(No Model.) 4 Sheets—Sheet 1.

G. HILDRETH.

WIRE COILING MACHINE.

No. 423,252. Patented Mar. 11, 1890.

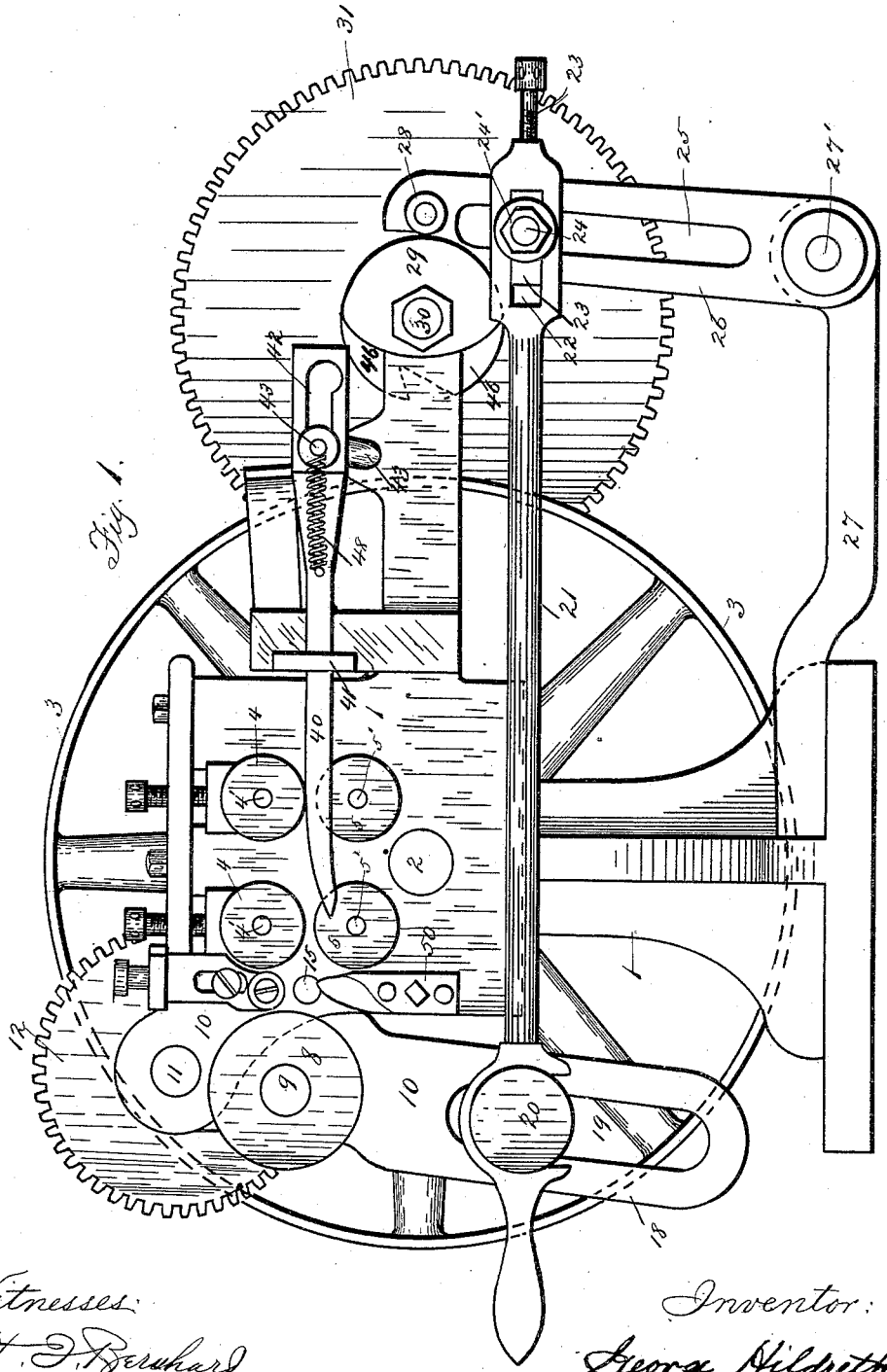

Fig. 1.

