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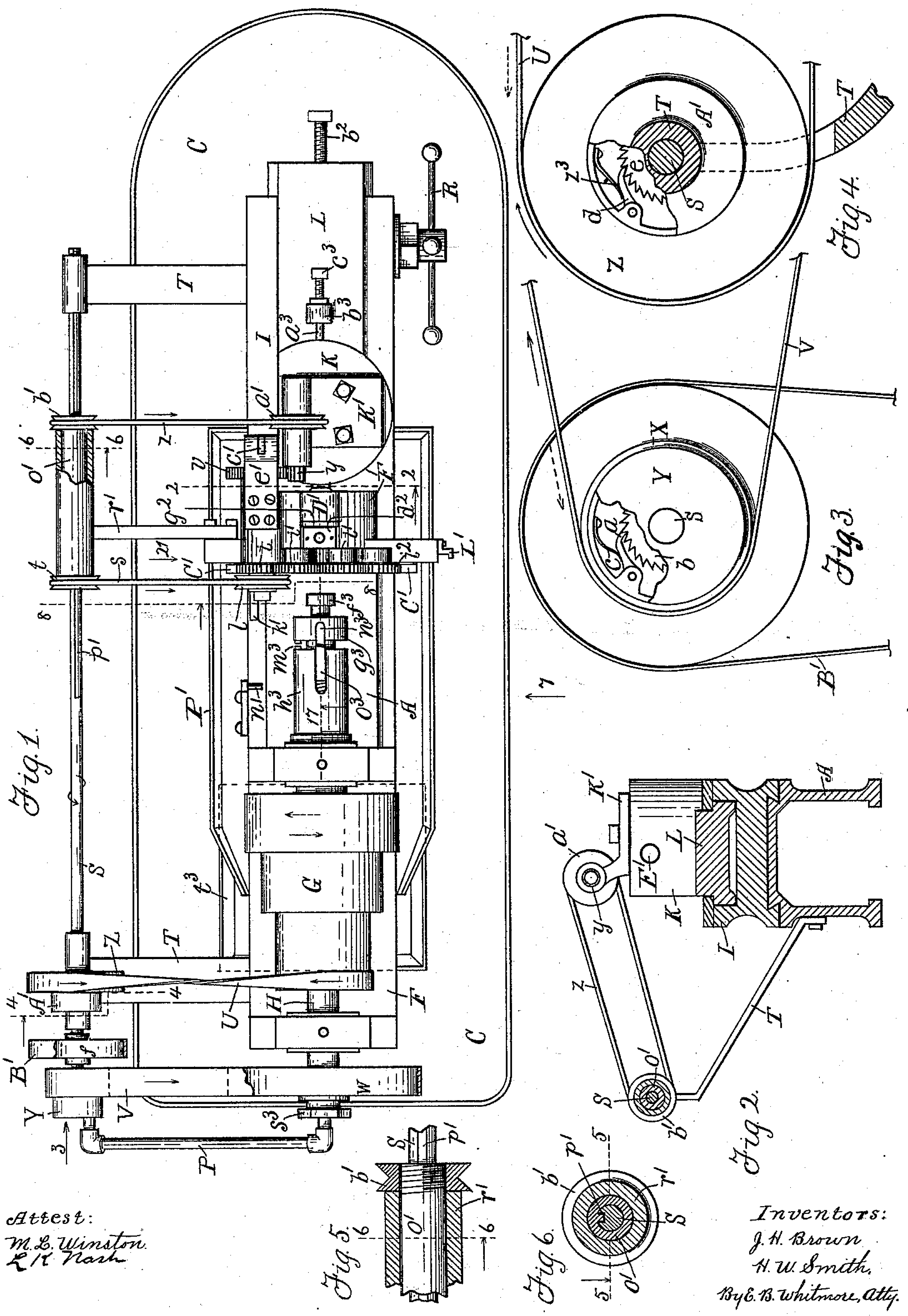
J. H. BROWN & H. W. SMITH.

SCREW THREADING MACHINE.

No. 547,417. Patented Oct. 8, 1895.



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J. H. BROWN & H. W. SMITH.

