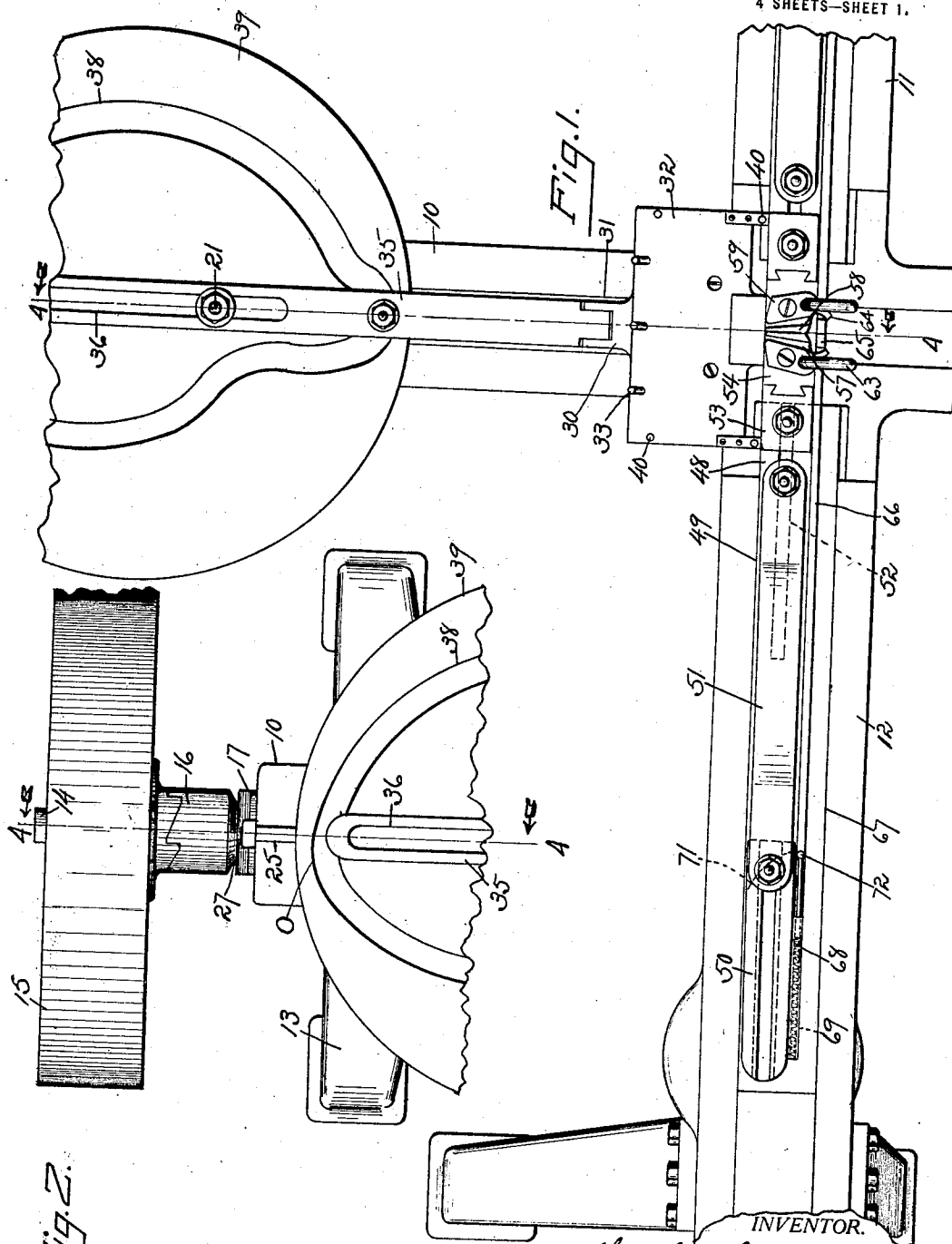


1,377,150.

A. G. HAGSTROM.
WIRE BENDING MACHINE.
APPLICATION FILED JULY 14, 1919.

Patented May 3, 1921.

