

No. 641,707.

Patented Jan. 23, 1900.

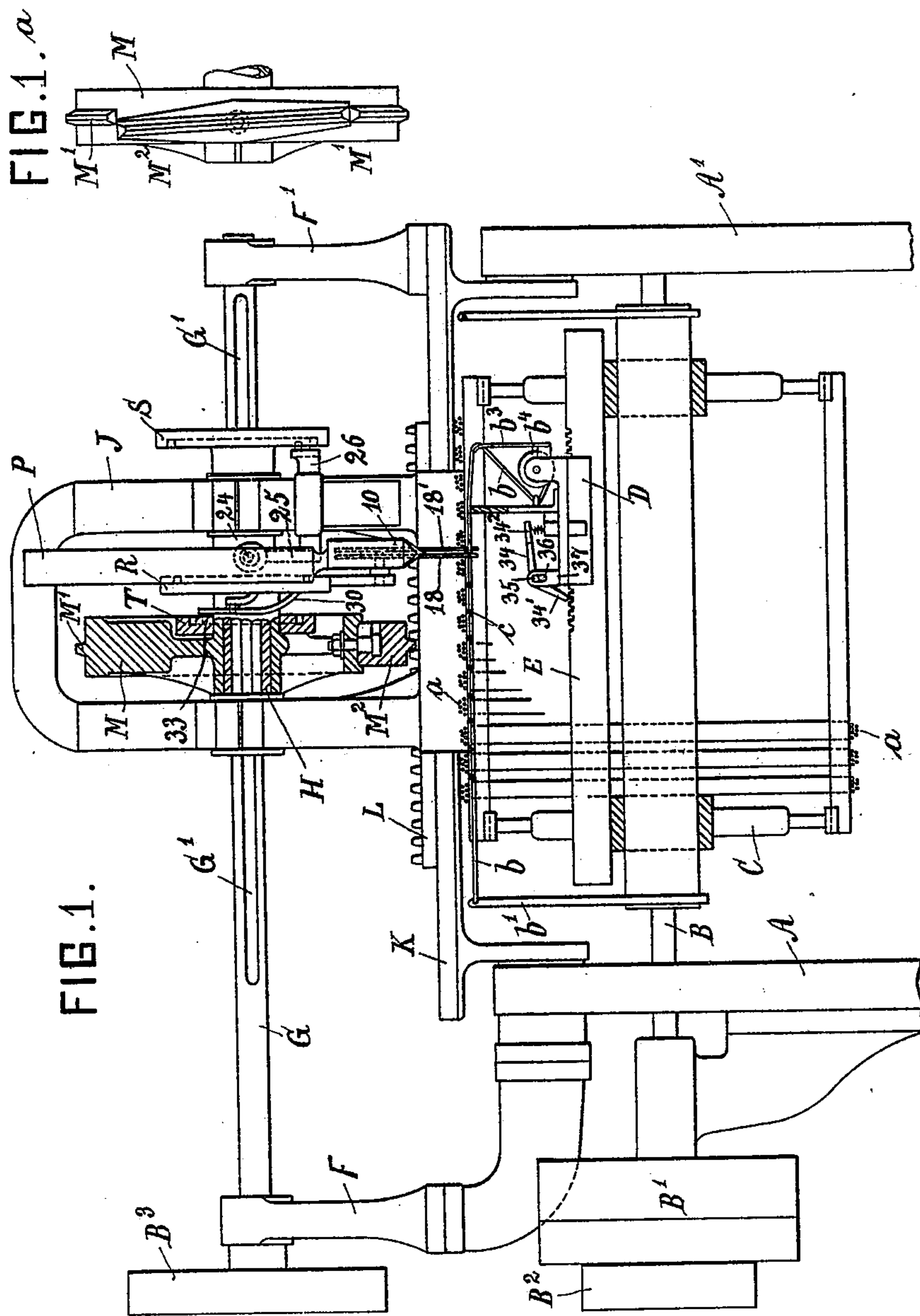
A. KRYSZAT.

AUTOMATIC MACHINE FOR TWISTING AND KNOTTING THREADS.

(Application filed Dec. 13, 1898.)

(No Model.)

