

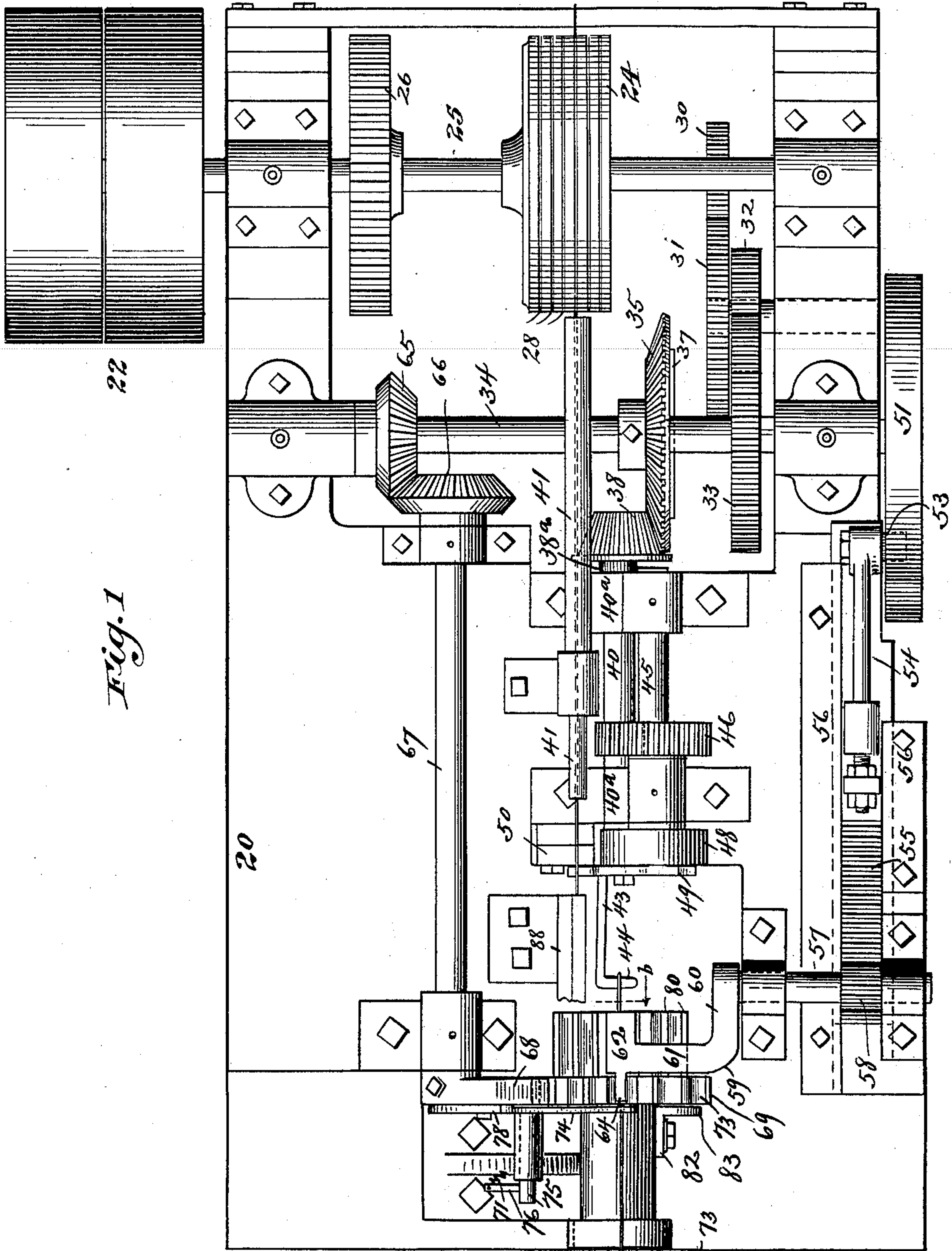
(No Model.)

4 Sheets—Sheet 1.

H. E. SCHNABEL.  
MACHINE FOR MAKING WIRE BALE TIES.

No. 596,721.

Patented Jan. 4, 1898.



