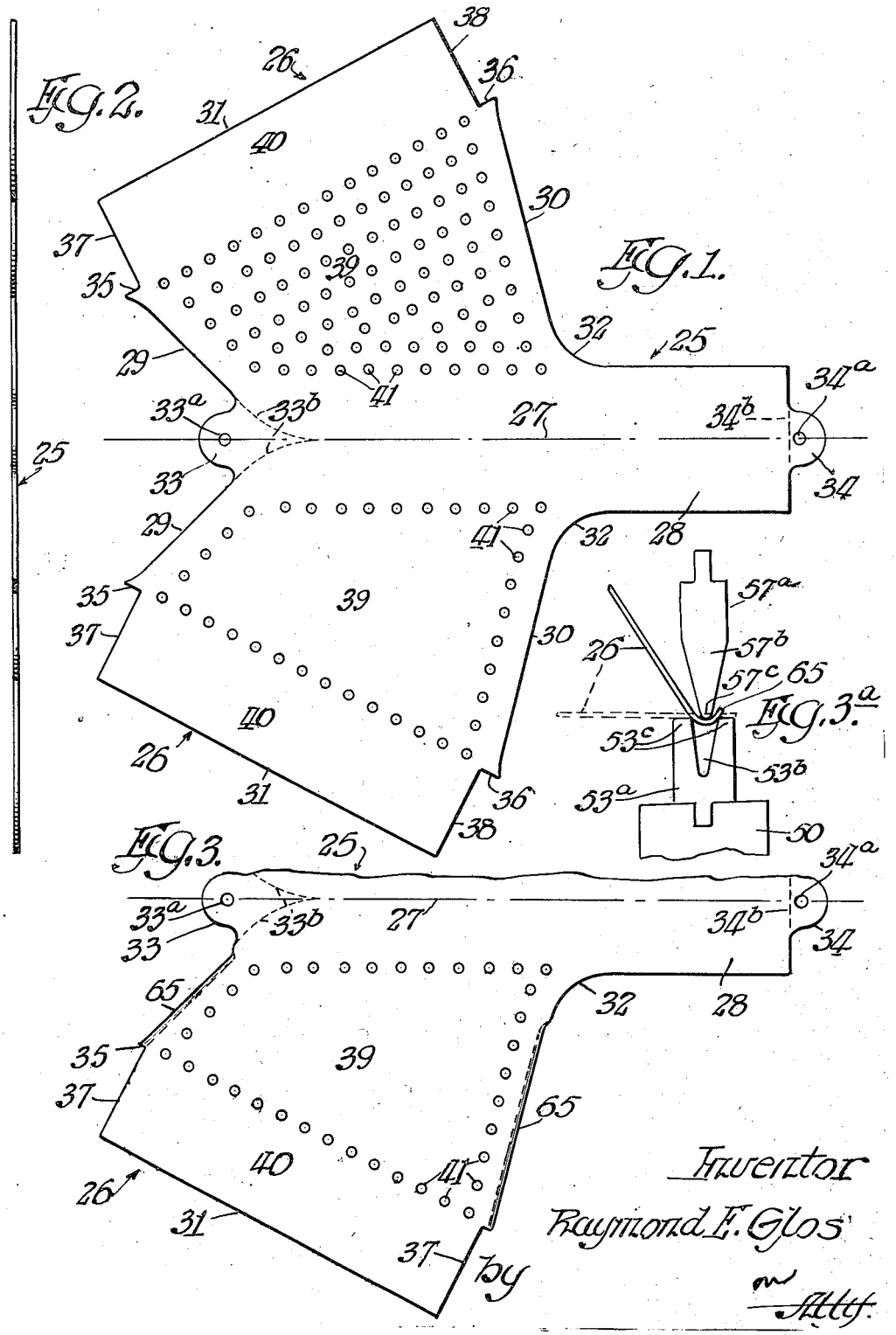
Sept. 27, 1949. R. E. GLOS 2,483,091

METHOD OF MAKING THERMIC SIPHONS

Filed April 5, 1945 5 Sheets-Sheet 1



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METHOD OF MAKING THERMIC SIPHONS

