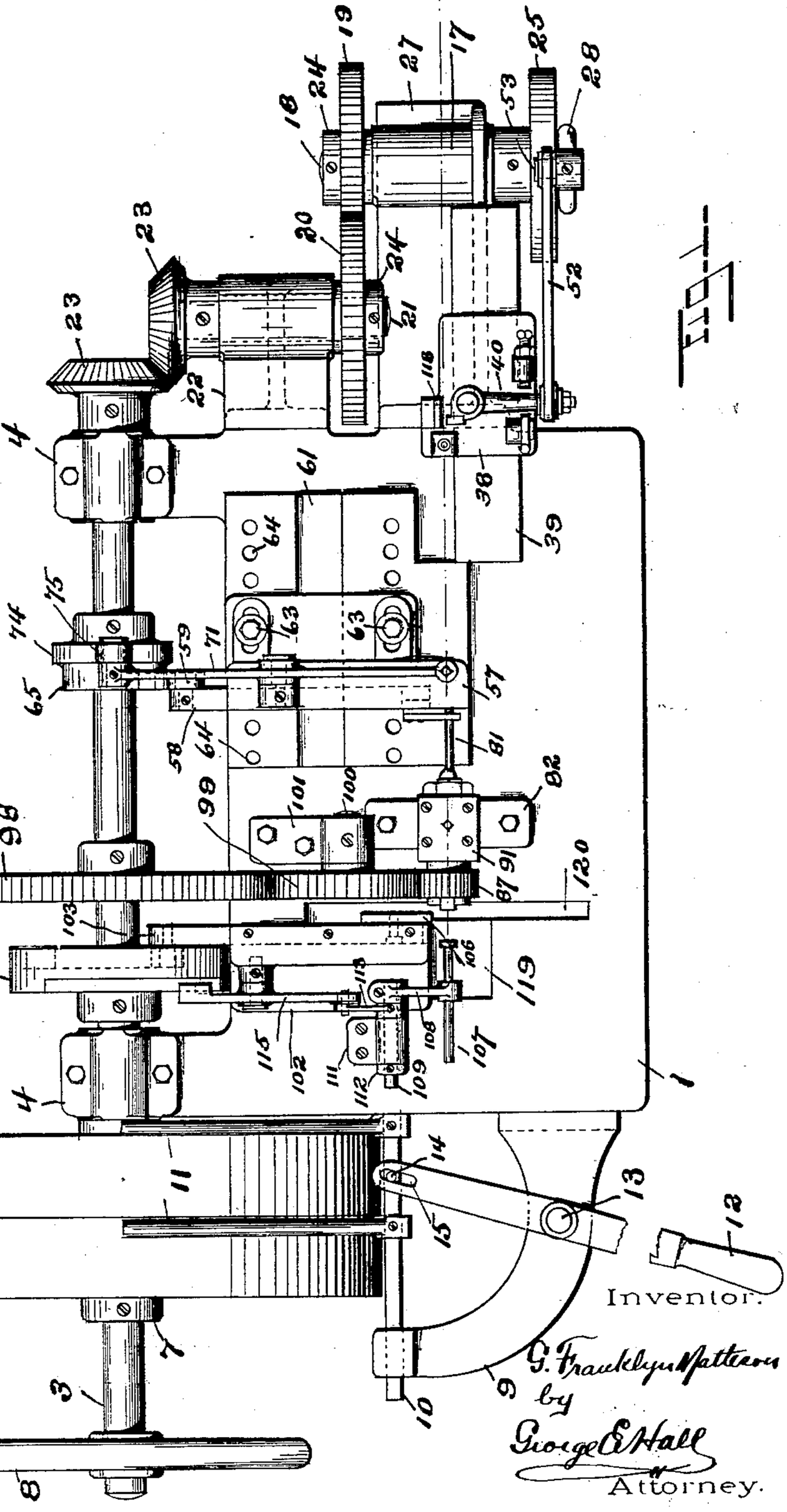
No. 630,907. Patented Aug. 15, 1899.

G. F. MATTESON.

WIRE WINDING MACHINE.

(Application filed Jan. 26, 1899.)

(No Model.) 4 Sheets—Sheet 1.



Witnesses.
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William O'Brien

Inventor.
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(No Model.) 4 Sheets—Sheet 2.

FIG. 2.

