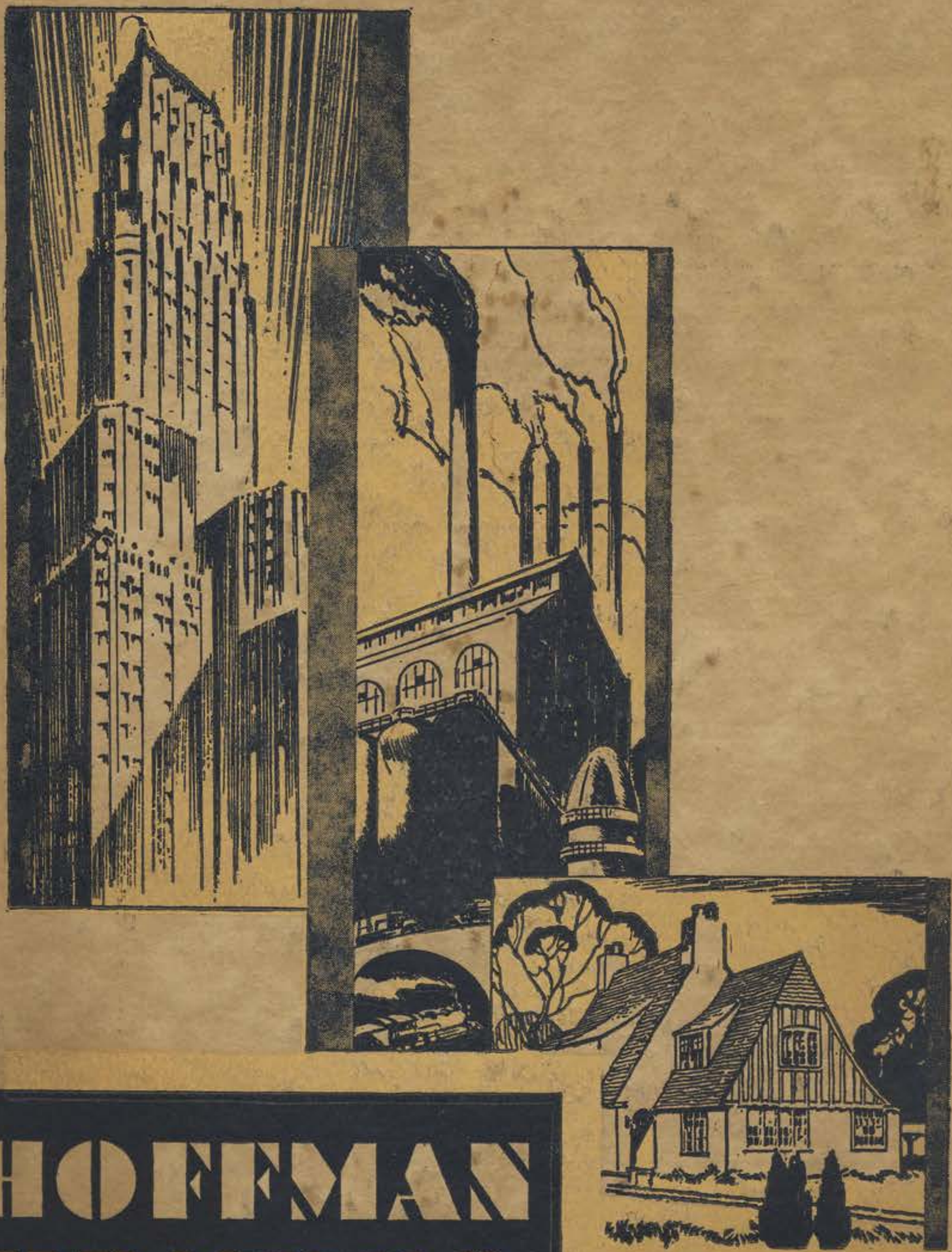


HOFFMAN HEATING EQUIPMENT

HOFFMAN
HEATING EQUIPMENT

HOFFMAN VALVES

HOFFMAN CONTROLLED HEAT

HOFFMAN-ECONOMY PUMPS

HOFFMAN MOTO-HEATERS

HOFFMAN SPECIALTY COMPANY, Inc.
Waterbury, Conn.

BRANCHES IN PRINCIPAL CITIES
Canadian Representative: Crane, Ltd., Montreal
Branches Throughout the Dominion

Hoffman Heating Equipment

INDEX

PART I

PART II

PART III

PART I

Hoffman Valves and Controlled Heat Equipment

Efficient Heating

To give maximum heat and comfort from fuel burnt is the fundamental requirement of the modern heating system. Fuel consumption beyond that necessary to maintain indoor heating comfort is waste.

By providing the correct handling of steam, air and water, Hoffman Valves insure the reduction of fuel waste, efficient performance of the heating system and the elimination of heating troubles.

Basic Principle

The basic principle used in the design of all Hoffman Venting Valves is that of an all-metal thermostatic member, with one or more flexible diaphragms, containing a volatile or heat sensitive fluid which causes valve action upon slight temperature changes.

Automatic

Hoffman Valves are automatic and non-adjustable, and thus insure flexibility and economy of operation without thought or attention on the part of the user.

Accuracy

As the internal fluid pressure in the thermostatic member maintains a constant relationship with the external steam pressure, Hoffman Valves operate with the same degree of accuracy throughout the wide range for which each valve is intended.

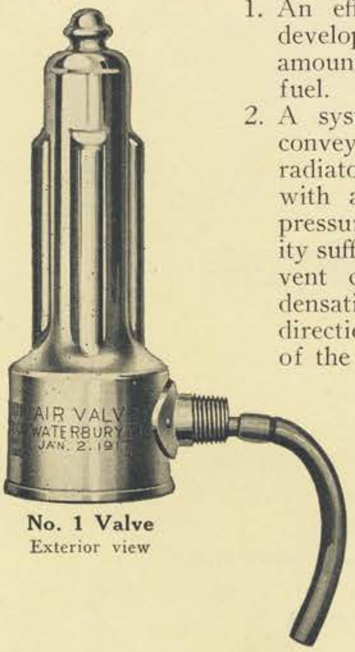
GUARANTEE

Every Hoffman Valve (except Nos. 20 and 21 Traps) is individually tested and guaranteed to function properly for a period of five years, when installed and operated under conditions for which they were designed. A written guarantee is gladly furnished upon request.

HOFFMAN VENTING VALVES

One-Pipe Gravity Steam Systems

The satisfactory and economical operation of one-pipe steam systems is dependent upon:



No. 1 Valve
Exterior view

1. An efficient boiler that develops the maximum amount of steam from fuel.
2. A system of piping to convey steam to the radiators or heating units with a nominal loss in pressure and at a velocity sufficiently low to prevent conflict with condensation flowing in a direction opposite to that of the steam.
3. Air valves on heating units and pipe lines to eliminate air from the system at a rate consistent with best results and to close the vent port when valve is in contact with steam or water.

Perfect results can be obtained only when these three requirements are met. A combination of the first two cannot completely overcome a deficiency in the third. An efficient boiler with a well-designed system of piping cannot result in a satisfactory heating plant unless air is properly relieved from the system. Money well invested in a reliable boiler and piping becomes a "frozen asset" through false economy in using low priced inefficient air valves.

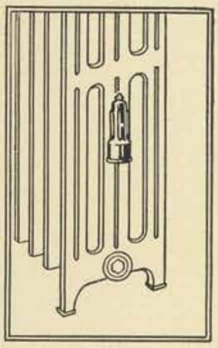
Hoffman No. 1 Valve

The No. 1 Hoffman Siphon Air Valve insures positive, noiseless and trouble-proof venting of radiators. It also goes a step farther in improving the action of the boiler and piping system or overcoming to a large extent any deficiencies that may exist in them.

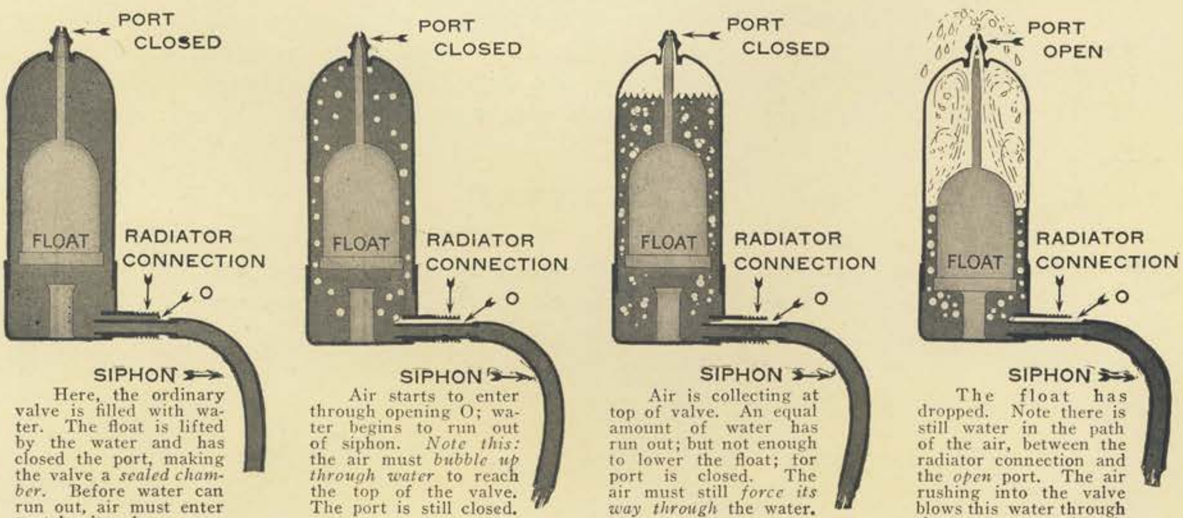
The diameter of the vent port in the No. 1 Hoffman Valve has been scientifically determined to free the radiator of air at a rate which does not cause excessive initial condensation during the heating-up period. Such action prevents the gurgling or pounding which is caused by too rapid release of air.

The rate of air flow *from* the radiator governs the rate of steam flow *into* the radiator. The rate of air venting is, therefore, an important factor in radiator performance. In addition, if air is released at too high a velocity, water piles up in the far end of the radiator causing valve action. This slows the rate of venting and, with improper valve action, "spitting" occurs.

Thermostatically, the action of the Hoffman Valve is so sensitive that it positively distinguishes between steam and heated air. Upon contact with steam the valve instantly closes and when air at a temperature a few degrees less than that of the steam reaches the valve it is promptly released. This action is very important, for approximately one-third of a cubic inch of air or non-condensible gas is released by the condensation of steam



The Operation of the Ordinary Valve



Here, the ordinary valve is filled with water. The float is lifted by the water and has closed the port, making the valve a *sealed chamber*. Before water can run out, air must enter to take its place.

Air starts to enter through opening O; water begins to run out of siphon. *Note this:* the air must *bubble up through water* to reach the top of the valve. The port is still closed.

Air is collecting at top of valve. An equal amount of water has run out; but not enough to lower the float; for port is closed. The air must still *force its way through* the water.

The float has dropped. Note there is still water in the path of the air, between the radiator connection and the *open* port. The air rushing into the valve blows this water through the port, spattering it over floors and walls.

HOFFMAN VENTING VALVES

per square foot per hour, and unless provision is made for venting this air from the radiator, full efficiency is not obtainable.

The thermostatic member is a light buoyant float which closes the port without leakage whenever water surges into the valve. As soon as water is siphoned from the valve the port is opened and venting is resumed without the slightest "spit." This action is made possible by the double shell construction which makes the Hoffman Valve the only one on the market having perfect siphonic action.

The difference between the action of ordinary air valves and the Hoffman Valve under water conditions is shown by the diagrams at the bottom of pages 2 and 3.

Operation of No. 1 Hoffman Valve

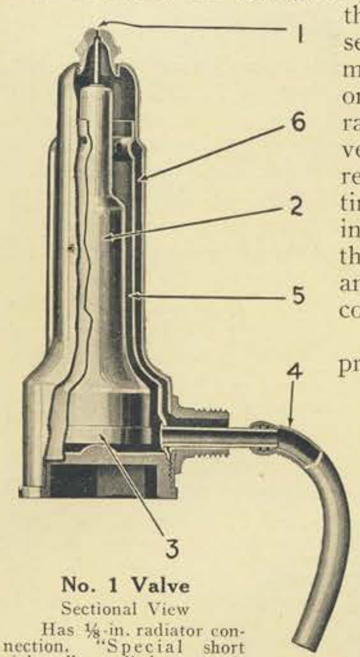
As soon as steam is generated at the boiler, a pressure is exerted on air in the radiators and as the vent port (1) is open, air will escape at the proper rate to cause steam to flow into the radiator and condensation to return through the same pipe line without commotion of any sort.

As steam advances in the radiator the air becomes warmer, but this temperature increase has no effect on the fluid sealed up within the float (2) until a temperature of 180° F. is reached. At this point the thermostatic fluid starts to vaporize. As the fluid is sealed up in the float under a vacuum, the vaporization continues until a temperature of 195° is reached, when the fluid pressure becomes equivalent to atmospheric pressure. With further increase in temperature the fluid pressure increases until, at a temperature of 207-208°, a sufficient pressure is generated to overcome the metal tension of diaphragm (3). Then the vent port instantly closes.

It will thus be seen that the vent port is either wide open or closed tightly. The instantaneous action in changing from a wide open to a closed port results in practically noiseless venting. In valves where the port is slowly closed a noticeable hissing occurs as the air escapes through the narrow aperture. In addition, the port is frequently prematurely closed and air bottled up in the radiator.

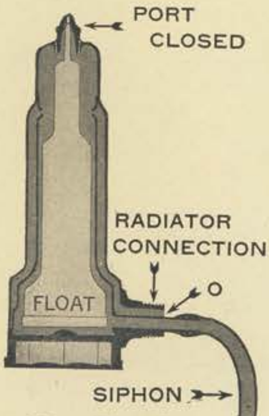
Whenever air at a temperature of one or two degrees less than the temperature of the steam reaches the valve, the port is opened and the air vented. Observation of a Hoffman Valve installed on a steam hot radiator will show venting of air at regular intervals, the time between venting depending upon the size of radiator and rate of steam condensation.

If, through improper pitch of the piping, or radiator, water is present in excessive quantities, its escape through the vent port is prevented by the prompt operation of the thermostatic member which is likewise a buoyant float. As soon as water drops away from the valve the

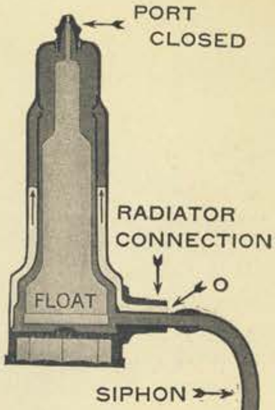


No. 1 Valve
Sectional View
Has ⅛-in. radiator connection. "Special short siphons" supplied to permit installation in narrow pattern radiators or 1-in. pipe radiators. Maximum guaranteed operating pressure, 10 lbs.

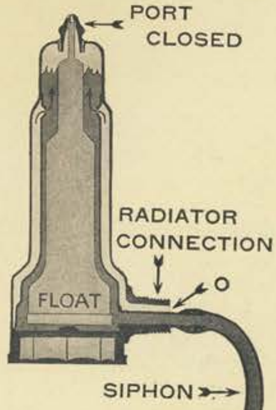
The Operation of the Hoffman Valve



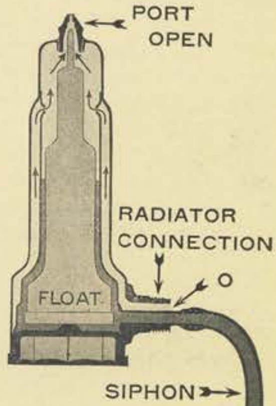
Here: The Hoffman Valve is completely filled with water. The float is raised and the port is closed, making the valve a *sealed chamber*, which air must enter before the water can run out.



Air starts to enter through opening O; water starts to run out of siphon. But note this difference: Instead of bubbling through water, the air is *compelled* to move through *special air channels* to reach the top of the valve.



Air is collecting at top of valve and an equal amount of water has run out. The port is still closed. Notice that the air-channels are now *clear of water*.



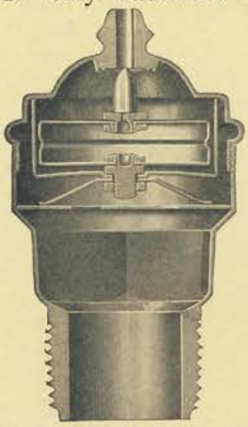
The float has dropped and the port is open. And *now*, the outlets of the air channels are *above* the water line in the valve. There is not a *drop* of water in the path of the air. Therefore valve *cannot* spit or leak.

HOFFMAN VENTING VALVES

siphon (4) drains the float chamber (5) and the vent port is opened, air passing through the valve in the space (6) between the inner and outer shell. The flow of air through this space occurs at the same time that the water lowers in the float chamber. As a result, the opening of the vent port occurs without the escape of water. Because of this construction providing separate passages, release of air from the valve and the drainage of water back into the radiator takes place without conflict.

Venting the Pipe Lines

If only radiators in a one-pipe system are vented, distribution of steam is not uniform. The radiators near the boiler will heat first and those at the end of the pipe lines will be the last to fill with steam. If, however, the end of the main is vented, steam will quickly fill the piping and upon closing the main vent will then flow into the radiators at a uniform rate. This permits the radiators located at distant points from the boiler to receive their supply of steam practically as quickly as the radiators close to boiler.

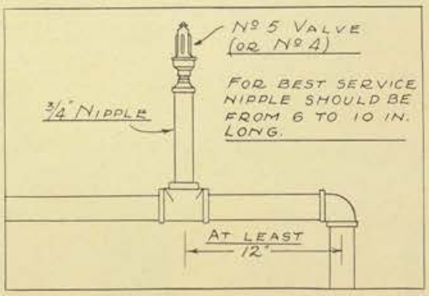


No. 4 Valve

Standard connection, 3/4 in. Supplied with 1/4-in. connection when so ordered. Maximum guaranteed operating pressure, 10 lbs.

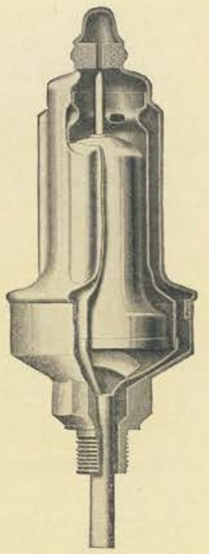
Hoffman No. 4 Quick Vent Valve

The No. 4 Hoffman Quick Vent Valve provides correct venting of the ends of mains and long risers. It is a large capacity valve with 1/8-inch port and is also recommended for other conditions where quick venting is required.



The valve is intended for service where steam and air only are to be handled. It should not be installed under conditions where water is present in excessive quantities, for the valve does not contain combination float and thermostatic member similar to the No. 1 Valve. It, therefore, should not be used for venting the end of return mains where the distance between the low point in the main and the boiler water line is less than 18 inches.

Thermostatically, the No. 4 Valve operates in the same manner as the No. 1 Valve in that it closes tightly upon steam contact and opens when air at a temperature of two or three degrees less than steam is delivered at valve.



No. 5 Valve

Maximum guaranteed operating pressure for valves with 1/16-in. port, 10 lbs.; for 3/16-in. port, 3 lbs. Supplied with 3/8-in. pipe connection. For less than 3 lbs. pressure 3/16-in. port should be specified—from 3 lbs. to 10 lbs., 1/16 in.

Hoffman No. 5 Valve

The No. 5 Hoffman Quick Vent Float Air Valve is intended for service similar to that of the No. 4, but in addition it may be used under conditions where water is encountered. Under water conditions the valve operation is the same as the No. 1 Valve, the double shell construction and siphon performing the same functions.

Use of No. 1 Hoffman Valves on Two-Pipe Gravity Systems

Hoffman No. 1 Valves are also suitable for use on two-pipe gravity systems.

Venting Valve Specification for One-Pipe Gravity Systems

The purpose and intent of this specification is to cover venting valves for a complete one-pipe gravity steam system.

While the system is being operated for temporary heat, or while it is being cleaned, radiators shall be equipped with pet cocks, or second-hand air valves.

After the system has been thoroughly cleaned, the No. 1 Hoffman Siphon Air Valve shall be installed on each radiator, and a No. 4 3/4-inch Hoffman Quick Vent inserted in a nipple and coupling, approximately 12 inches from the end of each main, and so placed that it will be as far above the waterline as possible, but in no event closer than 18 inches. (Where waterline difference is less than 18 inches a No. 5 Hoffman Valve with 1/16-inch port shall be used.)

Optional—To prevent theft in Public Buildings, Apartment Building Entrances, etc.

Each No. 1 Valve shall be securely fastened to the radiator by means of a Hoffman Valve Lock. No tapping in the radiator for this purpose will be permitted.

One-Pipe Gravity Vacuum Systems

The purpose of vacuum heating is to create and maintain a partial vacuum in the radiators and mains in order that steam may be generated at a temperature below 212 degrees.

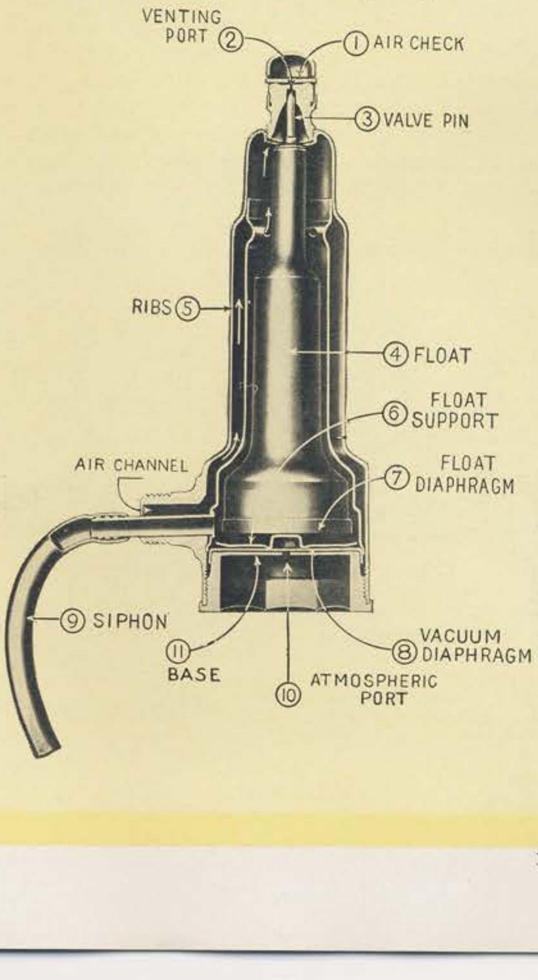
The advantages of a vacuum system over an ordinary steam system are that the radiators will retain their heat much longer—it is possible to get up steam more quickly—and a considerable saving in fuel consumption is effected.

Hoffman No. 2 Valves and Vacuum Specialties

Specialties for converting an ordinary one-pipe steam system into a vacuum system were first perfected by Hoffman Specialty Company and consist of Hoffman No. 2 Radiator Valves, Hoffman No. 6 or 16 Valves for venting mains, and Hoffman Kompo Gage.

Hoffman No. 2 Valves vent the air from the system in the same way that the No. 1 Valve does—promptly, efficiently and noiselessly. In addition, they perform another function. After air is exhausted from the radiators, the valve port automatically locks itself and prevents air from re-entering the radiator.

Under these conditions and provided the system is air-tight at all other points, when steam condenses in the radiator and shrinks to approximately 1/1700 of its previous volume, a vacuum is created. Air does not rush back into the system, and cool it off, nor is it necessary to force air out when steam is again generated.



The practical advantages of a vacuum system with Hoffman No. 2 Valves are shown by the chart of comparative performances on page 6.

Hoffman No. 2 Valves make possible the distribution of steam to all the radiators in 15 minutes instead of an hour as with an ordinary steam system and insure radiators remaining hot for three hours instead of 30 minutes after fires are banked.

In systems using oil or gas burners, the number of operations of the burner per day is reduced about 25 per cent through the use of No. 2 Hoffman Vacuum Valves on the radiators and No. 6 or No. 16 Valves on the pipe lines. In coal burning systems reduction in fuel consumption of 33⅓ per cent is common.

No. 2 Valve

Radiator connection ⅛ in. "Special short siphons" can be supplied when required. Maximum guaranteed operating pressure, 10 lbs.

Operation of No. 2 Hoffman Valves

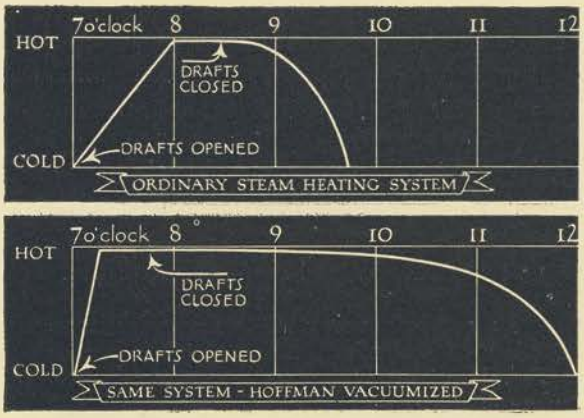
In construction the No. 2 Hoffman Valve is similar to the No. 1 but in addition it has an air check valve over the vent port working in conjunction with a vacuum diaphragm.

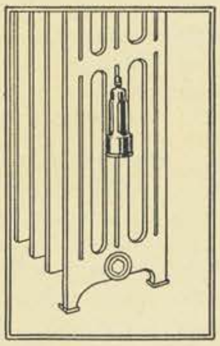
Normally the air check (1) does not function in the maintenance of a vacuum, for when a radiator is filled with steam and the float diaphragm (7) is expanded, closing the port, the vacuum diaphragm (8) will expand whenever the pressure goes down below atmosphere and follow up the contracting float diaphragm, thus maintaining the port closed against air intake.

In a half-hot radiator the float diaphragm (7) is not expanded and the vent port (2) is open. Consequently with a cessation of steam generation, air would be drawn in to fill the space given up by the steam as it condenses were it not for the fact that as soon as the pressure goes down to atmosphere the air check drops and temporarily closes the vent port. Return of air is prevented and as soon as a vacuum of 1 inch is present in the system, vacuum diaphragm (8) expands, lifting the float, and closing the vent port. After this action occurs the air check has no further function.

The superiority of the diaphragm controlled port compared with valves having air check only is indicated by the fact that the total pressure exerted in holding the vent port closed is approxi-

HOFFMAN VENTING VALVES





mately 20 times greater than that exerted in maintaining a check valve closed. This greater pressure exerted by the diaphragm holds the valve pin more tightly against its seat and also aids in crushing or pushing away small particles of dirt which might be caught between the valve pin and its seat, thus insuring a valve which is maintained tightly closed under normal as well as abnormal conditions.

How to Vacuumize a One-Pipe Steam System

To make an air-tight joint, white lead or some other joint compound should be used, but before applying, insert valve in tapping, giving it two or three turns, then apply the white lead to the thread. This will prevent lead from entering the valve through the inlet connection.

Valves

We recommend the use of packless or leak-proof radiator valves, but successful results can be obtained with ordinary radiator valves providing they are properly packed. If new valves of the standard type are installed they should be repacked in order to make certain that all possible air leaks through the stem stuffing box are eliminated. The same applies to old valves. For this purpose we recommend the use of $\frac{1}{16}$-inch Valve Stem packing of standard make. Customer should be informed that it is necessary to tighten up the stuffing nuts each year.

Air Leaks

The usual places for air leaks aside from stuffing boxes of the radiator valves are the water gauge, damper regulator diaphragm, gauge or try-cocks and safety valves. It is advisable to remove the old gauge glass washers and replace them with new washers. See that damper regulator does not permit escape of steam or allow air to be drawn into system. Discs and seats of the water column gauge cocks should be examined to make certain that they make an air-tight joint when closed. The try-cock on the water gauge should be tightened so that the handle can be turned only with considerable effort. Bubbles rising through the water in the gauge glass show a leak in the lower packing nut or try-cock.

For new work, the piping should be carefully installed so as to prevent as far as possible leakage of air at the joints. Before installing, fittings should be examined for sandholes. All pipe lines should be painted with black asphaltum.

Test

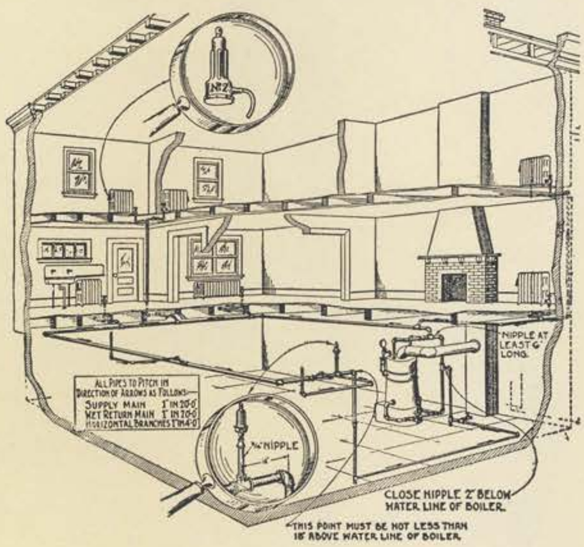
With boiler filled to proper level and before pipe covering is put on, a kindling fire should be started and a pressure of approximately ten pounds generated, maintaining this pressure until all radiators are steam hot from end to end.

Carefully examine joints for steam leaks. When it is ascertained that there are no leaks under steam pressure, dump the fire and open all windows in order to quickly create a vacuum.

If all joints are practically tight, the vacuum gauge should show at least 18 inches when the system is cold and should hold this vacuum with a loss of not over one inch every two hours. When the system is under highest vacuum, a second examination of all joints should be made and any air leaks will be denoted by a hissing at the point of leakage.

Installation of New Work

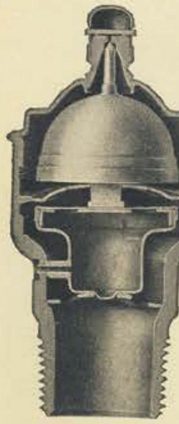
To obtain best results, valves should not be installed on new jobs until the system has been operated for several weeks using pet-cocks or old valves. The purpose of this preliminary operation is to clean out the radiators and pipes of the usual collection of dirt and other foreign substances which are always present in new work.



HOFFMAN VENTING VALVES

Hoffman No. 16 and No. 6 Valves

While Hoffman No. 2 Valves create a vacuum in the radiators, it is also necessary in order to completely vacuumize the system to vent and lock the air out of the mains. The No. 16 Hoffman Valve is recommended for this purpose except in cases where the presence of excessive amounts of water is encountered, when the No. 6 Valve should be used.



No. 16 Valve

Is 3⅜ in. high over all and can be installed where the pipe lines are run too close to ceiling to accommodate the No. 6. Operation similar to No. 6 valve. Can be used on steam pressure up to 10 lbs. Size of port $\frac{1}{16}$ in.; connection ¾ in.

The No. 16 and No. 6 Valves are suitable for use on mains, risers and other conditions where a quick vent is required and return of air to the system must be prevented.

For venting the ends of mains where the difference between the low point of the main and the water line is less than 18 inches, the No. 6 Valve should always be used.

For handling all conditions in one-pipe vacuum systems, the No. 6 Hoffman valve is suggested. This valve has the double shell construction and operates under steam, air and water conditions in the same manner as the No. 2 Vacuum Valve.

Hoffman Valve Lock

The Hoffman Valve Lock prevents the unauthorized removal or theft of No. 1 and No. 2 Valves in public buildings, apartment houses, etc. In office and apartment buildings equipped with No. 2 Vacuum Valves, the Lock prevents removal of the valve when system is operating under vacuum and the resultant intake of air.

The Lock fits all types of radiators and requires no extra labor for tapping. The threaded connection of the air valve is slipped through the opening in the lock and then inserted in the radiator. When valve is in proper position two set screws are tightened with a special key. The "double bite" of the set screws on the curved surface of the radiator prevents turning the valve and they cannot be loosened without using the special wrench.

No. 6 Valve

Maximum guaranteed operating pressure for valves with $\frac{1}{16}$-in. port, 10 lbs.; for $\frac{3}{16}$-in. port, 3 lbs. Supplied with ⅜-in. pipe connection.

Kompo Gage

In order that the user may see the conditions under which the system is operating, a Kompo Gage should be installed on the boiler. For description, see page 13.

Valve Lock

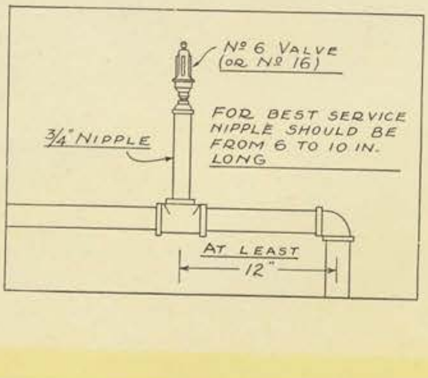
Suggested Specification for One-Pipe Gravity Vacuum System with Hoffman Specialties

The purpose and intent of this specification is to cover venting valves for a complete one-pipe vacuum system.

While system is being operated for temporary heat or cleaned, radiators shall be equipped with pet-cocks or second-hand air valves.

After the system has been thoroughly cleaned, the No. 2 Hoffman Vacuum Valves shall be installed on each radiator and a No. 16 Hoffman Vacuum Valve, inserted in a nipple and coupling, approximately 12 inches from the end of each main and so placed that it will be as far above the waterline as possible but in no event closer than 18 inches. (If waterline difference is less than 18 inches, specify No. 6 valve in place of No. 16.)

A Hoffman Kompo Gage shall be placed on the boiler.



