No. 684,946. Patented Oct. 22, 1901.

J. H. O'DONNELL.

WIRE DRAWING AND SPOOLING MACHINE.

(Application filed Apr. 27, 1901.)

(No Model.) 4 Sheets—Sheet 1.

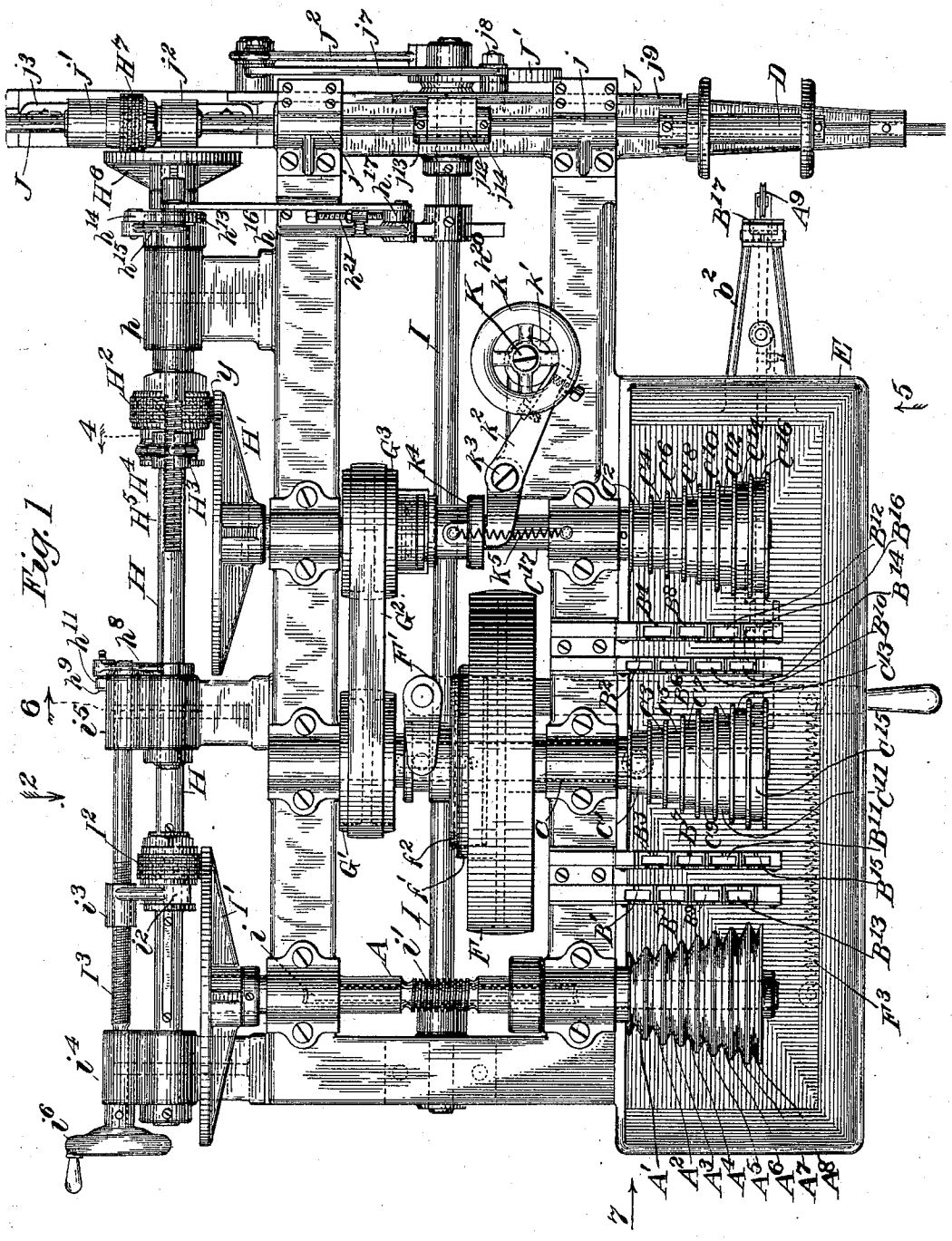


Fig. 1

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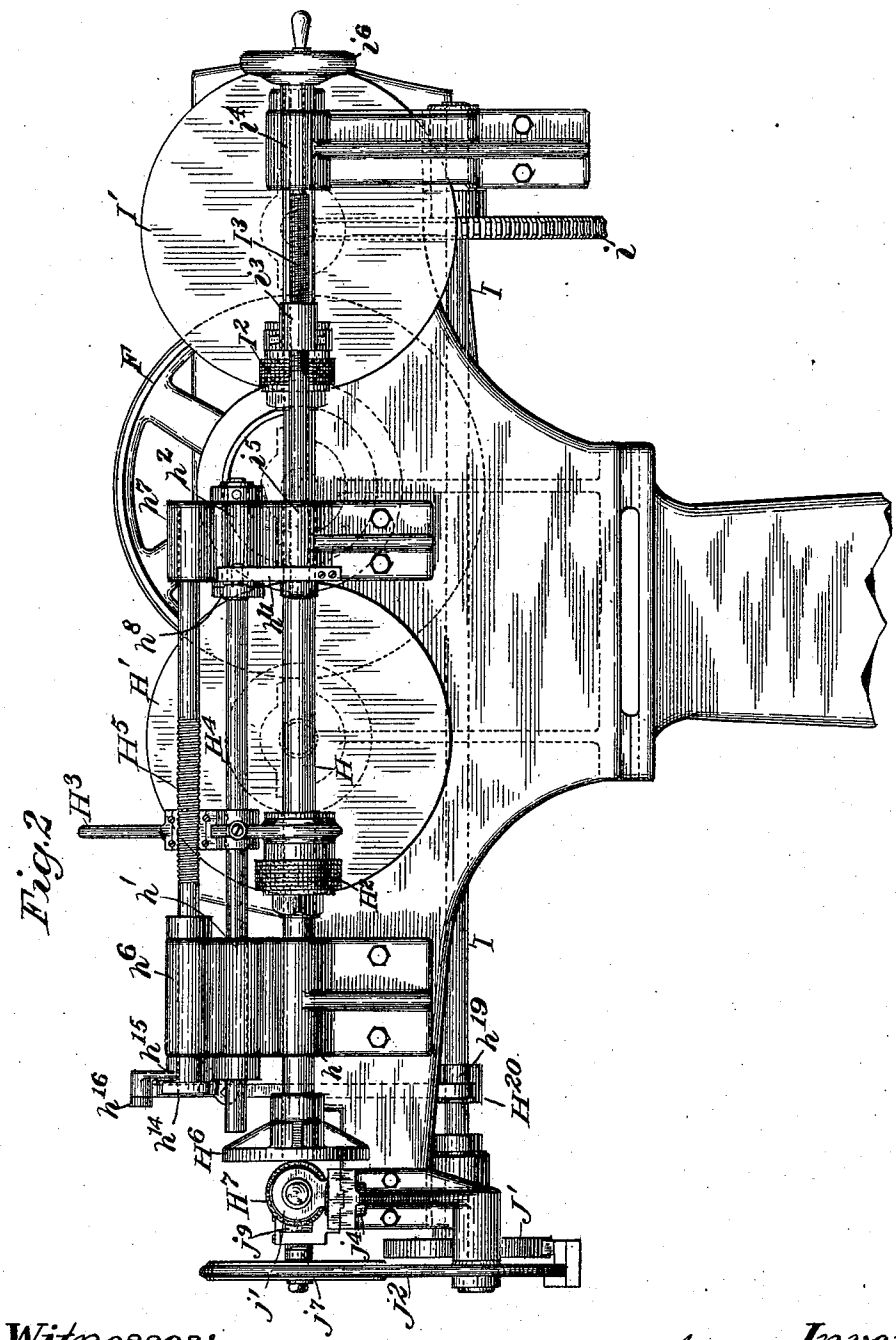