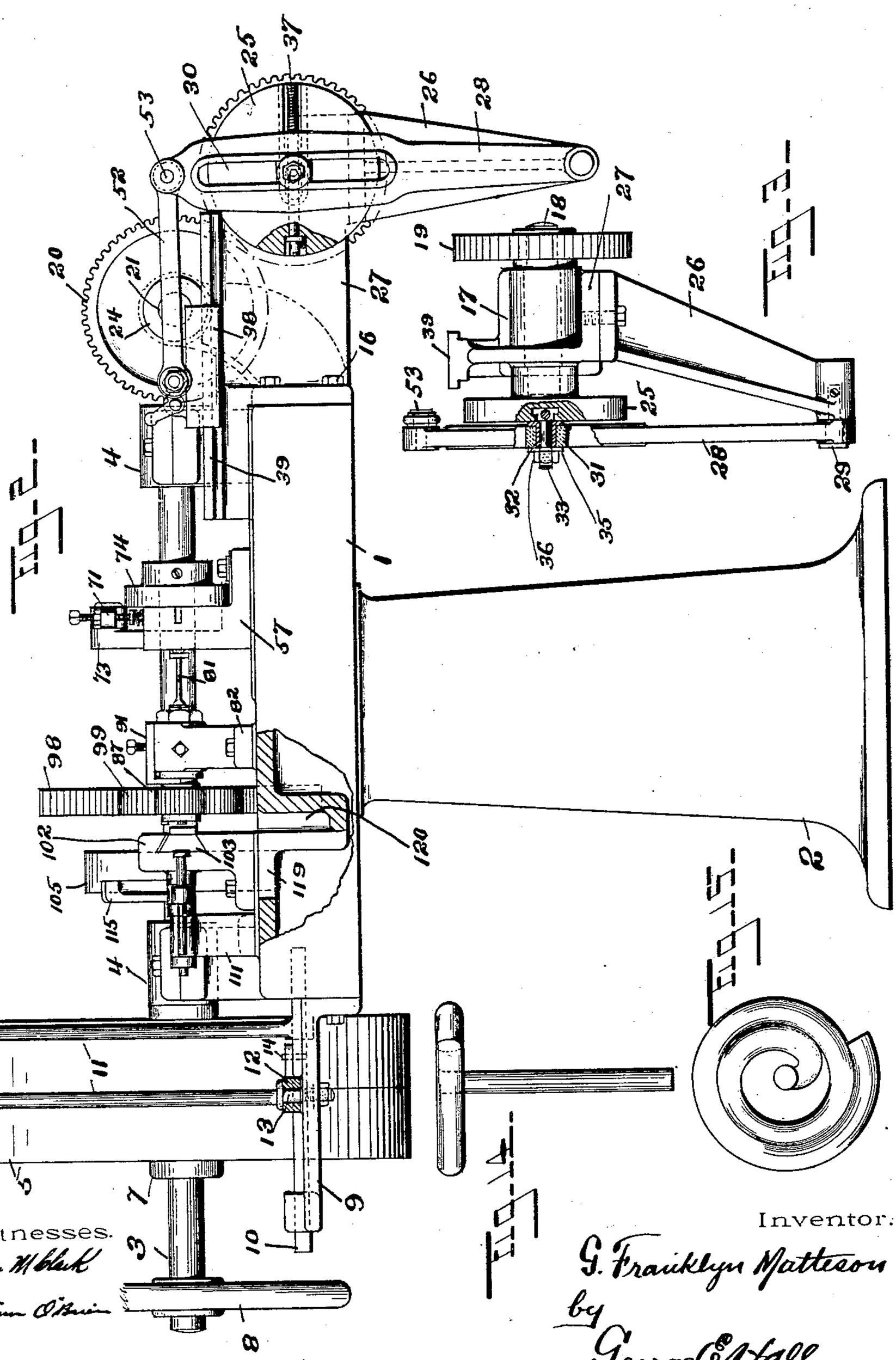

FIG. 3.

FIG. 4.

FIG. 5.

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(No Model.) 4 Sheets—Sheet 3.

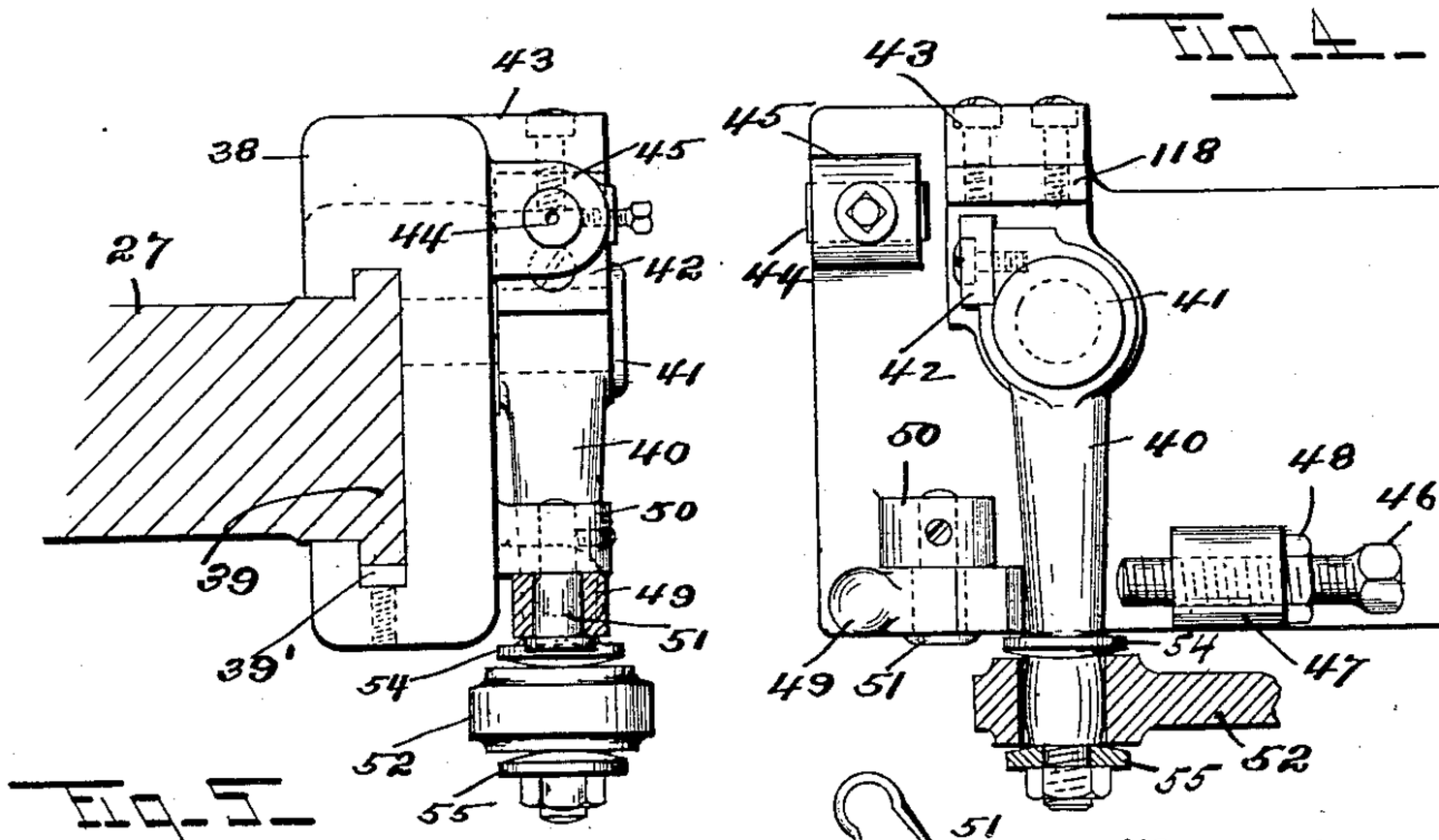

Fig. 5.

Fig. 4.

