

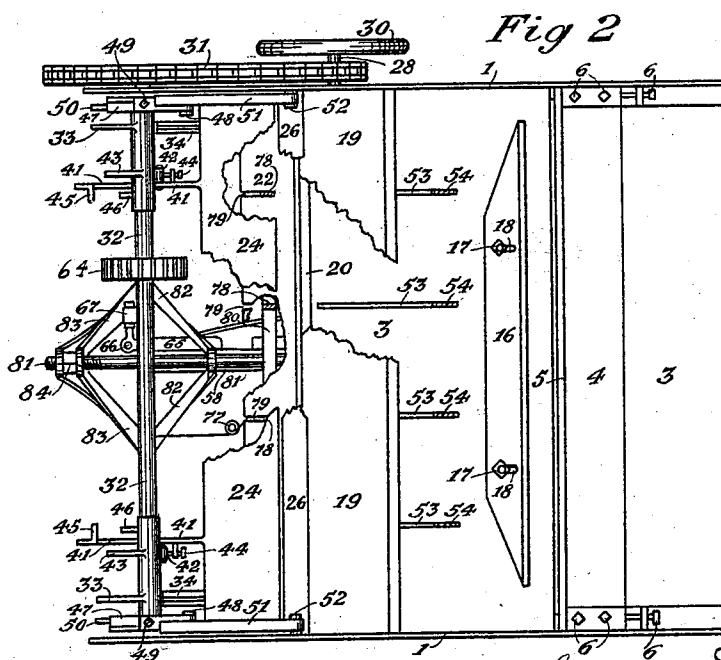
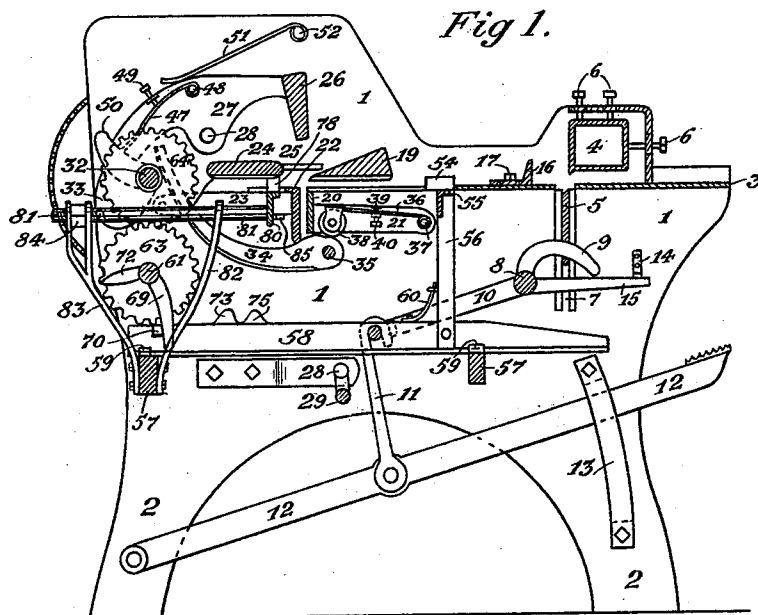
(No Model.)

2 Sheets—Sheet 1.

C. EFRAMSON.
FOLDING MACHINE.

No. 519,058.

Patented May 1, 1894.



