(No Model.)

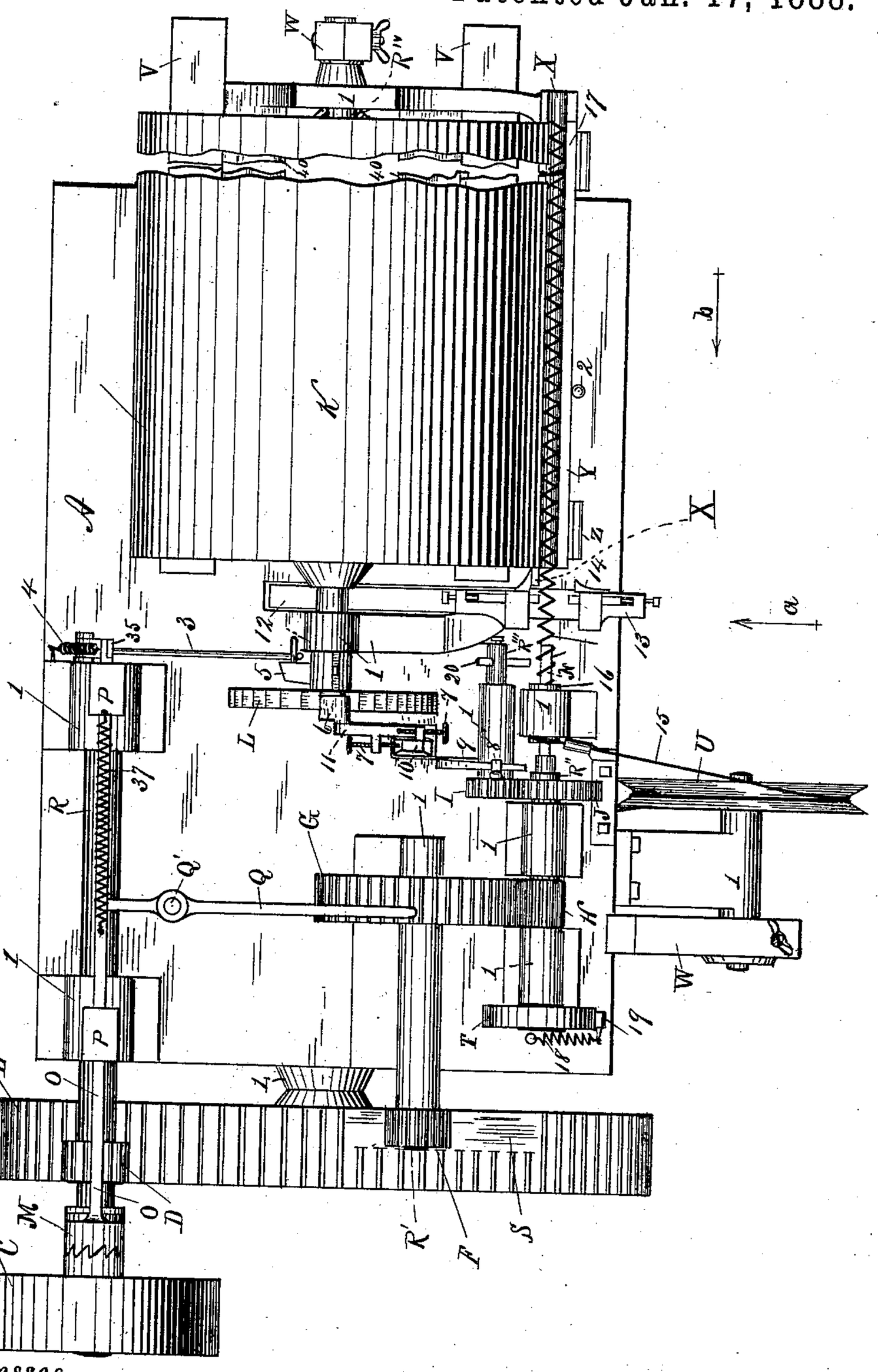
4 Sheets—Sheet 1.

D. C. STOVER & O. E. WINGER.

MACHINE FOR FORMING FABRICS FROM WIRE.

No. 376,560. Patented Jan. 17, 1888.

Fig. 1.



Witnesses.
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L. M. Currier.

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(No Model.)

