How To Properly Design and Install The

HONEYWELL SYSTEM of HOT WATER HEATING

Because of the fact that we desire to better acquaint the heating fraternity with the sterling merits of the Honeywell System, and impart a thorough knowledge of its designing, installing and working, this book is published.

If we shall be, in some measure, of real assistance to the fraternity at large, in producing a more perfect, better and cheaper system of hot water heating, we shall be amply repaid.

THE HONEYWELL HEATING SPECIALTY CO.,
WABASH, INDIANA.

THE HONEYWELL SYSTEM.

A considerable part of the heating fraternity of today are misled by the theoretical writers and old school heating engineers, and are contributing enormous sums of money to the pipe and fitting manufacturers for large pipes and fittings, and an endless amount of hard labor in cutting, threading and assembling the same in an attempt to overcome "friction" and produce what they have been led to believe is a properly proportioned system of hot water heating. Everyone is familiar with the faults, shortcomings and failures of the old fashioned, big pipe, water-logged method of hot water heating. At the present time there are 21,000 small piped, mercury sealed, Honeywell Systems in practical operation in every nook and corner of the United States and Canada, and a large percentage of the fraternity have had personal experience with it and they, as well as many of the brightest heating men of both countries, consider the Honeywell System a distinct and decided improvement and ten years in advance of the old fashioned method.

During the last four years the Honeywell System has forged to the front and has taken a position with the trade as the only method of hot water heating which is uniformly reliable and standardized.

The HONEYWELL HEAT GENERATOR produces, safely and automatically, by the action of mercury a pressure ranging from 0 to 10 pounds, thus sealing the entire system from the atmosphere and the pressure produced varies in exact consonance with the heat requirements of the building. With a pressure of 10 pounds applied to the water, the area of the pipes, radiator valves and radiator tappings should be reduced from 60 to 75% and the radiation from 10 to 15% below the pipe sizes and radiator footages usually employed in the old fashioned, gravity method.

The prime object of reducing the size of pipes

and radiators, is to eliminate every possible drop of water from the system. These reductions mean less water to heat and less fuel to heat it; less motive power required and more supplied to drive the water through the boiler, pipes and radiators and one-half less heat wasted in transmission. All this in connection with the action of our Generator causes the water to circulate throughout the system at a velocity FIVE TIMES faster than by the old fashioned, gravity method. Because of this high velocity of the water, it is caused to change over the heated plates of the boiler FIVE TIMES oftener, thus absorbing thousands more of the heat units from the fire and permitting thousands less being dissipated through the flue. Because of the small loss of heat in transmission and the high velocity of the water, a higher average temperature is maintained in the radiators; this is why the radiator surface may be safely reduced.

We positively do not advocate high water temperatures at the boiler, caused by excessive reduction of radiator surface, only normal temperatures are required, however, during extremely cold snaps, the ability to send the water temperatures soaring up to 240 degrees, without the annoyance of boiling, is an advantage that cannot be overestimated and makes the Honeywell System of the same efficiency as steam heat.

To Remedy an Old Fashioned, Unsatisfactory, Hot Water Job.

Connect a HONEYWELL HEAT GENERATOR to the expansion pipe and remedy almost any old, unsatisfactory job, where the radiation is insufficient; the piping too small (for gravity); the circulation sluggish, causing large fuel consumption; or where the water boils easily from quick firing. It greatly improves jobs having long mains or where the radiation is all on the first floor. It stimulates the circulation when the water is rising in temperature and prevents boiling over.

THE HONEYWELL HEAT GENERATOR
HOW IT OPERATES

By a careful study of cuts number 1, 2 and 3, and a perusal of the following description, a perfect knowledge of just how the Generator operates, to produce varying pressures of from 0 to 10 pounds, may be obtained.

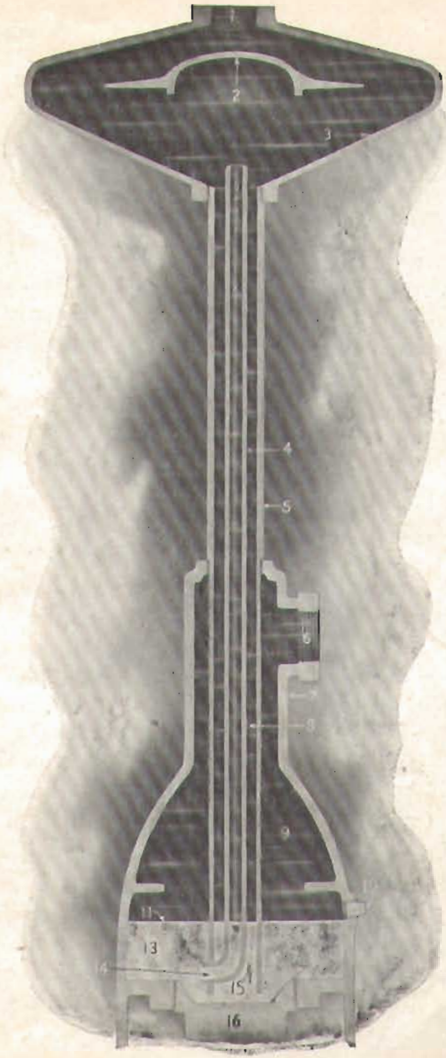
When the water in the system is cold, the mercury 11 Fig. 1, will all lie at the bottom of the mercury pot 7, about 1½ inches in depth, and all other parts of the Generator will be full of water.

Before the Generator can operate, all interior parts must be submerged in water.

When a fire is started in the boiler, the water is heated and begins to expand or increase in volume, this expanded water flows into the Generator at 6 and causes the water 9 to press down on the mercury, 11, Fig. 1.

The expansion of the water thus forces the mercury down in the mercury pot 7, and up through the circulating tube 4, and stand pipe 5, Fig. 2.

As the water continues to expand the mercury will continue to rise in the circulating tube 4, and stand pipe 5, and will lower to a corresponding extent in the mercury pot 7, Fig. 2, until it lies level with the top of the circulating tube inlet 14, Fig. 3. At this time



Illustrating position of mercury and water when Generator is producing NO pressure.

Fig. 1

the mercury is level with the top of the circulating tube 4, and stand pipe 5, Fig. 3.

The water having forced the mercury down slightly below the top of inlet 14, Fig. 3, will pass over the mercury, as 13., Fig. 3, into the circulating tube 4; the water being over thirteen times lighter than the mercury, will pass very rapidly through circulating tube 4, constantly carrying a quantity of mercury with it. When the water and mercury reach the top of the circulating tube 4, the water will pass up and around the deflector 2, Fig. 3, and out through opening 1, to the expansion tank.

The mercury which is driven upward with the water in the circulating tube 4, will not return through this same tube, but will return through space 8, or the stand pipe proper, into space 15; thence out through space 15, into the mercury chamber of pot 7, thus raising the mercury level in the mercury chamber, and operating in a manner similar to a balanced valve, to regulate the passage of water through the circulating tube 4.

