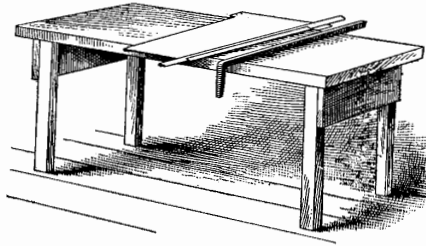


### THE BOY'S SECOND YEAR.

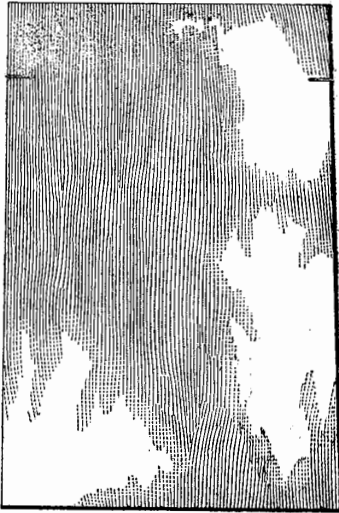
The first year of drudgery glides slowly away, and as the end of the second year approaches the long, weary, damp and chilly nights of October and November come with it; the heating-stoves of those who are compelled to use them are called into service, and with them comes a demand for stove-pipe, both iron and copper. Now, at the time of which we are writing there were no squaring-shears with which to cut the sheets into suitable pieces, so all the work had to be cut out with hand-shears or the stock-shears. Then there was no folder with which to fold the edges for grooving; the locks were all folded over a hatchet stake and closed down on a straight edge. The men usually cut out the pipe, and if it was not too large the boy was put to work folding edges and then closing them down over a straight-edge on a square mandrel laid across the bench (Fig. 16). If copper stove-pipe is to be made it is usually browned and planished. Here, then, is one of the boy's first lessons in the manipulation of a planishing-hammer. While he is engaged at this many a "half-moon" intrudes itself on the surface of his work to enlighten him that he must be careful and attend to his task.

#### COPPER STOVE-PIPE.

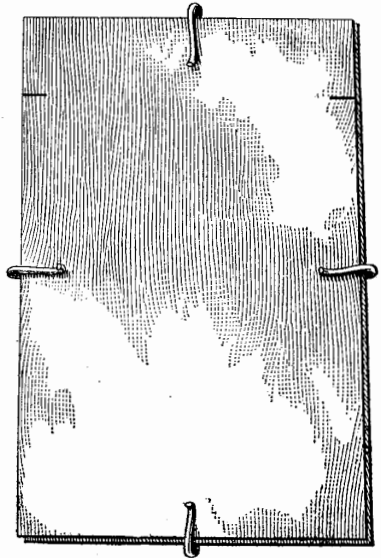
Let us now describe the making of two joints of copper stove-pipe. We will suppose the pieces are cut the proper width and of sufficient taper that the small end of one joint will when formed fit snugly into the large end of the other. The pieces are first clipped at the end as in Fig. 17, about 2 inches from the end and as far in on each side as the locks will take up; then, with a tow wisp, some dry Spanish brown is rubbed all over one surface of each piece, and the sheets are fastened together with four dogs, as shown in Fig. 18, or secured in whatever way seems best. The browned surfaces being outside the sheets are then taken to the large bottom-stake (Fig. 19), and with a suitable hammer, called a bottom-hammer, which has one face a little fuller in the center than the other, the pieces are planished—that is, the grain of the copper is closed. There is only one way to do this part of the work successfully and in a perfect manner, and there is a



*Fig. 16.—Folding Edges on Bench.*



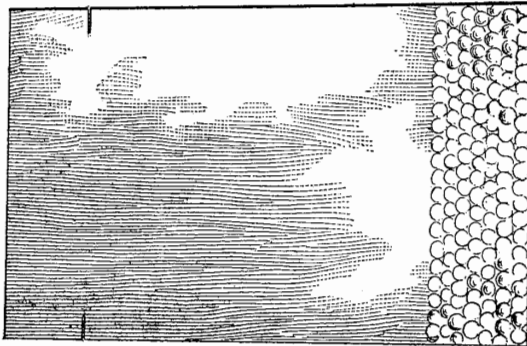
*Fig. 17.—Pattern Clipped Ready for Folding.*