Witnesses

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Fig 3

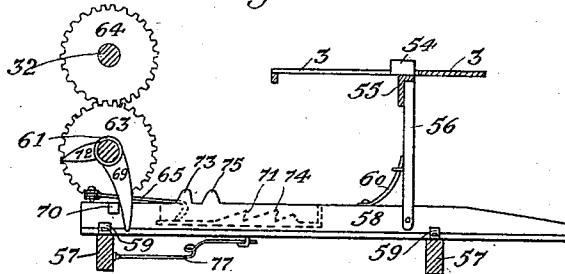


Fig 4

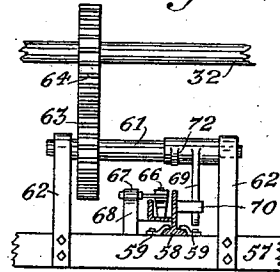


Fig 5

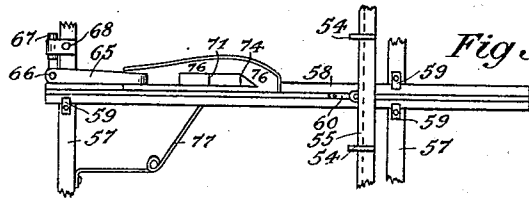


Fig 6

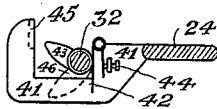


Fig 7

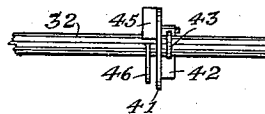


Fig 8

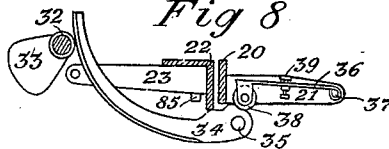


Fig 9

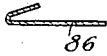


Fig 10

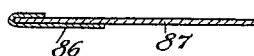
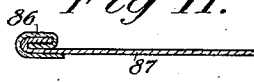


Fig 11.



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UNITED STATES PATENT OFFICE.

CARL EFRAMSON, OF MINNEAPOLIS, MINNESOTA, ASSIGNOR OF ONE-HALF
TO EDWIN WIEDENBECK, OF SAME PLACE.

FOLDING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 519,058, dated May 1, 1894.

Application filed October 2, 1893. Serial No. 487,037. (No model.)

To all whom it may concern:

Be it known that I, CARL EFRAMSON, a citizen of the United States, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented a new and useful Folding-Machine, of which the following is a specification.

My invention relates to improvements in apparatus for cutting strips of tin or other metal and securing the same to the edge of such articles as cardboard or paper calendars, advertising cards, maps or other display hangings usually placed against the wall; and the objects of my improvement are, first, to provide convenient means for cutting the strips of tin or other metal in connection with the folding apparatus; second, to provide a series of folding apparatus to fold the tin upon the edge of the card or other article; third, to provide an automatic feeder to feed the strips of tin into the folding machine; and fourth, to provide an adjustable holder to hold the strip of tin while being bent. I attain these objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a vertical section of the machine. Fig. 2 is a top view, with a portion of the upper jaw of the holder, a portion of the hammer and of the first and second folders broken away. Fig. 3 is a detail showing a side view of the feeding apparatus. Fig. 4 is a rear view thereof, and Fig. 5 a top view of a portion of the same. Fig. 6 is a detail showing the cams and arm which operate the second folder. Fig. 7 is a view of the same looking from the rear. Fig. 8 is a detail showing a cross section of the lower jaw of the holder and the first folder, with operating parts. Fig. 9 is an end view of the metal strip, when ready for the insertion of the edge of the paper or card. Fig. 10 is an end view of the metal strip and edge of the paper or card when the first fold is completed. Fig. 11 is an edge view of the paper or card and the end of the metal strip when the folding is completed.

Similar numerals refer to similar parts throughout the several views.

The frame of the machine is in the form of a table with its sides 1, its legs 2, and its top 3.

For cutting out the strips of tin, shears are employed operating after the manner of what are known as "square shears" composed of the jaw 4 and knife 5. The jaw is secured to the sides of the table 1, and slightly above its top so that the sheets of tin may be passed beneath it upon the table, and is made adjustable by means of the set screws 6. The knife 5, slides up and down within grooves or ways 7 at the sides of the table, and through a slot in its top. Its upper or cutting edge is higher at one end than at the other, so as to operate after the manner of shears in the usual way. It is obvious that the knife may be placed above and the jaw below the top of the table, if desired, though I prefer the arrangement above described.

For operating the shears, a rock shaft 8 extends from one side to the other of the sides 1 of the table and is pivoted therein. Curved arms 9, are rigidly attached at one end to the rock shaft 8,—preferably one thereof near each end of the rock shaft, and pass through openings in or loops upon the knife 5 as shown in Fig. 1. An arm 10 is also rigidly attached at one end to the rock shaft 8, and at the other end, by means of the link 11, is loosely attached to the pedal 12. The lever or pedal 12 may be pivoted at one end to the frame of the machine, and a guide 13 attached to the frame, may be provided to steady the free end of such pedal against lateral movement. By the downward pressure of the operator's foot upon the pedal 12, the rock shaft 8 will be rocked and the knife 5 of the shears raised to cut the metal sheet which is fed over the top of the table 3 beneath the jaw 4 by the operator.

