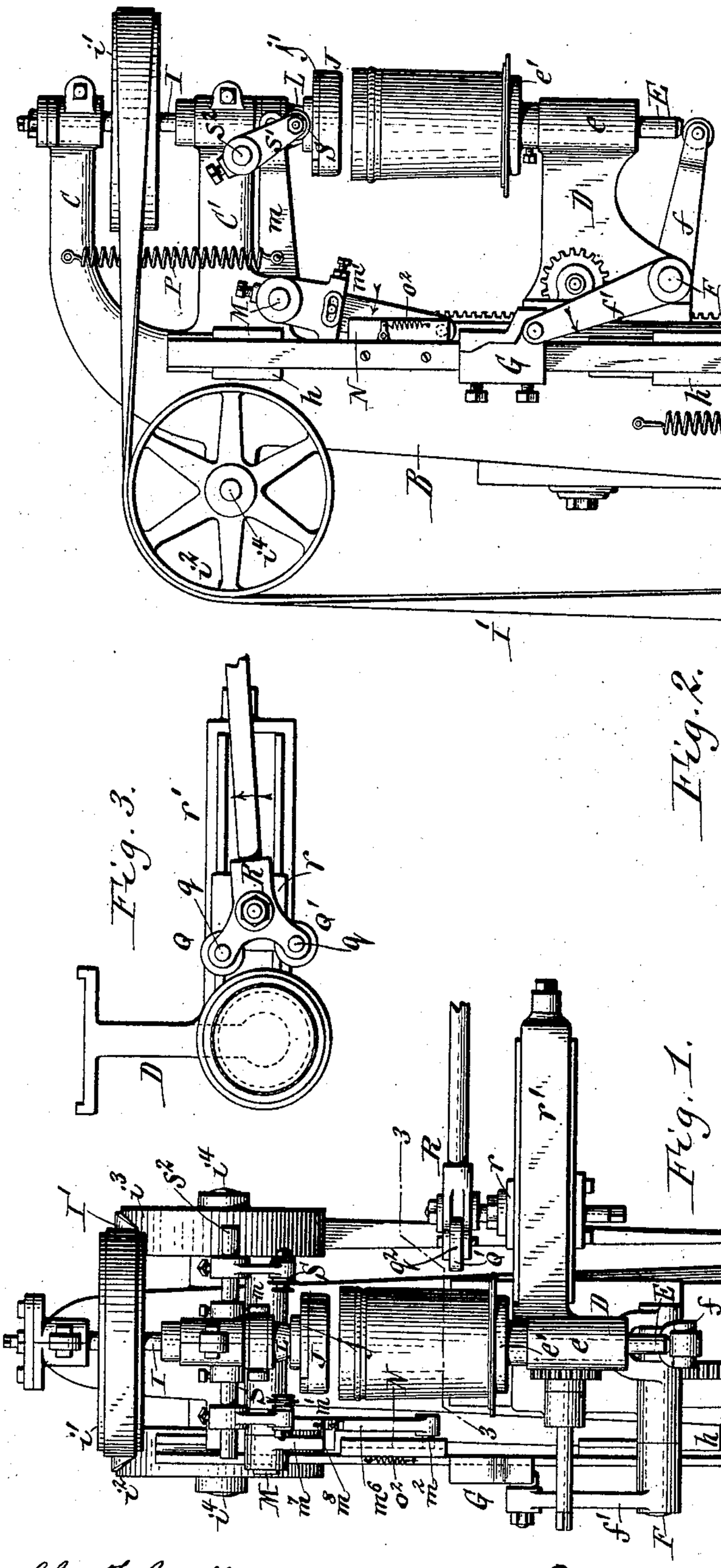
No. 620,398. Patented Feb. 28, 1899.

E. ZEH.

MACHINE FOR SEAMING AND CURLING SHEET METAL.

(Application filed Nov. 22, 1898.)

(No Model.) 2 Sheets—Sheet 1.



