

## TINNING AND RE-TINNING.

The object of covering the surface of a piece of sheet metal with tin is to protect the sheet from chemical action. In the case of iron, tinning prevents oxidation, in the case of copper cooking vessels, it protects the copper from the action of acids, which might prove injurious to health.

To insure the proper union of alloying of the tin with the iron or other surface to be covered, this surface must be made perfectly clean, and to assist the flow of the melted tin over it a suitable flux must be employed. According to the purpose for which the sheet metal under treatment is to be used, it has to be tinned on one or on both sides. If the sheet is to be tinned on one side only, the tin is placed, either in a melted or a solid state, on the cleaned surface, and heat, from a forge fire or a gas blowpipe, is applied to the under surface, so as to heat the sheet of metal to a temperature sufficient to keep the tin melted if already melted or to melt the tin if this is applied solid. Greater care is needed with the flux when the tinning is on one side only than when on both sides, because there is a tendency for fluxes such as chloride of zinc to dry and form a skin on the surface of the sheet before the tin has time to cover and unite with it. Hence fluxes such as salammoniac, rosin and tallow are the most suitable fluxes. Where a sheet has to be

tinned on both sides the like care is not required, as it can be dipped bodily into molten tin. Care is required, however, that the sheet metal to be dipped is not wet or damp or even very cold, for if it is the tin will fly out, perhaps even to the serious injury of the operator. The sheet should be dipped gradually so that any dampness is steamed off and the sheet warmed before it is finally plunged and submerged in the melted tin.

**Re-Tinning Copper.** In the re-tinning of copper saucepans and other vessels that have been used for cooking, they should first be warmed and all grease, especially near rivets, carefully wiped off. They can be cleaned by scouring thoroughly until bright with either wet forge scale, or better still, silver sand which has been moistened with lemon juice, and which may be applied either with a cork to secure friction, or with a piece of rough moleskin, or with tow or similar material. It is sometimes necessary, when articles are very dirty and where there are rivets, to first clean them with warm killed spirits before scouring thoroughly bright. In the case of copper moulds, it is often difficult and inconvenient to thoroughly scour the inside crevices. It will be found very helpful in such cases to half fill the moulds with a solution of equal parts lemon juice and spirits of salts, and after a few minutes to rub with a strip of cork. This greatly assists in securing a perfectly bright surface. Better results are obtained with the mixture of lemon juice and raw spirits of salts than with either of these liquids separately. When the vessel to be re-tinned has been thoroughly cleansed, it should be well washed for about a minute with chloride of zinc, and then if it is to be

tinned on both sides, it should be gradually and carefully dipped into a bath of melted tin. For re-tinning a vessel on one side only it is advisable to prepare the surface that is to go next the fire by coating it with a mixture of wet whiting and salt, as the untinned part can then be cleaned more readily afterwards. The vessel being placed on the fire, the tin is applied melted or solid. If melted or after melting, a little fresh mutton tallow or a little powdered rosin or powdered sal-ammoniac may be dusted over the surface to prevent oxidation. Then the vessel should be moved about gently so that the melted tin passes over the whole of the surface that is to be covered. If there are any spots to which the tin does not readily adhere, it may be wiped over them by means of a piece of tow or by a piece of rod wire that has been previously prepared by being coiled up at one end and tinned. It is useful to have at hand a lump of sal-ammoniac to make similar use of, wiping as it were with it the tin over the spots that do not readily cover. A large cork is also handy to rub the tin over the surface that does not willingly take it. The tin invariably clings about the edges of the vessel, and forms a list which must be shaken off. If it will not shake off, it must be wiped off gently and quickly with a piece of moleskin cloth, this is better than tow. When tinned either on one or both sides, the vessels should at once be washed with hot water, dried with bran, and polished bright, and it is important that this should be done immediately after the tinning if a bright surface is to be insured. Scouring and pickling liquids may be drained off and saved, and used over and over again, as well as the sand, which will settle at the bottom.

**Re-Tinning Wrought Iron.** Wrought iron is more difficult to tin than copper, and the surface requires longer time to prepare it to take a coating of tin, and the preparation is more troublesome. The article to be tinned should be heated to redness and afterwards placed in dilute sulphuric acid for about twelve hours and then immersed in killed spirits for about six hours, or, if the article cannot be annealed then it should be pickled in muriatic acid for twenty-four hours and afterwards immersed in chloride of zinc solution in which salammoniac has been dissolved. In either case, if there are patches on the surface which are difficult to clean or tin, it will be advantageous to well rub them with a piece of wet pumice stone. A wrought-iron stewpan which has been previously tinned and is in fair condition, may only require warming to clean off the grease, and judgment must be used as to the length of time required for the pickling, the article being examined at intervals to see whether the surface is clean and bright. The wrought-iron vessel thoroughly cleaned by either method, should now be gradually dipped in a bath of molten tin, and allowed to remain there for two or three minutes. If required to be tinned on one side only, the tinning may be done in the same way as already explained for copper.

**Re-Tinning Cast Iron.** Cast iron is most difficult to tin, and for this reason no attempt should be made to re-tin cast-iron cooking vessels, as it pays better to substitute new ones. If cast iron is to have anything like a good appearance when tinned, it must not be spongy, and its surface should be rendered smooth either by grinding, filing or machining, whichever it is most convenient to do. If possible the casting should

be made red hot, and then pickled for twenty-four hours in slightly diluted muriatic acid, and immediately on being removed should again be completely immersed for about two hours in a solution of chloride of zinc. If the casting cannot be made red hot, it should be immersed for about ten minutes in dilute sulphuric acid and warmed to about 90 degrees Fahrenheit, then pickled in muriatic acid for two days, and afterwards allowed to soak for two hours in a mixture of chloride of zinc solution and salammoniac, about two ounces of the latter to a gallon of spirits.

The casting, by whichever method cleaned, is now ready to be dipped gradually into the tinning pot. Should it not be sufficiently tinned the first time, the surface should be well rubbed with a piece of cork directly the casting is withdrawn from the melted tin, and be again dipped in the chloride of zinc solution and then once more into the tinning pot. Sometimes it is required to tin a part of a casting and to use the copper-bit. When such is the case it is essential that the surface be cleaned and smoothed by scraping or otherwise, then soaked with raw spirits of salts, and then with chloride of zinc solution in which salammoniac has been dissolved. Then the tin should be applied by means of the copper-bit, and a piece of cork used to rub in the tin where there is a difficulty to get it to adhere. Tinning in this way, though not so strong as tinning in the way just described, is sufficiently effective for most purposes.