CHAPTER 25

# How To Vent A Conversion Job

Were it not for the fact that water contains mechanically mixed with it 1/20 or 5% of its volume of air at atmospheric pressure, there would not be so many faulty acting heating installations. This air is liberated during vaporization and as a result, as steam starts to fill a cold heating system, it can enter the radiators only as fast as the air escapes.

**Ques.** What is the basic difference between coal and oil burner heating?

**Ans.** With coal, heating is continuous, but with oil burner, it is intermittent, that is, "on" and "off".

**Ques.** What is the result of these two methods of heating?

**Ans.** The type venting which will work satisfactory on a coal burning system will not be satisfactory on a conversion job.

**Ques.** Why?

**Ans.** With a coal burning (continuous heating) system, steam is always being generated, hence, when the air is once forced out of the system, the radiator will remain hot. With the "on" and "off" cycle of the oil burner, conditions are quite different and some remote radiators will remain cold.

**Ques.** What is the reason for this trouble?

**Ans.** The cold radiator didn't heat up because with the type air valve used (cheapest they could get), the air was not forced out in time for the steam to reach this radiator before the thermostat "was satisfied" and turned off the burner each cycle.

**Ques.** What kind of vent valve should not be used with automatic oil burner systems?

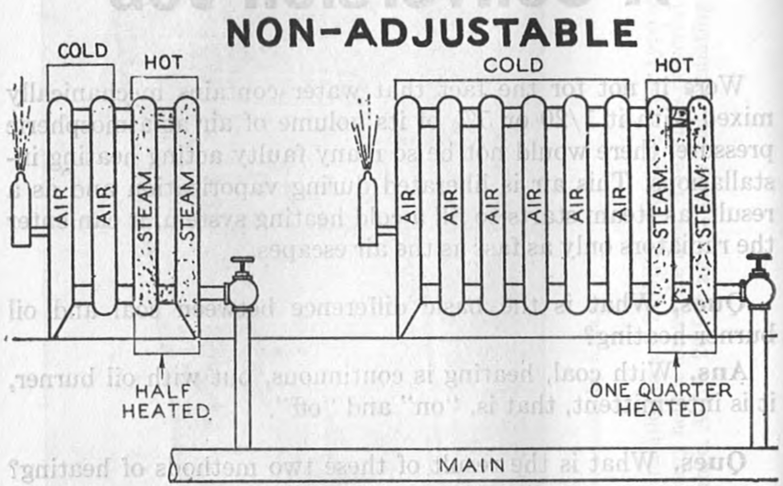



FIG. 1—Unequal heating of small and large radiators with non-adjustable air valves.

**Ans.** The non-adjustable type.

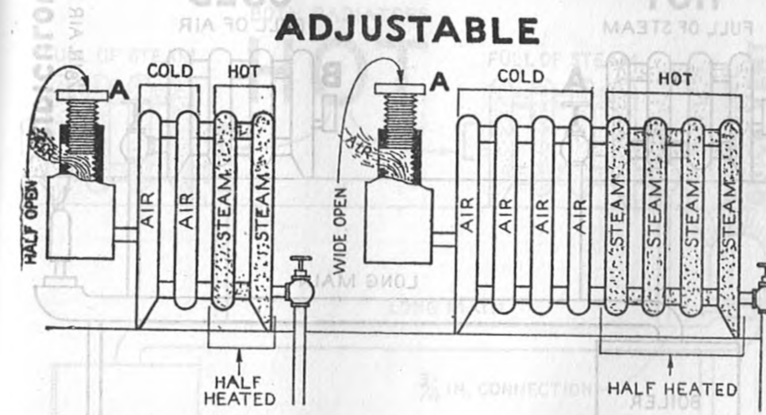
**Ques.** Describe the unsatisfactory operation with non-adjustable vent valves?

**Ans.** Small radiators hold less air to be vented than large radiators. As steam starts to fill the cold system, the air is pushed out at an equal rate from every radiator because an



identical non-adjustable radiator vent valve is on each one. The result is a small radiator becomes fully heated in half the time it takes to heat a radiator of twice the size.

