

condensate returns counter to the steam and where only the condensate from the riser so returns) are given in Tables 4 and 5. Investigation of limiting velocities for horizontal pipe with varying degrees of pitch has not yet been carried to a conclusion but the limiting velocities given in Table 17 are offered as safe. Further study of the subject may allow them to be increased.

Where the velocity of steam is the limiting factor of the capacity of a pipe, care must be taken that this velocity is not exceeded in any part of 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

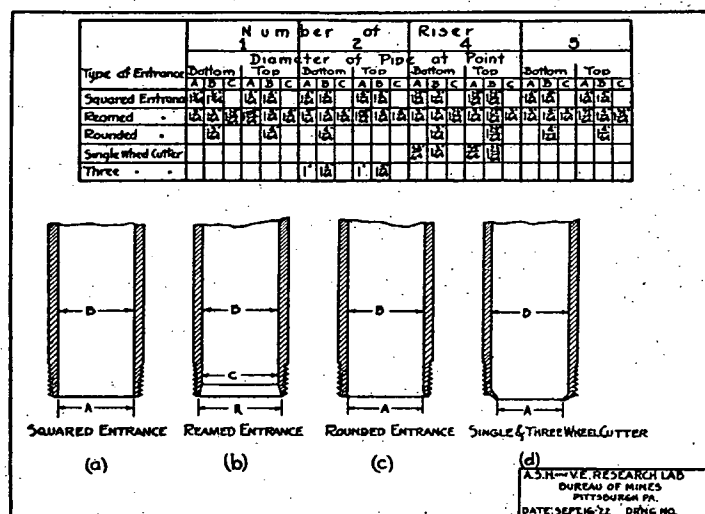


FIG. 9. EFFECT OF REAMING ENTRANCE TO ONE-PIPE RISERS

it at joints. Iron pipe should also be examined for constricting blisters, Fig. 9 and Table 18, from the Laboratory reports show the importance of these factors.

Table 20 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.

Free area of valves, unions, and other fittings as found on the market are not always equal to the inside area of pipe of the same nominal size.

Globe valves show a maximum capacity below that of pipe of the same nominal size. The maximum capacity of such valves in a horizontal pipe depends upon whether the stem is vertical or horizontal.

Table 19 shows capacities found for valves picked at random from the stock of a large supply house.

TABLE 17. COMPARATIVE CAPACITY OF STEAM LINES AT VARIOUS PITCHES*
Pitch of Pipe in Inches per 10 Ft.

PITCH OF PIPE— $\frac{1}{4}$ IN.			$\frac{1}{2}$ IN.		1 IN.		$1\frac{1}{2}$ 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.
$\frac{3}{4}$ "	25.0	12	30.3	14	37.3	18	40.4	19	42.5	20	46.1	21	47.5	22	49.3	22
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
$1\frac{1}{4}$ "	104.9	18	117.2	20	133.0	23	144.5	25	154.0	27	165.0	28	172.6	29	178.2	30
$1\frac{1}{2}$ "	142.6	18	159.0	21	181.0	23	196.5	25	209.3	27	224.0	28	234.30	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 18. EFFECT OF REAMING ENTRANCE TO ONE-PIPE RISERS*

See Fig. 9

	Maximum Capacity of Riser	Per Cent Decrease
Reamed entrances.....	24.7 lb. per hr.	0.0
Rounded entrances.....	23.9 lb. per hr.	3.2
Squared entrances.....	22.2 lb. per hr.	10.1
Three wheel cutter.....	19.2 lb. per hr.	22.2
Single wheel cutter.....	17.6 lb. per hr.	28.7

TABLE 19. 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
3/4"	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
1 1/4"	1.459	1.258	86.2	30.00	47.5	63.1
1 1/2"	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
3/4"	1.38	11.8	8.83	76.3
1"	7.73	35.7	14.06	66.1
1 1/4"	13.20	31.2	22.88	54.3
1 1/2"	18.81	33.0	32.00	56.7

TABLE 20. PER CENT DIFFERENCE IN CAPACITY DUE TO VARIATION OF PIPE SIZE AND SMOOTHNESS*

Capacity of Pipe.....	MAXIMUM CONDENSATION, LB. PER HR.			
	3/4"	1"	1 1/4"	1 1/2"
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

*Data from AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS Research Laboratory.