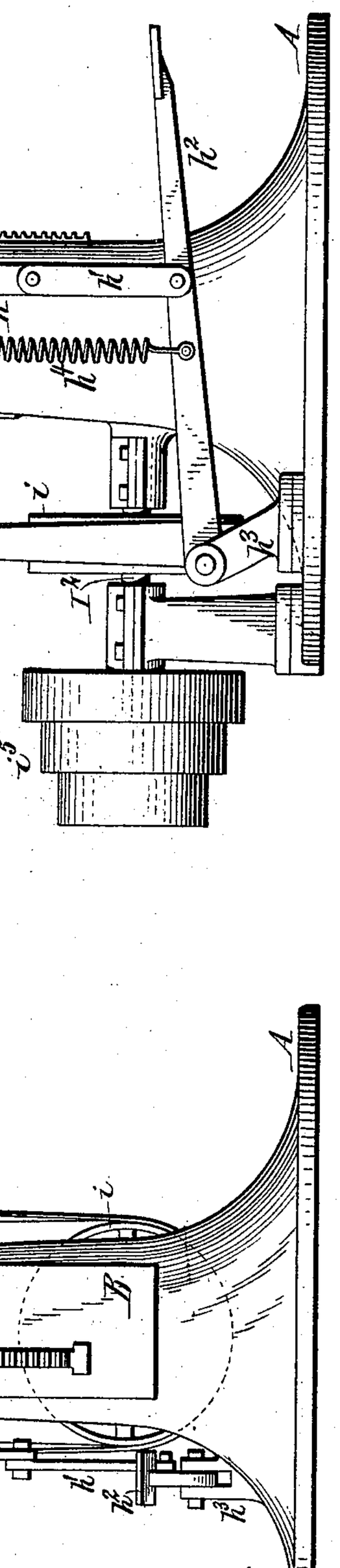


Fig. 2.

Fig. 3.

Fig. 1.

Witnesses:
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MACHINE FOR SEAMING AND CURLING SHEET METAL.

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(No Model.) 2 Sheets—Sheet 2.

Fig. 4.