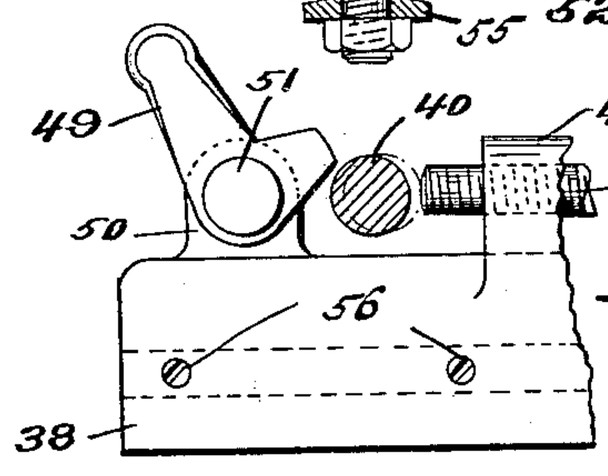

Fig. 6.

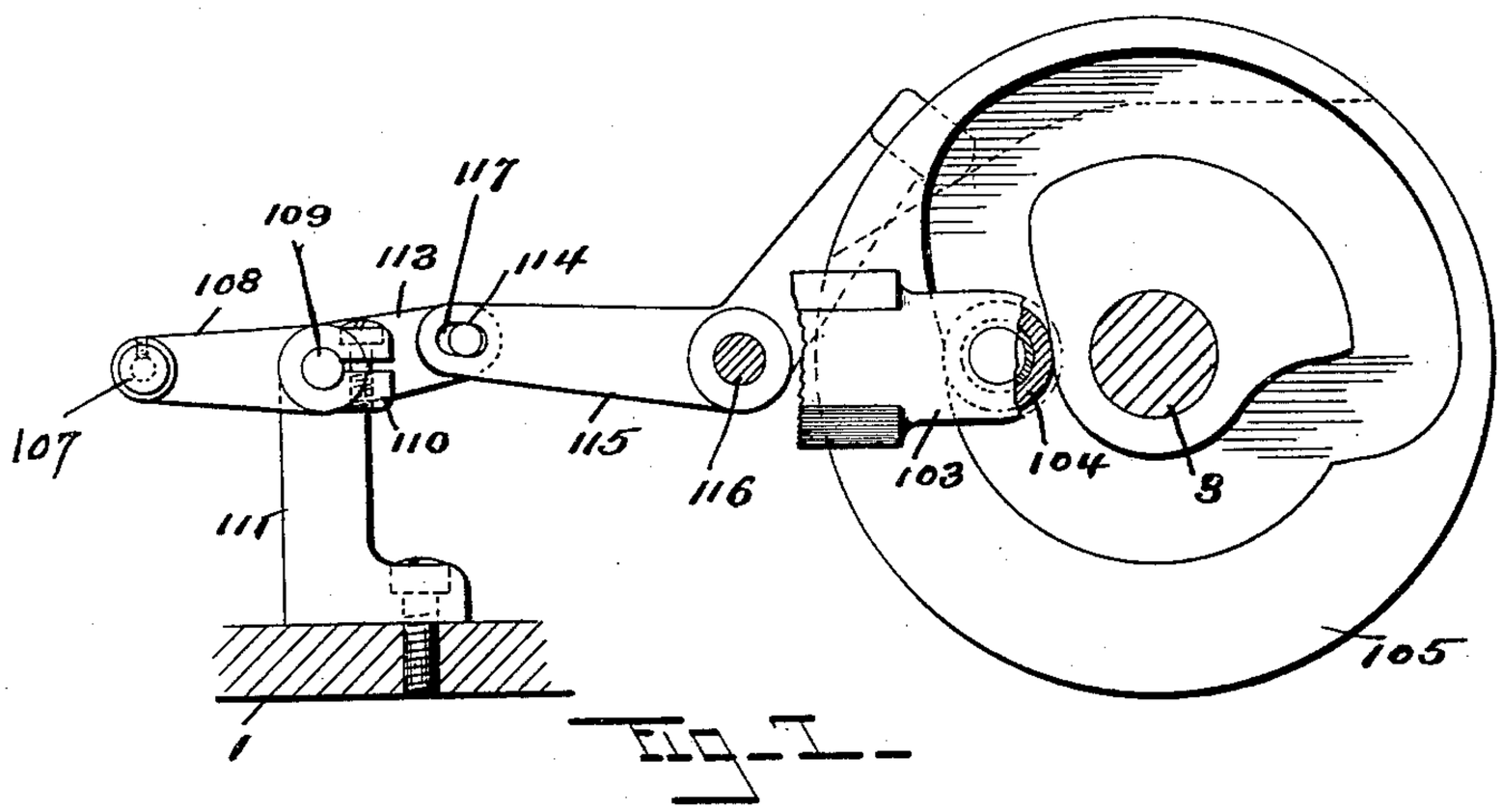

Fig. 1.

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(No Model.) 4 Sheets—Sheet 4.

Fig. 9.

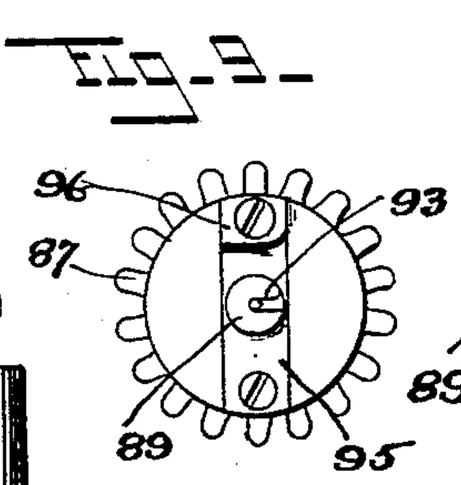


Fig. 10.

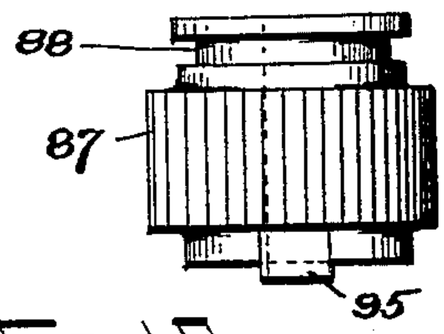


Fig. 8.

