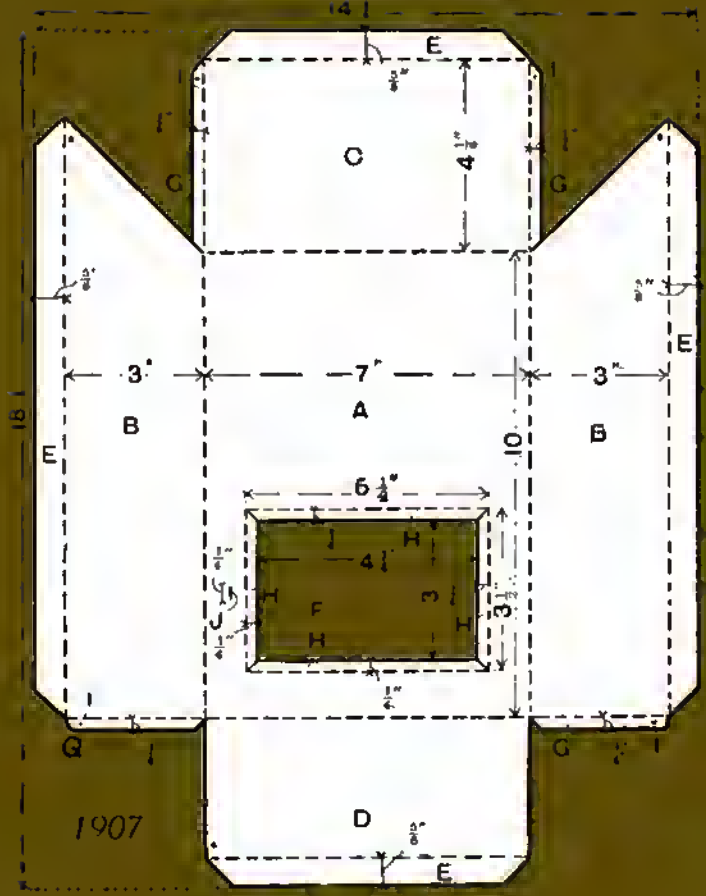

Fig. 85.—Letter Box Pattern.

Tinplate Work

Hasluck's "Work" Handbook Series
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TINPLATE WORK

TINPLATE WORK

WITH NUMEROUS ENGRAVINGS AND DIAGRAMS

EDITED BY

PAUL N. HASLUCK

EDITOR OF "WORK" AND "BUILDING WORLD"
AUTHOR OF "HANDYBOOKS FOR HANDICRAFTS," ETC. ETC.

CASSELL AND COMPANY, LIMITED

LONDON, PARIS, NEW YORK, TORONTO & MELBOURNE

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edited by Paul N. Hasluck

reprinted by
Lindsay Publications Inc
Bradley IL 60915

ISBN 1-55918-269-5

1 2 3 4 5 6 7 8 9 0

2002

WARNING

Remember that the materials and methods described here are from another era. Workers were less safety conscious then, and some methods may be downright dangerous. Be careful! Use good solid judgement in your work, and think ahead. Lindsay Publications Inc. has not tested these methods and materials and does not endorse them. Our job is merely to pass along to you information from another era. Safety is your responsibility.

PREFACE

THIS Handbook contains, in a form convenient for everyday use, a number of articles on tinplate work, contributed by practical craftsmen to WORK—one of the journals it is my fortune to edit.

Readers who may desire additional information respecting special details of the matters dealt with in this Handbook, or instructions on kindred subjects, should address a question to the Editor of WORK, La Belle Sauvage, London, E.C., so that it may be answered in the columns of that journal.

P. N. HASLUCK.

La Belle Sauvage, London,
May, 1907.

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TINPLATE WORK.

CHAPTER I.

TINMEN'S TOOLS, APPLIANCES, AND MATERIALS.

THE practical manufacture of tinplate articles is the subject on which this handbook will treat. It will hardly more than mention the methods of producing patterns for the work. This has been treated exhaustively in "Practical Metal Plate Work," a volume in the Technical Instruction Series produced under the direction of the editor of this handbook. Of course, all who wish seriously to undertake the manufacture of tinplate articles must become adept in forming the patterns, but this is work somewhat apart from that which it is the purpose of this book to describe. This handbook will discuss practically the manipulation of the tinplate, and will assume in most cases that the patterns have already been prepared.

The tools in use by the tinplate worker consist chiefly of hammers and stakes. The hammers are illustrated by Figs. 1 to 12, these including an illustration of the boxwood mallet, which should be 2¼ in. in diameter for light work and 2¾ in. for heavier work. The stakes (Figs. 13 to 29) fit into holes cut in the bench. Tinplate is shaped by being bent over them. The uses of these stakes will be fully explained in later chapters.

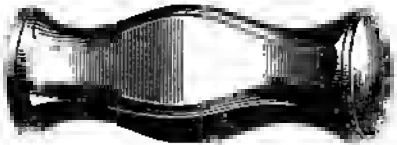

Fig. 1.—Block Hammer.

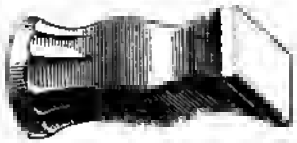

Fig. 2.—Square-faced Hammer.

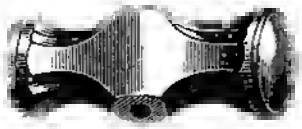

Fig. 3.—Planishing Hammer.

Fig. 4.—Flat Hammer.

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Fig. 12.—Mallet.

Fig. 10.—Convex Hammer.

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Fig. 14.—Round Stake.

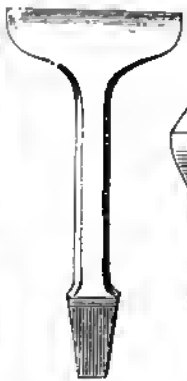

Fig. 15.—Hatchet Stake.

Fig. 16.—Anvil Stake.

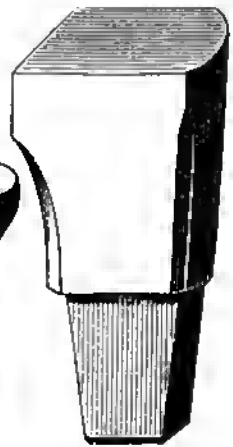

Fig. 17.—Tinmen's Anvil.

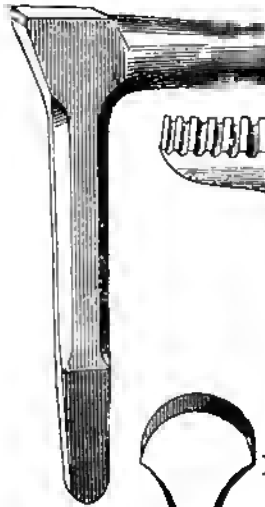

Fig. 18.—Side Stake.

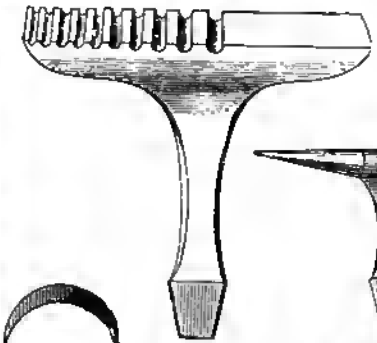

Fig. 19.—Creasing Stake.

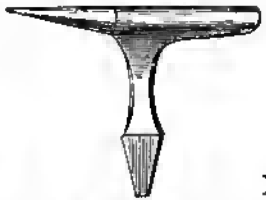

Fig. 20.—Extinguisher Stake.

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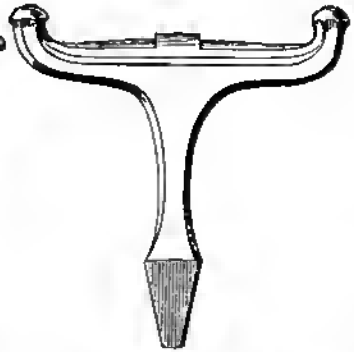

Fig. 23.—Saucepan Belly Stake.

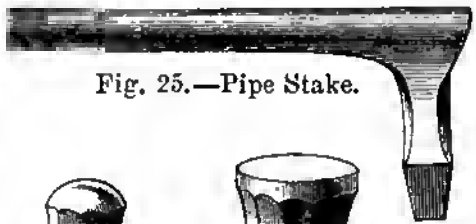

Fig. 25.—Pipe Stake.

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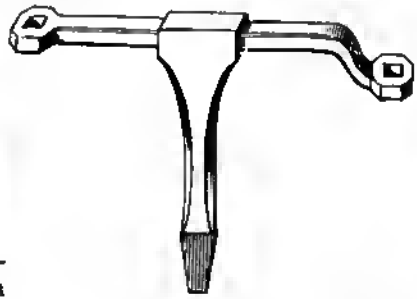


Fig. 26.—Horse.

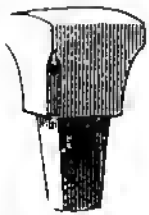


Fig. 27.

Fig. 28.

Fig. 29.

Figs. 27 to 29.—Horse-heads.

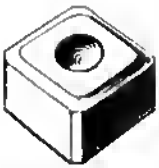


Fig. 30.

Fig. 31.

Fig. 32.

Fig. 33.

Fig. 34. Fig. 35.

Fig. 36.

Fig. 37.

Fig. 38.

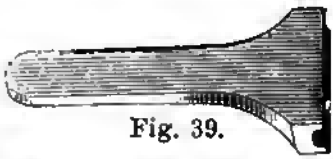


Fig. 39.

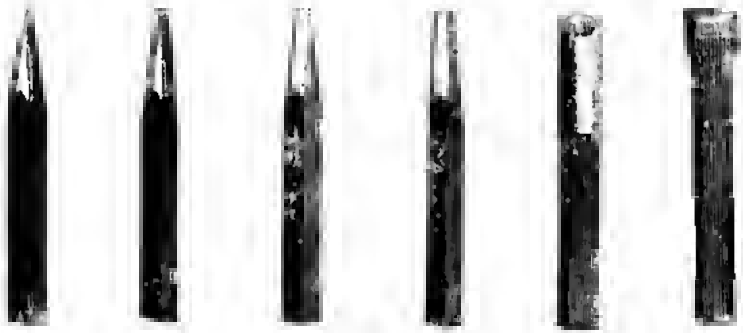


Fig. 40.

Figs. 30 and 31.—Stud Boss and Punches. Figs. 32 to 35.—Diamond-point, Flat, Foal's-foot, and Cross-cut Chisels. Fig. 36.—Rivet Set. Fig. 37.—Hollow Punch. Fig. 38.—Conical Solid Punch. Fig. 39.—Groove Punch or Groover. Fig. 40.—Various Solid Punches.

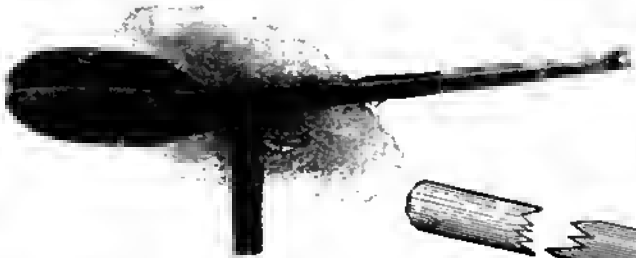


Fig. 42.—Block Shears.

Fig. 41.—Stock Shears.

Fig. 45.—Straight Snips.

Fig. 44.—Hand or Scotch Shears.

Fig. 46.—Bent Snips.

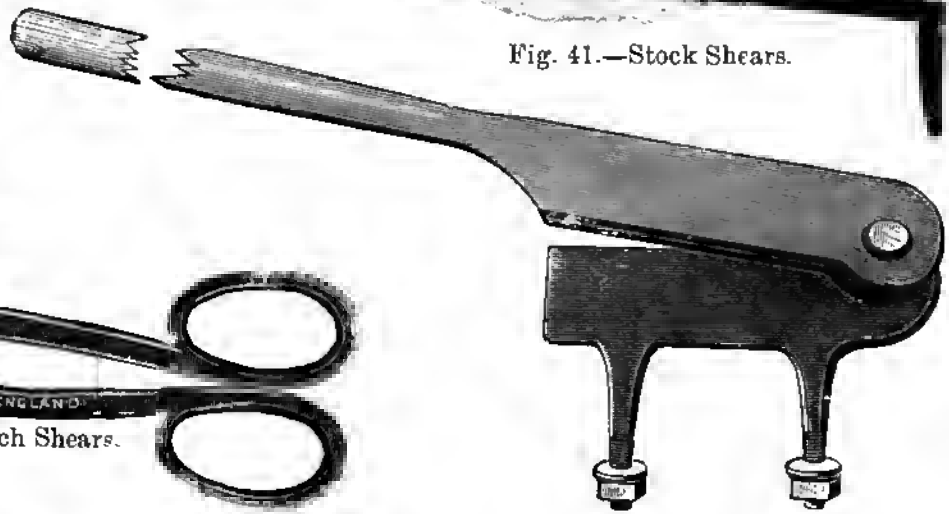


Fig. 43.—Stock Shears with Back Joints.

The stud boss and punches (Figs. 30 and 31) are used for forming the half-spherical studs which are soldered to the bottoms of water cans, etc. Chisels and punches are shown by Figs. 31 to 40. The tinplate is cut by means of shears and snips (see Figs. 41 to 46). The tinman's square is shown by Fig. 47. The ordinary pliers in use are the "tinman's" (Fig. 48) and the "round-nose" (Fig. 49).

There is a large number of machines in use in producing tinplate work. Fig. 50 shows the slitting shears. The burring machine, or jenny (Figs. 51 and 52), is used to edge bottoms and bodies, to crease and edge covers and funnels, close tinplate round wires, etc.; the shank fits into a hole cut in the bench or into special bench standards. A circle cutter is shown by Fig. 53. Bending rollers (Fig. 54) are used for shaping tinplate into cylinders. Cone rollers are illustrated by Fig. 55. The folding machine (Figs. 56 and 57) turns or folds the edges of tinplate goods that have to be joined by grooving. Fig. 58 illustrates an angle-bender. Two grooving machines are shown by Figs. 59 and 60. The bottom-closing or knocking-up machine is used for turning up the bottoms of saucepans, water-pots, and similar vessels. Swages (Fig. 61) are used for making the beading that forms the seats of kettle covers and for similar purposes. The paning-down machine (Fig. 62) closes the bottoms of articles that have been edged up in the jenny. In tinplate factories many other machines are in use as well as the above, but these will not interest the small worker, who, indeed, can do first-rate work without any one of the machines here illustrated, although he will gain in convenience and saving of time if he has the benefit of their use.

The tinplate worker's bench is made of beech or other tough, hard wood, 3 in. thick in front, where the stake tool holes are cut, and 1 in. or

Fig. 48.—Tinman's Pliers.

Fig. 49.—Tinman's Round-nose Pliers.

Fig. 47.—Tinman's Square.

Fig. 51.

Fig. 52.

Figs. 51 and 52. — Open and Enclosed Patterns of Jenny or Burring Machine.

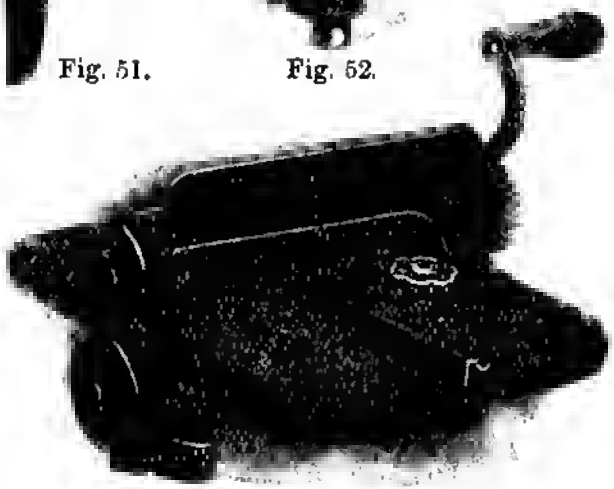


Fig. 50.—Slitting Shears.

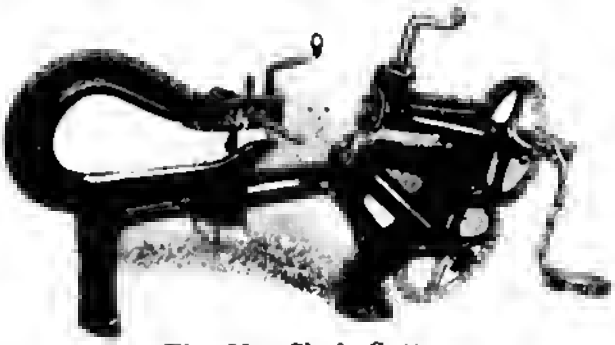


Fig. 53.—Circle Cutter.

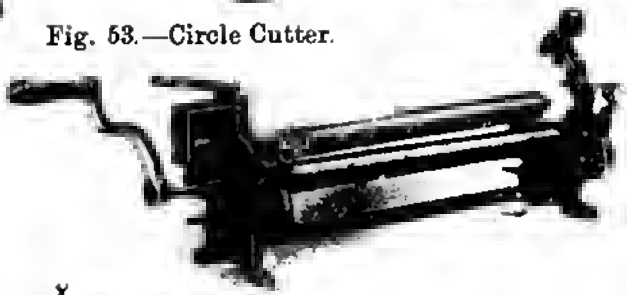


Fig. 54.—Bending Rollers.

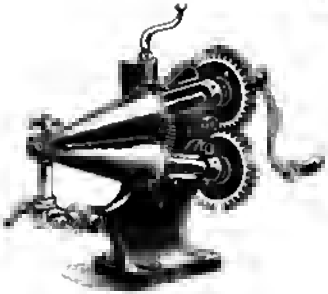


Fig. 55.—Cone Rollers.

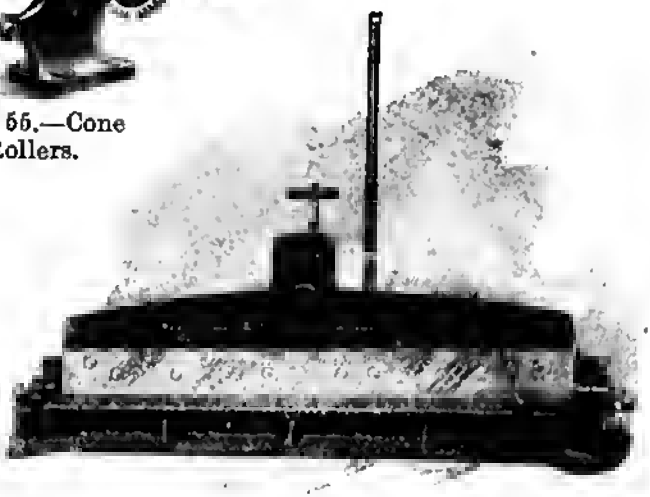


Fig. 56.—Folding Machine.

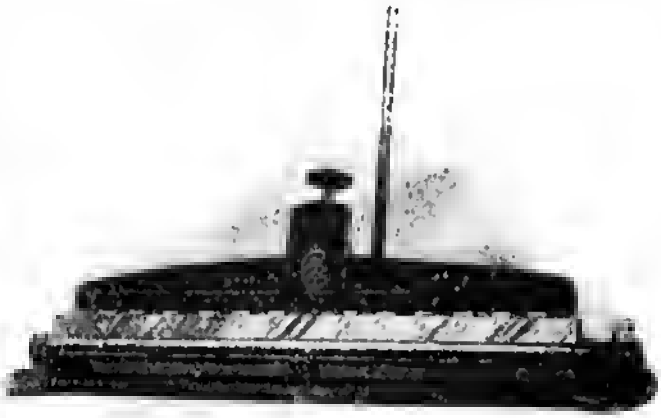


Fig. 57.—Folding Machine.

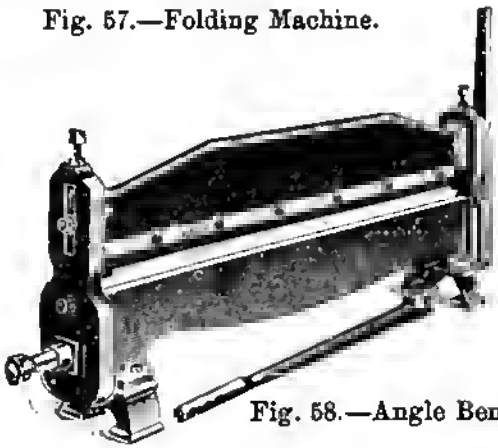


Fig. 58.—Angle Bender.

Fig. 59.—Grooving Machine.

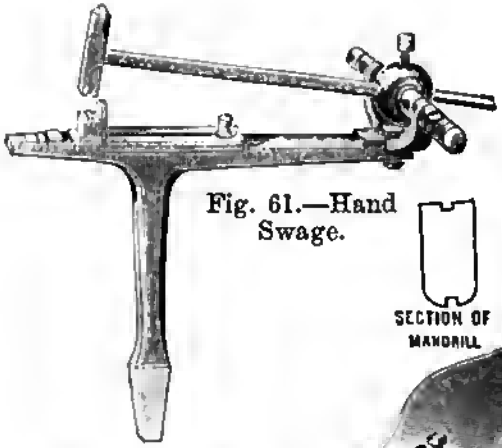


Fig. 61.—Hand Swage.

Fig. 60.—Lever Grooving Machine.

Fig. 63.—Soldering Bit.

Fig. 64.—Bent Soldering Bit.

Fig. 62.—Pening-down Machine.

1¼ in. thick at the back. The width may be from 2 ft. to 2 ft. 6 in., the height about 30 in., depending on the height of the worker, and the length as great as the shop will allow. It must be fixed very firmly, otherwise it will soon be loosened when using the heavy stakes and tools.

Soldering tools include, of course, a number of soldering bits (Figs. 63 to 66), and stoves in which to heat them (Figs. 67 to 70). Other small tools and appliances will be described as occasion requires.

Fig. 65.—Bottoming Bit.

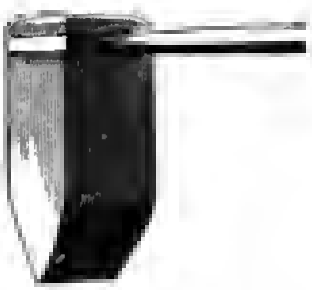


Fig. 66.—Hatchet Bit.

Tinplate is "sheet iron"—actually sheet steel—coated with tin. Tinned plates measuring 14 in. by 10 in. are known as singles; 15 in. by 11 in., middles or small doubles; 17 in. by 12½ in., doubles; 20 in. by 14 in., large doubles or twenties. The other sizes are generally called by their dimensions, such as 28 in. by 20 in., 30 in. by 22 in., 40 in. by 20 in., and various other sizes.

The thickness of these plates is denoted by the number of crosses on the box; thus there are one

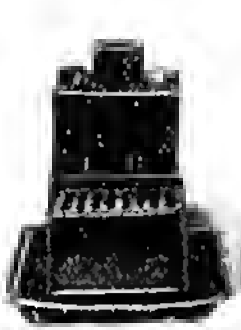


Fig. 67.

Fig. 68.

Fig. 69.

Fig. 70.

Figs. 67 to 70.—Various Stoves.

Thickness in Inches.	*B.W.G.*	*Strength of Tinned Steel (Approximate).*	*Weight in lbs. per sq. ft.*			
			Tinned Steel.	*Copper.*	*Brass.*	*Zinc.*
·012	30	1C	·48	·55	·52	·42
·014	28	1×	·56	·69	·65	·56
·016	27	DC	·64	·83	·79	·62
·018	26	1 × ×	·72	·92	·87	·63
·020	25	1× × × ×	·80	·97	·92	·71
·025	23	D× × ×	1·0	1·29	1·22	·93
·028	22	D× × × ×	1·13	1·34	1·27	1·06
·032	21	D× × × × ×	1·29	1·52	1·44	1·12

cross single, two cross double, and so on; it is written thus: 1 × S, one cross single; 1 × × S, two cross single; the 1 is always prefixed, no matter how many crosses there are; thus, 1 × × × × D is 4 cross double, and is a 4 × plate 17 in. by 12½ in.; the word double has no relation whatever to thickness.

The short table on p. 20 shows the weights of tinned plate of various thicknesses, as compared with the weights of sheet copper, brass, and zinc.

Tinman's solder for general purposes is made by melting in a ladle 1 part (by weight) of lead and adding 2 parts of tin; the molten alloy is mixed with a smaller ladle, the dross floating on the top is removed, and the solder is run into strips in iron moulds, generally triangular in cross section. For blowpipe solder, add ½ part bismuth to the above alloy, and run out upon a cold iron plate into fine strips by means of a half covered-in ladle having a fine spout. When scrap pewter (an alloy of tin and lead) is used, the proportions will generally be about 3 of lead to 10 of pewter, depending upon the composition of the pewter. Solder for rough jobbing may contain as much as 3 parts of lead to 4 of tin. Solder which turns a bluish-grey on cooling contains too much lead; if dull white and pitted with little dots, too much tin. A stick of good solder makes a slight crackling noise whilst being bent; if the noise is more than slight, a little more lead should be added. Zinc and composition pipe must be carefully kept away from all solder.

CHAPTER II.

ELEMENTARY EXAMPLES IN TINPLATE.

Tool Box.—A tool box in sheet-iron or stout tinplate is one of the simplest articles a tinplate worker may be called upon to make. The box may measure, say, 2 ft. 6 in. long, 1 ft. 1 in. wide, and 5½ in. deep. Begin by drawing to the re-

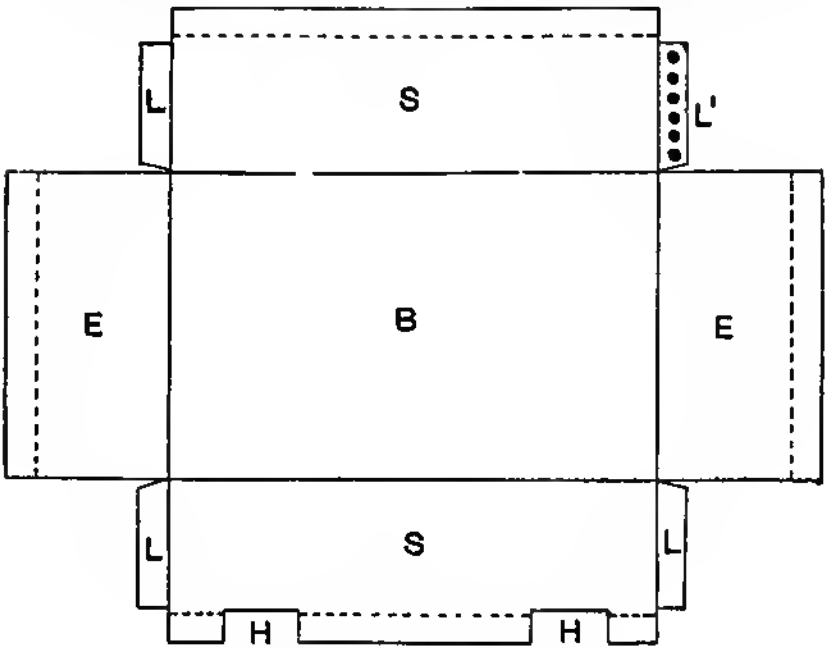


Fig. 71.—Tool Box Pattern.

quired dimensions the rectangle B (Fig. 71) forming the bottom of the box. Draw the ends E and sides S to a depth of 5½ in. on the sides and ends of the bottom. Mark an allowance along each top edge for the fold for the wire, this being indicated by the dotted lines; also make the allowances L on the ends of the sides for a lap at the corners,

and punch these for riveting as indicated on the lap L[1]. Also cut out the epacee H for the hingee, and cut them deep enough to allow a clearanco under the wire, so that the hinge may he formed. Fold each of the four sides for the wire, and then hend up the long sidee S square; also hend the lsps L round to make a right angle with the side. Now hend up the ends E square, and rivet them at each corner to the laps L; then wire the hox round

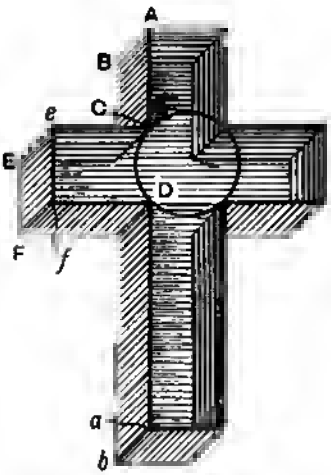


Fig. 72.—Plain Cross Flower Tray.

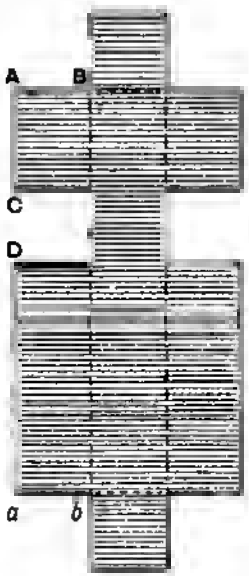


Fig. 73.—Part Pattern for Cross Flower Tray.

the top. For the hinges, cut strips of metal equal in width to H, pass these through under the wire, hend the metal, and close it over the wire. Punch holes through the thickness of metal so that the hinge can he riveted to the top. The top is a rectangle cut 1 in. longer and 1 in. wider than the outside dimensione of the hox. It is wired round the four sidee, and the flaps of the hinge are then riveted to it to secure it to the hox.

Flower Trays for Memorial Wreaths and Crosses.—The flower trays ahout to he descrihed

are used as a means of grouping flowers into different designs, for memorial wreathe and crosscs. The trays are 2 in. deep, heing intended to hold water; they can he made of tinplate or any sheet metal, hut zinc is most suitahle.

Fig. 72 shows a tray for a plain cross, the patterns for which are given at Figs. 73 and 74. The letters on Fige. 72 to 74 indicate the same parts of the cross, so no trouhle will he experienced in fitting them together correctly. Having cut out the patterns, hend at the dotted lines until the

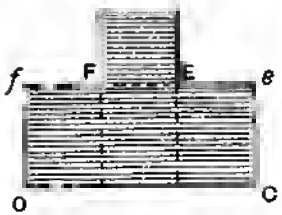


Fig. 74.—Part Pattern for Cross Flower Tray.

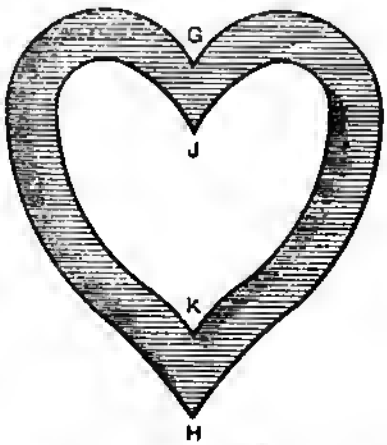


Fig. 75.—Plan of Heart-shaped Flower Tray.

edges are at right angles to the hottom, and solder the corners inside. The top edges should he wired with No. 12 B.W.G. tinned wire. The two projecting arms are then soldered in poeition, and a ring of No. 10 B.W.G. tinned wire soldered to the corners to make it rigid, as ehown in Fig. 72.

Circular wreath trays are of very simple construction. A plan consists of two concentric circles, the diameters varying according to the desired width of wreath. Two wired rime, 2 in. deep, are made to the required diameters, and a hottom ie cut and edged to fit, and then soldered to them.

The heart-shaped tray (Fig. 75) is made on the same principle as the circular tray; but in this case it will be better to make the rims in two halves, the seams of the outer rim being at G and H (Fig. 75) and those of the inner rim at J and K.

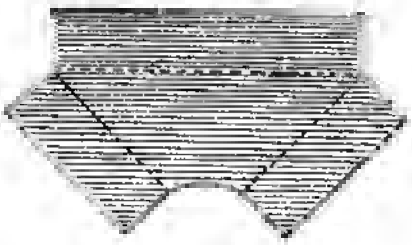


Fig. 78.—Pattern for Maltese Cross.

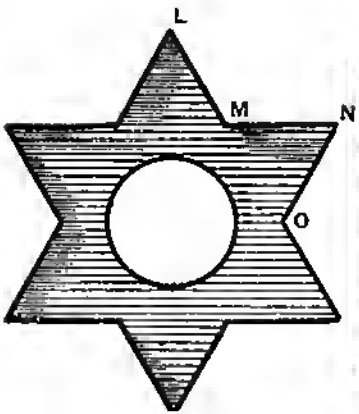


Fig. 76.—Plan of Star-shaped Flower Tray.

