

No. 622,690.

Patented Apr. 11, 1899.

J. C. HOWELL.

MACHINE FOR MAKING METALLIC RIBBON FOR BATTERY ELECTRODES.

(Application filed Jan. 3, 1899.)

(No Model.)

2 Sheets—Sheet 1.

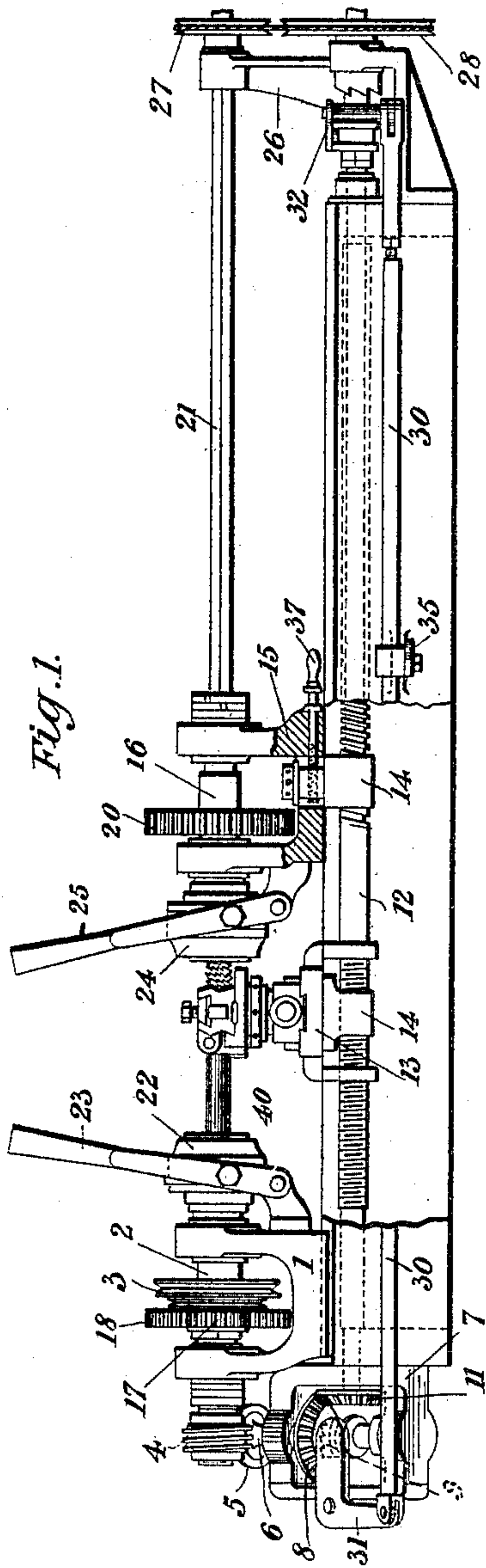


Fig. 1.

