(No Model.)

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E. P. & H. C. WALTER.

METAL PLANING MACHINE.

No. 364,980. Patented June 14, 1887.

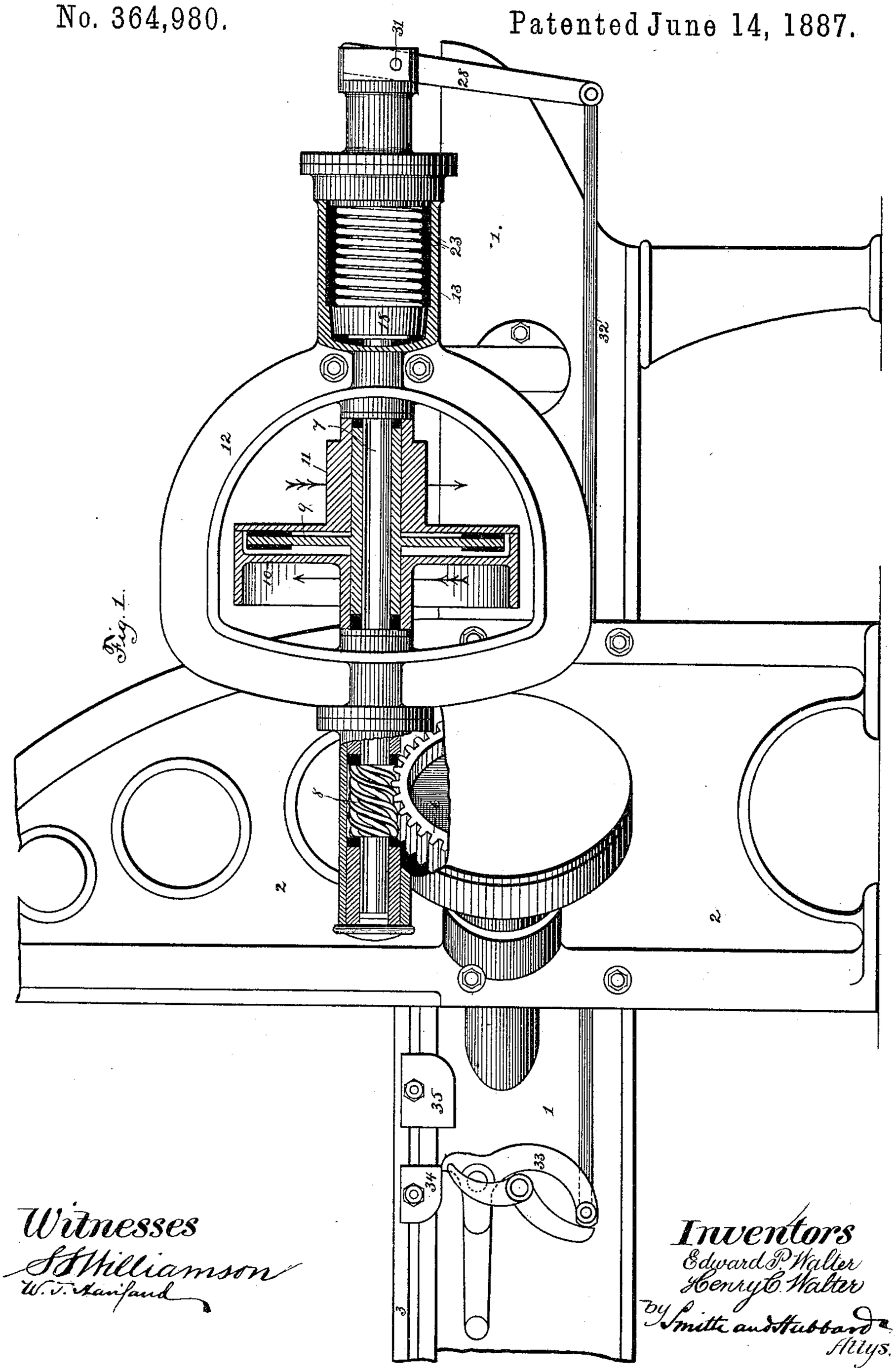

Fig. 1.

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(No Model.) 5 Sheets—Sheet 2.