Fig. 2

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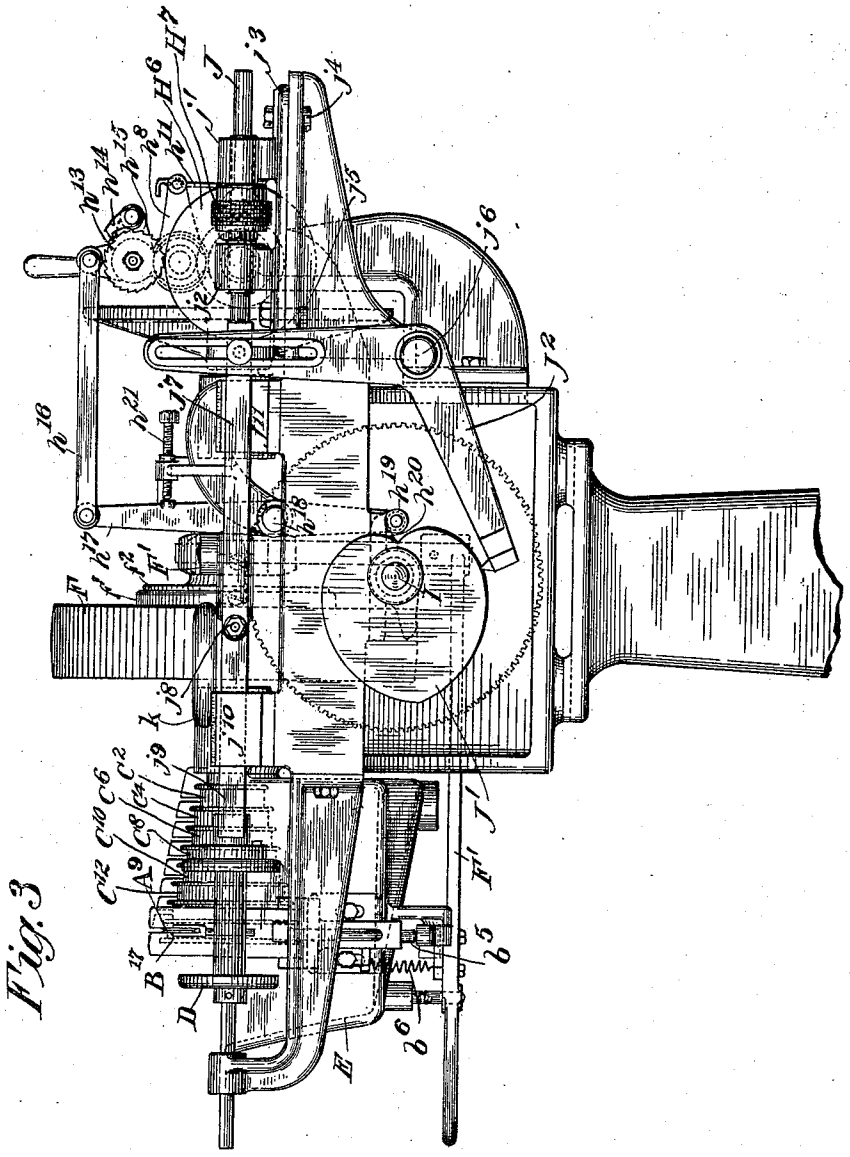


Fig. 3

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(No Model.) 4 Sheets—Sheet 4.