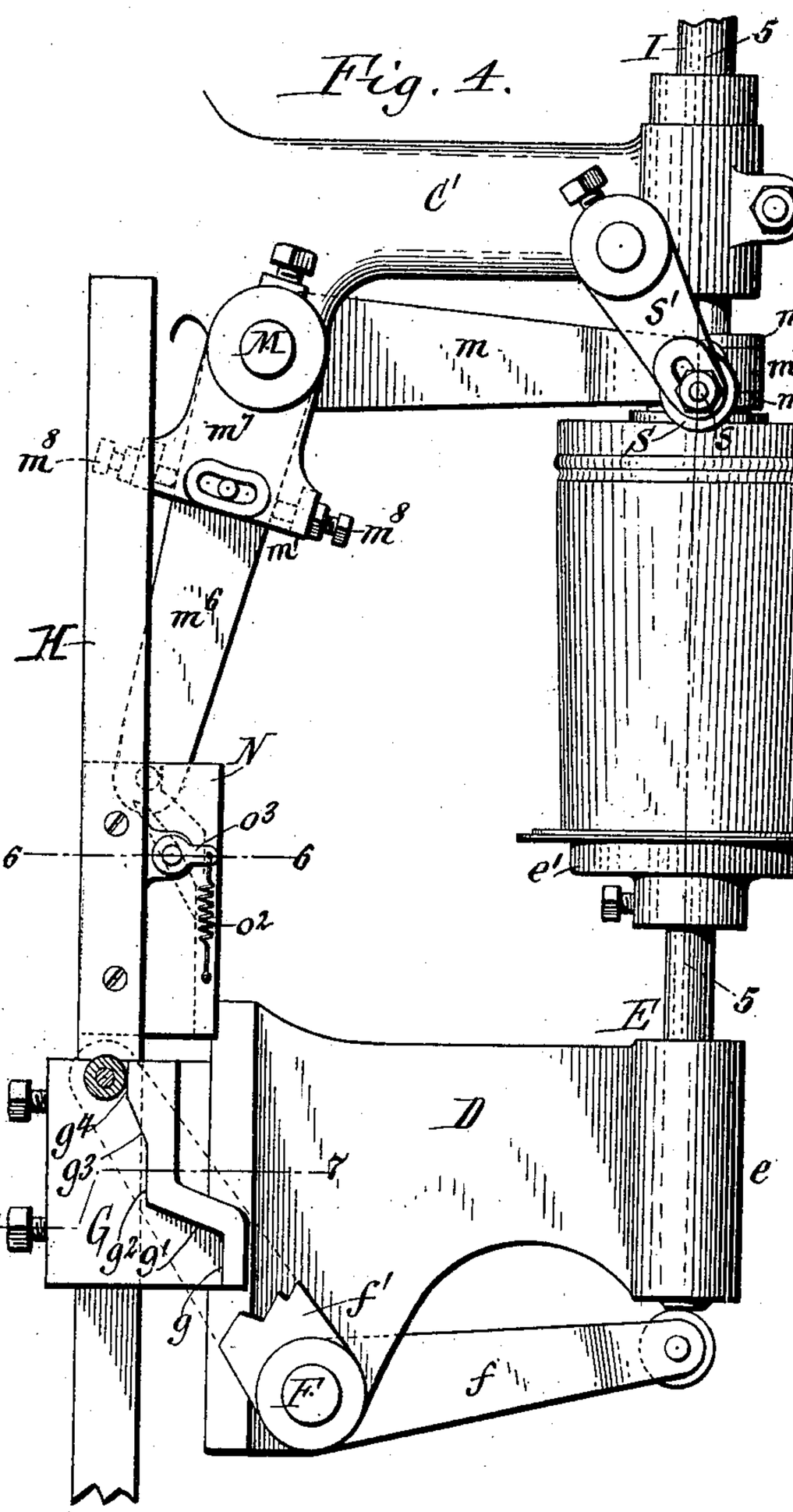
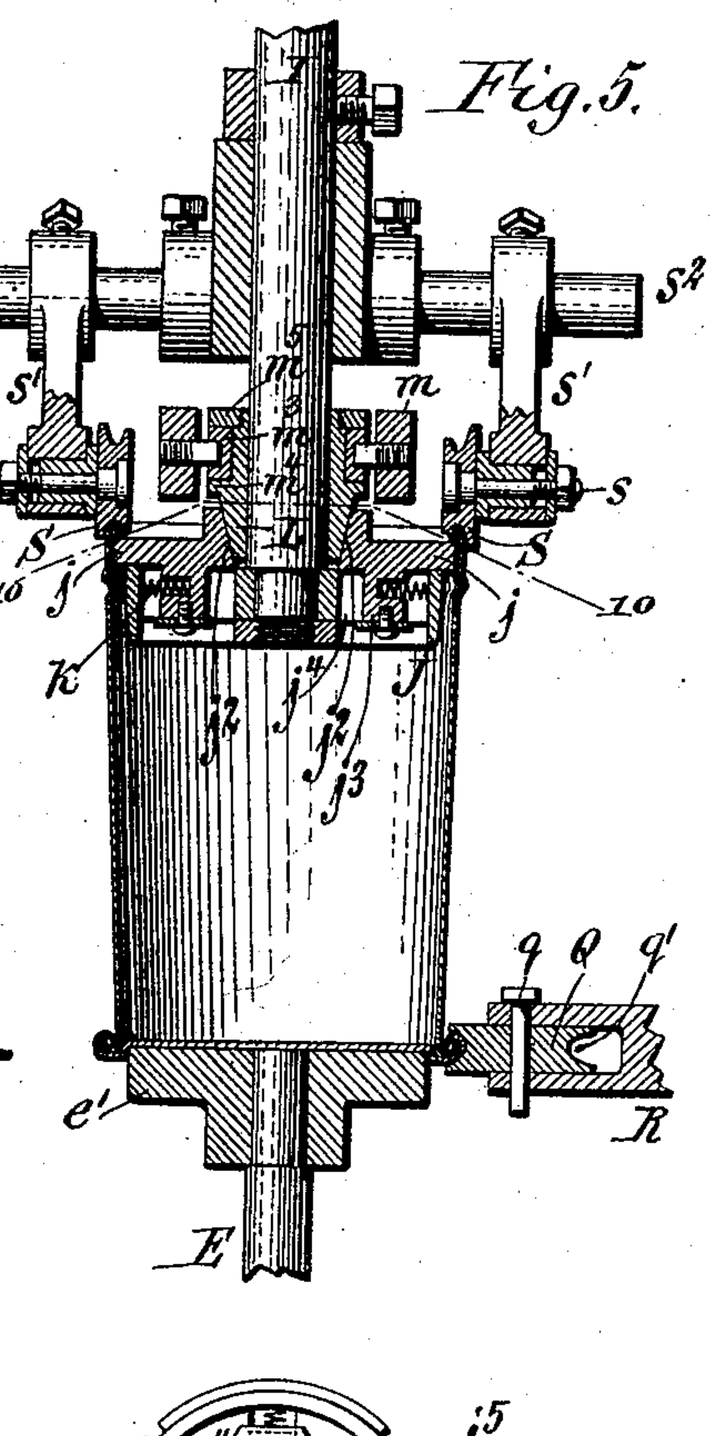


Fig. 5.



