

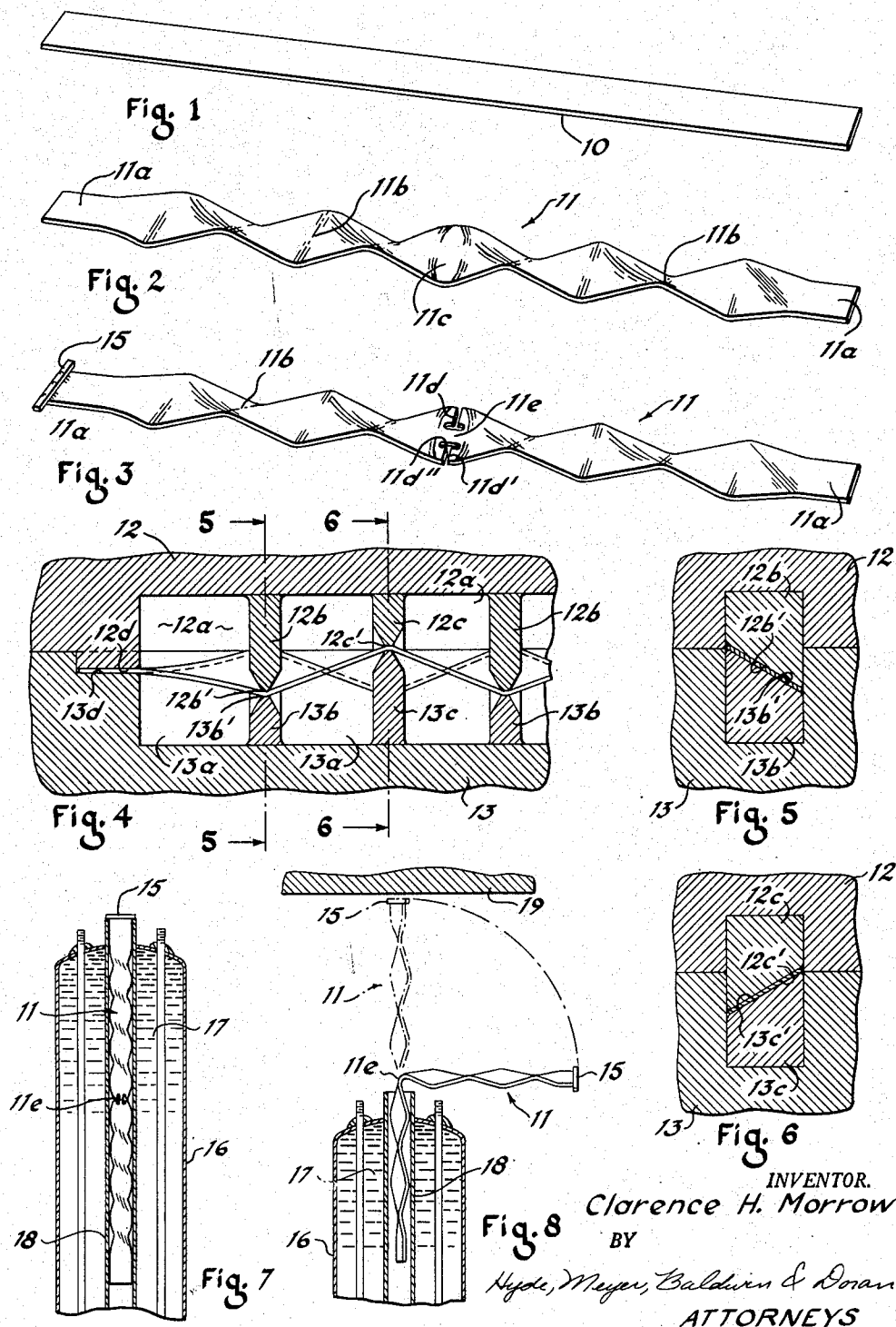
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C. H. MORROW

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HOT WATER TANK FLUE BAFFLE

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INVENTOR.
 Clarence H. Morrow
 BY
 Hyde, Meyer, Baldwin & Doran
 ATTORNEYS

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HOT WATER TANK FLUE BAFFLE

Clarence H. Morrow, Shaker Heights, Ohio, assignor to The Hotstream Heater Company, Cleveland, Ohio, a corporation of Ohio

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This invention relates to improvements in flue baffles and more particularly to a flue baffle readily removable from or insertable into its enclosing flue.