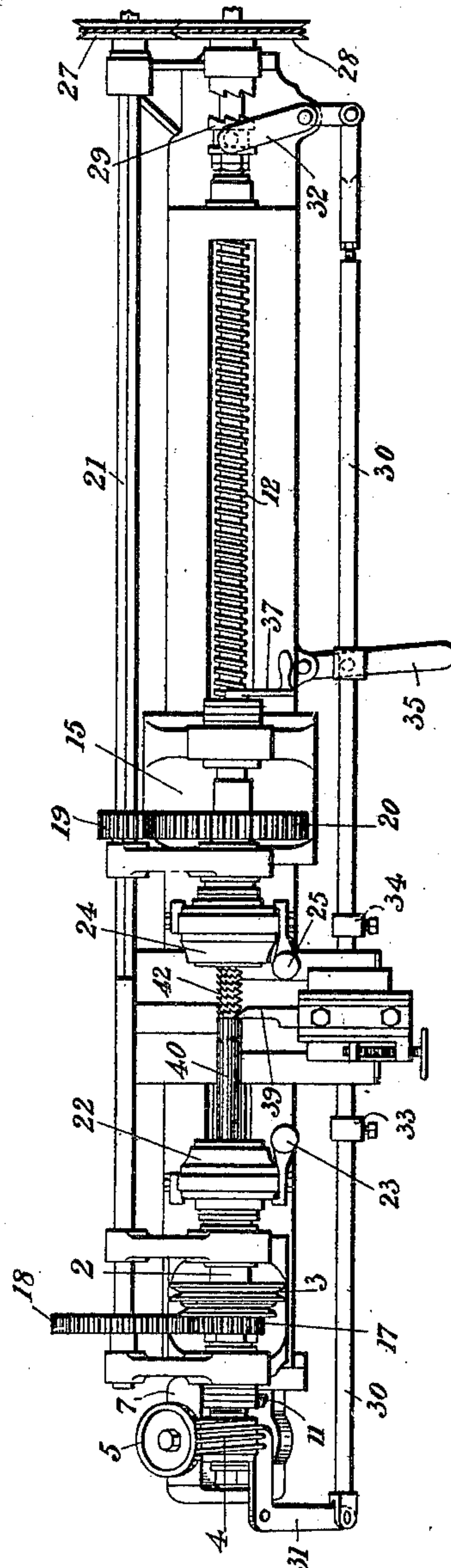


Fig. 2.

WITNESSES.

J. G. Hinkel  
A. E. J. Harnemann.

INVENTOR  
by John Charles Howell  
Foster Freeman  
attorneys

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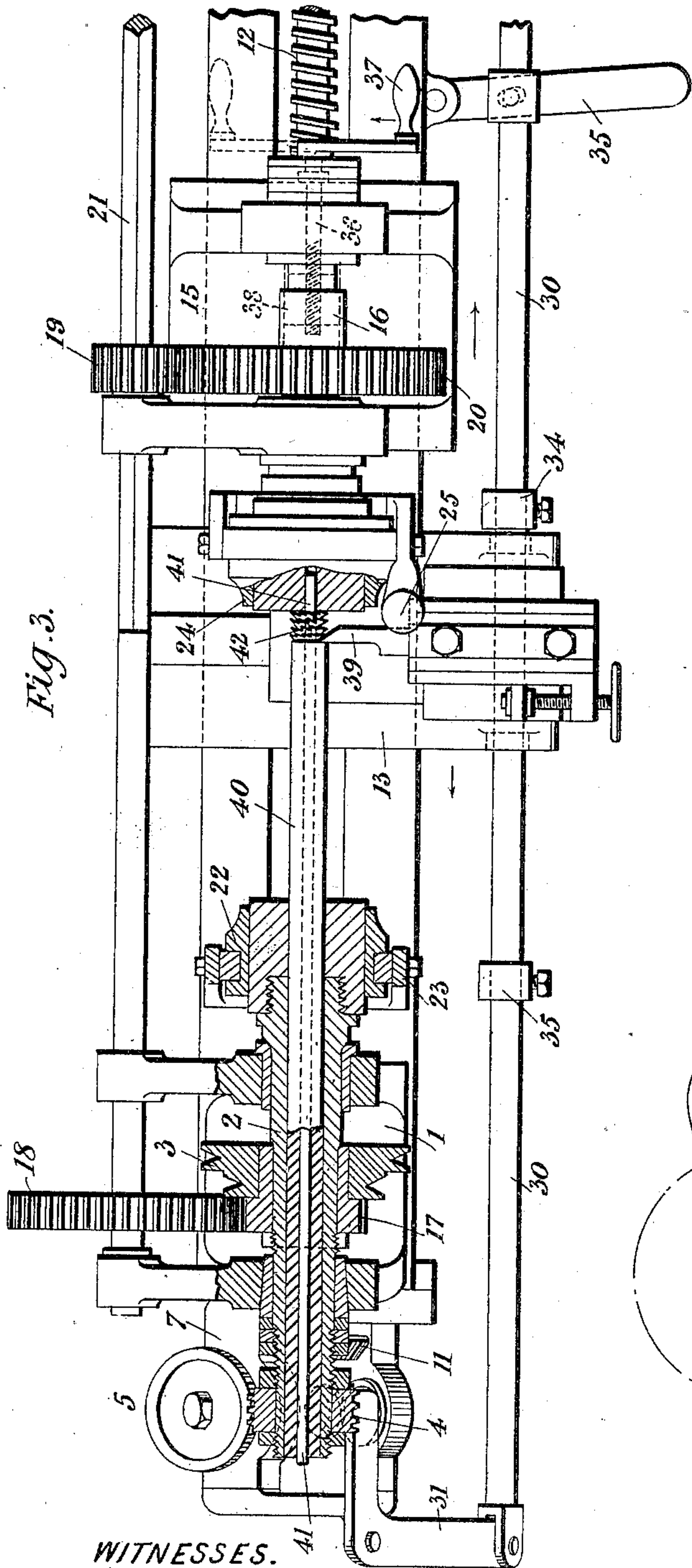


