(No Model.) 3 Sheets—Sheet 1.

M. BISCHOFF.

WOOD SCREW MACHINE.

No. 413,486. Patented Oct. 22, 1889.

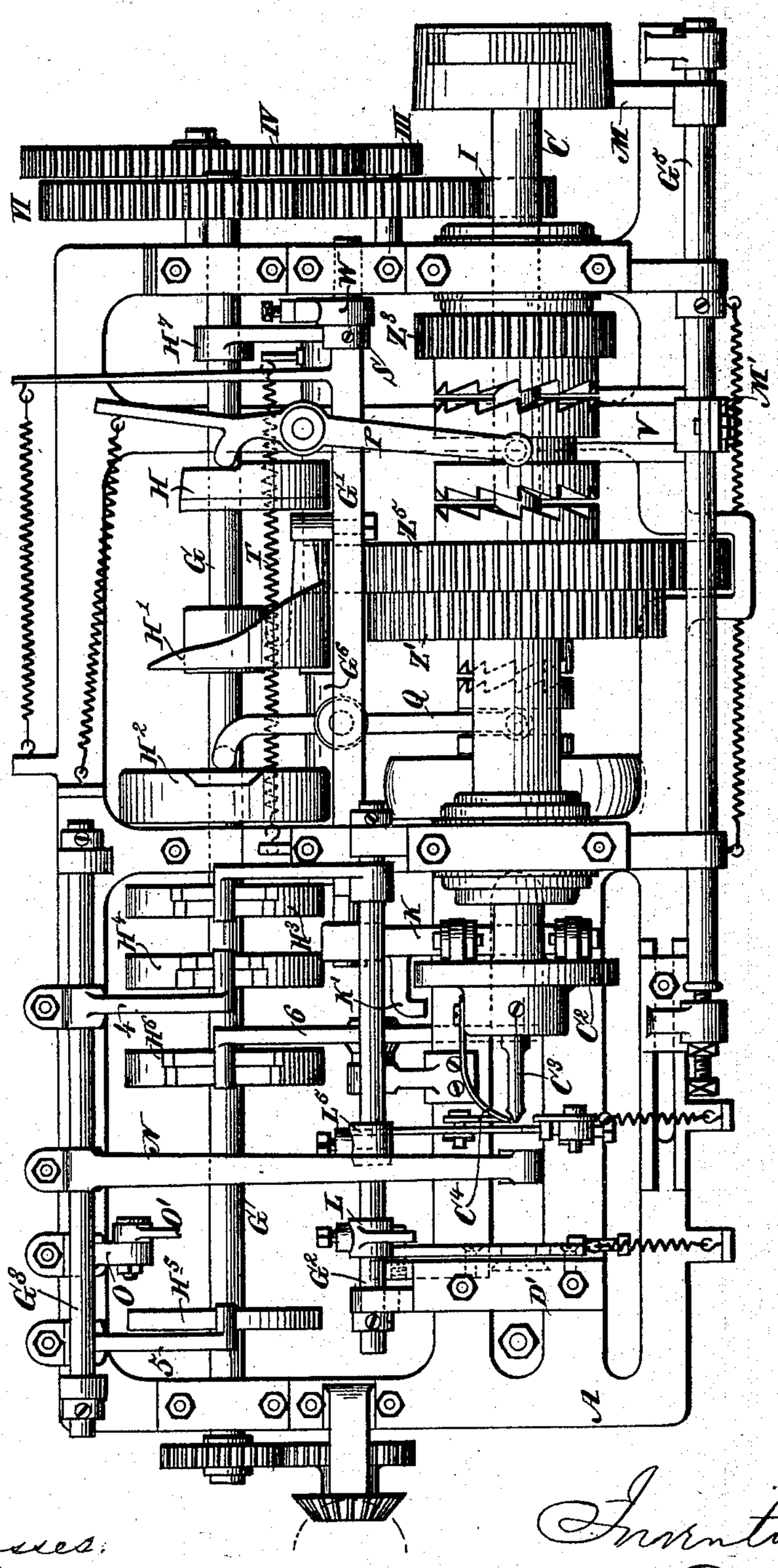

Fig. 1.

Witnesses:
J. A. Rutherford.
Geo. W. Rea.

Inventor:
Martin Bischoff.
By James La Norris.
Attorney.

(No Model.) 3 Sheets—Sheet 2.

M. BISCHOFF.

WOOD SCREW MACHINE.

No. 413,486. Patented Oct. 22, 1889.

Fig. 7.