Filed April 5, 1945 5 Sheets-Sheet 2

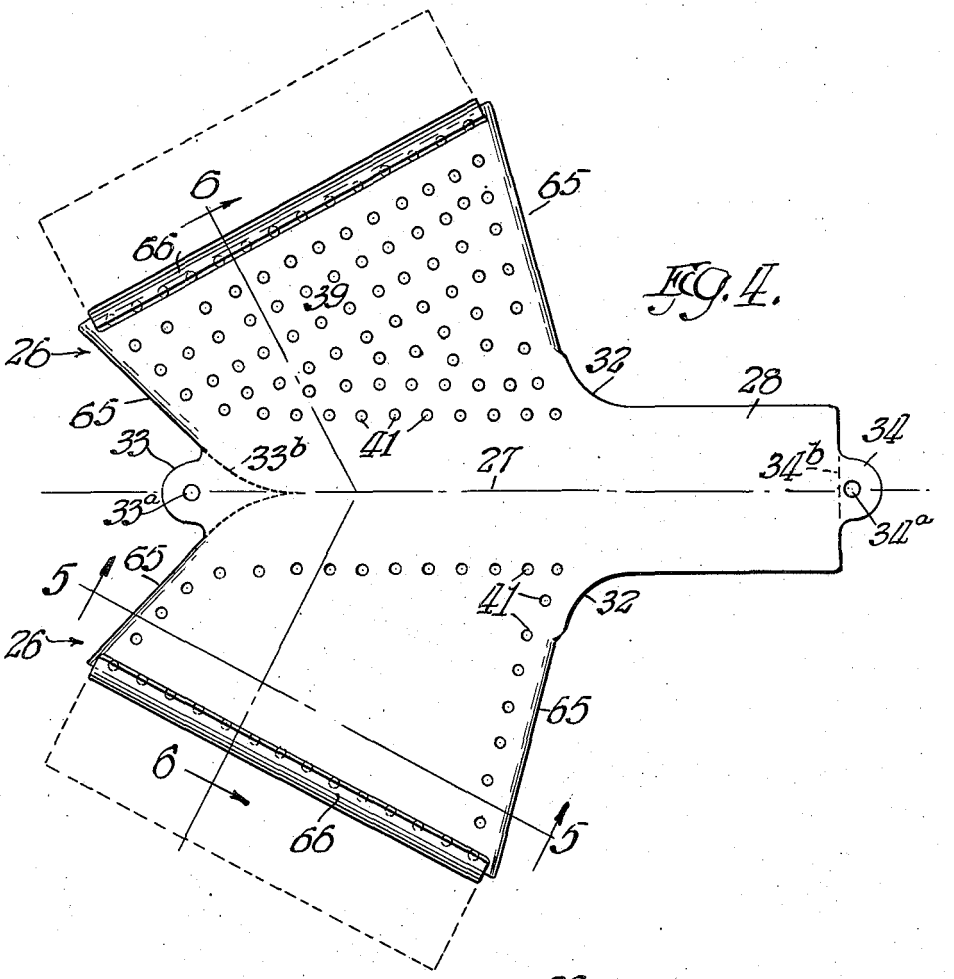

FIG. 4.

FIG. 5.

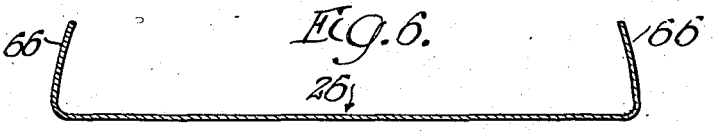

FIG. 6.

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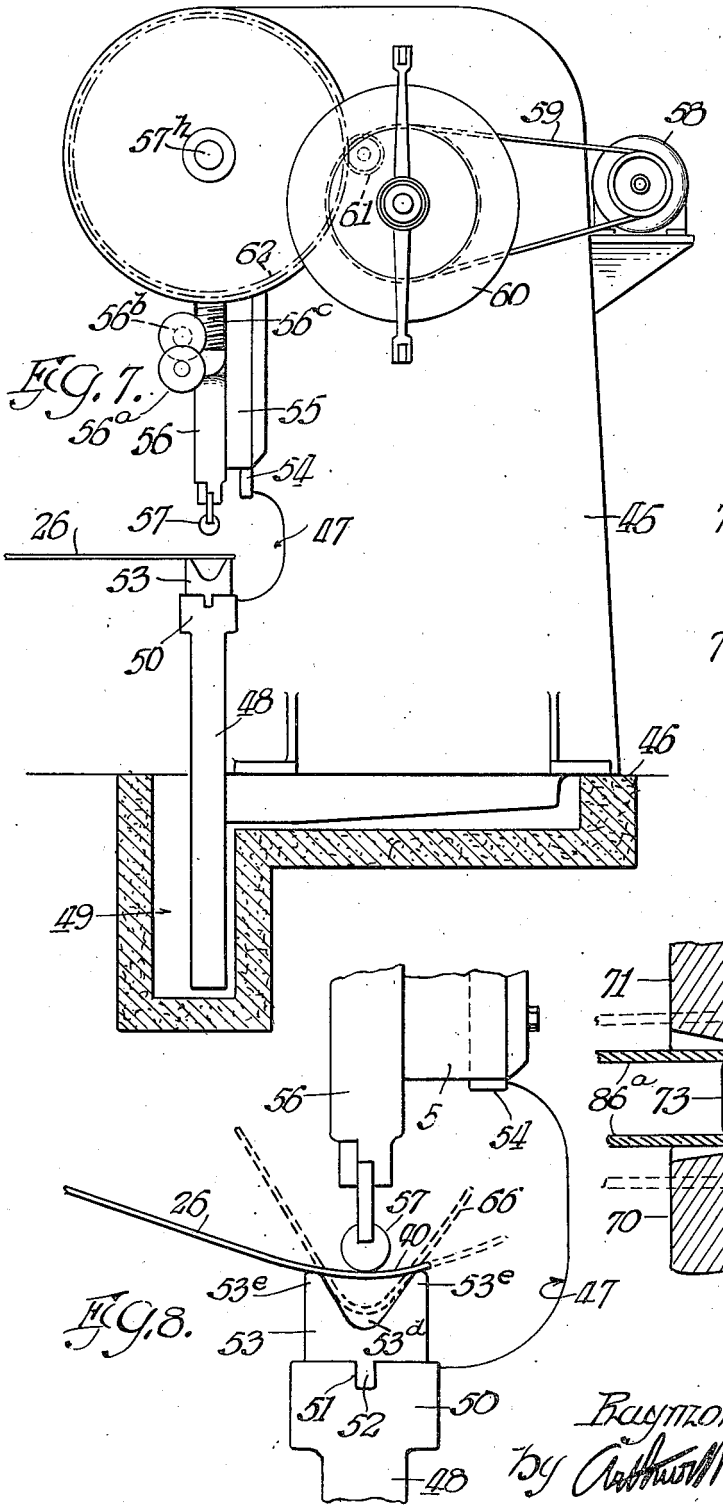

FIG. 7.

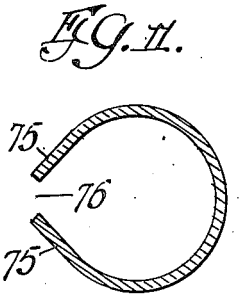

FIG. 11.

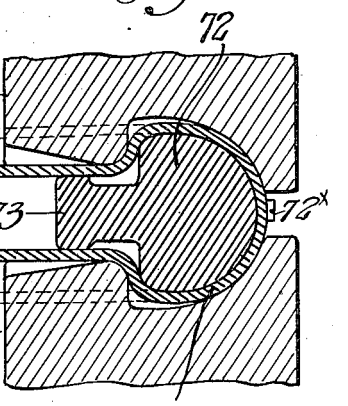

FIG. 10.

FIG. 8.