4 SHEETS—SHEET 1.



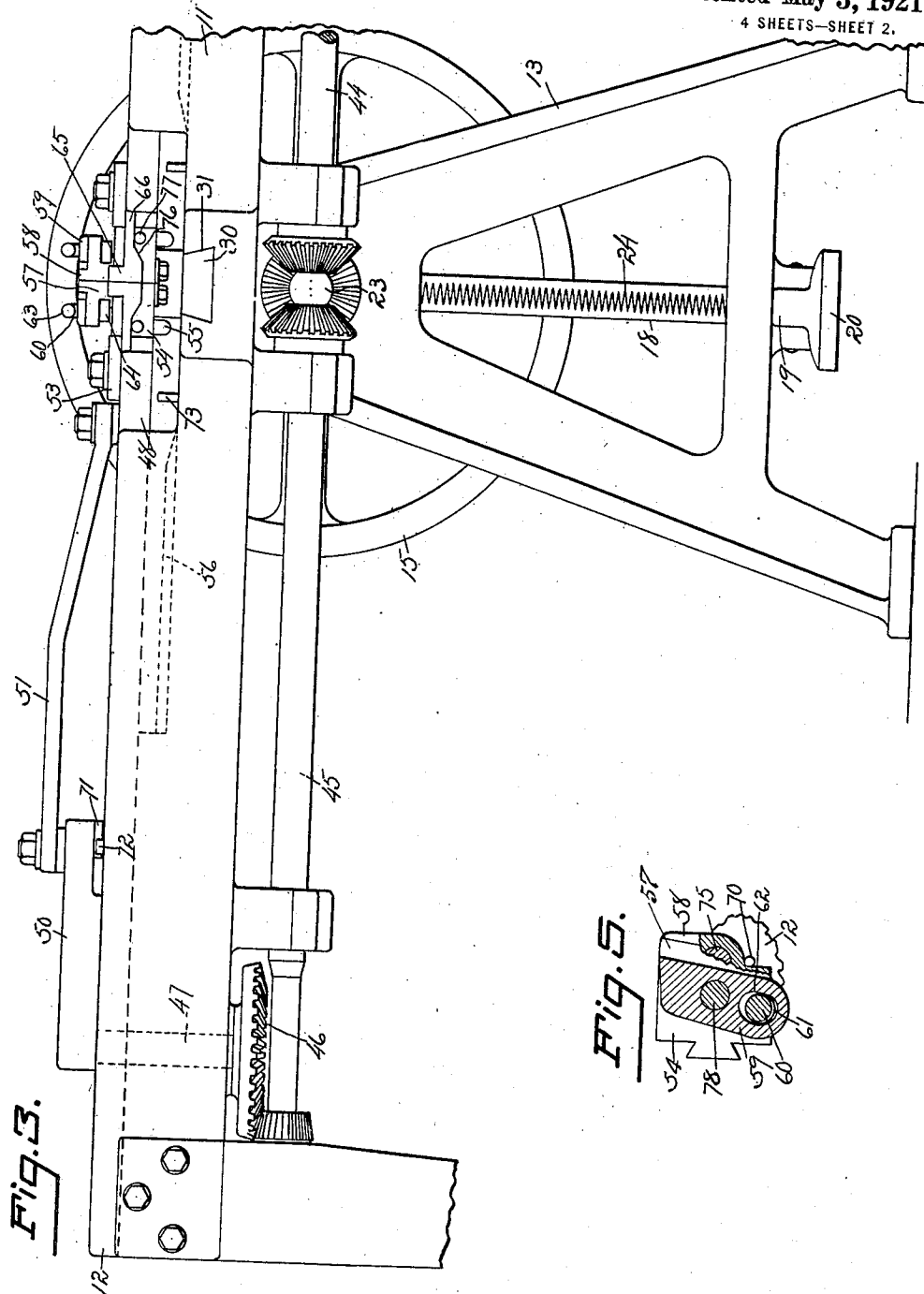
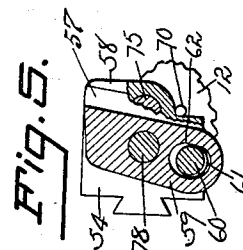
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BY
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ATTORNEY.

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4 SHEETS—SHEET 3.