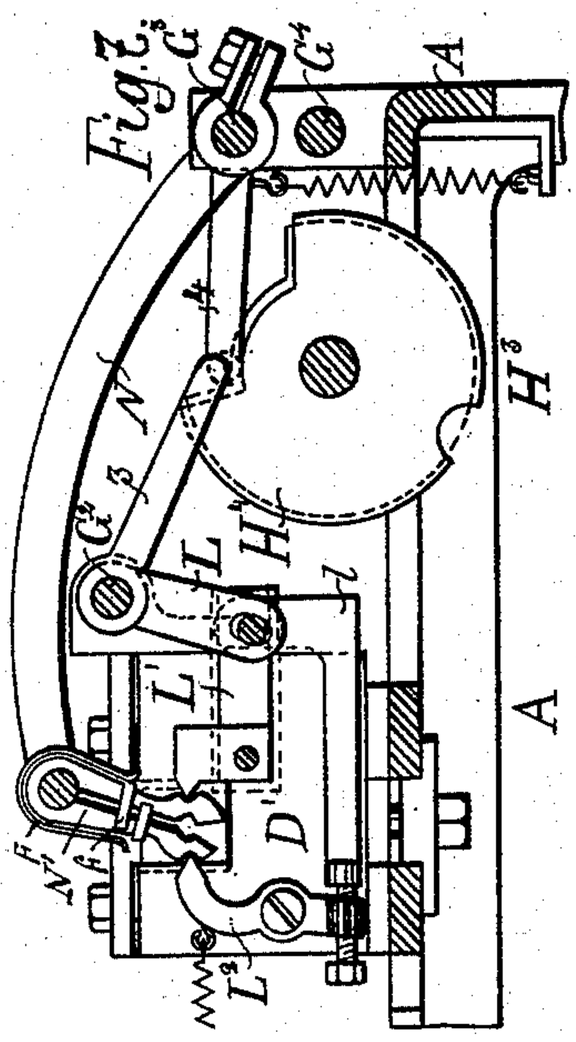

Fig. 12

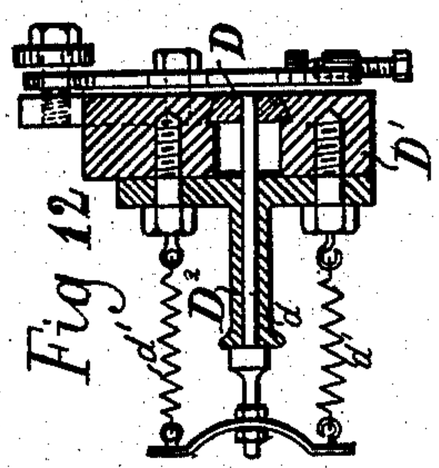

Fig. 10

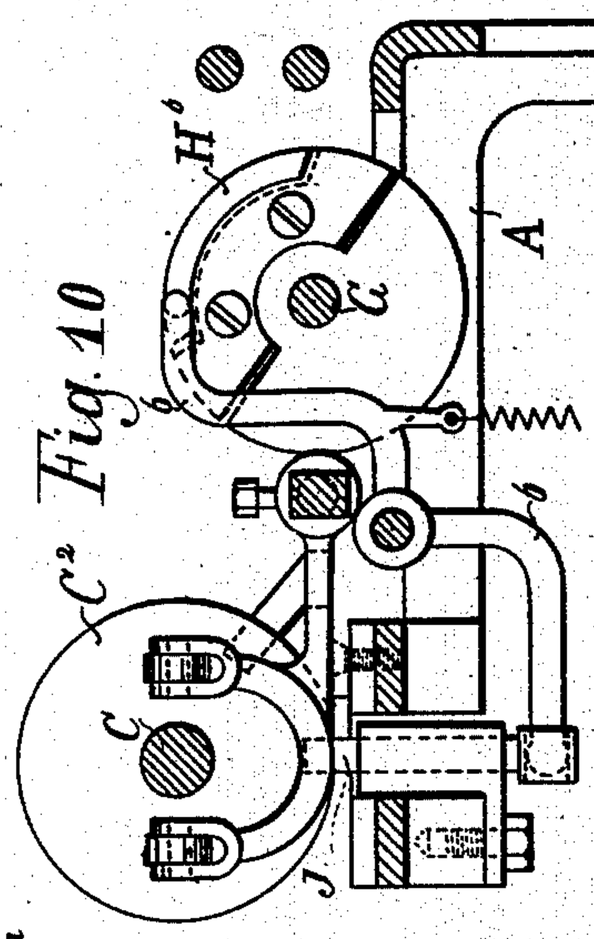

Fig. 8.

