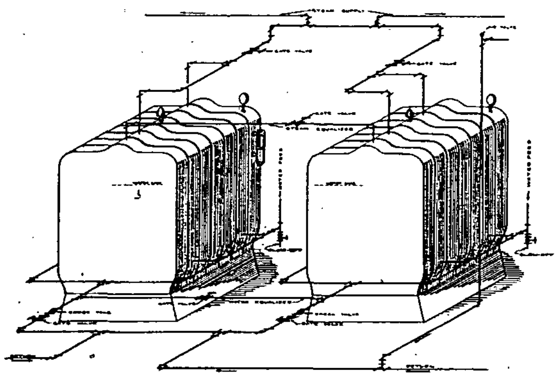

FIG. 20. CONNECTING TWO BOILERS USING CHECK VALVES AND EQUALIZERS IN RETURNS

5. The water line difference or distance between the water line of the boiler and the low point of steam main or dry return main should not be less than 24 in., because of the heavy drop in pressure from condensation in heating up a cold system. This difference should be increased 2 in. for every ounce pressure drop in the system. If the total pressure drop were 6 oz., the water line difference should be 6 × 2 + 24 or 36 inches.

6. There should be a uniform drop in pressure between the source of steam supply and the farthest radiator on every riser. With a boiler pressure of 16 oz. and a maximum total pressure drop of 8 oz., the steam pressure at the supply valve of the farthest radiator on each riser should be 8 oz. The riser whose farthest radiator is 100 ft. from the main would be sized on a drop of 8 oz. per 100 ft. minus the drop in the main to

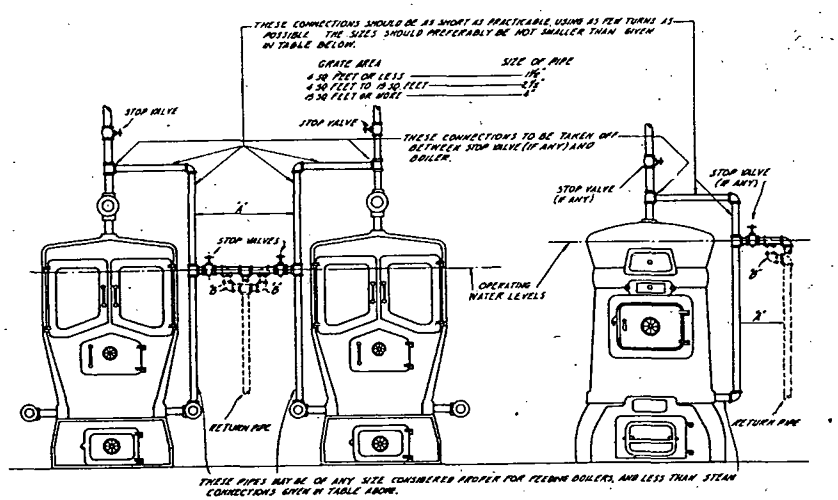

FIG. 21. CONNECTING TWO BOILERS USING THE HARTFORD RETURN LOOP

this riser connection; while one, 200 ft. from the main would be sized on a drop per 100 ft. —one-half of the difference between the drop of 8 oz. and the drop in the main to the riser connection.

The total drop, minus the drop in the main to the point of connection to any riser, divided by the equivalent length of the riser from the main to the farthest radiator in hundreds of feet, gives the drop per 100 ft. *in the riser. For a total drop 6 oz.*, with the farthest radiator on riser No. 4, 200 ft. equivalent from the main and this riser connection 100 ft. from the source of supply, this riser would be sized on a basis of $\frac{6-1}{2}$ or 2½ oz. drop per 100 ft. of riser.

TABLE 33. FLOW OF STEAM IN PIPES

P = Loss in pressure in lb.
d = Inside diameter of pipe in inches
L = Length of pipe in feet
D = Weight of 1 cu. ft. steam
W = Lb. of steam per min.

$$W = 87.0\sqrt{\frac{P\,D\,d^5}{\left(1+\frac{3.6}{d}\right)L}}$$

$$P = 0.000132\left(1+\frac{3.6}{d}\right)\frac{W^2\,L}{D\,d^5}$$

Pressure Loss in Oz.	Col. 1 $87.0\sqrt{\frac{P}{100}}$	Inside Dia. Pipe	Col. 2 $\sqrt{\frac{d^5}{1+\frac{3.6}{d}}}$	Steam Pressure by Gage	Col. 3 $\sqrt{D}$	Length Pipe in Feet	Col. 4 $\sqrt{\frac{100}{L}}$
1	2.175	1	0.522	0.0	0.193	20	2.240
2	3.076	1¼	1.177	0.3	0.195	40	1.580
3	3.767	1½	1.828	1.3	0.201	60	1.290
4	4.350	2	3.709	2.3	0.207	80	1.120
5	4.863	2½	6.109	5.3	0.223	100	1.000
6	5.328	3	11.183	10.3	0.248	120	0.912
7	5.754	3½	16.705	15.3	0.270	140	0.841
8	6.152	4	23.630	20.3	0.290	160	0.793
10	6.878	4½	32.098	30.3	0.326	180	0.741
12	7.532	5	43.719	40.3	0.358	200	0.710
14	8.138	6	69.718	50.3	0.388	250	0.632
16	8.700	7	105.35	60.3	0.415	300	0.578
20	9.727	8	150.33	75.3	0.452	350	0.538
24	10.655	9	205.37	100.3	0.507	400	0.500
28	11.509	10	271.16	125.3	0.557	450	0.477
32	12.290	12	437.51	150.3	0.603	500	0.447
40	13.756	14	733.90	175.3	0.645	600	0.407
48	15.069	16	925.19	200.3	0.685	700	0.378
80	19.454	....	....	....	....	800	0.354
160	27.512	....	....	....	....	900	0.333
320	38.863	....	....	....	....	1000	0.316
480	47.652	....	....	....	....	1400	0.267

Column 1 × 2 × 3 × 4 = lb. steam per min. will flow through a straight pipe for a given condition.

Example.—1 oz. drop — 2-in. pipe — 1.3 lb. press. — 100 ft. long — 2.175 × 3.709 × 0.201 × 1 = 1.615 lb. per min., then 1.615 × 60 — 20 per cent = 77.28 lb. per hr.

Preceding table does not allow for entrained water in low-pressure steam, condensation in covered pipe and roughness in commercial pipe, therefore reduce calculated capacities approximately 20 per cent.