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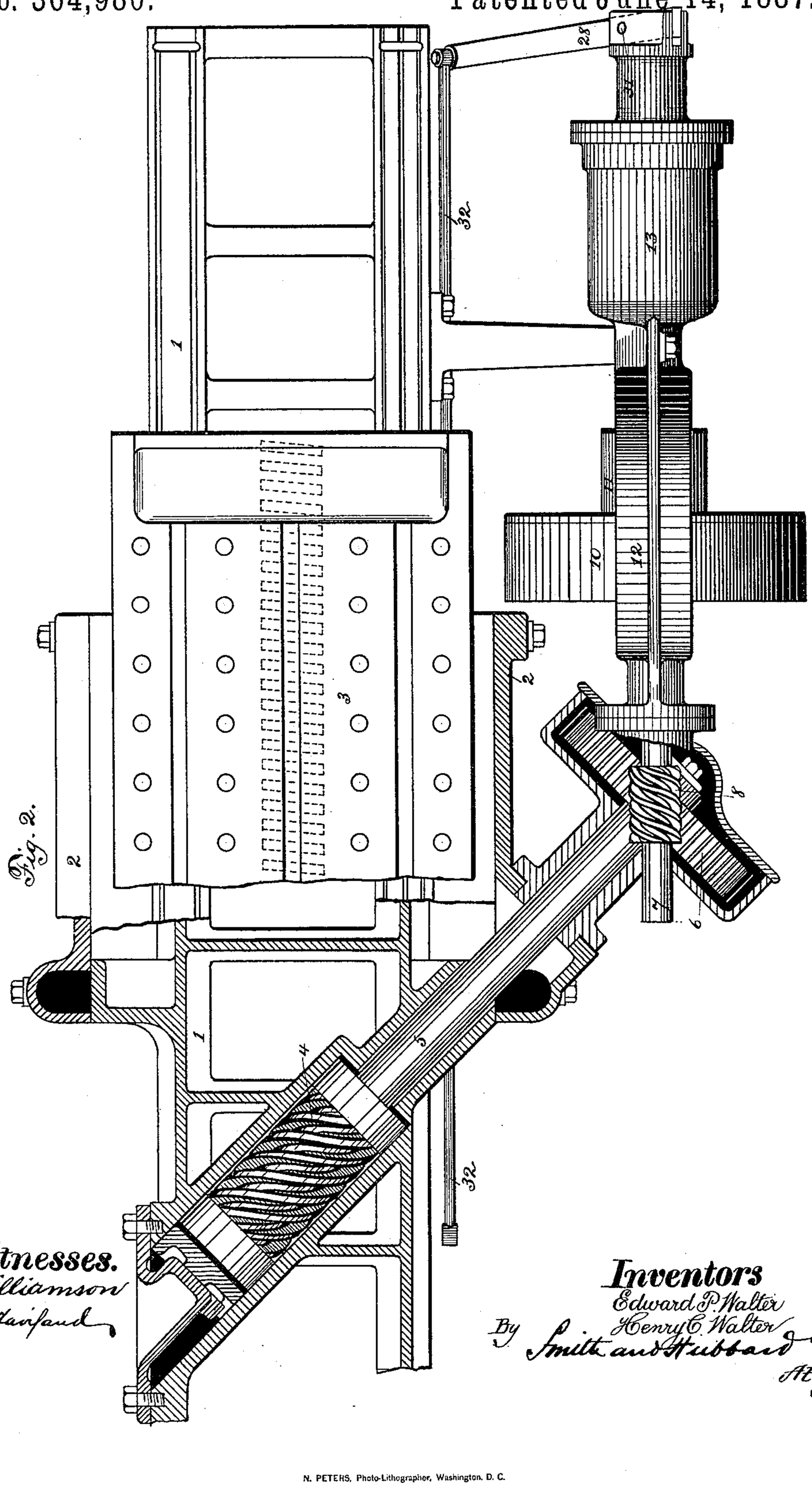

Fig. 2.

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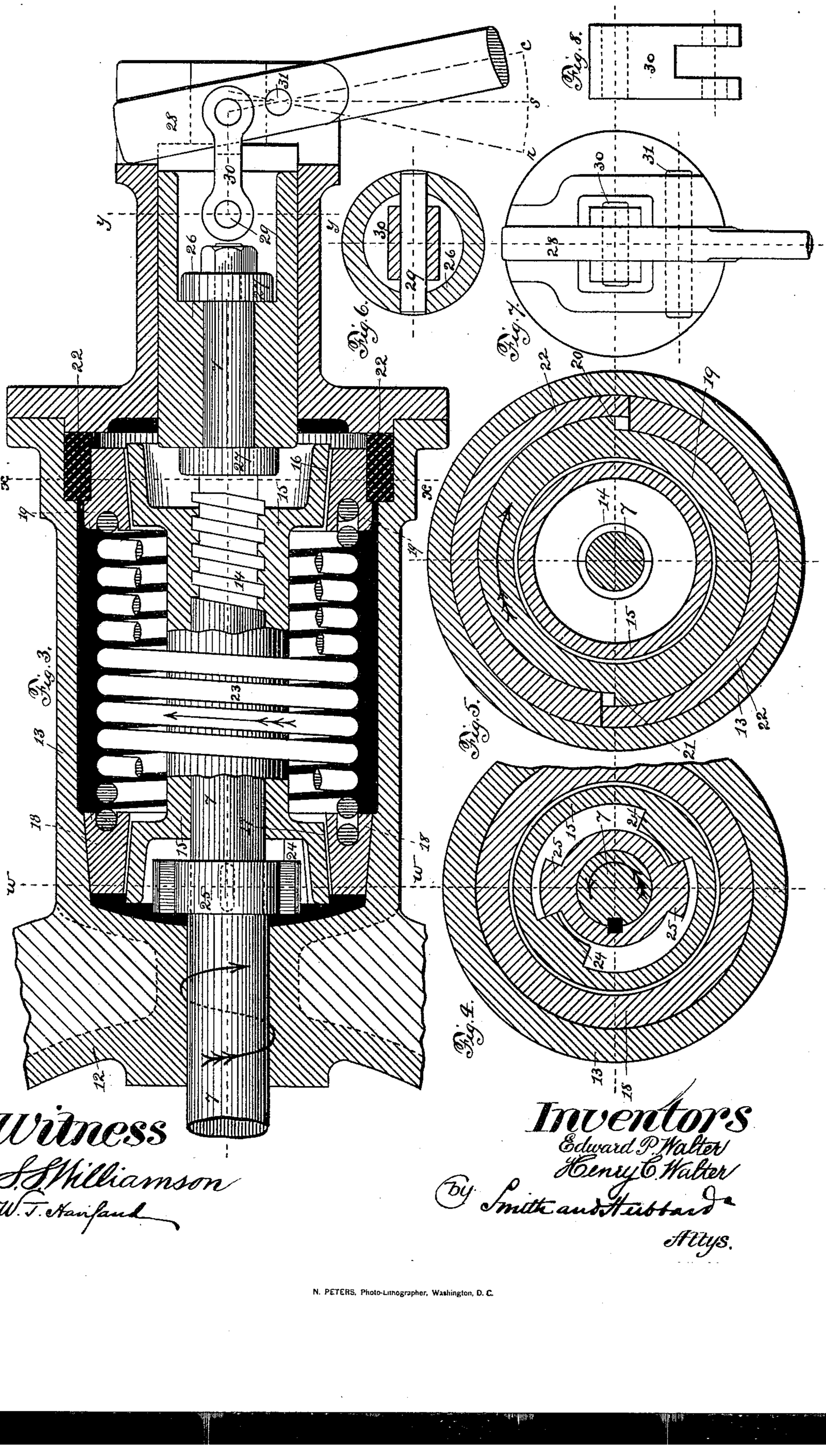

Witness
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(No Model.) 5 Sheets—Sheet 4.

