A. JOHNSTON.

METAL CRIMPING MACHINE.

APPLICATION FILED MAY 22, 1909.

944,559. Patented Dec. 28, 1909.

4 SHEETS—SHEET 1.

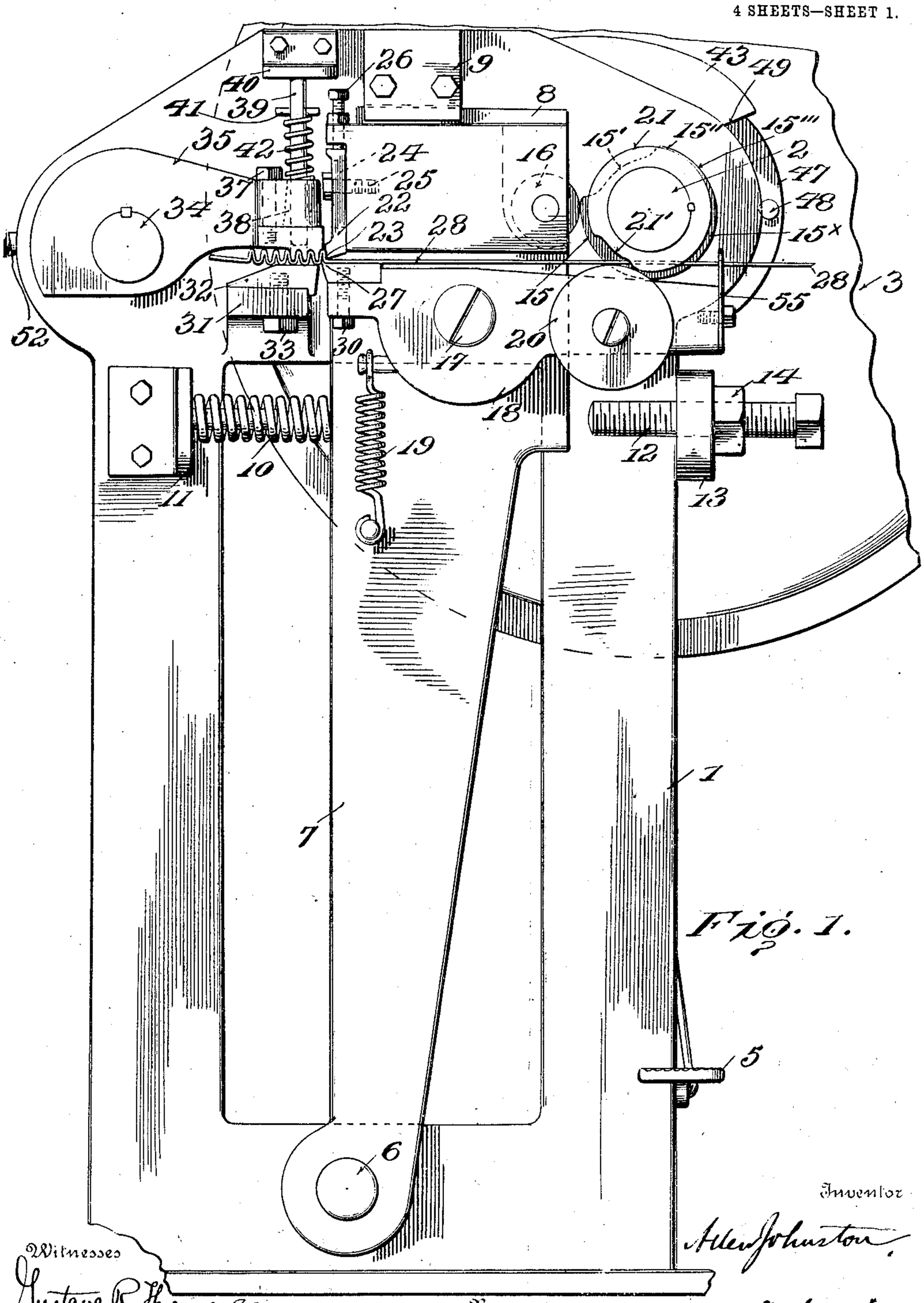

Fig. 1.

Witnesses

Gustave R. Thompson

M. A. Wood.

Inventor

Allen Johnston.

By Mauro, Cameron, Lewis & Massie

Attorneys

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4 SHEETS—SHEET 2.

Fig. 2.