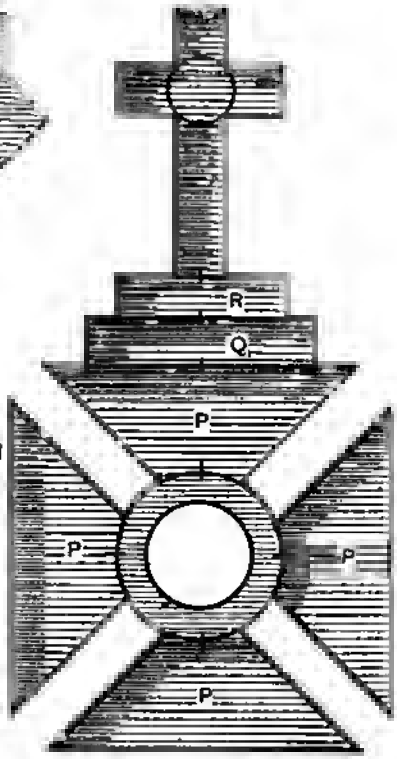


Fig. 77.—Plan of Combination Wreath and Crosses.

First wire the rims; then bend the two halves of the outer rim so that they are exactly the same shape, and solder them together. Having served the halves of the inner rim in the same way, lay both rims in position on a sheet of metal, and carefully mark out the bottom. This should be cut inside the marking, to allow of its fitting tight inside the rims, about $\frac{1}{32}$ in. off the bottom

edges, where it should be soldered to each rim. It is much better to fit the bottom inside, as otherwise it would be rather difficult to edge it to fit.

To make the star-shaped tray shown by Fig. 76 first set out the plan to the required size with the compasses, and from it transfer the distances L M, M N, N O, etc., to a strip of metal which is to form the rim. Wire the rim with No. 12 gauge B.W.G. tinned wire, and bend to shape. The circular rim in the centre is made next, and the bottom cut out and edged to fit. Solder the outer rim to the bottom first, and then place it on a flat surface and solder the circular rim in position.

Fig. 77 shows a combination tray for a wreath, Maltese cross, and plain cross, and is built up in

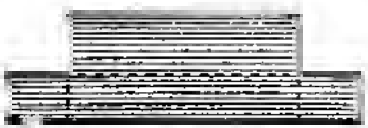


Fig. 79.—Pattern for Pedestal of Cross.

sections. A pattern for the four parts P is shown at Fig. 78. First make the circular rims for the central wreath as previously described. Next cut the four pieces P to the pattern (Fig. 78). Bend these along the dotted lines until the sides are at right angles to the bottom, solder the corners inside, and wire the edges. Punch four ½-in. holes in the outer rim of the circle, near to the bottom, at the points indicated in Fig. 77, to allow the water to pass through, and then solder the four parts P in position. A pattern for Q is shown at Fig. 79. This is bent along the dotted lines, soldered, wired, and fixed in position. The part R is made and fixed in a similar manner, the only difference being in the size. Holes of ½-in. diameter should be punched near to the bottom, as indicated. Finally, the plain cross, which is put

together in the same way as that shown at Fig. 72, is made and fixed in position. When soldering the different parts together, a flat board should be used to prevent buckling.

Another combination design is shown at Fig. 80. This should be marked out first, for reference, on a flat board. The outer and central rims are made as already described. Rims for the parts s are each prepared as follows. Cut a strip of metal the required depth, and transfer the

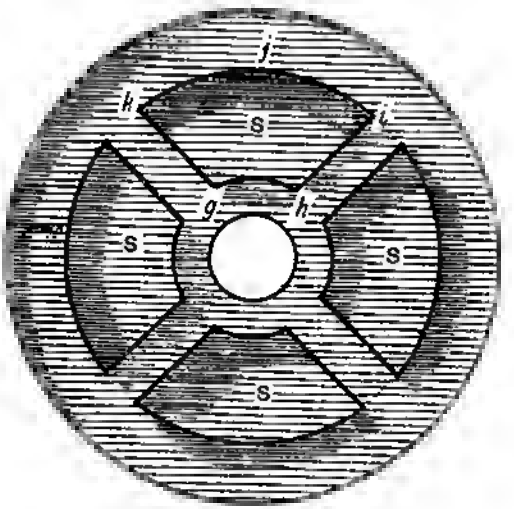


Fig. 80.—Plan of Combination Wreath.

distances *g h*, *h i*, *i j k*, *k g* from the plan, plainly marking them with a scriber. Notch the strip to the depth of the wire at *g*, *h*, *i*, *k*, wire it, and bend to shape, trying it occasionally over the plan until satisfactory, and then solder the seam. The bottom for this design should be let inside, but may be made in several pieces if more convenient.

Other designs of flower trays, a combination or modification of those given, will readily suggest themselves. The trays before use should be cleaned and given two or three good coats of

paint, white for the inside and dark green for the outside being suitable.

Knife Tray.—The knife tray shown in general view by Fig. 81 is slightly tapered, and is divided into two compartments by the partition A, the top of which is cut to shape, so that when the tube B is soldered in position it will form a convenient handle. A pattern for the sides is given at Fig. 82, where the dotted lines indicate the working edges. No pattern is shown for the ends, as they are cut to the same shape, though of course shorter, and the only working edges required are the top wiring edges. First set off the wiring

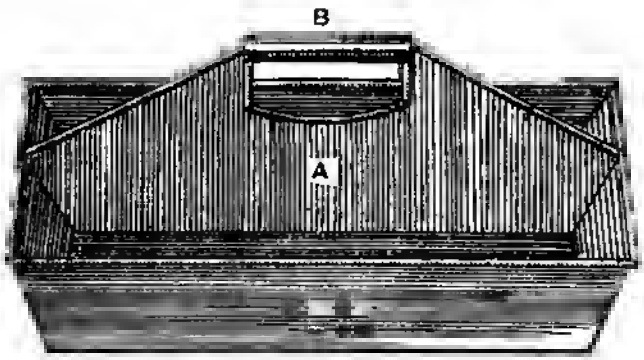


Fig. 81.—Knife Tray.

edges to take No. 10 B.W.G. wire, and then set off the other working edges of the two sides in the opposite direction. The body may then be soldered together and wired, after which the bottom is edged to fit tight, and soldered. By pressing the sides and ends well up to the edges of the bottom with a piece of flat wood during soldering, unsightly buckles are prevented. If a headed top is desired, cut four 1-in. strips, two of which must be about 1 in. longer than the length of the tray, and the two others 1 in. longer than the width. Bend these to a half-round section in the groove of a crease iron or over a rod of iron, mitre the ends, and solder in position.

A pattern for the partition is shown at Fig. 83, the dotted lines being the working edges. The top working edges are set off and flattened, and the side edges are set off at right angles to the pattern. The edges C, D, and E are headed. Cut the strips which are to form the heads ½ in. wide, bend to shape, mitre, and solder in position. The handle is a simple tube with soldered seam, and is fixed to the top of C and E. The partition is now placed in the middle of the tray and soldered thereto, after which two beads

Fig. 82.

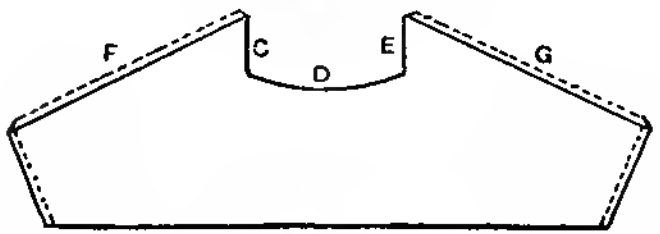


Fig. 83.

Figs. 82 and 83.—Patterns for Side and Partition of Knife Tray.

(cut 1 in. wide) are made for the edges F and G, these being mitred and soldered in position.

The tray should be thoroughly cleaned and japanned, and if relieved with a little gold lining, its appearance will be much improved.

Door Letter-box.—The body of the letter-box (Fig. 84) can be cut whole from a sheet of tinplate, and the hinges and pieces for holding the glass covering the spyhole in the door can be cut from the waste pieces. The door will, however, require a further piece of tinplate 6⅝ in. by 4½ in.

Take the sheet of tinplate to form the body of the letter-box, and with a square true the bottom edge with the left-hand side. If the bottom is already true, well and good, but it will probably be found about $\frac{1}{8}$ in. out. Then, by

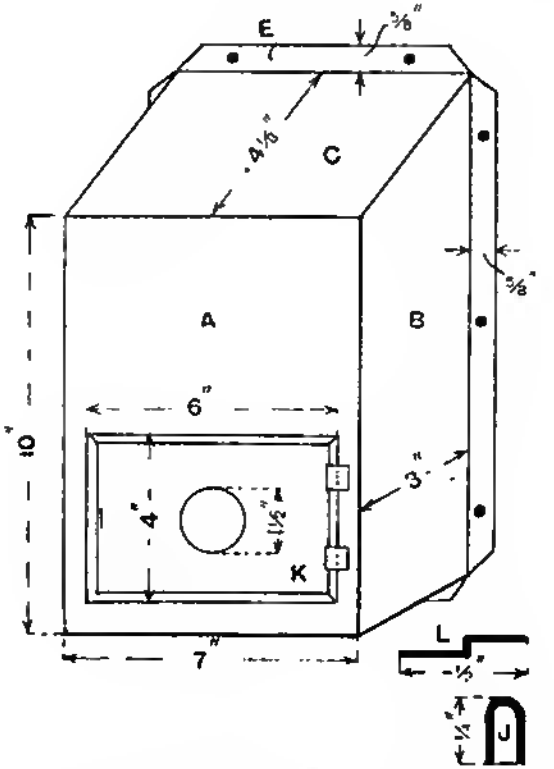


Fig. 84.—Letter Box.

using the left-hand side and bottom end only for the measurements, mark out on the tin with a sharp steel tool the design shown in Fig. 85, paying particular attention to the various measurements given. Having marked this out carefully, cut out along the black lines, as shown; the dotted lines show where the tin requires to be bent.

The sheet of tinplate is now shaped as in Fig. 85. With the aid of a chisel cut out the hole F hy which the letters are extracted. Place the sheet of tin on a piece of flat iron and place the edge of a chisel along the line; give one hlow with a hammer, and then move the

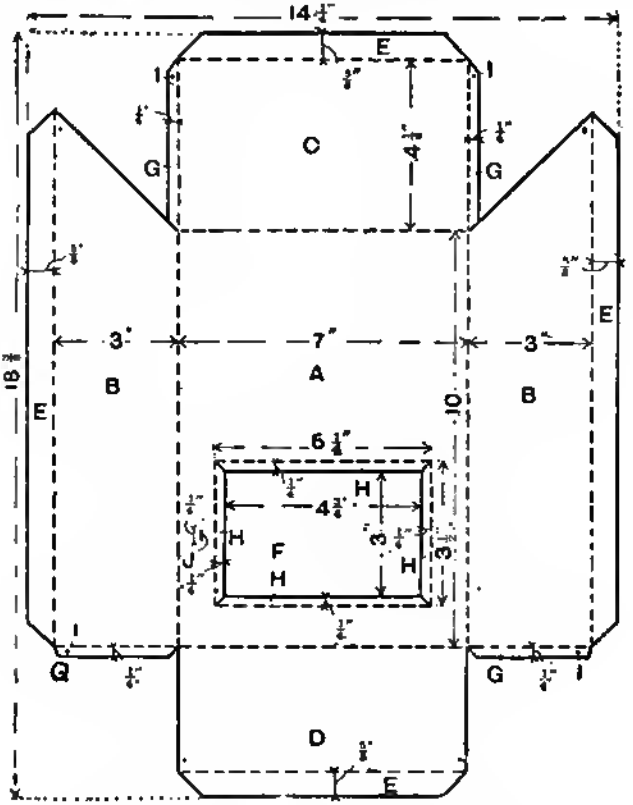


Fig. 85.—Letter Box Pattern.

chisel a little further and repeat, following the line round the square. After going round ahout three times it will he found that the piece F can he removed, hut care must he taken that the part where the hlow is struck rests on the flat iron each time.

Turn inwards the laps H on each side of this

square hole, and hammer them quite back, thus leaving smooth edges to the hole. Then proceed to bend outwards at right angles at the dotted lines the $\frac{5}{8}$-in. parts E at sides and bottom, and the top piece E at about half a right angle. Then the $\frac{1}{4}$-in. laps G at the sides of top C and bottom of sides B.

Now bend inwards at dotted lines, at a right angle, the bottom D, then the sides B, and finally the top C (the latter at about half a right angle). Secure the sides, top, and bottom by small rivets at the points I on the laps G, and solder all along the laps G; the rivets serve to hold the body in

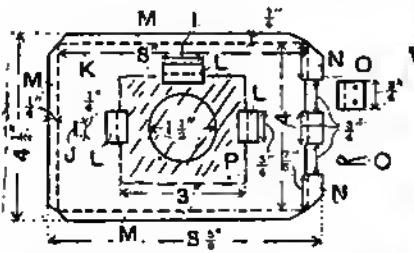


Fig. 86.—Door of Letter-box.

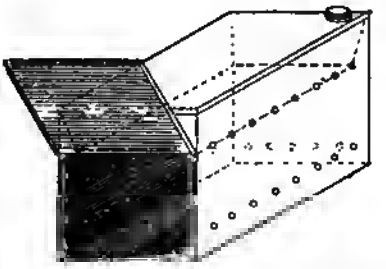


Fig. 87.—Outer Case of Picnic Outfit complete with Boiler.

position while soldering. Punch holes in the edges E, as indicated by the dots in Fig. 84; these are for securing the box to the door by screws. This completes the body.

Now proceed to make the door. Mark out a piece of tinplate, as shown in Fig. 86, which gives a back view of the door upside down; cut out, and then cut out the circle in the centre for the spyhole. Bend outwards the lap M at top, bottom, and one end, and turn them right over, thus making smooth edges to the door.

Take a piece of $\frac{1}{16}$-in. wire about $3\frac{1}{2}$ in. long, and bend the laps N of the door outwards over the wire, leaving just sufficient room between the wire and the door at the cut-out portions for

pieces of tinplate, bent to shape shown at O, Fig. 88, to form hinges; the laps N, after being bent round the wire, can be soldered down. Now solder on to the back of the door the pieces of tin L; these are to hold the glass P, which covers the spyhole. Make a small hole at J to fit the staple, and the door is ready to fix to the body. Rivet and solder the door to the body by the hinges O, taking care

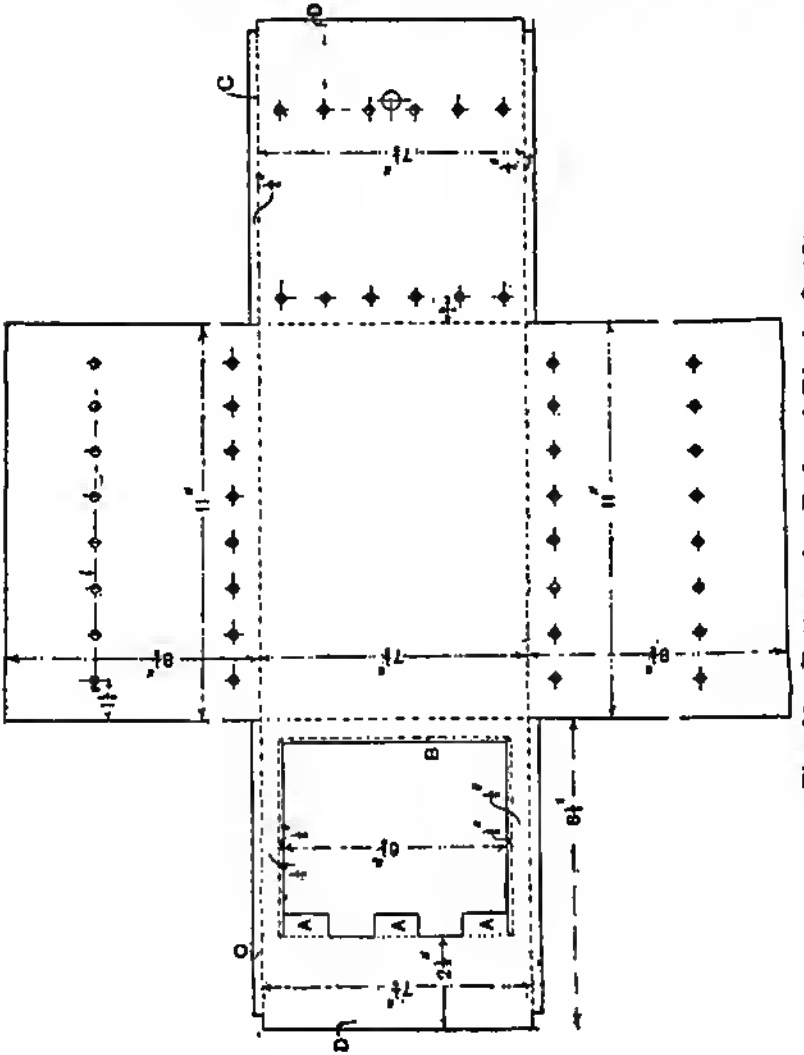


Fig. 88.—Pattern for Body of Picnic Outfit.

C

that the etaple hole in tbe door fits on the etaple fixed to the hody. The letter-box is now complete.

J (Fig. 84) represents the staple whicb is riveted to the body of the letter-hox at point J (Fig. 85). By meane of this etaple and a miniature padlock, the letter-hox can be locked up if desired.

Picnic Outfit.—The picnic outfit ahout to be illustrated and deecribed would he euitable for about four persons. The cupe, eaucere, and platee,

Fig. 89.—Method of Forming Hinge.

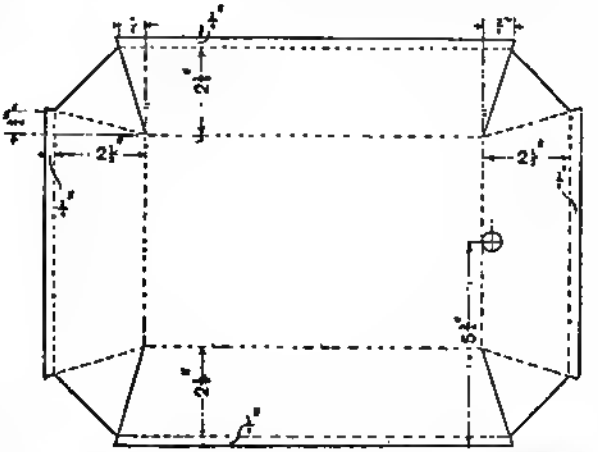


Fig. 90.—Pattern for Boiler for Picnic Ontfit.

which may he of enamelled iron, and the teapot and epirit flask, are all packed in the outer case or body (see Fig. 87), the knivee, forke, epoone, taps, etc., heing placed in the teapot. A sheet of tinplate, 6 ft. by 2 ft. 6 in., of ahout No. 26 gauge, will be eufficient to make the wbole outfit. The advantage of having a large eheet ie that all the parts can be cut out in one piece, thereby reducing the numher of soldered jointe to a minimum. All the various parts are ehown developed in the illuetratione; they are cut on the full lines and hent on the dotted lines.

The hody, the pattern for which is given in

Fig. 88, should be made first, the outside dimensions of the pattern being 2 ft. 4 in. by 2 ft. 0½ in. The projections A are 1¼ in. long by ⅝ in. deep, the spaces between them being of the same dimensions; they are bent round a piece of $\frac{3}{32}$-in. diameter wire, as shown in Fig. 89, so as to form a hinge, and are then riveted with two ⅛-in. diameter copper or soft-iron rivets.

The air holes are ¼ in. diameter, and spaced centrally 1¼ in. apart. The lower rows of air holes are ⅝ in. from the inner dotted lines, and the three other rows 2½ in. from the outer edge.

The hole for the tap, on the right-hand side of the pattern (Fig. 88), is ½ in. in diameter,

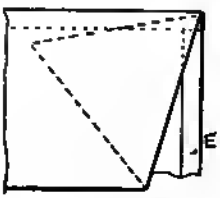


Fig. 91.—Part Section of Boiler for Picnic Outfit.

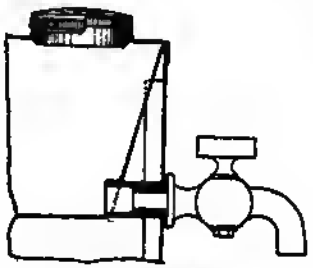


Fig. 92.—Boiler, etc., for Picnic Outfit in Position.

punched in the centre, as shown, 2¼ in. from the edge.

The air holes and the hole for the tap having been punched, the three ⅛-in. strips B are bent round the inside of the opening and beaten flat, and the four ¼-in. strips C are bent towards the inside at right angles to the ends. Then the ends and sides of the body are bent up at right angles to the bottom, and the ¼-in. fixing strips D soldered down the inside. The outer dimensions of the pattern (Fig. 90) are 1 ft. 3 in. long by 11½ in. wide. The inner dotted rectangle, which indicates the base of the boiler, is 9½ in. long by 6 in. wide.

The boiler fits into the upper portion of the

body, as indicated hy the dotted lines in Fig. 87. Fig. 91 is a section of the boiler when placed in position for soldering to the hody E. Care must he taken to punch the hole for the tube before the hoiler is secured in position; this hole is $\frac{1}{2}$ in. in diameter, and the centre is $\frac{1}{4}$ in. from the inner dotted rectangle, and sbould he a good fit to the tuhe. The tuhe is ahout $\frac{1}{16}$ in. thick, ahout $\frac{7}{8}$ in. long, and of such a diameter inside as to allow of a full thread heing made for the cock. Fig. 92 is a part section showing the hoiler, hody,

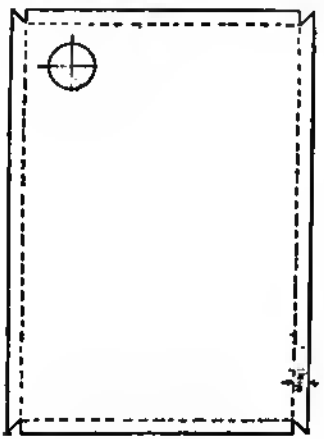


Fig. 93.—Pattern for Picnic Outfit Body Top.

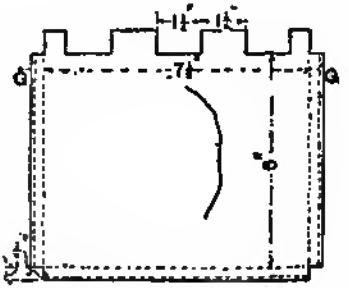


Fig. 94.—Pattern for Hinged Flap.

top, and filling bole; the cock also is shown in position. A $\frac{3}{8}$-in. cock will do very well; this will make tbe outside of the tube about $\frac{1}{2}$ in. in diameter. A little over $\frac{1}{32}$ in. should project on the outside of the body, and when the cock is screwed in, a leather washer is placed on.

The pattern for the body top (Fig. 93) is $8\frac{9}{32}$ in. wide hy $11\frac{25}{32}$ in. long, the inner dotted rectangle heing $7\frac{17}{32}$ in. hy $11\frac{1}{32}$ in. The top has a hole punched in it, the centre of which is $1\frac{1}{4}$ in. from the sidcs of the dotted rectangle; the diameter of the hole must suit the screwed husbing, which is soldered in. The hoiler is placed over

the body, and soldered all round. The tube for the cock is then soldered to the body, care being taken that there is no leak at the junction with the boiler, as this cannot be remedied afterwards without taking off the top. The top is put on next, and a water-tight joint made by soldering it all round.

The hinged flap of the body (Fig. 94) is now made, the outside dimensions of the pattern being

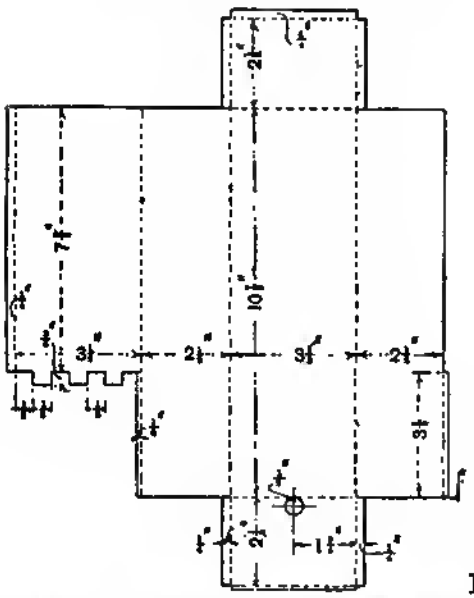


Fig. 96.—Pattern for Picnic Teapot.

Fig. 95.—Method of Binding Sides of Flap.

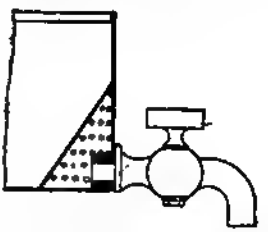


Fig. 97.—Part Section of Picnic Teapot.

8¼ in. by 7 in. The hinge projections are $\frac{5}{8}$ in. deep, the length of the two inner ones being 1½ in., and that of the two outer ones $\frac{5}{8}$ in.; they are bent over and riveted as shown in Fig. 89. The ⅛-in. stripe G (Fig. 94) are bent double and beaten flat, and the inner ¼-in. strips (shown by the dotted lines) are bent at right angles as indicated in Fig. 95. The flap is fixed to the body by running a piece of $\frac{3}{32}$ in. diameter brass or iron wire through the hinge.

The teapot (the pattern for which is illustrated by Fig. 96) is cut from a piece of tin 1 ft. $4\frac{1}{4}$ in. long by 1 ft. $0\frac{3}{8}$ in. wide. Fig. 97 represents a cross section of the tap and lid end, and shows the method of fixing the tube (which is about $\frac{1}{2}$ in. long) for the cock and the strainer. Fig. 98 shows the strainer developed; the radius of the top curve is $1\frac{3}{16}$ in., and the length of the chord from corner to corner is $2\frac{1}{16}$ in. Fig. 99 is a plan of the strainer when fixed in position.

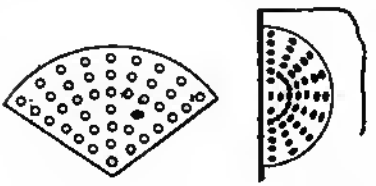


Fig. 98.

Fig. 99.

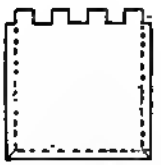


Fig. 100.

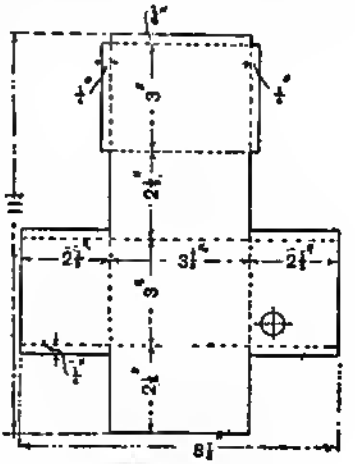


Fig. 101.

Figs. 98 and 99.—Pattern and Plan of Teapot Strainer. Fig. 100.—Pattern for Teapot Lid. Fig. 101.—Pattern for Spirit Flask.

Fig. 100 shows a pattern for the lid of the teapot; the outside dimensions of this pattern are $4\frac{1}{8}$ in. by 4 in., the inner dotted rectangle being $3\frac{1}{2}$ in. by $3\frac{1}{2}$ in., thus allowing $\frac{1}{4}$ in. for bending up. The hinge projections for this are $\frac{1}{2}$ in. wide by $\frac{3}{8}$ in. deep, the spaces being of the same dimensions, except the outer ones, which are only $\frac{1}{4}$ in. wide; they should be bent round a piece of $\frac{1}{16}$ in. diameter wire.

The spirit flask, a pattern for which is given in

Fig. 101, is next bent up and soldered together; the outside dimensions of this are 11¼ in. by 8⅞ in. The screwed bushing is soldered in afterwards. The hole in the pattern is of the same diameter as the screwed bushing, the centre being ⅝ in. from the sides of the inner dotted rectangle. Fig. 102 is a part section of the flask.

The capacity of the boiler is 5 pt., and that of the spirit flask nearly 1 pt. If the water is to be carried from the starting point, the boiler should be filled right up to the top, as this will prevent any lapping sound the water would otherwise make against the sides and top. A metal

Fig. 102.—Part Section of Spirit Flask.

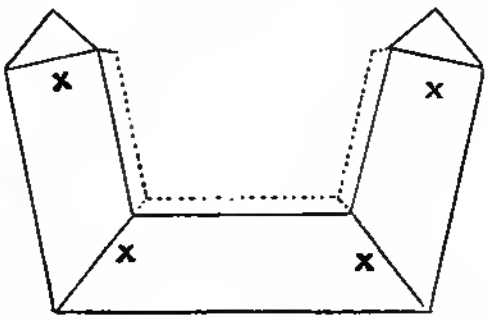


Fig. 103.—Pattern for Case for Lock.

plug or cork will be required to take the place of the tap in the boiler. Before lighting the spirit stove, care must be taken to see that the boiler tap is in, and that the cap of the filling hole is off, otherwise there will be an explosion. The best sort of spirit stove to use will be one that converts the methylated spirit into a gas before it is burned; there is a variety of these on the market.

The outside case should be cleaned of all rough particles of solder, and would look well stove-enamelled dark green outside and white inside. The teapot and spirit flask may also be enamelled a dark green colour.

Fastening Locks on Tinplate Boxes.—Locks

are fastened on tinplate hoxes in the following way : Put the lock in position, and hy means of the pin, either hy pressure or scratching, find the place for the keyhole, which can then he cut. Get two pieces of hrass $\frac{3}{8}$ in. square, drill and tap them for $\frac{5}{16}$-in. screws or less, fit them between the lock and hox under the screw-holes in the lock, put the screw in, and solder the pieces of hrass firmly to the hox. Now make a tinplate case to go round the lock and solder it in its place. Fig. 103 shows a pattern for such a case; it is hent at the points marked x, and the dotted lines show the edges to go

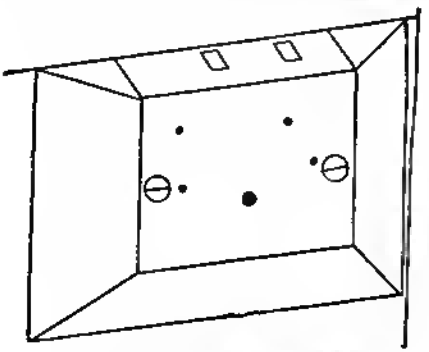


Fig. 104.—Lock enclosed in Case.

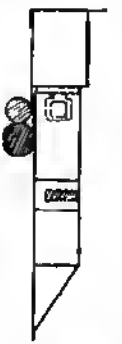


Fig. 105.—Section of Lock on Box.

against the lock. By this method, when the lock is out of order it can easily he taken out. Fig. 104 gives a sketch of it finished. That part of the lock that goes on the lid is filed hright on the top and tinned. A kind of hox is made and soldered inside the lid for this to he soldered to. When this is done, put a piece of stiff brown paper on thc top of the lock, push the top part through the paper to its place, lock it, melt some solder evenly on the top, and, hefore it has time to set, hring the lid down sharply; unlock it, and just run round it with the soldering-iron, taking care not to alter its position. Fig. 105 gives a sectional view of the lock with the lid closed.

CHAPTER III.

HOLLOWING TINPLATE.

For making ordinary etock articlee in sheet metal in quantities, the general introduction of etamped and spun work has rendered ekill in hollowing sheet metal of minor importance; hut where these articles are made to special eizee, the advantagee of the methods ahout to be described are obvious.

The metal is worked down in concave epaces of euitahle curvature, which are cut in the end of a section of an oak or a heech trunk, a convenient eize being ahout 3 ft. high and 2 ft. 6 in. in diameter; the hammere used should also he curved proportionately to the curve required for the work in hand.

When cutting out the material, allowancee extra to the eize of tne article muet he made, these heing ahsorhed in the curved hody.