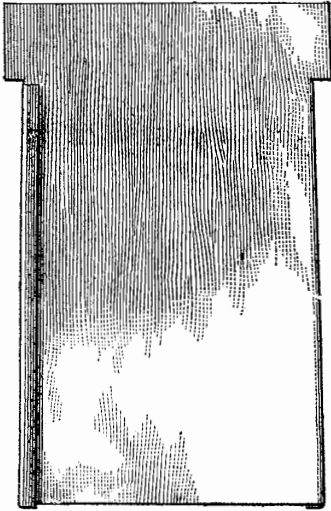
*Fig. 18.—Two Pieces Dogged Together.*



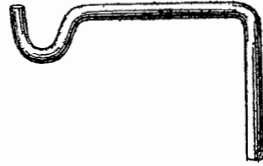
*Fig. 19.—Planishing at the Block.*



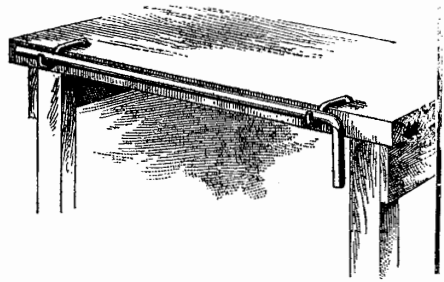
*Fig. 20.—Showing the Blows Arranged.*



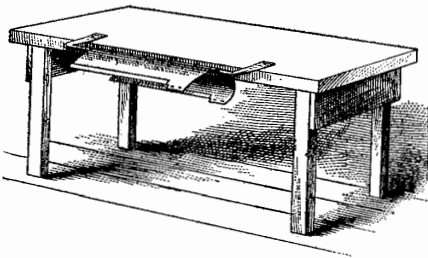
*Fig. 21.—Folded for Turning.*



*Fig. 24.—Bench Hook for Holding Mandrel.*



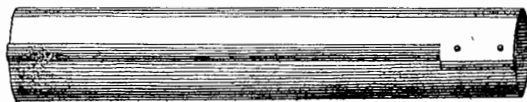
*Fig. 25.—Mandrel in Position.*



*Fig. 22.—Old Fashioned Bending Bar.*



*Fig. 26.—Loose Bar and Pipe.*



*Fig. 23.—Pipe Finished and Riveted at End.*

little knack in it which boys are a good while learning, particularly if they are, unfortunately, counted as unwelcome intruders in the shop. The secret of success is to keep the blows regular. The best results are obtained by striking each succeeding blow in as near a direct line with the previous one as possible, and then filling in between as each line is completed, as in Fig. 20. When the surface has been planished all over the sheets are taken apart and made to lay level; this done they are ready for folding and forming. They are then taken to the hatchet stake and folded, the edges being closed down, as in Fig. 21, and next they are taken to the bending-bar (Fig. 22) and bent round by placing one edge between the bar and the bench, and bending a little at a time until the locks will meet each other, and after grooving, rounded up and smoothed with a mallet, making finished pipe as in Fig. 23.

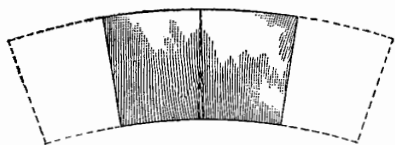
That old bar (used in the shop we are writing of), judging from the wear of the bench and itself, must have served as a former for many a boy before, and perhaps is used yet, for it was still clinging to its place in 1884. An improvement was introduced by my father in bending-bars by making two hooks of  $\frac{1}{2}$ -inch rod (Fig. 24) and placing them in the bench, so a mandrel or bar could lay in them close to the bench (Fig. 25) and permit of one end being raised so that the pipe could be slipped off readily (Fig. 26). One day there was some pipe of different sizes to make, and after finishing the smallest, while at work forming up the larger sizes one of the smaller pipes was placed on the bar and the larger pipes formed over it. During this simple operation it was noticed that the pipe was formed without any ribs appearing, as had been the case when the naked bar was used. By this method the pipe can be made smooth and much work saved in rounding up. This method has been used to advantage when no rollers were at hand, and as good work can be turned out by this means as by the use of the rollers, though of course not so rapidly.

