853,000 was the total number for their banner year. In New York City at one bath house alone in one year 865,650 people, over one-third of whom were women, availed themselves of its advantages; while in Cleveland 172,000 people have visited a single bath house in one year. This liberal use of public bath houses, wherever they have been erected, points out more forcibly than could words the necessity for the erection of bath houses in all cities of whatsoever size and class. In manufacturing or mining towns and large commercial centers the necessity

for bath houses will be found the more urgent, but there is not a city or village throughout the land where bathing facilities are not lacking for the great mass of people. In the smaller cities and villages, where cost must be considered, the basement of school houses, town halls or other public buildings can easily and at small cost be fitted up as public baths. If the baths are located in the basement of school buildings so much the better, for school children can then avail themselves of the advantages during the day-time and the general public at night.

**Location of Bath Houses.**—In locating public bath houses it is of the utmost importance that they be placed in the districts where there are the greatest demands for their use, and the buildings should be located as centrally as possible within those precincts, so they will be readily accessible from all points without entailing a long walk. It is obvious that men or women, tired after a hard day's work, will think twice before walking a dozen blocks for a bath, no matter how much good it would do them, whereas they would not hesitate a minute if the bath house were near by. In order that the bath might be brought, if not home to the patrons, at least convenient for all, it would be better in large districts to erect several bath houses at different points in preference to one large bath house of the combined capacity of the several at some central location.

If distance has a deterrent effect on attendance, no less so has the architectural character of

the building, an imposing and formal exterior frightening the more timid away, while a less pretentious building, more in keeping with the neighborhood, attracts them or invites their confidence. Such timidity might seem foolish, but, nevertheless, it is true, particularly in districts where bath houses are first being introduced. It would be well, therefore, in such cases, to make the buildings simple and attractive, both inside and outside, so far as architectural enrichment or sumptuous furnishings are concerned. Cleanliness, simplicity and sanitary completeness should be the cornerstones of the edifice.

**Requirements of a Public Bath.**—In order that some one will be on the premises at all times to give the building personal attention, living-rooms are provided for the superintendents of public bath houses, usually on the top floor, and these living-rooms require all of the sanitary appliances of a like apartment in any other building. In the bath house proper the requirements will depend to a great extent on the completeness of the equipment. For instance, but few baths are provided with a hot-air room, or “sweat room,” such as is used in a Turkish bath, yet no more beneficial provision could be made, for the “sweat bath” is the most cleansing to the skin and purifying to the blood of all the baths. As the installation of a “sweat room” is a very simple matter and not at all costly, it would seem that no public bath should be erected without this important adjunct. From the hot-air room the bather could pass to a shower bath for a

good scrubbing and subsequent cold spray to close the pores and tone the system. Next to the hot-air bath and the vapor bath the ordinary bath tub is the most beneficial, but outside of some bath rooms in the women's apartments tubs are not so desirable as shower baths. Soap and dirt cling to the surface of bath tubs and would have to be cleaned away after each bath. Liability exists of spreading disease if the tubs are not properly cleansed, and, finally, more time would be required for each bather if tubs were used, without giving them the advantage of a cold shower to finish off with. For these reasons overhead shower nozzles are commonly provided for general use in public baths, and bath tubs provided only in a few of the compartments in the women's departments, where they may be used by women either for themselves or for bathing children.

In addition to bathing-facilities, toilet accommodations must be provided both for men and women, and instead of having separate days when the bath house is for the exclusive use of men or women, it is much better to have separate compartments where either can bathe at any time.

In the larger and more complete bath houses plunge baths are constructed, and while they add greatly to the attractiveness of the place, and tempt many people to the establishment during the summer months, still they are not of much value from a bathing standpoint, as they are very poor cleansers of the person. As between the plunge bath and the hot room, the latter is by far the more preferable where real value instead of at-

tractiveness is desired. Swimming-baths, on the other hand, do untold good by alluring people to the bath house who otherwise would not attend, thus making of them regular patrons.

In order to launder numerous towels, sheets and bathing-trunks, unavoidably soiled in a bath house, a laundry is indispensable, and this may well be located in the basement. Rotary machine washers, centrifugal water extractors, drying-racks and mangles, all run by power, are about all that will be required even in the largest establishments.

**Fees for Bathing.**—The question whether a fee will be charged for the use of a bath is one which must be settled in every city which establishes a bath house. There is no doubt but that the ideal condition would be free baths, where soap, water, towel and the use of a compartment could be had without cost; but if the cost of maintaining one free bath would prevent the construction of another—in other words, if more pay bath houses could be built than free ones—it is doubtful if the better plan would not be to put up as many baths as were necessary or desirable and charge a small fee at all of them. By this plan the greatest amount of good would be done to the greatest number of people.

Again, as a rule people do not care to be dependent on others for assistance and would sooner pay their own way, particularly if the cost be moderate. That being true, a larger attendance can be expected if a small fee be exacted.

If a fee be charged for the privilege of a bath the fee should be only high enough so the patron's self respect will not suffer, not so high that it would prevent the free use of the bath house by anybody. Children under any condition should be admitted free, and a charge of five cents should be the most that would be exacted from anybody. Where there is no free list outside of children, tickets might be sold at, say, ten for a quarter, making the cost per bath two and one-half cents. This small fee would not prohibit any one, for, even though they could not afford the money, some one would give them a ticket, and even a pauper would feel more independent attending on a free ticket than asking for a free bath.

Where a hot-air room is provided, a fee of ten cents might be charged for what would be equivalent to a Turkish bath. In Glasgow, Scotland, a complete Turkish bath with massage can be had for twenty-five cents, so without personal attention the bath ought to be possible for ten cents. So far as the massage is concerned, that which is given in a Turkish bath may just as well be omitted, and there is nothing else about the process which the bather cannot do for himself.

**Public Wash Houses.**—Public wash houses have been found as great a boon in poor districts as have the public baths, and the two now go hand in hand. In many cities the public baths are combined with the public wash houses in one building and this practice, no doubt, will spread with time.



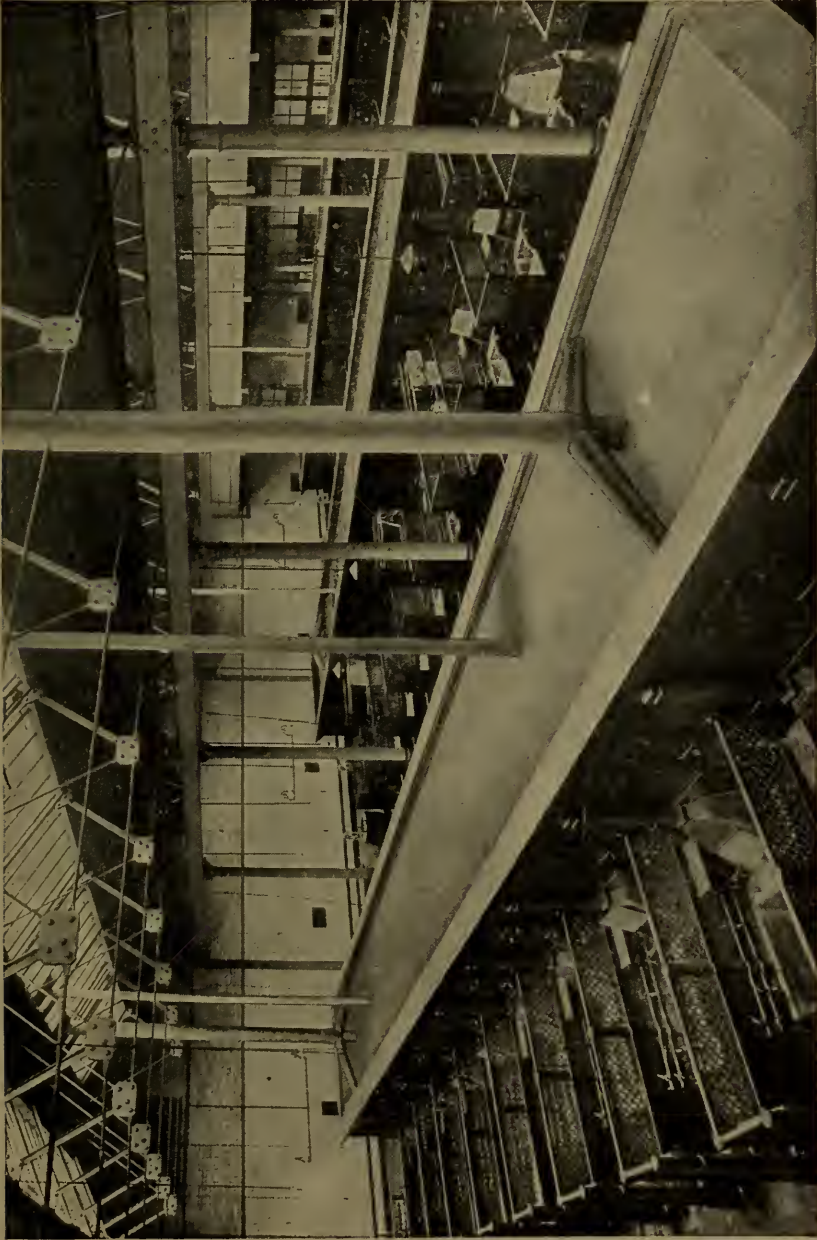


Fig. 109  
The Model Wash House at Whitevale, Showing Laundry Stalls

In public wash houses, for the small fee of four cents per hour, a woman can have soap, water, heat, light, a set of wash trays connected with hot and cold water and waste, and a corresponding rack in the drying-room, as well as the use of a mechanical washer, centrifugal water extractor, mangle, irons, heated iron stoves, ironing-boards and table—everything, in fact, that would be found in a fully equipped private laundry. All she needs to bring is the soiled clothing, which is taken away dry and clean. The interior of a large wash house in Glasgow, Scotland, showing the separate booths containing tubs, moisture extractors, and doors leading into the drying-racks, may be seen in the half-tone illustration, Fig. 109.