Tests

After installing No. 2 and No. 16 valves and before pipe covering is attached, a test shall be made in the presence of architect's representative and be conducted as follows:

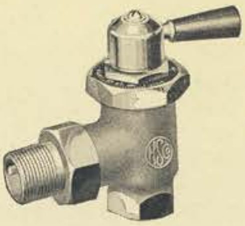
Boiler shall be filled to proper level and slow kindling fire started. When all radiators have been filled with steam, during which time boiler shall show a steady waterline, fire headway shall be increased and a pressure of 10 pounds generated. While maintaining this pressure, contractor will examine all joints for steam leakage and, upon finding system tight, fire is to be dumped and system permitted to go into vacuum as quickly as possible. When system is cool, a vacuum of not less than 18 inches shall be indicated and the rate of loss shall not be over a total of 2 inches in the following three hour period.

Optional—For Public Buildings, Apartment Houses, etc. "Each No. 2 Valve shall be securely fastened to the radiator by means of a Hoffman Valve Lock. No tapping in the radiator for this purpose will be permitted."

Hoffman Controlled Heat

Adaptable to All Types of Buildings

Hoffman Controlled Heat Consists of These Controlling Devices



No. 7 Valve

Controls—at the touch of a finger—the heat output of each radiator.

Differential Loop

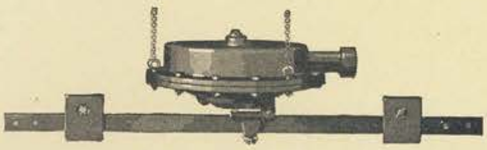
Controls—automatically—and protects the boiler water line.

No. 8 Return Line Valve

Controls—automatically—the flow of condensation and air from each radiator.

Kompo Gage

Registers pressure or vacuum under which the system operates.



Damper Regulator

Controls—automatically—the combustion of fuel and the production of steam in accordance with the demand.

Hoffman Controlled Heat

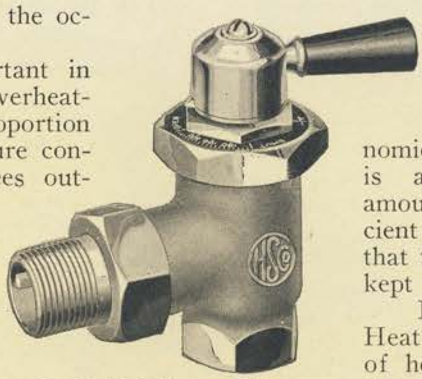
The ideal heating system is one in which heat is instantly available when required and where the heat output of each radiator can be controlled to meet the individual needs of the occupant of each room.

This requirement is important in preventing fuel waste due to overheating, as it is customary to proportion radiation for extreme temperature conditions (0 or minus 10 degrees outside, 70 degrees inside) notwithstanding the fact that in most localities minimum temperatures are reached on but ten or twelve days during the winter.

Therefore, during most of the heating season only 55 to 70 per cent of the total radiation is required to maintain 70 degrees inside.

In addition, the modern heating system should be economical to operate, require minimum attention and give trouble-proof service over a long period of time.

Hoffman Controlled Heat fulfills every requirement of the ideal heating system. It gives quick and uniform heating throughout the entire house or building—or it may be adjusted so as to provide rapid heating and high temperatures for certain rooms and lower temperatures for others.



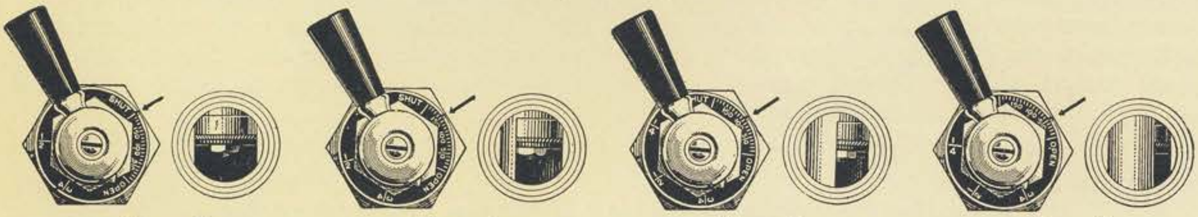
No. 7 Modulating Valve.
Regularly supplied with lever handle. On special orders, it can be furnished with wood wheels, lock shields or closed top. Also obtainable with extension stem and handle or chain pull.

It requires very little attention, being the most nearly automatic system of its type on the market. It is economical, because fuel consumption is accurately regulated by the amount of heat needed. And so efficient is Hoffman Controlled Heat that the amount of radiation can be kept at a minimum.

Finally, Hoffman Controlled Heat makes possible the regulation of heat output from a radiator in the same way that the flow of water from a faucet is controlled. By a touch of the finger, the valve lever may be set to turn the steam fully on, completely off or at any intermediate point desired. No other heating system offers the flexibility of Hoffman Controlled Heat.

Hoffman Controlled Heat is equally suitable for residences, apartment houses, schools, hotels, hospitals, office buildings or other structures.

How the No. 7 Valve Is Adjusted by the Heating Contractor



Dial Settings and Corresponding Port Areas

One of the outstanding advantages of Hoffman Controlled Heat is that the heating contractor can secure a perfect "balancing up" of the system. This is accomplished by the adjustment of a dial on the top of the valve which in turn regulates a port built into the valve.

The dial has a range of adjustments from 10 to 200 square feet of direct cast iron radiation, each graduation representing 10 feet with 2 ounces pressure at the radiator. When set at 200 feet the valve port is wide open and for smaller radiators it is cut down to the proper area for each individual radiator.

When the system is installed the dial is ordinarily set to correspond with the size of the radiator. Thus for an 80 foot radiator it is set at 80, for a 50 foot radiator at 50, etc. This setting is made by loosening the lock nut on top of the valve which permits turning the dial to the proper position.

With this done the system is ready to be balanced. The valve lever (which makes a secondary adjustment described on page 10) is set at the ½ mark. Steam is raised to the maximum pressure under which the system is intended to operate. Each radiator is inspected. Those one-half hot are O.K.

But some may be more than one-half hot due to oversizing the piping while others are less than half hot due to unreamed pipes or similar conditions. With other valves it would be necessary to let the radiators cool and take the valves apart to correct the adjustment.

Not so with the Hoffman No. 7. As the adjustment is *external* and *visible,* the valve may be set in a few moments *while the system is in operation.*

It is done in this way. If the radiator is less than half hot, the lock nut is loosened and the dial is set up a few graduations higher. On radiators that are more than half hot the dial is turned down a number of graduations. The lock nuts are then tightened to make the adjustment permanently correct.

The system is now "balanced up" and heat will be uniformly distributed to all parts of the system. But if it is desired to make some radiators heat first, it can be done by giving them a larger port opening than would be normally required. This valve is *truly modulating.* The port area may be varied with extreme accuracy, which means that an absolutely accurate control of steam admitted to the radiator is always readily obtained.

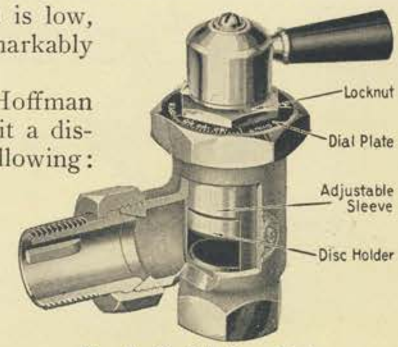
HOFFMAN CONTROLLED HEAT

Operating Principle of Controlled Heat

Hoffman Controlled Heat is a simple two-pipe vapor vacuum system. Because steam is generated at low pressure and a partial vacuum created in the system, fuel consumption is low, and the heating up period is remarkably short.

The specialties comprising Hoffman Controlled Heat and that make it a distinctly superior system are the following:

No. 7 Adjustable Modulating Valve



No. 7 Modulating Valve
Sectional View

The most important feature of Hoffman Controlled Heat is the No. 7 Adjustable Modulating Valve. This valve is made in one size only (¾ in.) and is adaptable for radiators up to 200 square feet of heating surface. An externally adjustable port permits the heating contractor to proportion the port area of each valve to meet the requirements of the radiator. The accuracy of the adjustment is controlled by means of a graduated dial plate and the adjustment can be made whether steam is present in the system or not.

The adjustment is very simple. By loosening a lock nut and turning the valve handle an adjustable sleeve varies the port diameter in accordance with the position of the dial plate, after which the lock nut is tightened and graduated control of the adjusted port is obtained through the use of a secondary set of graduations, which permit the entrance of sufficient steam to heat one-quarter, one-half, three-quarters or the entire radiator.

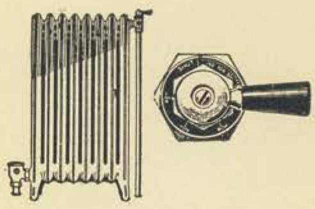
By means of this adjustable port the distribution of steam throughout the entire system can be so balanced that all radiators will heat uniformly, or if desired certain radiators can be favored and permitted to receive their supply of steam before the other radiators are completely heated.

In systems where oil or gas is used and the burner thermostatically controlled, the No. 7 Valve permits the proper distribution of steam and prevents the thermostat from closing down the burner before all radiators are uniformly heated.

The valve is ruggedly constructed, having a cast body of steam metal heavily nickel-plated. Bonnet and tail piece are hot brass forgings, which have a tensile strength considerably greater than castings of the same composition.

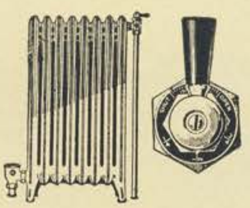
The action of the valve is very free; a touch of the finger being sufficient to change the position of the lever handle. The stem stuffing box is packed with a special laminated packing which lasts indefinitely without requiring attention or tightening of the stuffing nut. This feature practically places the valve in the so-called "packless class."

How the User Can Regulate Hoffman Controlled Heat



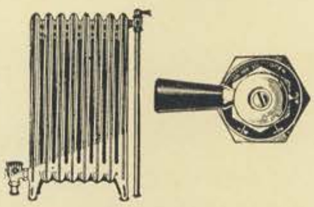
Mild Days

Open the valve so that the pointer is at the ¼ mark. Then there will be just enough heat in the radiator to take the chill off the room.



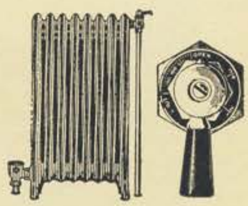
Average Days

If the valve is opened to the ½ mark, the radiator will give plenty of heat for the ordinary winter day.



Cold Days

On a really cold day more heat will be needed. Turn the valve to the ¾ mark.



Bitter Cold Days

On raw, biting cold days when the thermometer hangs around zero, open the valve all the way.

While the ability to furnish quick and uniform heat throughout the entire house or building is an essential requirement of a modern heating system, it is likewise desirable that the user be able to cut heat off quickly. Also, there are many times when for one reason or another the user may want to maintain temperatures above or below average in certain rooms. For example, a temperature of 72 degrees may be desired for a nursery—a temperature of 60 degrees for an unoccupied guest room, etc.

Hoffman Controlled Heat enables the user to control the temperature of each room in accordance with his needs. By a touch of the finger the lever on the top of the No. 7 valve may be turned full open, half open, closed or at any intermediate point.

Hoffman Controlled Heat offers perfect flexibility.

HOFFMAN CONTROLLED HEAT

Nos. 8 and 9 Return Line Valves

On the return side of each radiator is a No. 8 Hoffman Return Line Valve for controlling the release of air and condensation from the radiator without steam loss. This valve is extremely sensitive in operation and maintains the return end of the radiator at practically the same temperature as the inlet, insuring full heat output. The body of the valve is steam metal, heavily nickelplated with cap and tail piece made of a hot brass forging.

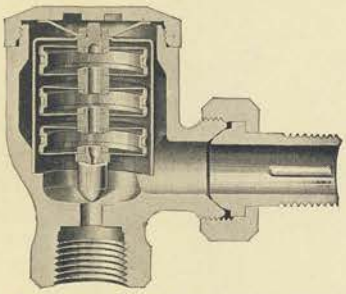
Nos. 8 and 9 Return Line Valve or Radiator Trap

The thermostatic member consists of six diaphragms assembled into a hollow chamber which contains the thermostatic fluid. Leakage at the joints is prevented by the special metal to metal construction, which is soldered at all points as an extra factor of safety. The method of making the joints, however, is such that the use of solder is not absolutely necessary.

In the thermostatic member of any valve it is essential that the metal used be such that it will not soften or crack under repeated operation. After several years of research the Hoffman Diaphragm Metal was developed which meets the most rigid requirements. Before being used the diaphragm metal must undergo durability tests which call for a minimum of three million operations expanding under pressure and contracting by metal tension at the rate of 70 times per minute in a temperature of 350 degrees. After passing this intensified test, which is more severe than would be encountered in ten years of service, the metal is put into manufacturing process.

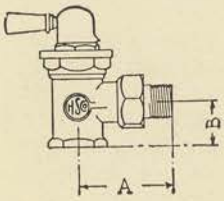
Another important feature in valve operation is the thermostatic fluid. In Hoffman Return Line Valves the fluid is of such a nature that its pressure maintains a constant relationship with that of steam and as a result the valves may be used within a wide pressure range and with uniformly sensitive operation under varying pressures. Because of the fluid and diaphragm metal used, Hoffman Return Line Valves may be used under pressures as high as 50 pounds without change or adjustment.

The thermostat is mounted in a cage so constructed that all thermostats for each size of valve may be interchanged without adjustment. This feature is very important in meeting specifications which call for the operation of a system during the cleaning out period with thermostat removed from the valve body. In replacing the thermostat it is simply necessary to insert it in the valve body, tighten the cap and perfect operation is obtained. This feature is also of great assistance in cleaning valves after they have been in service for long periods under unfavorable conditions.

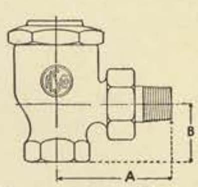


Nos. 8 and 9 Return Line Valve

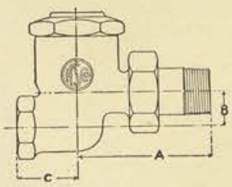
The No. 8 Valve is made in ½ in. size and can be supplied in angle, straightway, right and left hand offset patterns. The normal capacity is 200 sq. ft. of direct cast iron radiation; port diameter all pressures up to 50 lb., ¼ in. The No. 9 Valve is made in ¾ in. size, angle and straightway patterns only, having a normal capacity of 600 sq. ft. of direct cast iron radiation. For pressures under 15 lbs. valve is supplied with ⅜-in. port and 3/16-in. port for pressures of 15 to 50 lbs.



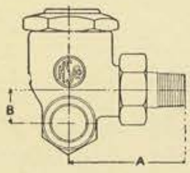
Nos. 7 and 19 Angle Pattern

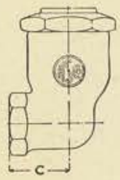


Nos. 8, 9 and 18—Angle Pattern



Nos. 8, 9 and 18—Straightway Pattern





Nos. 8 and 18—Right or Left, Offset Pattern

Style	Size, in.	Diameter valve port, in.	Maximum capacity, sq. ft.	Dimensions†		
				A	B	C
No. 7 Angle	$\frac{3}{4}$	....	200	$2\frac{7}{8}$	$1\frac{3}{8}$	....
No. 19 Angle	$\frac{3}{4}$	....	200	$2\frac{7}{8}$	$1\frac{3}{8}$	....
No. 8 Angle	$\frac{1}{2}$	$\frac{1}{4}$	200	$2\frac{23}{32}$	$1\frac{9}{32}$	....
No. 8 Straightway	$\frac{1}{2}$	$\frac{1}{4}$	200	$2\frac{23}{32}$	$\frac{25}{32}$	$1\frac{13}{32}$
No. 8 Offset	$\frac{1}{2}$	$\frac{1}{4}$	200	$2\frac{23}{32}$	$\frac{25}{32}$	$1\frac{5}{16}$
No. 18 Angle	$\frac{1}{2}$	$\frac{1}{4}$	100	$2\frac{3}{4}$	$1\frac{1}{4}$	....
No. 18 Straightway	$\frac{1}{2}$	$\frac{1}{4}$	100	$2\frac{3}{4}$	$\frac{7}{8}$	$1\frac{3}{8}$
No. 18 Offset	$\frac{1}{2}$	$\frac{1}{4}$	100	$2\frac{3}{4}$	$\frac{7}{8}$	$1\frac{3}{8}$
No. 9 Angle	$\frac{3}{4}$	$\frac{3}{8}$*	600	$3\frac{3}{32}$	$1\frac{11}{32}$	....
No. 9 Straightway	$\frac{3}{4}$	$\frac{3}{8}$*	600	$3\frac{1}{8}$	$\frac{13}{16}$	$1\frac{1}{2}$

*No. 9 Valve furnished with 3/16-in. port for pressures above 15 lbs.

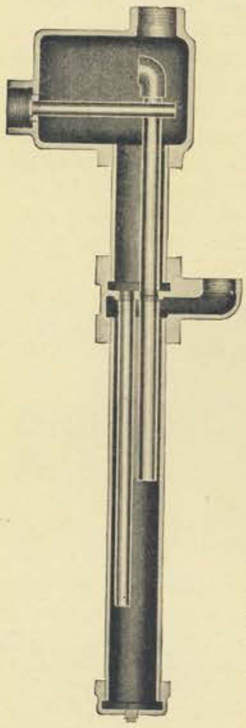
†When specified on order, Hoffman Nos. 7, 8, 18 and 19 Valves will be supplied in accordance with measurements adopted by the Heating and Piping Contractors' National Association.

HOFFMAN CONTROLLED HEAT

Hoffman Differential Loop

To eliminate complicated apparatus for handling condensation and returning it to the boiler it is possible in most cases to permit condensation to return by gravity. This, however, necessitates some control over the boiler water line to prevent water from leaving the boiler if a high pressure is accidentally generated.

The Hoffman Differential Loop is a simple, yet efficient, device, that provides this safeguard. It does not function under normal operation. If, however, a dangerous pressure should be generated, the loop instantly comes into action and prevents damage to the boiler.



Differential Loop

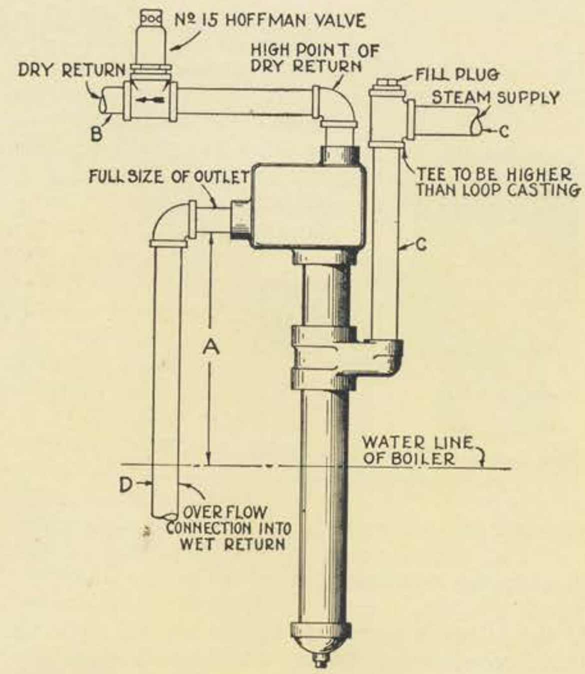
Sold as part of Controlled Heat Equipment.

Prices on loops or basement specialities, for use otherwise, are quoted on application, and sold only when we approve plan of installation.

No. 0 and No. 02 Loops should not be used where the low point in the dry return is less than 24 in. above boiler water line. With the No. 03 and No. 04 Loop this distance must be at least 30 in.

The Loop contains no moving parts to corrode or stick and prevent action at any time when necessary. The operation is obtained through the use of a water column which seals a connection between the steam and return mains until such time as a predetermined pressure is generated, when the connection is unsealed and a small quantity of steam is blown into the return main. This action closes the port of the main vent and compresses the air in the return sufficiently to prevent water from rising beyond the level in the return established by the predetermined pressure. As soon as a sufficient quantity of steam is delivered to the return to accomplish the desired results, the blow-over connection is resealed and remains so until there is need for an additional supply of steam.

When the Loop functions it maintains a fixed differential pressure between the steam and return main. In the standard No. 0 and No. 02 Loops the differential pressure is 10 ounces, while with the No. 03 and No. 04 a 14-ounce differential is maintained. The maintenance of this differential permits circulation of steam throughout the system even though the main vent port is closed. Furthermore, by the maintenance of this differential when the loop has functioned, a radiator which has been turned off may be put into commission and filled with steam in practically the same time as would be required if the Loop had not functioned.



As a positive control over the boiler water line and insurance against damaged boilers, due to forcing out of water under the excessive pressures, the Loop is the simplest and most efficient device on the market.

DIMENSIONS OF LOOP

Loop No.	Capacity, sq. ft.	Dimensions, in.			
		A	B	C	D
0	2000	24	1¼	1¼	¾
02	3500	24	1¼	1¼	¾
03	7500	30	1½	1½	1
04*	15000	30	2	2	1¼

*04 Loops made by siamesing 2 No. 03 Loops with nipples, tees and unions.

No. 15 Valve

In conjunction with the Loop a special valve for venting the entire system is used—the No. 15 Hoffman Vacuum Valve—which permits free venting of air through its ¾-inch vent port and prevents air returning to the system by means of a light check, which is thoroughly reliable in fulfilling its requirements.

No. 15 Valve

The No. 15 Valve is intended for use only in connection with Hoffman Differential Loops.

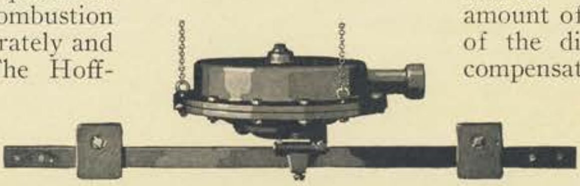
Venting of Mains

For venting the mains into the dry returns, from two to six, depending on the size of the installation, No. 18 Valves are used. A complete list of Controlled Heat Equipment required for various sizes of installations is given on page 14.

HOFFMAN CONTROLLED HEAT

Hoffman Damper Regulator

In order that heat may be supplied promptly when there is a demand for it, it is necessary to maintain the pipe lines filled with steam under very low pressure at all times. To prevent the generation of excessive quantities of steam, the rate of combustion in the boiler must be accurately and positively controlled. The Hoffman Damper Regulator fulfills this requirement in that it maintains steam in the pipe lines at all times under uniform pressure and whenever the demand for steam is changed, by opening or closing a No. 7 Valve, the response at the boiler is instantaneous.



Hoffman Damper Regulator

This sensitive operation is obtained through the use of a large diameter rubber diaphragm, which multiplies slight variations in pressure into sufficient power to operate the drafts.

The diaphragm is submerged in water at all times, preventing steam vulcanization of the rubber. To maintain a fixed amount of water on the upper side of the diaphragm at all times a compensating disc is used to occupy the space given up by the diaphragm as it expands in response to a pressure increase. With a constant water load on the upper side of the diaphragm and the balancing of the dampers by means of compensating weights on the lever, the regulator is just as sensitive in closing as in opening the drafts.

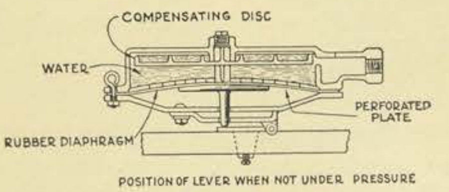


Figure 1

Shows Damper Regulator under no pressure. Compensating disc is in its uppermost position, the bottom of the plate being in line with bottom of inlet. The space above diaphragm is filled with water up to the inlet. Weights on lever are to be so placed that they will hold the diaphragm against the perforated plate. Drafts are held open until the predetermined pressure is generated, when, through diaphragm action which in turn is transmitted to the lever, drafts are closed.

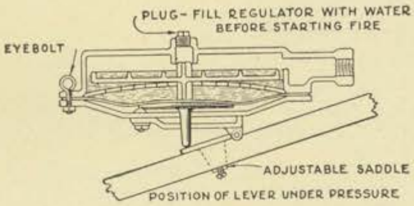


Figure 2

Shows position of Damper Regulator when drafts are closed. Vapor pressure has overcome upward force exerted by the weights on lever arm and forced diaphragm downward. The water on the diaphragm lowers with it and likewise the compensating disc until top of the disc is level with the bottom of the inlet, thus preventing any addition to the water above the diaphragm. With a slight drop in vapor the weights force the diaphragm upward and drafts are opened.

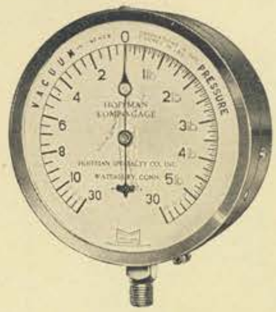
Hoffman Kompo Gage

The new Hoffman Kompo Gage is used with either Hoffman Controlled Heat installations or One-pipe Gravity Steam Heating Systems, equipped with Hoffman No. 2 Vacuum Valves. It accurately indicates the pressure of the vapor being generated in the boiler, or shows whether the plant is operating under vacuum conditions.

The Kompo Gage measures pressure up to 30 pounds, the first 5 pounds being shown in ounce graduations, with a retard from 5 pounds to 30 pounds. Vacuum is shown up to 30 inches, the first 10 inches being indicated in ½-inch graduations, with a retard from 10 inches to 30 inches.

An unusual feature of the Kompo Gage is the externally operated set screw which resets the hand. During shipment it often occurs that the hand is jarred from its normal position at zero. By turning the set screw, without dismantling the gauge or removing the glass, the hand may be reset to zero with perfect assurance that it will register as accurately as when it left the factory.

Coupled with the Hoffman Damper Regulator, this new gauge eliminates all guesswork from the important detail of firing the boiler. The result is marked fuel economy through more efficient firing.



Kompo Gage

The Hoffman Kompo Gage is made in one style only—pressed steel case and ring, finished in dull black, white dial 5 inches in diameter, pressure and vacuum readings in black. Pipe connection is ¼ inch.

Specifications for Controlled Heat

A six-page specification for Hoffman Controlled Heat installations is furnished upon request.

HOFFMAN CONTROLLED HEAT

Equipment for Controlled Heat

For convenience, Hoffman Controlled Heat Equipment is classified in two groups: Radiator Specialties and Basement Specialties.

Standard Radiator Specialties

Description	Size of connection	Capacity sq. ft. radiation†
No. 7—Modulating Radiator Supply Valve, Lever Handle (Angle Type Only)........... Wood wheel—lock shield—closed top, furnished without extra charge.	¾ in.	200
No. 7—Valve with extended stem	¾ in.	200
No. 7—Valve with chain pull attachment	¾ in.	200
*No. 8—Return-Line Valve or Radiator Trap, ¼ in. Port..	½ in.	200
**No. 9—Return Line Valve or Radiator Trap, ⅜ in. Port..	¾ in.	600

*No. 8 furnished in angle, straightway, right or left-hand corner type.

**No. 9 furnished in angle or straightway only.

Angle type Nos. 8 or 9 shipped unless otherwise ordered.

†Capacity based on 240 B. T. U. per hour.

Standard Basement Specialties

Class "O"—Basement specialties for installations up to 2000 square feet Direct Radiation, consisting of:

2 No. 18 Return Line Valves for venting Steam Mains into Dry Return.
1 No. 0 Hoffman Differential Loop, including one No. 15 Vacuum Valve.
1 No. 13 Hoffman Damper Regulator.
1 No. 14-A Hoffman Kompo Gage.

Class "B"—Basement specialties for installations of 2001 to 3500 square feet Direct Radiation, consisting of:

3 No. 18 Return Line Valves for venting Steam Mains into Dry Return.
1 No. 02 Hoffman Differential Loop, including one No. 15 Vacuum Valve.
1 No. 13 Hoffman Damper Regulator.
1 No. 14-A Hoffman Kompo Gage.

Class "C"—Basement specialties for installations of 3501 to 7500 square feet Direct Radiation, consisting of:

4 No. 18 Return Line Valves for venting Steam Mains intc Dry Return.
1 No. 03 Hoffman Differential Loop, including one No. 15 Vacuum Valve.
1 No. 13 Hoffman Damper Regulator.
1 No. 14-A Hoffman Kompo Gage.

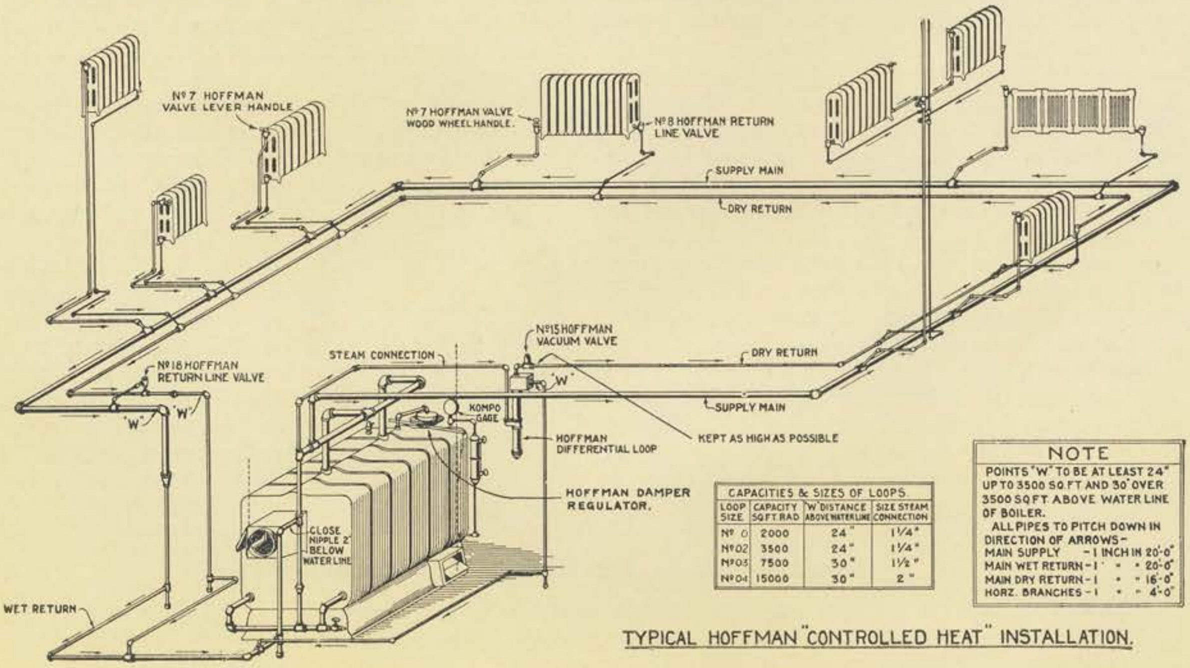
Class "D"—Basement specialties for installations of 7501 to 15,000 square feet Direct Radiation, consisting of:

6 No. 18 Return Line Valves for venting Steam Mains into Dry Return.
1 No. 04 Hoffman Differential Loop, including two No. 15 Vacuum Valves.
1 No. 13 Hoffman Damper Regulator.
1 No. 14-A Hoffman Kompo Gage.

Additional Basement Equipment

(Occasionally required for large installations.)