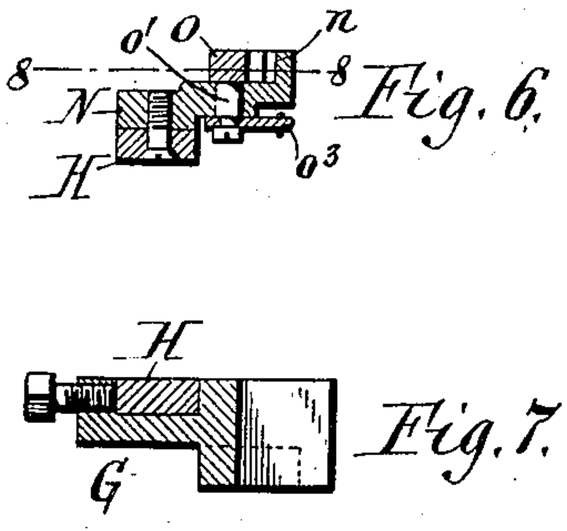


Fig. 6.

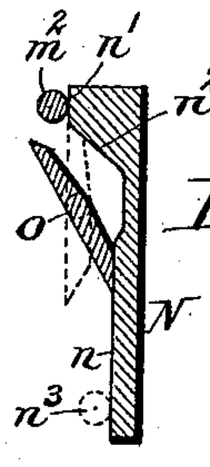


Fig. 8.

Fig. 7.

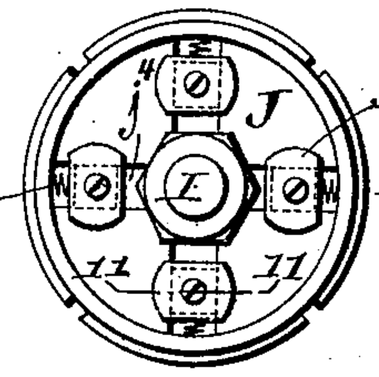


Fig. 9.

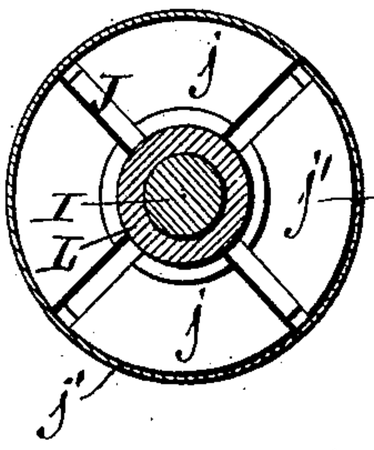


Fig. 10.

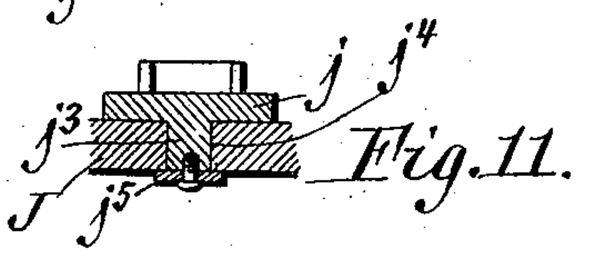


Fig. 11.

Chas. F. Burkhart.
Henry L. Deck. } Witnesses.

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By Wilhelm & Bonner
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UNITED STATES PATENT OFFICE.

EDMUND ZEH, OF BUFFALO, NEW YORK, ASSIGNOR TO THE NIAGARA MACHINE AND TOOL WORKS, OF SAME PLACE.

MACHINE FOR SEAMING AND CURLING SHEET METAL.

SPECIFICATION forming part of Letters Patent No. 620,398, dated February 28, 1899.

Application filed November 22, 1898. Serial No. 697,128. (No model.)

To all whom it may concern:

Be it known that I, EDMUND ZEH, a subject of the Emperor of Germany, residing at Buffalo, in the county of Erie and State of New York, have invented new and useful Improvements in Machines for Seaming and Curling Sheet Metal, of which the following is a specification.

This invention relates to a machine for connecting the lower edge of the body and the edge of the bottom of a sheet-metal pail or vessel by a seam-joint and for curling or turning over the upper edge of the body.

