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J. D. BEEBE.
FIN FORMING MACHINE.
APPLICATION FILED APR. 20, 1910.

Patented Aug. 8, 1911.

4 SHEETS—SHEET 1.

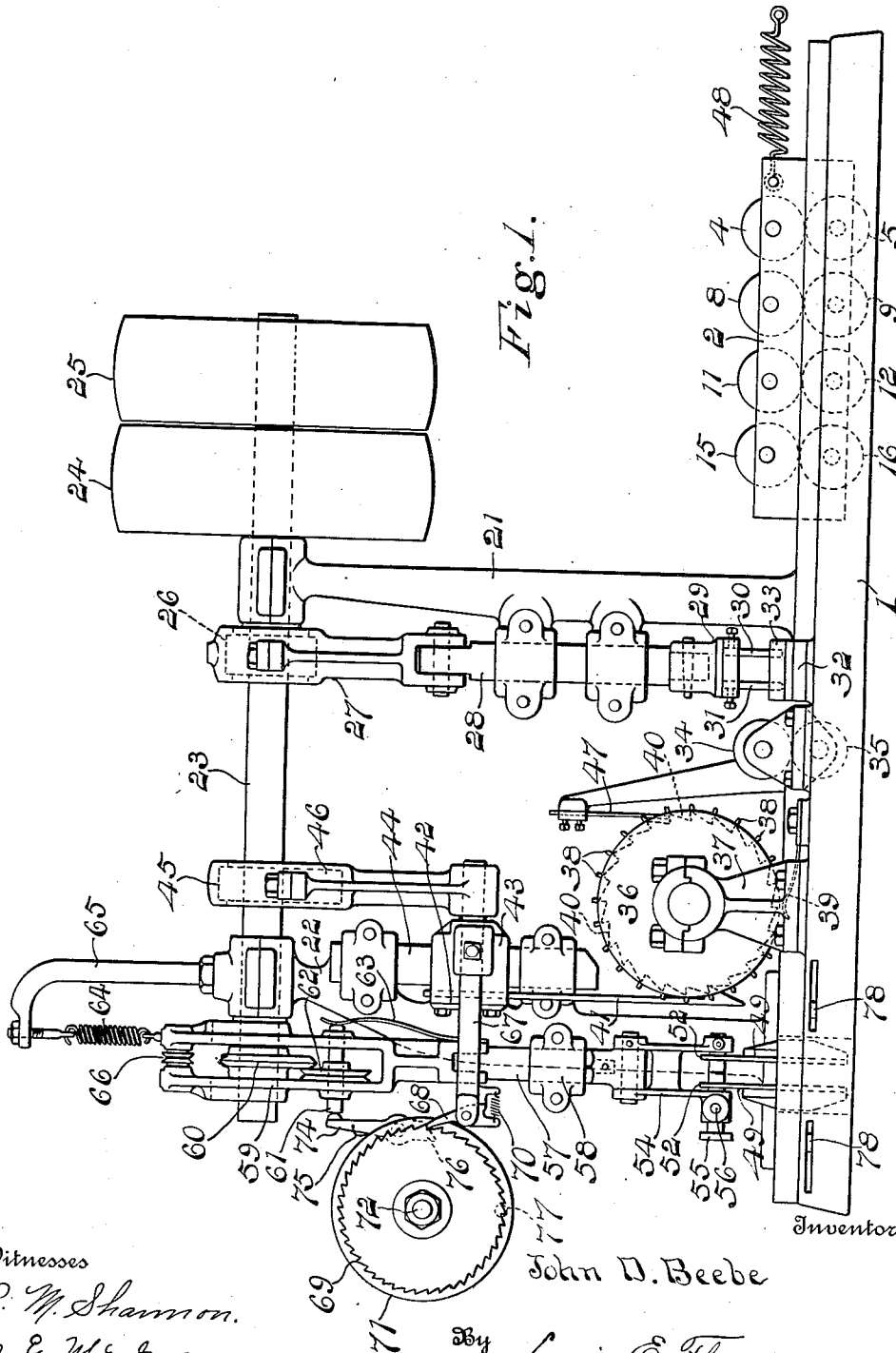


Fig. 1.

