BRAZING AND SOLDERING

Published @ 2017 Trieste Publishing Pty Ltd

ISBN 9780649249411

Brazing and Soldering by James F. Hobart

Edited by Trieste Publishing Pty Ltd.
Cover @ 2017

www.triestepublishing.com

JAMES F. HOBART

BRAZING AND SOLDERING

Trieste

Brazing and Soldering

BY JAMES F. HOBART

▼ ▼ ▼

Brazing.

Soldering and brazing are terms often used to denote the same operation, that of joining similar or dissimilar metals by means of molten metal which may be of the same kind, but which usually has a lower melting point than the metals to be joined. The term "brazing" is usually employed to denote the soldering with an alloy of copper or zinc. "Soldering" is usually taken to represent the joining of surfaces by means of an alloy of lead and tin, and "hard-soldering" is understood to mean the process of uniting as above described with silver and its alloys used as a uniting metal. Hard soldering and brazing are practically the same, and are both done in about the same way.

The theory of brazing is the melting of a low fusing metal against the metals to be united while they are in such a condition of cleanliness and temperature that the metal welds itself to them. Soft brass, when melted, will weld itself to iron, copper, and a number of other metals, while the temperature of the metals in question is at a considerable number of degrees below their several melting points. In fact, only heat enough need by employed to fairly melt the uniting metal and to render it fluid enough to flow, or to "run," as the mechanic aptly states it.

To braze, also to solder, it is absolutely necessary that the surfaces to be united are clean and free from oxide.

Brazing.

The term "clean" is used in brazing and soldering, to mean that there is no "matter in the wrong place" as far as the surfaces to be operated upon are concerned. If the surfaces should be covered with a mixture of plumbago and soap, it is pretty sure that the brass would not adhere, and they could be called "dirty." If, on the contrary, the surfaces were daubed with grease, resin, lime, borax or similar substances, the brazing will not be interfered with; hence, it is better to say that surfaces to be brazed or soldered, should be made bright and free from oxide, finger marks, and all other matter except the proper flux to prevent oxidization of the surfaces when heated. This, and this alone, is the purpose of all the fluxes used either in soldering, brazing or welding. The flux prevents oxidization from contact of the hot metal with the air, or with the gases from the fuel used in heating.

Aside from the proper cleaning and fluxing of metals to be brazed or soldered, it is necessary that they be fitted together as closely as possible. It may seem like a paradox, but is the truth never the less, that when surfaces are united by brazing, the union is stronger the less brass there is between the surfaces. That is: The closer the fitting of the parts, the stronger will the braze be after completion. It is unnecessary to "leave space for the brass," in fitting for a brazed joint. The penetrating power of melted brass may be demonstrated by drilling a hole in a piece of iron or steel. Drive a plug in the drilled hole, and force it in as tightly as possible, then rivet the ends of the plug and proceed to braze around one end of it, when it will be found upon test, that no matter how tightly the plug may have been driven in, the melted brass has found its way through the plate beside and around the riveted plug, and that it has brazed both ends of the plug and its

entire length as well. Therefore, fit tight, for brazing, and trust the liquid brass to find its way through the entire joint without fail.

Borax is the flux usually employed for all kinds of brazing. For commercial work on a large scale, boracic acid is used as it is cheaper than borax, being purchased in a granular form, in bulk, by the keg or barrel. For the uniting metal, some alloy of copper and zinc is universally employed. When other substances, such as silver is used, the operation becomes known as "hard soldering," as described elsewhere.

The particular alloy used for brazing, is called "spelter," and consists of equal parts of copper and zinc. For different operations it is necessary to use either a harder or softer alloy, hence the proportions of metals vary in the alloy according to the following table:

Brazing Alloys.	Tin.	Copper.	Zinc.	Antimony
Hardest,	0	3	1	0
Hard (spelter)	0	1	1	0
Soft,	1	4	3	0
Softest,	2	0	0	1

In a number of dictionaries, the proper metal for brazing is given as "Fine Brass, one part; Zinc, one part." This means that the copper in the brass receives another portion of zinc, thus making the alloy softer and lowering the melting point.

In commercial brazing, it is frequently profitable to mix the spelter with the proper proportion of boracic acid as found by experiment to be necessary. Then, the mixture is placed over or upon the parts to be brazed, and subjected to heat sufficient to melt the brass. As soon as the brass is seen to flow, "run," the workman calls it, the

article is removed from the fire and the surface—if it will allow—is rubbed or scraped with a piece of metal or with a scratch brush to remove the flux and a portion of the superfluous brass. In many cases the scraping can not be permitted owing to the nature of the work, but whenever possible, it should be done as the flux comes off much easier when hot than after it gets cold.

The manner of applying the spelter and borax also differs with the work to be done. When a plain ring is to be brazed, it is sufficient to hang the ring on the end of a wire or a rod of iron and place a bit of spelter and borax inside the ring which has been placed so that the part to be brazed is downward. Usually the spelter and borax can be deposited in some angle of the work, or, upon some flat surface which will keep it in place during the heating operation. Sometimes, however, this is impossible, as in brazing a wire. In such cases, select a bit of spelter which is long enough to bend up U-shaped so it could be hung over the wire. The borax can readily be made to adhere by warming the wire.