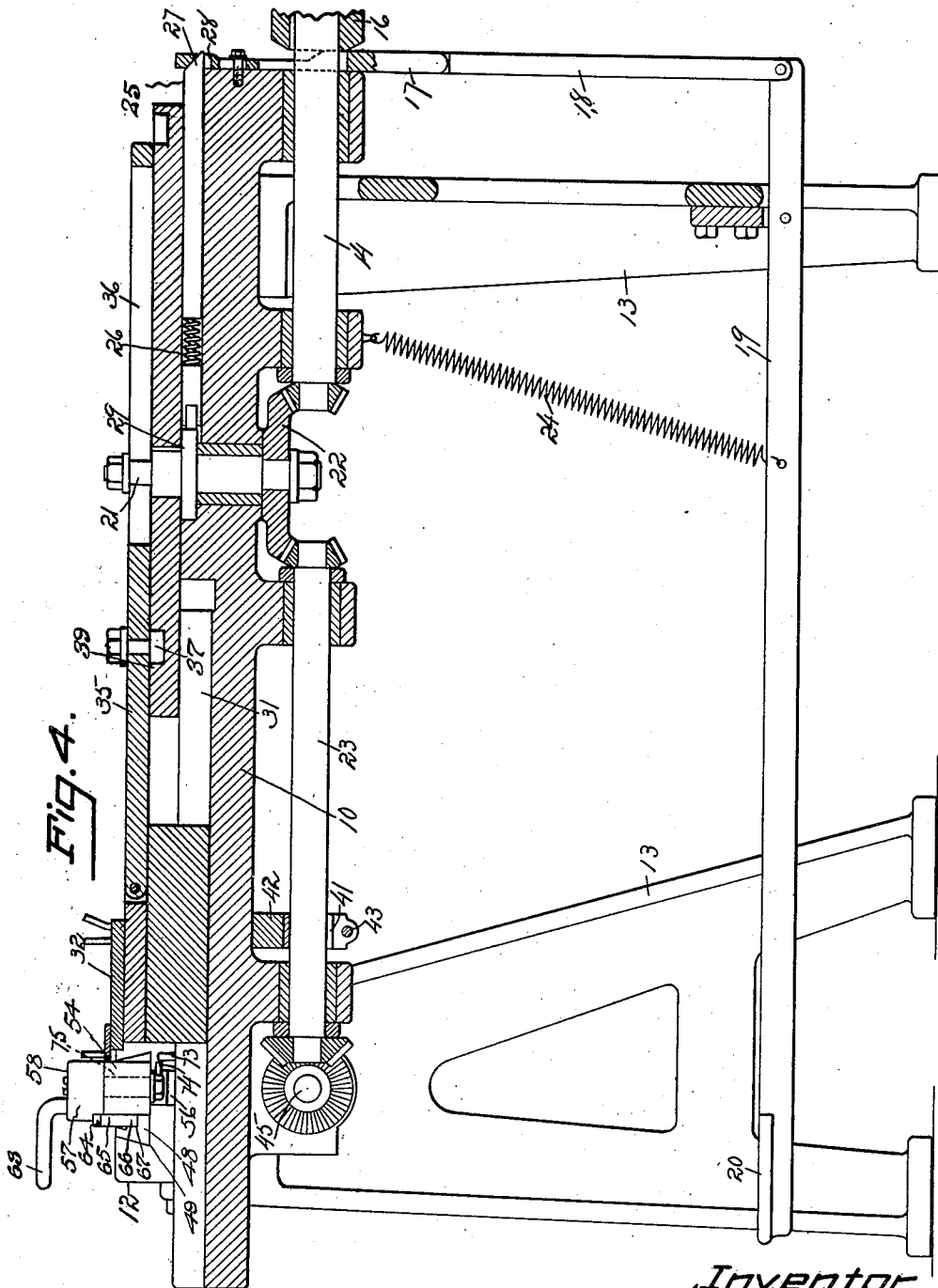


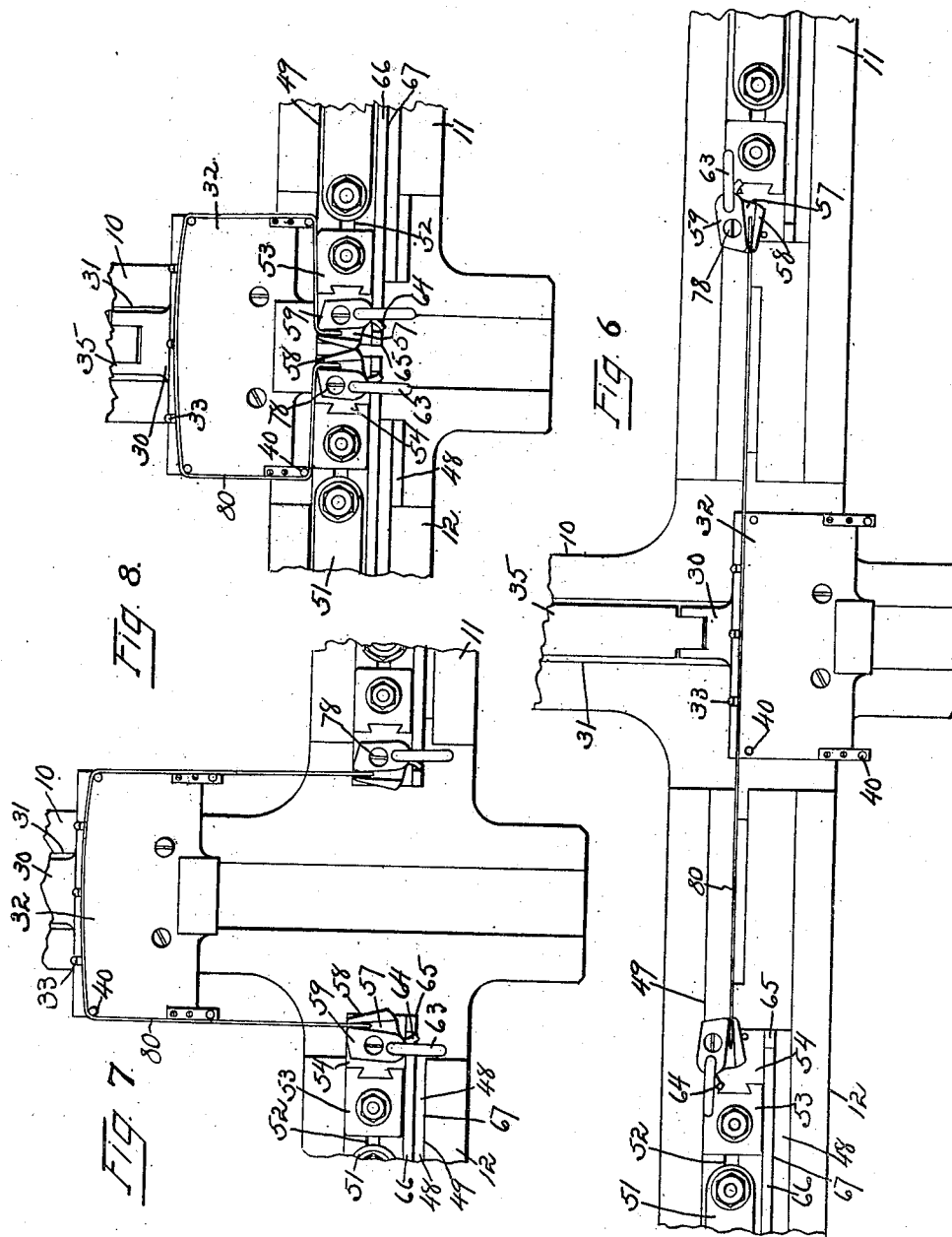
Fig. 4.

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UNITED STATES PATENT OFFICE.

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WIRE-BENDING MACHINE.

1,377,150.

Specification of Letters Patent.

Patented May 3, 1921.

Application filed July 14, 1919. Serial No. 310,764.

To all whom it may concern:

Be it known that I, ALBERT G. HAGSTROM, a citizen of the United States, residing in East Hartford, in the county of Hartford and State of Connecticut, have invented a new and Improved Wire-Bending Machine, of which the following is a specification.

My invention relates to the class of machines above mentioned, and an object of my invention, among others, is to produce a machine of this class that shall be rapid and efficient in its operation.

One form of machine embodying my invention and in the construction and use of which the objects herein set out, as well as others, may be attained, is illustrated in the accompanying drawings, in which—

Figure 1 is a top view of my improved wire bending machine.

Fig. 2 is a similar view of a part of the machine not shown in Fig. 1.

Fig. 3 is a view in front elevation of that part of the machine shown in Fig. 1, the former being omitted.

Fig. 4 is a view in vertical section on plane passing through the center of the cross portion of the frame.

That part of the machine shown in the above views is from one end to a point beyond and including the center, that end not shown being a counterpart of the end shown.

Fig. 5 is a detail view in horizontal section through a clamp jaw, showing the clamp slide partially broken away underneath and illustrating the stop pins for the clamp blocks.

Fig. 6 is a detail view illustrating the relative positions of the former and of the wire bending slides at the beginning of the operation.

Fig. 7 is a similar view illustrating the relative position of said parts at the end of the first step in the operation.

Fig. 8 is a similar view illustrating the relative position of said parts at a succeeding step in the operation.

While my improved wire bending machine is not limited in its application to any specific purpose yet, as it is especially adapted for bending twisted wire comprised in brushes, mops and like devices to which cotton threads, bristles or similar materials are secured, such a machine has been selected by me for the purpose of illustrating my

invention in the drawings herein, such machine comprising a frame of cruciform shape when viewed in plan and consisting of a stem portion 10 and a cross portion comprising sections 11—12 located at one end of the stem and extending in opposite directions therefrom, said frame being supported as by legs 13 preferably located at the ends of said parts and secured thereto in any suitable manner, as herein shown the ends of said frame parts being located in grooves in the upper edges of the legs and the latter being secured as by means of screw bolts.