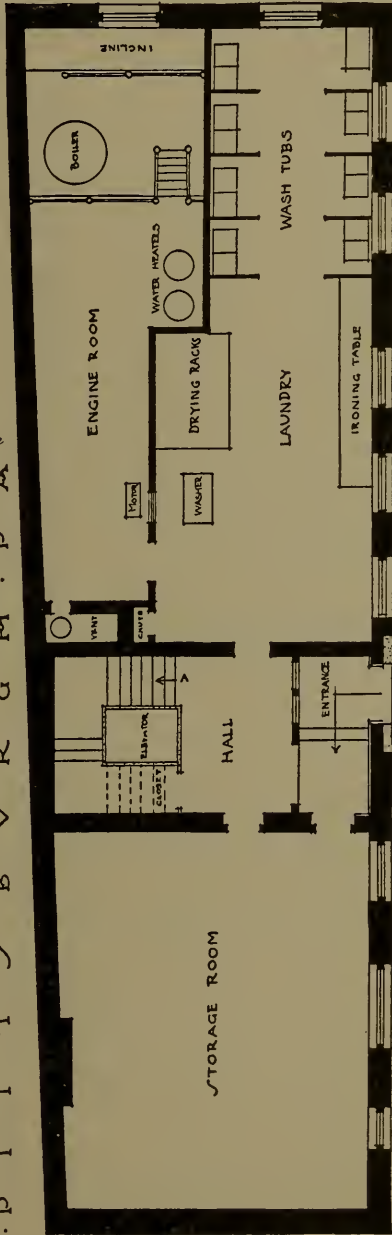
In large bathing establishments which are combined with public wash houses a separate laundry is maintained for the establishment, so that there will be no confusion between the public wash house and the bath-house laundry.

## EXAMPLE OF A PUBLIC BATH AND WASH HOUSE

The basement floor of a public bath and wash house is shown in Fig. 110. This floor is given over to the public wash house and contains, in addition to the hall, storage room and engine room, the public laundry. In the laundry are eight sets of two laundry tubs, a machine washer, drying-racks and ironing-table.

The plan of the first floor of the same building is shown in Fig. 111. This floor contains the men's

PUBLIC WASH HOUSE NO. BATHS;  
 P I T B V R G M P A



PLAN OF BASEMENT

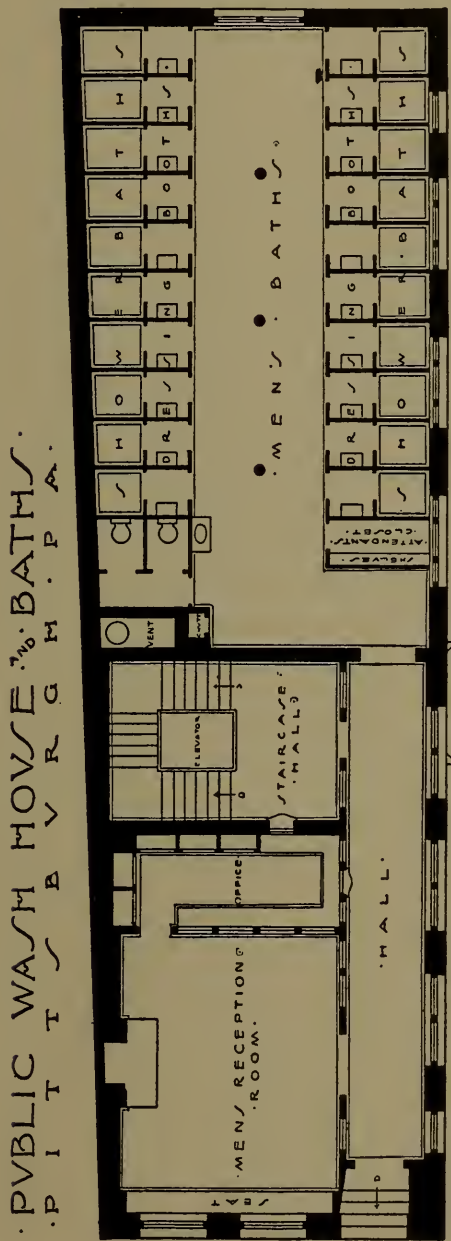
Fig. 110

baths and a toilet room, besides a reception or waiting-room, where patrons can be made comfortable while awaiting their turn. The main bath room is divided up into twenty separate booths, ten on each side, divided by a corridor. The booths are again subdivided into the inner shower rooms and the outer, or dressing, rooms. All that the dressing rooms contain are hooks on which to hang clothes and a stool, or seat, on which to sit. The partitions are of slate, marble or glass, about seven feet high, and the tops are covered with wire screens to prevent clothing or other valuables being "lifted" from one compartment to another.

The women's booths are on the second floor, as shown in Fig. 112. Here, in addition to the showers, are two booths containing bath tubs and a separate bath room for children. A nursery is likewise provided and a reception room for the women waiting for a bath.

## PUBLIC PLAYGROUNDS

A description of public conveniences—like comfort stations, bath and wash houses—would not be complete without some reference to public playgrounds, such as are receiving so much attention at present in the more progressive of the large cities. These public playgrounds, with their necessary buildings, provide facilities for all kinds of amusements, sports and comforts, and must, therefore, possess many of the features of a public comfort station, club building, library, restaurant, gymnasium, bath house and recreation park combined,



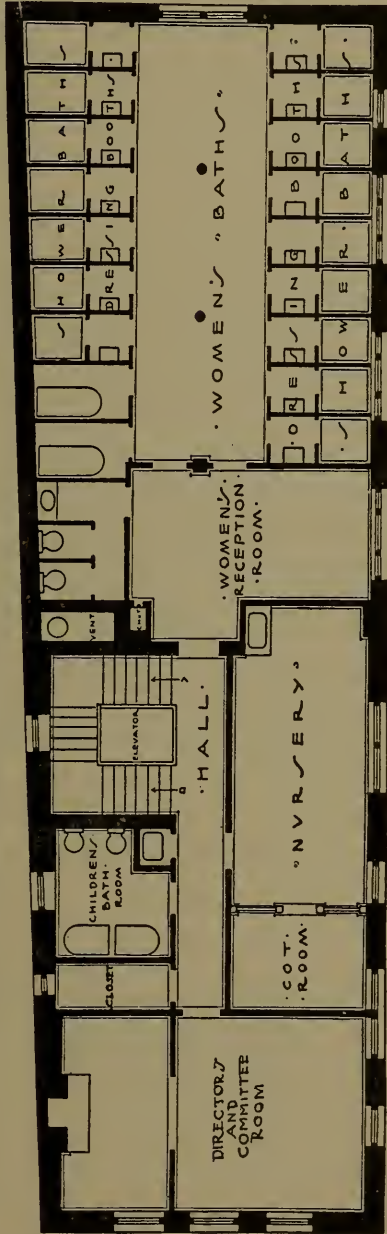
FIRST FLOOR PLAN  
Fig. 111

as may be seen by referring to Fig. 113, which shows the layout of a typical small playground in Chicago. Plans of the first and second floor of the recreation building erected on this park are shown in Fig. 114. Ample toilet accommodations, both for men and women, are provided in this building. In the indoor gymnasiums, in addition to the douche baths, there is a plunge bath, while outside in the open air is a large, delightful swimming-pool, a typical scene from which is shown in Fig 115. A shower house is provided close beside the swimming-pool, so that a thorough wash can be had before entering the water. See Fig. 116. The outdoor gymnasium is fully equipped with every kind of device that lovers of gymnastics could wish for, as may be seen in Fig. 117, while not least in importance is a sandy-bottom wading-pool, Fig. 118, in the children's playground, and close by is a sand court in which the children can build sand houses and make mud pies. Scattered throughout the grounds, at convenient points, sanitary drinking-fountains, Fig. 119, have been provided, so that no one need want for any personal necessities in the park.