**Fig. 1 shows a small and large radiator connected to main. Since the cheap non-adjustable air valves allow air to escape from each at same rate, when half of the small radiator becomes heated, as in fig. 1, only one quarter of the large radiator is heated.**




FIGS. 2 and 3—Equal heating of small and large radiators with adjustable air valves. Note by adjusting or "tuning" the adjustable air valves the radiators heat at an equal rate.

**Accordingly, to heat both radiators in the same length of time, the air valve on the large radiator should allow the air to escape twice as fast as on the small radiator.**

**Ques.** How can the radiators shown in fig. 1 be made to heat at the same rate?

**Ans.** By installing adjustable air valves and properly adjusting them so as to synchronize the heating of the radiators.

This is shown in figs. 2 and 3. Here the air valves are greatly enlarged and designed so you can see the adjustable feature. To make the large radiator heat faster, its air valve is adjusted to *"wide open"* position by turning the adjustment screw A. It remains to throttle the air valve on the small radiator by turning the adjustment screw A to *"half open"* position as shown in fig. 2. This slows down the small radiator so that both radiators heat at the same rate.

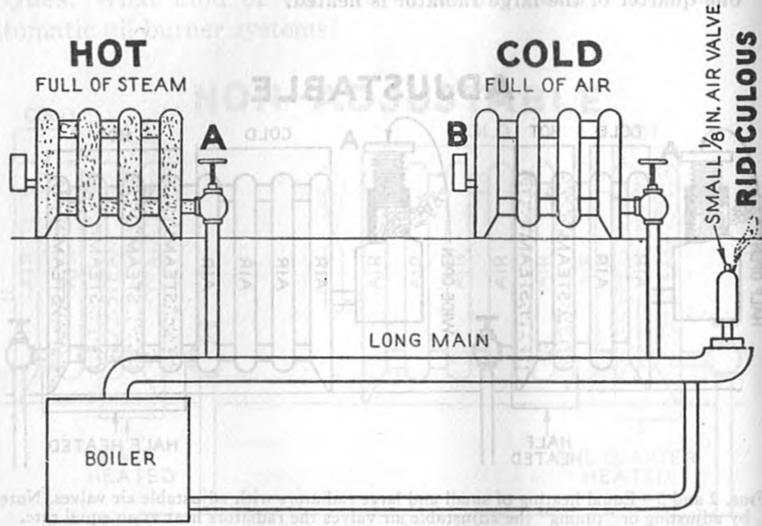



FIG. 4—Result of putting a ridiculous toy air valve on the end of a main. In most cases, when they put on such valves they know perfectly well that they will not be satisfactory, being more interested in chiselling two or three dollars off the price of a valve than in the comfort of the owner.

**Ques.** Why will one radiator get hot quick and another remain cold?

**Ans.** For such installation as shown in fig. 4, radiator B at the end of the line would probably remain cold permanently. The chief cause of this condition is the ridiculously small radiator air valve placed at the end of the main.



The main if properly proportioned is a big pipe and is of considerable length. It, of itself, holds a large volume of air. Only a pneumatic idiot or unscrupulous contractor would *"expect"* (?) the toy vent to clear the line of air and get steam in radiator B, before the burner goes off and the system cools down. Perhaps the most important air valves on the entire system are those venting the basement mains. They must be of sufficient capacity to free the boiler and mains of air in a hurry and speed up steam circulation and distribution of heat to the radiators.

**Ques.** What should be done to make the cold radiator B, fig. 4, work?

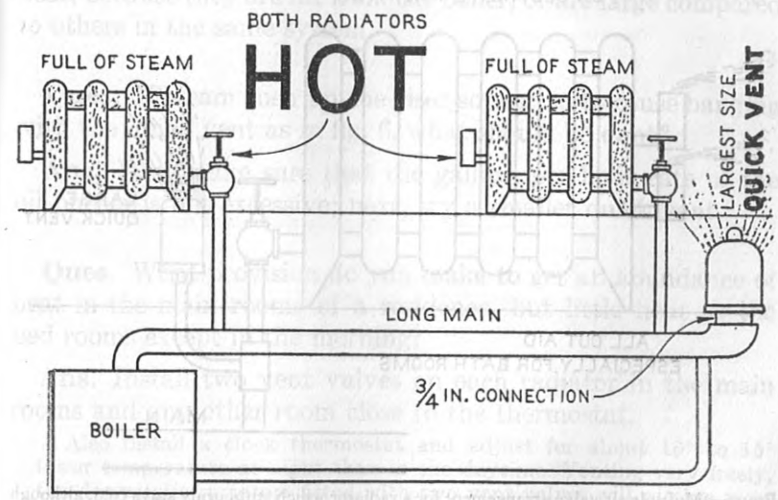



FIG. 5—Quick heating of radiators when the main is adequately vented with a large size quick vent air valve.

