No. 825,788. PATENTED JULY 10, 1906.

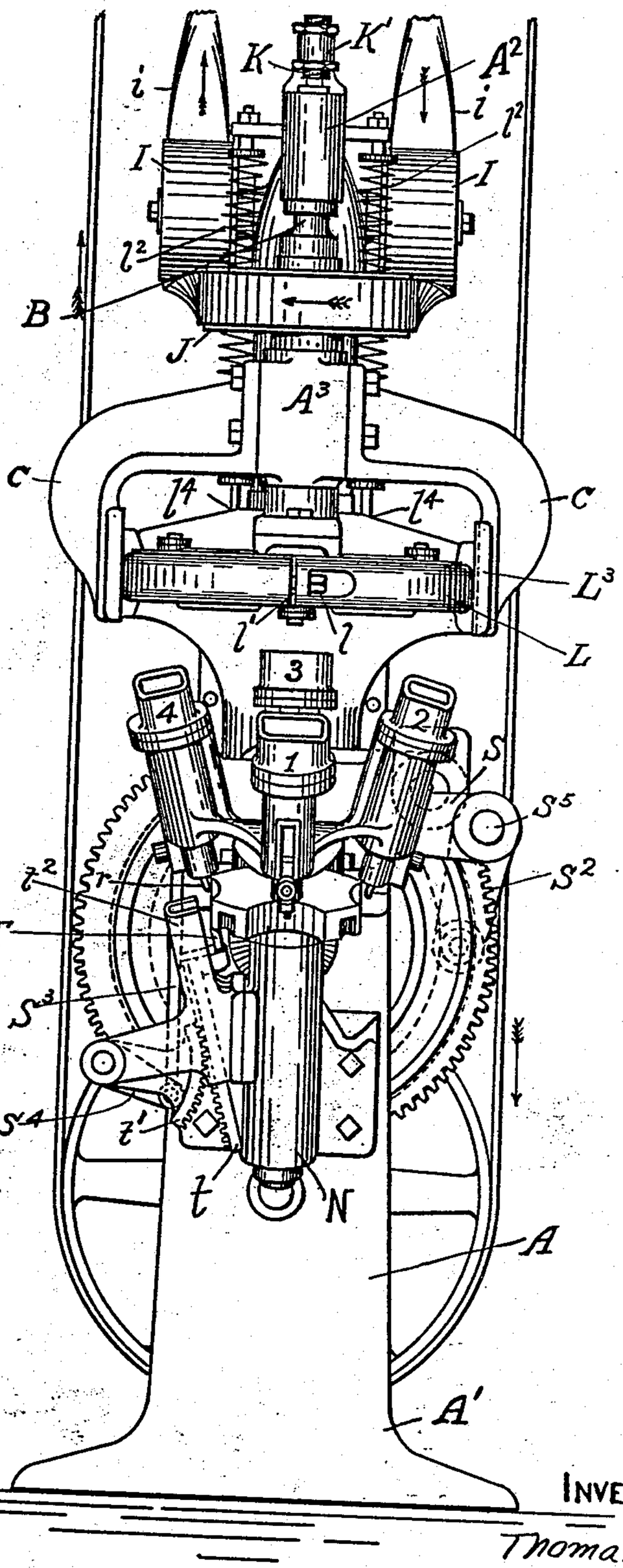
T. WOLFE.

METAL BENDING MACHINE.

APPLICATION FILED JULY 21, 1903.

7 SHEETS—SHEET 1.

FIG. 1



WITNESSES:

Geo. E. Hall.

O. H. Ledaux

INVENTOR:

Thomas Wolfe

BY Howard E. Barlow

ATTORNEY.

Can making machines,
Heat exhibit.
Roller, Stationary cruck.
Rotary seaming tool,
External.

DRAFTSMAN

No. 825,788.

PATENTED JULY 10, 1906.

T. WOLFE.

METAL BENDING MACHINE.

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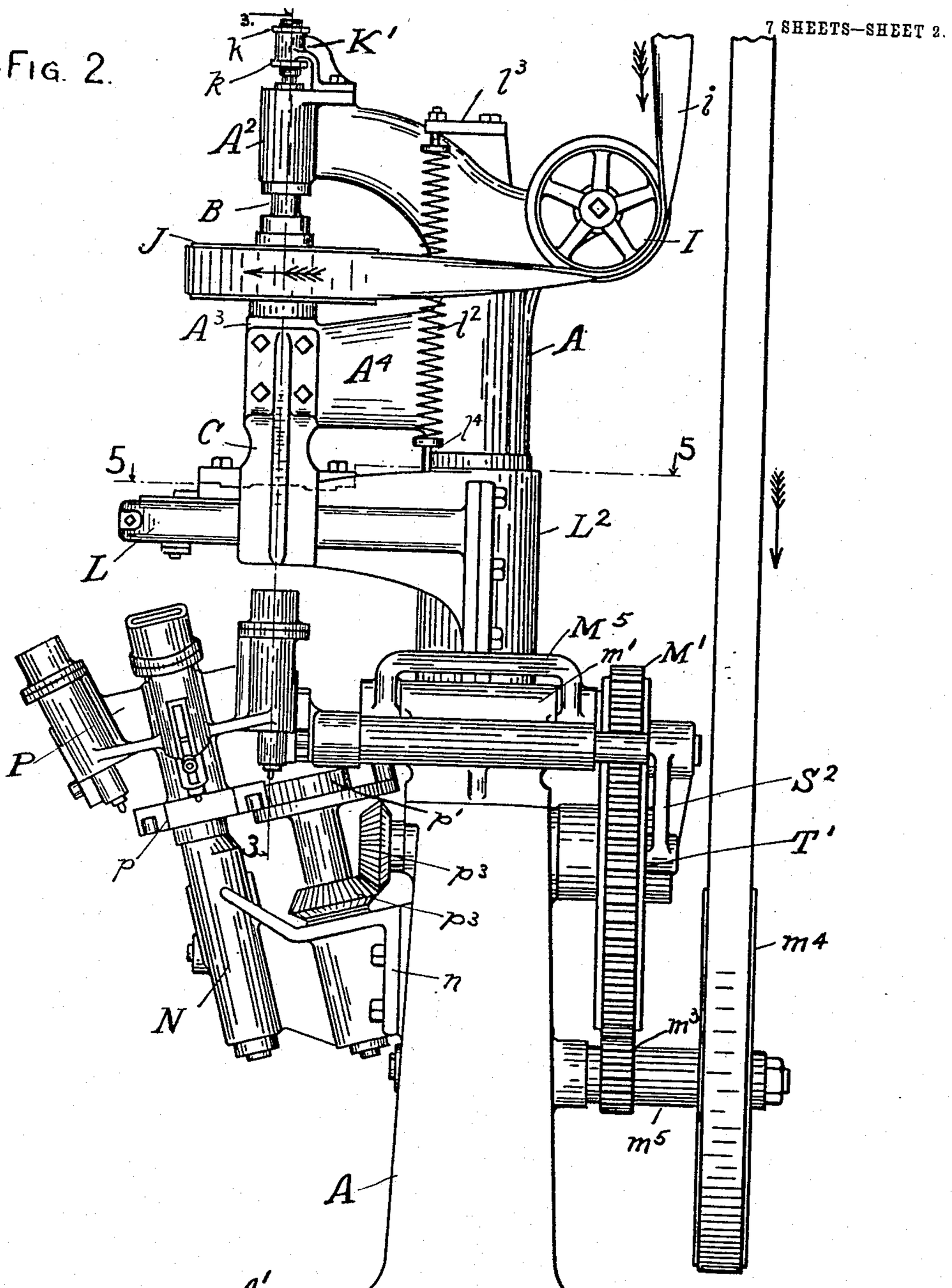
7 SHEETS—SHEET 2.