Public playgrounds are badly needed in all large cities, and sufficient space should be provided in each so that all the children included within the district can have a chance at their favorite pastimes. A sufficient number of playgrounds likewise should be provided so that each section of the city or district would have one of its own.

In the condemning of property for a playground site, a good plan is to select some run-

PUBLIC WASH HOUSE AND BATHS.  
 PITTSBURGH, PA.



SECOND FLOOR PLAN

Fig. 112

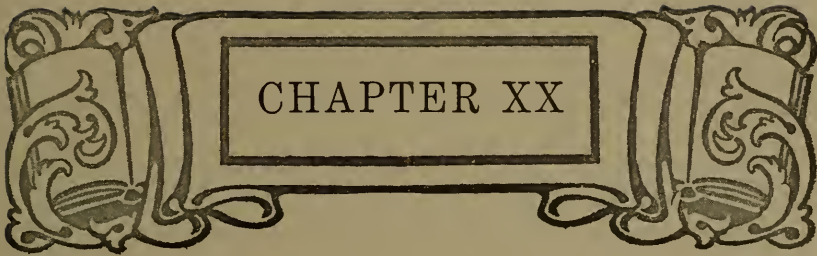
down ramshackle neighborhood where the dilapidated buildings and poor sanitary conditions are a menace to the health of the inhabitants, and by tearing down the old rookeries, convert this into one of the beauty spots as well as a useful city property.

In cities remote from water courses, the swimming pools may well be made serve as swimming schools, where boys and girls can be taught the art of swimming. A competent teacher or two in the course of a season would teach thousands to keep afloat in the water, and be able to save themselves in case of an accidental plunge into a lake or river.

The playground buildings, if properly conducted, can be made serve as boys' clubs, both winter and summer. If suitable instructors are provided, both in athletics and in manual training, the surplus energy in boys, the element which often leads a good boy astray by being misdirected, can be trained and turned into useful channels, reimbursing both the city and state a thousand fold.







## CHAPTER XX

### PLUMBING WORK IN THEATERS, HOSPITALS AND PRISONS



THE plumbing work in theaters may be conveniently divided into three different groups, each classified according to the purpose which it serves. The work and fixtures included in group No. 1 are intended solely for the accommodation and convenience of patrons of the theater. The work and fixtures in group No. 2 are for the use of the players while the fixtures in the final group are for the employees of the theater. As the patrons of a theater are restricted to the tier where their seats are located, whether gallery, balcony or orchestra—separate accommodation should be provided on the different tiers—a toilet room or, perhaps, smoking, lounging and toilet room for the men and a retiring and toilet room for the women. So far as the public is concerned, no further toilet accommodations will be required.

For the convenience of the players a lavatory with hot and cold water should be provided in each dressing room, while the leading actor usually has

a complete toilet room adjoining the dressing room. In addition, in that part of the building where the dressing rooms are located liberal toilet provision must be made for the actors, chorus and supers, both male and female, and a shower will be found a great convenience for actors in performances where tumbling, turning or like violent exercises are performed.

The mechanical installation for the theater and fixtures for the employees begin first in the manager's office, adjoining which a toilet room should be provided. In addition, in some part of that portion of the building taken up by the stage, wings and flies toilet accommodations must be provided for the stage hands and general employees, while near the engine room a toilet room will be required for the engineer and his help.

In order to be prepared for spectacular productions, in which there will be a water scene requiring a large tank of water, an extra large water main should be extended into the building, with all necessary controlling valves, so temporary connections can be made to temporary tanks or the water piped to other points to produce waterfalls or other water effects. The size of water main should be calculated in each case, so that the tank can be filled in the minimum time.

Not less important than filling the tank is the emptying of it, and a sufficiently large waste pipe to the sewer should be provided for this purpose, with all necessary valves and outlets where temporary connections can be made.

Plumbing Plans and Specifications

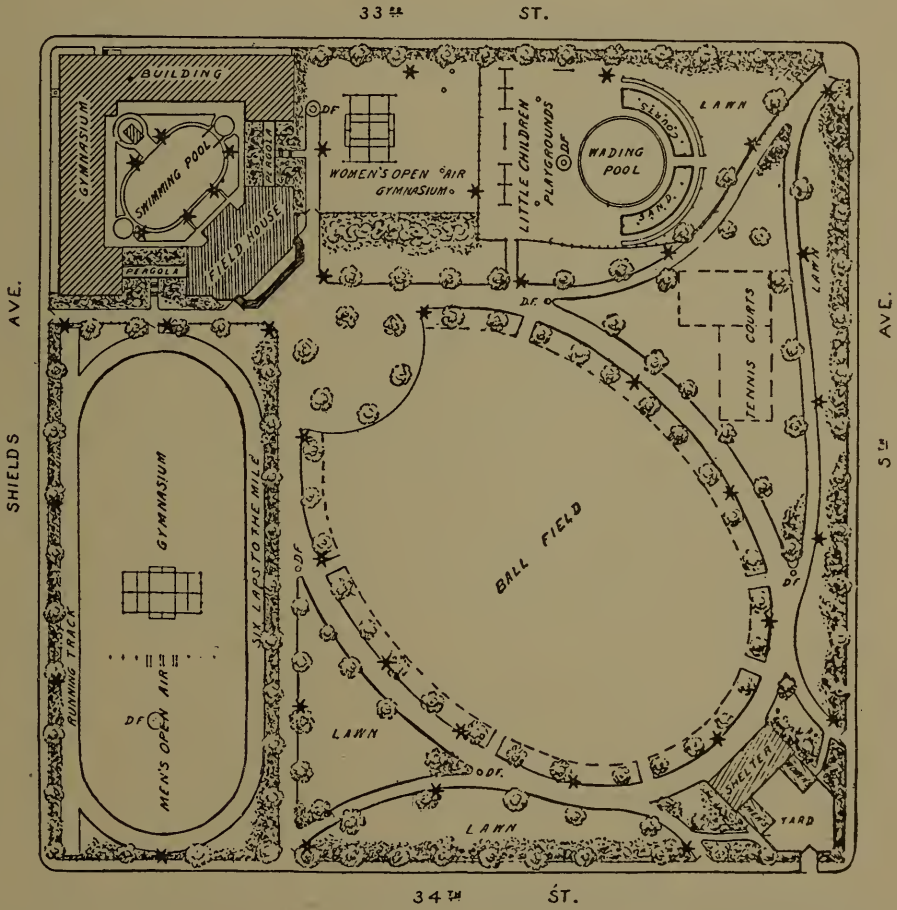


Fig. 113

South Park Commissioners' Armour Square, Typical of Other Small Parks, Chicago, 1906

The pumps, sprinklers, systems, tanks and all the necessary piping and apparatus for fighting fire should likewise be included in the mechanical installation, but fire pumps and piping belong more to fire-fighting apparatus than to the sanitary layout and will not be considered here.

## HOSPITALS

Hospital plumbing stands in a class by itself, and there is, perhaps, no other kind of building in which good plumbing work, materials and fixtures are of so much importance, particularly in that part of the installation which has to do with surgical cases and the preparation for operations. There are four divisions of the plumbing in hospitals—that which is installed for the general welfare of the patients, the fixtures and apparatus required for the institution as a whole, provision for the doctors and nurses, and apparatus and fixtures used in the curing of diseases and performing of operations.

In all large hospitals the patients may be roughly grouped as private cases, ward patients and children. The private patients are quartered in private rooms, the same as in a hotel building, and bath rooms should be provided adjoining these private rooms in the same manner as in hotels and club buildings.

In private rooms which are not connected with a bath room stationary lavatories, at least, should be provided.

