MODERN PRACTICE IN VAPOR HEATING

EDITOR'S NOTE: *For the purpose of this series of articles, a vapor, vacuum, vapor-vacuum, vacuum-vapor, atmospheric, modulated or thermograde system of heating will be considered as any system in which the steam pressure ordinarily carried is practically at atmosphere or slightly below or in which the returns are open to the atmosphere and where no pump or other positive mechanical device is employed to pull back the returns.*

XIII—THE SIMPLEX SYSTEM.

The distinguishing feature of the Simplex system is the use of the Wiley "safety-vent" vapor regulator, for regulating the boiler draft and controlling the vent outlet. Regulation and control are accomplished in a way that prevents damage to the boiler through the discharge of water through the vent opening in case of an accidental rise in pressure beyond the ordinary safe limits.

With this equipment boilers are fitted with regular low-pressure safety valves, as for ordinary steam heating work. If the pressure should rise through careless handling, the heat ordinarily lost through special low-pressure safety valves is stored up in the form of pressure and is given out again as the fire dies down and the pressure is lowered to the normal working range. The loss of water, in the form of vapor, through special low-pressure safety valves usually employed in vapor heating systems, is also prevented. Considerable stress is laid on this point by the manufacturers, as it is well-known that the discharge of steam through a safety valve at a few ounces pressure often lowers the water in the boilers to the danger point.

Other features of the Simplex system are the Wiley calibrating radiator valves and water-seal traps.

As these are all the specialties used with the system special importance attaches to the "safety-vent" vapor regulator. This device consists of a semi-circular cast-iron float chamber, with outlets at top and bottom for connecting into the vertical return pipe at one side of the boiler, as shown in Fig. 1. The casing is also threaded to receive the bronze float stem bonnet and stuffing box, as well as the bronze vent valve casing at the top.

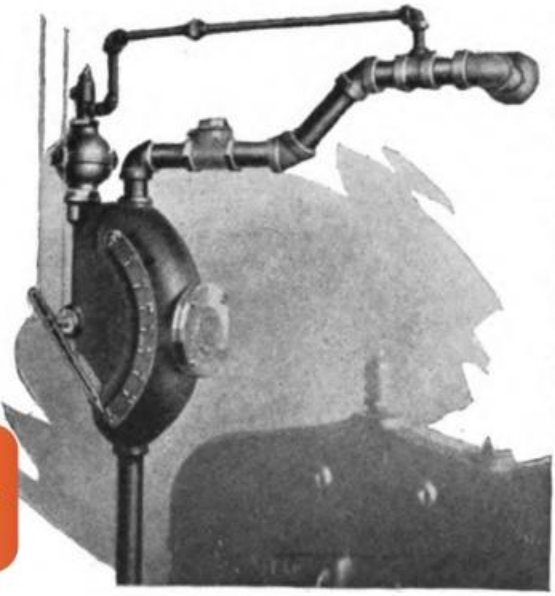
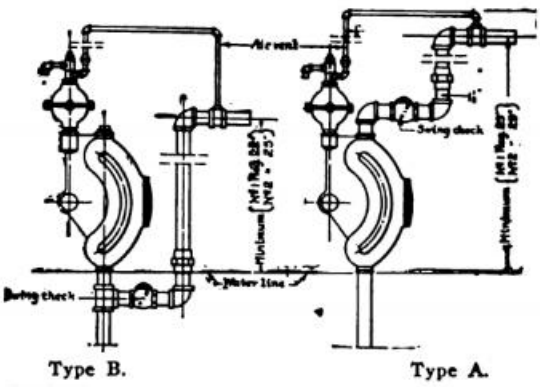


FIG. 1—SIMPLEX REGULATOR, WITH TYPE A RETURN PIPE CONNECTION.



Type B. Type A.

FIG. 2—METHODS OF CONNECTING SIMPLEX REGULATOR.

Type B for air return mains over 2½ in. or those limited to less than 25 in. above water line. Type A standard connection up to 2½ in. air return main, with 25 in. or more elevation above water line.

Inside of the float chamber is a copper float attached to a float arm carried by a float spindle extending through the bonnet and stuffing box. The float spindle carries a combination pointer and damper-operating lever. It will be noticed that this lever has a series of holes in it, so that it can be adjusted for any desired movement of the dampers.

The safety-vent regulator is equipped with an independent float-actuated safety-vent valve through which the air is discharged from the heating system It is mounted, with its spherical float chamber, directly on top of the regulator casing.

The float is designed to positively close the valve outlet in case of any accidental rise in pressure. Care should be taken to place the regulator above the water-line in the boiler.

In operation the air and condensation from the heating system passes through the float chamber on its way to the boiler, the air passing out through the vent valve on top of the casing while the water descends to the boiler by gravity.