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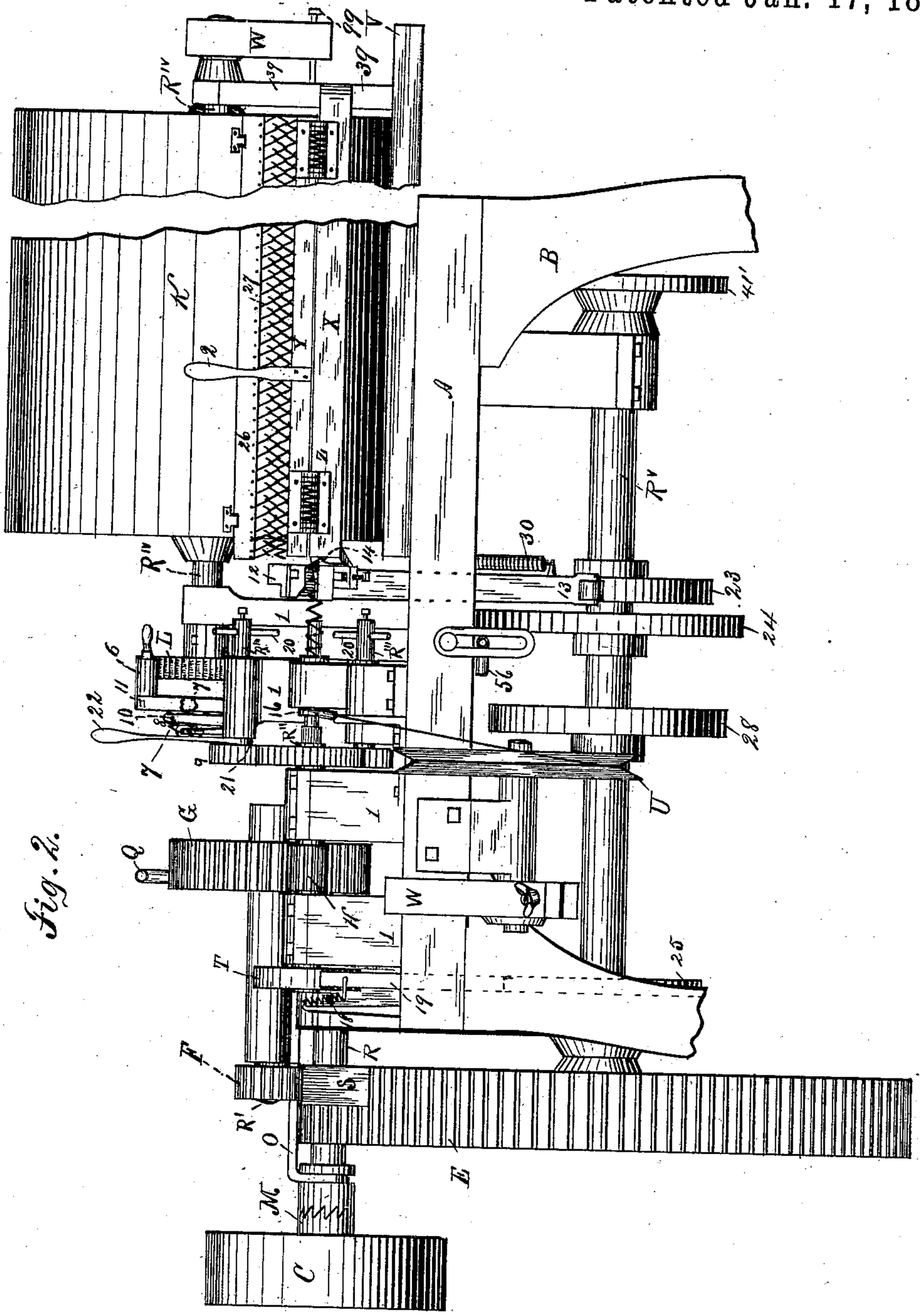

Fig. 2.

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4 Sheets—Sheet 3.

D. C. STOVER & O. E. WINGER.

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Fig. 3.