Inventor

John D. Beebe

Witnesses

A. M. Shannon.

W. E. Mc. Inam

By

Lewis O. Flanders

Attorney

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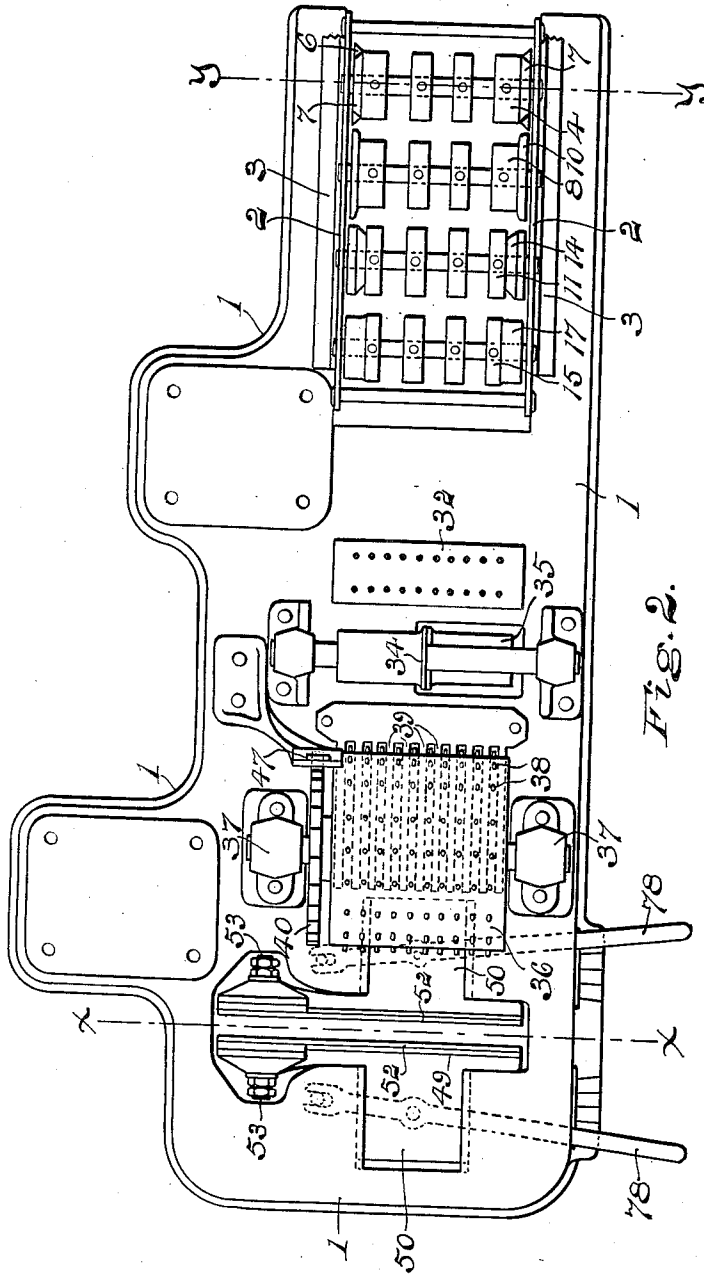


Fig. 2.