Fig. 5

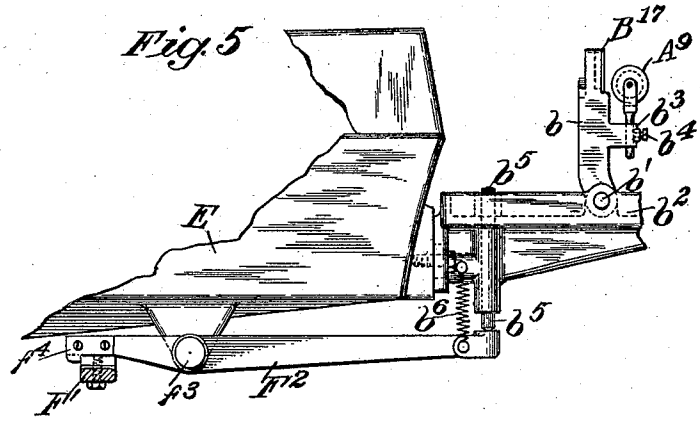


Fig. 4

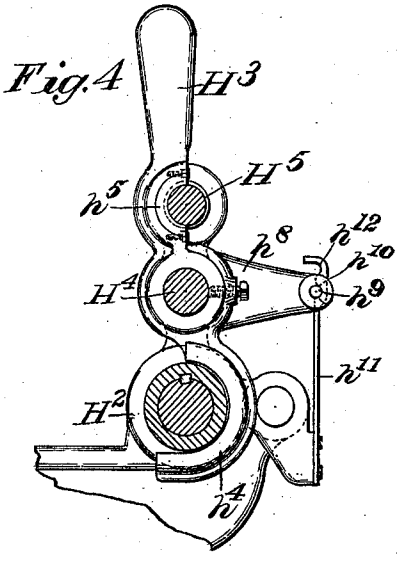
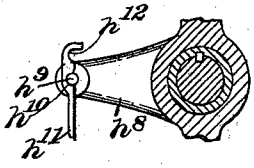


Fig. 6



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UNITED STATES PATENT OFFICE.

JOHN H. O'DONNELL, OF WATERBURY, CONNECTICUT, ASSIGNOR TO THE WATERBURY MACHINE CO., OF WATERBURY, CONNECTICUT, A CORPORATION OF CONNECTICUT.

WIRE DRAWING AND SPOOLING MACHINE.

SPECIFICATION forming part of Letters Patent No. 684,946, dated October 22, 1901.

Application filed April 27, 1901. Serial No. 57,678. (No model.)

To all whom it may concern:

Be it known that I, JOHN H. O'DONNELL, of Waterbury, New Haven county, State of Connecticut, have invented a new and useful Improvement in Wire Drawing and Spooling Machines, of which the following is a specification.

This improvement relates to a machine for drawing wire and for winding it upon a spool after it leaves the last drawing-die.

A machine embodying the improvement will be described, and afterward the novel features will be pointed out in the claims.

In the accompanying drawings, Figure 1 is a plan or top view of a machine embodying the improvement with a tank-cover omitted. Fig. 2 is a side elevation of the same looking in the direction indicated by the arrow 2 marked adjacent to Fig. 1. Fig. 3 is an elevation of that end where the wire after having been drawn is wound upon a spool. In this figure the tank-cover is omitted. Fig. 4 is a vertical detailed section taken at the plane of the dotted line 4 adjacent to Fig. 1 and looking in the direction indicated by the arrow marked at the end of said dotted line. Fig. 5 is a vertical detailed elevation of a certain part in section, the plane of the section being indicated by the dotted line 5 adjacent to Fig. 1. Fig. 6 is a sectional elevation taken at the plane of the dotted line 6 adjacent to Fig. 2 and looking in the direction of the arrow at the end of said line.

Similar letters of reference designate corresponding parts in all the figures.