Witnesses,  
*F. J. Mann,*  
*Frederick & Goodwin*

*Inventor,*  
*Herman E. Schnabel*  
*by Offield, Towle & Smith*  
*Attys.*

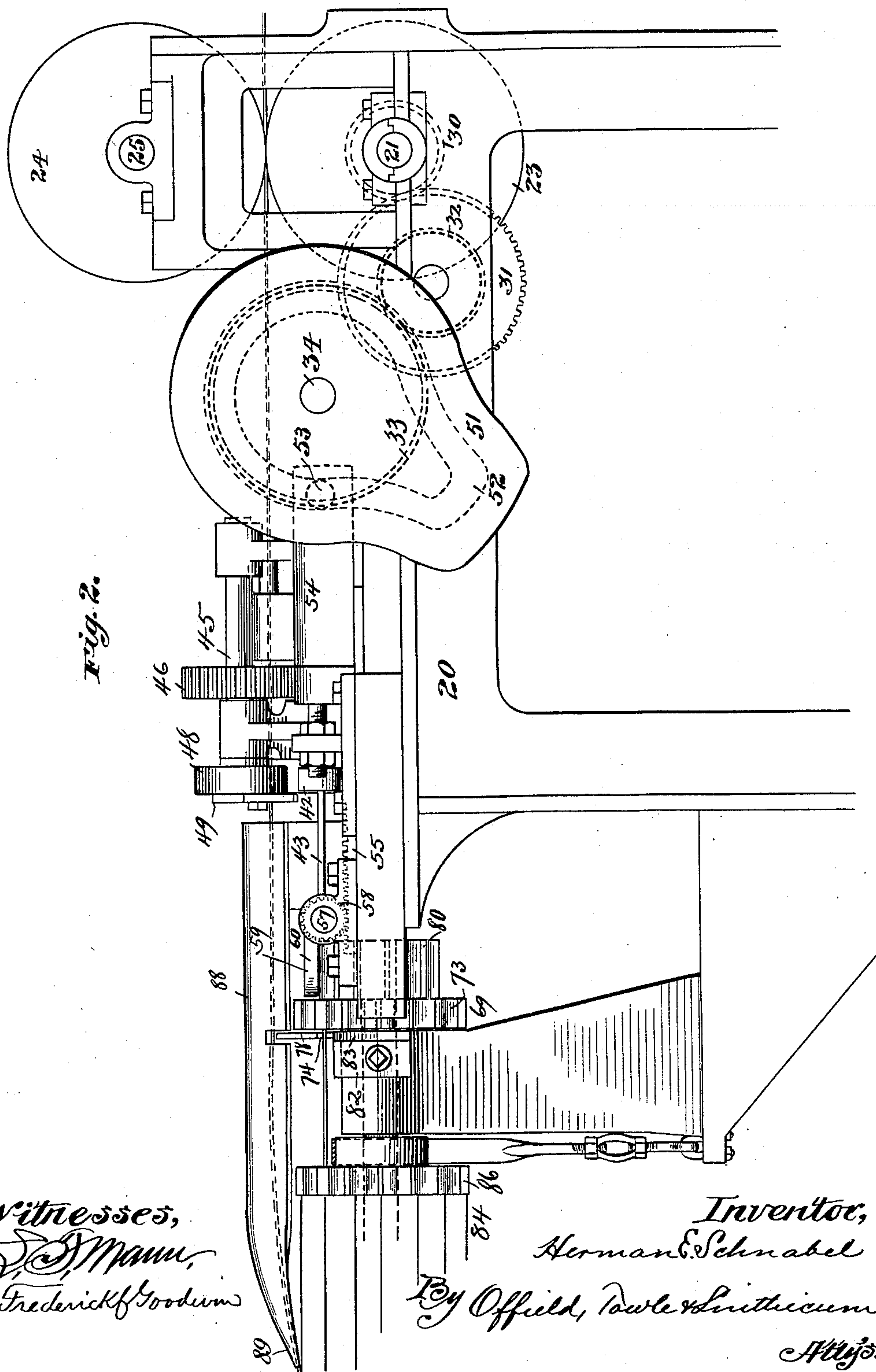
