(No Model.) 8 Sheets—Sheet 1.

J. KEATS.

MACHINE FOR WINDING THREAD UPON STAR SHAPED HOLDERS.

No. 543,185. Patented July 23, 1895.

FIG. 5.

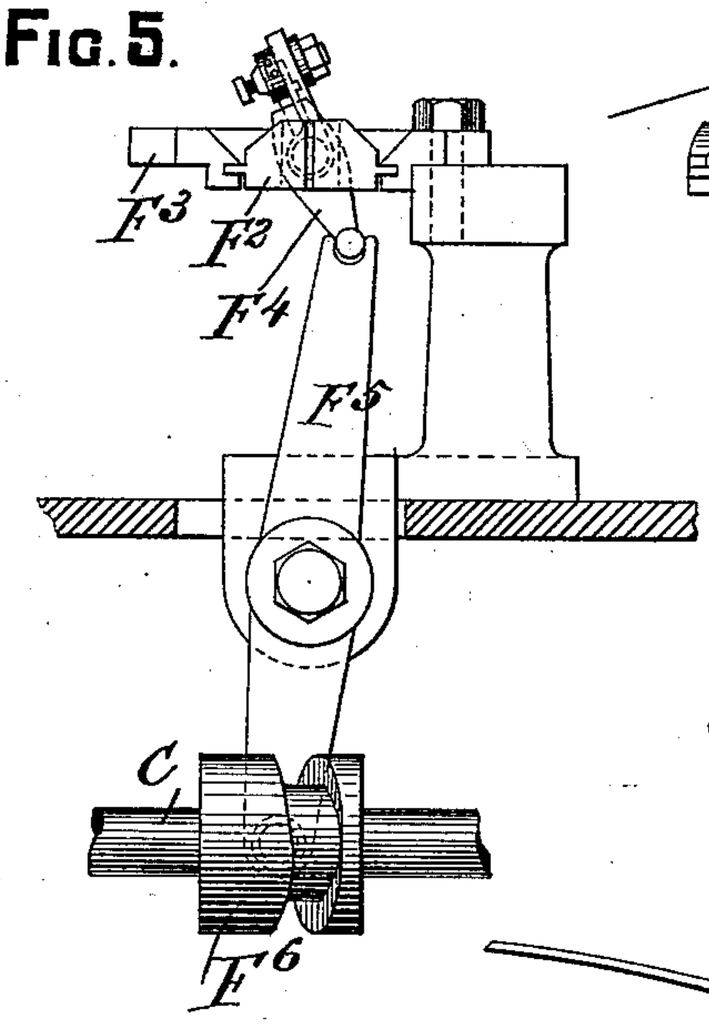


FIG. 6.

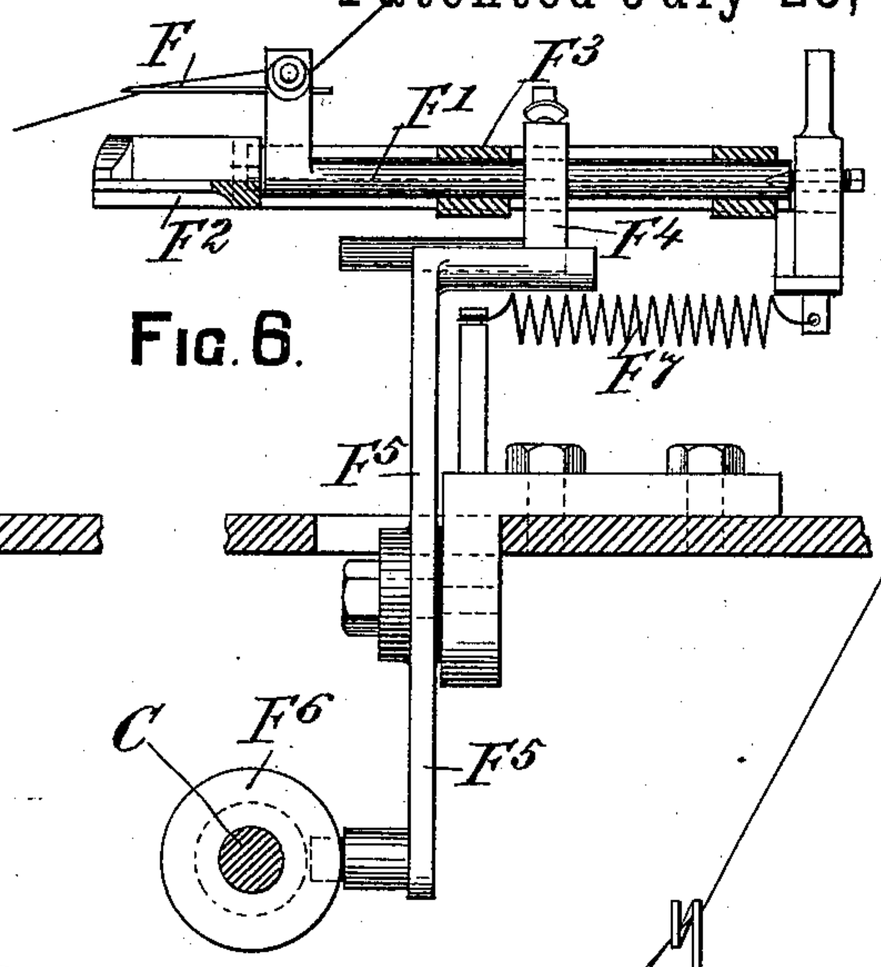
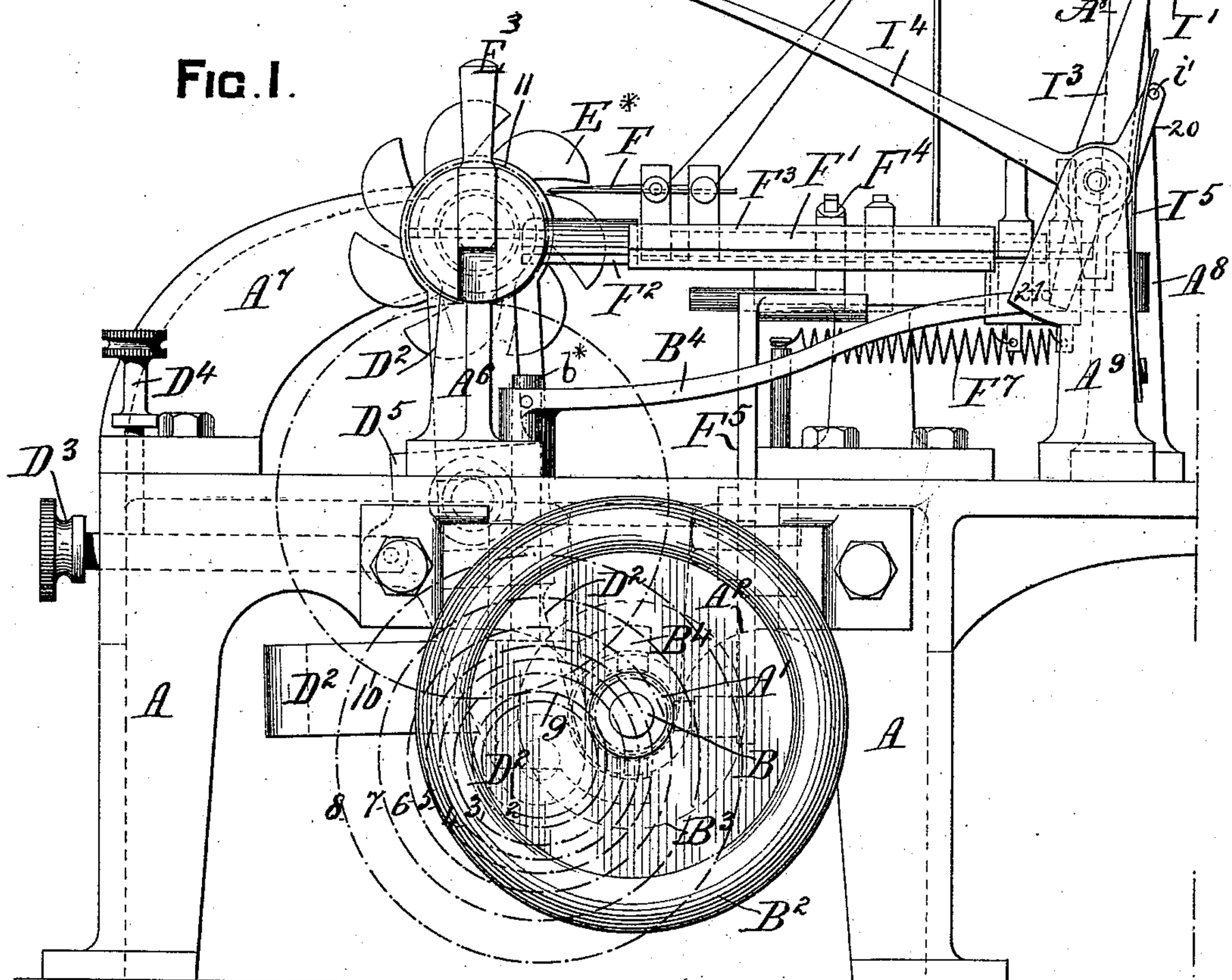