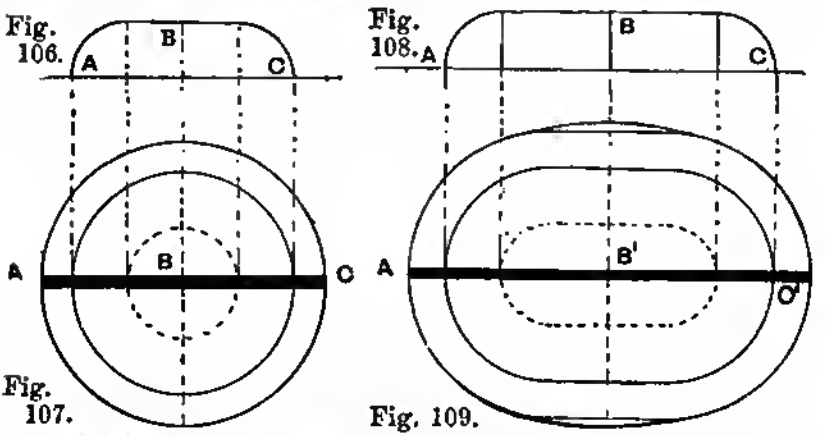
One of the commoneet hollowed articles is a circle hollowed to form a cover, ae A B C (Fig. 106). The diameter of the circle in the flat can he found hy hending a narrow strip of metal to the ehape ehown in section, and then etraightening this out to thc length A^1 C^1 (Fig. 107). The dotted circle B^1 indicatee where the hollow part cnds, so that the top of the cover may he left flat.

When hollowing a circle it is usual to begin hy working regularly round the edge with a round-faced hammer, the metal heing placed over a hollow in the hlock; the hlows are then delivered in a series of concentric circles as far in towards the centre as may be desired.

The hollowed circle is smoothed hy lighter

blows delivered over the surface with regularity or hy a series of radial strokes on a planishing wheel.

A second figure often met with is one with semicircular ends and parallel sides, as shown in Figs. 108 and 109. In making the allowances for hollowing with a figure of this shape, it is customary to draw the exact shape required in plan for the finished hollow; the length of the curve A B C (Fig. 108) is then taken as in the first case, and placed lengthwise, and centrally, across the



Figs. 106 and 107.—Section and Plan of Hollowed Circle. Figs. 108 and 109.—Section and Plan of Figure with Semicircular Ends.

plan of the figure, as A^1 B^1 C^1 (Fig. 109). Then, using the same centres as were used for drawing the plan, and radii to A^1 and C^1 alternately, describe the outer semicircles shown, and join the ends of these hy straight lines.

In hollowing a figure of the ahove shape, the ends take nearly the whole of the work, and are hammered as described for the circle. After a little hollowing, the sides are pressed up hy pushing them against the side of the hlock, the ends are hollowed a little deeper, and the sides again worked up level and to the same curve in section

as the ends, and this process is repeated until the desired depth of hollow is attained. As nearly all the hammering is on the ends, the metal is stretched more there than along the sides; consequently, if allowance were not made, the sides of the cover at the base would be concave, and to prevent this after-drawing curved allowances are made along the straight sides as shown in Fig. 109.

The greater the depth required for the hollow, the greater should be the allowance, and it is always advisable to allow too much rather than

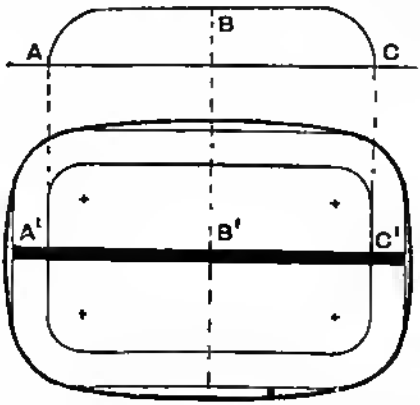


Fig. 110.

Fig. 111.

Figs. 110 and 111.—Section and Plan of Oblong with Round Corners.

an insufficient amount, as the surplus material can easily be pared away after the hollowing is finished.

Hollowed figures of the above shape are usually tight at the top flat part of the cover after being worked on the block, and this prevents the cover resting flat. A few blows from a flat planishing hammer, delivered on the flat part of the cover while this is resting on a bright anvil, will usually remove the springiness.

The rectangular figure with round corners shown at A B C (Fig. 110) is set out for hollowing in a similar manner to the preceding example, the

plan of the cover to the finished size being first drawn, the length round the section being next taken, and this length transferred to the plan as indicated hy the thick lines A¹ B¹ C¹ (Fig. 111). The extra length is added equally all round thc figure as sbown in Fig. 111. Most of the hammering or hlocking is done at the four corners, consequently the metal is stretched more there than at the sides; therefore, to make the hody true over the lower edge when finished, make curved allowances along the straight sides and ends as shown.

When an oval (Figs. 112 and 113) is to be bollowed as for a tea-kettle top, the plan is drawn first, and ths allowance for hollowing is ohtained in a similar manner, the extra distance outside the plan at A¹ and C¹ (Fig. 113) heing added equally round the figurs hy using the same centres as used for describing the figure first, with radius to A¹ and C¹ alternately, and then from the ends of these curves producing the curves for the sides. When hollowing, work round the figure as described for Figs. 106 and 107, hut tuck the ends of the oval inwards more than the sides, as these can he partly pressed up, and the hollow can then he smoothed as described for the circle.

Yet another figure often seen is a hollowed square top or cover (Figs. 114 and 115). For this ths plan is drawn first, hut instead of taking the true length of a section parallel to the side, hetter results are ohtained hy taking the true length of the section of the cover diagonally, and laying this across the plan diagonally, as indicated hy the thick line E B¹ F (Fig. 115). From the sxtremities of this line draw lines parallel to the sides of the figure, and this will give partly the allowance for hollowing. In addition to this allowance, make that shown hy the curves on the four sides.

When working a hollow of tbe type just de-

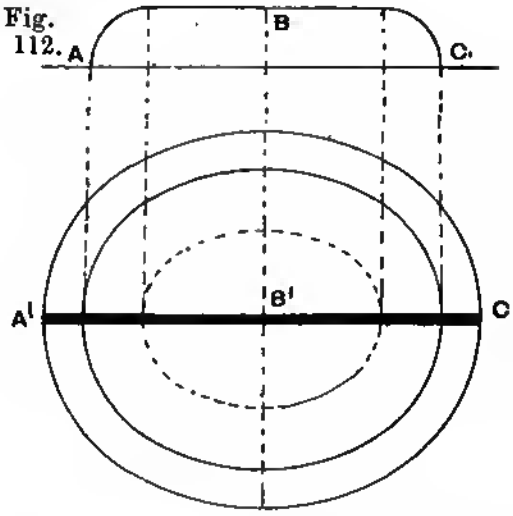


Fig. 113.

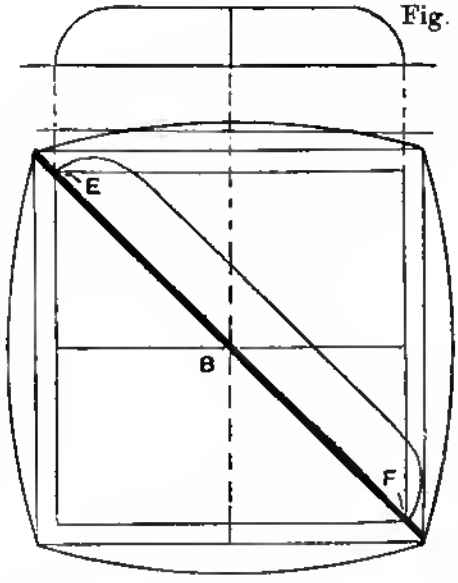


Fig. 115.

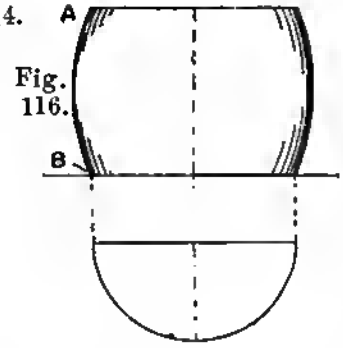


Fig. 117.

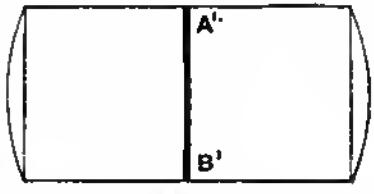


Fig. 118.

Figs. 112 and 113.—Section and Plan of Elliptical Pattern. Figs. 114 and 115.—Section and Plan of Square. Figs. 116 and 117.—Elevation and Half Plan of Curved Cylinder. Fig. 118.—Pattern of Curved Cylinder.

scribed on the block, begin by slightly hollowing the four sides, then with the bullet-faced hammer hollow the four corners, without working on the sides more than is necessary, so as to prevent the formation of any big puckers. After working the corners down to a depth equal to that required for the height of the top, place a side along an edge of the block, and, using a hammer with a large and rather flat face, hit the side on the block along the outside until it is brought down straight along the edge. Repeat this process on the other three sides. Again use the

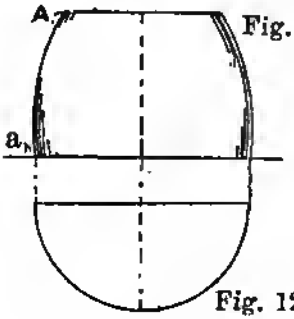


Fig. 119.

Fig. 120.

Figs. 119 and 120.—Elevation and Half Plan of Frustum of Curved Cone.

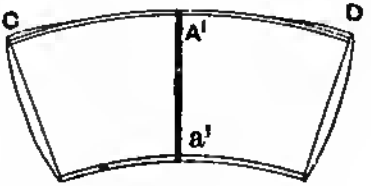


Fig. 121.—Pattern of Frustum of Curved Cone.

bullet-faced hammer, and work along the sharp shoulder formed by forcing down the sides, and work on a flat place on the block until the curve of the shoulder at the sides is the same as that at the corners. Then carefully work over the whole of the hollowed surface until it is rendered smooth. Should it be springy, this effect may be removed by working in the manner described for Fig. 109.

When cutting the pattern for a body which is to form a cylinder with curved sides, first draw a rectangle with a length equal to the circumference of the semicircle (Fig. 117), and of a depth equal to the distance round the curve A B (Fig.

116), this depth being shown on the pattern by the thick line A¹ B¹ (Fig. 118). Then, at the ends of the rectangle, make the curved allowances shown. After the body has been hollowed, trim the edges at the ends quite true, so that the two pieces forming the complete body meet at the seams edge to edge, so as to form a perfect seam. When the pattern is to be made for the frustum of a rounded right cone, the depth for the slant of the cone is found by taking the distance round the curve A B (Figs. 119 and 120), and then working the cone pattern in the usual way. On the pattern (Fig. 121), the distance round the curve A B (Fig. 119) is indicated by the thick line A¹ B¹. Owing to the greater part of the hammering on the block occurring at the centre of the pattern, the material increases in depth there more than at the ends; consequently, to bring the pattern true when finished, allowances should be made at C and D (Fig. 121) as shown, curved allowances on the sides as for the cylinder completing the pattern.

With the whole of the figures described above all allowances for flanges, edges, wiring, and grooving must be made additionally to the figures as drawn. If the metal used is copper, a trifle less than the distance round the section by which the length of the figure is obtained would be found correct, as that metal, being the softest of those in common use, stretches more during the hollowing process than tinplate, sheet-iron, or brass.

CHAPTER IV.

SIMPLE ROUNN ARTICLES IN TINPLATE.

Flour-bin.—The flour-hin shown in elevation hy Fig. 122 and in plan hy Fig. 123, can he made of No. 24 B.W.G. tinned iron. The pattern for the body is simply a rectangle, equal in length to the circumference, and in width to the proposed depth of the hin, plus working edges. Pass this through the rollers to "hreak" the metal; off the ends set two edges for a grooved seam, and edge the top to take ¼-in. rod iron. After wiring, turn to shape, groove the seam, and solder it inside.

Make two hoops of tinned hoop-iron to fit tightly round the hin, drive one up to the wired edge, and solder it in position, and fix the other similarly in the centre. Now set off an edge for the bottom, which is paned on and heaten up.

Make another hoop to fit the hottom of the hin tightly, drive it on, hut allow it to overhang the hottom ahout 1 in., and then solder round the top edge of the hoop, and float ahout four hodies of solder underneath the hottom at equal distances apart.

The top or cover of the hin is made of two parts, hinged together, the patterns for them heing shown at Figs. 124 and 125, where the dotted lines represent working edges. First cut out the hack portion (Fig. 124), and notch it at A and B for the hinges. Wire the straight edge with $\frac{5}{16}$-in. rod-iron, sink it in the crease iron, and hend it over to form a feather edge.

Two straps of metal equal in width to that of the notches A and B are hent over the exposed wire and sunk in the crease iron, and thus form the hinges. The other edge is set off downwards,

and is fitted to the back part of the top of the bin, to which it is then soldered. Fig. 125 is next cut out and wired, the working edges being represented by dotted lines; place this piece on the bin,

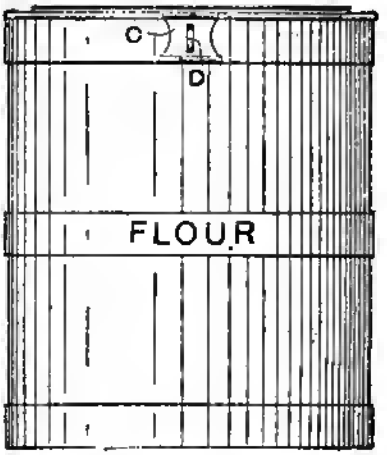


Fig. 122.

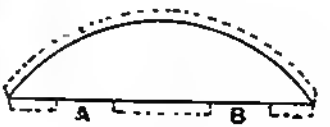


Fig. 124.

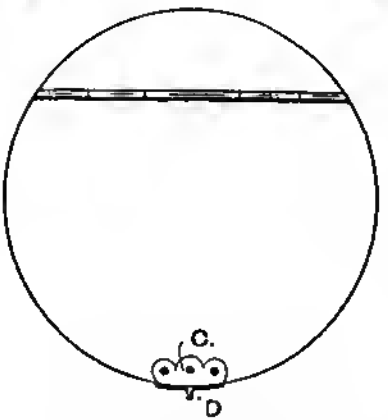


Fig. 123.

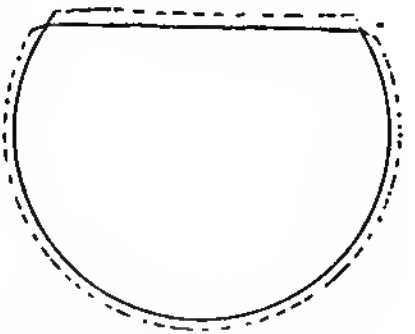


Fig. 125.

Fig. 122.—Front View of Flour Bin. Fig. 123.—Plan of Flour Bin. Figs. 124 and 125.—Patterns for Flour Bin Cover.

resting on the hinges of the other part, and solder them together. Then lift the cover and solder the hinges underneath also; these may be further secured with a couple of rivets through each.

A hasp c (Figs. 122 and 123) is then riveted on

the cover, and a plate and staple D are riveted on the bin. Clean with turpentine and whiting, and finish with dry whiting. The bin is usually painted oak colour, the hoops are painted black, and on the central hoop the word "flour" is gilded.

Colander.—Fig. 126 shows a tinplate colander for straining purposes. A pattern for the body is shown by Fig. 127, where the outer radius equals the diameter of the top of Fig. 126, while the inner radius equals the diameter of the bottom. The difference of radius arises from the fact that the sides of the colander are inclined at 60 degrees to the ground; for any other inclination the usual method must be adopted, as explained in the description of the making of a milk saucepan (pp. 80 to 82).

The perforations are marked as indicated, and the pattern "broken" through the rollers—that is to say, the tinplate is turned in opposite directions each time it is passed through the rollers; this prevents creasing the pattern when it is finally bent in shape. The holes are punched on a block of hardwood, and the burrs flattened and planished; the edges are then set off for a grooved seam; the pattern is bent to shape and seamed.

The seam is soldered inside, and on the larger end an edge is set off for the wire, No. 10 B.W.G. being used. If desired, a swaging can be raised on it about 1½ in. from the wired edge; this not only strengthens it, but improves the appearance.

The bottom is cut out, hollowed, and edged to fit the smaller end of the body; but before soldering, a series of circles are marked on the inside, beginning with one in the centre 1 in. in diameter, and making each circle 1 in. larger in diameter than its predecessor, until the outer edge of the bottom is reached. Holes are then punched at short intervals around these circles, and the burrs flattened on an upturned hollowing hammer, after which the bottom is soldered on.

The hoop is a strip of metal 1½ in. wide, ths length, of course, equalling ths circumference of the bottom. This is wired with No. 10 B.W.G. wire, rounded, seamed, and soldered in position.

A pair of how bandles is riveted opposite each other at the top, as shown in Fig. 126.

Clean with turps and whiting, and polish with

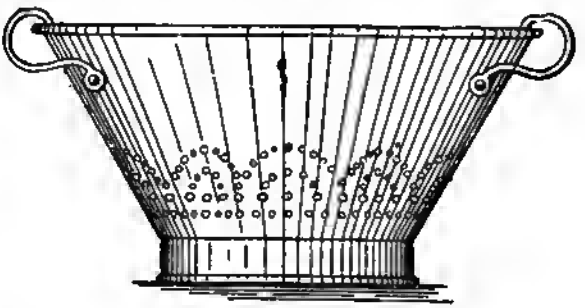


Fig. 126.

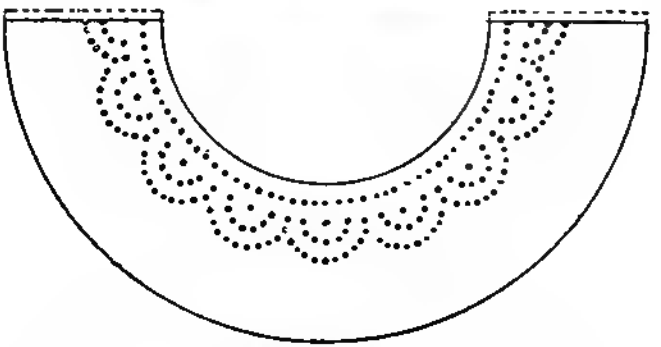


Fig. 126.—Tin Colander. Fig. 127.—Pattern for Colander Body.

dry whiting; hut befors using, steep it for a short time in hoiling water, a prscaution that should he taken in the case of all metal articles intended for culinary use.

Culinary Strainers.—Ths strainsr sbown hy Fig. 128 has a perforated tinplate hottom. Fig. 129 is the pattern for ths hody, the radius of ths outer arc of the semicircle being equal to the diameter of the top of the strainer, and ths radius

of the inner are equal to the diameter of the hottom. Working edges are additional, and must he allowed for accordingly.

Having made the pattern, turn it to shape, solder the seam, set off a wiring edge at the top, and wire with No. 12 B.W.G. tinned wire.

The perforated hottom, which may he hollowed or flat, is edged to shape and soldered on. Perforated tinplate, in various degrees of fineness, ean he ohtained at any ironmonger's, and costs

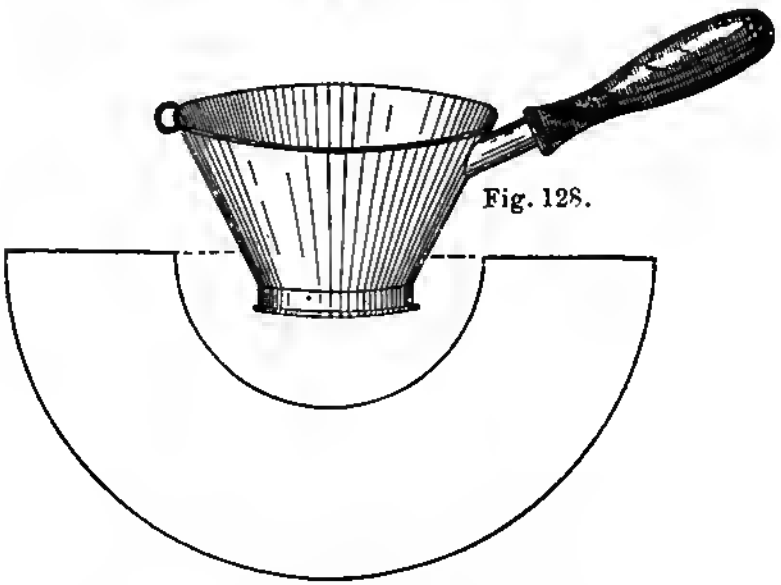


Fig. 128.

Fig. 129.

Fig. 128.—Strainer with Circular Bottom. Fig. 129.—Pattern for Body of Strainer.

very little. For the rim or foot of the strainer, eut a strip of tin to fit the hottom, wire it with No. 14 B.W.G. wire, hend to shape, and solder on.

A japanned wood coffee-pot handle is fitted to the body hy means of a strip of tinplate hent to shape and fitted over the shouldered part of the handle, the end of the strip heing hevelled to the angle of the strainer. Before soldering on, it is advisable to drive the tinplate socket of

the handle into the wood with a fine hradawl, as an absolutely tight fit is essential. Opposite the handle is a small wire ring, flattened in ons part to taks a small strip of tin, which is soldered to ths strainer.

Fig. 130 is a different typs of strainer, the perforated part being conical instead of circular.

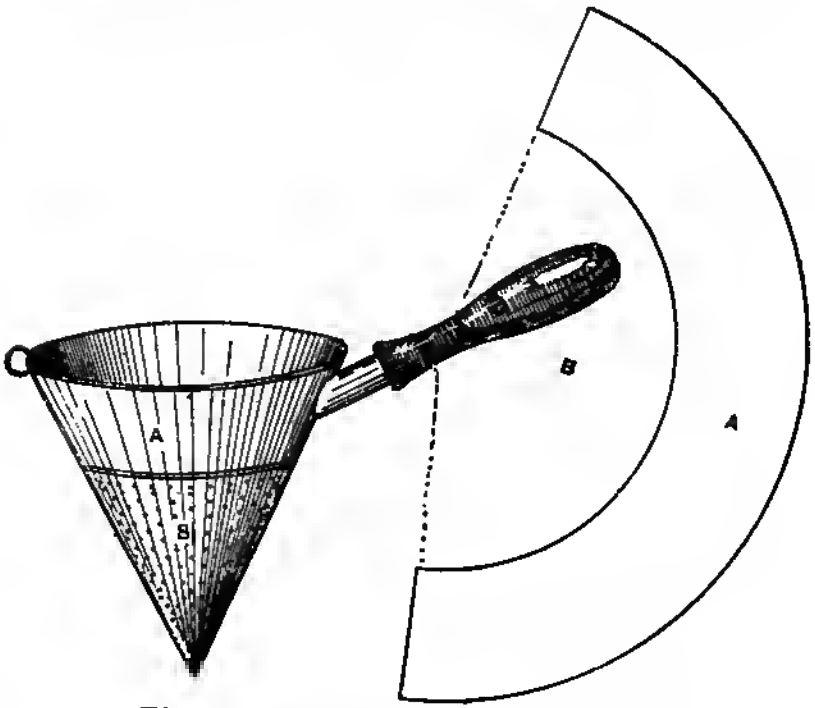


Fig. 130. Fig. 131.

Fig. 130.—Strainer with Conical Bottom. Fig. 131.—Pattern for Body of Strainer.

Patterns for ths parts A and B are shown at Fig. 131. In this cass the radius of the outer arc is equal to the total slant length of the side of ths strainer, and the radius of the inner arc equal to the slant length of B, while ths length of the arcs is equal respectively to the circumference of the tops of A and B. Ths part A is made in ths same way as the strainsr already described, and

B is cut out of perforated tin to the shape of the pattern, and turned over a funnel stake; the seam is then soldered, after which the two parts A and B are soldered together. When extra strength is required, two or three lengths of tinned wire are soldered radially on B, at an equal distance apart. The handle and ring are secured to the body in the same way as in the other strainer.

Rose Watering-can.—The watering-can shown by Fig. 132 can be made of tinplate or galvanised iron. For the body, cut a sheet of metal 2 ft. 1 in. by 8½ in.; wire, and sink it in the crease iron, and then round it and groove together. Solder the seam inside, and cut a hole for the spout diametrically opposite the seam and 2½ in. from the bottom.

The bottom is edged to fit the body, and beaten up, this also being soldered from the inside.

A pattern for the spout, which is in two pieces, is shown by Fig. 133, the dotted lines representing that part of the spout which is attached to the rose or sprinkler. The pieces are bent to shape and soldered at the seams; the larger spout is then fitted to the body and soldered in position. The length of the spout is usually governed by the class of work for which the can is intended. Where the plants are somewhat out of reach, a longer spout is required; and where in an elevated position, an elbow in the spout will be useful.

A pattern for the top is shown by Fig. 134; this is hollowed and fitted to the body; the inner arc is then wired, and the top soldered in position. The cross handle is a strip of suitable length and about 1¾ in. wide, wired with No. 12 B.W.G. wire, and bent to shape. It is fixed in position by cutting two holes in the top with a small sharp chisel, to receive the ends of the handle, which are then soldered inside as well as on the top.

Fig. 135 is a pattern for the body of the rose, the dimensions of the pattern being obtained thus: Multiply the diameter of the rose by 4, and divide by 3; the result will be the diameter of the pattern. For example, suppose the rose is 3 in. in diameter; then 3 in. × 4 = 12 in., which.

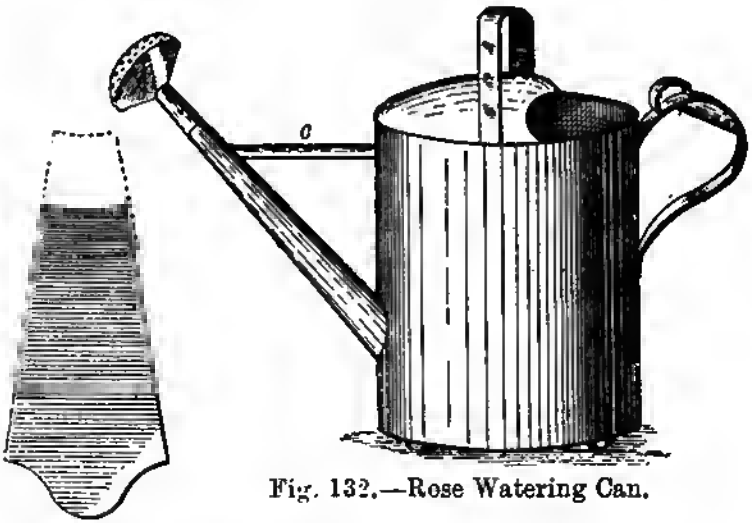


Fig. 132.—Rose Watering Can.

Fig. 133.—Spout Pattern.

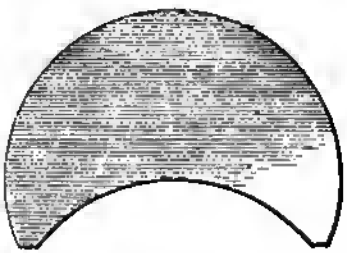


Fig. 134.—Pattern for Top of Watering Can.

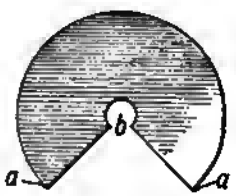


Fig. 135.—Rose Pattern.

divided by 3, gives 4 in. as the required diameter. The straight lines *a b* are at right angles to each other. Bend this to shape over a funnel stake, solder the seam, and mark out a disc of metal for the hollowed front, allowing working edges for hollowing and capping on. This disc is

hollowed, and, a creased edge having been set off, fitted to the rose.

Before soldering, a series of eireles are described from the eentre, inside the hollow, and these are perforated at intervals with a bradawl over a bard block of wood. Tbe sizes of tbe perforations are governed by the particular work for whieh the rose is intended. When required for small seedings and tender plants, the holes sbould be very fine. A good plan is to make several roses of different sizes. The stem and the hollow are then soldered to the body of the rose.

Fig. 136.—Pattern for Back Handle for Watering Can.

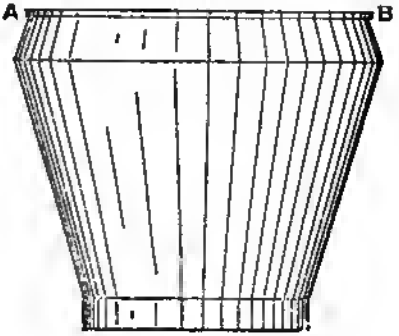


Fig. 137.—Horse's Nose Tin.

A stay *c* (Fig. 132) to support the spout is made by eutting a taper strip of metal equal in length to the space between the front of the can and the spout, and bending it to a half-round section, after whieh it is soldered in position.

Fig. 136 is a pattern for the back handle, wbieh is wired and bent to shape; a small boss is made and soldered underneath the upper portion, and the handle is held exactly opposite the spout and securely soldered; a thumb ring also being soldered at the top of the handle (see Fig. 132).

Three small hollowed studs of metal are soldered to the bottom to raise it from the ground. The tools for working these are illustrated by Figs. 30 and 31 (p. 12).

The can should now he cleaned with turps and whiting, and given two good coats of paint—red inside and green outside heing suitable colours.

Horse's Nose-tin.—The nose-tin illustrated hy Fig. 137 is of use in feeding a horse when it is inconvenient to take the horse out of the shafts for that purpose. It can be made of tinplate, and a pattern for the hody is shown in Fig. 138. Let A B represent the larger diameter and C D the smaller, F G heing the slant depth of the hody. Join A C and B D, and continue tbe lines until they

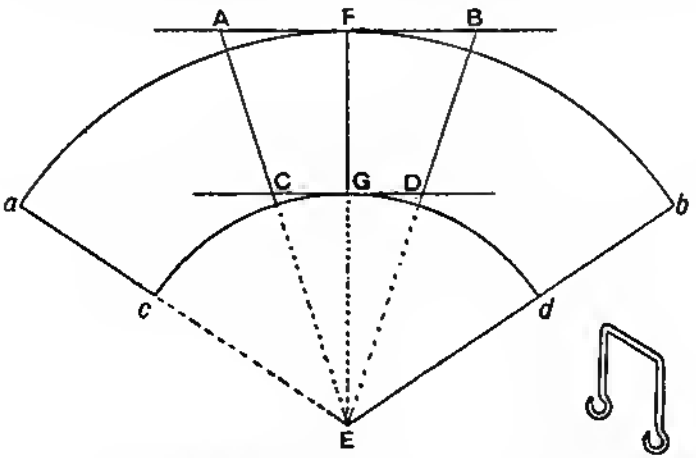


Fig. 138.—Setting out Body for Nose-tin.

Fig. 139.—Pattern of Loop for Strap.

meet at E. Then, witb E as centrc, and E F and E G as radii respectively, draw arcs of circles, and make *a* F and F *b* each equal to 3½ times A F. Join *a* E and *b* E with straight lines to give the required pattern *a* F *b c* G *d*. Working edges are additional, and should be allowed accordingly.

Now pass the metal through the rollers, set off the edges for grooved seams, turn to shape, and groove together. Set off the body thus formed, edges top and bottom in an outward direction, to receive the top rim and the hollowed bottom.

Some nose-tins are made with straight top rims, but it is much better to have them slightly taper. A pattern ean easily he ohtained hy the foregoing method.

Wire the top edge with not less than No. 8 B.W.G. tinned wire, bend to shape, seam together, and then set off a creased edge, so that the top of the body will fit tight in it, after which pane down and beat up in the usual way.

The soldering is all done from the inside, thus making a mucb stronger and neater job.

The hottom, whieh should be hollowed on a hollowing hloek, is now crease-edged and heaten up. It should he noted that the top rim is put on before the bottom.

A hoop is made of $1\frac{1}{4}$-in. tinned hoop iron, to fit well over tbe hottom, where it is fixed in position by soldering the top edge to the hody. It will he strengthened considerahly if a little solder is floated in two or three places underneath.

Two loops to receive the straps are made of $\frac{3}{16}$-in. round iron, a pattern for which is shown hy Fig. 139. Two holes are punched at A (Fig. 137) and two at B; the loops are threaded through, and closed ahove the rim.

After cleaning with turps and whiting, and polishing with dry whiting, the strap-loops and the bottom hoop are coated with hrunswiek blaek.

Funnels.—The funnels deseribed below can be made of tinplate or sheet copper. If copper he preferred on account of its durability, one side, afterwards to be the inside, should he tinned to prevent the action of eertain fluids on copper, this action resulting in the formation of deadly poisons. Hence all cooking utensils, etc., made of eopper should he tinned inside.

Fig. 140 represents a rim funnel, the form perhaps most commonly used. Thc pattern for the eone part is, generally, a semieirele.

Pass the pattern through the rollers several

times to " hreak " the metal thoroughly and take out the creases, and then bend it to shape over a funnel stake and solder the seam. A creased edge is set off the larger diameter, and in it the rim fits tightly.