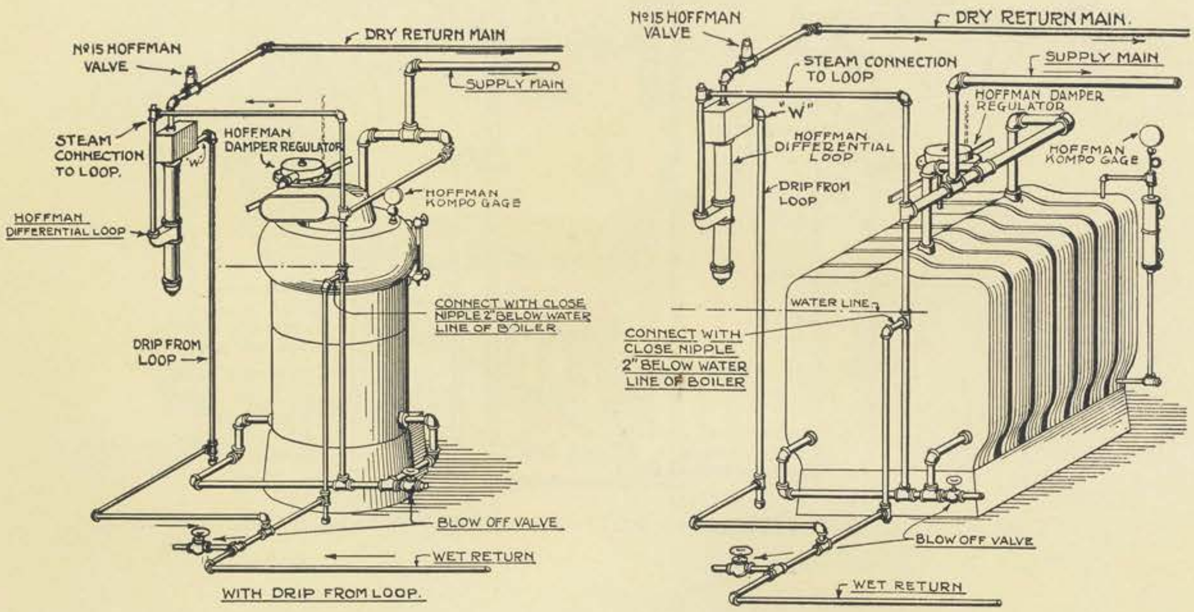
Service	Valve No.
Return Line Valves for Venting Air only from Mains, Indirect Radiators, etc., into Dry Return..................	8 or 18
Return Line Valves for Return Connections from Indirect Radiators, Unit, Superfin, Vento or Aerofin Heaters, or to drip Steam Mains, Risers, etc.......	9 or 12
Damper Regulator for Each Additional Boiler	13
Kompo Gage for Each Additional Boiler	14-A



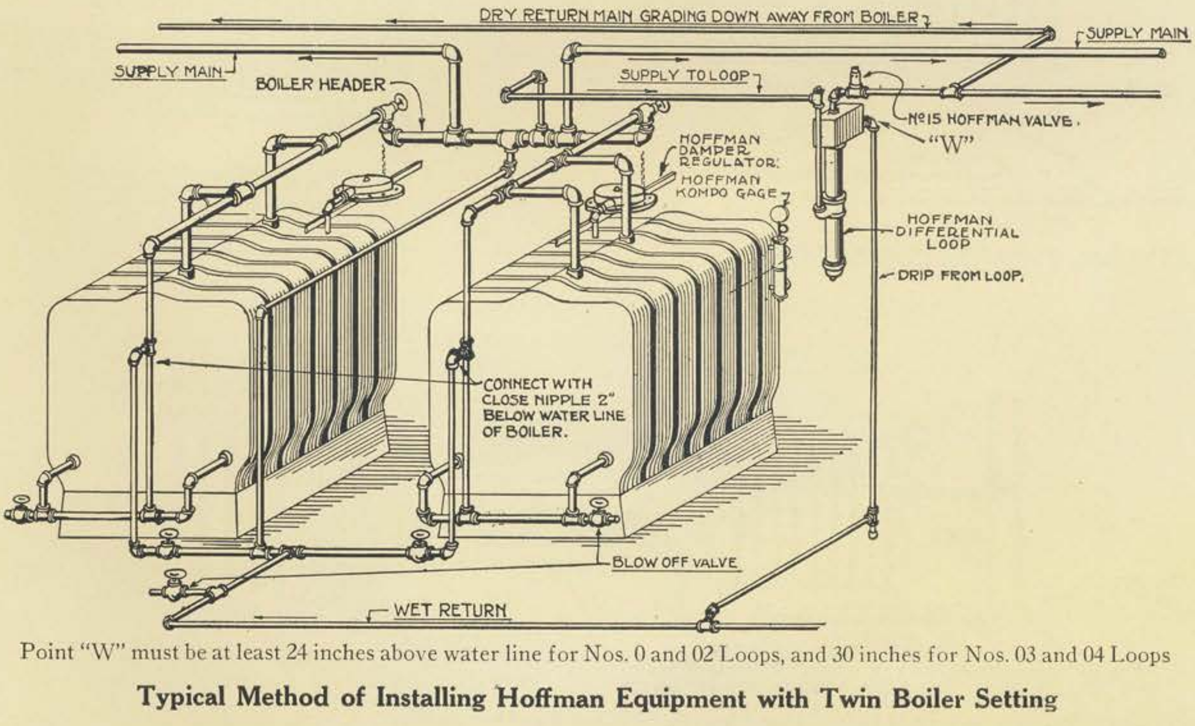
TYPICAL HOFFMAN "CONTROLLED HEAT" INSTALLATION.

HOFFMAN CONTROLLED HEAT

Typical Installation Details



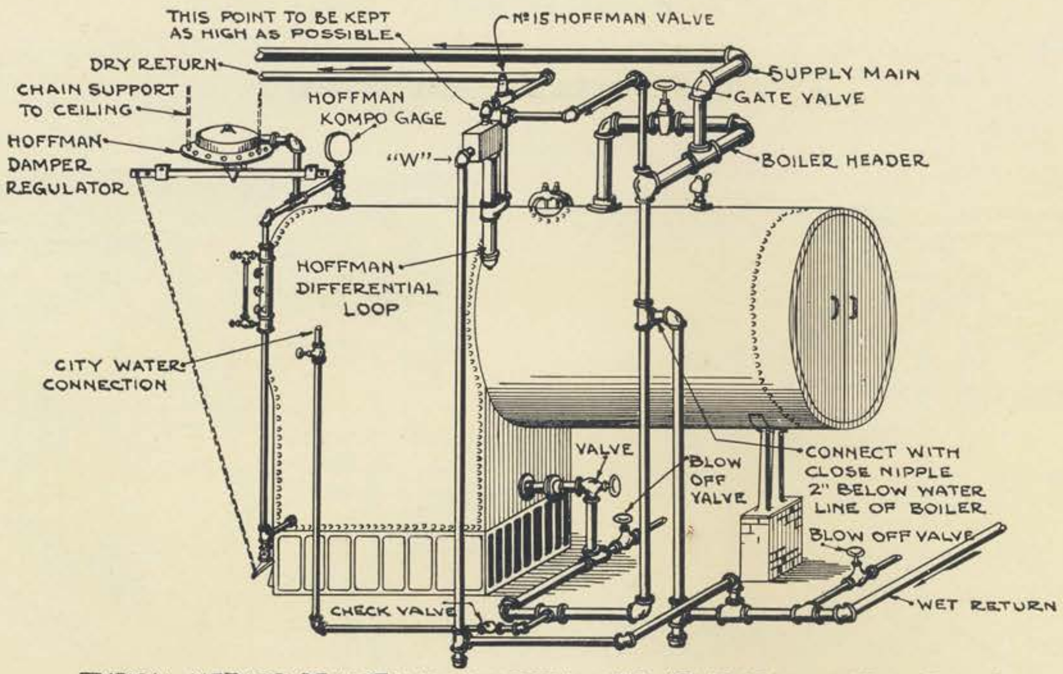
Typical Method of Installing Hoffman Equipment on Round and Sectional Boilers



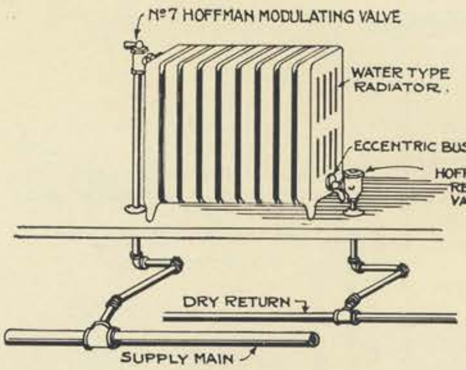
Point "W" must be at least 24 inches above water line for Nos. 0 and 02 Loops, and 30 inches for Nos. 03 and 04 Loops

Typical Method of Installing Hoffman Equipment with Twin Boiler Setting

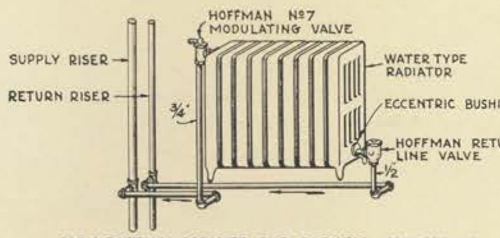
HOFFMAN CONTROLLED HEAT



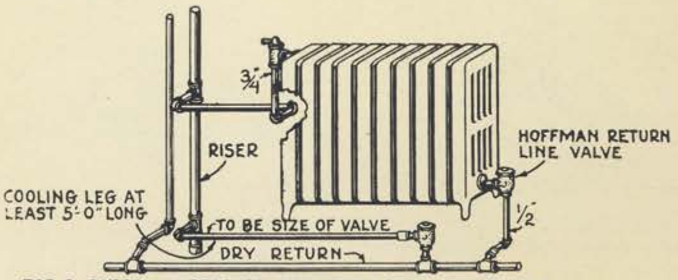
TYPICAL METHOD OF INSTALLING HOFFMAN EQUIPMENT ON STEEL BOILERS.



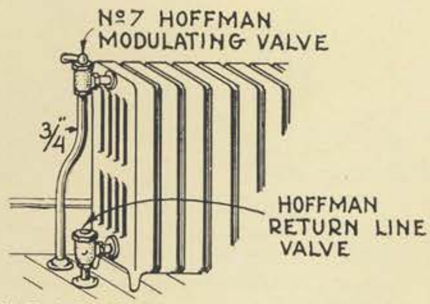
TYPICAL RADIATOR CONNECTION.



TOP & BOTTOM OPPOSITE END RADIATOR CONNECTIONS FROM UP OR DOWN FEED RISERS — (USUAL METHOD)



TOP & BOTTOM OPPOSITE END RADIATOR CONNECTION WITH HEEL OF DOWN FEED RISER DRIPPED INTO DRY RETURN

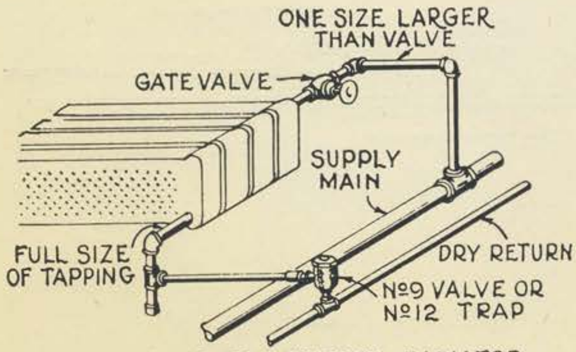


TOP & BOTTOM — SAME END RADIATOR CONNECTION

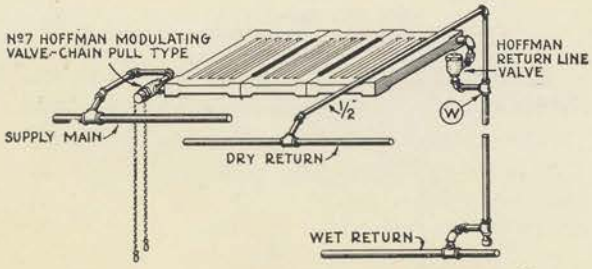
Point "W" must be at least 24 inches above water line for Nos. 0 and 02 Loops, and 30 inches for Nos. 03 and 04 Loops

Typical Installation Details

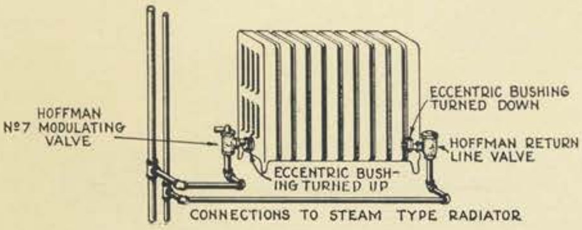
HOFFMAN CONTROLLED HEAT



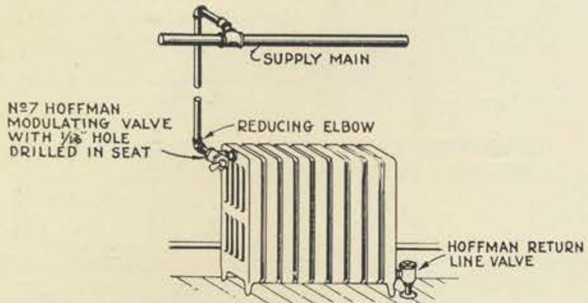
CONNECTIONS TO INDIRECT RADIATOR DRIPPING & VENTING INTO DRY RETURN.



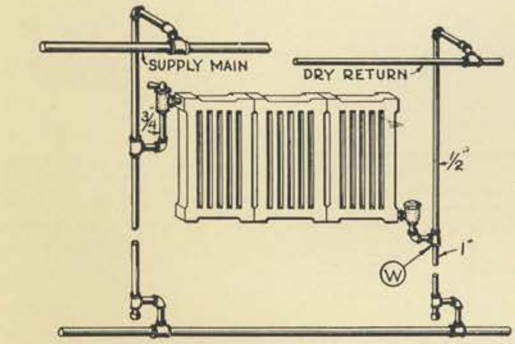
CONNECTIONS TO CEILING RADIATOR WITH RETURN DRIPPED INTO WET RETURN & AIR VENTED INTO DRY RETURN



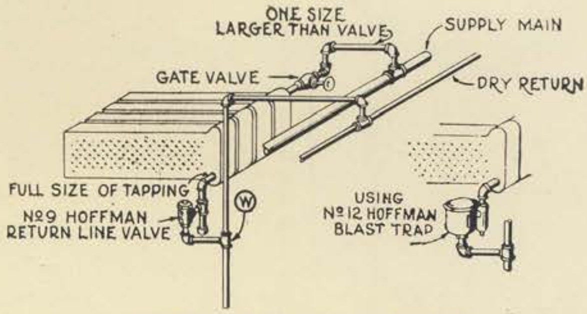
CONNECTIONS TO STEAM TYPE RADIATOR



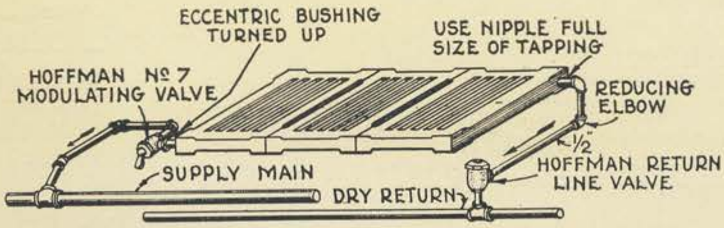
RADIATOR CONNECTION WITH DOWN FEED RISER DRIPPED THROUGH SUPPLY VALVE



CONNECTIONS TO RADIATOR HUNG ON WALL
[WHEN SUPPLY & RETURN DRIPS CONNECT TO WET RETURN AND AIR IS VENTED THRU HOFFMAN VALVE INTO DRY RETURN]



CONNECTIONS TO INDIRECT RADIATOR DRIPPING INTO WET RETURN & VENTING AIR INTO DRY RETURN.

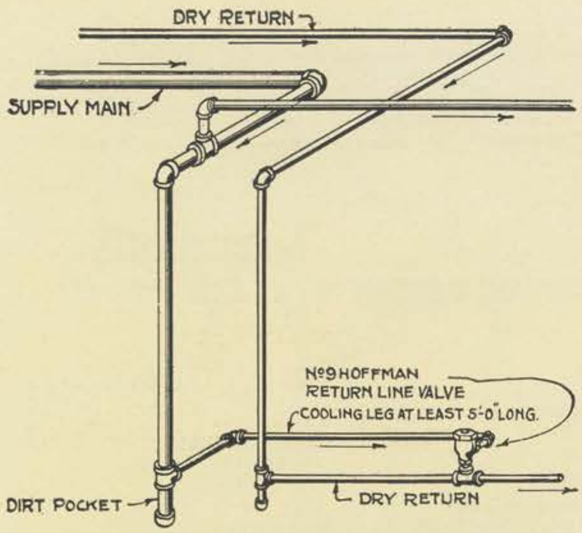


CONNECTIONS TO CEILING RADIATOR ABOVE SUPPLY & RETURN MAINS

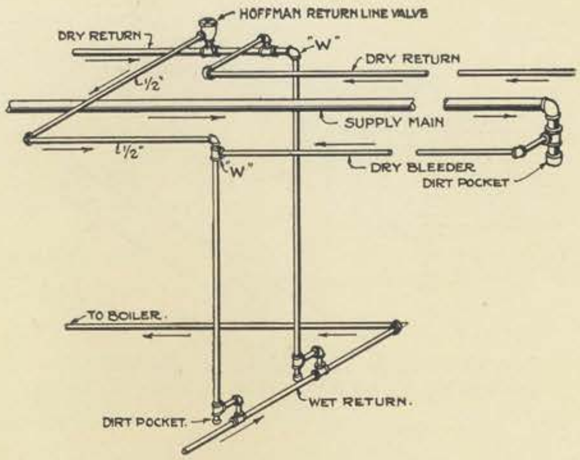
Point "W" must be at least 24 inches above water line for Nos. 0 and 02 Loops, and 30 inches for Nos. 03 and 04 Loops

Typical Installation Details

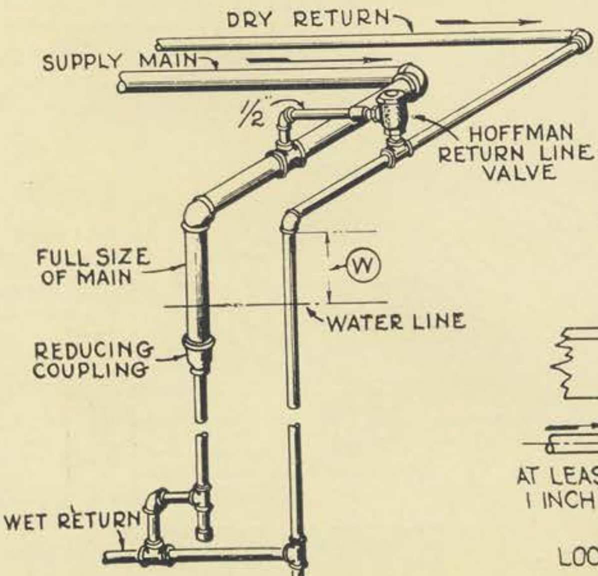
HOFFMAN CONTROLLED HEAT



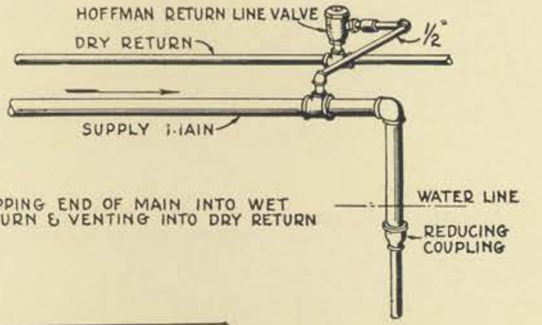
DRIPPING END OF SUPPLY & RETURN MAINS INTO DRY RETURN AT LOWER LEVEL.



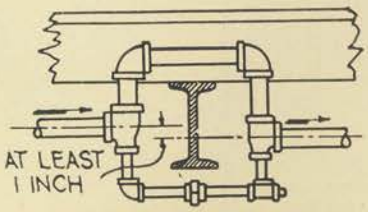
BLEEDING & VENTING END OF MAIN FROM UNEXCAVATED PART OF BUILDING.



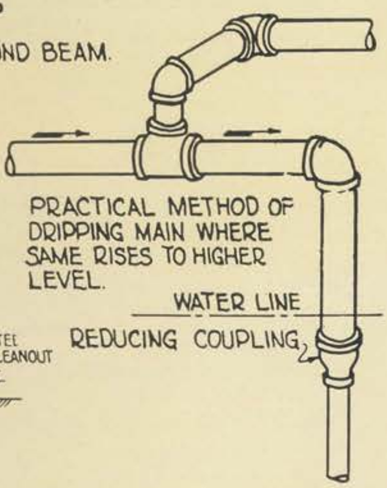
VENTING & DRIPPING ENDS OF MAINS



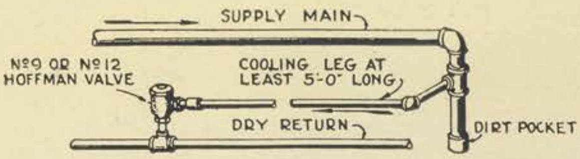
DRIPPING END OF MAIN INTO WET RETURN & VENTING INTO DRY RETURN



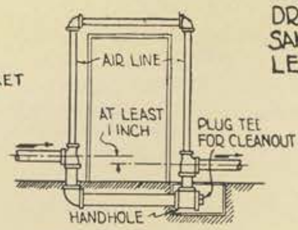
LOOPING MAIN AROUND BEAM.



PRACTICAL METHOD OF DRIPPING MAIN WHERE SAME RISES TO HIGHER LEVEL.



DRIPPING END OF MAIN INTO DRY RETURN



LOOPING DRY RETURN MAIN AROUND OPENING.

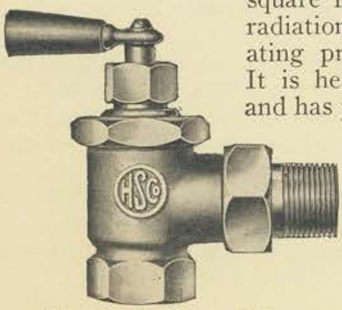
Point "W" must be at least 24 inches above water line for Nos. 0 and 02 Loops, and 30 inches for Nos. 03 and 04 Loops

Typical Installation Details

MISCELLANEOUS HOFFMAN VALVES

No. 19 Hoffman Radiator Valve

Quick-opening, semi-packless type intended for vacuum pump installation or for vapor systems where modulation is not required. Valve is made in ¾-inch size only, having a capacity of 200 square feet direct cast iron radiation; maximum operating pressure 15 pounds. It is heavily nickel plated and has polished trimmings. The valve stem is in one piece, the end engaging in disc holder having a quadruple thread which allows full port opening with three-quarters of a turn of handle.



No. 19 Radiator Valve
Supplied with lever handle, wood wheel, lock shield, closed top or extended stem

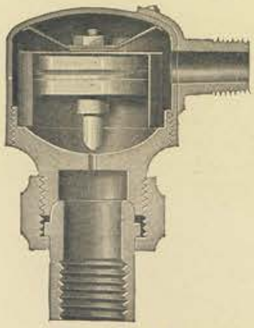
The stem packing is lubricated, compressed asbestos fibre that will last indefinitely and requires no attention other than an occasional take-up of the packing nut. Handle is hard black fibre that withstands severe service without breakage. Valve disc is genuine Jenkins Bros. composition.

Regularly supplied in lever handle type. On special orders, wood wheel handles, lock shields, closed tops or extended stems furnished.

No. 3 Hoffman Air Line Valve

The No. 3 Hoffman Air Line Valve is a compact all-metal valve for air line or Paul Systems, where an exhaust line is carried from the valve back to a central point where in many cases air is drawn out of the system by a vacuum pump.

Normally the port is open for the passage of air and remains so until steam reaches it, when the thermostatic member instantly closes the discharge port tightly and no steam escapes into the air line.



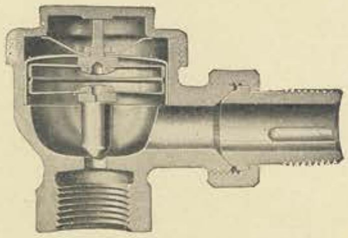
No. 3 Valve
Radiator connection, ⅛ in.; air line connection, ¼ in. Maximum guaranteed operating pressure, 10 lbs.

With proper instalation of air line systems no difficulty is encountered with water logged radiators, but if water is present in the system in excessive quantities and thrown against the No. 3 valve it will escape into the air line. To allow for unforeseen conditions, the use of an automatic water feeder is recommended on all boilers in air line systems.

The Hoffman-Economy Air Line Pump (see page 40) is intended for accelerating the removal of air from these systems and maintaining a vacuum on the air line.

No. 18 Hoffman Return Line Valve

This valve is similar in construction and basic principle to the No. 8 Hoffman Return Line Valve. It is used where radiator units contain not over 100 square feet of direct cast iron radiation, and the pressure at the trap not in excess of 15 pounds. The thermostat consists of one chamber made by two diaphragms separated by a space ring to which they are fastened. In the center of the bottom diaphragm the valve pin is attached. The joint being expanded and soldered remains absolutely tight. The thermostat is held in its cage by a pin expanded and attached to the top diaphragm, this pin extending through the cage and engaging with the boss on the cap. All thermostats are interchangeable.



No. 18 Return Line Valve
Made in ½ in. size only and is furnished in angle, straightway, right and left hand offset patterns. Maximum guaranteed pressure is 15 lbs.

No. 11 Hoffman Vapor Vacuum Valve

This valve is used for venting return mains in vapor vacuum systems or for other conditions where a large venting capacity is required. Valve has a ¾-inch vent port. For preventing the escape of water the valve has a large buoyant float with a double valve, one disc controlling ¾-inch port and the other an auxiliary port $\frac{3}{16}$ inch in diameter. If water enters the valve, closing off the port, and then recedes, the $\frac{3}{16}$-in. port is first opened and as air pressure is relieved slightly the ¾-inch port opens and full venting area obtained. Above the float-controlled port is the thermostat which controls a ¾-inch single valve port. An air check over the discharge port prevents return of air to system.

For preventing damage to valves in shipment a set screw is used to hold the float tightly against its seat. It is necessary that the set screw be backed away before valve is installed.

No. 11 Vapor Vacuum Valve
Valve has ¾-in. pipe connection and is guaranteed for operating pressures up to 15 lbs.

MISCELLANEOUS HOFFMAN VALVES

No. 12 Hoffman Blast Trap

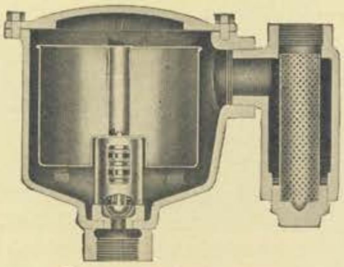
Especially well adapted for draining condensation from:

- Indirect Radiators
- Blast, "Vento" or "Superfin" Stacks
- Unit Heaters
- Ends of Steam Mains and Risers
- Dryers and Drums
- Hot Water Generators
- Laundry Machinery

In functioning it distinguishes between steam, heated air and water of condensation, giving free discharge of air and condensation.

The trap embodies the desirable feature of open bucket or float traps in that it relieves condensation immediately upon its arrival at the trap regardless of the water temperature. Combined with the float is a thermostatic member which positively overcomes the chief difficulty with float traps by automatically relieving air as well as condensation from the system.

The normal position of the valve is open and this is held until steam reaches it when it closes tightly. If small quantities of condensation flow to the trap the thermostat functions and relieves the water, but if larger amounts of condensation, beyond the capacity of the port controlled by the thermostat reach the trap, the float lifts the thermostat from its seat and opens the large port. Maximum capacity is thus obtained.

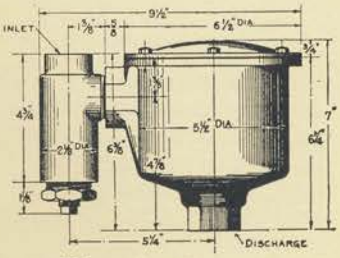


No. 12 Blast Trap
Pipe connections with strainer, 1 in. inlet and outlet.

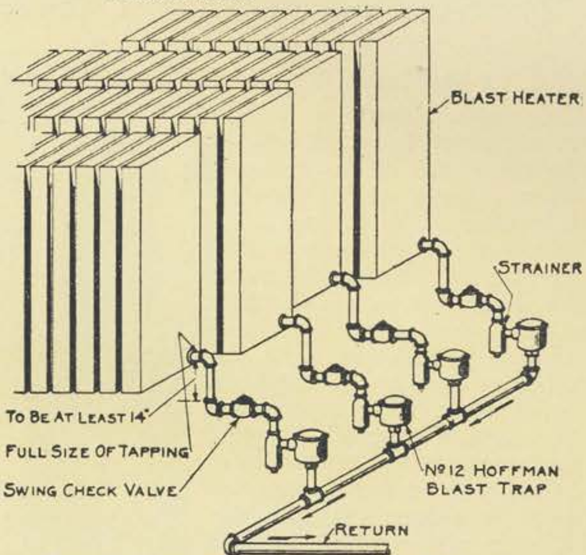
TABLE OF NOMINAL CAPACITIES

Pressure, lb. per sq. in.	½	1	2	3	4	5
Capacity, lb. per hr.	800	1,000	1,500	1,800	2,000	2,500
Capacity in sq. ft. radiation with ¼ lb. condensation per sq. ft. per hr.	3,200	4,000	6,000	7,200	8,000	10,000

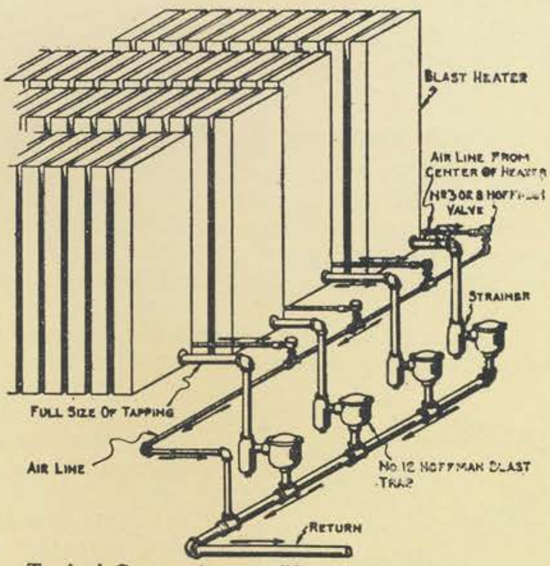
Maximum guaranteed operating pressure 30 lbs. Capacities for over 5-lbs. pressure furnished on application.



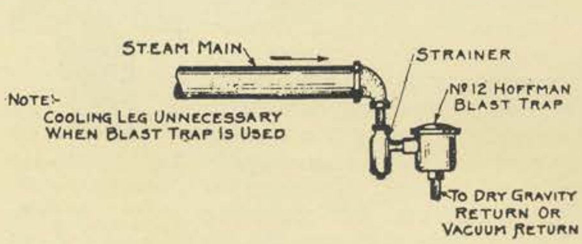
Dimension Diagram



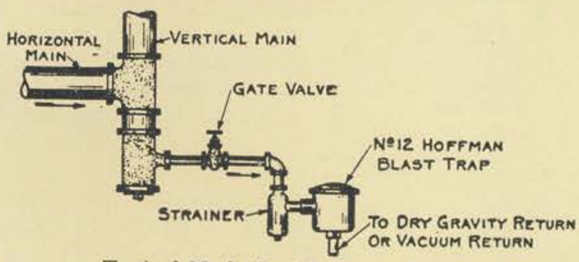
Typical Connections to Blast Coils Having Less Than 12 Sections



Typical Connections to Blast Coils Having More Than 12 Sections



Typical Method of Dripping End of Mains



Typical Method of Dripping End of Mains

MISCELLANEOUS HOFFMAN VALVES

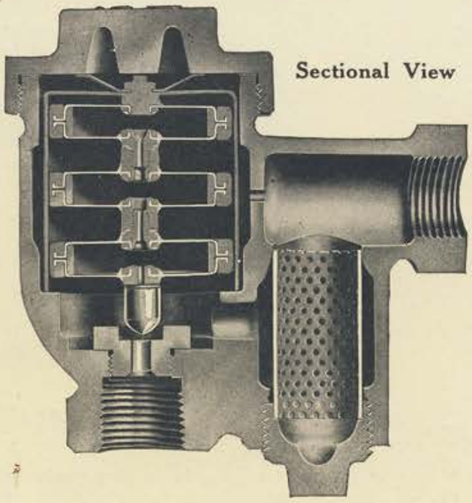
Hoffman Thermostatic Steam Traps

Nos. 20 and 21 Steam Traps
Pressure Range 0 to 100 Pounds without Change or Adjustment

Construction

The Hoffman Steam Trap is of strong, rugged all bronze construction. The diaphragms in the thermostat, the valve pins and valve seat are all made of the same non-corrosive alloy which has been successfully used for diaphragms in Hoffman Valves for a number of years. The alloy withstands high temperature steam without softening, and repeated action without cracking. It also withstands the scoring action of steam, hence its use in the wearing parts.

A strainer attached to a plug is built into the trap body permitting ready removal for cleaning. All renewable parts are interchangeable, permitting replacement without change or adjustment of any sort.



Sectional View

Advantages

The Hoffman Steam Trap is easy to install and may be placed directly in the pipe line without requiring hangers or supports. It is made in Angle Pattern, saving one fitting. It has only one moving part which expands in a straight line, with no levers or hinged joints to stick.

The Hoffman Steam Trap normally has a wide open vent port which is maintained until all air and condensation are relieved from the system, after which steam contact with the thermostat closes the port. No hand operated by-passes are required to vent air from the system. The trap cannot air-bind or freeze.

The opening and closing of the port are practically instantaneous. By means of a cooling leg condensation is held a short time until its temperature drops sufficiently below that of steam to contract the thermostat and permit a full port opening. The length of cooling leg permits the engineer to vary the trap capacity and number of discharges.

The Hoffman Steam Trap has the thermostat on the inlet side of the trap and sensitive accurate action is obtained thereby. Compared with traps having thermostatic members on the discharge side of the port, a considerable saving in steam in the course of a year is possible.

CONTINUOUS DISCHARGE CAPACITY NO. 20 TRAP
Pounds of water per hour

Pressure per sq. in., lb.	Temperature drop			
	20°	25°	30°	35°
10	275	450	600	725
20	425	615	775	900
30	550	750	940	1075
40	640	860	1075	1225
50	715	960	1210	1380
60	775	1050	1340	1540
70	820	1130	1440	1675
80	860	1200	1510	1760
90	900	1250	1560	1830
100	925	1260	1590	1860

Pipe connections, in.
Trap No. 20..........½
Trap No. 21..........¾

Operation

The uniform operation of Hoffman Steam Trap throughout its wide pressure range is due to the constant relationship between the fluid pressure within the thermostat and the external steam pressure. When the thermostat is in contact with steam the internal fluid pressure generated is such that the diaphragms are fully expanded and the discharge port closed. When water or air at temperatures below that of steam reach the thermostat a reduction in fluid pressure occurs and the steam pressure compresses the thermostat, thus opening the port by an amount directly proportional to the fluid pressure loss within the thermostat. As the fluid pressure loss is dependent on the temperature of the air or condensation surrounding the thermostat, it will be seen that the lower the temperature of condensation the greater the pressure loss and the wider the port opening. The necessity for and influence of a cooling leg on trap capacity is thus clearly indicated.

Capacity

The discharge capacity of Hoffman Steam Traps is dependent upon differences between the temperature of condensation delivered to the trap and steam temperature. The following tables give continuous discharge capacities:

CONTINUOUS DISCHARGE CAPACITY NO. 21 TRAP
Pounds of water per hour

Pressure per sq. in., lb.	Temperature drop			
	20°	25°	30°	35°
10	375	610	800	950
20	575	825	1050	1200
30	725	985	1250	1410
40	835	1150	1450	1640
50	925	1285	1620	1860
60	1010	1410	1775	2075
70	1085	1525	1900	2250
80	1150	1600	2010	2400
90	1190	1660	2090	2490
100	1225	1725	2140	2550

Port Diam., in.	Weight, lb.
3/16	3¼
¼	3¾

PART II

Hoffman-Economy Pumps

VACUUM PUMPS

CONDENSATION PUMPS

RECIPROCATING PUMPS

UNDERGROUND PUMPS

AIR LINE PUMPS

Condensation or vacuum pumps are widely used in heating systems for all classes of buildings where accelerated circulation at low pressure is desired or where condensation cannot return to boiler by gravity.