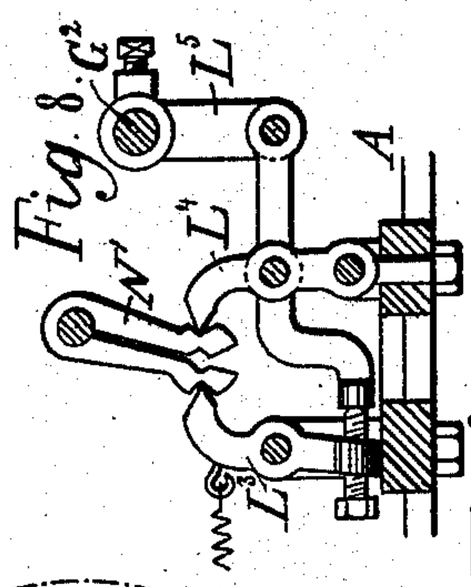

Fig. 9.

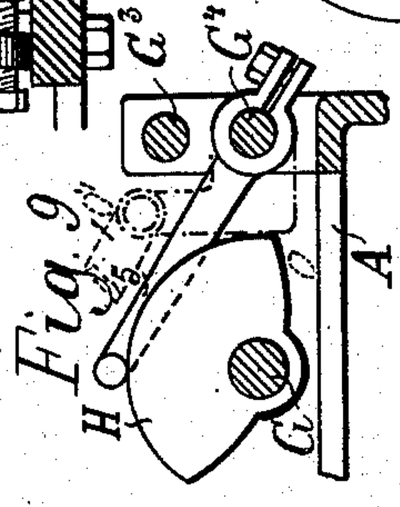

Fig. 11a.

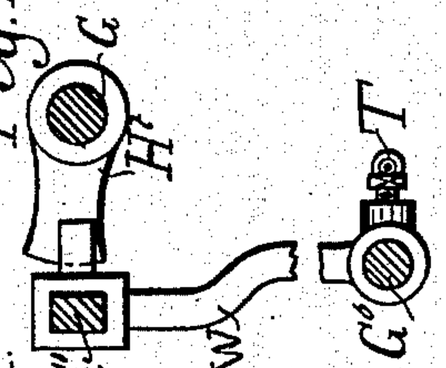

Fig. 2.

