soldered types of connection. Table 5 from *A.S.A.* Standard A40.3-1941 contain dimensions for soldered joint elbows, tees, crosses, and 45 deg elbows.

The compression type fitting is generally limited to smaller size tubing while the flared and soldered types are used in both large and small sizes. An American Standard, *A.S.A.* A40.2-1936 has been prepared to standardize dimensions for brass fittings for flared copper water tubes. Flared tube fittings are widely used in refrigerating work where *S.A.E.* dimensions and a 45-deg flare render most fittings interchangeable, although for refrigeration use, thread fits and tolerances on thread gages must be

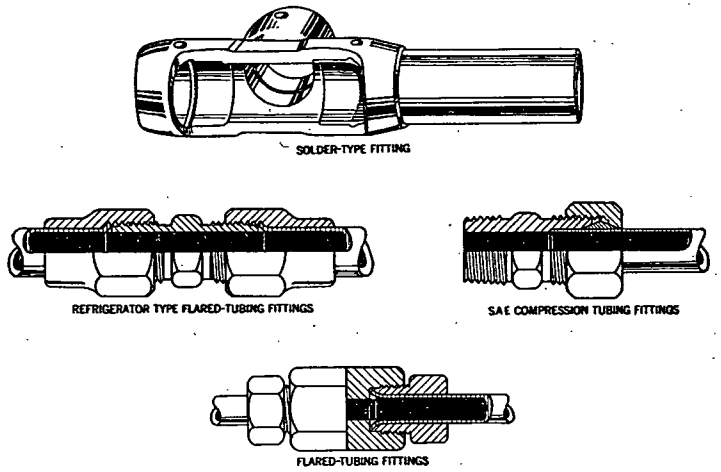


FIG. 2. COPPER OR BRASS TUBING FITTINGS

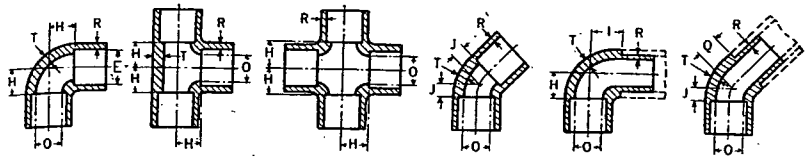
maintained within close limits. Brass fittings with *S.A.E.* dimensions are not interchangeable with the American Standard fittings for water tubes.

Ammonia pipe fittings made of cast-iron were formerly used extensively in handling refrigerants in large installations. Replacement of ammonia by other refrigerants operating at lower pressures has seriously curtailed the market for these fittings. For this reason formulation of an American Standard for these fittings was abandoned by the *A.S.A.* in 1936.

FLANGE FACINGS AND GASKETS

A number of different flange facings in common use are plain face, raised face, tongue and groove, and male and female. Cast-iron fittings for 125 lb pressure and below are normally furnished with a plain face, while the 250 lb cast-iron fittings are supplied with a 1/16-in. raised face. The standard facing for steel flanged fittings for 150 and 300 lb is a 1/16-in. raised face although these fittings are obtainable with a variety of facings. The gasket surface of the raised face may be finished smooth

TABLE 5. AMERICAN STANDARD DIMENSIONS OF ELBOWS, TEES, CROSSES, AND 45 DEG ELBOWS, SOLDERED-JOINT FITTINGS, *A.S.A.* A40.3-1941



NOMINAL SIZE[a]	CAST BRASS[b]							WROUGHT METAL	BORE OF FITTINGS
	Laying Length, Tee, Ell, and Cross[b]	Laying Length, Ell With External Shoulder	Laying Length, 45 Deg Ell	Laying Length, 45 Deg Ell External Shoulder	Inside Diameter of Fittings,[c] Min.	Metal Thickness[d]		Metal Thickness[e] Min.[f]	
	H	I	J	Q	O	T	R	T and R	E, Min.
1/4	1/4	3/8	3/16	1/4	0.31	0.08	0.048	0.030	0.378
3/8	5/16	7/16	3/16	5/16	0.43	0.08	0.048	0.035	0.503
1/2	7/16	9/16	3/16	5/16	0.54	0.09	0.054	0.040	0.628
3/4	9/16	11/16	1/4	3/8	0.78	0.10	0.060	0.045	0.878
1	3/4	7/8	5/16	7/16	1.02	0.11	0.066	0.050	1.1285
1 1/4	7/8	1	7/16	9/16	1.26	0.12	0.072	0.055	1.3785
1 1/2	1	1 1/8	1/2	5/8	1.50	0.13	0.078	0.060	1.629
2	1 1/4	1 3/8	9/16	3/4	1.98	0.15	0.090	0.070	2.129
2 1/2	1 1/2	1 5/8	5/8	7/8	2.46	0.17	0.102	0.080	2.629
3	1 3/4	1 7/8	3/4	1	2.94	0.19	0.114	0.090	3.129
3 1/2	2	2 1/8	7/8	1 1/8	3.42	0.20	0.120	0.100	3.629
4	2 1/4	2 3/8	15/16	1 1/4	3.90	0.22	0.132	0.110	4.129
5	3 1/8	.....	1 7/16	.....	4.87	0.28	0.168	0.125	5.129
6	3 5/8	.....	1 5/8	.....	5.84	0.34	0.204	0.140	6.129

All dimensions given in inches.

[a]This size is the nominal bore of the tube.

[b]These dimensions may be used for wrought-metal fittings as well as for cast-brass fittings at manufacturer's option.

[c]This dimension is the same as the inside diameter Class L tubing (American Standard Specifications for Copper Water Tube, *A.S.A.* H23.1-1939 (*A.S.T.M.* B88).

[d]Patterns shall be designed to produce body thicknesses given in the table. Metal thickness at no point shall be less than 90 per cent of the thicknesses given in the table.

[e]This dimension has the same thickness as Type L tubing.

[f]These dimensions are minimum, but in every case the thickness of wrought fittings should be at least as heavy as the tubing with which it is to be used.

NOTE 1:—Wrought fittings, as well as cast fittings, must be provided with a shoulder or stop at the bottom end of socket.

NOTE 2:—Street fittings with male ends are for use in connection with other fittings illustrated.

or may be machined with concentric or spiral grooves often referred to as serrated face or phonograph finish, respectively.

The dimensions of elbows, tees and crosses for 125 lb cast-iron screwed fittings are given in Table 6, whereas the dimensions for 125 lb cast-iron flanged fittings are given in Table 7.

For low temperature service not to exceed about 220 F, a number of paper or vegetable fiber gasket materials will prove satisfactory; for plain raised face flanges, rubber or rubber inserted gaskets are commonly employed. Asbestos composition gaskets are probably the most widely