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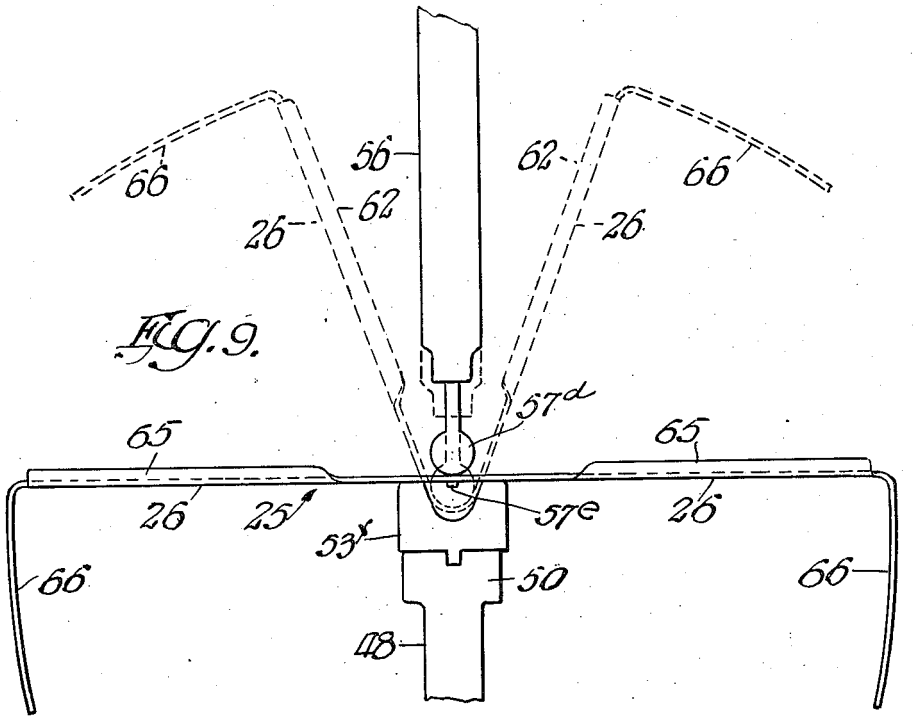

FIG. 9.

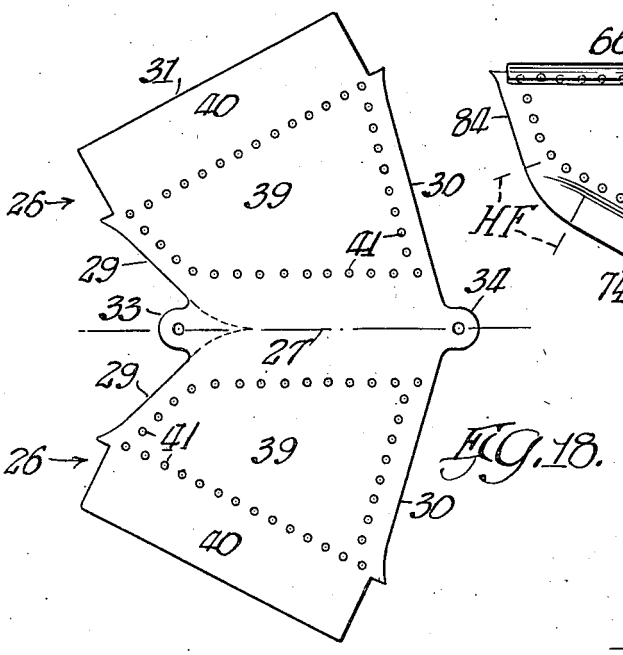

FIG. 18.

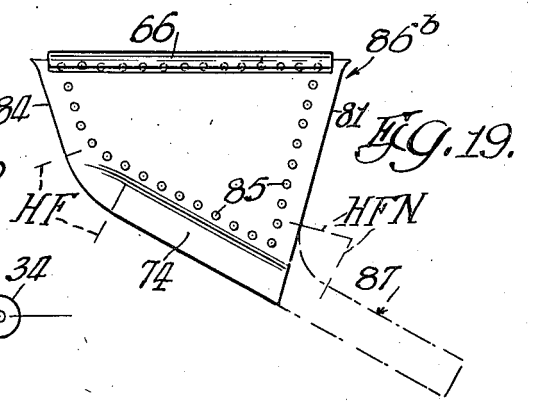

FIG. 19.

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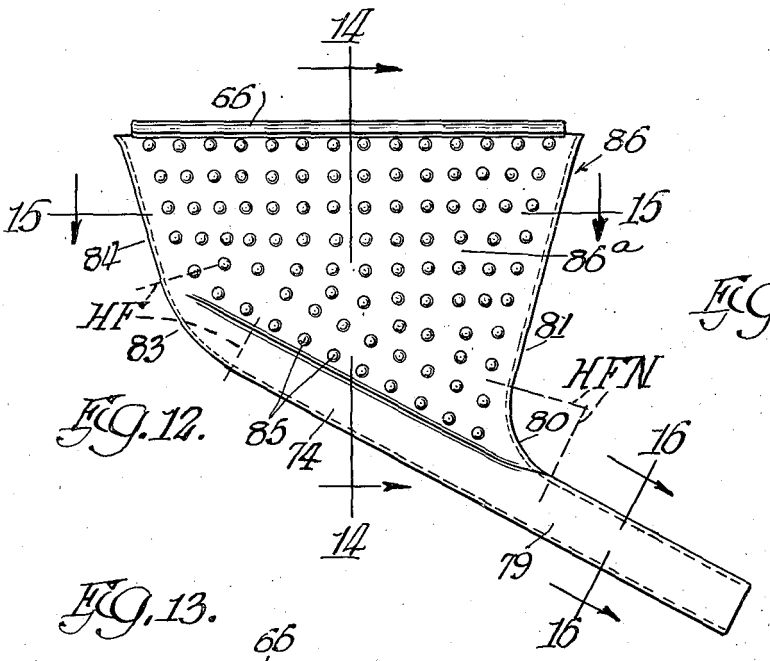


FIG. 12.

FIG. 13.