It is best to heat rather slowly, in order that the joint may be brought to a dull red heat without burning any portion, or without any part remaining too cold. When the heat is forced so that one portion of the metal is hot enough to melt the spelter that happens to be on it, while another part of the joint is below the melting part of spelter, there is little possibility of securing a perfect joint. Heating evenly is absolutely necessary. It must be insisted upon or there will be no good work done in brazing.

Brazing can be done with any source of heat which will melt the spelter, but a properly arranged gas flame is the best that can be provided. The writer has more

than once done work in an excellent manner in a pile of coals in an open fireplace with the hand-bellows as a source of air pressure. Indeed, upon one occasion, in a hunter's camp, a hatchet, split through the poll to the very eye, was successfully brazed with a bit of soft brass wire used for snaring fish. The flux was a bit of borax from the medicine chest, and the brass melting fire was a kettle full of coals set just inside the camp door and banked with wet clay to approximate a smith's forge. The necessary blast was supplied by a cone of birch bark, the large end of which was daubed with clay tightly into a hole in the wall of the camp. The small end of the cone led into a little clay passage which conducted the wind pressure into the bed of coals. No better working outfit could be desired for the limited work to be done.

When a smith's forge is to be used for brazing, use a charcoal fire, if possible. If bituminous coal must be used, coke enough of it to do the work, as the sulphur in the soft coal is not conducive to good brazing any more than it is to good welding, although a fair job of brazing may be done in an ordinary green coal fire by letting the coal remain without stirring while the brazing is being done.

If the work permits of being readily handled, make a sort of pit or crater in the pile of coal on the forge, and blow a few minutes until all the visible smoke and gas has ceased. Then lower the work carefully into the crater and blow very lightly, taking care that the spelter is in place and that it is not crowded away by the melting of the borax. Heat slowly and evenly, allowing the fire to lie without blast for short intervals. This permits the work to "soak" in the heat, as it is called by the workmen, resulting in very even heating of the work.

Brazing.

The workman should have at hand a small pointed rod or wire, with which to poke into place any bit of spelter which may shift its position and at the instant of melting, the spelter may be made to flow quickly and in the direction desired, by pressing the bits of spelter, one at a time, against the hot surface of the work. A row or group of spelter granules seem a good deal like sheep. Let one start to run, and all the others quickly follow. A bit of spelter forced against the hot metal receives its heat much quicker than when lying loose, and, as soon as one particle melts, it flows around the others, permitting them to receive heat and melt very quickly, hence the seeming following in the leadership of the first granule to melt. The work can be brazed at a considerable lower heat if a little care is taken to start the spelter a-flowing, as above noted.

In brazing in the smith's forge. it is well to hold the work "high up," that is, do not let it rest on the coal, but keep it suspended between the banks of incandescent fuel so that heat must reach all parts by radiation instead of a part by convection, as would be the case were the work to rest directly against the hot coals. When large work is to be handled, of course the above will not apply, and direct contact with the coal of the part to be brazed must be prevented by the work being supported at other places, leaving the working portion free and clear.

When considerable brazing is to be done, build a special furnace for that work alone, and, if possible, do the heating with gas. A blast of air will be necessary but a very small blower, similar to that used for a portable forge, will do all that is required. The diagram contained in Fig. 1, shows plainly the construction of a small home-made furnace for brazing. This furnace may be built up

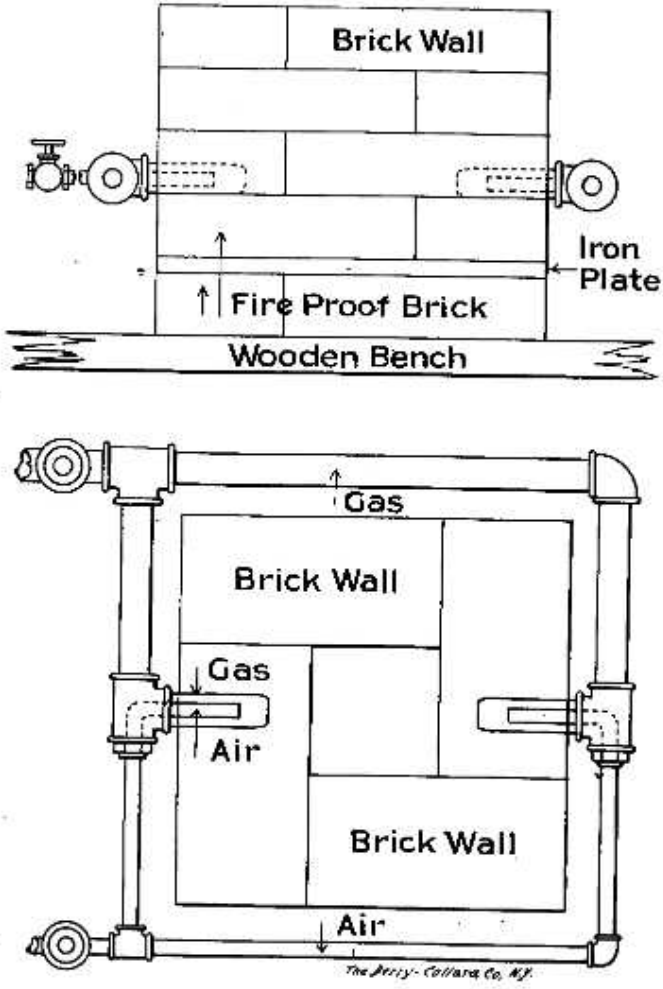

Fig. 1. Home made brazing furnace.