also be welded with as much certainty as iron, and the advantage of steel is that it is from 30 to 50 per cent. stronger than iron, so that a ⅜-inch steel shell is quite as strong as a ½-inch or 9-16-inch iron plate; in fact, steel offers so many advantages that ere many years we may look for it to supersede iron in the great bulk of our manufactures, and steel makers are now engaged in trials in order that they may turn out steel at the least possible cost.

Few boilers, at any rate those in large concerns, are now worked without being inspected by an engineer of one of the great insurance companies, the three principal of which have their head offices at Manchester. We would recommend all steam-users to have their boilers inspected by one of the companies, and boiler-tenters will find that it frequently relieves their mind of great responsibility; the cost is, moreover, very trifling, and as the men have such great experience they are enabled to advise in the most awkward cases. The question of pressures is at the present time a vexed one, some preferring to work at the 100 pounds to the square inch, or even higher; others maintain that 70 pounds to 80 pounds will give the best result. Theoretically, there is a slight gain by using the higher pressures, but practically, considering the great difficulty to keep joints tight, the wearing away of the various working parts, etc., it is doubtful whether higher pressures are really more economical.—*English Mechanic.*

BRAZING, OR HARD SOLDERING.

The following practical instructions are taken from an excellent little work, published at the "Bazaar" Office, 170, Strand, London, called "Working in Sheet Metal." Price 6d.

The simplest form of brazing or hard soldering, which should be the one first attempted, is the junction of iron to iron by means of fused brass wire. Take, for instance, two large nails. File one surface of each bright; smear the cleaned faces with borax made into a paste with water; tie the two together with iron wire (binding wire) in one or two places, just sufficiently to prevent slipping, but not by successive coils one over the other; and then wind round several coils of brass wire, smearing more borax upon these. All you now have to do is to hold them over a bright coke fire, or over a forge fire, or even lay them on any fire in a close stove of good draught, and presently the brass will melt and run into the joint, and the work will be complete. You may then file off any superfluous metal, and the job will be seen to be neat and of great strength. Just as the brass melts you will see a blue flame arise. This is the spelter or zinc of the brass, which is thus dissipated, and is a sign that the work is complete. You may thus mend all sorts of broken iron (keys, for instance, which frequently get broken in the bit or the ring), and will gain some practice in manipulation. But when brass or copper require to be brazed it is plain you will not be able to use the same as solder, because you would fuse the article itself, a feat not usually desirable. The solder used in this case bears the name of spelter, and is made of equal parts of zinc and copper. It is, in fact, itself a softer kind of brass, and there are two qualities even in this, viz., hard and soft spelter. The latter will be bought in the form of bright granules, the colour of gold, and can be had at most tool shops. The borax—a salt composed of boracic acid and soda, the chemical name being borate of soda—swells up in a wonderful manner when heated, and may possibly displace the solder. It is better, therefore, to heat it first of all until the swelling has subsided by the total omission of its water of crystallisation; it can then be pounded and kept for use. Suppose it is desired to form a tube or cylinder of sheet brass. If very thin —as paper—let it be soldered and do not attempt to braze; but if as thick as stout card proceed as follows: Cut the necessary strip and take special care the edges are straight, so that when the piece is folded into the cylindrical form they may come together accurately. Before folding scrape or file bright the sides of the strip for a width of a ¼in. or so. Thus, when folded, there will be a clean strip of metal ½in. wide from end to end of the tube. Let this be inside; bind the tube in position with a ring of iron wire placed here and there, or when heated the seam will open; now smear the borax paste along the bright part, and also drop along it the little granules of spelter, and gently heat till the borax holds the bits of solder, as it soon will. The fire to be used must be clear and bright—flame and smoke are inadmissible for this work—and if no forge can be got at a temporary fireplace should be made with a few bricks, and the fire (of small pieces of coke or coke and charcoal) should be urged with a pair of bellows. An assistant should be impressed to use the latter, if possible, as the manipulation of the brass tube is of a delicate nature, and indeed some jobs of this kind damand the greatest possible skill to insure satisfactory results. Let the tube in the present case be warmed all round, first of all, and then held in a pair of light tongs over, but not touching, the hottest part of the fire, moving it to and from so that the whole length shall be equally heated. After a few minutes the blue flame will arise, and the whole must be instantly removed or the tube itself will melt. If it is tapped so as to shake it the solder will flow the more readily into the seam. The danger in this case, remember, arises from the fact that the melting point of spelter is not much below that of the brass itself. Hard spelter, indeed, should never be used unless the workman is an adept. It is "no end of a sell" to melt the work, especially if it be the property of a friend who has intrusted it to your well-known skill (?) instead of more judiciously sending it to the smith or brazier.

