PLUMBING AND SOLDERING LEAD PIPE.

The following interesting article on the art of plumbing and forming joints on lead pipes is condensed from the *Ironmonger* :—The tools necessary for the work comprise a hammer, chipping knife, drawing or strong clasp knife, a pair of compasses, chalk-line, file, pincers, cutting pliers, boxwood mallet with round taper head, chase-wedge, shave-hook, rasp, turnpin, dresser, wiping cloth, ladles and irons. Of course, a full plumber's kit would contain many more items to meet various contingencies, but those above-named will perform all ordinary work. Some of them are sufficiently well-known not to require description ; those that are peculiar to the plumber are the following :—

The shave hook is a sharp, triangular, or heart-shaped blade of steel, riveted on to the end of a steel stem, which is fixed in a wooden handle ; the use is to shave or clean the surface of the part to be soldered, by taking off thin shavings, so as to present a bright metallic face, perfectly free from oxydation, without which it would be quite useless to attempt to solder.

The turnpin is a spherical cone of box or other hard wood, tapering to a blunt point ; it is of various sizes, from 1 inch to 6 inches or more in length, and from 1 inch to 4 inches or more in diameter at the larger end ; this is used for opening the ends of lead pipe, to admit of one part entering the other.

The dresser is simply a piece of hard, tough wood, planed to a smooth face on one side, a handle shaped at one end ; this is for dressing the surface of the sheet lead flat into its place, and by means of a somewhat sharp edge along one side, to beat it into angles.

The round headed mallet is used for beating the lead into circular corners or recesses, also for bossing up lead for strainers, and will be found useful for a variety of purposes, as it is not advisable to use a hammer to lead.

The chase wedge is a wedge of hard wood (usually box), with a piece left in shape of a handle on the top or thick part of the wedge, and is used for chasing the lead into sharp angles, the wedge being run along the lead, and lightly struck with a mallet at the same time.

The wiping cloth, which is one of the most important things, as without it the others are comparatively useless, is made by taking a piece of new linen bed-ticking, and folding it into eight or ten thicknesses, forming a pad of from 3 to 6 inches long, and 2 to 4 inches wide. This before using must be pinned together at one edge, and thoroughly saturated with tallow, by holding it in front of the fire, and rubbing the tallow in till the cloth is quite soft and supple ; this is used to wipe the solder round the joint of a pipe. The object of the tallowing process is to prevent the solder from adhering to the cloth and burning it, which it would do if this precaution were not adopted and frequently repeated.

Lead is a metal of a blueish grey color, and, when freshly scraped or polished, has a very high degree of metallic luster. It tarnishes by exposure to the air, becoming of a dull grey hue, known as lead color. It is the softest of the common metals, being easily cut with a knife or scratched with a nail, and it leaves a dark streak when rubbed on paper. It is remarkably flexible, but destitute of elasticity ; it is malleable to a very considrable extent, and may be either beaten, or rolled out into very thin sheets ; these, however, possess but little strength. Its ductility and tenacity are small ; it cannot be drawn out into wires of less than one-twelfth of an inch in diameter, and they will not support a weight of more than twentypounds. In weight it exceeds the common metals, being upward of eleven times heavier than water. The best lead pipe is made by drawing (on the same principle as wire drawing), by small but powerful machines, in 12 and 15 feet lengths, also by hydraulic machines in 60 feet lengths. It is sometimes a great advantage to have the pipe in these long lengths, whereby a great saving of time and labor in making joints is effected ; but it has also these disadvantages, that the lead is usually harder, and not so easily got into intricate bends and windings, and is also apt to be faulty, having one side much thinner than the other. Sometimes this fault is carried to so great an extent, that there is scarcely any thickness on one side, and twice the proper amount on the other ; this, if not observed by the practiced eye of the workman at the time of fixing, is likely to lead to serious inconvenience and damage when any great pressure of water is put on, or when the pipe comes under the influence of frost. The weld or seam of the hydraulic pipe is sometimes so defective as to yield to a very slight pressure. For ordinary purposes, the pipe in long lengths is sufficiently strong, and to be depended upon ; but for high pressure work, or where pipes have to be fixed in situations difficult of access, in case of accident, the stronger and better made pipe should always be used : good useful ¾-inch pipe should weigh 28 lbs. per 15 feet length ; strong would be 35 or 36 lbs.; 1-inch pipe at about 42 lbs. for ordinary, and 54 lbs. to 56 lbs. for strong, would be good weights ; 1½-inch pipe is usually in 12 feet lengths, which should weight from 60 to 70 lbs. and 2-inch pipe from 70 to 84 lbs.