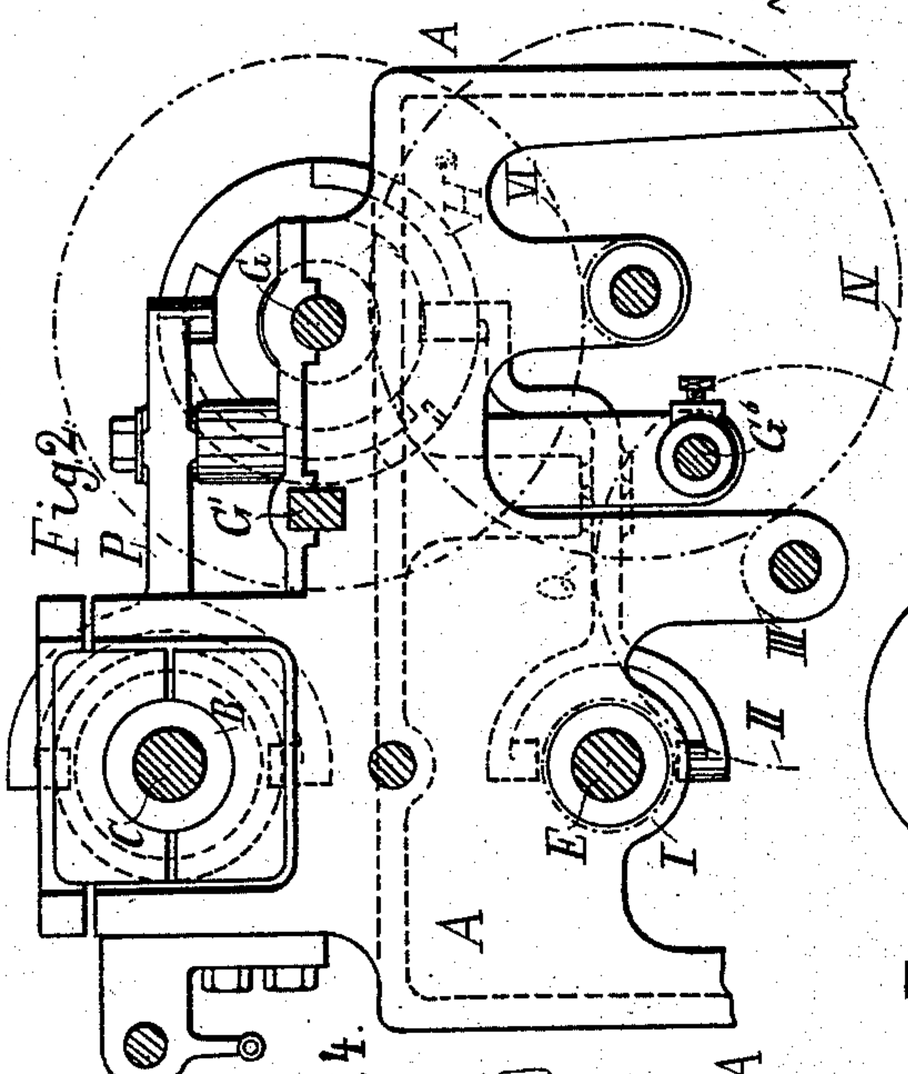

Fig. 6.

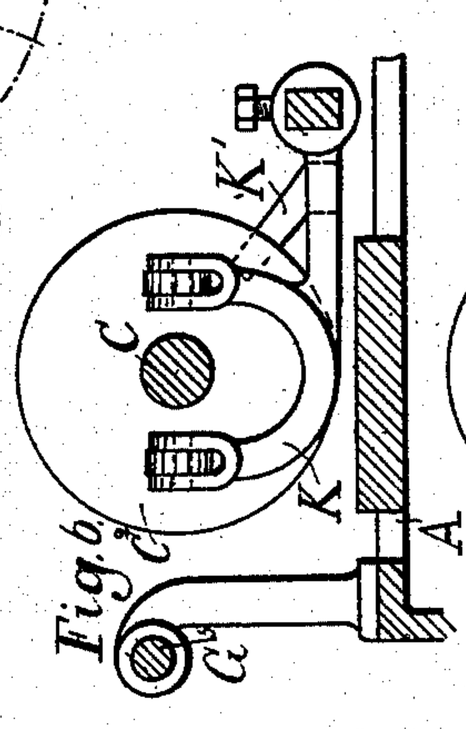

Fig. 4.

Fig. 4a.

Fig. 5.

Witnesses:
J. A. Rutherford
Geo. H. Rees

Inventor:
Martin Bischoff.
By James L. Norris
Atty

(No Model.) 3 Sheets—Sheet 3.

M. BISCHOFF.

WOOD SCREW MACHINE.

No. 413,486. Patented Oct. 22, 1889.