FIG. 1.



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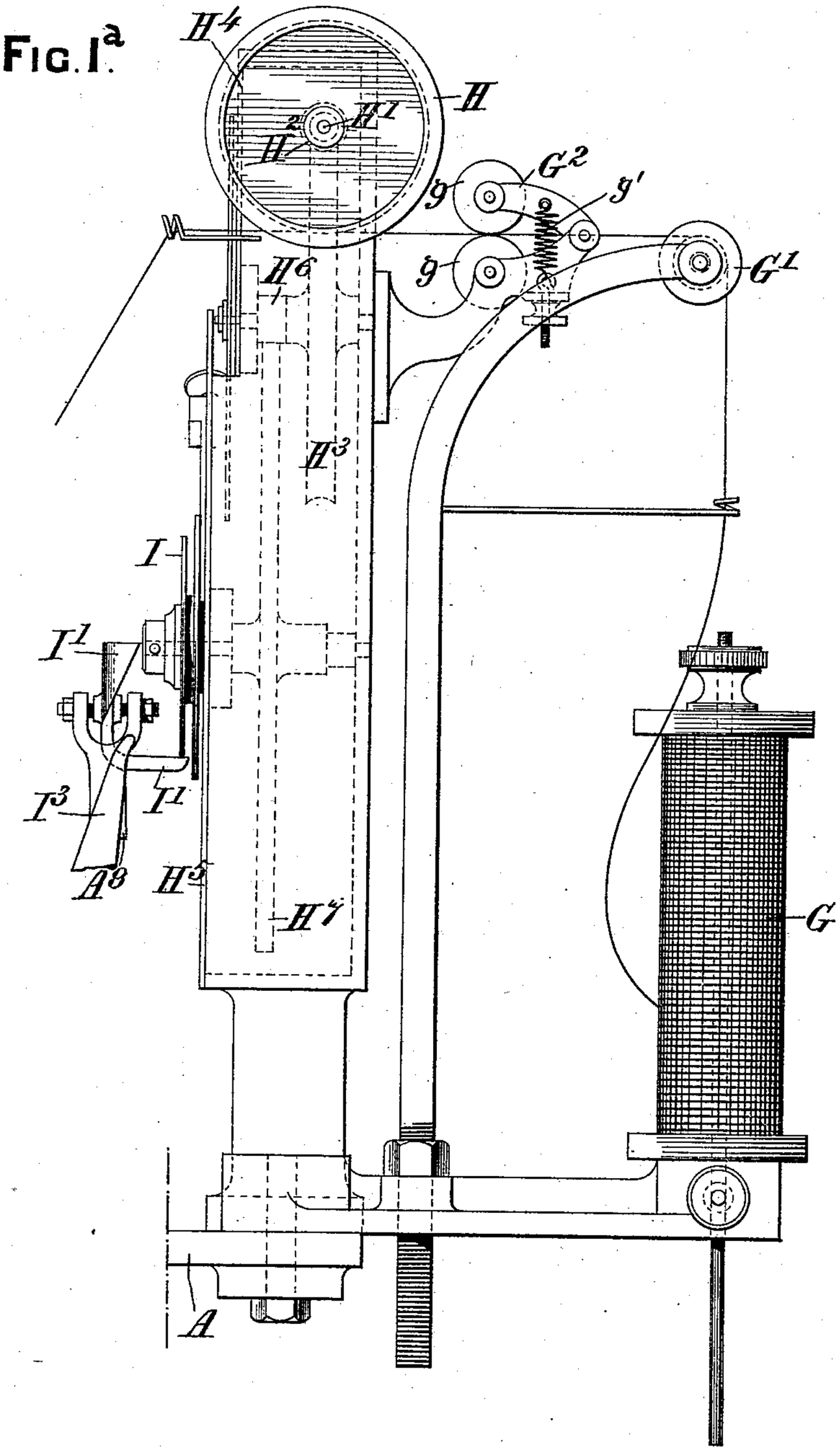
MACHINE FOR WINDING THREAD UPON STAR SHAPED HOLDERS.

No. 543,185. Patented July 23, 1895.

FIG. 1ª.