From the above description it is apparent that a positive circulation of the mercury, upward through the circulating tube 4 and downward through the stand pipe 5, Fig. 3, is attained under all normal working conditions, thus positively retaining the mercury within the circulating tubes of the Generator. It is also apparent that a 10 pound pressure will be produced and maintained and at the same time

Illustrating position of mercury and water when Generator is producing 5 pounds pressure

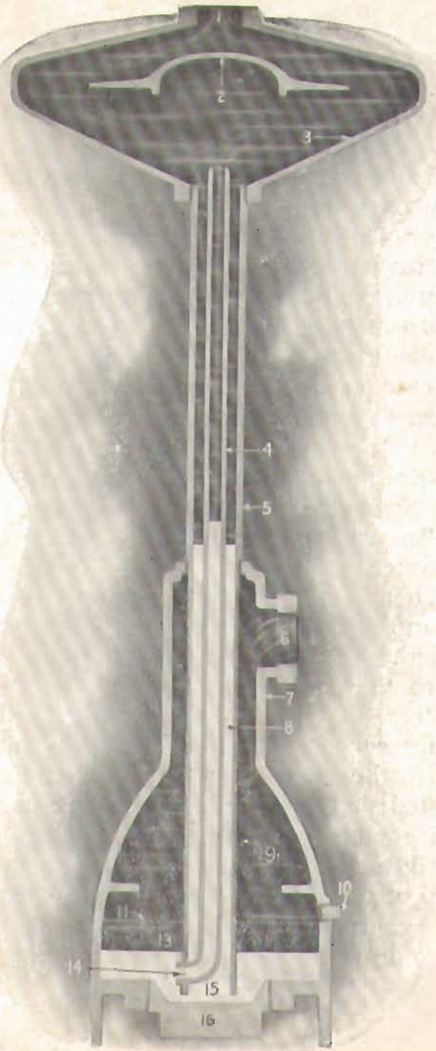


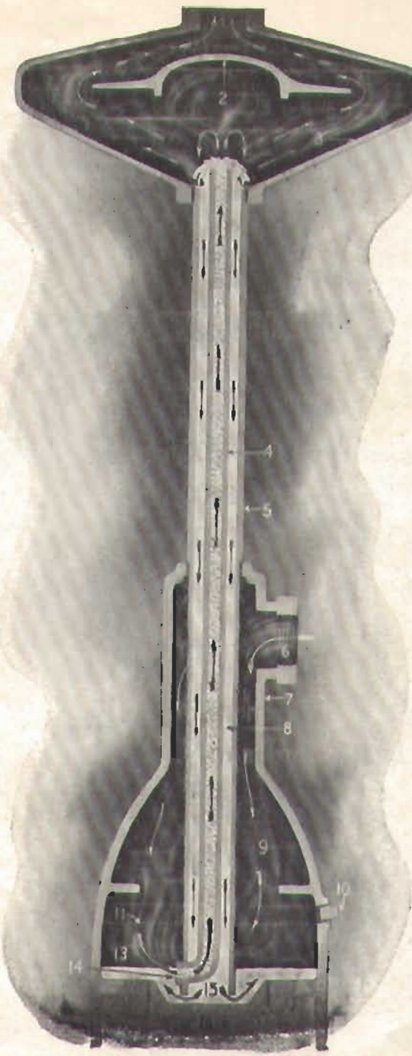
Fig. 2

permit all excess water of expansion to pass freely into the expansion tank.

When the water throughout the system cools and contracts, the exact reverse of the above operation takes place and the mercury will gradually lower in the circulating tube 4 and stand pipe 5, and rise to a corresponding extent in the mercury chamber of pot 7, Fig. 2. If the water continues to cool the above action will continue until the mercury will all lie in the mercury chamber, to a depth of about 1½ inches, 11 Fig. 1. A pressure of ½ pound at 1 causes the water to flow from the expansion tank downward through the stand pipe 5, outward through space 15, thence upward through the mercury, 11, Fig. 1, and out through 6 into the system.

When filling the system from city service, the rapid flow of water at high pressure, through the Generator, will lift the mercury and force it all upward and into the separating chamber 3, where the deflector 2, will arrest the mercury, and the full flow of water will pass to the tank through the Generator unobstructed; but the moment the valve in the city service pipe is closed, the mercury will instantly drop into the bottom of the mercury pot 7, Fig. 1, and will be ready for operation again.

To drain the Generator remove plug 10.



Illustrating position and action of mercury and water, when Generator is in complete operation, producing 10 pounds pressure.

Fig. 3

SIZE OF GENERATORS

No. 1 Carries up to 1200 square feet of radiation

No. 2 Carries up to 2500 square feet of radiation

No. 3 Carries up to 3500 square feet of radiation

No. 4 Carries up to 10000 square feet of radiation

Larger sized Generators and for special purposes, built to order only.

THE CORRECT METHOD OF DESIGNING AND INSTALLING THE HONEYWELL SYSTEM.

THE CHIMNEY.

The first and one of the most essential requirements of any heating job—whether Hot Water, Steam or Hot Air—is a chimney of such area and height as will insure the best possible combustion in the fire pot of the boiler, therefore it is of prime importance that the steam fitter make a critical examination of the chimney and satisfy himself, beyond reasonable doubt, that it is entirely adequate for the requirements of the job.

The following table of sizes will serve as a guide:—

From	300 to	600 sq. ft. of radiation	8x8"--20'	high
From	600 to	1,000 sq. ft. of radiation	10x10"--30'	high
From	1,000 to	1,500 sq. ft. of radiation	12x12"--40'	high
From	1,500 to	2,000 sq. ft. of radiation	14x14"--45'	high
From	2,000 to	3,000 sq. ft. of radiation	16x16"--50'	high
From	3,000 to	4,000 sq. ft. of radiation	18x18"--50'	high
From	4,000 to	6,000 sq. ft. of radiation	20x20"--60'	high
From	6,000 to	10,000 sq. ft. of radiation	24x24"--60'	high
From	10,000 to	15,000 sq. ft. of radiation	30x30"--70'	high

CONSTRUCTION OF BUILDING.

In every class of building it is well to make a thorough examination of the construction or proposed construction. This caution applies especially to residences, small business rooms and factories. In residence work, particularly of veneered construction, especial care should be exercised to ascertain whether the construction is such as will permit a circulation of air up and down between the studding and crosswise through the ceilings. It has been found almost impossible to heat buildings so constructed, as the heat losses are enormous. New buildings as well as old, many times, have very loosely fitted doors and windows due to poor construction and shrinkage. By way of illustration, consider a ten room house having three outside doors, each 3 by 7 feet in size, eighteen windows, each 2 feet 6 inches by 6 feet in size, assuming a clearance of 1-8 inch all around each of the doors and a clearance of 1-16 inch all around each of the windows, plus a clearance of 1-16 inch by 2 feet 6 inches where the sash join, gives a total area of 353 square inches, or equalling a pipe of more than 21 inches in diameter through which the cold, outside air is pouring into the building. Unreasonable though these figures may seem, they are cold, hard facts and should cause every steam fitter to think. Many times a steam fitter has installed his hot water job in a first-class manner, has a good circulation and plenty of boiler and radiator capacity, and yet is unable to heat the building. In all such cases, look to the construction, and for abnormal air leakage around doors and windows.

COMPUTING RADIATION.

The only correct method for computing ra-

diator surface is to ascertain the total loss of heat units through glass (counting outside doors as glass), through exposed walls and by ventilation, dividing the sum of these by the number of heat units one square foot of radiator surface can be made to supply. All other rules are based on this one. However, this method is but little used by the rank and file of the heating fraternity as each steam fitter has a short rule of his own which is presumed to be about correct for his particular locality and latitude.

For the HONEYWELL SYSTEM, 10 to 15 per cent. less radiation should be used than is *known* to be sufficient for an old fashioned, gravity job.

LOCATION OF RADIATORS.

Radiators should always be located against outside walls and in such position that they may gather in and warm the cold air which is sifting in through walls and windows, and they should be set out from the walls a sufficient distance to permit the freest possible circulation of air around them.