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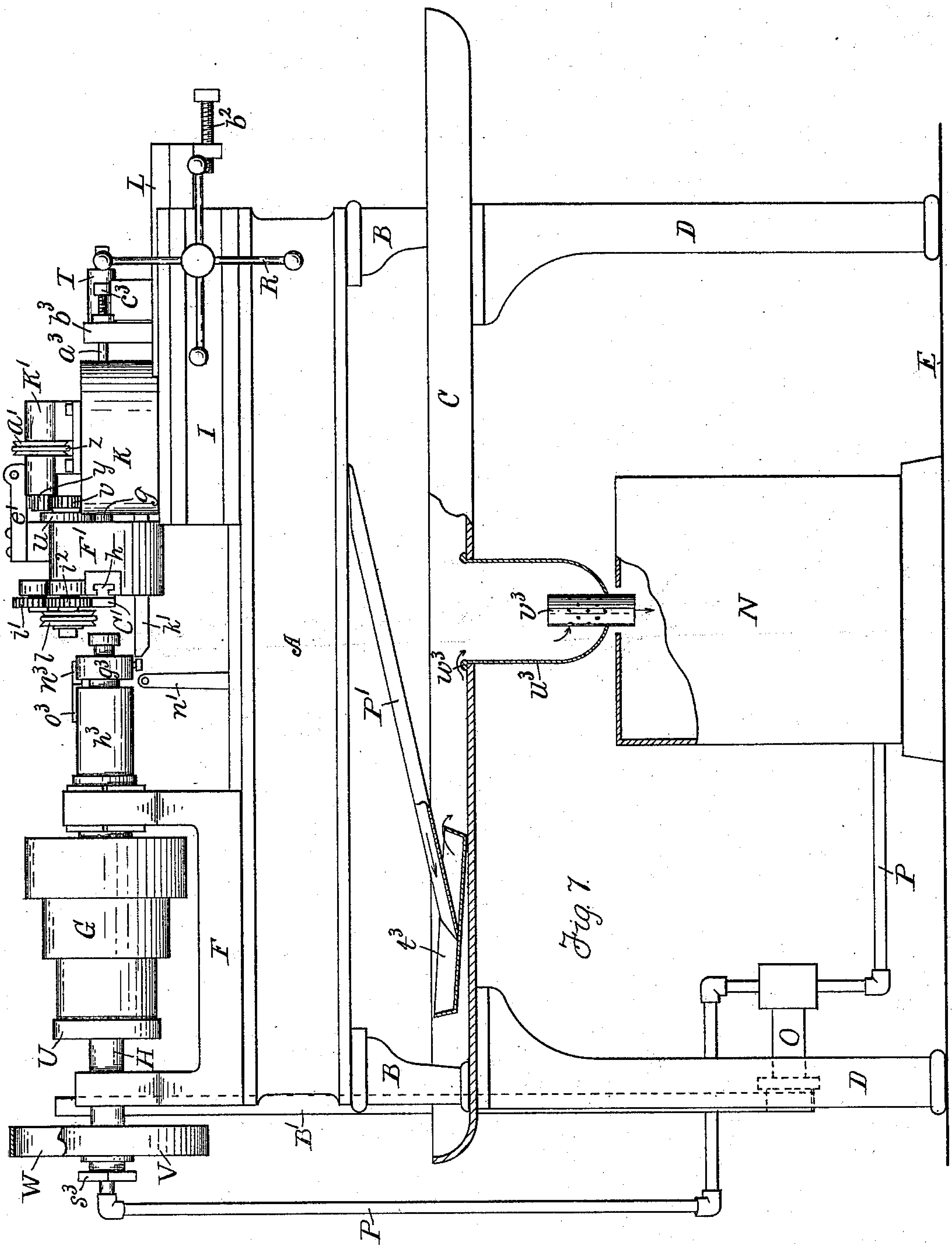

Fig. 7.

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SCREW THREADING MACHINE.

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Fig. 8.