The generation of steam in the boiler

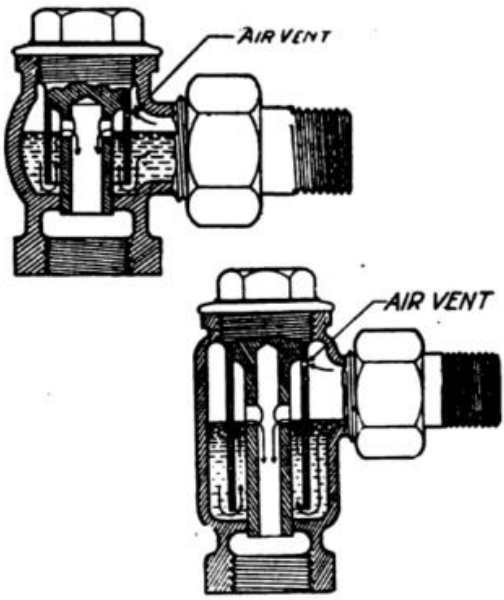


FIG. 3—WATER SEAL RADIATOR TRAPS USED WITH SIMPLEX SYSTEM.

Type A used when radiator connections are taken off above floors.

produces a downward pressure on the surface of the water, forcing it up into the float chamber. This action carries the float upward and also moves the damper operating lever and pointer, incidentally indicating the pressure in ounces on the graduated scale on the side of the float chamber, while operating the dampers by means of flexible cables.

The manipulation of the dampers retards the rate of combustion and controls the generation of steam, so as to hold it within the desired operating range of a few ounces.

In addition to the provision in the safety-vent valve for the closing of the vent opening in case of an accidental rise in pressure and consequent elevation of water beyond the range of the float chamber, the return line is provided with a swing check valve located just above the regulator, to prevent the water from being forced into the return line during such rise in pressure. It will be noticed that the check valve is provided with a by-pass pipe connected into the safety-vent valve. This is to provide for a free passage for the outgoing air during the normal operation of the apparatus, without overcoming the resistance of the check valve in the return line.

The construction of the water-seal vapor traps and of the Wiley calibrating radiator valves may be seeen from Fig. 3. The radiator valves are sent out with adjusting spindles screwed down to the finest adjustment suitable for radiators up to 15 sq. ft. For larger radiators adjustments are made by turning the spindles to the left. One complete turn to left adapts the valve for a 15 to 20 sq. ft. radiator, and so on, running up to 100 to 150 sq. ft. radiator, which takes seven complete turns to the left. This applies for pressure up to 6 oz.

SPECIFICATION DATA.

The directions and specification data issued by the company, offer some good suggestions. The boiler, of course, should have a steam rating from 25% to 30% greater than the total net vapor radiation to be served. For ordinary residence work, boiler-rooms should have a pitch of about 8 ft. in the clear below the floor joists, measuring from the bottom of girders or beams. Some boilers with low water-lines can be installed in small residences with less than 8 ft. in many cases but the importance of good head room under the pipes, as well as a good working margin for the return of the condensation, is well emphasized.

As has been brought out in previous articles in this series, the terminals of the steam mains and the return lines coming back to the boiler must have an elevation of not less than 30 in. above the water-line in residences and small buildings, and 36 in. to 48 in. in larger buildings.

The company's recommendations for flue sizes are 7 in. x 11. in. inside for small residences, and 11 in. x 11 in. inside for average residences up to 1500 sq. ft. of radiation, based on a height of about 40 ft. For larger buildings the flues should have an area of not less than 112 sq. in. for each 1,000 sq. ft. of radiation, based on a height of 40 ft. and the sizes can be reduced about 6% for each additional 10 ft. in height up to 100 ft.

Under "radiators," the suggestions are that they be of the water type, connected both top and bottom and tapped for steam valves at top and returns at bottom on

opposite ends, all steam tappings to be ¾-in.

The steam mains and supply risers in small or moderate-sized plants should have an area of not less than 0.78 sq. in. for each 100 sq. ft. of radiation supplied, and mains should have a grade of not less than ½-in. in 10 ft. in the direction that steam flows. The sizes of mains, of course, can be reduced in large plants with comparative short runs and the risers can be reduced in the larger sizes under average conditions.

It is recommended that return mains should not be less than 1 in. in diameter at any point and should gradually be increased to 1½ in. for plants up to 1,500 sq. ft. of radiation, 2 in. for plants from 1,500 to 2,500 sq. ft., 2½ in. for plants from 2,500 to 3,500 sq. ft., etc.

For the top-floor radiators, ¾-in. steam risers are recommended for radiators under 40 sq. ft., 1 in. for radiators from 40 to 100 sq. ft., and 1¼ in. for single radiators above this size; riser connections with mains to be one size larger than risers. All horizontal steam connection from risers or mains to radiators should be ¾ in. up to 60 sq. ft., 1 in. from 60 to 100 sq. ft. and 1¼ in. above this size. All vertical steam connections for radiators up to 150 sq. ft. should be ¾ in. from floors up to radiator valves.

Return connections should be ½ in. from traps through the floors and ¾ in. horizontal back to risers or return mains, for radiators up to 150 sq. ft. All return risers should be ¾ in. up to 300 sq. ft. of radiation and 1 in. above this amount.

The simplex system is manufactured by the Simplex Heating Specialty Co., Lynchburg, Va.