Witnesses
C. M. Shannon.
E. E. M. Bram

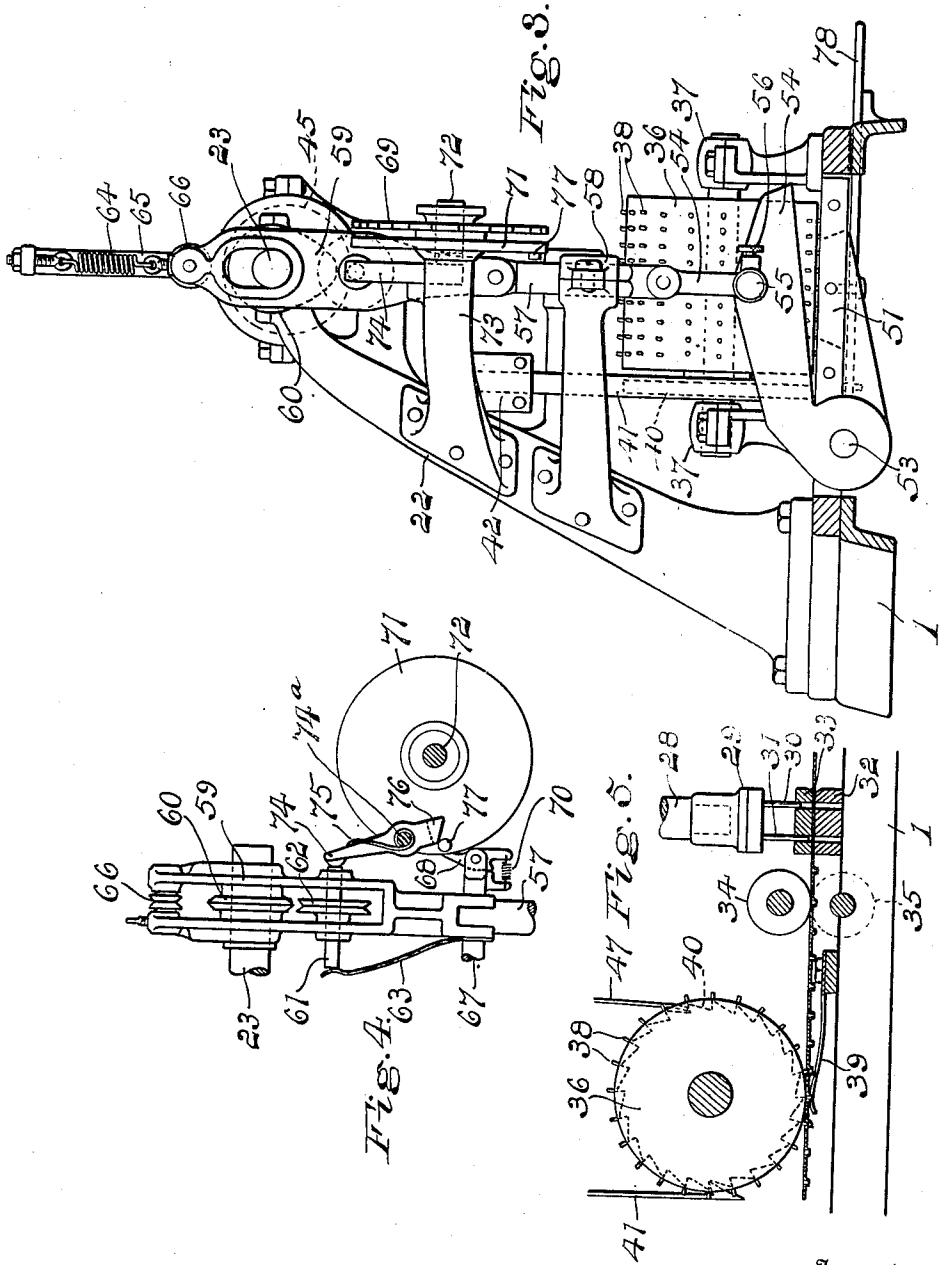
Inventor
John D. Beebe

By Lewis A. Handess
Attorney

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Witnesses
A. M. Shannon
E. E. Mc. Jerram

Inventor
John D. Beebe

By *Lewis C. Standers*
Attorney

1,000,144.