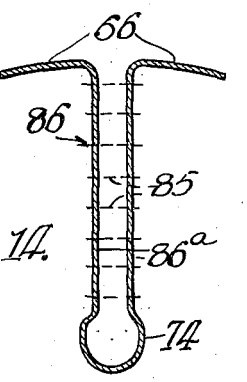
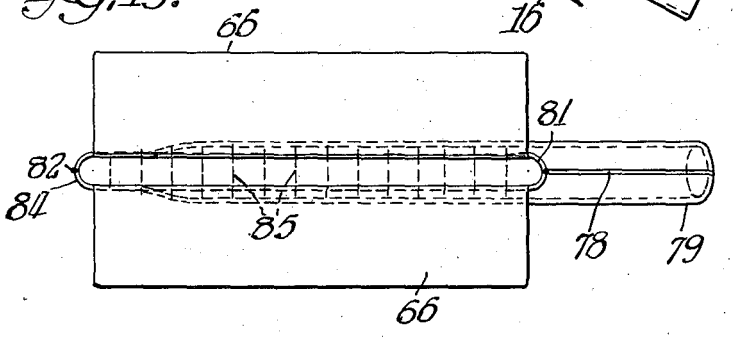


FIG. 14.



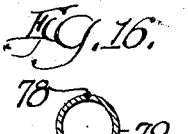


FIG. 16.

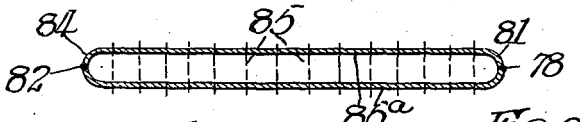


FIG. 15.

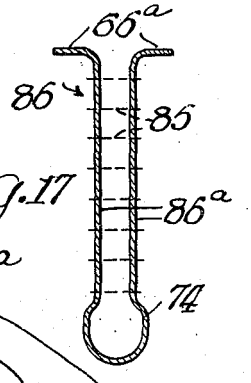


FIG. 17.

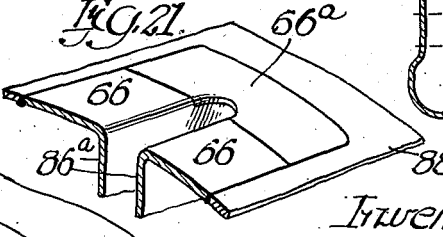


FIG. 21.

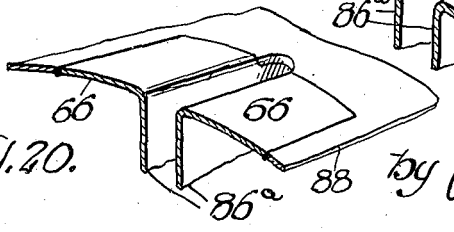


FIG. 20.

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Patented Sept. 27, 1949

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UNITED STATES PATENT OFFICE

2,483,091

METHOD OF MAKING THERMIC SIPHONS

Raymond E. Glos, Freeport, Ill., assignor to Locomotive Firebox Company, Chicago, Ill., a corporation of Delaware

Application April 5, 1945, Serial No. 586,806

1 Claim. (Cl. 153—3)

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This invention relates to improvements in methods of making thermic siphons and it consists of the matters hereinafter described and more particularly pointed out in the appended claim.

The term "thermic siphon" is herein used to designate a structure or element particularly adapted for use in a locomotive boiler type of firebox for increasing the water circulating and steaming efficiency of the boiler as a whole, and is well known in the art. One form is the so-called Nicholson thermic siphon, which is somewhat of an irregular triangular shape. This particular design will be referred to for illustrative purposes. Such thermic siphons, while they may vary considerably in size, shape and structural form, usually comprise a flat hollow body of generally triangular shape, having an opening at the top, which when the siphon is installed in the boiler firebox communicates with the water space over the crown sheet. Frequently the upper part of the siphon terminates in flange portions which are designed to be united to the crown sheet as by welding. These flanges may be of various widths depending upon the particular installation. The flange along one side may be considerably wider than that along the other. The crown sheets of locomotive boilers are cambered or arched more or less depending upon the particular locomotive boiler size and design. Furthermore the curvature of the crown sheet is usually one having a much smaller radius adjacent the side sheets than in that portion of the crown sheet centrally of the side sheets.

It is usually desirable to obtain as much heating area in the siphon as possible, so that there is considerable variation in the shape of the body, even within its generally triangular configuration. Thus in many instances the siphon body is provided with front and rear rounded walls of different heights, the rear wall being relatively shorter than the front wall of the same siphon.

Generally the siphon is formed to coact in supporting the firebrick of a refractory brick arch and to this end is provided with a bulged bottom which in turn is preferably curved on its under side and somewhat flattened along upper portions to form better supporting surfaces for the firebrick. In many instances it is also desirable to have the bulge terminate by merging into the rear of the siphon at the rounded corner sometimes termed the "nose."

The siphon body is connected to the lower part of the boiler firebox by an inlet neck. Generally

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the inlet neck is made as an integral part of the body although it may be made separately therefrom and be constituted by a piece of seamless tubing that is welded to the body as a continuation of the front end of the bulged bottom.

By reason of their peculiar construction and irregular triangular shape, and the many variables which enter into their manufacture, such siphons have heretofore been difficult to make and have required a large amount of hand shaping and forming. As heretofore made a blank which has been cut to a patterned shape was positioned upon a mandrel or horse and then folded by means of heavy folding wings, as of the type shown in the Hawley Patent 1,676,733 of July 10, 1928. Apparatus of this kind is indeed of a "special" character, is relatively slow in operation, is difficult to manipulate without causing disalignment of the staybolt holes, does not form the flanges and generally requires many subsequent operations by hand tools, which increases the cost of production and tends to nonuniformity in the finished article making installation in the firebox difficult as there are usually several siphons in a single firebox.

One of the objects of the invention is to provide a novel method of producing siphons and which method consists in the performance of certain operations in such sequential order that the production of siphons is simplified.

Another object of the invention is to provide a novel method of producing a siphon in which practically all of the steps necessary to form the siphon to its final shape may be performed by means of relatively reciprocating die parts which need engage only limited portions of the siphon structure and hence may be of simple easily constructed shape.