3 Sheets—Sheet 1.



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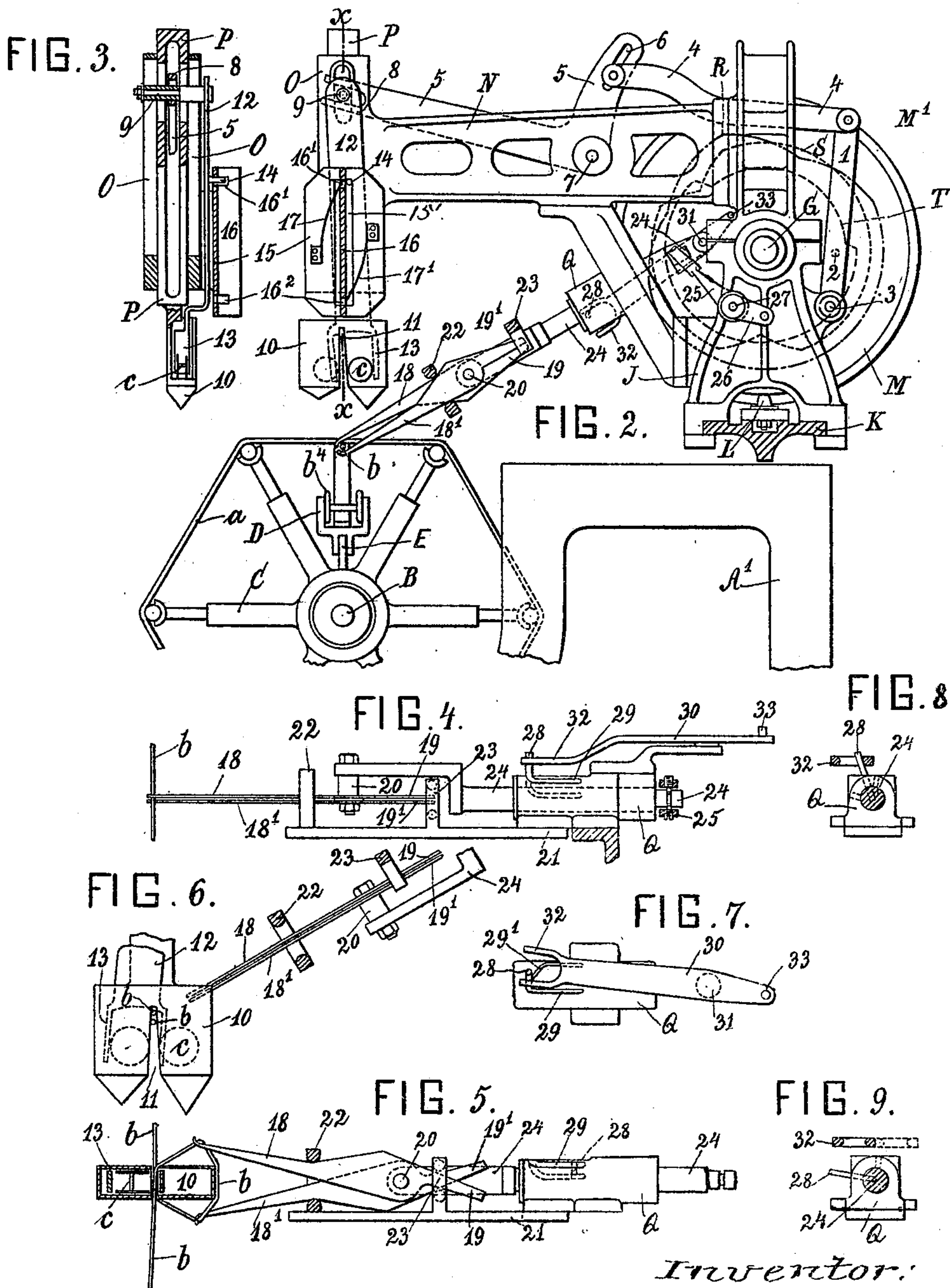
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(Application filed Dec. 13, 1898.)

(No Model.)

3 Sheets—Sheet 2.



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3 Sheets—Sheet 3.

FIG.10.