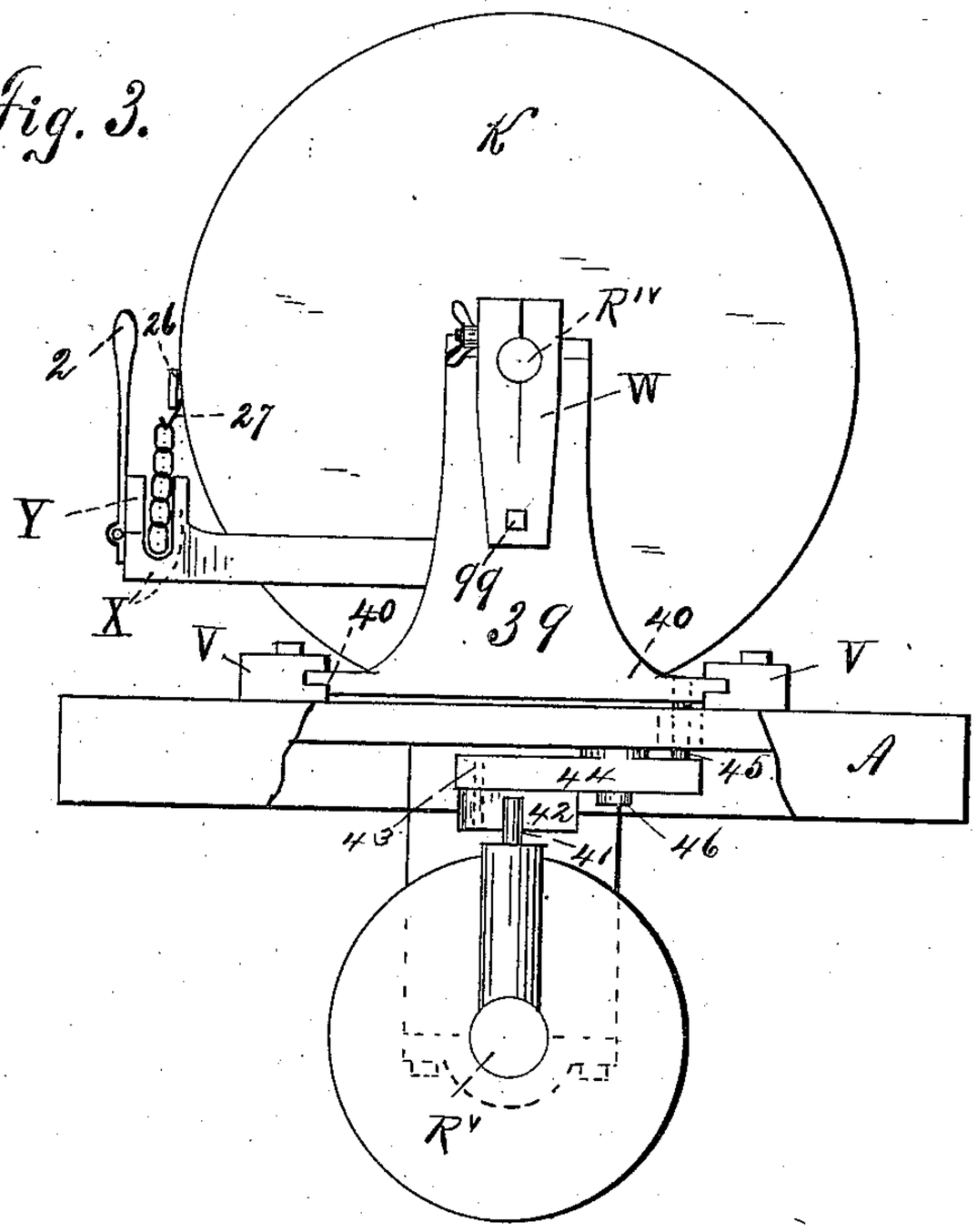


Fig. 9.

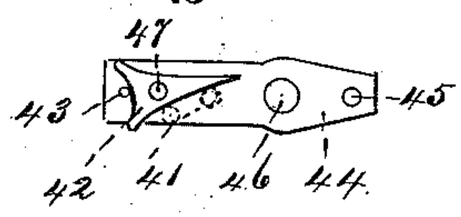


Fig. 10.

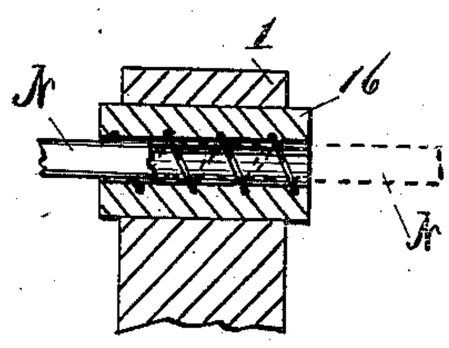
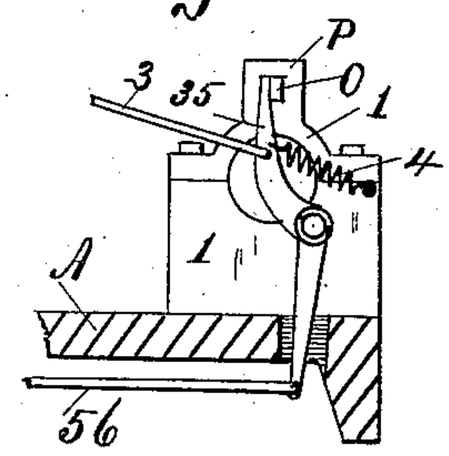


Fig. 11.



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(No Model.)

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D. C. STOVER & O. E. WINGER.

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Fig. 8.

Fig. 7.

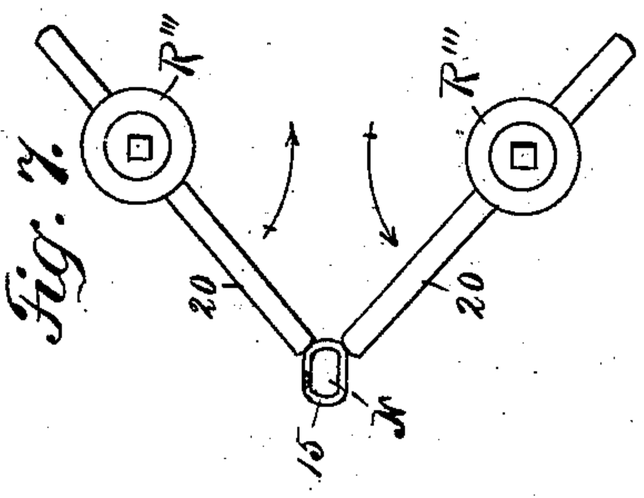


Fig. 6.