The wire to be drawn enters the machine in a direction indicated by the arrow 7 adjacent to Fig. 1. It passes thence over a guide-roll A′, which is loosely mounted upon a shaft A. Leaving this guide-roll the wire passes to the first drawing-die B′. Thence it passes to and around a drawing head or roll C′. Next it passes to a drawing-die B^2. Thence it passes around a drawing head or roll C^2, and returns back to a guide-roll A^2, loosely mounted upon the shaft A. Next it passes to a drawing-die B^3, thence around a drawing roll or head C^3, thence through a drawing-die B^4, and afterward around a drawing head or roll C^4. Then it passes backward to and around a guide-roll A^3, loosely mounted upon the shaft A. From the guide-roll A^3 it passes to a drawing-die B^5, and thence around a drawing head or roll C^5, next through a drawing-die B^6, and thence around a drawing head or roll C^6. It then returns and passes around a guide-roll A^4, loosely mounted upon the shaft A. It passes thence through a drawing-die B^7, then around a drawing head or roll C^7, next through a drawing-die B^8, and afterward around a drawing head or roll C^8. It then returns and passes around a guide-roll A^5, loosely mounted on the shaft A. Passing forward again it runs through a drawing-die B^9, then around a drawing head or roll C^9, then through a drawing-die B^{10}, and afterward around a drawing head or roll C^{10}. Returning it passes around a guide-roll A^6, mounted loosely upon the shaft A. Passing thence forwardly, it runs through a drawing-die B^{11}, passes thence around a drawing head or roll C^{11}, thence through a drawing-die B^{12}, and thence around a drawing head or roll C^{12}. Next it returns and passes around a guide-roll A^7, loosely mounted upon the shaft A. It then passes forwardly through a drawing-die B^{13}. Thence it passes around a drawing head or roll C^{13}. Next it passes through a drawing-die B^{14}. Afterward it passes around a drawing head or roll C^{14}, and then it returns and passes around a guide-roll A^8, loosely mounted upon the shaft A. Leaving that roll, it passes through a drawing-die B^{15}, thence around a drawing head or roll C^{15}, thence through a drawing-die B^{16}, and afterward around a drawing head or roll C^{16}. Leaving the latter, it passes through a drawing-die B^{17} and over a guide-roll A^9 to a spool D. All the guide-rolls A′ A^2 A^3 A^4 A^5 A^6 A^7 A^8, which are loosely mounted upon the shaft A, so as to be free to turn independently thereof, are preferably grooved circumferentially, as shown. The drawing rolls or heads C′ C^2 C^3 C^4 C^5 C^6 C^7 C^8 C^9 C^{10} C^{11} C^{12} C^{13} C^{14} C^{15} C^{16} are preferably flanged. The drawing heads or rolls C′ C^3 C^5 C^7 C^9 C^{11} C^{13} C^{15} are affixed to a shaft C, so as to rotate therewith. The drawing rolls or heads C^2 C^4 C^6 C^8 C^{10} C^{12} C^{14} C^{16} are all affixed to a shaft C^{17} to rotate therewith. The surface speed of the drawing heads or rolls C^2 C^4 C^6 C^8 C^{10} C^{12} C^{14} C^{16} is of course

to be greater than that of the drawing heads or rolls C′ C^3 C^5 C^7 C^9 C^{11} C^{13} C^{15}. The drawing heads or rolls, the guide-rolls, and the dies are all arranged within a tank E, containing lubricating and cooling liquid. The tank has a cover which will provide for total immersion of all the parts.

The machine is driven by means of a belt applied to a main driving-pulley F, which is loosely mounted upon the shaft C and connected thereto by a clutch. Preferably this belt will derive motion from a pulley operating with a gradually-increasing speed—as, for instance, an expanding pulley. With the use of such a pulley obviously a long belt and a belt-tightener must be provided to compensate for the varying size of the pulley. One part of the clutch f' is formed integral with the pulley and the other part f^2 is connected to the shaft C, by means of a spline or feather, so as to be incapable of independent rotation, but so as to be free to slide lengthwise. A bell-crank clutch-lever F′ has one of its arms forked to engage with a circumferential groove in the hub of the part f^2 of the clutch. Normally the position of the lever F′ is that indicated in Fig. 1, and it is held in such position by a catch-lever F^2, fulcrumed to a pin f^3, supported by a bracket on the under side of the tank E, as shown in Fig. 5. With this catch-lever F^2 are combined means for depressing the forward end. Whenever the forward end is depressed, the rear end rises far enough to disengage a hook f^4, with which it is provided, from the bell-crank clutch-lever F′. Whenever the clutch-lever is released, a spring F^3 swings it in such a direction as to disengage the part f^2 of the clutch from the part f' of the clutch, whereupon the main driving-pulley F ceases to transmit motion to the shaft C. The spring F^3 is fastened at one end to the under side of the tank E and at the other end to the clutch-lever. Whenever the machine is to be started, the main arm of the clutch-lever is moved forwardly against the resistance of the spring F^3 until engaged by the catch-lever F′. By this movement the parts of the clutch will be engaged, and thereafter they will be held in engagement, so that rotary motion will be transmitted from the main driving-pulley F to the shaft C.

