

a narrowed outlook and a shallow sympathy. If he is influenced by lax moral codes of living, he stands before the world a failure; he is not the engineer

in truth, for he is not in touch with nature's great forces, and has not reached out to the wide fields of human service for which he was intended.

A New Principle in Vacuum Heating

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All readers of the Power Edition are probably conversant with the standard principle of maintaining a partial vacuum in the return line of a two-pipe steam heating system to secure a more free and complete circulation of steam in the system, and which also secures other advantages that cannot be secured with the gravity return system.

They are also aware that all such systems are installed along practically the same lines, by the different firms that are at present installing the two-pipe vacuum system, and as a result the only advantage one company may have over another in this line, is in case that one has a vacuum valve that is more economical or that will give less trouble than the others.

The point of economy in any vacuum valve, can only be from the fact that such valve will take care of the air and water of condensation from the radiator to which it is connected, with less waste of steam than the other valves offered.

The freedom from trouble in one make of vacuum valve, over another would be in case one valve was so constructed as to be less liable to clog or foul with scale or other foreign matter that is carried into the valve with the water.

The only improvements in vacuum steam heating systems, over the original Williams vacuum system which was brought out many years ago, have been along the two points above mentioned, "steam waste and trouble with valves," and as a result the only difference in the type of system is in the valves and a few minor details as to equipment.

On account of a recent radical change, involving a new principle in connection with the two-pipe vacuum system, and the desire of progressive architects, engineers and heating contractors to keep posted on improvements along this line, a brief review of the similarity of present vacuum systems has been given, as an introduction to a brief description of the improved system.

Any person that has operated the standard vacuum system has learned that it is necessary to use a condenser of some kind in the return line close to the vacuum pump (generally a jet or spray of cold water), in order to condense the steam that may leak through the vacuum valves, but in any case to condense the vapor that forms from the hot water of condensation when it is discharged into the lower pressure of the partial vacuum maintained in the return lines.

This re-evaporation from the condensation, is a factor of more importance than the heating engineer is aware of, and if the vapor from such is used, as it can be, in an independent unit of radia-

tion in the rooms to be heated, it greatly increases the steam economy of the system, over the former plan of destroying such vapor by a jet of cold water at the vacuum pump for the sake of maintaining the vacuum in the return line. Also insures the discharge of water from the vacuum pump, which is later put back in the boiler, not being over-cooled, as is usual when an attendant does not want to be troubled with adjusting the amount of injection water admitted to the condenser, and, naturally admits more than is really necessary, which reduces the temperature of the feed water to boiler (in an independent heating plant), and necessitates a waste of the additional water as it cannot all be used in the boiler.

In order to overcome this waste of heat units, a patented method embracing this new principle has been brought out along the vacuum line of heating, and to distinguish it from the former vacuum plan of heating has been termed the Compound System of Vacuum Heating, as it follows the same general plan as the compound engine and with a relative economy when comparing the compound engine to the simple engine. For the same reason the old plan of vacuum heating can be termed the Simple System of Vacuum Heating.

With the compound system the radiation is divided into Primary and Secondary sections.

The Primary radiation is connected to the steam supply and has a vacuum valve on return from same as usual with the simple system, instead, however, of discharging from the vacuum valve direct to the return line, this valve discharges its water into the secondary section, which is under the same partial vacuum as the return lines, and really a part of such.

The water of condensation being from 208 degrees to 210 degrees (if the system is operating under atmospheric pressure), will, in part, re-evaporate, owing to its heat, under this lower pressure, and the vapor from such re-evaporation will heat the secondary radiation.

This vapor being condensed in the secondary radiation, will pass to the vacuum pump as solid water, and no injection water being required in condenser will have a higher temperature when entering the boiler again, than possible with the simple vacuum system and its attending cold injection water in condenser, and usually such return water to boiler has a higher temperature than return water from a gravity system of any extent, as while more units of heat are used up in the radiation of the compound system, the water

after leaving the secondary radiation, moves very rapidly in the return lines, owing to the influence of the vacuum pump, and the total heat lost in the return line is a great deal less than in the gravity return, where the water, after leaving the radiation moves very slowly, through the large return (which is usually under ground, under floor, or in the coldest part of the building), back to the boiler, as, although the main is large, the water travels through it only at a speed corresponding to the small amount of water discharged into it from the laterals, and is giving up its heat during the entire time it is passing through the return lines. As a result of this Compounding of the radiation, and only supplying the primary section with steam from the main, the steam mains, risers and feeders can be much smaller than usual with the simple system.

In this regard, it may be mentioned that the proportion of Primary and Secondary radiation, found to give the best results under average condition, that is, a pressure in the steam mains of zero to one quarter pound above atmosphere and with eight to ten inches of vacuum in returns, is two-thirds and one-third, the Primary having double the radiation of the Secondary. To better show how the mains, risers, etc., can be made smaller than usual, it is only necessary to say that in figuring for such, the Primary radiation only is considered, thus, if a building calls for three thousand square feet of radiation, and plans were made to compound it fully, the mains would only be figured for the two thousand square feet of (Primary) radiation, and each riser and feeder figured on the same basis, as the Secondary radiation is heated entirely from the re-evaporation of the water of condensation of the Primary radiation.

All of the advantages of the Simple Vacuum System are secured in this Compound system, together with the increased economy in fuel, also the advantages of smaller pipes and consequent saving in first cost.

In order to secure the proper results in the secondary radiation, certain rules for connecting into the same must be observed. Compounding can be accomplished on many different combinations to fit the conditions.

For cast iron radiation the two sections, Primary and Secondary, can be used in one unit, or the Compound Radiator, and Pipe coils can be built to compound one into another, or two into one, and many other ways, according to conditions.

This Compound System has been installed in many buildings in the United States for the past three years with universal satisfaction. There is also a system in operation in Canada. The owners of the patents in both countries have, however, decided to dispose of the Canadian patents and devote their entire attention to the United States.

Anyone desiring to get into a clean, safe and pleasant business, should write the Simonds Heating & Specialty Co., 106 Washington avenue, Detroit, Mich., for particulars.