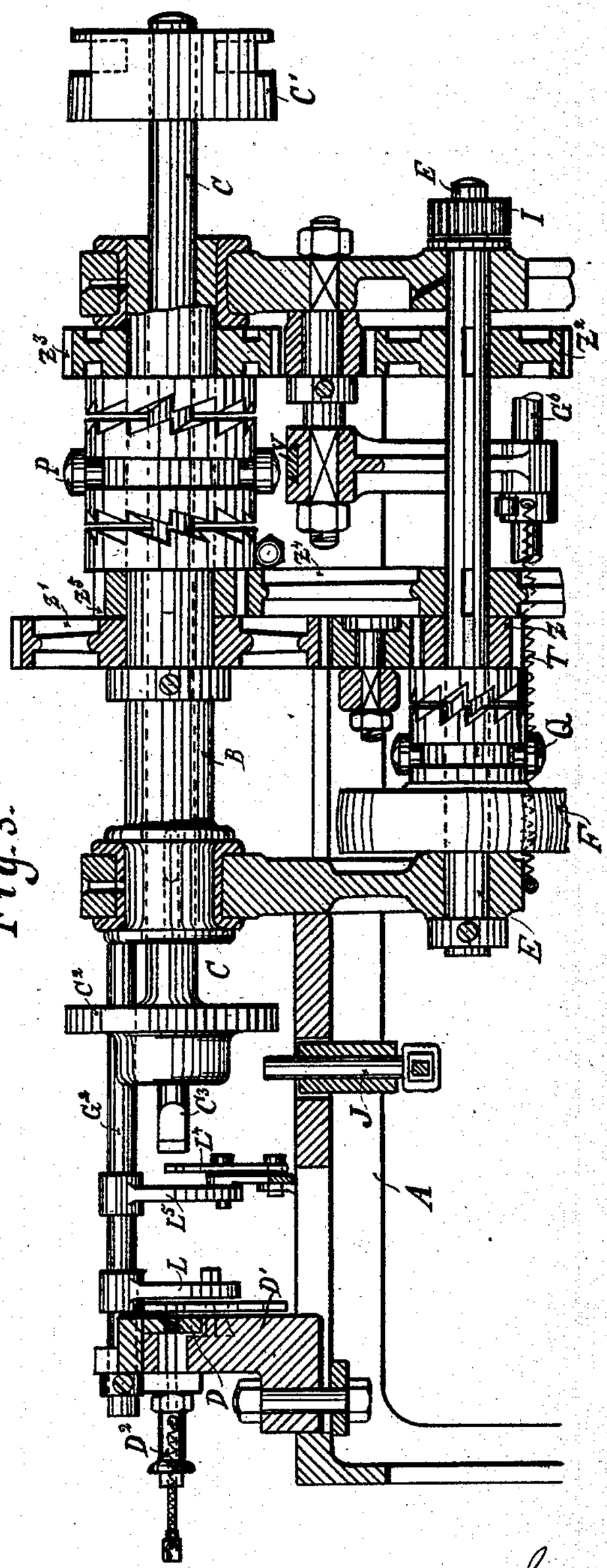

Fig. 3.

Witnesses:
Jno. A. Rutherford.
Geo. W. Rea.

Inventor:
Martin Bischoff
By James L. Norris Attorney.

UNITED STATES PATENT OFFICE.

MARTIN BISCHOFF, OF SCHWELM, PRUSSIA, GERMANY.

WOOD-SCREW MACHINE.

SPECIFICATION forming part of Letters Patent No. 413,486, dated October 22, 1889.

Application filed April 5, 1888. Serial No. 269,759. (No model.)

To all whom it may concern:

Be it known that I, MARTIN BISCHOFF, a subject of the King of Prussia, residing at Schwelm, Kingdom of Prussia, German Empire, have invented new and useful Improvements in Screw-Cutting Machines, of which the following is a specification, reference being had to the accompanying drawings.

This invention relates to machines for automatically cutting the threads on screw-bolts the heads of which are of square or hexagonal shape or are round and provided with a slot for the screw-driver. The machines heretofore employed for this purpose do not operate automatically, but require the continual aid of a workman, while the machines constructed according to this invention require a workman only when by any accident a stoppage of the operation occurs or when the machine requires to be provided with fresh material.

In the accompanying drawings, Figure 1 shows a plan of the machine. Fig. 2 is a side view of part of the frame on the right-hand side of Fig. 1, showing the disk H actuating the coupling-lever P, and the coupling-lever Q operated by the disk H^2, and also the pitch-circles for the toothed driving-wheels of the shaft G. Fig. 3 is a section on the line *x x*, Fig. 1. Figs. 4, 4^a, and 5 show the arrangement of the disengaging device, (which is actuated by the cam-disk C′,) of the coupling upon the sleeve B. Fig. 6 shows the fork K, provided with friction-rollers and acting upon the cam. Fig. 7 shows the gripper to be operated by the disk H^4, and the clamping device to be driven by the disk H^3 and arranged nearest to the screw-plate. Fig. 8 shows the clamping device arranged nearer to the screw-driver. Fig. 9 shows the driving of the feed mechanism by the disk H^5. Fig. 10 shows the pin J, upon which the disk H^6 acts. Figs. 11 and 11^a show the disks H′ and H^7, which displace or retain the pins *g* and *w* of the rod G and connecting-bar W. Fig. 12 is a horizontal section through the screw-ejecting device.

In this machine the screw-cutter and the gripper conveyer hand and plate are formed as in the known machines of this kind, while the arrangement for seizing the slot or hexagonal or square head, and also the remainder of the mechanism of the machine, are new.

In the frame A are supported the main shafts C and E, the latter of which serves as the driving-shaft, and is provided with the belt-pulley F, Figs. 1 and 3. The second shaft C does not turn directly in its bearings, but turns with the sleeve B, which incloses it, and in which it can be displaced in the longitudinal direction. The sleeve B is driven from the shaft E by means of what I will term "three chains of intermediate gearing," such comprising sets of toothed wheels, which I will now describe in detail. When the wheels Z Z′, operating in conjunction with the intermediate wheel $Z^\times$, are thrown into gear, the sleeve will turn very slowly. The wheels Z^2 Z^3, working with the intermediate wheel $Z^{\times\times}$, impart to the sleeve a velocity equal to that of the shaft E, and the wheels Z^4 Z^5, engaging directly with each other, cause a quick movement of the sleeve B. The continually-rotating wheels Z^2 and Z^5 are alternately coupled with the sleeve B and turn it in one or the other direction. The wheel Z is revolved by the shaft E as soon as the simple clutch upon the same is engaged. The shaft C has at one end a slightly-conical cam-disk C′ and at the other end a flanged socket C^2 for the reception of a screw-driver C^3, as in the present case, or of a holder having a square or hexagonal depression, according as the screw-heads are formed with a slot or square or hexagonal. The said socket is widened at the rear end to form a disk C^2, against the rear side of which runs a pair of rollers and effects the displacement of the spindle C. On a line with the axis of the spindle C is the die-plate D, which is formed as in the ordinary screw-cutting machines, and which is secured in the die-plate holder D′. The latter can be fixed upon the frame so that it may be displaced according to the length of the screws.