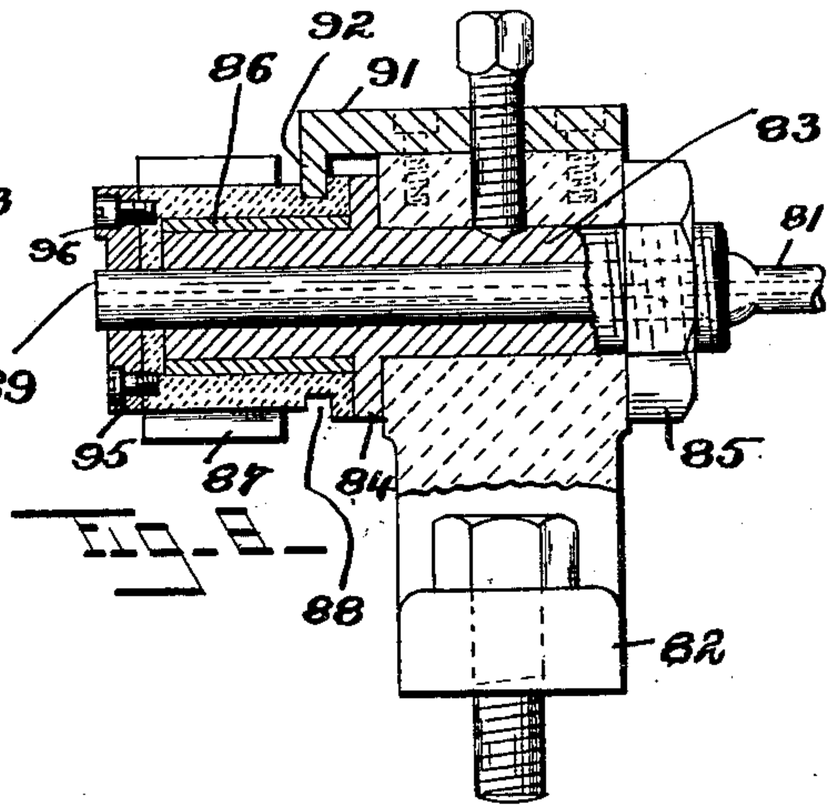


Fig. 12.