For the rim, cut a strip of copper to the required width plus a wiring edge, and equal in

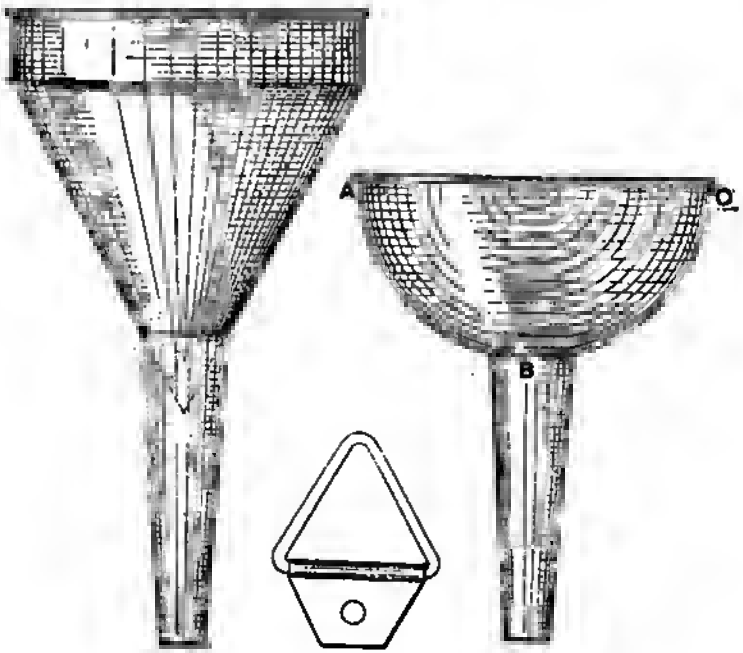


Fig. 140. Fig. 141. Fig. 142.

Fig. 140.—Rim Funnel. Fig. 141.—Hanging Loop for Funnel. Fig. 142.—Hollowed Funnel.

length to the circumference of the funnel plus lap for seam. Roll, edge, and wire it, and turn it to shape through rollers or over a round mandrel, solder it, and attach it to the rim.

So that the spout may he more secure, the small end of the funnel should he " burred " or edged, and this can hest he done by pushing and turning simultaneously the end of thc funnel up a bcak-iron or taper mandrel.

A pattern for the spout is set out as described for the body, Fig. 138, and allowance for the seam lap is, of course, additional. Bend the pattern to shape over a beak-iron, solder the seam, and attach the spout to the funnel as shown in Fig. 140.

If a grid or strainer be required, a disc of metal is finely perforated and soldered inside the funnel.

Fig. 141 shows a loop; this is a piece of wire bent to shape, plated with a strip of metal to form a hinge, and then soldered and riveted to the rim for the purpose of hanging the funnel.

Fig. 142 shows a hollowed funnel, which is made by cutting a disc of metal equal in diameter to the semicircular section A B C, plus an allowance for a wiring edge. This is then hollowed on a hollowing block with a hollowing hammer. Begin by delivering a series of blows concentrically round the edge, and alternate these occasionally with blows delivered radially and take out the puckers as they occur until the required shape is obtained; then smooth with a smoothing hammer. Success in producing a shape like this is mainly dependent on the skill of the operator. The chief point to be watched is to prevent buckling; should this occur after about a dozen blows, try to take it out as soon as possible by working a circle of blows inside all the others, and then working radially from this circle to the edge. When the shape is obtained, set off a wiring edge and wire the top. Now at the centre of the hollow mark a circle equal in diameter to that of the proposed spout, and cut it out. The spout can then be made as previously described, and an edge set off the larger end, when the spout is pushed through from the inside and soldered in position. A strainer and loop can be added if necessary. Fig. 143 shows a deep rim and hollowed bottom. The rim, after being cut the required length and

width, is made as in the case of Fig. 140. The bottom is cut from ½ in. to ¾ in. larger in diameter than that of the rim, according to the amount of hollow required. It is hollowed to shape, the hole for the spout is cut, and the piece is creased round the edge and soldered in position. The spout is fixed as in the case of Fig. 142.

Barrel-shaped Urn.—The urn shown by Fig. 144 can be made in tinplate or, preferably, copper.

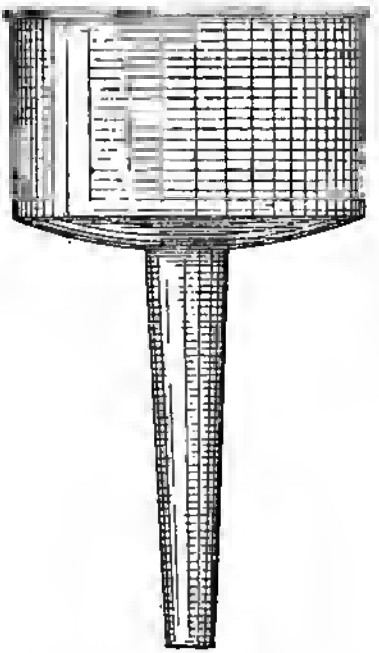


Fig. 143.—Cylindrical Funnel.

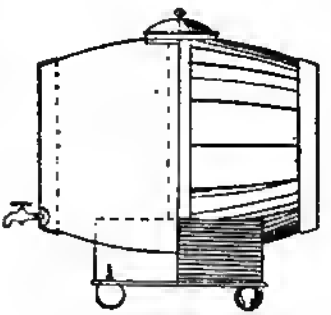


Fig. 144.—Barrel-shaped Tea-urn.

Assuming that the latter is used, and that the desired capacity is 1 gal., get 9 lb. of No. 23 B.W.G. cold rolled copper sheet, say 4 ft. by 2 ft. An urn to hold about a gallon will be 9 in. in length, 7 in. diameter in the centre, and 5¼ in. at the ends. The support is an oblong box-like structure, with the back and front cut out as shown in Fig. 145. It has a ¼-in. brass bead round the bottom, and four brass knobs under-

neath. Set out a full-size drawing of the article complete, and proceed to get the patterns. Those for ths hody will consist of two truncated cones. Dsvelop the pattern as shown in Fig. 146. These

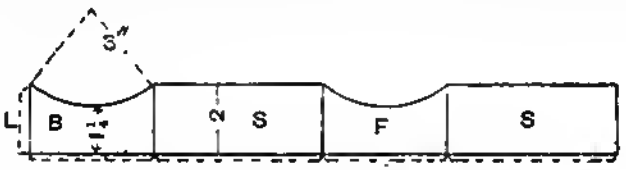


Fig. 145.—Support for Tea-urn.

pieces will have to he hollowed, and therefore ths edge for the seams will have to he curved ahout as much as the curve of the harrel. In fact, one of ths pieces, cut off the end of the pattern, will serve as a template for hollowing the hody pieces. Allow a ¼-in. edge on the largest circumference of one of the pieces. Mark the staves, as in Fig. 146, with a scriher.

The hoops for the ends will he drawn in the same manner as the hody patterns. The centre

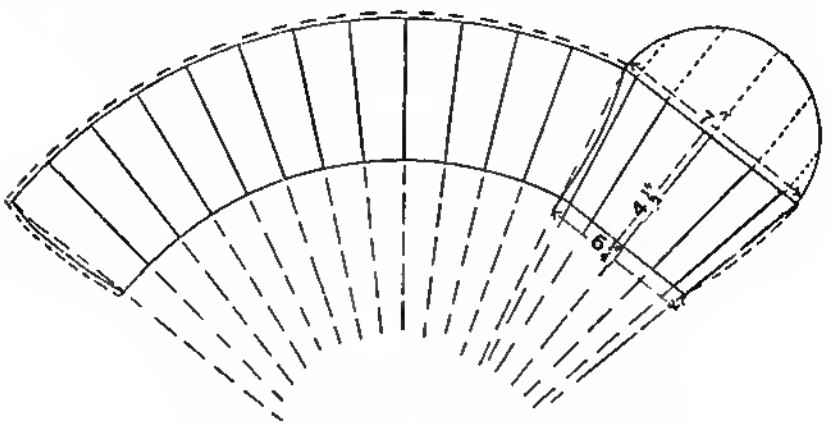


Fig. 146.—Pattern for Tea-urn.

hoop—or, mors correctly, the two pieces in the centre—may hs cut straight and hollowed to fit. Of course, they only extend from the lid to the support. Make the hoops of hrass, ths end ones

about $\frac{3}{4}$ in. wide, and centre one 1 in. wide. Fig. 145 shows the method of drawing the pattern for the support. Fig. 147 is a section, and shows how the hottom, head, and knohs are fastened on. Solder hoth head and knohs.

The lid (Fig. 148) should have a slightly tapering rim and a hollowed top. The rim should he tinned all over, and the top and hody pieces inside should also be tinned.

A hammer with a convex face, and a bardwood hlock with a slight hollow in it, will he needed. Place the hody pieces, tinned side up, over the hollow, and go evenly all over them. To facilitate "hlocking," use the template mentioned ahove.

Fig. 147.—Section of Tea-urn Support.

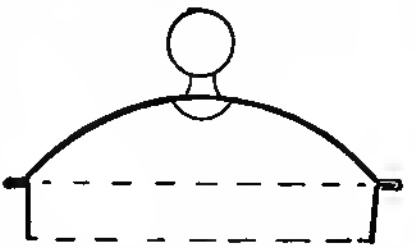


Fig. 148.—Lid for Tea-urn.

To ascertain if the pieces are sufficiently blocked, turn them roughly till the seams meet, and try the template on. Then, to leave the surface smooth, hammer on a smooth, flat portion of the hlock. The lid is hlocked in the same way.

Now turn the hody pieces, and solder the seams inside. Mark the pieces out for the ends (they should come ahout $\frac{5}{16}$ in. from the end), punching a suitahle hole in one of them for the tap. Tin the insides, solder the tap in, and solder all in position from the inside. Solder a perforated cover on the inside to prevent the tea-leaves passing. Put the two pieces for the body togetber temporarily hy fastening them lightly here and there; keep tbe seams at the bottom, and mark tbe hole out for the lid.

Cut a strip of copper about 1 in. wide and $10\frac{1}{2}$ in. in length, and wire it with No. 12 B.W.G. To do this a $\frac{1}{4}$-in. edge must be thrown off: cut a piece of wire the same length as strip, and fold the edge over it. Leave about a quarter of an inch out at one end, so that when it is turned the projecting piece will cross the seam and fit in the other end. This is for the body rim. Give it the same lap as the rest, and solder it inside, taking

Fig. 149.—Template for Hollowing Tea-urn Body-pieces.

care to leave it smooth, so as not to prevent the lid fitting properly. When it is rounded up, put it on the top of the urn and mark the hole off for it. Loose the fastenings, and cut the hole out. Put the pieces together again, and solder them firmly all round. Now solder the rim on the top. Put the support together and fix that on, soldering it neatly all round. Then make the hoops and put them on, and there only remains the lid. Fig. 148 makes this quite clear. Take care to clean off all solder on the outside.

CHAPTER V.

SAUCEPAN MAKING.

THE following detailed explanation of the processes adopted in the making of a simple tinplate saucepan (Fig. 151) is taken from "Practical Metal Plate Work," a volume in Cassell's Technical Instruction series, produced under the direction of the Editor of this handbook.

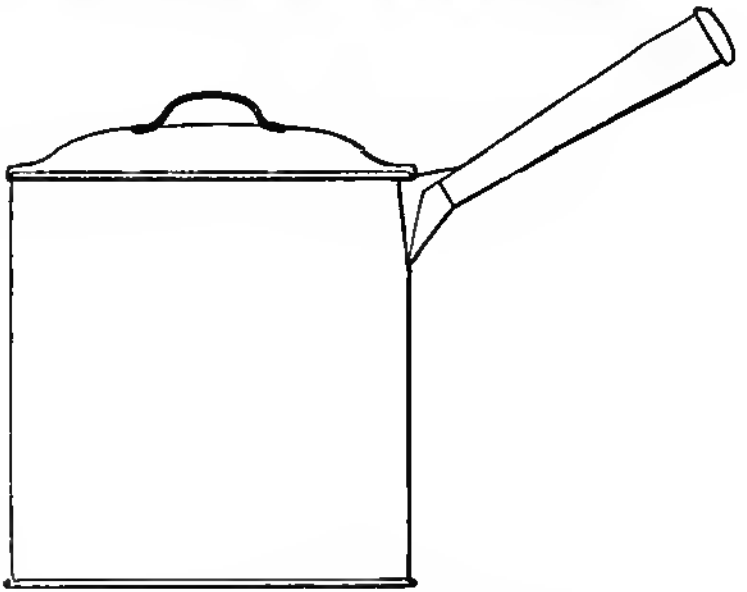


Fig. 150.—Saucepan.

A 2-qt. saucepan (Fig. 150) is about 6 in. in diameter and the same in depth. Its patterns in sheet metal are shown by Figs. 151 to 156. They consist of saucepan body (Fig. 151), handle (Fig. 152), boss (Fig. 153), apron (Fig. 154), notch pattern (Fig. 155), and cover handle (Fig. 156). The bottom and cover are struck out with the com-

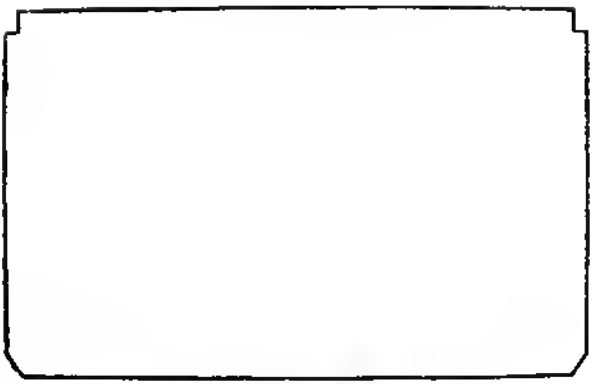


Fig. 151.—Pattern of Saucepan Body.

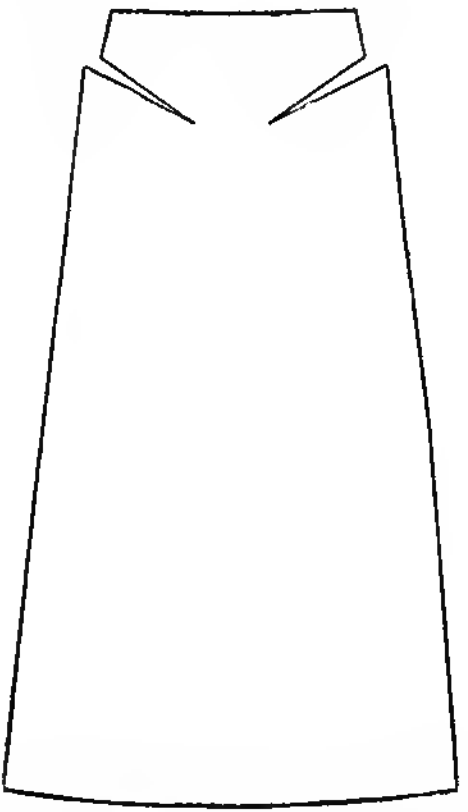


Fig. 152.—Pattern of Saucepan Handle.

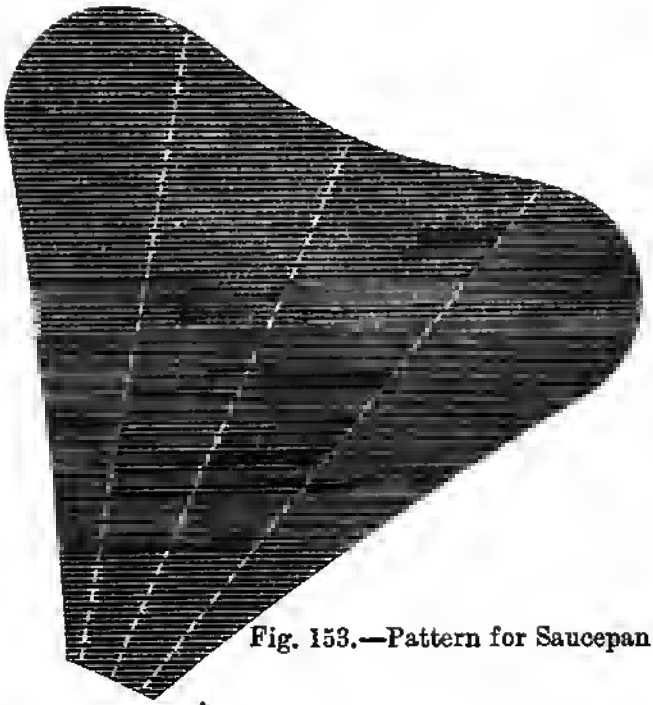


Fig. 153.—Pattern for Saucepan Boss.

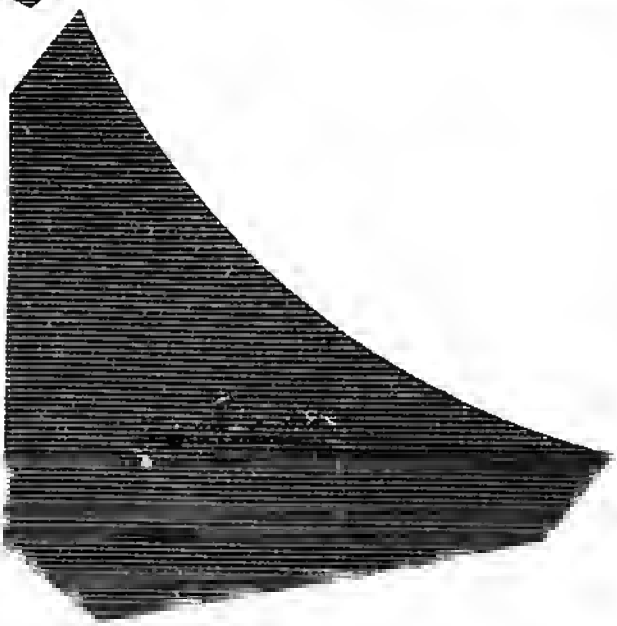


Fig. 154.—Pattern for Saucepan Apron.

passes, as they do not require patterns; and the rim of the cover is marked out by means of a flue rim, made as illustrated by Fig. 176 and described on p. 75.

Referring to the body pattern (Fig. 151), it will be noticed that each corner is notched. The

Fig. 155.—Notch Pattern.

notches at the top are for the seam and wire, and they are cut longer one way than the other, as the wire fold requires more metal than the seam fold. The notches are cut at the bottom so that after the seams are put together there shall not be four thicknesses of metal plate.

The body will be in two pieces if cut out of single plates, and in one piece if cut out of 20-in. plates. To afford an example of grooving two pieces together, it is supposed that two plates are to be used. The pattern laid on the tinplate will show that two pieces can be got out of each sheet, leaving a narrow piece, which will do for the rim—thus one plate will cut the body and rim. The cover, bottom, and small work will be

Fig. 156.—Pattern for Cover Handle.

marked out when required. When many saucepans are made at a time, it is best to use the stock shears for cutting out, as two or three tin sheets can be cut at one time, and then only the top one of each lot need be marked. To keep the tin

plates from shifting, they are cut in convenient places and twisted over and hammered down to form "ties." An example of this is shown by Fig. 157. Commence to cut the circle at A, in the direction shown, and the ties then hold the plates together till the cut has been made right round to B; if the cut commenced as shown at B, the ties would be cut off before the circle was completed. Great care must be taken to get all edges of the bodies quite straight, or trouble will occur when they are being folded in the machine.

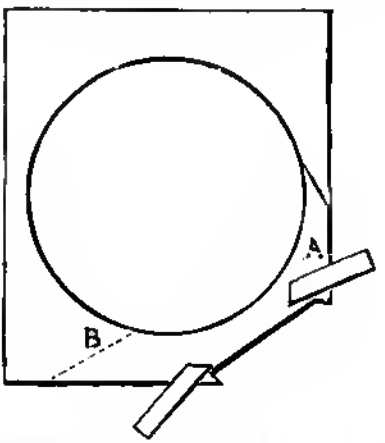


Fig. 157.—Method of "Tying" when Cutting several Thicknesses.

Having cut out the body parts, pass them through the rollers to break the "grain" of the metal. Set the front roller so as not to pinch the plates; pass them through six pieces at a time, setting the back roller down till the pieces roll out in a semicircle; turn them over, replace in the rollers, bend down so as to allow the plates to catch under, and pass them through once more; again turn over and place between the front rollers, raise the back roller two or three turns and pass through, and the plates will then come out straight. By this means the plates, when

wired and turned round, do not present a ribbed appearance, which looks very bad: where rollers are not available the grain may be taken out across the knee; although by the latter plan the "burr" of the metal is apt to cut the apron or trousers.

The bodies are next folded for seaming and wiring. Place the body pieces on the left of the folding machine with the top notches from the workman; this is especially important when the articles are to be lap-wired, which is the most workmanlike method. Set the machine to fold a trifle over $\frac{1}{8}$ in.; a large fold makes an ugly seam. Raise the front roller of the machine to give a close, flat fold; put in body piece, press it close to the guide-plate, raise the handle of the machine, keep the plate in place with the left hand, let it come up as far as it will, and then lower it on to the bench, when the folded piece will slip out easily. The other end of this piece must be folded on the opposite side (Fig. 158), or the two pieces will not be in right positions for seaming together. When both pieces are done, they must be folded for wiring with No. 10 or 11 gauge wire. Set the compasses to twice the diameter of the wire, and at that distance from the edge mark a line on the tin, and set the machine till it just allows the line to disappear, and this time lower the front roller to give a rounding fold. Raise the handle only half the distance, as for wiring the fold does not require to be brought over so far. Should any piece slip out of the machine, either when folding the seams or the wiring, it must be finished on the hatchet stake; should a folding machine not be available, the whole of the folding must be done on the stake; when folding the seams in this way, the notches must be kept towards the workman.

Grooving together of the body pieces, which is the next operation, is best done on a bench plate.

This is a piece of cast iron, planed smooth, about ½ in. or ⅝ in. thick and from 12 in. to 15 in. square. With the wire fold towards the worker, slip one fold over the other, and with a groover (Fig. 39, p. 12) of suitable size placed on the seam, form the groove by striking it with a mallet, moving it up and down the seam and increasing the weight of the blows until properly formed, as shown by the section of the seam, Fig. 159. It may then be closed with light blows of the square-faced hammer.

Wiring the bodies is the next operation; this can be done on the bench plate or on the crease iron. With a roll of wire begin at the right-hand end of the body, ½ in. to ¾ in. from the end of the fold; hold the wire in position with the thumb while knocking down the fold to fix the wire, then

Fig. 158.—Section of Folded Body.

Fig. 159.—Section of Grooved Seam.

proceed along the body. The curved shape of the wire assists in keeping it close to the tin, and as the wiring proceeds the body piece may curve to the shape of the wire; but this will not matter, as it has to be rolled. After wiring all along, cut off the wire, leaving at the left-hand end as much extra wire as was left out on the right-hand end. Pass all the bodies through the jenny to smooth down the wiring, which up to this has a puckered appearance. Begin at the end nearest to the worker; turn the handle and slightly raise the body; the wheels should have grip enough to draw it through; if not, tighten both screws half a turn. The wire will then be neatly tucked in and smoothed.

Rolling comes next. Set the top front roller

so as to allow the seam to go between it and the hottom one without heing flattened; lower ths hack roller to give sufficient curve to make the hody circular. Place a hody piecc hetween thc rollers, with the wire in one of the grooves in the top roller; if the circle is too large, depress the hack roller, and if too small raise it. The body will require pulling to tbe right as it goes through, as there is always a tendency to draw to ths left.

Shaping and seaming will he the next process, and in practics a certain amount of shaping has to he dons always. Pcrhaps, owing to one-half of the hody heing a little thinner than the other half, it has hent more, or other causes may necessitate shaping, which is done partly hefors grooving the second seam and partly afterwards. Usc the side stake to groove the two edges together. Open the wire fold wbere there is no wire in it and where it has heen pressed down by the roller, lay in the piece of wirc that projects from ths other side and tuck it in smoothly, place it on the tool with the wire part towards the worker, and groove the seam in the way described for the first one.

Edging the hodies may he done with the stock shears or the jenny, or the hatchet may he used when there is no other tool. Edging with ths jenny is an easy and quick method. The hottom of the body must he trimmed quite true at thc scams, or the edgs will he unequal. The guidc of tho jenny is screwed hack to leave ahout $\frac{1}{8}$ in. or less of the hack part of ths hottom whecl, the saucepan hody is inserted, and thc top screw tightened down enough to prevent its slipping out as it turns round. The hody is held lightly hy ths wire and pressed from the worker and in towards ths guide, hut not too hard, or ths size of the edge will increase. An edgc $\frac{1}{8}$ in. wide is sufficient for this size articls; more would necsssi-

tate a larger hottom and make a clumsy-looking turn up.

The hottoms are next marked out to allow as much turn up as there is edge. The size of the hottom, when found and proved correct, should he marked with the compass on the hody pattern; these marks are not shown in Fig. 151.

Attention can he given now to the small work, heginning with the handle, Fig. 152. After cutting out the pieces to shape, turn them on the heak iron. Some workmen work with the point of the heak iron pointing away, hut others use it with the point towards them. With the mallet hend one edge slightly on the tool, then, grasping the handle and tool together with the right hand, hend the handles round the tool ahout two-thirds the required distance; then hend the other edge with the mallet as hefore, and finish hending them round, making the lap ahout ¼ in. The flap must he left flat; after the handle is turned it is hent hack, and with a small hammer tapped close to the handle. Next, with a hollow punch of suitahle size, punch out some studs and hollow them with the stud hoss and punch, or with a stud hammer on the lead piece; these studs must he edged on a small stool, slipped on the handles and soldered. The flaps of the handles can then he knocked hack and fitted to shape.

The hoss, Fig. 153, is held on the hatchet stake at the outer dotted lines, and is struck a hlow or two. The flaps are then hent down, next turned over, placed on the tool in the centre of the hoss, and pressed down each side; this roughly shapes them. They are finished on the extinguisher stake with the mallet, and the outside edges are very slightly hevelled. Fig. 160 shows the hoss as it comes from the hatchet; Fig. 161 shows it when finished. The apron and cover handle are folded with a small fold, and then the apron is false wired hy heing held on the hatchet

with thumb and finger, and tapped lightly all along with a mallet, the folded part being allowed to just lap over the edge of the tool; on turning it over it will have the appearance of being wired. Cover handles are frequently treated in the same way. It does very well for common goods, but good work ought to be wired with 15 or 16 gauge wire. The tip of the apron should be bent back slightly with the mallet, and the hollowed-out part slightly bevelled on the hatchet with the round end of the mallet.

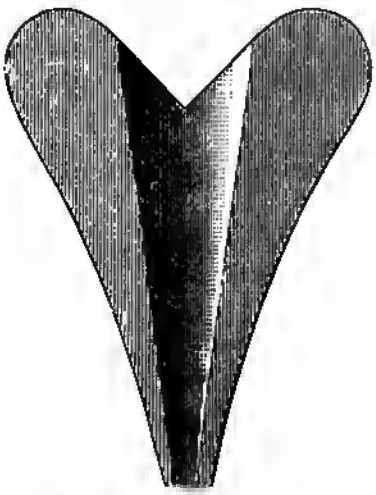


Fig. 160.—Rough Boss of Saucepan.

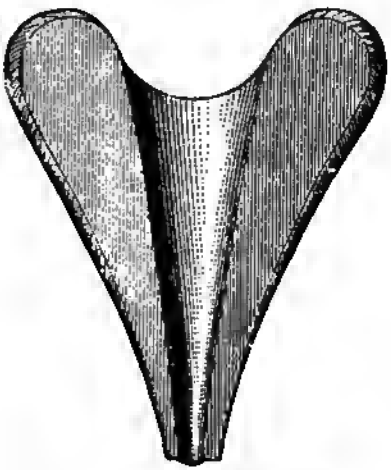


Fig. 161.—Finished Boss of Saucepan.

The small work is now ready to be fixed to the saucepan. The handle is first tacked to the body by a drop of solder placed so as to fix the points of the handle and the flap to the body at the seam that was last grooved; next place the boss in its place behind the handle and tack that also top and bottom. Next solder on the apron; place it so that the point is in the centre of the handle and the wide part just below the level of the top of the saucepan, and fasten it with a drop of solder on the point, then solder along the flap. Next rivet the two ears of the boss, and the

flap of the handle which is beneath them; rather small rivets, about 14 oz., will do very well. Place a rivet on the tool, and on it the saucepan; tap with the hammer, and the position of the rivet will be shown by a mark. Place the rivet set, Fig. 36, p. 12, with its hole over the mark, and draw the rivet through by hammering the set; hammer the rivet to a head, and finish with the button or countersunk side of the rivet set. Follies may be used for punching such rivet holes, and where much riveting has to be done they are very useful. After riveting, the boss has to be soldered round. Commence at the left-hand side with plenty of solder, well run in at the joint of the handle with the saucepan, and lead the solder down one side of the boss and up the other, well soaking the sides, and then over the bridge of the boss.

Of the cover, the rim is the first part to be made; the pieces for it come off the body. The rim is marked out by means of a home-made tool called a flue-rim. The object of cutting the rims slightly tapering instead of straight is that a better fit may be made, and they are easier to put on and take off.

To make the flue-rim, take a pair of long-legged compasses, set them to a radius of 5 ft. or 5 ft. 6 in., and on a strip of tin 2 in. wide and 20 in. long draw an arc. If, instead of the compasses, string or wire is used, make a loop in one end and place it over a bradawl stuck in the floor, and with another awl at the other end describe the arc; cut the tinplate along the line very carefully, fold over the straightedge, and knock down with the mallet; this gives a short straightedge and flue-rim combined, and a rule also; set out and stamp the figures on it. This flue-rim pattern will do for straight-sided round articles, and for those larger at the bottom than at the top, but for those that taper smaller at

bottom, such as slop-pails, a pattern with a emaller radius must he used, or the rim binds against the sides of the article beforc it is fully down to the wire.

To mark out the rime, placc the flue-rim on the piece of plate to he ueed ae near the top as possible and seribe a line; with the compasses at the ends mark off the width required for the rim and ecribe lines through these marks with the flue-rim as a guide. The procedure in making a dozen rims from a sheet of tin is the same. When all the rim pieecs are cut out, point one end as shown in Fig. 162. Two pieces can next he eoldered together, and for this a fairly flat and smooth hoard will he wanted. Take the flue-rim and with an awl seribe a line aeross it, placc one

Fig. 162.—Part of Saucepan Cover Rim.

of the rim pieces with its pointed end over the hlunt cnd of thc other and solder together, holding them down with an awl or piece of wood till cool.

The rims must he folded on the hatchet stake, as owing to their curvature it eannot be done in a machine. It is usual to do two at a time, but heginncrs should try one firet. Rims are folded on the inner eurvc; a full $\frac{1}{8}$ in. will bc ahout right for this size, hut for larger rims make larger folds; let them pass under the left arm; eommenee at the blunt end, so that when folded the solder is outside. Go over it twice, then hammer flat on the crease iron and hend round two at a time in the rollers. The ende of them will require rounding up before taeking to the size of the saucepan. To do this, placc a rim in a saucepan, make it a

comfortable fit, and draw it out carefully and tack the outside; replace it to see that it has not shifted, and then tack inside; some cut off all superfluous lengths, but some think it better to leave them, as they strengthen the rim.

The next process is to edge the rims, which will be done in the jenny, the same as the bodies were. The covers must then be marked and cut out, allowing more margin than for the bottoms because of the doming or hollowing; about ¼ in.

Fig. 163.—Section of Hollowed Saucepan Cover.

Fig. 164.—Section of Hollowed Kettle Cover.

all round larger than the outside of the rim is sufficient, and after the covers have been hollowed and found to be correct in size, mark this on the body pattern in the same way as mentioned for the bottom.