A driving shaft 14 is mounted in bearings underneath the outer end of the stem portion 10 of the frame and supports a driving pulley 15 loosely mounted thereon and having one member of a clutch to engage with a clutch member 16 splined to the driving shaft and adapted to be engaged with the clutch member on the pulley as by means of a cam on a cam slide 17 mounted on the frame and connected by a rod 18 with a treadle lever 19 having a pad 20 at its front end by means of which said lever may be actuated by the foot of the operator of the machine, said mechanism being operated to engage the clutch members, and the member 16 being disengaged from its companion clutch member as by means of a spring (not shown) in a manner that will be readily understood. The treadle lever is held in its upper position as by means of a spring 24.

A cam shaft 21 is mounted in the stem portion 10 of the frame and has a bevel gear 22 meshing with beveled pinions on the shaft 14 and on a connecting shaft 23 whereby the shaft 21 is driven by the shaft 14 and drives the shaft 23. The driving shaft 14 makes three complete rotations to one rotation of the cam shaft 21, and in order to automatically stop the operation of the machine when the cam shaft has made one complete rotation a stop motion slide 25 is mounted in a groove in the top of the stem portion 10 of the frame. This slide is composed of two members connected by a spring 26 to prevent injury to parts should anything be interposed to prevent movement of the slide. The end of the slide has a cam slide retainer 27 adapted to engage an opening 28 in the cam slide, said retainer being beveled as to that portion engaging said

opening. The opposite end of the stop motion slide engages a stop motion cam 29 secured to the cam shaft 21.

When the clutch members are thrown into engagement by an upward movement of the cam slide 17 through the operation of the treadle lever, the main driving shaft and cam shaft are set in motion. At this time one end of the stop motion slide is engaged with the lower part of the cam, that is, the part nearest the axis of the cam. Immediately after the cam shaft starts its rotation the stop motion cam forces the stop motion slide and the retainer thereon into the opening in the cam slide 17 thus retaining the latter in its uppermost position and holding the clutch parts in engagement. As soon as the cam shaft completes one rotation said lower part of the cam, constituting a notch, moves opposite to the end of the stop motion slide, and the latter is allowed to move backward under the pressure of the cam slide on the beveled end of the stop motion slide, which pressure is caused by the spring that moves the treadle lever to operate the rod 18 connected with the cam slide, and operation of the machine is thus automatically stopped.

A former slide 30 is located in a slideway 31 on the portion 10 of the frame, this slide carrying a former 32, that, in the structure herein shown, comprises a block with pins rising therefrom. The slide 30 has a former slide operating bar 35 pivotally connected thereto and extending rearwardly, said bar having a slot 36 to receive the upper reduced end of the cam shaft 21. A stud having a roller 37 projects from the under side of the bar and engages a cam slot 38 in a cam 39 secured to the cam shaft 21, the cam slot in said cam being properly formed to impart timely movement to the former and to the extent required in the different movements of the parts.

The pins rising from the block 32 are arranged in two sets, a set of holder pins 33 and a set of former pins 40, the latter being disposed to give the proper shape to the wire when it is finally bent.

The connecting shaft 23 has a brake disk 41 located within a friction member 42, said member being contracted by a tension screw 43 by means of which the amount of friction on the disk 41 may be regulated, this being employed to cause the machine to stop at a certain point in each operation and not overrun.

The connecting shaft 23 has a bevel pinion meshing with bevel pinions on the sections 44—45 of a cross shaft, each section of which is of a construction similar to the other and operates in the same manner, and one of said shafts and mechanism operated thereby only will be described, it being understood that said description applies equally to the other

shaft and mechanism operated thereby. This section of the cross shaft is mounted on a section 11 or 12 of the cross portion of the machine and has a beveled pinion meshing with a bevel gear 46 on a crank shaft 47 vertically mounted near the outer end of the cross portion of the frame, said crank shaft at its end opposite the gear extending through a wire bending slide 48 mounted in a slideway 49 in a cross portion of the frame. A crank 50 is secured to said crankshaft and has a connecting rod 51 adjustably secured at one end in a slot in the crank, the other end of said rod being adjustably secured in a slot 52 in the slide 48. A base block 53 is adjustably secured in the slot 52 and a clamp slide 54 is vertically slidably mounted in said block, said slide having a dove-tailed shaped projection located in a groove of similar shape in said block. The clamp slide has a stud 55 in its under side adapted to rest upon a cam plate 56, the forward end of which is beveled to permit the slide to drop on release of the wire bending slide 48 as it approaches or reaches its forward position.