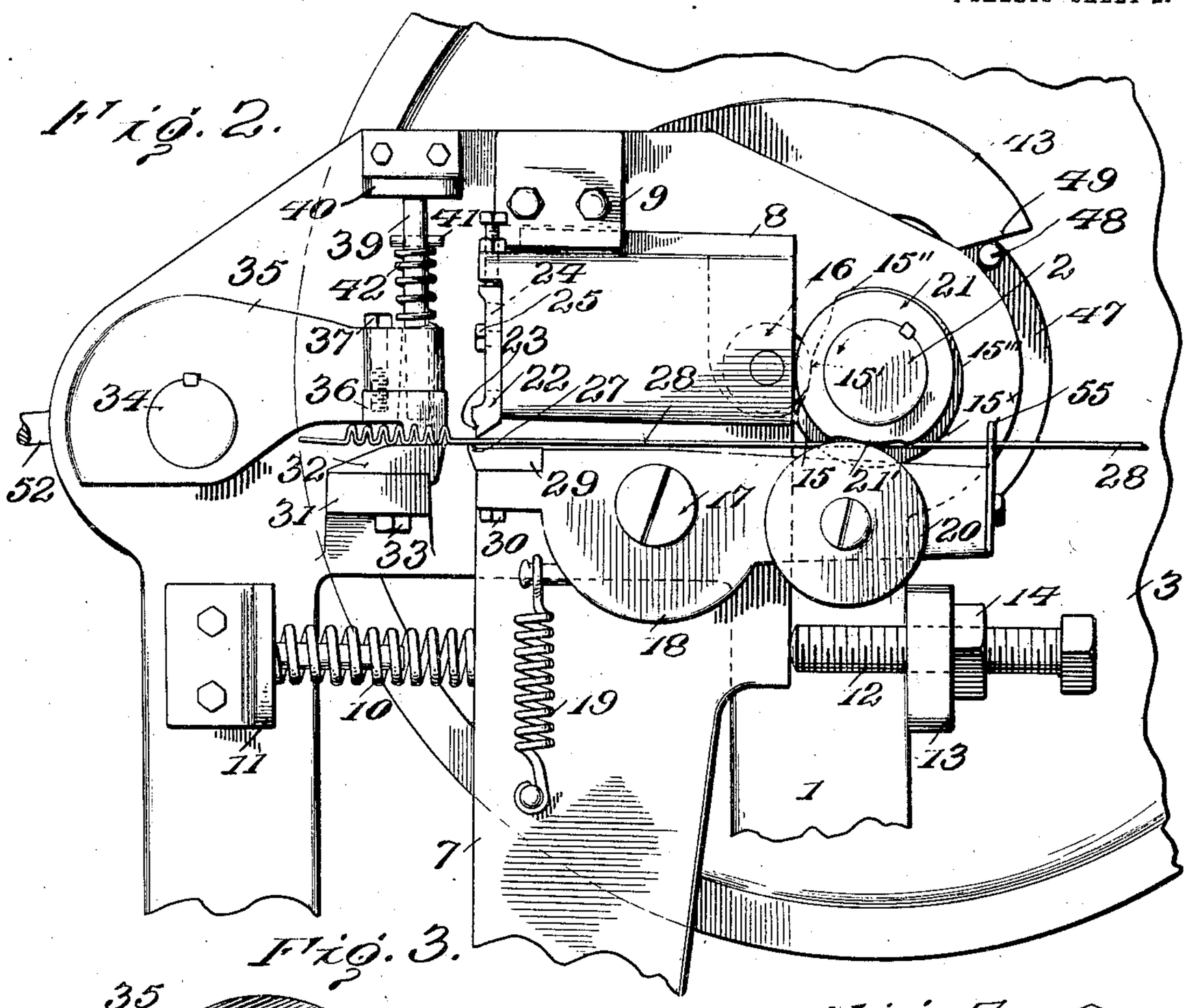


Fig. 3.