Affixed to the shaft C is a belt-pulley G′, whence motion is transmitted by a belt G^2 to a pulley G^3, which is affixed to the shaft C^{17}. The shaft C^{17} has affixed to it a friction-disk H′, whose flat face engages with the periphery of a friction-pinion H^2, mounted upon a shaft H. This shaft H is supported in bearings h, so as to be free to rotate. The pinion H^2 is free to slide lengthwise of the shaft H, but is engaged with it by means of a spline or feather, so that it will transmit rotary motion to that shaft. By sliding the pinion lengthwise of the shaft it will be made to engage with the flat face of the disk H′ nearer to or farther from the axis of the latter, so that the shaft H will be rotated at a constantly-decreasing speed. A convenient means for sliding the pinion H^2 along the shaft H toward the axis of the disk H′ consists of a lever H^3, fastened to a shaft H^4 and supported in bearings h' h^2 so as to be free to rock and also to slide in said bearings. This lever h^3 may be fastened to the shaft h^4 by means of a set-screw h^3. The lever H^3 is provided with a ribbed segment h^4, adapted to engage with a peripheral groove in the hub of the pinion H^2, and it is also provided with a screw-threaded segment h^5, which is adapted to engage with a screw H^5, supported in bearings h^6 h^7, so as to be capable of rotary movement. The segments h^4 h^5 of the lever H^3 are reversed. When the lever is rocked in one direction, the segment h^5 will be disengaged from the screw. This will not, however, disengage the segment h^4 from the collar of the friction-pinion H^2, because the segment h^4 engages with a groove in the collar of the friction-pinion H^2 of greater depth than the depth of the thread of the screw H^5. When the lever is rocked in the reverse direction, the segment h^5 again engages with the screw H^5. The lever is held in either position by means of an arm h^8, affixed to the shaft H^4 and provided with a pin h^9, which when the lever is in operative position coacts with a notch h^{10} in a spring-detent h^{11}, but which when the lever is in an inoperative position will engage with a notch h^{12} in said spring-detent h^{11}.

While the lever H^3 is in engagement with the screw H^5 and the friction-pulley H^2 the rotary motion of the screw transmitted through the lever H^3 by means of the screw-threaded segment h^5 of the latter will cause a sliding movement of the friction-pulley H^2 toward the axis of the friction-disk H′. This movement is to compensate for the increasing diameter of layers of wire wound upon the spool D.

Rotary motion is imparted to the screw H^5 by means of a ratchet-wheel h^{13}, affixed to said screw and actuated by a pawl h^{14}. This pawl is pivotally connected to one arm of an elbow pawl-lever h^{15}. The other arm of the pawl-lever is connected by a rod h^{16} with a lever h^{17}, fulcrumed to a stud h^{18}, and at the lower end provided with an antifriction-roller h^{19}, coacting with a cam h^{20}, the latter being affixed to a shaft I, journaled in bearings in end pieces of the machine-frame. Any suitable spring may be employed for causing the lever h^{17} to move toward the axis of the cam h^{20}. The motion of the lever h^{17} toward the axis of the cam is limited, as may be desired, by means of a stop-screw h^{21}. Obviously by adjusting this screw the amount of feed given to the pawl h^{14} can be varied.

The spool-holding devices are affixed to a shaft J, supported in bearings j, so as to be capable not only of rotating, but of sliding longitudinally. The rotary movement is for the purpose of causing the winding of wire upon the spool D and the longitudinal move-

ment is to give the spool a traverse which will cause the wire to be wound in coils side by side and layer for layer in the same manner. The rotary movement of the shaft J is derived from the shaft H by means of a friction-disk H^6, affixed to the shaft H, and a friction-pinion H^7, combined with the shaft J by means of a spline or feather, so that it will not interfere with the sliding movement of the latter. To prevent the friction-pinion from sliding with the shaft J, it is held between two bearings j' j^2, through which said shaft passes. These bearings extend from the base j^3, which is supported upon the main frame of the machine in such manner as to be free to slide in the direction of the length of the shaft J for the purpose of adjusting the friction-pinion H^7 toward and from the axis of the friction-disk H^6 to provide for varying the rotary speed of the shaft J suitably for spooling wires of different sizes.