Patented Aug. 8, 1911.
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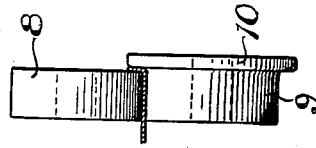
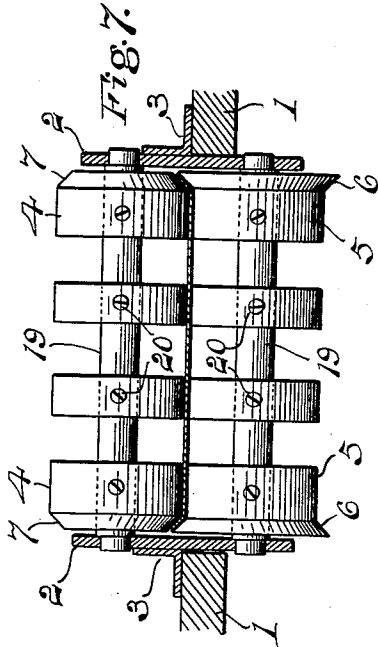


Fig. 8.

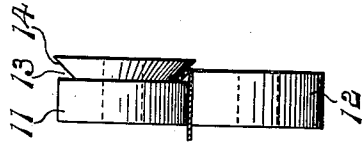


Fig. 9.

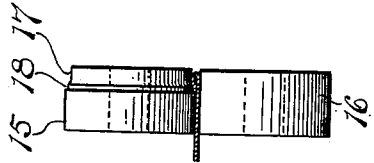


Fig. 10.

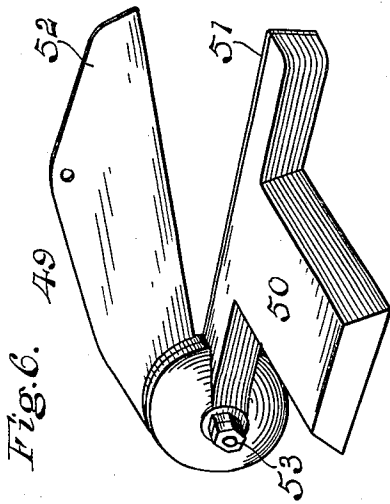


Fig. 6.

Witnesses
 A. M. Shannon
 E. C. Mc Gram

Inventor
 John D. Beebe

By Lewis E. Henders
 Attorney

UNITED STATES PATENT OFFICE.

JOHN D. BEEBE, OF DETROIT, MICHIGAN.

FIN-FORMING MACHINE.

1,000,144.

Specification of Letters Patent. Patented Aug. 8, 1911.

Application filed April 20, 1910. Serial No. 556,564.

To all whom it may concern:

Be it known that I, JOHN D. BEEBE, a citizen of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Fin-Forming Machines, of which the following is a specification.

This invention relates to a machine for forming radiating fins for liquid cooling devices and its object is to provide a machine for automatically forming from a roll of sheet material radiating fins of any desired length having rows of holes and a folded strengthening edge.

A further object is to provide a convenient adjustment for determining the length of the fins and to provide certain other new and useful features all as hereinafter more fully described reference being had to the accompanying drawings in which,

Figure 1 is a side elevation of a machine embodying the invention; Fig. 2 is a plan view of the lower portion of the same with parts removed; Fig. 3 is an end elevation showing the base in section on substantially the line $x-x$ of Fig. 2; Fig. 4 is a detail showing a tripping device for a cutter; Fig. 5 is a sectional detail showing punching, cutting, and feeding mechanism; Fig. 6 is a perspective detail of one of the cutters; Fig. 7 is an enlarged cross section of the folder substantially on the line $y-y$ of Fig. 2, showing the first step in the process of folding; Fig. 8 is a detail illustrating the second step of the process of folding; Fig. 9 a similar detail illustrating the third step; and Fig. 10 a detail illustrating the fourth and last step.