Upon the frame A is also supported the shaft G, which carries eight cam-disks H H′ to H^7, of suitable shape. Of these disks H actuates the double clutch of the sleeve B, Figs. 1 and 2, by means of the disengaging-lever P, which is continually pressed by the spring R against the disk. The disk H′, by means of the pin *g* sliding upon its inclined surface, regulates the reciprocating movement of a square rod G′, which latter, through the medium of the spring R′, presses the roller-fork K K′, fixed thereon, against the disk

C^2, this pressure being transmitted to the screw-driver C^3, Figs. 1 and 6. The third disk H^2 upon the shaft G, by means of the lever Q, causes the engagement of the clutch of the driving-shaft E, if the screw to be cut is to be inserted and placed before the die-plate. The disk H^3, through the medium of the lever 3, causes the movement of a short auxiliary shaft G^2, Fig. 1, which carries the lever L. The latter has for its object to set in motion the slide L′, let into the die-plate holder D′, Figs. 1, 3, and 7. Simultaneously with the rectilineal movement of the slide L′ the arm L^2 is caused to swing on its pivot l' by the action of a rod l, having a slotted connection with and moved lengthwise by the lever L when the latter is oscillated by the shaft G^2, lever 3, and disk H^3. The slide L′ and the arm L^2 are provided with points or projections $n\ n$, which, when the gripper N′ is lowered, engage with the notches $n'\ n'$ in the latter for the purpose of seizing and inserting the screws to be cut. The spring f^2 always tends to force apart the slide L and the lever L^2, the two points or projections of which are always at equal distances from the center line of the shaft C, so that the center line of the screw held by the gripper coincides exactly with the aforesaid center line. The screw-driver in an entire revolution will be placed parallel with the slot cut in the screw-head and will project into the same. When screws of great length are to be provided with threads, the gripper-lever N is displaced so far to the right-hand side, Figs. 1, 3, and 7, that the gripper can be seized by the levers L^3 L^4 in the same manner by the points or projections $n\ n$, Fig. 8. These levers, which are drawn asunder by the spring f^3, are to be so adjusted that they act immediately upon the bolt and hold the same in the direction of the axis C. The movement of the levers L^3 L^4 is likewise caused by the auxiliary shaft G^2. To the lever L^5, adapted to be moved longitudinally upon it, is jointed the bent rod l^2, which acts upon the levers L^3 L^4 at points, one of which is below the pivot l^3 of the lever L^3 and the other above the pivot l^4 of the lever L^4. If now the lever L^2 and slide L′ are used alone, the levers L^3 L^4 are placed so far apart that the screw-driver C^3 will pass freely between them even when they come nearest to each other. The upward and downward movement of the gripper-lever N, which is connected with the shaft G^3 and is forced downward by the spring $f^{\times\times}$, is caused by the cam-disk H^4, upon which slides the lever 4, connected with the shaft G^3, Figs. 1 and 7. The gripper N′ consists of two arms, which are adapted to turn upon the pin m of the lever N, and the naves of which overlap each other, as in a pair of cutting-nippers. By a spring f, bent to the shape of a horseshoe and placed around the arms, the latter are pressed against each other. A second spring f'', bent in the same manner, and which surrounds the spring f, is fixed to the gripper-lever N by a screw, so that the gripper swinging upon the pin m will automatically return to its position to the gripper-lever. The disk H^5 acts upon a lever 5 on the auxiliary shaft G^4, thereby setting in motion levers and mechanism indicated by O′ O′, Figs. 1 and 9 of the accompanying drawings, which mechanism operates in the known manner a fork fixed to the conveyer and a hand, so that the screws to be cut are conveyed to the gripper N′. In like manner, as already known, a plate for the reception of the screws to be cut is set in motion by the shaft G. The disk H^6 acts through the medium of levers 6 upon a pin j, which is forced upward by the spring f^6, and which holds back the flanged socket C^2 when required, Figs. 1, 2, and 10. The disk H^7, by its cam, Fig. 11^a, acts against the side of a pin w on the rod G′ to relieve the latter of the spring-pressure at the time when the screw-driver C^3 is inserted in the screw-head, which occurs when the cam-disk H^7 has rotated to the position shown in Fig. 11^a. The shaft G is operated from the driving-shaft E through the medium of the change-wheels I II III IV V VI, Figs. 1 and 2. The wheels II and III turn simultaneously upon the journal α and the wheels IV and V upon the journal β of the frame. Their size depends on the length of the thread of the screw to be cut. The wheels must be such that the shaft G has to make a complete revolution for every screw cut. Upon the frame A is, moreover, supported a shaft G^5, which can be adjusted by the slide g' and the screw g^2, and is forced to the left-hand side by the spring T, the lever M, Figs. 1 and 5, of the said shaft working upon the cam-disk C′ of the shaft C. In the engagement of the lever M into one of the grooves of the disk C′, which is effected by the spring $f^\times$, motion is imparted by means of the lever M′ to a slide V, which acts upon a pin of the disengaging-lever of the clutch in such a manner that the said clutch is disengaged, Figs. 1, 3, and 4. The auxiliary shaft G^6, Figs. 1, 2, and 11, is connected with the rod G′ by a bar W, which is secured upon the said shaft G^6, but does not prevent a displacement of the rod G′. As the powerful spring T always presses the rod G^6 to the left-hand side, connecting-bar W, by means of the adjusting-ring S upon the rod G′, will displace the latter to the left-hand side as soon as the disk H^7 releases the pin w of the connecting-bar. The springs R′ and T will then act together to displace the spindle C.