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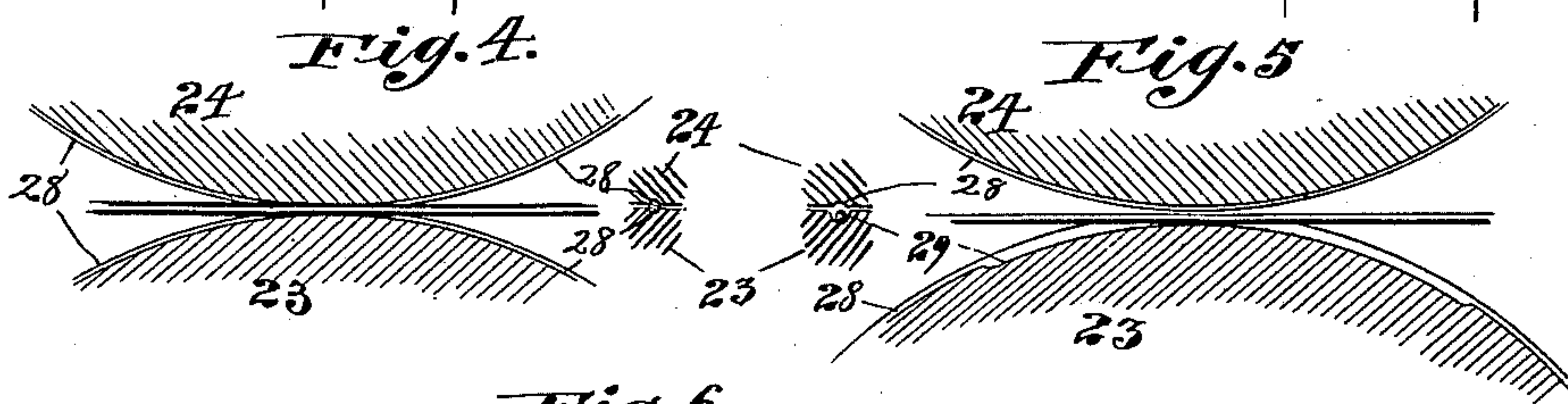
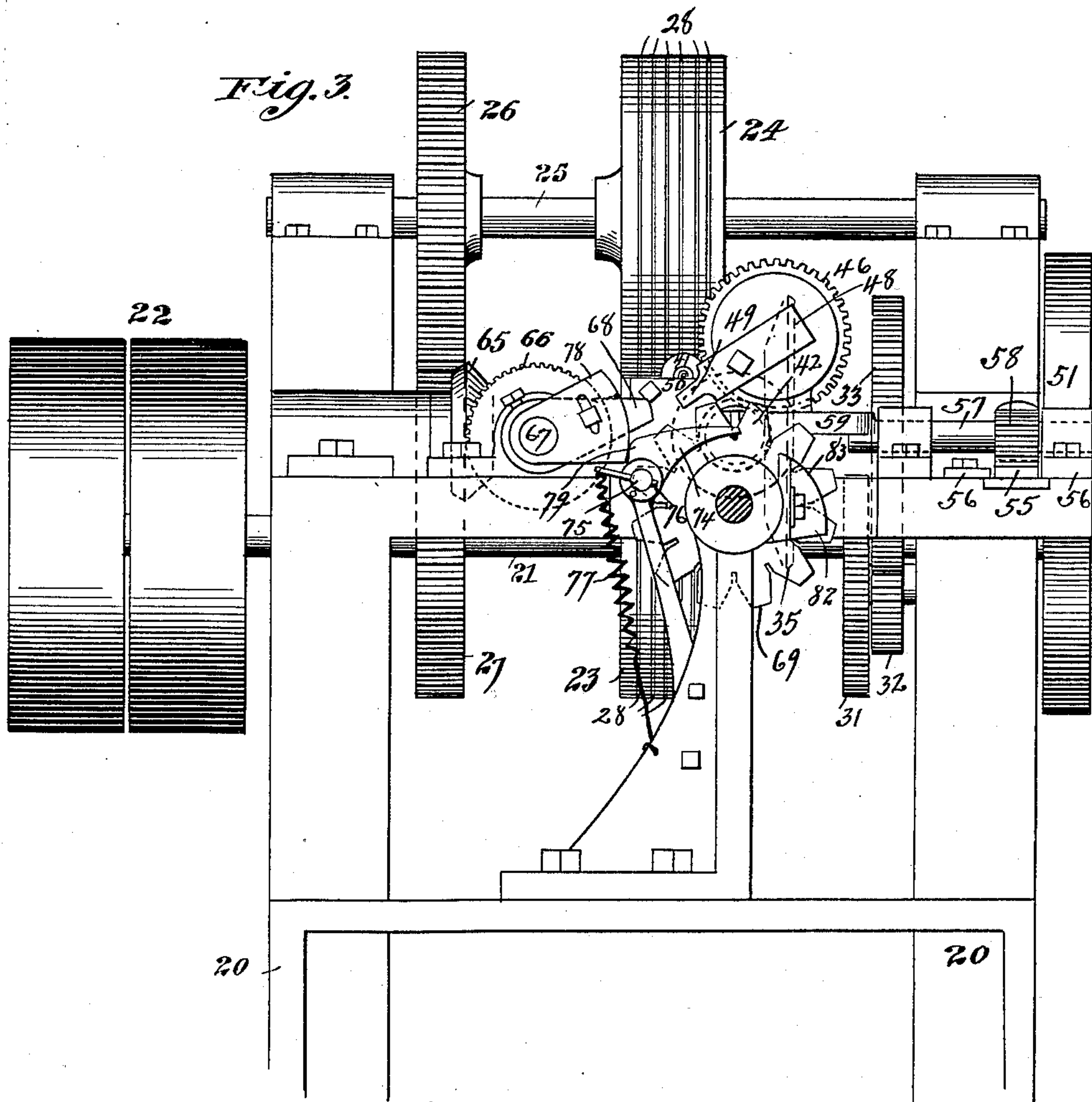
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*Frederick Goodwin*