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METAL PLANING MACHINE.

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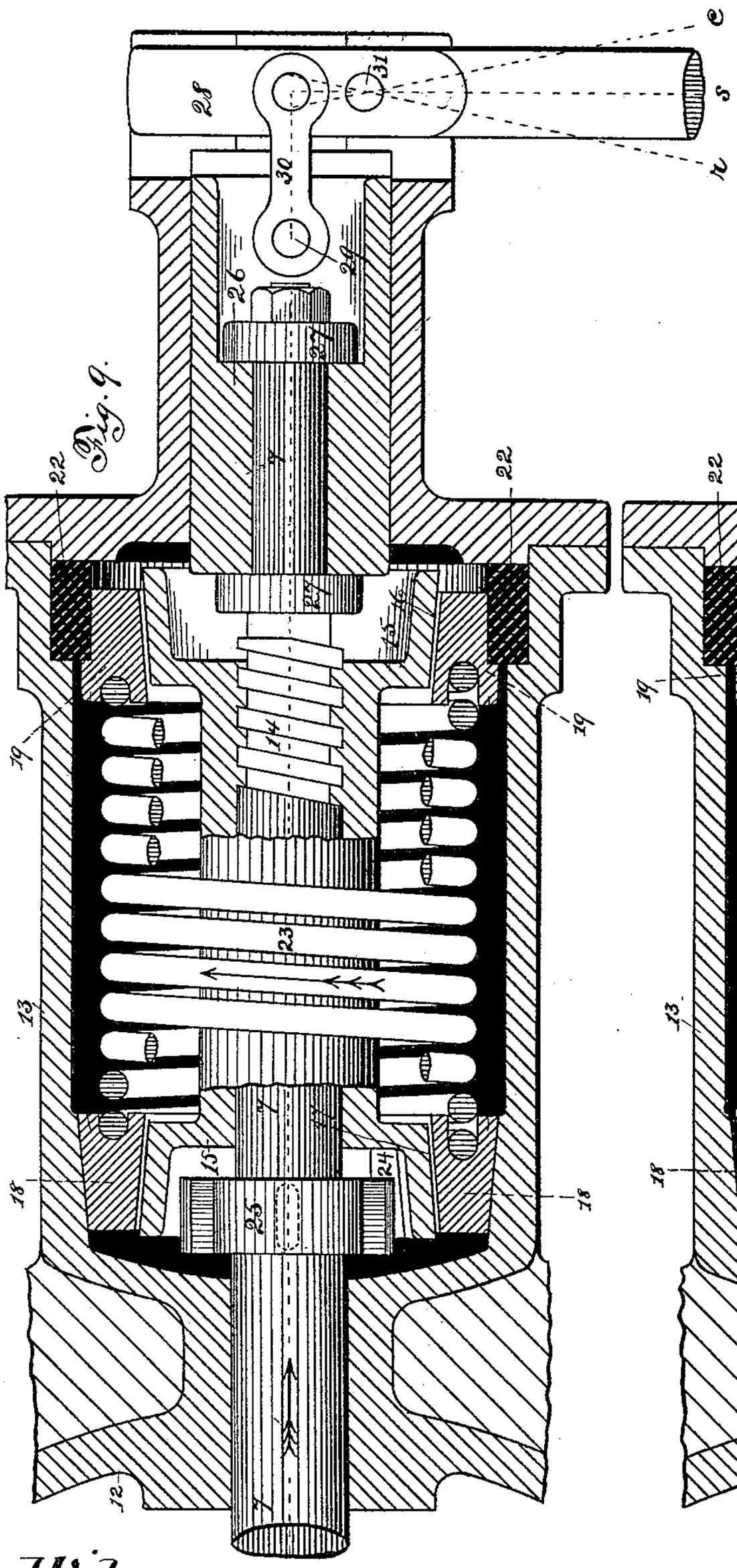

Fig. 9.