Witnesses:
W. D. Burchard
Geo. A. Bradley

Inventor:
George Hildreth
By his Attorney
Jas. H. Vennilye

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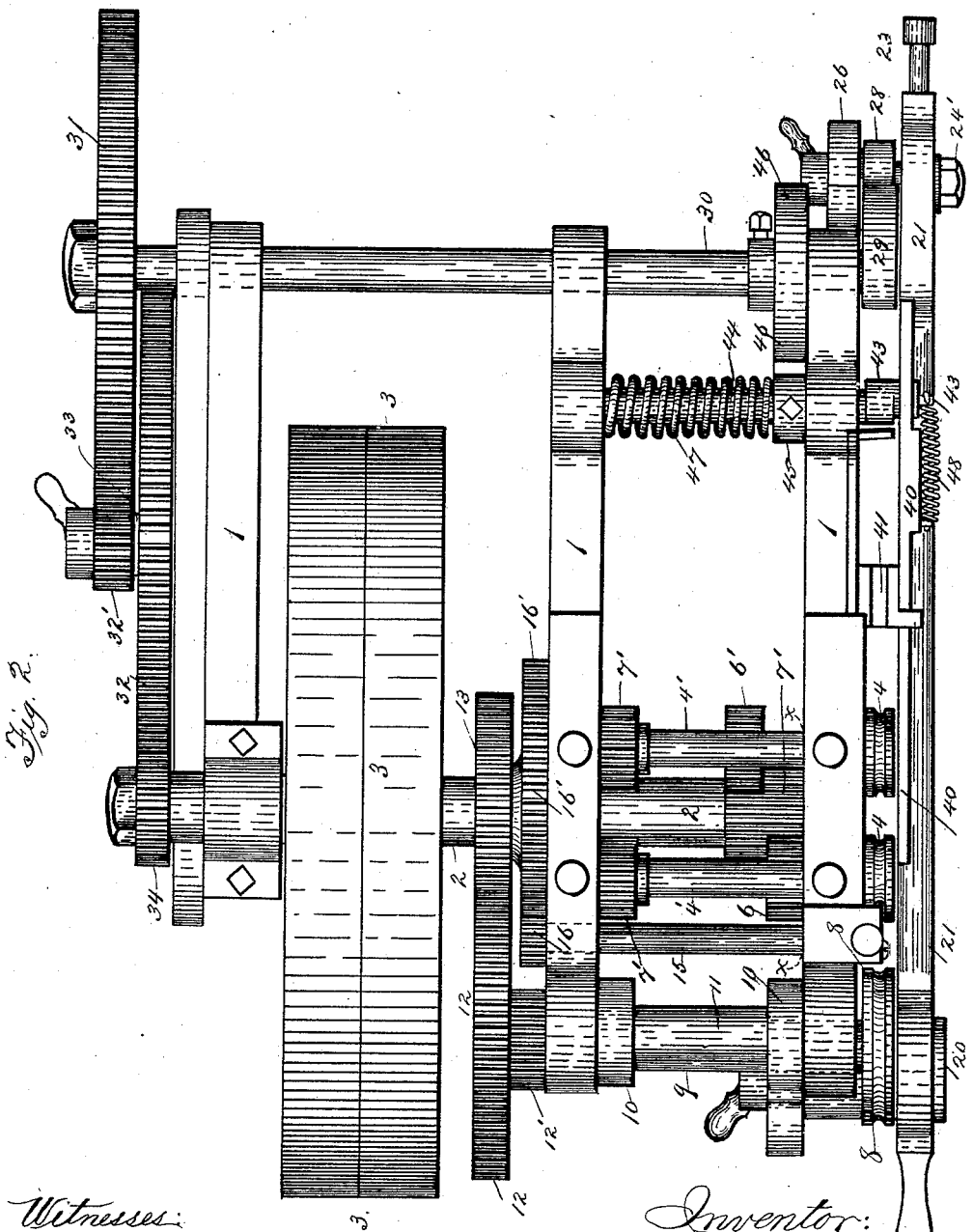

Fig. 2.