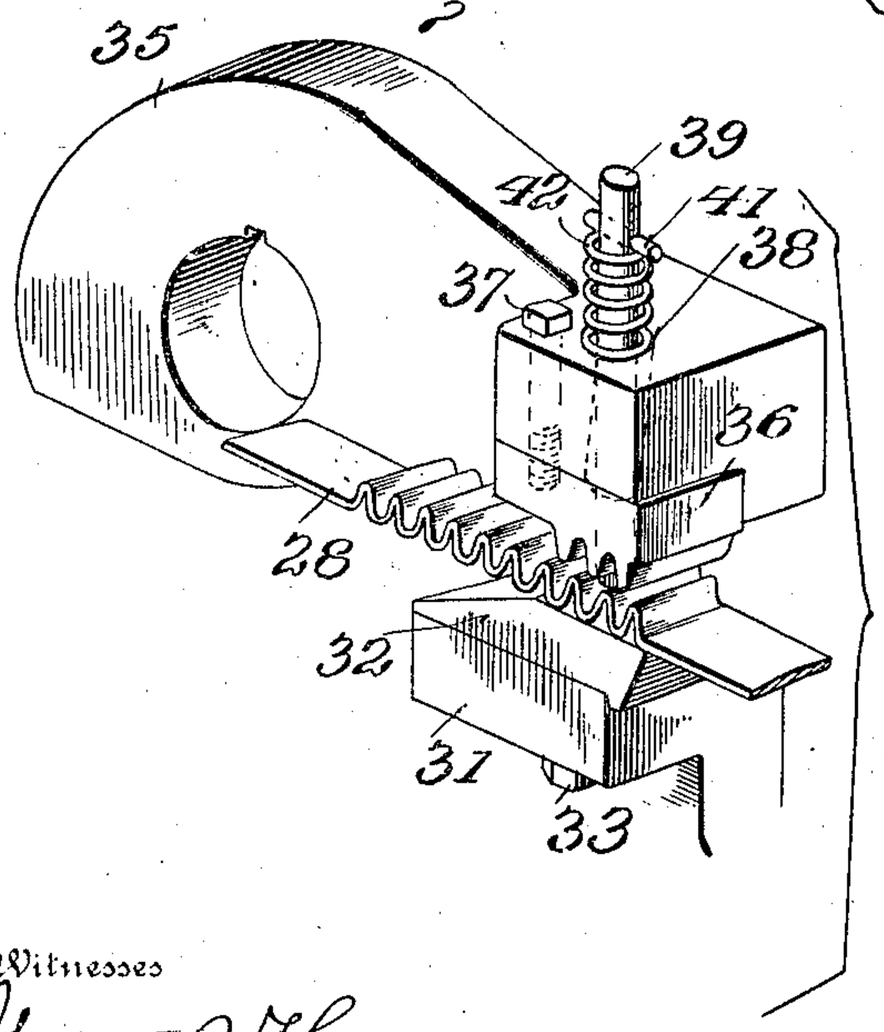
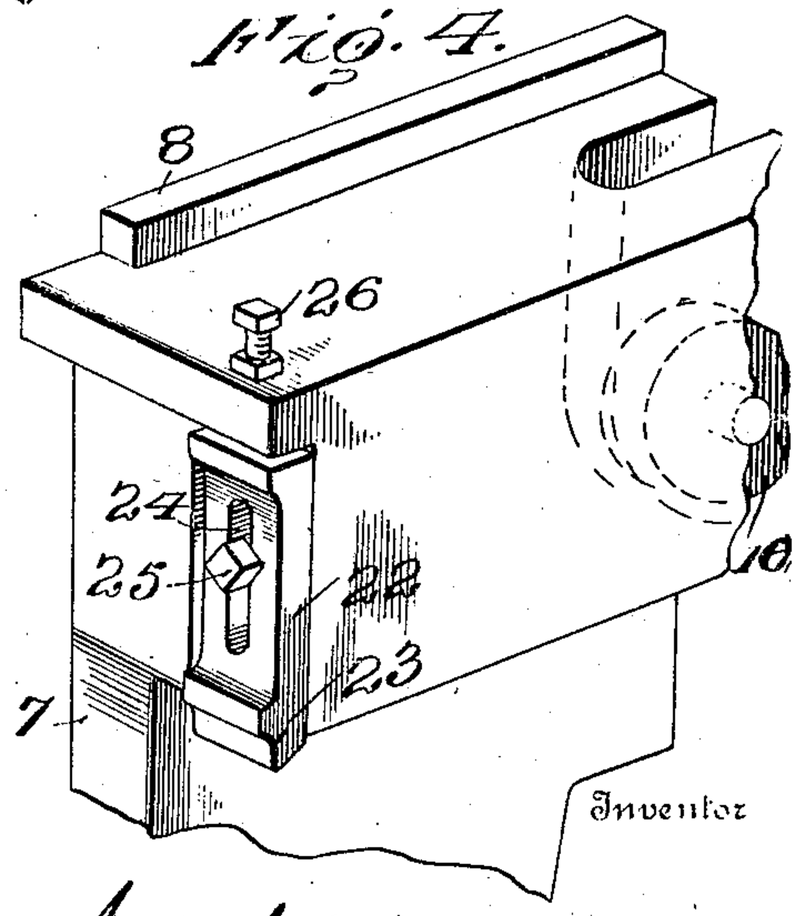


Fig. 4.



Witnesses

Gustave R. Thompson

M. A. Frook

Inventor

By Mauro, Cameron, Lewis & Macrae

Attorneys

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4 SHEETS—SHEET 3.

