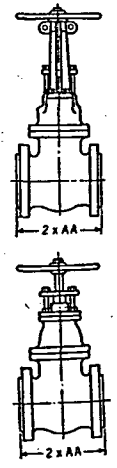
The material used for valves of small size is generally brass or bronze for low pressures and forged steel for high pressures, while in the larger sizes either cast-iron, cast-steel or some of the steel alloys are employed. Practically all iron or steel valves intended for steam or water work are bronze-mounted or trimmed.

Brass, bronze, and iron valves are generally designed for standard or extra heavy service, the former being used up to 125 lb and the latter up

TABLE 12. AMERICAN STANDARD CONTACT SURFACE TO CONTACT SURFACE DIMENSIONS OF CAST-IRON AND STEEL FLANGED WEDGE GATE VALVES, *ASA* B16.10-1939

NOMINAL PIPE SIZE	CONTACT SURFACE TO CONTACT SURFACE DIMENSIONS, (2 × AA)				
	Cast-Iron[a]			Steel	
	125	175[b][c]	250[b]	150[b]	300[b]
1	.....	.....	.....	.....	.....
1¼	.....	.....	.....	.....	.....
1½	.....	.....	.....	.....	7½
2	7	7¼	8½	7	8½
2½	7½	8	9½	7½	9½
3	8	9¼	11⅛	8	11⅛
3½	8½	10	11⅞	8½	11⅞
4	9	10½	12	9	12
5	10	11½	15	10	15
6	10½	13	15⅞	10½	15⅞
8	11½	14¼	16½	11½	16½
10	13	16¾	18	13	18
12	14	17½	19¾	14	19¾
14 O.D.	15	.....	22½	15	30
16 O.D.	16	.....	24	16	33
18 O.D.	17	.....	26	17	36
20 O.D.	18	.....	28	18	39
24 O.D.	20	.....	31	20	45



All dimensions given in inches.

[a] These dimensions are the same for Cast-Iron Double-Disc Flanged Gate Valves.

[b] These are pressure designations which refer to the primary service ratings in pounds per square inch of the connecting end flanges.

[c] The connecting end flanges of 175 lb valves are the same as those on 250 lb valves.

NOTE 1:—Where dimensions are not given, the sizes either are not made or there is insufficient demand to warrant the expense of unification.

NOTE 2:—Female and groove joint facings have bottom of groove in same plane as *flange edge*, and center to contact surface dimensions for these facings are reduced by the amount of the raised face.

to 250 lb saturated steam working pressure, although most manufacturers also make valves for medium pressure up to 175 lb steam working pressure. The more common types are gate valves or straightway valves, globe valves, angle valves, check valves and automatic valves, such as reducing and back-pressure valves.

Gate valves are the most frequently used of all valves since in their open position the resistance to flow is a minimum, but they should not be used where it is desired to throttle the flow; globe valves should be used for this purpose. Gate valves may be secured with either a rising or a non-rising stem, although in the smaller size the rising stem is more commonly used. The rising stem valve is desirable because the positions of the

handle and stem indicate whether the valve is open or closed, although space limitations may prevent its use. The globe valve is less expensive to manufacture than the gate valve, but its peculiar construction offers a high resistance to flow and may prevent complete drainage of the pipe line. These objections are of particular importance in heating work.

An American Standard, *ASA* B16.10-1939, has been prepared giving the face-to-face dimensions of ferrous flanged and welding-end valves. The following types are covered: wedge gate, double disc gate, globe and angle, and swing check. One purpose of establishing these dimensions is to insure that gate valves of a given rating and flange dimension of either the wedge or double disc design will be interchangeable in a pipe line. Contact surface to contact surface dimensions of cast-iron and steel flanged wedge-gate valves are given in Table 12. End-to-end dimensions for steel butt-welding valves in sizes up to 8 in., inclusive, are the same as those given in Table 12 for steel valves.

Check valves are automatic in operation and permit flow in only one direction, depending for operation on the difference in pressure between the two sides of the valve. The two principal kinds of check valves are the swing check in which a flapper is hinged to swing back and forth, and the lift check in which a dead weight disc moves vertically from its seat.

Valves commonly used for controlling steam or water supply to radiators constitute a special class since they are manufactured to meet heating system requirements. These valves are generally of the angle type and are usually made of brass. Graduations on the heads or lever handles are often supplied to indicate the relative opening of the valve.

Automatic control of steam supply to individual radiators can be effected by use of direct-acting radiator valves having a thermostatic element at the valve, or near to it. The direct-acting valve is usually an angle-type valve containing a thermostatic element which permits the flow of steam in accordance with room temperature requirements. These valves usually are capable of adjustment to permit variation in room temperature to suit individual taste.

Ordinary steam valves may be used for hot water service by drilling a $\frac{1}{16}$-in. hole through the web forming the seat to insure sufficient circulation to prevent freezing when the valve is closed. Valves made for use in hot water heating systems are of simpler design, one type consisting of a simple butterfly valve, and another of a quick opening type in which a part in the valve mechanism matches up with an opening in the valve body.

In one-pipe steam-heating systems, automatic air valves are required at the radiators. Two common types of air valves available are the vacuum type and the straight-pressure type. Vacuum valves permit the expulsion of air from the radiators when the steam pressure rises and, in addition, act as checks to prevent the return of air into the radiator when a vacuum is formed by the condensation of steam after the supply pressure has dropped. Ordinary air valves permit the expulsion of air from the radiator when steam is supplied under pressure, but when a vacuum tends to be formed the air is drawn back into the radiator.

REFERENCES

[1] See (1) *Piping Handbook*, by Walker and Crocker (McGraw-Hill Co.); (2) *A Manual for The Design of Piping for Flexibility by the Use of Graphs*, by E. A. Wert, S. Smith, E. T. Cope (The Detroit Edison Company).

[2] See *API Specification 5L for Line Pipe, American Petroleum Institute.*

[3] *Standard Manual on Pipe Welding (Heating, Piping and Air Conditioning Con-*