Witnesses:
W. J. Berukart
Jas. A. Bradley

Inventor:
George Hildreth
By his Attorney
Jas. H. Vermilya

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G. HILDRETH.

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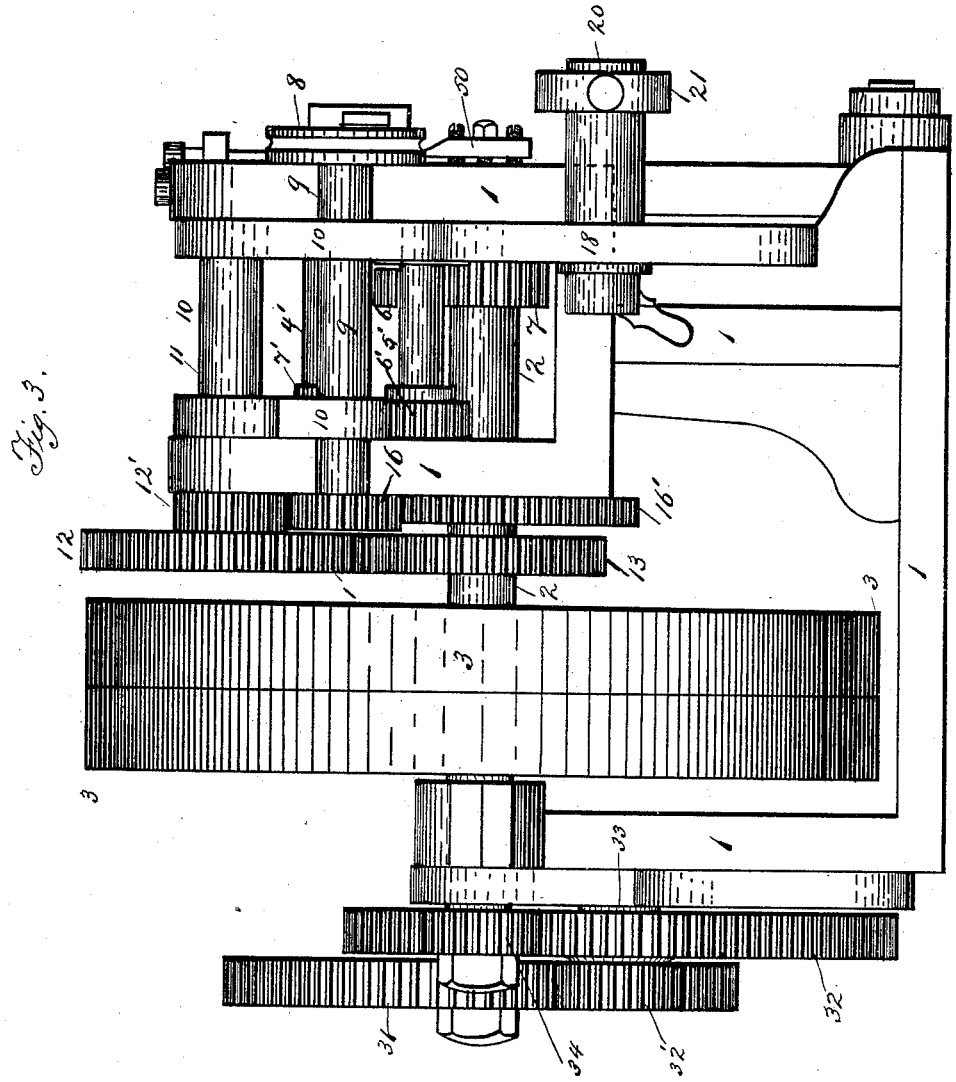
Fig. 3.



Witnesses:
H. J. Bernhard
Geo. A. Bradley

Inventor:
George Hildreth.
By his Attorney
Jas. H. Vermilya

(No Model.)

4 Sheets—Sheet 4.

G. HILDRETH.

WIRE COILING MACHINE.

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Fig. 4.