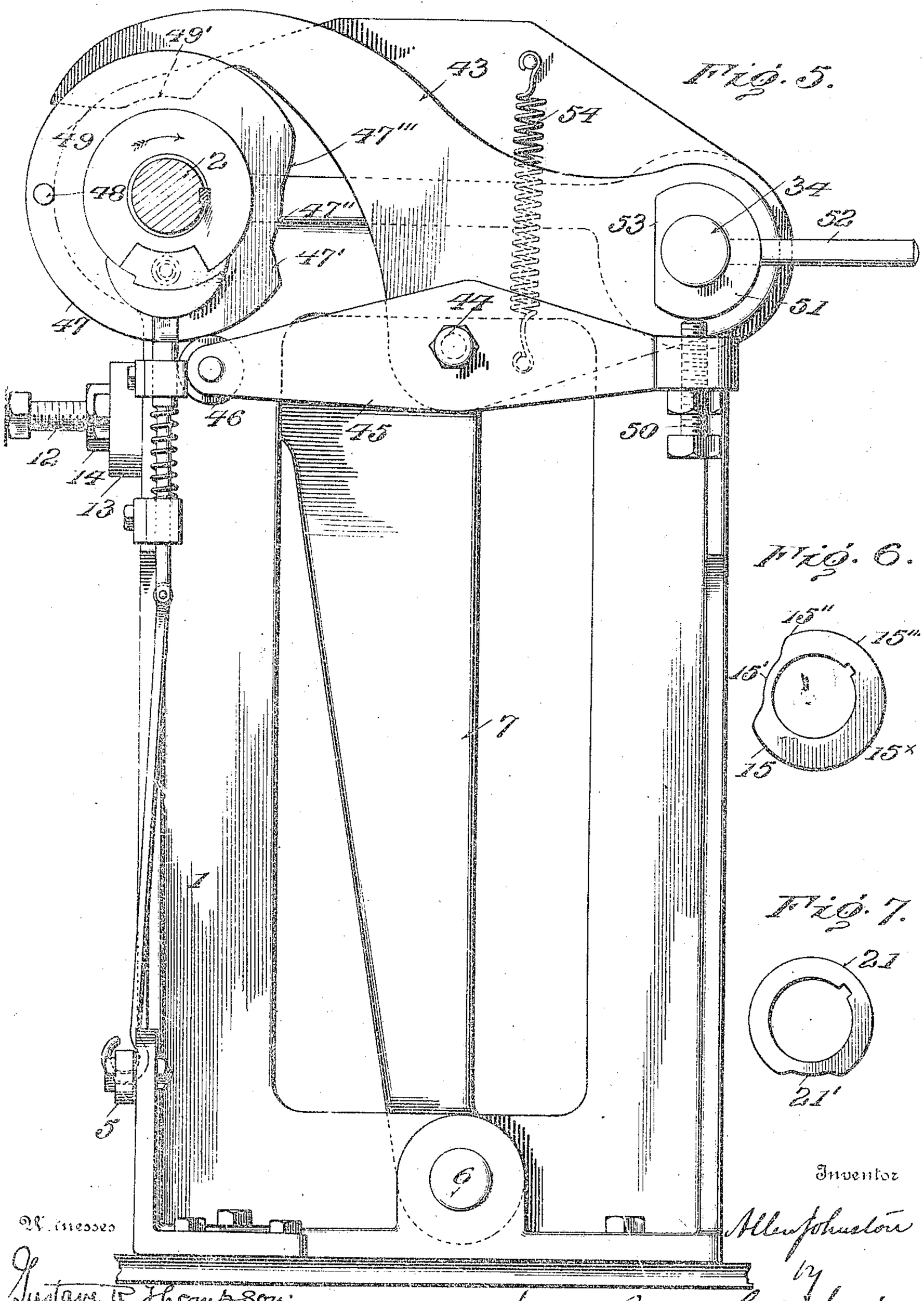

Fig. 5.

Fig. 6.

Fig. 7.

Witnesses

Gustave P. Thompson

M. A. Hook

Inventor

Allen Johnston

by

Munn, Cameron & Lewis

Attorneys

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4 SHEETS—SHEET 4.

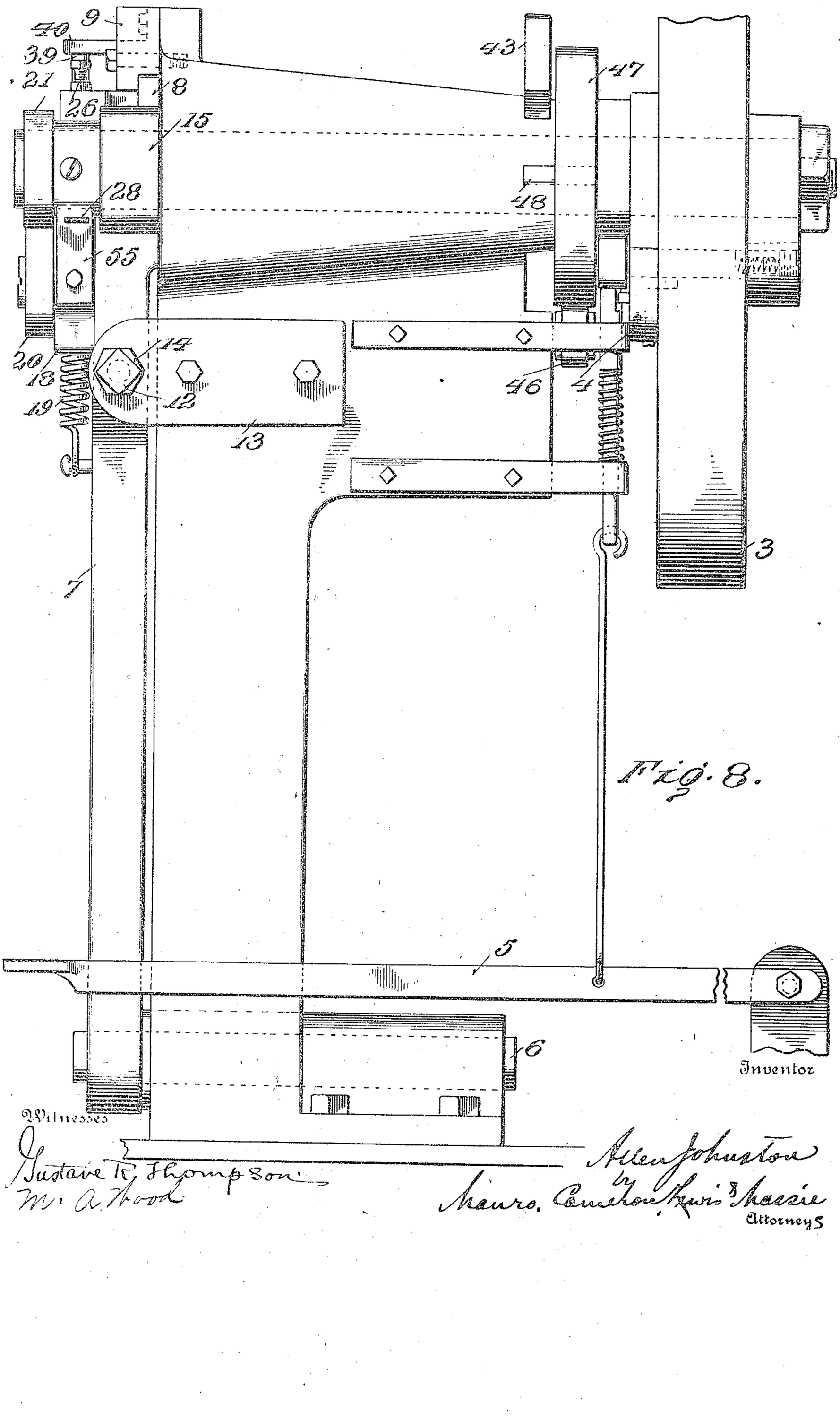

Fig. 8.