#### MAKING WASHING-COPPERS.

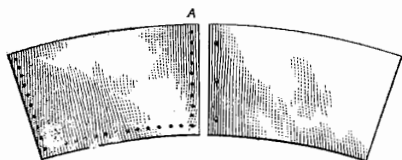
The next lesson in the use of the hammer would be "spotting" coppers, or, more properly, making coppers complete. In the South of England scarcely a house could be found without a washing-copper in or near it; hence there was always plenty of this kind of work for a boy in any brazier's shop. The capacity of these coppers runs from 8 to 25 gallons or more, according to the size of the house, and they

are much more economical as regards fuel and would seem much better adapted for washing purposes than a wash-boiler on a cook stove. Some of these boilers are made to serve for both washing and brewing. A copper to be used for brewing is made a little different from a washing-copper, although the greater part of their construction is the same. Let us proceed with a washing-copper to hold about 20 gallons and a brewing-copper of a little larger capacity. Now, in nearly all cases the sides are all cut out and furnished ready to be put together, and the bottoms also, which are already raised up at the edge some 3 or 4 inches, and therefore few boys or men trouble themselves as to the dimensions they ought to be, their only care being to put them together into shape as quickly as possible, which they proceed to do in the following manner: The sides are first examined and made true, if necessary. As shown in Fig. 27, one piece is laid half-way on the other and a line drawn along the edge of the top piece; it is then turned over and the end of the same edge placed at the end of the line drawn on the other piece. If the edge coincide with the line drawn and the curved edges also coincide, it will be considered true. If the end edges do not coincide, divide the difference at one end and pare it until the edge and line coincide with each other. Next, the holes are punched along the side and bottom edge, as shown in Fig. 28, in such a way that the distance between the center of the holes will be equal to the diameters of the head and shank of rivet added together. Thus if the head be 1 inch and the shank  $\frac{1}{4}$  inch, then the distance between the centers of the holes will be  $1\frac{1}{4}$  inches. The rivets in the bottom must be at least one size larger, sometimes two sizes, according to the strength of the bottom, which is always much stronger than the sides.

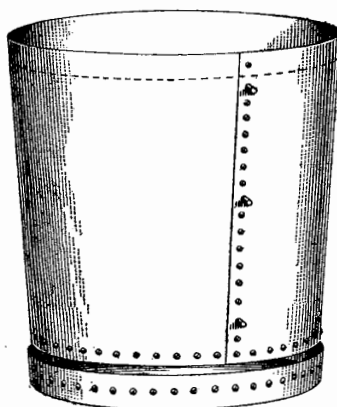
Now form the sides and put three rivets in each seam, as in Fig. 29, and knock them down half-way temporarily, and put a small tack in the middle of the part which will form the brim at top; then with a racer (Fig. 30) or a pair of compasses mark off the width of the brim as in Fig. 29. Now take the copper and put it on a suitable head, which is placed in the square shank (Fig. 31) and run a course around with a hammer on the bottom side of the line that marks the width of the brim, to harden the metal, after which proceed to lay off the brim with a mallet, being careful to get it down true. Next smooth it down on an anvil, with a full-faced hammer, this being done carefully so as to preserve the roundness. The sides are now stiff