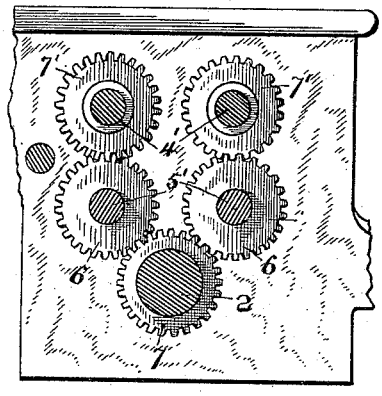
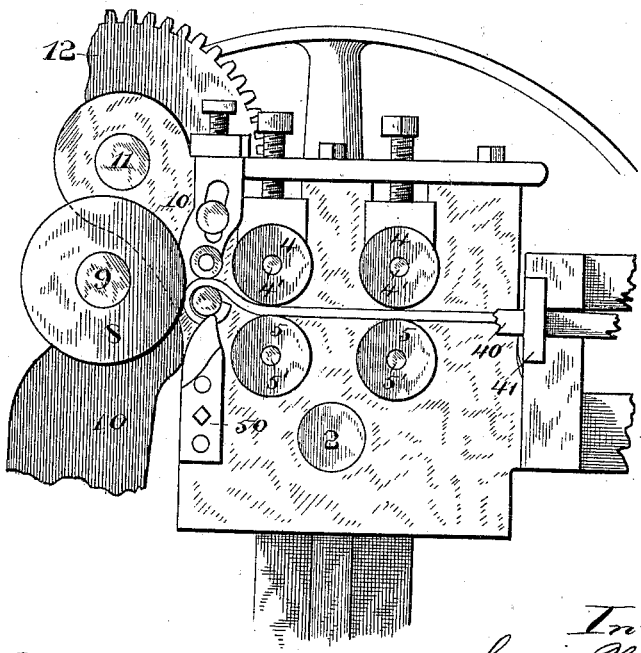


Fig. 5.



Witnesses:
H. B. McGirr.
N. T. Berukoff

Inventor.
George Hildreth
By his Attorney
Jos. H. Vernitzy

UNITED STATES PATENT OFFICE.

GEORGE HILDRETH, OF TROY, NEW YORK.

WIRE-COILING MACHINE.

SPECIFICATION forming part of Letters Patent No. 423,252, dated March 11, 1890.

Application filed September 26, 1889. Serial No. 325,226. (No model.)

To all whom it may concern:

Be it known that I, GEORGE HILDRETH, of Troy, county of Rensselaer, State of New York, have invented a new and useful Improvement in Wire-Coiling Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, making part of this specification.

My invention relates to a wire-coiling machine, which will be hereinafter fully described, and particularly pointed out in the claims.

The object of my invention is to provide a machine adapted for bending wire into coils of various kinds—such, for example, as a continuous spiral or a connected series of helispherical coils adapted to be cut or severed at intervals to form separate coils—with mechanism whereby the wire is prevented from buckling or becoming twisted between the feed-rolls and the forming and deflecting rolls; and a further object of my present invention is to provide mechanism whereby the relative distances between the forming and bending rolls can be varied to make the wire coils greater or less in diameter to adapt the machine to work of different kinds.

With these ends in view, and such others as pertain to my invention, it consists of the combination, with a set of feeding-rolls, of a forming and deflecting roll, which is carried by a swinging frame and is capable of a positive revolution on its own axis, and a bending-roll, also positively rotated on its own axis, and located between the feed-rolls and the forming-roll in such relation to the latter roll that the wire passes over the same and is bent into coils around it by the forming-roll. The peripheral speed of the forming and bending rolls, or only one of said rolls, is greater than the corresponding speed of the feed-rolls, whereby the wire is properly held under tension between the forming and feed rolls and prevented from buckling or twisting, which is very desirable.

My invention further contemplates the provision of novel means for varying and regulating the stroke or length of movement of the swinging frame which carries the forming-roll, of an automatic marking device for indenting the wire coils at suitable intervals, and in the several combinations of devices and peculiar construction and arrangement of parts, all to be hereinafter fully described and claimed.