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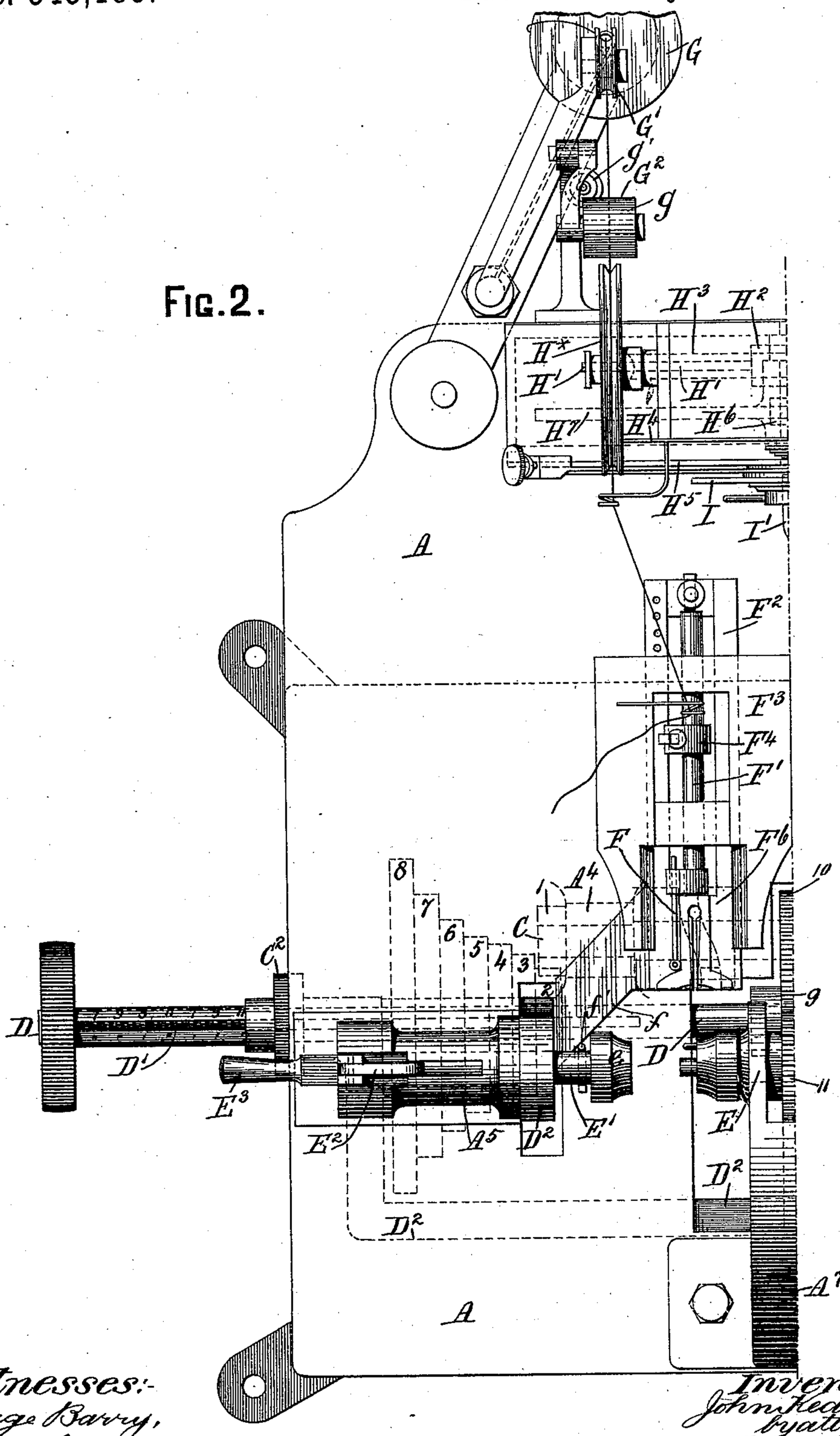
MACHINE FOR WINDING THREAD UPON STAR SHAPED HOLDERS.

No. 543,185. Patented July 23, 1895.

FIG. 2.



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MACHINE FOR WINDING THREAD UPON STAR SHAPED HOLDERS.

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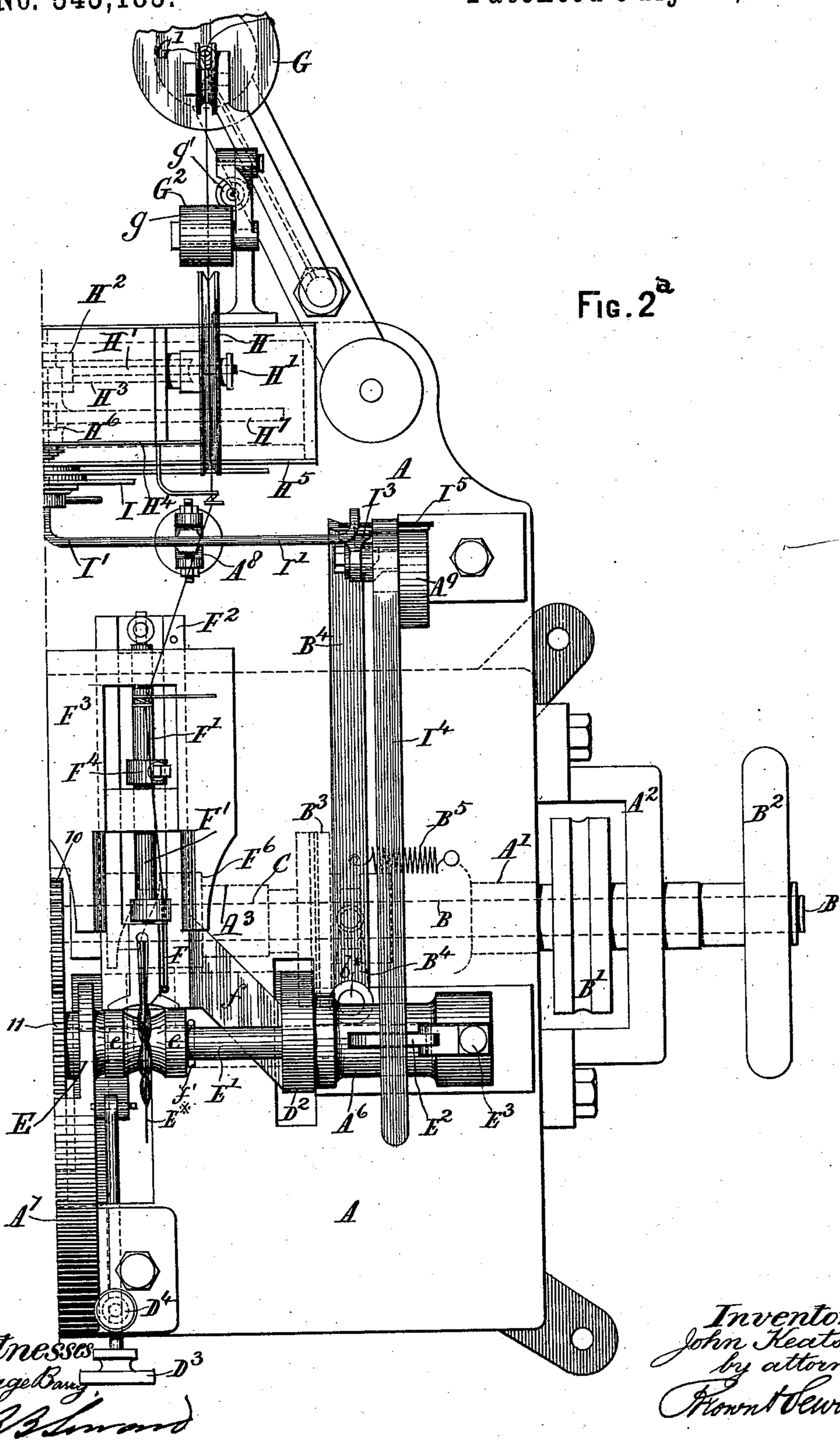

Fig. 2a

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MACHINE FOR WINDING THREAD UPON STAR SHAPED HOLDERS.