*Fig. 6.*

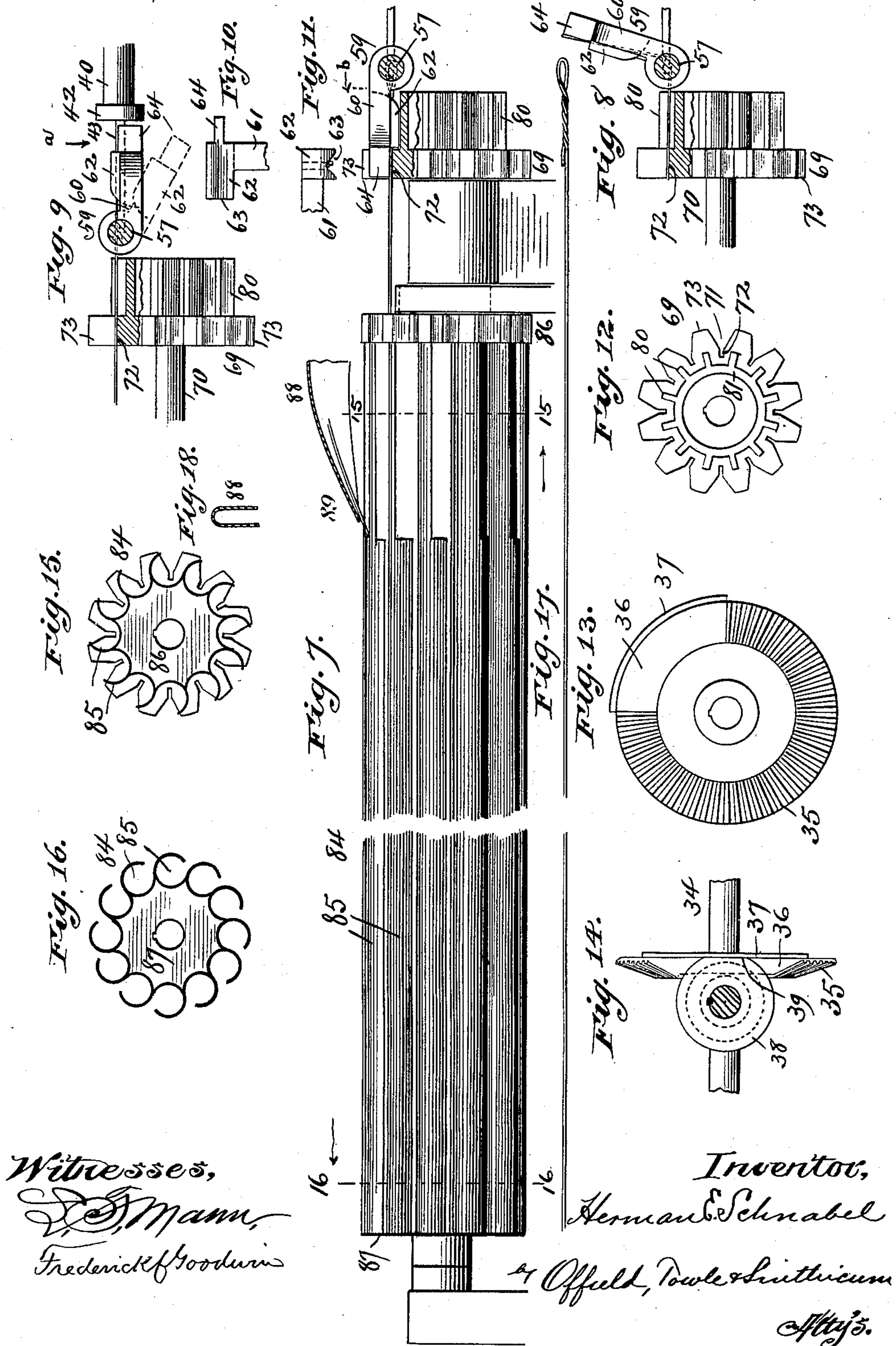
Inventor,  
*Herman Schnabel*  
by *Offield, Bowle & Lenthicum*

