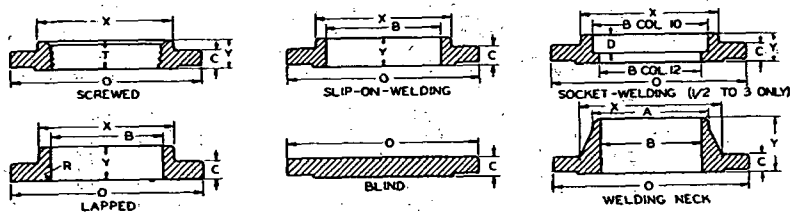
pressure work. Steel is the only valve material that can stand appreciable expansion stresses.

The characteristics of valves restrict their use. The five main uses for valves are listed below:

1. *Stopping flow:* The most general use for valves. *Gate* valves are generally used for this purpose. The gate valve operates by a disc moving at right angles to the

TABLE 12. DIMENSIONS OF STEEL FLANGES FOR PRIMARY SERVICE PRESSURE RATING OF 150 PSI (GAGE)



1	2	3	4	5	6	7	8	9	10	11	12	13	14
Nominal Pipe Size	Outside Diameter of Flange O	Thickness of Flange, Min C	Diameter of Hub X	Hub Diameter Beginning of Chamfer Welding Neck A	Length Through Hub Y: Screwed Slip-On Socket Welding	Lapped	Welding Neck	Thread Length Screwed T	Bore B: Slip-On Socket Welding, Min	Lapped, Min	Welding Neck Socket Welding	Corner Radius of Bore of Lapped Flange and Pipe r	Depth of Socket D
½	3½	7/16	1 5/16	0.84	5/8	5/8	1 7/8	5/8	0.88	0.90	0.62	1/8	3/8
¾	3 7/8	½	1½	1.05	5/8	5/8	2 1/16	5/8	1.09	1.11	0.82	1/8	7/16
1	4¼	9/16	1 15/16	1.32	1 1/16	1 1/16	2 3/16	11/16	1.36	1.38	1.05	1/8	1/2
1¼	4 5/8	5/8	2 5/16	1.66	1 5/16	1 5/16	2 1/4	1 5/16	1.70	1.72	1.38	3/16	9/16
1½	5	1 1/16	2 9/16	1.90	7/8	7/8	2 7/16	7/8	1.95	1.97	1.61	1/4	5/8
2	6	¾	3 1/16	2.38	1	1	2½	1	2.44	2.46	2.07	5/16	1 1/16
2½	7	7/8	3 9/16	2.88	1 1/8	1 1/8	2¾	1 1/8	2.94	2.97	2.47	5/16	¾
3	7½	15/16	4¼	3.50	1 5/16	1 5/16	2¾	1 5/16	3.57	3.60	3.07	3/8	13/16
3½	8½	1 1/16	4 13/16	4.00	1¼	1¼	2 15/16	1¼	4.07	4.10	3.55	3/8	
4	9	1 3/16	5 5/16	4.50	1 5/16	1 5/16	3	1 5/16	4.57	4.60	4.03	7/16	
5	10	1 5/16	6 7/16	5.56	1 7/16	1 7/16	3½	1 7/16	5.66	5.69	5.05	7/16	
6	11	1	7 9/16	6.63	1 9/16	1 9/16	3½	1 9/16	6.72	6.75	6.07	½	
8	13½	1⅛	9 11/16	8.63	1¾	1¾	4	1¾	8.72	8.75	7.98	½	
10	16	1 3/16	12	10.75	1 15/16	1 15/16	4	1 15/16	10.88	10.92	10.02	½	
12	19	1¼	14 3/16	12.75	2 1/16	2 1/16	4½	2 1/16	12.88	12.92	12.00	½	
14	21	1 3/8	15¾	14.00	2¼	3 1/16	5	2¼	14.14	14.18	To be specified by purchaser	½	
16	23½	1 7/16	18	16.00	2½	3 7/16	5	2½	16.16	16.19		½	
18	25	1 9/16	19 7/8	18.00	2 11/16	3 13/16	5½	2 11/16	18.18	18.20		½	
20	27½	1 11/16	22	20.00	2 7/8	4 1/16	5 11/16	2 7/8	20.20	20.25		½	
24	32	1 7/8	26 1/16	24.00	3¼	4 3/8	6	3¼	24.25	24.25		½	

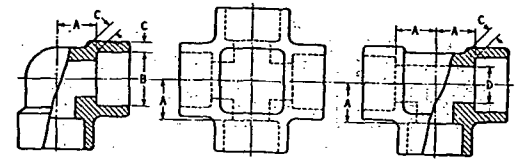
From American Standard for Steel Pipe Flanges and Flanged Fittings, *ASA* B16.5-1953.
All dimensions given in inches.

path of the fluid. The fluid flows straight through the valve, hence, a gate valve offers the minimum resistance when it is fully open. The gate is moved by a stem screw attached to the handle. Gate valves are poor regulators because at nearly closed position (where best regulation is obtained) the fluid velocity either causes vibration and noise, or else tends to erode the disc.