*Fig. 27.—Making Sides True.*



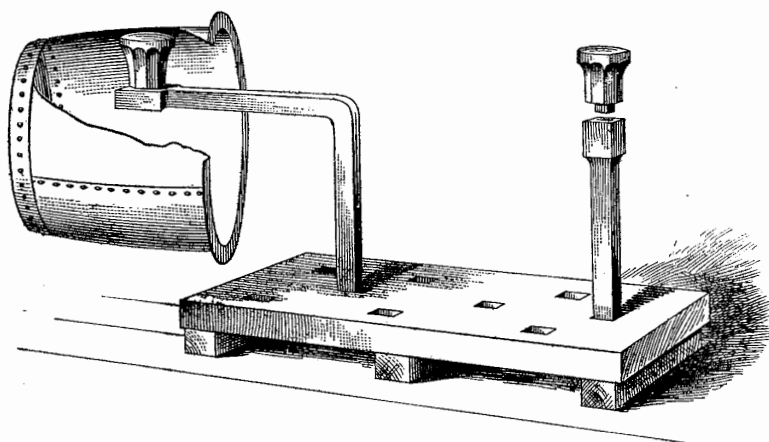
*Fig. 28.—Sides Prepared and Punched.*



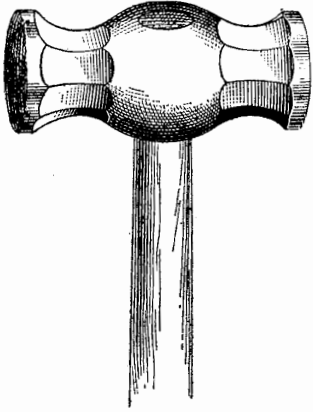
*Fig. 29.—Sides Formed.*



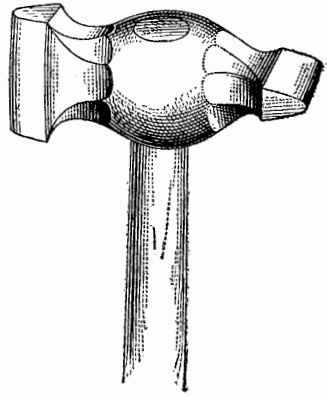
*Fig. 30.—A Racer.*



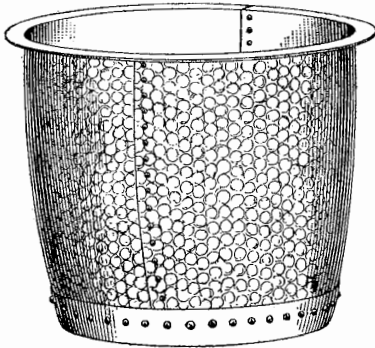
*Fig. 31.—Riveting and Planishing.*



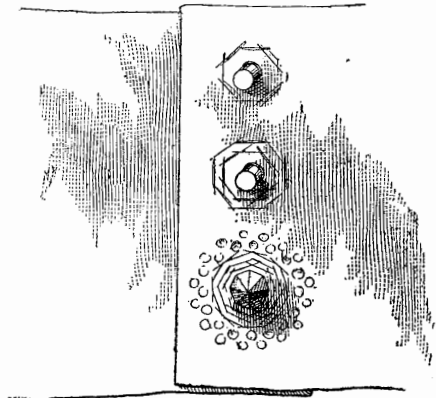
*Fig. 32.—Planishing Hammer.*



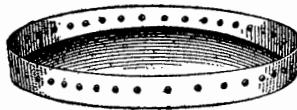
*Fig. 35.—Scrubbing Hammer.*



*Fig. 33.—Spotting Copper.*



*Fig. 36.—Way to Scrub Rivets.*



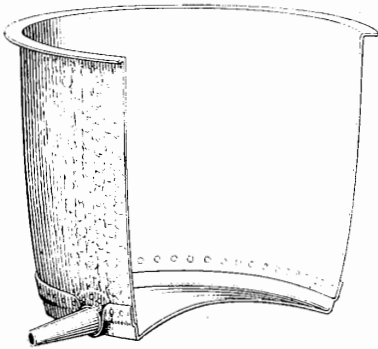
*Fig. 34.—Bottom Punched.*

enough to handle, and we proceed to draw in the bottom ends to fit the bottom, as in Fig. 29, making them small enough to go into the raise of the bottom, and the bottom to lap up the side about  $\frac{3}{4}$  inch more than the diameter of the rivet-head. When these are fitted, shape up the sides true and smooth them with a mallet on the head in the square shank (Fig. 31). Now take a wispful of Spanish brown and rub it all over the outside surface, and with another wisp rub a little dry black-lead over the inside. We are now ready to commence the spotting, which is done as follows: Take the bottom of the slides in the left hand, and with a double-faced planishing-hammer (Fig. 32) begin by striking several blows in succession around each other until the spot formed is from  $\frac{3}{4}$  to 1 inch in diameter; then repeat, making each spot regular and in line and about  $\frac{1}{4}$  inch apart, or so that the spots are clearly defined, and cover the whole surface as shown in Fig. 33. As this proceeds and each course comes to a rivet, scrub it enough to set the sides down to the head to draw up the head of the rivet, or the whole joint may be partly scrubbed before spotting begins. When the spotting is complete finish the scrubbing and draw up the rivets with the set. Clean the end of the rivet-shank with a file and knock down the rivet, finishing it in a pyramid form, as near octagon as possible. Now take the bottom (Fig. 34) to the head in an upright shank as shown at the right in Fig. 31, and with the bottom in both hands, hit it on the head enough to make the outside convex; then smooth it, brown it and planish it all over. This could be done on the head (shown at the left in Fig. 31) if more convenient, and only one is engaged on the work. Put the sides into the raise of the bottom and mark four holes (being careful that the sides set true before marking the holes) opposite each other and punch them in the bottom; then place the sides into the bottom again, and put in four rivets and knock them half-down temporarily, and punch the rest of the holes through the bottom from the inside. Next put in all the rivets, knocking them half-down in the same way, and when they are all in take a suitable cross-piened hammer (Fig. 35) and begin to scrub up the bottom rivets, after which draw them up with the set and head them up eight square to the form of a pyramid. If the scrubbing is properly done there will be no need of any cement being used to secure the joint against leaking; all that is required is good workmanship. What is called scrubbing is to hammer the part all around the