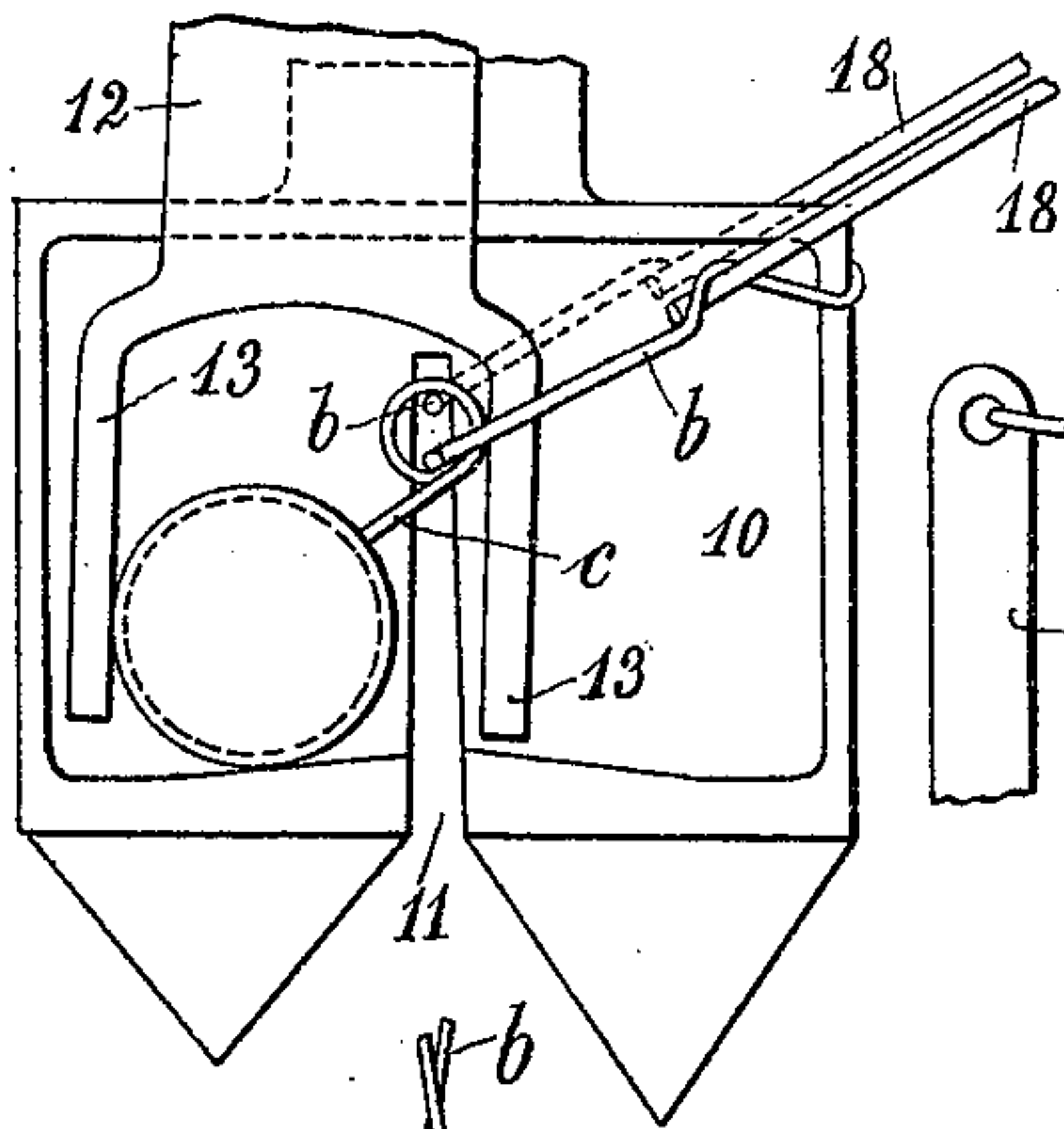


FIG.12.

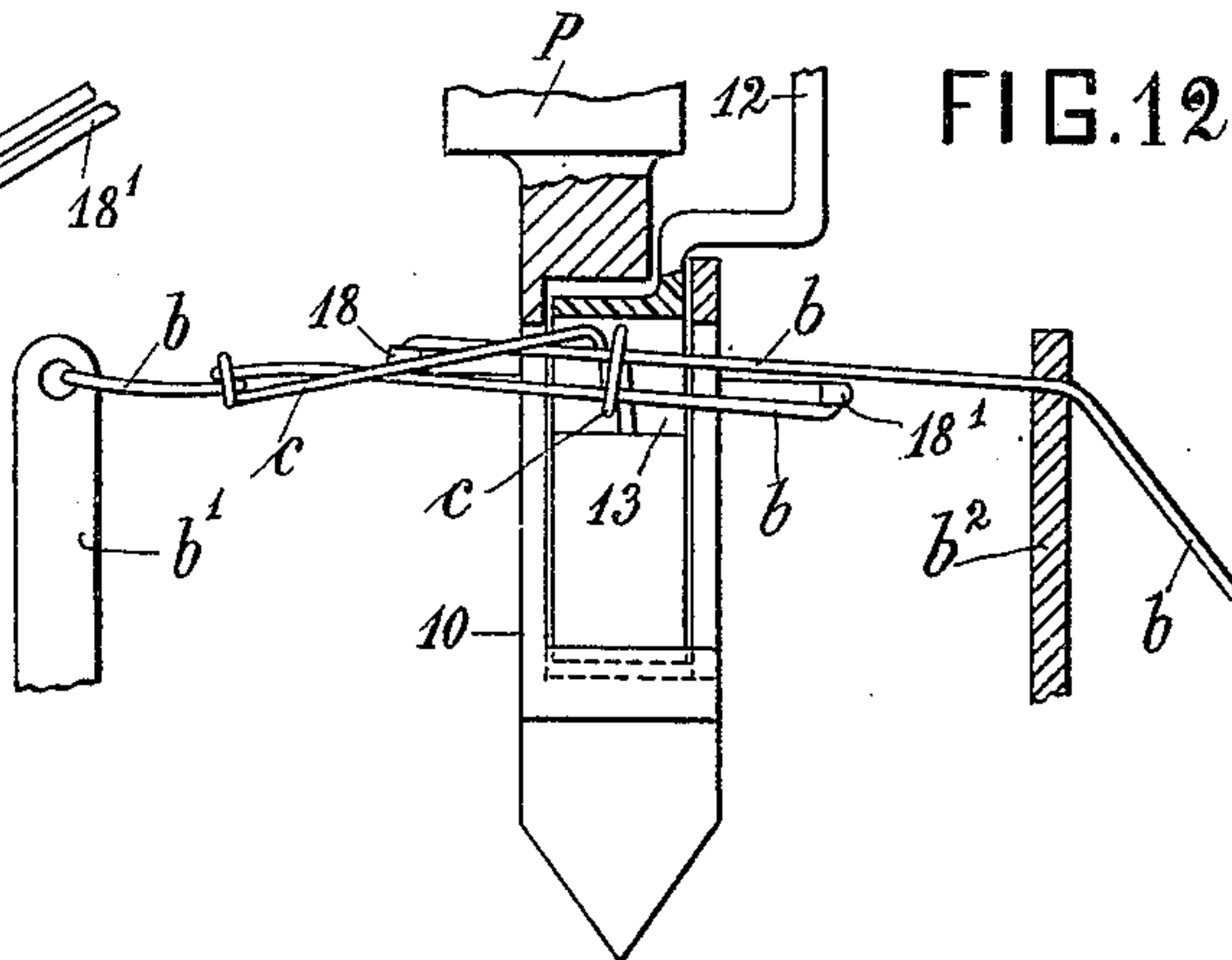


FIG.11.