Again it is an object of the present invention to provide a novel method whereby substantially all of the steps of forming parts of a siphon blank, as well as bending it into shape for the welding operation, may be carried out by means of dies in connection with a conventional press brake.

A further object of the invention is to provide a method of and means for making siphons which is faster than methods heretofore employed and which results in greater accuracy and uniformity in the finished siphon, requires fewer hand operations, less heating of localized areas and which materially reduces the costs in making the finished siphon.

The above mentioned objects of the invention, as well as others, along with the several advan-

tages thereof will more fully appear as the specification proceeds.

In the drawings:

Fig. 1 is a plan view of a flat patterned metal plate blank from which a thermic siphon, including a body and integral inlet neck, may be made in accordance with one embodiment of the invention.

Fig. 2 is an edge view of one end of the blank appearing in Fig. 1.

Fig. 3 is a plan view of a fragment of the blank of Fig. 1 after marginal portions along the two side edges of the wings of the blank have been operated upon by dies in a press brake, to form such portions into curved flanges projecting from one side of the blank and which flanges later coact to form the front and rear end walls of the siphon body.

Fig. 3*a* is a detail view in end elevation of parts somewhat similar to those in Fig. 8 but showing the dies for carrying out the initial forming step of the method in flanging over marginal portions of the blank along the side edges of the wings thereof as shown in Figs. 3 and 5 respectively.

Fig. 4 is a view of the blank after a marginal portion along each end edge of the wings of the blank has been operated on by dies in the press brake to form such portions into flanges projecting from the other side of the blank and which flanges later provide the top end flanges for the siphon body.

Figs. 5 and 6 respectively, are sectional views through the blank appearing in Fig. 4 as taken on the lines **5**—**5** and **6**—**6** respectively and on the scale of Fig. 4.

Fig. 7 is a view in end elevation of a conventional type of press brake that may be advantageously used in carrying out the steps of the improved method of making siphons.

Fig. 8 is a view in elevation of the throat portion of the press brake appearing in Fig. 7, on a somewhat enlarged scale, and with some of the parts in a position different from that appearing in Fig. 7.

Fig. 9 is an end view of fragments of the bed and ram of the press brake of Fig. 7, showing in full lines, in end elevation, the blank appearing in Fig. 4 in position upon the bed of the brake and showing said blank in dotted lines after it has been bent along its longitudinal medial line by means of the dies of said brake.

Fig. 10 is a vertical detail sectional view on an enlarged scale, showing the step of forming the bulge for the bottom of the siphon body and which step is performed subsequent to the step appearing in dotted lines in Fig. 9.

Fig. 11 is a detail transverse sectional view through the neck extension portion of the blank as during a partial closure thereof and which step may be carried out simultaneously with or after the step appearing in Fig. 10.

Fig. 12 is a view in side elevation of a finished integral neck siphon having relatively wide top end flanges produced from the blank of Fig. 1 in accordance with one embodiment of the invention.

Fig. 13 is a top plan view of the siphon appearing in Fig. 12.

Fig. 14 is a vertical sectional view through a part of the finished siphon appearing in Fig. 12 as taken on the line **14**—**14** thereof.

Fig. 15 is a horizontal sectional view through a part of the finished siphon appearing in Fig. 12 as taken on the line **15**—**15** thereof.

Fig. 16 is a transverse sectional view through the integral inlet neck of the siphon appearing in Fig. 12 as taken on the line **16**—**16** thereof.

Fig. 17 is a view similar to Fig. 14 showing a siphon with relatively narrow top end flanges made in accordance with the invention.

Fig. 18 is a view similar to Fig. 1, but on a reduced scale, showing a blank that may be operated upon in accordance with the invention, to form a neckless siphon and to which a length of seamless tubing is thereafter welded to form the inlet neck therefor.

Fig. 19 is a view in side elevation of a siphon body made from the blank of Fig. 18 in accordance with the invention.

Fig. 20 is a detail perspective view showing the manner in which a portion of the top end of the siphon appearing in Fig. 12 is secured in place in a corresponding associated opening in the crown sheet of a firebox.

Fig. 21 is a detail perspective view showing a modification in which a separate flange is attached at each end of the top portion of the siphon before the siphon is installed in the firebox.

Referring now in detail to that embodiment of the invention illustrated in the drawings and especially to Fig. 1 thereof, and in which there is shown a flat steel plate blank **25** cut to a patterned shape suitable for producing the integral neck siphon appearing in Fig. 12. Said blank, which is of an irregular outline shape, has a generally three sided wing **26**—**26** on each side of its longitudinal line **27**, at one end. At its other end it has a neck extension **28** formed of portions of equal size on each side of said line and said neck extension has a width that approximates the circumference of the neck for the finished siphon.

Each wing **26** has a relatively short side edge **29**, a longer side edge **30** and an end edge **31**. The side edges **29** and **30** of each wing, which are non-parallel, are both directed inwardly from their outer ends at different angles, toward the line **27** and also toward that end of the blank having the neck extension **28**. The inner end of the edges **30** merge into associated parallel edges of the neck extension **28** by inside corners **32**—**32**. The inner end of the edges **29** joins the edges of a spotting ear **33** having a spotting opening **33***a* disposed on the line **27**. The end of the extension **28** is also provided with a spotting ear **34** having an opening **34***a* on said line **27**. These ears serve to "spot" the blank in position while it is bent along the line **27** in a press brake as will later appear and also to accommodate temporary fastening devices for holding the partly formed siphon in position on an internal die member in a subsequent operation as later described. Thereafter said ears are removed in any suitable manner.

The outer ends of the edges **29** and **30** respectively of each wing terminate at short cut back edge portions **35** and **36** respectively which are parallel with but spaced from the edge **31** of the associated wing by right angled edges **37** and **38** respectively.

That part **39** of each wing between the edges **29** and **30** thereof and inwardly from the plane of the edge portions **35**—**36** later provides parts of not only each side wall but also parts of the end walls of the siphon, as will later appear. That part **40** of each wing between the edges **31**—**37**—**38** and the edge portions **35**—**36** later constitutes an associated top end flange for the body of the finished siphon.