Plumbing Plans and Specifications

SOUTH PARK COMMISSIONERS' PLAN OF RECREATION BUILDING ARMOUR SQUARE IN SMALL PARKS 1906

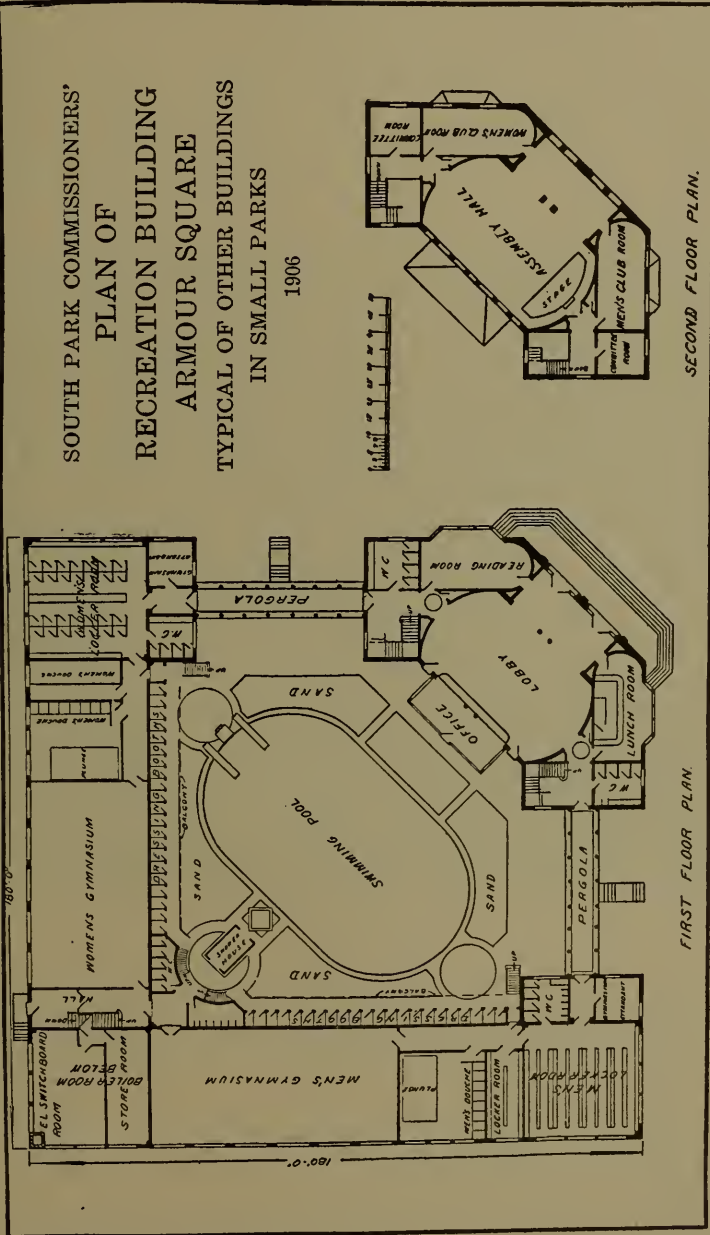


Fig. 114

For the accommodation of ward patients general toilet rooms, also bathing facilities, are provided convenient to the wards, and in the receiving wards showers which can be operated by an attendant from a distance are very desirable, particularly where charity patients are received, so that when



Fig. 115

Typical Swimming Pool Scene

necessary the incoming patient can be thoroughly scrubbed before being assigned to quarters in the hospital.

For the children's ward a bath room can be fitted up in which infants' and children's baths are installed. Likewise in the toilet rooms children's closets, which are only about twelve inches high,

may be specified instead of the standard size of closets.

For the institution in general a kitchen and diet kitchen, a laundry, water-heating apparatus, fire lines, helps' toilet and bathing accommodations, engineers' toilet room and sundry other provisions



Fig. 116

A Thorough Wash Before Entering Swimming Pool

will be necessary. In like manner toilet and bathing facilities will be necessary for the doctors and nurses.

All of the foregoing enumerated sanitary requirements are common to all institutions of this character and differ but little in the various hospitals. When, however, the matter of sanitary ap-

pliances for use in the surgical wing of the building is to be considered it will be well to go over the matter thoroughly with the surgeon having charge of that branch of the hospital work. Before doing so the designer should familiarize himself with the various fixtures and appliances designed for hospital service and the advantages and limitations of each when they have been installed.



Fig. 117

An Outdoor Gymnasium

Portable bath tubs on wheels, some of them fitted with frames for the immersion of typhoid-fever and sunstroke patients, are among the plumbing fixtures which will be required, and a sink or other receptor, set with the top level with the floor, will be found necessary for drawing off the waste



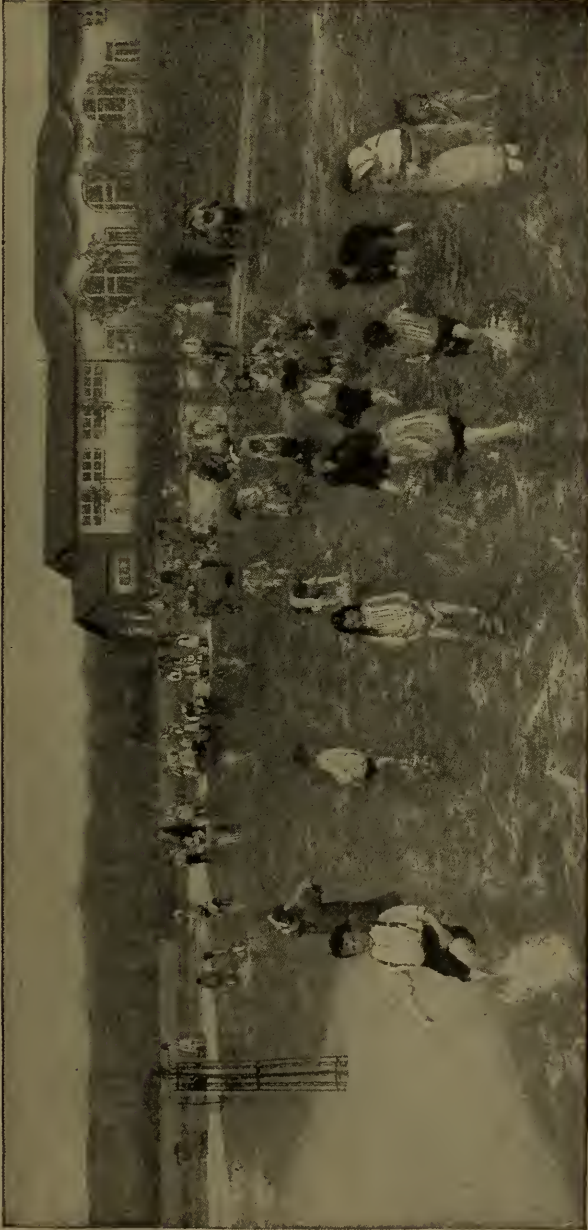


Fig. 118  
Typical Wading-pool Scene. Children's Playground

water from the tubs. Further, hot and cold water faucets, with long swing spouts set over the sink, will be required for filling the tubs.

Slop sinks will be required at suitable places to facilitate the cleaning of wards, rooms and corridors, and floor drains will be found necessary in some places—as, for instance, the operating rooms, autopsy rooms and morgue. A battery of lavatories fitted with knee-action or pedal arrange-



Fig. 119

Typical Drinking Fountain Scene

ments for turning on or shutting off water and operating the waste plug will be found desirable in the doctors' wash room, where they clean their hands before and after operations.

Hospital sinks will be required in the examining rooms, operating rooms, morgue,

wards, toilet rooms, sterilizing rooms and, possibly, at other points, while hospital lavatories with knee-action or pedal-operated cocks will be found desirable in the operating, sterilizing and anesthizing rooms. At some of the fixtures in the operating, sterilizing and other rooms connected with the operating room, sterilized water will be required, and special water-distilling apparatus will be neces-

sary for this purpose, together with the pipes leading to the fixtures. Sterilizing apparatus will likewise be required and will be located, no doubt, in a special room set aside for sterilizing purposes. In this room, in addition to lavatories and a sink, large, deep vats or tubs, similar to sinks but much deeper and provided with plugs, will be necessary for holding antiseptic fluids. A portable immersion tub of this description set upon a framework with wheels will be found convenient for moving from place to place—as, for instance, into an operating room—so that basins and other utensils used during an operation can be immersed from time to time in the antiseptic solution.

In the laboratory considerable plumbing will likewise be required, the kind and amount depending largely upon the size and completeness of the laboratory equipment. Autopsy tables with waste connections in the autopsy room, and mortuary slabs in the morgue, will also be required, and sinks will be convenient in most of the rooms referred to in the surgical quarter.

In addition to all of the fixtures and apparatus enumerated in the foregoing paragraphs a complete Turkish bath will be found of value in all large hospitals, while apparatus for hydrotherapeutic treatment of patients will be found necessary in some hospitals and sanitariums.

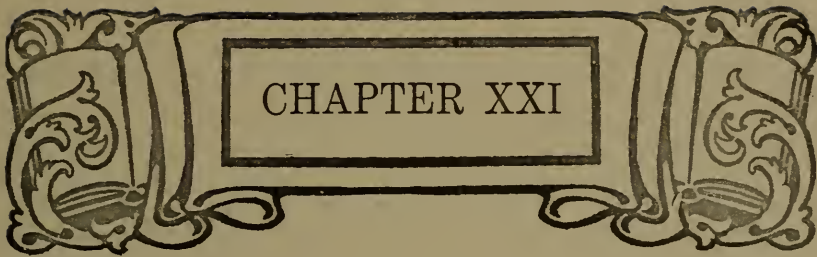
## PRISONS

The plumbing work in jails and prisons is simple as can be, yet the installations are of necessity as full and complete as that of a hotel or club

house. Most of the plumbing work in prisons is in the tiers of cells, each one of which is provided with a lavatory and water closet for the convenience of the prisoners.