As shown in the drawing 1 is a suitable bed or base in an opening in the forward end of which is mounted a suitable frame 2 free to slide in the opening and supported by angle bars 3. Within this frame is a series of rolls for folding the edges of a strip of sheet metal which is led to the rolls from a spool or coil not shown. The first rolls 4 and 5 between which the strip of metal passes are formed to turn its edges at an angle of 45 degrees, the lower roll 5 being provided with an end flange 6 having a face extending at an angle of 45 degrees to the face of the roll, and the upper roll having its ends cut away at a similar angle as at 7, to conform to the said flange. The second set of rolls 8 and 9 between

which the strip passes is formed to turn the edge of the strip upward at an angle of 90 degrees, the lower roll 9 being provided with a right angle flange 10 and the upper roll 8 being of a length to fit between the end flanges 10 of the lower roll. The third step in the process of folding the edges of the metal strip is performed by the rolls 11 and 12, the lower roll being a plain roll to engage the lower side of the strip and the upper roll being formed with a groove 13 near each end having a side or incline 14 extending inward at an angle of 45 degrees adapted to engage the edges of the strip which had been previously turned upward at an angle of 90 degrees and turn said edge inward at an angle of 45 degrees to the upper face of the strip. The last step in folding the edges is performed by the rolls 15 and 16, the lower roll 16 being a plain roll and the upper roll 15 being provided with reduced end portions 17 to engage the upstanding edges and fold the same downward, said ends being so reduced that the edges of the metal will not be compressed tightly downward upon itself at the edges of the strip. A shoulder 18 is provided at the inner end of the reduced portions of the roll to engage the extreme inner edge of the folded over portions of the strip and compress said edge down hard upon the body of the strip which is thus formed with a strengthening bead along each edge to give the strip strength and prevent it from being kinked and bent.

Each of the forming rolls is made up of adjustable sections secured upon a supporting shaft 19 by means of set screws 20 with spaces between the sections so that by loosening the set screws the sections may be shifted upon their shaft to lengthen or shorten the roll. Provision is thus made for folding the edges of strips of metal of different widths.

Mounted in suitable bearings upon the upper ends of brackets or posts 21 and 22 secured to the base 1, is an outer shaft 23 having a tight pulley 24 and a loose pulley 25 thereon for the engagement of a suitable driving belt. Upon this shaft is also secured an eccentric 26, the strap 27 of which is pivotally attached to a vertically reciprocable bar 28 mounted in bearings upon the bracket 21. To the lower end of the bar 28 is detachably secured a head 29 provided with two rows of pins 30 and 31 adjustably

and detachably secured in the head by means of set screws.

32 is a die secured to the bed 1 and 33 is a block secured upon the die and provided with openings to receive and guide the pins. The strip of metal as it passes from the folding rolls passes over the die 32 and under the block 33 and is perforated by the pins 30 and the metal around the perforations is punched downward to form a collar or flange around each perforation, by the second row of pins 31. After passing over the die 32 and being perforated, the strip of metal passes between cutting rolls 34 and 35 which have cutting edges engaging the strip of metal along its longitudinal center line to slit the strip into two parts. There are preferably ten punches 30 and after the metal is cut by the slitting rolls each strip has five perforations in each transverse row. To draw the strip of metal through the folder over the die and between the slitting rolls, a pin wheel or drum 36 is provided. This drum is mounted in bearing brackets 37 secured to the bed 1 and is provided with rows of pins 38 projecting from its periphery and adapted to engage the transverse rows of perforations in the strip of sheet metal to be pulled through. Spring fingers 39 are provided with their yielding ends directly beneath the drum 36 in a position to press upward against the under side of the strip and hold the same against the lower side of the drum so that as the drum is turned its pins will engage the perforations.

Secured to the end of the drum 36 is a toothed wheel 40 engaged by a spring hook or dog 41 which is adjustably secured at its upper end by means of a clamping plate 42 to a vertically reciprocable head 43 on a bar 44 reciprocable in suitable bearings on the bracket 22. The head and bar are reciprocated to actuate the dog 41 and turn the drum one notch at a time or the distance between the transverse rows of perforations in the strip, by an eccentric 45 secured to the shaft 23 pivotally connected to the head by the eccentric strap 46.