-FIG. 2.



WITNESSES:

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O. H. Adams

INVENTOR:

Thomas Wolfe

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ATTORNEY.

No. 825,788. PATENTED JULY 10, 1906.

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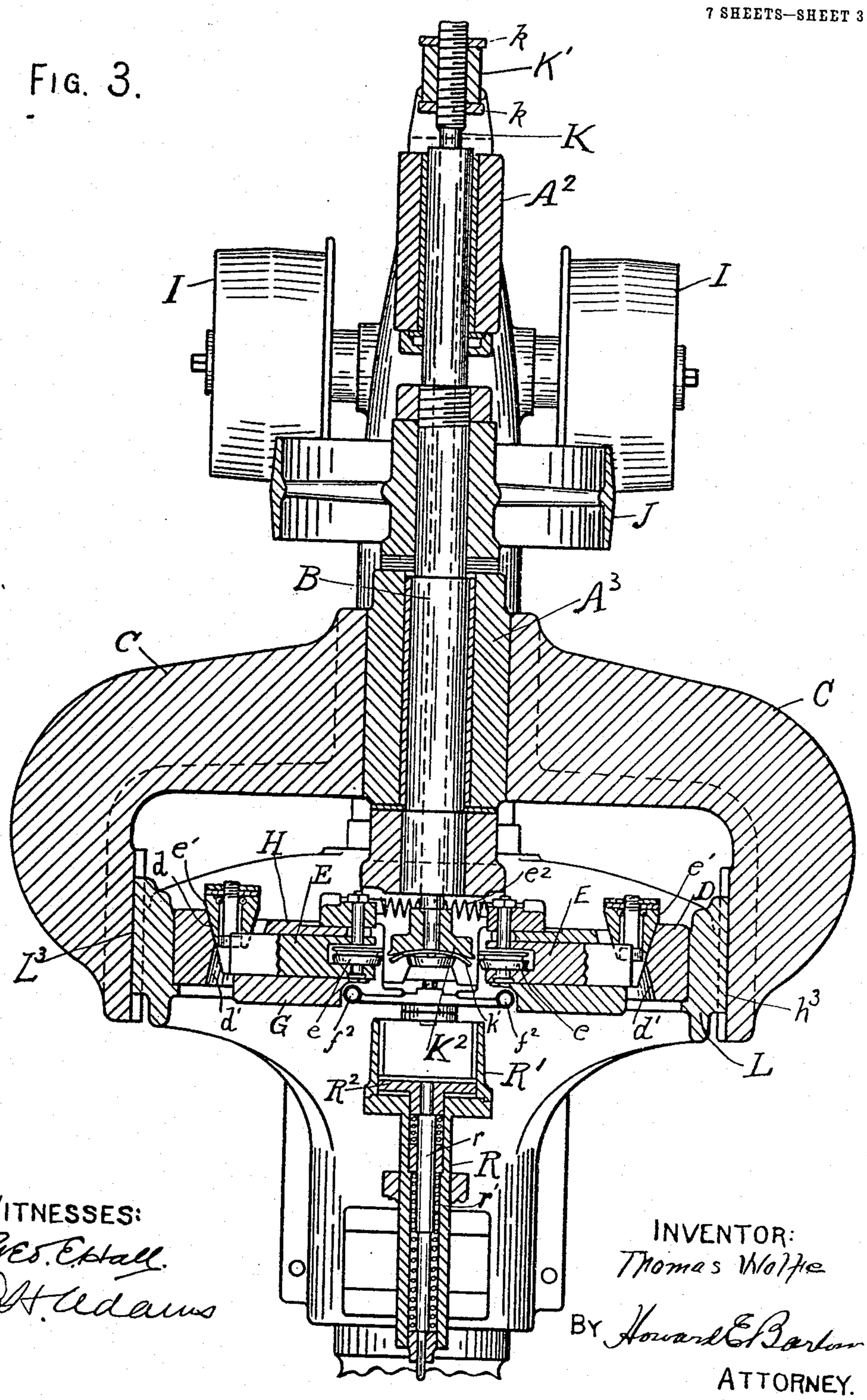
7 SHEETS—SHEET 3.

FIG. 3.



WITNESSES:
Ges. E. Hall.
O. H. Adams

INVENTOR:
Thomas Wolfe
By Howard E. Barton
ATTORNEY.

Can making machines.
Head-forming,
24 Rotary stationary chuck.
Rotary seaming tool,
No. 825,788.

DRAFTSMAN

PATENTED JULY 10, 1906.

T. WOLFE.

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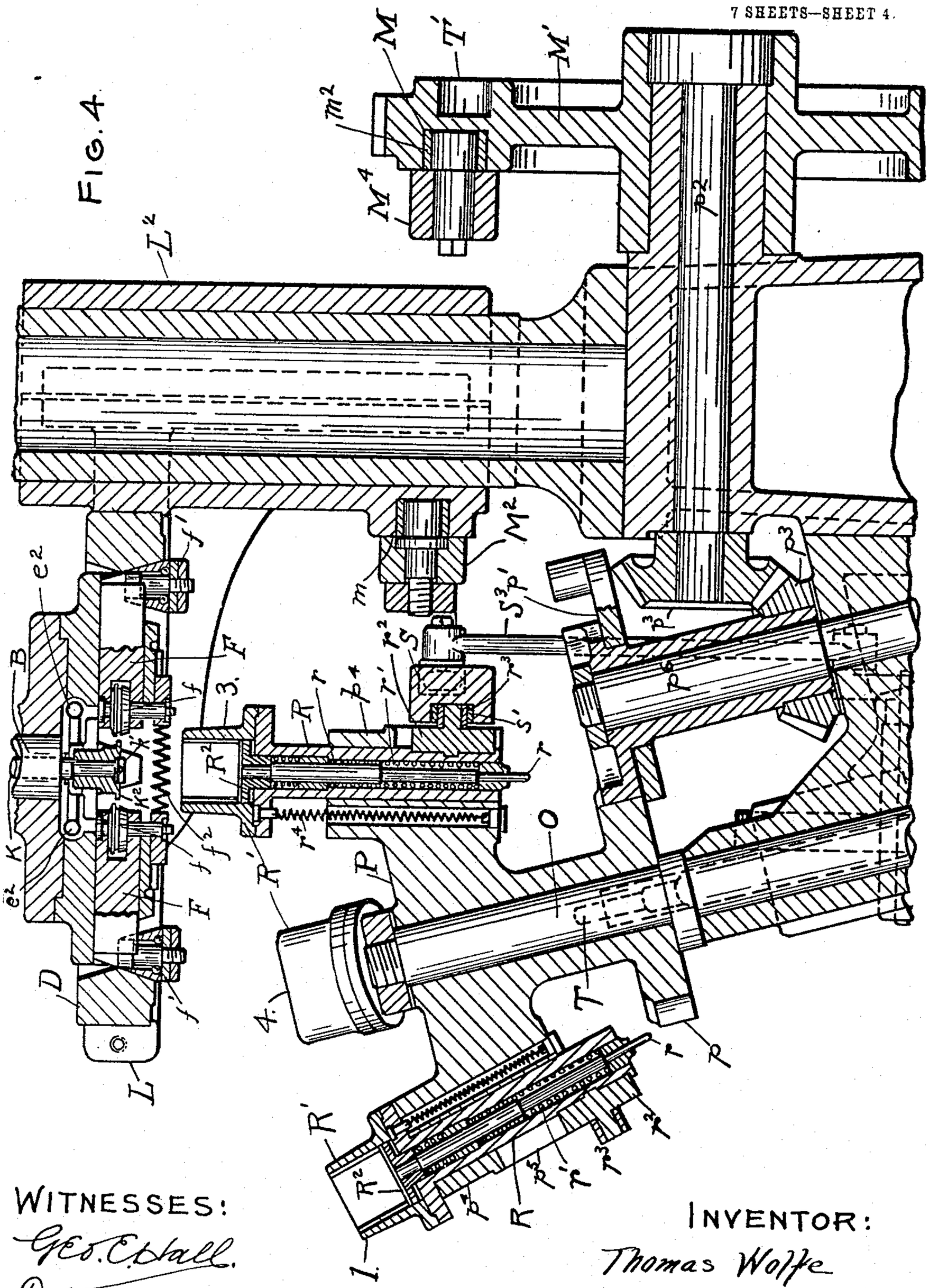
7 SHEETS—SHEET 4.