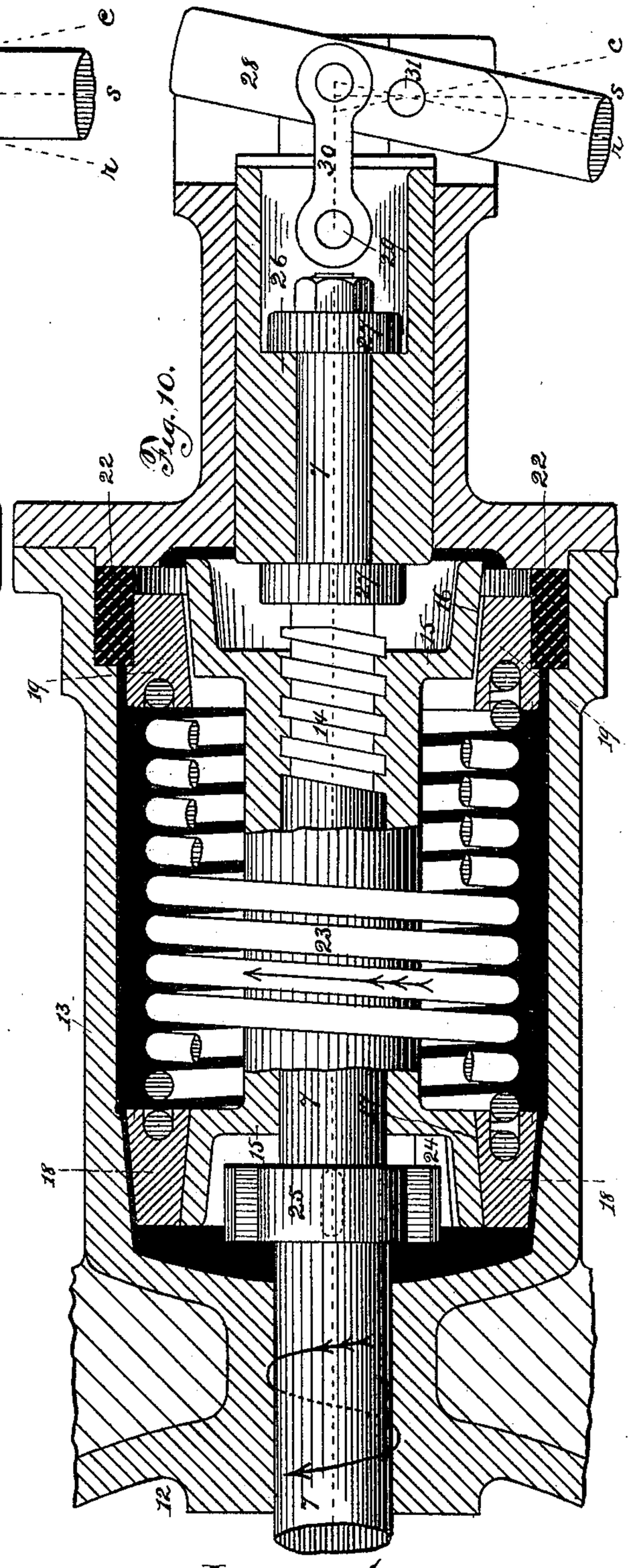

Fig. 10.

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(No Model.) 5 Sheets—Sheet 5.

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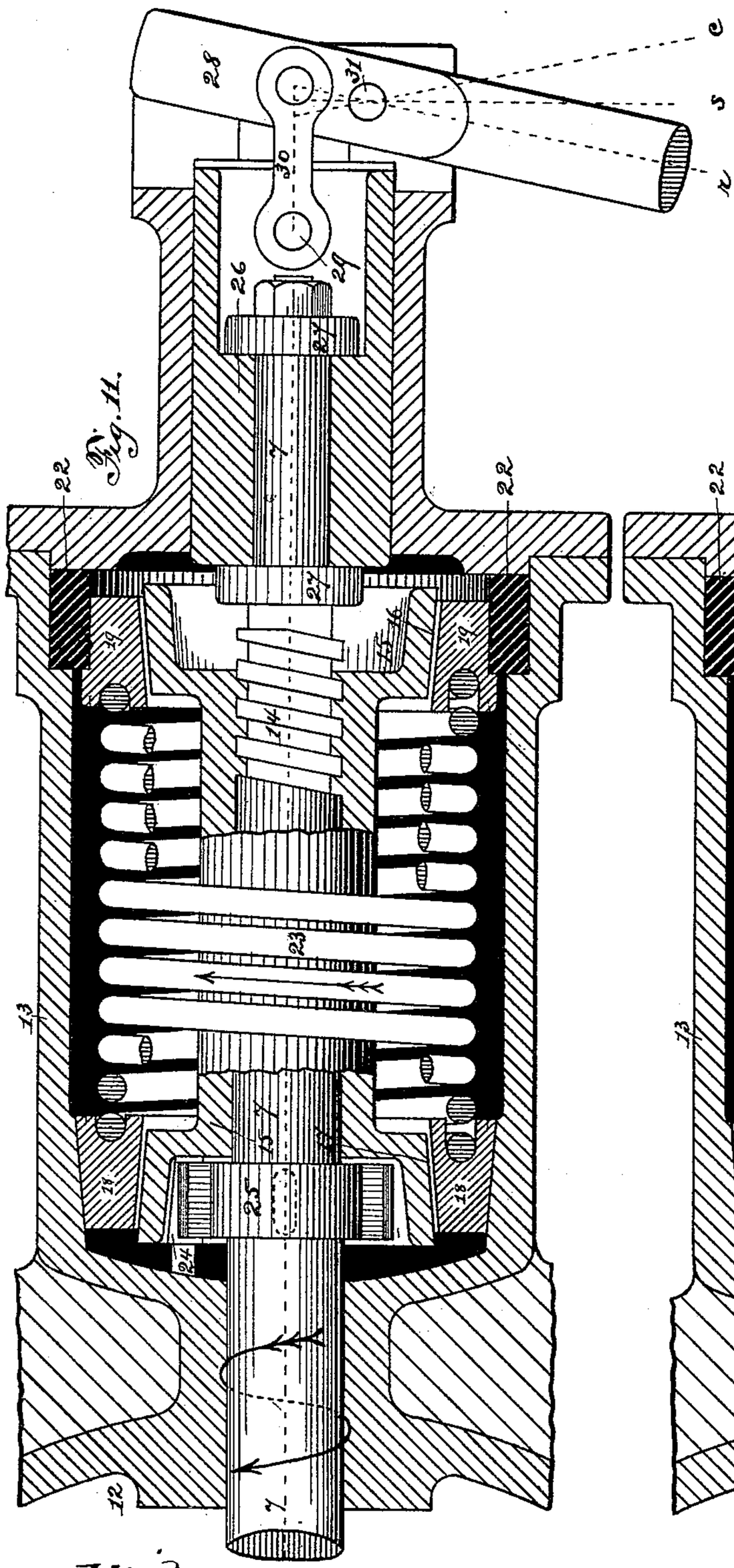

Fig. 11.