Hoffman-Economy Pumps offer to architects, engineers and heating contractors a line of products designed and built to meet the most exacting requirements. The basic engineering principles are scientifically correct—materials and workmanship are of the finest grade—and the units are sturdily constructed in every detail.

Hoffman-Economy Pumps are manufactured in a complete range of sizes for all types of installations requiring such equipment; and can be specified with the definite assurance that they will give years of efficient service with minimum maintenance.

GUARANTEE

Hoffman-Economy Pumps are guaranteed for capacity and against defects in material or workmanship for a period of one year from the date of installation. This guarantee applies to the pump only and covers the furnishing of new parts to replace those found defective. The guarantee applying to motors and electrical equipment is the same as that given by the manufacturer of the motor or equipment used or specified.

It is a condition of purchase that Hoffman Specialty Co., Inc. shall not be held liable for any damage or delay which may be caused by defective material and that no allowance for labor will be made for the replacement of parts claimed defective without written consent of Hoffman Specialty Co., Inc.

HOFFMAN-ECONOMY PUMPS

Uses and Selection of Hoffman-Economy Pumps

Vacuum Heating Systems

Return Line Vacuum Systems—On large installations, where it is desired to accelerate steam circulation at low pressures by maintaining a vacuum on the return mains, a Hoffman-Economy Return Line Vacuum Pump provides rapid removal of air from the system and the return of condensate to the boiler. See pages 24 to 29.

Air Line Systems—On air line or "Paul" systems, a Hoffman-Economy Air Line Vacuum Pump is used to remove air from the system. The pump, however, handles no condensate and does not act as a boiler feed pump. See page 40.

Gravity Heating Systems

Low Pressure—*For Drainage of Radiation Below Water Line . . .* In installations where part of the radiation is below the boiler water line, it is only necessary to provide a pump of sufficient capacity to handle the condensate from these units, allowing condensate from radiators on upper floors to return to the boiler by gravity.

For Acceleration of Circulation . . . In many installations, especially those covering a large area, where the distances between the boiler water line and the low point of the piping system are not sufficient to compensate for the friction in the pipe lines, the use of a pump and receiver will improve circulation of steam. It will also insure prompt return of condensate to the boiler. This permits lower boiler pressure with resultant saving in fuel.

Medium and High Pressures (35 to 100 pounds square inch)—On installations where pressures above 25 pounds are required only part of the time, electric condensation pumps replace steam driven pumps and traps for returning condensate to the boiler. Steam driven devices require the maintenance of a predetermined boiler pressure to insure their operation, even though steam is not required for other purposes. On such jobs electric pumps reduce fuel consumption, permit banking fires at night and over week-ends and operate without attention.

When steam is required for process work and where all condensate is not returned to the boiler, electric condensation pumps are used for returning condensate and for automatically feeding makeup water by the addition of a float controlled water feeder.

How to Determine Correct Pump—Wherever condensate will drain to the horizontal receiver, a Horizontal Pump is recommended. See pages 30 to 36.

In factories or where pressures of 50 to 100 pounds are carried and where lower initial cost is a factor and slight noise not objectionable, a Reciprocating Pump may be substituted for a horizontal pump. See page 37.

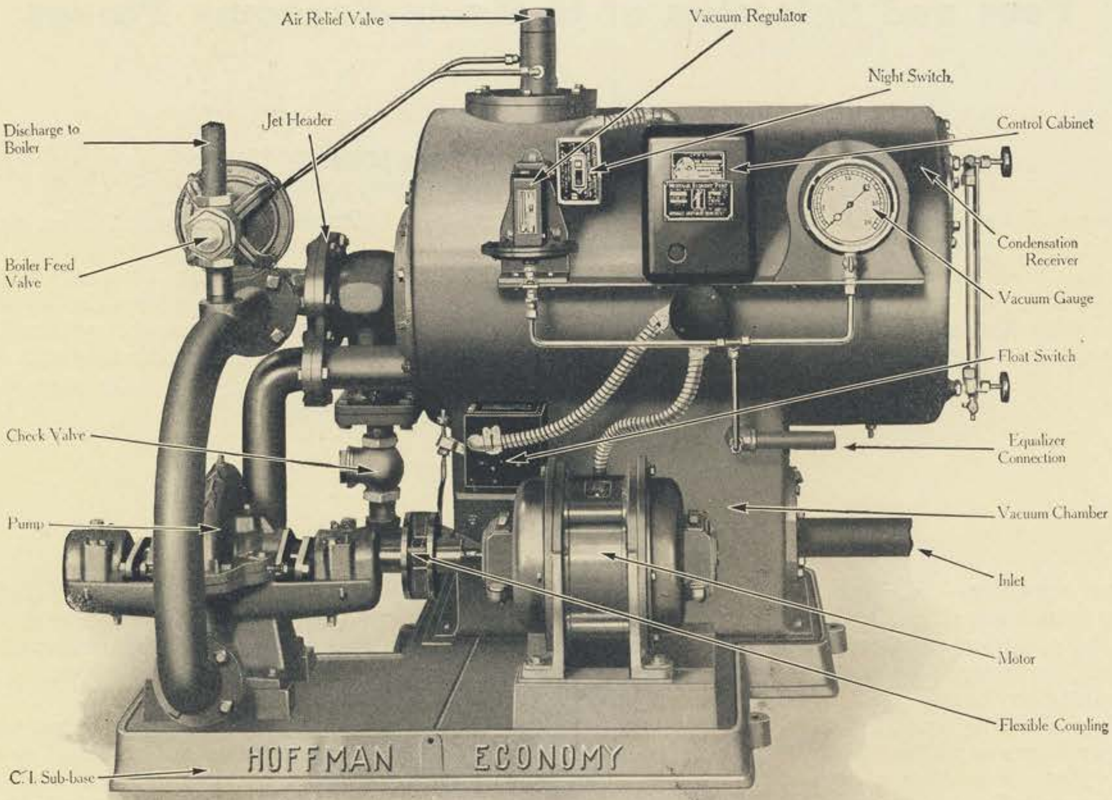
Where returns are below floor level or where condensate cannot flow by gravity to horizontal tank, a Vertical Underground Pump should be selected. See pages 38 and 39.

How to Determine Electric Current Available

In various parts of the country or sometimes in the same city, different electric currents are available. It is, therefore, necessary to ascertain from the architect, electrician or power company the current furnished to the building. Often this information is given on the name plate of the electric power meter.

Alternating current may be one, two or three phase, 110, 220, 440, or 550 volts and 60, 50, 40, 30, or 25 cycles. Two or three phase power is usually found where there is a total of 5 hp. or more in a single building. If there is only a lighting line the current will probably be single phase or direct current. Care must be used in selecting pumps having motors 3 hp. and over, as power companies frequently run in two or three phase lines to operate motors of this size. If, therefore, there is only a lighting circuit in the building and it is desired to use a large pump, inquire of the power company what current will be furnished.

HOFFMAN-ECONOMY PUMPS



Hoffman-Economy Return Line Vacuum Pumps
Single and Duplex Units

The Hoffman-Economy Return Line Vacuum Pump performs three functions: it removes air from the heating system; maintains a vacuum on the return mains for lifting condensate, if necessary; and returns condensate to the boiler.

Efficiency—The jet type vacuum producer used in these pumps is the simplest and best known method for exhausting air and vapors. It has no moving parts and avoids close clearances on pump; difficulties in maintaining vacuum due to wear are reduced to a minimum.

Pumps can handle extremely hot water and are smooth and quiet in operation.

Unit is capable of producing a vacuum of 20 inches in all sizes and a considerably higher vacuum in sizes SV-4 and larger.

Dependability—Special arrangement of relief valve eliminates danger of water overflowing to floor, even in event of current failure.

The pump being submerged always maintains its water seal; under normal conditions there is no possibility of pump running dry and requiring priming.

Because pump maintains a constant pressure on the jets the motor load is constant, thus insuring longer life of motor.

Easy to Install and Service—Return inlet is located 8½ to 15½ inches above floor. In many installations it is possible to have water return by gravity, whereas with other pumps lift fittings or a pit would be required.

The use of standard motors permits replacement from local stocks when necessary.

All operating parts are readily accessible without dismantling unit.

Duplex Units—Duplex units consist of a single tank with one set of jet vacuum producers, one float switch, two pumps, two motors and two vacuum regulators. Each pump is valved so that access may be had to one pump without interrupting the operation of the other.

Standard pumps are adapted for pressures up to 20 pounds. High pressure units or steam turbine drive can be furnished when desired.

HOFFMAN-ECONOMY PUMPS

Construction Details

Centrifugal Pump—All units of 16,000 square feet capacity and over have horizontal split case centrifugal pumps, which are fitted with enclosed type, double suction, non-overloading bronze impellers, carefully machined. Shaft is of alloy steel turned and ground all over.

Bearings are of renewable bronze ring oiling type mounted in large oil wells. Construction of bearing housings prevents escape of oil and excludes water and dust. Oil level cups and inspection holes are fitted with spring hinge covers.

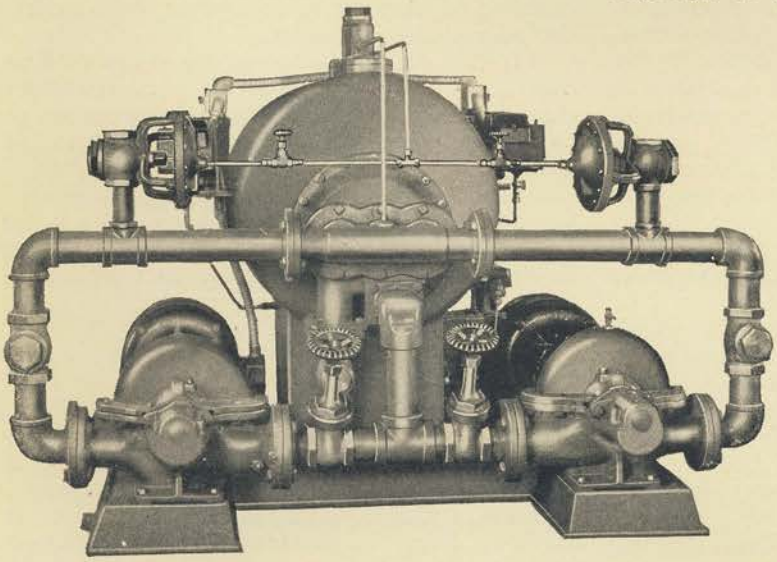
SV-1, SV-2 and SV-3A units have vertically split volute pumps with enclosed bronze impellers, renewable bronze stand bearing and outboard ball bearing. All impellers are carefully balanced and hand filed on the interior to insure smooth, efficient operation.

Jet Vacuum Producer—Hoffman-Economy jet vacuum producer is extremely simple in construction and has been thoroughly tested both in the laboratory and in actual service. It consists of the manifold and body, into which are fitted brass pressure nozzles and the venturi discharge tubes. These parts are all flanged and bolted together. Multi-jets are used to increase capacity.

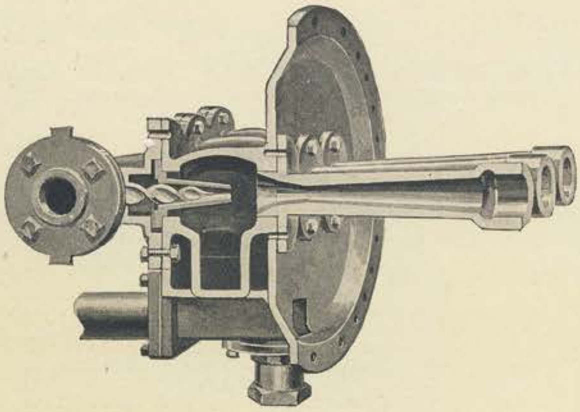
Tanks—Tanks are of a heavy gauge welded steel. Lower tank acts as a pedestal and serves as an accumulator, while upper tank holds the circulating water and controls the feeding of water to the boiler.

Lower tank has two compartments, one serving as a combined baffle and sediment chamber which removes all dirt and scale before reaching the accumulator chamber.

An underground auxiliary accumulator tank may be substituted for lift fittings where radiation or returns are below pump level.



Standard Duplex Vacuum Pump



Cross Section of Jet Vacuum Producer

Motors—Motors have liberal overload capacity and are guaranteed against a temperature rise greater than 40° when operating at full load.

Single phase 1 hp. 110 volts and 1½ hp. 220 volts motors and larger are equipped with magnetic contactors with thermal overloads. Smaller motors are controlled directly from float switch.

Polyphase motors of all sizes are equipped with thermal overload cutouts. Magnetic contactors with overload and no voltage release are used in 2 hp. sizes and larger. Smaller sizes are controlled directly by float switch.

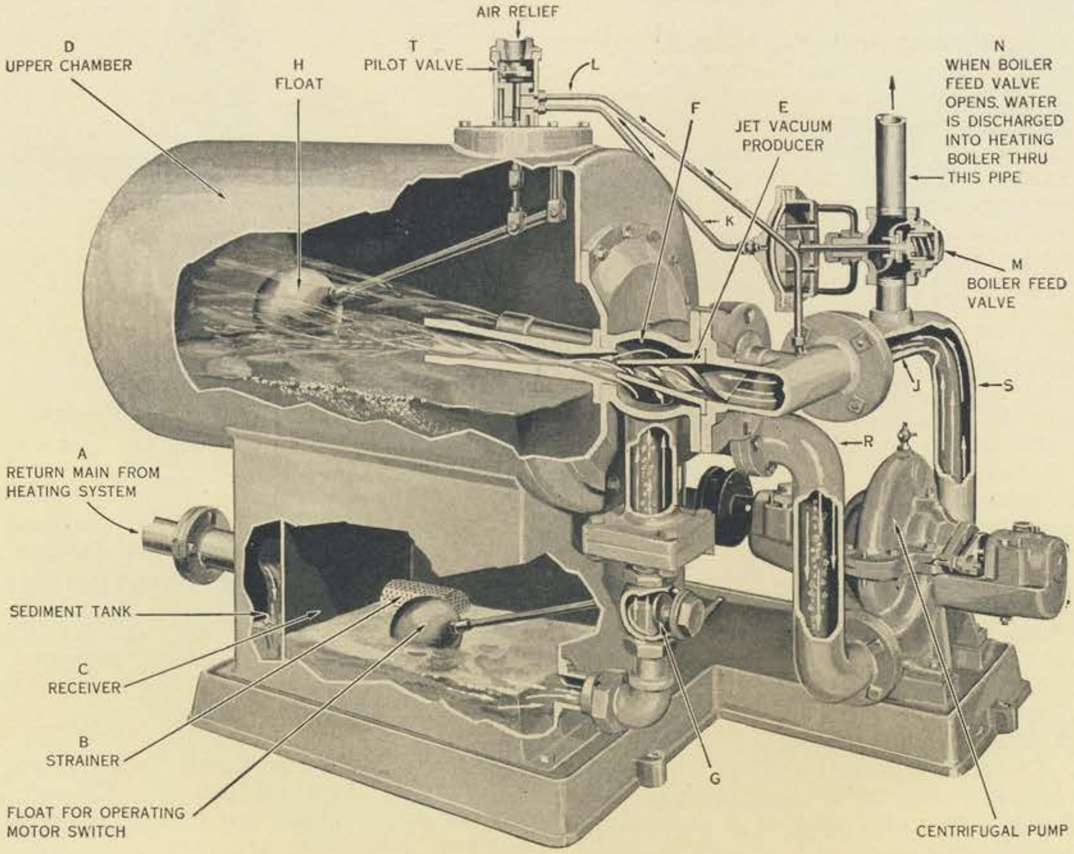
Direct current motors 1 hp. and over are equipped with automatic starter having overload protection. Smaller motors are controlled directly by float switch.

Connection between the smaller pumps and motors is by means of pin and strap type flexible couplings. In units requiring 7½ hp. or more, rubber bushing couplings are used.

Automatic Control—The automatic control supplied as standard equipment consists of automatic starter, double pole vacuum regulator and float switch, all of standard make enclosed type. Automatic starters are used on large units so that vacuum regulators and float switches carry only pilot currents. All wiring conforms to National Electric Code.

Boiler Feed Control Valves—The diaphragm operated boiler feed valve is a single seated valve controlled by a pilot in the pump discharge. This valve closes tightly without water hammer and lasts indefinitely. All parts are readily accessible for inspection or cleaning.

HOFFMAN-ECONOMY PUMPS



How Return Line Vacuum Pump Operates

Before starting pump, the upper chamber D should be half filled with water. The pump upon being started will circulate this water through circuit RSJ and by the discharge of water from jet E a partial vacuum is formed in chamber F, which lifts check G and permits air and condensation which has flowed through strainer B into receiver C to be lifted into upper chamber D.

If return main A is so located that condensation cannot flow into receiver C by gravity, vacuum is first created in C and the water is then drawn up from a lift pocket at the low point in the return.

When upper chamber D receives its full charge of water, float H rises, lifting pilot valve T and permitting the passage of water from line J (which is under approximately 30 pounds pressure) to pass through lines L to K to boiler feed valve M, which is opened and condensation is discharged through line N directly to boiler. When water in D recedes, pilot valve T is closed and, with pressure relieved from diaphragm in valve M, the boiler feed valve closes, remaining so until the cycle is repeated.

This operation continues until the required vacuum is obtained, when the automatic vacuum regulator* comes into action and stops the pump, provided the float switch* is in the off position. When vacuum in the system drops to the minimum setting or when sufficient condensation has collected in receiver C to operate float switch, the pump is again started.

If it is desired to operate the pump on float control only, the switch in the vacuum control circuit can be opened and the pump permitted to operate without maintaining any predetermined vacuum.

Because of the constant head pressure of cool water in upper chamber D and lines RSJ and the mixture of this cool water with the hot water flowing through check G, it will be readily seen why the Hoffman-Economy Pump handles hotter water than other vacuum pumps.

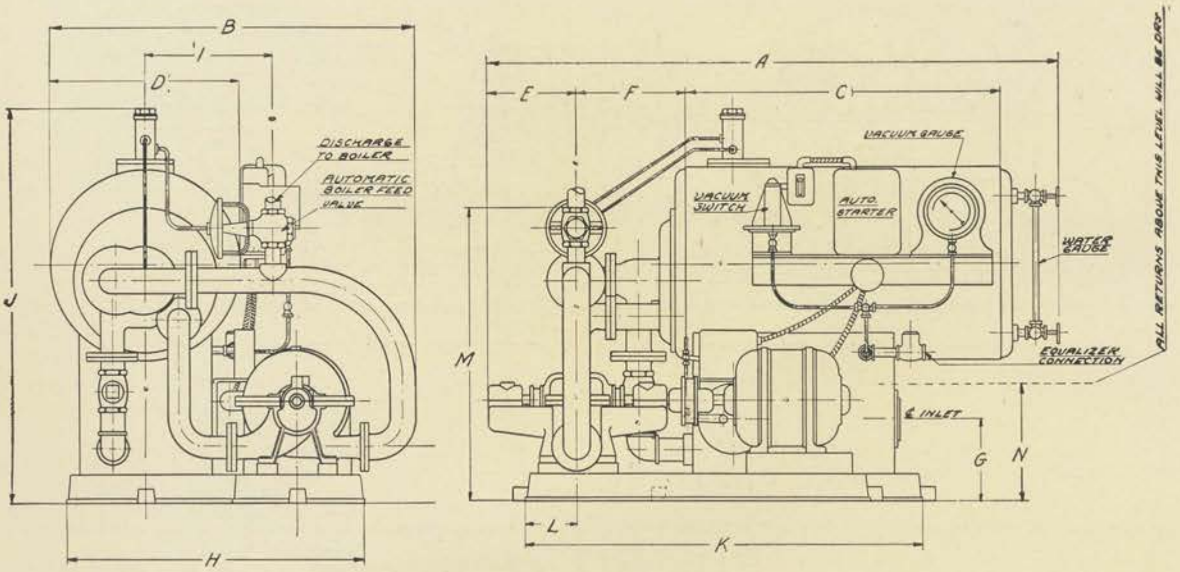
*Illustrated on page 24.

Tested and Guaranteed

Every Hoffman-Economy Vacuum Pump is carefully tested before shipment for capacity, pressure, etc. and permanent record retained at factory. Pump is guaranteed for capacity and against defects for a period of one year.

HOFFMAN-ECONOMY PUMPS

Table of Dimensions
Hoffman-Economy Return Line Vacuum Pumps



SINGLE PUMPS

Size of Pump	Cap. sq. ft. direct cast iron radiation	Water cap. g.p.m.	Air cap. cu. ft. min.	Orifice size,* in.	Motor. hp.	Size discharge to boiler, in.	Size return inlet, in.	Approx. shipping wt. lb.†	Dimensions in inches (These dimensions are approximate and must not be used for construction) A	B	C	D	E	F	G	H	I	J	K	L	M	N
SV-1	2500	5	1¾	3/32	¾	¾	1½	650	49½	29	30	18	10½	2	11½	28	13	40	31		29	12
SV-2	5000	9	4	7/64	1	1	2	750	49½	29	30	18	10½	2	11½	28	13	40	31		29	12
SV-3A	12000	16	7	5/32	1½	1	2½	900	56½	39	30	20	9½	12	8½	31	13½	41½	45	6½	29	12
SV-4	16000	20	10	3/16	2	1¼	3	1025	56½	39	30	20	9½	12	8½	31	13½	41½	45	6½	31	12
SV-5	20000	25	15	7/32	3	1¼	3	1150	58	46	30	24	10½	12	9	37	18½	46	50	7½	33	12½
SV-6	26000	35	19	¼	5	1½	3	1300	58	46	30	24	10½	12	9	37	18½	46	50	7½	33	12½
SV-7	40000	60	24	9/32	5	2	4	1550	64	47	36	26	10½	12	11	37	18½	48	50	7½	34	13
SV-8	65000	100	40	⅜	7½	2	5	1800	69½	52	42	28	10½	12	11	41	21	54	57	7¼	41	14
SV-9	100000	150	60	7/16	10	2½	8	3100	78	64	54	36	11	12	15	48	23½	66	62	8½	52	18
SV-10	150000	225	90	17/32	15	2½	10	4000	84	72	60	42	11	12	15½	54	25	72	70	9½	58	18½
SV-11	250000	375	150	11/16	25			6000	Furnished on application													

*Size of sharp edge orifice in ⅛-in. plate through which pump maintains 10-in. vacuum.
†Weights of 25 cycle units will be approximately 33⅓% in excess of weights listed.
Note: Dimensions are for 20-lb. pumps only. Dimensions of high pressure pumps furnished on application.

Auxiliary Accumulator Tanks for Use with Vacuum Pumps

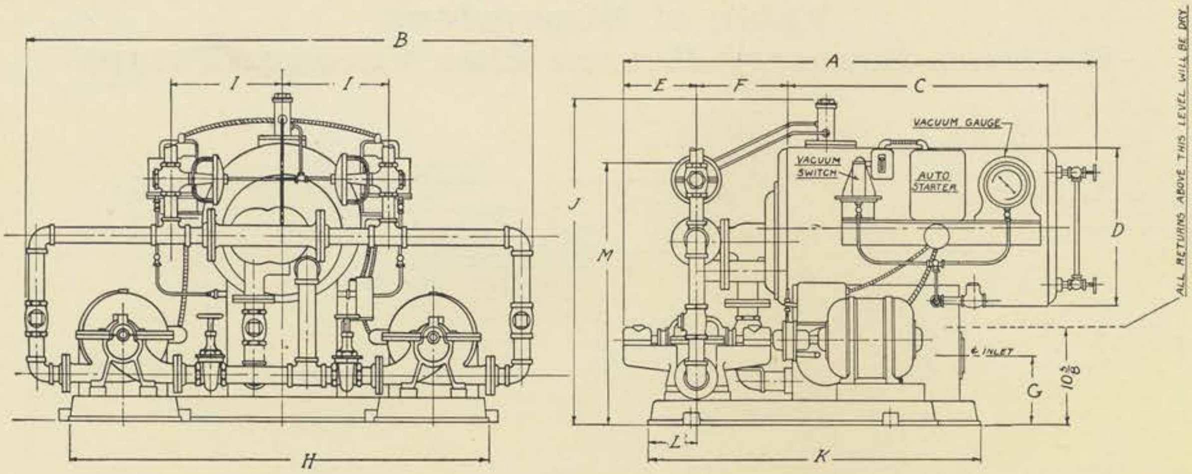
In many installations where returns are brought back to the pump below floor level, it is desirable to operate the pump during the day under vacuum and float control, while at night the vacuum control is cut out. By using Hoffman-Economy Accumulator Tank it is possible to let condensation flow to tank by gravity and by means of a float control in tank operate the pump without maintaining a predetermined vacuum. The tank is made of cast iron, equipped with Float Control and Lift Fitting and may be placed so that cover will be flush with floor. In such installations the vacuum control on pump should be connected to the auxiliary tank or return before it enters the pump.

STANDARD SIZES

Tank size Diam., in.	Tank size Depth, in.	Suitable for draining sq. ft. rad.	Capacity gallons per ft. depth	Approximate shipping weight, lb.
16	30	8,000	10.4	350
20	30	20,000	16.3	500
24	30	26,000	23.4	650
30	36	40,000	36.6	1,000
30	48	65,000	36.6	1,200
36	48	100,000	53.0	1,600

Tanks longer than standard may be furnished in two sections. In such case, flanges are faced and bolts and gaskets furnished for assembly.

HOFFMAN-ECONOMY PUMPS



DUPLEX PUMPS

Size of Pump	Cap. sq. ft. direct cast iron radiation	Water cap. g.p.m.	Air cap. cu. ft. min.	Orifice size,* in.	Motor, hp.	Size discharge to boiler, in.	Size return inlet, in.	Approx. shipping wt. lb.†	Dimensions in inches (These dimensions are approximate and must not be used for construction)													
									A	B	C	D	E	F	G	H	I	J	K	L	M	N
DV-1	2500	5	1¾	3/32	¾	¾	1½	1140	50½	50	30	18	9½	4½	8	45½	‡	40	33	1½	29	12
DV-2	5000	9	4	7/64	1	1	2	1310	50½	50	30	18	9½	4½	8	45½	‡	40	33	1½	29	12
DV-3A	12000	16	7	5/32	1½	1	2½	1570	57	65½	30	20	9½	12	9	53½	13½	42	45¼	6	29½	12
DV-4	16000	20	10	3/16	2	1¼	3	1800	57	65½	30	20	9½	12	9	53½	13½	42	45¼	6	31½	12
DV-5	20000	25	15	7/32	3	1¼	3	2000	59	71½	30	24	10½	12	9½	57	18½	46½	48	6	33½	12½
DV-6	26000	35	19	¼	5	1½	3	2280	59	71½	30	24	10½	12	9½	57	18½	46½	48	6	33½	12½
DV-7	40000	60	24	9/32	5	2	4	2700	65	73	36	26	10½	12	11½	57	18½	48½	48	6	34½	13
DV-8	65000	100	40	⅜	7½	2	5	3150	70½	79½	42	28	10½	12	11½	64	21	54½	54¼	7½	41½	14
DV-9	100000	150	60	7/16	10	2½	8	5420	79	95	54	36	11	12	15	75	23½	66½	59	8½	52½	18
DV-10	150000	225	90	17/32	15	2½	10	7000	85	106	60	42	11	12	15½	85	25	72½	63	8¾	58½	18½
DV-11	250000	375	150	11/16	25			10500	Furnished on application													

*Size of sharp edge orifice in ⅛-in. plate through which pump maintains 10-in. vacuum.
†Weights of 25 cycle units will be approximately 33⅓% in excess of weights listed.
‡Dimension I: On left hand side of receiver, 19¼ in.; on right hand side of receiver, 14⅞ in.
Note: Dimensions are for 20-lb. pumps only. Dimensions of high pressure pumps furnished on application.

Suggested Specification for Vacuum Pump

Install where indicated on plans a Hoffman-Economy Vacuum Pump type......having a capacity of......square feet of direct cast iron radiation or equivalent and capable of discharging against a pressure of 20 pounds per square inch (maximum pressure for standard pumps; special pumps furnished for pressures above 20 pounds per square inch) at the pump. The unit shall consist of a double chamber, horizontal, welded steel receiving tank with float switch and strainer installed in lower part. Receiving tank shall be so constructed that water will not overflow in the event of current failure. Unit shall be equipped with adjustable vacuum control. Motor shall be continuous rated 40 degrees for.....volts..... phase......cycle alternating current (or...... volts direct current) and shall have a speed not in excess of 1750 r.p.m. and shall be direct connected to a horizontal bronze fitted centrifugal pump by a flexible coupling. Entire unit shall be assembled on a cast iron base ready for installation.

Where auxiliary accumulator tank is required add:

Install where indicated with cover flush with floor one....in. x ....in. Cast Iron Auxiliary Accumulator Tank complete with float switch and lift fitting connecting to pump in manner approved by manufacturer.

HOFFMAN-ECONOMY PUMPS

Information for Installing Hoffman-Economy Return Line Vacuum Pumps

Setting—Unit should be placed on firm foundation, carefully levelled and evenly supported. Alignment of flexible coupling between motor and pump should be checked.

Return Lines—If possible, have return line above inlet connection on accumulator chamber so that condensate will flow to pump by gravity. This allows pump to be operated on float control only in mild weather or when fires are banked. Condensate can be lifted a considerable height, but lifts should be avoided whenever possible.

If operating with float control only, vacuum will be created during pumping operations, but amount of vacuum will be less than when vacuum control is used.

When return mains come back under floor, an auxiliary accumulator tank is installed with top flush with floor and with connections as illustrated below.

When operated with vacuum control, the pump will elevate condensate from lift pockets in return lines.

On all installations a gate valve should be installed in the return line and provision made for drain to sewer.

Equalizer Connection—An outlet with check valve is provided for equalizer connection to steam header. The purpose of this connection is to equalize vacuum in system and accumulator and prevent condensate from remaining in return lines during night operation or other period when no steam pressure is carried.

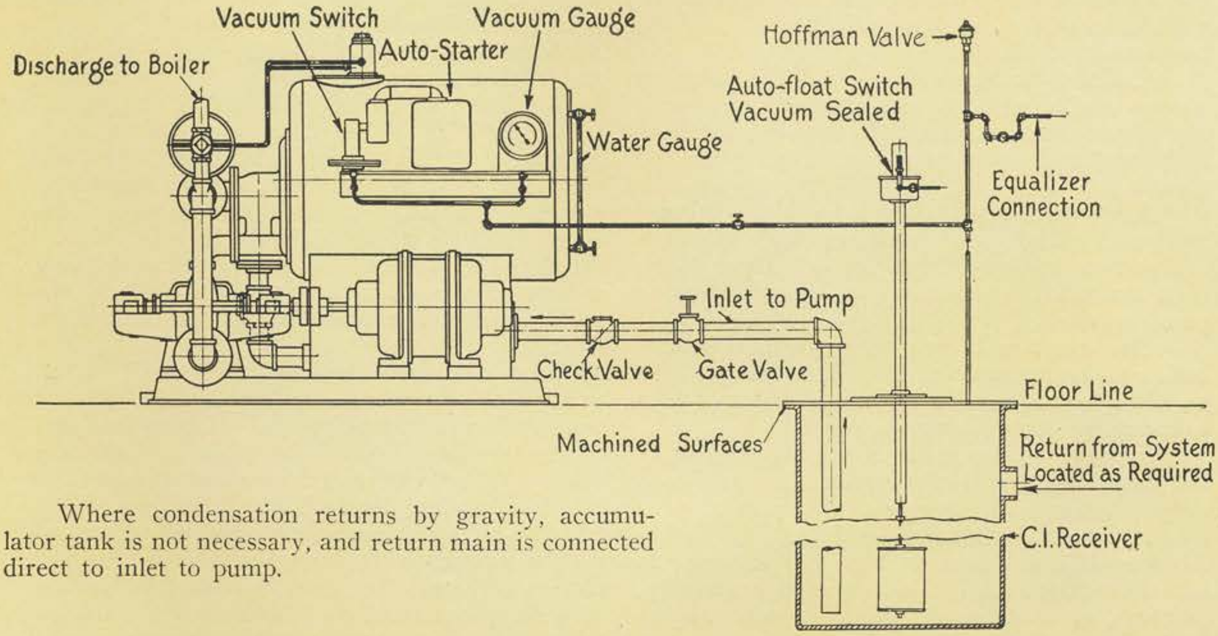
On high pressure or central station jobs, install vent pipe with check valve several feet above return line. Omit connection to header.

Setting of Vacuum Regulators—Vacuum regulators are set at factory to cut in at 3 inches and out at 7 to 8 inches unless otherwise specified. This adjustment may readily be changed after installation.

Information Required with Order

In ordering Hoffman-Economy Return Line Vacuum Pumps, the following information should be furnished.