A spring stop arm 47 is carried by a suitable bracket secured to the base 1 and engages the toothed wheel 40 at the opposite side to that engaged by the dog 41 to prevent the drum from turning backward. As previously described the frame 2 of the folder is slidable longitudinally within an opening in the base 1 and attached to this frame is a coiled spring 48 which exerts a force to move the frame forwardly or away from the drum 36 so that when the hook 41 moves downward the drum will be turned backward slightly into firm engagement with the stop 47 by the spring 48 which will move the frame 2 and pull forwardly on the strip. The drum is thus brought against a positive stop each time and the perfect spac-

ing of the transverse rows of holes in the strip is insured.

After passing beneath the feed drum 36 the strip passes beneath cutting knives 49 for cutting the strip into the desired length. Each of these knives 49 comprise a sliding block 50 mounted in an opening in the bed plate to slide therein and provided with a shear plate 51 against which the pivoted blade 52 acts to cut the strip of sheet metal when the blade is turned upon its pivotal attachment 53 to the block. There are two of these cutters set parallel to each other and when moved apart to the extreme limit of the movement of the blocks 50 in the bed by operating levers 78 pivotally attached to the lower side of the blocks, the two knives will cut close to the perforations of two adjacent transverse rows of openings in the strip, cutting from the strip a piece of metal nearly the width between the rows of holes and leaving each end of the strip in the same condition, that is, the holes near one end of the strip will be the same distance from said end as those in the adjacent end of the other strip. By adjusting the blocks 50 toward each other a narrower piece will be cut from the strip between the rows of holes therein and when it is desirable to cut a strip just half way between the rows, one of the cutter blades may be disconnected from the operating link 54 and the other blade moved to mid position so that it will cut exactly half way between the rows of holes in the fin plate or strip. To so disconnect the knife the pin 55 which has a bearing in the link and projects through a hole in the upper edge of the knife is first unlocked by pulling out a locking pin 56 which locks the pin 55 in its bearing against endwise movement and then pulling out said pin to disconnect it from the knife.

The link 54 which is attached to and operates the knives or blades 52 is pivotally attached at its upper end to a vertically reciprocable bar 57 slidable in a suitable bearing 58 on an arm of the bracket 22. An open frame 59 is pivotally attached to the upper end of the bar 57 and near its upper end has a slotted guide bearing engaging the projecting end of the shaft 23 upon which the frame is guided and is free to slide. Secured upon the shaft 23 within the open frame is a cam wheel 60 and mounted in the frame and extending parallel with the shaft 23 is a shaft 61 upon which is secured within the open frame a roller 62 adapted to be engaged by the cam 60. The shaft 61 is mounted to slide longitudinally in the frame so that when it is in the position shown in Fig. 1 the roller 62 will be out of alinement with the cam 60 and said cam in turning will be inoperative. A flat spring 63 secured to the side of the frame engages one end of the shaft 61 to normally hold the roller out of

alinement with its cam. A coiled spring 64 is attached to the upper end of the frame 59 at one end and at its opposite end to the supporting arm 65 on the bracket 22 to normally hold the frame and its connected bar 57 and cutter blades 52 in raised position, with the shaft 23 in the lower end of the slotted bearing which it has in said frame 59. To assist the spring 64 in lifting the frame 59 and its connected parts into raised position, a small roller 66 is mounted in the upper end of the frame 59 in a position to be engaged by the cam 60 when the frame is in lowered position.

Secured to the vertically reciprocable head 43 is an arm or bar 67 carrying upon its free end a dog 68 which is normally held in engagement with a ratchet wheel 69 by a spring 70. This ratchet wheel is detachably secured to a disk 71 rotatably mounted upon a stud 72 on an arm 73 projecting from the bracket 22. A dog 74 is pivoted intermediate its ends upon a pin 74^a on the arm 73 adjacent to the disk and is normally held by a spring 75 with its upper end in engagement with one end of the sliding shaft or pin 61. The lower end of the dog 74 is provided with a lug 76 projecting laterally therefrom toward the face of the disk 71 which disk is provided with a pin 77 to engage said lug 76 and operate the dog.