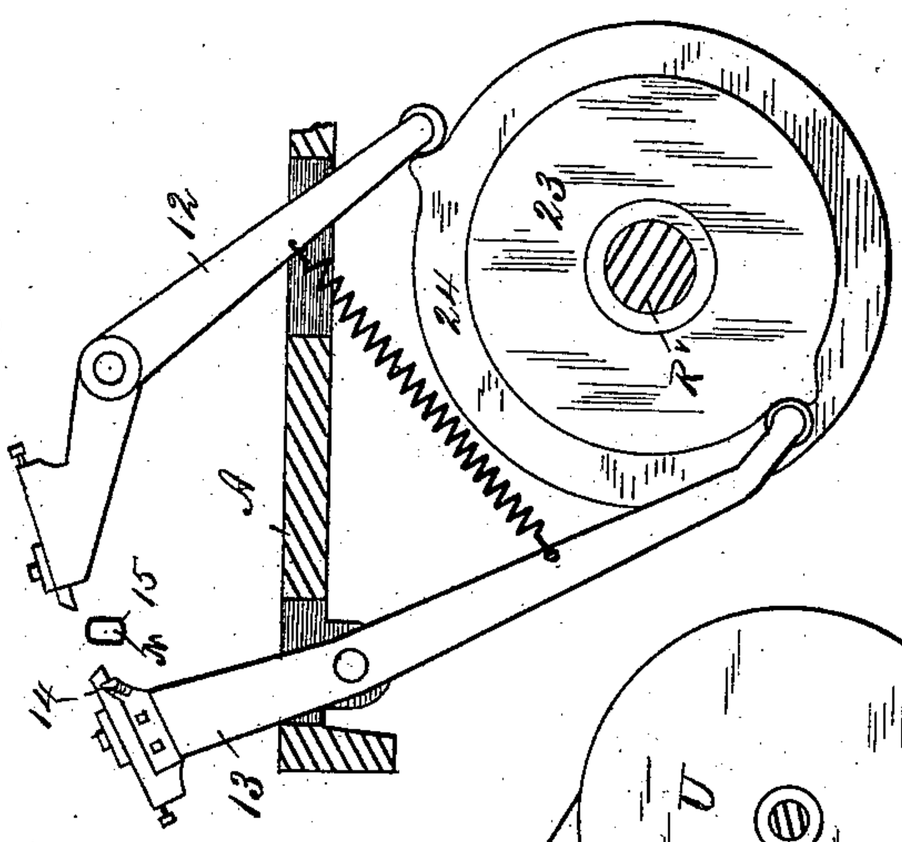


Fig. 4.