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FIG. 3.

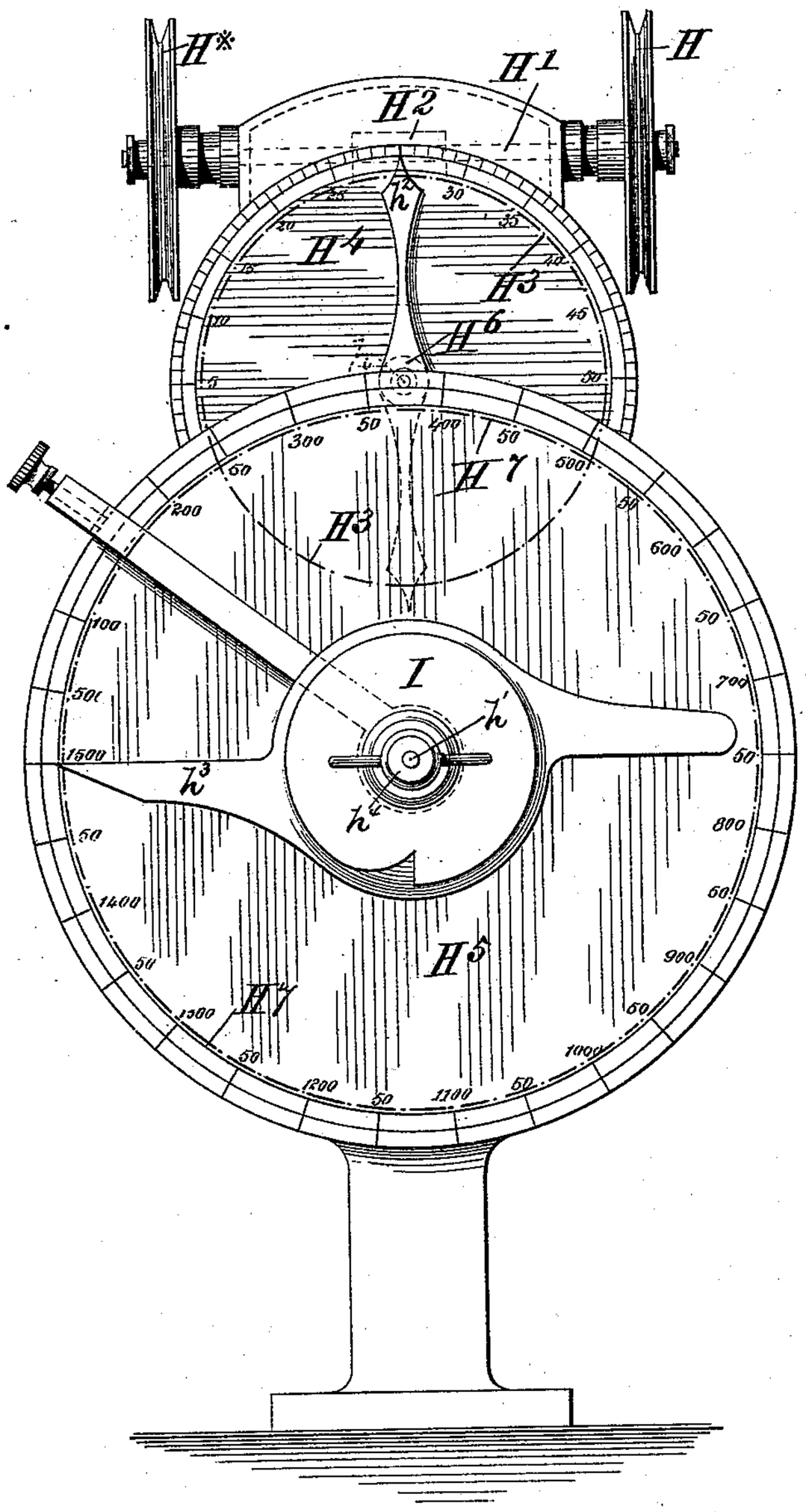
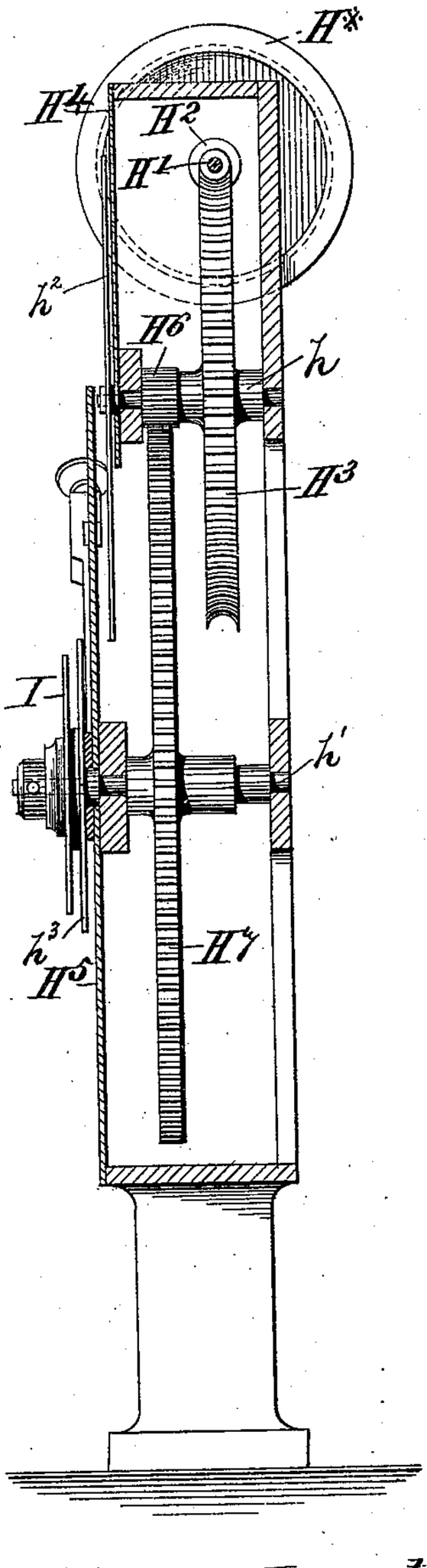


FIG. 4.



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MACHINE FOR WINDING THREAD UPON STAR SHAPED HOLDERS.