One of the objects of the present invention is to provide a relatively rigid flue baffle especially designed for maximum heat removal from the hot flue gases.

Another object of the present invention is to provide in a flue baffle of the type set forth above a bendable portion intermediate its ends so that the baffle may be easily removed from or inserted into its enclosing flue within a very limited space.

Other features of this invention reside in the arrangement and design of the parts for carrying out their appropriate functions.

Other objects and advantages of this invention will be apparent from the accompanying drawings and description and the essential features will be set forth in the appended claims.

In the drawings, Fig. 1 is a perspective view of the blank from which the finished baffle is formed;

Fig. 2 is a perspective view of the baffle in an intermediate stage in its manufacture;

Fig. 3 is a perspective view of the finished baffle;

Fig. 4 is a vertical longitudinal sectional view of the dies in closed position forming the baffle shape;

Fig. 5 is a vertical transverse sectional view taken along the line 5—5 of Fig. 4;

Fig. 6 is a vertical transverse sectional view taken along the line 6—6 of Fig. 4;

Fig. 7 is a vertical sectional view of a hot water tank and flue containing the baffle of this invention; while

Fig. 8 is a vertical sectional view similar to Fig. 7 but showing the baffle being removed from the hot water tank flue within a small overhead clearance.

Before the flue baffle here illustrated is specifically described, it is to be understood that the invention here involved is not limited to the structural details or arrangement of parts here shown since baffles embodying the present invention may take various forms. It also is to be understood that the phraseology or terminology herein employed is for purposes of description

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and not of limitation since the scope of the present invention is denoted by the appended claims.

While the baffle of this invention might be adapted for other uses, I have chosen to show the same used in a flue of a hot water tank. The flue baffle of this invention is especially designed for center-flue hot water tanks wherein the baffle forces the vertically rising, hot flue gases to impinge against and come in contact with the flue wall to give up their heat to the flue wall and the surrounding water in the hot water tank. The flue baffle is especially designed to extract as much heat as possible from the hot flue gases. The baffle design also includes a weakened portion so that the baffle may be readily removed from the flue for cleaning purposes or for any other purpose desired.

The novel baffle is manufactured from an elongated strip of ductile material, shown at 10 in Fig. 1. This strip or blank made of ductile material, for example, steel, is of uniform width and thickness throughout its length.

The first step in the manufacture of the baffle is to stamp the blank shown in Fig. 1 into the baffle shape 11 illustrated in Fig. 2. A set of dies consisting of upper die 12 and lower die 13, as shown in Figs. 4 to 6, perform this function. The dies 12 and 13 respectively have cavities 12a and 13a adapted to align when the dies are brought together and to form a cavity of rectangular parallelepiped shape. The upper die has inserted die pieces 12b and 12c in the cavity 12a adapted to align with the corresponding die pieces 13b and 13c inserted in the lower die cavity 13a. These die pieces are preferably welded in place in their respective cavities and each has an inclined, thin, substantially straight line, metal bending edge. These metal blank engaging and bending edges are shown at 12b', 13b', 12c', and 13c'. The metal bending edges are alternately inclined in opposite directions, as clearly shown in Figs. 5 and 6. Every other set of metal bending edges, for example, metal engaging or bending edges 12b' and 13b', are inclined in the same direction. The metal bending edges of each set, edges 12b' and 13b' or 12c' and 13c', are parallel to each other and spaced apart the thickness of the strip 10 when the dies 12 and 13 are in their stamping or fully engaged