The object of my invention is to produce a simple and efficient machine whereby the above operations can be performed with but one handling of the blanks, thereby expediting the manufacture of sheet-metal pails and similar tubular vessels and reducing the cost thereof proportionately.

In the accompanying drawings, consisting of two sheets, Figure 1 is a front elevation of my improved seaming and curling machine, showing the position of the parts when the pail-blanks are placed in the machine. Fig. 2 is a side elevation thereof. Fig. 3 is a fragmentary horizontal section in line 3 3, Fig. 1. Fig. 4 is a fragmentary side elevation, on an enlarged scale, of the blank elevating, clamping, and curling mechanism, showing the same in an operative position. Fig. 5 is a vertical section in line 5 5, Fig. 4. Figs. 6 and 7 are horizontal sections in lines 6 6 and 7 7, Fig. 4, respectively. Fig. 8 is a vertical section in line 8 8, Fig. 6. Fig. 9 is a bottom plan view of the blank-holding chuck. Fig. 10 is a horizontal section in line 10 10, Fig. 5. Fig. 11 is a fragmentary vertical section in line 11 11, Fig. 9.

Like letters of reference refer to like parts in the several figures.

The main frame of the machine consists, essentially, of a base A, a standard B, rising from the base, and upper and lower arms C C′, projecting forwardly from the upper portion of the standard.

D represents a bracket projecting forwardly from the lower portion of the standard and capable of vertical adjustment thereon in any usual and well-known manner.

E represents an upright shifting rod or spindle which slides vertically in a way *e* on the front end of the bracket and which is provided at its upper end with a horizontal supporting disk or table *e′*. This table may be mounted loosely on the upper end of the shifting rod, so as to turn thereon, or it may be secured to the rod, and the latter may turn in its guideway. When the table is in its lowered position, the operator places a pail-bottom blank upon the table and a body-blank, having a laterally-projecting flange at its lower end, upon the bottom-blank, after which the table is raised for bringing the lower edge of the body and the edge of the bottom in line with the seaming devices and the upper edge of the body into engagement with the curling devices. This upward movement of the blank-supporting table is effected by a horizontal rock-shaft F, journaled in a bearing on the lower rear portion of the bracket D and provided at one end with a forwardly-projecting arm *f*, having a roller which engages with the lower end of the shifting rod E, and at its other end with an upwardly-projecting arm *f′*, having a roller or pin which engages with a vertically-movable cam G. The face of this cam, with which the upright rock-arm *f′* engages, consists of a lower vertical portion *g*, an inclined portion *g′*, extending upwardly and rearwardly from the upper end of the vertical portion *g*, a vertical portion g^2, extending upwardly from the rear end of the inclined portion *g′*, an inclined portion g^3, extending rearwardly and upwardly from the upper end of the vertical portion g^2, and a vertical portion g^4, extending upwardly from the upper end of the inclined portion g^3, as shown in Figs. 2 and 4. The platform-shifting cam G is secured to a vertically-reciprocating bar H, which is guided in ways *h h* on the standard and connected at its lower end by a link *h′* to a treadle h^2. This treadle is pivoted at its rear end to the bracket h^3 on the base and is normally held in a raised position, together with the parts connected therewith, by a spring h^4. Upon depressing the treadle to its fullest extent the body and bottom blanks are lifted by the cam G and the intermediate mechanism, so that the edge of the bottom-blank and the laterally-projecting flange on the lower end

of the body stand opposite the seaming device and the upper edge of the body is engaged with the curling devices. While in this elevated position, the body and bottom blanks of the pail are rotated by the following mechanism:

I represents a continuously-rotating upright spindle, which is journaled in bearings in the front ends of the arms C C', but is held against vertical movement therein. This spindle is arranged axially in line with and above the shifting rod E and is rotated by a belt I', passing around pulleys $i\,i'$, mounted on the driving-shaft I^2 and the spindle I, respectively, and around intermediate pulleys $i^2\,i^3$, mounted on arbors i^4. The latter are arranged horizontally in rear and at right angles to the spindle I, and the driving-shaft is arranged horizontally below and at right angles to the arbors, whereby the belt is twisted in a well-known manner between the driving-pulley and the spindle-pulley. The driving-shaft is journaled in bearings on the base and standard and is rotated by a driving-belt running around a step or cone pulley i^5 arranged on the rear end of the driving-shaft.