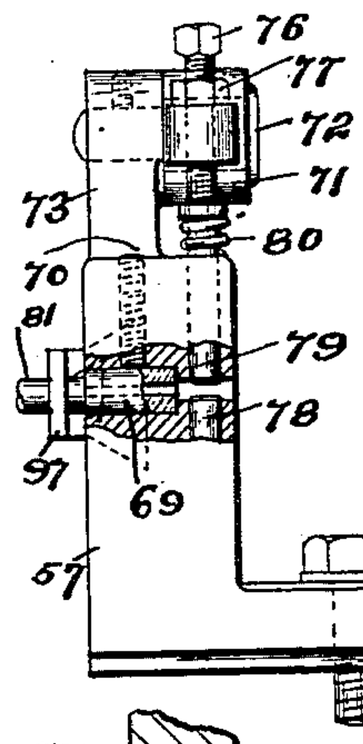
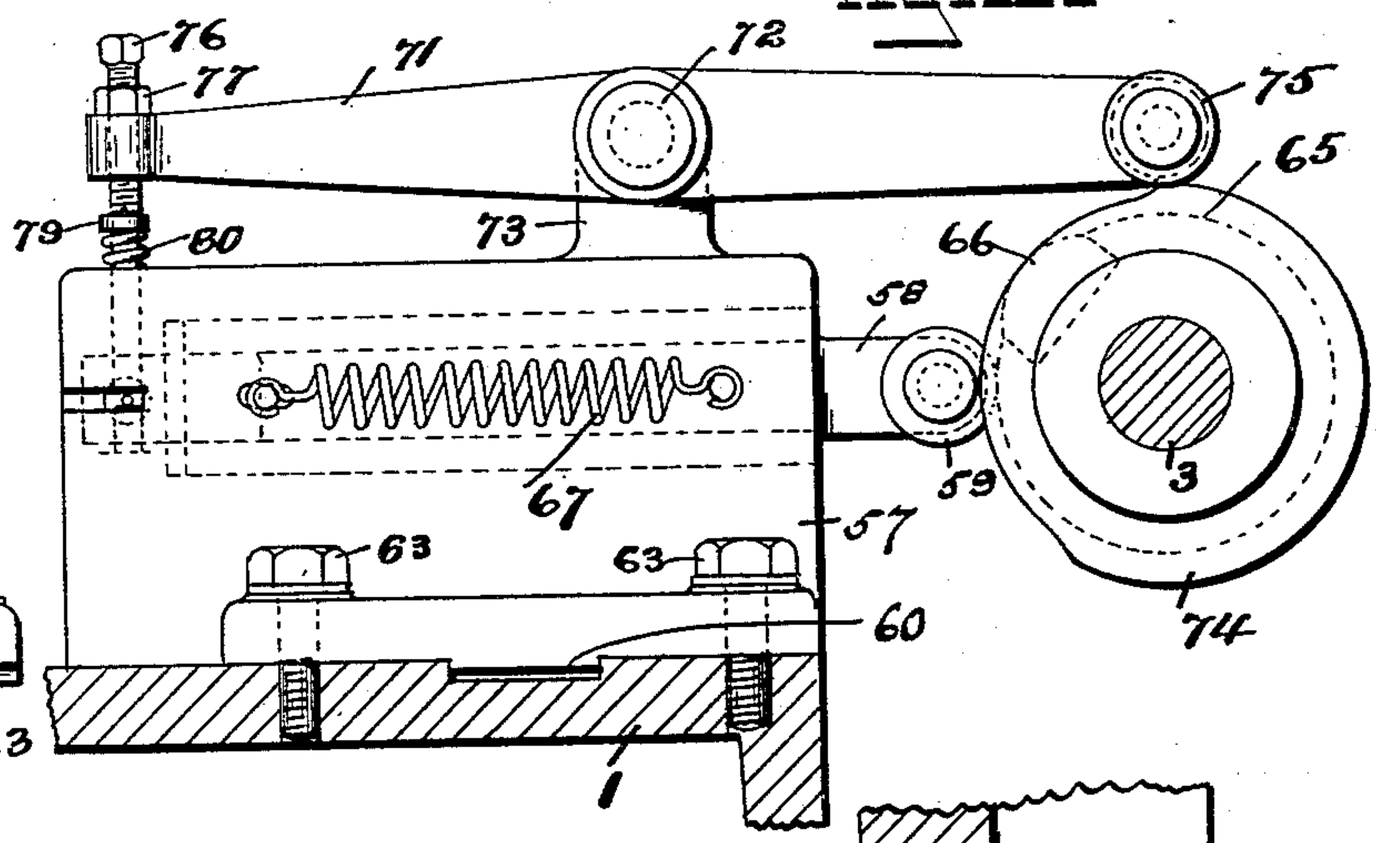
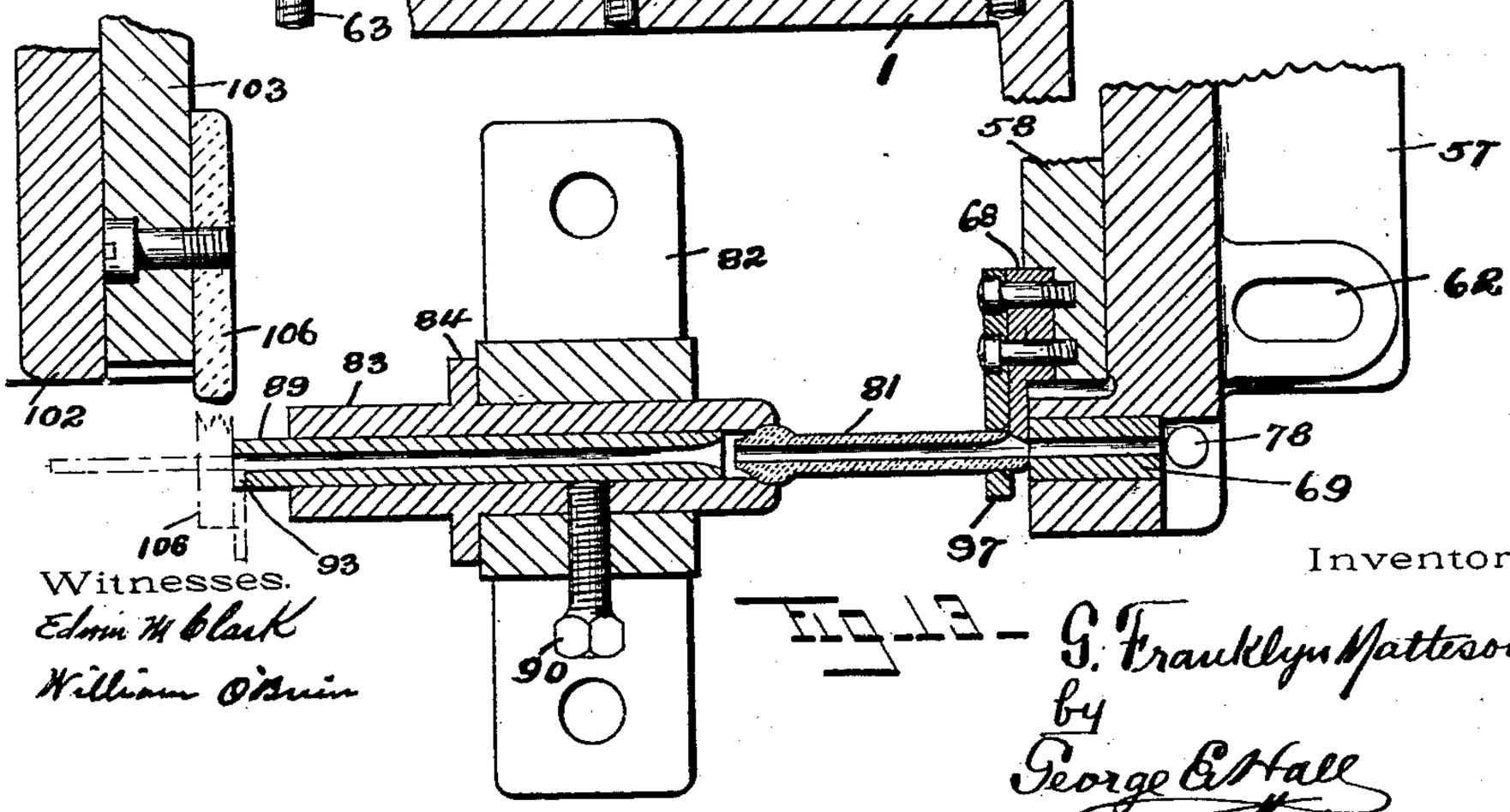


Fig. 11.





Witnesses.
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Inventor.

Fig. 13.

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by
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UNITED STATES PATENT OFFICE.

GEORGE FRANKLYN MATTESON, OF WATERBURY, CONNECTICUT, ASSIGNOR TO THE WATERBURY MACHINE COMPANY, OF SAME PLACE.

WIRE-WINDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 630,907, dated August 15, 1899.

Application filed January 26, 1899. Serial No. 703,422. (No model.)

To all whom it may concern:

Be it known that I, GEORGE FRANKLYN MATTESON, a citizen of the United States, residing at Waterbury, in the county of New Haven and State of Connecticut, have invented certain new and useful Improvements in Automatic Wire-Winding Machines, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to machines for automatically forming articles from wire which have a coiled-wire portion, and is especially designed to automatically form an article having a straight shank or body portion and a head portion at a right angle thereto made by coiling the wire strand about itself into a flat coil. Other analogous articles to the one described can be formed, however, by slight variations in the details of the machine.

It is the object of my invention to construct a machine of the character described that will be entirely automatic and require only the occasional attention of an operator, that will produce the articles desired without waste of stock or material, and which will be composed of the fewest possible parts of the simplest design that can be cheaply made and readily duplicated.

To this end my invention consists in the automatic wire-winding machine having certain details of construction and combinations of parts, as hereinafter described, and more particularly pointed out in the claims.