To withdraw the knife 5 promptly after each operation of cutting to make ready for the next, it is desirable to use some appropriate spring such as that designated 14 Fig. 1, attached to the frame and operating downward upon the outer end of the arm 15 which is secured at its inner end rigidly to the rock shaft 8. I gage the width of the strips to be used by means of a set slide or gage 16, which is adjustably secured to the top of the table 3, by means of bolts 17 passing through slots 18 in the set slide and provided with nuts to screw down thereon as shown in Figs. 1 and

2. By this arrangement the metal strips are conveniently cut and delivered where they are wanted by the operator to be fed into the parts of the machine hereinafter described.

5 The more important features of my invention pertain to the folding of the metal strip. To assist in this operation, a holder is provided consisting of the cross beam 19 attached rigidly to the sides 1 of the table, forming
10 the upper jaw of the holder, and a cross bar 20, Figs. 1, 2 and 8, beneath it forming the lower jaw thereof. The upper jaw 19 is raised sufficiently above the top of the table 3, to allow the strip of metal to be passed beneath it
15 upon the table. The lower jaw 20 has two arms 21, cast in one piece with or rigidly attached to the lower jaw, and pivoted to the sides 1 of the table as shown in Figs. 1 and 8, so as to allow the jaw to move up and down
20 in grasping and releasing the metal strip. The first folder 22, may be constructed similarly to the lower jaw 20, and pivoted to the sides of the table by arms 23, Figs. 1, 2 and 8. The second folder 24 extends transversely
25 across the table and may be made capable of moving in a horizontal plane, by being confined at its ends within grooves 25 upon the sides 1 of the table. The hammer 26 is rigidly attached to two arm plates 27, one at
30 each side of the table, which are pivoted to the sides 1, by pivots 28.

The folding mechanism just described may be operated in any suitable manner. For this purpose I have provided a short shaft 28
35 at the side of the frame or table, having a crank 29 and a fly wheel 30 thereon. The link 11 at its upper end may be detached from arm 10 and attached to said crank 29, and the shaft 28 revolved by the foot of the
40 operator upon the treadle 12. The sprocket wheel on shaft 28 by means of the endless chain 31 and sprocket wheel on the cam shaft 32, as shown in Fig. 2, will serve to transmit such motion to the latter shaft. The cam
45 shaft 32 may extend transversely across the table and revolve in journals at its sides 1.

Upon the cam shaft 32, is arranged a system of cams for operating the folding parts. Two of these cams designated 33 operate upon
50 levers 34, pivoted one to each side of the table by pivots 35, Figs. 1, 2, and 8. Arms 36 are pivoted preferably upon the same pivots 37 to which the arms 21 of the lower jaw are pivoted, and are provided with rollers 38 that
55 rest upon the upper side of levers 34. A lug 39 on arms 21 extends over arms 36, and a set screw 40 passes through arms 36 and is screwed up against the lug, so that the weight of the lower jaw 20 is thereby borne upon the
60 arm 36, and the height of the lower jaw is adjusted by the set screws to suit the thickness of metal which is to be grasped by the holder. The cams 33 raise the levers 34 which
65 first lift the jaw 20 to grasp the metal strip, and the first folder 22 quickly follows lifted by the same lever. When the cams 33 have passed the levers 34, the levers drop against

the cam shaft allowing the folder and jaw to drop down. It is desirable to have the folder
22 rest upon lugs 85 projecting from each side 70 1, of the table under the arms 23, when the folder is down.