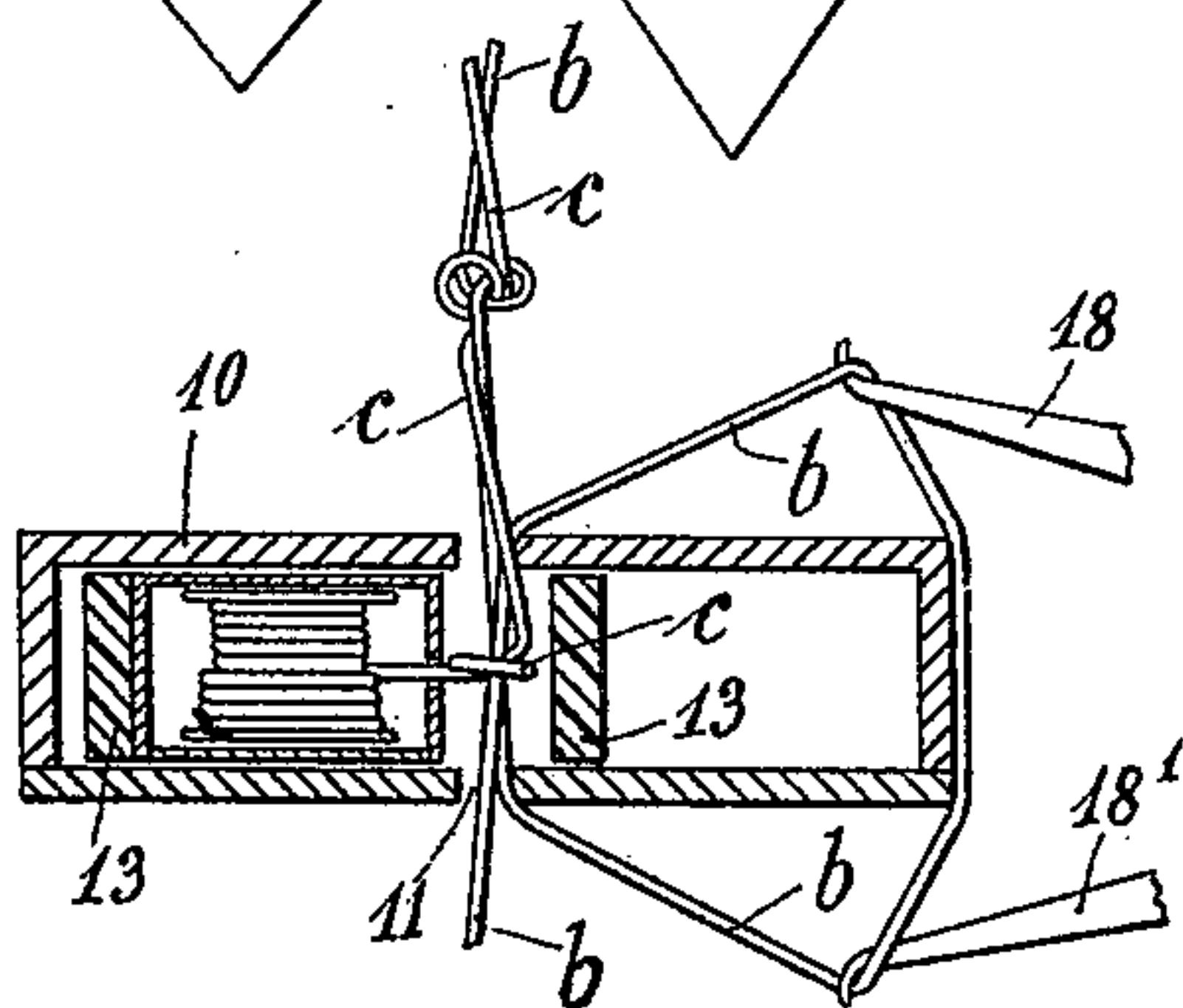
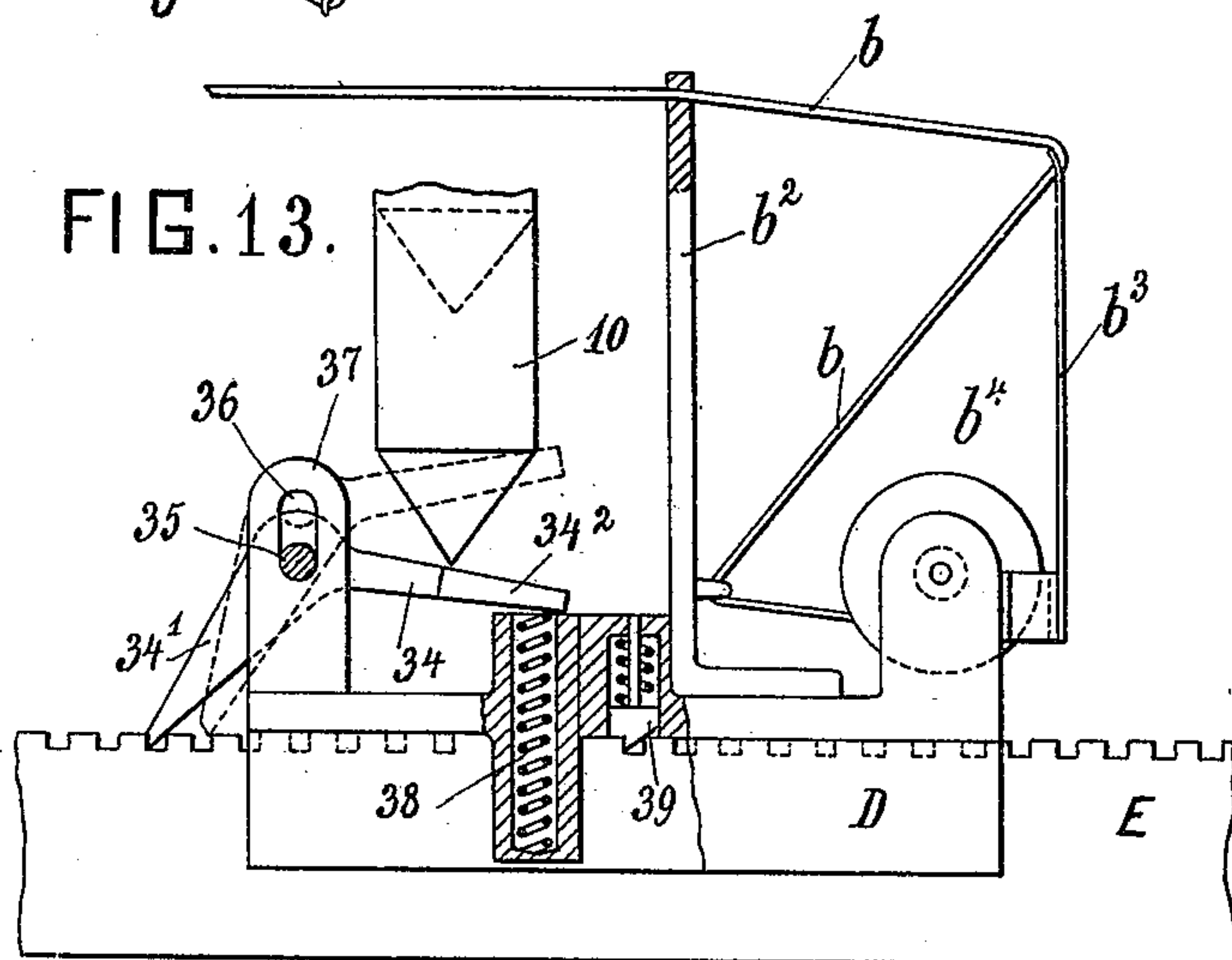