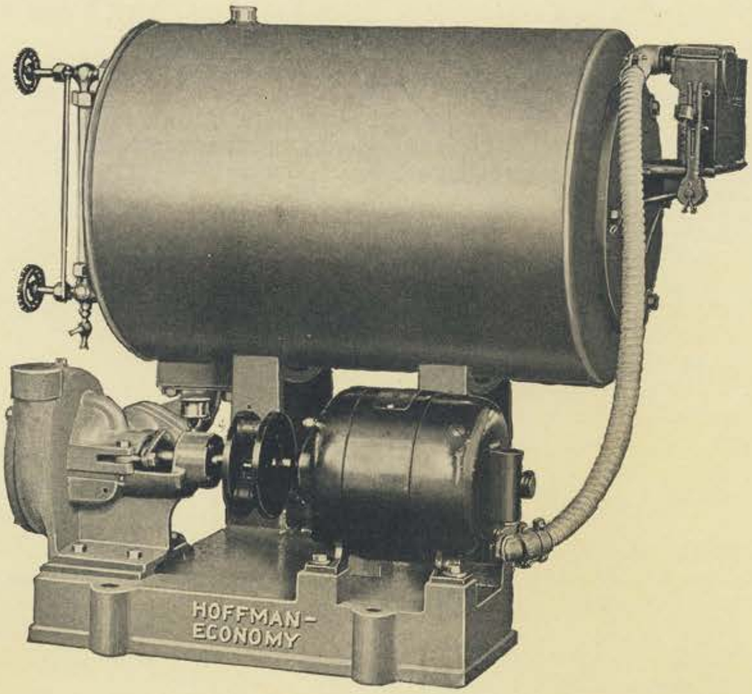
1. Square feet of direct cast iron radiation or equivalent. (Each foot of Vento, Super-Fin or other blast coil should be figured as the equivalent of 5 to 6 feet of direct radiation).
2. Electric current available—one, two or three phase, number of cycles and volts if alternating current; or voltage only if direct current.
3. Boiler pressure—safety valve setting.
4. Difference in elevation between pump and boiler water line with size and length of intervening piping.



Where condensation returns by gravity, accumulator tank is not necessary, and return main is connected direct to inlet to pump.

Installation Diagram of Return Line Vacuum Pump

HOFFMAN-ECONOMY PUMPS



Hoffman-Economy Horizontal Condensation Pumps and Receivers

Single and Duplex Units

Horizontal condensation pumps and receivers are used on gravity heating systems and are adapted for all kinds of industrial and commercial installations where condensate will drain to the horizontal receiver.

Hoffman-Economy Horizontal Condensation Pumps and Receivers are carefully designed, sturdily constructed and built to give continued high operating efficiency even after years of service.

Automatic float switch assembly is simple and positive. Pumps are bronze fitted throughout and especially adapted for operation at the high temperatures encountered in condensation pump service.

The entire unit, consisting of pump, motor, tank and tank trimmings, is compactly assembled on a single cast iron base having machined pads to insure perfect alignment.

Improved pump performance makes possible the use of comparatively small motors and consequent low consumption of electric power.

Tested and Guaranteed — Every Hoffman-Economy Condensation Pump and Receiver is carefully tested before shipment for capacity, pressure, etc., and a permanent record retained at the factory. Pump is guaranteed for capacity and against defects for a period of one year.

Low Pressure Units—All low pressure units (0 to 20 pounds per square inch) are furnished in Style "A," and with speeds of 1750 or 1440 r.p.m., according to current available.

Medium and High Pressure Units—Medium and high pressure units (35 to 100 pounds per square inch) are made in Style "B," Style "C" and Style "D." (See table of sizes on pages 33 and 35.) Speeds are 1750 r.p.m. and 3500 r.p.m. For apartment houses, office buildings, etc., where extreme quietness of operation is desired, 1750 r.p.m. units should be selected.

Duplex Units—Consisting of two pumps and motors with a single tank and float switch control, mounted on one base can be furnished when desired.

Motors—Standard motors are used on all units, thus permitting easy replacement without waiting for factory shipment. Motors have 40° continuous temperature rating and are liberally selected to provide ample overload capacity.

Single phase motors 1 hp., 110 volts and 1½ hp., 220 volts and larger, are equipped with magnetic contactors with thermal overloads. Smaller motors are controlled directly from float switch.

Polyphase motors of all sizes are equipped with thermal overload cutouts. Magnetic contactors with overload and no voltage release

HOFFMAN-ECONOMY PUMPS

are used in sizes 2 hp. and larger. Smaller sizes are controlled directly by float switch.

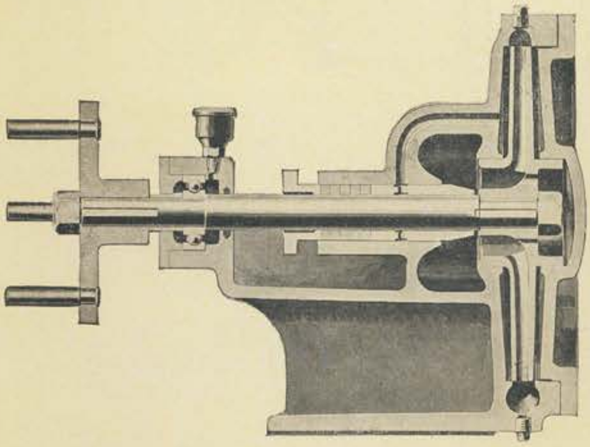
Direct current motors 1 hp. and over have an automatic starter with overload protection. Smaller motors are controlled directly by float switch.

All wiring between automatic controls and motors is carried in flexible metallic conduits.

Pump—All units are equipped with highly efficient, bronze fitted, enclosed impeller centrifugal pumps, especially adapted for operation at the high temperatures encountered in condensation pump service. Pumps have accurately balanced bronze impeller, heavy turned and ground steel shaft and water sealed packing box with bronze gland.

Styles "A," "B" and "C" pumps have vertically split case; Style "D" has horizontally split case.

Style "A" pumps have outboard ball bearing and self-lubricating, renewable bronze stand bearing.



Cross Section of Style "A" Condensation Pump

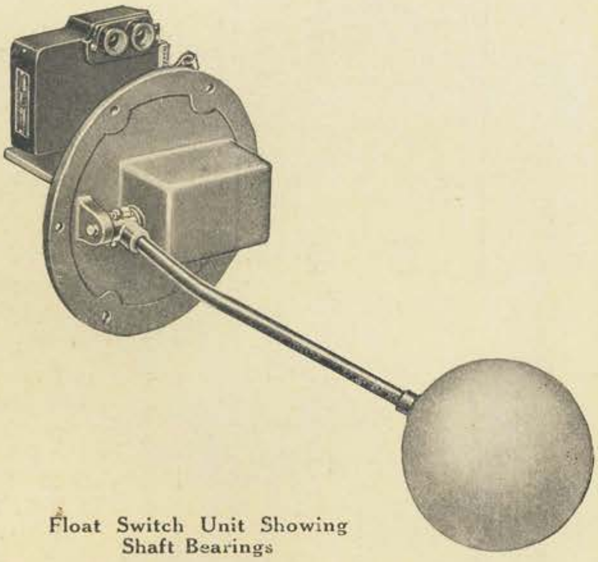
Styles "B" and "C" have double outboard bearings, ring oiling at driving end and ball bearing at opposite end. Both bearings are readily renewable.

Style "D" has double outboard ring oiling bearings; both may easily be renewed if necessary.

Pumps are connected with motor by flexible shaft coupling.

Base Plate—Base plate is of cast iron, heavily ribbed to prevent distortion and to permit bolting to floor without special foundation. Pump and motor are aligned on machined pads and are securely attached to base with cap screws. The cast iron feet on which receiver is mounted are bolted to the base.

Receiver—Receiver is of heavy gauge welded steel securely attached to cast iron feet by anchor bolts welded to the shell. Connection between receiver and pump is arranged to permit expansion.



Float Switch Unit Showing Shaft Bearings

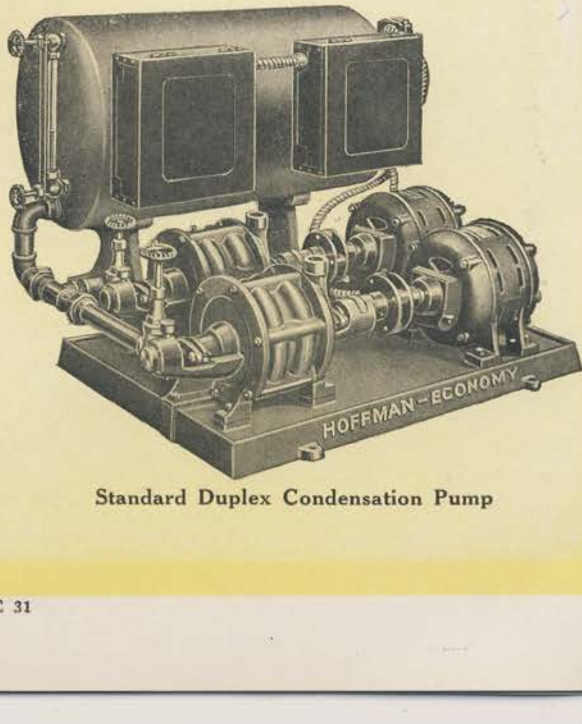
Cast iron receivers can be furnished, if desired, at slight additional cost; but because of lighter weight, standard steel receivers are recommended.

Float Switch Mechanism—Float switch is positive and dependable in starting the motor when condensation collects in receiver. Mechanism can be removed as a unit and is easily adjustable to individual conditions.

Bronze float shaft is firmly supported by two liberal bearings, reducing danger of sticking or binding.

Float switch and operating mechanism are mounted on a cast iron tank head attached to receiver. Float is made of seamless copper tested under high pressure.

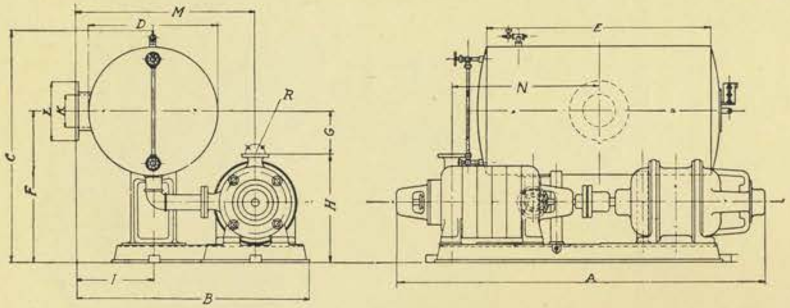
The switch itself is an especially constructed spring loaded type, having wiping contacts with double break, designed to prevent arcing.



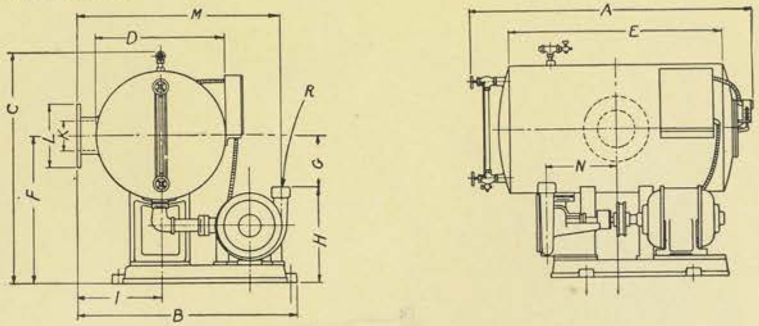
Standard Duplex Condensation Pump

DIMENSION DIAGRAMS

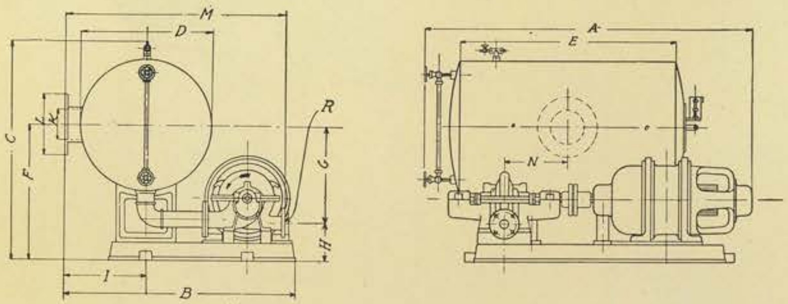
Condensation Pumps Equipped with 110-220-440 Volt—60 Cycle—Single or Polyphase Motors and 110-220 Volt Direct Current Motors



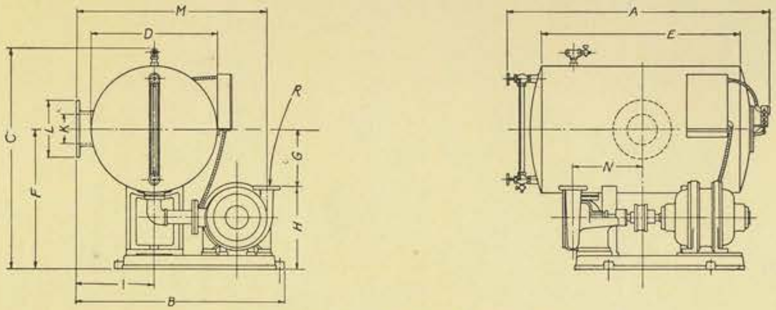
Dimension Diagram No. 1



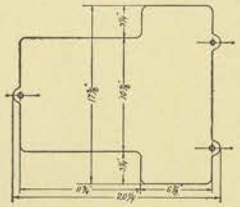
Dimension Diagram No. 4



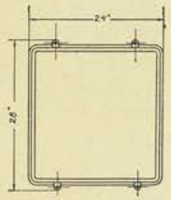
Dimension Diagram No. 2



Dimension Diagram No. 3



No. 1



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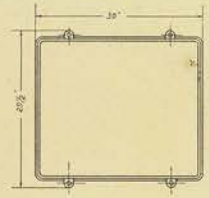

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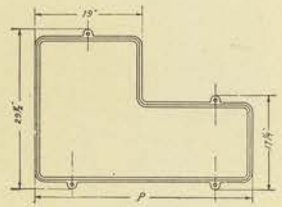

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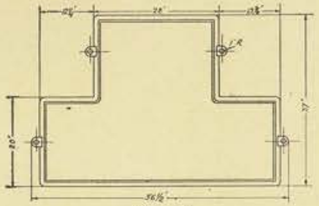

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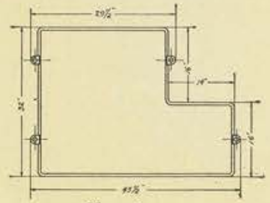


No. 6

Base Diagrams

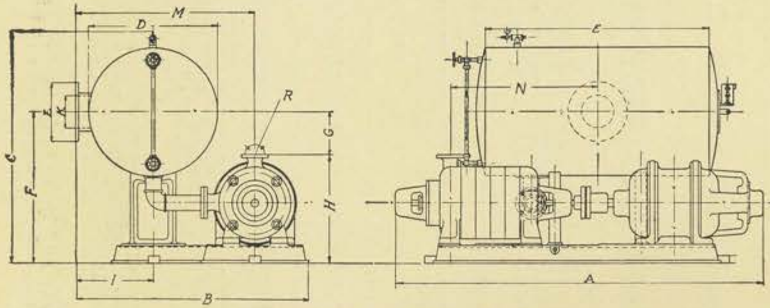
CAPACITIES AND DIMENSIONS
CONDENSATION PUMPS EQUIPPED WITH 110-220-440 VOLT—60 CYCLE—SINGLE OR POLYPHASE MOTORS AND DIRECT CURRENT MOTORS

Pump and Style No.	Capacity, sq. ft. direct c. rad. or equiv.	Capacity, lbs. condensate per hr.*	Discharge pressure, lbs. per sq. in.	Pump capacity, g. p. m*	Motor hp.	Capacity receiver, gal.	Speed, r.p.m.	Approximate shipping weight, lb.	Dimensions—These dimensions are approximate. Not to be used for construction																	
									Dimension diagr'm	Base diagr'm	A	B	C	D	E	F	G	H	I	K	L	M	N	P	R	No. stages
10A	1,000	250	10	2	¼	10	1,750	250	Fig. 3	Fig. 1	30	25	26	13	18	15½	5¼	10¼	9	2	Cplg.	23⅝	8½	......	1	1
30A	3,000	750	10	5	¼	13	1,750	250	3	1	32	25½	27	14	20	16	5¾	10¼	9½	2	Cplg.	24⅛	8½	......	1	1
31A	3,000	750	15	5	½	13	1,750	340	3	2	31	29½	29½	14	20	19¼	6⅛	13⅛	9½	2	Cplg.	26½	9¼	......	1½	1
32A	3,000	750	20	5	¾	13	1,750	430	3	2	31	29½	29½	14	20	19¼	6⅛	13⅛	9½	2	Cplg.	26½	9¼	......	1½	1
60A	6,000	1,500	10	12	¼	20	1,750	275	3	1	42	25½	27	14	30	16	5¾	10¼	9½	3	Cplg.	24⅛	8½	......	1	1
61A	6,000	1,500	15	12	½	20	1,750	360	3	2	41	29½	29½	14	30	19¼	6⅛	13⅛	9½	3	Cplg.	26½	9¼	......	1½	1
62A	6,000	1,500	20	12	¾	20	1,750	450	3	2	41	29½	29½	14	30	19¼	6⅛	13⅛	9½	3	Cplg.	26½	9¼	......	1½	1
64B	6,000	1,500	30	12	1	20	1,750	550	4	4	45	31	30	14	30	19¾	5½	14¼	9½	3	Cplg.	24½	3	35	1	2
65B	6,000	1,500	40	12	1½	20	1,750	650	4	4	51	31	30	14	30	19¾	5	14¾	9½	3	Cplg.	24½	¼	40½	1	3
65C	6,000	1,500	40	12	1½	20	3,500	525	4	4	42	31	30	14	30	19¾	5½	14¼	9½	3	Cplg.	24½	5¾	35	1	1
66B	6,000	1,500	50	12	2	20	1,750	650	4	4	52	31	30	14	30	19¾	5	14¾	9½	3	Cplg.	24½	¼	40½	1	3
66C	6,000	1,500	50	12	2	20	3,500	550	4	4	44	31	30	14	30	19¾	5	14¾	9½	3	Cplg.	24½	5¾	35	1	1
67B	6,000	1,500	60	12	3	20	1,750	750	4	4	57	31	30	14	30	19¾	4¼	15½	9½	3	Cplg.	24½	2½	40½	1	4
67C	6,000	1,500	60	12	3	20	3,500	600	4	4	45	31	30	14	30	19¾	5	14¾	9½	3	Cplg.	24½	5¾	35	1	1
68C	6,000	1,500	75	12	3	20	3,500	650	4	4	48	31	30	14	30	19¾	5	14¾	9½	3	Cplg.	24½	3	35	1	2
69C	6,000	1,500	100	12	5	20	3,500	700	4	4	51	31	30	14	30	19¾	4¼	15½	9½	3	Cplg.	24½	3	35	1	2
100A	10,000	2,500	10	20	¼	26	1,750	290	3	1	42	26½	29	16	30	17	6¾	10¼	10½	3½	8½	25⅛	8½	......	1	1
101A	10,000	2,500	15	20	½	26	1,750	375	3	2	41	30½	32½	16	30	20¼	7⅛	13⅛	10½	3½	8½	27½	9¼	......	1½	1
102A	10,000	2,500	20	20	¾	26	1,750	475	3	2	41	30½	32½	16	30	20¼	7⅛	13⅛	10½	3½	8½	27½	9¼	......	1½	1
103B	10,000	2,500	25	20	1	26	1,750	625	4	4	45	32	33	16	30	20¾	6½	14¼	10½	3½	8½	25½	3	35	1	2
104B	10,000	2,500	30	20	1½	26	1,750	650	4	4	48	32	33	16	30	20¾	6	14¾	10½	3½	8½	25½	3	35	1	2
105B	10,000	2,500	40	20	1½	26	1,750	675	4	4	51	32	33	16	30	20¾	6	14¾	10½	3½	8½	25½	¼	40½	1	3
105C	10,000	2,500	40	20	1½	26	3,500	550	4	4	42	32	33	16	30	20¾	6½	14¼	10½	3½	8½	25½	5¾	35	1	1
106B	10,000	2,500	50	20	2	26	1,750	700	4	4	52	32	33	16	30	20¾	6	14¾	10½	3½	8½	25½	¼	40½	1	3
106C	10,000	2,500	50	20	2	26	3,500	600	4	4	44	32	33	16	30	20¾	6	14¾	10½	3½	8½	25½	5¾	35	1	1
107B	10,000	2,500	60	20	3	26	1,750	775	4	4	57	32	33	16	30	20¾	5¼	15½	10½	3½	8½	25½	2½	40½	1	4
107C	10,000	2,500	60	20	3	26	3,500	650	4	4	45	32	33	16	30	20¾	6	14¾	10½	3½	8½	25½	5¾	35	1	1
109C	10,000	2,500	100	20	5	26	3,500	750	4	4	51	32	33	16	30	20¾	5¼	15½	10½	3½	8½	25½	3	35	1	2
151A	15,000	3,750	15	30	½	33	1,750	400	3	2	41	31½	34½	18	30	21¼	8⅛	13⅛	11½	4	9	28½	9¾	......	1½	1
152A	15,000	3,750	20	30	¾	33	1,750	525	3	2	41	31½	34½	18	30	21¼	8⅛	13⅛	11½	4	9	28½	9¾	......	1½	1
153B	15,000	3,750	25	30	1	33	1,750	675	4	4	45	33	35	18	30	21¾	7½	14¼	11½	4	9	26½	3½	35	1	2
155B	15,000	3,750	40	30	2	33	1,750	750	4	4	52	33	35	18	30	21¾	7	14¾	11½	4	9	26½	¾	40½	1	3
155C	15,000	3,750	40	30	2	33	3,500	650	4	4	44	33	35	18	30	21¾	7	14¾	11½	4	9	26½	6¼	35	1	1
157B	15,000	3,750	60	30	3	33	1,750	825	4	4	57	33	35	18	30	21¾	6¼	15½	11½	4	9	26½	2	40½	1	4
157C	15,000	3,750	60	30	3	33	3,500	700	4	4	48	33	35	18	30	21¾	7	14¾	11½	4	9	26½	3½	35	1	2
159C	15,000	3,750	100	30	5	33	3,500	775	4	4	51	33	35	18	30	21¾	6¼	15½	11½	4	9	26½	3½	35	1	2
200A	20,000	5,000	10	40	½	41	1,750	425	3	2	41	32½	36½	20	30	24¼	11⅛	13⅛	12½	4	9	29½	9¾	......	1½	1
201A	20,000	5,000	15	40	¾	41	1,750	450	3	2	41	32½	36½	20	30	24¼	11⅛	13⅛	12½	4	9	29½	9¾	......	1½	1
202A	20,000	5,000	20	40	1	41	1,750	550	3	2	41	32½	36½	20	30	24¼	11⅛	13⅛	12½	4	9	29½	9¾	......	1½	1
203B	20,000	5,000	25	40	1½	41	1,750	675	4	4	48	34	37	20	30	22¾	8	14¾	12½	4	9	27½	3½	35	1	2
205B	20,000	5,000	40	40	2	41	1,750	750	4	4	52	34	37	20	30	22¾	8	14¾	12½	4	9	27½	¾	40½	1	3
205C	20,000	5,000	40	40	2	41	3,500	650	4	4	44	34	37	20	30	22¾	8	14¾	12½	4	9	27½	6¼	35	1	1
207B	20,000	5,000	60	40	3	41	1,750	625	4	4	57	34	37	20	30	22¾	7¼	15½	12½	4	9	27½	2	40½	1	4
207C	20,000	5,000	60	40	3	41	3,500	700	4	4	48	34	37	20	30	22¾	8	14¾	12½	4	9	27½	3½	35	1	2
209C	20,000	5,000	100	40	5	41	3,500	775	4	4	52	34	37	20	30	22¾	7¼	15½	12½	4	9	27½	¾	40½	1	3
300A	30,000	7,550	10	53	½	49	1,750	500	3	2	48	32½	37½	20	36	24¼	11⅛	13⅛	12½	5	10	29½	12	......	1½	1
301A	30,000	7,550	15	53	¾	49	1,750	525	3	2	48	32½	36½	20	36	24¼	11⅛	13⅛	12½	5	10	29½	12	......	1½	1
302A	30,000	7,550	20	53	1	49	1,750	630	3	2	48	32½	36½	20	36	24¼	11⅛	13⅛	12½	5	10	29½	12	......	1½	1
303A	30,000	7,550	25	53	1½	49	1,750	725	4	3	45	34	36	20	36	22¼	8	14¼	12½	5	10	30⅛	12¼	......	2" Flg.	1
304A	30,000	7,550	30	53	2	49	1,750	760	4	3	46	34	36	20	36	22¼	8	14¼	12½	5	10	30⅛	12¼	......	2" Flg.	1
307C	30,000	7,550	60	53	5	49	3,500	1,150	2	6	52	37½	36¾	20	36	23¾	17⅜	6⅜	12½	5	10	36½	10½	......	1½ Flg.	1
308C	30,000	7,550	75	53	7½	49	1,750	1,260	1	5	60	41½	39	20	36	26	5¾	20¼	12½	5	10	31½	20¼	......	1½ Flg.	3
309B	30,000	7,550	100	53	10	49	1,750	1,550	1	5	63	41½	39	20	36	26	5¾	20¼	12½	5	10	31½	20¼	......	1½ Flg.	3
400A	40,000	10,000	10	80	1	70	1,750	725	4	3	45	35	38	22	36	23¼	9	14¼	13½	5	10	31⅛	12¼	......	2" Flg.	1
402A	40,000	10,000	20	80	1½	70	1,750	750	4	3	45	35	38	22	36	23¼	9	14¼	13½	5	10	31⅛	12¼	......	2" Flg.	1
403A	40,000	10,000	25	80	2	70	1,750	800	4	3	46	35	38	22	36	23¼	9	14¼	13½	5	10	31⅛	12¼	......	2" Flg.	1
404A	40,000	10,000	30	80	3	70	1,750	850	4	3	48	35	38	22	36	23¼	9	14¼	13½	5	10	31⅛	12¼	......	2" Flg.	1
407D	40,000	10,000	60	80	5	70	3,500	1,400	2	6	52	38½	38¾	22	36	24¾	18⅜	6⅜	13½	5	10	37½	10½	......	1½ Flg.	1
408D	40,000	10,000	75	80	7½	70	3,500	1,400	2	6	55	38½	38¾	22	36	24¾	18⅜	6⅜	13½	5	10	37½	10½	......	1½ Flg.	1
409B	40,000	10,000	100	80	10	70	1,750	1,550	1	5	63	42½	41	22	36	27	6¾	20¼	13½	5	10	32½	20¼	......	1½ Flg.	3
700A	70,000	17,500	10	135	2	82	1,750	900	2	6	60	40⅛	39½	24	42	24½	16¼	8¼	14½	6	11	......	12½	......	2" Flg.	1
703A	70,000	17,500	25	135	3	82	1,750	1,000	4	3	49	36	40	24	42	24¼	10	14¼	14½	6	11	32⅛	14¼	......	2" Flg.	1
705D	70,000	17,500	40	135	7½	82	1,750	1,300	2	6	60	40⅛	39½	24	42	24½	16¼	8¼	14½	6	11	......	12½	......	2" Flg.	1
708B	70,000	17,500	75	135	10	82	3,500	1,400	1	5	63	43½	43	24	42	28	7¾	20¼	14½	6	11	33½	22¼	......	1½ Flg.	3
709B	70,000	17,500	100	135	10	82	1,750	2,100	1	5	67	43½	43	24	42	28	7¾	20¼	14½	6	11	33½	25	......	1½ Flg.	4

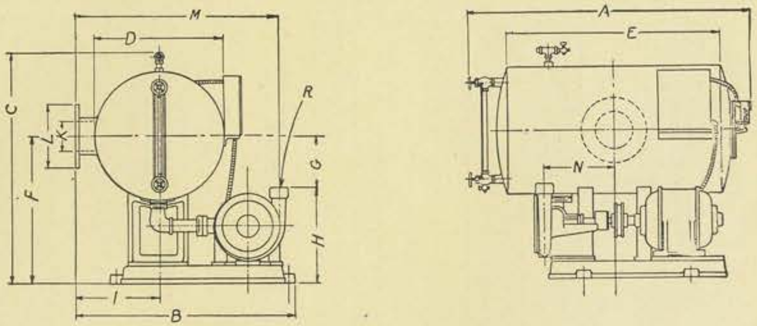
*As an indication of the conservative rating of Hoffman-Economy Pumps—the capacity under continuous operation is four times that given in table.
Where extreme quietness of operation is required select pumps of 1750 r.p.m. instead of 3500 r.p.m. motor speed.

DIMENSION DIAGRAMS

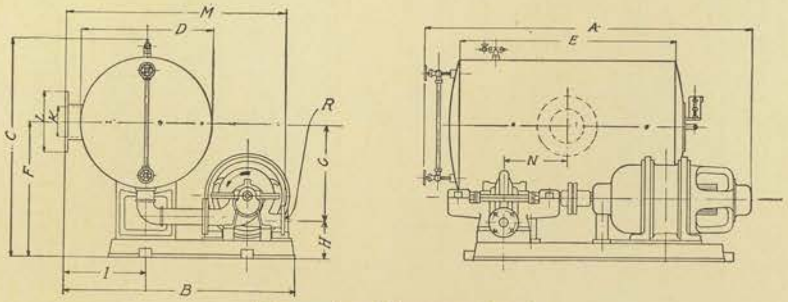
Condensation Pumps Equipped with 110-220-440 Volt, 25 or 50 Cycle, Single or Polyphase Motors



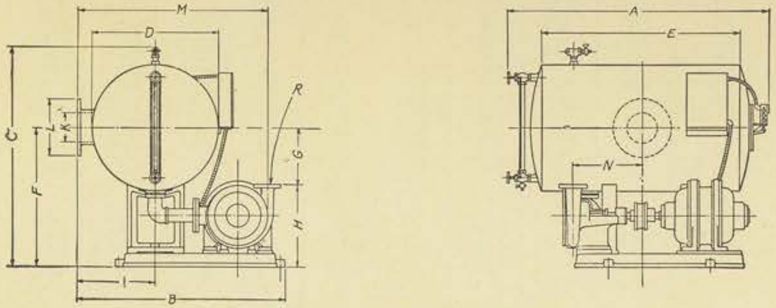
Dimension Diagram No. 1



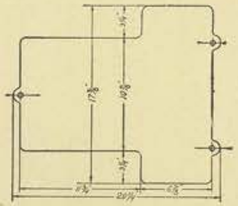
Dimension Diagram No. 4



Dimension Diagram No. 2



Dimension Diagram No. 3



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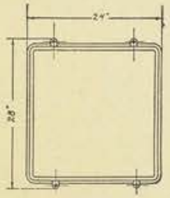

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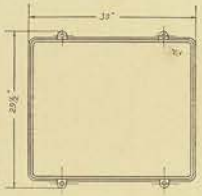

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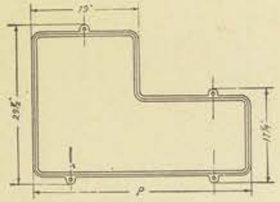

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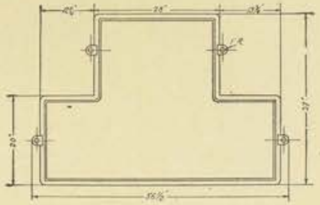
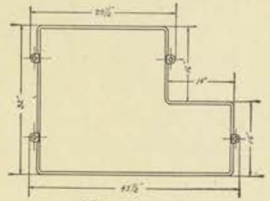


