the pipe or fittings by a constriction, since the velocity at any one constriction will limit the whole system. For this reason, particular care must be taken to ream such pipe and guard against dope constricting it at joints. Iron pipe should also be examined for constricting blisters, Fig. 22 and Table 46, from the Laboratory reports already mentioned show the importance of these factors.

Table 46 shows variation in capacity of a pipe as affected by variation of size and smoothness of pipe generally found on the market. The maximum and minimum results were obtained by picking out very smooth and very rough pipe from the stock room of a large manufacturer.

TABLE 44. MAXIMUM CAPACITY OF STEAM LINES AT VARIOUS PITCHES

Pitch of Pipe in Inches per 10 Ft.

PITCH OF PIPE—¼ IN.			½ IN.		1 IN.		1½ IN.		2 IN.		3 IN.		4 IN.		5 IN.	
Pipe Size	Sq. Ft. Rad. Based on 240 B.t.u.	Max. Vel.	Sq. Ft. Rad. Based on 240 B.t.u.	Max. Vel.	Sq. Ft. Rad. Based on 240 B.t.u.	Max. Vel.	Sq. Ft. Rad. Based on 240 B.t.u.	Max. Vel.	Sq. Ft. Rad. Based on 240 B.t.u.	Max. Vel.	Sq. Ft. Rad. Based on 240 B.t.u.	Max. Vel.	Sq. Ft. Rad. Based on 240 B.t.u.	Max. Vel.	Sq. Ft. Rad. Based on 240 B.t.u.	Max. Vel.
¾"	25.0	12	30.3	14	37.3	18	40.4	19	42.5	20	46.1	21	47.5	22	49.3	23
1"	45.8	12	52.6	15	63.0	17	70.0	20	75.2	22	83.0	23	87.9	25	90.2	26
1¼"	104.9	18	117.2	20	133.0	23	144.5	25	154.0	27	165.0	28	172.6	29	178.2	31
1½"	142.6	18	159.0	21	181.0	23	196.5	25	209.3	27	224.0	28	234.8	30	242.6	31
2"	236.0	19	263.5	20	299.5	23	325.5	25	346.5	27	371.5	28	388.4	29	401.1	30

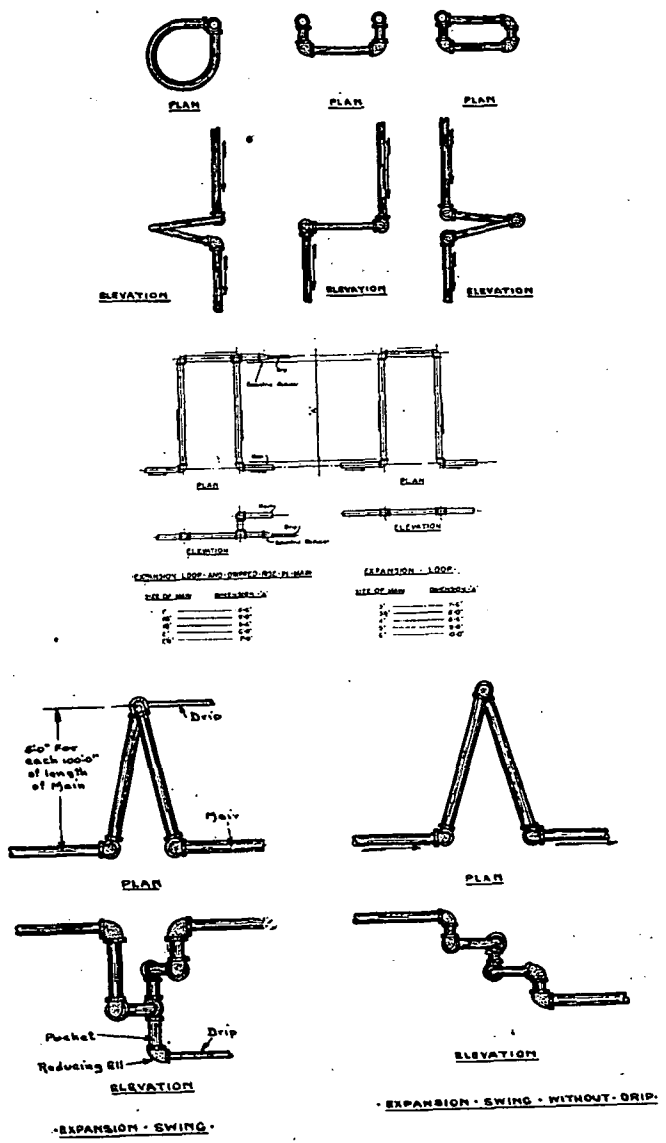
TABLE 45. RESULTS OF TESTS ON ANGLE AND GLOBE VALVES

NOMINAL SIZE OF PIPE IN.	AREA OF PIPE SQ. IN.	AREA VALVE SEAT OPENING SQ. IN.	PER CENT OF AREA OF PIPE	MAXIMUM PIPE AND VALVE	CAPACITY PIPE ALONE	PER CENT OF CAPACITY OF PIPE ALONE
¾	0.537	0.4418	82.2	9.68	13.52	71.6
1	0.835	0.822	98.4	22.10	23.30	95.0
1¼	1.459	1.258	86.2	30.00	47.5	63.1
1½	1.927	1.773	92.2	46.13	68.5	67.4

NOMINAL SIZE IN.	VALVE STEM—VERTICAL		VALVE STEM—HORIZONTAL	
	Capacity of Pipe and Valve Lb. per Hr.	Per Cent of Capacity of Pipe Alone	Capacity of Pipe and Valve Lb. per Hr.	Per Cent of Capacity of Pipe Alone
¾	1.38	11.8	8.83	76.3
1	7.73	35.7	14.06	66.1
1¼	13.20	31.2	22.88	54.3
1½	18.81	33.0	32.00	56.7

TABLE 46. PER CENT DIFFERENCE IN CAPACITY DUE TO VARIATION OF PIPE SIZE AND SMOOTHNESS

	MAXIMUM CONDENSATION, LB. PER HR.			
Capacity of Pipe	¾"	1"	1¼"	1½"
Minimum	14.00	24.89	45.42	70.50
Maximum	15.20	30.08	52.08	82.00
Per Cent Variation	8.6	20.8	14.7	16.3



Note.—Allowance for expansion must be made in long runs of mains both vertical and horizontal. One expansion joint or swing should be installed in any run over 100 ft. 0 in. long and one for each additional 100 ft. 0 in. of run. All branch connections should be made so as to allow a swing both at the main and the other end connections.

FIG. 23. TYPICAL EXPANSION CONNECTIONS FOR RISERS