

else; zinc, for instance, if the bolt be a little too hot, will melt at the spot where it is applied, leaving a hole. Tin-plate is hardier.

The beginner has already heard of the bolt, the solder, and, let us say, resin. For tin-plate work, a pair of shears, hammer, file, &c., will be necessary; and a most useful sort of file for solders or soft metals is a "float," the teeth cut right across from side to side, preventing the clogging or fouling that happens to even a new file when used on brass, tin, lead, &c. It may be stated, without fear of contradiction, that there is no one thing in the world that is not useful to a tinman: broken scissors pierce holes for him, old hoop iron makes handles for his saucepans, a bit of iron bar allows him to hammer up a tube upon it, a bit of wire with the plate bent over it forms a finish and adds strength where wanted; but in a laboratory very few things need be specially added. It seems right to inform a beginner that he can never hope to equal the finish of a saucepan that costs sixpence at a shop, in his own work; but it is simply that we cannot rival the precision of machinery. If he would "break a lance" on the subject, let him try to make the top of a common coffee pot, and when he retires it will be as a sadder and a wiser man. The tops of coffee pots, the little round feet of watering-pots, handles of various kinds, &c., are struck out by machinery, and supplied to shops, where they are worked up, just as nitrate of silver is sold to us to use to the best of our ability. The side of a boiling kettle is rounded to its curve in a machine that costs some pounds sterling; evidently, we cannot face those who are armed with such weapons, but we can make very useful things for all that, and very cheaply. For instance, a particular gluepot that was advertised at seven shillings and sixpence could be made by the amateur at sevenpence, rougher, of course, but not one whit less strong nor less efficient. With the first rudiments of the art in his head, a photographer may make a still, alter one, or improve it, and this without the bother of explaining his views to workmen perhaps a dozen times over, and paying in proportion. Not that such a thing is very useful when made, for, without entering on the domain of distilled water, a tin still is a delusion and a snare, and about as useful in giving pure water as a half-used blacking-bottle might be. If a case is required to hold a silver bath, so that either hot or cold water may surround it, a little work at a cost of a few pence, and it is ready; if a hot-water arrangement for drying a wet plate is wanted suddenly, you can make it sooner than your messenger could get it made at any shop, even if you were close to one, and not, as in my own case, a mile and a half from any shop.

Any one may concede that soldering is useful and economical; he may feel equally certain there is nothing beyond his depth in such work as he is likely to contemplate from a photographic point of view.

It would have been better placed, in the first letter, to say that copper is chosen for the bolt, from the facility with which it is tinned; but if an observer stopped in the street to see a plumber soldering a gas-pipe, he would observe that bolt in this case is iron and red hot; that the man holding in his left hand a thick leather saturated with tallow, has in the other hand a ladle, which he dips into a "crook" of melted solder and pours over and about the intended joint; the bolt merely comes as an accessory after the fact, and keeps the solder in a semi-fluid state, while the hand protected with the greased leather moulds the mass into the required shape. This is soldering, though rather rough-looking; the process is different from tin-plate work; there is more lead entering into the composition of the solder.

The mixture of tin and lead in varied proportions is very useful; add bismuth, and it is fit for pewterers' work. But this mixture, in any proportion, has one formidable enemy: let but a mite of zinc get into it, and there is an end to all soldering. A jeweller, with a mixture of gold and silver, or gold, copper, and silver, for uniting gold, or brass, silver, and zinc, for uniting silver, neither uses the

bolt of the tinman nor the iron of the plumber, but uses a blowpipe, for as his work is minute, and the solder with difficulty fusible, very small pieces are cut and laid along the work, with borax, rubbed up with a little water on a bit of slate, freely covering the work and acting as the resin of the tinman, the tallow of the plumber, or the hydrochlorate of ammonia of the coppersmith, to prevent oxidation of the metals to be joined together. Though it has been said that it is not absolutely necessary to scrape the edges of metals free of oxide before soldering, still no one would think of joining lead without first doing so, while in tin-plate or zinc it is unnecessary.

It is necessary for a time to remember that experience has found that some metals prefer certain solders, &c.; thus, if iron—for such purposes as iron is generally chosen—must be soldered, it must be with "spelter" (mixed copper and zinc). It can be united with soft solder; but here it again shows a choice. Try it with resin or oil, and it shows no change; use "spirit," and it works smoothly at once. Zinc is also deaf to the blandishments of resin or oil, and equally open to the influence of "spirit." The reader will see in any receipt book the mixture and general proportions of solders used for different purposes; and if he obtain much acquaintance with them he will vary them to his own taste.

We have seen that soldering means many things: the use of a tinned copper bolt, a lump of iron, or a blowpipe; yet the list is not finished; as in brazing the foot of the steel scabbard, the heat of a forge is necessary. Some thought is evidently required; but if the beginner feels at home in tin-plate "fine solder" and resin, he will very shortly estimate the necessities of each case. When much work has to be done, two bolts are used, and one is always in the fire, and this is a good plan if speed is an object, even on a small job. In shops, the bolts left to boys to heat are over-heated perhaps fifty times a day, always requiring new facets to be cut on the copper and re-tinning; but an amateur may use his bolt for six months without requiring the process. Resin should either be wiped off with a rag whilst still melted, or allowed to get cold, when it chips off easily. In work where you cannot reach it conveniently to clear away, oil is better; but burning oil is horrible, whilst the smell of burning resin is rather pleasant. These *pros* and *cons* must be settled by each for himself; but, as powdered resin is a thing to be watched on account of its stickiness, it may be as well to say that a board one foot deep by one and a-half long is very useful. Powdered resin lies in a shallow tin in one corner, tacked there; solder run into thin ribands near it in another such dish. These reserves are for the work in hand; but for coating the bolt a lump of resin is melted, and forms a most adhesive coating to an inch or two of the board, where it is always ready for use; and a bit of solder is fixed to the board close by, by boring a few holes into the wood and melting the solder over them, when it runs into the cavities and holds on as so many claws. A broken file is nailed on my own, on which the bolt is rubbed when it comes from the fire, but with a light hand; and the hot bolts lie about on this primitive bit of apparatus without any further harm than by chance lighting on the resin and filling the room with dense vapours. Like Sam Slick, I have praised "soft sawder," for it will do more than any other, and more easily too.

Sir, you have often enlightened me when in the dark, and it will be much pleasure to me if any reader of the PHOTOGRAPHIC NEWS finds use in any hint in this letter.—I am, sir, yours faithfully,
A PHYSICIAN.

THE MORPHINE PROCESS.

SIR,—Mr. Fry, I think, has left no loophole for failure for any one trying the morphine process; but there is this additional advantage in it, that, on an emergency, plates can be prepared and used before drying, with a very much larger margin for keeping moist than with the nitrate silver left on, and possibly this may be very much extended by using