FIG.13.



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UNITED STATES PATENT OFFICE.

ALBERT KRYSZAT, OF BERLIN, GERMANY, ASSIGNOR TO ALBERT KRYSZAT & CO., OF SAME PLACE.

AUTOMATIC MACHINE FOR TWISTING AND KNOTTING THREADS.

SPECIFICATION forming part of Letters Patent No. 641,707, dated January 23, 1900.

Application filed December 13, 1898. Serial No. 699,160. (No model.)

To all whom it may concern:

Be it known that I, ALBERT KRYSZAT, machine manufacturer, a subject of the Emperor of Germany, and a resident of No. 3-4 Colonie-
5 strasse, Berlin, in the Empire of Germany, have invented a certain new and useful Improved Automatic Machine for Twisting and Knotting Threads, of which the following is an exact, full, and clear description.

10 This invention relates to an automatic machine for twisting threads together and securely knotting same. Such twisting and knotting of threads occurs, for instance, in the textile industry in order to bind the
15 threads or yarn wound upon the reels into bundles at certain distances by means of special threads and to knot these threads. This is effected by employing two special threads, the so-called "lower" or "under" and "up-
20 per" threads. The lower thread is drawn through the reel in such a manner that it is located directly against the lower side of the skeins or hanks of the yarn and is directed crosswise to these, while the upper thread is
25 arranged as a ball or bobbin in a bobbin or spool holder, which may be moved up and down against the lower thread. The twisting and knotting of the upper and lower threads on simultaneously binding bundles or hanks of
30 yarn are thereby effected that the bobbin-holder with the upper thread material during its upward-and-downward movement surrounds the lower thread and is moved within such bobbin-holder from one side to the other
35 by means of a fork. The upward-and-downward movement of the bobbin-holder and the operation of the fork for laterally moving the upper-thread bobbin are so proportioned that an entwining of the lower thread by the material of the upper-thread bobbin is effected.
40 The number of entwining can be easily arranged as desired by the number of upward-and-downward movements of the bobbin-holder and the corresponding reciprocating
45 movements of the upper-thread bobbin.

In order to knot or loop the lower thread with the upper thread put around the former and the skein or hank of yarn to be tied or bound, the lower or under thread is grasped
50 or caught by a tool in form of scissors and made into a loop. The tool, which may be