Fig. 3.

Fig. 5.

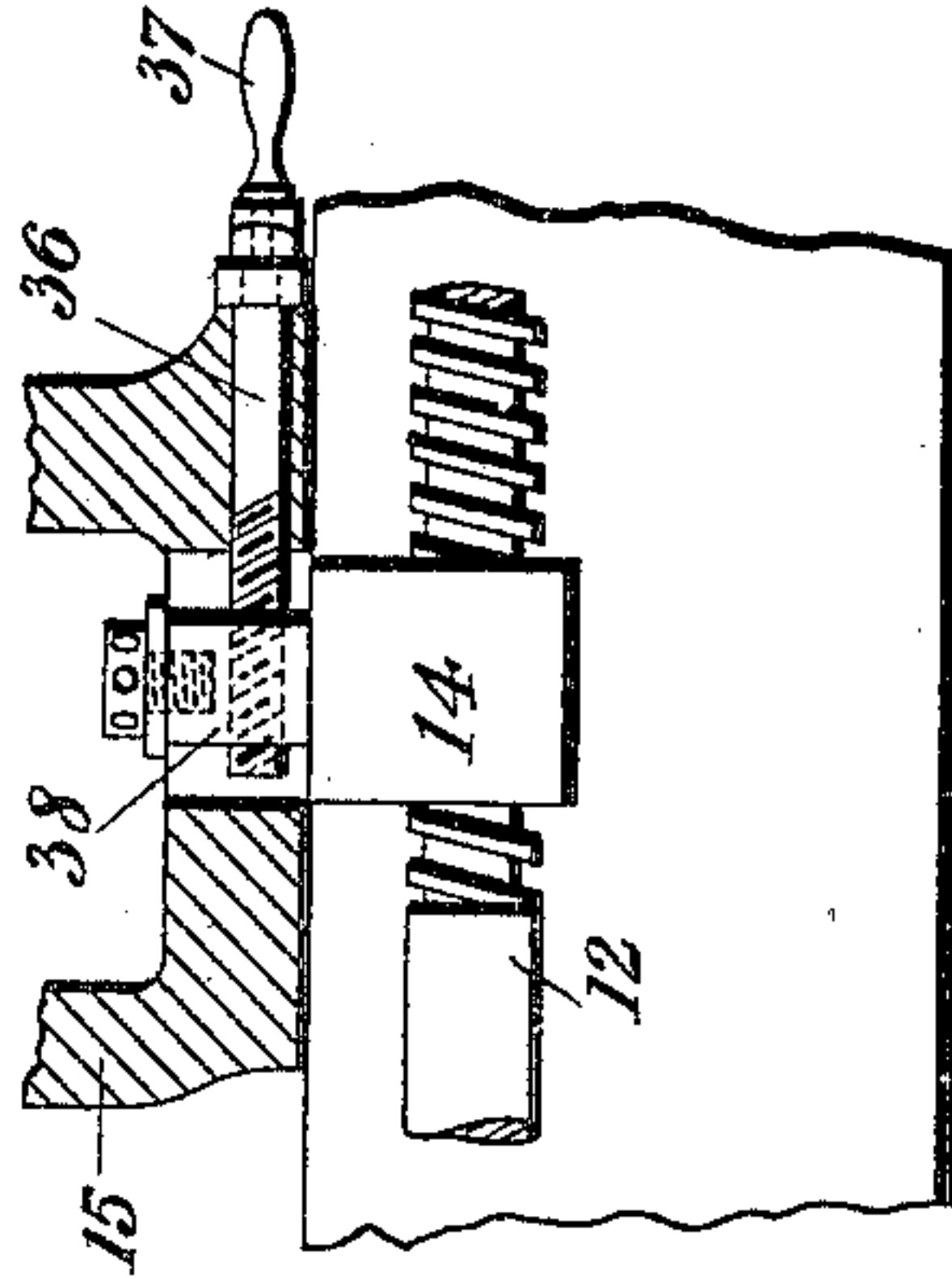