*W. H. S.*

4 Sheets—Sheet 4.

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# UNITED STATES PATENT OFFICE.

HERMAN E. SCHNABEL, OF CHICAGO, ILLINOIS.

## MACHINE FOR MAKING WIRE BALE-TIES.

SPECIFICATION forming part of Letters Patent No. 596,721, dated January 4, 1898.

Application filed September 9, 1897. Serial No. 651,060. (No model.)

*To all whom it may concern:*

Be it known that I, HERMAN E. SCHNABEL, of Chicago, Illinois, have invented certain new and useful Improvements in Machines for Making Wire Bale-Ties, of which the following is a specification.

This invention relates to machines for making bale-ties, and more particularly to machines for making wire bale-ties provided at one end with a loop formed by bending the wire upon itself at one end to form the loop and then twisting the extremity of the wire around the body portion thereof to fasten the same and insure the permanency of the loop.

The object of my invention is to provide a machine by means of which bale-ties of this description may be automatically manufactured with great rapidity and at a slight cost; and to this end my invention consists in certain novel features, which I will now proceed to describe and will then particularly point out in the claims.

In the accompanying drawings, Figure 1 is a plan view of the main portion of a machine embodying my invention. Fig. 2 is a side elevation of the same. Fig. 3 is an end view thereof. Fig. 4 shows sectional views through the feed-rolls in one position. Fig. 5 shows similar views through the feed-rolls in another position. Fig. 6 is a detail end elevation of the cutter and twister. Fig. 7 is a side elevation of the revolving carrier, portions of the looping and twisting mechanisms being shown partly in section. Fig. 8 is a view showing so much of the looping and twisting mechanism as is shown in Fig. 7, but with the parts in another position. Fig. 9 is a similar view with the parts in still another position. Fig. 10 is a plan view of the looper, viewed in the direction of the arrow *a* in Fig. 9. Fig. 11 is an elevation of a portion of the looper, viewed in the direction of the arrow *b* in Figs. 1 and 7. Fig. 12 is a face view of the gripping-wheel. Fig. 13 is a face view of the interrupted gear which transmits power to the looper. Fig. 14 is an edge view of the same with its pinion. Fig. 15 is a detail sectional view of the revolving carrier, taken on the line 15 15 of Fig. 7 and looking in the direction of the arrow. Fig. 16 is a similar view taken on the line 16 16 of Fig. 7 and looking in the direction of the arrow. Fig. 17 is a

view of the bale-tie as it comes from the machine. Fig. 18 is a detail sectional view of the guide.

In the said drawings, 20 represents a suitable supporting-frame, in which is mounted the main shaft 21, having the usual driving-pulleys 22 and carrying the lower feed-roll 23. The upper feed-roll 24 is mounted on a shaft 25, provided with a gear 26, which meshes with a similar gear 27 on the shaft 21. The feed-rolls are provided with grooves 28 to receive and grasp the wire, as shown in Fig. 4, and the groove in one of the rolls, preferably the lower, is deepened for a portion of its length, as shown in Fig. 5 at 29, for the purpose hereinafter set forth. This deepening may be made in either or both rolls.

The shaft 21 is provided with a pinion 30, from which, by suitable gearing 31, 32, and 33, motion is imparted to a counter-shaft 34, from which the twisting, cutting, looping, and gripping mechanisms are operated.