No. 5



No. 6

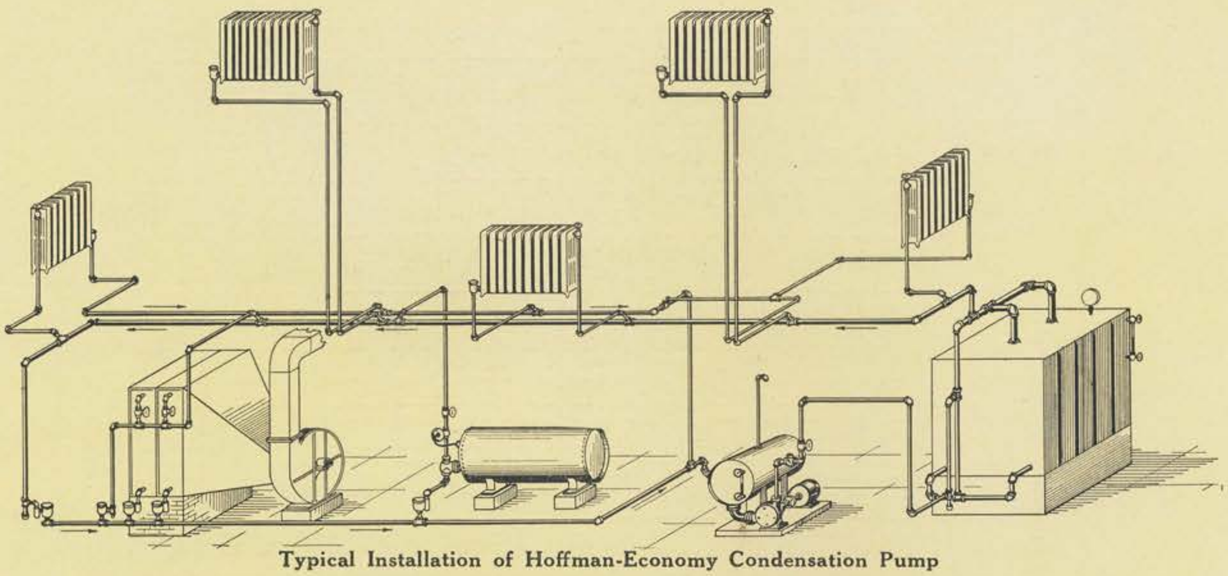
Base Diagrams

CAPACITIES AND DIMENSIONS
CONDENSATION PUMPS EQUIPPED WITH 110-220-440 VOLT—25 OR 50 CYCLE—SINGLE OR POLYPHASE MOTORS

Pump and Style No.	Capacity, sq. ft. direct c. i. rad. or equiv.	Capacity, lbs. condensate per hr.*	Discharge pressure, lbs. per sq. in.	Pump capacity, g. p. m.*	Motor hp.†	Capacity receiver, gal.	Speed, r.p.m.	Approximate shipping weight, lb.	Dimensions—These dimensions are approximate. Not to be used for construction																			
									Dimension diagr'm	Base diagr'm	A	B	C	D	E	F	G	H	I	K	L	M	N	P	R	No. stages
10A	1,000	250	10	2	¼	10	1,450	330	Fig. 3	Fig. 2	30	28½	28¾	13	18	18¾	5⅝	13⅛	9	2	Cplg.	26	9¼	......	1½	1
30A	3,000	750	10	5	¼	13	1,450	330	3	2	31	29½	29¼	14	20	19¼	6⅛	13⅛	9½	2	Cplg.	26½	9¼	......	1½	1
31A	3,000	750	15	5	½	13	1,450	450	3	2	31	29½	29¼	14	20	19¼	6⅛	13⅛	9½	2	Cplg.	26½	9¼	....	1½	1
32A	3,000	750	20	5	¾	13	1,450	570	4	4	41	28	30	14	20	18	5	13	9½	2	Cplg.	24¼	2½	35	1	2
60A	6,000	1,500	10	12	¼	20	1,450	365	3	2	41	29½	29½	14	30	19¼	6⅛	13⅛	9½	3	Cplg.	26½	9¼	......	1½	1
61A	6,000	1,500	15	12	½	20	1,450	480	3	2	41	29½	29½	14	30	19¼	6⅛	13⅛	9½	3	Cplg.	26½	9¼	......	1½	1
62A	6,000	1,500	20	12	¾	20	1,450	600	4	4	45	31	30	14	30	19¾	5½	14¼	9½	3	Cplg.	24½	3	35	1	2
64B	6,000	1,500	30	12	1	20	1,450	730	4	4	51	31	30	14	30	19¾	5	14¾	9½	3	Cplg.	24½	¼	40½	1	3
65B	6,000	1,500	40	12	1½	20	1,450	865	4	4	57	31	30	14	30	19¾	4¼	15½	9½	3	Cplg.	24½	2½	40½	1	4
66B	6,000	1,500	50	12	2	20	1,450	865	4	4	63	32	34	14	30	21½	5½	16	9½	3	Cplg.	25½	5½	50	1	5
67B	6,000	1,500	60	12	3	20	1,450	1,000	4	4	68	32	35	14	30	22½	5½	17	9½	3	Cplg.	25½	8¼	50	1	6
100A	10,000	2,500	10	20	¼	26	1,450	385	3	2	41	30½	32½	16	30	20¼	7⅛	13⅛	10½	3½	8½	27½	9¼	......	1½	1
101A	10,000	2,500	15	20	½	26	1,450	500	3	2	41	30½	32½	16	30	20¼	7⅛	13⅛	10½	3½	8½	27½	9¼	......	1½	1
102A	10,000	2,500	20	20	¾	26	1,450	630	4	4	45	32	33	16	30	20¾	6½	14¼	10½	3½	8½	25½	3	35	1	2
103B	10,000	2,500	25	20	1	26	1,450	830	4	4	51	32	33	16	30	20¾	6	14¾	10½	3½	8½	25½	¼	40½	1	3
104B	10,000	2,500	30	20	1½	26	1,450	865	4	4	51	32	33	16	30	20¾	6	14¾	10½	3½	8½	25½	¼	40½	1	3
105B	10,000	2,500	40	20	1½	26	1,450	900	4	4	57	32	33	16	30	20¾	5¼	15½	10½	3½	8½	25½	2½	40½	1	4
106B	10,000	2,500	50	20	2	26	1,450	930	4	4	63	33	35	16	30	22½	6½	16	10½	3½	8½	26½	5½	50	1	5
107B	10,000	2,500	60	20	3	26	1,450	1,030	4	4	68	33	36	16	30	23½	6½	17	10½	3½	8½	25½	8¼	50	1	6
151A	15,000	3,750	15	30	½	33	1,450	530	3	2	41	31½	34½	18	30	21¼	8⅛	13⅛	11½	4	9	28½	9¾	......	1½	1
152A	15,000	3,750	20	30	¾	33	1,450	700	4	3	44	33	36	18	30	21¼	6¾	14½	11½	4	9	29⅛	10	30	2 Flg.	1
153B	15,000	3,750	25	30	1	33	1,450	900	4	4	52	33	35	18	30	21¾	7	14¾	11½	4	9	26½	¾	40½	1	3
155B	15,000	3,750	40	30	2	33	1,450	1,000	4	4	57	33	35	18	30	21¾	6¼	15½	11½	4	9	25½	2	40½	1	4
157B	15,000	3,750	60	30	3	33	1,450	1,100	4	4	68	34	37	18	30	24½	7½	17	11½	4	9	27½	7¾	50	1	6
200A	20,000	5,000	10	40	½	41	1,450	565	3	2	41	32½	36½	20	30	24¼	11⅛	13⅛	12½	4	9	29½	9¾	......	1½	1
201A	20,000	5,000	15	40	¾	41	1,450	600	4	3	45	33	36	20	30	22¼	8	14¼	12½	4	9	30⅛	10	......	2 Flg.	1
202A	20,000	5,000	20	40	1	41	1,450	730	4	3	45	34	36	20	30	22¼	8	14¼	12½	4	9	30⅛	10	......	2 Flg.	1
203B	20,000	5,000	25	40	1½	41	1,450	900	4	4	52	34	37	20	30	22¾	8	14¾	12½	4	9	27½	¾	40½	1	3
205B	20,000	5,000	40	40	2	41	1,450	1,000	4	4	57	34	37	20	30	22¾	7¼	15½	12½	4	9	27½	2	40½	1	4
207B	20,000	5,000	60	40	3	41	1,450	830	4	4	68	35	38	20	30	24½	7½	17	12½	4	9	28½	7¾	50	1	6
208B	20,000	5,000	75	40	5	41	1,450	1,600	1	5	68	41½	39	20	30	26	5¾	20¼	12½	4	9	31½	20¾	......	1½ Flg.	4
209C	20,000	5,000	100	40	5	41	1,450	1,030	1	5	68	41½	39	20	36	26	5¾	20¼	12½	5	10	31½	25¾	......	1½ Flg.	5
300A	30,000	7,550	10	53	½	49	1,450	665	3	2	48	32½	37½	20	36	24¼	11⅛	13⅛	12½	5	10	29½	12	......	1½	1
301A	30,000	7,550	15	53	¾	49	1,450	700	4	3	45	34	36	20	36	22¼	8	14¼	12½	5	10	30⅛	12¼	......	2 Flg.	1
302A	30,000	7,550	20	53	1	49	1,450	835	4	3	45	34	36	20	36	22¼	8	14¼	12½	5	10	30⅛	12¼	......	2 Flg.	1
303A	30,000	7,550	25	53	1½	49	1,450	970	1	5	52	41½	39	20	36	26	5¾	20¼	12½	5	10	31½	17½	......	1½ Flg.	2
304A	30,000	7,550	30	53	2	49	1,450	1,010	1	5	57	41½	39	20	36	26	5¾	20¼	12½	5	10	31½	17½	......	1½ Flg.	2
306B	30,000	7,550	50	53	3	49	1,450	1,860	1	5	65	41½	39	20	36	26	5¾	20¼	12½	5	10	31½	20¼	......	1½ Flg.	3
308C	30,000	7,550	75	53	7½	49	1,450	1,680	1	5	68	41½	39	20	36	26	5¾	20¼	12½	5	10	31½	23	......	1½ Flg.	4
309B	30,000	7,550	100	53	10	49	1,450	2,060	1	5	68	41½	39	20	36	26	5¾	20¼	12½	5	10	31½	25¾	......	1½ Flg.	5
400A	40,000	10,000	10	80	1	70	1,450	965	4	3	45	35	38	22	36	23¼	9	14¼	13½	5	10	31⅛	12¼	......	2 Flg.	1
402A	40,000	10,000	20	80	1½	70	1,450	1,000	4	3	45	35	38	22	36	23¼	9	14¼	13½	5	10	31⅛	12¼	......	2 Flg.	1
403A	40,000	10,000	25	80	2	70	1,450	1,060	1	5	58	42½	41	22	36	27	6¾	20¼	13½	5	10	32½	17½	......	1½ Flg.	2
404A	40,000	10,000	30	80	3	70	1,450	1,130	1	5	58	42½	41	22	36	27	6¾	20¼	13½	5	10	32½	17½	......	1½ Flg.	2
407D	40,000	10,000	60	80	5	70	1,450	1,860	1	5	65	42½	41	22	36	27	6¾	20¼	13½	5	10	32½	20¼	......	1½ Flg.	3
408D	40,000	10,000	75	80	7½	70	1,450	1,860	1	5	66	42½	41	22	36	27	6¾	20¼	13½	5	10	32½	23	......	1½ Flg.	4
409B	40,000	10,000	100	80	10	70	1,450	2,060	1	5	69	42½	41	22	36	27	6¾	20¼	13½	5	10	32½	25¾	......	1½ Flg.	5
700A	70,000	17,500	10	135	2	82	1,450	1,200	2	6	60	40⅛	39½	24	42	24½	16¼	8¼	14½	6	11	......	12½	......	2 Flg.	1
701A	70,000	17,500	15	135	2	82	1,450	1,860	2	6	60	40⅛	39½	24	42	24½	16¼	8¼	14½	6	11	......	12½	......	2 Flg.	1
703A	70,000	17,500	25	135	3	82	1,450	1,335	2	6	60	40⅛	39½	24	42	24½	16¼	8¼	14½	6	11	......	12½	......	2 Flg.	1
705D	70,000	17,500	40	135	7½	82	1,450	1,730	1	5	65	43½	43	24	42	28	7¾	20¼	14½	6	11	33½	25	......	1½ Flg.	3
708B	70,000	17,500	75	135	10	82	1,450	1,860	1	5	69	43½	43	24	42	28	7¾	20¼	14½	6	11	33½	27¾	......	1½ Flg.	5

*As an indication of the conservative rating of Hoffman-Economy Pumps—the capacity under continuous operation is four times that given in table.
†Horsepower of 25-cycle motors may vary somewhat from those shown in table.

HOFFMAN-ECONOMY PUMPS



Typical Installation of Hoffman-Economy Condensation Pump

Information for Installing Hoffman-Economy Horizontal Condensation Pumps

Horizontal condensation pumps and receivers are suitable for use where the radiation is 12 to 18 inches above the floor or foundation upon which the pump is set. If the pump is installed in a pit, proper provision must be made for drainage and ventilation, as it is essential to keep the motor absolutely dry. Vertical underground pumps should be used for draining radiation close to or below the floor level. (See pages 38 and 39.)

All condensation pumps and receivers must be selected to discharge against the pressure at which safety valve is set, plus allowance necessary to overcome pipe friction and difference in level between boiler water line and pump. Unless the pump is capable of discharging against this maximum pressure, there is danger that it will fail to return water to the boiler if the pressure exceeds normal. Hoffman-Economy pumps will discharge against a pressure of at least three pounds over their rating.

All receivers are vented to the atmosphere, and unless especially ordered, are not designed for internal pressures. No responsibility will be assumed by the company if receiver vents are closed for any reason.

If radiators are not equipped with individual traps, it will be necessary to install a trap at inlet of receiver to prevent steam entering receiver and interfering with the pump action. Traps are not regularly furnished with pumps.

High water alarm, bell and batteries can be furnished with any pump at an extra charge.

Information Required with Order

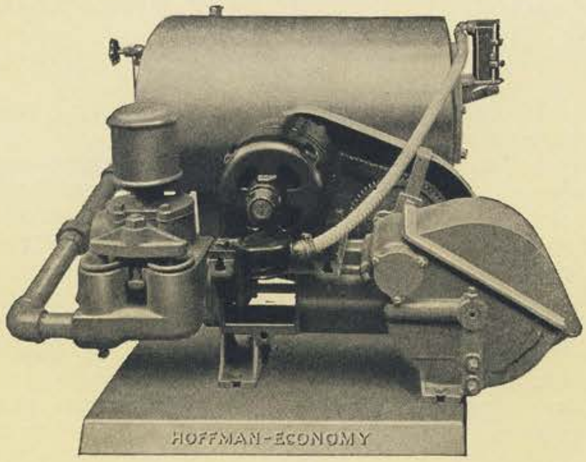
1. Square feet of direct cast iron radiation or equivalent. (Each foot of Vento, Super-Fin or other blast coil is considered equivalent to 5 or 6 feet of direct radiation.)
2. Electric current available—one, two or three phase, number of cycles and volts if alternating current; or voltage only if direct current.
3. Boiler pressure—safety valve setting.
4. Difference in elevation between pump and boiler water line with size and length of intervening piping.

All Hoffman-Economy Pump and Receivers are shipped with pump, motor and automatic control completely assembled. After making necessary electrical connections and provision to prevent steam entering pump, the unit is ready to run.

Suggested Specification for Horizontal Condensation Pump

Install where indicated on plans one size...... Hoffman-Economy Horizontal Condensation Pump and Receiver suitable for......square feet direct cast iron radiation or equivalent and capable of operating against a pressure of......pounds per square inch at the pump. Pump shall be of the centrifugal type, with enclosed bronze impeller and so constructed that access may be had to impeller and other interior parts without breaking pipe connections. Shaft shall be run in two renewable bronze bearings, one of which shall be of the ball type. Motor shall be continuous rated 40 degrees and shall be suitable for....volts.... phase......cycles alternating current (or...... volts direct current) and shall be direct connected to pump by a flexible coupling. Operation of motor shall be controlled by an automatic float switch installed in receiver. All parts shall be assembled on a cast iron base ready for installation.

HOFFMAN-ECONOMY PUMPS



Hoffman-Economy Reciprocating Pumps and Receivers

The Hoffman-Economy Reciprocating Pump and Receiver is a dependable unit for use in laundries, cleaning and dyeing plants, greenhouses and other industrial establishments where it is necessary to carry pressure from 50 to 100 pounds and where moderate priced equipment is required.

Reciprocating pumps operate on less power than the centrifugal type, but are not as quiet, due to the slight pulsation at the end of each stroke and the hum from the chain drive. Ordinarily, this is not objectionable, but where extreme quietness is desired, Style "B," "C" or "D" 1750 r.p.m. pumps should be used. (Pg. 30.)

Reciprocating pumps are frequently used on remodeled jobs in which various types of systems have been supplied from the same boiler. In such installations the pump handles the condensate from the entire job and also establishes a low vacuum on the return mains. This vacuum is not capable of control, being incidental to the operation of the unit as a condensation pump. Vacuum may be controlled by manually operated valves.

Construction Details

Pump—Is self-oiling enclosed type with bronze lined cylinders, bronze valve seats and piston rod. It has Timken bearings; cast steel crank shaft driven through accurately cut gears; silent chain drive from pump to motor. *Receiver and Automatic Float Control* are same as used in centrifugal pumps.

Motors—Are standard make, 40° rise continuous duty, 1750 r.p.m. They are ample to start pump under any load and to operate without overheating.

Single phase motors 1 hp., 110 volts and larger are equipped with magnetic contactors with thermal overload. Smaller motors are controlled directly from float switch.

Polyphase motors of all sizes are equipped with thermal overload cutouts. Magnetic contactors with overload and no voltage release are used in 2 hp. size. Smaller sizes are controlled directly from float switch.

Direct current motors 1 hp. and over are equipped with automatic starter having overload protection. Smaller motors are controlled directly by float switch.

Information for Installing

Units are shipped complete with pump, motor, automatic control and receiver with trimmings, all mounted on cast iron base, ready for installation.

It is unsafe to install a gate valve in the discharge line as these pumps are positive. A check valve only should be used.

Information Required with Order

Same as for Horizontal Condensation Pump. See page 36.

STANDARD SIZES

Pump No.	Capacity, sq. ft. direct radiation or equiv.	Capacity, lbs. condensate per hr.	Discharge pressure lbs. per sq. in.	Pump cap. g.p.m.	Motor hp.	Receiver capacity, gal.	Approx. shipping weight, lb.
R- 11	1,000	250	50	2	½	9	500
R- 12	1,000	250	100	2	¾	9	600
R- 31	3,000	750	50	5	½	13	575
R- 32	3,000	750	100	5	¾	13	625
R- 61	6,000	1,500	50	10	½	20	700
R- 62	6,000	1,500	100	10	1	20	725
R-101	10,000	2,500	50	16	1	26	900
R-102	10,000	2,500	100	16	2	26	950

HOFFMAN-ECONOMY PUMPS

Hoffman-Economy Vertical Underground Pumps and Receivers

Hoffman-Economy Vertical Underground Pumps and Receivers are used where returns are located below floor level or otherwise too low for horizontal pumps. To save floor space, they may be installed flush with floor so as to occupy only space enough for the motor and control.

Duplex Units—Two pumps with individual motors may be installed in a single tank of larger size if desired.

High Pressure Units—Where it is necessary to use underground pumps on high pressure jobs, a horizontal booster pump is furnished. Information furnished on request.

Construction Details

Pump—Pump is a special vertical centrifugal pump with enclosed bronze impeller of the non-overloading type, machined all over and balanced.

Pump shaft is ball bearing, mounted in dust-proof housing. Lower bearing is self-lubricating and easily renewable without removing impeller from shaft or dismantling pump. Shaft is protected in lower bearing from wear by renewable sleeve, turned, ground and locked to shaft.

Flexible shaft coupling connects pump and motor.

Base—Both pump and motor are mounted on base plate, permitting removal of pump without disturbing receiver cover. Motor is aligned by means of shoulder and recess.

Receiver—Receiver is of heavy cast iron suitable for underground use without danger of corrosion.

Float Control Mechanism—Float switch is of same design as used in horizontal pumps. Float is removable without disturbing pumps.

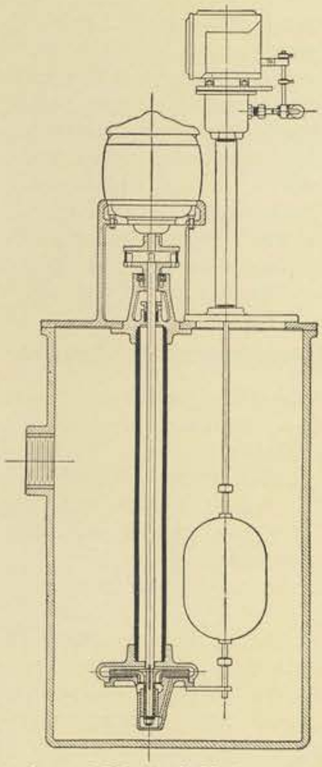
Motors—Motors are standard make, continuous rated 40 degrees, 1750 r.p.m.

Single phase 1 hp., 110 volts and 1½ hp., 220 volt motors are equipped with automatic starters having thermal overloads. Smaller motors are controlled directly from float switch.

All polyphase motors are equipped with thermal overload cutouts. Magnetic contactors with overload and no voltage release are used in 2 hp. sizes and larger. Smaller sizes are controlled directly by float switch.

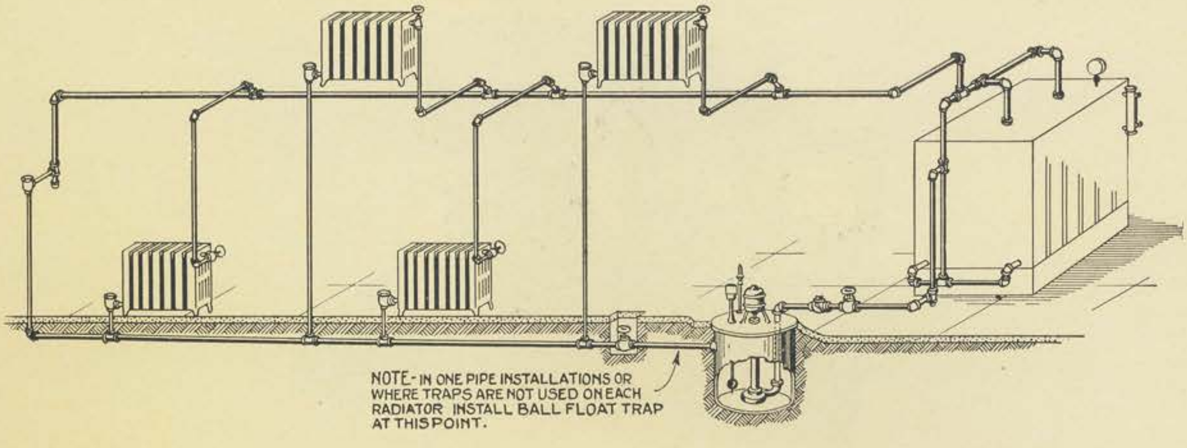
Direct current motors 1 hp. and over have automatic starters with overload protection. Smaller motors are controlled directly by float switch.

Vertical Underground Unit



Cross Section of Vertical Underground Pump

HOFFMAN-ECONOMY PUMPS



Typical Installation of Underground Unit

Information for Installing

Units are shipped with cast iron tank with one inlet, vertical pump and motor with full automatic control, completely wired.

Standard tanks have single inlet with center located 9 inches below top cover. Other location of tapping may be obtained without extra charge; additional inlets will be furnished at slight extra cost.

In installing unit, if radiators are not equipped with individual traps, a float trap should be installed in return main at receiver to prevent entrance of steam.

Vertical Underground Pumps and Receivers

STANDARD SIZES

Pump No.	Diameter inlet conn., in.	Diameter outlet conn., in.	Hgt. above floor, in.	Capacity, sq. ft. direct c.i.rad. or equiv.	Capacity, lb. condensate per hr.	Discharge pressure, lb. per sq. in.	Pump cap. g.p.m.	Motor hp.	Receiver dimensions, in.	Approx. shipping weight, lb.
U- 30	3	1¼	24	3,000	750	10	6	¼	16 x 30	445
U- 31	3	1¼	44			15		½	20 x 30	750
U- 32	3	1¼	44			20		¾	20 x 30	780
U- 50	3	1¼	24	5,000	1,250	10	10	¼	16 x 30	445
U- 51	3	1¼	44			15		½	20 x 30	750
U- 52	3	1¼	44			20		¾	20 x 30	780
U- 80	3	1¼	24	8,000	2,000	10	16	¼	18 x 30	490
U- 81	3	1¼	44			15		½	20 x 30	750
U- 82	3	1¼	44			20		¾	20 x 30	780
U-120	4	1½	44	12,000	3,000	10	24	½	24 x 36	960
U-122	4	1½	44			20		¾	24 x 36	990
U-200	4	1½	44	20,000	5,000	10	40	½	24 x 36	960
U-201	4	1½	44			15		¾	24 x 36	990
U-202	4	1½	44			20		1	24 x 36	1,080
U-300	5	2	44	30,000	7,500	10	60	1	30 x 36	1,200
U-301	5	2	44			15		1½	30 x 36	1,290
U-302	5	2	44			20		2	30 x 36	1,330

All 25-cycle units operate at 1450 r.p.m. Weights will be approximately one-third greater than shown. Receivers furnished with 25-cycle units may be larger than shown in table.

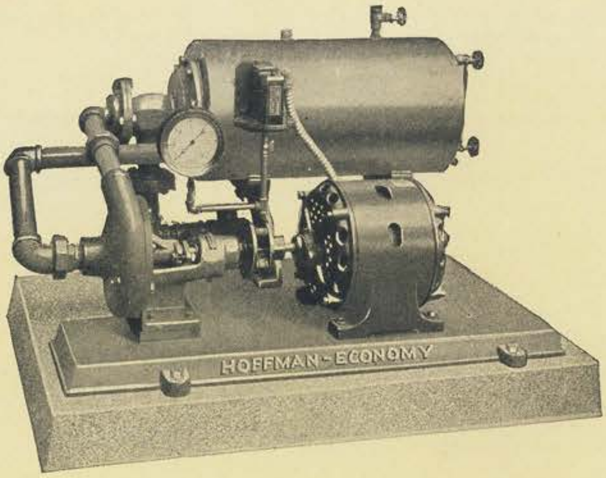
Information Required with Order

1. Square feet of direct cast iron radiation or equivalent.
2. Electric current available.
3. Boiler pressure—safety valve setting.
4. Difference in elevation between pump and boiler water line with size and length of intervening piping.
5. Distance from floor to center of return main.

Suggested Specification for Vertical Underground Pump

Install where indicated on plans a Hoffman-Economy Underground Condensation Pump and Cast Iron Receiver No...... complete with vertical bronze fitted centrifugal pump suspended from receiver cover. Pump shall be so constructed that bearings may be renewed without removing impeller from shaft or shaft from pump. Shaft shall be protected from bearing wear by a removable sleeve. Receiver shall be equipped with an automatic float switch for controlling motor and shall be removable without disturbing pump or pipe connections. Pump shall be directly connected to motor by a flexible shaft coupling. Motor shall be 40 degree continuously rated, and shall be suitable for...... volts...... cycle......phase alternating current (or......volts direct current) and shall be mounted on a machined tripod cast integral with pump base.

HOFFMAN-ECONOMY PUMPS



Hoffman-Economy Air Line Vacuum Pumps

The Hoffman-Economy Air Line Vacuum Pump is a highly efficient unit for the removal of air from gravity heating installations such as "Paul" or other systems equipped with air line valves. The pump removes air only and does not handle condensate nor act as a boiler feed pump.

Construction Details

Pump—Sizes AL-1 to AL-4 are equipped with single suction, enclosed impellers, bronze fitted centrifugal pumps with outboard ball bearings.

Sizes AL-5 to AL-9 are equipped with double suction, horizontal split case, bronze fitted centrifugal pumps.

All pumps have removable cover which gives access to all working parts without breaking pipe connections.

Jet Vacuum Producer—Jet type vacuum producer is of same design as used in Hoffman-Economy Return Line Vacuum Pumps. (See page 25.)

Tank and Base—Tank is of heavy gauge welded steel and both tank and motor are rigidly bolted to cast iron base with machined pads to insure accurate alignment of unit.

Piping between tank, vacuum producer and pump is completely assembled at factory and unit is shipped wired and ready for installation. All wiring is in strict accordance with National Electrical Code.

Motors—Standard make motors are used on all units, permitting the obtaining of replacements from local stocks without waiting for factory shipment.

Single phase motors 1½ hp. and larger are equipped with magnetic contactors in addition to vacuum controllers. Overload protection is provided wherever contactors are used.

Polyphase motors are equipped with thermal overload cutouts in sizes under 1½ hp. In larger sizes magnetic contactors with both overload and no voltage release are furnished in addition to the vacuum regulator.

Direct current motors of 1 hp. and under are compound wound, self-starting type. Above 1 hp. automatic starters are furnished in addition to vacuum regulators.

Vacuum Regulator—Vacuum regulator is set to cut in at 3 inches and out at 8 inches when unit leaves the factory, but may easily be adjusted to a higher or lower vacuum if desired.

Duplex Units—All sizes are available in both single and duplex units. Duplex unit consists of a single tank with two pumps, two motors and automatic starters.

Information Required with Order

1. Square feet of direct cast iron radiation or equivalent.
2. Electric current available—one, two or three phase, number of cycles and volts if alternating current; or voltage only if direct current.

STANDARD SIZES

Pump No.	Capacity, sq. ft. direct radiation	Air capacity, cu. ft. per min.	Motor hp.	Approx. shipping weight, lb.
AL-1	4,000	1¾	¾	500
AL-2	8,000	4	1	600
AL-3	12,000	6	1½	750
AL-4	20,000	10	2	900
AL-5	30,000	15	3	1,000
AL-6	40,000	20	5	1,000
AL-7	60,000	30	5	1,200
AL-8	80,000	40	7½	1.400
AL-9	150,000	70	10	1,600

PART III

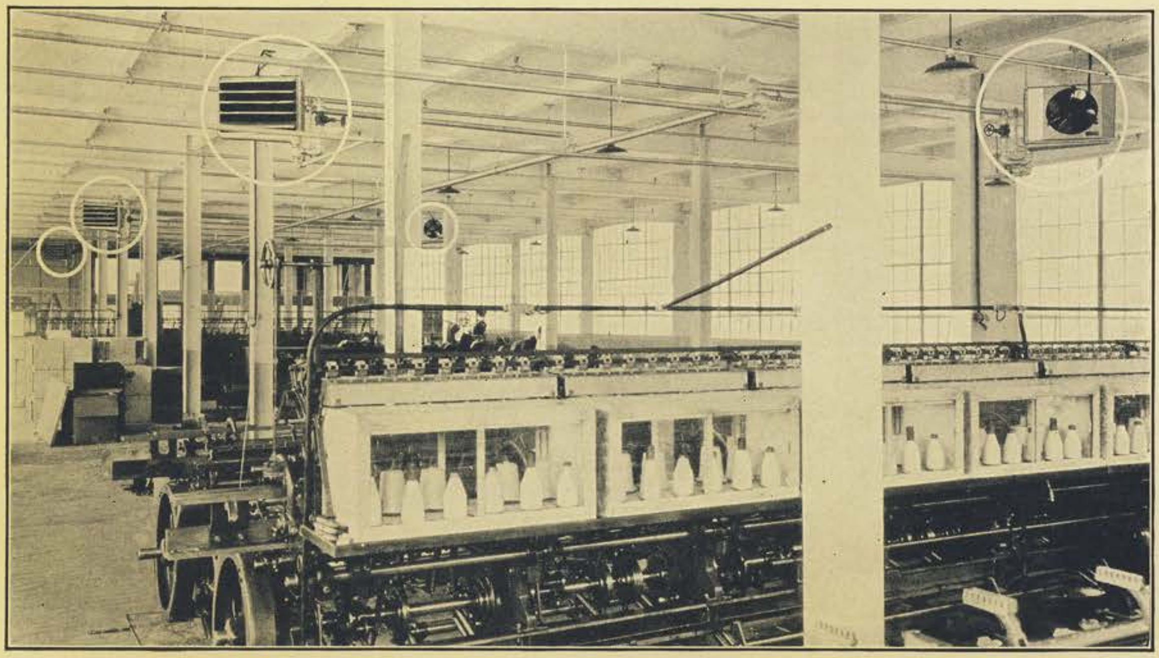
Hoffman Moto-Heaters

A pound of coal and a pound of steam each contains a definite number of heat units, commonly called B.t.u. But the way these heat units are applied and distributed determines the degree of efficiency and economy that a heating system provides.

The following pages describe the new way of heating large area industrial and commercial buildings—the new way of securing more uniformly distributed heat from less fuel with Hoffman Moto-Heaters.

GUARANTEE

Hoffman Moto-Heaters are guaranteed for capacity when operated at their rated voltage and specified steam pressure, and against defects in material or workmanship for a period of one year from date of installation. This guarantee applies to the heater only and covers the furnishing of new parts to replace those found defective. The guarantee covering motors and electrical equipment is the same as that given by the manufacturer of the motor or equipment used or specified. (See important note, Page 45.)



A Modern Industrial Heating System Using Hoffman Moto-Heaters

HOFFMAN MOTO-HEATERS

Heating That Is Upside Down

Warm air rises; cold air settles to the floor. These two basic facts have been known for hundreds of years, yet their full significance in the heating of industrial and commercial buildings has been but recently recognized. And only within the last few years have engineers devised means of reversing the normal flow of heated air and thus provide more efficient heating at less cost per pound of fuel consumed.

Let us consider the usual way of heating factories, mills and other large area buildings. A series of pipe coils are placed around the walls. The air surrounding these coils, upon being heated, becomes lighter and rises almost vertically to the ceiling.

The first heat that enters the building, therefore, is largely spent in heating the area directly beneath the roof or ceiling. Obviously, this heat benefits no one—it is wasted.

As more heat is applied and more air heated, it, too, drifts upward and tends to bank up under the ceiling. Only after the cool air near the floor has passed over the heating surface does the warm air under the ceiling settle downward toward the lower areas. In brief, heat goes first to the unoccupied portions of the building and reaches the working zone last. *The heating system is upside down.*

In residences, offices and other buildings with low ceilings the difference between floor and ceiling temperatures is not a serious matter. For such service, with smaller areas to be heated, recirculation is more rapid, and direct radiation is quite satisfactory.

In large area buildings with high ceilings, the inefficiency and wastefulness of "upside down" heating systems are too important to be ignored. Tests made by heating engineers show that when full capacity of the heating system is required, for every foot from knee-height to ceiling, the temperature rises about 2 degrees per foot up to about 20 feet. This means that in a room 16 feet in height, heated with usual radiation, a temperature of 60 degrees at a height of 5 feet, at breathing line, is not attained until after the temperature at the ceiling reaches approximately 82 degrees.

From this it is easy to see why, particularly during the morning hours, heating coils may be sizzling hot, yet the working areas in the center of the room remain cold and uncomfortable. The heat is there but it is above the workers' heads. Not until sufficient time has elapsed for the upper areas to become overheated do the lower levels reach a normal working temperature.

Let us consider the problem of wasted heat from another angle. If the room measures 60x 100 feet and 16 feet in height, the number of cubic feet is 96,000. The area above the workers' heads is approximately 60,000 cubic feet—62% of the total. The temperature of this area averages considerably higher than that of the working zone. About three-fourths of the heat in the room is in the unoccupied area.

With the high fuel costs that prevail today; with industrial wages constantly mounting, the problem of utilizing heat more advantageously is of prime importance in maintaining efficient plant operation.

In the final analysis, the economical utilization of heat is largely a matter of distributing heat in accordance with known engineering principles.

Fortunately, the solution has been found. In Hoffman Moto-Heaters lies the means of securing uniformly distributed heat at minimum cost per B.t.u.