Witnesses

Gustave E. Thompson

M. A. Wood

Inventor

Allen Johnston

by Mauro, Carlton, Kerr & Maccie

Attorneys

UNITED STATES PATENT OFFICE.

ALLEN JOHNSTON, OF OTTUMWA, IOWA.

METAL-CRIMPING MACHINE.

944,559. Specification of Letters Patent. Patented Dec. 28, 1909.

Application filed May 22, 1909. Serial No. 497,612.

To all whom it may concern:

Be it known that I, ALLEN JOHNSTON, of Ottumwa, Iowa, have invented a new and useful Improvement in Sheet-Metal-Crimping Machines, which invention is fully set forth in the following specification.

This invention relates to means for crimping strips of sheet metal.

The more particular object in view is to provide a machine for automatically and regularly crimping strips of sheet metal designed for use in making the toothed portion of gear wheels, such, for example, as the gear wheels shown and described in my application for Letters-Patent Serial No. 420,690, filed March 12, 1908. While this is the special object in view, the invention is not limited to crimping sheet metal for this specific purpose, but, as will be manifest from reading the description herein, it is applicable to the crimping of sheet metal for a variety of uses.

According to the present invention, the regular and uniform crimping of the sheet metal strip is effected by having the strip of metal gripped between two sets of jaws at a distance apart equal to the length of the strip required to form that portion of the crimp extending from the center of the crown of one crimp to the center of the crown of the next succeeding crimp, and then bringing the two sets of jaws together whereby the straight portion of the strip thus lying between the two sets of jaws is bent up into the crimp, means being employed to control the direction of the crimp so that it will always be uniformly in the same direction, that is, in the present instance shall always be crimped upward. Preferably, the movement between the two sets of jaws is by the present invention obtained by having one pair of holding jaws stationary during the crimping movement, while the other pair moves forward toward the stationary pair of jaws to effect the crimp. While this particular movement is shown in the drawings, and is the one preferred, the invention is not limited to this kind of movement between the two sets of jaws, since it is manifest that the two sets of jaws might move toward each other, or other kinds of relative movement between the two sets of jaws might be employed with the same result. A crimp having been effected, the vibratory pair of jaws moves backward to take a new hold upon the strip of sheet metal, the extent of this backward movement being determined by suitable stop mechanism, which likewise determines the amount of metal entering into the next succeeding crimp. Upon the next succeeding forward movement of the vibrating jaws, the relatively stationary or holding pair of jaws open, and as the vibrating jaws move forward again, the entire strip of metal, including both the crimped and the uncrimped portion thereof, is advanced a distance equal to that between the centers of the crowns of two adjoining crimps, when there is a pause in the forward movement of the vibratory jaws, and the holding jaws close upon the crimped strip. Immediately thereafter, the vibratory jaws continue their forward movement, and the next succeeding crimp is formed. It will thus be seen that the vibratory jaws perform the double function of feeding the strip forward and crimping the same, and that the holding jaws are stationary so far as any relative movement in a right line to or from the crimping jaws is concerned, their only movement being an opening and closing movement to permit the feed. The movements of the vibratory crimping and feeding jaws are effected and controlled by suitable cams, and the opening and closing movements of the holding jaws are effected likewise by suitable cam mechanism, the whole operation proceeding automatically so long as a sheet of strip metal remains in position to be crimped.

The inventive idea involved is capable of receiving a variety of mechanical expressions, one of which, for the purpose of illustrating the invention, is disclosed in the accompanying drawings, but it is to be understood that said drawings are for the purpose of illustration only, and are not intended to define the limits of the invention, reference being had to the appended claims for this purpose.

In said drawings, Figure 1 is a front elevation of the machine, with the parts in the position which they occupy at the instant when a crimp has been completed; Fig. 2 is a like view with the parts in the position which they occupy just before the feeding movement of the vibratory jaws begins; Fig. 3 is a detailed perspective of the holding jaws, the parts being separated for better showing their construction; Fig. 4 is a perspective view of the upper end of the vibratory member with its attached parts;

Fig. 5 is a rear elevation of the machine, showing the cam mechanism for controlling the opening and closing of the holding jaws; Figs. 6 and 7 are details of the cams controlling the vibratory jaws; and Fig. 8 is a side elevation of the machine showing the position of the various cams on the main shaft.

Referring to the drawings, in which like reference numerals indicate like parts, 1 indicates the framework of the machine, of any suitable construction, and 2 a power shaft having suitable bearings in the frame 1. A constantly driven fly-wheel 3 is mounted to be connected to or disconnected from the shaft 2, by means of any suitable clutch mechanism 4 controlled by the workmen, as through the lever 5. As this clutch mechanism forms no particular part of the present invention, it need not be further described herein. Pivoted to the frame 1 at 6 is a vibratory lever 7, whose upper end or head is provided with a flange 8, moving under the lip of a bracket 9, whereby the lever 7 is guided in its vibrations and held securely to its work. A spring 10 reacts between a bracket 11 and the vibratory lever 7, tending to throw the lever from the position shown in Fig. 1 to that shown in Fig. 2, the limit of the movements of the lever under the influence of the spring 10 being controlled by a screw 12 passing through a bracket 13 on the frame, and provided with the usual lock nut 14.