**Ans.** Remove the toy vent from the end of the main, also the bushings in the elbow and install the largest quick vent you can get which is ¾ in. size, as shown in fig. 5.

**Ques.** What all out aid can be applied to a radiator (especially in a bath room) which stays cold with 20 minute "on" periods of the burner?

**Ans.** The main in the basement of course should have the large size quick vent as in fig. 5, and if this doesn't thaw out the obstinate radiator, double vent the radiator and in extreme cases, put a quick vent on the supply pipe, as in fig. 6.

The idea of applying two radiator vent valves to one radiator is not new. The two vent valves on the radiator let out the air twice as fast as a single vent, so that steam reaches the radiator before the thermostat

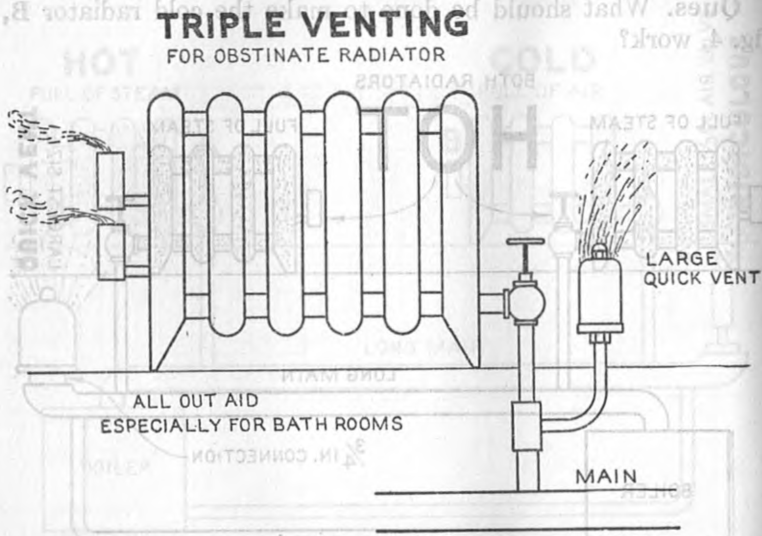



FIG. 6—Multiple air valve arrangement for a radiator which stubbornly stays cold, although ordinary methods are tried. If the application of this triple venting does not produce results nothing will. *In operation* if the radiator do not get hot during the "on" period it never will unless the on period be lengthened by altering the differential.

turns off the burner each cycle. To put the finishing touch on quick response, a quick vent valve may be put on the supply pipe near the radiator as shown. This gets rid of the air in a super hurry and allows steam to do its work in giving out heat before the burner goes off each cycle.

Service men will do well to keep in their tool boxes the inexpensive equipment needed to drill and tap additional ⅛ in. pipe thread openings in radiators for additional vents. It takes less than 5 minutes in



most instances, to install the second vent valve. The service man with this trick at his command can do things which other men declare are impossible.

**Ques.** What is the application for the "all out aid" or triple venting shown in fig. 6?

**Ans.** The multiple air valve arrangement shown in fig. 6 should be applied to radiators which stay cold or are slow to heat, because they are far from the boiler, or are large compared to others in the same system.

**Ques.** If steam rush up the riser so fast as to cause banging with the quick vent as in fig. 6, what should be done?

**Ans.** First make sure that the gallons per hour rate of the oil burner is not excessive; next, try a smaller quick vent.

**Ques.** What provision do you make to get an abundance of heat in the main rooms of a residence, but little heat in the bed rooms except in the morning?