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position shown in Figs. 4 to 6. Grip members 12d and 13d on dies 12 and 13 respectively grip the ends of the strip 10 during the stamping operation and keep the ends in their original flattened condition. At approximately the longitudinal center of the cavities, 12a and 13a, another set of inserted die pieces are mounted similar to those previously described except this set has flat edges octagonal shaped in outline for engaging the upper and lower surfaces of the metal blank. The previously described inserted die pieces had thin, substantially straight line edges.

The baffle shape 11 in Fig. 2 is the finished stamping coming from dies 12 and 13. The straight ends 11a, 11a have the same shape as the ends of the original blank or strip 10 since they were held by the grip members 12d, 13d. Transverse bend lines 11b are alternately inclined in opposite directions and were formed by the inclined, substantially straight line, metal blank engaging edges 12b', 13b', 12c' and 13c'. The portion of the baffle shape between each adjacent pair of bend lines 11b forms a smooth connecting curve. The octagonal shaped, flat, metal blank engaging edges at the center of the die engage opposite sides of the metal blank and form a roughly octagonal shaped, flattened zone 11c approximately at the middle of the baffle shape 11 in Fig. 2. This flattened zone is a plane extending transversely and longitudinally of the baffle shape 11. A line in this zone and extending across the widest dimension of the baffle and bisecting the opposite lateral sides of the octagon is transverse to the longitudinal axis of the baffle. This line in the flattened zone and the bend lines 11b are substantially equally spaced along the length of the baffle shape 11.

The elongated baffle shape 11 is relatively rigid and resists bending. It is of sinuous shape and has its opposite longitudinal edges alternately bent downwardly and upwardly to provide high and low points on an undulated curve wherein the low points on one side are opposite the high points on the other. The waves or scallops have relatively sharp peaks and valleys. None of the longitudinally extending elements of the strip is a straight line; each forms an undulated or wavy curve. The high and low points on the longitudinal edges are arranged so that a line drawn through the high points on one edge and a line drawn through the low points on the same edge taken with corresponding lines drawn through the corresponding points on the other edge form the four, longitudinal, straight line edges of a rectangular cylinder. This relationship exists since blank 10 is of uniform width and cavities 12a and 13a form a rectangular parallelopiped while the metal blank engaging edges 12b', 13b', 12c' and 13c' form substantially the same angle with the horizontal.

In the second step of the baffle manufacture, T-shaped slots 11d are punched in the opposite transverse ends of the octagonal shaped flattened zone 11c. Each of the T-shaped slots has a transverse slot 11d' cut in from the opposite longitudinal edges or sides of the baffle shape 11 and forming the stem of the T. These transverse slots 11d' are in alignment with each other. The top cross bars 11d'' of the T's are parallel to the longitudinal edges of the baffle shape 11 and to each other. These T-shaped slots form a weakened zone 11e of reduced width between the cross bars 11d''. These T-shaped slots 11d and the flattened zone 11c form a bendable por-

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tion intermediate the ends of the relatively rigid baffle.

A suspension or supporting means may be provided on one end of baffle shape 11, if desired. One type of such means is shown in the drawings as a supporting or suspension bar 15 welded to one end of and transversely extending with respect to baffle shape 11.