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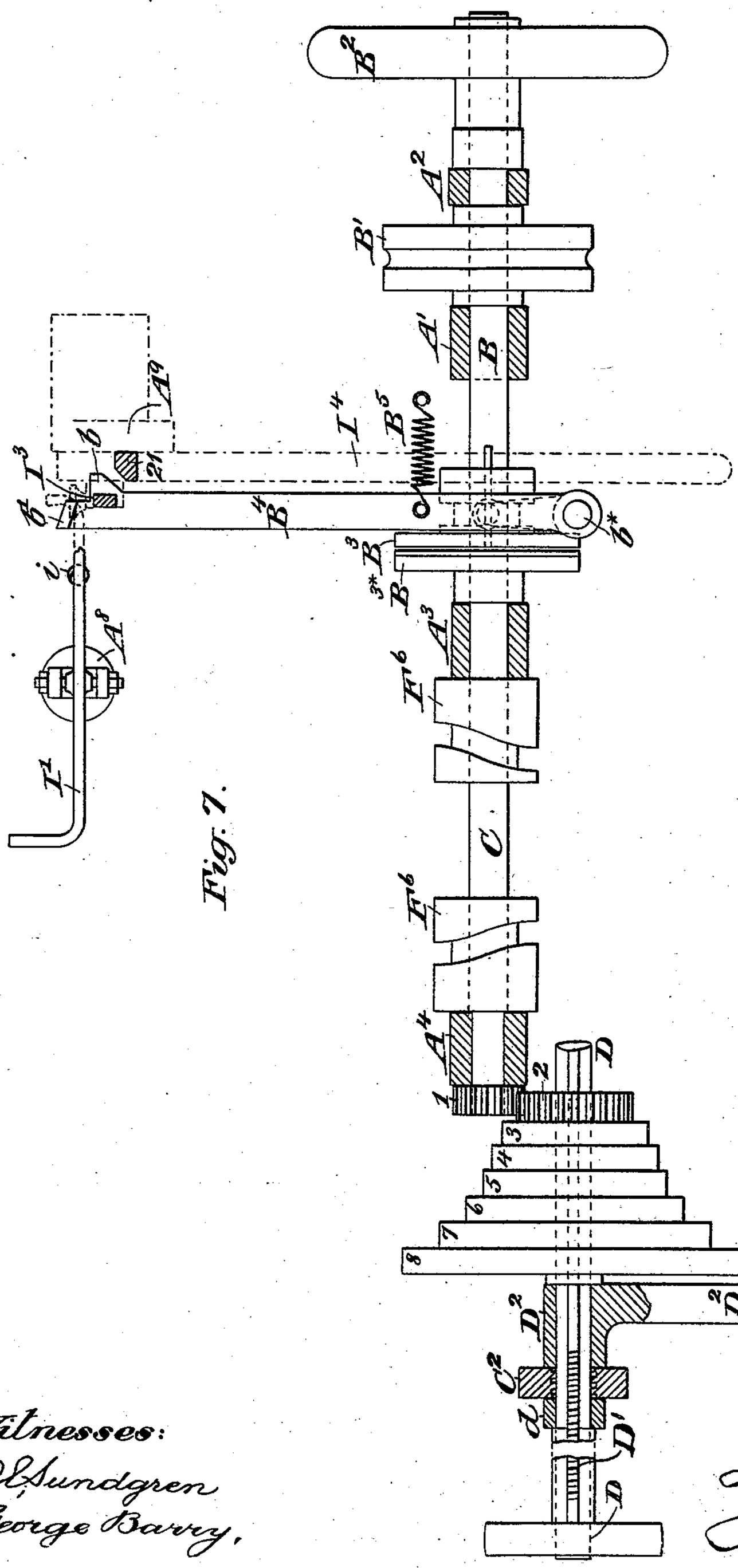

Fig. 7.

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MACHINE FOR WINDING THREAD UPON STAR SHAPED HOLDERS.

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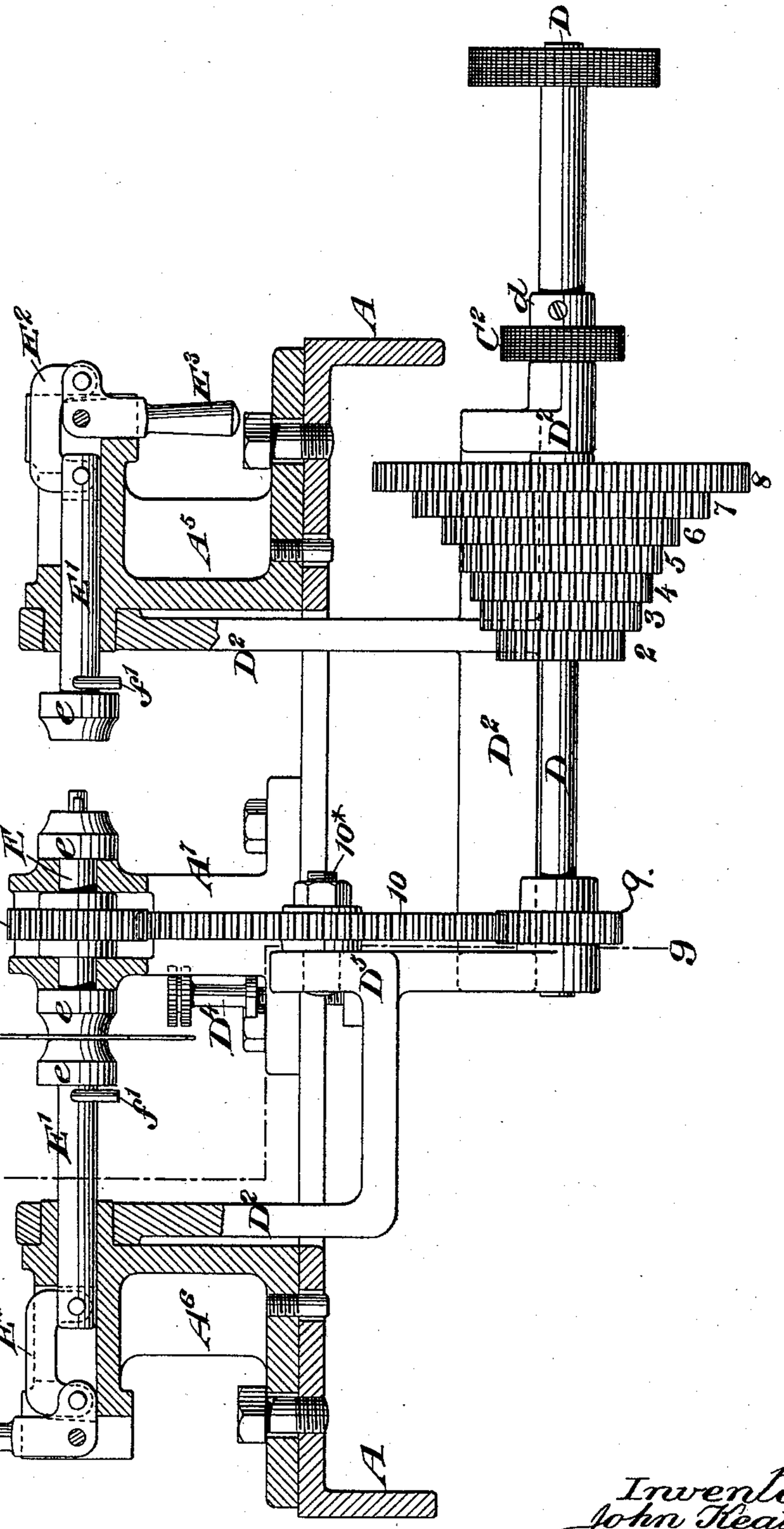
Fig. 8.