A bevel-gear 35 on shaft 34 has a blank segment 36, and adjacent thereto a flat cam-segment 37, as shown in Fig. 13. This gear meshes with a bevel-pinion 38, provided with a flattened portion 39, adapted to bear upon the cam 37, as shown in detail in Fig. 14. The pinion 38 is secured on the twister-shaft 40, which is mounted in suitable bearings 40<sup>a</sup> on the frame of the machine parallel with and adjacent to but not in the line of feed of the wire through the machine, which line of feed is determined by a suitable guide, consisting in the present instance of a tube 41, extending from the feed-wheels to the cutting mechanism. The twister-shaft 40 carries at its end opposite to that on which the pinion 38 is mounted the twister-head 42, (shown in Fig. 6,) and the twister consists of an arm or rod 43, mounted eccentrically in the twister-head, extending rearward therefrom in a direction parallel to the axis of the twister-shaft, and having at its extremity a finger 44 at a right angle to said axis and to the arm 43. The twister-shaft 40 is capable of a slight longitudinal play in its bearings 40<sup>a</sup>, and between the pinion 38 and the bearing 40<sup>a</sup> adjacent thereto there is mounted an elastic washer 38<sup>a</sup> of rubber or other elastic material.

The cutter-shaft 45 is mounted parallel and adjacent to the twister-shaft 40 and is driven



therefrom by means of a gear 46 on the cutter-shaft meshing with a pinion 47 (shown in dotted lines in Fig. 6) on the twister-shaft. The cutter-head 48 carries the cutter 49, which is rotated thereby and which coöperates with a fixed anvil 50, over which the wire is fed from the guide 41.

Mounted on the end of the shaft 34 is a cam-wheel 51, provided with a cam-groove 52, (shown in dotted lines in Fig. 2,) with which engages a pin 53 on an arm 54, secured to a rack 55, reciprocating in suitable ways 56 on the frame. The connection between the arm and rack is preferably made adjustable, as shown in Figs. 1 and 2, to insure the proper gripping of the wire by the gripping-finger of the looper. The looper-shaft 57 is provided with a pinion 58, which meshes with the rack 55, so that a movement of oscillation is imparted to the looper-shaft and to the looper 59. This latter is mounted on the inner end of the looper-shaft 57 and consists of an arm 60, radial to the shaft, an arm 61, forming a right-angled extension of the arm 60 and parallel to the axis of the looper-shaft, and a body portion 62, having on its working face a V-shaped groove 63 and provided with a projecting gripping-finger 64, as shown in detail in Figs. 7 to 11. It will be noticed that the axis of the looper-shaft is in line with the twister-finger when this latter is in the position shown in Fig. 1.

Mounted on the shaft 34 is a bevel-gear 65, which meshes with a similar gear 66, mounted on one end of a shaft 67, which carries at its other end a single tooth or spur 68, which actuates the gripping-wheel 69. This latter, as shown in detail in Figs. 7, 8, 9, and 12, is mounted on a shaft 70 and is provided with a circumferential series of V-shaped notches 71, terminating in radial slits 72, forming intermediate teeth 73. The tooth or spur 68 by its successive engagement with the teeth 73 advances the gripping-wheel one step or the distance of one tooth for each revolution of the shaft 67, thus imparting to said wheel a step-by-step or intermittent rotary motion.

As an auxiliary to the gripping-wheel I provide a pressing-finger 74, adjacent to said wheel, secured on a shaft 75, having an arm 76, to which is connected a spring 77, which tends to lift the pressing-finger. A cam 78 on the end of the shaft 67 engages the heel 79 of the finger 74 and presses and holds the same down at the proper time and during the proper interval.

The stripping mechanism, which for convenience of construction I have shown as formed in one piece with the gripping-wheel, consists of a series of radial teeth or plates 80, located between the gripping-wheel and the twister and connected to and actuated from the former by means of an annular body portion 81. As an auxiliary to the stripper I provide on the opposite side of the gripping-wheel a fixed stripping-plate 82, having an inclined or cam edge 83, as shown in Fig. 3.

The revolving carrier 84 (shown in Figs. 7, 15; and 16) consists of a series of troughs or compartments 85, grouped around a central axis, which may be a continuation of the shaft 70 of the gripping-wheel or which may be suitably coupled or connected thereto so as to move therewith. These troughs or compartments are of sufficient length to receive the greater portion of length of wire sufficient to form one bale-tie, and the opening of each trough is wider at that end adjacent to the gripping-wheel to receive the end of the wire as it is fed forward, the remainder of said opening being contracted, as will be seen from said Figs. 7, 15, and 16. As shown, these troughs or compartments are supported on their axes by means of heads 86 and 87, that adjacent to the gripping-wheel being substantially identical in conformation with said wheel.