Mounted on the shaft 2 is a cam 15 bearing against an anti-frictional roller 16 carried in the head of the vibratory lever 7. The outline of the cam 15 is such that when the cam is in the position shown in Fig. 2, the spring 10 throws the lever 7 to the right, and the further revolution of the cam in the direction indicated by the arrow brings a portion of the cam 15′ (which is concentric with the shaft 2) opposite the roller 16, thereby producing a dwell in the movement of the lever 7. Immediately thereafter, that portion 15″ of the cam contacts with the roller 16, acting to quickly throw the lever 7 from right to left, and at the termination of the active part 15″ of the cam 15 occurs a second dwell 15‴, succeeding which the diameter of the cam gradually increases, as at 15^{x}.

Pivoted upon the vibratory lever 7 at 17 is a lever 18 normally pulled downward by a spring 19 reacting between the two levers 7 and 18. On that end of the lever 18 adjacent to the power shaft 2 is a friction roller 20, which bears against a cam 21. This cam is of uniform diameter except at a part 21′, which is shaped as shown in Fig. 7. When the part 21′ is opposite the roller 20, spring 19 depresses the forward end of the lever 18, but when the roller 20 bears against the remaining portion of the cam 21, the forward portion of the lever 18 is thrown upward as shown in Fig. 1.

Mounted in the forward face of the head of the vibratory lever 7 is a jaw 22, which jaw is shaped at its lower portion as shown in detail in Fig. 4 to form a shaping die, the outline of the jaw at 23 being preferably that of one-half of the crimp to be formed from the crown portion of the crimp down to its base. This jaw 22 is provided with a slot 24 through which passes a screw 25 taking into the head of the lever 7, and a second screw 26 bears on the top of the jaw. By means of the two screws 25 and 26, the desired position of the jaw 22 may be secured and maintained.

On the forward end of the lever 18 is an upwardly projecting rib 27, which when the rear end of the lever 18 is pressed downward, bears forcibly against the under side of the strip 28 of sheet metal to be crimped, and acts to grip the said sheet firmly between said rib 27 and the lower edge of the jaw 22, the bearing of the rib 27 being slightly in advance of the bearing of the lower edge of the jaw 22, for the purpose of directing the bending of the crimp upward. Preferably, and as here shown, this rib 27 is not formed integrally with the lever 18, but is formed on a removable block of metal 29, secured by any suitable means, as by a set screw 30, to the forward end of the lever 18. It will be observed that the jaw 22 and the rib 27 constitute a pair of vibratory jaws between which the sheet metal strip 28 is gripped, for a purpose which will more fully hereinafter appear.

Mounted on an outwardly projecting bracket 31 on the main frame is the lower member of a pair of holding jaws, here shown in the form of an anvil block 32, the same being retained in position by any suitable means, as a screw 33.

Mounted in the main frame of the machine is a rock shaft 34 having keyed thereto an arm 35 (Figs. 1 and 2), which projects over the jaw 32 and carries a holding jaw 36 provided with three toothed corrugations approximately the shape of the spaces intervening between the crimps or teeth of the crimped sheet metal strip, as will be clearly understood by an inspection of Fig. 3. This holding jaw is secured to the arm 35, as by a screw 37. Passing through a vertical hole or opening 38 in the arm 35 and the holding jaw 36 is a stripping pin 39, whose upper end bears loosely against a bracket 40 projecting outward from the frame 1 of the machine. This stripping pin 39 is provided with an abutment 41, against which one end of a spring 42 bears, while the other end bears upon the top of the arm 35.

Referring to Fig. 5, 43 is a lever shaped as shown in said figure and keyed to the shaft 34, and pivoted to the lower portion

of said lever 43 at 44 is a second lever 45, having an anti-friction roller 46 at one end which bears on a cam 47 keyed to the main shaft 2, which cam throughout a greater portion of its periphery is concentric with the shaft 2, but is provided with a descending portion 47′, a dwell 47″, and an ascending portion 47‴. The outer end of the lever 43 extends alongside of the cam 47, and is shaped as shown in dotted lines in Fig. 5, and the cam 47 is provided with a pin 48, which contacts with the cam portion 49 on the lever 43 as the roller 46 comes opposite the descending portion 47′ on the cam 47.

Passing through the end of the lever 45 opposite the roller 46, is a screw 50 whose upper end bears against a sleeve 51, mounted to turn loosely on the rock shaft 34, and arranged to be operated by a handle 52. This sleeve 51 has a flat or cut-away portion 53, which by turning handle 52 from a horizontal to a vertical position, may be brought opposite the screw 50, thereby permitting the screw and the end of the lever 45 to which it is secured to move upward.