To enable others to more readily understand my invention, I will now proceed to a detailed description thereof in connection with the accompanying drawings, in which—

Figure 1 is a side elevation of my improved wire-coiling machine. Fig. 2 is a top plan view thereof. Fig. 3 is an end elevation. Fig. 4 is a detail sectional view on the line $x\,x$ of Fig. 2, to show the gearing intermediate of the main shaft and the feed-roll shafts. Fig. 5 is an enlarged view, in side elevation, of the bending-roll, the set of feed-rolls, and the forming or deflecting roll in the swinging frame, the wire being shown as passing between the feed-rolls and around the bending-roll.

Like numerals of reference denote corresponding parts in all the figures of the drawings.

1 designates the main frame of the machine, which supports all of the operative parts and in which is journaled the main driving-shaft 2, which carries the large belt-pulley 3, adapted to be driven by a belt. In the upper part of the main frame is journaled the shafts 4′ 4′ of the upper feed-rolls 4 4, and immediately below or in the same vertical planes of these upper feed-rolls are arranged the lower feed-rolls 5 5, which coact with said upper feed-rolls to properly feed the wire to be formed into coils, said lower rolls being carried by shafts 5′ 5′. The shafts of the lower feed-rolls are provided with gear-pinions 6 6′, the pinions 6, on which lower feed-roll shafts mesh with a common driving-pinion 7 on the main driving-shaft 2, while the pinions 6′ on said lower feed-roll shafts mesh with pinions 7′ on the upper feed-roll shafts, as shown in Fig. 4, whereby the lower and upper feed-rolls are concurrently rotated in opposite directions.

8 designates the forming and deflecting roll, which is located at one side of the set of feed-rolls and a little to one side of a line drawn through said feed-rolls, and this forming-roll is carried by a positively-rotated shaft 9, that is journaled in a swinging frame 10, which is pivoted at its upper end on a stud or shaft

11, supported in the main frame 1. The forming-roll shaft is driven by the connected gears 12 12′, the larger of which meshes with the pinion or gear 13 on the main driving-shaft 1.

Intermediate between the forming and deflecting roll 8 and the last of the set of coacting feed-rolls is located a bending-roll 15, of very small diameter as compared with the diameters of the forming or feed rolls, this bending-roll being located in a plane slightly above the line of feed of the wire as it passes between the feed-rolls, so that the wire is caused to pass over and around the small bending-roll in position for the forming-roll 8 to act thereon, in order to deflect and coil the wire around said small bending-roll. This bending-roll is also rotated positively on its axis by intermeshing gears 16 16′, secured, respectively, to the roll-shaft and the main driving-shaft.

The forming-roll and the gearing for positively rotating the same are so proportioned that the forming-roll is capable of a peripheral speed, which is greater or in excess of the peripheral speed of the feed-rolls, and by reason of this greater peripheral speed and the positive revolution of the same upon its own axis, this forming-roll is caused to draw upon the wire and prevent the same from buckling or twisting between the feed and forming rolls, whereby the increased length of wire caused by bending is compensated for and buckling of the wire effectually overcome.

If the forming-roll is rotated or driven simply by the friction of the wire, the coil is necessarily formed by the power or motion of the feed-rolls, in which event the wire has a tendency to buckle between the feed and forming rolls; but by the construction and adaptation of parts just described all such tendency of the wire to buckle is entirely overcome.