The center-flue hot water tank 16 in Fig. 7 has the completed baffle. The water jacket 17 surrounds the vertical, elongated, central, cylindrical flue 18 in the hot water tank. The completed baffle, consisting of the baffle shape 11, T-slots 11d and the suspension bar 15, is suspended in the flue 18 with the outer edges of the bar 15 engaging on the top of the cylindrical wall of the flue 18. The flue bore diameter is substantially equal to but slightly greater than the width of the original blank or strip 10 or the baffle shape 11. Hence, the baffle is readily insertible into and removable from the bore of the cylindrical flue with the longitudinal edges of the baffle being in close proximity to the flue bore surfaces. Very little flue gas can pass directly up the bore surface of the flue without being deflected by the baffle in view of this close fit. The shape of the baffle controls the upward travel of substantially all of the flue gas traveling through the flue 18. Since every longitudinally extending element of the flue baffle has a sinuous or wavy shape, none of the gas can pass directly up the flue but instead is deflected from one portion of the flue wall to another so that a maximum amount of heat is extracted from the hot gases to heat the water.

Sometimes the baffle must be withdrawn from the flue for cleaning or replacement or for some other reason within a very limited overhead space, as shown in Fig. 8. Since the baffle shape 11 is very rigid and resists bending, it cannot be readily bent to withdraw it from the flue, and since the baffle shape 11 has been especially designed for maximum heat extraction from the hot flue gases, it is not desirable to materially change its design which would alter its efficient gas flow and heat exchange characteristics. The bendable portion or weakened portion at the center of the baffle presents an ideal solution. It is inexpensive to manufacture the T-shaped slots 11d and the flattened zone 11c in the stamping operations. No expensive hinge must be added to the baffle so that the parts may be bent with respect to each other during removal of the baffle. The weakened portion interferes very little with the gas flow pattern for high heat transfer inherent in the well-designed baffle shape 11.

The baffle may be very readily withdrawn from the top of the flue 18 within a limited overhead space, for example 18 inches, as seen in Fig. 8. Frequently, the ceiling or overhead interfering member 19 prevents the withdrawal of the baffle from the flue without bending of the baffle. Baffle shape 11 is readily bent along a transverse line through the weakened portion 11e to reduce the distance between the ends of the baffle so that it may be readily removed from the top of the flue within a space above the flue substantially less than the length of the baffle. No part of the baffle protrudes above a plane located substantially less than the length of the baffle above the top of the flue.

After the baffle has been removed and cleaned or otherwise treated or examined, it may be readily reinserted within the flue 18 by a procedure in reverse of the removal procedure, set forth above. Of course, a replacement baffle may be

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inserted, if desired, instead of reinserting the original baffle. The reinserted or replacement baffle will then assume the position shown in Fig. 7. It should be noted that this bending never distorts the well designed, gas flow, rigid surface of the major portion of the baffle. Only the weakened zone or neck 112 is bent or distorted. This bendable area 111 will stand numerous bends without rupture or fracture and the rigid major portions of the baffle on each side of the bendable area 111 will return substantially to their original position after the baffle is inserted into flue 18.

This invention contemplates, of course, that several weakened or bendable portions could be provided along the length of the baffle to divide it into thirds or quarters, if desired, so that the baffle could be removed from the top of the flue within a smaller overhead clearance than one-half of the length of the baffle, which latter clearance is shown in Fig. 8.

It should now be apparent that this application discloses a new and novel baffle design wherein the baffle controls the flow of substantially all the flue gas and prevents excessive leakage past its edges, extracts the maximum amount of heat from the hot flue gases, is rigid throughout most of its length so as to readily retain its shape in use, and has a bendable portion intermediate its ends which does not interfere with normal gas flow but permits the baffle to be withdrawn from or inserted into the top of the flue within a very small overhead space.

Various changes in details and arrangement of parts can be made by one skilled in the art without departing from the spirit of this invention or the scope of the appended claims.

What I claim is:

1. A baffle comprising a strip having opposite ends and having over substantially its whole length, its longitudinal edges alternately bent downwardly and upwardly to provide high and low points, the low point on one side being opposite the high point on the other, whereby said baffle is rigid and resists bending, and a bendable portion intermediate the ends of said strip whereby said strip may be bent to reduce the distance between said opposite ends.