The operation of the machine as thus described is as follows:—For the purpose of inserting the strip of sheet metal to be crimped, the handle 52 is turned from the horizontal position shown in Fig. 5 to a vertical position, thereby bringing the cut-away face 53 on the sleeve 51 opposite the set screw 50, whereupon spring 54, reacting between the frame of the machine and the lever 43, elevates said lever, thus rocking the shaft 34 and the arm 35, and lifting the holding jaw 36 up so that the sheet metal strip 28 may be inserted through the guide 55 (Figs. 1, 2 and 8) between the jaws 22 and 27, and between the holding jaws 32 and 36. This being done, the handle 52 is thrown into the horizontal position shown in Fig. 5, thus acting to again depress the lever 43, and rocking the shaft 34 and arm 35 to bring the holding jaw 36 down upon the sheet metal strip, where it is held between the jaws 32 and 36. The sheet metal strip being thus in position, the operator connects the shaft 2 with the fly wheel 3 by operating the clutch 4 through the medium of the treadle lever 5, whereupon the vibratory lever 7 is advanced from the position shown in Fig. 2 to that shown in Fig. 1. The several cams 15, 21 and 47 are so timed that as the lever 7 starts to advance, the rear end of the lever 18 is forcibly depressed by reason of the fact that the roller 20 is out of the cut-away portion 21′ on the cam 21, so that the sheet metal strip is firmly gripped between the lower edge of the jaw 22 and the rib 27 on the lever 18. During the first part of the advance of the lever 7, the roller 16 thereon is in contact with the advancing portion 15″ of the cam 15, and the pin 48 on the cam 47 is acting on the portion 49′ of the lever 43 to hold it elevated, thereby elevating the holding jaw 36, and permitting the strip 28 to be advanced or fed forward from right to left in Fig. 2. While the pin 48 on the cam 47 is in the dwell portion 49′ of the lever 43, the roller 46 on the lever 45 is in the dwell portion 47″ of the cam 47, but as the pin 48 passes from under the dwell portion 49′ of the lever 43, the roller 46 comes in contact with the upward active portion 47‴ of the cam 47, thereby forcibly depressing the lever 43, and thus bringing the holding jaw 36 down firmly upon the sheet metal strip 28. During this descending movement of the jaw 36, the dwell portion 15‴ of the cam 15 has been opposite the roller 16 on the vibratory lever 7, so that there has been a slight momentary dwell in the forward advance of the jaws 22 and 27 and the strip gripped thereby, but at the instant that the strip is grasped and held between the holding jaws 32 and 36, the active portion 15× of the cam 15 comes into contact with the roller 16 and the jaws 22 and 27 are then forcibly advanced to the position shown in Fig. 1. The latter part of the advance of the jaws 22 and 27, acting in connection with the upward pressure on the under side of the strip of sheet metal by the rib of jaw 27, gives the metal an upward crimp the exact shape of which is determined by the contour of the shaping die 23 of the jaw 22 and the corresponding contour of the oppositely disposed shaping die on the holding jaw 36, as will be clearly understood by an inspection of Figs. 1, 2 and 3. The crimp having thus been formed, the cut-away portion 21′ on the cam 21 comes opposite the roller 20 on the lever 18 at the same instant that the descending portion on the cam 15 comes opposite the roller 16 on the vibratory lever 7, so that the grip on the sheet metal strip between the jaws 22 and 27 is relieved, and at the same instant the vibratory lever 7 is thrown from left to right by the action of the spring 10, the extent of such throw being determined by the position of the set screw 12 and the contour of the cam 15. During the time that the lever 7 has been completing this throw from left to right, the roller 20 has been traveling in the dwell portion 21′ of the cam 21, and immediately upon the completion of the rearward throw of the lever 7 the roller 20 rides out of the dwell portion 21′ of the cam 21, and the strip is again firmly gripped between the jaws 22 and 27. As this gripping action occurs, the dwell 15′ on the cam 15 comes opposite the roller 16, and the vibratory lever 7 therefore remains stationary for an instant, and it is at this time that the pin 48 on the cam 47 acts on the cam portion 49 of the lever 43, and that the roller 46 on the lever 45 enters the descending portion 47′

of the cam 47, thereby elevating the holding jaw 36. The metal strip is prevented from moving upward with the holding jaw 36 by the action of the stripping pin 39, which is held down in its engagement with the bracket 40 on the frame.

At the instant when the holding jaw 36 is raised above the crimped strip, the active portion 15″ of the cam 15 comes opposite the roller 16 on the lever 7, and advances the lever from right to left, thereby effecting a feed of the crimped strip from right to left over a distance equal to the space from the center of the crown of one crimp to the center of the crown of the next succeeding crimp. When this has been accomplished, the roller 16 enters the dwell 15‴ of the cam 15, and the lever 7 again remains stationary for a short period of time, and the pin 48 on the cam 47 having passed from under the dwell 49′ on the lever 43, and the roller 46 having also passed beyond the dwell 47‴ of the cam 47, the lever 43, and with it the arm 35, is again rocked so as to throw the holding jaw 36 downward, the teeth on the under side of said jaw entering the spaces between the crimps on the strip of sheet metal. Just as this occurs, the roller 16 is actuated by the active cam portion 15× on the cam 15, and the vibratory lever is then again advanced from right to left to effect the crimp as before described.

The holding jaw 36, the crimping jaw 22, and the cams 15 and 21 are all made removable, to the end that other corresponding parts may be substituted therefor, to provide for crimping sheets of metal of various thicknesses, and to also provide for effecting crimps of varying form such as the right hand crimp in Fig. 1, where the inner surfaces of the metal forming the crimp contact for the whole or a part of the depth of the crimp, or such as the more open forms of crimp shown in Figs. 2 and 3. Thus, when it is desired to crimp a strip of sheet metal for the purpose of forming the same into a sheet metal gear wheel of one pitch, one set of cams and one set of jaws may be employed, and when a sheet of metal is to be crimped for a gear wheel having a different number of teeth or different pitch, a different set of cams and jaws are employed. When this change is made, the throw of the vibratory lever 7 has also to be altered, and this is readily accomplished by means of the adjustable stop screw 12. By this simple means, provision is made for a great variety of crimps, and on sheet metal strips of a great variety of thicknesses.