In said part **39** of each wing rows of staybolt openings **41**—**41** are provided, the openings in one wing portion registering with those in the

other wing portion after the blank has been finally bent along said line 27. The operation of forming the staybolt openings can most conveniently be performed while the sheet is in flat form. However, this requires very accurate control in subsequent operations in order that said openings be in accurate alignment. In accordance with prior practice considerable trouble and expense arose during the forming operation caused by a shifting of surfaces, resulting in undesired disalignment of portions of the siphon. It is pointed out that in the lower wing appearing in Fig. 1 only the outline row of staybolt openings 41 appear. This is for ease in illustration and therefore it is to be understood that there is a matching opening in said lower wing for each opening in the upper wing for the purpose of receiving staybolts at a later stage of the operation.

The blank shown in Fig. 1 just above described is intended to be operated upon between suitable coacting dies. Proper actuation of the dies may be had by mounting them in a conventional press brake, which is schematically illustrated in end elevation in Fig. 7. Said brake includes laterally spaced upright end standards 45 (only one of which appears in said Fig. 7) firmly secured to a foundation or floor 46. At the front central portion of each standard is a throat or gap recess 47 and at the front of and connecting both standards is an upright bed plate 48. In some instances the bed plate is of such height that a recess 49 is provided in the foundation to accommodate a bottom portion thereof and provide more clearance space for the piece operated upon by the brake. On the upper end of the bed plate is a somewhat widened die supporting rail 50, the top surface of which is substantially flush with the bottom of the throat or gap in the end standards. In the flat top surface of said rail there is usually a straight longitudinal groove 51 to receive a matching rib 52 on any one of a number of V or female dies 53. Such dies have a considerable length and may be applied and removed endwise from the rail. When applied and in position, such dies may be secured in any suitable manner, by means not shown herein.

Along the front edge of each standard is an upright rail 54, upon which the guides 55 of the ram 56 have sliding engagement, for a controlled reciprocating motion toward and away from the die 53. The lower end of the ram may have detachably secured thereto any one of a number of male dies 57. The upper end of the ram 56 is operatively connected to suitable reciprocating mechanism, in turn driven from a horizontal shaft 57*a* suitably mounted in the standards 45—45. Said shaft is rotatively driven from a motor 58 and associated belt 59, carried by one of the end standards, by means of a control clutch 60 and reducing gears 61—62 indicated in dotted lines in Fig. 7. Of course the press brake includes hand, foot and electric controls (not shown) whereby the reciprocating movement of the ram 56 may be controlled to make one or more "hits" of the male die carried thereby, as may be required by the particular work being done. Also means are provided whereby the length of the stroke may be changed in very small increments. Such means is illustrated diagrammatically in Fig. 7 wherein 56*a* is a motor, which through suitable gearing 56*b* operates screws 56*c* which adjusts the position of the ram and thereby determines its stroke. This enables the bending of the plate in the manner desired and permits imparting just the right pressure to conform the particular plate since no two plates are exactly alike as they come from the mill.

According to one embodiment of the invention, in carrying out certain steps of the improved method by means of the press brake mentioned and the dies appearing in Figs. 3*a*, 7, 8 and 9 respectively, marginal portions of both wings, along the side edges 29 and 30 thereof are preferably first operated upon to form curved flanges projecting from one side of the blank. Then marginal portions along the end edge 31 of each wing are bent over to project from the other side of said blank. In flanging over the marginal portions along the side edges 29 and 30 respectively of the wings of the blank, I provide a die 53*a* (see Fig. 3*a*) upon the bed rail 50 and a coacting die 57*a* on the ram. The die 53*a* is provided with a relatively deep and narrow longitudinal groove 53*b* in its top surface, the front tnd rear margins of the die at this point providing spaced ledges 53*c*. The operative bottom portion 57*b* of the die 57*a* is formed as a rather sharp wedge having a rounded bottom edge 57*c*.

When the ram is in its "up" position at the top of its stroke, so that the edge 57*c* of the die 57*a* is spaced above the top of the die 53*a*, that portion of the blank along one of the edges 29—30 of one of its wings is disposed upon the top ledges 53*c* of the die to bridge the groove 53*b* therein. The control of the press brake is actuated to start it into operation and wherein the ram is vertically reciprocated. In this reciprocation of the ram, the die edge 57*c* engages that part of the blank bridging the groove 53*b* and depresses the same partly thereinto so as to form said margin over into a curved flange 65 of relatively small radius which is tested from time to time with a template. Care is taken not to "overform" the flange as it would be difficult to restore the metal to desired curvature. However, by virtue of the accurate control of the ram, it is possible to impart just the desired curvature. By shifting the blank, the margins along the edges 29 and 30 of both wings are flanged over in the same manner. The flanges thus produced all project from the same side of the blank and have a depth approximating half the width of the body of the siphon to be made from the blank.

In making up a number of siphons at one time, it is convenient to operate upon each blank, as above described, so as to build up a stock of partially formed blanks, each having marginal portions along the edges 29 and 30 of the wings thereof flanged over as mentioned before performing subsequent operation.

Preferably the next step is to flange over the margins 40—40 along the end edge 31 of the wings. The dies employed for this operation, while embodying the same principles, are somewhat different in their cross sectional shapes. Such dies are indicated at 53 and 57 in Fig. 8. After removing the dies 53*a* and 57*a* endwise from the rail 50 and ram 56 respectively, the dies 53 and 57 are substituted therefor. The die 53 is provided along the longitudinal medial line of its top surface with a V shaped groove 53*d* having a rounded bottom and this provides a ledge 53*e* along the front and rear top edge of the die. The male die 57 is in this instance of a cylindrical cross sectional shape.