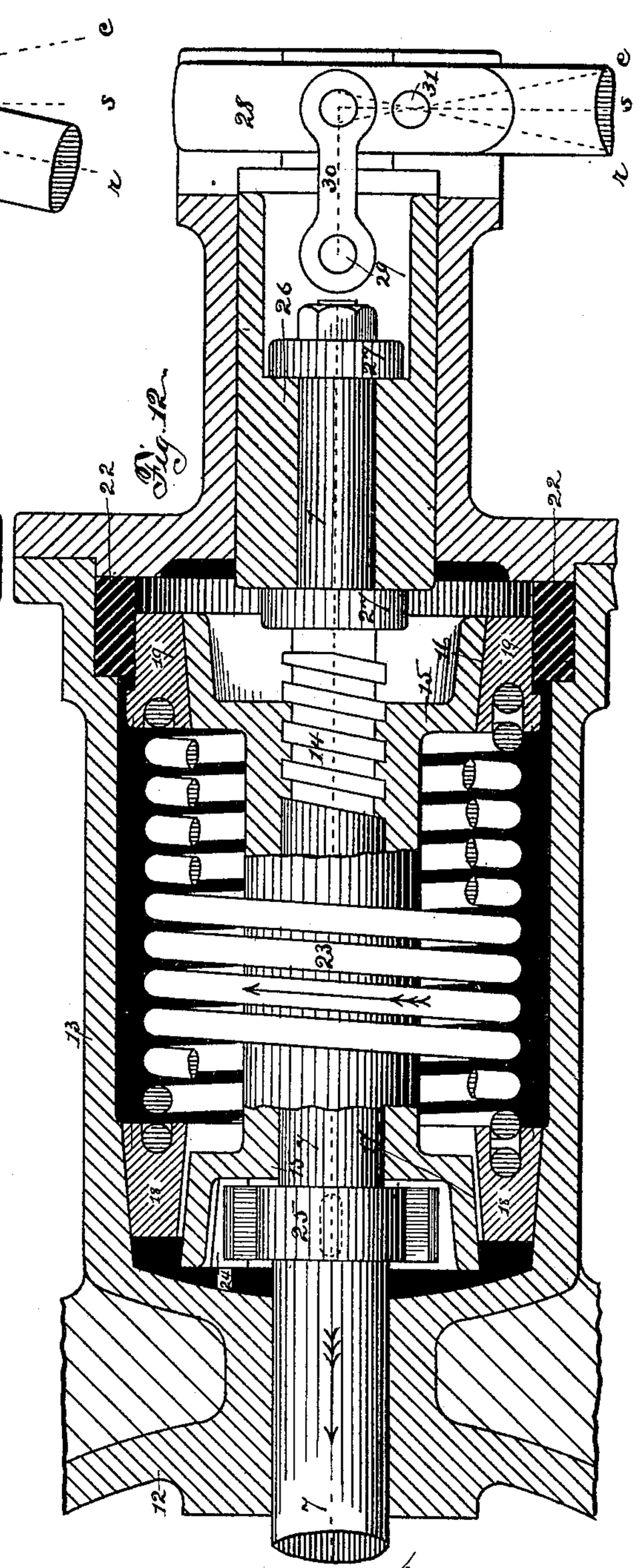

Fig. 12.

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UNITED STATES PATENT OFFICE.

EDWARD P. WALTER AND HENRY C. WALTER, OF BRIDGEPORT, CONNECTICUT.

METAL-PLANING MACHINE.

SPECIFICATION forming part of Letters Patent No. 364,930, dated June 14, 1887.

Application filed January 31, 1887. Serial No. 226,007. (No model.)

To all whom it may concern:

Be it known that we, EDWARD P. WALTER and HENRY C. WALTER, citizens of the United States, residing at Bridgeport, in the county of Fairfield and State of Connecticut, have invented certain new and useful Improvements in Metal-Planing Machines; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

Our invention relates to metal-planing machines, and while it may be applied with great advantage to any metal-planer having a reciprocating table, it is more especially adapted to machines employing a driving principle—such as is set forth and shown in certain Letters Patent of the United States, No. 293,289, granted to us the 12th day of February, 1884—and a reversing principle, such as is shown and described in certain other Letters Patent of the United States, No. 329,244, granted to us the 27th day of October, 1885.

The demand of metal-workers at the present time is for a machine for planing metal which upon its return-stroke shall move at a much higher speed than upon its forward or cutting stroke, and many devices calculated to effect this result have been produced. One of the greatest of the difficulties incident to the accomplishment of this desired end has been the difficulty of starting the table on its return-stroke very quickly and at high speed, and as quickly stopping the same prior to its next forward movement.

While our planer herein to be described possesses many advantages, the principal object of our invention is to furnish a device which shall perform the twofold function of overcoming the inertia of the table at the commencement of its backward stroke, and thereby obviate undue strain upon the driving mechanism and belts, and at the other extremity of the backward movement shall overcome the momentum of the moving table, and at that point also do away with undue strain upon the driving mechanism and belts. In addition, this quick starting and stopping effects a great saving of time; and with these ends in view our invention consists in certain details of construction and combinations of elements, hereinafter to be fully and in detail set forth, and then recited in the claims.

Before describing the particular elements which in combination are employed by us, we desire to say that the principle upon which our machine operates is that of quickly overcoming the momentum of the table at the end of its fast return, independent of belts or similar devices, and utilizing the power derived from that momentum in starting the table upon its next backward movement.

It will be observed that in Figure 1 is exhibited a particular construction of shipper-dogs and levers, and in Fig. 2 is shown an arrangement of the spiral driving-pinion underneath the table, which differs in some details from that shown in Letters Patent No. 293,289, hereinbefore referred to. These we have shown so as to exhibit our improved planer in its most advantageous construction. They are not described or claimed herein, and will form the subject-matter of separate applications.

In order that those skilled in the art to which our invention appertains may fully understand both its construction and operation and how to make and use the same, we will describe the same in detail, referring by figures to the accompanying drawings, which form a part of this specification, and in which—

Fig. 1 is a side elevation of our machine, the pulleys and clutch-disk being shown in section; Fig. 2, a plan view; Fig. 3, a detail section of the housing 13, showing the position of the parts contained therein during the forward cutting movement of the machine; Fig. 4, a transverse section taken at the line *w w* of Fig. 3; Fig. 5, a similar section at line *x x* of Fig. 3; Fig. 6, a similar section taken at line *y y* of Fig. 3; Fig. 7, a detail end elevation of the journal-block, lever, and connections; Fig. 8, a detail of the connecting-link 30; Fig. 9, a detail similar to Fig. 3, but showing the position of the parts when at rest at the end of the cutting movement—spring still in torsion; Fig. 10, a view similar to the last figure, but showing the position of the parts at the moment of reversing—spring clutched to the shaft and unwinding; Fig. 11, a similar view,

but showing the position of the parts when the table is moving backward—spring out of action and entirely disconnected from the shaft; and Fig. 12, a view similar to that last described, but showing the position of parts at limit of the backward movement—spring winding.