The swinging frame 10 is pivoted on the main frame, so that the forming-roll is adapted to rotate concentrically with the small bending-roll, and as the frame is swung back and forth the forming-roll is caused to approach and recede from the bending-roll at regular intervals, thus making the coils of uniform size. The swinging frame is provided with a depending arm 18, in a longitudinal slot 19, in which is fitted a stud 20, which receives one end of a horizontal connecting-link 21, that extends from one end of the machine to the other end thereof. In the free end of this horizontal link or bar is formed a longitudinal slot 22, which receives a carrier or block 23, that is adjustable in the slot longitudinally of the link or bar by means of a regulating-screw 23, and this carrier or block is provided with a laterally-extending stud or bolt 24, which enters a longitudinal slot 25 in a vertical link or arm 26. The stud or bolt can be clamped at any desired longitudinal adjustment on the vertical slotted link or arm by a nut 24′, and the lower end of this vertical link is pivoted to a rigid horizontal arm 27 on the main frame, as indicated at 27′, while the upper end of said vertical link or bar carries a loose contact-roller 28, which rides against a cam 29, fixed on a horizontal transverse cam-shaft 30, that is journaled in the main frame at one end thereof. This cam-shaft has a driving-gear 31 at its outer end, which meshes with the smaller of two pinions 32 32′ on a short shaft 33, and the larger pinion 32 of said short shaft in turn meshes with a driving-gear 34 on the main driving-shaft. It is obvious that when the cam-shaft is driven from the main shaft the vertical link or bar will be moved back and forth, owing to its loose contact-roller impinging against the rotary cam on said cam-shaft, and that the longitudinal connecting-rod intermediate of this vertical link or bar and the swinging frame will cause the latter to move on its pivot back and forth, whereby the forming-roll is caused to recede from and approach the bending-roll. In the position of the cam shown in Fig. 1 that portion thereof having the longer radius is in contact with the loose contact-roller on the vertical link or arm, and the swinging frame is adjusted to cause the forming-roll to occupy its extreme forward limit of movement to form the small coils; but when the cam rotates a half-revolution that portion thereof having the shortest radius is in contact with the loose roller to force the forming-roll away from the bending-roll to form coils of greater diameter. It will thus be seen that the rotary cam determines to a great extent the shape of the coils, and this result is further secured by adjusting the studs or bolts that connect the horizontal connecting-bar to the vertical link or bar and the swinging frame without necessitating a change of the operating-cam on the cam-shaft. The stud or bolt at either or both ends of the horizontal connecting-bar can be adjusted longitudinally on either or both the vertical link or the swinging frame, in order to vary the distance between the pivot of the vertical link or the swinging frame with relation to the point of attachment of the horizontal connecting-bar to adapt the swinging frame to move in an arc of a circle with a greater or less radius. The machine can thus be adapted to perform work of different kinds with a few simple adjustments of parts, which is highly desirable.

I will now proceed to describe my improved mechanism for marking or indicating on the wire coils the points where the latter are to be severed to form the separate coils.

The marker has a longitudinally-reciprocating chisel-bar 40, which is arranged laterally of the feed-rolls and guided in a fixed guide 41 on the main frame 1. The forward end of the chisel-bar is tapered or pointed, as shown in Fig. 1, to adapt it to indent or scarf the wire coil when it impinges against the same, and in the rear end of this bar is

formed a longitudinal slot 42, in which is fitted a crank or bent arm 43 on one end of an oscillating shaft 44. This shaft is journaled in the main frame 1 in close proximity to and parallel with the cam-shaft, and it carries a detent 45, which is adapted to ride on the periphery or take into a notch of a cam 46 on the cam-shaft, according to the relative positions of the cam and detent. When the detent rides on the periphery of the cam during a part of each revolution of the cam, the chisel-bar is retracted from the wire coils by means of a coiled spring 47, which is fitted around and connected to the oscillating detent-shaft 44; but when the detent enters the notch in said cam 46 the spring actuates the shaft and the crank-arm thereof to forcibly thrust the chisel-bar forward and cause it to indent the coil. The chisel-bar is in contact with the wire coil only momentarily, because it is retracted a short distance sufficiently to clear the coil by a supplementary spring 48, attached to the crank or bent arm and the chisel-bar, this arrangement being intended to prevent the chisel-bar from scraping the wire coil and only to be used as auxiliary to the cam as the means for actuating the chisel-bar.

The coils of the wire are properly deflected after they have been bent or formed by the forming and bending rolls by means of a deflector-plate 50, which is fixed rigidly on the frame 1 at a point below and in the same vertical plane as the small bending-roll. This deflector is located laterally of the bending-roll and its upper beveled or pointed extremity is projected above or to the plane of the lower edge or face of the small bending-roll, (see Figs. 1 and 3,) to adapt it for efficient service.