The blank is now reversed face for face so that the flanges 65—65 produced in the step above

mentioned face downwardly. The blank is then swung around to present the margin 40 along the end edge of one of the wings to the die 53 so that a part of said margin bridges the groove 53*d*. When the ram is again started into operation, the die engages that part of said plate margin to curve the same transversely, the blank being fed into the throat of the brake, step by step after each impact by the die 57. Templates are employed to gauge the width of the margin being operated upon to form it into a flange. Also by adjusting the length of the stroke of the ram, desired curvature, within fine limits, may be imparted to the flange. This is important, especially if the flanges are of considerable width, because these flanges must match with adjacent edges of the crown sheet of the firebox in which the siphon is to be installed. When of proper width, the curved margin as a whole is bent with respect to the remainder of the wing by manipulating the ram and the blank. When this operation has been completed, a relatively wide curved flange 66 (see Fig. 6) is provided, which projects from that side of the blank opposite the flanges 65. The flange 66 will have a transverse curvature that corresponds to the like curvature of the crown sheet of the firebox in which the siphon is to be installed. While the flanges 66 are shown as of the same extent on each side, for some installations one may project a lesser distance than the other. However, it is feasible to make the flanges of different sizes. The blank formed to the extent described is removed and turned around to present the margin 40 along the edge 31 of the other wing to the dies for operation thereon, as before mentioned. The blanks that had been previously operated upon to form the flanges 65 on one side thereof are now operated to form the flanges 66 on the other side thereof so that all of said blanks are now further partially completed and in the condition shown in Fig. 4.

In thus far describing the improved method, the forming of the flanges 65—65 has been mentioned as the first or initial step and the forming of the flanges 66—66 has been mentioned as the second step. However while this sequence of steps is preferred, it is not absolutely essential because advantageous results will be had even if the sequence mentioned is reversed.

It is pointed out at this time, that in some instances relative wide flanges may be desired in the finished siphon and in other instances narrower flanges may be desired. Crown sheets of fireboxes having long service records often wear down in thickness as to require replacement of at least portions thereof considered too thin for safety. When a siphon is to be installed in such a firebox, the thin part of its crown sheet, which may have a considerable width, is cut away to provide an opening in the crown sheet. The siphon to be installed in such an opening will be one having relatively wide flanges 66 of an area that will fit in said opening.

When the siphons are to be installed in new fireboxes then such flanges 66 usually will be relatively narrow, say about a width approximating the spacing between the longitudinal rows of conventional crown sheet stays. In the latter instance, due to being narrow, such flanges need not be deliberately curved but may be approximately straight. Such narrow flanges are indicated at 66*a* in Fig. 17.

With the blank in the condition shown in Fig. 4 wherein the flanges 65—65 project from one side thereof and the flanges 66—66 project from

the other side thereof, the next or third step is to bend the thus far formed blank along its medial line 27 so that the wings 26—26 are brought into the desired angular relation wherein they diverge from the region of said line.

This third step is best illustrated in Fig. 9 wherein dies 53*f* and 57*d* are substituted for the dies 53 and 57 used in the previous step. The dies 53*f* and 57*d* are similar to the dies 53—57 and differ only in certain dimensions and in this instance the die 57*d* is provided along its bottom with pilot pins 57*e* (only one of which appears in Fig. 9) for engagement in the openings 33*a* and 34*a* provided therefor in the ears 33—34 of the blank 25.

In carrying out said third step the blank in the condition shown in Fig. 4 is placed upon the die 53*f* with the median line 27 of the blank extending longitudinally of and centered with respect thereto, with the flanges 66 facing downwardly and the flanges 65 facing upwardly. When the blank is so positioned, the die 57*d* is brought into engagement with the top surface of the blank to bear along said line 27 and with the pilot pins 57*e* thereof engaged in the openings 33*a* and 34*a* in the ears 33—34 respectively. This accurately positions the blank in the press brake in relation to the dies. The ram 56 is now caused to move downwardly and the die 57*d* will press against and bend the blank along said line 27 and this will cause the two wings 26—26 of the blank to swing upwardly into diverging angular positions as appears in dotted lines in Fig. 9.

To facilitate the removal of the thus far formed blank, the die 57*d* is caused to ascend to the upper limit of movement of the ram of the brake. The die 53*f* is then slid endwise from the rail 50. By properly manipulating the thus far formed blank, it is removed from the brake. The die 53*f* is then replaced and another blank in the condition shown in Fig. 4 is operated upon as just above mentioned.

By providing proper clearance as by enlarging the throat or providing a removable section in the part 48, it is possible to bend the plate so that the faces 26 are substantially parallel before the plate is removed from the press. However, by leaving the plate in the divergent form shown in Fig. 9 by dotted lines, removal is facilitated.

If the blank is in the form shown by dotted lines in Fig. 9, when removed from the brake operation depicted in Fig. 9, it is preferably, prior to the next die forming operation, bent so that the wings 26, 26, which now constitute the sides of the siphon body are substantially parallel. No special mechanism is required to perform this operation because when in the condition shown in dotted lines in Fig. 9, the blank has been sufficiently formed so that pressure against the wings 26, 26, toward the center will swing the parts into parallelism. A vertical section through the body of the siphon, below the flanges 66 at this time will be substantially U-shaped with the wings 26, 26 as extensions of the bottom curve as indicated by dotted lines in Fig. 10.

The next forming step is to operate upon the blank by a pair of dies 70 and 71 respectively in connection with a mandrel 72 shown in Fig. 10. The dies mentioned are operatively engaged with the rail 50 and ram 56 respectively of the press brake in the same manner as the sets of dies employed in the previous steps.

The die member 72 can conveniently be inserted into the U-shaped partly completed siphon

before it is placed in the brake to perform the operation depicted in Fig. 10. To this end the mandrel 72 is inserted into the bottom of the U-shaped blank from that end of the blank from which the neck extension 28 projects. The mandrel 72 and the siphon blank are temporarily held together by machine screws 72x which pass through the openings 33a, 34a of the plate bottom, into threaded openings in the body of the mandrel 72. This enables the siphon blank and the enclosed mandrel 72 to be moved about freely without danger of relative shifting movement. The U-shaped blank is next turned into a substantially horizontal position for presentation of the bottom thereof to die parts associated with the brake, as will shortly be described.

The mandrel 72 includes an extension 73 having parallel top and bottom surfaces that determine the inside width of the body of the siphon to be made. When said dies are in the separated condition, as when the ram is in the upper limit of its movement, the thus far finished blank with the mandrel 72 disposed therein is applied in position between said dies.