called a "loop making or forming device," receives for this purpose a reciprocating motion against the lower thread and is arranged in such a manner that it automatically opens
55 and closes in order to correspondingly release or catch the lower thread. It also receives a partial rotation in order to cross the thread portions forming the loop of the drawn-out lower thread. The upward-and-downward
60 moving holder of the upper-thread bobbin engages over these crossing loop portions, for which purpose it is provided with a slot, so that the upper-thread bobbin on its movement in the holder from the one side to the
65 other and on the upward-and-downward movement of the bobbin-holder against the lower thread is wound around the crossing portions of the loop. In this manner a knot is formed by the lower and upper threads,
70 which is made tight by tensioning the lower thread released by the looping device. The kind or nature of the knot (single, double, or special knot) depends on the movement of the upper-thread bobbin and may be varied
75 in many ways. The upward-and-downward movements, necessary for carrying out this work or operation, of the bobbin-holder for the upper thread, as also the reciprocating and rotating motion of the loop-making de-
80 vice for the lower thread, are derived from three cams on the same shaft which is operated by the shaft of the reel. The construction is such that all the mechanisms can exert a longitudinal stepwise movement on
85 the driven shaft of the cams by providing longitudinal grooves on said shaft. After knotting the lower and upper thread and tying or binding a skein or hank of the yarn or other material an automatic feed of the whole
90 mechanism onto shaft of the cams and also of the holder for the lower-thread bobbin for a distance corresponding to the thickness or width of the hank or skein of yarn is effected. There is likewise effected an automatic ten-
95 sioning of the lower thread for the purpose of tightening the knot formed by twisting the lower and upper threads. The material to be bound into hanks or skeins in the said manner may be of any suitable kind or nature
100 and is of just as little moment for the operation of the hereinafter-described device as

the nature of the knot itself, which, as already mentioned, can be easily altered or changed by, for instance, modifying the number of twists or the upper thread.

5 Referring to the accompanying drawings, Figure 1 is partly a front elevation and partly a vertical section of the whole machine for binding yarn hanks or skeins of a reel by lower and upper threads to be twisted and
10 knotted together. Fig. 1^a is an end elevation of the disk M on the shaft G. Fig. 2 is partly a side elevation and partly a vertical cross-section of the machine, of which some parts have been broken off. Fig. 3 is a vertical
15 section on line *x x* of Fig. 2. Fig. 4 is a plan, and Fig. 5 a side elevation, of the loop-making device for the lower thread shown on a somewhat larger scale than in Fig. 2, the loop-forming device being opened and the
20 bobbin-holder for the upper thread, shown in section, being passed into the loop of the lower thread. Fig. 6 is a side elevation of the left part of Fig. 5. Fig. 7 is an elevation of the bifurcated lever effecting the partial rotation of the loop-forming device. Figs. 8
25 and 9 are sectional views and end elevations, respectively, of the guide for the loop-forming device in the end positions before and after the partial rotation effected by the fork. Fig. 10 is a vertical longitudinal section, Fig.
30 11 a horizontal cross-section, and Fig. 12 a vertical cross-section, on a larger scale, through the bobbin-holder for the upper thread in coöperation with the loop-forming device of the lower thread, in order to show the formation of the knot by both threads.
35 Fig. 13 is a sectional view, likewise on a larger scale, of the device for automatically operating or feeding the carrier for the lower-thread bobbin and the device for tensioning the lower thread.

In the standards A A' of the frame is mounted the shaft B of the reel C, with driving-pulleys B', on which reel is wound the yarn or
45 the like to be bound into hanks *a*. This binding of the hanks of yarn is effected by means of a lower thread *b* and upper thread *c*, arranged as a ball or bobbin in a bobbin-holder, to be more particularly described
50 later on. The lower thread *b* is secured to a holder *b'* and passes through a thread-guide *b²*, over a tension-spring *b³*, to the bobbin *b⁴*, which is rotatably mounted in a carrier D. This carrier D is guided on a fixed or stationary rack E, the pitch of its teeth corresponding to the hanks *a* of yarn to be bound and
55 effecting the automatic feed of the carrier D with all its parts.

The shaft G, mounted in the frame parts
60 F F', derives its driving motion from the shaft B by means of the pulleys B² B³, such shaft G being provided for the greatest or major part of its length with longitudinal grooves G'. On this shaft G is mounted a sleeve H,
65 which is rotated by the shaft by wedges or like, but can move longitudinally on the shaft. The frame J for the mechanisms, to be oper-

ated indirectly by the sleeve H and to be fully described later on, can likewise move longitudinally with all its parts on the shaft
70 G, such frame being guided on the fixed or stationary base-plate K. This base-plate K carries a fixed rack L, in which engages the rim M' of a disk M, keyed onto the sleeve H. This rim is formed for a quarter of its length
75 as an arched piece M², pivoted on a central pin, so that it can be moved or oscillated to the one or other side. This construction has for its object during, say, three-quarters of the rotation of the shaft G and its sleeve
80 H to secure against lateral movement the parts driven by the latter and also the whole frame J and its parts by engagement of the rim M' in the stationary or fixed rack L. With this relative locking of the frame or
85 standard J the binding of the hanks *a* of yarn and the knotting of the lower and upper threads *b* and *c* (still to be described) take place or coincide. The movable part M² of the rim adjusted to one side effects, during
90 the last quarter of the rotation of the shaft G, an automatic lateral movement of the standard or frame J with all its parts, so that the mechanisms for twisting and knotting the threads *b* and *c* are operative on the
95 neighboring or adjacent hank of yarn. The turning over of the part M² of the rim to the one or other side thus causes the movement of the standard or frame J, with its part, in the one or other direction and renders it possible
100 to also automatically reverse this movement. This standard or frame J carries a lateral arm N, whose front part is in form of a box-like guide O for the bobbin-carrier P. A guide Q for the loop-forming device is also
105 rigidly connected to the frame.