2. *Throttling flow:* This is best accomplished by *globe* or *angle* valves. These valves cause the fluid to change direction, and consequently, offer considerable fluid resistance even when in the open position. Both the globe and angle valves operate by closing a plug into a fitted seat. The angle valve is similar to the globe valve

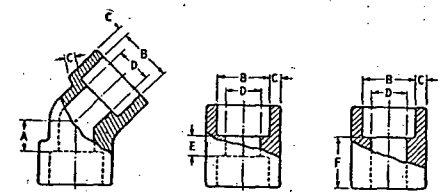
TABLE 13. DIMENSIONS OF SOCKET WELDING FITTINGS

A. DIMENSIONS OF SOCKET WELDING ELBOWS, TEES, AND CROSSES



Nominal Pipe Size	Depth of Socket, Min	Center to Bottom of Socket: Sched 40 and 80	Center to Bottom of Socket: Sched 160	Bore Diameter of Socket, Min	Socket Wall Thickness, Min: Sched 40	Sched 80	Sched 160	Bore Diameter of Fitting: Sched 40	Sched 80	Sched 160
		A		B	C			D		
⅛	3/8	7/16	....	0.420	0.125	0.125	....	0.269	0.215	....
¼	3/8	7/16	....	0.555	0.125	0.149	....	0.364	0.302	....
⅜	3/8	17/32	....	0.690	0.125	0.158	....	0.493	0.423	....
½	3/8	5/8	¾	0.855	0.136	0.184	0.234	0.622	0.546	0.466
¾	½	¾	⅞	1.065	0.141	0.193	0.273	0.824	0.742	0.614
1	½	7/8	1 1/16	1.330	0.166	0.224	0.313	1.049	0.957	0.815
1¼	½	1 1/16	1¼	1.675	0.175	0.239	0.313	1.380	1.278	1.160
1½	½	1¼	1½	1.915	0.181	0.250	0.351	1.610	1.500	1.338
2	5/8	1½	1 5/8	2.406	0.193	0.273	0.429	2.067	1.939	1.689
2½	5/8	1 5/8	2¼	2.906	0.254	0.345	0.469	2.469	2.323	2.125
3	5/8	2¼	2½	3.535	0.270	0.375	0.546	3.068	2.900	2.626

B. DIMENSIONS OF SOCKET WELDING 45-DEG ELBOWS, COUPLINGS, AND HALF COUPLINGS



Nominal Pipe Size	Depth of Socket, Min	Center to Bottom of Socket for 45-Deg Ells: Sched 40 and 80	Center to Bottom of Socket for 45-Deg Ells: Sched 160	Couplings Distance Between Bottoms of Sockets	Half Couplings, Bottom of Socket to Opposite Face	Bore Diameter of Socket, Min	Socket Wall Thickness, Min: Sched 40	Sched 80	Sched 160	Bore Diameter of Fitting: Sched 40	Sched 80	Sched 160
		A		E	F	B	C			D		
⅛	3/8	5/16	....	¼	5/8	0.420	0.125	0.125	....	0.269	0.215	....
¼	3/8	5/16	....	¼	5/8	0.555	0.125	0.149	....	0.364	0.302	....
⅜	3/8	5/16	....	¼	1 1/16	0.690	0.125	0.158	....	0.493	0.423	....
½	3/8	7/16	½	3/8	7/8	0.855	0.136	0.184	0.234	0.622	0.546	0.466
¾	½	½	9/16	3/8	1 3/16	1.065	0.141	0.193	0.273	0.824	0.742	0.614
1	½	9/16	1 1/16	½	1⅛	1.330	0.166	0.224	0.313	1.049	0.957	0.815
1¼	½	1 1/16	1 3/16	½	1 3/16	1.675	0.175	0.239	0.313	1.380	1.278	1.160
1½	½	1 3/16	1	½	1¼	1.915	0.181	0.250	0.351	1.610	1.500	1.338
2	5/8	1	1⅛	¾	1 5/8	2.406	0.193	0.273	0.429	2.067	1.939	1.689
2½	5/8	1⅛	1¼	¾	1 11/16	2.906	0.254	0.345	0.469	2.469	2.323	2.125
3	5/8	1¼	1 3/8	¾	1¾	3.535	0.270	0.375	0.546	3.068	2.900	2.626

From American Standard for Steel Socket-Welding Fittings, *ASA* B16.11-1946.
All dimensions are in inches.