Extending from the cutting mechanism to and some distance over the revolving carrier 84 is a guide 88, closed at the top and sides, but open at the bottom, as shown in detail in Fig. 18, and having its terminal portion downwardly inclined, as shown at 89, to guide the end of the wire into the wide portion of the opening of the compartment of the revolving carrier which is to receive the same.

The machine thus constructed operates in the following manner: The wire after having been straightened, if necessary, is fed forward by the feed-rolls through the guide 41, over the anvil 50, and through the guide 88, by means of which it is fed into and along the compartment 85 of the revolving carrier 84, which is ready to receive the same, said compartment being the one next to the top. When the proper length of wire has been fed forward, the deepened portion 29 of the groove of the feed-roll 23 stops the feed of the wire for an instant, and the cutter-head, which has been slowly revolving during this forward feeding of the wire, reaches a point where the cutter severs the wire, which thereupon falls from the guide 88 into that one of the notches 71 of the gripping-wheel next to the top. The cutting and twisting mechanisms then stop, owing to the blank segments 36 of the bevel-gear 35 coming opposite the pinion 38, and remain stationary, owing to the engagement of the flattened surface 39 of said pinion with the cam 37, with the twister in the position shown in Fig. 1. The cam 78 then engages the heel 79 of the pressing-finger 74, and said finger presses and holds the wire down firmly into the slit 72 of the gripping-wheel. The spur 68 then engages one of the teeth 73 of the gripping-wheel 69 and advances the same one step, carrying the wire up into line with the axis of the twister-shaft and under the twister-finger 44. When this occurs, the looper is in the position shown in dotted lines in Fig. 9, so that the end of the wire projects over the V-shaped groove 63 in the working face of the looper and will lie in said groove when the looper is raised, as hereinafter set



forth. When the parts are in this position, the cam 51 by means of the rack 55 actuates the looper-shaft and the looper rises to the position shown in Fig. 8, bending the end of the wire around the finger 44, and swinging in the arc of a circle completes the loop by carrying the said end down into the position shown in Fig. 7. The V-shaped notch in the face of the looper serves to retain the wire in position during this operation, and the wire now doubled upon itself enters the slit 72, where it is pressed and gripped by the finger 64 of the looper. At the same time the cam 78 clears the heel 79 of the gripping-finger 74, and the spring 77 raises said finger upward and outward away from the gripping-wheel and carrier a sufficient distance to permit the main wire to drop between it and the said parts. The cam 37 and blank segment 36 having now passed clear of the pinion 38, this latter engages with the bevel-gear 35, and the twister is revolved until the two strands of wire between the twister and gripping mechanism are sufficiently intertwisted. The longitudinal movement of the twister-shaft permitted by the elastic washer 38<sup>a</sup> allows for the shortening of the distance between the gripping and twisting mechanism caused by this twisting operation, and the elastic washer restores the twister-shaft to its normal position when the loop has been stripped from the twister-finger. During these operations the feed-rolls have been feeding forward the main wire from which the length being operated upon was severed, and owing to the fact that the feeding and cutting mechanisms are not in line with the looping and twisting mechanism this feeding goes on practically without interruption, except for the brief instant during which the wire is being severed, since a fresh notch of the gripping-wheel and a fresh compartment of the carrier are ready to receive the main wire as soon as the severed length has been carried up into position to be looped and twisted. When the twist is completed, the cam 51 swings the looper back into the position shown in dotted lines in Fig. 9. At the same time, the next length of wire having been fed forward and severed, the spur 68 engages the next tooth 73 of the gripping-wheel, and as said wheel advances that stripper-blade 80 which is next to the loop just formed and which, as shown in Fig. 8, projects above the same will engage the said loop and force it off from the finger 44, while at the same time that portion of the wire on the opposite side of the gripping-wheel will come into contact with the inclined or cam surface 83 of the fixed stripper 82, and the wire will be thereby forced out of the slit 72. As the carrier continues to revolve each compartment as its opening becomes lowermost will discharge the completed bale-tie it contains and will thus become empty and ready to receive a severed length in the manner first described.

It will be seen that the machine is automatic in its action and practically continuous

in its operation, the only interruption in the feed of the wire being the very slight one during the operation of severing the blank necessary to prevent bending or kinking of the wire during said operation.