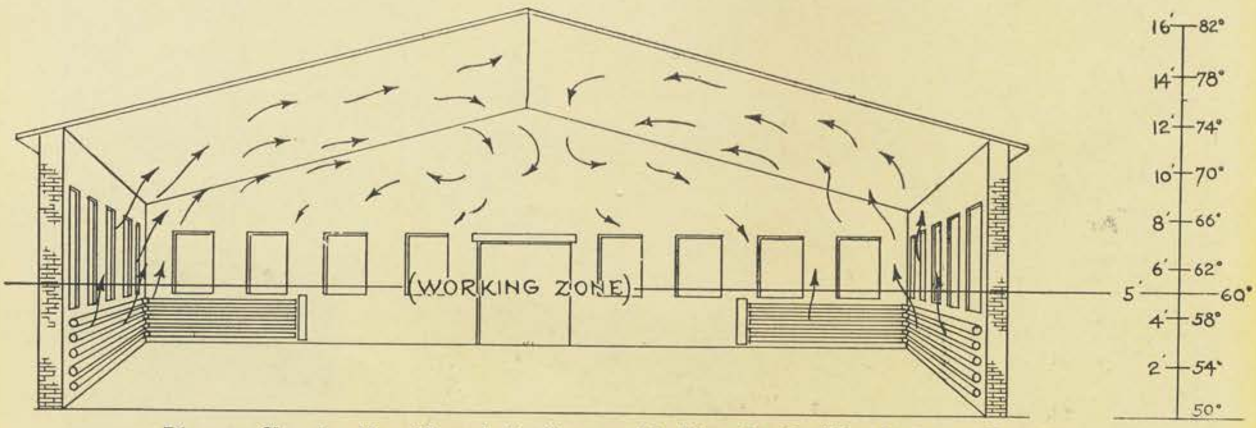


Diagram Showing How Heated Air Rises and Is Wasted with "Upside Down Heating"

HOFFMAN MOTO-HEATERS

The Scientific Application of Heat

Hoffman Moto-Heaters offer factories, mills, garages, etc. a means of supplying heat quickly, of bringing it into the working zone and reducing the amount of waste heat stored in the upper areas of the room. Not only does this modern, scientific method of heating insure lower fuel bills, but it also reduces the investment in the heating plant, and makes possible greater efficiency on the part of employees.

The principle of Hoffman Moto-Heaters is comparatively simple. The unit consists of a copper radiator with extended fins, mounted in a steel casing, and a motor driven fan to force the air through the radiator.

The unit is placed above the heads of the workers so that warmed air is distributed directly in the working zone, immediately placing the heat where it is needed.

While it is impossible to prevent some of the heated air from going up towards the ceiling, Hoffman Moto-Heaters materially reduce the amount of unused heat.

This is clearly shown by the fact that with Hoffman Moto-Heaters the difference in temperature between the upper and lower air areas is generally about one-half that of the ordinary systems. Instead of a difference of 2 degrees in temperature per foot of height, there is a variation of only about 1 degree to 1½ degrees.

Thus, in a building with a 16-foot ceiling, a temperature of 60 degrees at a height of 5 feet normally means maintaining a temperature of 82 degrees at the ceiling. With Hoffman Moto-Heaters the ceiling temperature will be approximately 75 degrees.

In this reduction in the amount of heat in the upper areas of the room lies the most important reason for lower fuel costs with Hoffman Moto-Heaters.

Hoffman Moto-Heaters offer other important advantages. Heat is distributed uniformly throughout the entire working zone. There are no cold spots or drafty corners. Also, because heat is *first* directed towards the floor, less time is required to build up a comfortable temperature in the working zone.

Installation costs, including piping, radiation, labor, etc., will generally average around 20% or 25% less with Hoffman Moto-Heaters than with ordinary methods.

To the concern that is erecting new structures having large areas to heat, every consideration favors the selection of Hoffman Moto-Heaters. Also, in the case of old buildings, it is generally more economical to install Hoffman Moto-Heaters than to continue to operate the old, inefficient equipment.

Aside from the physical and psychological effect on workers of poor heating (which is sufficient reason in itself for making the change), the various economies effected by Hoffman Moto-Heaters represent a more than satisfactory return on the investment in the new equipment. To make the change is a sound business proposition.

During the summer months, Hoffman Moto-Heaters may be operated simply as recirculating fans for cooling purposes without additional investment in regular fan equipment. Note from the tables on pages 52 to 55 the large volumes of air handled, 350 to 3740 cubic feet per minute.

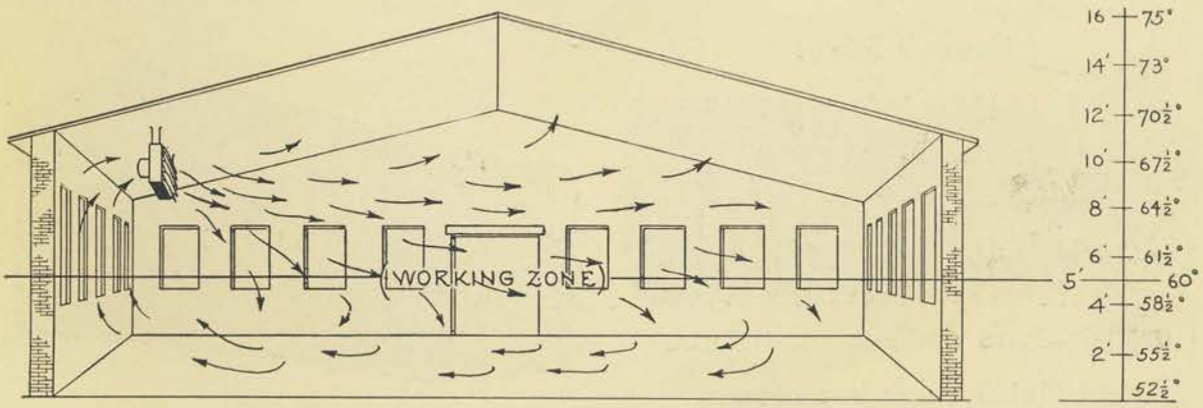


Diagram Showing How Heat Is Applied Directly to the Working Zone with Hoffman Moto-Heaters

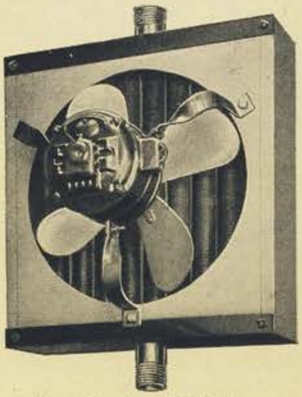
HOFFMAN MOTO-HEATERS

The Improved Type of Unit Heater

The advantages of heating large area buildings with unit heaters have clearly been demonstrated over a period of years and are fully recognized by leading heating authorities.

To those specifying or purchasing such equipment, however, there remains the important question as to which of the many unit heaters on the market best meets all requirements of efficiency, dependability and economy.

Obviously, the answer to this question requires, first of all, a yardstick by which to measure values. While the general principle of all unit heaters is substantially the same and all of them will "work," there are various differences in design and construction that have a direct bearing on the degree of efficiency and length of service the equipment will give.



Nos. 2, 4 and 5 Moto-Heaters
Rear view

As a guide in selecting unit heaters, the following five questions provide a sound and practical basis for judging comparative quality.

Question No. 1—How Efficient Is the Heating Surface?

In Hoffman Moto-Heaters the construction of the copper tubing and fins insures high thermal efficiency. The copper fins, which are 1½ in. outside diameter, are embedded in the copper tubing, without the use of solder, giving a three-side metal to metal contact. This permits maximum transfer of heat from tube to fin. Also, because fins have smooth surfaces, the collection of dirt with subsequent loss in heating efficiency is reduced to a minimum.

Question No. 2—At What Pressure Is the Unit Tested and Guaranteed?

A unit heater must be permanently steam tight if it is to give satisfactory service. Even where the heater operates under low pressure, water hammer may subject it to a strain equivalent to that of high pressure steam.

By actual fusion of metal the copper tubes are united to the steel headers in Hoffman Moto-Heaters, making a one-piece joint. This does away with troublesome expanded joints and eliminates all danger of leakage. Every heater is tested under 1,000 pounds per square inch hydrostatic pressure and *guaranteed for any operating steam pressure up to 200 pounds.*

Question No. 3—How Does the Price Compare with Other Heaters?

A fair basis of comparison is cost per B.t.u. From this standpoint Hoffman Moto-Heaters are economical in first cost, depreciation and maintenance charges.

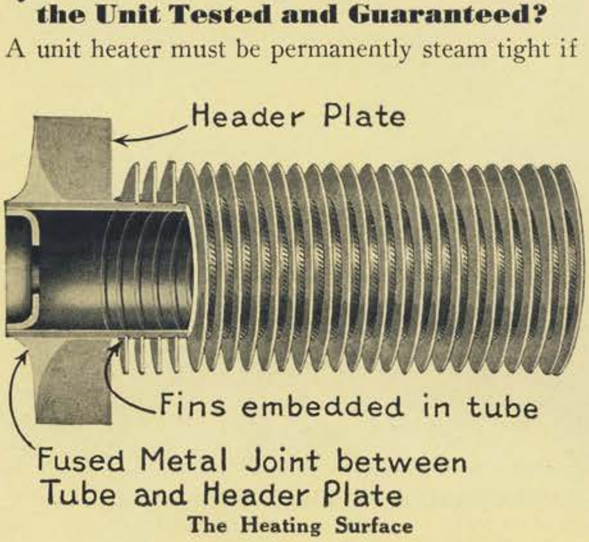
Question No. 4—How Efficiently Does the Unit Distribute Heat?

Because of the special construction of the heating surface and the scientific design of the fan, Hoffman Moto-Heaters provide uniform and quick distribution of heat. The heating up period is very short.

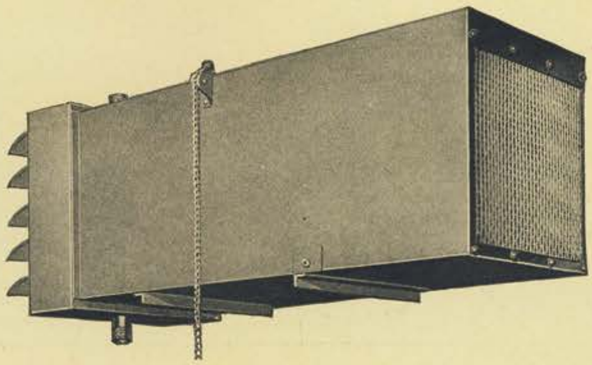
Question No. 5—By Whom Is the Heater Made?

Unit heaters are essentially a *heating* product. In selecting Hoffman Moto-Heaters, engineers have the assurance that they are selecting equipment designed and manufactured by heating engineers.

The reputation and years of experience of HOFFMAN SPECIALTY COMPANY are a guarantee of satisfactory service.



The Heating Surface



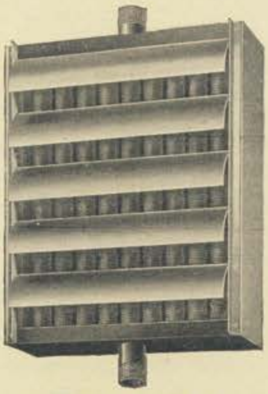
Nos. 4 and 5 Moto-Heater with Horizontal Outside Air Intake

HOFFMAN MOTO-HEATERS

Electric Motors and Controls for Hoffman Moto-Heaters

Due to the fact that in various parts of the country, or sometimes in the same city, different electric currents are used, it is necessary to obtain from the architect, electrician or local power company exact information on the current furnished to the building. Often this can be obtained from the name plate on the electric power meter.

Alternating current may be one, two, or three phase, 110, 220 or 440 volts and 60, 50, 40, 30 or 25 cycles. Two or three phase power is usually found where there is a total of 5 hp. or more in a single building. If there is only a lighting line, the current will probably be single phase or direct current. Care must be used in quoting on Moto-Heaters having a total load of 3 hp. and over, as power companies frequently run in two or three phase lines to handle loads of this size. If, therefore, there is only a lighting circuit in the building and it is desired to use a large number of Moto-Heaters, inquire of the power company whether the light lines have sufficient capacity or whether a new power line is necessary, and what current will be furnished.



Nos. 2, 4 and 5 Moto-Heaters
Front view

Extra Starting Equipment

For 110 or 220 Volt, Single Phase, 60 or 25 Cycle and Direct Current Motors Only

Hand Switch—A small manually operated self-contained, completely enclosed switch, having overload and undervoltage protection, is furnished when total connected load is not in excess of ½ hp.

Automatic Switch—For conditions where total connected load is ½ hp. or less, the switch furnished is of the completely enclosed, externally operated, across the line quick break safety type, having an inverse time limit thermal overload cut-out. Switch is of the three-position type, permitting automatic or manual control of motor when a thermostat is used.

Thermostats—Where automatic control is required, a thermostat is combined with the above automatic switch. If the total connected load is not over ½ hp. one or more Moto-Heaters may be connected to one starter and thermostat. If the load is more than ½ hp. one thermostat may be connected to several automatic switches, provided the maximum load on each automatic switch is not in excess of ½ hp. Thermostats are furnished for two temperature ranges. Standard, 56° to 80° F. and Special, 38° to 60° F.

When power circuit is higher than 220 volts, the thermostat and relay coil in automatic starter must be connected to a circuit which does not exceed 220 volts.

For 220 or 440 Volt Polyphase Motors

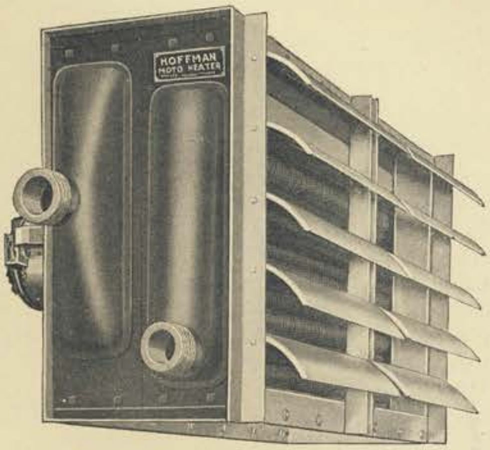
Hand Switch—Manually operated, completely enclosed switch having overload and phase failure protection by means of thermal overload cut-outs.

Automatic Switch—Completely enclosed, having a three-position snap switch in cover and provided with thermal relays with overload phase failure and low voltage protection.

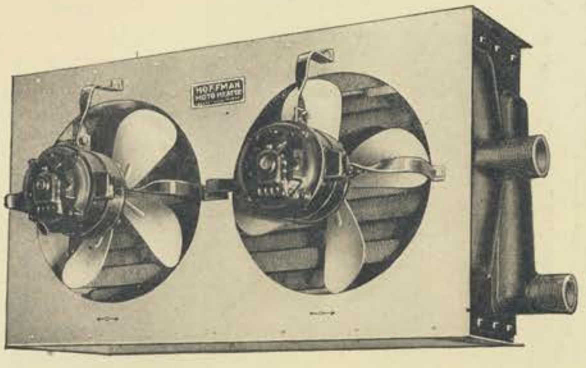
Thermostats—Same as Single Phase Equipment.

IMPORTANT

Motors, either manually or automatically controlled, must not be thrown directly across the line unless equipped with thermal protective devices. Fuses alone do not furnish sufficient protection. All starting switches, described above, have these protective devices. We assume no responsibility where motors are burned out and these protective devices are not used.



Nos. 6, 7 and 8 Moto-Heaters
Front view



Nos. 6, 7 and 8 Moto-Heaters
Rear view

HOFFMAN MOTO-HEATERS

Types and Sizes of Hoffman Moto-Heaters

Hoffman Moto-Heaters are manufactured in six sizes, as follows:

Heater No.	Tube position	Number tubes deep	Number fans
2	Vertical	2	1
4	Vertical	2	1
5	Vertical	2	1
6	Horizontal	2	2
7	Horizontal	3	2
8	Horizontal	4	2

Each size, except No. 2, may be obtained in three types: suspended, with horizontal outside air intake, and with floor mounted recirculating box. No. 2 is furnished in suspended type only. This range of sizes and types permits the selection of equipment for the requirements of each installation.

Coils are removable from end of casing without disturbing motor in Nos. 6, 7 and 8 Heaters. Duplex Heaters (Nos. 6, 7, 8) when equipped with double switches have variable heat output, 100% with both fans operating, 55% with one fan, 6% with no fans running.

Suspended Type

Suspended type heaters are available with or without louvres. Heaters Nos. 6, 7 and 8 may also be obtained with plate having two 45 degree outlets for 500 feet per minute velocity and 15 degree or 90 degree elbows added to outlet.

APPROXIMATE SHIPPING WEIGHTS

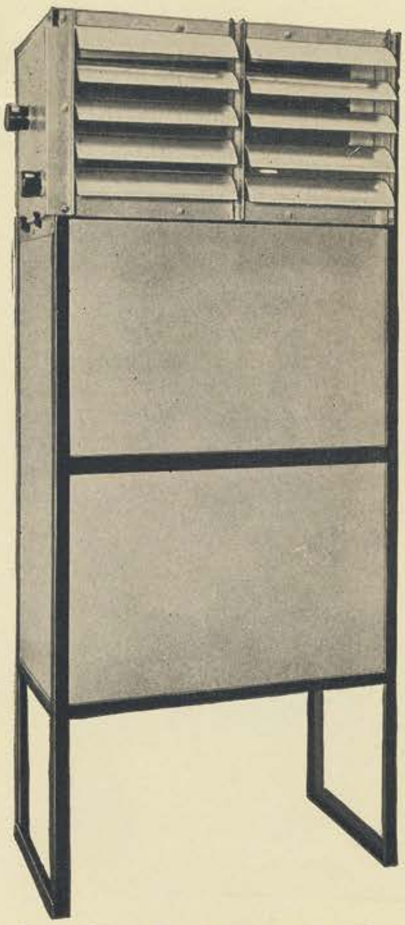
Size	2	4	5	6	7	8
Weight, lb.						
With louvres	105	170	200	430	450	470
Without louvres	80	135	150	360	380	400

Horizontal Outside Air Intake

All sizes, except No. 2, are available in horizontal outside air intake chamber with recirculating damper, either with or without louvres. A screen over outlet is ordinarily furnished as part of this equipment, but may be omitted if desired.

Approximate shipping weights for outside air intake with recirculating damper, louvres and screen are as follows:

Size	4	5	6	7	8
Weight, lb	200	200	300	300	300



Front View Nos. 6, 7, and 8 Floor Mounted Unit with Louvres

Floor Mounted Type

All sizes, except No. 2, are available with floor mounted recirculating box with motor inspection doors. This equipment may be purchased with or without louvres and outlet screen.

Approximate shipping weights of floor mounted recirculating boxes, complete with all equipment, are as follows:

Size	4	5	6	7	8
Weight, lb	300	300	450	450	450

Information for Ordering

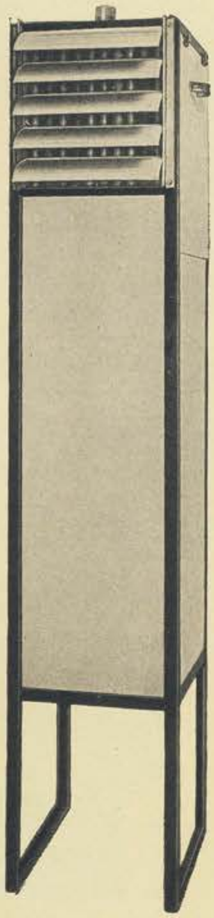
In ordering Hoffman Moto-Heaters the following information should be furnished:

1. Stock number of heater.
2. Whether furnished with louvres or without
3. Any additional equipment desired.
4. Type of electric current and motor speed.

It is necessary to specify the type of electric current to be used—whether one, two or three phase, number of cycles and number of volts if alternating current—or number of volts if direct current.

Where two or three phase current is supplied, single phase motors may be used in most cases by making proper connections. Single phase equipment is lower in price and can be obtained more promptly than polyphase. Consult electrical contractor before ordering.

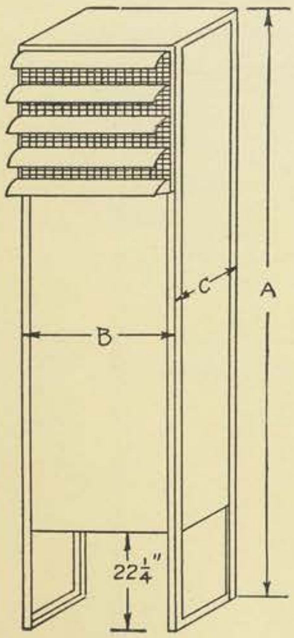
For very quiet operation, motors with a speed of 870 r.p.m. should always be selected. In factories where slight noise is not objectionable higher speeds are used.

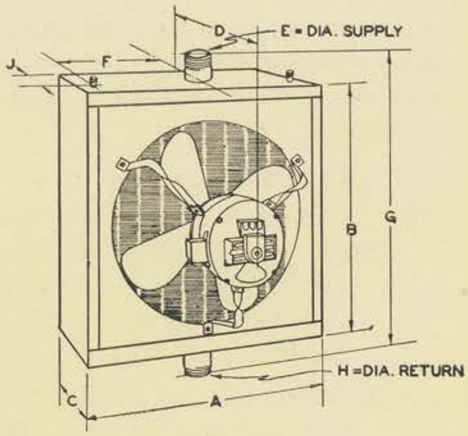


Front View Nos. 4 and 5 Floor Mounted Unit

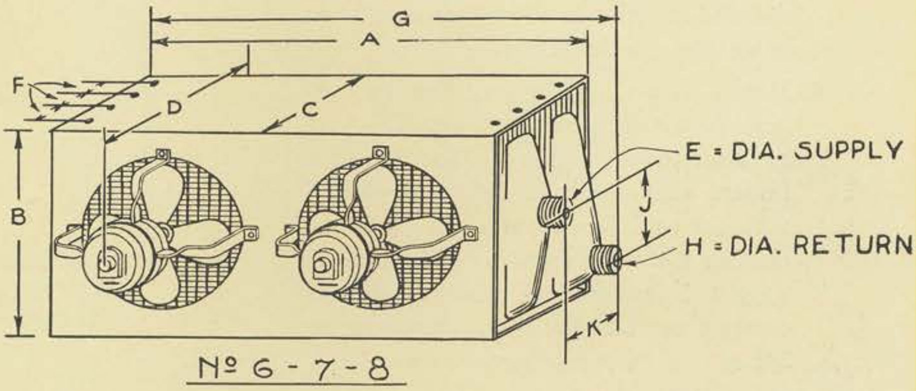
HOFFMAN MOTO-HEATERS

Dimension Diagrams





NO. 2-4-5



Nº 6-7-8

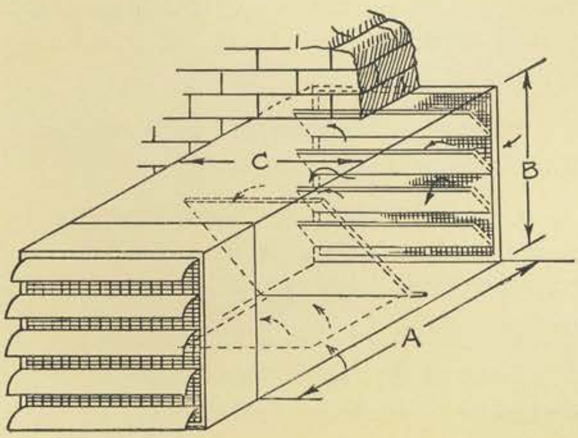
DIMENSIONS IN INCHES

Heater size	A	B	C
No. 4	102	20⅞	24
No. 5	102	20⅞	24
No. 6, 7, 8	102	42½	24

Pipe sizes same as suspended type.

DIMENSIONS IN INCHES

Heater size	A	B	C	D	E	F	G	H	J	K
No. 2	14⅝	15¾	6⅜	14⅛	1¼	5	19⅛	1¼	5	...
No. 4	19⅞	21⅜	6⅜	15⅛	2	8	25⅛	2	5	...
No. 5	19⅞	27⅜	6⅜	18⅛	2	8	31⅛	2	5¼	...
Nos. 6, 7, 8	41½	23	10	18¾	3	2½	45¼	3	15$\frac{1}{16}$	5¼



DIMENSIONS IN INCHES

Heater size	A	B	C	Wall opening
No. 4	43½	18⅝	17⅞	19⅝x18⅞
No. 5	43½	18⅝	17⅞	19⅝x18⅞
No. 6, 7, 8	45	19½	38½	20½x39½

Pipe sizes same as suspended type.

Selection and Installation of Hoffman Moto-Heaters

The method of locating Hoffman Moto-Heaters, of course, varies considerably according to the size and design of the building. In general, however, the following principles should be observed in installing heaters.

1. The units should be placed from forty to sixty feet apart.
2. For greatest efficiency, units should be located from 7 to 8 feet above the floor. They should never be installed at a height greater than 15 feet.
3. Where units are installed with back to a wall, a space of at least 3 feet should be left between the rear of the heater and the wall in order to allow free circulation of air through the heater.
4. Heater should be so placed that air currents do not oppose each other. This may be accomplished either by installing the heaters so that air is delivered parallel with the wall (see diagram 1) or by arranging the units opposite each other in staggered fashion and directing the air currents out into the room (see diagram 2).

Where conditions permit, it is better engineering practice to install the floor mounted units rather than the suspended type. As previously explained, the efficient heating of large area buildings involves not only distributing the heated air to the working zone but also removing the cold air from the floor.

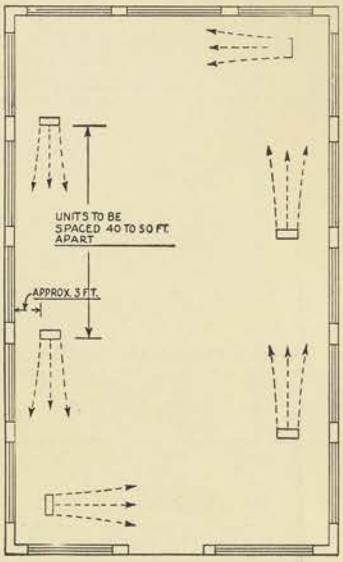


Diagram 1

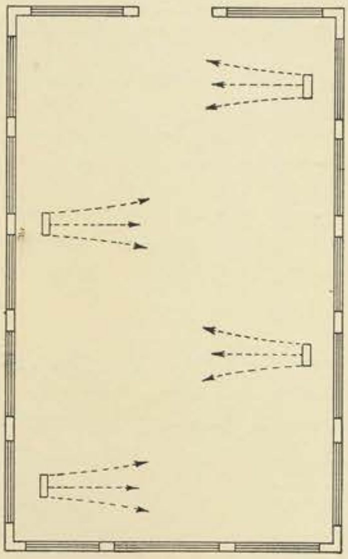


Diagram 2

This is better accomplished with the floor mounted unit as this style heater draws cold air directly from the floor and thus provides somewhat more rapid heating than the suspended type.

It is especially desirable to use the floor mounted units for large rooms, where two or more units are required. In smaller rooms the difference in heating efficiency is so slight that the choice between floor mounted and suspended heaters is chiefly one of ease of installation, appearance, etc.

If, however, floor mounted units are impractical, the units may be suspended.

Units with horizontal outside air intake should be selected in heating basements, laundries, etc. where ventilation as well as heating is required.

Some of the more common methods of installing Hoffman Moto-Heaters in various types

HOFFMAN MOTO-HEATERS

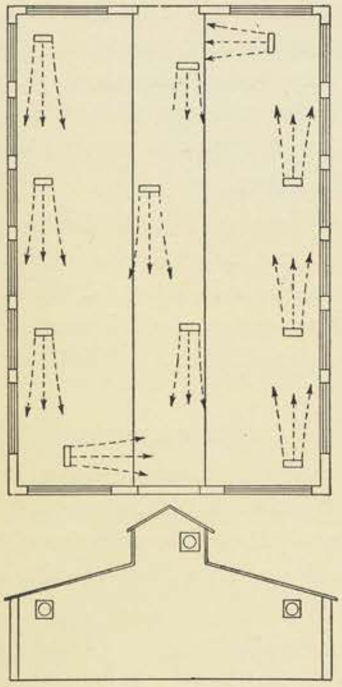


Diagram 3

of industrial and commercial buildings are as follows:

Factories and Industrial Plants

The temperature generally desired in such buildings is from 60°—65° F. The accompanying diagrams, Nos. 3 and 4 show typical layouts for various types of structures.

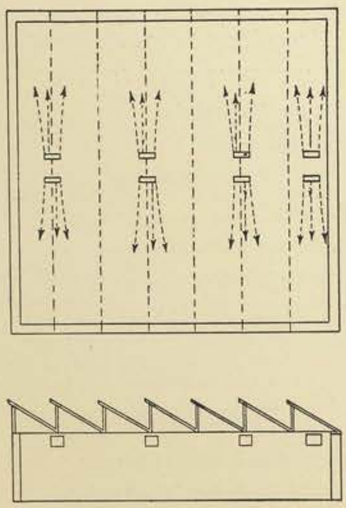


Diagram 4

Garages

For a storage garage a temperature of 45 degrees is usually adequate, while for a repair shop, a temperature of from 60 degrees to 65 degrees should be maintained. Allowance must be made for frequent air changes due to the opening of garage doors.

Diagram No. 5 shows a good layout for a typical combination display room and service station.

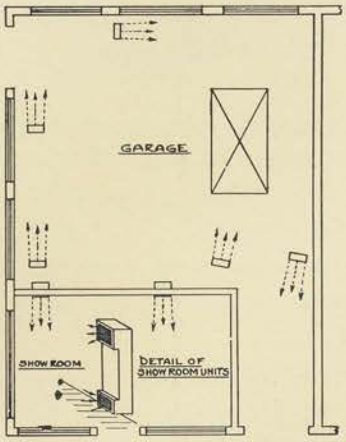


Diagram 5

Stores

Store temperatures should be figured at 65 degrees to 68 degrees. Many small stores where floor space is at a premium can be heated very efficiently by one Hoffman Moto-Heater, as shown by diagram No. 6. This method is well adapted

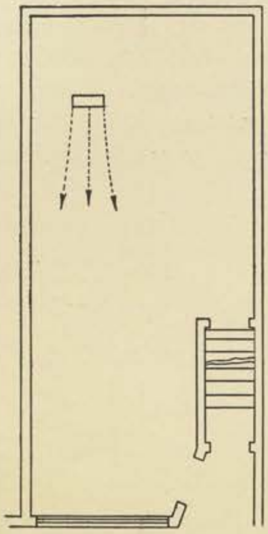


Diagram 6

HOFFMAN MOTO-HEATERS

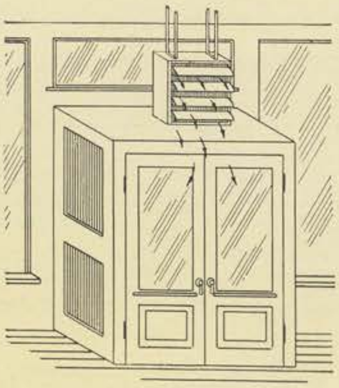


Diagram 7

for meat markets, groceries, etc. Not only does the Moto-Heater provide quick and abundant heat, but also generally prevents the collection of frost on the window.

This is an important advantage in motor car display rooms and other places having large display windows.

The doorways and entrances of stores, restaurants, etc. frequently present a difficult heating problem, which can be solved by installing a Moto-Heater directly over the entrance as shown by Diagram No. 7.

Laundries, Dye Houses, Paper Mills, Etc.

In such establishments and others where excessive moisture is present in the atmosphere, Hoffman Moto-Heaters with outside air intake and recirculating damper provide an ideal heating system. See Diagram No. 8. By thus bringing in fresh air from the outside, fog conditions and condensation are eliminated. Where air is heavily charged with moisture it is advisable to include an exhaust system in the installation.

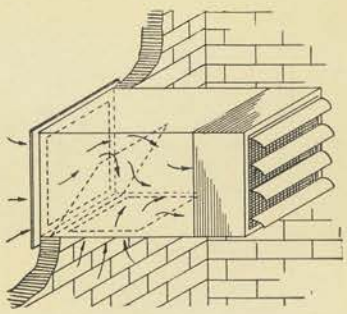


Diagram 8

An important point to bear in mind in installing all units with outside air intake is that provision must be made to guard against freezing by hanging the unit and pitching the pipe lines so that all condensation is properly drained from the coil and piping.

Heaters equipped with outside air intake boxes should not be used where the temperature of the entering air is below 32 degrees unless a constant steam pressure of 5 pounds or more is maintained at the heater.

Basements

There are many places where damp, unused basements can be converted into dry storage rooms or used for work shops or other purposes by installing Hoffman Moto-Heaters with outside air intake.

This method of heating provides fresh, dry air, properly tempered. It is usually best to install the heater opposite the stairway as shown in Diagram No. 8.

Warehouses

Warehouses are usually figured on the basis of a temperature of 50 degrees. Due allowance must be made for the heating up of the contents as well as the air.

The method of installing Hoffman Moto-Heaters in a typical warehouse is similar to Fig. 1 or 2.

Other Buildings

Some of the other types of buildings where Hoffman Moto-Heaters can advantageously be used, and the temperatures generally recommended, are as follows:

Schools

Classrooms ....68°
Gymnasiums ....55°—65°
Assembly rooms.............65°—68°
Locker rooms...............65°—68°
Swimming pools.............75°

Miscellaneous

Kitchens and laundries.......66°
Foundries and boiler shops...50°—60°
Paint shops................80°

How to Figure Size of Moto-Heaters

To determine the size of unit required to heat a given room or space, first estimate the—

Total square feet of glass area (including outside doors and skylights).

Total square feet net exposed wall area (including partitions exposed to a lower temperature than the desired room temperature).

Total square feet of net roof area.

Total square feet of exposed floor area.

(*Note:* Assume temperature of unheated rooms as half of difference between inside and outside temperatures. Floors of earth or concrete on earth, assume ground temperature as 50 degrees).

Multiply each area by its coefficient of heat transfer (see Hoffman Data Book or A.S.H. & V.E. Guide) times the difference between the desired room temperature and the outside temperature. The result will be the B.t.u. loss per hour through each material.

Example: 120 sq. ft. glass area × 1.1 (coefficient for single glass) × 70 (temperature difference between 60° inside and —10° outside) = 9240 B.t.u.'s loss per hour through the glass area.

Figure the loss through each surface in the same manner and the sum of these calculations equals the total B.t.u. loss per hour from the room by radiation.