Similar figures of reference denote like parts in all the drawings hereinbefore referred to.

1 is the bed of our machine, 2 the uprights, and 3 the reciprocating table. These are of the construction common to metal-planers of modern design.

4 is the spirally-toothed driving-pinion, arranged beneath the table and meshing with the rack which is formed in the under surface thereof.

5 is the pinion-shaft, having spur-gear 6 secured upon its extremity.

7 is the pulley-shaft, carrying spiral pinion 8, which meshes with and drives the spur-gear 6. The pulley-shaft runs in journals suitably arranged at intervals throughout its length.

9 is a clutch-disk rigid on the shaft 7, and journaled on the outside of said shaft, one on each side of the clutch-disk, are the forward loose driving-pulley, 10, and the backward loose driving pulley, 11. These pulleys are driven in opposite directions and at different speeds (the backward driving-pulley in about the ratio of ten to one to the forward driving-pulley) by means of belts, which we have not thought necessary to show, and in the directions indicated by the arrows on Fig. 1.

12 is a pulley-frame extending around the pulleys to take up the end-thrust incident to the engagement of the clutch-disk with said pulleys.

13 is a housing which surrounds the shaft at the rear end of the pulley-frame, and this housing contains the mechanism which forms the principal feature of this invention, and whose nature, construction, and function we shall now explain. Within said housing, and near the extremity thereof, the shaft 7 has cut thereon a left-hand thread, as seen at 14.

15 is a clutch-hub surrounding shaft 7, and secured thereto by the engagement of the thread 14 with a corresponding female thread cut upon the interior surface of the hub. At each end of the hub are circumferential tapered seats 16 17, and, for convenience in future explanation, we will term that lettered 16 as the "winding-seat" and that lettered 17 as the "unwinding seat."

18 is a ring which is tapered in cross section, (see Fig. 3,) and which we will term the "unwinding-ring." The outer surface of this ring seats against the housing, and its inner surface is adapted to engage at certain times with the unwinding-seat of the hub 15. Near the other end of the housing is a ring, 19, which we will call the "winding-ring." Its inner surface is adapted to be engaged by the winding-seat of the hub 15, and its periphery has two cam-surfaces and shoulders, 20 21, and between its said periphery and the housing are interposed two semicircular wedges, 22, which are adapted to the eccentric contour of the ring, as clearly appears at the sectional view, Fig. 5.

23 is a left-hand spiral spring, whose ends are connected to the rings 18 and 19, respectively, and which, when placed in position within the housing, is compressed somewhat in the direction of its length.

Within the end of the clutch-hub 15 is formed a female clutch, 24, (see detail section, Fig. 4,) and 25 is a male clutch keyed upon shaft 7. The shape of these clutches is shown in the figure last referred to, and their function we shall presently explain.

26 is a sliding journal-block arranged in the end of the housing. The end of shaft 7 is journaled in this block, and by means of collars 27 the shaft may be given longitudinal movement by any movement of the block. The said block is adapted to be moved by lever 28, which is secured to the block by cross-pin 29 and link 30, and is fulcrumed at 31. Lever 28 is connected to and operated from the table by means of rod 32, reversing-lever 33, and shipper-dogs 34 and 35. (See Fig. 1.)

Upon the detail, Figs. 3, 9, 10, 11, 12, letters *c*, *r*, and *s* denote the respective positions of the mechanism within the housing, as indicated by the lever 28, and stand respectively for "cutting," "reversing," and "stopped."

The operation of our invention is as follows: The table is driven in both directions by the spiral driving-pinion 4, which meshes with the rack on the under side of the table. The rotation of said driving-pinion is derived from the pulley-shaft through pinion 8 and the spur-gear on the shaft 5, all of which is shown and described in the Letters Patent No. 293,289, hereinbefore referred to. The forward and reverse rotation of the pulley-shaft 7 is effected by the engagement of the clutch-disk with the loose driving-pulleys, which are arranged upon either side thereof, the shaft having sufficient longitudinal movement in its bearings to permit of such engagement.

The arrangement of shaft, pulleys, and clutch-disk, and the method of operation thereof, is more particularly described in the Letters Patent No. 329,244, to which we have heretofore referred. The longitudinal movement of the pulley-shaft should be particularly borne in mind, since it is upon such movement that the clutch mechanism and also the parts contained within the housing are dependent for their proper operation. The device whereby the inertia of the backwardly-moving table is overcome, or, to borrow a term from the steam-chest, "its stroke is cushioned," and the power of said inertia stored for use, in starting the table at the beginning of its next backward stroke, is the spiral spring 23. The other parts which are contained within the housing are designed, first, to wind up said spring in the direction of its spiral around the shaft at the end of the table's backward stroke; second, to hold said spring in tension during the whole of the for-

ward of cutting movement, and, third, to so connect the pulley-shaft and spring at the beginning of the backward stroke that the power stored in said spring shall be applied in giving the initial reverse movement to said shaft, and therethrough to the table.