In addition to the plumbing work in the cells, a prison requires a kitchen, bakery and laundry, as fully equipped with fixtures as would be a hotel designed to accommodate an equal number of people. In the keeper's quarters toilet and bathing facilities should not be overlooked, and a bath room for the prisoners is a vital necessity, where at least once a week each inmate can have a thorough scrubbing.





## CHAPTER XXI

### PLANNING PUBLIC CONVENIENCE STATIONS



**I**F PUBLIC toilet accommodations are necessary in public and semi-public buildings where a large number of people congregate, how much more necessary are toilet accommodations or public comfort stations in city squares, public parks and other places which at times are congested by masses of people brought together by business or pleasure? Some idea of the necessity for public convenience stations in large cities may be gained by a statement of the number of people that avail themselves of the advantages thus offered in cities where stations have been erected. For instance, the number of people that visited the underground public convenience station at Thirteenth Street and Pennsylvania Avenue, Washington, D. C., during the month of August, 1907, was 86,500. Of those, 4,600 visited the station during one day—that being the greatest number for an open period—and 1,100 was the minimum number of people that visited the station during any one

day. During the same month the public convenience station at Seventh Street and Pennsylvania Avenue in the same city had an attendance of 88,000, of which 4,300 attended on the maximum day and 1,600 on the minimum day. Of the people visiting both those stations about 12 per cent. were women. In other words, during that month of August 10,380 women visited the Thirteenth Street station and 10,560 women visited the Seventh Street station.

That the free use of public convenience stations is not confined to certain cities or localities, but is common to all, is evidenced by the attendance in other cities and in all quarters where such conveniences have been provided. In Brooklyn, during the months of January, February and March, 1908, 574,845 persons, or an average of almost 200,000 persons per month, made use of the public convenience station at Lorimer Street and Broadway. Many more instances could be cited and statistics could be multiplied to show by the number who use them the real necessity for such conveniences, but the truth is so self evident that further comment as to their advisability seems unnecessary.

**Location for Public Convenience Stations.**— Public convenience stations are necessary only in the business, theatrical and shopping districts of large cities and at public parks, recreation piers and like places of public assemblage. In the shopping, theatrical and business districts those corners or crossings where traffic is greatest will be found

most desirable places for location of the stations. If there is a public square near by or a gore plot, such as is formed by the intersection of three or more streets or two streets at less than right angles, the public convenience station may well occupy this gore plot.

It may be laid down as a rule from which there can be no deviation without entailing loss and trouble that no public convenience station should be erected without making provision for an attendant and having some one in charge during the hours the building is open to the public. It is a fact, born of experience, that petty thieves will pilfer and vandals destroy the fittings and fixtures in public convenience stations as fast as they can be repaired or replaced if somebody is not in attendance to watch them. It will prove a matter of economy, therefore, instead of building several small one or two-fixture, dark, cold and illy lighted apologies in a district, to build one good substantial station, well lighted, comfortably heated, freely ventilated and perfectly sanitary in all respects, then put some one in charge to superintend the plant.

Heating and ventilation are two features which must be well considered in the planning of a public convenience station. Without heat not only does it entail discomfort on the attendant and visitors, but further exposes the piping and fixtures to the danger of being damaged by the frost. If the building is not well ventilated, on the other hand, people will refuse to avail themselves of its doubtful advantages.

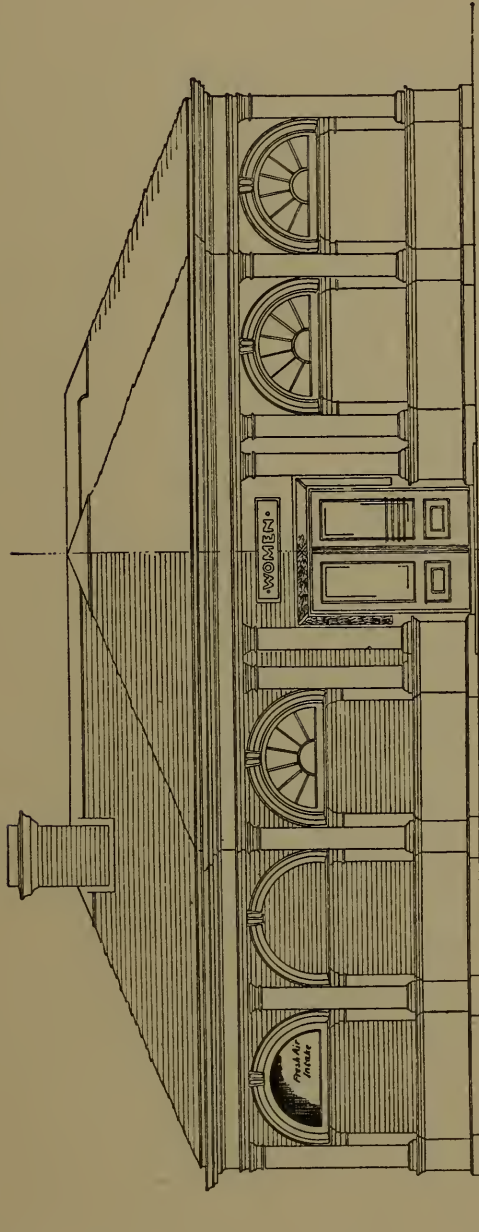
## EXAMPLES OF PUBLIC CONVENIENCE STATIONS

**An Above-Ground Station.**—The front and rear elevations of a public convenience station built above ground are shown in the east elevation, Fig. 120, and the west elevation, Fig. 121. The only reason for showing these elevations in this work is because buildings of this character are not very numerous, and the elevations are interpolated as a helpful suggestion to those who are called upon to design a public convenience station without having seen one.

The valuable features of this station lie, however, not so much in the elevation as in the interior arrangement, shown in Fig. 122. It will be noticed that the building is well lighted, both by windows and by artificial light. This is absolutely necessary if a clean, sanitary and pleasing interior is to be maintained. There is no greater foe to dirt and filth diseases than well-lighted nooks and crannies where dirt cannot be concealed. Next to light, air is the chief consideration, and, as may be seen by an examination of the layout on the floor plan, every closet compartment, all of the urinals and the rooms in general are liberally provided with ventilation. This in itself, however, would not be sufficient if means were not provided for moving the air, and to this end a fan is installed to mechanically remove the air from the rooms, urinals and closet compartments.

In order to heat the building and supply hot water to the lavatories, a boiler and water heater





• EAST ELEVATION •

Fig. 120

Public Convenience Station No. 1, District of Columbia

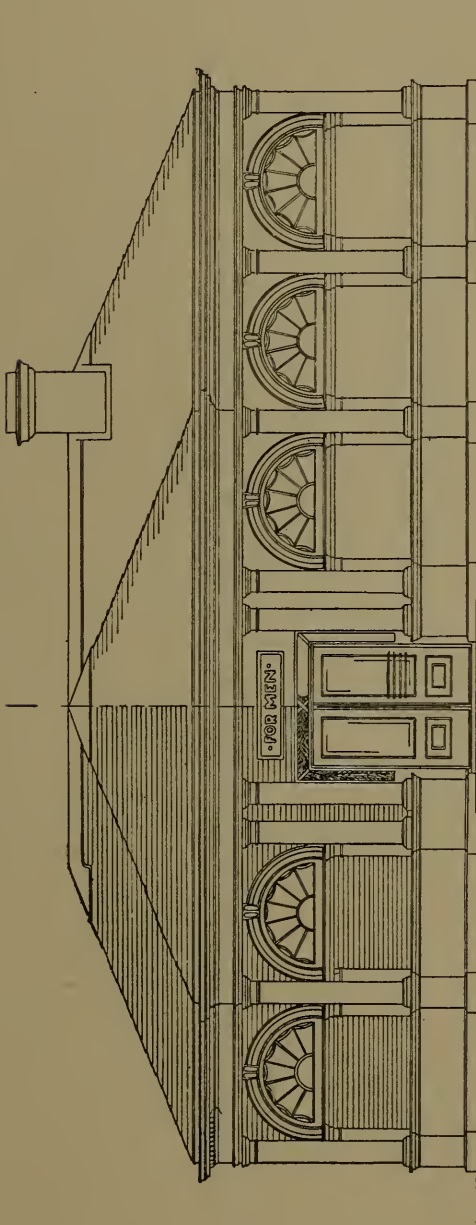
HENRY B. DAVIS, *Architect*

are necessary, and these are provided for in the boiler room.

It will be seen that the building is divided by a masonry wall into two compartments, one for men and the other for women. Each compartment is further provided with an attendant's room and a closet with shelves for storing supplies. There are two special features to this public convenience station which will commend themselves to every one. In the women's department there is an emergency room, or retiring room, fitted with a cot, where a patient can be taken in case of emergency while medical attendance is summoned. Telephones are likewise provided to speedily communicate with distant points.