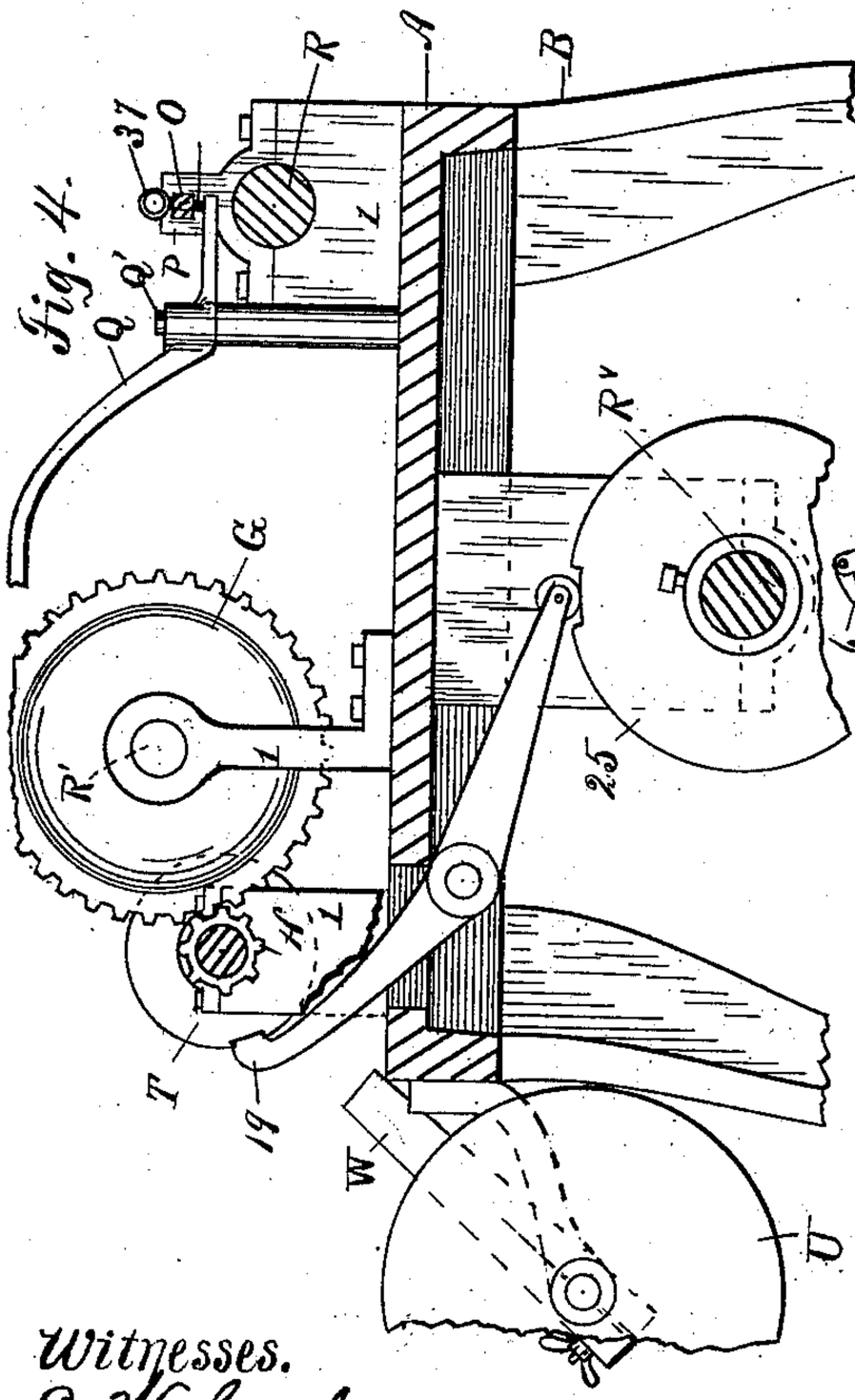
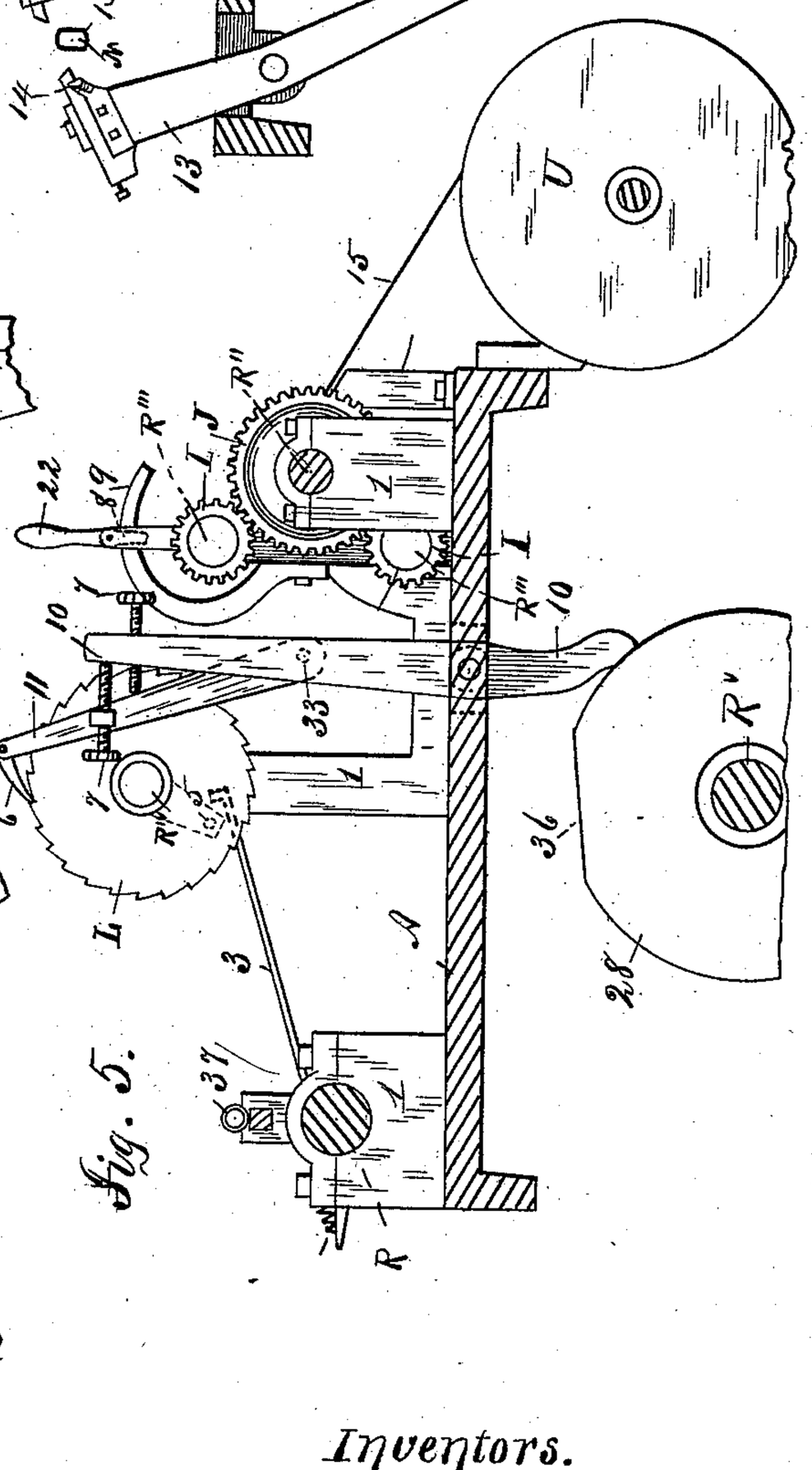