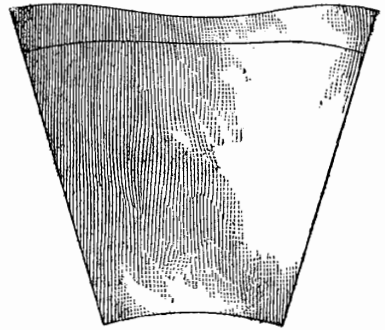
rivet down close to the head, making the surface on the inside perfectly smooth, the rivet-head being, as it were, in a countersink when the scrubbing is completed. To do this we first use the pane of the hammer between the rivets; then on each side; then across the four corners made by the previous blows, as shown in Fig. 36.

#### MAKING BREWING-COPPERS.

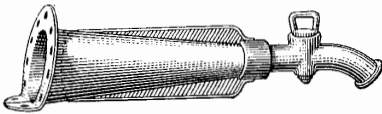
We will now finish the brewing-copper (Fig. 37), the sides of which have been made the same as those described for a washing-copper. We next take the bottom (Fig. 34) in both hands and hit it on a head in an upright shank (Fig. 31) enough to make it concave on the outside, as shown in Fig. 37. Then brown and planish it from the inside, after making the crown nearly level with the raise of the bottom. This is done so that all liquor will run out clean through the pipe. The rivets are now put in the bottom the same way as described for the washing copper, except that enough rivet holes are left where the pipe is to go. A pipe is seldom put in a brewing-copper by a boy until he has been at the trade for a considerable time; but we will work it in, and, in doing so, let us suppose the pipe is 3 inches in diameter at the large end and  $1\frac{1}{2}$  inches at the small, so as to fit the socket of the cock. The pattern (Fig. 38) should be extra heavy copper, thick enough to allow a flange to be worked on it from 2 to 3 inches wide, which is commenced while the pattern is flat, using in the operation a cross-piened hammer, and, as the flange is being laid off, the pattern or pipe is made to curl with each blow as the work is being done (Fig. 40). The bottom of the pipe flange (Fig. 39), or that part which spreads over the bottom, requires a little more work than the part of the flange intended to go up the side, to make it fit to its place and secure a good job. When the flange is laid off enough and the seam of the pipe is soldered down, the hole for the pipe is cut in the side of the copper, close to the bottom, where the rivets have been left out for that purpose, and in the middle of one of the sides or sections of the body, the hole being cut small enough so that about a quarter inch can be turned out to let the pipe and its flange go up to its place easily and form a narrow collar around the pipe, the seam of the pipe being on the bottom, as shown in Fig. 39. Now turn the copper on its side as in Fig. 42 and with a suitable piece of rope, passed down through the pipe, sling the head A, and pass a strong wooden bar through the loop B, so that it will hang in the right position, and a boy can hold it