A clamp block 57 is rotatably mounted on the clamp slide 54, as by means of a pivot 75 projecting from said block into said slide (see Fig. 5 of the drawings), said clamp block having a fixed clamp jaw 58 and a movable clamp jaw 59, the latter, in the structure herein shown, being pivotally mounted on a pivot 78 on the block 57 and operated by a hand lever to clamp the end of a wire against the fixed jaw, said lever comprising a clamp shaft 60 having a clamping cam 61 located in a cam slot 62 in the jaw, said shaft having a handle 63 by means of which it may be manually operated. A clamp releasing finger 64 projects from the shaft 60, at its lower end, in position to be engaged by a clamp releasing lug 65 on a clamp releasing bar 66 mounted in a groove 67 in the wire bending slide 48, the end of said bar projecting into a socket piece 68 and resting against a spring 69 therein that forces the bar normally toward the inner end of the wire bending slide 48 or center of the machine.

In the operation of the machine, the wire bending slides being in their rearward position as shown in Fig. 6, and the roller 37 on the former operating bar 35 being at the starting point 0 (see Fig. 2) in the cam slot 38, a wire 80, commonly twisted with the threads or bristles to form a brush secured thereto, but shown herein as a straight wire, is placed between the holder pins 33 and the former pins 40, and the ends of the wire are secured between the clamp jaws 58—59 at each end of the wire, the spaces between the jaws in which the ends of the wire are located being at this time substantially in line in a direction lengthwise of the cross or main portion of the machine as shown in

Fig. 6. The treadle lever 19 being now pressed down, the clutch parts are engaged and the driving shaft 14 is started and the machine thus begins its operation. During the first part of the operation the cam 39 draws the former rapidly back bending the wire so that the center portion is located at substantially right angles to the bent portions. This operation is assisted by the action of the cranks 50 that force the wire bending slides 48 forwardly, that is, toward the center of the machine, moving the ends of the wire 80 toward each other until they touch the former pins 40 nearest the center of the machine and as shown in Fig. 7. This may be considered the first step in the operation. In this first step of the operation the clamp blocks 57 being freely pivotally movable on the clamp slides 54, such clamp blocks readily and automatically conform their positions pivotally to the changed conditions thus caused. In the continued operation of the machine the second step in the bending operation takes place, this after the wire has been brought into the position just described with the end portions at substantially right angles to the central portion. The shape of the cam slot 38 at this time causes a momentary dwell in the movement of the former 32 while the cranks 50 continue the movement of the end portions of the wire toward each other, the bending now taking place around the two former pins 40 located nearest the center of the machine, and the wire now beginning to assume a rectangular form and the end portions being bent to a position substantially parallel with the center portion of the wire. During this second step in the bending operation, the clamp blocks 57 rotate to their fullest extent in this direction, further rotation being prevented by stop pins 70 projecting upwardly from the clamp slides 54, and as a result the now extreme ends of the wire of comparatively short length are bent around the edges of the movable jaws to positions at substantially right angles to those parts from which they project and that are parallel with the central portion.

The adjacent edges of the clamp blocks 57, in the positions in which they now are, are diagonally arranged with respect to each other and with respect to the lines of movement of the wire bending slides, the space between said clamp blocks at this time being of V-shape, with the wider part of the space toward the former, and with a result that as said slides are thus pressed against each other at the point of the V-shaped space in the continued movement of the bending slides, they are caused to swing on their pivots, the latter being so located as to effect this result, in a direction reverse to that in which they were swung earlier in the operation, and the ex-

treme short ends of the wire are bent beyond and past the point of right angular location hereinbefore described, this to compensate for the spring qualities of the wire, with a result that when the said ends are released, and the wire assumes its natural shape, the short ends will be located substantially at right angles to the parts from which they project.

As the bending slides 48 approach the ends of their bending movements, the studs 55 are carried free from the cam plates 56 and are held suspended by engagement of the ends of the wire with the clamps above the upper surfaces of the frame at this point.

When the wire bending slides are in this position at the end of their bending movements, the lugs 65 are between the releasing fingers 64, that is, on that side of said fingers toward the center of the machine as shown in Fig. 1. As the cranks 50 cross the vertical central plane of the cross portion of the machine and begin to draw the slides back, cam shoulders 71 on the under sides of the cranks engage cam lugs 72 on the upper surfaces of the clamp releasing bars 66 and draw said bars backwardly, causing the lugs 65 to engage the releasing fingers 64 and rotate the clamp shaft 60 that releases the ends of the wires from the clamp jaws, and the clamp blocks 57, being now free, drop until the studs 55 rest upon the upper surface of the frame of the machine, the clamps being thus moved away from the ends of the wire and the latter being freed for removal from the machine.