On setting the machine in motion the above-mentioned known mechanism, consisting of a fork, plate, conveyer, and hand, will commence to work in such a manner that the fork, by the action of the lever-work O O′, which is set in motion through a lever 5 upon the auxiliary shaft G^4, Figs. 1 and 9, receives one or more screws supported upon the plate and transmits them to the conveyer, which allows them to pass to the hand. The gripper secured to the gripper-lever N, when the hand arrives with the screw to be cut, will

then, passing down a little with a jerk, take hold of the screw and hold it by the spring *f*, whereupon the hand passes back again in order to receive another screw. The jerk in the movement is caused by a depression in the cam-disk H^4, into which the end of the lever 4 engages, Figs. 1 and 7. By this movement the screw is brought to the center of the die-plate, and is held by the slide L′ and the lever L^2. A part of the spring-pressure previously taken up by the cam-disk H′ is now brought to bear upon the axis C, whereby the screw-driver C^3 is caused to press against the head of the screw and the latter against the screw-plate. The more powerful spring of the pressing part W is kept back by the disk H^7 until the cutting commences. During this time the clutch of the driving-shaft has been thrown into gear by the cam-disk H^2, whereby the spindle B, and at the same time the screw-driver, is set in the slowest motion by means of the wheels Z, $Z^\times$, and Z′. The double clutch is still disengaged. By this slow movement carried out with pressure the screw-driver is to be caused to enter the slot in the head. After this has been done, which is after one revolution of the shaft C, the clutch of the driving-shaft E is thrown out of gear by the disk H^2, and the double clutch of the spindle B is caused by the cam H to engage for the cutting, so that the wheels Z^2, $Z^{\times\times}$, and Z^3 will now set the spindle C in motion. Meanwhile the disk H^7 has advanced so far that the more powerful spring T of the pressing-bar W can act upon the rod G′. The slide L′ and lever L^2 now release the gripper N′ and recede far enough to leave sufficient room for the head of the screw, after which the gripper N′ can move upward in order to fetch during the cutting another screw which is to be cut. When the screw has been cut as far as the head, the cam-disk C′ has advanced so far that in the last half of the revolution one of the grooves of the cam-disk passes above the lever M, thereby compelling the latter by means of spring-pressure to engage deeper and deeper with the same, Fig. 5. The lever M′ is thus moved, and the slide V works with an inclined side upon the engaging and disengaging lever of the double clutch and throws the same out of gear, Figs. 4 and 4^a. The disk H will after this conduct the clutch to the opposite wheel Z^5, and thereby set the spindles B and C in rapid rotation in the opposite direction, and thus turn out the screw which has been cut. In the backward movement the cam-disk C′ will press the lever M down again. The same bears again upon the circumference of the disk and the slide V returns to its original position. While the screw is turned out of the die-plate, the pressure of the roller-fork K upon the spindle C is taken up by the disk H′. In order that in the rapid outward movement of the cut screw from the screw-plate the screw-driver shall remain in the slot, the cam-disk C′ is made slightly conical, whereby the pressure of the spring $f^\times$ upon the lever M will also be caused to act in the direction of the axis of the shaft C. When the screw is quite turned out, the axis G′ is still farther drawn back by a steeper projection on the disk H′, so that a carrier-lever K′, secured to the roller-fork K, draws the spindle C still farther back in order to provide sufficient room for a fresh screw to be cut. At the same time the double clutch is thrown out of action and the gripper N′ can now feed a fresh screw to be cut. Should it occur that no screw is fed, and therefore the pressure of the shaft G′ does not act upon a screw to be cut too quick, a forward movement of the spindle C against the gripper N′ would take place. In order, therefore, to prevent contact, the lever 6 upon the disk H^6 raises a pin *j*, which strikes the front of the disk C^2 of the spindle C and remains there until the gripper N′ has moved back. In the further rotation H′ enables the further forward movement of the spindle C until the lever M passes into a groove of the cam-disk C′ and sets the clutch at rest.