J represents a circular chuck-head which is secured to the lower end of the spindle and which is arranged within the upper portion of the pail-body when the latter is in its elevated position.

j represents a number of radially-movable clamping-jaws, which are mounted horizontally on top of the head and each of which is provided at its outer end with a segmental gripper-face *j'*, which is adapted to bear against the inner side of the pail-body, and at its inner end with an inclined face j^2. The clamping-jaws are guided on the chuck-head by depending lugs j^3, formed on the jaws and engaging with radial slots j^4 in the head, each jaw being held against displacement by a plate j^5, which is secured to the lower end of its lug and bears against the under side of the head. The jaws are yieldingly held in their retracted innermost position by springs *k*, each of which bears with its ends against the head and the lug of one of the jaws, as shown in Figs. 5 and 9.

L represents a vertically-movable cone which engages with the inclines of the clamping-jaws. Upon depressing this cone the clamping-jaws are spread and engaged with the inner side of the elevated pail-body, and upon raising the cone the springs *k* contract the jaws or move them inwardly out of engagement with the pail-body. The vertically-reciprocating movement of the cone is produced by a horizontal rock-shaft M, journaled in bearings arranged on the supporting-arm C' in rear of the spindle and provided at its inner end with a forwardly-projecting upper rock-arm *m*, which is connected with the cone, while its outer end is provided with a depending lower rock-arm *m'*, having a pin m^2, which is engaged by a cam-shifting device arranged on the vertical bar H. The front end of the upper arm *m* is bifurcated or forked and pivoted to a ring m^3, which is mounted loosely between two collars or shoulders $m^4\,m^5$ on the cone, whereby the latter is free to turn with the chuck, but is compelled to rise and fall with the rock-arm *m*. The lower arm *m'* is preferably made in two sections, one section m^6 being hung loosely onto the rock-shaft M, while the other section m^7 is secured to said shaft and provided with adjusting-screws m^8, bearing against opposite sides of the section m^6, as shown in Figs. 1, 3, and 4, whereby the throw of the cone may be adjusted in a well-known manner.

The cam-shifting device, which engages with the lower rock-arm *m'* for operating the chuck, is constructed as follows:

N represents a cam-plate secured to the inner side of the bar H and provided on its inner side with a cam-face consisting, essentially, of a lower vertical portion *n*, an upper vertical portion *n'*, arranged rearward of the lower portion, and an inclined portion n^2, extending upwardly and rearwardly from the upper end of the lower vertical portion *n* to the lower end of the upper vertical portion *n'*.

O represents a movable latch or switch which is arranged on the rear side of the cam-plate and pivoted thereto near its middle by a horizontal pin *o'*, journaled in a bearing in the cam-plate N. In its normal position the switch is inclined with its lower end bearing against the lower vertical portion of the cam-face, in which position of the switch its rear side forms a cam-face, which extends from its lower end upwardly and rearwardly to its upper end, as shown in full lines, Fig. 8. The switch is yieldingly held in this position by means of a spring o^2, connected with its ends to the cam-plate N, and an arm o^3, secured to the outer end of the pivot of the switch, as shown in Figs. 4 and 6.

P represents a spring which connects the upper rock-arm *m* with the supporting-arm C, and whereby the rock shaft and arms are turned for raising the cone and releasing the chuck.

When the cam-plate N is in its highest position, the pin of the rock-arm *m'* engages with the lower vertical portion *n* of the cam-face, as shown by dotted lines n^3, Fig. 8. Upon depressing the cam-plate the rear inclined side of the switch engages with the rock-arm *m'* and deflects the same rearwardly, thereby lowering the cone and spreading the clamping-jaws of the chuck. This movement of the cone continues until the pin m^2 of the lower rock-arm *m'* reaches the pivot of the switch, and after this pin passes the pivot the forward pressure of the pin against the upper portion of the switch causes the latter to be turned until it bears with its upper end against the incline n^2, as shown in Fig. 8. In this position of the switch its rear side is flush with the upper vertical portion *n'* of the cam-face, whereby the pin of the lower rock-arm is directed by the switch upon the upper ver-

tical portion n' of the cam-face during the last portion of the downward movement of the cam-plate N. As the pin m^2 during the downward movement of the cam clears the upper end of the switch the latter is returned to its inclined position by the spring o^2. During the first portion of the subsequent upward movement of the cam-plate N the pin m^2 passes from the upper vertical portion of the cam-face to the inclined portion thereof, whereby the cone is raised for contracting the clamping-jaws, and as the cam-plate completes its upward movement the pin m^2 deflects the switch in order to pass below the same into its initial position. As the clamping-jaws are expanded they bear against the inner side of the pail-body with sufficient friction to cause the pail-body, together with the bottom and its support, to turn with the chuck, and while the body and bottom are so rotated the upper edge of the body is curled or turned over and the flange at the lower end thereof and the adjacent edge of the body are united by a seam.

