To use Table 58, multiply the quantity of condensate to be handled by the factor corresponding to the temperature of the condensate at the pump suction and select a pump suitable for the quantity thus found.

The above increase in pump capacity may be reduced by providing a static head above the pump suction and when this static head is made equivalent to 15 lb. the absolute boiling pressure of the condensate (measured in feet of water) no increase is necessary.

Allow sufficient head in addition to the total head necessary to overcome static head, velocity head, pipe friction and boiler pressure, wherever condensate is to be returned direct to a boiler from the pump.

TABLE 63. DUPLEX PISTON TYPE RETURN PUMPS WITH RECEIVERS
STANDARD PRESSURE

SIZE OF PUMP	RECEIVER CAPACITY GALLONS	SQ. FT. DIRECT RADIATION	LB. CONDENSATE PER HOUR	MINIMUM STEAM PRESSURE
3 × 2 × 3½	12	6000	2000	50
4½ × 2¾ × 4	20	10,500	3500	40
5¼ × 3½ × 5	40	19,500	6500	35
6 × 4 × 6	60	30,000	11,000	35
7¼ × 5 × 6	100	45,000	15,000	30
Low Pressure				
4½ × 2 × 4	12	6000	2000	25
5¼ × 2½ × 5	20	10,000	3500	20
6 × 2½ × 6	40	120,000	4000	15
6 × 3 × 6	40	180,000	6000	20
6 × 3½ × 6	60	290,000	9000	25

Return line vacuum heating pumps may be divided into three classes as follows:

1. Direct acting reciprocating steam driven vacuum return line pumps.
2. Reciprocating power driven return line vacuum pumps.
3. Motor driven return line vacuum pumps.

In estimating the size of the vacuum pump, it is not sufficient to know merely the square feet of equivalent direct radiation. There are other variables which enter into the problem such as the following:

1. The degree of tightness of the system.
2. The efficiency of the radiator traps.
3. The temperature of the condensate at the pump.
4. The probable cooling effect of the return piping.
5. Are lift points required in the return?
6. What vacuum must be maintained at the pump?
7. Do large volumes of high temperature water enter the return piping near the pump?
8. Are the runs of piping long from the source of steam supply to the farthest radiator?

High pressure traps should never discharge directly into a vacuum return. An excessive amount of vapor will form due to re-evaporation

of a considerable part of the hot condensation. This may cause a very material reduction in the vacuum maintained by the pump. Fig. 17 shows a method of disposing of the greater part of the vapor of re-evaporation and at the same time lowering the temperature of the condensate.

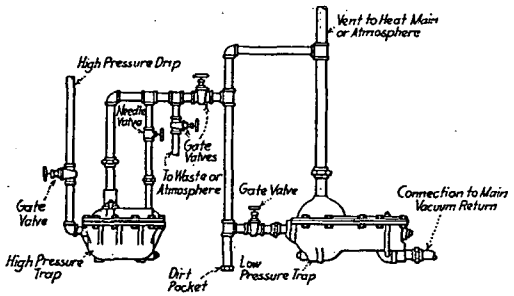

FIG. 17. METHOD OF DISCHARGING HIGH-PRESSURE APPARATUS INTO LOW-PRESSURE HEATING MAINS AND VACUUM RETURN MAINS THROUGH A LOW-PRESSURE TRAP

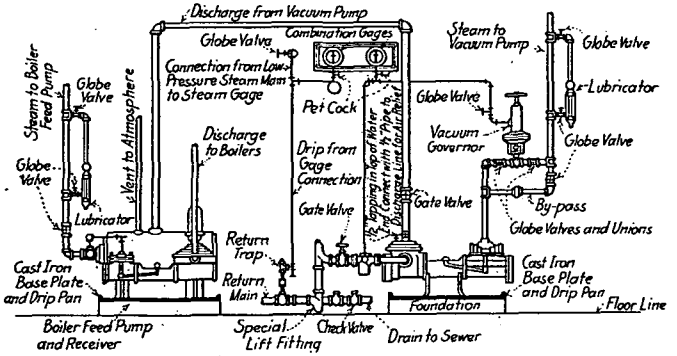

FIG. 18. METHOD OF CONNECTING VACUUM PUMP AND AUTOMATIC BOILER-FEED PUMP AND RECEIVER

DISPOSAL OF VACUUM PUMP DISCHARGE

The discharge from reciprocating vacuum pumps of either the steam or power driven type is a mixture of water and air so that some means must be provided for releasing the entrained air. This requires water surface area in either a tank having a large horizontal cross section or a stand pipe of enough sectional area to permit a low velocity water flow downward while the entrained air is escaping to the surface against the