The operation and advantages of my invention will be readily understood and appreciated by those skilled in the art to which it appertains from the foregoing description, taken in connection with the drawings, and I do not therefore deem it necessary to repeat the same here.

Various changes may be made in the form and proportion of parts and details of construction of the mechanisms herein shown and described as embodiments of my improvements, and I would therefore have it understood that I hold myself at liberty to make such changes and alterations as fairly fall within the scope of my invention.

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

1. In a wire-coiling machine, the combination, with a set of feed-rolls, of a forming-roll positively rotated on its axis, a swinging frame in which said forming-roll is journaled, and a bending-roll, substantially as described, for the purpose set forth.

2. In a wire-coiling machine, the combination, with a set of feed-rolls and a bending-roll, of a forming-roll carried by a swinging frame and positively rotated on its axis, the peripheral speed of the forming-roll being in excess of the peripheral speed of the feed-rolls, for the purpose described, substantially as set forth.

3. In a wire-coiling machine, the combination of the feed-rolls, a positively-rotated bending-roll of small diameter located in the line of feed of the wire as it passes through the feed-rolls, and a forming-roll carried by a swinging frame and having a peripheral speed greater than the speed of the feed-rolls, substantially as described.

4. In a wire-coiling machine, the combination of a set of feed-rolls, a positively-rotated bending-roll of small diameter arranged in the line of feed of the wire after it passes the feed-rolls, a forming-roll carried by a swinging frame and having a greater peripheral speed than the feed-rolls, and a deflector fixed at a point below and in the vertical plane of the small bending-roll and laterally thereof, substantially as described.

5. In a wire-coiling machine, substantially as described, the combination, with the feed-rolls and a cam-shaft, of a slotted swinging frame carrying a forming-roll, a vertical slotted link adapted to be oscillated by a cam on the cam-shaft, and a horizontal connecting-rod adjustably connected at its ends to the swinging frame and vertical link, substantially as set forth.

6. In a wire-coiling machine, the combination, with the feed-rolls and a cam-shaft, of a swinging frame carrying a forming-roll, a vertical slotted link, a horizontal connecting-bar pivoted to the swinging frame and having a longitudinal slot in one end, an adjustable carrier or block fitted in said slot of the horizontal bar and provided with a lateral stud which fits in the slot of the vertical link, and a regulating-screw for moving the carrier or block longitudinally of the horizontal bar, substantially as described.

7. In a wire-coiling machine, the combination, with the feed-rolls, a vertical link, a cam-shaft having a cam adapted to act on said vertical link, of a swinging pivoted frame carrying a forming-roll and having a slotted arm, and a horizontal connecting-bar pivoted to the vertical link and adjustably connected to the slotted arm of the swinging frame, substantially as described.

8. In a wire-coiling machine, the combination, with the feed-rolls, a swinging frame carrying a forming-roll, a cam-shaft, and mechanism operated by the cam-shaft for moving the swinging frame, of a reciprocating chisel-bar located laterally of the feed-rolls, a shaft having an arm connected to the chisel-bar, and a detent carried by the shaft and normally in contact with a cam on the cam-shaft, substantially as described.

9. In a wire-coiling machine, substantially as described, the combination of a reciprocating chisel-bar, a shaft controlled by a spring and having a connection with the chisel-bar

to forcibly thrust the latter forward when released by a detent, and a rotary notched cam on which the detent rides, substantially as described.

10. In a wire-coiling machine, substantially as described, the combination of a reciprocating chisel-bar having a slot, a shaft having a crank which fits in the slot of said chisel-bar, a detent carried by said shaft, a cam for actuating or controlling the detent, and a spring for forcibly thrusting the chisel-bar forward when the detent drops or enters a notch in the cam, substantially as described.

11. In a wire-coiling machine, the combination, with a reciprocating chisel-bar and mechanism for impelling the same forward at intervals, of a spring arranged and adapted to retract the chisel-bar a limited distance after it has been thrust forward and prior to its retraction or full return to the normal position, substantially as described.

In testimony whereof I have hereunto set my hand.

GEORGE HILDRETH.

Witnesses:
JOSIAH PATMAN,
CHARLES HILDRETH.