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MACHINE FOR WINDING THREAD UPON STAR SHAPED HOLDERS.

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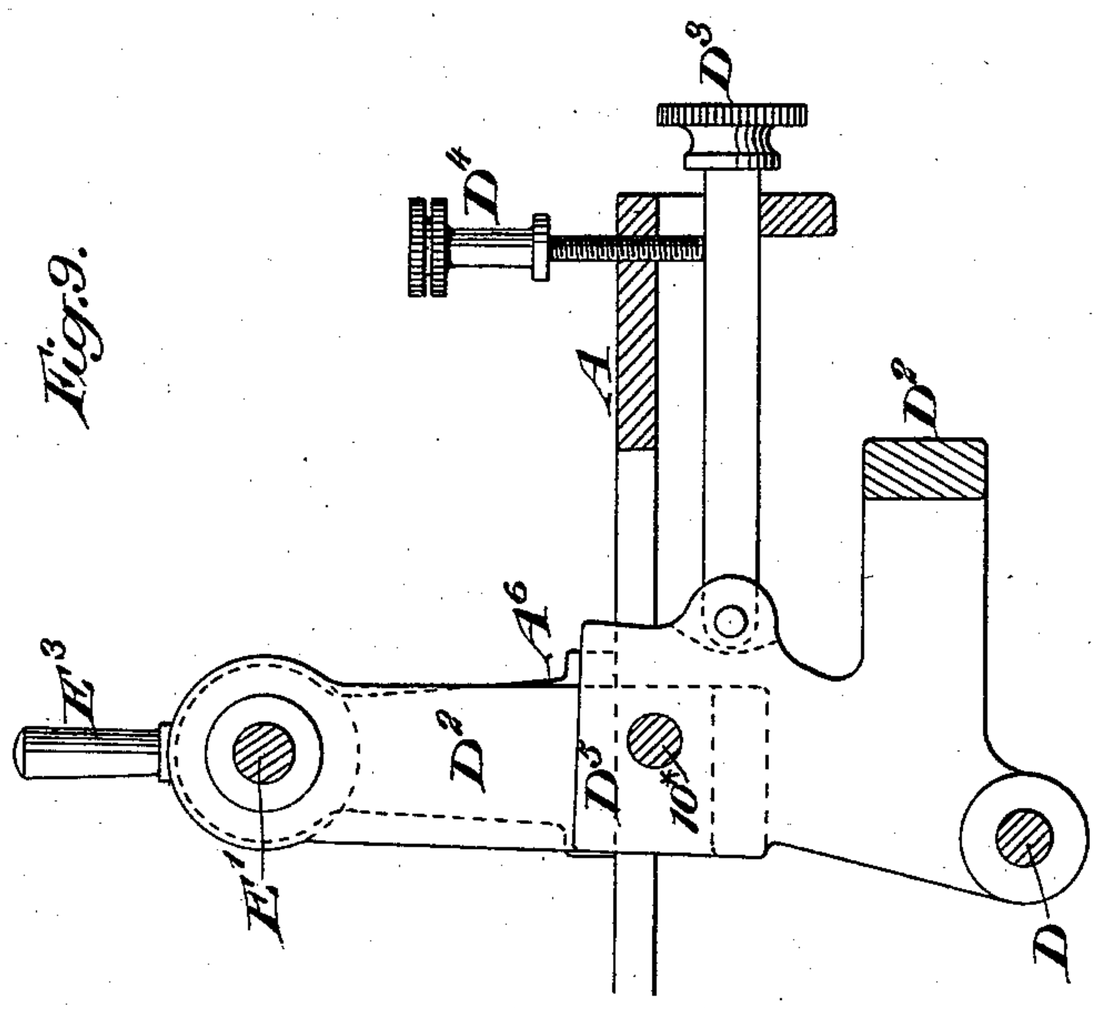
Fig. 9.



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UNITED STATES PATENT OFFICE.

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MACHINE FOR WINDING THREAD UPON STAR-SHAPED HOLDERS.

SPECIFICATION forming part of Letters Patent No. 543,185, dated July 23, 1895.

Application filed December 5, 1893. Serial No. 492,815. (No model.) Patented in England January 14, 1893, No. 878; in France September 27, 1893, No. 233,081, and in Canada June 20, 1894, No. 46,397.

To all whom it may concern:

Be it known that I, JOHN KEATS, of Bagnall Hall, in the county of Stafford, England, have invented certain new and useful Improvements in Machinery for Winding Thread upon Star-Shaped Disk-Holders, of which the following is a specification, and for which patents have been obtained as follows: In Great Britain, No. 878, dated January 14, 1893; in France, No. 233,081, dated September 27, 1893, and in Canada, No. 46,397, dated June 20, 1894.

This invention relates to a novel construction of thread-winder, whereby thread may be wound on star-shaped disks with great regularity and speed, either in bulk or in pattern, as desired, the laps of thread being made alternately on opposite sides of the thread-holder and upon each spur or arm in succession, or on two spurs or arms in succession.

The machine which I am about to describe is constructed to fill two holders at the same time, but it may be made to take one holder only, if desired.

The invention further relates to the measuring of the thread as it is wound on the holders, and the automatic registering of the lengths wound on the holders.

In the accompanying drawings, Figures 1 and 1ª are side elevations of the improved machine fitted with star-shaped thread-holders, and Figs. 2 and 2ª are plan views of the same. Fig. 3 is a front elevation of the counting apparatus, and Fig. 4 is a vertical section of the same. Figs. 5 and 6 are detached views of the thread-guide or thread-layer with the parts in connection therewith. Fig. 7 represents a plan view, partly in section, of the driving-shaft and certain other shafts of the machine and their attached and adjacent parts, which will be hereinafter explained. Fig. 8 represents a vertical section taken at right angles to Fig. 1, approximately in the line of the winder-shaft, and showing the thread-holder clamps and gearing for driving the winder-shaft. Fig. 9 represents a vertical section taken in a direction parallel with Fig. 1, approximately in the line 9 9 of Fig. 8.

A A is the table of the machine, cast with feet at its angles to provide space below the table-top for the driving-gear.

B is the driving-shaft, fitted with a driving-pulley B′ and a hand-wheel B^2. The shaft B is mounted in bearings carried, respectively, by a pendent bracket A′ cast with the table A, and a yoke-bracket piece A^2, bolted to the side of the table. This driving-shaft is fitted at its inner end with a driving-disk B^3, which runs in contact with a similar friction-disk B^{3*} on the transverse shaft C, mounted in bearings carried by pendent brackets A^3 A^4, cast with the table.