Fig. 5.



Witnesses.
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UNITED STATES PATENT OFFICE.

DANIEL C. STOVER AND OSWALD E. WINGER, OF FREEPORT, ILLINOIS.

MACHINE FOR FORMING FABRICS FROM WIRE.

SPECIFICATION forming part of Letters Patent No. 376,560, dated January 17, 1888.

Application filed July 16, 1887. Serial No. 244,538. (No model.)

To all whom it may concern:

Be it known that we, DANIEL C. STOVER and OSWALD E. WINGER, of Freeport, in the county of Stephenson and State of Illinois, have invented certain new and useful Improvements in Machines for Forming Fabrics from Wire; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same.

In this machine ordinary wire is formed into flattened coils, and these are automatically interlocked, each with the preceding, to form the fabric.

In the drawings, Figure 1 is a plan of the machine. Fig. 2 is a side elevation looking in the direction of the arrow a of Fig. 1. Fig. 3 is an end elevation looking in the direction of the arrow *b* of Fig. 1. Fig. 4 is an irregular section near the middle of the machine, showing parts upon the left in Fig. 1. Fig. 5 is a similar section looking in the opposite direction. Figs. 6, 7, 8, 9, 10, and 11 show details of construction hereinafter described.

The entire mechanism is borne upon a bed or table, A, having suitable supports B. It consists of a flattened coiling-spindle, N, Figs. 1 and 2, driven through intermediate gearing by a power-pulley, C, mechanism for flattening the coil as fast as it is coiled, means for properly interlocking the coils, means for severing the coils at suitable intervals, and certain adjusting devices for regulating the operation of its special devices.

The power-pulley transmits motion, through the clutch M upon a shaft, R, to the gears D E F G H in succession, and thus rotates the coiling-spindle, which is a continuation of the shaft R″, upon which the latter gear is mounted. The shaft R and various other shafts hereinafter mentioned are mounted on bearings 1, fixed to the bed A of the machine. A hollow steel cylinder or sleeve, 16, Figs. 1, 2, 10, incloses a portion of the spindle, and has its interior surface spirally grooved with the "lead" desired for the coil and to a depth nearly equal to the diameter of the wire to be used. The spindle is flattened upon two opposite sides, Figs. 6, 7, and consequently the wire when once bent about it must be carried with it in its rotation. The wire 15 then, after passing about a tension-wheel, U, is thrust into the spiral groove in the sleeve 16, when the spindle by rotation winds it into a coil of approximately the same form as the spindle itself, and, as the greatest diameter of the spindle is nearly the same as the inner diameter of the sleeve, the wire must at all times lie in the groove and take precisely the same lead. The wire, then, forms a kind of screw-thread upon the spindle, and the sleeve a nut in which the thread must advance when rotated, and, as the spindle can neither rotate in the flattened coil nor advance with it, the coil slips continually toward the end of the spindle. The tension upon the wire may be varied at will by a friction-clamp, W, upon the shaft of the tension-wheel U, and thus the coil be drawn more or less closely against the spindle's flattened sides. The clamp W, like the similar clamp shown upon the drum-shaft hereinafter mentioned, is without novelty, being a partially-split block clamped upon the shaft by a thumb-screw, and prevented from rotating with the shaft by the bed of the machine or by a bolt passing through it and into some fixed adjacent part.

It is well known that when any coil formed under tension upon a mandrel is released there is a slight recoil of the wire or an uncoiling motion of each turn. This, when the coil is cylindrical, causes no inconvenience, as it is still cylindrical after the recoil, although slightly larger; but when the mandrel is not cylindrical the slight unwinding causes the coil itself to assume a spiral auger-like form unsuited for most purposes. We obviate this difficulty by independently bending still farther inward each of the flatter sides of each turn of the wire by a blow given before the coil has left the mandrel.