When the cam shoulders release the cam lugs, the releasing bars 66 move forward or toward the center of the machine under the impulse of their springs, the clamp blocks turning on their pivots to permit this.

As the parts of the machine approach the end of their cycle of movement just described, the cam slide retainer 27 is withdrawn from within the opening 28 and the stop motion slide moves downwardly under the influence of the spring 24 thus releasing the clutch parts and causing the machine to stop its operation until the treadle is again depressed to start the machine, when the operation above described again takes place.

It will be noted that the clamp blocks are automatically swung from the positions occupied when the operation of the machine begins and that if not so swung they will strike against each other before the wire bending slides reach the limit of their movement inwardly, and that injury to the machine will thereby result. Such a result is liable to take place should the machine be started without a wire in place on the former with its ends clamped by the jaws of the clamp. To guard against such an event, 130

safety lugs 73 (see Fig. 4) extend upwardly from the upper surface of the frame into the path of movement of safety fingers 74, when the clamp blocks are in their initial positions, said fingers projecting laterally from the lower ends of the pivots 75 of the clamp blocks, as shown herein, said fingers projecting from nuts on said pivots. Should the machine be started with the clamp blocks in their initial positions, the safety fingers striking the safety lugs will swing the clamp blocks into a position of safety and injury of the parts will thus be avoided.

In order to insure downward movement of the clamp slides, clamp slide actuating cams 76 (see Fig. 3) are formed on the under side of the bar 66, said cams acting against clamp slide actuating pins 77 that, in the backward movement of the bars 66, are struck by said cams and the slides are thereby forced downwardly should they, for any reason, be held in their upper positions.

In accordance with the provisions of the patent statutes, I have described the principles of operation of my invention, together with the device which I now consider to represent the best embodiment thereof; but I desire to have it understood that the device shown is only illustrative, and that the invention may be carried out by other means.

I claim:—

1. A wire bending machine including a former to receive the wire to be bent, movably mounted clamps to receive and hold the ends of said wire, means for moving said former away from a position approximately between said clamps and laterally to the direction of movement of said clamps to perform one step in the bending operation, and means to move said former toward said clamps to effect another step of the bending operation.

2. A wire bending machine including a former to receive the wire to be bent, clamps to receive and hold the ends of said wire, means for moving said former away from a position approximately between said clamps to perform one step in the bending operation, means for moving the clamps in cooperation with said movements of the former, and means for moving said former toward said clamps to effect another step in the bending operation.

3. A wire bending machine including a former to receive the wire to be bent, clamps to receive and hold the ends of said wire, means for moving said former away from a position approximately between said clamps and laterally to the direction of movement of said clamps to perform one step in the bending operation, means to move said former toward said clamps to effect another step in the bending operation, and means independent of the former for moving said clamps

during the latter part of the bending operation.

4. A wire bending machine including clamps to receive and hold the ends of a wire to be bent, means for moving said clamps during one step of the bending operation, a former to receive said wire, said former being mounted for movement in one direction, and means for moving said former in a direction reverse to its movement just mentioned and independently of the movement of the clamps during another step in the bending operation.

5. A wire bending machine including a former to receive the wire to be bent, clamps to receive and hold the ends of said wire, means for moving said former away from a position approximately between said clamps and laterally to the direction of movement of said clamps to perform one step of the bending operation, means for moving said former toward said clamps to effect another step of the bending operation, and means for moving said clamps toward each other during both steps of said bending operation.

6. A wire bending machine including a former to receive the wire to be bent, clamps to receive and hold the ends of the wire, means for moving the clamps toward and from each other, and a cam operatively connected with said former to move it in a direction laterally to the direction of movement of said clamps.

7. A wire bending machine including a frame of cruciform shape, a former mounted to slide on the stem portion of said frame, means for operating the former, clamps mounted to slide on the cross portion of said frame, and means connected with said clamps to move them toward and away from each other in unison with but independently of the movement of the former.

8. A wire bending machine including a driving shaft, a cam shaft connected with said driving shaft, a cam on the cam shaft, a connecting shaft driven by said cam shaft, cross shafts driven by said connecting shaft, a former movably mounted and operatively connected with said cam, and clamps slidably mounted and operated by said cross shafts to be moved toward and from each other in unison with said former.