The friction-disk B^3 is free to slide on a feather which connects it with the shaft B. In its boss an annular groove is turned to receive the fork of a clutch-lever B^4, by which it is thrown into and out of contact with the disk of the shaft C for the purpose of starting and stopping the machine. The said lever works on a fixed fulcrum-pin *b**, Figs. 1, 2, and 7, fast in the table A. Keyed also to the shaft C is a pinion 1, (see Fig. 7,) which gears into one or other of the change-wheels 2 3 4 5 6 7 8 made fast to each other and to a sliding key D′. This key D′ fits into a longitudinal groove made in a shaft D, mounted in a rocking frame D^2. This rocking frame is fulcrumed on hollow bosses cast with standards A^5 A^6, which are bolted onto the bed-plate A. This arrangement of rocking frame provides for the movement of the shaft D nearer to or farther from the shaft C, for the purpose of bringing either of the change-wheels 2 to 8 into gear with the pinion 1. The sliding key D′ carries rack-teeth, through which it receives an endwise adjustment. These teeth project outward from the groove of the shaft D to receive a nut C^2, Figs. 2 and 7, which turns loosely on the shaft D, and is held in place between one end of the rocking frame D^2 and a collar *d*, Fig. 7, fixed to the shaft D. By turning this nut C^2 a lateral motion is given to the change-wheels, so as to bring any desired ring of teeth into gear with the pinion 1 to suit the work in hand. To permit of this movement of the change-wheels, the rocking frame D^2 is pulled forward by means of a link terminating in a knob D^3. The change-wheels are then adjusted by

means of the nut C^2, and when the proper ring of teeth is brought opposite the pinion 1 the same are brought into gear, and the new position of the rocking frame is secured by a binding-screw D^4, passing through a tapped hole in the table and bearing on the link of the rocking frame.

On the inner end of the shaft D is a spur-pinion 9, Fig. 2, which gears into an idle-wheel 10, Figs. 2 and 8, mounted on a stud-axle 10*, Figs. 8 and 9, carried by a bracket-arm D^5, Figs. 1, 8, and 9, of the rocking frame D^2. This idle-wheel gears into a pinion 11 keyed onto a short shaft E, which may be called the "winder-shaft." This shaft has its bearings in a forked bracket-standard A^7, bolted to the bed-plate A, and within the fork of this bracket the pinion 11, in gear with the idle-wheel 10, is situated. Mounted in line with this shaft E, and to the right and left thereof, are pressing devices consisting of sliding and pressing rods E′ E′, which carry on their inner ends loosely-mounted clamping-heads *e* for the purpose of gripping the star-shaped thread-holders or bobbin E*, fitted to the winder-shaft E, and hold them firmly in place while the same are rotated. The sliding rods are supported in the hollow bosses of the standards A^5 A^6, on which the rocking frame D^2 is mounted, and in these bosses, which act as guides, the rods are moved to and from the winder-shaft by means of toggle-levers E^2, Fig. 8, actuated by handles E^3.

The winder-shaft at either end terminates in a central stud, and is fitted also with an eccentric-pin to receive the thread-holders and carry them round as the shaft is driven by the gearing above described.

The thread-holders used in this machine may be of various diameters and have a greater or lesser number of arms or spurs, it being understood that an odd number is essential to my system of progressive winding.

I have said that the machine is provided with seven change-gear wheels. This number is adopted to correspond with the number of changes in the winding which I find it desirable to effect. Thus I may lay the thread to the right or left of each succeeding spur or arm of the rotating holder, whether the holder has five, seven, nine, or eleven spurs; or, taking the larger sizes of holders, I may lay the thread over every two succeeding spurs, and in this case I produce an ever-changing circular progressive movement of the thread on the holder, by which means a large quantity of thread can be piled up on the holder; but in what I call "single" winding a marked pattern is produced in the work and a less quantity of thread is accumulated on the holder.

The numerals on the shaft D, viz: 7, 9, 5, 11, 7, 9, and 11, are intended to indicate the position which the point of the key D′ should occupy when the machine has been set with the proper change-wheel to wind either single or double disks, with five, seven, nine, or eleven spurs. The machine, as shown in Fig. 2 of the drawings, is set to wind double or over every two succeeding spurs of a seven-spurred disk-holder.

I will now explain the means which I employ for laying the thread upon the holders, and measuring the same as it is wound up, premising that as the mechanisms employed for laying the thread for the two holders are counterparts the one of the other, the winding only of one holder need be referred to.

As respects the measuring of the thread it will be obvious that one act of measuring will serve for the two threads that are being simultaneously wound.

F F are the thread-layers carried respectively by the arms of their rock-shafts F′.

F^2 are slides mounted in fixed guides F^3, made fast to a pedestal bolted on the bed-plate A. The slides F^2 are fitted with centers which carry their respective rock-shafts F′. Made fast to each rock-shaft is a pendent arm F^4, carrying a horizontal pin, which lies in a groove made to receive it in the upper end of a rock-lever F^5. This mechanism is best shown in the detached views, Figs. 5 and 6, where the rock-lever F^5 is shown in face view at Fig. 5 and edge view at Fig. 6 as connected through a bowl with a grooved cam F^6, keyed to the shaft C.

It will now be understood that as the shaft C is rotated its cams F^6 will rock the levers F^5 and cause them to impart an oscillating motion to their respective thread-layers F.

By reference to the plan view, Fig. 2, it will be seen that the slide F^2 is slotted centrally at its inner end to afford free space for the rotation of the thread-holder. An inclined extension *f*, Fig. 2, of this slide at one side of the slot bears against a pin *f′* on the under side of the sliding and pressing rod E′, it being held up to the pin by the tension of the coiled spring F^7, Figs. 1 and 6.

The object of mounting the thread-layer on a slide which receives a tendency to approach the holder is to provide an endwise motion for the thread-layer as the thread accumulates on the holder to produce balling of the thread. As the thread accumulates it serves to press back the slide by bearing against the inner end thereof, and thereby automatically adjust the position of the thread-layer to suit the progress of the work.

It will now be understood that on starting the machine (which we will assume has been properly threaded in the manner that will be hereinafter described) the disk-holder will receive a rapid rotary motion and present its spurs or arms to its thread-guide, which, in its rapid reciprocation, will pass between the arms and lay the thread alternately on opposite sides of the succeeding arms, traveling through every slot or opening in the disk as they are presented, or every other slot, as the case may be.

When it is desired to lay the thread sepa-

rately on each succeeding arm or spur I fasten back the slide F^2 by inserting a pin in one of the pin-holes of the slide, (shown at Fig. 2,) which will then fix the position of the oscillating thread-layer, keeping it outside the plane of motion of the rotating thread-holder.

When a holder is filled or balled with the required amount of thread it is released from the machine by drawing back the sliding and pressing rod to the position shown at the left-hand side of Fig. 2. By this movement the slide F^2 is forced back, the pin of the rod E′ acting upon the inclined extension of the slide F^2.