FIG. 4



WITNESSES:
Geo. C. Hall.
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Howard E. Burton
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PATENTED JULY 10, 1906.

T. WOLFE.

METAL BENDING MACHINE.

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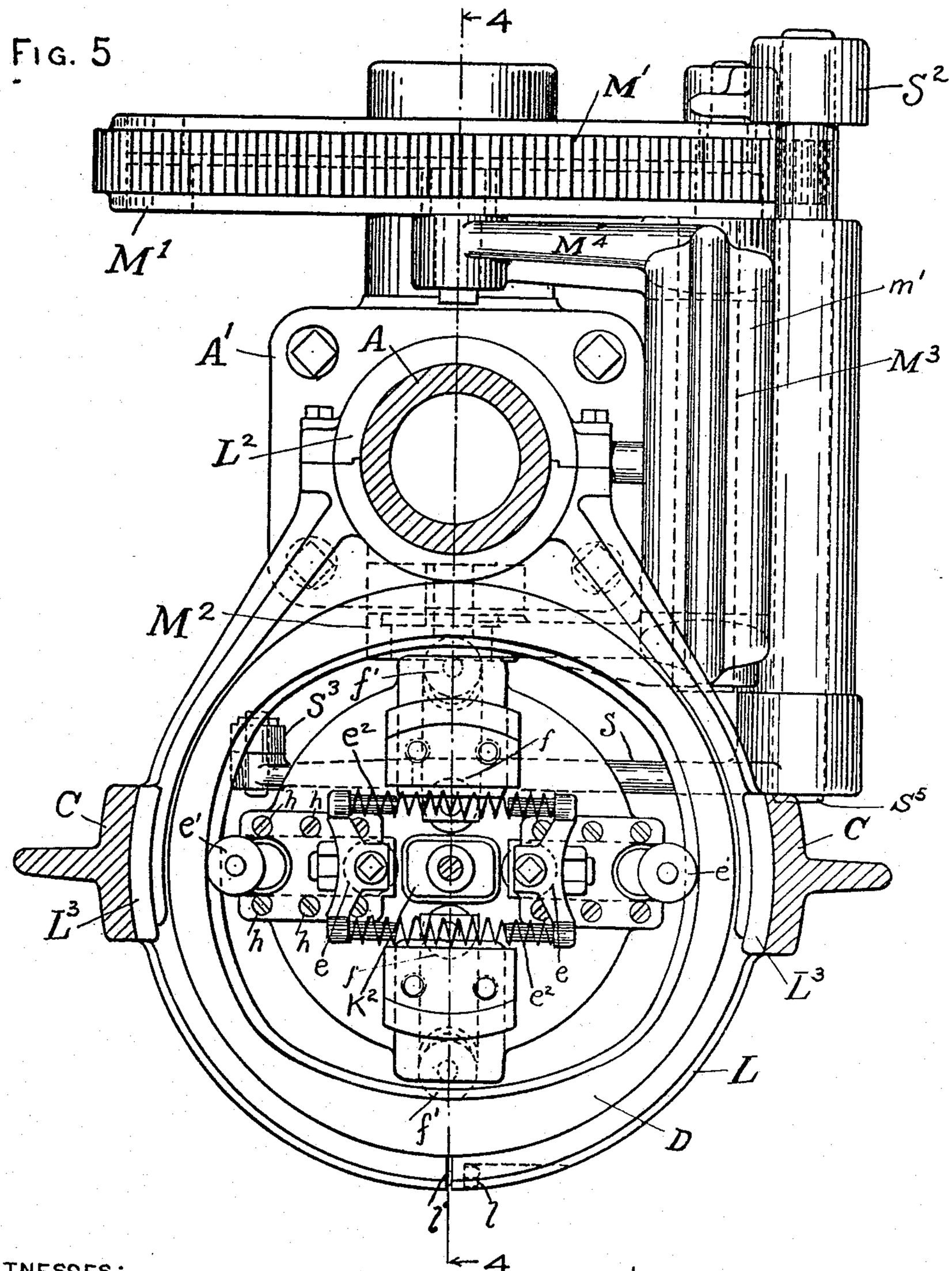
7 SHEETS—SHEET 5

FIG. 5



WITNESSES:
Geo. E. Hall.
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INVENTOR:
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No. 825,788. PATENTED JULY 10, 1906.

T. WOLFE.

METAL BENDING MACHINE.

APPLICATION FILED JULY 21, 1903.