**Ans.** Install two vent valves on each radiator in the main rooms and any other room close to the thermostat.

Also install a clock thermostat and adjust for about 10° to 15° lower temperature at night than in the daytime. Venting very freely, the downstairs radiators fitted with two vent valves will receive most of the steam generated during typical burner "on" periods from morning to night and during the night. The rooms heated by these radiators will be kept very comfortable, but other rooms in the house will receive little heat. Mornings, however, the burner will run a considerable length of time when the room thermostat shifts from night to day setting, and at that time the bedroom radiators will be heated. This automatically gives bed-room heat only at getting up times, if desired, by setting the room thermostat high to cause the burner to take a long run, or by turning off one or more of the radiators in the dining room or living room, near the thermostat. For home owners determined to save oil, even if this entail keeping the bed-rooms cool daytimes when the main rooms on the lower floor are snug and warm, this idea fills the bill.

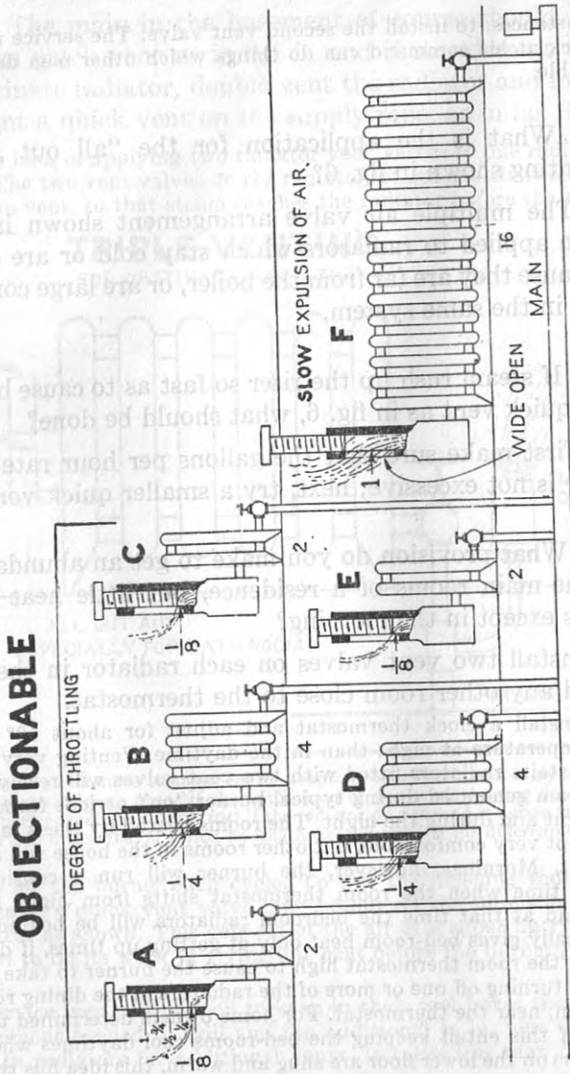



FIG. 7—The practice of throttling to wait for a large radiator to heat. Objectionable when carried to extreme as here shown.



**Holding Back by Throttling.**—The purpose of adjustable air valves is to synchronize the heating of the various radiators by throttling.

Where the radiators are all the same size and venting adjustment for synchronous heating is just to overcome location conditions, a high degree of throttling is not necessary which in such cases is not objectionable because it will not cause too much "holding back."

However, in installations comprising several small radiators and one large (slow to heat) radiator conditions are different. With the same size air valve on all radiators, evidently it will take much longer to discharge the air out of the large radiator than out of the small radiators. Hence, considerable throttling is necessary to hold back the small radiators so that all the radiators will become hot at the same time.

For instance consider fig. 7. The system comprises three very small two section radiators, two four section radiators and one large sixteen section radiator. Evidently the large radiator F, holds 8 times more air than the small radiators A, C, and E, and 4 times more air than the four section radiators B and D.

To tune up this system so all the radiators would become hot at the same time (disregarding the air in the main) would require a high degree of throttling of the smaller radiators. That is, with radiator F, air valve set wide open, radiators A, C and E, would be throttled to ⅛ opening, and radiators B, and D, to ¼ opening of air valve. The time required for this heating up period is entirely too long, because with the small air valve on the big radiator F, although wide open will require a long time for the air to escape because of the large volume of air in that radiator, also because of location. Considerable air from the main will flow through this radiator, the latter is especially the case when an unscrupulous mechanic puts on a ridiculous valve on the end of the main, such as shown in fig. 4.