CAPACITY OF BOILER.

The boiler is the most vital part, the very heart of every heating job, therefore it is of the utmost importance that it should be of ample power and properly constructed. Select a boiler having thin water ways, large flue areas and a deep fire pot. Small and medium sized, round boilers should have a depth of fire pot approximately equal to the diameter of the grate. It is generally best to use a horizontal sectional boiler, for jobs of more than one thousand square feet of radiation. Never reduce the boiler power for the HONEYWELL SYSTEM, but keep it ample, just the same as for an old fashioned, gravity job. To ascertain the boiler power required, *add at least fifty per cent. to the total footage of cast iron radiation necessary for a gravity job.*

WHERE TO LOCATE BOILER.

In residences and small buildings it is usually best to locate the boiler at one end or a corner of the building (if the location of the chimney will permit) as by so doing a better piping system and a better circulation can be secured, besides cheapening the cost of installation somewhat.

In many large buildings, where very long mains would be required, it is advisable to locate the boiler at one side and midway of the basement, thus eliminating excessively long mains.

THE SMOKE PIPE.

Always connect the boiler to the chimney with a smoke pipe of the same size as the collar on the boiler and make it as straight and short as permissible. A tight damper should be placed in the smoke pipe, near the boiler. When dampers are to be thermostatically controlled, it is essential that a balanced check damper of equal area to the smoke pipe be

used, and it should be located between the tight damper and the chimney.

SIZE OF VALVES.

It is most important that valves of proper size be used for they have much to do with governing the velocity of the flowing water and with the general excellence of the job, therefore they should be sized in consonance with the work they are to perform, and in regard to their relative position on the piping system.

The following list of radiator tappings will serve as a guide:—

FIRST FLOOR.

Up to 30 square feet - - ½ inch.
From 30 to 75 square feet - ¾ inch.
Over 75 square feet - - 1 inch.

SECOND FLOOR.

Up to 40 square feet - - ½ inch.
From 40 to 100 square feet - ¾ inch.
Over 100 square feet - - 1 inch.

THIRD FLOOR.

Up to 50 square feet - - ½ inch.
From 50 to 125 square feet - ¾ inch.
Over 125 square feet - - 1 inch.

The valve on the last radiator at the ends of the mains should generally be made one size larger. In many instances the intelligent steam fitter will be able to use his own judgment and vary these radiator tappings to suit conditions.

LAYING IN THE PIPING SYSTEM.

Laying in the piping system is perhaps the most interesting and important subject in connection with hot water heating and should receive the most careful thought and calculation.

A first floor plan of the building should be drawn and accurately scaled, one-quarter inch to the foot. At this time the first floor radiators should be properly located and the footage indicated on each, then decide on the location of the second (or higher) floor radiators and indicate definitely on the plan where the risers must extend against or inside the walls. Now mark in the risers on the plan, giving them a slant of 45 degrees that they may be distinguished from other pipes, (see cut), and at the top of each pair of risers indicate plainly the footage of the radiator these risers are to supply.

Taking the foregoing tapping list as a guide, the next step is to indicate plainly at each radiator the size of the valve to be used.

Complete data for laying in the piping system is now shown on the plan, and the piping should be penciled in.

If the general outline of the building is square or oblong and the boiler has been located at one end or a corner, two mains are usually enough. In long, narrow buildings where most of the radiation is located at one exposed side, one main is usually sufficient. The mains should be extended as directly as

possible, and end in the largest, practicable first floor radiator. Never end mains in risers which extend to a second (or higher) floor.

Try to balance the piping system by having each main supply as nearly as convenient, equal amounts of radiation, however, this is something that cannot always be accomplished, and good judgment must largely govern.

Now pencil in the branches which connect the radiators and risers to the mains. When this is completed the piping plan is ready to have the pipe sizes marked on it.

SIZE OF MAINS.

This much mooted question has been discussed pro and con, by heating engineers, for many years, and is no nearer solution than at the beginning. The following simple rule solves absolutely and beyond cavil, this supposed difficult problem, and if the steam fitter and others, whose business it is to make piping plans, will follow it closely, they will never go astray. Rule—*The area of the main must equal approximately the total valve area which it is to supply.*

A careful study of the piping plan shown on pages 26 and 27 will illustrate and bring out the meaning of the rule.

Main No. 1 is 30 feet long and supplies two first floor radiators and two second floor radiators. The first floor radiators contain 55 and 70 square feet respectively, and the second floor radiators contain 45 and 35 square feet respectively.

The main ends in the 70 foot, first floor radiator, and this radiator is supplied through a ¾ inch valve, which is ample. The 55 foot first floor radiator, is also supplied through a ¾ inch valve. Both second floor radiators are supplied through ½ inch valves. There are on these four radiators, two ¾ inch valves and two ½ inch valves, having a combined area of 1.28 square inches. The nearest commercial pipe size is 1¼ inch, with an area of 1.22 square inches, therefore the main should be 1¼ inch. In this instance the combined valve area exceeds the main area by .06 square inch, which will do no harm.

Main No. 2 is 32 feet long and supplies two first floor radiators and two second floor radiators. The first floor radiators contain 75 and 100 square feet, respectively, and the second floor radiators contain 50 and 40 square feet respectively. The main ends in the large, 100 foot first floor radiator, which is supplied through a 1 inch valve which is amply large. The 75 foot, first floor radiator is supplied through a ¾ inch valve, which is large enough because of its close proximity to the boiler. Both second floor radiators are supplied through ½ inch valves.

There are on these four radiators, one 1 inch valve, one ¾ inch valve and two ½ inch valves, having a combined area of 1.62 square

inches. The nearest commercial pipe size is 1½ inch with an area of 1.76 square inches, therefore the main leaving the boiler should be of 1½ inch pipe. In this instance the main area exceeds the combined valve area by .14 square inch, or nearly equalling a ½ inch valve, therefore this main would easily supply an additional radiator having a ½ inch valve.

If a 1¼ inch main is used starting at the boiler, never reduce it, but extend it full size to the end. If a 1½ inch main is used, starting at the boiler, it may be reduced one size, i. e., to 1¼ inch, but not smaller, and should be extended this size to the heel of the last radiator, however it is generally best to extend a 1½ inch main full size, i. e., 1½ inch to the end, as this will obviate the necessity of using a B connection, and the consequent danger of a short circuit.

Never attempt to connect a 1 inch riser extending to a second (or higher) floor, to a 1¼ inch main; a 1¼ inch riser to a 1½ inch main; nor a 1½ inch riser to a 2 inch main. It cannot be done successfully. The size of the main should always exceed the size of the riser by at least two commercial pipe sizes.

To secure a high velocity and even distribution of the water throughout the system, mains having a diameter of 1½, 2 and 2½ inches should not be reduced after leaving the boiler, more than one size, i. e., a main starting at the boiler 2½ inch should end at the last radiator 2 inch, etc. When mains are required, having a diameter of 3 inches or larger, it is permissible and practicable to make more than one reduction.

Branches connecting first floor radiators and risers to the mains should not be larger than the valves they are to supply, except where ½ inch valves are used, the branches should always be ¾ inch.

SIZE OF RISERS.