Shafts R‴, each parallel to the spindle and at a suitable distance therefrom, are rotated from the spindle shaft by means of gears J I, Figs. 1, 2, 5, 7. Each shaft R‴ carries a hammer, 20, and these strike the wire, as shown in Fig. 7, and bend it against the spindle's flattened sides. The proportion of the gears J I is such that the hammers make two revo-

lutions to one made by the spindle, and thus each edge of the coil is subjected to the action of the hammers.

It is found that commercial wire is not uniform in hardness, even in the same coil, and that equal blows of the hammers will occasionally fail to produce perfect flattened coils, and for this reason the hammer-shafts are mounted in eccentric-sleeves 21, Fig. 8, within the shaft-bearings 1. These sleeves (one only being shown) project beyond the bearings 1, and are provided with levers 22, by which they may be rotated within the bearings, and the hammers while in motion be instantly brought nearer to or carried away from the spindles. A spring, 8, fixed to the side of the lever 22, serves, by its friction against a fixed curved bar, 9, to prevent accidental displacement of the lever.

The coil, when of a length equal to the width of the desired fabric, is severed by jaws 12 13, Figs. 1, 2, 6, pivoted to lugs upon the bed of the machine and actuated by cams 23 24 upon a shaft, R^{v}, beneath the bed. The coil and spindle are stationary during the severing, although the gears D E are still in motion, for the part of the gear E meshing with the gear F has its teeth removed at S, and the proportions of the gears E F G H are such that one revolution of the gear E produces a coil of the length desired; but it is necessary that the spindle and coil stop very precisely at the proper point, or either the coils will vary in length or the wire will not fall between the meeting jaws, which should sever it. We therefore place upon the shaft R^{v}, Fig. 4, a wheel, 25, having in its periphery a notch, and upon the spindle-shaft a similar wheel, T, and pivot at its middle, upon the bed, a pawl, 19, whose ends may be, respectively, thrown into the notches in the wheels by the action of a spring, 18, fixed to the bed. The upper end fits its notch so closely as to prevent motion of the spindle, either forward or backward, at the moment of severing or until the constantly-rotating wheel 25 raises the lower end of the pawl.

The fabric as it is formed is wound upon a drum, K, above the bed of the machine. Upon the drum's surface is hinged a bar, 26, Fig. 2, provided with a series of hooks, 27, spaced like the successive turns of the coils, and with which the successive turns engage as the first coil advances, if the drum be in proper position. Immediately after the severing of the coil the drum is rotated, raising the coil, which engages the hooks until its lower side is in position to be engaged by the succeeding coil. The rotation is caused by a cam, 28, upon the shaft R^{v}, Figs. 2 and 5, operating a ratchet-wheel, L, fixed upon the inner end of the drum-shaft. A lever, 10, pivoted to the bed and jointed at 33, bears upon its branch 11 a pawl, 6, to engage the ratchet-wheel. The lower end of the lever is kept at the same distance from the shaft R^{v} during most of each revolution; but when the portion 36 of the cam passes beneath the lever end a spring throws the lever end inward and causes the pawl 6 to fall over a tooth upon the ratchet-wheel, and as the part 36 passes the lever the pawl is advanced to its original position, rotating the drum through the angular space of one ratchet-tooth. Screws 7, each working in one branch of the lever 10 11 and against the other branch, enable the operator to increase the rotation of the drum while the machine is in motion, should the interlocking coil advancing along the margin of the fabric from the spindle seem to indicate the desirability of such further rotation.

A clutch-bar, O, sliding longitudinally in bearings P, formed integrally with the bearings 1 of the shaft R, Figs. 1, 2, 4, 5, serves to disengage the power-pulley C from the machine, being thrown forward by a hand-lever, Q, and retained by a spring-catch, 35, Figs. 1 and 11, which engages its notched end. The catch may at any time be disengaged by means of a rod, 36, Figs. 2 and 11, when it is thrown back by a spring, 37. The catch is automatically disengaged by means of a lug and pin, 5, Figs. 1 and 5, rotating with the drum-shaft, and at a certain point in its revolution engaging the upwardly-turned end of a rod, 3, Figs. 1, 5, and 11, attached to the catch. The length of the fabric formed before automatic disengagement of the power is determined by the relative position of the lug 5 and the hook-bar 26, for after the lug passes the rod 3 the drum is rotated by hand until the hooks are in proper position to receive the first coil of another piece of the fabric.

