War standard ratings in effect for the duration of the emergency permitted higher ratings for certain sizes of the 125 lb cast-iron flanged fitting standard, and for 300 lb steel flanges and flanged fittings, than those shown in the regular American Standards mentioned previously.

Screwed fittings include: nipples or short pieces of pipe of varying lengths; couplings of steel or wrought-iron; elbows for turning angles of either 45 deg or 90 deg; return bends, which may be of either the close or open pattern, and may be cast with either a back or side outlet; tees;

TABLE 5. THREADING DATA FOR PIPE

Nominal Size[a]	Pipe O. D.	Standard Weight			Extra and Double Extra Strong		
		Threads per Inch[b]	Coupling O. D.	Coupling Length	Threads per Inch	Coupling O. D.	Coupling Length
⅛	0.405	27	0.563	1 3/16	27	0.563	1 3/16
¼	0.540	18	0.719	1 3/16	18	0.719	1 5/8
⅜	0.675	18	0.875	1 3/16	18	0.875	1 5/8
½	0.840	14	1.063	1 5/16	14	1.063	2 1/16
¾	1.050	14	1.313	1 5/8	14	1.313	2 1/8
1	1.315	11½	1.576	2	11½	1.576	2 5/16
1¼	1.660	11½	1.900	2 1/16	11½	2.054	2 3/4
1½	1.990	11½	2.200	2 1/16	11½	2.200	2 3/4
2	2.375	11½	2.750	2 3/8	11½	2.875	2 7/8
2½	2.875	8	3.250	3 1/8	8	3.375	4 1/8
3	3.500	8	4.000	3 1/4	8	4.000	4 1/4
3½	4.000	8	4.625	3 3/8	8	4.625	4 3/8
4	4.500	8	5.000	3 1/2	8	5.200	4 1/2
5	5.563	8	6.296	3 3/4	8	6.296	4 5/8
6	6.625	8	7.390	4	8	7.390	4 7/8
8	8.625	—	—	—	8	9.625	5 1/4
10	10.750	—	—	—	8	11.750	5 3/4
12	12.750	—	—	—	8	14.000	6 1/8
14	14.000	—	—	—	8	15.000	6 3/8
16	16.000	—	—	—	8	17.000	6 3/4
18	18.000	—	—	—	8	19.000	7 1/8
20	20.000	—	—	—	8	21.000	7 5/8

[a] All dimensions in inches.

[b] Taper of threads is ¾ in. per ft on diameter on all sizes of pipe, and in couplings of 2½ in. and over. Couplings 2 in. and smaller are straight tapped.

crosses; laterals or *Y* branches; and a variety of plugs, bushings, caps, lock-nuts, flanges and reducing fittings. Reducing fittings as well as bushings, both of which are used in changing from one pipe size to another, may have the smaller connection tapped eccentrically to permit free drainage of the water of condensation in steam lines or free escape of air in water lines.

Fittings for copper tubing are available in the soldered, flared, or compression types. Illustrations of each of these types are shown in Fig. 2. Fittings for copper pipe of *IPS* dimensions are available in screwed or soldered types of connection. Table 6 from *ASA* Standard A40.3-1941 contains 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, *ASA* 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 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

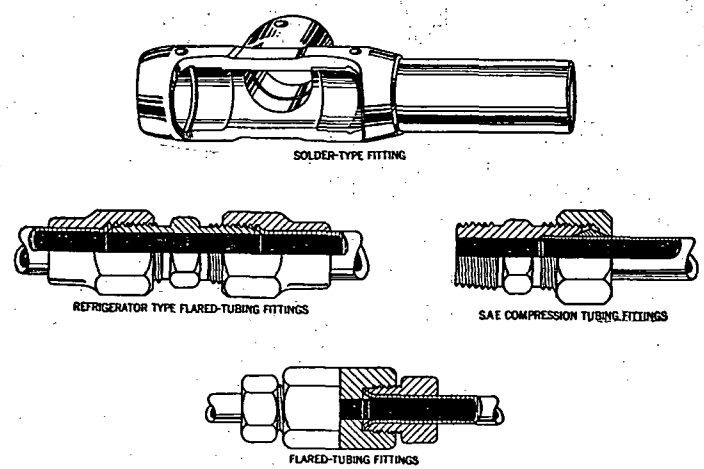


FIG. 2. COPPER OR BRASS TUBING FITTINGS

the market for these fittings. For this reason formulation of an American Standard for these fittings was abandoned by the *ASA* 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 psi and below are normally furnished with a plain face, while the 250 lb cast-iron fittings are supplied with a $\frac{1}{16}$-in. raised face. The standard facing for steel flanged fittings for 150 and 300 psi is a $\frac{1}{16}$-in. raised face, although these fittings are obtainable with a variety of facings. The gasket surface of the raised face may be finished smooth 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 7, whereas the dimensions for 125 lb cast-iron flanged fittings are given in Table 8.

For low temperature service not to exceed about 220 F, a number of