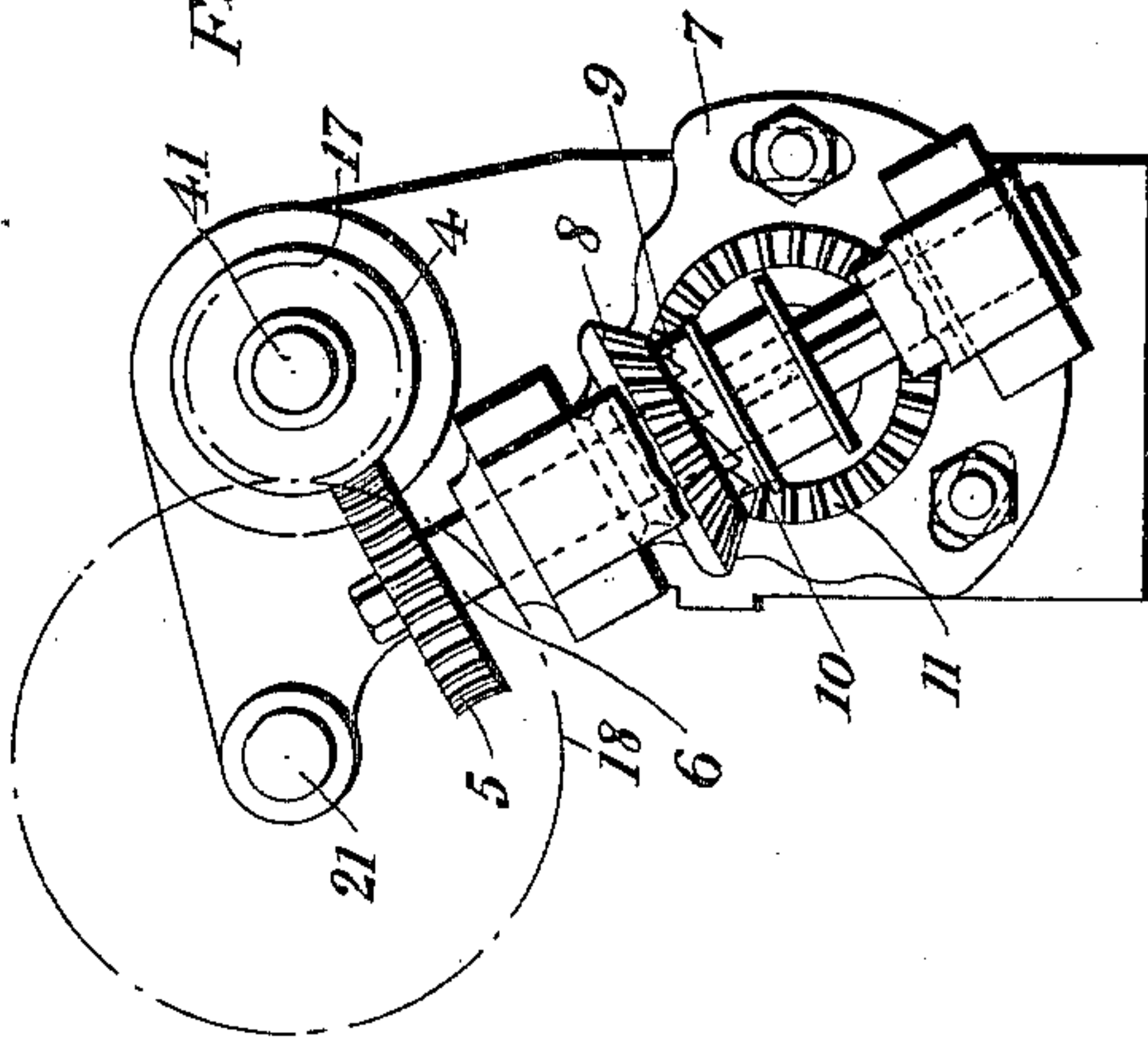