Fig. 2 shows the base j^3 of the bearings j' j^2 as provided on its under side with a tongue fitting a groove formed in the upper side of the contiguous part of the main frame of the machine.

In Fig. 1 the base j^3 is shown as longitudinally slotted, and in this figure and also in Fig. 3 there are shown bolts j^4 j^5 for clamping the base j^3 in position.

The longitudinal motion of the shaft J is produced by a heart-shaped cam J', coacting with an elbow-lever J^2, fulcrumed upon a stud j^6, extending from the main frame of the machine. The lower arm coacts with the cam and may be held in engagement therewith by any suitable spring. The upper arm has connected to it a rod j^7, and to provide for varying the extent of traverse of the spool D the upper arm of the lever J^2 is preferably longitudinally slotted and has the rod j^7 connected to it by means of a screw-bolt, so that the point of connection may be varied at will. The rod j^7 is connected by a screw or bolt j^8 to a slide-bar j^9, working in bearings j^{10} j^{11}. This slide-bar is connected to a block j^{12}, which surrounds the shaft J and is secured in position thereon by collars j^{13} j^{14}.

The shaft I has affixed to it a worm-wheel i, Figs. 1 and 2, engaging with a worm i', affixed to the shaft A. The shaft A has affixed to it a friction-disk I', which derives motion from a pinion I^2, combined with the shaft H by means of a spline or feather, so as to derive rotary motion therefrom, but so as to be free to slide lengthwise on said shaft toward and from the axis of the friction-disk I'. The hub of the friction-roll is provided with a circumferential groove, with which engages a collar i^2, extending from a nut i^3, surrounding a screw I^3, which is journaled in bearings i^4 i^5 and is capable of being rotated by a hand-wheel i^6. By adjusting the friction-pinion I^2 relatively to the axis of the friction-disk I' the rotary motion of the shaft I may be changed to vary the rapidity of the traverse motion of the spool D and the rapidity of the variation in the rotation of the spool, compensating for the increasing diameter of the layers of wire wound upon the spool.

As already indicated, the relation of the rotary speed of the shaft J to that of the shaft H may be varied by adjusting the friction-pulley H^7 by hand.

K designates a vertical shaft provided at its upper end with a hand-wheel k and having affixed to it an eccentric k', which coacts with a lever k^2, affixed to a stud k^3 and having one arm made to embrace the shaft C^{17} and coact with a collar k^4, affixed thereto. By rotating the shaft K in one direction its eccentric k' will move the shaft C^{17} in such direction as to force the friction-disk H' in contact with the friction-pinion H^2. This will be necessary for the starting of the machine. After the winding of a spool D the shaft K will be rotated in such direction as to release the friction-disk H' from the friction-pinion H^2, whereupon a spring k^5 will move the shaft C^{17} in such direction as to disengage its friction-disk H' from the friction-pinion H^2. The longitudinal movement of the shaft C^{17} will be very slight.

The last drawing-die B^{17} is supported in a holder b, made in the form of an upright arm, pivoted at its lower end by a pin b' to a fixed platform b^2. The guide-roll A^9 is supported upon a bracket b^3, extending from the die-holder b and transversely to the length of the latter. As here shown, the guide-roll A^9 is journaled in a bracket provided with a shank passing through the bracket b^3 and fastened therein by a set-screw b^4. During the operation of the machine the forward movement of the wire will sustain the die-holder b in an upright position; but if the wire breaks the die-holder b will fall rearwardly, because the pin b' is forward of the center of gravity of this die-holder. Upon falling rearwardly the die-holder b will fall on the upper end of a vertical pin b^5, the lower end of which contacts with the catch-lever F^2. Thus the forward arm of the catch-lever F^2 will be depressed against the resistance of a spring b^6, which normally holds it in a raised position. As already stated, this depression will cause the disengagement of the rear arm of the catch-lever from the clutch-lever F', so that the latter may cause the stoppage of the machine.