If interlocked coils be cut by a plane perpendicular to the axis of each coil, the severed ends will be alternately in two planes, separated by a distance equal to the coil's diameter, and in this machine, were there no devices other than those already described, the coils, if of the same length, must be cut alternately upon the front and rear faces; and, indeed, this would not be sufficient, for if the severed coil be simply displaced laterally by the rotation of the drum, it would not be engaged by the next coil. The drum, therefore, immediately after the severing of the first coil is thrown bodily away from the spindle to a distance just equal to one-half the distance between successive spirals of the coils. For this purpose the drum-shaft R^{iv} slides in a bearing fixed upon the bed at its inner end, while its outer end is mounted in a sliding frame, 39, whose lower horizontal members, 40, work in grooves in bars V, bolted rigidly upon the bed with the shaft-slide, the drum, the frame 39 40, the trough X, with its attachments, the lug and pin 5, and the ratchet-wheel L. The sliding of the drum alternately in each direction after the completion of successive coils is caused by the mechanism shown in Figs. 3, 9.

A lever, 44, pivoted at 46 to the bed by means of a pin, 45, fixed in one of its ends and

passing through a slot in the bed, engages the frame 39. Upon the lower surface of the opposite end of the lever 44 is pivoted a wedge, 42, which is shown in Fig. 9 as it appears from below. A pin, 41, rigidly connected with the shaft R^v and revolving therewith in the plane of the pivot 46, passes in the upper portion of its path along one lateral face of the wedge, crowding the wedge bodily to one side with the lever end upon which the wedge is mounted. Now, it is plain that such motion of the lever must throw the frame 39, with its attachments, in a contrary direction, since the pin 45 connects the frame and the opposite end of the lever; and, further, as the pin passes from the wedge point it will first push the wedge aside bodily, and then, in passing the part 42, which still lies in its path, cause the wedge to rotate upon the pivot until its point lies upon the opposite side of the plane of the pin's rotation. The pin in the next revolution strikes upon the opposite face of the wedge, and as the two faces are symmetrical with respect to the wedge-pivot, the lever is swung as before, but in a contrary direction, and the wedge is left in its original position. In other words, since each rotation of the shaft R^v forms a complete coil, the drum K, mounted upon the frame 39, is thrown alternately in opposite directions at the completion of successive coils. A pin, 43, limits the motion of the wedge.

Figs. 1, 2, 3 further show a trough, X, in which each advancing coil lies, and which prevents undue vibration and displacement. A bar, Y, is attached to the upper edge of this trough by spring-hinges, and serves to prevent motion of the fabric's edge during the time its edge is being interlocked by an advancing coil in the trough. The handle 2, fixed to the bar, affords a convenient means for throwing it into or out of position. The cutting-jaw 13 bears upon its side a compressor, 14, which, at the instant of cutting, presses gently against the coil holding it in position.

What we claim is—

1. In an automatic machine for forming coiled-wire fabrics, mechanism for coiling the wire, means for supporting the fabric with its marginal coil in position to receive an additional interlocking-coil, and mechanism for moving said marginal coil both laterally and longitudinally, combined with means whereby the operator may at will add to or subtract from such lateral movement while the machine is in operation, substantially as set forth.

2. In machines for making coiled-wire fabrics, the combination, with mechanism for coiling the wire, of automatic mechanism for stopping and starting the coiling mechanism at intervals without disconnecting the power from the machine, and mechanism for automatically disconnecting the power from the machine at the completion of a predetermined length of the fabric.

3. In machines for forming coiled-wire fabrics, the combination, with a non-cylindrical coiling-mandrel and a fixed spirally-grooved sleeve inclosing a portion of said mandrel, of a rotary hammer adapted to strike, in each of its revolutions, the wire coiled upon said mandrel, and means whereby the impact of the blow upon the wire may be varied at will while the parts mentioned are all in operation.

4. In machines of the class described, the combination of a coil-forming mandrel, coil-severing jaws, a support, X, for the coil when formed, and a compressor fixed to one of said jaws and adapted to press the coil against said support at the instant of severing.

5. In a machine of the class described, the combination of a non-cylindrical rotating coil-mandrel and a hammer actuated automatically by said machine and striking, at suitable intervals, the wire coiled upon said mandrel, whereby the wire is forced more closely against certain parts of the mandrel and "set" sufficiently to prevent appreciable uncoiling of the wire when released from tension.

6. In machines of the class described, the combination of a non-cylindrical rotating mandrel or coiling-spindle, a shaft parallel to said mandrel mounted in a suitable support and bearing a hammer adapted to strike the wire coiled upon said mandrel, an eccentric-sleeve within said support and forming the bearing of said shaft, and means whereby said sleeve may be rotated about said shaft and in said support, for the purpose set forth.

7. The combination, with the power-driven mutilated gear E and the mutilated wheel 25, both mounted upon a shaft, R^v, of the shaft R′, connected by gearing with said mutilated gear and carrying the coiling-spindle N, the mutilated wheel T, mounted upon the shaft R′, and the centrally-pivoted pawl 19, engaging both said mutilated wheels, whereby the rotation of the spindle may be stopped at exact intervals without disconnecting the power from the machine.

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

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OSWALD E. WINGER.

Witnesses:
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