Fig. 4.



WITNESSES.

*J. Hinkel*  
*A. E. S. Hansmann*

INVENTOR.

*John Charles Howell*  
*by Foster S. Sherman*  
*attorneys*



# UNITED STATES PATENT OFFICE.

JOHN CHARLES HOWELL, OF LONDON, ENGLAND, ASSIGNOR TO THE POROUS ACCUMULATOR COMPANY, LIMITED, OF SAME PLACE.

MACHINE FOR MAKING METALLIC RIBBON FOR BATTERY-ELECTRODES.

SPECIFICATION forming part of Letters Patent No. 622,690, dated April 11, 1899.

Application filed January 3, 1899. Serial No. 701,042. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN CHARLES HOWELL, a subject of Her Majesty the Queen of Great Britain, residing at London, England, have invented certain Improved Means for Manufacturing Metallic Ribbon Especially Applicable for Battery-Electrodes, of which the following is a specification.

This invention relates more particularly to means for producing the coiled-metallic-ribbon electrodes referred to in specification of patent application filed the 8th of July, 1898, under Serial No. 685,449.

It is well known that when a suitably-ground slide-rest tool is presented to a piece of metal revolving in a lathe if the tool be caused to advance in a direction parallel to the axis of the revolving metal a long curling shaving will be produced, the section of this shaving depending on the shape of the cutting edges of the tool and the rate of its advance. By substituting a metallic tube for the usual solid revolving metal and placing a tool with a single cutting edge extending from the periphery of the revolving tube to its interior edge the whole of the metallic tube can be converted into a long curled shaving by causing the tube to revolve and the tool to advance at a slow rate in a direction parallel to the axis of the revolving tube. This invention relates to apparatus for so producing and at the same time for gathering up this shaving as fast as it is produced and coiling it upon a mandrel, so that it forms a spiral of as many or fewer turns as were originally required of the tube to produce it. The spiral coils may be so compressed that they do not occupy a very much greater space than the original piece of metal from which they are cut, or they may be extended, so that an air-space separates each individual turn from its neighbor. By causing the spiral to have fewer turns than the number of turns of the tube from which it has been cut the shaving may be bent in and upon itself, so as to become radially crinkled, and this crinkling tends to occupy a portion of the air-space formed between each individual coil when the spiral is so made as to occupy a longer space than the tube from which it has been produced.

In the accompanying drawings, which form part of this specification, Figure 1 is a side elevation of apparatus made in accordance with this invention. Fig. 2 is a plan view of same. Fig. 3 is a plan view, partly in section, on a larger scale, of the main portion of the machine. Fig. 4 is an end elevation showing part of the driving-gear; and Fig. 5 is an elevation, partly in section, of part of the tail-stock and connected parts.