A common solder is made by melting together about two parts of "lead" to one of "tin." Great care should be exercised not to let the "metal get too hot during the process, as if allowed to get red hot a great deterioration of quality takes place, and the solder becomes hard and brittle. It should be poured into molds of dry sand, or of sheet iron as being more convenient, if required frequently, in bars or ingots, for future use. Old joints or hards, as they are termed in the trade, are sometimes used for making up solder —previous to doing which as much of the dirt as possible should be knocked off ; the hards then melted in a pot or ladle by themselves, well stirred, and the dross or scum well skimmed off the top ; the metal may then be cleansed, by burning a little brimstone in it, and again skimmed ; after which the tin may be gradually added.

We will now suppose that two lead pipes, say 1-inch water pipe, are desired to be soldered together. As it requires a skillful and practiced workman to make a joint to an upright pipe, we will first describe the mode of making a joint while the pipe is in a horizontal position.

The two ends which are to be brought together must first of all be cut off perfectly square—next, with a mixture of size and lampblack, the pipe for a space of six inches each way is to be thoroughly painted ; this is called soiling, and the vessel that holds the mixture the "soil pot ;" the soil should be applied with a painter's sash tool. If the proper soil cannot be procured, some fresh cabbage leaves may be well bruised, and rubbed on to the pipe. The objectof this soiling is to prevent the solder from adhering to the pipe beyond the limits required for making the joint. When this is quite dried, with the turnpin and hammer, the end of one pipe is to be slightly opened, and the edge of the other end very lightly rasped, so that it will enter the first about a quarter of an inch. Having thus nicely fitted the joint, separate the pipes, and with the shave-hook carefully shave about one inch or an inch and a half of each end, so that they be perfectly clean and bright. This is very important, and cannot be too carefully done—at the same time too much of the lead must not be taken away to weaken the pipe. Immediately the shaving is completed the bright part must be lightly anointed with a piece of tallow candle ; this performs the double part of a flux, and prevents the oxydation of the surface, which would be very rapid if the parts were exposed to the action of the atmosphere. The two ends must now be brought together, the outer edge tapped round lightly with a hammer, till it fits closely to the inner pipe, and the pipes securely fixed, to prevent their moving during the making of the joint. While the plumber has been performing this part of the business, his attendant, laborer, or assistant has been getting the solder and irons hot. The irons should be of a good bright red heat, and the solder look white and silvery when poured from the ladle ; if a scum of dross be formed on the top, it must be carefully skimmed off. The iron should be taken from the fire (by means of a piece of stout iron wire, with an eye at one end, and called the quench hook), and the bent handle cooled in a pail of water, so that it can be conveniently borne by the naked hand ; it must then be lightly filed all over the ball part (while still red hot), with an old file, to remove the thin scale which forms during the heating ; the cloth must be warmed, and a little fresh tallow rubbed in. Solder, irons and joint are now ready, and all that now remains is to make the joint. To do this, take a small ladle full of the melted solder in the right hand, and the cloth in the left, lying loosely in the palm of the hand, and just kept in place with the thumb and little finger. Hold this under the joint, pour the solder in a fine stream on to the joint, moving the ladle slightly, so as not to pour all in one place. While pouring the lead move the cloth and push the solder around the pipe, and if it sets very fast allow the first lot of solder to fall off, and pour on more, until a good-sized lump lie on. Then take the iron, and passing it lightly backward and forward, over and under, you will just melt the metal till it becemes of a soft buttery consistency, all the while keeping the left hand and cloth at work wiping up the solder, as it has a tendency to fall. When the pipe appears to be well tinned, and warm, and while the solder is still soft, finish off, by wiping all round with the cloth, leaving the solder about three-eighths of an inch thick in the center of the joint, and wipe off tapering at the ends. Sometimes, after wiping, joints are overcast by lightly passing the heel of the iron when barely hot enough to melt the solder over from end to end, and all round the joint, leaving a succession of ridges of metal, as it were, overlapping each other. Be careful not to touch or move the pipe for a few moments after finishing the joint, as the solder is at first very soft, even after apparently set, and will very easily break, when the only thing is to make the joint over again. If a pipe be burst or fractured by frost or some other cause, it is not always necessary to cut the pipe, and make a fresh joint ; the burst or crack may be lightly brought together with a hammer, and a patch of solder wiped on, by following the same processes of soiling, shaving, &c., as described above. If the pipe be in a perpendicular position the solder may be poured on from the ladle on to a piece of wood held in the left hand, with a slight groove down the middle. This is called a pouring stick, and by pouring the solder into the groove it is thrown on to the face of the place to be repaired, and as the pipe becomes warm it will adhere, until enough remains on to enable the iron and cloth to be used, when the solder should be worked well into the pipe with the iron, wiping up as it runs down, or it may be caught in the cloth as it falls off, just melted again with the point of the iron, and skillfully wiped on to the patch from the hand.

