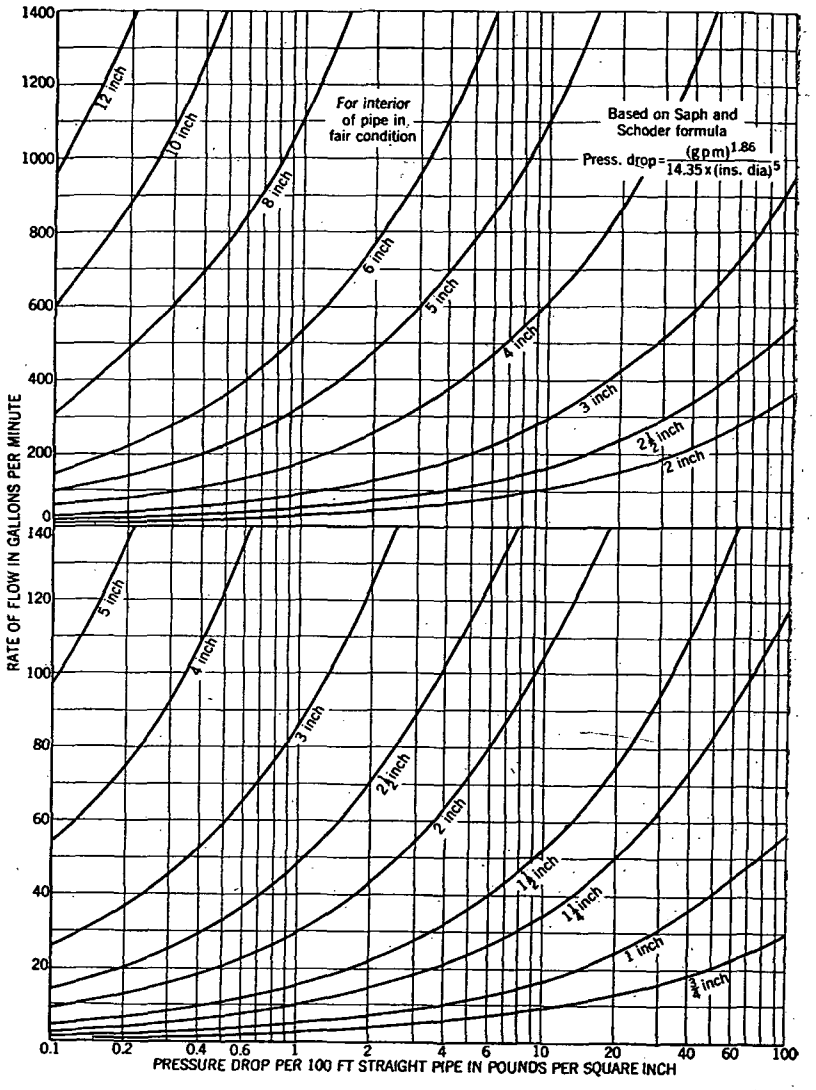

FIG. 2. CHART GIVING PRESSURE DROP FOR VARIOUS RATES OF FLOW OF WATER

ALLOWANCE FOR FITTINGS

Before applying charts for pipe friction, the resistance due to fittings and valves should be evaluated. Table 3 gives this resistance expressed in equivalent feet of straight pipe. To use Table 3, the size of the valve or fitting must be known. Table 3 is therefore of little use in the original design of a system, since the valve and fitting allowances must be made before the pipe size is known. Experience indicates, however, that an average increase of 50 per cent in the length of the longest measured pipe will account for the fittings, and thus a tentative length can be assumed for computing the pressure drop per 100 ft of run. The values of Table 3 should always be used to recheck the exact equivalent length of the pipe after an approximate diameter has been selected and after the number of fittings has been determined. The allowable pressure drop per 100 ft of pipe may be determined by dividing the total allowable drop for the system by the equivalent length of the system in hundreds of feet.

TABLE 3. APPROXIMATE ALLOWANCES FOR FITTINGS AND VALVES IN FEET OF STRAIGHT PIPE

SIZE OF PIPE (INCHES)	TYPE OF FITTING OR VALVE					
	90 DEG ELBOW	45 DEG ELBOW	TEE IN RUN OF MAIN	GATE VALVE	GLOBE VALVE	ANGLE VALVE
½	2	1	1	1	17	9
¾	2	1	2	1	21	12
1	3	1	2	1	29	15
1¼	4	2	3	1	38	19
1½	5	2	3	1	45	22
2	5	3	3	1	58	28
2½	7	3	5	2	68	34
3	8	4	6	2	82	42
4	11	5	7	2	115	56
5	14	6	9	3	140	70
6	16	8	11	4	160	85

The pressure drop for various rates of water flow for standard size pipes is given in Fig. 2. This chart carries an allowance for reasonable roughness of the interior surface and for the effect of many years of service. The Saph and Schoder formulae have been proved conservative not only by the *American Water Works Association* but also by various tests conducted by the A.S.H.V.E. Committee on Research.

Example 2. Assume a street pressure of 70 lb, the height of the highest fixture 50 ft, the length of the longest run 200 ft, the pressure at the top fixture 15 lb, and the pressure loss through the meter 10 lb. Without knowing the additional length of pipe to be added for the fittings it will be assumed that this is about 100 ft. The surplus pressure which will be available for pressure drop will then be 70 lb − (15 lb + 10 lb + 50 ft × 0.43 lb) = 70 lb − (15 lb + 10 lb + 21.5 lb) = 23.5 lb.

To change this into drop per 100 ft: $\frac{23.5 \text{ lb} \times 100}{200 \text{ ft} + 100 \text{ ft}} = 7.8$ lb per 100 ft.

The pipe may then be sized from the probable flow by selecting a size that does not give a drop in excess of 7.8 lb per 100 ft.