It will be noted that much of the mechanism is simply that of an ordinary lathe and requires little or no description.

In the drawings, 1 represents a mandrel head-stock mounted upon a planed bed supporting the hollow mandrel 2, which is caused to rotate by driving the cone-grooved pulley 3 by any suitable means. On an extension of this mandrel is carried a single pitch-worm 4, which gears into a worm-wheel 5, attached to a spindle 6, supported in a swiveling bracket 7, in order that gears of different sizes may be from time to time employed. Upon this spindle 6 is fixed a loosely-fitting bevel-wheel 8, which can, by means of the claw-clutch 9 10, sliding on a feather on the spindle, be caused to drive the bevel-wheel 11, which is attached to the right and left handed leading-screw 12, which extends the whole length of the machine-bed. If this leading-screw is made with a thread of ten turns to the inch on that portion which operates the feed of the cutting-tool and of two and one-half turns to the inch on the portion which causes the tail-stock to be withdrawn, the result in practical working will be the manufacture of a spiral coil occupying a space of five times the length of metal from which it is cut. To the first-mentioned portion of the leading-screw is attached by the usual form of nut a slide-rest 13, so that it can be caused to travel up and down the bed. To the second portion of the leading-screw, which is threaded in the opposite direction, is attached by a nut the tail-stock 15, supporting the hollow mandrel 16. This mandrel 16 is caused to rotate in a similar direction to the mandrel 2 by means of the toothed wheels 17, 18, 19, and 20, fixed upon the respective mandrels and the back shaft 21, a portion, at least, of such shaft being square, so as to provide for the



rotation of the mandrel 16 independent of the position it may occupy on the machine-bed.

Upon the screw-nose of the mandrel 2 is fixed a three-jaw chuck 22, the movement of the jaws being controlled by the lever 23, and upon the nose of the mandrel 16 is fixed a three-jaw chuck 24, controlled by the lever 25.

The right-hand end of the back shaft 21 is supported by a bracket 26, and upon its end is fixed a grooved wheel 27, gearing, by means of a band, into the wheel 28, loosely fitted onto the end of the leading-screw 12, with which it can be connected by the claw-clutch 29, sliding on a feather on the leading-screw.

Immediately in front of the machine-bed is fixed a sliding rod 30, upon the opposite ends of which, by means of suitable crank-levers 31 and 32, the claw-clutches 9, 10, and 29 can be moved, so that either one can be in gear, but not the two together. Upon this sliding rod 30 are fixed two adjustable stops 33 and 34, so attached that the movement of the slide-rest 13 takes either clutch out of gear. The sliding rod can also be moved by the hand-lever 35.

The tail-stock 15 is capable of a supplementary movement along the bed controlled by a quick-pitch screw 36, attached to the tail-stock 15, so that by half a turn of the handle 37 the tail-stock can be moved about one-half inch in either direction independently of the movement caused by the rotation of the leading-screw 12, this independent movement being permitted by making the upper portion 38 of the nut 14, which enters the tail-stock 15, of less size than the opening in such tail-stock.

The gear-wheels 17, 18, 19, and 20 may have such a number of teeth as to provide for a rotation of the mandrel 16 at one-fifth the rate of rotation of the mandrel 2.