The die 71 (see Fig. 10) is then caused to approach the die 70 and in this operation the mandrel 72 in combination with the dies 70—71 produces the bulge 74 for the bottom of the finished siphon and which bulge forms supports for ends of the brick used in the arch of the firebox in which the siphon is installed.

It is pointed out that an end portion of the mandrel 72, which is disposed within the neck extension of the blank at this time, in connection with end portions of the dies 70—71 coacts in the press operation, to cause said neck extension to assume the cross sectional shape appearing in Fig. 11. Such shape is substantially circular with tangential marginal portions 75—75 which face in opposite directions leaving the space 76 therebetween.

The neck portion may be subjected to another operation while in the brake to close the gap 76 (Fig. 11) or the same may be closed later around a suitable internal mandrel.

After the bulge has been formed, the siphon is removed from the press and the mandrel 72 withdrawn from the siphon after first removing the fastening members 72x.

As the next operation the ears 33 and 34 are cut away along the dotted lines 33b and 34b respectively in Figs. 1–3 and 4. To complete the siphon for welding it is only necessary to hand flange the siphon at the nose corner (within the dotted lines HF) and at the juncture of the body with the neck (within the dotted lines H. F. N.) and which lines appear in Fig. 12.

Having followed the steps before described there results a siphon body blank that is ready for welding and to receive the usual stay bolts to produce the finished siphon shown in Figs. 12 and 13. In such a siphon, which is indicated as a whole as at 86, a line of welding 78 (see Fig. 13) will run along the top side of the neck which is indicated at 79, up around the inside corner 80 and up the front wall 81 of the siphon to the top end of the siphon. Another line of welding 82 (see Fig. 13) will run from the end of the portion of the nose 83 of the siphon, up to the top end of the rear wall 84 of the siphon body. The staybolts provided between the sides 86a of the siphon body and which occupy the registering openings 41—41 therein are indicated in Fig. 12 by the numeral 85. Because of the very accurate control which the described method provides, the staybolt holes are in accurate alignment so that application of the staybolts is generally facilitated.

In Fig. 18 I have illustrated on a reduced scale a blank from which a neckless siphon may be produced by the same general method heretofore described.

In comparing the blank of Fig. 18 with the blank of Fig. 1, it will be noted that except for the absence of the neck extension 28, the blank of Fig. 18 is the same as that of Fig. 1. Therefore, it is not believed necessary to describe the blank of Fig. 18 in detail and wherein the same numerals are employed to indicate like parts of the blank of Fig. 1. The method of producing the siphon will also be obvious without further detailed description.

In Fig. 19 I have illustrated in side elevation the neckless siphon indicated as a whole as at 86b produced from the blank of Fig. 18.

In order to provide a neck for the siphon of Fig. 19, I may employ a length of seamless tubing 87 which is welded at one end to the lower front end portion of the body to join the bulge thereof. Some hand forming will be required on the body of the siphon and on that part of the tube 87 adjacent the siphon body where indicated.

In Fig. 20 I have illustrated in perspective a detail view of the front top end portion of a siphon (produced by either of the described methods) disposed in a part of a crown sheet 88. It is to be noted from said figure that the flanges 66—66 at the top end of the siphon body do not extend around the end thereof as in a conventional flange topped siphon heretofore has been customary. Thus the associated portion of the crown sheet is cut to a patterned shape to fit the top end portion of the siphon and to which it is welded from the underside of the crown sheet.

Or, if desired, a separate plate 66a may be welded to the flanges 66 of the siphon before it is welded to the crown sheet. In the latter event, the crown sheet will, of course, be provided with an opening, the contour of which matches the flange line of the siphon. Fig. 21 shows such an end flange section secured to the siphon. The opposite end would be similarly formed.

The improved method has many advantages. It may be practiced by means of very simple dies. If desired, a conventional press brake, with suitable dies, may be used instead of special and relatively inefficient apparatus heretofore employed. Furthermore faster production is possible with greater accuracy. Also less hand work is required. Hence the improved method results in lower production costs and provides a product of greater uniformity and which can, therefore, be installed easier and at lower cost.

While in describing the invention I have referred in detail to the form, arrangement and construction of parts as well as a particular sequence in the steps of the method, these are to be considered only in the illustrative sense and therefore I do not wish to be limited thereto except as may be specifically set forth in the appended claim.

I claim as my invention:

The steps in the method of making a firebox thermic siphon which consists in providing a flat patterned metal plate blank with a three sided wing on each side of its longitudinal medial line, each wing having an end edge and two side edges

disposed at other than right angles to said line, bending over marginal portions of each wing along each of its two side edges in one direction from one side of the blank to form flanges projecting from the corresponding side of the blank, bending the blank along said medial line to cause the flanged sides of both wings to swing toward each other into relatively inclined planes and then moving parts of said wings spaced outwardly from said line into parallel relation while operating upon portions of said blank along said line to form the same into a bulge for the bottom of said body and prior to so bending the blank along said line bending over a margin of each wing along the end edge thereof to later form outwardly extending top end flanges for the finished siphon.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
136,654	Kintz	Mar. 11, 1873
281,522	Knapp	July 17, 1883
338,079	Kittredge et al.	Mar. 16, 1886
338,100	Ohl	Mar. 16, 1886
610,585	Guild	Feb. 13, 1898
1,337,720	Nicholson	Apr. 20, 1920
1,402,012	Petrie	Jan. 3, 1922
1,571,558	Russell	Feb. 2, 1926
1,573,548	Hawley	Feb. 16, 1926
1,607,377	Wolf	Nov. 16, 1926
1,679,051	Nicholson	July 31, 1928
1,704,144	Nicholson	Mar. 5, 1929
1,739,902	Hazelton	Dec. 17, 1929
1,813,951	Rafter	July 14, 1931
1,934,021	Wafter	Nov. 7, 1933
1,953,726	Rutherford	Apr. 3, 1934
2,077,454	Almdale	Apr. 20, 1937

FOREIGN PATENTS

Number	Country	Date
2,229	Great Britain	1853