I will now explain the course of the thread through the machine and show how the drag put upon it by the holder in the act of winding sets the indicating apparatus in action.

G is the fixed bobbin or cop, from which the thread to be wound is led up to and over a guide-pulley G′ to a tension apparatus G^2.

From the tension apparatus the thread passes to and around a pulley H, forming part of the measuring apparatus, and from this pulley the thread is led, as shown at Fig. 1, to the thread-layer F.

The tension apparatus G^2 (see Figs. 1 and 2) consists of two india-rubber rollers *g*, mounted loosely in a pair of arms, one of which is made fast to the case of the measuring apparatus and the other is pivoted to the fixed arm. These rollers are made preferably the one of soft and the other of hard rubber, and they are caused to bite the thread which is led between them by means of a light tension-spring *g′* in such manner as to avoid the crushing of the thread.

The pulley H is keyed to one end of a horizontal shaft H′, which turns in bearings in the case of the measuring apparatus. The other end of this shaft carries a loose pulley H*, which acts simply as a guide for the thread to the second thread-layer. H^2 is a worm cut on the shaft H′, and gearing into a worm-wheel H^3, mounted on an arbor *h*, which forms the center of a small dial H^4. Immediately below this dial is a larger dial H^5, graduated to fifties and hundreds of yards, while the small dial is graduated to single yards. Made fast to the worm-wheel H^3 is a spur-pinion H^6, which gears into a spur-wheel H^7, mounted on an arbor *h′*, that forms the center of the dial H^5. The arbors *h h′* of the two dials carry one an index-hand h^2 and the other an index-hand h^3, which are adjustable thereon and serve to point out the progress of the winding. The hand H^2 of the small dial H^4 is held by friction to its arbor, but the hand h^3 of the dial H^5, which may be called the "indicator-setting hand," is made fast to its arbor by a winged nut h^4, for the purpose to be presently explained.

The amount of thread to be wound on the holders will constantly vary, and it is desirable that the working should be automatically stopped. This I effect by causing the index-hand of the dial H^5, on reaching the end of its course, to release the friction-clutch $B.^3$ The dial H^5, it will be seen, is graduated up to fifteen hundred yards, which may be assumed to indicate the maximum amount of thread to be wound on a holder. Supposing it is desired to wind five hundred yards only, I slacken the indicator-hand, (before starting the machine,) shift it to 500, and make it fast to the arbor by means of the winged nut. On starting the machine, the thread which is laid around the pulley H will, by the draft put upon it, cause the pulley and its worm-shaft to rotate and thereby set in action the indicator-hands.

In order that the machine may automatically stop when the hand h^3 of the dial H^5 points to zero, a notched cam I is permanently fastened to the boss of the indicator-hand and serves to hold out of action a rocking-lever I′, one end of which is wedge-shaped and the other end of which is held in contact with the cam I by a spiral spring *i*, which connects the said lever with the table A in such manner as to pull down its wedge-shaped end. This rocking lever I′ is fulcrumed in a forked standard A^8, erected on the table and its wedge-shaped end occupies a position in front of a vertical lever I^3, fulcrumed on a stud-pin carried by a standard A^9. To this standard A^9 is also fulcrumed a hand-lever I^4, which may be termed the "starting-lever." The head of this lever is T-shaped, and the upper limb 20 of the T-head serves to carry across pin *i*, Fig. 1, which projects out from opposite sides of the T-head. One end of this pin bears against the back of the lever I^3, and the other end of the pin is borne upon by a pressure-spring I^5, the use of which is to lift the starting-lever I^4 from its depressed position.

The lower limb 21 of the T-head reaches down to the clutch-lever B^4 before mentioned and stands in front of a lateral projection *b* (see Fig. 7) of that lever, so that when the starting-lever is depressed the lower limb of its T-head being moved forward will strike the lateral projection or incline of the clutch-lever, rock the clutch-lever on its fulcrum, and put the friction-clutch into action.

By the depression of the starting-lever the pendent end of the lever I^3 will be brought opposite the turned-up extremity *b′*, Fig. 7, of the clutch-lever, and serves as a stop to prevent that lever from yielding to the pull of its tension-spring B^5 and throwing the clutch out of action. The starting-lever will be thus left free to rise to its normal position under the pressure of its spring I^5. It is in this position that the levers I^3, I^4, and B^4 remain while the machine is in action. So soon, however, as the indicator-hand reaches zero the notch of the cam I will be presented to the rocking lever I′ and the spring *i*, being then permitted to pull down the wedge-shaped end of the said rocking lever, will cause the said wedge-shaped end to thrust back the

lever I^3 clear of the clutch-lever, leaving that lever free to take the position shown in Fig. 2, and put the clutch out of action.

The smaller dial and index-hand provide for the winding of samples, and when the machine is thus used the working and stopping the machine will be by hand.

The indicator-hand h^3 and its attached notched cam I being fastened to their arbor h by a clamping-nut h^4 in such manner that by unscrewing the said nut the said hand can be turned as much or as little as may be desired on the said arbor, provide for the measuring of the thread and the control of the stoppage of the machine with infinitesimal exactness after a given amount of thread has been wound on the holder or holders.

What I claim is—

1. The combination with a rotary shaft for carrying a winding disk, of a slide slotted for the entrance into it of a portion of the disk and movable from said shaft by the accumulation of thread on the disk, an oscillating thread layer on said slide, means of producing the oscillation of said thread layer and a spring for moving said slide and thread layer toward said shaft, substantially as herein described.

2. The combination with a rotary shaft for carrying a winding disk, a pressing device movable toward and from said shaft in line therewith, a slide carrying an oscillating thread layer and movable toward and from said shaft transversely thereto, the said slide having an inclined extension at the end next said shaft to be operated upon by said pressing device for pushing back the slide and thread carrier by the act of moving said pressing device away from the said shaft, substantially as herein set forth.

3. The combination with a rotary shaft for carrying a winding disk, of a pressing device movable toward and from said shaft in line therewith, a slide movable toward and from said shaft transversely thereto and carrying an oscillating thread layer, and means of locking back said slide to a fixed point, substantially as and for the purpose herein set forth.

4. In a thread winding machine, the combination with a measuring apparatus deriving motion from the thread undergoing the measuring operation, a driving shaft for driving the winding mechanism of the machine, a clutch for engaging said shaft with and disengaging it from the winding mechanism and a notched cam carried by said measuring apparatus, of the clutch lever B^4 for operating the movable member of said clutch furnished with an inclined lateral projection b and having a turned-up end b', the T-headed starting lever I^4 for operating on the said projection b of the clutch lever to produce the engagement of the clutch, the spring I^5 for disengaging said starting lever from the clutch lever, the upright lever I^3 for engaging with the turned-up end of the clutch lever to hold the clutch in engagement, the rocking lever I′ having a wedge-shaped end for disengaging the said upright lever from the clutch lever, the spring i for throwing said rocking lever I′ into operation under the control of the said notched cam, and the spring B^5 for operating on the lever B^4 to disengage the said clutch, all substantially as and for the purpose herein described.

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