As the head 43 is reciprocated by the turning of the cam 45 to actuate the hook 41 and turn the feeding drum 36 one notch at a time, the bar 67 carried by said head and carrying the dog 68 is also raised and lowered and the ratchet wheel 69 and disk 71 is turned with a step by step motion by said dog. The turning of the disk 71 will bring the pin 77 into engagement with the dog 74 and actuate the same. The movements of the parts are so timed that when the dog is actuated, the small side of the cam will be turned toward the roller and thus said dog will when actuated, shove the roller 62 into alinement with the cam 60 which cam engaging the roller will force the frame 59 downward and actuate the cutter knives to sever the fin strip at the proper time. The length of each fin strip is therefore determined by the size of the ratchet wheel 69, the greater the diameter of said ratchet the greater the number of strokes of the reciprocating head to turn the disk 71 a complete revolution and bring its pin 77 into engagement with the dog 74 to operate the cutters. The ratchet wheel 69 is therefore made detachable from the disk 71 and other wheels of different diameters may be put in its place to determine the number of transverse rows of holes which each fin plate will contain and the length of each fin plate beyond its end row of perforations at each end of the plate is determined by the adjustment of the cutters 49.

With a machine of the character described sheet metal fins of any desired length and having any number of transverse rows of perforations may be formed by a continuous operation of the machine and the edges of the strip at the same time folded to give the fins finish and strength.

It is obvious that changes in the construction and arrangement of parts may be made without departing from the spirit of my invention, and I therefore do not wish to limit myself to any particular form or construction.

Having thus fully described my invention what I claim is:—

1. The combination of punches for forming transverse rows of holes in a strip of sheet metal, means for intermittently feeding the strip in timed relation to the movement of the punches, a cutter adapted to sever the strip transversely between the rows of perforations having two cutting edges, one at each side of said cutter to cut from said strip a transverse strip of metal, and means for adjusting the cutting edges to vary the width of the transverse strip.

2. The combination of punches for forming transverse rows of holes in a strip of sheet metal, means for intermittently feeding the strip in timed relation to the movement of the punches, a cutter comprising parallel cutting members, and means for adjusting said members toward and from each other.

3. The combination with punches and means for actuating the same, of means for intermittently feeding a strip of metal in timed relation to the movement of punches, a cutter comprising parallel cutting members, means for actuating said members in timed relation to the movement of the feeding means, and means for detachably attaching one of said members to said actuating means whereby one of said members may be thrown out of operation.

4. The combination of punches and means for actuating the same, of means for intermittently feeding a strip of metal, a cutter comprising parallel cutting members, means for actuating said members to which they are detachably attached, and means for adjusting said members toward or from each other.

5. The combination with punches and means for actuating the same, of means for intermittently feeding a metal strip in timed relation to the movement of the punches, a cutter comprising pivoted cutting blades extending parallel to each other, a reciprocable member actuated in timed relation to the movement of the punches for actuating the blades, means for detachably connecting said blades to said member, and means for adjusting said blades toward or from each other.