7 SHEETS—SHEET 6.

Fig. 6

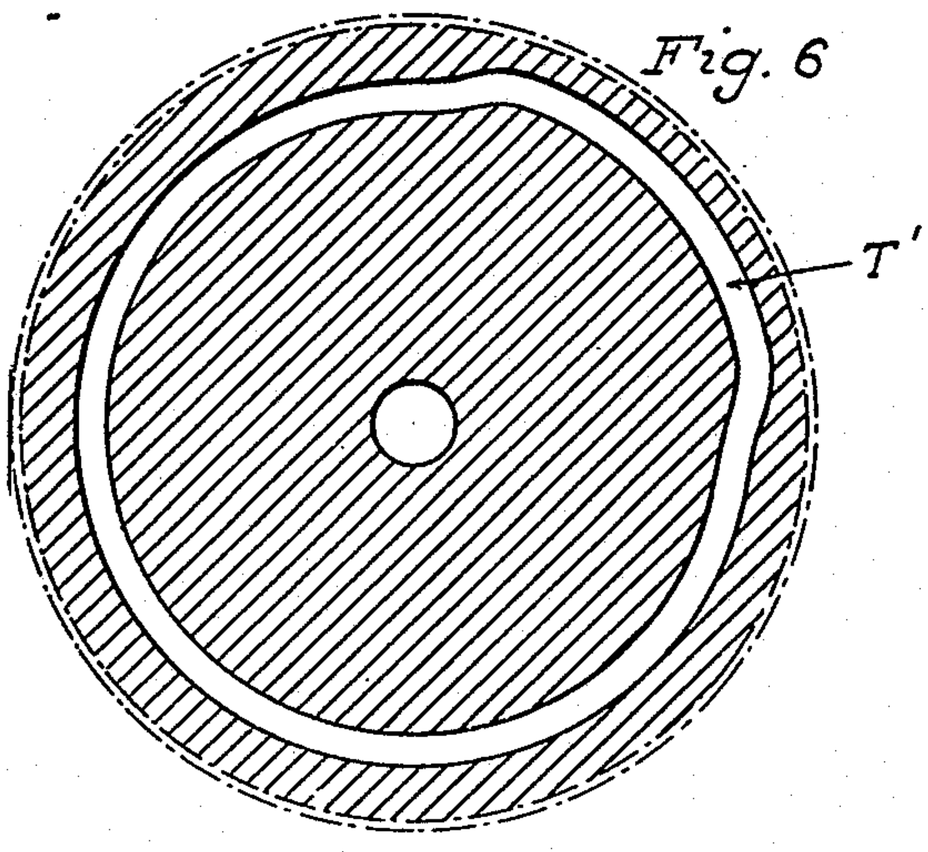


Fig. 7

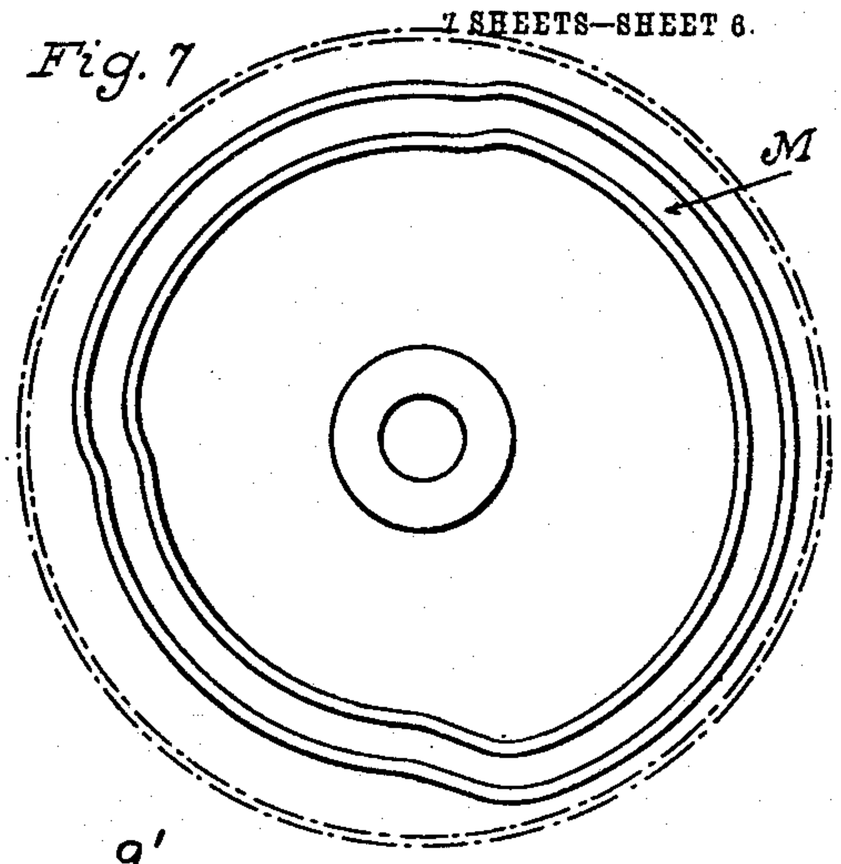
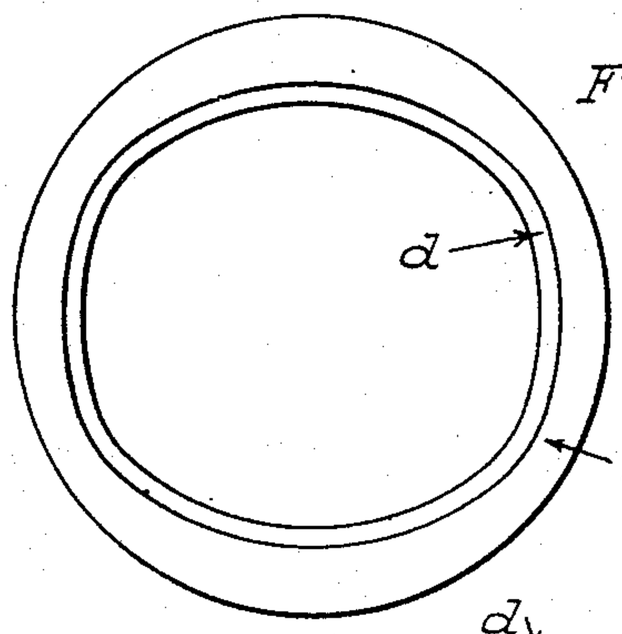


Fig. 8



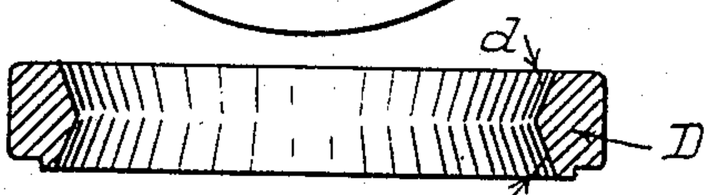


Fig. 9

Fig. 12

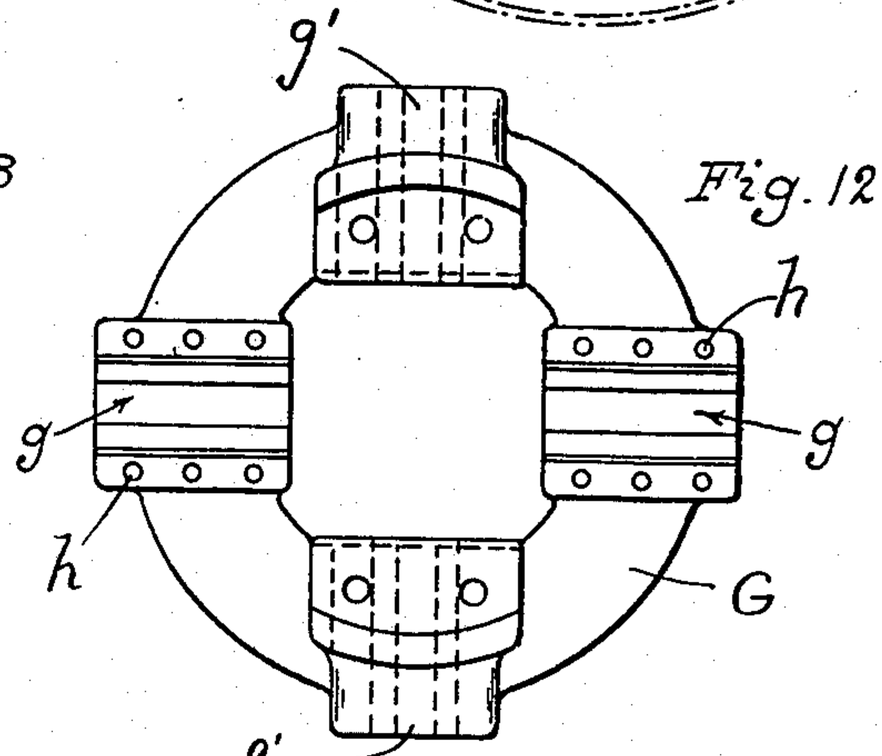


Fig. 13

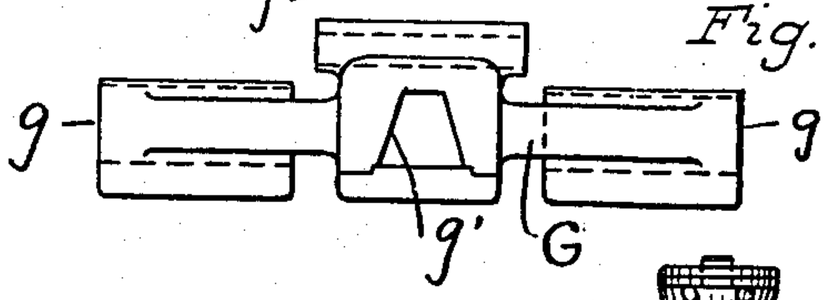
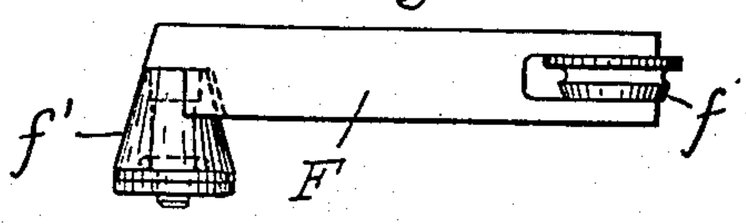