The hollowing or blocking of the covers, the next operation, is one which requires much skill and practice to perform successfully. The block should be of a tough and close-grained wood, such as beech, walnut, or apple, and not less than 15 in. in diameter at the bottom. The top must be

sawn off smooth and level, but need not be planed. It should be about the height of the bench. If intended to work at it standing, as many do, it may be a couple of inches higher, and if sitting down to it a little lower. To get it ready for use, take a good-sized hollowing hammer, and about 3 in. from the edge hammer a depression; this latter must be deepest on the edge where it is about $\frac{3}{8}$ in. deep, the heel of the hammer doing most of the work; the hole is shallow towards the centre of the block, but it will get deeper by frequent use. Another hollow may be made, a little shallower than the first. Covers for new work are hollowed up four or six at a time, according to the thickness of the plate. Covers of 1 C and 1 × may be hollowed in lots of six; when of 1 × × or 1 × × × tinplate, four at a time will be enough. Before beginning to block up, describe a circle a little less than one-third of the diameter. It is a guide to the limit of the hollowing, as saucepan covers are not hollowed right to the centre, though a tea-kettle cover would be; see Figs. 163 and 164, which give a section through the centre, showing the difference between the hollowing of a saucepan and a tea-kettle cover. Begin by grasping the lot of covers at A, Fig. 165, thumb inside, and hold them over the shallower hole, so that the part marked 1 in the circle comes just over the middle of it; then give firm blows of the hammer as shown, 1, 2, 3, 1, 2, 3, 1, 2, 3, working in the direction shown by the arrow, and proceeding all round. The covers will have hollowed considerably, but may present a very puckered appearance, which may cause the beginner some misgivings as to his ever being able to get them smooth; but patience and perseverance will accomplish this.

To finish the hollowing, hammer round in circles as shown by the dotted rings in the order marked, 1, 2, 3; finally transfer the covers to the

deeper hole. Having bollowed thc lids, next smooth them off; this is done with a hammer having a slightly flatter face, especially for the centre part of the cover. Most workmen, bcfore beginning to smooth, shake the covers apart and turn cach round a little way so that the puckers arc not opposite one another. Begin working from the inner cirele outwards on a flat placc on thc block, and finish at the edges with the hollowing bammer.

The flange is now tbrown back in tbe jenny; for the covers under consideration thc width will

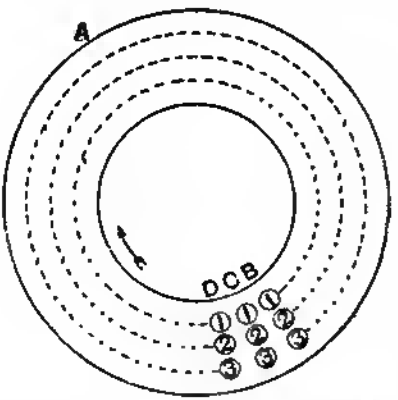
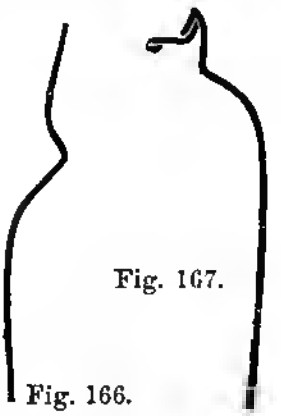


Fig. 165.—Diagram of Blocked Saucepan Cover.



Figs. 166 and 167.—Sections of Turn-ups.

be about $\frac{3}{8}$ in. Place tbe cover between the wbeels and screw down, not tightly, and holding the cover the same as for jennying up a bottom, work round earefully once; run it round scveral timcs, gradually raising the flange till it assumes the shape shown by the seetion line, Fig. 166. Do the inner eover—the one nearest the hammer; first offer the rim to it, and when it is the right size and shows suffieient to allow for the turn up, the other eovers ean be jennied. The outer one may want a little trimming, becausc each one nearer tbe outside is slightly larger; but therc

is generally a little variation in the rims which makee up for this.

To turn over the second edge which covere the flange on the rim (see section, Fig. 167), proceed as in turning up a hottom. If a rim is too large to get in, the turned-up edge of the cover may be rapped back slightly; and, if necessary, the rims pared a little. After pening down on the flat part of the heak iron, get ready the handle.

The cover handle (Fig. 156, p. 68) is folded and a emall wire put in, or it may he falsc wired

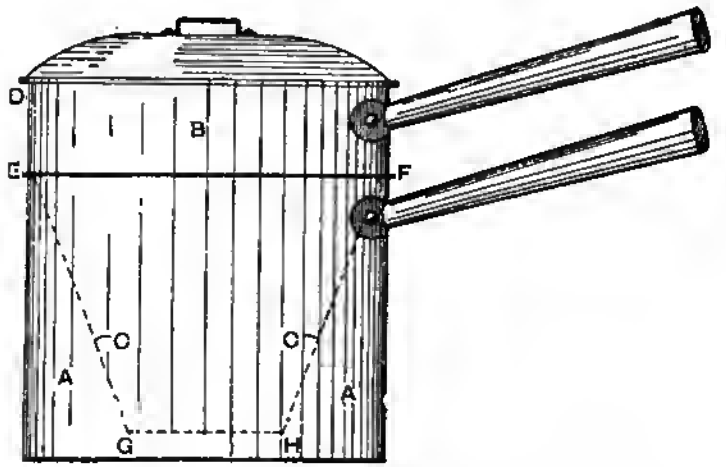


Fig. 168.—Porringer or Milk Saucepan.

as described for the apron. The correct position for the handle is found hy describing a circle in the centre of the cover, of a diameter equal to the width of the handle outside the flaps. It is hent into semicircular form, the flaps straightened on each side and soldered to the cover hy tacking each under the handle. Put a small rivet through each flap, ueing one of the round heads or a hlock hammer fixed in the vice as a support, and the eaucepan is then complete.

Porringer or Milk Saucepan.—A porringer or milk saucepan (Fig. 168) in which milk, porridge,

etc., may he cooked without fear of burning, consists of an outer and an inner saucepan, the outer saucepan containing water, which, when hoiling, cooks the food in the inner saucepan. It can he made of tinplate, and the pattern for the outer saucepan A is a rectangular-shaped piece of metal, with a length equal to its circumference, the width heing equal to the proposed depth, plus working edges. This is edged for a grooved seam, wired, turned to shape, and grooved, and the hottom is

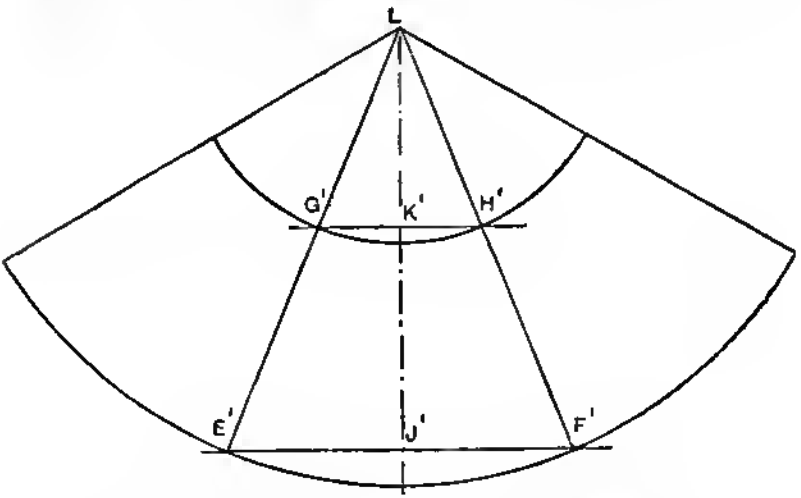


Fig. 169.—Bottom Part of Inner Saucepan.

heaten up and a handle is riveted on as illustrated.

The hody of the inner saucepan is made of two pieces, the top B and hottom part C (shown dotted). The part B has also a rectangular-shaped pattern, having a length equal to that of the outer saucepan, hut with a width equal to D E, plus the working edges. This is made without a hottom, hut it has a creased edge set off the hottom edge to take the top of C, the other portion of the hody. The method of setting out a pattern for C is shown in Fig. 169, where E^1 F^1 is equal to E F (Fig. 168), whilst G^1 H^1 (Fig. 169) and J^1 K^1 are

respectively equal to G H (Fig. 168) and E G. Lines are now drawn from E^1 (Fig. 169) to G^1 and from F^1 to H^1 and produced until they meet at L. With L as centre and radii respectively equal to L E^1 and L G^1 (Fig. 169), draw arcs of circles. The larger arc is made equal to $3\frac{1}{7}$ times E F (Fig. 168), and then joined to the centre L with straight lines, thus giving the pattern required. Working edges are additional, and must he allowed. This pattern, after heing edged for a grooved seam, is hent to shape and grooved together. An edge is set off the wider end so as to fit tight in the creased edge on B (Fig. 168), after which it is pened together, and a hottom heaten on the

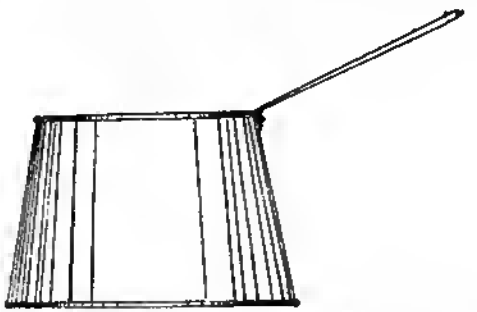


Fig. 170.—Saucepan with Tapering Sides.

smaller end of C. The handle is riveted in position as hefore, and the soldering is now done on the inside, resin heing the flux. A lid is now required, and the rim is made to fit each saucepan separately, so that for convenience one lid answers for either saucepan. A hollowed disc is next creased and paned on the rim, after which a small handle is riveted in the centre, as shown in Fig. 168.

Saucepan with Tapering Sides.—A pint copper saucepan (Fig. 170) with tapering sides can he made of tinplate, hut usually and preferahly is made of copper. The size will he $3\frac{1}{2}$ in. at the top, $4\frac{1}{2}$ in. at the hottom, and 3 in. deep. Use

9-lh. copper, wbich is ahout 23 gauge. Allow for edges $\frac{1}{4}$ in. at the top for 12 gauge wire, about $\frac{1}{8}$ in. at the hottom for knocking up, and $\frac{5}{16}$ in. at each end for the grooved seam. The edges for

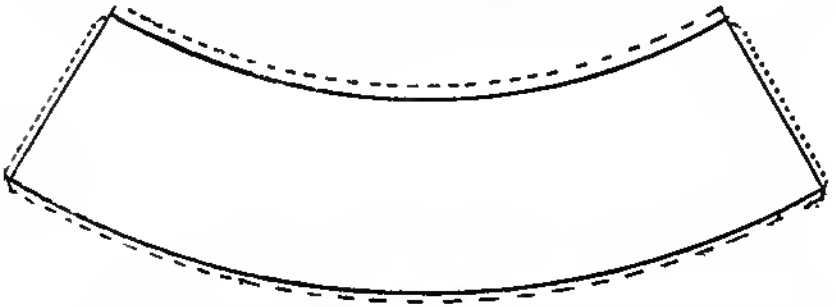


Fig. 171.—Pattern for Saucepan with Tapering Sides.

tbe seam, however, must only be $\frac{1}{8}$ in., as a third is taken up in grooving. Suppose it is a $\frac{1}{4}$-in. groove, allow $\frac{3}{8}$ in. at each end. Clean hoth sides of the copper thoroughly, and tin one side. This may be done easily as follows: Cover the surface to he tinned with killed spirit, and with a soldering-iron melt some solder on it, and work it with the soldering-iron all over the surface. Hold it with a pair of pliers over a gas jet, tinned side up, and, when the solder is all melted, wipe off all superfluous metal with a piece of tow quickly

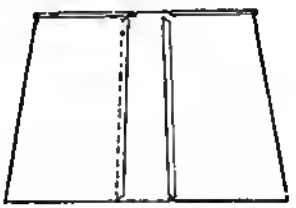


Fig. 172.—Joint in Saucepan Body.

Fig. 173.—Section of Saucepan showing Pened-on Bottom.

and smoothly; then cool it in water. Notch the corners as shown in Fig. 171. Now edge each end, taking care not to quite flatten the edges;

do this by inserting something slightly thicker than the copper between the body and the edge.

The edges have to fit into each other when the body is rounded, so it is obvious that one has to be edged up and the other down—see Fig. 172.

For the wire at the top, throw off a ¼-in. edge outwards, and put the wire in, taking care that

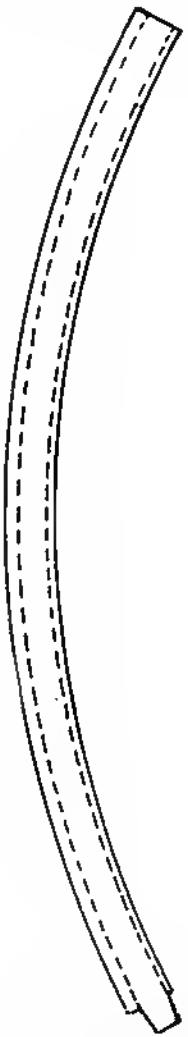


Fig. 176.—Rim Pattern for Saucepan Cover.

Fig. 174.—Saucepan Cover.

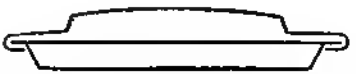


Fig. 175.—Another Shape of Saucepan Cover.

Fig. 177.—Handle Pattern.

Fig. 178.—Finished Handle.

the edge folds well over it. Leave about ¼ in. of the wire through at one end, and as much short at the other, so that when the body is rounded up and the seam in its place, the projecting piece fits into the vacant place. Lay or groove the seam, and solder it inside.

Edge the bottom—⅛-in. edge—and fit it in its

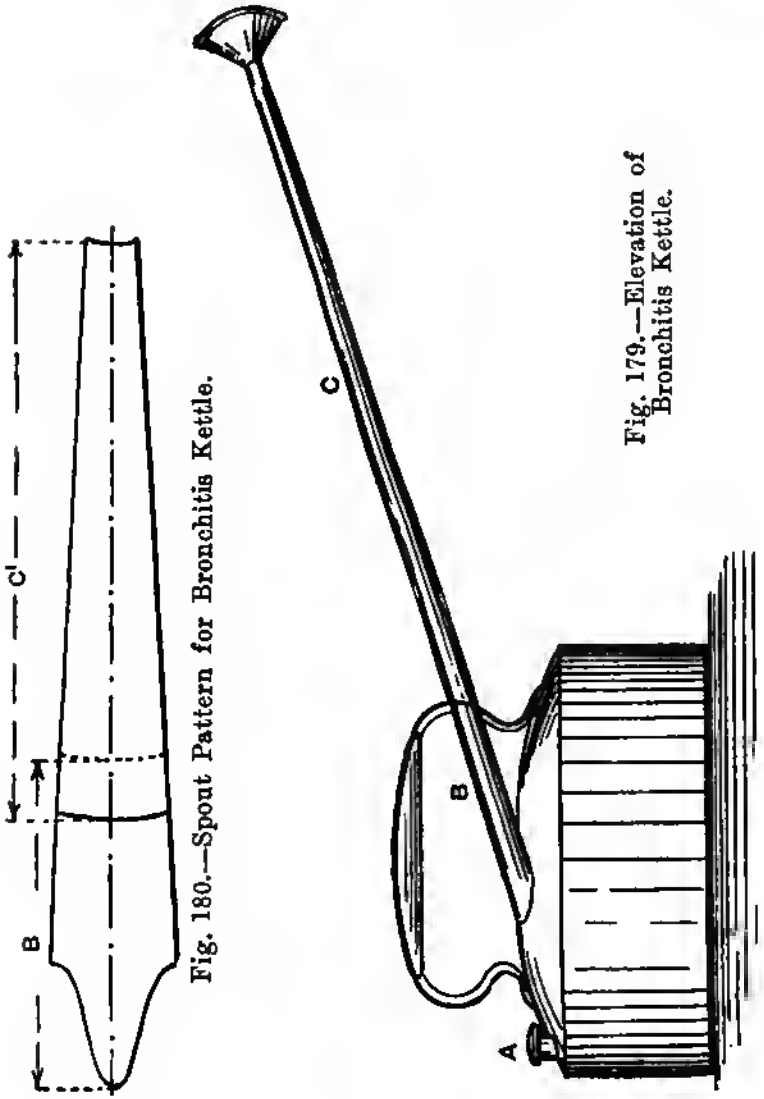


Fig. 179.—Elevation of Bronchitis Kettle.

Fig. 180.—Spout Pattern for Bronchitis Kettle.

place. Tin it on one side, and pane it over the edge on the hody, finally knocking it up on a stake. Fig. 173 will prohahly make this clear.

As regards the handle, one might he forged to suit the joh in hand. To tin it, file it clean all over, and tin it as described ahove.

Saucepan Covers.—The hollowing of saucepan covers has already been fully described. These covers are made in two shapes, as shown hy Figs. 174 and 175. The rim pattern is illustrated hy Fig. 176, the handle pattern hy Fig. 177, and the finished handle hy Fig. 178.

Bronchitis Kettle.—A hronchitis kettle is a

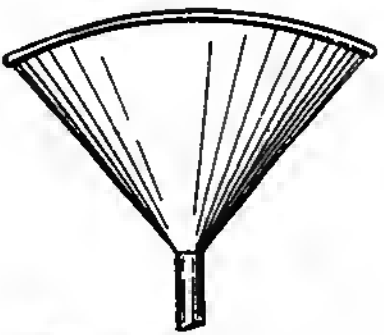


Fig. 181.—Steam Spreader for Bronchitis Kettle.

type of kettle used to increase the humidity of the atmosphere in a room occupied hy a person suffering from hronchitis. As shown in the elevation, Fig. 179, the top is fitted with a feeder screw A, and soldered to it is a spout in two pieces B and C, the latter heing detachahle, and having on the end a rose or spreader. This kettle may he made of tinplate or tinned sheet copper.

For the hody, cut a strip equal in length to the circumference, and in width equal to the depth of the kettle; edge for a grooved seam, turn to shape, and groove the edges together. The hody is then edged top and hottom, and the seam soldered inside. The hottom is now cut, and edged

to fit the body; it ie paned and heat up in the usual way, after which it is soldered round ineide.

The top is next cut out, and ehould be at least two edges larger in diameter than the bottom. It is hollowed on a wooden hollowing block, and crease-edged to fit the body tight; hut hefore fixing it to the body, the handle, feeder screw, and spout should be attached. The handle ie a strip cut $1\frac{3}{4}$ in. wide, wired with No. 12 B.W.G. wire, this being hent to the required shape. A boss is fitted and eoldered underneath, and a hole cut to allow the epout to pass through, after which the handle is riveted and soldered in poeition. A hole is also cut in the top, at the hack, to take a

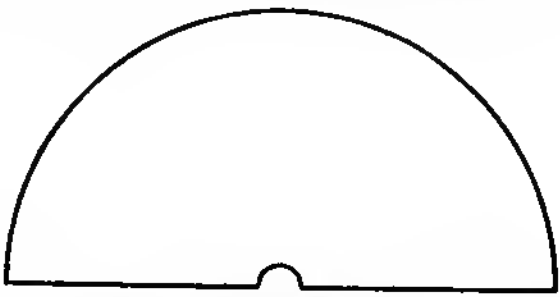


Fig. 182.—Pattern for Steam Spreader for Bronchitis Kettle.

$\frac{3}{4}$-in. feeder screw, which is soldered in position as shown.

Two patterne are required for the spout, as shown at B^1 and C^1 (Fig. 180). These are turned to ehape and fitted to each other eo that the tube C (Fig. 179) will slide over the tube B ahout 1 in., after which the seams should he soldered. The tuhe B should now he fitted to the top, the epout being passed through a hole in the handle cut to receive it; it is eoldered in position to the top of the kettle and to the handle as well. Fig. 181 is an enlarged view of the rose or epreader, a pattern for which is given at Fig. 182. This is first rounded over a funnel stake, and

then, after the seam has been soldered, flattened as shown in Fig. 181. It is soldered to the smaller end of the spout.

The top of the kettle may now be fixed to the body, being first pened down and then soldered round. Clean with turps and whiting, and polish with dry whiting.

To prepare the kettle for use, unscrew the feeder screw, nearly fill the kettle with water, replace the feeder screw, and set the kettle on the fire to boil, placing it in such a position that the ross projects well into the room.

Fish Kettle.—A fish-kettle (Fig. 183) is actually a type of saucepan. It is usually made of tinplate. Two pieces are required for the body,

Fig. 183.—Fish Kettle.

each cut to 1 ft. 5 in. by $6\frac{1}{4}$ in. or 1 ft. 8 in. by 7 in., and these are notched, edged, and grooved together. Edge and wire one edge with $\frac{3}{16}$-in. iron rod; then bend to shape and seam together by gradual hammering on the block with a hollowing hammer and alternate bending over a mandrel. When a satisfactory shape has been obtained, an edge is set off the bottom, and the seams are soldered inside. Now lay the body on a sheet of metal, mark round, allowing a working edge, and cut it out. This bottom is edged and fitted to the body, after which it is pared on, beaten up, and soldered from the inside. A pair of handles are riveted in position, the heads of the rivets being also soldered over.

Fig. 184 is a pattern for the strainer; the four studs or feet A are for the purpose of raising the strainer off the hottom of the kettle. To ohtain the pattern, place the kettle on a sheet of metal, mark round, and cut out; and when a wiring edge is set off this, it will he found a nice easy fit. Before wiring it, set out any suitahle design, such as a diamond, and perforate it, as shown in Fig. 184. Flatten the hurrs on a hright hench anvil, and take out the huckles with a planishing hammer. These huckles are unavoidahle, hut are readily taken out. When only the centre of a sheet of metal is perforated and flattened, this operation causes the metal to stretch, gaining length and hreadth at the expense of thickness; consequently it huckles in the region of

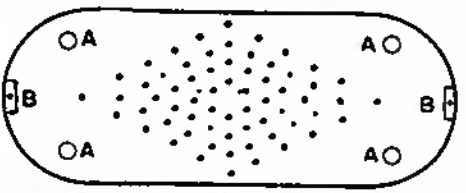


Fig. 184.—Strainer for Fish Kettle.

the perforations. To remedy this, the outer edge must he proportionately stretched, so as to allow that part which has heen perforated to occupy its normal position. This is accomplished by planishing. Work from the centre to the outer edge radially, tapping lightly in the centre, and increasing the weight and numher of hlows as the outer edge is reached. When this has been done, wire the edge with No. 10 B.W.G. tinned wire, and solder the four feet in position. Two handles are required for lifting out the strainer, a pattern for these heing shown hy Fig. 185. Having cut two to this pattern, wire the edges, and hend to the shape of Fig. 186, letting the narrow part of the pattern form the ring; then rivet and solder them to the strainer as shown at B (Fig. 184).

Ths lid (Fig. 187) may now hs taken in band. For the rim, cut a strip 1¼ in. wids and sufficisntly long to fit the hody when hent to shape. Tho hottom should hs edged and flattened beforo hending, and afterwards made an easy fit; it is then soldered at ths seam, and edged at the top. The bollowed top is next cut out, a larger working edge being allowed on the sides than on the ends.

Fig. 185.

Fig. 186.

Figs. 185 and 186.—Patterns for Strainer Handles.

Fig. 187.—Lid for Fish Kettle.

In hollowing, ths ends should hs hollowed rather mors than the sides, whicb should be brought to sbaps hy hending rather than hollowing, after which a creased edge is set off and paned on to ths rim. The handle for ths cover is then made and riveted in position.

When finished, all the parts should he thoroughly cleaned with turps and whiting, and polished with a soft cloth and dry whiting.

CHAPTER VI.

KETTLE MAKING.

Square Kettle.—A square kettle (Figs. 188 and 189) is preferably made of sheet copper, but can, of course, he made of tinplate. If the hody of a square kettle is to measure, when finished, 9 in. by 9 in. by 3⅝ in. deep, the patterns for the sides and ends would he rectangles, those for the ends

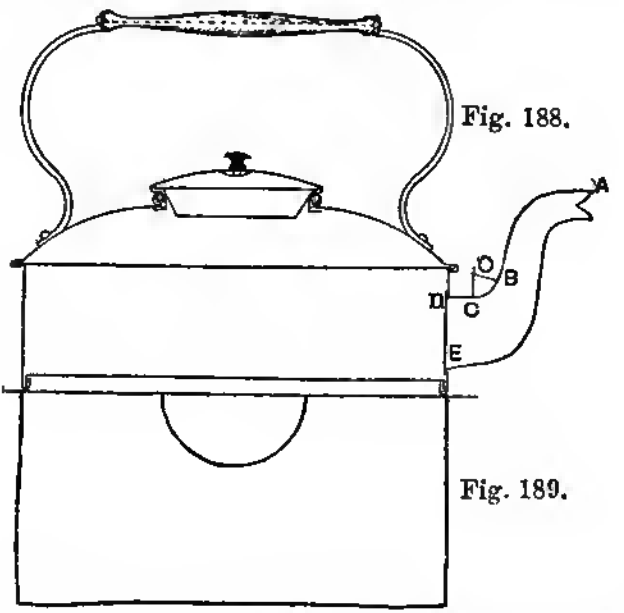


Fig. 188.

Fig. 189.

Figs. 188 and 189.—Elevation and Half Plan of Square Kettle.

measuring 9½ in. hy 4 in., and those of the sides 9¼ in. hy 4 in., the last pieces being notched for hox seams to he formed at the corners, as shown hy Figs. 190 and 191, the former representing half the side pattern, and the latter half the end pattern. The allowance along the top edge is for folding up square, so that the top may he pened

down upon it, and that along the bottom of the patterns is for folding an edge over into which the edge of the bottom is fitted, as shown at the bottom of Fig. 188. This method affords better

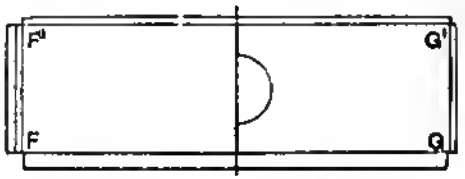


Fig. 190. Fig. 191.

Figs. 190 and 191.—Half Patterns for Side and End of Kettle.

protection from wear than when the bottom is joined to the body by a knocked-up seam. Each notch at F and F′ (Fig. 190) equals two folds, and each at G and G′ (Fig. 191), one fold only. A hole should also be punched in the front end of the kettle through which the spout is inserted.

When working the spout pattern from the elevation (Fig. 188), first draw two lines at right angles to each other at B (Fig. 192). Make the top of the spout pattern along the line at A equal to the circumference of the spout at A (Fig. 188),

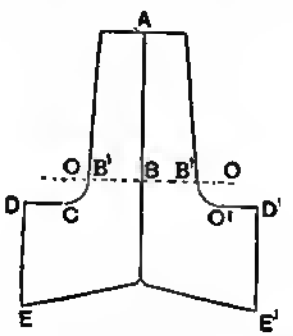


Fig. 192.—Kettle Spout Pattern.

and make A B (Fig. 192) equal to the length of the curve A B (Fig. 188). Through the point B (Fig. 192) draw a line at right angles to A B and make the distance from B′ to B″ equal to the cir-

cumference at B (Fig. 188). Set off the radius O B (Fig. 188) on the pattern as B′ O, B″ O (Fig. 192), and with the points O as centres and O B′ as radius, draw arcs of circles. Then transfer the length B C (Fig. 188), and set it off on the pattern as B′ C B″ C′. From the points C and C′ draw lines parallel to B′ B″ and make the distances C D and C′ D′ equal to C D (Fig. 188). From D and D′ on the pattern, draw lines at right angles to C D, and make D E and D′ E′ equal to the semi-circumfer-

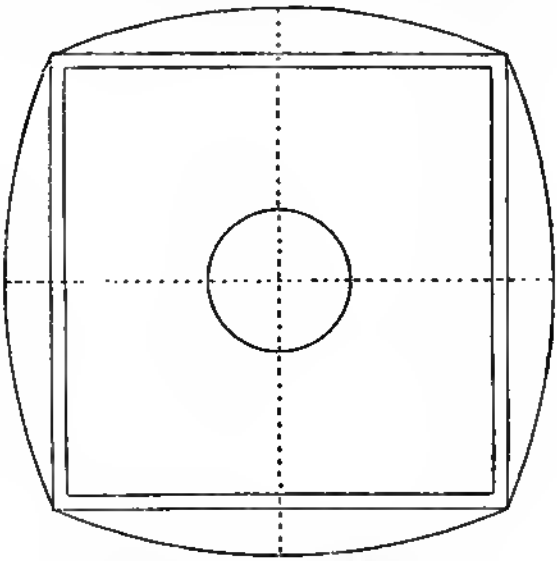


Fig. 193.—Pattern for Kettle Top.

ence of the spout at D E (Fig. 188). From E and F′ to the centre of the pattern draw lines, which are inclined at the same angle to D E as the base of the spout makes with D E (Fig. 188). A small notch cut where these lines join the centre line completes the pattern.

To draw the pattern for the top, first draw a square of 10½ in. side, and add to the square curved allowances for hollowing, as shown by Fig. 193. A circle 4 in. in diameter for the cover

hole should also hs marked at the centre of the pattern. Fig. 194 is the cover pattern with an allowance for hollowing and edging, and Fig. 195 is a frustum of a cone, which forms the cover

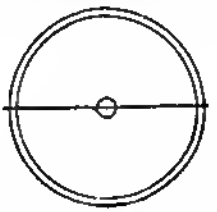


Fig. 194.—Pattern for Kettle Lid or Cover.

rim, the dotted line heing ths allowancs for an edge.

The uprights for the handle may he cut from stout hrass or copper hand to the shaps shown hy Fig. 196. The holes for the rivets should then be drilled, and also one at the top of each upright through which the spindle could pass to the opposite end. The spindls carries the wood handle, ths uprights also heing hent to the shape shown hy Fig. 188. Instead of making ths uprights as described, a wood pattern could hs prepared for use in making suitabls copper or hrass castings.

To make the kettle spout, hegin hy thinning the long edges hy hammering; then with a stretching hammer, used upon a heak iron, set inwards ths two arcs of circles forming the throat. Bend

Fig. 195.—Rim of Kettle Lid or Cover.

the spout round upon the same tool along the sdges B′ and B″ (Fig. 192) and work it round until ths edges overlap. Fasten some hinding wirs round the spout at the top and hottom,

arrange some spelter and horax along ths inside of ths seam, and hraze it. Then work over ths undsrneath part of the spout until the edges E and E′ overlap, and then hrazs this seam. Now load the spout with lead, and hsnd the neck at ths top of ths spout by working it round with a round-faced hammer ussd on the hollowing hlock. While the spout is still loaded, fils off all spare spelter that may havs run through ths seams, and with a small hammer work ths metal smooth and ths spout to the shaps required when finished.

Fig. 196.—Kettle Handle Upright.

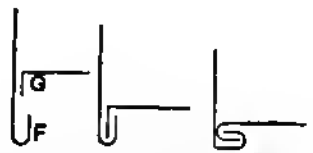


Fig. 197. Fig. 198. Fig. 199.

Figs. 197 to 199.—Sections of Seams.

The lsad is then run out from ths spout, a small edgs or seating is thrown off round the larger end, and the top is cut with ths snips to shaps. Then the spout is tinned inside.

Whsn making the body, fold up ths edges along ths top and ends squars on ths front and hack, as shown at G (Fig. 197), and fold the edgs along the hottom right over upon the opposite side or inside the hody, as shown at ths hass of Fig. 188. Fold the long edgs at the top of the sides square and outwards, and the hottom edge as for the front. The ends of these pieces are folded over inwards, as shown at F (Fig. 197).

To form ths seam at the corners, hook ths end of a side over ths end of the front, as shown hy Fig. 198, place the two pieces upon any flat-faced tool which has a straight edge, and then work until a seam is formed, as shown hy Fig. 199, this method of working heing repeated for ths rsmaining three corners. Ths hottom pattern is a square 9½ in. hy 9½ in., notched to allow for a ¼-in. edge heing turned up square on sach sids; whsn this is done, the hottom is placed edgs downwards insids the hody, and pushed down into the hottom folds until it rests as shown hy Fig. 188. The hottom and seams are then soldered down and along each side of ths hody, which is then ready for the top to he pened on to it.

The kcttle top is hollowed on the hlock. Begin hy working the metal down to a slight depth along thc four sides. Then take a hullet-faced hammer, and working in a rather deep hole on the hlock, hollow the corners to the depth required for the top. Then placs a side of the top along an edge of the hlock, and using a hammer with a largs and rather flat face, hit the side until it is hrought flat and straight along the edge. Repeat this process on each side. Again using the hullet-faced hammcr, work along the sharp shoulder formed hy forcing the sides down, and work ths metal upon a flat place on the hlock until the curve of the shoulder of the top is of equal height all the way round it; then carefully work ovsr the whole of the hollowed surfacs until it is rendered smooth.