The driving or operating mechanism of the bobbin-holder and loop-forming device corresponding to the described operation for effecting the upward-and-downward movement
110 of the bobbin-holder and the forward-and-backward movement and rotation of the loop-forming device consists of three cams R S T and sleeve H, secured to the shaft G. The form or shape of the grooves of these cams,
115 in which run rollers of the arms or links to be moved, is shown by dotted lines in Fig. 2. The cam R receives in its groove a small roller 2 of a lever 1, pivoted at 3, to which lever 1 a link 4 is hinged, whose pivot engages
120 in a slot 6 of a bell-crank lever 5, pivoted at 7. The free end of the lever is bifurcated at 8 and surrounds or incloses a pin 9 of the bobbin-holder P, such pin being adapted to move upward and downward in slots of the
125 box-like guide O. On the lower end of the bobbin-holder is provided the box 10 for the ball or bobbin of the upper thread *c*. The box 10, formed below into two unequally long conical points, is provided with a transverse
130 vertical slot 11, which extends almost to the full height of the box and allows of same being moved below for the purpose of overcrossing the lower thread *b*.

The movement or reciprocation of the upper-thread bobbin *c* from one side of the slot 11 to the other for the purpose of twisting the upper thread around the lower thread *b* is effected by a bifurcated lever 12, which can oscillate on the pin 9 and embraces the bobbin for the upper thread *c*, with its lower fork 13 extending into the bobbin-box 10. For effecting the lateral oscillation of the bifurcated lever 12 at the end positions of the upward-and-downward-moving bobbin-holder *P* the bifurcated lever 12 is provided with a lateral pin or projection 14, which engages in a slot 15' of a plate 15, secured on the side of the frame *O*. This slot 15' is divided by a central ridge 16 into two lateral slot-guides, which are connected above and below by holes or recesses 16' and 16², which are closed by the heads of springs 17 and 17', respectively. In this manner the pin 14, moving upward and downward with the bifurcated lever 12, is pressed by the springs 17 and 17', respectively, into the one or other slot on the side of the ridge 16, and thus effects a movement of the fork 13 and the bobbin of the upper thread *c* to the one or other side of the bobbin-box slot 11 receiving the lower thread, so that the upper thread *c* is wound or twisted around the lower thread by the upward-and-downward movements of the bobbin box or carrier.

The knotting of the lower and upper threads is caused, as already stated, by forming a loop and crossing the said lower thread and passing the bobbin-box for the upper thread *c* into the formed loop of the lower thread *b* in such a manner that the crossing portions of the loop enter the slot 11 of the lowered bobbin-box 10, so that on the said movement of the upper thread and its bobbin a twisting of the crossing portions of the lower thread by the upper thread is effected and by tightening or tensioning the lower thread a tight or firm knot is obtained.

The forming of a loop and crossing of the lower-thread parts forming this loop is effected by means of the so-called "loop-forming" device. The same is a scissors-like tool, consisting of the arms 18 18', with projections or lugs 19 19' rotatable on a pin 20. These arms and lugs are provided with inclined or wedge-shaped surfaces, which on the longitudinal movement operate the arms 18 and 18' by means of the stationary guides 22 and 23, secured to a holder 21, the hooked ends of such arms 18 and 18' engaging with the lower thread *b*, and on the continuation of their engaging movement beyond the end position on rotating on the pin 20 form a loop, at the same time crossing the lower thread, Fig. 5. The forward-and-backward movement of the loop-forming device is effected by a rod 24, carrying the pin 20, such rod being guided in the sleeve *Q* and operated by a lever or arm 25, carried by a rock-shaft 27, journaled in the frame *J*, said rock-shaft having an arm 26 engaging with and operated by the cam *S* of the sleeve *H* on the shaft *G*.

For effecting a quarter-rotation of the rod 24 and of the loop-forming device for the purpose of crossing the lower thread the rod 24 is provided with a lateral pin or projection 28, moving in a slot of the sleeve *Q*. This slot consists of a part 29, straight or parallel to the direction in which the rod 24 moves, and a part likewise straight and parallel which communicates with the former part 29 by a curve slot 29'. The curve slot acts in such a manner that on the pin 28 passing over from the straight-slotted part 29 through the curve slot into the parallel slot a quarter-rotation of the rod 24, with the loop-making device, is effected. This movement of the pin 28 on the rod 24 is effected by means of a lever 30, which is movably mounted at 31 and whose forked end 32 engages the pin 28 in order to effect its aforesaid movement. Figs. 8 and 9 show the corresponding different positions of the pin according to the different positions of the loop-making device. The bifurcated lever 30 is operated by the third cam *T* on the sleeve *H*, a small roller 33 on the free arm of the lever engaging in the groove of the cam *T*.

The formation of the knot is shown in Figs. 10, 11, and 12, and is readily understood by following the letters of reference of the lower and upper threads. Briefly related, the operation is as follows: The loop-forming arms are advanced to engage the lower thread, whereon they are given a partial rotation to produce a twist or loop therein. The backward movement of the loop-former causes the arms to separate, thus enlarging the loop, and simultaneously the descent of the upper-bobbin carrier causes one of the legs to penetrate the loop, as shown in Figs. 10 and 11, the crossed portion of the loop entering the slot 11. While this movement is taking place, the movement of the bobbin from one leg to the other and back winds the thread *c* around the said crossed portion of the loop, as clearly shown in Figs. 10, 11, and 12.