Fig. 11



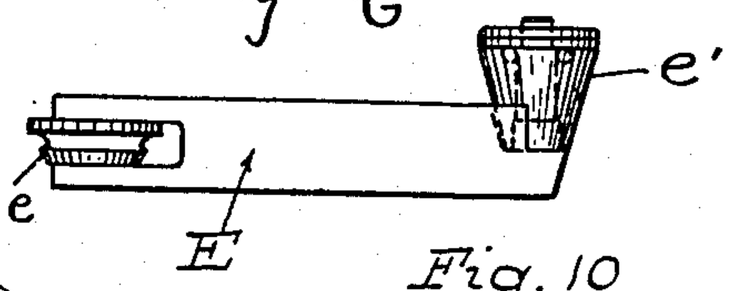
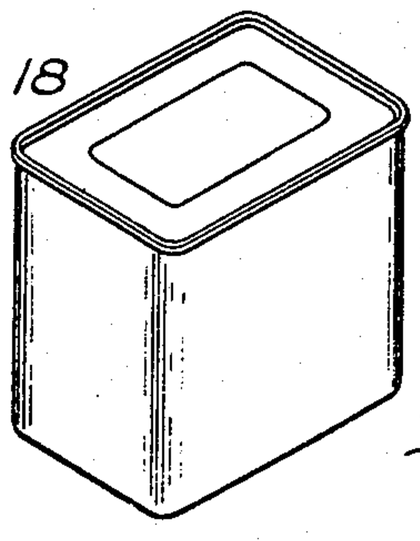


Fig. 10

Fig. 18



Witnesses
Geo. E. Hall.
C. H. Adams

Inventor
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By Howard E. Berlow
Attorney

Can making machines,
Bead seaming,
Roller, Stationary chuck.
24 Rotary seaming tool,

No. 825,788. PATENTED JULY 10, 1906.

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METAL BENDING MACHINE.

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7 SHEETS—SHEET 7.