The second special feature is pay compartments in both the women's and men's rooms. These pay compartments are fitted up with water closets and lavatories, and the use of one, together with a fresh cake of soap in an unbroken wrapper and a clean towel, can be had for the small sum of five cents. The pay compartments are about  $7\frac{1}{2}$  feet long by  $4\frac{1}{2}$  feet wide and can be conveniently used by hot and dirty travelers in which to take a refreshing sponge bath.

**Underground Public Convenience Stations.—**  
A suitable site is not always available for an above-ground public convenience station, for a public convenience station built above ground might form more or less of an obstruction or might not lend itself readily to the decorative effect of the locality. In such cases, or when for any other reason it be-



WEST ELEVATION.

HENRY B. DAVIS, *Architect*

Fig. 121

Public Convenience Station No. 1, District of Columbia

comes necessary or advisable, public convenience stations may be built underground.

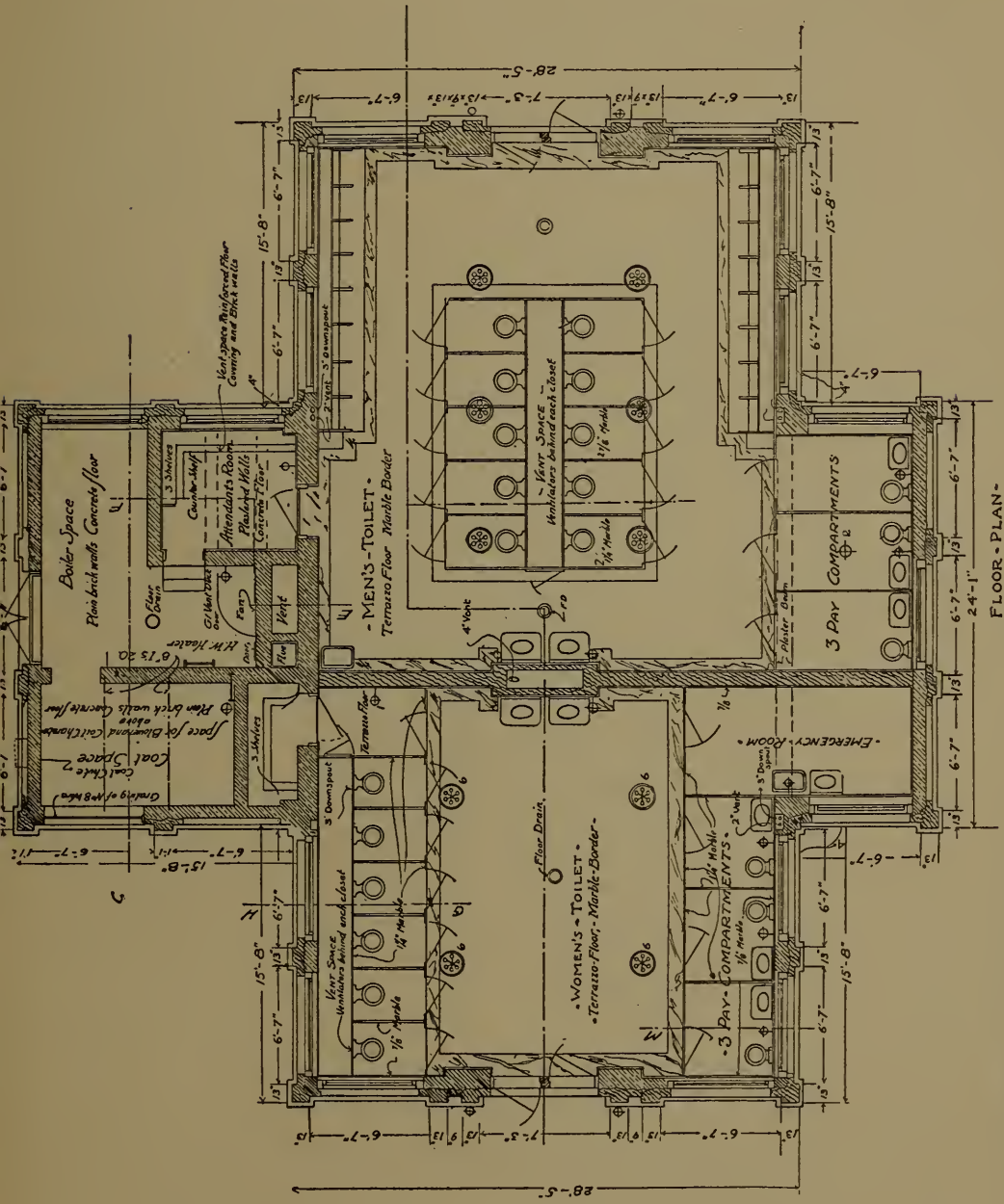
A sectional view through the stairway of an underground public convenience station, showing an elevation of the structure, may be seen in Fig. 123. In this station the stairways are located outside of the building. Ordinarily, however, it will be found better to place them within when such a design is possible. This is more particularly true in cold climates, where, if located outside, they might become covered with ice, thereby proving dangerous to the visitors and the source of numerous lawsuits for damages by people injured by falling on the icy surfaces.

This illustration does not show the ventilator shaft, which projects above the top to carry off the exhaust air from within which is forced out by electrically operated fans.

It might seem unnecessary to remark that all that part of the structure of an underground public convenience station which shows at the surface or projects above ground level should be made ornate and attractive rather than ugly and repellent. If a station is attractively designed and well managed it will prove a welcome convenience in any locality, not an objectionable feature or a nuisance.

The interior arrangement of this underground public convenience station is shown in Fig. 124. It may be said that not only is this interior similar to the one previously shown, but, further, that the interiors of all public comfort stations are practically the same, the arrangement and kind of fixtures, shape and dimensions of the building, and

# Plumbing Plans and Specifications



FLOOR PLAN -

Fig. 122  
Public Convenience Station No. 1, District of Columbia

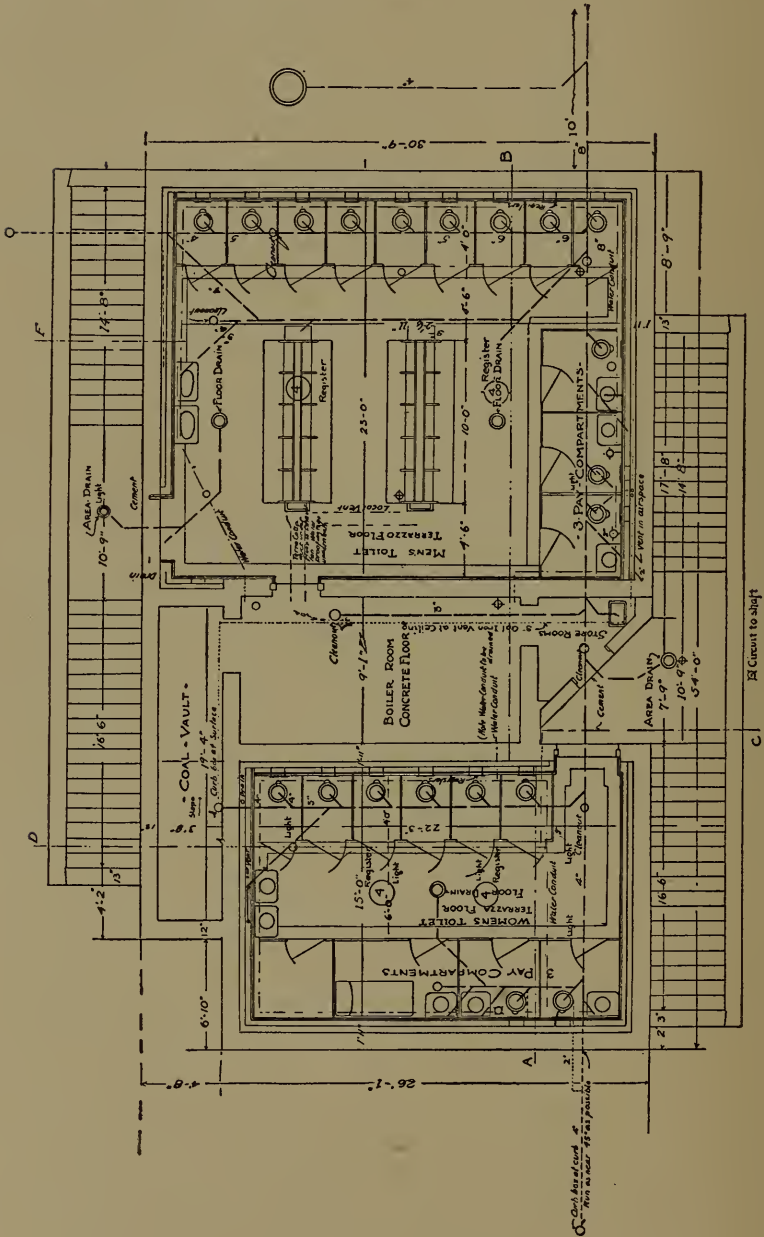
general arrangement of the various compartments being the only details in which they differ. The object is to make every station a public convenience in every sense. To this end an attendant should be on duty both in the men's and women's compartments at all times while the station is open, and the services of the attendants should be at the command of patrons free of charge.