In order to prevent the cut screw in the rapid turning out from sticking in the last thread in the die-plate, a casing D^2 is arranged on the rear side of the die-plate holder D′, Fig. 12. The pin *d*, guided in the casing, is always pressed toward the die-plate by the springs *d*″, secured to the said casing, but is prevented by the collar *d*′ from projecting beyond the die-plate. If the pin *d* were to advance, it would render difficult the insertion of a fresh screw. In like manner, to cause the falling from the screw-driver, upon the projection of the spindle C is arranged a spring C^4, Fig. 1, which presses against the head of the screw, so as to eject the latter if it is released.

What I claim is—

1. In a screw-cutting machine, the combination of a sleeve B, a spindle C, having a flanged socket C^2, and adapted to turn with and slide in the sleeve, a screw driver or holder C^3, the sliding rod G′, having a fork engaging the flanged socket, and the shaft G, having cam-disks H′ and H^7 for moving the rod lengthwise, substantially as described.

2. The combination of the sleeve B, the spindle C, having a screw driver or holder C^3, the cam-shaft G, having a cam-disk H^2, the driving-shaft E, the change-wheels, the three chains of intermediate gearing between the sleeve and driving-shaft, the clutch on the driving-shaft, the clutch-lever Q, actuated by the cam-disk, the double clutch on the sleeve, the cam H, and the lever P, substantially as described.

3. The combination of the sleeve B, the spindle C, turning with and adapted to slide in the sleeve, the driving-shaft E, the three chains of intermediate gearing between the sleeve and driving-shaft, the clutch on the driving-shaft, the double clutch on the sleeve,

the levers Q and P, and cam-disks H^2 and H, substantially as described.

4. The combination of the sleeve B, the spindle C, turning with and sliding in the sleeve and having the grooved disk C′, the screw driver or holder C^3, the lengthwise-movable shaft G^5, the spring T, the lever M on the shaft engaging the grooved disk, the double clutch on the sleeve, the slide V for disengaging the clutch, and the lever M′ on the shaft for operating the slide, substantially as described.

5. The combination of the sleeve B, having the gear Z′, the spindle C, turning with and adapted to slide lengthwise in the sleeve and having a screw driver or holder C^3, the driving-shaft E, having the gear Z, the intermediate gear $Z^{\times}$, a clutch on the driving-shaft to engage and disengage its gear Z, the change-wheels, the shaft G, the double clutch on the sleeve, the gears Z^2 Z^3 $Z^{\times\times}$, the gears Z^4 Z^5, the levers Q and P, and the cam-disks H^2 and H, substantially as described.

6. The combination, with the rising and falling grippers, of the pivoted levers or arms L^2 L^3, the slide L′, the rock-shaft G^2, having the lever L engaging the slide and provided with the lever 3, the cam-disk H^3 for actuating the latter, the pivoted lever or arm L^4, the lever L^5, extending from the rock-shaft, and the rods l l^2, which actuate the said pivoted levers or arms, substantially as described.

7. The combination, with the sleeve B, having the gear Z′, and spindle C, having a screw driver or holder C^3, of the driving-shaft E, having the gear Z, the intermediate gear $Z^{\times}$, the clutch on the driving-shaft, the clutch-operating lever Q, and the rotary cam-disk H^2, for slowly rotating the spindle and engaging the screw driver or holder with the head of the screw to be cut, substantially as described.

In witness whereof I have signed the foregoing specification this 13th day of June, 1887.

MARTIN BISCHOFF.

Witnesses:

EWALD HIMHOFF,

H. SPELSBÉRG.