Wheat and Savages.—When some European missionaries introduced into New Zealand the culture of wheat, telling the Maories that bread is made of it, they were rejoiced, for bread in the form of ship-biscuit, they had often tasted, and much relished. But when the corn was tall they dug some of it up, expecting to find edible roots ; and when they found only fibres, they thought the missionaries were making game of them. The Maories had derived their vegetable food from roots, and therefore, naturally supposed bread to be made of roots. That little hard seeds were to be ground (a process they had never seen or imagined) and the powder made into a paste with water, and then baked, was what could never have occurred to them.

Amylaceous Matter in Fruits.—It is asserted by Pelouze and Fremy that starch cannot be detected in green fruits, either by means of the microscope or by iodine. M. Payen shows that it can be easily recognized by iodine in the following way :—He takes a thin slice off a growing pear, apple, or quince, plunges it under water to avoid the action of the air, and to wash away soluble matters, and when the washing is complete, puts into a weak alcoholic solution of iodine. In an hour or two an intense blue coloration is produced. He also recognized starch granules by the microscope. One curious fact observed was, that as the fruit ripened the starch first disappeared from the neighborhood of the peduncle.

The London *Engineer* says :—An experiment is being made upon malleable cast iron as a material for boilers. A small boiler 4 feet long, 7 inches diameter, ⅜ inch thick, and intended to bear a test of over 1,700 lbs., or ¾ tun per square inch, has been cast whole by a maker of malleable castings. Malleable cast iron is made from cast iron of good quality, decarbonizaed by exposure to a high heat while surrounded with oxide of iron.

Eleven-inch guns are common in the American navy. No Armstrong gun has yet been made with a bore larger than 10½ inches.

Improved Army Hat and Cap.

The English army in the East Indies have long been in the practice of wearing capes to their caps to protect their necks from the sun and dust, and when the rebellion broke out in this country, the capes, under the name of Havelocks, were introduced into our army, and at one time there was a great rage among fashionable young ladies and madams for making Havelocks for the soldiers. It is well known that they were partially a failure. Though very comfortable at times, they were found to collect the dust and consequently to become very filthy after a little use. Mr. Warburton, of Philadelphia, has recently obtained a patent for an arrangement by which the cape is folded in the top of the hat or cap when not needed, in such manner that it can be readily dropped around the neck when required.

This invention is illustrated in the accompanying engravings in connection with a ventilating arrangement for hats patented by Mr. Warburton on the 11th of December, 1860. Figs. 1 and 2 are sectional views of a military hat of the regulation pattern with this improvement, and figs. 3 and 4 are sectional views of a fatigue cap with a modification of the improvement.

In figs. 1 and 2, A represents the body and B the brim of the hat, C being the sweat band, around the edge of which is secured a light whalebone spring. About one half of the sweat band is secured to the hat in the usual manner, the rear half being disconnected, so that it can be drawn forward away from the rear of the hat.