NOTE.—***Don't write in*** and tell us that the air valves are all out of proportion, entirely too large, etc. On the contrary the author's master artist draughtsman could have drawn them even larger considering the ***purpose*** in view—a point which the *intelligentia* will see at once. In order to impress basic principles on a few ignorantia, that is, those hard to impress, the author advisedly uses a pile driver method of impressing—***save stamp***. Moreover, *intelligentia* and *ignorantia* are spelled with a ***t*** or an *s*—the ***t*** is preferable for euphony—save stamp on this also.

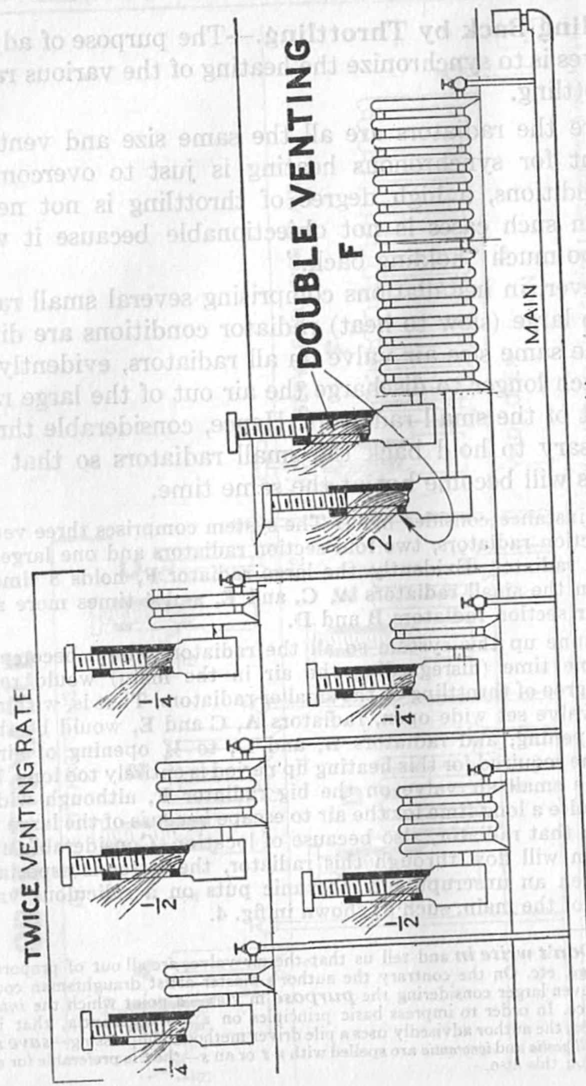



Fig. 8. *Double venting* to avoid extreme degree of throttling in synchronizing.



It is thus seen that all the radiators except the largest **F**, are und held back to insure proper heating of **F**. With the high degree throttling, venting is much slower than it would be with all the valv set wide open.

Back pressure builds up on the boiler during venting, depending upon the degree of throttling, hence radiators do not heat rapidly.

**Ques.** What can be done to remedy the objectionable conditions shown in fig. 7?

**Ans.** Put two vent valves on the largest radiator **F.**

**Ques.** What is the effect of this?

**Ans.** With two vent valves (wide open) on the largest radiator the adjustment of every other vent valve can be set at twice the venting rate, thus reducing holding back and causing the radiators to heat more rapidly. See fig. 8.

**Ques.** What should be noted about adjustable vent valves?

**Ans.** They perform more dependably when adjusted for relatively high venting rates, than when throttled to nearly closed positions.

**Ques.** How can you put two vents on a radiator when there is only one opening?

**Ans.** Very easy if you have a 1/8 in. pipe tap and a drill of the proper size.

Instead of tapping for a second vent, if the metal of the radiator be thick enough, enlarge the vent opening and tap 3/4 in. size, putting on large size quick vent valve, setting the valves on other radiators for still quicker venting.

**Ques.** How can the greatest speed be obtained in heating up the system shown in fig. 9?

**Ans.** Put large size quick vent on radiators **F** and **F′** and increase vents to half open for the two section radiators and wide open for the four section radiators as in fig. 10.