FIG. 14

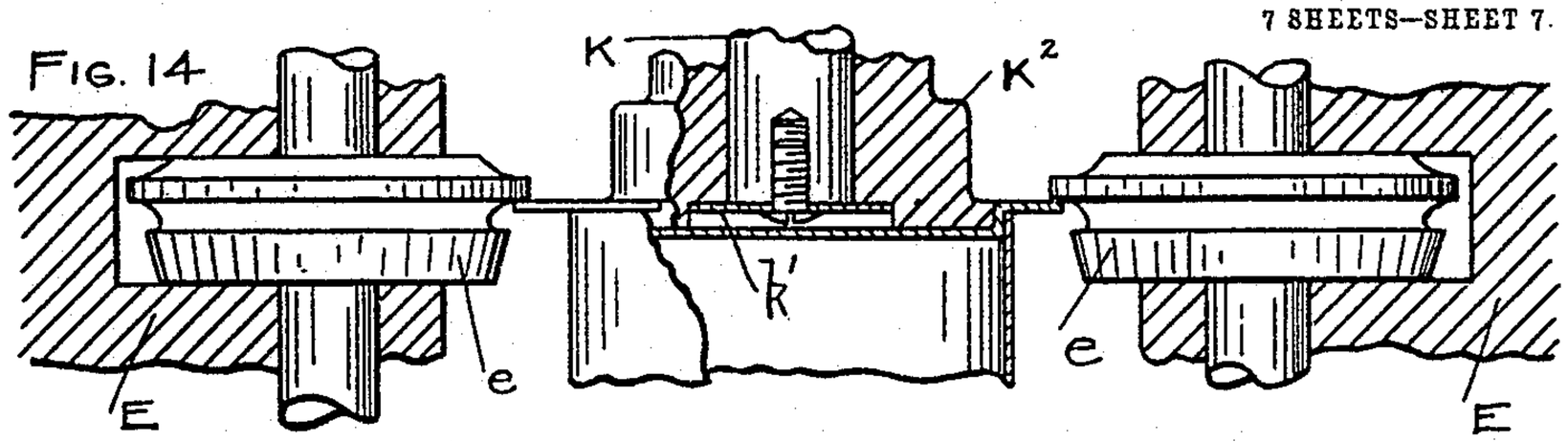


FIG. 15

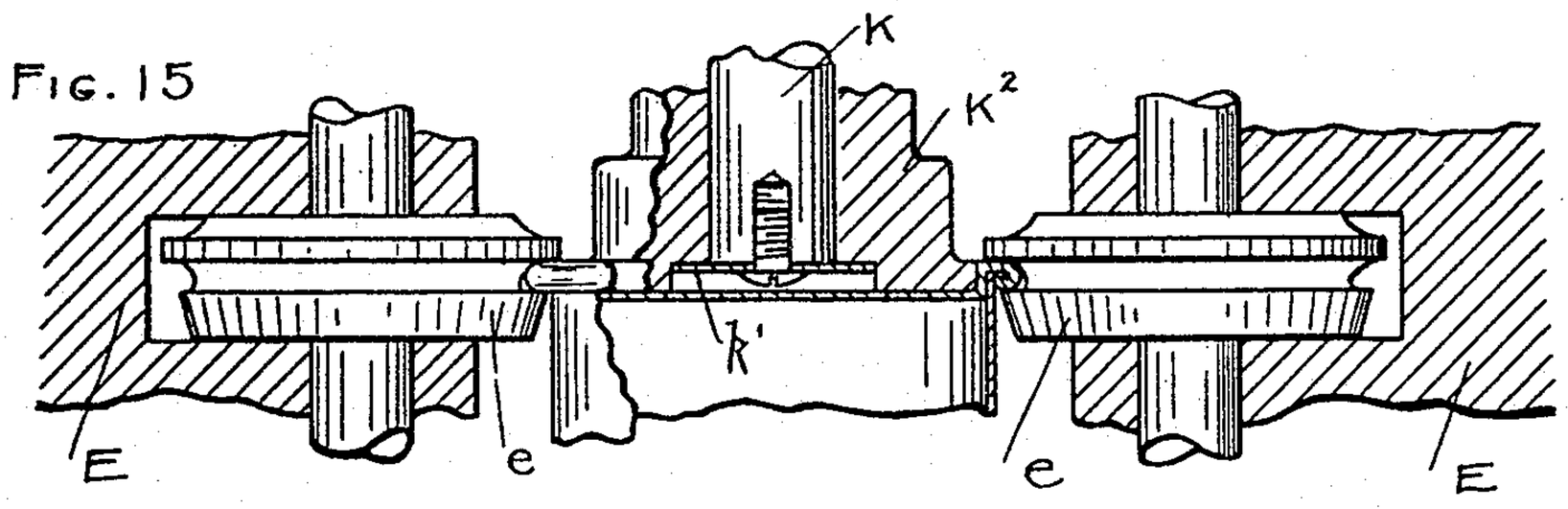
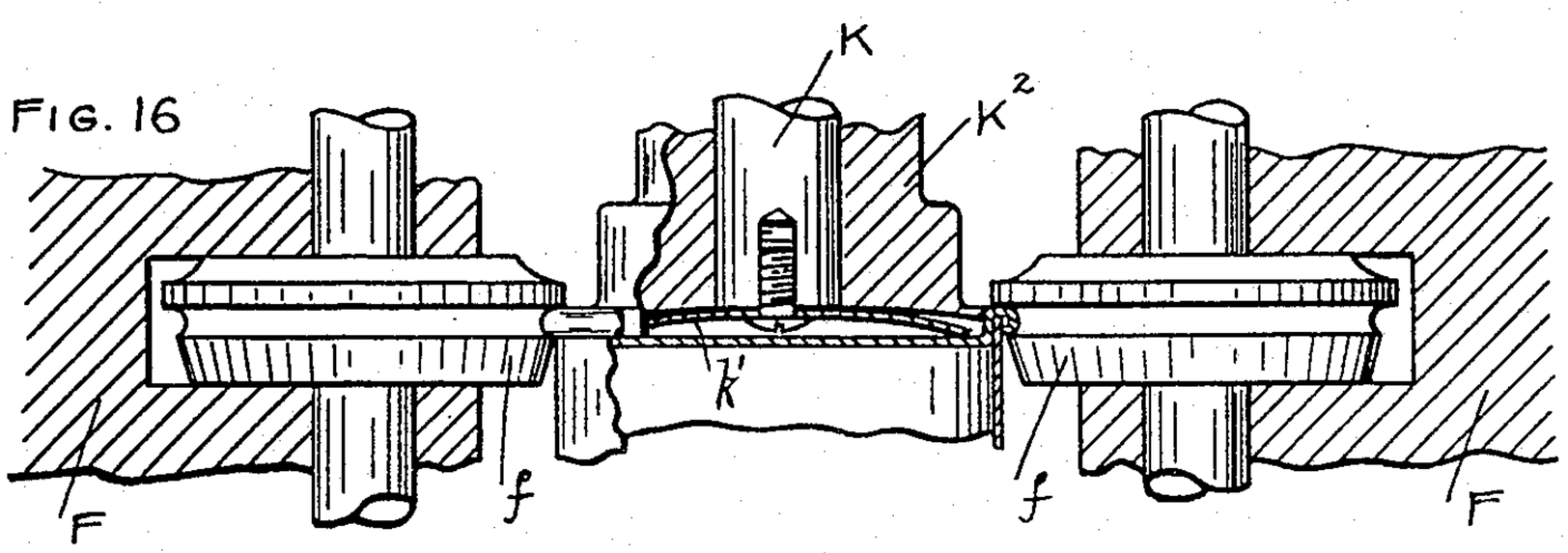


FIG. 16



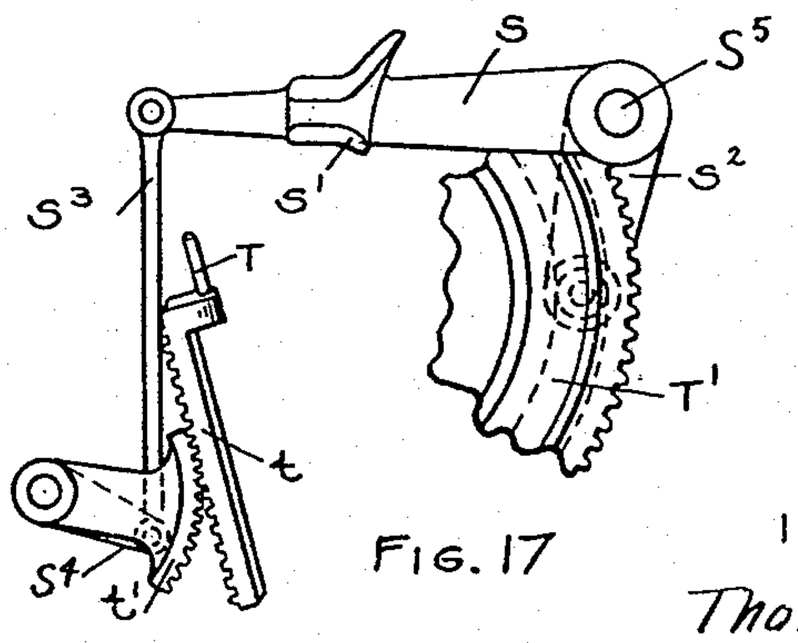


FIG. 17

WITNESSES:
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O. H. Adams

INVENTOR:
Thomas Wolfe
By Howard E. Barlow
ATTORNEY.

UNITED STATES PATENT OFFICE.

THOMAS WOLFE, OF PROVIDENCE, RHODE ISLAND, ASSIGNOR TO OAKDALE MANUFACTURING COMPANY, OF PROVIDENCE, RHODE ISLAND.

METAL-BENDING MACHINE.

No. 825,788. Specification of Letters Patent. Patented July 10, 1906.

Application filed July 21, 1903. Serial No. 166,426.

To all whom it may concern:

Be it known that I, THOMAS WOLFE, a resident of the city of Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Metal-Bending Machines; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention pertains to machines for crimping or rolling in the seams in securing the heads to the body of metal cans.

It is found in practice that in order to properly secure the head of a can to its body the rim of the head must be first turned over or crimped onto the body and then rolled down with a different-shaped tool.

The object of this invention is to construct a machine which will automatically produce this double rolling on cans having ends of irregular shapes, such as square, triangular, oblong, and the like.

The invention consists of novel features and parts and combinations of the same, as will be fully described hereinafter and then pointed out in claims.

A practical embodiment of the invention is represented in the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is a front elevation of the machine. Fig. 2 is a side elevation of the same. Fig. 3 is a vertical section on line 3 3 of Fig. 2, enlarged, looking in the direction of the arrows. Fig. 4 is a central vertical section taken on line 4 4 of Fig. 5. Fig. 5 is a longitudinal section on line 5 5 of Fig. 2 looking down. Fig. 6 is a detail of the cam which operates to raise the can, with its head, to be operated on up into the revolving crimping-tools and withdraw the same, and also at the same time to eject the can previously operated upon from arm 4 of the carrier. Fig. 7 is a detail of the cam which raises and lowers the tool-operating cam-ring. Fig. 8 is a detail showing a plan view of the cam-ring which operates the crimping-tools. Fig. 9 is a sectional view of said cam-ring. Fig. 10 is a detail of the tool-holding arm which is operated when said tool-actuating cam-ring is raised. Fig. 11 is a detail of the tool-holding arm which is actuated when said cam-ring is lowered. Fig. 12 is a plan view of the tool-arm guide-plate. Fig. 13 is an edge view of the same. Fig. 14 shows the tools in position to turn or crimp the edges of the can-head. Fig. 15 shows the tools as having completed the first operation on said can. Fig. 16 shows the second-process tools as rolling down the seam on the can. Fig. 17 shows a front elevation of the mechanism which operates to raise the can into the position to be operated upon and simultaneously discharge the finished can from its holder. Fig. 18 is a perspective view representing the finished can.

Referring to the drawings, at A is the frame of the machine, preferably constructed in the form of a hollow column, which is supported on the base A′. The upper end of this column is curved forward, forming a bearing A^2 in its end for the upper end of shaft B. At A^3 is the lower bearing for this shaft B, which bearing is supported from the column and held in line with the bearing A^2 by the arm A^4.