Referring to the drawings, in which like numerals designate like parts, Figure 1 is a plan view. Fig. 2 is a front elevation, partly in section. Fig. 3 is an end elevation of a portion of the feed mechanism. Fig. 4 is a plan view of the feed-slide. Fig. 5 is an end elevation, and Fig. 6 is a partial front elevation, thereof. Fig. 7 is a side elevation of the stop device and its actuating-cam, showing also a portion of the bending-slide. Fig. 8 is a partial transverse section of the winding-head. Fig. 9 is a view of the face of the winding-pinion, and Fig. 10 is a plan view thereof. Fig. 11 is a side elevation, and Fig. 12 is a front elevation, of the cutter-head. Fig. 13 is a sectional plan of the cutter-head, radially-actuated guide, winding-head, and bending-slide, taken upon the wire-line. Figs. 14 and 15 illustrate one form of work that can be performed by this machine.

Before describing the details of the machine I will briefly enumerate the successive operations through which the wire passes until the article is completed, after which I will describe the mechanisms which combine to perform the several operations.

A continuous wire rod is fed by an adjustable feeding device through a cutter-head and is there cut off into lengths, after which it is presented to the winding mechanism and the wire wound about itself to form the coiled head portion and complete the operations, after which it is pushed out of the winding-head into a receptacle conveniently located to receive it.

The numeral 1 designates the bed of the machine; 2, the stand upon which it is supported; 3, the main shaft journaled in the overhanging brackets 4 4; 5, the loose and 6 the tight pulley; 7, the pulley-collar fixed to the shaft, and 8 the balance-wheel.

The belt-shifting mechanism comprises a bracket 9, bolted to one end of the bed, a shipper-bar 10, supported at the inner end by the bed 1 and at the outer end by the said bracket, two shipper-arms 11 11, which are fixed to said shipper-bar and extend around a portion of the pulleys, and a shipper-lever 12, which is pivotally secured to said bracket 9 upon the stud 13 and having operative connection with the shipper-bar 10 by means of the fixed pin 14 and the longitudinal slot 15. It is obvious that shifting the position of the shipper-lever 12 from one of its extreme positions to the other will carry the driving-belt from one pulley to the other, and vice versa.

The mechanism for feeding the wire into the cutter-head will now be described. Attached to the bed by the bolts 16 is the feed-bracket 27, terminating at its outer end in a journal 17 for the feed-shaft 18 and projecting over the bed at its inner end to provide a support for the feed-slide. The feed-shaft 18 is connected with the main shaft 3 through the spur-gear 19, fixed to the said feed-shaft spur-gear 20, fixed to the intermediate shaft 21 and meshing into the said gear 19, the said intermediate shaft being journaled in the bracket

22, which is bolted to the bed 1, and the bevel-gears 23 23, keyed, respectively, to the ends of the main shaft 3 and intermediate shaft 21, complete the connection. Collars 24 24 upon shafts 18 and 21 prevent longitudinal movement of the said shafts within their respective journals.

The numeral 25 designates the feed crank-plate, which is fixed to the feed-shaft 26, the lever-bracket secured to the feed-bracket at its top side 28, the feed-lever having the transverse longitudinal slot 30 therethrough and pivotally secured at its lower end by the stud 29 to the lever-bracket. Within the slot 30 is fitted a rectangular box 31, which is adapted to slide therein, the said box having a sleeve 32 through the center thereof, and the whole being mounted upon the crank-stud 33, having a T-head operating in the T-slot in the face of the crank-plate. (See Fig. 3.) A collar 35 and the nut 36 prevent the displacement of the box and sleeve. The position of the crank-stud 33 on the crank-plate is adjusted within the T-slot by means of the adjusting-screw 37, which is rotatably secured to the crank-plate and is threaded within the head of the crank-stud 33.

The gripping portion of the feed mechanism is shown in Figs. 4, 5, and 6, and comprises a slide 38, which has a reciprocating movement upon the top T portion 39 of the feed-bracket 27, its frictional contact upon the sides thereof being governed by the adjustable gib 39′, a gripping-lever 40, rotatably secured upon the said slide by the stud 41, a movable jaw 42, fastened to the lever 40, a stationary jaw 118, fastened to the backing-lug 43, integral with the said slide, a guide-bushing 44, having a central bore of substantially the same diameter as the wire and held rigidly within the integral guide-lug 45 by a suitable binding-screw, an adjustable stop device, as the adjusting-screw 46, threaded within the stop-lug 47 and the check-nut 48, and a feed-release composed of the release-lever 49, stud 51, and lug 50. Feed-lever 28 and the gripping-lever 40 are joined by the connection-bar 52, the feed-lever end of the said bar being mounted upon the stud 53. That portion of the gripping-lever 40 within the connection-bar is rounded lengthwise, (see Fig. 4,) and the collars 54 55 upon either side of said bar are rounded from the center to the periphery, thus allowing the end of said gripping-lever to rock within the said bar.

The wire is presented to the feed mechanism by passing it between the faces of the stationary jaw 118 and the movable jaw 42 and then through the bore of the guide-bushing 44. A continuous rotary movement is imparted to the crank-plate 25 from the main shaft 3 through the train of gears before described, and a reciprocating movement is imparted to the slide 38 from the said crank-plate through the feed-lever 28 and connection-bar 52. As the slide begins to move forward the wire is pinched between the faces of the stationary and movable jaws through the action of the gripping-lever 40, which swings upon the stud 41. The grip upon the wire is maintained throughout the entire forward movement of the slide. Immediately upon the beginning of the return movement of the connection-bar the movable jaw upon the gripping-lever is drawn away from the wire, owing to the pull upon the opposite end of said lever by the said connection-bar. The continued backward movement of the connection-bar swings the said gripping-lever upon the stud 41 until the said lever is brought against the end of the adjusting-screw 46, which limits the movement thereof, and throughout the balance of the backward movement of the connection-bar the slide is carried with it. At the end of the stroke a new grip is taken upon the wire and the operations continued as before. It is desirable that the friction of the slide 38 upon the feed-bracket should be greater than that of the gripping-lever 40 upon the stud 41 in order that the gripping-lever will swing upon its stud before the slide moves, thus enabling the grip upon the wire to be released before the slide begins its return movement. To accomplish this end, I have inserted the gib 39′, against one side of which bear a plurality of screws 56 and by means of which I am able to obtain any desired friction. By varying the position of the adjusting-screw 46 within the lug 47 the extent of the opening of the jaws can be regulated, and by shifting the friction of the crank-stud 33 upon the crank-plate 25 any desired length of stroke for the feed-slide may be attained.