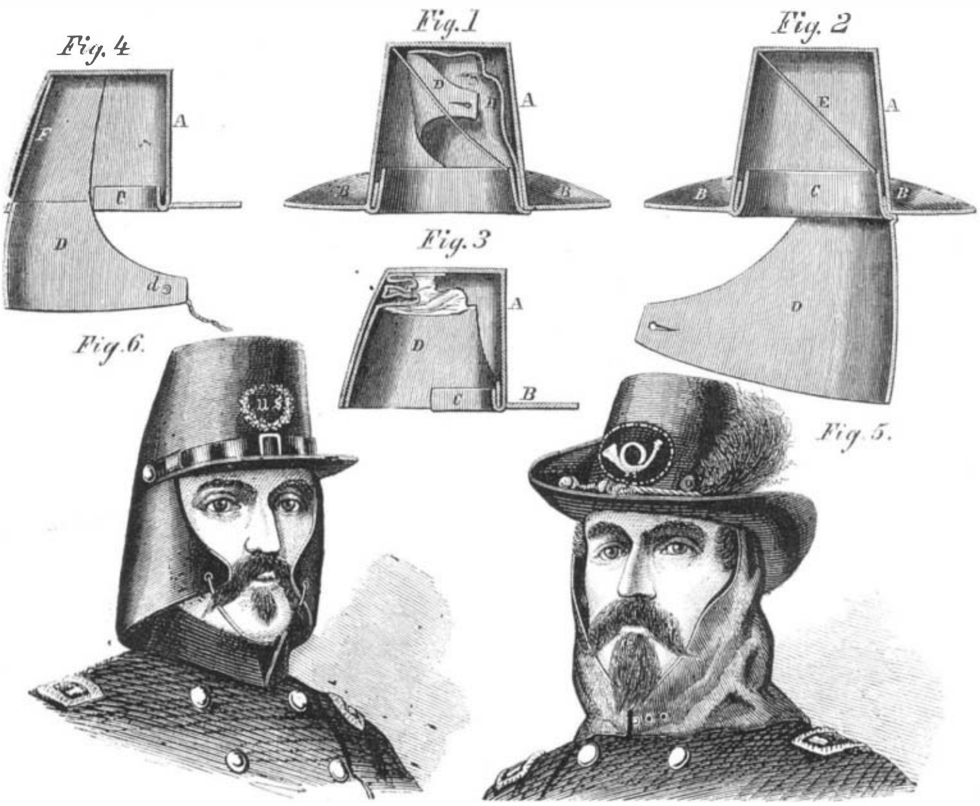
To the inside of the hat, between the body and the sweat band, is secured the cape, D, which, when not required for use, may be packed away in the interior of the body, as shown in Fig. 1; the sweat band then springs back to its proper place covering the cape from the grease and sweat of the wearer's head. When the cape or curtain has to be used, however, the rear of the sweat band, C, is drawn forward, so that the cape can fall to the position shown in Fig. 2, after which the sweat band, which is made of a material somewhat elastic, but not stretchy, is allowed to recover its former position against the interior of the hat.

The upper end of the curtain, D, is attached to about one half of the circumference of the hat, and is of sufficient extent to cover the back of the head and neck, as well as the opposite sides of the face of the wearer, its lower end being furnished with projecting ends *d d*, having any suitable appliances for connecting one end to the other, under or over the chin. The loose rear of the sweat band may be retained in its proper vertical position, by means of a band or tape, E. It will be evident, that while the cape affords the desired protection to neck and face of the wearer, its adoption involves no necessity for changing the form of the hat from the established regulation pattern, while it can be readily applied to any hat varying in outward form.

In Figs. 3 and 4, the cape is represented of a somewhat stiffer material than that referred to above, the upper end of the cape being in this instance connected to the top of the interior of the cap or hat, by a piece F, of muslin, or other suitable material. The sweat band, C, extends throughout the front portion only of the circumference of the hat or cap. When the cape is not required for use it occupies the position shown in Fig. 3 in the interior of the cap.

There are holes in the front edge of the sweat band for the admission of air to the interior of the hat, through the space between the sweat leather and the hat. This space is obtained by securing the ends of a thin metal strap across the front of the interior of the hat, it being set off from the hat about one-eighth of an inch. In addition to obtaining a space for the entrance and circulation of air in connection with the usual holes in the top, a flexible rest, or spring cushion is provided for the forehead, and grease and perspiration are by the same means kept away from reaching the hat.