It will be observed that once the sheet metal strip is introduced and the crimping action begun, the machine continues automatically to perform its functions, and to effectively crimp the strip until the entire strip has been crimped, no attention being necessary on the part of the operator, except to insert a new strip when the preceding one has been fully crimped.

Various obvious changes may be made in the construction of detailed parts of the machine without departing from the spirit of the invention, and such variations are designed to be included in the accompanying claims.

Having thus described my invention, what is claimed is:—

1. In a machine for crimping sheet metal strips, the combination of two sets of gripping devices seizing the strip at two points, a shaping die on each of said sets of gripping devices, and means moving one of said sets of gripping devices toward the other.

2. In a machine for crimping sheet metal strips, the combination of two shaping dies which together have the contour of a crimp, two sets of gripping devices seizing the strip at two points, means moving one of said sets of gripping devices toward the other and closing said dies on the crimp.

3. In a machine for crimping sheet metal strips, the combination of two sets of gripping jaws seizing the strip at two points with sufficient of the strip between them to form a crimp, one member of each set of jaws having a shaping die, and means to bring the two sets of jaws together to close the shaping dies and form the crimp.

4. In a machine for crimping sheet metal strips, the combination of a pair of gripping jaws arranged to grip the strip of metal and hold it stationary, a shaping die on one of said jaws having the contour of one side of the crimp to be formed, a second pair of gripping jaws arranged to grip the strip of metal at a sufficient distance away from said first set to form a crimp, a shaping die on one of said second set of gripping jaws, and means moving said second set of jaws toward said first set to form the crimp.

5. In a machine for crimping sheet metal strips, the combination of a shaping die having the contour of one side of a crimp, means reciprocating said die transversely to the strip, a second shaping die having the contour of the other side of said crimp, and means reciprocating said second die lengthwise of said strip.

6. In a machine for crimping sheet metal strips, the combination of a gripping or holding device carrying a shaping die having the contour of one side of a crimp, means reciprocating said holding device and die transversely to the strip, a second gripping device engaging said strip and carrying a shaping die having the contour of the other side of said crimp, and means reciprocating said second gripping device and die lengthwise of said strip.

7. In a machine for crimping sheet metal strips, the combination of two sets of grip-

ping means seizing the strip at two points with enough of said strip between them to form one complete crimp, a die on each of said sets of gripping devices having the contour of one side of a crimp, and means reciprocating said sets of gripping means on lines transverse to each other.

8. In a machine for crimping sheet metal strips, the combination of a stationary anvil, a holding device having a die conforming to part of the contour of a crimp, means reciprocating said holding device toward and from said anvil, a gripping device having a die conforming to the remaining part of said crimp, and means reciprocating said gripping device toward and from said anvil on a line transverse to the line of reciprocation of said holding device.

9. In a machine for crimping sheet metal strips, the combination of a holding device for the strip, a die on said device having the contour of one side or face of a crimp, with a reciprocating gripping device the gripping members of which consist of two elements one of said elements being a shaping die having a contour conforming to the other side or face of said crimp, and the other gripping element constituting means to control the direction of the crimp.

10. In a machine for crimping sheet metal strips, the combination of an anvil, a reciprocating holding device, a die on said holding device having a contour corresponding to one face or side of a crimp, means reciprocating said holding device with a dwell at the end both of the to and the fro motion thereof, a gripping device, means giving said device a to and fro motion with relation to said anvil, with a dwell or interruption in the movement toward said anvil, and a die carried by said device and having a contour conforming to the other side or face of said crimp.

11. In a machine for crimping sheet metal strips, the combination of a forming jaw having on its face the contour of one side of a crimp, a second jaw on which the strip is clamped by the first jaw, a reciprocating jaw having on its face the contour of the other side of the crimp, a clamping jaw clamping the strip to the reciprocating jaw and moving with it, and means reciprocating the two last named jaws.

12. In a machine for crimping sheet metal strips to form gearing, two sets of gripping devices gripping the sheet metal strip at a suitable distance apart to form a crimp for a tooth of the desired size, and means forcing one of said gripping devices toward the other until the inner faces of the crimp contact with each other.

13. In a machine for crimping sheet metal strips to form gearing, two sets of gripping devices gripping the sheet metal strip at a suitable distance apart to form a crimp for a tooth of the desired size, means controlling the direction of the crimp, and means forcing one of said gripping devices toward the other until the inner faces of the crimp contact with each other.

14. In a machine for crimping sheet metal strips to form gearing, the combination of means controlling the direction of the crimp, and means forcing the inner surfaces of the metal of a crimp into contact with each other.

15. In a machine for crimping sheet metal strips, the combination of a pair of vibratory feeding and crimping jaws, means vibrating the same, means for varying the amplitude of vibration of said jaws, and means releasing said strip during the feeding but seizing said strip during the crimping portion of each vibration.

16. In a machine for crimping sheet metal strips, the combination of a pair of vibratory feeding and crimping jaws, means vibrating the same, and means releasing said strip during the feeding but seizing said strip during the crimping portion of each vibration.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

ALLEN JOHNSTON.

Witnesses:
THOS. E. RODGERS,
F. A. WRIGHT.