It is obvious that various modifications in the details of construction may be made without departing from the principle of my invention, and I therefore do not wish to be understood as limiting myself strictly to the precise details of construction hereinbefore described and shown in the drawings.

I claim—

1. In a machine for making wire bale-ties, the combination, with means for feeding forward the main wire and means for severing the blank, of looping and twisting mechanism arranged immediately adjacent to and laterally of the feeding mechanism, and an intermittently-rotating carrier extending beyond the feeding, severing and looping and twisting mechanisms in the direction of the feed, and comprising a series of compartments to successively receive, carry and discharge the severed lengths of wire, whereby the main wire may be fed forward while the severed blank is being looped and twisted at the end thereof nearest the cutting mechanism when severed, substantially as set forth.

2. In a machine for making wire bale-ties, the combination, with means for feeding forward the main wire and means for severing the blank, of an intermittently-rotating twister having its axis of revolution parallel with the line of feed, an intermittently-rotating gripping-wheel for carrying the severed blank laterally under the twisting-finger and over the looper, and a looper oscillating in a vertical plane around the twister-finger and provided with a gripping-finger to cooperate with the gripping-wheel to grip the wires while the twister revolves, substantially as set forth.

3. In a machine for making wire bale-ties, the combination, with means for feeding forward the main wire and means for severing the blank, of an intermittently-rotating twister having its axis of revolution parallel with the line of feed, an intermittently-rotating gripping-wheel for carrying the severed blank laterally under the twister-finger and over the looper, a looper oscillating in a vertical plane around the twister-finger and provided with a gripping-finger to cooperate with the gripping-wheel to grip the wires while the twister revolves, and means for positively stripping the loop from the twister-finger, substantially as set forth.

4. In a machine for making wire bale-ties, the combination, with means for feeding forward and severing the wire, of an intermittently-rotating notched gripping-wheel for receiving the severed blank, a pivoted pressing-finger adjacent to said gripping-wheel, means for depressing said finger to hold the wire in the notch of the gripping-wheel during the movement of this latter, and means for raising



said finger out of the path of the wire after said movement, substantially as set forth.

5. In a machine for making wire bale-ties, the combination, with means for feeding forward the main wire and means for severing the blank, twisting and looping mechanism arranged laterally of the line of feed, and a gripping-wheel having an intermittent movement of rotation relatively to the line of feed and to the twisting and looping mechanism, of a carrier moving in unison with and around the same axis as the gripping-wheel, and comprising a series of compartments to successively receive, carry and discharge the severed lengths of wire, substantially as set forth.

6. In a machine for making wire bale-ties, the combination, with means for gripping the looped wires, of a twister and rotary twister-shaft capable of longitudinal motion, a pinion whereby said shaft is driven, and an elastic washer interposed between said pinion and the shaft-bearing, substantially as set forth.

7. In a machine for making wire bale-ties, the combination, with the gripping-wheel, of the oscillating looper having a gripping-finger, and having a pinion in its shaft, a rack meshing with said pinion, a cam-wheel, and an arm engaging said cam-wheel and adjustably connected with said rack, substantially as set forth.

8. In a machine for making wire bale-ties, the combination, with an intermittently-rotating twister-finger, of a looper oscillating around the same and having a V-shaped groove in its working face, substantially as set forth.

9. In a machine for making wire bale-ties, a gripping-wheel having a series of V-shaped notches terminating in radial slits, substantially as set forth.

10. In a machine for making wire bale-ties, a gripping-wheel having a series of V-shaped notches terminating in radial slits, in combination with an oscillating looper having a gripping-finger adapted to force the wires into said slits, substantially as set forth.

11. In a machine for making wire bale-ties, the combination, with the gripping-wheel having V-shaped notches forming intermediate teeth, of a continuously-rotating shaft having a single tooth or spur to successively engage the teeth of the gripping-wheel and impart to said wheel a step-by-step rotary motion, substantially as set forth.

12. In a machine for making wire bale-ties, the combination, with the twister-finger, oscillating looper, and gripping-wheel, of a stripper comprising radial blades or plates intermediate the gripping-wheel and twister, substantially as set forth.

13. In a machine for making wire bale-ties, the combination, with the gripping-wheel having V-shaped notches terminating in radial slits, of a fixed stripper-plate adjacent to said wheel, having an inclined or cam edge to engage the wire and force it out of said slits, substantially as set forth.

HERMAN E. SCHNABEL.

Witnesses:

FREDERICK C. GOODWIN,  
IRVINE MILLER.