That all people shall be treated alike, tips should be barred and attendants should not be permitted to solicit visitors to purchase notions or novelties which they have for sale. Only such toilet articles as are necessary or convenient should be carried on hand for sale, and these should be obtainable for a small fee, which should go to the maintenance fund of the station, not be a personal transaction of the attendant. Bootblacking privileges may be given or rented, pay telephone stations provided, and directories, maps and other charts and books should be on hand for free consultation, so that all possible information about the city—streets, hotels, theaters, libraries, schools, bath houses, art galleries and other points of interest—may be obtained. Drinking fountains may likewise be installed to minister to the wants of thirsty patrons, and soap, towels and other toilet necessities should be obtainable at small cost.

The question whether to make a station self supporting often comes up for consideration. In densely crowded districts, where the attendance is large, the small fee of one cent per person would not only pay operating expenses and interest on the money invested but in from four to ten years



Plumbing Plans and Specifications



FLOOR PLAN

Fig. 124  
Public Convenience Station No. 2, District of Columbia



pay off the original indebtedness, leaving the building free and clear. By charging one quarter cent each visit and issuing tickets of admission the operating expenses of the station can be earned.

The plan of charging admission might satisfactorily solve the problem for many municipalities which otherwise could not see their way clear to assume the original indebtedness and yearly charges attendant upon the construction of a suitable number of stations for the public needs. In such cases the public would not object to paying a nominal fee of one cent for adults—children free—and by this means within a few years the city would own the stations, when they could be thrown open to the free use of the public. It would be better, for instance, for a large city requiring twenty public convenience stations to erect them all and charge a small admission fee than to build only one for free use. When possible, however, to build and maintain free public convenience stations no fee should be exacted. The prime object is to make the stations public conveniences and the full value of the convenience will not be experienced if a fee, no matter how small, is charged.





# INDEX



## A

Above-ground Convenience Station, An.....	258
Accommodations, Temporary Closet.....	118
Advanced Schools—and Colleges.....	165
Analysis of Specifications.....	101
Apparatus for Apartment Houses, Miscellaneous.....	154
Apartment House Fixtures, Overflows for.....	154
Apartment Houses.....	147
Apartment Houses, Miscellaneous Apparatus for.....	154
Apartment House Plans, Example of.....	152
Apartment Houses, Planning the Plumbing in.....	147
Apparatus on Plans, Indicating Plumbing.....	13
Arbitration.....	113
Arranging Fixtures in the Bathroom.....	57
Athletic Clubs.....	212

## B

Bath and Wash House, Example of a Public.....	236
Bath Houses, Location of.....	230
Bath Houses, Necessity for....	229
Bath Houses, Public.....	229
Bath in the Home, Turkish....	136
Bath, Requirements of a Public.....	231
Bathing, Fees for.....	233
Bathroom, Arranging Fixtures in the.....	57
Bathroom Fixtures.....	128
Bathroom, Scale Drawings of..	57
Baths in Schools, Shower.....	162
Beginning and Termination of Work.....	108

Brass Goods, Weights and Quality of.....	121
Building, Example of a Club..	207
Buildings, Example of a Hotel..	203
Buildings, Club.....	205
Buildings, Planning the Plumbing for Club.....	205
Buildings, Planning the Plumbing for Factory.....	222
Buildings, Planning the Plumbing for Hotel.....	193
Buildings, Planning the Plumbing for Office.....	224
Buildings, Planning the Plumbing for School.....	157
Buildings, Planning the Plumbing in Y. M. C. A.....	171
Buildings, Requirements for Various Types of.....	123
Buildings, School.....	157
Buildings, Y. M. C. A.....	171

## C

Changes from Plans.....	110
Churches.....	215
Churches, Planning the Plumbing for.....	215
City Clubs.....	206
Clauses, Salvation.....	114
Closet Accommodations, Temporary.....	118
Club Building.....	205
Club Building, Example of a..	207
Club Buildings, Planning the Plumbing for.....	205
Clubs, Athletic.....	212
Clubs, City.....	206
Clubs, Country.....	205
Colleges and Schools, Advanced	165
Conditions, General.....	87
Connections to Drains.....	122
Contractor, Photographic Prints for the.....	60

Convenience Station, An Above-ground .....	258
Convenience Stations, Exam- ples of Public.....	258
Convenience Stations, Location for Public .....	256
Convenience Stations, Planning Public .....	255
Convenience Stations, Under- ground Public .....	260
Country Clubs.....	205
Courthouses .....	183
Courthouses, Planning Plumb- ing for.....	183

## D

Dentists' and Doctors' Homes..	134
Description of Drawings .....	104
Detail Drawings.....	34
Details, Plumbing .....	45
Divisions and Subdivisions of Specifications.....	85
Doctors' and Dentists' Homes..	134
Drains, Connections to.....	122
Drainage Pipes, Testing.....	121
Drainage System.....	87
Drawings, Description of.....	104
Drawings, Detail.....	34
Drawings of Bathrooms, Scale	57
Drawing Plumbing Plans .....	55
Drinking Fountains for Schools	165

## E

Elements Into Specifications, Reading .....	118
Engine Houses, Planning the Plumbing for Fire.....	220
Example of Apartment House Plans .....	152
Example of a Club Building...	207
Example of a Hotel Building..	203
Example of a Plumbing Speci- fication .....	65
Example of a Public Bath and Wash House.....	236
Example of New Method Plumbing Plans .....	35
Examples of New Method Plumbing Details.....	45
Examples of Plumbing in Schoolhouses .....	166
Examples of Public Conve- nience Stations.....	258

Examples of Residence Plumb- ing.....	138
Example of the Usual Plumb- ing Plan.....	27
Extra Work, Prices for.....	112

## F

Factory Buildings, Planning the Plumbing for.....	222
Fees for Bathing.....	233
Filter .....	134
Fire Engine Houses, Planning the Plumbing for.....	220
Fixtures.....	88
Fixtures, Bathroom .....	128
Fixtures for Schools, Number of Toilet.....	160
Fixtures in the Bathroom, Ar- ranging.....	57
Fixtures, Kitchen.....	131
Fixtures, Laundry.....	132
Fixtures, Location and Num- ber of.....	105
Fixtures, Nursery.....	131
Fixtures on Plans, Indicating Plumbing.....	15
Fixtures, Overflows for Apart- ment House.....	154
Fixtures Required, Number of,	159
Framing for Plumbing Pipes..	56
Function of Specifications .....	61

## G

Guaranteeing Work and Ma- terials .....	115
--	-----

## H

Homes, Doctors' and Den- tists'.....	134
Home, Turkish Bath in the....	136
Hospitals .....	246
Hospitals, Theaters and Pris- ons, Plumbing Work in....	243
Hotels .....	193
Hotel Building, Example of a..	203
Hotel Buildings, Planning the Plumbing for.....	193
Hot Water for Residences .....	133
House, Example of a Public Bath and Wash.....	236
Houses, Apartment.....	147

Houses, Location of Bath.....	230
Houses, Necessity for Bath....	229
Houses, Public Bath.....	229
Houses, Planning the Plumbing for Fire Engine.....	220
Houses, Planning the Plumbing in Apartment.....	147
Houses, Public Wash.....	234

## I

Improved Type of Plumbing Plans .....	33
Indicating Plumbing Apparatus on Plans.....	13
Indicating Plumbing Fixtures on Plans.....	15
Indicating Plumbing Works on Plans.....	3
Infirmary.....	161
Intermediate and Primary Schools .....	158
Interpretation of Plans and Specifications.....	101
Inspection and Superintendence .....	107
Instructions, Verbal.....	111

## K

Kitchen Fixtures.....	131
Kitchens in Schools.....	163

## L

Laundry Fixtures .....	132
Layout of Plumbing Systems..	25
Libraries, Planning the Plumbing for.....	219
Location and number of Fixtures.....	105
Location of Bath Houses.....	230
Location of Public Convenience Stations .....	256
Lunches, School Tax Item....	164

## M

Main, Water.....	89
Materials and Work, Guaranteeing.....	115

## N

Necessity for Bath Houses... ..	229
New Method Plumbing Plans, Example of.....	35
Noiseless Plumbing in Residences.....	135
Number and Location of Fixtures.....	105
Number of Fixtures Required..	159
Number of Toilet Fixtures for Schools .....	160
Nursery Fixtures.....	131