C C are two side arms bolted one on each side to the bearing A^3, said arms projecting outward with their outer ends hanging downward, forming supporting-guides for the vertically-reciprocating yoke L, that carries the tool cam-ring D. This tool cam-ring D (best illustrated in Figs. 8 and 9) is shown circular on its outside and is cut out on the inside to correspond in form to the exact shape of the can to be seamed, several times enlarged. The ring is preferably made of steel with its cam-surfaces hardened. The inside surface of this cam is, as shown in the cross-section, beveled back from the center both from the upper and under side at *d* and *d′*. Within this ring D are the four tool-arms E E and F F. The tool-arms E E are mounted to reciprocate toward and from each other in suitable grooves or guides on the rotatable guide-plate G.

H is a cap secured over each guide by screws at *h h*.

Rotatably pivoted on the inner end of each arm E E is the rolling or forming roll *e*, and on the outer end of each of these arms is the truncated-cone-shaped roll *e′*, held inverted on a spindle to rotate when it comes in contact with the face *d* of the cam D.

The tool-arms F F are, like E E, set in grooves g' g' on the guide-plate G with their ends toward each other, but set at right angles to arms E E. They are similar in construction. Their inner ends hold the rolling-down or finishing tools $f f$, while on their outer ends are pivoted similar conical rolls $f' f'$, but set with their small ends up for engaging the lower bevel d' on the cam-ring D. Compression spiral springs e^2 e^2 and f^2 f^2 are set between each pair of tool-arms to act with the centrifugal force and hold the revoluble tool-arms out against the surface of the cam which they are supposed to follow.

B is a vertical hollow shaft journaled in bearings A^2 and A^3 and is connected at its lower end to the guide-plate G, through which said plate receives its rotary motion by a driving-belt i, which runs over the idler-pulleys I I and the pulley J, which latter is fixed to said shaft B. Within this upright hollow shaft B is the fixed spindle K, with its upper end projecting above said shaft and adjustably held in position in the bracket K' by the check-nuts k k. The lower end of this spindle projects below said shaft B and supports a shoe K^2, against which shoe the head of the can is forced in the manner hereinafter described. Said shoe is provided at its lower end with the curved plate-spring k'.

The cam-ring D is removably held in place in the yoke L by drawing the split ends of the yoke together at l' by the screw l. This yoke L is held to reciprocate vertically on the column A, around which it is supported on the sleeve L^2. The sides of the outwardly-extending portion of this yoke are also supported at L^3 in bearings in the guide-arms C C. This yoke is actuated to reciprocate vertically by the cam M in the cam-gear M' through the arm M^2, (which engages said sleeve at m,) rock-shaft M^3, (journaled in bearing m' on the side of the column,) and arm M^4, which latter engages said actuating-cam M at m^2. This cam-gear M' is driven by the pinion m^3 through the pulley m^4 and shaft m^5. The two cam-operated arms M^2 and M^4 may be joined together in the casting, as shown at M^5 in Fig. 2. The weight of this yoke L and ring D, held within it, is balanced or supported by the springs l^2 l^2, which springs are suspended from a cap l^3 on the upper end of the frame A and are connected to said yoke on either side by bolts at l^4.

The feeding mechanism is supported on the bracket N, (see Fig. 2,) which latter is bolted to the column at n. This bracket is set off at a slight angle to said column for convenience in working. Fixed into and extending upward from said bracket is a spindle O, on which is hung the four-armed revoluble carrier P. This carrier is caused to rotate intermittently one-quarter of a turn at a time by the star-wheel p on the lower end of the carrier and its driver p'. This driver is supported on the spindle p^6 and is caused to rotate at the required speed by the large gear M' through the shaft p^2 and bevel-gears p^3 p^3. At the end of each of the four arms of this carrier P is a boss p^4, drilled out to receive the hollow spindle R, which spindle supports the cup or work-holder R' on its upper end. Within this cup or work-holder R' is an ejector-head R^2, fixed on the upper end of a spindle r, which latter extends down through said hollow spindle R and is held down in place by a spring r', which spring allows the spindle to be pressed up from its lower end and raise the ejector R^2 when it is desired to throw out the work from the work-holder R'.

In order to raise the work up to be operated upon by the revolving rolling-tools, a plate r^2, having a roll r^3, is secured to the side of the hollow spindle R and is arranged to work through a slot p^5 in the side of the boss p^4.

A groove or slot s' is formed in the side of the arm S for the purpose of receiving the extending roll r^3, which roll is for the purpose of being acted upon by said arm to raise the work when the carrier conveys the same into a position directly under the operating-tools. (See Fig. 4.) When the work is raised, it is assisted to be brought back again to place by the tension of the spiral spring r^4.

After the work has been operated upon it is conveyed by the intermittently-rotating carrier one-quarter of a revolution and ejected from the work-holder 4 by the pin T coming in contact with the lower end of the spindle r. This pin T is on the end of the rack t, which rack slides in the guide t^2 and is actuated to be raised and lowered by the cam T' through arm S^2, shafts S^5, lever S, connection S^3, lever S^4, and segment t'.

As the carrier P is revolved and each work-holder R brings its work in turn under the seaming-tools the projecting roll r^3 enters the slot s' in the arm S and by this arm is raised, carrying the work up against the shoe K^2 to be operated on by the revolving tools, after which it is dropped down in place again and the carrier P rotated, and this roll r^3 passes out of the slot, which is entered by the next succeeding roll.

The operation of the machine is further described as follows: The work-carrier P has four arms and is rotated intermittently at short intervals one-quarter of a revolution at a time. During the intervals through which this carrier rests the body of a box, with the flanged cover placed on its end, is inserted in the front work-holder No. 1 (see Fig. 1) by the attendant. At the same time the opposite holder No. 3, with the box to be operated on, is raised up by the arm S into the revolving rollers and seamed. The same operation of this arm S, which raises the work in holder No. 3, ejects the finished can from

the holder No. 4 by the mechanism described above, leaving said holder No. 4 free to receive another can as it presents itself to the operator on the next quarter-turn of the carrier, and the operation of raising, seaming, and ejecting the can is repeated at each quarter-revolution of the carrier. In order to seam cans of irregular shapes, it has heretofore been necessary to operate the seaming-tools by hand in order to produce satisfactory results; but by my improved machine I am able to do this seaming automatically. To do this properly, two kinds of tools should be used. The first must be of a shape to turn or crimp the edge of the metal back against the can and the second to roll the same down, producing a smooth joint. To produce this result, the can to be seamed is brought around by the carrier underneath the tools and raised up until its loose head comes in contact with the ejecting-spring k' on the end of shoe K^2, against which shoe it is firmly pressed and held while it is being operated upon by the tools. The cam-ring D then is raised in the manner described above and brought into contact with the cone-shaped rolls e' e' on the outer end of the rapidly-revolving tool-arms E E, pressing them in against the can, and the first operation is performed. The ring D is then lowered, releasing the first tool-arms E E and engaging and pressing in the second tool-arms F F by contact with its conical rolls f' f', and the second operation of seaming and finishing is completed. By this method the work of seaming irregular-shaped cans is performed very rapidly and accurately without the aid of a skilled attendant. As the work-holder R returns to its normal position the spring k' forces the can out of engagement with the shoe K^2.