In machines of this character it is frequently necessary to stop the feed mechanism instantly and before the entire machine can be stopped, and to accomplish this purpose the feed-release is devised, it being apparent that by throwing the arm of the release-lever 49 into the path of the gripping-lever the movement thereof will be so limited that it will have no gripping action upon the wire, but will slide over it, and hence will not feed. Adjustable lengthwise upon the top of the bed is the cutter-head 57, supporting the cutter-slide 58, having the cutter 68 secured to its forward end and the cam-roll 59 upon its rear end. A depending lip 60 upon the under side of the cutter-head, which is fitted into the groove 61, prevents lateral displacement of the said head upon the bed, and the elongated slots 62, bolts 63, and series of tapped holes 64 coöperate in providing means for the longitudinal adjustment of the said head and for retaining it in any of its adjusted positions. Motion is imparted to the cutter-slide 58 by the cam 65, a shoe 66 being inserted in the cam-face, as shown in Fig. 11, the cam-roll 59 being held permanently against the face of said cam by the action of the coil-spring 67, that is fastened at one end to the cutter-slide and at the other to the cutter-head. Held rigidly in the forward end of

the cutter-head by the set-screw 70 is the cutter-bushing 69, preferably of hardened steel and having a hole therethrough of substantially the same diameter as the wire. Also attached to the cutter-head 57 is the mechanism for holding the wire from being drawn backward while the feed-slide is on the return portion of its stroke. This mechanism comprises a lever 71, fulcrumed upon the stud 72, fixed in the integral lug 73, a cam 74 to operate the said lever, a cam-roll 75, mounted upon the rear end of said lever and resting upon the face of said cam, a pressure-screw 76, threaded through the end of the said lever and the check-nut 77, a fixed plug 78, and a vertically-operated plunger 79, which receives its downward movement through the said lever from the contact of the end of the pressure-screw upon its head and its upward movement from the coil-spring 80, as is apparent from Fig. 11. The completion of the forward movement of the feed-slide and the downward movement of the plunger 79 are simultaneous acts, and the wire is held rigid between the said plunger 79 and the plug 78. The pressure upon the wire is maintained until the return stroke of the feed-slide is completed, when the plunger is released, the coil-spring returning it to its retracted position and allowing the wire to be fed forward another length. From the cutter the wire passes through a radially-moving guide 81 to the winding mechanism, the end of the wire being brought abruptly against a stop device to determine the length of wire for the coil.

Referring to Figs. 8, 9, 10, and 13, the numeral 82 designates a standard fastened to the bed; 83, a sleeve held rigid within the said standard between the integral collar 84 and the jam-nut 85; 86, an antifriction-bearing bushing; 87, a winding-pinion having a peripheral groove 88 near its rear end, and 89 a stationary guide-tube which is secured within the bore of the sleeve 83 by the set-screw 90 and through the center of which is a hole of substantially the same diameter as the wire. A continuous rotary movement is given the pinion 87 by the spur-gear 98, fixed to the shaft 3, and the intermediate gear 99, rotating upon the stud 100 in the standard 101 and which meshes into the said spur-gear and pinion, as shown. Endwise movement of the pinion 87 is prevented by the cap 91, fastened to the top of the standard 82 and having a forked portion 92 projecting downwardly into the peripheral groove 88. A radial slot 93, of the same width and depth as the wire, is cut in the end of the guide-tube 89 (see Figs. 8, 9, and 13) from the central hole to the periphery, for a purpose hereinafter to be described. In the face of the winding-pinion 87 is the steel former 95, having a projecting lug 96, the face of the lug and the end of the guide-tube 89 which projects outward in front of said pinion being substantially flush with each other. The radially-moving guide 81 terminates at one end in a spherical head, which operates within the concaved seat in the end of the sleeve 83. The other end of said guide abuts against the face of the cutter-bushing 69 and is supported within a hole having rounded edges in the plate 97, which is fastened to the cutter by suitable screws.

Bolted to the bed adjacent to the winding mechanism is the upright 102, in one side of which operates the bending-slide 103, having a cam-roll 104 upon its rear end operative within the groove in the side of the cam 105. A bending-block 106 is fastened to the forward end of said slide, with its front portion projecting outward therefrom and its side face being in substantially the same plane as the end of the guide-tube 89.

The mechanism which determines the length of wire for the coil is called a "stop" device and is shown in Figs. 1 and 7, wherein 107 represents the stop-rod; 108, the stop-arm, which is adapted to be fastened upon the rock-shaft 109 in any radial position by means of the split hub 110 and the screw therein; 111, the standard fastened to the bed of the machine and supporting the said rock-shaft; 112, a collar made fast to the said rock-shaft to prevent endwise movement thereof; 113, the rock-arm fixed to said rock-shaft and having a laterally-projecting stud 114 at the outer end, and 115 the rock-lever, which is fulcrumed upon the stud 116 midway of its length and having an elongated slot 117 near the end of one of its arms and its other arm terminating in a rounded lug which rides upon the face of the cam 105. A portion of the periphery of the cam 105 is cut away to form the cam for the stop device, as shown more particularly in Fig. 7. As the cam actuates the rock-lever 115 motion is imparted to the rock-shaft through the rock-arm 113, and the stop-rod 107, which is fixed to the stop-arm 108, is shifted in a rotary path away from its normal position. The rod 107 can be adjusted longitudinally within the stop-arm 108 for various lengths of wire, and by shifting the stop-arm from one end of the rock-shaft 109 to the other a much longer length of wire can be accommodated. A stationary stop will be sufficient and will answer all of the purposes of this machine whenever the length of wire used in the coil is less than the length of the shank; but whenever these conditions are reversed it is essential that a stop should be used which will be in position to determine the length of wire for the coil before the same is made and which will be removed when the finished article is pushed out of the winding-head, it being obvious that if the shank is the longer the stationary stop would prevent the same being released from the winding-head.