The seaming and curling devices are constructed as follows:

Q Q′ represent a pair of seaming-rollers which are arranged adjacent to the lower edge of the pail when the latter is in an elevated position and which are pivoted by vertical pins q to the arms of a bifurcated lever R. The latter is pivoted to swing horizontally on a carriage r, which is supported in any suitable manner on a horizontal extension r' of the bracket D, so as to permit of moving the seaming-lever bodily toward and from the axis of the blank-supporting table for adapting the seaming device to pails of different diameters. The seaming-roller Q is provided in its periphery with a groove q', as shown in Fig. 5, while the other roller Q′ is provided with a flat periphery q^2, as shown in Fig. 1.

Upon turning the seaming-lever in the direction of the arrow, Fig. 3, the seaming-roller Q engages with its groove against the edge of the bottom-blank and the flange at the lower end of the body-blank and turns or curls the same upwardly and inwardly, as shown in Fig 5. The seaming-lever is next turned in the opposite direction, whereby the grooved seaming-roller is swung away from the curled edges of the body and bottom blanks and the other seaming-roller is pressed against the same, thereby flattening the curled edges against the body and finishing the seam in a well-known manner.

S S represent two curling-rollers, which are arranged vertically in line with the upper edge of the pail-body and on diametrically opposite sides thereof and each of which is provided with a peripheral groove which is constructed to turn over or curl the upper edge of the pail-body when the same is rotated in engagement with said groove. Each of the curling-rollers is pivoted by a horizontal pin or bolt s to the lower end of a supporting-arm s', which is secured at its upper end to a horizontal supporting-rod s^2. The latter is secured to the lower arm C′ of the main frame.

Preparatory to beginning the seaming and curling of a pail the shifting bar is raised to its highest position, in which position the table-shifting arm f' bears with its pin against the vertical portion g of the table-shifting cam G, and the chuck rock-arm m' bears with its pin against the lower vertical portion n of the chuck-cam N, whereby the table e' is lowered and the clamping-jaws are retracted, as shown in Figs. 1 and 2. The operator now places a bottom-blank on the table and a body-blank on the bottom-blank and then depresses the treadle, whereby the shifting bar and the parts connected therewith are depressed. During the first part of the downward movement of the shifting bar the incline g' engages with the rock-arm f' and turns the same sufficiently to lift the pail-blanks, so that the upper part of the body incloses the chuck-head and its jaws, and during this movement of the bar the lower vertical face n of the chuck-operating cam N slides past the pin of the lower chuck rock-arm m' and does not turn the same. During the next part of the downward movement of the shifting bar the vertical portion g^2 of the cam G engages with the rock-arm f', whereby the upward movement of the pail-blanks for the time being is arrested, and during this movement of the shifting bar H the lower portion of the inclined switch engages with the lower rock-arm m' and turns the same, so as to depress the cone and spread the clamping-jaws into engagement with the inner side of the pail-body, whereby the pail-blanks are rotated. During the next portion of the upward movement of the shifting bar H the inclined portion g^3 of the cam G engages with the rock-arm f' and turns the same, thereby continuing the lifting of the pail-blanks, whereby the body is slid upwardly along the chuck-jaws, and its upper edge is engaged with the curling-rollers for curling or turning over the same, and while the pail is being so moved the rock-arm m' engages with the upper part of the switch O and turns the same into the position shown by dotted lines in Fig. 8, which movement of the switch does not affect the chuck, but holds the jaws thereof in an extended position. During the last portion of the upward movement of the shifting bar H the rock-arm f' engages with the vertical portion g^4 of the cam G, whereby the upward movement of the pail is arrested and the rock-arm m' passes from the switch to the upper vertical portion n' of the cam N, thereby permitting the switch to resume its normal inclined position. While the pail-blanks are rotating in their highest position, the operator engages the seaming-rollers Q Q′ successively with the flange on the lower end of the body and the projecting marginal portion of the bottom and forms a seam-joint between the same. The operator now re-