The size of risers is computed by the same rule that is used for ascertaining the size of mains, except where a ½ inch valve is used on a second (or higher) floor radiator, it is best to extend ¾ inch risers. When two radiators on a second (or higher) floor are supplied through ½ inch valves, ¾ inch risers are amply large to supply both. This has been demonstrated in thousands of installations. If a radiator on a second floor, having a ¾ inch valve and a radiator on a third floor having a ½ inch valve, were both to be supplied by one continuous riser, the riser from the mains to the second floor should be 1 inch and from the second floor to the third floor, ¾ inch. The combined area of the valves would be .64 square inch, and the nearest commercial size of pipe is 1 inch, with an area of .78 square inch, therefore a 1 inch riser to the second floor and a ¾ inch riser to the third floor, would be required. This same riser will easily supply two radiators on a second floor, having

½ inch valves and two radiators on a third floor having ½ inch valves. Total area of four ½ inch valves .78 square inch.

Avoid long, horizontal branches between upper ceilings and floors by extending more and smaller risers.

PITCH OF MAINS AND BRANCHES.

All mains and branches should pitch upward from the boiler for the up feed method of piping and downward toward the boiler for the overhead or down feed method, about ½ inch to each 10 feet, or just enough to thoroughly vent all air from the mains and branches, as this is the real reason for pitch in mains and branches.

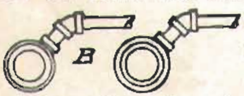
CONNECTIONS.

What connections to use for joining the branches to the mains and how to make them, is a subject fraught, perhaps, with more vital interest and importance to the steam fitter than any other.

This company has spent a large amount of money, time and labor in perfecting the HONEYWELL SYSTEM, no small part of which has been devoted to ascertaining the proper connections to be used to secure the most perfect distribution and highest velocity of the water, throughout the system. The constant aim of heating engineers for years, has been to so balance and adjust the piping system as to cause each radiator to discharge warm water into the return pipe at practically the same moment. This represents the acme of perfection in the circulation of hot water, and with the small pipes we use and our method of connecting the branches to the mains, we have succeeded in accomplishing this much desired result.

Connections A, B, D, E and F, illustrated herewith, are all that are necessary to use in the installation of any job.

Connection B is used where a reduction occurs in the mains, and its duty is to relieve the air from the mains at this point. Usually



when B connections are used to join branch pipes to the main, the valve on the radiator is reduced one size, except where the branch is very long. (See connection B, main No. 2). Where a reduction occurs in the mains, branches to a first floor radiator should always be connected. Never connect riser branches at this point.

All branches to first floor radiators and to risers extending to the second (or higher) floor radiators, should be joined to the mains by D connections, for a distance from the boiler of half the length of the

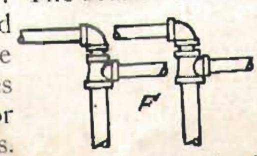
main. (See D connections, mains No. 1 and 2). By using D connections intelligently an extraordinarily strong and quick circulation is obtained at the extreme ends of the mains. When D connections are used the 45

degree ells should be tapped at the bottom and a ⅛ inch pet cock inserted, for the purpose of draining. Some steam fitters may find fault with the D connection on account of this: if so, the A connection may be substituted. No steam fitter who has once used the D connection and observed the beautiful and perfect circulation obtained thereby, will install his con nections any other way, and when the extreme value of this connection for high risers and for preventing short circuits, etc., at any part of the piping system, becomes known, it will be adopted by every intelligent steam fitter.

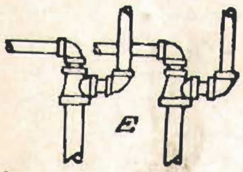
The A connection should be used wherever a B or D connection is unnecessary. Branches

to first floor radiators at the outer ends of the mains should be joined to the mains by A connections (See mains, No. 1 and 2). This connection can be made by using two nipples and two 45 degree ells, this method being preferable.

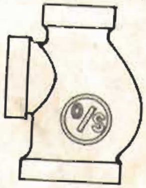
Connection F is the correct method of connecting two radiators to one pair of risers on a second (or higher) floor. The branches from the larger radiator should connect into the top of the tees, and the branches from the smaller radiator into the side of the tees.



Connection E illustrates the proper method of taking off branches for a second (or higher) floor radiator and extending a riser to the floor



above. Risers extending higher than to a second floor should be broken or offset, where branches from radiators are connected. The branches from the second floor radiator should connect into the top openings of the tees and risers extending to the next higher floor should connect into the side openings of the tees. O. S. Distributing tees, designed especially for this purpose, are superior to connection E and are cheaper to install.



O. S. Distributor

SEPARATE RETURN PIPES FROM RADIATORS, NEAR BOILER.

It is imperative that the return pipes from radiators near the boiler be connected directly into the return header or boiler, and not into the main return pipe (see return pipe connection from 50 foot, second floor radiator, on plan). Usually a size smaller valve may be used on radiators connected in this way. If there are no extra tappings at the bottom of the boiler, the shell of the boiler may be tapped, as the pipes are small, or a tee may be inserted in the *horizontal portion* of the main return pipe near where it enters the boiler. The

small return pipe should enter the tee with an A connection. Never insert this tee in the vertical portion of the main return pipe.

It is bad practice to connect the return pipes from radiators near the boiler, directly into the main return pipe, because such radiators generally are circulated more quickly than those farther away, thus discharging warm water into the main return pipe and slowing the circulation through the whole main and its connecting branches.

REAM BURR FROM ALL PIPE ENDS THOROUGHLY.

It is of vital importance that all pipe ends be thoroughly reamed, not only to prevent the lodgment of sediment, but to remove the cause of whirling water and eddies, thus promoting an easy and continuous flow and high velocity of the water.

PIPE DOPE.

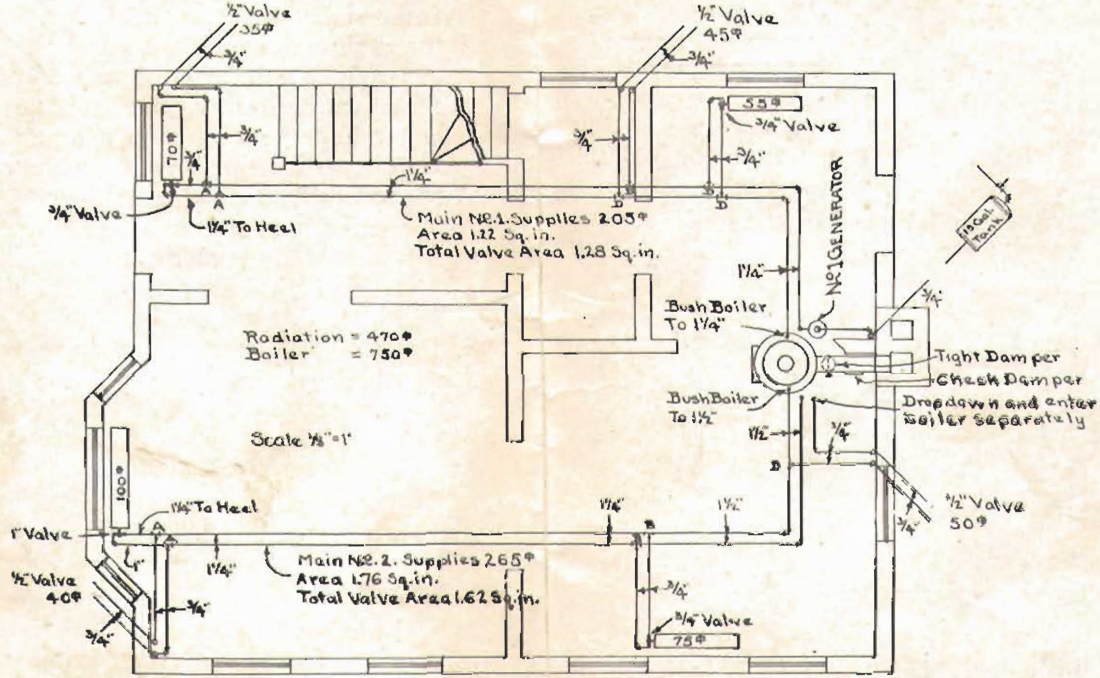
Steam fitters should avoid the use of thick, viscous dope, in making up pipe joints. Good sharp threads with a little oil is best.