The operation of the machine is as follows: The end of a continuous wire rod is first inserted between the faces of the jaws 42 118, then through the bore of the guide-bushing 44, between the plug 78 and the plunger 79, and through the bore of the cutter-bushing 69

and radially-movable guide 81. At this point the machine is started and the feed mechanism grips the wire and forces the wire already in the machine through the guide-tube 89 until it strikes the end of the stop-rod 107. Immediately upon the completion of the forward movement of the feed mechanism the plunger 79 is brought down upon the wire and holds the same stationary during the return of the feed-slide, as before described, and while the said feed-slide is upon the return portion of its stroke the cutter mechanism is operated, thereby cutting off the wire into the proper predetermined lengths, which are supported within the radially-moving guide 81. I am enabled by the use of the said moving guide, one end of which travels with the cutter, to cut the wire into comparatively short lengths, the lengths being pushed through the said guide and winding-head by the length of wire immediately following. This is an important feature of my invention and enables me to operate the cutting mechanism at a point not too close to the winding-head, an advantage of great value in this class of machinery. As soon as the end of the wire is brought into contact with the stop-rod 107 the bending-slide advances by means of the cam 105 and the bending-block bends the wire outside of the guide-tube 89 at a right angle to that portion of the wire within the said guide-tube, as shown in Fig. 13. The bend in the wire is made within the slot 93, and that portion of the wire already bent which is adjacent to the bend is within the said slot. The bent portion of the wire is now directly in the path of the projecting lug 96 upon the former 95, which has a continuous rotary movement, as before described, and as it comes in contact therewith it winds the same around the projecting end of the guide-tube 89 until the wire length is exhausted and the end of the wire is freed from the said lug. The article is now completed and the next length of wire pushes it out of the winding-head and it drops through the hole 119 in the bed of the machine into a receptacle conveniently placed to receive it.

In the bed of the machine, directly below the face of the winding-head, a recess 120 is made therein to provide clearance for the end of the bent wire as it revolves with the winding-pinion.

There are many minor changes and alterations that can be made within my invention, and I would therefore have it understood that I do not limit myself to the exact construction herein shown and described, but claim all that falls fairly within the spirit and scope of my invention.

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

1. In a winding mechanism the combination of the standard 82, sleeve 83 secured therein, winding-pinion 87 having the former 95 fastened to the front face thereof, means for rotating the said pinion, means for preventing endwise movement of the said pinion, and a stationary guide-tube 89 within the said sleeve, all constructed and operating substantially as described.

2. In a machine of the character described, a feed device, means for rigidly holding the wire during a portion of the movement of the feed device, adjustable cut-off mechanism for cutting the wire into lengths, a stationary guide-tube, means for bending the wire projecting out from the front of said guide-tube at a right angle thereto, and means for winding the said bent portion in a coil about the said guide-tube, substantially as described.

3. In a machine of the character described, a winding mechanism having a central stationary guide-tube, means for feeding wire lengths through said tube, a stop device for determining the length of wire projecting from the said guide-tube, means for bending the projecting wire at a right angle to the wire within the said guide-tube, means for winding the bent portion of the said wire around the said guide-tube, and means for holding that portion of the wire within the guide-tube rigid during the winding operation, substantially as described.

4. In a machine of the character described, a feed mechanism comprising a gripping device, a rotary crank-plate, means for continuously rotating said crank-plate, a feed-lever joined to said gripping device by a connection-bar and imparting a reciprocating movement thereto through the operative connection between the said crank-plate and said feed-lever, and means for varying the stroke of the said gripping device, substantially as described.

5. In a machine of the character described, a feed device comprising a slide 38, a fixed jaw 118 secured to said slide, a gripping-lever 40 rotatably mounted upon said slide and carrying a jaw 42, an adjusting-screw 46 for determining the movement of said lever in one direction, a release-lever 49 for limiting its movement in the opposite direction, and means for imparting a reciprocating movement to said slide, substantially as described.

6. In a machine of the character described, in combination with a gripping device and the feed-slide 38, of the feed-bracket 27 attached to the bed of said machine, a feed-shaft 18 journaled in the said bracket and carrying the crank-plate 25, spur-gears 19 and 20, intermediate shaft 21 and bevel-gears 23, for rotating the said feed-shaft, feed-lever 28 pivotally secured at its lower end to the lever-bracket 29 and having an operative connection with the said crank-plate whereby the upper end of said lever travels in a path forming an arc of a circle, and a connection-bar 52 joining the upper end of said lever and the said gripping device, substantially as described.

7. In a machine of the character described, the combination with the winding-head, of

means for cutting the wire into lengths, a guide connecting the said cutting mechanism with the said winding-head, the said guide partaking of the forward and backward movement of the cutter at the cutter end and having a ball connection with the said winding-head, substantially as described.

8. In a machine of the character described, a stop device comprising an adjustable stop 107 adjustably secured to a stop-arm 108, a rock-shaft 109, cam 105, lever 115, and rock-arm 113 for moving the said stop 107 from its normal position, at a predetermined time, substantially as described.

9. In a machine for the purposes described, comprising in its construction, an adjustable mechanism for feeding the wire, a cutter for severing it into lengths, a radially-acting guide for conveying the said lengths from the cutter mechanism to the winding-head, and mechanism for coiling one portion of the wire lengths about itself to form a flat coil, substantially as described.

10. In a machine for the purposes described, comprising in its construction, a rigidly-fixed guide-tube, having a bore therethrough and a radial slot in one end extending from the said bore to the periphery, means for feeding wire lengths through said guide-tube, so that the forward portion will protrude from the front end thereof, a slide movable across the end of said guide-tube whereby the projecting end of the wire length is bent at a right angle to the said guide-tube and held within the said radial slot, and a former having a lug projecting therefrom and rotating in a circular path about the said guide-tube, substantially as described.

11. In a machine for the purposes described, comprising in its construction, an intermittent feed device, a cutter for severing the wire into lengths, a winding-head for coiling a portion of the said wire lengths, means for conveying the wire lengths from said cutter to said winding-head, whereby the said winding-head may be separated from the said cutter by more than one length of said wire, substantially as described.

12. In a machine for the purposes described, comprising in its construction, a winding-head, feed mechanism for feeding the wire lengths through said winding-head, an adjustable stop for determining the length of wire projecting from the face of said winding-head, means for retaining the stop in a fixed position until the wire length has been determined and means for shifting the position thereof out of the path of the wire-feed, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

G. FRANKLYN MATTESON.

Witnesses:
GEORGE E. HALL,
R. LESTER WILCOX.