9. A wire bending machine including a frame of cruciform shape, a driving shaft mounted at the end of the stem portion of said frame, a cam shaft vertically mounted in said stem portion and connected with the driving shaft, a cam secured to the cam shaft, a connecting shaft mounted in bearings on the stem portion of said frame and connected to be driven from the cam shaft, a former slidably mounted on the stem portion of the frame and operatively connected with said cam, two cross shafts mounted on the cross portion of said frame and each con-

connected to be driven by said connecting shaft, and clamps slidably mounted on the cross portion of the frame and operatively connected with each of said cross shafts to be operated in unison with said former.

10. A wire bending machine including a former to receive the wire to be bent, clamps to receive and hold the ends of said wire, means for moving the clamps toward each other, and means for moving the former away from the line of movement of the clamps during one step in the bending operation for causing a momentary dwell in the movement of said clamps, for causing a movement of the former toward the clamps in another step in the operation, then for causing a momentary dwell in the movement of the former, and then for withdrawing the former away from the line of movement of the clamps.

11. A wire bending machine including a former comprising a set of holding pins and a set of former pins between which sets the wire to be bent is placed, clamps to receive and hold the ends of said wire extending from said former, means for operating the former, and means for operating the clamps independently of the former to impart final shape to said wire.

12. A wire bending machine including a former to receive the wire to be bent, bending slides movable toward and from each other, clamps each comprising a fixed and movable jaw carried by said bending slides, and means for automatically releasing the movable jaws.

13. A wire bending machine including a former to receive the wire to be bent, bending slides movable toward and from each other, clamp slides movably supported by the bending slides, clamps each including a fixed and a movable jaw mounted on the clamp slides, and means for automatically releasing the movable jaws.

14. A wire bending machine including a former to receive the wire to be bent, bending slides movable toward and from each other in one plane, clamp slides supported by the bending slides and movable transversely to the plane of movement of the latter, clamps each including a fixed and a movable jaw mounted on the clamp slides, means for automatically releasing the movable jaws, and means for returning the clamp slides to their starting positions.

15. A wire bending machine including a frame, a former movably mounted on the frame, bending slides movable toward and from each other in guideways on the frame, clamp slides supported by the bending slides and movable vertically thereof, cam plates to effect movement of the clamp slides, clamps supported by the clamp slides, and means for operating the clamps.

16. A wire bending machine including a

frame, a former movably mounted on the frame, bending slides movable toward and from each other into the path of movement of the former upon the frame, clamp blocks pivotally supported by the bending slides, and clamps supported by said clamp blocks.

17. A wire bending machine including a frame, a former movably mounted on the frame, bending slides movable toward and from each other on the frame, clamp blocks pivotally supported by the bending slides and having a certain movement during part of the bending operation, clamps supported by the clamp blocks, and means for imparting a different movement to the clamp blocks independently of the former to impart a final bend to the wire being formed.

18. A wire bending machine including a frame, a former movably mounted on the frame, bending slides movable toward and from each other on the frame, clamp blocks pivotally supported by the bending slides and having their meeting edges diagonally arranged with respect to the line of movement of the bending slides to impart a final bend in the wire as said clamp blocks are pressed together, and clamps supported on said clamp blocks.

19. A wire bending machine including a frame, a former movably mounted on the frame, bending slides movable toward and from each other on the frame, clamp blocks pivotally supported by the bending slides, clamps supported by the clamp blocks, and a safety device for automatically rotating said blocks into proper position on the bending slides.

20. A wire bending machine including a former to receive a wire to be bent, movably mounted means to receive and hold the ends of said wire to direct the movement of said ends, and means for moving said wire end receiving and holding means and means for moving said former, each independently of the other and one into the path of movement of the other.

21. A wire bending machine including a former to receive a wire to be bent, movably mounted means to receive and hold the ends of said wire, to direct the movement of said ends, means for moving said former transversely of the direction of movement of said wire holding means, and means to move said wire holding means into the path of movement of the former.

22. A wire bending machine including a former to receive a wire to be bent, movably mounted means to receive and hold each end of said wire to direct the movement of said ends, means for moving said wire holding means toward and from each other, and means for independently moving the former toward and from the path of movement of said wire receiving and holding means.

23. A wire bending machine including a

former to receive a wire to be bent, movably
mounted means to receive and hold the ends
of said wire to direct the movement of said
ends, means for moving said former into a
5 position between said wire holding means,
and means for moving said wire holding
means into the path of movement of said
former.

24. A wire bending machine including a

former to receive a wire to be bent, movably 10
mounted means to receive and hold each end
of the wire to direct the movements of said
ends in the bending operation, means for
moving said wire holding means toward each
other to effect the bending operation, and 15
means for moving said former in reverse di-
rections during said bending operation.

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