leases the treadle, whereby the shifting bar and connecting parts are raised by the spring h^4. During the first part of the upward movement of the bar H the pin of the rock-arm m' passes from the vertical portion n' along the inclined portion n^2, whereby the clamping-jaws are retracted and the pail is released. During the remaining portion of the downward movement of the shifting bar the rock-arm f' passes from the vertical portion g^4 successively along the inclined portion g^3, vertical portion g^2, inclined portion g', and vertical portion g to the place of beginning, thereby lowering the pail, and the pin on the rock-arm m' deflects the switch and passes along the vertical portion n of the cam to its place of beginning. By releasing the chuck from the pail before the latter begins its downward movement the pail is not rotated as it descends, which otherwise would result in throwing the pail laterally from the table. By releasing the clamping-jaws from the pail before the descent of the latter the curling-rollers can be constructed to curl the upper edge of the pail inwardly instead of outwardly, as shown in Fig. 5, which otherwise would not be possible, because the curled edge of the pail would engage with the jaws and prevent the pail from descending.

I claim as my invention—

1. The combination with a curling device, of a movable table adapted to support a tubular blank and to engage the edge thereof with the curling device, and a driving-chuck adapted to grasp the blank and rotate the same, substantially as set forth.

2. The combination with a curling device, of a movable table adapted to support a tubular blank and to engage the edge thereof with the curling device, and a driving-chuck constructed to engage with the inner side of said blank and rotate the same, substantially as set forth.

3. The combination with a curling-roller, of a table movable toward and from the curling-roller and adapted to carry a tubular blank with its edge against the curling-roller, and a driving-chuck adapted to engage with the inner side of said blank adjacent to the curling-roller and rotate said blank, substantially as set forth.

4. The combination with a curling-roller, of a table movable toward and from the curling-roller and adapted to carry a tubular blank with its edge against the curling-roller, a driving-chuck adapted to engage with the inner side of said blank, and cams whereby said table and chuck are operated, substantially as set forth.

5. The combination with the curling-roller, of a movable table adapted to support the bottom and body blanks of a pail and to carry the upper edge of the body toward and from the curling-roller, a driving-chuck adapted to engage with the body-blank, and a seaming device adapted to engage with the lower portion of the body-blank and the marginal portion of the bottom-blank and to unite the same, substantially as set forth.

6. The combination with the curling-roller, of a table adapted to support a tubular blank and to carry the upper edge thereof toward and from the curling-roller, and a rotary chuck-head adapted to enter the top of the blank and provided with radially-movable jaws adapted to engage with the inner side of the blank and with an axially-movable cone engaging with said jaws, substantially as set forth.

7. The combination with the curling-roller, of a table adapted to support a tubular blank and to carry the upper edge thereof toward and from the curling-roller, a cam whereby the table is shifted, a rotary driving-chuck adapted to engage with said blank, and a cam which operates said chuck and which is provided with a movable switch, whereby this cam in moving back and forth causes the chuck to grasp the blank before the latter completes its forward movement and to release the blank before the same begins its backward movement, substantially as set forth.

8. The combination with a table adapted to support the bottom and body blanks of a pail and capable of a horizontal rotary and a rising-and-falling movement, a horizontally-turning driving-chuck adapted to engage with the body-blank, a curling-roller adapted to engage with the upper edge of the body-blank for curling the same, and a horizontally-swinging seaming-lever provided with seaming-rollers which are adapted to engage with the marginal portion of the bottom-blank and the lower portion of the body-blank when the pail-blanks are in an elevated position for uniting the same, substantially as set forth.

9. The combination with the curling-roller, of a table adapted to support a tubular blank and to carry the upper edge thereof toward and from the curling-roller, a shifting rod supporting said table, a rock-shaft provided with two rock-arms, one of which bears against the shifting rod while the other engages with a table-shifting cam, a driving-chuck provided with jaws adapted to engage with the inner side of the blank, a rock-shaft provided with two rock-arms, one of which is connected with said chuck while the other engages with a chuck-operating cam, a switch arranged on said chuck-operating cam and yieldingly held in its normal position by a spring, and a shifting bar carrying said cams, substantially as set forth.

Witness my hand this 10th day of November, 1898.

EDMUND ZEH.

Witnesses:
GEO. A. LAUTZ,
THEO. L. POPP.