The second folder 24, may be provided with two arms 41 rigidly secured to it, each having a spring, shoulder 42 at the front side of
75 the cam shaft 32 against which the cams 43 upon the cam shaft operate to press the second folder forward within its grooves, Figs. 1, 2, 6 and 7. The shoulders 42 being springs will prevent breakage or the pressing of the
80 tin fold too tightly. Set screws 44 will regulate the tension. For drawing the second folder back, shoulders 45 may be provided upon each arm 41 at the rear of the cam
85 shaft, against which cams 46 press in the revolution of the cam shaft 32. To drive the hammer 26 down upon the metal fold, two flat springs 47 may be provided, secured to
90 the two arm plates 27 at 48, and adjusted by means of set screws 49, these springs 47 forming shoulders against which the cams 50 press, Figs. 1 and 2. The hammer may be lifted after
95 the cams 50 have passed the shoulders 47, by means of appropriate springs, such as those designated 51, firmly secured to the sides 1 of the table, at 52 and with their free
ends pressing downward upon the arm plates 27 at points to the rear of the pivots 28.

In order to feed the strips of metal into the
100 folders, I provide slots 53 in the top 3 of the table through which the feeders 54 project above the table, Figs. 1, 2, 3 and 5. No certain number of slots and feeders is essential, but I prefer to provide several so as to adapt
105 the machine to use strips of metal of various lengths. The feeders 54 may be rigidly secured to a horizontal cross piece 55, borne upon a standard 56. Upon the two horizontal
110 cross beams 57 secured to the two sides 1 of the table, may be placed a horizontal bar 58, which may be provided with flanges over which lugs 59 attached to the cross beams 57
115 project, holding the bar 58 to the cross beams, and allowing it to move endwise freely, as shown in Figs. 3, 4 and 5. The standard 56 is secured to the horizontal bar 58. For best
120 results this connection should be a joint and the standard 56 will be held in substantially a perpendicular position by means of a suitable spring such as 60, attached to the bar 58, while a loop holds the standard 56 against the
125 upper end of the spring. Grooves are provided in the under side of the upper jaw, 19, Fig. 1, immediately over the grooves 53 in the top of the table, so that when the bar 58 is moved toward the rear of the machine, the
130 feeders 54 may be carried in such grooves as far as the rear edge of the jaw 19, thus carrying the strip of metal to be fed finally beyond the holders. Similar grooves may also
be provided in the lower jaw 20. Such grooves in the holders are not essential but are desirable since they will enable the feeders to be made to extend both above and below the

space between the jaws of the holder, and will insure that the thin strip being fed, will be kept from wedging between the feeders and the jaws or table.

In the process of folding, the metal strip is advanced successively three times toward the rear end of the machine. To accomplish this, I prefer the following mechanism: I place a secondary cam shaft 61 below the cam shaft 32, revolving within journals in the standards 62, which are rigidly secured to the rear cross beam 57, Fig. 4. This secondary cam shaft may be made to revolve with cam shaft 32, by means of two cog wheels 63, 64, on the respective shafts engaging each other. A dog 65 is pivotally secured by two joints 66, 67 to a standard or support 68 upon the rear cross beam 57, Fig. 5. A cam 69 upon the secondary cam shaft 61 by the revolution of the latter, engages a lug 70, on the side of the bar 58, draws the latter bar rearward and with it the feeders, until the dog 65 drops into the first notch 71 on the side of the bar 58. By this time the cam has passed beyond the lug 70, and the dog holds the feeding apparatus at the point to which it has advanced. The cam 72 on the same shaft next engages the lug 73 on the bar 58 and draws it back until the dog engages in the second notch 74, and holds the apparatus as before. The cam 72 in its next revolution engages the lug 75 and draws the feeding mechanism still farther rearward, until the rear edge of the feeders have delivered the folding strip of metal beyond the holders 19, 20. The dog 65 has then advanced beyond the notches 71, 74, and has dropped into the groove 76, which leads around said notches and back to the first position of the dog. When the cam 72 passes the second lug 75, any suitable spring such as that designated 77 which is attached to the rear cross beam 57 and engages in a hook upon the bar 58, will serve to drive the feeding mechanism toward the front of the machine and so return the feeders ready for another strip of metal. The dog 65 will return to its first position along the groove 76, the pivot 66, allowing the dog to swing laterally in the groove around the notches in returning to the position shown in Fig. 5, while the pivot 67 will allow it to rise over the notches when the bar 58 is being drawn back.