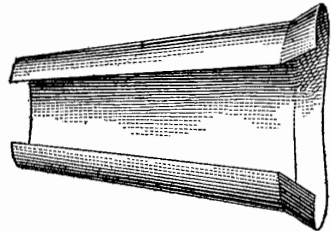
*Fig. 37.—Brewing Copper, Showing Bottom.*



*Fig. 38.—Pipe Pattern.*



*Fig. 39.—The Way to Fit Pipe, Cock and Boss.*



*Fig. 40.—Pipe Pattern Half Worked.*



*Fig. 41.—Showing Boss Ready.*

steady while the rivets are worked in which hold the flange to the bottom. When the rivets are all in scrub them and the edge of the flange until both are smooth with the surface of the side and bottom, and close down the narrow collar tight around the pipe (Fig. 37).

The cock is then made to fit tight on the pipe (Fig. 39), and a case of light copper (Fig. 40) made to fit tight around the large end of the pipe and outside of the socket of the cock, with a collar, as shown. When it is fitted, a hole is cut in the case and a lip turned back, as in Fig. 41. The case is now put on the pipe and the end of the pipe driven tight into the socket of the cock, and then the pipe rammed full of damp sand from the inside of the copper and some clay rubbed in around the collar of the case and a little rosin in the case. When all is ready the case is filled with old, rough solder, burnt tin or any other suitable metal which cannot be used with advantage for anything else. When cool enough, the lip is closed down and a nail driven in to keep it close while it is being soldered.

Inside diameter at top, in inches.	Diameter of bottom at lag, in inches.	Depth of sides, in inches.	Diagonal length from lag to brim, in inches.	Contents in gallons.	Approximate weight, in pounds.
13 $\frac{1}{2}$	11 $\frac{1}{2}$	11	16	6	8
15 $\frac{1}{2}$	13 $\frac{1}{2}$	12	19 $\frac{1}{2}$	8	10 $\frac{3}{4}$
17	14 $\frac{1}{2}$	13	21	10	13 $\frac{1}{4}$
18 $\frac{1}{2}$	15 $\frac{1}{2}$	13 $\frac{1}{2}$	22 $\frac{1}{2}$	12	16
20	17	15	24 $\frac{1}{2}$	16	21 $\frac{1}{4}$
22	18 $\frac{1}{2}$	16 $\frac{1}{2}$	27	21 $\frac{1}{2}$	28 $\frac{1}{4}$
23 $\frac{1}{2}$	20	17 $\frac{1}{2}$	28 $\frac{3}{4}$	25 $\frac{1}{2}$	34
25	21 $\frac{1}{2}$	18 $\frac{1}{2}$	30 $\frac{1}{2}$	31	41 $\frac{1}{2}$
26	22 $\frac{1}{2}$	19	31 $\frac{1}{2}$	35	46 $\frac{1}{2}$
27	23	20	33	41 $\frac{1}{2}$	55 $\frac{1}{4}$
28	24	20 $\frac{1}{2}$	34	44 $\frac{3}{4}$	59 $\frac{1}{2}$
29	25 $\frac{1}{2}$	22	36	49 $\frac{1}{2}$	66
30 $\frac{1}{2}$	27	22 $\frac{3}{4}$	37 $\frac{1}{2}$	55 $\frac{3}{4}$	74
31 $\frac{1}{2}$	27 $\frac{1}{2}$	23 $\frac{1}{2}$	38 $\frac{1}{2}$	60	80
32 $\frac{1}{2}$	28 $\frac{1}{2}$	23 $\frac{3}{4}$	39 $\frac{1}{2}$	66	88
34	29 $\frac{1}{2}$	24 $\frac{1}{2}$	42	75	107
34 $\frac{1}{2}$	30 $\frac{1}{2}$	25	43	83	121 $\frac{1}{2}$
35	31	26	43 $\frac{1}{2}$	87	128
37	32 $\frac{1}{2}$	27	44 $\frac{1}{2}$	93	137
38	33 $\frac{1}{2}$	28	46	106	159

*Table Showing Dimensions, Capacity and Weight of Coppers.*

The above table gives the dimensions of coppers, with their capacity and approximate weight up to 100 gallons. Small country shops seldom make anything larger, not having room or the conveniences for building them. The work was paid for by the pound—that is, the weight when finished—at a rate of from 3 to 5 cents per pound.