EXPANSION JOINTS.

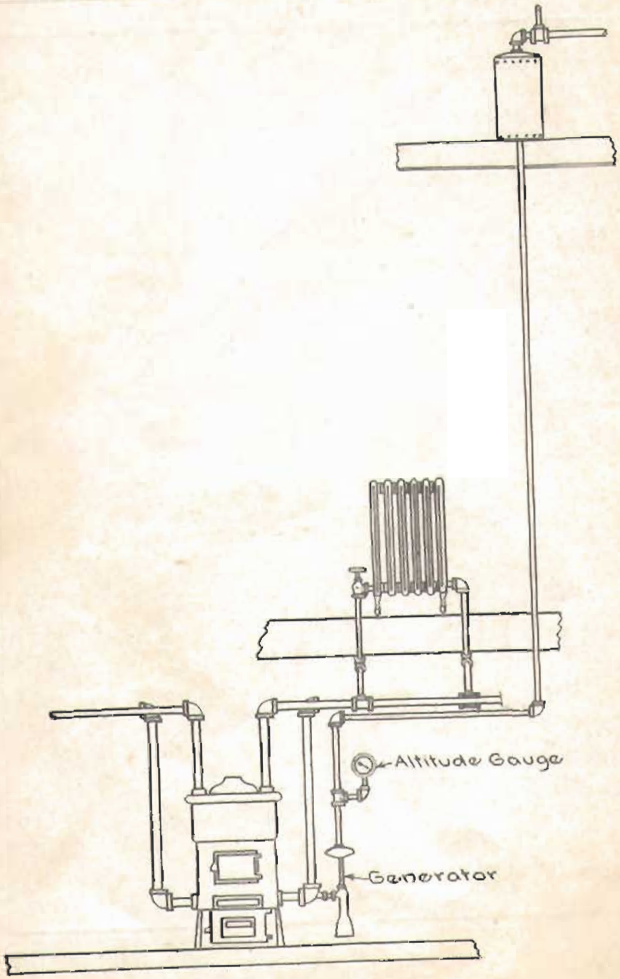
Expansion of long runs of pipe should be provided for by supplying swing joints at the ends of the mains. In most of the ordinary residence jobs, it is not necessary to provide for expansion.

THE GENERATOR.

The best place to locate the Generator is in the basement near the boiler. (See cut).



This is a reproduction of the piping plan of a Honeywell System which has been in operation 3 years

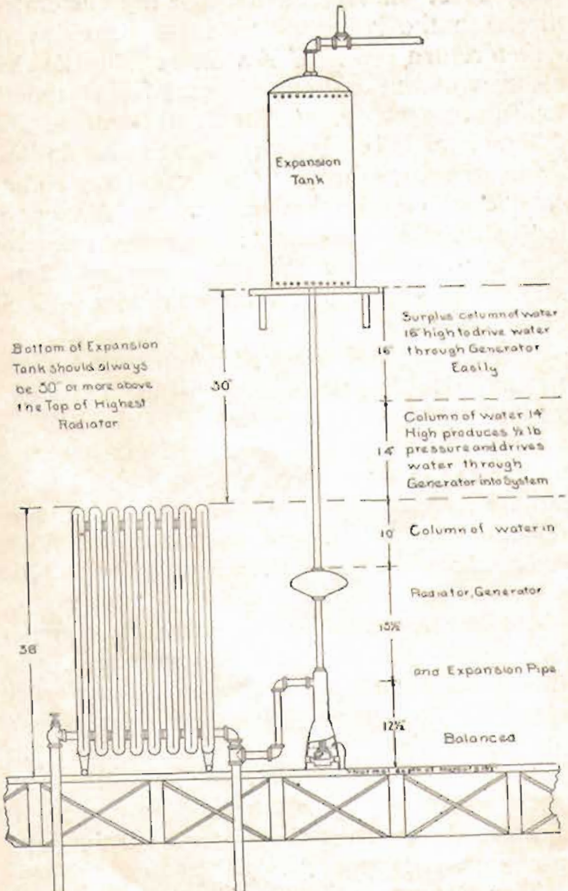


Connect the *side* opening of the Generator direct to the boiler or to a tee provided in either return pipe. Use a *union* to make this connection and do not screw the Generator on by turning it over and over, as some of the mercury will be discharged into the boiler. After the Generator is joined to the boiler, connect the expansion pipe to the *top* opening of the Generator and extend to the expansion tank. When a No. 1 Generator is used, it is not necessary to use larger than a ¾ inch expansion pipe.

Frequently it is desired to connect a Generator to the expansion pipe of an unsatisfactory job. If the expansion pipe does not extend to the boiler, but is taken from a return connection of some second (or higher) floor radiator, locate the Generator at the most convenient point, allowing it to rest on the floor, and connect exactly as already described. (See cut).

Do not suspend the Generator close under the expansion tank. The Generator performs its function exactly the same and equally well whether it be located at the boiler or on a first, second or higher floor. Do not expect the Generator or the expansion pipe above the Generator to become hot as there is no movement of water through the Generator until the pressure exceeds 10 pounds.

The Generator is caused to operate and produce a pressure by the expansion of the



water in the heating system. When fire is applied to the boiler, the water is heated and thereby expanded or increased in volume. As the water is being increased in volume, it endeavors to pass through the mercury in the lower chamber of the Generator, and in its effort, drives the mercury upward in the stand pipe and circulating tube—thus producing a back pressure—until the mercury has risen to the top of the circulating tube, when the mercury begins to circulate up and down quite rapidly, at which time the maximum pressure is produced and maintained. When this position of the mercury is attained, the excess water of expansion is carried upward with the flowing mercury, and passes freely and noiselessly into the expansion tank.

An expansion or increasing of the volume of water in the system amounting to 6 fluid ounces, causes the Generator to produce its maximum pressure, and likewise a diminuation of that quantity of water releases all the pressure. Only under a rising temperature of the water is it possible or desirable to produce pressure, it is therefore apparent that any pressure of from 0 to 10 pounds, in exact consonance with the requirements, will be produced.

Air is the worst enemy against which the steam fitter has to contend. It is the most elastic gas known and may be compressed until reduced to a liquid, therefore we would warn every one against the use of devices in which it is necessary to compress air before a pressure is obtained on the system. It means high water temperatures, to cause sufficient expansion, to compress even a small amount of air, before any perceptible pressure is produced. When the HONEYWELL HEAT GENERATOR is used, pressure is being produced the *moment* a fire is lighted in the boiler.

DRAINING COCK.

The draining cock should be located at the opposite side of the boiler from the Generator connection.

THE ALTITUDE GAUGE.

When the Generator is located at the boiler, the best place to connect the altitude gauge is in the expansion pipe, above the Generator.

When so connected, the pressure produced by the Generator will have no effect on the gauge, and it will always register the exact height of water in the system.

When the altitude gauge is connected to the boiler or any part of the piping system, on the pressure side of the Generator, the pointer will rotate in exact unison with the pressure produced by the Generator. *If the altitude gauge is connected in this manner, pay no attention to the action of the pointer as it indicates nothing but the varying pressures generated.*

THE THERMOMETER.

