TABLE 10. SIZE OF PLAIN AND HYDRO-PNEUMATIC TANKS

COMPENSATION LB. PER HR.	SIZES OF PLAIN AND HYDRO-PNEUMATIC TANKS			
	FOR AIR SEPARATOR ONLY		FOR AIR SEPARATOR AND WATER STORAGE	
	Diameter In.	Length In.	Diameter In.	Length In.
4000	12	24	24	36
6000	12	36	24	48
8000	18	30	24	72
10,000	18	48	30	48
16,000	24	48	30	60
24,000	30	48	36	60
	24	72	36	72
34,000	36	60	36	96
	36	72	42	72
45,000	42	60	42	96
	36	96	---	---
60,000	42	72	48	72
	42	96	48	96

LIFT FITTINGS

Lift fittings are special devices used in pairs at points in a vacuum heating system where condensation is to be lifted to a higher level. The condensation is lifted in "slugs" on the air lift principles: the slugs being obtained by the use of a comparatively small diameter vertical return with its lower end submerged in the well below the level of the horizontal return which it drains. The lower lift fitting allows the condensation to accumulate in the well below the inlet connection until it seals the vertical passage, thus causing a slight reduction of the vacuum on the inlet side and forcing the water from the well through the vertical lift pipe to the higher level. The upper lift fitting allows the condensation to flow into the horizontal return without falling back into the lifting line.

Lifts of 6 ft. or over should be made in steps rather than all in one rise. Steps should be used instead of "Drag" lifts through long upwardly inclined pipes. In any case the pipes between the lifts must grade downward toward the pump.

When these fittings are required, the usual places to install them, is with a suction strainer at the pump, and when step-ups occur, in the return line.

STEAM DRIVEN RECIPROCATING RETURN LINE VACUUM PUMPS

Volumetric displacement of the water cylinders should be 8 to 10 times the volumetric rate of flow of the condensate to be handled.

Piston Speeds.—Not more than 20 times the square root of the number of inches in the length of stroke.

Steam driven pumps can be economically used with steam pressures of 15 lb. or over and where the exhaust steam can be completely utilized.

Where the supply of exhaust steam from engines or other sources is continuously in excess of that necessary to supply the heating system the electric driven pump is generally the most efficient and is also preferable when the steam pressure is too low to operate a steam driven pump.

TABLE 11. DIRECT DOUBLE ACTING STEAM DRIVEN RECIPROCATING VACUUM PUMPS

DIAMETER IN INCHES WATER CYLINDER	CONDENSATION LB. PER HR. FOR PUMPS WITH STROKE EQUAL TO BORE	DIRECT CAST IRON RADIATION SERVED	PIPE SIZES		DISCHARGE IN.	PUMPS HAVING UNEQUAL STROKE AND BORE	
			Steam In.	Suction In.		Stroke Bore	Capacity Factor
3	510	1700	½	1¼	¾	2.50	1.58
4	1047	3490	½	1½	1	2.25	1.48
5	1830	6100	½	2	1¼	2.00	1.38
6	2890	9633	½	2½	1½	1.90	1.34
7	4250	14,166	¾	2½–3½	1½–2	1.80	1.31
8	5920	19,733	¾	3–3½	2	1.75	1.29
9	7980	26,600	¾	3½–4	2	1.70	1.27
10	10,350	34,500	1	4–4½	2½	1.67	1.25
12	16,300	54,333	1	4½–5	2½	1.60	1.23
14	24,000	80,000	1¼	5–6	3	1.50	1.10
16	33,500	111,666	1¼	6–7	3½	1.40	1.15
18	45,000	150,000	1½	7	4	1.33	1.13
20	58,500	195,000	1½	7–8	4½	1.30	1.12
22	74,300	247,666	2	8	4½	1.25	1.10
24	92,300	317,666	2	8–10	5	1.20	1.08
26	112,800	376,000	2½	10	6	1.10	1.04
28	135,800	452,666	2½	12	6	1.00	1.00
30	161,300	537,666	2½	12	6	0.90	0.96
32	189,600	632,000	3	14	7	0.80	0.91
34	221,000	736,333	3	14	7	0.75	0.89
36	254,000	846,666	3	14	8	0.70	0.87
						0.67	0.85
						0.60	0.82
						0.50	0.78

The capacities given in Table 11 are for pumps having water cylinder with the length of stroke equal to the diameter of the water piston.

The capacities for pumps of a greater or less length of stroke may be found by use of the last two columns in this table as follows:

Divide the stroke by the piston diameter and find the corresponding ratio in the column headed stroke-bore. The capacity factor opposite this in the last column is then multiplied by the capacity given in the table to give the capacity of the pump in question.

Proportioning of Steam End of Reciprocating Vacuum Pumps

In proportioning the steam cylinder of the pump the following formula will give results which are safe to use.

$$A_s \times \frac{P_b}{3} = A_w \times \left(\frac{V}{2} + P_d\right)$$