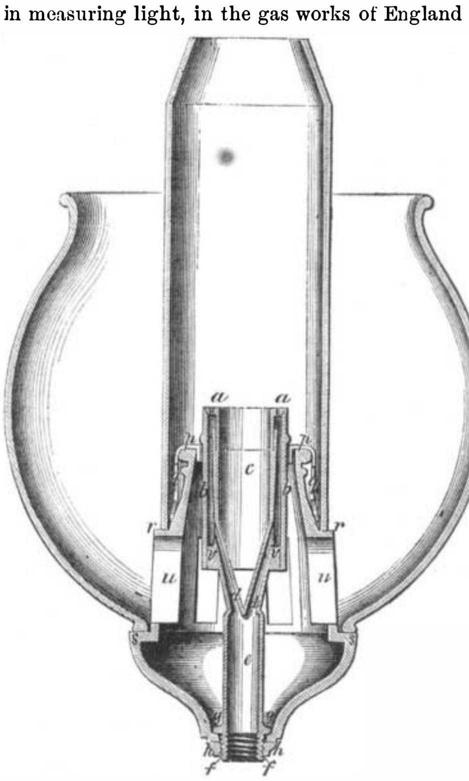
The patent for this invention was granted Feb. 25, 1862, and hat manufactures and others, who may desire to use the invention for only a special contract, or to purchase local rights, or to buy out the entire patent, can learn the terms and obtain further information from the inventor and patentee, W. F. Warburton, 430 Chestnut street, Philadelphia, Pa.



WARBURTON'S ARMY HAT AND CAP.

MONIER'S GAS BURNER.

The Argand gas burner is employed as the standard in measuring light, in the gas works of England and the United States. It forms a hollow flame which is surrounded by a chimney and supplied with two currents of air, one upon the inside and the other upon the outside. The gas is allowed to issue through a flat horizontal ring perforated with a number of small holes, from the $\frac{1}{50}$ to the $\frac{1}{32}$ of an inch in diameter according to the quality of the gas, and one current of air rises through the ring while another flows upward against the outside; the whole being surrounded by a glass chimney.



The annexed cut illustrates an improvement in the Argand burner invented by Hippolyte Monier, of Paris, France, and patented in the United States through the Scientific American Patent Agency. It consists in a substitution of an incorrodible refractory substance which is a slow conductor of heat for metal in certain parts of the burner, and in the employment of a glass basket for supporting the chimney and shade to avoid a shadow below the lamp.

The grate, *a*, is a short tube of which the exterior is in the form of an inverted frustrum of a cone, with a flange at its upper extremity perforated with holes from which the gas issues; this flange being beveled as shown. In Monier's improvement this tube is made of burnt plaster, clay, or other incorrodible, refractory material which is a slow conductor of heat; *b* is a porcelain tube forming the exterior of the burner, having its upper end beveled to fit the flange of the grate, *a*; *c* is a tube of metal into which the tube of the grate, *a*, fits and which combines with the latter tube to fit the tube of the burner. The tube, *c*, has a deep flange, *v*, at the bottom to fit the interior of the tube, *b*, and it is made in the same piece with the hollow fork, *d d*, and hollow stem of the burner. The piece *c d e f g*, being protected from the heat by the slow conducting nature of the substance composing the other two pieces, *a b*, may be made of lead or other fusible metal when cheapness is an object. The three pieces of which the burner is composed are united by a suitable cement, and the burner thus constructed presents essentially the same form as the ordinary Argand gas burner. The metal portion may be painted white to harmonize in appearance with the tube, *b*.

The stem of the burner, besides the internal screw thread which screws on to the gas pipe, has an external screw thread, *f*, and a collar, *g*, above the thread. This is for the attachment of the glass basket that supports the chimney and shade; a nut, *h*, being screwed on below the basket. A washer of soft leather should be interposed between the collar and basket to prevent the glass from breaking. The basket has a horizontal ledge around its outer side for the support of the shade, and projections above the ledge to support the chimney. Between these projections are openings through the basket for the admission of air; the air entering the shade at the top and passing down by the side of the chimney, and thus being warmed in its passage. The chimney is steadied by the elastic arms, *g*, of the metal ring, *p*.

There are modifications of the basket proposed by the inventor, embracing, however, the same principle. For instance, the shade and chimney may both rest upon the same ledge, and the air may be admitted through holes below the ledge, and under the edge of the chimney between the projections upon which it rests.

We have seen flattering mention of this burner in the French journals, with statements of the great saving of gas effected by its use. It has also been used to some extent in this country. The advantage of having no shadow directly beneath the light is obvious.

Persons wishing to treat with Mr. Monier, in respect to the introduction of this invention into the United States, can address him to the care of M. Desnos Gardissal, No. 29 Boulevards St. Martin, Paris.