The automatic feed of the bobbin-holder *D* for the lower thread is effected by the device shown on a larger scale in Fig. 13. The same consists of a ratchet-pawl 34, whose pivots 35 can be moved up and down in longitudinal slots 36 of the arm 37. The tapered arm 34' of the pawl 34 engages in the stationary rack *E*, while the enlarged arm 34² is forced down by the descending bobbin-box 10. The arm 34² is under the control of a spiral spring 38, which is tensioned by the depression of the arm. On the farther descent of the bobbin-box and downward movement of the pivots 35 in the slots 36 the transmission of the carrier *D* on the rack *E* and after the ascent of the bobbin-box the releasing of the arm 34' of the pawl is effected. A spring-actuated catch 39, engaging in the rack *E*, insures the secure position of the bobbin-holder *D*, whose spring *b*³ effects in the said manner the tightening of the lower thread *b* for forming a tight knot.

The operation of the various parts during the different steps in tying the knot is as fol-

lows: If a knot is formed and the loop-former has dropped the loop just formed by closing its arms 18 18' simultaneously with its feed in the direction to the thread or yarn *b* and the corresponding retrograde movement of ninety degrees around its longitudinal axis the standard or frame J moves longitudinally with all its parts on the shaft by means of the piece M² of the disk M and the rack L in the manner as fully described in the specification, whereas at the same time a further feed of the loop-former in the direction to the lower thread *b* and opening of its arms 18 18' beyond the end position, which is caused by the guides 22, takes place. The arms are opened to such an extent that the thread or yarn *b* can easily pass through same, (somewhat wider than shown in Fig. 2.) Now if the piece M' engages with the rack L, so that during the further rotation of the shaft G no longitudinal movement of the standard J takes place the loop-former between whose arms 18 18' the lower thread is now located will be drawn back and rotate to the extent of ninety degrees on its longitudinal axis, whereas at the same time on account of its retrograde movement and by means of the guides 23 and the lugs 19 19' an opening of its arms in the direction opposite to that according to the above-described forward movement takes place as far as the position shown in Fig. 5. After the loop is formed in this manner the same is surrounded in the described manner by the upper thread by the bobbin *c* passing twice through the loop-ring.

In Fig. 2 the loop-former is shown in the position in which the lower thread has just passed between its (loop-former) arms 18 18' and the same have already commenced to close in order to assume the position as shown in Fig. 5.

Having now particularly described and ascertained the nature of the said invention, I declare that what I claim, and wish to secure by Letters Patent, is—

1. An automatic knotting-machine for binding the hanks of reeled yarn, comprising a reel having devices for feeding a lower thread, a vertically-moving bifurcated bobbin-carrier carrying a bobbin for supplying the upper thread, a pair of pivoted arms having hooked ends adapted to engage said lower thread, means for rotating said arms to form a loop and then separating them to enlarge the loop sufficiently to permit the entrance of one leg of the bifurcated bobbin-carrier, and means for shifting the bobbin back and forth from one leg to the other of the carrier to wind said upper thread around the loop, substantially as described.

2. In combination, the reel, the bobbin carried thereby for supplying a lower thread, tension means for such thread, means for im-

parting to such bobbin a step-by-step movement longitudinally of the reel, a bifurcated bobbin-carrier with a bobbin for an upper thread movably carried therein, a pair of arms having hooked ends for engaging the lower thread, means for rotating said arms to form a loop and separating said arms to enlarge the loop, means for reciprocating the bobbin-carrier to cause the loop of the lower thread to enter the slot between the legs thereof, means for simultaneously moving the bobbin from one leg to the other to wind the upper thread about the loop, and means for imparting to the bobbin-carrier and twisting-arms an intermittent horizontal movement, substantially as described.

3. In combination with the reel and means carried thereby for supplying a lower thread, a bobbin-carrier for supplying an upper thread and a device for forming a loop in said lower thread comprising a rod capable of a reciprocating and axially-rotary movement, a pair of arms pivoted on said rod and having thread-engaging ends, stationary guides co-acting with said arms for opening and closing the same on the reciprocating of the rods, means for imparting to said rod a reciprocating motion and means for rotating said rod, substantially as described.

4. In combination with the reel and means carried thereby for supplying a lower thread, a bobbin-carrier and bobbin with operating means for supplying an upper thread, a bearing-sleeve Q carried by the frame of the machine, a rod 24 mounted thereon capable of longitudinal and rotary movement therein, loop-forming arms pivotally mounted on said rod 24, means for reciprocating said rod, a guide-slot in the sleeve Q, a pin 28 projecting from the rod into said guide-slot, a bifurcated lever engaging said pin, and means for operating said lever to impart a rotary movement to said rod, substantially as described.

5. In a machine of the class described, the combination with the reciprocating bobbin-carrier and bobbin for the upper thread and the loop-forming devices, with means for imparting movement bodily to said parts after each tying operation, of a reel for the skeins to be tied, a rack arranged longitudinally thereof, a bobbin-carrier movable longitudinally of said rack, a bobbin for a lower thread carried by said carrier, a spring-actuated pawl carried by said carrier and engaging the rack and arranged to be struck and operated by the descending bobbin-carrier of the upper thread, substantially as described.

In witness whereof I have hereunto set my hand in presence of two witnesses.

ALBERT KRYSZAT.

Witnesses:

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