If accuracy of temperature is desired, the

thermometer should be connected direct to the top of the boiler. The mercury cup of the thermometer should extend through the boiler shell and be immersed in the water.

THE EXPANSION TANK.

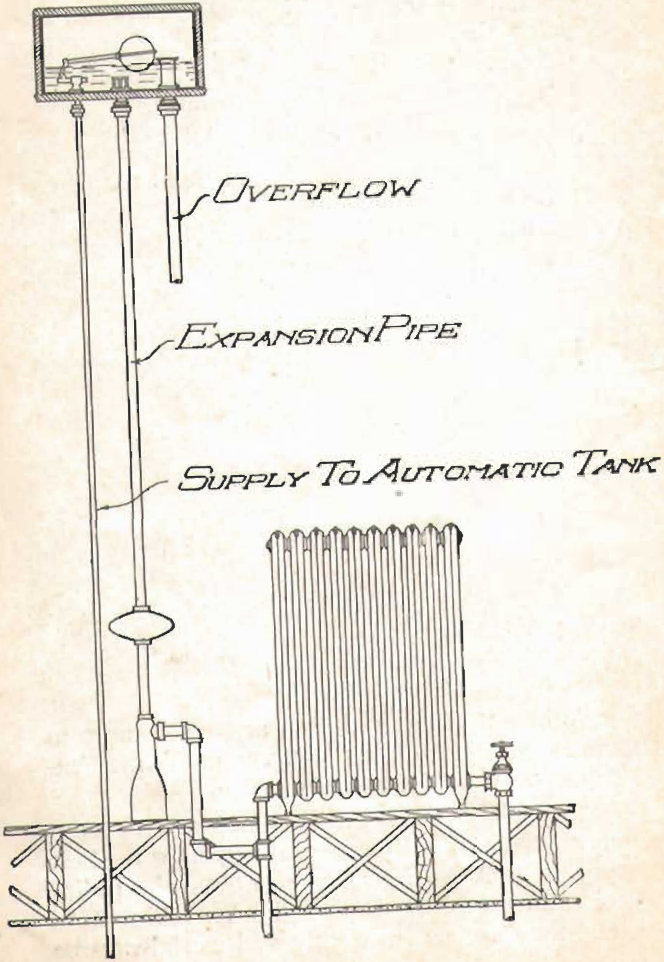
The expansion tank should be of ample capacity to easily accommodate the water of expansion, through 200 degrees range of temperature, plus a safe margin for permanent water in the tank.

The following sizes of tanks are safe to use for the quantities of radiation specified:—

Size	Gal.	Sq. ft. of Radiation
10x20"	8	250
12x20"	10	300
12x30"	15	500
14x30"	20	700
16x30"	26	950
16x36"	32	1300
16x48"	42	2000
18x60"	66	3000
20x60"	82	5000
22x60"	100	6000

When it is desired to warm the water in the expansion tank, a HONEYWELL TANK CIRCULATOR should be used.

Expansion tanks which automatically supply the system with water, are perhaps the best type of tank to use, as they insure the radiators always being kept full. In addition to this, they are not unsightly and can always be



located in a closet, hall or back room, which eliminates all danger of freezing.

A distance of at least thirty inches should always intervene between the bottom of the expansion tank and the top of the highest radiator in the building. (See cut).

WHERE TO FILL THE SYSTEM.

The filling connection should be placed *between* the Generator and the boiler or directly into the boiler or any return pipe near the boiler.

PIPE AND BOILER COVERING.

If heat is not desirable in the basement, the pipes and boiler should be thoroughly insulated. Heat lost in transmission means that much less heat in the radiators and a greater fuel consumption.

HINTS TO STEAM FITTERS.

When the material is on the ground and the steam fitter has commenced the job, he should stick to it until it is completed. Many a house owner has been made dissatisfied with his job because the work has been dragged out almost interminately. After the job has been completed and filled with water, it should be *fired and most thoroughly tested.* The steam fitter should satisfy himself that the water circulates through all radiators evenly and rapidly. He should then make the house owner acquainted and conversant with his job; show him how to fill it; how to fire it; how to adjust the dampers; how and when to vent the air from the radiators, and insist that the boiler flues be frequently and thoroughly cleaned. With all this, do not desert the house owner, and later on, if he comes in with a complaint, ninety-nine times in a hundred the trouble will be found in improper handling of the fire.

A little patience and an occasional visit to the job will do wonders, toward satisfying a customer and will return for time thus spent, a hundred fold, in good will and future business.

HOW TO SECURE PIPING PLANS FOR THE HONEYWELL SYSTEM.

Because it is necessary to pipe differently for the HONEYWELL SYSTEM than for the old-style large pipe system, and in order that fitters who have not had experience with small piping make no mistakes with their first jobs, we will prepare without charge one or two complete piping plans for any legitimate heating contractor who wishes to install the HONEYWELL SYSTEM, and will send us floor plans of the building to be heated together with the following information and data:

1—Locate each radiator just where you want it. We recommend that radiators be located on outside walls, when possible.

2—Mark plainly the footage of each radiator.

3—State if UNIQUE VALVES are to be used on any of the radiators, and plainly indicate such radiators

4—Locate the boiler and indicate which way it is to face. Also give capacity of same, and make, if possible.

5—It is of prime importance that the man on the job estimate the radiation, since he has access to the building or location and can note construction, exposure, etc.

6—Figure radiation just as you always have for the ordinary gravity method of heating, then deduct 10 to 15 per cent. which will place it on a correct basis for the HONEYWELL SYSTEM.

7—This information positively must be given. Any plans sent to us without the above information will be returned.

It costs us from one to fifteen dollars (owing to size) to prepare a piping plan and blue print it, *for which we make no charge.* All we ask is that sufficient postage be enclosed to cover their return, from 15 cents to 25 cents per plan, owing to size.

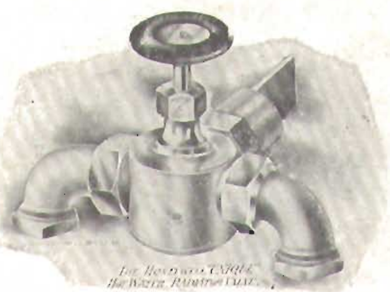
We prepare plans only for architects and the legitimate trade, or those entitled to buy heating materials. Under no circumstances will we knowingly make piping plans for the HONEYWELL SYSTEM for house owners or others not entitled to trade protection.

Before we will make plans you must write us on your regular letter head that we may know definitely that you are regularly engaged in the plumbing and heating business.

THE HONEYWELL UNIQUE HOT WATER RADIATOR VALVE.

A valve designed to be connected to one end of the radiator only.

By using the UNIQUE valve it is only necessary to extend the risers directly through the floor to the valve elbows, which avoids taking up the flooring and cutting joists and timbers in order to extend the return pipe to the return end of the radiator.

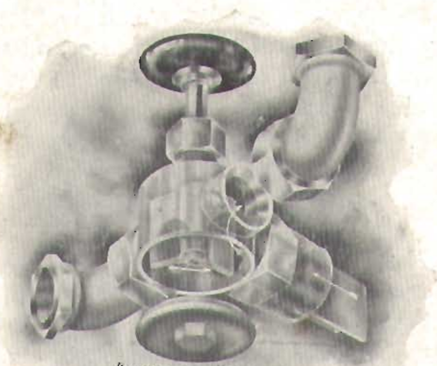


When the UNIQUE valve is used, the water is caused to circulate in one positive direction through the radiator, viz:—through the valve inlet up through the first section, across the top and down through the remaining sections, back through the lower ports and out through the valve outlet.