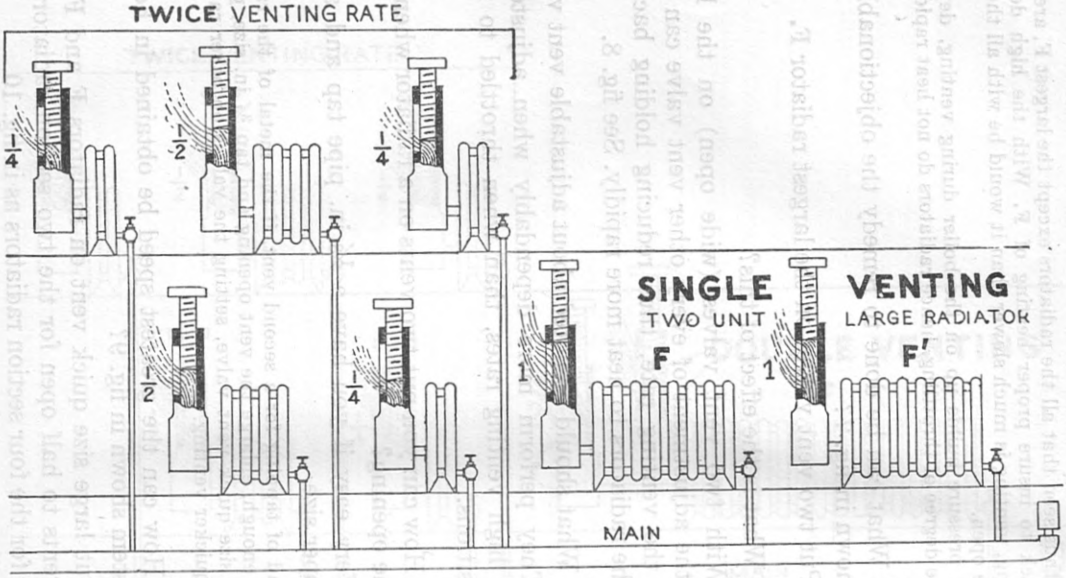



Fig. 9—Single venting equivalent of double venting, obtained by substituting two independent units F, and F′ for the large radiator F of fig. 8 — this avoids tapping the extra outlet for a double vent on a large single unit.



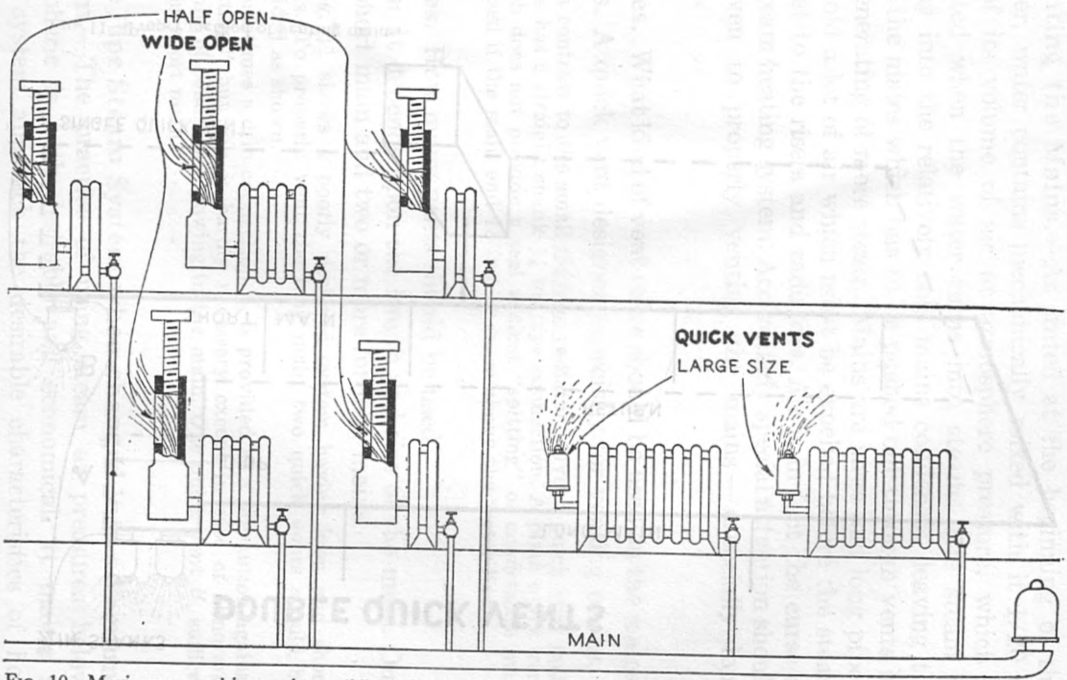



Fig. 10—Maximum speed in venting a difficult installation.