2. A baffle comprising a strip having opposite ends and having over substantially its whole length its longitudinal edges alternately bent downwardly and upwardly to provide high and low points, the low point on one side being opposite the high point on the other, the high and low points being arranged so that a line drawn through the high points on one edge and a line drawn through the low points on the same edge and corresponding lines drawn through the corresponding points on the other edge are straight lines forming in transverse cross section the four corners of a rectangle, whereby said baffle is rigid and resists bending, and a bendable portion intermediate the ends of said strip whereby said strip may be bent to reduce the distance between said opposite ends.

3. A baffle comprising a strip of uniform width having opposite ends and having over substantially its whole length its longitudinal edges alternately bent downwardly and upwardly to provide high and low points, the low point on one side being opposite the high point on the other, the high and low points being arranged so that a line drawn through the high points on one edge and a line drawn through the low points on the same edge and corresponding lines drawn

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through the corresponding points on the other edge are straight lines forming in transverse cross section the four corners of a rectangle, whereby said baffle is rigid and resists bending and said baffle is readily insertable into the bore of a cylindrical flue with the longitudinal edges of said baffle being in close proximity to the flue bore surface when the diameter of the bore is substantially equal to but slightly greater than the width of said strip, and a bendable portion intermediate the ends of said strip whereby said strip may be bent to reduce the distance between said opposite ends.

4. A baffle comprising a strip having opposite ends and having over substantially its whole length its longitudinal edges alternately bent downwardly and upwardly to provide high and low points, the low point on one side being opposite the high point on the other, whereby said baffle is rigid and resists bending, and a bendable portion intermediate the ends of said strip whereby said strip may be bent to reduce the distance between said opposite ends, said bendable portion comprising a flattened zone extending transversely on said strip and having transverse slots cut in from opposite sides of said strip.

5. A baffle comprising a strip of uniform width having opposite ends and having over substantially its whole length its longitudinal edges alternately bent downwardly and upwardly to provide high and low points, the low point on one side being opposite the high point on the other, the high and low points being arranged so that a line drawn through the high points on one edge and a line drawn through the low points on the same edge and corresponding lines drawn through the corresponding points on the other edge are straight lines forming in transverse cross section the four corners of a rectangle, whereby said baffle is rigid and resists bending and said baffle is readily insertable into the bore of a cylindrical flue with the longitudinal edges of said baffle being in close proximity to the flue bore surface when the diameter of the bore is substantially equal to but slightly greater than the width of said strip, and a bendable portion intermediate the ends of said strip whereby said strip may be bent to reduce the distance between said opposite ends, said bendable portion comprising a flattened zone extending transversely on said strip and having transverse slots cut in from opposite sides of said strip.

6. A baffle comprising a strip having opposite ends and having longitudinally spaced bend lines over substantially its whole length and extending across the full strip width with said bend lines being alternately inclined in opposite directions so that the longitudinal edges of the strip are alternately bent downwardly and upwardly to provide high and low points, the low points on one side being opposite the high points on the other, the portion of said strip between each pair of bend lines forming a smooth curve connecting said bend lines whereby said baffle is rigid and resists bending, and a bendable portion intermediate the ends of said strip whereby said strip may be bent to reduce the distance between said opposite edges.

7. A baffle comprising a strip having opposite ends and having longitudinally spaced bend lines over substantially its whole length and extending across the full strip width with said bend lines being alternately inclined in opposite directions so that the longitudinal edges of the strip are alternately bent downwardly and upwardly to

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provide high and low points, the low points on one side being opposite the high points on the other, the portion of said strip between each pair of bend lines forming a smooth curve connecting said bend lines whereby said baffle is rigid and resists bending, and a bendable portion intermediate the ends of said strip whereby said strip may be bent to reduce the distance between said opposite edges, said bendable portion comprising a flattened zone extending transversely on said strip and having slots cut in from opposite sides of said strip with the inner edge of each

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slot being spaced apart and terminating in a longitudinally extending portion.

CLARENCE H. MORROW.

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