What I claim as new, and desire to secure by Letters Patent, is—

1. The combination with a wire-drawing machine of spooling mechanism, a friction-pinion H^2, means for shifting said friction-pinion axially, a friction-disk H' affixed to a longitudinally-movable shaft, and means consisting of a lever and eccentric for causing longitudinal movement of said shaft.

2. The combination with a wire-drawing machine of a spool-holder, means for rotating the spool-holder for winding wire upon a

spool and means for giving the spool-holder a traverse movement, said means comprising variable-speed gearing whereby the speed of the traverse movement may be varied.

3. The combination with a wire-drawing machine of a spool-holder, means for rotating the spool-holder for winding wire upon a spool and means for giving the spool-holder a traverse movement, said means comprising variable-speed gearing and devices for gradually shifting one gear with reference to the other.

4. The combination with a wire-drawing machine of a spool-holder, means for rotating the spool-holder for winding wire upon a spool and means for giving the spool-holder a traverse movement, said means comprising variable-speed gearing consisting of a friction-disk and a friction-pinion, with means for adjusting the pinion relatively to the axis of the friction-disk.

5. The combination with a wire-drawing machine of a spool-holder, means for rotating the spool-holder for winding wire upon a spool, and means consisting of a shaft J for producing a longitudinal movement of the spool-holder, a lever J^2 connected to said shaft and a cam J', substantially as set forth.

6. The combination with a wire-drawing machine of a spool-holder, means for rotating the spool-holder for winding wire upon a spool, and means consisting of a shaft J a lever J^2 connected to said shaft, a cam J', a friction-disk I', a friction-pinion I^2 for producing a longitudinal movement of the spool-holder, and means for shifting the friction-pinion relatively to the axis of the friction-disk.

7. In a wire-drawing machine the combination of a drawing-die, a holder for said die supported so as to be free to fall backward when relieved from tension induced by the forward movement of wire through the die, and means actuated by said die-holder and serving to stop the machine.

8. In a wire-drawing machine the combination of a drawing-die, a holder for said die supported so as to be free to fall backward when relieved from tension induced by the forward movement of wire through the die, and means actuated by said die-holder to disengage the clutch-lever and thereby stop the machine.

9. In a wire-drawing machine the combination of a drawing-die, a holder for said die supported so as to be free to fall backward when relieved from tension induced by the forward movement of wire through the die, a pin actuated by said die-holder, a catch-lever oscillated by said pin and a clutch-lever controlled by said catch-lever.

10. The combination with a wire-drawing machine of a spool-holder, means for rotating the spool-holder for winding wire upon a spool, means comprising a cam and cam-lever for producing a traverse of said spool-holder, and an adjustable connection between said lever and the spool-holder whereby the amplitude of the traverse movement may be varied.

11. The combination with a wire-drawing machine of a spool-holder, means for rotating the spool-holder for winding wire upon a spool, means comprising a cam and a cam-lever for producing a traverse of said spool-holder, a connecting-rod between said lever and the spool-holder, and devices whereby the connecting-rod may be fastened to the lever at different distances from the fulcrum of the latter whereby the amplitude of the traverse movement may be varied.

12. The combination with a wire-drawing machine, of spooling mechanism comprising variable-speed gearing, and means automatically operated for shifting one gear relatively to the other.

13. The combination with a wire-drawing machine of spooling mechanism comprising variable-speed gearing, means for shifting one gear relatively to the other, and other variable-speed gearing for regulating the action of said speed-shifting means.

14. The combination with a wire-drawing machine, of spooling mechanism comprising variable gearing for rotating it, means for shifting one gear relatively to the other, other variable-speed gearing for regulating said shifting means and a mechanism operated from said second-mentioned variable-speed gearing for moving the spool-holder of the spooling mechanism longitudinally.

15. The combination with a wire-drawing machine, of spooling mechanism, and means comprising variable-speed gearing consisting of a friction-pinion H^2, means for shifting said friction-pulley axially, a friction-disk H' affixed to a longitudinally-movable shaft and means for positively moving said shaft to bring the disk H' into and out of contact with the pinion H^2.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOHN H. O'DONNELL.

Witnesses:
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ROGER S. WOTKYNS.