Copper is brazed in precisely the same way, but it will bear about 60 degrees more heat than brass before it begins to melt, making it rather more easy, therefore, to manipulate in the above operation. Brass fuses at 1,859 degrees; copper at 1,923 degrees; but the fusing point of brass, it must be remembered, varies according to quality, so much so that one kind might be used to braze another. Very often, in works of copper, the joint is not made merely by bringing the edges into contact, but by snipping the edges at intervals and cutting out pieces in each, so that they can be made to interface, so to speak; or one edge is clipped in this way, and the intermediate bits between the cuts are alternately bent so as to form a kind of channel into which the opposite edge, which is not thus cut, is placed, these little bits being then hammered down. This procludes the necessity of the wire ties while the work is being done, and as copper is not so springy as brass the tube is not so prone to fly open while being heated. The joint, too, is perhaps somewhat stronger, but not much, for the spelter enters into close combination with the metal in such cases, so much so that a tube of brass thus made can be drawn to a considerable length without danger of such seam opening. Copper is so malleable that hardly any raised seam need appear, and when the spelter has run the whole may be hammered and filed quite level.

FRENCH IMITATION OF GOLD.—One of the most remarkable achievements in the production of an alloy for perfectly imitating gold, is said to have been made by M. Meiffren, of Marseilles, the alloy standing a very acid test, and its specific gravity being also extremely close to that of gold of the fineness indicated by the acid test—being, therefore, peculiarly adapted to the manufacture of jewelry. The method of production in this case is to place in a crucible, copper as pure as possible, platinum and tungstic acid in proportions as follows: Copper, 800 grammes, 25 of platinum, 10 of tungstic acid, 175 of gold; when these metals are completely melted they are stirred and granulated by being run into water containing 500 grammes of slacked lime and the same of carbonate of potash for every cubic meter of water, this mixture, dissolved in water, having the property of rendering the alloy still purer. The granulated metal is next collected, dried and, after remelting in a crucible, a certain quantity of fine gold is added. In this way an alloy results which, when run into ingots, presents the appearance of red gold of the standard of 750-1,000ths. The color of the alloy may be changed by varying the proportions of the different metals. As a flux, boric acid, nitrate of soda and chloride of sodium, previously melted together in equal proportion, are used, the proportion of flux employed being 25 grammes per kilogramme of the alloy.

MEATS COOKED BY COLD.—It seems unlikely at first thought, yet it is a fact that extreme cold produces in organic substances effects closely resembling those of heat. Thus, contact with frozen mercury gives the same sensation as contact with fire; and meat that has been exposed to very low temperature assumes a condition like that produced by heat. This action of intense cold has been turned to account for economical uses by Dr. Sawiczevosky, a Hungarian chemist, as we learn from *La Nature*. He subjects fresh meats to a temperature of minus 33° Fahrenheit, and having thus "cooked them by cold," seals them hermetically in tin cans. The results are represented as being entirely satisfactory. The meat, when taken out of the can a long time afterward, is found to be, as regards its appearance and its odor, in all respects as inviting as at first. A German government commission has made experiments with this process, and in consequence two naval vessels dispatched on a voyage of circumnavigation were provided with meat prepared in this way. Hungary has an establishment for preserving meats by this process.