My invention is not restricted to the precise construction and arrangement of parts herein shown and described nor to the various details thereof, as the same may be modified or rearranged in various particulars without departing from the spirit and scope of my invention, one practical embodiment of which has been herein illustrated and described without attempting to show all of the various forms and modifications in which my invention might be embodied.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A machine of the character described comprising tools, a supporting-plate therefor, means for rotating said plate, and non-rotating means adapted to engage the outer ends of said tools and adapted to impart a sliding reciprocating movement thereto, said engaging means being located beyond the periphery of said plate.

2. A machine of the character described comprising tools, reciprocating carriers therefor, a supporting-plate therefor, means for rotating said plate, and non-rotating means located beyond the periphery of said plate and adapted to engage the outer ends of said carriers, whereby the latter are reciprocated.

3. A machine of the character described comprising tools, for turning the edge to form the seam, tools for finishing the seam, a supporting-plate, means for rotating said plate, and non-rotating means located beyond the periphery of said plate and adapted to alternately engage the outer ends of said tools, whereby a sliding reciprocating movement is imparted to the latter.

4. A machine of the character described comprising tools, a supporting-plate therefor, means for rotating said plate, and a cam-ring located beyond the periphery of said plate and acting on said tools, and means for automatically reciprocating said cam-ring, whereby said tools are successively operated.

5. A machine of the character described comprising tools, sliding reciprocating carriers therefor, a supporting-plate for said carriers, means for rotating said plate, a cam-ring located beyond the periphery of said plate, and rolls mounted in the outer ends of said carriers and bearing against said ring, and means for reciprocating said ring.

6. A machine of the character described comprising seam-forming tools, seam-finishing tools, reciprocating carriers for said tools, a cam-ring having oppositely-beveled inner faces, upper and lower bearing-rolls mounted in the outer ends of said carrier and bearing against said beveled faces, and means for raising and lowering said cam-ring.

7. A machine of the character described comprising forming and finishing tools, carriers therefor, a supporting-plate, means for rotating said plate, a non-rotating cam-ring surrounding said plate and having beveled surfaces adapted to alternately engage the outer ends of said carriers, and means for reciprocating said cam-ring.

8. A machine of the character described comprising crimping-tools mounted in reciprocating carriers, a cam-ring adapted to engage the outer ends of said carriers, a non-rotating yoke supporting said cam-ring, and means for raising and lowering said yoke.

9. A machine of the character described comprising crimping-tools mounted on reciprocating carriers, a cam-ring adapted to engage said carriers, a non-rotating yoke supporting said cam-ring, a guide for said yoke, and means for automatically raising and lowering said yoke.

10. A machine of the character described comprising a supporting-plate, crimping-tools mounted on carriers adapted to reciprocate on said plate, means for rotating said plate, a cam-ring surrounding said plate and carriers, and means for raising and lowering said cam-ring.

11. A machine of the character described

comprising a stationary work-holding shoe, crimping-tools mounted in sliding reciprocating carriers, a supporting-plate therefor, means for revolving said plate, and means located beyond the periphery of said plate and acting upon the outer ends of said carriers, whereby said tools are caused to move into and out of engagement with the work.

12. A machine of the character described comprising a work-holding shoe, crimping-tools mounted on reciprocating carriers, means for revolving said carriers around said shoe, non-rotating means surrounding said carriers and adapted to engage the outer ends thereof to reciprocate the same, and means for feeding the work to said shoe.

13. A machine of the character described comprising a stationary shoe, reciprocating tools adapted to revolve around the same, a cam-ring encircling said tools and arranged to reciprocate the same, a rotary carrier, a plurality of work-holders carried thereby, and means whereby said holders are successively raised to bring the blank into engagement with said shoe.

14. A machine of the character described comprising crimping-tools, means for operating the same, a rotatable carrier, a plurality of work-holders carried thereby, and means independent of the carrier with which said work-holders intermittently interlock, whereby the work is presented to the tools.

15. A machine of the character described comprising crimping-tools, means for operating the same, a rotatable carrier, a plurality of work-holders carried thereby, means independent of the carrier with which said work-holders intermittently interlock, whereby the work is presented to the tools, an ejector carried by each work-holder, and means for automatically operating the same.

16. A machine of the character described comprising crimping-tools, means for operating the same, a rotatable carrier, a plurality of work-holders mounted in said carrier and each provided with a projecting member, and a reciprocating arm adapted to successively interlock with said projecting members, whereby said work-holders are elevated.

17. A machine of the character described comprising crimping-tools, means for operating the same, a rotatable carrier provided with a plurality of slotted bosses, a work-holder mounted in each boss, reciprocating members working in the slots of said bosses and engaging said work-holders, and a reciprocating arm adapted to successively interlock with said reciprocating members, whereby said work-holders are elevated.

18. A machine of the character described comprising crimping-tools, means for operating the same, a rotatable carrier, a plurality of work-holders mounted in said carrier and each provided with a projecting member, an arm provided with a slot adapted to receive said projecting members, and means for reciprocating said arm.

19. A machine of the character described comprising crimping-tools, means for operating the same, a rotatable carrier, a plurality of work-holders mounted therein, each provided with an ejector having a projecting member, and a reciprocating arm provided with a pin adapted to engage the projections on said ejectors.

20. In a machine of the character described, the combination of an annular forming-guide having internal, oppositely-inclined forming-surfaces, with edge turning and compressing rolls, and roll-carrying slides having antifriction-rollers, the roller of one of the slides engaging with one of the inclined surfaces of said annular forming-guide, and the roller of the other slide engaging with the other inclined surface.

21. In a machine of the character described, the combination of a mandrel, a roll-carrying head, an edge-turning roll, a compressing-roll, and roll-carrying slides, with an annular forming-guide having internal, oppositely-inclined forming-surfaces adapted for action upon the roll-carrying slides, and means for reciprocating the forming-guide, the movement of the forming-guide in one direction serving to bring the edge-turning roll forward, and the movement of the forming-guide in the opposite direction serving to cause the forward movement of the compressing-roll.

22. In a machine of the character described, the combination of the mandrel, with an intermittently-rotated carrier, provided with holders for receiving the body portion and bottom plate of a can, the elevator-spindle, the ejector-spindle held within the elevator-spindle, a spring for causing the downward movement of the ejector, means for causing the upward movement of the ejector to discharge a finished can from the receiving-holder of the carrier, and a spring which provides for the yielding engagement of the head of the ejector with the end of the inserted body portion of a can, upon the upward movement of the elevator-spindle, and the consequent engagement of the inserted bottom plate of a can with the face of the mandrel.

23. In a machine of the character described, the combination of the mandrel, with a rotary carrier provided with holders for receiving the body portion and bottom plate of a can, said holders being set at an angle with the axis of the rotary carrier, and having the axis of the carrier inclined relatively to the axis of the mandrel, means for intermittently rotating the carrier, and means for elevating the receiving-holders to carry the bottom plate up to the mandrel.

24. In a machine of the character described, the combination of the mandrel, with

a rotary carrier provided with holders for receiving the body portion and bottom plate of a can, said holders being set at an angle with the axis of the carrier, and having the axis of the carrier inclined relatively to the axis of the mandrel, means for intermittently rotating the carrier, means for elevating the receiving-holders to carry the bottom plate up to the mandrel, and means for ejecting the finished can.

25. In a machine of the character described, the combination of a supporting-plate, sliding tools for turning the edge to form the seam, removable at one side of the said plate, sliding tools for finishing the seam removable at the opposite side of the plate, means for rotating the said plate, and means adapted to alternately engage the outer ends of said sliding tools, whereby the said tools are reciprocated.

In testimony whereof I have hereunto set my hand this 14th day of July, A. D. 1903.

THOMAS WOLFE.

In presence of—

HOWARD E. BARLOW,

H. J. PAGE.