This insures a most rapid circulation as there are no conflicting currents in the radiator.

The HONEYWELL UNIQUE valve is adapted to any system of piping. When a radiator is turned off, a by-pass is formed in the valve body, the full area of the piping, the advantages of which are many, and readily understood.

Owing to the by-pass feature the UNIQUE



Position of Valve when Radiator is turned on.

valve is particularly adapted to the over-head system of piping. It eliminates the construction of a pipe by-pass at the end of the radiator.

The rotating elbows permit the piping to enter the valve from any direction.

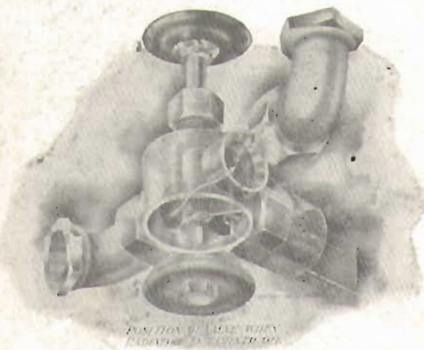
When risers are concealed in outside walls, there is absolutely no danger of freezing, as the full flow of water will circulate through the

risers, even though the radiators be turned off.

Every radiator in a job can be turned off without affecting the circulation in any part of the piping system.

It only requires one-sixth of a turn of the valve handle to completely open or close the valve.

Should it ever become necessary to increase the size of a radiator when the UNIQUE valve is used, it only requires the addition of extra



sections, as there is no return elbow and pipe to contend with; no new holes to make through the floor, or return pipe to extend.

As there is no piping necessary under the floor with the UNIQUE valve, leaks from concealed connections beneath the radiators are entirely done away with, which means a saving of time and trouble.

The HONEYWELL UNIQUE hot water radia-

tor valve is neat in appearance; is compact, very symmetrical in design and is made of the best steam metal.

It is not cheaply constructed. Ample metal is used to insure a good strong valve and the workmanship and finish is of the highest standard.

The roughing in measurements of the

UNIQUE VALVE.

are as follows:

Center to Center of Ells.

½"	¾"	1"	1¼"
5⅛"	5¾"	7"	7½"

End of Spud to Center of Body.

½"	¾"	1"	1¼"
2⅞"	2⅞"	3"	3¼"

Center of Spud to Bottom. of Ells.

½"	¾"	1"	1¼"
1¾"	1¾"	2"	2⅛"

Radiators Should be Tapped

1¼" for ½" valve
1¼" for ¾" valve
1½" for 1" valve
2" for 1¼" valve

THE HONEYWELL TEMPERATURE REGULATOR.

Automatic, thermostatic temperature controlling devices for regulating the temperature of buildings by operating the heater dampers are becoming so well and favorably known that it is not necessary to make reference to the benefits to be derived from their use. Suffice to say a reliable temperature regulator is a great labor and fuel saver.

Several thermostatic devices for controlling the dampers of house heating boilers are now being manufactured, the majority of which are constructed along much the same lines and are electrically controlled.

THE HONEYWELL TEMPERATURE REGULATOR differs from all others principally in the motor, the device which is located in the heater room and operates the dampers.

THE HONEYWELL MOTOR is small, compact and neat in appearance, and unlike other motors, operates the dampers by means of a positive and gradual moving arm or lever. Those who have had experience with motors having cranks that pull and haul long horizontal damper chains, which, owing to lost motion, will clap and bang the dampers, will appreciate this feature of the HONEYWELL MOTOR.

The movement or speed of the HONEYWELL MOTOR is controlled by an absolutely noiseless

and positive acting governor, and the closing and opening of the dampers is done so quietly and easily that the movement could not be detected unless seen.

The motive power is furnished by a six pound weight, which is supported by a flexible, braided brass wire cable which winds around a drum. Also wound on the drum in an opposite direction is an equal length of cable, to which is attached a small hand weight, the winding so arranged that when the power weight runs down, the hand weight will be wound up. To set or rewind the power weight, all there is to do is to pull down on the hand weight. One winding of the weight will run the Motor for several days. The drum around which the cable is wound is connected to the shaft of the motor by a positive and extremely simple ratchet.

There are no springs or delicate parts in the Motor to rust and cause trouble, and the moving parts are so few and extremely simple that with ordinary care, they should last a lifetime.

The thermostat is small and very attractive, and will prove an ornament to any room, no matter how rich the furnishings. The greatest care has been given every detail of construction. The cover is of seamless oxidized brass, to the front of which is fitted an accurate thermometer.

The wires which connect the Motor and Thermostat have colored coverings which correspond with the colors of the binding posts on Motor and Thermostat with which they should be connected. The wires are encased in a neat covering which obviates running one wire at a time when installing.

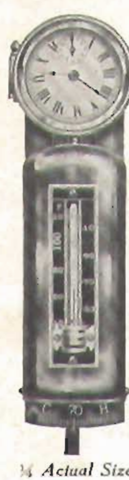
Notwithstanding the quality and workmanship which enter into every part of the Honeywell Temperature Regulator, it sells for only half the price of other regulators.

Heretofore heating contractors have not made a practice of including a temperature controlling device in their bids, because of excessive cost, but now for only a few dollars, a Honeywell Temperature Regulator can be included, and the contractor will be in a position to specify automatic temperature control in his bid, which, in many instances, will influence the closing of the contract.

There are in the United States, more than 250,000 existing heating systems that are not thermostatically controlled, from practically none of which would a good reliable temperature regulator be removed, if once installed and operated for thirty days during cold weather. A Honeywell Temperature Regulator can be installed on any number of these old jobs on thirty days' trial and we will take back, at our expense, every one that is not acceptable.

Installing Honeywell Temperature Regulators on old jobs will prove profitable to any wide-awake fitter during the dull winter months.

DIRECTIONS FOR SETTING UP AND OPERATING THE HONEYWELL TEMPERATURE REGULATOR.



¼ *Actual Size*

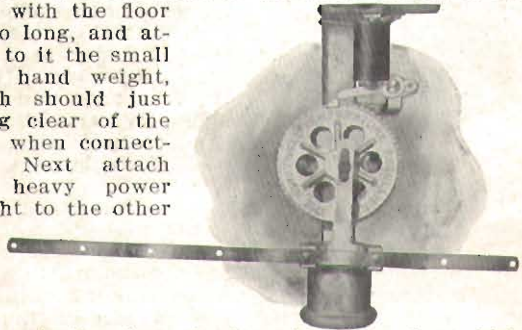
Bolt the lever to the rocker arm on the motor and securely fasten the motor to the ceiling over the heater by means of screws; screw pulleys to ceiling in proper position above dampers and connect chains with dampers and motor lever. It is usually more convenient to place the motor to the right of the heater. It should be located so that the weights will drop to the floor without coming in contact with any part of the heater or piping and the damper chains be as plumb as possible.

Next, place on a board nailed to the joists, or on a shelf on the wall in the basement, the dry batteries. The batteries should be located several feet from the boiler or smoke pipe, as the heat, if placed directly over the boiler or smoke pipe, will affect them and cause them to lose their strength.

Next, locate the thermostat. It should be placed in a hall or living room, and on an inside wall about five feet from the floor. After screwing the thermostat to the wall, unwrap the cable which contains one red, one white and one blue covered wire. Connect the red covered wire to the red binding post on thermostat, the white covered wire to the white binding post, and the blue covered wire to the blue binding post; after which pass the cable either through a hole made in the partition back of the thermostat down through the partition to the motor, or expose it down the wall and through a hole in the floor near the quarter round. The cable can be stapled along the joists or on the basement ceiling to the motor.