6. The combination with punches and means for actuating the same, and means for feeding a strip of sheet metal, of a cutter for severing the strip transversely, a reciprocable member to which the cutter is attached for operating the same, a cam, means adapted to be thrown into and out of the path of the cam to be engaged thereby and actuate the reciprocable member, and means operating in timed relation to the movement of the feeding means to move said member into the path of said cam.
7. The combination with punches and means for actuating the same, of means for intermittently feeding a strip of metal, a cutter for severing the strip, a reciprocable frame connected to the cutter to actuate the same, a cam within the frame, a member carried by the frame and adapted to be moved into the path of the cam to be engaged thereby to move the frame, and means actuated in timed relation to the actuation of the feeding means to move said member into the path of the cam.
8. The combination with punches and means for actuating the same, of means for feeding a strip of metal, reciprocable means for actuating the feeding means moved in timed relation to the movement of the punches, a cutter, means for actuating the cutter comprising a cam and a member adapted to be moved into the path of the cam to be engaged thereby to actuate the cutter, a dog for moving said member into the path of the cam, and a rotatable member actuated by the reciprocation of the reciprocable member to operate the dog.
9. The combination with punches and means for actuating the same, of a rotatable member for feeding a strip of metal, a reciprocable member actuated in timed relation to the movement of the punches for turning the feeding member, a cutter, means for actuating the cutter comprising a cam and a member adapted to be moved into the path of the cam to be engaged thereby to actuate the cutter, a rotatable member turned by the reciprocation of the reciprocable member, and means operated by the turning of the rotatable member to move the movable member into the path of the cam.
10. The combination with punches and means for actuating the same, of a rotatable feed member for feeding a strip of metal, a reciprocable member reciprocated in timed relation to the movement of the punches for turning the rotatable feeding member, a cutter for severing the strip of metal, a vertically reciprocable frame connected to the cutter for actuating the same, a cam within the frame, a roll within the frame normally held out of the path of the cam and adapted to be moved into position to be engaged by the cam to actuate the frame, a detachable ratchet wheel, means carried by the reciprocable member to engage and turn the ratchet wheel, a dog adapted to move the roll into engagement with the said cam, and means moved by the turning of the ratchet wheel to engage and actuate the dog.
11. The combination with punches for forming transverse rows of holes in a strip of metal and means for actuating the same, of a rotatable member provided with peripheral projections to engage the rows of holes in the strip, means for turning the rotatable member in timed relation to the movement of the punches, a stop to prevent the backward turning of the rotatable member, members frictionally engaging said strip and movable in a direction longitudinally of the strip, and means for yieldingly resisting the movement of said members with the strip when said strip is moved by the turning of said rotatable member.
12. The combination with punches for forming transverse rows of holes in a strip of metal and means for actuating the same, of a rotatable member provided with peripheral projections to engage the rows of holes in the strip, means for turning the rotatable member in timed relation to the punches, a stop to prevent the backward turning of the rotatable member, a folder comprising a movable frame, and a spring to move the folder in a direction opposite to that in which the strip is fed by the rotatable member.
13. The combination with punches for forming transverse rows of holes in a strip of metal and means for actuating the same, of a rotatable feed drum provided with peripheral projections to engage the rows of holes in the strip, means for turning the drum with a step by step movement in timed relation to the movement of the punches, a stop for the drum, a movable frame, a series of folding rolls mounted in said frame to engage and fold the strip of material, and a spring to move the frame.
14. The combination with punches and means for actuating the same, of means for feeding a strip of material in timed relation to the movement of the punches, a cutter comprising movable blocks, blades pivotally attached to the blocks and movable therewith and having plain adjacent sides, means for adjusting the blocks, and means engaging the blades to actuate the same in timed relation to the feeding means.
15. The combination of a power shaft, punches for forming holes in a strip of material, an eccentric on the power shaft for actuating the punches, a feed drum having projections upon its periphery to engage the holes in the strip, a reciprocable bar, an eccentric on the power shaft to reciprocate the bar, means reciprocable with the bar to turn the feed drum in timed relation to the move-

ment of the punches, a cutter, a cam on the
power shaft for actuating the cutter, means
movable into and out of the path of the cam
for actuating the cutter, and means actuated
5 by the reciprocable bar for moving said
means into the path of the cam in timed re-
lation to the movement of the feed drum.

In testimony whereof I have affixed my
signature in presence of two witnesses.

JOHN D. BEEBE.

Witnesses:

ANNA M. SHANNON,
LEWIS E. FLANDERS.