To regulate the width of the fold of the metal strip I provide stops 78, which I prefer to have project upward through slots 79 in the first folder 22. The same number of stops as of feeders may ordinarily be provided. The stops may be rigidly secured to a horizontal transverse bar 80 similar to that to which the feeders 54 are secured, and bar 80 rigidly secured to a longitudinal bar 81 which may be held by front and rear standards 82, 83, attached to the rear cross beam 57. The rear standards 83 may be bifurcated at the upper end between the branches of which a nut 84 working upon screw threads upon the bar 81, may be placed for the purpose of adjusting the position of

the stops 78, at any point forward or backward desired, Figs. 1 and 2. It is preferable also to provide grooves in the under side of the second folder 24 corresponding to the slots 79 in the first folder, so that the stops 78 may extend upward within such grooves, for the same reason that such grooves are provided in the under side of the jaw 19 as before stated. Similar grooves may also be provided in lower edge of the hammer 26, if desired, to prevent injury to the stops 78 and feeders 54 by the descent of the hammer, though the stops and feeders will ordinarily be out of the way of such harm.

The method heretofore used for accomplishing the work which may be done by my machine, has been slow and laborious, by the use of the common tinner's tools known as "square shears" and "common folder."

By the use of my machine the work may be done rapidly and hence with much less expense, and is done neatly, with uniformity and precision. The operator having provided a quantity of strips of metal of proper width cut upon the shears, as described, places a strip on the table in front of the feeders 54. The first movement of the feeders described, carries the strip back so that its rear edge is against the stops 78. The jaw 20 rises, firmly grasping the strip in the holder, followed by the first folder which turns the portion of the strip projecting over it, upward, forming a right angle, and this is followed quickly by the forward movement of the second folder 24, which comes in contact with the upturned edge of the strip and bends it forward over the top of the jaw 19. The metal strip 86 is now in the shape shown in Fig. 9, ready for the insertion of the edge of the card-board or other material over which it is to be folded. In order that this may be inserted, the first folder drops down, the second folder moves back out of the way, the lower jaw 20 drops releasing its grasp upon the metal strip, and the second feeding motion of the feeders carries the strip back till it is again in contact with the stops 78, at the angle of the turn. The operator then quickly passes the paper over the top of the upper jaw 19 and under the hammer 26, and inserts its edge into the open mouth of the first fold of the strip. The hammer 26 next descends upon the first fold causing it to press tightly about the inserted edge of the paper 87, and grasping it as shown in Fig. 10. The first fold is thereby completed. The second fold is made by a repetition of the same action of the folding parts. After the first descent of the hammer just stated, and the cams 50 which operate it have passed the spring shoulders 47, the hammer flies up out of the way and the jaw 20 again grasps the unfolded portion of the strip. The first folder 22 rises pushing up the first fold lying upon it to a position at right angles to the part held in the holder, and the second folder 24 moves forward pressing the first fold over onto the

top of jaw 19. The first folder again drops, the second folder recedes and the lower jaw 20 drops down releasing the strip for another action of the feeders. The feeders now make
 5 their third rearward motion, by the cam 72 engaging on the lug 75. This moves the folded strip again back against the stops 78, and this time completely out of the holder. The hammer 26 now descends again pressing
 10 down the second fold tightly, thus completing it, and rises as before. The paper with its metal border is drawn out over the top of jaw 19 as the paper was inserted, and the operation is completed as shown in Fig. 11. The
 15 feeders 54 have returned to the first position ready to feed a new strip of metal as heretofore described.

In the adjustment of the parts, it is desirable that it be so made that the lower jaw 20
 20 will rise and grasp the metal strip before the first folder 22 has risen materially; and that after the first folder shall have risen to bend the strip upward, it shall begin to descend out of the way, before the forward motion of
 25 the second folder 24 has been completed. Any appropriate spring such as that designated 60 applied to the feeders gives an elasticity that is very desirable, though the machine would operate without this spring. In
 30 other words, spring feeders will adapt themselves to the width of the strip and to the adjustment of the stops 78.