If ths four edges of the top do not rest quite flat, they should he pared true with ths snips hefore ths next operation. This consists in marking the top along each edge with an edging machine, the distance from the edge of the top to whers it is marked heing made equal to the amount required for the flange, usually ahout ⅛ in. Now with the top upon a flat surface,

place the edge of a hatchet stake on the crease formed by the edging machine along one side, and drive down the tool with the mallet until the flange is set down square; repeat this operation on the remaining sides. An edge is next taken up on each side, so that the top will fit closely over the edge at the top of the body, and this edge may be pened down upon the body edge to form a seam, as shown where the top joins the body in Fig. 188.

The small cover is made by first turning the frustum of a cone forming the cover rim (Fig. 195), and fitting it rather tightly to the wired rim fixed in the top, and soldering the overlapping edges. A small flange is then thrown off round the top edge. The circle (Fig. 194) is then hollowed slightly all over, an edge on it being taken up so that it will fit over the flange of the rim; this edge is closed down to form the seam shown in section by Fig. 188. The knob is soldered in position from the inside of the cover, and a little hollowed circular stud is then placed over the patch of solder, and very neatly soldered to the inside of the cover; or the knob may be fixed with a small nut screwed on the threaded shank of the knob, in which case a stud would not be necessary.

Before the top is pened down as described above, the hole for the cover is cut out with circular snips, and a narrow wired rim of the same diameter as the hole is inserted in it, its lower edge being worked over to the inside of the top with a round-faced hammer. Rivet the handle upon the top, solder over the rivet heads on the inside, and place the top in position on the body, and then pene it down smoothly. It is then soldered along each edge to render it sound. Now from the inside of the kettle push the spout through the hole punched for it; the larger end butts close against the front

of the kettls; then solder it strongly there from tbe inside.

Oval Kettle.—The making of an oval kettle will now hs discussed. Fig. 200 shows the kettls complete; Fig. 201, pattern for hottom; Fig. 202, pattern for sids; Fig. 203, pattern for top; Fig. 204, pattern for lid; and Fig. 192 illustrates method of ohtaining a pattern for spout. Such a ksttls is best made in copper, hut can of course hs mads in good tinplate. The patterns should be first set out, and then the practical work can be started. It is here assumed that copper is the material used.

Ths hody should he thinned along the hottom and side edges hy hammering, so that, when lapped over, ths thickness of ths two edges is hut slightly greater than that of the rest of the body. After the edges are thinned, ths bottom of the body should he notched as shown in Fig. 202, and one end cut in to the dotted line, to form the cramps for ths seam.

Next hend up and down alternately the cramps on the end of the pattern; turn the hody round, and place the uncut end of ths hody in hetween ths cramps, which havs heen bent to receivs it. Now fasten the ends securely hy drawing a length of hinding wire round the top and hottom of the hody, and fasten the ends of ths wire hy twisting up tightly with pliers. The open cramps, inside and outside the seam, should hs closed down smoothly, hut not too tightly.

If soms of ths water in which the horax has been soaked is now poured down tbs inside of tbs seam, and flows easily through each of the closed cramps, then the spelter and horax (the horax heing used as a flux) may he placed along inside the seam ready for the fire. Have a good, clear coks fire ready, and placing the kettle, with ths seam resting horizontally, on the fire, allow it to gradually get hot. The metal expands equally

when slowly warmed, and the opening of the cramps by unequal expansion, which generally occurs when the metal is very quickly heated, is thus prevented.

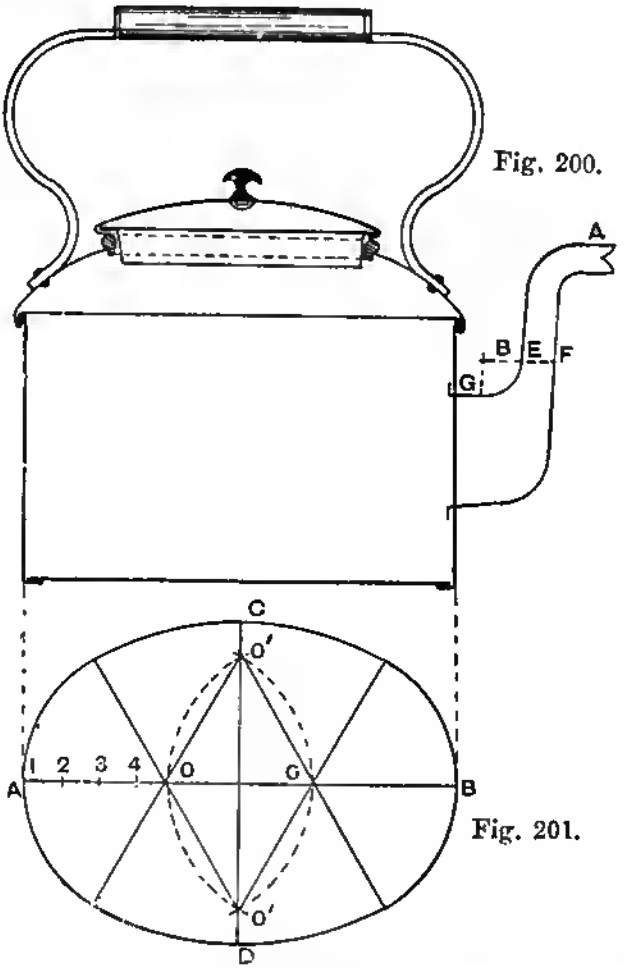


Fig. 200.

Fig. 201.

Fig. 200.—Oval Kettle. Fig. 201.—Pattern for Bottom of Oval Kettle.

When the copper has attained a dull red colour the fire should be blown up vigorously until the spelter begins to flow; any little knobs of spelter that refuse to flow should have a little dry borax

dropped on them, which may he done with a piece of wire flattened at one end, and, as soon as the horax mslts, ths spelter will flow with it. Now lift the hody from the fire, and cool it hy immersion in cold water. Any hlack scals remaining upon any of ths cramps round ths bottom must hs removed hy pickling.

Rsmove ths hinding wire, hend ths hody upon a mandrel to its proper shape, and then, upon a round, flat-headed stake, knock over inwardly svery altsrnate cramp upon the hottom of the hody until sach is at right angles to the side of the hody. Place the hottom (ths edgs of which has heen slightly thinned in the same mannsr as adopted for the seams) upon the hent cramps, and hend over one cramp on each side and end, to hold it in position. The remaining perpendicular cramps can then he closed down smoothly upon ths upright stake, and the hrazing process adopted for the seam repeated, the hody, while on the fire, heing so inclined that the spelter will flow into the cramps upon the edge of body and hottom. After removal from the firs the horax and dirt from the fuel are got rid of hy dipping in diluted sulphuric acid, the work heing then rendered hright hy dipping in nitric acid and then rinsing in clean cold water, this process heing rspeated twics or thrics until ths kettls is quits clean, when it should he dried with sawdust.

All lumps of spelter that may have run through any of ths cramps should he smoothly filed off, and any of the edges of the cramps that may have opsnsd a little should he treated in a similar way. The kettle hody is then ready for smoothing and hardening.

The seams are first smoothed hy hammering, the hammering heing continued until ths whols of ths spelter has heen driven into ths copper, forming a smooth, strong seam. Ths spelter round the hottom is also hammered smoothly in

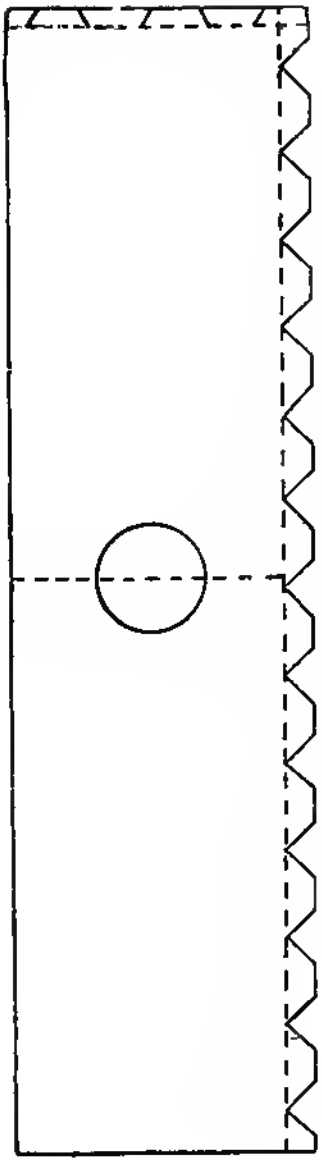


Fig. 202.—Pattern for Side of Oval Kettle.

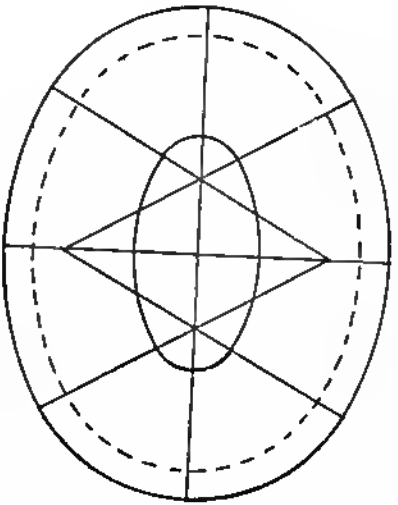


Fig. 203.—Pattern for Oval Kettle Top.

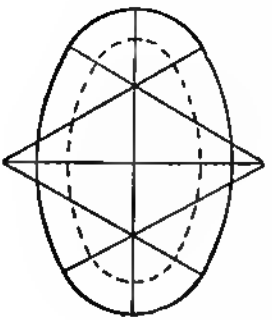


Fig. 204.—Pattern for Oval Kettle Lid.

upon an upright stake, or sometimes a hevel stake is used, ths hottom, when finished, heing curved instead of forming a sharp angle where it joins the hody.

Ths surfacs of the hody and thc hottom of the ksttls must now hs hammercd so as to harden the copper and also to rsnder it smooth and hright. Begin hy hammering the hottom with a hright hammer upon a flat, upright stake with a smooth surface, heginning at the centre and working towards the outside edge with a regular series of close overlapping hlows. If, after going over the whole of the hottom, it is found to he loose in ths csntre, hammer round near its edge until the hollow in the centre is drawn down flat.

Now hammer the hody upon a large smooth mandrel, heginning at the hottom, and work round with regular hlows from the hottom of the hody to ths top until the whole surface has heen hammered smooth and hright; the hody is then ready for tinning.

It is necessary to protect the outer surface of the kettle from oxidation during the tinning process, and this may he done hy wiping it round with a pad of tow which has heen immersed in a strong solution of salt and water, hy coating the surface with moist whiting, or with a comhined solution of whiting, salt, and water, after which the hody should he gently warmed until the outside coating is dry. The surface to hs tinned should hs rinsed with a little clean chloride of zinc (killed spirits) and then sprinkled over with soms powdered sal-ammoniac, after which the hody should hs heated until a stick of tin held upon its surface will melt. When this occurs a small quantity of tin should hs allowed to melt off the stick, and while in a molten condition should he quickly wiped round the surface with a pad of wadding, any superfluous tin heing wiped out cleanly and smoothly after the whole

of the eurface has heen covered. Should any small patches he left untinned, they may he covered up hy ruhhing them over with eome of the molten tin and a lump of eal-ammoniac while the hody is hot. But if the hody, hefore tinning, wae quite clean, and wae not overheated during the tinning process, euch patches will not he found. The outeide protective coating, after the kettle hae heen cooled, can he removed with a pad of tow moistened with a little hydrochloric acid (raw epirite), the pad being quickly ruhhed over

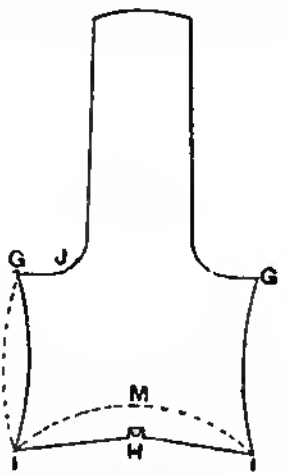


Fig. 205.—Spout Pattern for Oval Kettle.

the outside eurface, and the hody afterwarde rinsed in clean water. Both the outside and the inside of the kettle are then ecoured hright with fine sand and water.

The spout hole ie punched in front of the hody; a punch elightly emaller than the diameter of the epout is ueed, heing held ineide the hody, so that the hurr is on the outside. An edge ie next thrown off round the upper part of the hody for the top to he pened down upon.

Cut out the oval for the top (Fig. 203) and tin it upon one side. Next hollow it upon the hlock with a hullet-faced hammer (tucking the ends

more than the sides) until it is brought to the required height; then make the outer surface smooth and bright by hammering it with a bright hammer upon a round-headed upright stake.

Cut out the cover hole with the bent snips, Fig. 46, or with a small sharp chisel upon a block of lead, and file the edge of the hole until smooth and true in shape.

Cast rims for kettle tops are sold by most dealers in coppersmiths' mounts, the section of rim being as shown in Fig. 200. These rims are placed in position as shown, and then soft-soldered round on the inside of the top.

The top is next swaged around the bottom edge, the swaging forming a small head of semicircular section around the edge, and this, when fitted closely over the edge that has already been thrown off upon the body, forms an edge to pene down over the body edge, and also a seating to rest upon the edge of the anvil stake while pening down. After pening down, the edges are brought down a little more by closing the edge over upon a hatchet stake, or with a swage specially constructed for this purpose. The seam is then closed down, as shown in Fig. 200, by knocking it over upon a round head fitted into a horse. The seam is then soft soldered on the inside of the kettle with a copper bit bent to a suitable shape for the purpose.

The smaller oval (Fig. 204) is next cut out, tinned, and slightly hollowed all over, and then fitted to, and pened down upon, the rim, which is tinned upon both sides, and a cast knob soldered in position through a hole punched in the top for that purpose, as shown in Fig. 200.

Cut out the spout (Fig. 205) and thin the long edges by hammering; then set inwards, with a stretching hammer upon a beak iron, the two small quarter circles forming the throat; bend the spout round upon the same tool along C E

and D F, and work it round until the edges overlap; then work over the end of the spout at G G upon a brazier's spout tool until G overlaps G, and the seam underneath G G and ending at H also overlaps, the small cramp at H being on the outside. Fasten the two seams in position by means of the crampe, and draw them together closely with binding wire placed round the spout at the top centre and end. Then arrange the spelter along the seam, and braze, afterwards cleaning the spout, as described when dealing with the body.

In order that the neck may be bent without injury to the spout, the latter must be filled with lead. Close the small end of the spout by wrapping around and over it two or three layers of stout brown paper; tie securely, and insert this end of the spout in sand in case the paper should burn through. Then, with an ordinary plumber's ladle, fill the spout with molten lead; when the metal has cooled, remove the paper wrapping and file the seams smooth and round. In a block of lead, punch a hole of the same diameter as the small end of the spout, rounding off the edge on one side of the hole. Fasten the lead down securely to a support, insert the end of the spout in the hole, and gradually bend it over towards the rounded side of the hole until the spout has attained the shape shown in Fig. 200. Should the spout prove so tough that the required shape cannot be completely obtained by manual pressure, a few blows with a mallet while the neck of the spout is held over a beak iron will generally complete the job. The shoulder at the bottom of the spout next requires attention. Place the curved side of the spout (opposite to the shoulder) upon a beak iron and then work the square shoulder by hammering upon the tool until it becomes round; after working it to the proper shape, the spout is smoothed by going over the

whole of its surface with a small smoothing hammer. Next melt the lead out of the spout, and tin it inside. Notch the nozzle of the spout as shown in Fig. 200, and, after paring true the large end, throw off a small edge that will hutt up against the side of the kettle whsn the spout is fittsd into it. After fitting ths spout, soft soldsr it securely from ths inside of the kettls.

The handle may be bought ready made. Place it in position in a straight line with the spout, mark the position of the holes and punch them, place the rivet upon a tool similar to that used for knocking up the top, and rivet on the handle. The rivet heads should he soldered over inside the kettle.

If a huffing machine is not availahle, the kettle may he hand-polished by scouring with emery powdsr and oil until all scratches are removed; then wipe the oil off clean, and finally polish with crocus or tripoli.

CHAPTER VII.

OIL COOKING STOVE.

THE instructions given in this chapter are taken from "Metalworking," the comprehensive treatise of 760 double column pages by the Editor of this handbook.

The large oil cooking-stove to be described has an oven which will admit anything not larger than 9½ in. by 11 in. by 8 in., whilst two or three saucepans can be boiled on the top at the same time as the oven is in use.

The only part of the stove likely to prove troublesome in the making is the burner, and considerable care is required to secure both safety and efficiency. One pattern only is described, as, once the principle of construction is grasped, the making of other patterns and sizes will not present much difficulty; but this principle must be thoroughly understood before any attempt is made to vary the pattern, otherwise there may be a dangerous failure.

Fig. 206 illustrates the principle on which the particular form of oil burner used in cooking-stoves is constructed. A is the wick-tube; B is the section of the "strainer," a piece of perforated tinplate; C is the chimney, almost invariably made of metal, with a small sight-hole in it, covered with mica; D is the section of a curved piece of sheet metal called the "dome," which has a slit in the centre for the flame to pass through.

Hot air always rises and cold air sinks, so, when the wick is lighted, the air in the stove chimney, getting heated, rises, and flows out of the top, no matter how tall the chimney may be

or how tortuous the passage. It may he straight, or may have elbows in it, or may he hent at right angles and round corners; hut if it dips downwards at any part the lamp will most likely hurn hadly. The hot air passing out of the chimney is immediately replaced hy cold air entering through the perforations in the strainer. The latter moderates the rush of air, steadies the flame, and prevents it from heing hlown out hy any stray puff of wind. It also forms with the dome, when the ends are hlocked up, a sort

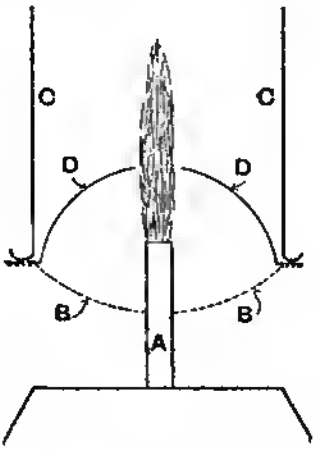


Fig. 206.—Section of Oil Stove Burner.

of chamher, in which the air is partially warmed hefore it comes in contact with the flame. The dome compels all the air which is drawn up into the chimney to pass through the narrow slit; and the air, thus forced into contact with the flame, is partly hurnt, thus increasing hoth the light and heat.

It will he hest to make the hurner first. The dimensions given are calculated to suit a 4½-in. wick, and if any other size is wanted it is only necessary to increase or reduce the measurements correspondingly in thc direction of the width of

the wick; hut it is hetter to make a duplex hurner than to make the wick wider than 4½ in. Very wide wicks rarely work smoothly and evenly.

Make the wick-tuhes of stout tinplate, each tube of two pieces, with the sides overlapping, as shown in section in Fig. 207. When one half is slid into the other a space large enough to admit the wick freely should remain. The length of the tuhe from top to hottom is 3¼ in., and, of course, the neatest end will he put uppermost in the hurner. In one of the halves of cach wick-tuhe holes ½ in. hy ⅛ in. must he cut to admit

Fig. 207.—Section of Wick Tube.

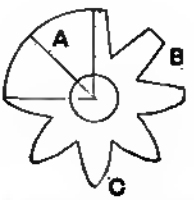


Fig. 208.—Winding-wheel.

the winding-wheels, and the tops of these holes must be 1½ in. from the top edge of the wick-tuhe. One hole should he ½ in. from each side of the tuhe, and the intervening space should have not less than one hole to the inch.

On a piece of hrass plate as thick as a new florin mark out ½-in. circles for the winding-wheels. Drill all the centres to admit tinned hard-iron wire, ⅛ in. thick, or a size larger. Cut out the circles, and file teeth in them, as shown in Fig. 208. A shows part of wheel marked out; B, wheel notched with triangular file; C, finished teeth. Several discs can, of course, he threaded

on a piece of wire to keep them together, and he filed out at once.

The labour of making these wheels can be lightened somewhat by buying the discs ready stamped out, and, if expense is no object, the wheel-cutter will cut the teeth. Probably, also, brass pinion-wire can be had as large as required, or nearly so, and with suitable tools, slices may be cut off the end to produce the wheels.

Great accuracy is not required in the spacing of the teeth, the only points to observe strictly being that the teeth are all the same length, and that there are no burrs or sharp corners to tear

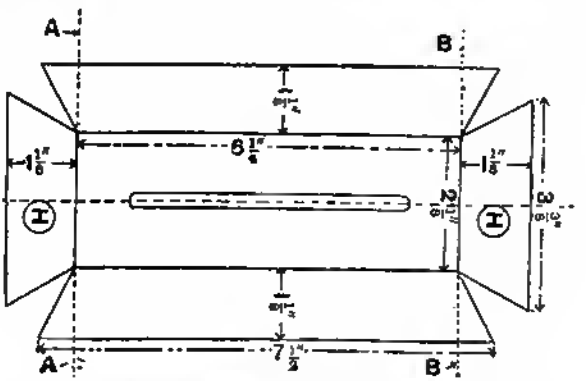


Fig. 209.—Base of Oil Stove Burner.

the cotton. Thread the wheels on a piece of the wire, and solder them on, one wheel opposite each of the holes in the wick-tube. Put the halves of the latter together, and solder them, first clearing off all burrs and sharp edges likely to catch or fray the wick. If the top is not square with the sides, correct it by filing.

Cut out a piece of tinplate to the dimensions shown in Fig. 209. If any other size of burner is being made, the dimensions between the dotted lines A and B must be altered accordingly. Bend up the edges to form a tray, and solder the corners inside. The long slot must admit the wick-tube

without shake or forcing; and the round holes must he large enough to admit the winding-wheels. Solder the wick-tube in position with $1\frac{1}{4}$ in. of the top projecting, taking care that it is upright. Make two $\frac{3}{4}$-in. tinplate discs, each having a hole in the centre.

Put the winder in position, thread one of the discs on each end of the wire, and solder them over H (Fig. 209), so as to cover up the holes. These small discs should he soldered only temporarily until it is seen that the winding-wheels work smoothly and without catching in the slots of the wick-tube. The wheels should project into the tube equally—far enough to dig about half-

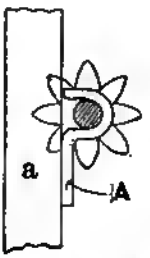


Fig. 210.—Bearing for Wick-winder.

way into the wick; and the winder must he parallel with the top of the wick-tube. Considerable care is required over this part of the work in order to ensure a smooth and even winding action.

The small tinplate discs on the ends of the winder-handle facilitate adjustment. The winder is still too weak to wind up the wick without bending. It must therefore he strengthened by a piece of stout brass, bent and soldered as shown at A in Fig. 210, so as to form a bearing near the middle of the winder. A very wide wick may want two or more of these bearings. A thick disc of brass as large as a halfpenny, and having a milled edge, must he soldered on the end of the winder.

In default of a milled edge, notching with a file will answer well. A cross-shaped piece of hrass would afford a hetter grip to the fingers and do away with the difficulty of milling. Both hurners must he made to wind to the right to raise the wick; the winder must not project more than ahout 2¼ in. from the hurner.

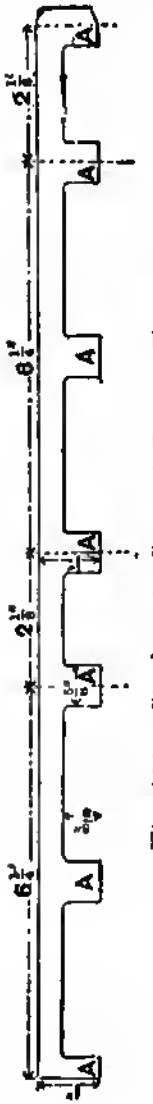


Fig. 212.—Strainer to Support Burner Frame.

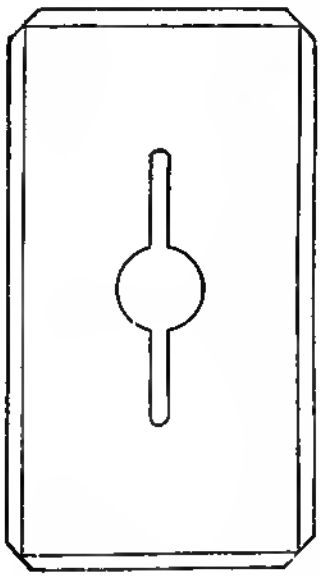


Fig. 211.—Bottom of Burner Base.

For the hottom of the hurner, a piece of tinplate with a slot shaped as shown in Fig. 211 must he cut out, of such a size that when ¼ in. of the edge is turned under all round, and the hurner placed on top with the wick-tuhe threaded through the slot, ½ in. of the tin will be eeen all round tbe burner. Solder it on, but do not solder the wick-tuhe to it. The semicircles are cut out of the piece shown by Fig. 211 for ventilation, and to allow of the escape of the oil, that would otherwise accumulate in the burner and smell badly.

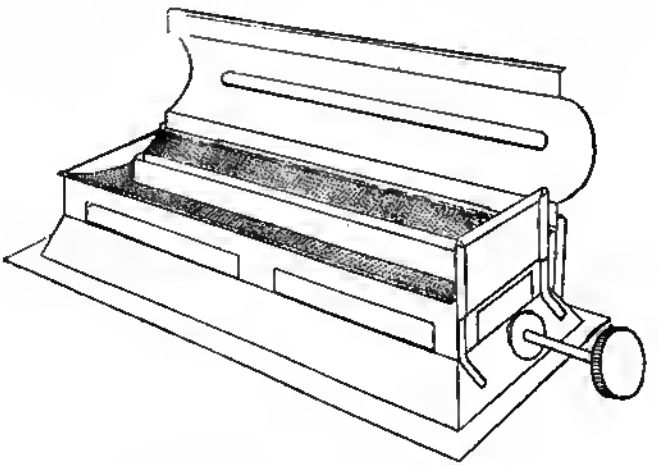


Fig. 213.—Oil Stove Lamp.

The frame for supporting the strainer must be cut out like Fig. 212; and when it ie hent into a rectangle across the dotted lines, and the join soldered, tbe feet A should come just on the edges of the base of the hurner as in Fig. 213. The frame is soldered on. The strainer is made of perforated tinplate, which is sold in sheets 14 in. by 10 in. of various degrees of fineness. A good size is 14 holes to the inch linear. Coareer perforation, although cheaper, would not be so effective; finer can be had, but it would be too fragile, besides heing more liable to get clogged

up with dust when in use. Cut out a piece of the perforated tin as long as the supporting frame, and, having cut a long slot to admit the wick-tube, bend the strainer to a semicircular form, and drop it into position. The edges which stand above the long sides of the frame must be bent downwards until horizontal; and, if more than ¼ in. projects, cut the surplus off. With spots of solder, tack the strainer to the supporting frame and wick-tube here and there, just to keep it in position.

Make the burner dome out of sheet brass as thick as can be bent to the curve required. A slot is cut in the top ⅜ in. wide, and ¼ in. longer than the width of the wick. The top of the dome is ⅝ in. from the top of the wick-tube. The two long sides are bent out horizontally. One edge rests on the turned-out edge of the strainer, and the other is bent round a piece of ⅛-in. wire to form a hinge. The ends of the wire are turned down, and, after being bent to fit the sloping side of the base of the burner, are soldered to it. The entire length of the dome-edge need not be used for the hinge; 1 in. at each end is sufficient.

If all is correctly done, the dome will lie flat over the strainer with its ends flush; the slot in the dome will be exactly over the wick, and the dome itself will be capable of being thrown back to allow of trimming and cleaning (see Fig. 213). Both ends of the dome are still open. The back end will be closed by the chimney when the lamp is in position; and the front end must be closed by a piece of tinplate bent round a stout wire frame soldered to the end of the burner-base as in Fig. 213.

To form the reservoir, cut out a piece of tinplate like Fig. 214. Bend up the sides, and solder the corners inside very carefully, as they cannot be subsequently got at in case of leakage.

Solder the brass fillers to pieces of tin tube, and, having cut the tube to the proper angle, solder it on the reservoir over the hole A. The hole in the top of the reservoir should be ½ in. larger all round than the wick-tube. Make the bottom of the reservoir to snap on, and solder it carefully. Solder on the handle, observing, as regards both handle and filler, that the reservoirs are rights and lefts.

To fix the burner in position, little fastenings like Fig. 215 must be made, A being soldered on

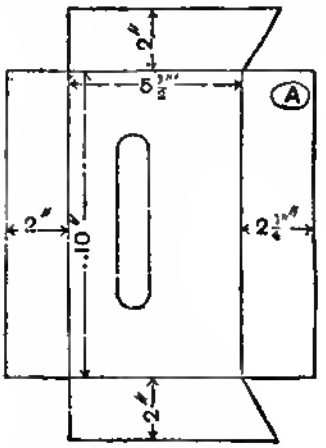


Fig. 214.—Oil Stove Reservoir Pattern.

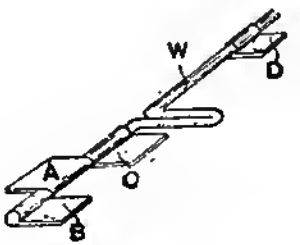


Fig. 215.—Lamp Catch.

the projecting base of the burner, and B, C, and D on the top of the reservoir; and if all is properly done the burner will be held down truly and firmly. D prevents the wire W being entirely withdrawn, and perhaps lost.

The remainder of the oil stove had best be made of the best sheet charcoal iron, which has a bluish, smooth surface. The common coke iron, with a grey, rough, blistered surface, is much cheaper, but will crack if bent sharp, and the sheets are almost invariably buckled badly. Make the chimneys 10½ in. high after the bottom edge is

wired, and before the top edges are turned over, and of such dimensions in horizontal section that the chimneys would fit easily over the dome as regards its width, and tightly—or, better, would just not slip over—as regards its length from back to front. The bottom edges must be wired with $\frac{1}{8}$-in. wire along the back and sides, but not on the front; the latter has a semi-circular piece cut out of it to agree with the curve of the dome. The join in the chimney ought to be a folded one, but riveting will do, provided the joint is close.

A $1\frac{1}{4}$-in. circle for a sight-hole is cut out of the

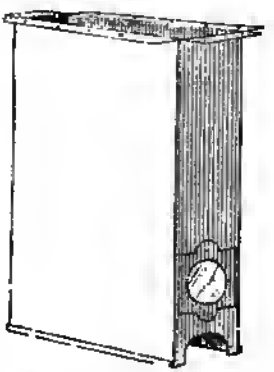


Fig. 216.—Oil Stove Chimney.

front of the chimney, with its centre $3\frac{1}{2}$ in. from the bottom, and a similar hole is cut in an oblong piece of metal. The latter is temporarily riveted over the hole in the chimney so that the two holes coincide, and a piece of mica, not glass, is slipped in between. The whole arrangement is shown in Fig. 216; the top edges, however, must not be turned down until the chimney is finally fixed in the oven. The lamp can then be lighted; when, on standing the chimney in position on the dome, the flame should be steady and white.

The body of the oil stove can now be taken in hand. Cut out a piece of sheet iron to the

dimensions given in Fig. 217. Bend it up at right angles along ths dotted lines to form ths sides and back. Turn outwards at right angles ¼ in. of top and bottom, and wire the two re-

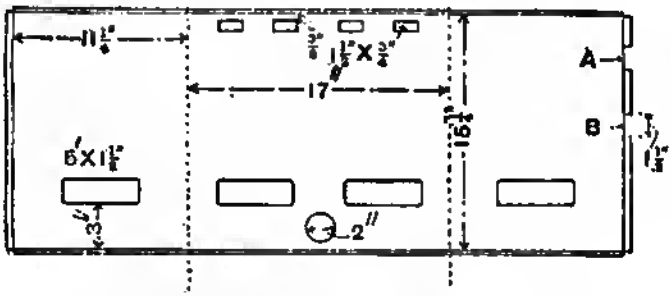


Fig. 217.—Stove Body Pattern.

maining edges, turning them outwards also. The edges are not included in ths measurements. Ths five holes help to keep the lamps cool, and the others to create a draught up ths chimney whsn the stove is in use. The epacee A and B will provids places for hinges when ths edge is wired. Cut out ths bottom of the oven (Fig. 218) to fit. Ths front edge is wired, and ths holes for the chimneys should not be cut clean out, but ½ in. of ths edges should hs turned up as shown, both to get a closer join and to prevsnt juice or gravy from running out of ths ovsn down to the burner.

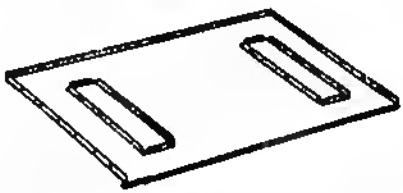


Fig. 218.—Bottom of Oil Stove Oven.