Figs. 3, 9, 10, 11, 12 show positions which follow in regular sequence, and we will therefore explain the successive operations of the machine in the order of said figures, beginning with Fig. 3, in which, as above recited, the table is moving forward to take the chip, the spring is in tension, and the shaft and table are entirely independent thereof. In other words, the table is being carried in the ordinary manner. At this time the clutch-hub is in engagement with neither of the rings and is carried by the male clutch 25, as shown by the section, Fig. 4, and the arrow thereon. At the limit of the forward movement, by means of the reversing mechanism, shipper-dogs, &c., the lever 28 is brought to position *s*, when, through the journal-block, sufficient longitudinal movement is imparted to the pulley-shaft to disengage the clutch disk from the forward driving-pulley, but not enough to engage it with the backward driving-pulley. The machine is therefore at rest. The position of the parts is now as follows: The spring is spirally in tension, and is so held at one end by the semicircular wedges, the eccentric contour of the winding-ring, and the wall of the housing, and at the other end by the wedging of the tapered periphery of the unwinding-ring against the tapered seat within the housing. Further movement of the lever 28 to the position *r* imparts further longitudinal movement to the shaft and engages the clutch-disk 9 with the backward loose driving-pulley. This of itself would reverse the machine; but the arrangement of parts within the housing imparts the initial movement to the table and relieves the belts from the strain as follows: The movement of the shaft just referred to in the direction of the arrow, Fig. 9, not only engages the clutch-disk, as above stated, but (see Fig. 10) it engages the unwinding-seat of the clutch-hub with the unwinding-ring and draws the latter out of its engagement with the inner wall of the housing. Thus firmly wedged together, the spring, through the unwinding-ring, exerts its stored-up power to turn the clutch-hub in the direction shown by the arrow at Fig. 10. Now the female clutch at the end of the hub takes hold and carries the male clutch and the shaft 7, to which the latter is secured, exactly reversing the driving action and direction of rotation shown at Fig. 4. The power which is thus imparted to shaft 7 by the spring is in the form of tremendous reversing energy for two or three revolutions, but this is sufficient to enable the reversing-belt to take up and carry the table without having had the task of overcoming the inertia. As the backward energy imparted by the spring ceases and the belt takes hold, the female clutch, having expended the power derived from the spring, is again taken up and driven by the male clutch—that is, for a brief moment the hub has been driving the shaft, now the shaft again catches up with and drives the hub. At this time the screw-thread engagement of the shaft and hub withdraws the latter to the position shown at Fig. 11, when the endwise elasticity of the spring wedges the unwinding-ring again into its seat against the housing. (See Fig. 11.) Now the table runs backward, the parts being in the position shown at the figure last referred to and the spring having no stored-up energy. At the time of reversing to again commence the cutting movement, the lever 28, moved to position *s*, gives the shaft 7 longitudinal movement in direction of the arrow, Fig. 12. The winding-seat of the clutch-hub and the winding-ring are wedged together, and the inertia of the moving table is imparted in the form of revolution to the clutch-hub and the winding-ring. The semicircular wedges allow the said winding-ring to turn in this direction; but when the machine reverses (this time the initial movement which is at slow speed is given by the belt) the said wedges bind against the housing, and so hold said spring wound up throughout the forward movement. It will be understood that the stoppage of the table winds up the spring—that is to say, the momentum of the table at the end of the backward stroke after the driving-power has been thrown off. When the shaft is moved longitudinally by the manipulation of the lever to effect the forward movement of the table, the winding-seat of the hub is thereby withdrawn from engagement with the winding-ring to the position shown at Fig. 3. The spring is always wound up by means of the clutch-hub, winding-ring, and shaft, as is clearly shown at Fig. 12, and always unwinds by means of the clutch-hub, the unwinding-ring, the clutches in the end of the clutch-hub, and the shaft, as is clearly shown at Fig. 10.

In the drawings of this application we have shown the housing, spring, &c., as arranged upon the pulley-shaft; but we do not desire in any sense to be limited to this position, since the spring, clutches, &c., can be mounted upon any shaft through which the driving of the table can be accomplished. In the machine as shown it could be arranged upon the pinion-shaft. In a machine constructed as shown in Letters Patent No. 293,289 it could be arranged upon the transverse shaft.

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In a metal-planing machine, the combination, with the reciprocating table and the means for actuating the same, of a spiral spring controlled from the driving mechanism, coupling devices for connecting said spring to the primary shaft prior to the ending of the backward movement of the planer-table, whereby the momentum of said table will wind up said spring, and further coupling

mechanism for connecting said spring in its wound condition to said shaft at the beginning of the next backward movement of the table, whereby the power of the spring shall impart to said table, through the shaft, a rapid initial movement, substantially as set forth.

2. In a metal-planing machine, the combination, with the reciprocating table and the means whereby the same is traversed beneath the tool, of the pulley-shaft adapted to have a longitudinal movement in its bearings, a spiral spring controlled by said shaft, clutch mechanism between said shaft and spring, whereby, during the backward movement of the table, the said shaft and one end of the spring become secured together and the spring caused to be wound, retaining devices—as, for example, wedges—for holding the spring in tension independent of the shaft during the forward or cutting movement of the table, and further clutch mechanism arranged between the shaft and the other end of the spring, whereby at the beginning of the backward movement of the table the stored-up power of the spring may be permitted to actuate the shaft, substantially as specified.

3. In a metal-planer, the combination, with the table and the mechanism whereby the same is traversed, of the pulley-shaft adapted to have a limited longitudinal movement in its bearings, the spiral spring having at either end thereof a ring to which it is attached, a double clutch secured to the shaft and adapted to engage with either of said rings, and a pair of wedges arranged to hold said spring in its wound position, substantially as set forth and specified.

4. In a metal-planing machine, the combination, with the driving-shaft adapted to have a longitudinal reciprocation in its bearings, of a housing arranged around said shaft, a clutch-hub having seats at each end and longitudinally movable on said shaft, a clutch interposed between the shaft and hub, a pair of rings arranged between the hub and housing, and a spiral spring whose ends are respectively secured to said rings, substantially as set forth.