If building is used for warehouse purposes, proper allowance must be made for heating the material stored. This is arrived at by multiplying the quantity of material in pounds by the specific heat of the material, times the temperature rise (usually assumed as one half the difference between the desired breathing line temperature and outside temperature).

Example: 30,000 lb. steel × .119 (specific heat of steel) × 35 (half of temperature difference between 60° and —10° = 124,950 B.t.u.'s required.

Due to the forced circulation of air within the room, which this method of heating employs, careful consideration must be given to air leakage through window and door crevices, or infiltration. Numerous tests show that the following coefficients added to the heat transfer coefficients, will provide for infiltration losses.

- 0.9 × sq. ft.—Window glass area
- 3.0 × sq. ft.—Factory door area
- 10.0 × sq. ft.—Garage and shipping room door area
- 15.0 × sq. ft.—Ramp garage door area
- 0.5 × sq. ft.—Monitor or saw-tooth glass and skylight area

Multiply the total square feet of each type of surface covered in the above table by its coefficient, times the temperature difference equals the B.t.u. loss per hour by infiltration which should be added to the radiation losses.

Example: 90 sq. ft. window glass area × .9 × 70 = 5670 B.t.u.'s.

30 sq. ft. factory door area × 3 × 70 = 6300 B.tu.'s, etc.

To conform with the requirements of the Industrial Unit Heater Manufacturers Association it is necessary that the infiltration loss equal a minimum of ½ air change per hour. Therefore, the total calculated infiltration loss in B.t.u.'s must equal or exceed the result of the following computation.

Cubical contents of room × temperature difference between inside and outside × 0.5 ÷ 55.2.

As a maximum condition, the infiltration loss should not exceed 1½ air changes per hour for normal factory buildings of masonry construction; 2½ air changes per hour for shipping rooms and single story garages nor 3 air changes per hour for first floor of ramp garages.

In corrugated iron or poorly constructed frame buildings, when leakage is naturally great, the air change method should be used for computing infiltration loss, using 1½ air changes per hour as a minimum.

The sum of the B.t.u.'s for radiation losses plus infiltration losses plus heating material stored, will equal the total B.t.u. load.

As a safety factor it is customary to add 10 per cent to the above total B.t.u. load to cover incomplete building plans, possible errors when assumptions must be made as to the kind and thickness of building and roof materials and any fluctuation of steam pressure at the heater.

In selecting the proper unit to supply the required number of B.t.u.'s, consideration must be given to

(1) Normal steam pressure
(2) Temperature of air entering heater
(3) Allowable fan speed

Condition No. 1 refers to the pressure available at the heater, which is the boiler pressure less the line loss or pressure drop between the boiler and heater.

Condition No. 2, the temperature of the air entering the heater is dependent upon the height of the heater above the breathing line or 5-foot level. Each foot of elevation between the breathing line and center line of heater times 1½, plus the figured room or breathing line temperature, equals the intake air temperature on which the heater output must be figured.

Condition No. 3 refers to noise of operation due to velocity of air passing through heating element. For industrial plants, garages, repair shops, etc., where noise is present, the 1750 r.p.m. unit is usually used. For semi-industrial applications such as factory offices, public waiting rooms, etc., the unit operating at 1160 r.p.m. is recommended. For churches, auditoriums, etc., where extreme quiet is required, the 870 r.p.m. unit should always be used.

HOFFMAN MOTO-HEATERS

Rated Capacities of Hoffman Moto-Heaters

The following tables show the rated capacities of each of the six sizes of Hoffman Moto-Heaters at the three most common steam pressures: 4 ounces per square inch, 2 pounds per square inch and 5 pounds per square inch. For other pressures use coefficients given in table, page 57.

The capacity tables give the heat output, B.t.u.'s per hour, and the condensation in pounds per hour.

The first step in applying the tables is to ascertain the required air temperature at entrance of heater and steam pressure at heater.

Room temperature is customarily figured in terms of temperature at the breathing line—5 feet above the floor. Inasmuch as the Capacity Tables show "Entrance" temperature (the temperature at the heater), allowance must be made for the difference between the breathing line and the height at which the heater is located. With Hoffman Moto-Heaters, temperature will vary from 1 degree to 1½ degrees per foot of height, but allowing a factor of safety, figure on a basis of 1½ degrees.

To arrive at the pressure at the heater, determine the normal steam pressure at the boiler or source of supply from which deduct the line drop or loss in pressure due to friction, etc., in the piping between the heater and source of supply.

Let us assume that the room temperature desired is 60 degrees (at the breathing line). If the heater is located 12 feet above the floor, it is then 7 feet above the breathing line. Multiplying 7 feet by 1½ degrees, which equals 10½ degrees and adding this to 60 degrees, gives 70½ degrees, as the "Entrance" temperature necessary to provide a breathing line temperature of 60 degrees.

To complete the example, assume that the steam pressure is 2 pounds per square inch.

After locating the proper steam pressure, next find 70 degrees under "Air Temperature—Entrance" which is given in the first or left hand column of each table.

Then, reading from left to right, it will be seen that Moto-Heater No. 2, 1750 r.p.m. has a heat output of 37,100 B.t.u.'s per hour. The condensation is 38 pounds per hour, the temperature of air as it leaves the heater is 119 degrees, and dividing 37,100 by 240 the unit provides the equivalent of 154 square feet of cast iron radiation.

At 1160 r.p.m. the heat output is 27,200 B.t.u.'s per hour and is equivalent to 113 square feet of C.I. radiation.

The other sizes can be checked up in the same way. Thus, Moto-Heater No. 6, at 1750 r.p.m. has a heat output of 141,500 B.t.u.'s per hour and is equivalent to 590 square feet of C.I. radiation.

Equivalent direct radiation, which should be used in determining boiler capacity, can always be calculated by dividing the B.t.u. output per hour by 240, the number of B.t.u.'s given up in one hour per foot of C.I. direct radiation. For ordinary calculations the capacity of the heater with 2 pounds pressure and 60 degrees entering air temperature is the basis for calculating equivalent direct radiation. This method is recommended by The Industrial Unit Heater Manufacturers Association.

For figuring B.t.u. output for steam pressures and air temperatures other than those given in tables, use constants and method described on page 57.

RATED CAPACITIES MOTO-HEATER No. 2

Motor speed 1750 r.p.m. 60 cycle—700 cu. ft. air/min. entering heater motor 1/15 hp.				Motor speed 1450 r.p.m. 25 cycle—580 cu. ft. air/min. entering heater motor 1/20 hp.				Motor speed 1160 r.p.m. 60 cycle—465 cu. ft. air/min. entering heater motor 1/30 hp.				Motor speed 870 r.p.m. 60 cycle—350 cu. ft. air/min. entering heater motor 1/40 hp.			
Air temp. deg. Fahr. at heater — Entrance	Exit	Heat output B.t.u.'s per hour	Condensation lb. per hour	Air temp. deg. Fahr. at heater — Entrance	Exit	Heat output B.t.u.'s per hour	Condensation lb. per hour	Air temp. deg. Fahr. at heater — Entrance	Exit	Heat output B.t.u.'s per hour	Condensation lb. per hour	Air temp. deg. Fahr. at heater — Entrance	Exit	Heat output B.t.u.'s per hour	Condensation lb. per hour
Steam Pressure at Heater—4 Oz. Per Sq. In.															
40	95	44500	46	40	98	38600	40	40	101	32600	34	40	105	26300	28
50	102	41300	43	50	105	36000	37	50	108	30400	31	50	112	24400	25
60	109	38300	40	60	112	33300	34	60	115	28100	29	60	118	22600	23
70	116	35200	36	70	119	30700	32	70	121	25900	27	70	125	20800	21
80	123	32400	33	80	125	28100	29	80	128	23800	25	80	131	19100	20
Steam Pressure at Heater—2 Lb. Per Sq. In.															
40	97	46200	48	40	100	40200	42	40	103	33900	35	40	108	27400	29
50	105	43200	45	50	107	37500	39	50	110	31700	33	50	114	25400	26
60	112	40000	41	60	114	34800	36	60	117	29400	30	60	121	23600	24
70	119	37100	38	70	121	32200	33	70	124	27200	28	70	128	21900	23
80	126	34100	35	80	128	29700	31	80	130	25000	26	80	134	20100	21
Steam Pressure at Heater—5 Lb. Per Sq. In.															
0	71	62200	65	0	75	54000	56	0	79	45600	48	0	84	36800	38
40	100	48300	51	40	103	42000	44	40	106	35500	39	40	111	28600	30
50	107	45000	47	50	110	39200	41	50	113	33100	34	50	119	26600	28
60	114	42000	44	60	117	36600	38	60	120	30900	32	60	124	24800	26
70	121	39000	41	70	124	33900	35	70	127	28600	30	70	131	23000	24
80	128	36000	37	80	130	31200	33	80	133	26500	28	80	137	21100	22

Note: The equivalent of direct cast iron radiation is normally based on the heater output at 2 lb. steam pressure and 60° entering air temperature. To determine this for any special condition, divide the B.t.u. output by 240 or multiply the condensation per hour by 4.

HOFFMAN MOTO-HEATERS

RATED CAPACITIES MOTO-HEATER No. 4

Motor speed 1750 r.p.m. 60 cycle—1700 cu. ft. air/min. entering heater motor 1/6 hp.				Motor speed 1450 r.p.m. 25 cycle—1410 cu. ft. air/min. entering heater motor 1/8 hp.				Motor speed 1160 r.p.m. 60 cycle—1130 cu. ft. air/min. entering heater motor 1/8 hp.				Motor speed 870 r.p.m. 60 cycle—850 cu. ft. air/min. entering heater motor 1/10 hp.			
Air temp. deg. Fahr. at heater		Heat output B.t.u.'s per hour	Condensation lb. per hour	Air temp. deg. Fahr. at heater		Heat output B.t.u.'s per hour	Condensation lb. per hour	Air temp. deg. Fahr. at heater		Heat output B.t.u.'s per hour	Condensation lb. per hour	Air temp. deg. Fahr. at heater		Heat output B.t.u.'s per hour	Condensation lb. per hour
Entrance	Exit			Entrance	Exit			Entrance	Exit			Entrance	Exit		
Steam Pressure at Heater—4 Oz. Per Sq. In.															
40	93	102800	107	40	96	90000	94	40	99	77000	80	40	105	63500	66
50	100	95100	98	50	103	83800	86	50	106	71400	74	50	111	59000	61
60	107	88000	91	60	110	77500	80	60	114	66000	68	60	118	54500	56
70	114	81100	84	70	117	71400	74	70	120	60800	63	70	124	50200	52
80	121	74400	77	80	124	65500	68	80	126	55800	58	80	131	46000	47
Steam Pressure at Heater—2 Lb. Per Sq. In.															
40	95	106500	111	40	98	93500	98	40	102	80000	83	40	108	66000	69
50	102	99000	103	50	105	87200	90	50	108	74200	77	50	114	61400	64
60	109	92000	95	60	112	81000	84	60	115	69000	72	60	121	57000	59
70	116	85200	88	70	119	75000	78	70	122	63900	66	70	127	52800	55
80	123	78500	81	80	126	69000	72	80	129	58800	61	80	134	48600	50
Steam Pressure at Heater—5 Lb. Per Sq. In.															
0	68	143300	145	0	72	126000	131	0	76	107300	112	0	84	88800	92
40	97	111000	116	40	100	98000	102	40	104	83500	87	40	111	69000	72
50	104	103800	108	50	107	91200	95	50	111	77700	81	50	117	64200	67
60	111	96500	101	60	114	85000	89	60	118	72500	76	60	124	59900	62
70	118	89500	93	70	121	79000	83	70	125	67200	70	70	130	55500	58
80	126	82800	86	80	129	73000	76	80	132	62100	65	80	137	51400	54

RATED CAPACITIES MOTO-HEATER No. 5

Motor speed 1750 r.p.m. 60 cycle—1850 cu. ft. air/min. entering heater motor 1/6 hp.				Motor speed 1450 r.p.m. 25 cycle—1530 cu. ft. air/min. entering heater motor 1/8 hp.				Motor speed 1160 r.p.m. 60 cycle—1230 cu. ft. air/min. entering heater motor 1/8 hp.				Motor speed 870 r.p.m. 60 cycle—920 cu. ft. air/min. entering heater motor 1/10 hp.			
Air temp. deg. Fahr. at heater		Heat output B.t.u.'s per hour	Condensation lb. per hour	Air temp. deg. Fahr. at heater		Heat output B.t.u.'s per hour	Condensation lb. per hour	Air temp. deg. Fahr. at heater		Heat output B.t.u.'s per hour	Condensation lb. per hour	Air temp. deg. Fahr. at heater		Heat output B.t.u.'s per hour	Condensation lb. per hour
Entrance	Exit			Entrance	Exit			Entrance	Exit			Entrance	Exit		
Steam Pressure at Heater—4 Oz. Per Sq. In.															
40	98	122500	128	40	101	108000	113	40	106	93000	97	40	112	76200	80
50	105	113900	117	50	107	100200	103	50	112	86400	89	50	118	70900	73
60	111	105200	109	60	115	92800	96	60	119	79800	83	60	124	65500	68
70	118	97000	100	70	121	85500	88	70	125	73500	76	70	130	60300	62
80	125	89000	92	80	128	78400	81	80	131	67500	70	80	136	55400	57
Steam Pressure at Heater—2 Lb. Per Sq. In.															
40	100	127500	133	40	104	112100	117	40	108	96600	101	40	115	79200	83
50	107	118600	123	50	111	104500	108	50	115	90000	93	50	121	73800	76
60	114	110000	114	60	117	97000	100	60	121	83500	87	60	127	68500	71
70	121	102000	106	70	124	89900	93	70	128	77400	80	70	134	63500	66
80	128	93900	97	80	131	82700	86	80	134	71200	74	80	140	58500	61
Steam Pressure at Heater—5 Lb. Per Sq. In.															
0	74	171500	179	0	79	151200	158	0	85	130000	136	0	93	106500	111
40	103	133000	139	40	107	117200	122	40	111	101000	105	40	118	82800	86
50	109	124000	129	50	113	109200	114	50	118	94000	98	50	124	77100	80
60	116	115500	120	60	120	101800	106	60	124	87600	91	60	131	72000	75
70	123	107000	111	70	127	94400	98	70	131	81200	85	70	137	66600	69
80	130	99200	103	80	134	87400	91	80	137	75200	78	80	143	61700	64

Note: The equivalent of direct cast iron radiation is normally based on the heater output at 2 lb. steam pressure and 60° entering air temperature. To determine this for any special condition, divide the B.t.u. output by 240 or multiply the condensation per hour by 4.

HOFFMAN MOTO-HEATERS

RATED CAPACITIES MOTO-HEATER No. 6

Motor speed 1750 r.p.m. 60 cycle—3740 cu. ft. air/min. entering heater motor 1/3 hp.				Motor speed 1450 r.p.m. 25 cycle—3100 cu. ft. air/min. entering heater motor 1/4 hp.				Motor speed 1160 r.p.m. 60 cycle—2480 cu. ft. air/min. entering heater motor 1/4 hp.				Motor speed 870 r.p.m. 60 cycle—1860 cu. ft. air/min. entering heater motor 1/5 hp.			
Air temp. deg. Fahr. at heater		Heat output B.t.u.'s per hour	Con-densa-tion lb. per hour	Air temp. deg. Fahr. at heater		Heat output B.t.u.'s per hour	Con-densa-tion lb. per hour	Air temp. deg. Fahr. at heater		Heat output B.t.u.'s per hour	Con-densa-tion lb. per hour	Air temp. deg. Fahr. at heater		Heat output B.t.u.'s per hour	Con-densa-tion lb. per hour
En-trance	Exit			En-trance	Exit			En-trance	Exit			En-trance	Exit		
Steam Pressure at Heater—4 Oz. Per Sq. In.															
40	79	169400	175	40	82	149000	153	40	85	127700	132	40	89	105500	109
50	87	158300	163	50	90	139300	144	50	93	119000	123	50	97	98000	101
60	95	146200	151	60	97	128700	133	60	100	110000	113	60	104	905000	93
70	103	134800	139	70	106	118500	122	70	108	101200	104	70	111	83500	86
80	111	123900	128	80	113	108800	112	80	115	93100	96	80	118	75800	78
Steam Pressure at Heater—2 Lb. Per Sq. In.															
40	81	176500	182	40	83	155000	160	40	87	133000	137	40	91	110000	114
50	89	165000	170	50	91	144500	149	50	94	124000	128	50	99	102500	106
60	97	153000	158	60	99	134500	139	60	102	115000	119	60	106	95300	99
70	105	141500	146	70	107	124500	128	70	110	106500	110	70	114	88200	91
80	113	130000	134	80	115	114500	118	80	117	98400	102	80	121	81200	84
Steam Pressure at Heater—5 Lb. Per Sq. In.															
0	51	237000	247	0	54	208000	216	0	58	178500	186	0	63	147500	154
40	83	184000	192	40	85	162000	169	40	89	139000	145	40	94	115000	120
50	91	172000	179	50	93	151000	157	50	96	130000	135	50	101	107000	111
60	99	160500	167	60	101	141000	147	60	104	121000	126	60	108	100000	104
70	107	149000	155	70	109	130500	136	70	112	112000	117	70	116	92600	96
80	115	138000	144	80	117	121000	126	80	119	104000	108	80	123	85800	89

RATED CAPACITIES MOTO-HEATER No. 7

Motor speed 1750 r.p.m. 60 cycle—3490 cu. ft. air/min. entering heater motor 1/3 hp.				Motor speed 1450 r.p.m. 25 cycle—2890 cu. ft. air/min. entering heater motor 1/4 hp.				Motor speed 1160 r.p.m. 60 cycle—2320 cu. ft. air/min. entering heater motor 1/4 hp.				Motor speed 870 r.p.m. 60 cycle—1740 cu. ft. air/min. entering heater motor 1/5 hp.			
Air temp. deg. Fahr. at heater		Heat output B.t.u.'s per hour	Con-densa-tion lb. per hour	Air temp. deg. Fahr. at heater		Heat output B.t.u.'s per hour	Con-densa-tion lb. per hour	Air temp. deg. Fahr. at heater		Heat output B.t.u.'s per hour	Con-densa-tion lb. per hour	Air temp. deg. Fahr. at heater		Heat output B.t.u.'s per hour	Con-densa-tion lb. per hour
En-trance	Exit			En-trance	Exit			En-trance	Exit			En-trance	Exit		
Steam Pressure at Heater—4 Oz. Per Sq. In.															
40	94	218800	226	40	98	192000	198	40	102	166000	171	40	108	137200	142
50	102	204000	210	50	105	180000	186	50	108	155300	160	50	115	127500	132
60	109	188300	194	60	112	166300	172	60	116	143400	148	60	121	118000	122
70	116	173500	179	70	119	153300	158	70	122	132100	136	70	128	109000	112
80	123	159500	165	80	126	141100	146	80	129	121400	125	80	133	98800	102
Steam Pressure at Heater—2 Lb. Per Sq. In.															
40	97	228000	236	40	100	200500	207	40	105	173000	179	40	111	143000	148
50	104	212500	220	50	107	187000	193	50	112	161500	167	50	118	133500	138
60	111	197000	203	60	114	174000	180	60	118	150000	155	60	124	124000	128
70	118	182500	189	70	121	161000	166	70	125	139000	144	70	131	114500	118
80	125	168000	174	80	128	148000	153	80	132	128000	132	80	137	103500	109
Steam Pressure at Heater—5 Lb. Per Sq. In.															
0	70	306000	318	0	74	269000	280	0	80	232500	242	0	88	192000	200
40	99	238000	248	40	103	209500	218	40	108	181000	188	40	114	149000	155
50	106	222000	231	50	110	195500	204	50	115	169000	176	50	121	139500	145
60	114	207000	215	60	117	182500	190	60	121	157500	164	60	127	130000	135
70	121	192000	200	70	124	169000	176	70	128	146000	152	70	134	120500	125
80	128	177500	185	80	131	156500	163	80	135	135000	141	80	140	111500	116

Heat output of Moto-Heaters Nos. 6 and 7 when equipped with double switches may be varied; 100% of B.t.u. output with both fans operating, 55% with one fan and 6% with no fan running.

Above capacities are in accordance with rules for rating and testing unit heaters as adopted by Industrial Unit Heater Mfrs. Association.

Note: The equivalent of direct cast iron radiation is normally based on the heater output at 2 lb. steam pressure and 60° entering air temperature. To determine this for any special condition, divide the B.t.u. output by 240 or multiply the condensation per hour by 4.

HOFFMAN MOTO-HEATERS

RATED CAPACITIES MOTO-HEATER No. 8

Motor speed 1750 r.p.m. 60 cycle—3240 cu. ft. air/min. entering heater motor 1/3 hp.				Motor speed 1450 r.p.m. 25 cycle—2680 cu. ft. air/min. entering heater motor 1/4 hp.				Motor speed 1160 r.p.m. 60 cycle—2150 cu. ft. air/min. entering heater motor 1/4 hp.				Motor speed 870 r.p.m. 60 cycle—1610 cu. ft. air/min. entering heater motor 1/5 hp.			
Air temp. deg. Fahr. at heater		Heat output B.t.u.'s per hour	Con-densa-tion lb. per hour	Air temp. deg. Fahr. at heater		Heat output B.t.u.'s per hour	Con-densa-tion lb. per hour	Air temp. deg. Fahr. at heater		Heat output B.t.u.'s per hour	Con-densa-tion lb. per hour	Air temp. deg. Fahr. at heater		Heat output B.t.u.'s per hour	Con-densa-tion lb. per hour
En-trance	Exit			En-trance	Exit			En-trance	Exit			En-trance	Exit		
Steam Pressure at Heater—4 Oz. Per Sq. In.															
40	111	262000	270	40	114	228800	236	40	119	196500	203	40	127	161000	166
50	117	244300	252	50	121	214200	221	50	125	183200	189	50	132	149500	154
60	123	225500	233	60	127	198000	204	60	131	169200	175	60	137	138000	143
70	129	208000	215	70	133	182500	188	70	137	156000	161	70	143	127500	132
80	135	191000	196	80	139	167700	173	80	142	143300	148	80	147	116000	120
Steam Pressure at Heater—2 Lb. Per Sq. In.															
40	113	273000	282	40	117	238500	246	40	123	204500	211	40	131	168000	174
50	120	254500	263	50	124	223000	240	50	129	191000	197	50	136	156500	162
60	126	236000	244	60	130	207000	214	60	134	177000	183	60	142	145500	150
70	132	218500	226	70	136	191500	198	70	140	164000	169	70	147	134500	139
80	138	201500	208	80	142	176000	182	80	146	151000	156	80	152	124000	128
Steam Pressure at Heater—5 Lb. Per Sq. In.															
0	90	366000	381	0	95	320000	333	0	102	274500	286	0	112	225000	234
40	116	285000	296	40	121	249000	259	40	126	213500	222	40	134	175000	182
50	123	266000	277	50	127	232500	242	50	132	199500	208	50	140	163500	170
60	129	248000	258	60	133	217000	226	60	138	186000	194	60	146	152500	159
70	135	230000	239	70	139	201000	209	70	144	172500	180	70	151	141500	147
80	142	213000	222	80	145	186000	193	80	150	159500	166	80	156	131000	136

Heat output of Moto-Heater No. 8 when equipped with double switches may be varied; 100% of B.t.u. output with both fans operating, 55% with one fan and 6% with no fan running.

Above capacities are in accordance with rules for rating and testing unit heaters as adopted by Industrial Unit Heater Mfrs. Association.

Note: The equivalent of direct cast iron radiation is normally based on the heater output at 2 lb. steam pressure and 60° entering air temperature. To determine this for any special condition, divide the B.t.u. output by 240 or multiply the condensation per hour by 4.

Suggested Specifications for Hoffman Moto-Heaters

Suspended Type

Furnish and install where indicated on plans or as hereinafter specified, Hoffman Moto-Heaters of the suspended type, complete with louvres, having a total output of....B.t.u. with.... units. Heaters to be equipped with copper tubing brazed into welded steel header. Fins to be smooth 1½ inches outside diameter imbedded in the tubing. Complete unit to be tested to 1,000 pounds hydrostatic pressure and suitable for steam pressures up to 200 pounds.

Motors shall operate at a speed of.... r.p.m. with....phase....cycle....volt alternating current. (Where direct current is used specify voltage only.)

Starting equipment shall consist of (see note below).

Floor Mounted Recirculating Type

Furnish and install where indicated on plans or as hereinafter specified, Hoffman Moto-Heaters of the floor mounted type, complete with recirculating boxes, motor inspection doors and louvres, having a total output of....B.t.u. with....units. Heaters to be equipped with copper tubing brazed into welded steel header. Fins to be smooth 1½-inch outside diameter imbedded in the tubing. Complete unit to be tested to 1000 pounds hydrostatic pressure and suitable for steam pressures up to 200 pounds.

Motors shall operate at a speed of....r.p.m. with....phase....cycle....volts alternating current. (Specify voltage only for direct current.)

Starting equipment shall consist of (see note below).

Horizontal Outside Air Intake Type

Furnish and install where indicated on plans or as hereinafter specified, Hoffman Moto-Heaters equipped with horizontal outside air intake boxes, complete with recirculating dampers, screens and louvres, having a total output of....B.t.u. with ....units. Heaters to be equipped with copper tubing brazed into welded steel header. Fins to be smooth 1½-inch outside dimension imbedded in the tubing. Complete unit to be tested to 1000 pounds hydrostatic pressure and suitable for steam pressures up to 200 pounds.

Motors shall operate at a speed of....r.p.m. with.....phase.....cycle.....volts alternating current. (Specify voltage only for direct current.)

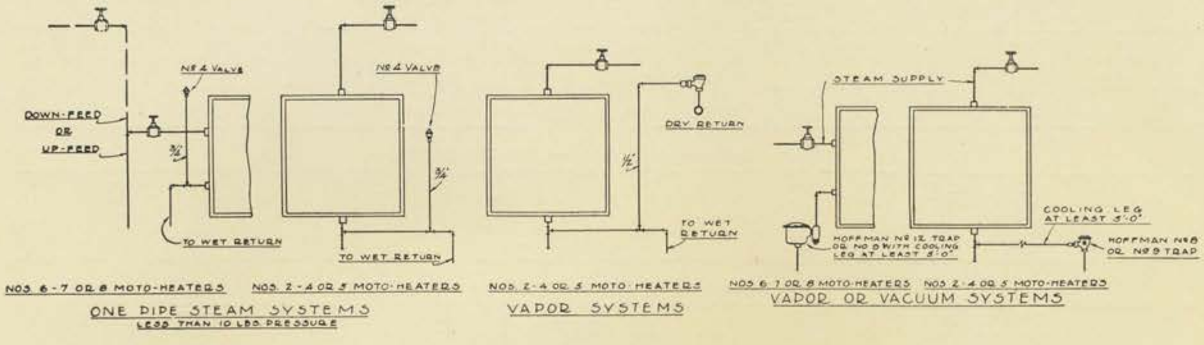
Starting equipment shall consist of (see note below).

SPECIAL NOTE

For starting equipment, switches, automatic control, etc. for all types of heaters, see description on page 45.

HOFFMAN MOTO-HEATERS

Suggested Methods of Installation and Suspension



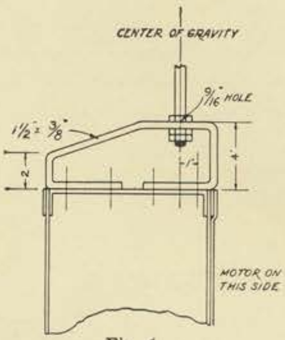


Fig. 1
Using Formed Bar Stock

Hoffman Moto-Heaters Nos. 2, 4 and 5

Moto-Heaters Nos. 2, 4 and 5 are furnished with ½-in. bolt ends at center of gravity, suitable for attaching rods, lag screws or other desired method of suspension.

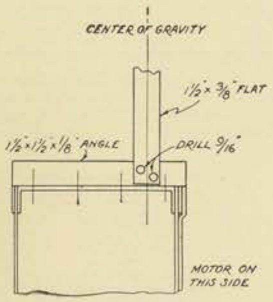


Fig. 3
Using Angle Iron

Hoffman Moto-Heaters Nos. 6, 7 and 8

In suspending heaters Nos. 6, 7 and 8, all four bolt holes at each end of unit must be used.

Where it is permissible to make two connections to the ceiling or beam at each end of unit—method suggested in Fig. No. 4 may be used. Figs. No. 1, 2 and 3 suggest methods where but one connection at each end of unit is desired.

Note: In each case center of gravity is located at a point 1 inch from rear bolt hole—away from motor.

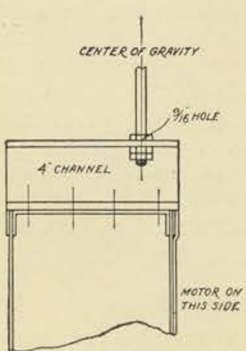


Fig. 2
Using Channel Iron

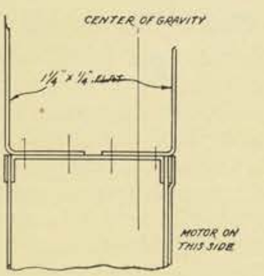


Fig. 4
Using Flat Stock

Method of Determining Heater Output at Other Steam Pressures

To find the output of any heater at a steam pressure or entering air temperature other than shown in the Capacity Tables, multiply the capacity of the heater at 0 degrees entering air temperature and 5 pounds steam pressure by the factors shown in the following table:

B.t.u. Constants for Blow-Thru Units
For use with Hoffman Moto-Heaters having constant volume of air at entering temperature

Steam pressure lbs. per square inch	Temperature of entering air																							
	−10°	0°	10°	20°	30°	40°	45°	50°	55°	60°	65°	70°	75°	80°	85°	90°	100°	110°	120°	130°	140°	150°	175°	200°
0	.993	.935	.878	.817	.762	.715	.687	.664	.635	.614	.590	.566	.542	.514	.492	.473	.429	.384	.342	.298	.262	.223	.131	.042
2	1.03	.965	.908	.851	.796	.743	.716	.692	.677	.640	.617	.592	.568	.546	.518	.499	.455	.410	.367	.323	.286	.248	.154	.065
5	1.06	1.00	.942	.885	.829	.776	.748	.724	.699	.672	.648	.624	.600	.576	.550	.530	.485	.440	.397	.356	.315	.276	.182	.092
10	1.12	1.06	.997	.938	.882	.828	.804	.780	.751	.727	.699	.678	.649	.625	.602	.578	.533	.491	.448	.401	.360	.321	.229	.134
15	1.17	1.10	1.05	.978	.924	.870	.846	.817	.792	.768	.740	.719	.690	.665	.637	.617	.572	.525	.485	.439	.397	.357	.261	.169
20	1.21	1.14	1.09	1.02	.962	.907	.884	.854	.828	.800	.776	.756	.726	.701	.673	.653	.606	.559	.519	.472	.430	.390	.293	.200
30	1.27	1.21	1.15	1.08	1.02	.970	.944	.915	.888	.865	.835	.813	.783	.757	.734	.709	.663	.615	.574	.526	.483	.442	.344	.250
40	1.33	1.26	1.20	1.14	1.08	1.02	1.00	.965	.938	.915	.889	.864	.837	.807	.783	.762	.715	.666	.620	.571	.532	.492	.392	.296
50	1.38	1.31	1.25	1.18	1.12	1.07	1.04	1.01	.986	.961	.936	.905	.887	.847	.827	.802	.754	.709	.663	.613	.569	.528	.427	.330
60	1.42	1.35	1.29	1.22	1.16	1.11	1.08	1.05	1.02	.998	.972	.941	.913	.886	.862	.836	.788	.744	.696	.645	.601	.560	.458	.361
80	1.49	1.43	1.36	1.30	1.24	1.18	1.15	1.12	1.08	1.06	1.03	1.01	.986	.949	.923	.903	.854	.808	.760	.708	.662	.621	.518	.418
100	1.56	1.49	1.43	1.35	1.30	1.23	1.21	1.18	1.15	1.12	1.09	1.07	1.04	1.01	.977	.955	.910	.855	.810	.762	.716	.674	.569	.468
125	1.63	1.55	1.49	1.42	1.35	1.30	1.27	1.23	1.21	1.18	1.15	1.13	1.09	1.06	1.04	1.02	.962	.915	.870	.815	.768	.727	.621	.518
135	1.65	1.58	1.51	1.44	1.37	1.32	1.29	1.26	1.22	1.20	1.17	1.15	1.12	1.08	1.06	1.03	.988	.931	.887	.828	.785	.743	.637	.533
140	1.66	1.59	1.53	1.45	1.39	1.33	1.30	1.27	1.24	1.22	1.18	1.16	1.13	1.10	1.07	1.04	.997	.949	.896	.845	.797	.755	.648	.545
150	1.69	1.61	1.55	1.47	1.41	1.35	1.32	1.29	1.26	1.24	1.21	1.18	1.15	1.12	1.09	1.06	1.01	.966	.904	.860	.814	.772	.664	.560
175	1.74	1.66	1.60	1.52	1.46	1.40	1.37	1.34	1.31	1.28	1.25	1.23	1.19	1.16	1.13	1.11	1.06	1.01	.955	.904	.860	.812	.704	.598
200	1.78	1.71	1.64	1.57	1.51	1.44	1.41	1.38	1.35	1.32	1.29	1.27	1.24	1.20	1.18	1.15	1.10	1.04	.995	.945	.892	.852	.743	.637

For pressures less than 2 lbs. always use coefficient for 0 pressure.

Example: To find the output of Heater No. 4, 1750 r.p.m. motor, at 20 lb. steam pressure—65° entering air temperature.

143,300 (output 0° air — 5 lb. pressure) × .776 (factor for 65° air — 20 lb. pressure) = 111,200 B.t.u. per hr.

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