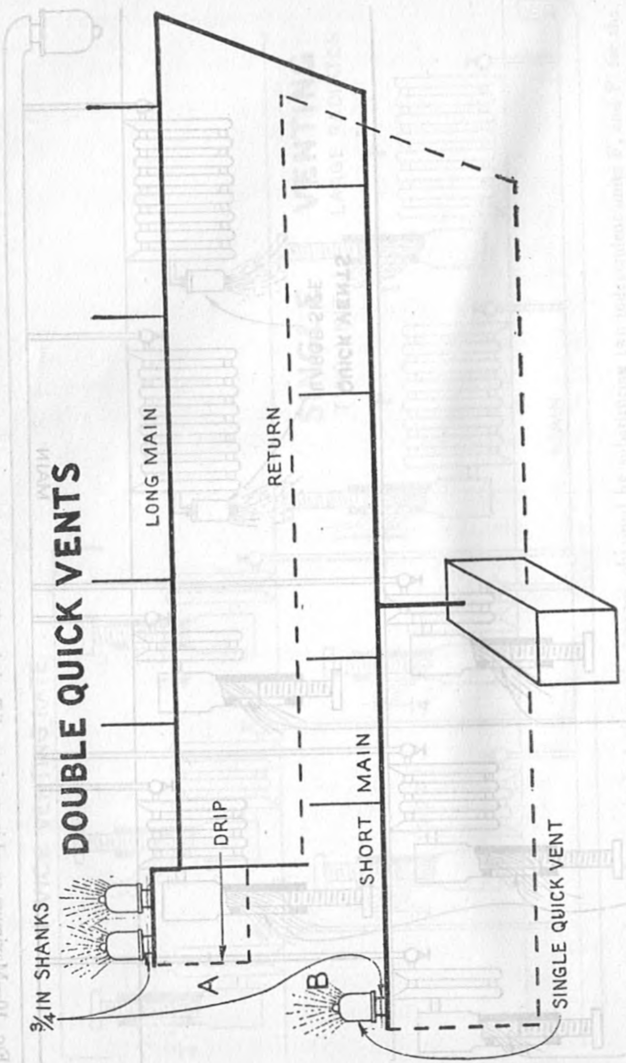



FIG. 11—Proper method of venting mains.



**Venting the Mains.**—As stated at the beginning of this chapter, water contains mechanically mixed with it 1/20 or 5% of its volume of air at atmosphere pressure, which is liberated when the water turns into steam. The steam in flowing into the relatively cold mains condenses, leaving the air in the mains which has to be pushed out through vents by the generating of more steam. Mains are large and long pipes, and hold a lot of air which must be expelled before the steam can get to the risers and radiators. Air is in fact the curse of any steam heating system. Accordingly special attention should be given to properly venting the mains — especially long mains.

**Ques.** What kind of vent valve should be used on the mains?

**Ans.** A quick vent designed especially for venting mains.

In contrast to the small (⅛ tap) radiator valve, a quick vent main valve has a straight shank ¾ in. pipe connection. A plain quick vent which does not provide a seal against "spitting" of condensate may be used if the main end 18 ins. or more above the water line.

**Ques.** How many vents should be used?

**Ans.** It depends upon the length and size of the main. One for a short main and two or more for long mains.

Fig. 11 shows a poorly designed system having long and short mains. To properly vent the long main two quick vents should be provided as shown.

Sometimes a drip connection *A*, is provided as a precaution against "spitting," but this is hardly necessary except in case of abnormal amount of condensate flowing in the main. One quick vent *B*, suffices for the short main.

