investigation the following problems have thus far been studied, at the Research Laboratory and complete reports will be found in the Society's JOURNAL:

1. Critical velocity of risers—one and two-pipe systems;
2. Effect of rounded, reamed and unreamed entrances, to pipe upon the critical velocity;
3. Effect of entrances of pipe cut with single and three-wheel cutters upon the critical velocity;
4. Effect of unions and couplings upon the critical velocity;
5. Critical velocity in horizontal, vertical and inclined pipes;
6. Effect of high pressures, horizontal offsets and valves.

Fig. 14 shows the relation between the pressure drop through a 10 ft. vertical pipe and its capacity.

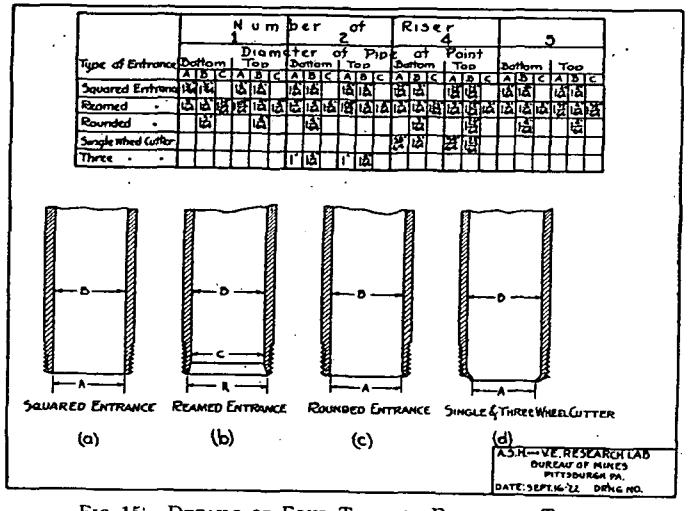

FIG. 15. DETAILS OF FOUR TYPES OF ENTRANCES TESTED

The capacity of a vertical pipe is greatly affected by the shape of its entrance. By gently flaring the entrance of the pipe its capacity may be greatly increased.

A series of tests were made on 1-in. risers with various shaped entrances as shown in Fig. 15. The maximum capacities obtained in these tests were as follows:

		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 42. EFFECT OF VARIATION OF SIZE AND SMOOTHNESS OF PIPE

Per Cent Difference due to Variation of Pipe

	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

Table 42 shows the 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.

The capacity of risers based upon 18 and 22 ft. velocity is given in Table 43.

TABLE 43. CAPACITIES OF ONE PIPE RISERS

Allowable Velocity in Feet per Second

DIA. OF PIPE IN.	18			22		
	COND. LB. HR.	B.T.U. LOSS HR.	SQ. FT. RAD. BASED ON 240 B.T.U.	COND. LB. HR.	B.T.U. LOSS HR.	SQ. FT. RAD. BASED ON 240 B.T.U.
¾	8.9	8,640	36.0	10.9	10,580	44.1
1	14.5	14,070	58.6	17.8	17,270	72.0
1¼	25.2	24,460	101.9	30.8	29,890	124.5
1½	34.2	33,190	138.1	41.8	40,560	169.0
2	56.5	54,830	228.4	69.0	66,960	279.0

TABLE 44. PITCH REQUIRED IN HORIZONTAL PIPES TO GIVE SAME CAPACITY AND VELOCITY AS GIVEN IN TABLE 43 FOR RISERS OF LIKE SIZE

Allowable Velocity in Feet per Second

NOMINAL DIAM. OF PIPE IN IN.	18				22			
	COND. IN LB. PER HR.	B.T.U. LOSS PER HR.	SQ. FT. RAD. BASED ON 240 B.T.U.	PITCH OF PIPE IN. PER 10 FT.	COND. IN LB. PER HR.	B.T.U. LOSS PER HR.	SQ. FT. RAD. BASED ON 240 B.T.U.	PITCH OF PIPE IN. PER 10 FT.
¾	8.9	8,640	36.0	1.00	10.9	10,580	44.1	2.6 to 3.0
1	14.5	14,070	58.6	0.75	17.8	17,270	72.0	1.7 to 2.0
1¼	25.2	24,460	101.9	0.50	30.8	29,890	124.5	1.00
1½	34.2	33,190	138.1	0.50	41.8	40,560	169.0	1.00
2	56.5	54,830	228.4	0.50	69.0	66,960	279.0	1.00