What I claim as my invention, and desire to secure by Letters Patent, is—

35 1. In a folding machine for folding strips of metal upon the edge of hanging cards and other like articles, the combination of a holder, a first folder, a second folder adapted to follow the action of the first folder, and further
 40 complete the fold, spring shoulders against which cams act to press the second folder upon the fold, and a cam shaft having cams to operate the second folder, substantially as set forth.

45 2. In a folding machine for folding strips of metal upon the edge of hanging cards and other like articles, the combination of feeders adapted to feed the strip to be folded successively into the folding parts, stops against
 50 which the strip is fed, and folding parts adapted to fold the strip, with suitable mechanism to operate the parts, substantially as shown and described.

3. In a folding machine for folding strips of
 55 metal upon the edge of hanging cards and other like articles the combination of automatic spring feeders adapted to feed the strip to be folded successively into the folding parts, stops against which the strip is fed,
 60 and folding parts adapted to fold the strip, with suitable mechanism to operate the parts, substantially as shown and described.

4. In a folding machine for folding strips of metal upon the edge of hanging cards and
 65 other like articles, the combination of a cam shaft having cams mounted thereon adapted to engage lugs on a bar, feeders secured to

such bar, a table having slots through which the feeders project, and folding parts, substantially as shown and described.

5. In a folding machine for folding strips of metal upon the edge of hanging cards and other like articles, the combination of a cam shaft having cams mounted thereon, adapted to engage lugs on a bar, to move the bar and feeders, feeders secured to such bar, a dog adapted to engage in notches upon the bar, and to swing in a grooved way around such notches, a spring adjusted to move the bar back when the dog is released, and mechanism adapted to fold the strip which is fed into the same by such feeders, substantially as set forth.

6. In a folding machine for folding strips of metal upon the edge of hanging cards and other like articles, the combination of a holder, folding parts adapted to fold a strip of metal upon the edge of a card, automatic feeders adapted to advance the metal successively three times into the folding parts, so that the folding may be performed, the edge of the card inserted, and the completed fold withdrawn, mechanism whereby the feeders are held in the position to which they advance each time but the last when they return to the point of first starting, and stops against which the metal is fed, substantially as specified.

7. In feeding mechanism for the purpose set forth an automatic spring feeder secured to a bar having lugs on which cams upon a cam shaft engage to draw the bar back with a dog adapted to engage in notches upon the bar, and to swing in a grooved way around such notches, and a spring adjusted to move the bar back when the dog is released, substantially as set forth.

8. In a holder for a folding machine for folding strips of metal upon the edge of hanging cards and other like articles, the combination of a stationary jaw, a movable jaw pivoted upon arms, roller arms having rollers upon which the movable jaw is supported, levers adapted to act against the rollers to move the jaw, and a cam shaft having cams adapted to operate against the lever, substantially as specified.

9. In a folding machine for folding strips of metal upon the edge of hanging cards and other like articles the combination of a holder composed of a stationary jaw and a movable jaw, rollers upon which the movable jaw is supported, levers adapted to act against the rollers to move the jaw, a cam shaft having cams adapted to operate against the lever, automatic feeders to feed a strip of metal into the machine, folding parts adapted to fold the strip of metal around and upon the stationary jaw while being held by the holder, and a hammer to close down the fold, substantially as specified.

10. In a folding machine for folding strips of metal upon the edge of hanging cards and other like articles, the combination of automatic feeders, stops against which the metal

strip is fed, a first and second folder adapted to move in different directions successively, a hammer and a holder adapted to grasp the metal while the metal is being folded, and then to release it for the action of the feeders in moving the fold away from the bar over which it is folded for the insertion of the paper and for the hammer to close down the folds, substantially as specified.

10 11. In a machine for cutting strips of metal and folding the same upon the edge of cards and other like articles, the combination of shears adapted to cut such strips of metal from a larger sheet and to deliver them near

the feeders of the folding parts, said shears 15 consisting of a stationary jaw and a movable knife actuated by a curved arm upon a rock shaft, a spring adapted to withdraw the knife after a strip is cut, an adjustable gage so placed as to leave the proper space for the 20 width of such strip between the gage and the cutting edge of the knife, folding mechanism, and a table to support the whole, substantially as shown and described.

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