On the motor will be found three binding posts, one red, one white and one blue. To the red one should be attached the end of the red covered wire, and to the blue one the end of the blue covered wire. To the end of the white covered wire should be securely twisted one end of the long (10 feet long) single pieces of white covered wire, which should extend over to and connect with one terminal of one of the batteries; to the opposite terminal of the same battery connect the short (6 inch long) piece of white covered wire, which should also be connected with the opposite terminal of the other battery. Then, from the other terminal of the second battery, connect the other long piece of white covered wire, and extend back to the motor, and join to the white binding post thereon.

The motor is now ready for the weights. Untie the braided brass wire cord from the drum housing, and measure same to the floor, cutting it off even with the floor if too long, and attach to it the small light hand weight, which should just swing clear of the floor when connected. Next attach the heavy power weight to the other cord projecting from the drum housing, after which untie the cord which binds the gear wheel to the rocker arm.



A small split tongued wedge will be found, driven under the small bevel gear wheel. This wedge should now be removed, by pulling it out with a pair of pliers.

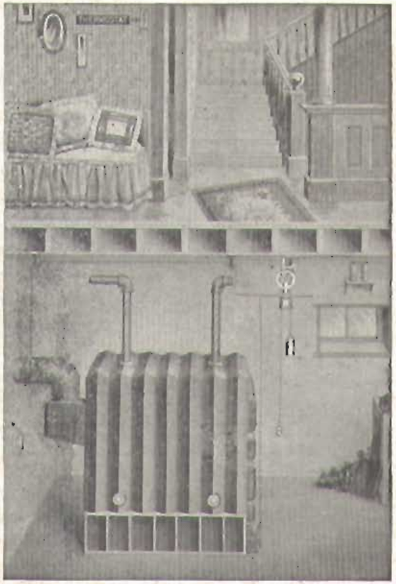
If all the instructions have been followed carefully and good batteries used, it will be found that by moving the indicator at the bottom of the thermostat slightly to the right or left between points H (hot) and C (cold) that the motor will operate,

one movement causing the motor lever to rise and the next movement causing it to lower, the range being about 1½ inches at the end of the lever. More or less movement of either damper can be had by connecting the chains at different points on the lever, holes being provided in the lever for that purpose.

Several heaters now on the market have properly balanced draught and check dampers, while a very large number have not. If the draught damper is heavy and not balanced, a counterweight should be attached to the vertical chain above the check damper. This weight should equal the weight of the draught damper, so that the Regulator will not have a heavier pull when it opens the draught damper than it has to close it. The average check damper is light and balanced and does not need counter-balancing; however, if the heater is not fitted with this kind of a check damper, **our special butterfly check damper** should be used. When our special butterfly check damper is used, there should be placed in the smoke pipe, between the heater and our special damper, a tight damper, which can be set according to the draught of the chimney.

Fully **seventy-five per cent.** of the labor of controlling the fire falls upon the check damper, and it should be of sufficient size that when opened wide, the area of the opening will equal the area of the smoke pipe.

Our special butterfly check damper can be adjusted so that a very slight movement of the motor lever will either open wide or entirely close the damper. The nearer the center of the damper the chain is connected, the wider the damper will open.



This adjustment must be made, however, to conform with the range of the motor lever.

In cases where it is not convenient to add a counter-balance or weight to the chain to balance the weight of the draught damper, a counterweight can be placed on the rear end of the motor lever. For most draughts, the draught damper should only open about one-half inch, with the check damper closed, and when the draught damper is closed, the check damper should be wide open.

SUGGESTIONS.

If the ratchet in the drum does not catch and hold the power weight at any position of the weight, see if the ears or stops on the gear wheel are one above the other, or one engaged with the detent or dog. The ratchet will not catch if the ears or stops on the gear wheel are horizontally opposite one another.

The ratchet used in the motor is of the simplest form. The principle has been used for years in lawn mowers, where the work performed is much greater in one mowing than a lifetime's use of the Regulator.

In connecting the wires either to the binding posts or with one another, the cotton covering should be cut away slightly from the ends, and the wires scraped bright before joining. The binding posts should be screwed down tightly on the wire, and where wires join one another, they should be twisted together tightly.

Do not expect the motor to operate properly if weak batteries are used. One set of batteries will last for one or two seasons. Dust will not affect the operation of the motor. If the motor fails to operate properly, look for a loose or improper wire connection, or weak batteries, also examine the spring brass brush that is fastened to the large gear wheel. This may not project far enough from the gear wheel to make contact with the heads of the red and blue binding posts on the motor. It may strike one and not the other. It should make good contact with both.

The contact points of the thermostat are sterling silver, and should be cleaned in the fall, each year, or before starting up the plant. The thermostat has been adjusted at the factory to hold the room at seventy degrees, with the indicator at the bottom of the thermostat at the center of the dial. Should a higher or lower temperature be required, it can be had by moving the lever to the right or left respectively.

Although the thermostat has been adjusted at the factory, the adjustment may have been disturbed in shipment. To adjust the thermostat, set the indicator at the bottom at 70, then when the thermometer on the cover registers 70, screw in or out the adjustable contact points until they nearly touch the contact point on each side of the thermostatic blade.

Care should be taken when connecting the wires to the binding posts that the ends of the wires do not project through the posts and touch the frame of either the motor or thermostat, which would canse a short circuit and affect the working of the coils.

The oil that is used in the governor pot is non-evaporating. Should any leak out in shipment, it can be removed with a cloth dampened with gasoline or turpentine, after the motor has been set up.

Do not expect satisfacotry results if the check damper is small, and not equal in area or nearly so of the smoke pipe.

The power weight which is furnished with the motor weighs 6 lbs., and is heavy enough to operate the average damper. Do not add weight to the power weight, if an unusually heavy damper is to be operated, but counter-balance on opposite damper chain.

The contact points of the thermostat are adjustable. If too wide apart, the room temperature will change several degrees before the motor will operate. They should be so adjusted that a piece of writing paper can be slipped between the contact point of the thermostatic blade and one of the adjustable points. The motor will then operate with a change of one or two degrees of room temperature.

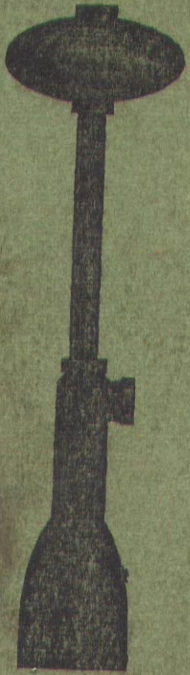
If a hole is made in partition back of thermostat to pass the cable through, care should be taken to stop up the hole with cotton or paper to prevent a draught from affecting the thermostatic blade.

By connecting the red covered wire to the blue binding post and the blue covered wire to the red binding post on the motor, the movement of the motor lever will be reversed. Some settings of the motor will make this change necessary.

AREAS OF PIPES.

½	inch	.20	sq. inch
¾	"	.44	" "
1	"	.78	" "
1¼	"	1.22	" inches
1½	"	1.76	" "
2	"	3.14	" "
2½	"	4.90	" "
3	"	7.06	" "
3½	"	9.62	" "
4	"	12.56	" "
4½	"	15.90	" "
5	"	19.63	" "
5½	"	23.75	" "
6	"	28.27	" "

.60
1.56
2.16



HONEYWELL
HEAT GENERATOR