The method of producing a crinkled coil spiral in a machine such as has been described is as follows: The cutting-tool 39 is inserted in the tool-post of the slide-rest 13 and is preferably of a V-section piece of tool-steel, with the top face ground to an angle of approximately sixty degrees with the left-hand side and a front face ground to an angle of approximately forty-five degrees with the side, the tool being accurately adjusted, so that the cutting edge is strictly radial to the axial line of the mandrel-centers. The slide-rest 13 is then brought to the right-hand extremity of its run, this movement bringing the tail-stock, with its chuck 24, approximately within one-half inch of the knife in the slide-rest 13. The metallic tube 40 to be operated upon is now passed through the mandrel 2, so that its right-hand edge touches the knife in the slide-rest 13, and is clamped in this position by moving the lever 23, closing the jaws of the chuck 22. A steel spindle 41, of a diameter slightly less than the bore of the metallic tube 40, is now passed through the back mandrel 16, so that it passes for the desired length of spiral coil up the metallic

tube 40, and is clamped by a movement of the lever 25, controlling the jaws of the chuck 24, on the tail-stock mandrel 16. If the machine be then started and lever-handle 35 moved to the right, it will put the leading-screw 12 into gear, causing the slide-rest 13 to move toward the left and the tail-stock 15 to the right. To cause the first few turns of the metallic ribbon 42 to bind upon the spindle 41 and the chuck 24, this movement of the tail-stock to the right has to be counteracted by a quick movement of the handle 37, which throws the chuck 24 slightly back toward the left, so that the first portion of the ribbon shaving is jammed hard against the face of the chuck and also on the spindle. The metallic tube 40 will now continue to be cut into a shaving, which, as it is very thin, is crinkled as fast as it is produced, owing to the speed of rotation of the spindle being so much less than that of the tube, and the crinkled ribbon is wound upon the retreating spindle until the slide-rest 13 comes in contact with the adjustable stop 33 and moves the sliding rod 30, so that the clutch 9 10 is put out of gear and the movement of the slide-rest ceases and the ribbon is cut off. The handle 37 is now brought back to its original position, thus increasing the retreat of the tail-stock, so that the spindle on moving the lever opening the jaws of the chuck on the tail-stock mandrel can be removed. A movement to the left of the hand-lever 35 now puts the clutch 29 into gear, reversing the motion of the leading-screw, so as to quickly bring both slide-rest and tail-stock into position for starting another cut.

What I claim is—

1. In apparatus for the manufacture of metallic ribbon the combination with mechanism adapted to cut a metal tube of a mandrel having both a rotating and a receding motion with relation to the tube and adapted to collect and spirally wind the ribbon so produced, substantially as described.

2. In apparatus for the manufacture of metallic ribbon the combination with mechanism adapted to cut a metal tube of mechanism adapted to collect, crinkle and spirally wind the ribbon so produced, substantially as described.

3. In apparatus for the manufacture of metallic ribbon the combination with the slide-rest and cutting-tool of a leading-screw and a tail-stock operated by such leading-screw in a reverse direction to the motion of the slide-rest, substantially as described.

4. In apparatus for the manufacture of metallic ribbon the combination with the slide-rest and cutting-tool of a leading-screw, a tail-stock operated in reverse direction to the slide-rest by such leading-screw and means whereby a slight independent movement may be imparted to the tail-stock, substantially as described.

5. In apparatus for the manufacture of metallic ribbon the combination with the chuck



carrying the material to be operated upon of  
a slide-rest, a mandrel carried by the tail-  
stock, gearing operating the chuck carrying  
the material to be operated on, and also the  
5 mandrel, and a leading-screw operating the  
slide-rest and the tail-stock in opposite direc-  
tions, substantially as set forth.

6. In apparatus for the manufacture of me-  
tallic ribbon the combination with the chuck  
10 carrying the material to be operated upon and  
of the mandrel upon which the ribbon is to  
be collected, of gearing operating said chuck  
and mandrel, a leading-screw, a slide-rest and

a tail-stock operated by said screw, a rod op-  
erated by the slide-rest and adapted to throw 15  
the leading-screw out of gear with the chuck  
and reversing-gear to enable the slide-rest  
and tail-stock to be reset in starting position,  
substantially as set forth.

In testimony whereof I have hereunto set 20  
my hand in the presence of two subscribing  
witnesses.

JOHN CHARLES HOWELL.

Witnesses:

PHILIP M. JUSTICE,

ALLEN PARRY JONES.