Ths nearest eides of the chimnsys ars 9½ in. apart. Slip the chimneys into the holee provided, and rivst the oven bottom in position at such a height from the bottom of ths stovs that ths lamps can

he slid in and out without catching against the wired edge. Rivet only temporarily at present.

Make the top of the oven just the same as the bottom, except that the chimney holes must he cut out clean, and the measurement from hack to front must he somewhat greater, as $2\frac{3}{8}$ in. of the front is turned up at right angles, and $\frac{3}{8}$ in. of the turned-up part is turned out horizontally, forming a hollow top to the stove 2 in. deep. Temporarily fix it to the stove, and insert the chimneys. If all is right, the latter will he upright, and there will he a turned-out edge all round the top. The front edge, however, will not project beyond the wired edges of the sides more than $\frac{1}{16}$ in., if as much.

Make and fix the hottom of the stove hy lapping the edges over those of the sides and hack, and wire the front edge.

Small feet of some sort must he put on the hack to compensate for the unevenness caused hy the thickness of the wired edge in front.

Insert the lamps, taking great care that the chimneys rest on the tops of the burners, and then mark round the chimney-tops which project heyond the top of the oven. Take out chimneys and oven-top and hottom altogether, and, without separating them, turn the marked-off portion of the chimney tops outwards; which done, all can he replaced, the riveting finished, and the mica clamps (removed to permit of the insertion of the chimneys) permanently fixed. The top of the stove should then present the appearance of Fig. 219.

During riveting the lamps must he frequently slipped in and out, for fear of their becoming hound or too loose. There must he no holes, due to imperfect fitting, to admit soot or smoke to the oven.

The top of the stove is fitted on like the hottom, except that the edges are turned over all round.

A circular hole, about 5 in. in diameter, is cut over each chimney-top (the precise spot does not matter), and the top strengthened across the middle by a sort of girder, made as follows: A strip of sheet iron, 2 in. by 9 in., has ¾ in. of one side bent at right angles, and the other side wired. The unwired edge is rivsted to the underside of the stove top, thus enabling the stove to support a large saucepan without caving in.

Before finally fixing on the top, provision must be made for saucepans smaller than the holes in the top of the stove, as the lamp will go out if anything is stood flat down on the chimney-top. The usual thing is a perforated

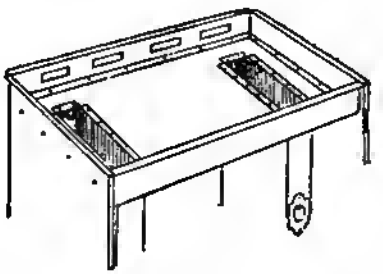


Fig. 219.—Oil Stove with Top Removed.

cast-iron plate with feet that are bolted to the oven-top; but, if this is impracticable, a very good substitute would be two lengths of stout iron rod fixed about 1 in. above the chimney-tops.

Two covers of sheet iron must be made for the holes in the top of the stove, for use when nothing but baking is being done. Unless the heat is compelled to pass over the top of the oven, and out at the back, baking will be almost impossible. These covers ought to be sunk in the centre, so as to fit in the holes without sliding about, and they should have a ring, or something similar, by which to lift them.

The oven door must fit well to prevent loss of heat. Bend up the edge of a piece of sheet iron

so that, when dropped in the place intended for ths door, it fits neatly all round; then wire the edges. Holes for the ventilator must be carefully marked, and cut out as in Fig. 220; and similar holes must be cut out of a circular piece of metal, which is riveted at the hack of the door over the holes. Riveting must hs done over a washer, so that ths ventilator can be moved. A short length of wire is riveted into the movable part, and projects through a curved slot in the door, to ssrve as a handle for opening and closing the ventilator.

Circular sight-holes must he cut in the door to

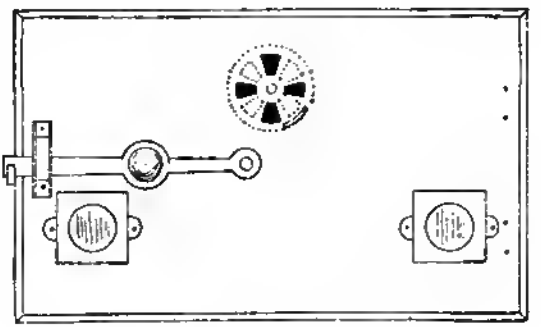


Fig. 220.—Oil Stove Oven Door.

correspond with those in thc chimneys, hut they sbould be put a little higher up, so as to enahle ths ohserver to look down to the flame. Make two frames of sheet brass, like thosc in Fig. 220. Bend up ¼ in. of all four edges, and then hend ths lugs outward. Put a piecc of glass in each, and rivet themn on the door. Rivet over washers, to facilitate removal if the glass breaks.

The oven door latch is of cast hrass. Make two wooden patterns like Figs. 221 and 222, ¼ in. thick, and with the bend in the ends, as shown, to avoid the wired edges of the door and side of the stove. The latch may be of the dimensions shown, hut the size should vary with the size of

the stove. A small latch looks rather paltry. A few incised lines improve the appearance. File up the latch casting, and, having fixed on a brass knob, rivet the latch to the door with a large

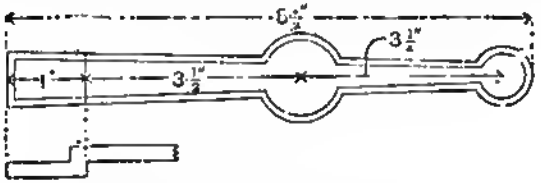


Fig. 221.—Latch of Oven Door.

copper rivet and washer, not so tight as to prevent its moving. Rivet over the latch a band of brass to keep it in place. About ¾ in. will be enough movement to allow.

The door can now be fixed on the stove. Make two hinges of tinplate like B (Fig. 215, p. 115) on a piece of wire. Pull them open, and push them on to the places where the wire is left exposed on the side of the oven. Tin the edges of the door where they come against the hinges, and, having placed the door in exactly the position it is intended to occupy when closed, run some solder along the hinges, so as to fasten them to the edge of the door. A thin table-knife inserted under the hinges will keep them up against the door whilst they are being soldered.

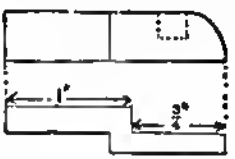


Fig. 222.—Catch of Oven Door.

The catch for the latch can now be riveted on the side of the stove, and a shelf (movable, of course) fitted in the oven. Fig. 223 shows the finished stove with the door removed. If the

best charcoal iron has been used, no better finish could be had than the natural surface of the iron. In any event, black varnish must not be used, as it smells for a long time when the stove is in use. Blacklead the stove in the ordinary way. There is no heat to spare in this stove. Every little aperture lets in cold air and lessens the power of the oven. If there are any holes due to bad fitting in corners and the like, they may be filled in with a little squeezed fireclay.

Some makers fit plate-warmers and a boiler.

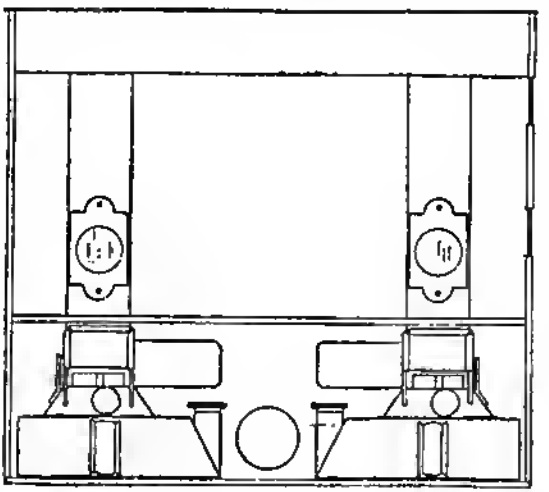


Fig. 223.—Oil Stove with Door Removed.

The plate-warmer is simply a narrow sort of cupboard made of sheet metal, and riveted to the side of the stove; and the plates are slipped in on their edges, and the door closed. There is no real need for such an arrangement, as plates can be slipped between the chimneys and the sides of the oven. If desired, a plate-warmer might be fixed on the back of the stove; there is more room there. Although there may be little use for these plate-warmers, considered as such, they serve as "jackets" to the oven and keep

tbe heat in. Stoves are frequently made with shallow trays of sheet metal, about ½ in. deep, riveted to the sides, which answer the purpose hetter, perhaps. The hoiler is a tinplate tank, having a lid and tap; and it is hung on the side of the stove, so as to get thc heat from the sidc of the chimney.

With regard to the lamps, never cut the wicks; simply ruh off the charred portion with the finger, ruhhing from the centre of the wick to the sides, so as to spread it out. This is most important, as rubbing from the sidcs to the middle tcnds to narrow the wick, and leaves spaces at the sides, down which the flame is apt to flicker dangerously. As a safeguard to some extent, the wick tubes may be prolonged nearly to the bottom of the reservoir. The wicks can be turned up very high without smoking, if it is done gradually.

When in use the stove should not he placed so that the hot air is discharged into the room, as the hot, dry, vitiated air from the lamps is most injurious. It is well always to have a kettle or saucepan of water on the top, whether it is wanted or not, as the steam keeps the air moist.

CHAPTER VIII.

SET OF WORKSHOP OIL CANS.

EVERY well-regulated workshop should contain a set of oil cans, which should be always ready for use.

Fig. 224 illustrates what is usually termed a loco oil can. It is very useful for machinery, other than locomotive engines, which is in any way difficult of access for oiling purposes. A triangular piece of stout metal A, working easily on a rivet B, operates a valve C by means of a thumb-push D. The spring E automatically closes the valve when pressure is removed from the push.

The cylinder F O H J is first made, and the seam should be grooved and soldered inside. A hole is punched in the centre, opposite the seam, to receive the stuffing box K, which should be soldered in. The support L for the triangular lever A should now be made and fixed in position, with the rods M and N and the lever mounted in position, as in Fig. 224. A piece of stout brass, at least $\frac{1}{16}$ in. thick, should be used for the support, and a $\frac{1}{4}$-in. edge should be set off the bottom, which should be floated over with solder. The lever A can be cut out of the same strength material as the support, while the rods M and N are made of No. 10 B.W.G. tinned wire, hooked through the holes in the lever and then strongly soldered. The spring E should be not less than $\frac{1}{2}$ in. in width, and after bending to the required shape, one end O should be filed and well tinned and soldered, a small strap being afterwards soldered over for additional strength.

The hollowed end is now made. Cut a disc of

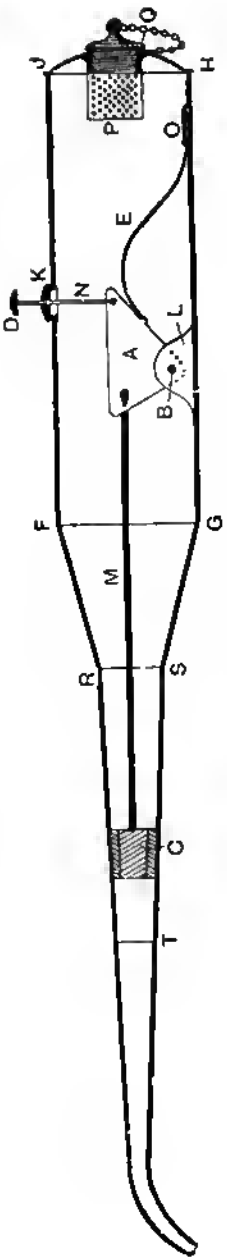


Fig. 224.—Loco Oil Can.

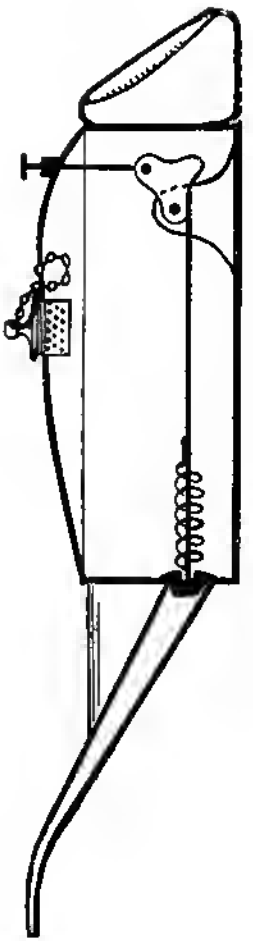


Fig. 225.—Engineers' Spring Oil Can.

metal, allow extra for working edges, hollow it deeply on the block, or with a bullet-faced hammer on a block of lead, and crease the edge to fit tightly on the body. A hole is now cut in the centre to receive a ¾-in. feeder screw, which should be soldered to it from the inside of the hollow. A small cap of perforated tin to act as a strainer should be made and soldered as at P. One end of a small brass chain is fastened to the feeder screw, and the other end is soldered as at Q to prevent the screw being lost. Do not solder on the end yet; that is the last job. The pattern for the truncated cone F G R S is obtained in the usual manner; see Fig. 169, p. 81. Bend the pattern to shape, solder the seam, edge the larger end to fit the end of the body F G, and solder it. The spout pattern can be set out in a similar manner as for the part F G R S, bearing in mind that it is bent after rounding, and when soldered in position. If a long spout is required, the seam should be at T, relatively to the valve C.

The rod N is now cut to its proper length, and the button D is soldered on to form the push. The valve bed can be soldered in the spout with a short length of ⅜-in. copper rod pointed and tinned at one end. This forms a very handy tool for other small work.

Guide the spout over the rod M until the end touches the valve which now rests in the valve seat. Measure carefully the difference the end of the spout is from its true position on the end of the cone R S, withdraw the spout, and cut off the rod M that amount. Solder the valve to the rod, guide the spout over it once more, tap it well home, and solder in position, with the seam underneath. A little experience is required to do this properly, as it is probably the most intricate part of the job, but if the above instructions are carried out, any difficulty will soon be overcome. The end of the oil can containing the

feeder screw can now be soldered on, and the spout bent by gradually tapping it with a mallet over the round part of another mallet.

Fig. 225 shows another type of spring oil can more generally used, a plan and pattern for the top being shown by Fig. 226. The length of the body is obtained by bending a strip of tin around the outside of Fig. 226. The bottom edge of the body is wired, creased, and shaped. The seam is then soldered, and a hole for the spout is cut, leaving the burr inside. The bottom is marked off the body, edged to fit inside, and soldered about ¼ in. from the wired edge. The lever, support, valve rod, and push rod are now made and fixed as previously described. A spiral

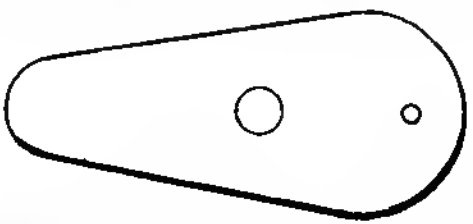


Fig. 226.—Pattern for Top of Oil Can.

spring is used in this can, both ends being thoroughly tinned, after which it should be threaded over the valve wire and left loose for the time being.

The top is now made. The larger hole is for the feeder screw, while the other is for the push rod; but these should not be punched until it has been hollowed. Additional working edges should, of course, be allowed; it is then hollowed and edged plainly to fit the body, and the holes cut. A feeder screw with chain and strainer are soldered in position, and a stuffing box, through which the push works, is soldered from the inside.

A piece of good leather, cut in the form of a washer sufficiently large to well cover the hole, is used as a valve. This is fixed between two metal

washers, small enough to freely work in the hole over which the spout is fixed. Now adjust and fix the valve, which is very simple. First set the lever and rods as shown at Fig. 225, slide the spring in position, and securely solder one end

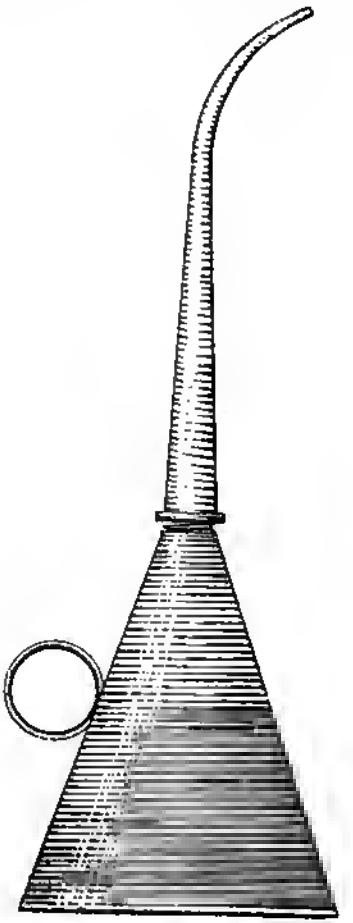


Fig. 227.—Spring Bottom Oil Can.

to the valve rod and the other to the inside of the body. Mark the rod outside, and solder one small metal washer to it, so that when the leather is pushed up it will tightly bind the body. This can easily be done by pressing the push to bring

through the valve rod farther. Then solder the other metal washer to the rod tight up to the leather, and cut off any length remaining. The top can now be soldered on, and the button fixed to the push rod. The spout is next made large enough to allow the leather washer to freely work, and fixed; it is strengthened with a boss as shown in Fig. 225.

For the handle, a strip is wired, and should not be more than 1 in. wide when finished. Bend this to shape, solder on a small boss, and fix in position as indicated. The spout should be bent last of all, as previously described.

Fig. 227 shows a spring-bottom oil can. The body is set out as for a truncated cone, bent to shape and soldered, and a screw top soldered at the narrow end. The spout is then made and soldered to the male part of the screw top. A piece of spring sheet brass should be obtained for the bottom. This should be struck about half a dozen blows with the planishing hammer on a bright anvil just round the centre, to cause a slight buckle. Set the jenny for a double edge and work it up a little, afterwards reversing it and edging it to fit the body. A good spring in the bottom should be the result.

Solder on the spring-bottom with a bit that is not too hot. The bottom should not be pressed until thoroughly cold. Cut a strip about $\frac{3}{4}$ in. wide for the ring on the side, edge it, bend to shape, and solder in position. Then carefully bend the spout. Leather washers should be put on all the feeder screws, the stuffing boxes properly packed, and whiting and turps should be used for cleaning. Polishing can be done with a soft cloth and dry whiting.

CHAPTER IX.

FANCY PASTE-CUTTERS.

In making fancy paste-cutters, very thin tinplate must be used to obtain the best results, as far as symmetry and general appearance are concerned. The few tools required include a soldering-bit, a sharp-edged stake (a hatchet stake preferably), a pair of round-nosed pliers, a pair of snips, a round stake, and a mallet.

To make the cutter represented by Fig. 228,

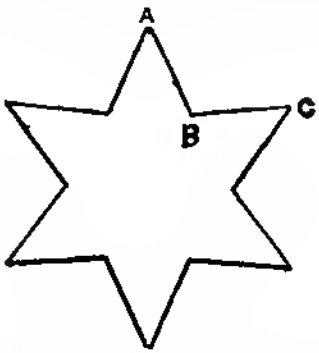


Fig. 228.—Star Paste-cutter.

Fig. 229.—Handle for Paste-cutter.

a strip of tinplate, ½ in. wide, is cut equal in length to the stretched-out measurement of the design, plus ¼ in. for lap of seam.

A width of ½ in. is sufficient for the strips of all the cutters described, and ¼ in. is suitable for all the seam laps.

Having marked the design on a piece of wood, set off along the strip of tinplate the distances A B, B C, and so on; bend the metal sharply over a hatchet stake at the points indicated, allowing the seam to come at A, then solder together. During the bending, occasionally test the tin over the design marked on the wood.

A disc of tinplate is then cut, ½ in. larger in diameter than the larger diameter of the design. A ⅛-in. edge is set off this, and a hole, which must not hc nearly so large in diameter as a

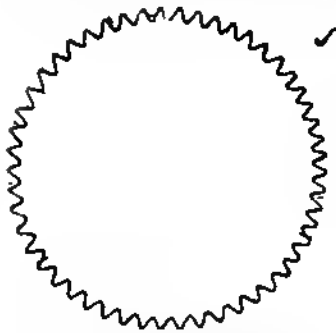


Fig. 230.—Corrugated Circle Paste-cutter.

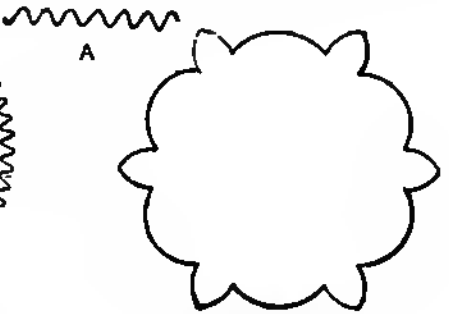


Fig. 231.—Geometrical Paste-cutter.

circle drawn to touch the inside points of the design, is punched in the centre. This will allow the paste to drop more freely out of the cutter. The design is then laid centrally on the ring, and soldered thereto. A handle (Fig. 229) for the

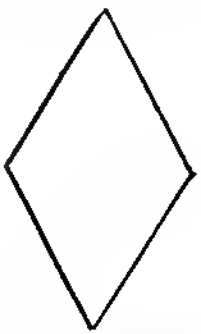


Fig. 232 —Diamond Paste-cutter.

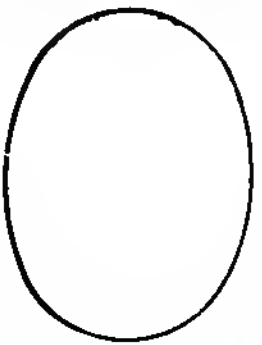


Fig. 233.—Oval Paste-cutter.

top is a hent strip of tinplate ahout ⅝ in. or ¾ in. wide. A ⅛-in. edge is set off and beaten down at each length-edge; the handle is then bent to shape and soldered on.

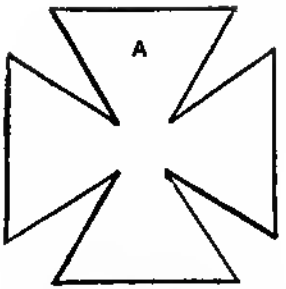


Fig. 234.—Maltese Cross Paste-cutter.

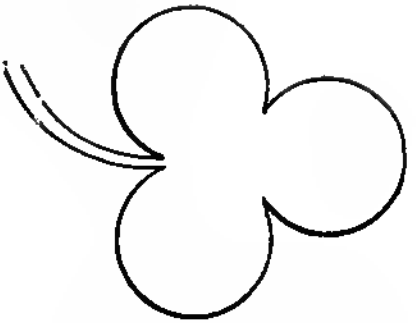


Fig. 235.—Leaf Paste-cutter.

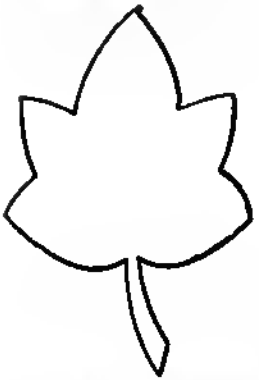


Fig. 236.—Leaf Paste-cutter.

Fig. 237.—Leaf Paste-cutter.

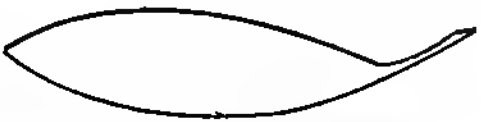


Fig. 239.—Leaf Paste-cutter.

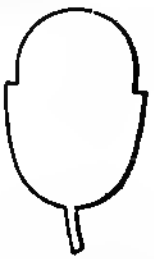


Fig. 240.—Acorn Paste-cutter.

Fig. 241.—Crescent Paste-cutter.

Fig. 238.—Leaf Paste-cutter.

Fig. 242.—Border Paste-cutter.

Fig. 230 represents a corrugated circle, the strip being waved, as at A, by being bent over a wire rod, alternately backwards and forwards; better still, pass it through any machine which has two small cog wheels. Special machines are used when making large quantities.

The strip required for Fig. 230 must be equal in length to the circumference, plus the lap, after the corrugations have been taken up. It is bent round and soldered, after which it may be finished as previously described. Figs. 231, 232, and 233 are made on the same principle as for Fig. 228, but Fig. 234 can be more conveniently made in four pieces, one of which is represented by A. In this case allow the seams to come at the four inner points. Figs. 235 to 239 represent different leaves, Fig. 240 representing an acorn, Fig. 241 a crescent, and Fig. 242 a border pattern, all of which are similarly made.

A few general hints are here offered. First, always have the proposed design plainly marked, preferably on wood, and work to it. Complex geometrical designs are best made in two, three, or even more pieces. This also applies to the intricate patterns of some leaves which are sometimes required; the stems, particularly, should be made separate from the leaves.

A crescent (Fig. 241) should be made of two pieces, the outer and the inner arcs, joined together at the ends. The top plate, on which the cutter proper is soldered, should approximate to the design of the cutter.

All the designs can, if preferred, be made corrugated, but extra lengths of strips will be required, owing to the amount taken up to make the corrugations. The designs could, of course, be supplemented indefinitely so as to include patterns of insects, animals, birds, fruit, flowers, etc., as well as geometrical designs not included in the accompanying designs.

CHAPTER X.

LAMPS AND LANTERNS.

Wall Lamp for Workshop Use.—The parts required for ths wall lamp about to bs described ars easily made, except the burner and screw collar, which can be purchased at any ironmonger's. A single or double chimney-burner will be suitable, but if a single burner is used, the wick should not be less than 1 in. wide. A sheet of two-cross charcoal tinplate 20 in. by 14 in. will bs large enough for all the parts.

Beginning with the back, mark a piece to the dimensions given in Fig. 243, cut it out, and turn back the edges to receive the wire. Straighten a piece of No. 12 B.W.G. iron wire, and bend it to the dimensions of the back, the ends butting togethsr in the centre of the bottom. After fitting the wire in position under the turned-down edges, fold them over, using a mallet or a square-face hammer, care being taken not to bruise ths back. A hole $\frac{3}{8}$ in. in diameter, should be punched 1 in. from the top, so that thc lamp can hang on a wall.

To form the hody of the lamp, cut a strip of tinplate to the measurements given in Fig. 244. Ths two narrow edges must be turned inside at right angles to the sides, to give the body additional strength, and to prevent it being drawn out of shaps in soldering. Measure off the width at the back, and tack the body in position level with the bottom, the wired part of the back being outside. Make the top and hottom of the body to Fig. 245, the edges being turned down at right angles, the hack edge fitting inside, the others to lap outside the body. Cut a hole $1\frac{1}{2}$ in.

in diameter in the top (as shown hy dotted line in Fig. 245) for the wick, and tack the top and hottom in position on the hody. These should fit exactly. Solder the parts together, and fix the

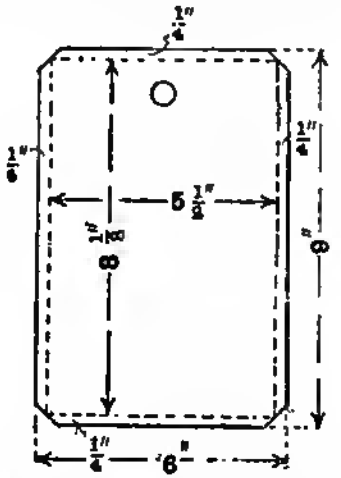


Fig. 243.—Back of Wall Lamp.

screw collar over the hole at the top, taking care that the winder of the hurner is in a convenient position for use. The lamp will then he completed.

A simple method of constructing a reflector for the lamp is shown hy Fig. 246. Cut a circle

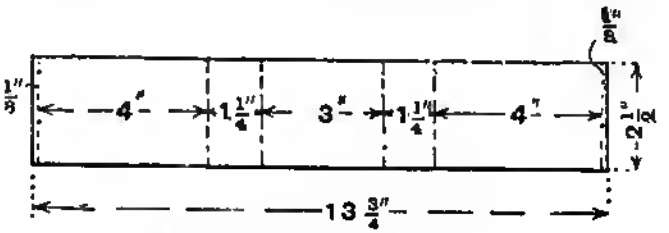


Fig. 244.—Body of Wall Lamp.

of tinplate 8 in. in diameter, and with compasses divide the outer edge into sections 1 in. wide. From these divisions draw lines to the centre, making twenty-two complete sections. Cut out

the large remaining section, and punch a ½-in. hole in the centre. The piece can then be drawn into a conical shape by placing on a sharp edge tool (preferably a hatchet stake), keeping the marked side at top, and with a mallet making a mark or ridge along each line. Do not mark it too deeply, or it will be drawn up too much for the purpose required, and in opening out again the sections will bulge inwards. Lap the two outer sections, and solder together at the back. Try the reflector on a level surface, and see that it is perfectly true. Then turn the edge out-

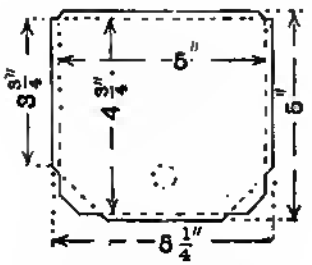


Fig. 245.—Top and Bottom of Wall Lamp Body.

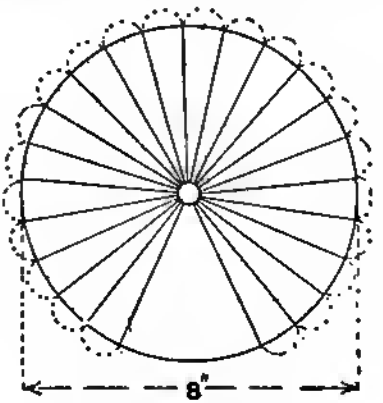


Fig. 246.—Section of Reflector before Turning.

wards for about $\frac{1}{16}$ in., and draw it over towards the back, but do not fold close. This will strengthen and improve its appearance if neatly done. If preferred, the outer edge may be scalloped, for which an allowance must be made in cutting out (see dotted lines, Fig. 246).

To support the reflector, a strip of tinplate 1½ in. long by 1 in. wide must be fixed to the centre of the back to cover the hole. This will slip into a piece soldered to the back of the lamp, allowing it to be easily removed for cleaning. One or two coats of enamel will finish the lamp and prevent rust.

Van or Cart Lamp.—A square-pattern lamp (Fig. 247) may he made to fix to the front of the van, so that there will he glass at the front and hoth sides, instead of only one side if it has a side fixing. The method of fixing the lamp is by a lug made at the hack of the lamp, which slips into an iron socket or staple, as shown in elevation (Fig. 248) and section (Fig. 249). These

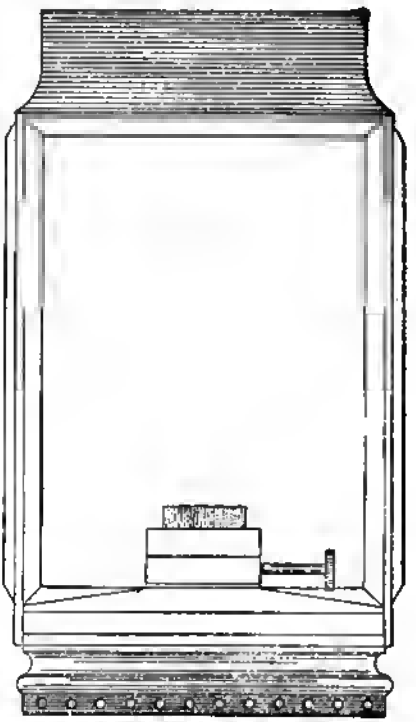


Fig. 247.—Van Lamp.

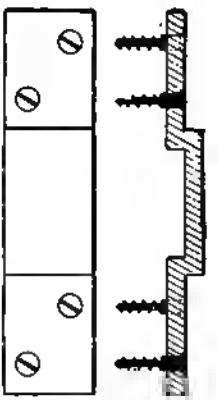


Fig. 248. Fig. 249.

Figs. 248 and 249.—Elevation and Section of Socket or Staple.

lamps are usually made to hurn oil, and should have stout hevelled glasses.

Good Cart Lamp.—Fig. 250 represents a useful cart lamp which can he made of sheet copper, hrass, or tinplate. Should copper or hrass he preferred, one side should be tinned with hlock-tin or solder, using killed spirits (chloride of zinc) or sal-ammoniac as a flux.