**One Pipe Steam System when changed into a Vacuum System.**—The practice of using steam at pressures below atmospheric is both desirable and economical. It makes a steam system approach the desirable characteristics of hot

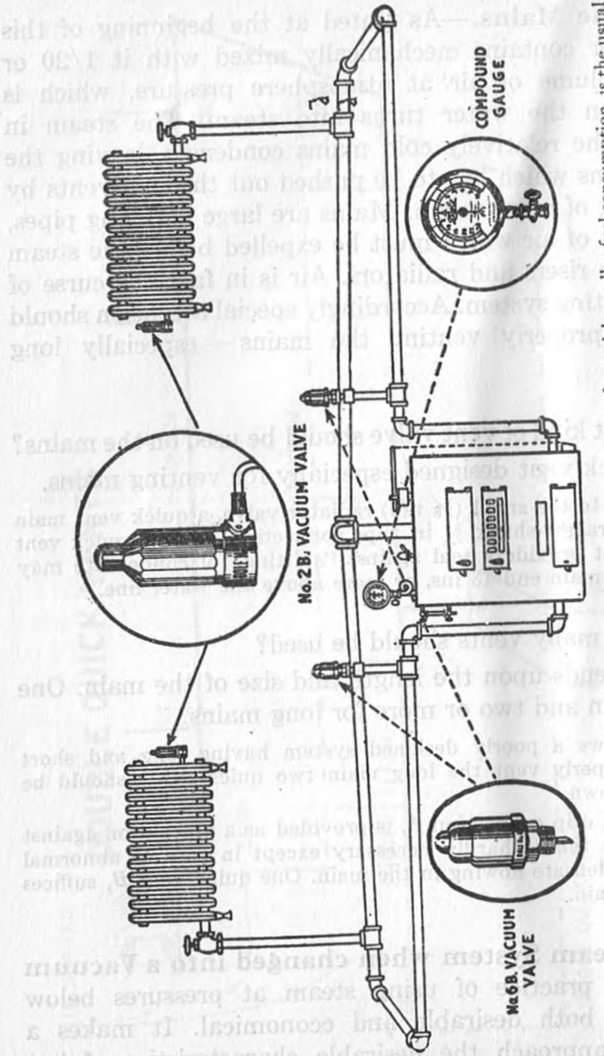



Fig. 12—Vacuumizing a one-pipe steam heating system. Greater heating comfort, with smaller fuel consumption, is the usual result because with the heating system operating under vacuum, water boils and creates steam at lower temperatures than the normal boiling point of 212° F. It is upon this principle that vacuum valves depend for their fuel savings. Further, since vacuum valves prevent the return of air into the system as pressure drops, the vacuum enables low temperature steam to circulate, thus keeping the radiators warm on one firing for many hours. Any gravity one pipe steam plant may be converted into a vacuum system without any material piping changes or alteration. The illustration shows the installation of vacuum valves and compound gauge.



water heating that is, it is a mild form of heat working at temperatures below 212° Fahr.

On the "off" period, as the radiators cool, instead of air coming in to quicken the cooling, more steam is generated at decreasing pressures corresponding to the drop in temperature. Accordingly the radiators stay warm longer than with steam systems, thus increasing the efficiency.

**Ques.** What is the essential condition for the proper working of a vacuum system.

**Ans.** For proper operation *the piping system must be made* **absolutely tight** as a small leak will spoil a vacuum.

**Instructions for Changing to Vacuum.**—Clean boiler thoroughly with a good cleaning compound. Fire the boiler and with full pressure maintained, check the entire system for leaks. Carefully inspect all radiators, pipes and fittings, also the boiler connections and trimmings. Then carefully repair all the leaks revealed, that is, make the entire system air tight as success depends upon this.

As an additional precaution repack all the supply valve stuffing boxes. Also make sure that boiler gauge glass nuts are properly packed and tightened. Replace steam gauge with a compound gauge reading 30 inch vacuum and 15 lbs. pressure.

Replace each radiator air valve with a vacuum valve and the mains with quick vent vacuum valves. Paint threads of valves and necessary nipple connections with white lead before installing. Fig. 12 shows a typical installation.

**Ques.** How do you test the system.

**Ans.** Fire the boiler and raise a steam pressure of five lbs. or more. With this pressure maintained again check the system for steam leaks. Then permit the system to cool. As the system cools sufficiently a partial vacuum should be indicated on the compound gauge.

**Ques.** If the gauge do not show a vacuum or indicate a rapid loss of vacuum, the job should be checked for leaks. Watch the water level glass for air bubbles. If any arise at this point, tighten the packing and pet cocks.