5. The combination, with the pulley-shaft and the means for longitudinally moving the same, of the clutch-hub having the circumferential seats at either end thereof, the winding-ring adapted to engage the hub, and means, as wedges, interposed between the ring and housing for holding said ring, the unwinding-ring adapted to engage the clutch-hub at its other end, and the spring secured at either end to the rings aforesaid, substantially as set forth.

6. The combination, with the pulley-shaft and the clutch-disk secured thereon, of the forward and backward loose driving-pulleys mounted and adapted to rotate upon said shaft, the clutch-hub having circumferential tapered seats at either end thereof and screw-threaded upon the pulley-shaft, a clutch interposed between and adapted to connect said shaft and hub, the winding and unwinding rings and the spring arranged between them, and means, as described, for imparting longitudinal movement to the said shaft, substantially as specified.

7. The combination, with the driving-shaft and driving-pinion, and the reciprocating table carried thereby, of the pulley-shaft and its connection to the driving-shaft, the clutch-disk and forward and backward driving-pulleys, the spiral spring coiled about the driving-shaft, and coupling mechanism, substantially as described, whereby said spring and pulley-shaft may be secured together, substantially as set forth.

8. The combination, with the reciprocating table and the driving shaft and pinion, of the pulley-shaft, the clutch-disk secured thereon, the forward and backward loose driving-pulleys arranged upon either side the said clutch-disk, the clutch-hub screw-threaded on the pulley-shaft and the clutch arranged to bind said shaft and hub together, the winding-ring and its wedges, the unwinding-ring, the spiral spring secured between the rings, and means, as described, whereby longitudinal movement may be given to the pulley-shaft, substantially as and for the purpose set forth.

9. The combination, in a machine of the character described, with the longitudinally-movable pulley-shaft and the means for driving the same, of the spiral spring and the winding and unwinding rings, as described, the clutch upon the shaft, and the clutch-hub having tapered circumferential seats, as described, and adapted both to move with and to have a movement independent of said shaft, substantially as and for the purpose set forth.

10. The combination, in a metal-planer, with the table and its actuating mechanism and the pulley-shaft, of a spiral spring coiled about said pulley-shaft and provided with winding and unwinding rings secured thereto, a clutch-hub arranged upon the screw-threaded extremity of the said shaft and provided with tapered seats adapted to engage with said rings, and means, as described, for engaging said hub with the winding-ring near the termination of the table's backward movement, and for engaging said hub with the unwinding-ring at the commencement of the next backward movement of the table, substantially as set forth.

11. In a metal-planer or similar machine, the combination, with the table and the mechanism whereby the same is traversed, of a coil-spring arranged to take up the momentum of the table at the limit of its backward movement, locking devices whereby said spring is held in torsion independent of the planer during the cutting movement of the latter, and clutch mechanism, as described, arranged between said spring and pulley-shaft, whereby the power of the spring may be imparted to the said shaft at the beginning of the next backward movement of the table, substantially as set forth.

12. The combination, in a metal-planer, with the primary shaft, of a spring coiled around the same, and clutch mechanism, as described, whereby at the end of the backward movement of the table the said spring is coupled to the shaft and is wound in the direction of its spiral by the momentum of said table, substantially as set forth.

13. In a planing-machine, the combination, with the reciprocating table and the means for traversing the same, of the pulley-shaft, a spring coiled about the latter, and the ends whereof are connected to a pair of tapered rings, clutch mechanism, as described, whereby at the end of the backward movement of the table the said spring is coupled through the winding-ring to the shaft and is wound in the direction of its spiral by the inertia of the table, and means, as a pair of wedges, for locking the winding-ring fast and thereby securing the spring in its wound condition, substantially as set forth.

14. In a planing-machine, the combination, with the driving shaft longitudinally movable in its bearings, and the housings 13, arranged around the same, of the coiled spring secured to the winding and unwinding rings, the double-seated clutch-hub screw-threaded on the pulley-shaft within the housing, a locking device for securing said winding-ring to said housing, and a driving-clutch arranged between the shaft and clutch-hub, substantially as described.

15. In a metal-planer or similar machine, the combination, with the driving-shaft capable of longitudinal movement, of a friction-clutch arranged on said shaft and adapted to effect the reverse movement of the latter, a coil-spring concentric with said shaft, friction-rings to which the ends of said spring are secured, and a clutch-hub secured to the shaft and adapted to effect the rigid binding of one of said rings, while the other is free to revolve with the shaft in the direction of the spiral of the spring, whereby the latter is convoluted or wound, substantially as set forth.

16. In a metal-planer, the combination, with the primary shaft, of a spring adapted to be convoluted by the revolution of said shaft, locking-abutments secured to each end of the spring and adapted to alternately engage, first, with a fixed abutment and with the shaft immediately prior to the forward movement of the table, whereby the spring is wound, and then with a fixed abutment at the end of the forward movement of the table, whereby the torsional force of the spring is communicated directly to the shaft, substantially as described.

17. The combination, in a metal-planer, with the reciprocating table and means for traversing the same beneath the tool, of the shaft 7, arranged to have a longitudinal movement in its bearings, the housing 13, arranged around said shaft, the coiled spring 23 within said housing, and the winding and unwinding rings to which the ends of said spring are secured, the wedges interposed between the winding-ring and housing, the clutch-hub threaded on the shaft and provided with seats adapted to engage the winding and unwinding rings, and means, as a clutch, arranged between the shaft and clutch-hub and adapted to drive said shaft from the hub, or to drive said hub from the shaft, substantially as set forth and specified.

18. That method of operating differentially-speeded planing-machines which consists in taking up the momentum of the moving table at the end of its fast backward movement and storing the power thus obtained, then retaining the power so stored during the whole of the forward movement of the planer, and finally applying said power to overcome the inertia of the table and impart thereto at the beginning of the next backward stroke a high initial speed, substantially as set forth.

In testimony whereof we affix our signatures in presence of two witnesses.

EDWARD P. WALTER.
HENRY C. WALTER.

Witnesses:
S. H. HUBBARD,
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