A pattern for the hottom is shown at Fig. 251, where A B C D represents the plan of the lamp bottom proper. The corners should he notched as indicated, and the centre should he perforated for

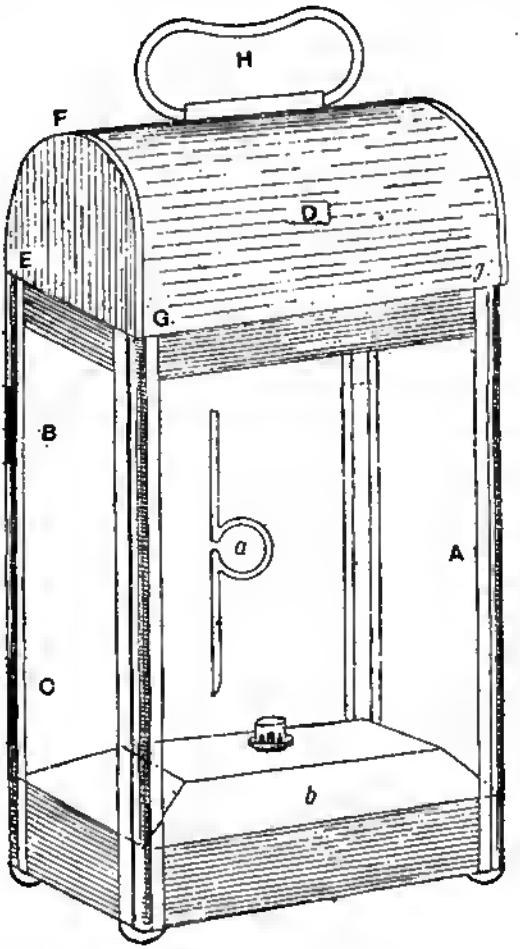


Fig. 250.—Cart Lamp.

ventilation hy punching the holes over a block of lead or hard wood, and then flattening the hurrs. The edges of the pattern are then set off at right angles to the hottom along the lines lettered.

Fig. 252 represents a pattern for the top of the body; this should he cut exactly the same size, and notched in the same manner as the bottom, but instead of the perforations, cut a hole A in the centre and a slot B and C on each side. Set off the edges as in the previous instance, and also a $\frac{1}{4}$-in. edge off the hole A in an outward direction.

Two front angle hars are now required, and can he made hy cutting strips of metal equal in length to A (Fig. 250) and ahout $\frac{3}{4}$ in. wide.

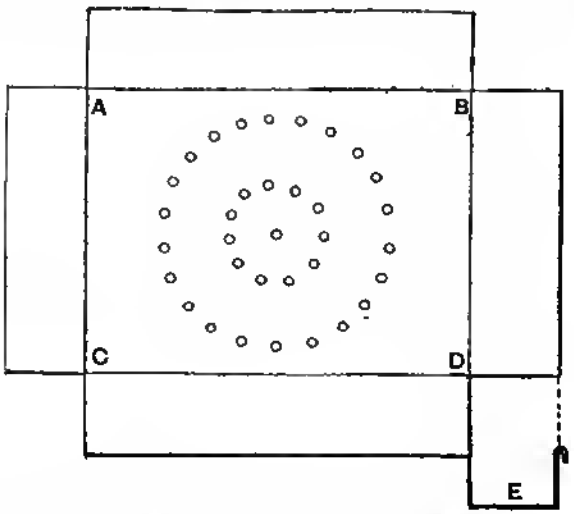


Fig. 251.—Pattern for Bottom of Cart Lamp.

These are hent over a hatchet stake, or, hetter still if availahle, under an angle hender, or in a folding machine.

Two half-round heads are now required to strengthen the angle hars, and are cut ahout $\frac{5}{8}$ in. wide and of the same length as the bars, and are hent to shape on a crease iron hy sinking them with a round iron rod. The two hack hars are cut the same length, and $\frac{1}{2}$ in. wider than the angle hars, and one is notched as at B and C for two hinges which carry the door. Both hars

are now edged, wired with No. 10 B.W.G. wire sunk on the crease iron. Set the compasses to $\frac{3}{8}$ in. and mark along the wired edges. These are now bent over the hatchet stake and flattened

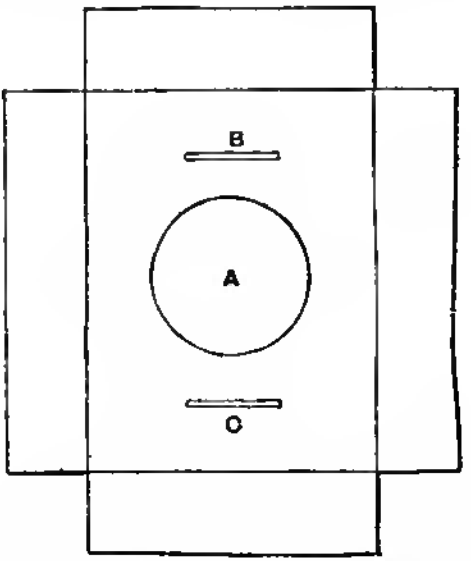


Fig. 252.—Pattern for Top of Cart Lamp.

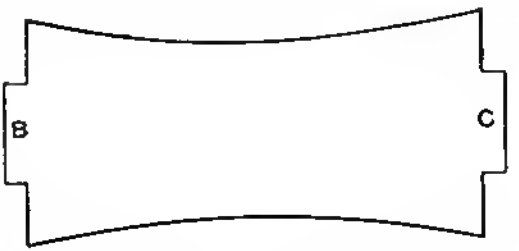


Fig. 253.—Pattern for Wind-guard for Cart Lamp.

down, thus forming a rabbet for the door. Cut two strips of metal, say 2 in. long, and equal in width to the notch B, Fig. 250, and wrap and sink them over the exposed wire at the notches for the hinges.

The body is now built up, care being taken

to get it true and square. First solder all the bars to, and flush with, the bottom, and then gently fit the top in position, and solder strongly together.

A piece of metal is cut to Fig. 253; sheet copper should be used for this, as it will best withstand the heat. Bend it to a semicircular shape, fit the projections B and C in the slots B and C (Fig. 252), clench them from inside, and solder

Fig. 254.—Lamp Door Clip.

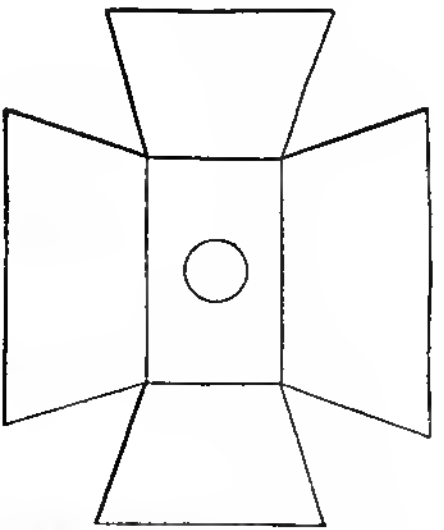


Fig. 255.—Pattern for Oil Container for Cart Lamp.

together. This makes an effective wind-guard for the hole A (Fig. 252).

For two runners, along which the bottom of the oil container is to slide, cut two strips of metal equal in length to B D (Fig. 251), and bend them to section E. They are soldered to the bottom of the lamp, one on each side, so that the small curved end of each fits close to the side, to which it is also soldered.

The top D (Fig. 250) has for its pattern a rectangle equal in width to the front of the lamp,

and in length to the circumferential measurement around E F G, plus working edges. Break the metal through the rollers, wire the two sides as E F G, cut a central slot for the handle H (which

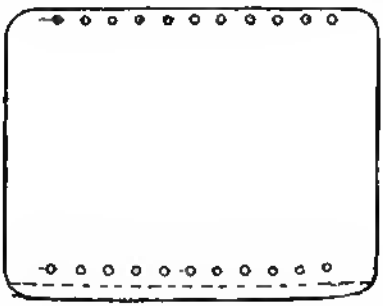


Fig. 256.—Oil Container Bottom.

is of No. 8 B.W.G. brass wire, plated with metal to form a hinge), bend to shape, and set off inwardly a ¼-in. edge along the line G *g* and the corresponding edge.

The hinge of the handle is pushed through the slot and clenched inside, after which it is secured with rivets and the top is soldered to the body of the lamp. The two front heads are sol-

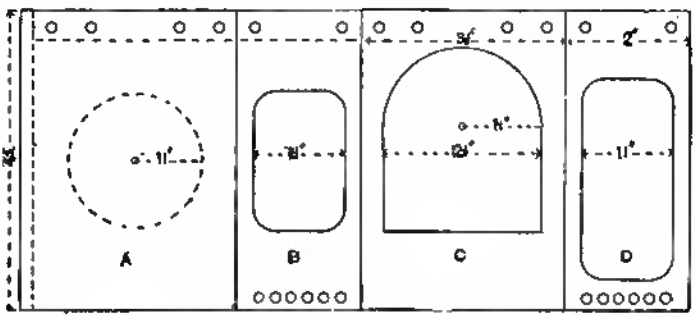


Fig. 257.—Body Pattern of Hand Lamp.

dered to the angle bars, and four small hollowed studs are attached to the corners of the lamp underneath.

The door is cut the same size as the back of the

lamp, plus working edges; the top and hottom are wired, and edges are set off the remaining sides, hut in an opposite direction, and at right angles to the door, so that they will fit the rahhet. Bend a piece of 2-in. stout hoop iron to Fig. 254, and rivet it to the door to serve as a clip.

A circular electro-plated reflector is soldered to the inside of the door; the door is placed in position, and the hinges are secured and strongly soldered to it. A holt *a* (Fig. 250) is made of No. 10 B.W.G. hrass wire, and three tuhes are made to fit it easily. Two of these tuhes and the holt are attached to the door, and the other

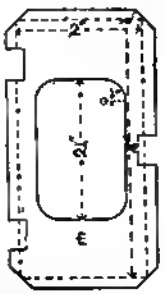


Fig. 258.—Door for Hand Lamp.

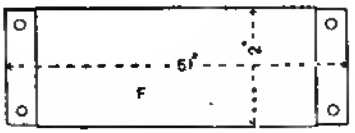


Fig. 259.—Inner Arch Top of Hand Lamp.

tuhe is fastened to the lamp, hy which means the door is held closed.

A pattern for the oil container *b* (Fig. 250) is shown at Fig. 255. Get a 1-in. hurner for colza oil, that is, one which will take a 1-in. wick, and cut a hole in the centre of Fig. 255 to suit it. Bend the pattern to shape, solder the corners from the inside, and fix the hurner. This is now soldered to Fig. 256, which is a piece of stout metal cut to slide along the runners in the lamp, and perforated; it is wired along the dotted line, which is the front edge. The perforations, while heing sufficient, prevent excessive draught.

The glass, if plain, can he attached hy means of tahs or small heads inside; if bevelled, it would

he better to bead it with metal and solder from the outside. Finally, rub a little putty along the edges of the glass and where it comes in contact with the metal, then thoroughly clean the lamp, and give it two coats of suitable paint.

Hand Lamp.—Patterns for a hand lamp in tinplate are illustrated by Figs. 257 to 264. Fig. 257 shows the body pattern; Fig. 258, the door pattern; Fig. 259, the inner arched top pattern; Fig. 260, outer arched top pattern; Fig. 261, lamp bottom pattern; Fig. 262, reservoir pattern; Fig. 263, reservoir bottom pattern; Fig. 264, section of plated wire handle. In arranging the constructional details for a small hand lamp which

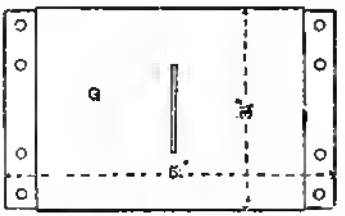


Fig. 260.—Outer Arched Top for Hand Lamp.

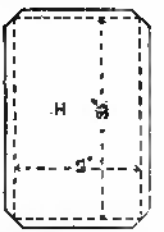


Fig. 261.—Hand Lamp Bottom.

could be conveniently carried in a coat pocket, care should be taken to avoid as far as possible any useless ornamental projections on the sides of the lamp, and so ensure compactness.

To construct a lamp of this description in tinplate, first set out the diagrams to the sizes given. Fig. 257 represents the pattern for the body of the lamp, A C being the back and front, and B D the sides. Cut out the body, and also the spaces set out upon it which are intended to receive the glasses. Fold over the lap on A (indicated by a dotted line) upon a hatchet stake or in the folding machine until it forms a right angle; then bend over the plate upon the same tool along the line which separates the back and side A B until

the hack forms a right angle with the side. Repeat this operation upon each division line, and this will bring the body to a rectangular shape, the end D lying over the lap folded on the back A to form the seam.

Next solder this down neatly and strongly; then proceed to fix the glasses in position. Begin by folding at right angles a number of short narrow lengths of tinplate, making the depth of the fold equal to the thickness of the glass.

Lay the glass on the inside of the body over

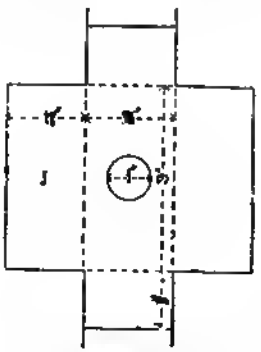


Fig. 262.—Reservoir Pattern for Hand Lamp.

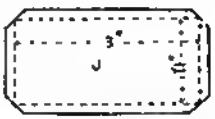


Fig. 263.—Reservoir Bottom.

Fig. 264.—Section of Plated Wire Handle.

the open spaces already cut; place the narrow angle pieces in position around and overlapping the edges of the glass, then solder them neatly to the body.

If bevelled glass is used for the front, a neat finish may be made by soldering a wire around the aperture before placing the glass in position. A small head is also used for this purpose, the head being fitted closely to the edge of the glass, and then carefully soldered to the face of the lantern; or where quantities of one pattern are made, the head around the aperture is stamped upon the material. Form a small head across from notch to notch at both ends of the pieces F and G, Figs. 258 and 259, by countersinking with

a wire in a crease of suitable size in the creasing iron, and turn the arched top F until its length equals the length of the top of the lamp, then rivet it through the holes marked to the top of the sides B D.

Turn the outer top G to a regular curve, leaving the sides bulged out sufficiently for a clear space to be left between the sides of G and the ends of F. Place G in position, its curved surface passing over F from the front to the back of the lamp, and rivet it with small rivets to both the front and back.

If a silvered copper reflector is to be used (purchasable ready for use from most dealers in lamp fittings), it should, for convenience in cleaning, be made removable. This can be effected by soldering a small tongue-shaped clip upon the back of the reflector, and bending up both sides of a second piece of tin so that it just lays over the tongue-shaped clip. Solder it on the inside of the back (the position of the reflector is indicated by the dotted circle on A) so that the reflector can be hooked upon it.

After cutting out the bottom H and door E, fold H up square along the dotted lines, and make it fit tightly the bottom of the lamp body. Before finally fixing it by soldering it on, solder a strip of metal along the inner dotted line, so that when the reservoir is placed inside the lamp, it will, if fitted closely, be held steadily in position.

Fold the door along the dotted lines for wiring; cut straight wires equal in length to the sides and ends of the door, and, placing one wire at a time under the folds, close the folds down over the wires with a mallet on the flat side of the creasing-iron. When the wired edges are straight, countersink them in a suitable crease.

Cut three slips of metal exactly equal in width to the spaces marked on the sides of the door; place these strips of metal through the narrow

spaces between the wire and the back of the cut, and double them over the wire. Then countersink each piece where it covers the wire and cut off the superfluous length of metal on the two pieces which form the hinges. Fasten the glass in position on the door, as described when dealing with the body, then place the door on the side D, and solder the two hinges to the side of the body. With the round-nose pliers curl the double strip of metal plated on the centre of the opposite side of the door until it will, when passed over the edge of the back of the lamp, snap tightly, and fasten the door.

The reservoir is shown in the flat by the diagram I (Fig. 262). Bend the sides and ends up square, and solder down inside the reservoir, the angles formed by the sides and ends mitreing. Turn up the edges square around the reservoir bottom J, and place it inside the reservoir flush with the bottom edges of the ends of the reservoir, and solder it in sound.

Fit the bottom half of the brass burner in the hole in the centre of the top and solder it in. When the reservoir is placed inside the lamp, it will be seen that the bottom is raised at the ends, just clear of the ventilation holes in the body; this being done so as to prevent a sudden gust of wind affecting the flame through the holes. A swing handle of wire is convenient for a lamp of this type; so bend a length of wire to an oval or an oblong shape to a convenient size, and then cut a piece of metal equal in width to the length of the slot shown in Fig. 260. Double the metal over one of the long straight sides of the wire handle, and countersink it. Pass the two ends of the metal through the slot and open them; then lightly fasten the plated part of the handle in a vice and flatten the ends of the metal as shown in Fig. 264; the arched top carrying the handle is then placed in position.

Bull's-eye Lantern.—The bull's-eye lantern illustrated by Fig. 265 is made of tinplate. The pattern for the body is shown by Fig. 266, the

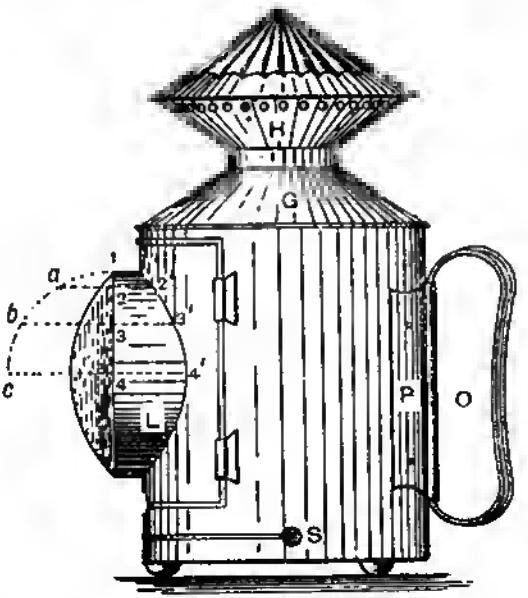


Fig. 265.—Bull's-eye Lantern.

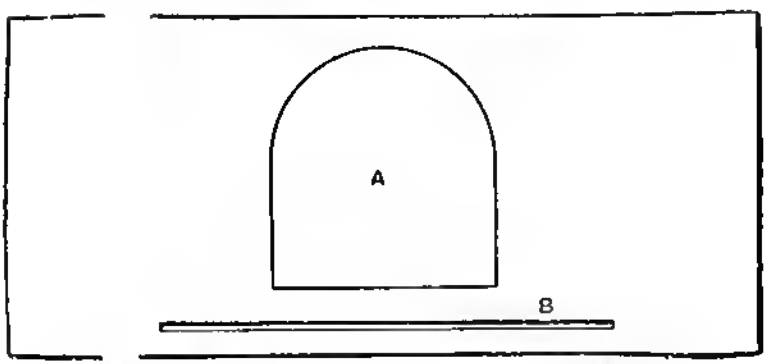


Fig. 266.—Body Pattern of Bull's-eye Lantern.

parts A and B being cut out. A is the opening for the door at the front of the lantern, while the slot B enables the inside to be turned so as to give a red backing to the light, or to cut off

the light from the lens altogether, as desired. The top of the body pattern is first wired with No. 12 B.W.G. wire, then rolled to shape, and soldered down the seam. Working edges are not shown on the patterns, these being additional.

The pattern for the bottom is shown by Fig. 267, where the inner circle represents a disc of

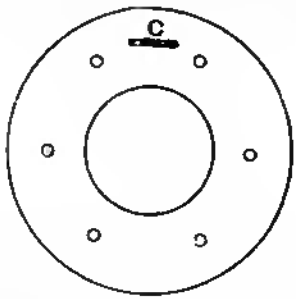


Fig. 267.—Pattern for Bottom of Bull's-eye Lantern.

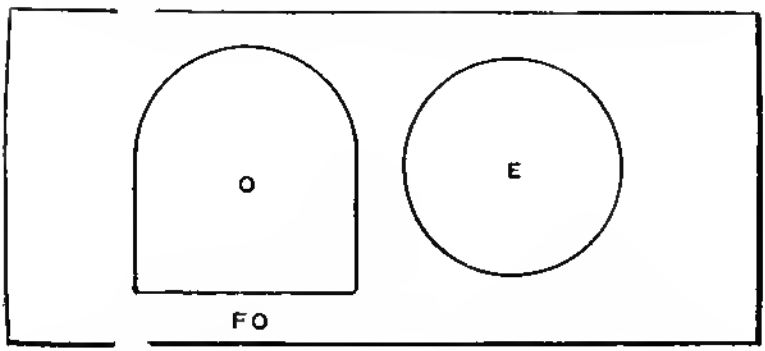


Fig. 268.—Pattern for Shade of Bull's-eye Lantern.

tin, edged and soldered in position, to carry the oil-container or burner, thereby raising it a little from the ventilation holes.

A stout piece of tinplate, 2½ in. long by ¾ in. wide, with a wire soldered down the centre lengthwise to stiffen it, is soldered firmly at C. This is to hold the oil-container in position. The bottom is then fitted to the body, and soldered on.

The pattern for the body of the inner lining, or shade, is shown at Fig. 268. D and E are cut out, and a hole is punched at F to accommodate the pin of the knob (Fig. 269). This, when rolled

Fig. 269.—Sliding Knob.

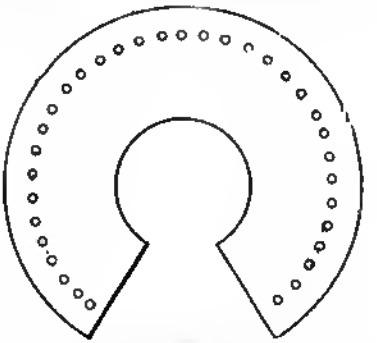


Fig. 270.—Pattern for Parts G and H (Fig. 265).

to shape and soldered firmly down the seam, should be not less than $\frac{1}{8}$ in. smaller in diameter than the body of the lamp, so that it will turn freely in it. Along the top, set off an edge outwards, and turn the bottom edge slightly inwards.

The pattern for the parts G and H (Fig. 265) is shown at Fig. 270; only one is perforated for ventilation. The smaller ends of both are edged, fitted together, and soldered. A strip of tinplate

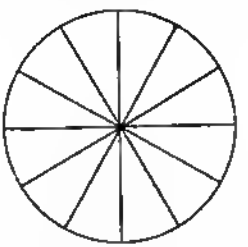


Fig. 271.—Pattern for Top of Bull's-eye Lantern.

is afterwards bent to shape and soldered over the joint, as in Fig. 265. G is edged or creased to fit the top of the inner lining, and then paned on and soldered round. A disc of tinplate is

hollowed for the top and edged to fit H. A hole is cut in the centre of this of a diameter equal to the radius of the disc, and edged outwards.

The pattern for the extreme top of the lan-

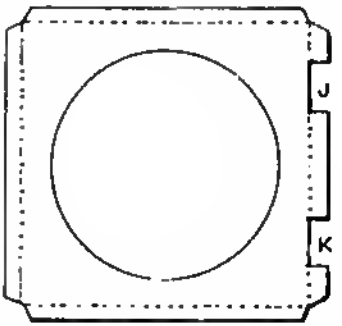


Fig. 272.—Door Pattern for Bull's-eye Lantern.

tern is shown at Fig. 271, which is a circle with a number of radial lines marked on it. First strike across a hatchet stake along the radial lines, then reverse the disc, and bend over a small round tool the distances between the lines, and at the same time work it into a cone until of the required form. These tops are usually stamped by machinery, but a good job can be made by the foregoing method if care is taken. Secure this with three small copper rivets to the hollowed disc, and solder them in position.

The pattern for the door is shown by Fig. 272, where the dotted lines represent working edges,

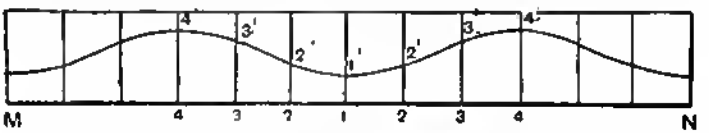


Fig. 273.—Pattern for Lens Holder.

the notches J and K being made for the hinges. The four edges having been wired, the door is curved to fit the body of the lamp, and two straps of metal are bent over the exposed wire

at the notches to form the hinges. The diameter of the hole in the centre of the door should equal that of the lens to be inserted; a 2-in. to 2½-in. lens would be suitable.

The lens-holder pattern L (Fig. 265) is shown by Fig. 273. To set out this pattern, first draw the elevation as at L (Fig. 265); with 4 as centre and 4 1 as radius, draw a semicircle (only half is shown here, to avoid confusion), and divide it into six equal parts as at 1, *a*, *b*, *c*, etc. From these points of division draw lines at right angles to the line 4 1 until they intersect as at 1′, 2′, 3′, 4′. Now along the lines M N (Fig. 273), step off with the compasses twelve distances, each equal to the distance 1 *a* (Fig. 265), and mark the lines 1 1′, 2 2′, 3 3′, 4 4′ (Fig. 273) to coincide with those in Fig. 265. A curved line drawn through the points of division gives the required pattern. Turn this to shape, solder the seam, and then set off the straight end a small edge inwards, so that when the lens is dropped in from the other end the edge will lie closely on it. The lens is held in position with a ring of thin wire, about No. 16 B.W.G., pushed close to it and soldered to the holder. The lens-holder is soldered to the door, care being taken to prevent warping; and the door is soldered by the hinges to the lamp, as shown in Fig. 265.

The handle O (Fig. 265), which consists of two pieces of No. 10 B.W.G. wire bent as shown, is riveted to the lamp diametrically opposite the door by means of the strap of metal P. Three small hollowed studs are fixed to the bottom, so that when the lamp stands on a flat surface air will have free access to the holes underneath.

The fastener for the door is made of No. 10 B.W.G. brass wire, as shown at Fig. 274, fitted loosely in pieces of small tube; two (in which the fastener is secured) on the door and one below these on the lamp.

The pattern for the top of the burner is shown by Fig. 275, where Q is a hole for the wick-holder, and R a hole for the feeder screw. A bottom is cut to the same shape, both are edged, and a strip of tinplate $\frac{3}{4}$ in. wide is bent to fit them. Solder the wick-holder and feeder screw in position, and then solder the top and bottom to the rim. A strip of tinplate is edged to form a slide for the upright C (Fig. 267), which holds the burner in position and is soldered to the back of the burner.

A $2\frac{1}{2}$-in. circular reflector is bent half round

Fig. 274.—Door Fastener for Bull's-eye Lantern.

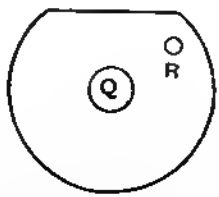


Fig. 275.—Pattern for Top of Oil Container or Burner.

and soldered to the top of the burner; it is also fixed to the slide, thus forming a support for both.

A piece of ruby glass, slightly bent to the shape of the shade, is fixed inside by means of tabs over E (Fig. 268).

Put the shade inside the lamp, and fix the knob to both through S (Fig. 265), with one nut on each side of the shade, so that the shade may be freely turned by the knob. Three small clips are made and soldered on the lamp, two on the door and one above the handle, to hold the shade in position when the door is shut and the lamp ready for use. When the door is opened, the two clips attached to it are consequently released

from the shade; if required, the shade can easily be released and withdrawn.

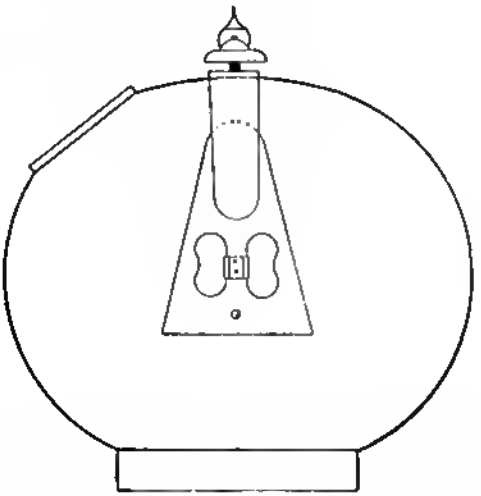


Fig. 276.—Side Elevation of Lamp for Binnacle Cover.

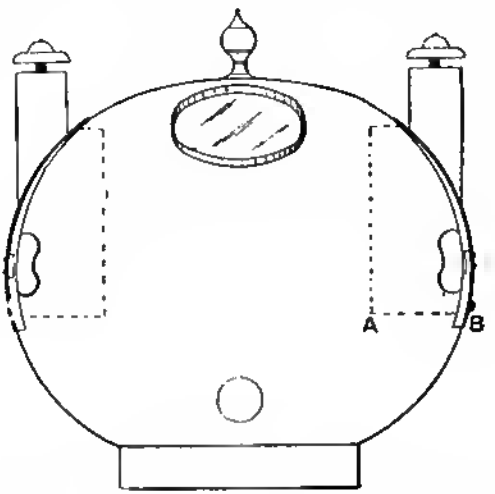


Fig. 277.—Front Elevation of Lamp for Binnacle Cover.

The lantern, burner, and shade should be cleaned with turps and whiting, and polished with dry whiting, after which the outside of the

riveting the handles on, the back piece may be pened on to tbe body.

Lamp for Binnacle Cover.—Presuming the hole is eut in the binnaele eover to admit the lamp, proeeed to make the body of the lamp. From a side elevation, as shown in Fig. 276, measure the length round the inside of the hole. Now get the length of A B (Fig. 277), whieh is a front elevation of the eover. These measurements give the size to whieh tbe brass for the body

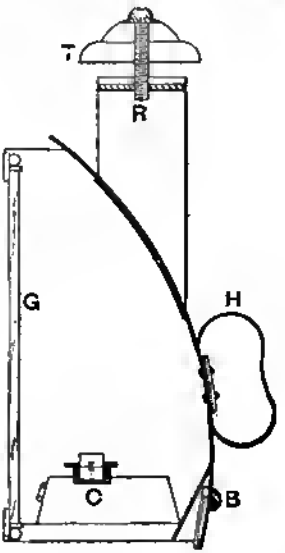


Fig. 278.—Enlarged Section of Lamp for Binnacle Cover.

should be eut. The front or inside edge of the lamp body must be wired before it is bent to shape; therefore allow, say, an inch above A B, as some will have to be cut off the other end. Make the body up, put it into position, and mark round the outside. Allow about $\frac{3}{16}$-in. edge all round, and eut off the superfluous stuff.

To get the piece for the back or outside of the lamp, eut a piece of brass about an ineh larger all round tban tbe aperture in the eover. Bloek

it to fit, hold it in position, and mark off inside. Allow $\frac{3}{8}$ in. all round this mark, and cut off the remainder. A $\frac{3}{16}$ in. edge is turned toward the inside and paned over the edge allowed on the body. Before fastening to the body, a catch must be fixed to the lower part. It works in a slot, so that when the lamp is put in its place the button on the outside is pressed down, causing the bolt—to which the button is fastened—to project inside the binnacle cover (see section, Fig. 278). When the outside is fastened to the body,

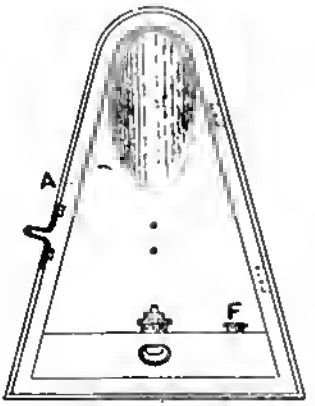


Fig. 279.—Door of Lamp for Binnacle Cover.

Fig. 280.—Lens Rim for Lamp Door.

a piece of brass is bent and soldered over the catch inside.

The regulator consists of a brass tube R (Fig. 278), about $1\frac{1}{2}$ in. diameter, with a bar across near the top. In the centre of the bar is a hole, tapped to receive a screw attached to the brass top T (Fig. 278), which can thus be raised or lowered. The pipe R (Fig. 278) is swaged and turned down inside the back piece. Make two brass wire handles of the shape shown at H (Fig. 278). Now cut a piece of sheet brass long enough to fold over each handle at either end, and leave sufficient room to rivet (see Fig. 276). After

riveting the handles on, the back piece may be paned on to the body.

The door of the lamp consists of a piece of stout brass cut as shown in Fig. 279. On the inside is soldered a rim x (Fig. 280), which fits nicely into the front of the lamp. Inside this rim fits the glass, which is held in its place by pieces soldered to the rim. The hinges may he made when the body is being made, or they can go on the outside. The door is fastened with a draw-wire, as shown in Fig 279.

The cistern c (Fig. 278) is an ordinary hand-lamp cistern, with $\frac{5}{8}$-in. flat wick, brass feeder screw, and projecting pieces at either side, which run in grooves soldered to the sides of the body. g (Fig. 278) is the glass in the door, and b the button for the catch. These lamps are made in brass throughout and tinned inside.

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