## O

Office Buildings, Planning the Plumbing for.....	224
Offices, Planning the Plumbing for Printing .....	227
Overflows for Apartment House Fixtures.....	154

## P

Pantry Sink .....	131
Payments.....	116
Permits and Plumbing Laws..	105
Photographic Prints for the Contractor.....	60
Pipe, Service .....	92
Pipes, Framing for Plumbing..	56
Pipes, Specifying Weights of..	121
Pipes, Testing the Drainage... ..	121
Plan, Example of the Usual Plumbing.....	27
Planning Plumbing for Court-houses.....	183
Planning Plumbing Work....	123
Planning Public Convenience Stations .....	255
Planning the Plumbing for Churches .....	215
Planning the Plumbing for Club Buildings.....	205
Planning the Plumbing for Factory Buildings.....	222
Planning the Plumbing for Fire Engine Houses .....	220
Planning the Plumbing for Hotel Buildings.....	193
Planning the Plumbing for Libraries .....	219
Planning the Plumbing for Office Buildings.....	224

Planning the Plumbing for Printing Offices.....	227	Plumbing for Railway Stations, Planning the .....	225
Planning the Plumbing for Railway Stations.....	225	Plumbing for Residences, Plan- ning the.....	127
Planning the Plumbing for Residences.....	127	Plumbing for School Buildings, Planning the.....	157
Planning the Plumbing for School Buildings.....	157	Plumbing for Various Struc- tures, Planning the.....	219
Planning the Plumbing for Va- rious Structures.....	219	Plumbing in Apartment Houses, Planning the.....	147
Planning the Plumbing in Apartment Houses.....	147	Plumbing in Residences, Noise- less.....	135
Planning the Plumbing in Y. M. C. A. Buildings.....	171	Plumbing in Schoolhouses, Ex- amples of.....	166
Plans and Specifications, Inter- pretation of.....	101	Plumbing in Y. M. C. A. Build- ings, Planning the.....	171
Plans, Changes from .....	110	Plumbing Laws and Permits..	105
Plans, Drawing Plumbing.....	55	Plumbing Plan, Example of the Usual.....	27
Plans, Example of Apartment House.....	152	Plumbing Plans .....	1
Plans, Improved Type of Plumbing.....	33	Plumbing Plans, Drawing....	55
Plans, Indicating Plumbing Apparatus on.....	13	Plumbing Pipes, Framing for..	56
Plans, Indicating Plumbing Fixtures on.....	15	Plumbing Plans, Example of New Method.....	35
Plans, Indicating Plumbing Work on.....	3	Plumbing Plans, Improved Type of.....	33
Plans, Plumbing.....	1	Plumbing Plans, Symbols for..	1
Plans, Symbols for Plumbing..	1	Plumbing Plans, Usual Type of	25
Plans, Usual Type of Plumb- ing.....	25	Plumbing Specification, Exam- ple of a.....	65
Playgrounds, Public.....	238	Plumbing Specifications.....	61
Plumbing Apparatus on Plans, Indicating .....	13	Plumbing Specifications, Writing .....	61
Plumbing, Examples of Resi- dence.....	138	Plumbing Systems, Layout of..	25
Plumbing Details.....	45	Plumbing Work in Theaters, Hospitals and Prisons....	243
Plumbing Fixtures on Plans, Indicating.....	15	Plumbing Work on Plans, Indi- cating .....	3
Plumbing for Churches, Plan- ning the.....	215	Plumbing Work, Planning....	123
Plumbing for Club Buildings, Planning the .....	205	Prices for Extra Work.....	112
Plumbing for Courthouses, Planning.....	183	Primary and Intermediate School .....	158
Plumbing for Factory Build- ings, Planning the.....	222	Prints for the Contractor, Pho- tographic.....	60
Plumbing for Fire Engine Houses, Planning the.....	220	Printing Offices, Planning the Plumbing for.....	227
Plumbing for Hotel Buildings, Planning the .....	193	Prisons .....	253
Plumbing for Libraries, Plan- ning the.....	219	Prisons, Hospitals and Thea- ters, Plumbing Work in ...	243
Plumbing for Office Buildings, Planning the .....	224	Public Bath and Wash House, Example of .....	236
Plumbing for Printing Offices, Planning the .....	227	Public Bath Houses .....	229
		Public Bath, Requirements....	231
		Public Convenience Stations, Examples of.....	258
		Public Convenience Stations, Location for.....	256

Public Convenience Stations, Planning.....	255
Public Convenience Stations, Underground.....	260
Public Playgrounds.....	238
Public Wash Houses.....	234

## Q

Quality and Weights of Brass Goods.....	121
--	-----

## R

Railway Stations, Planning the Plumbing for.....	225
Reading Elements Into Speci- fications.....	118
Requirements for Various Types of Buildings.....	123
Requirements of a Public Bath	231
Residences, Hot Water for....	133
Residences, Noiseless Plumb- ing in.....	135
Residence Plumbing, Exam- ples of.....	138
Residences, Planning the Plumbing for.....	127
Room, Teachers'... ..	161
Rooms, Ventilation of Toilet..	160

## S

Salvation Clauses.....	114
Scale Drawings of Bathrooms..	57
School Buildings.....	157
School Buildings, Planning the Plumbing for.....	157
School Lunches Tax Item.....	164
Schools and Colleges, Ad- vanced.....	165
Schools, Drinking Fountains for.....	165
Schoolhouses, Examples of Plumbing in.....	166
Schools, Intermediate and Pri- mary.....	158
Schools, Kitchens in.....	163
Schools, Number of Toilet Fix- tures for.....	160
Schools, Shower Baths in.....	162
Schools, Swimming Pools in... ..	163
Schools, Water Closet Accom- modations for.....	158
Service Pipe.....	92

Shower Baths in Schools.....	162
Sink, Pantry.....	131
Sinks, Slop .....	130
Slop Sinks.....	130
Specification, Example of a Plumbing .....	65
Specification Writing, Sugges- tions for.....	85
Specifications, Analysis of....	101
Specifications and Plans, Inter- pretation of.....	101
Specifications, Divisions and Subdivisions of.....	85
Specifications, Function of....	61
Specifications, Plumbing . ....	61
Specifications, Reading Ele- ments into.....	118
Specifications, Writing Plumb- ing.....	61
Specifying Weights of Pipes..	121
Station, An Above-ground Con- venience.....	258
Stations, Example of Public Convenience.....	258
Stations, Location for Public Convenience.....	256
Stations, Planning Public Con- venience.....	255
Stations, Planning the Plumb- ing for Railway.....	225
Stations, Suburban.....	225
Stations, Terminal.....	226
Stations, Underground Public Convenience .....	260
Structures, Planning the Plumbing for Various.....	219
Subdivisions and Divisions of Specifications.....	85
Suburban Stations.....	225
Suggestions for Specification Writing.....	85
Superintendence and Inspec- tion.....	107
Supply, Water.....	88
Supply, Water.....	89
Symbols for Plumbing Plans..	1
Swimming Pools in Schools....	163
System, Drainage.....	87
Systems, Layout of Plumbing..	25

## T

Tax Item, School Lunches.....	164
Teachers' Room.....	161
Temporary Closet Accommoda- tions.....	118

Termination and Beginning of Work.....	108
Terminal Stations.....	226
Testing the Drainage Pipes....	121
Theaters, Hospitals and Prisons, Plumbing Work in....	243
Toilet Fixtures for Schools, Number of.....	160
Toilet Rooms, Ventilation of...	160
Type of Plumbing Plans, Improved.....	33
Type of Plumbing Plans, Usual	25
Types of Buildings, Requirements for Various.....	123
Turkish Bath in the Home....	136

### U

Underground Public Convenience Stations.....	260
Usual Plumbing Plan, Example of the.....	27
Usual Types of Plumbing Plans.....	25

### V

Various Types of Buildings, Requirements for.....	123
Ventilation of Toilet Rooms...	160
Verbal Instructions.....	111

### W

Wash House and Bath, Example of a Public.....	236
Wash Houses, Public.....	234
Water Closet Accommodations for Schools.....	158
Water for Residences, Hot....	133
Water Main.....	89
Water Supply.....	88
Water Supply.....	89
Weights and Quality of Brass Goods.....	121
Weights of Pipes, Specifying..	121
Work and Materials, Guaranteeing.....	115
Work, Beginning and Termination of.....	108
Work in Theaters, Hospitals and Prisons, Plumbing....	243
Work on Plans, Indicating Plumbing.....	3
Work, Planning Plumbing....	123
Work, Prices for Extra.....	112
Writing Plumbing Specifications.....	61
Writing, Suggestions for Specification.....	85







One copy del. to Cat. Div.

JUN 29 1910



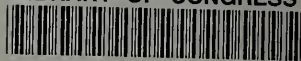








LIBRARY OF CONGRESS



0 021 218 284 9