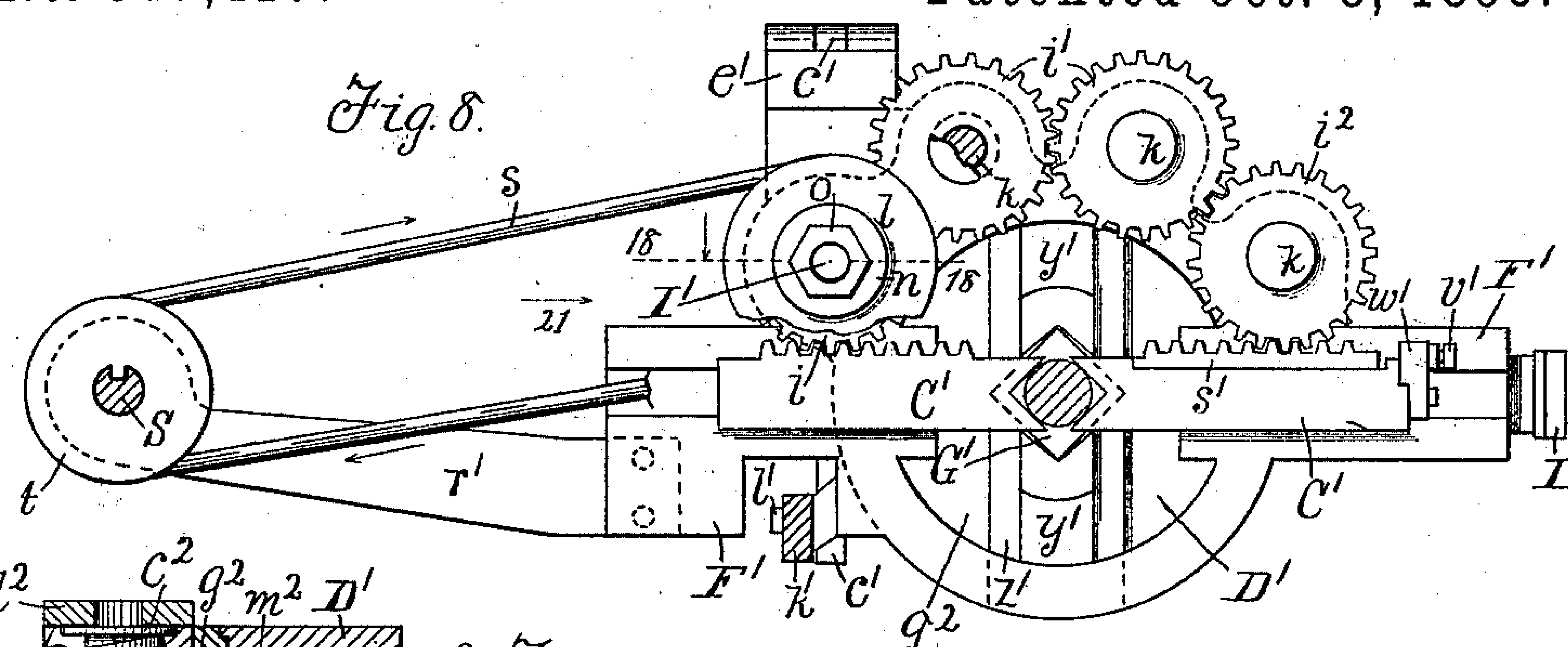


Fig. 9.

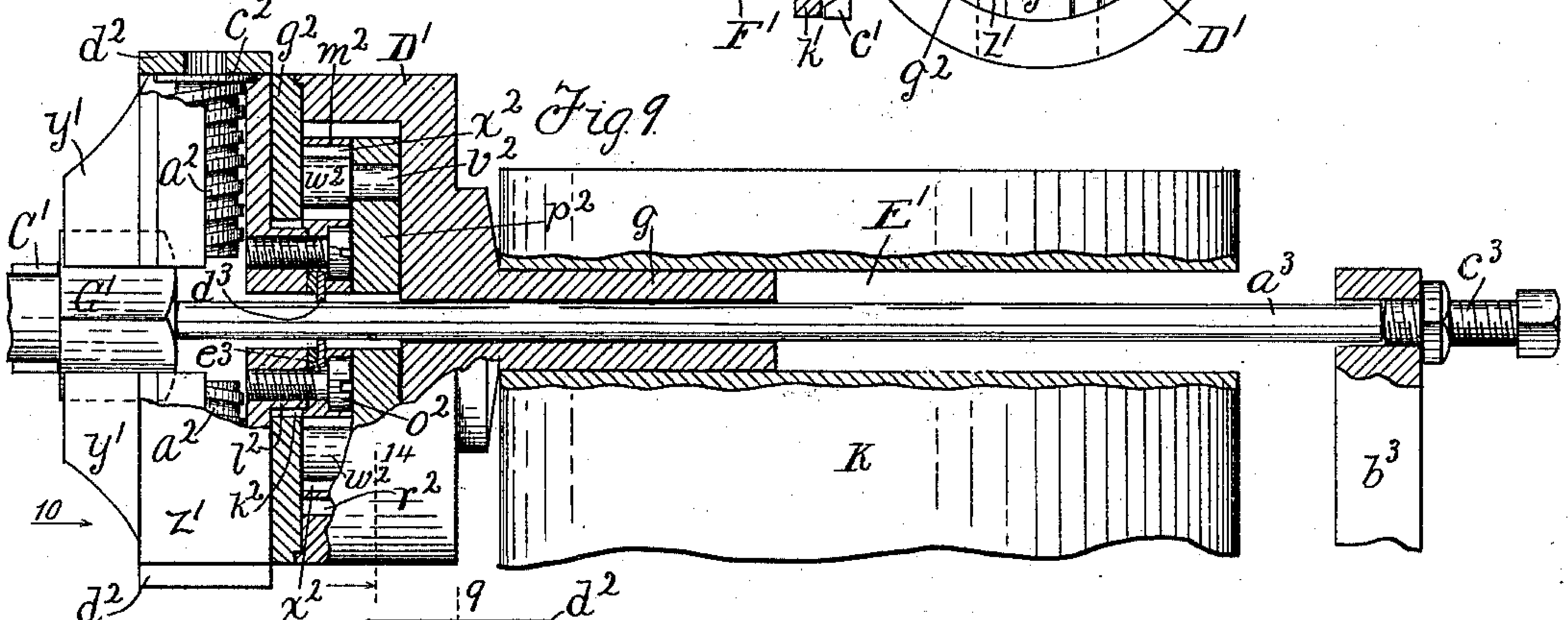


Fig. 10.

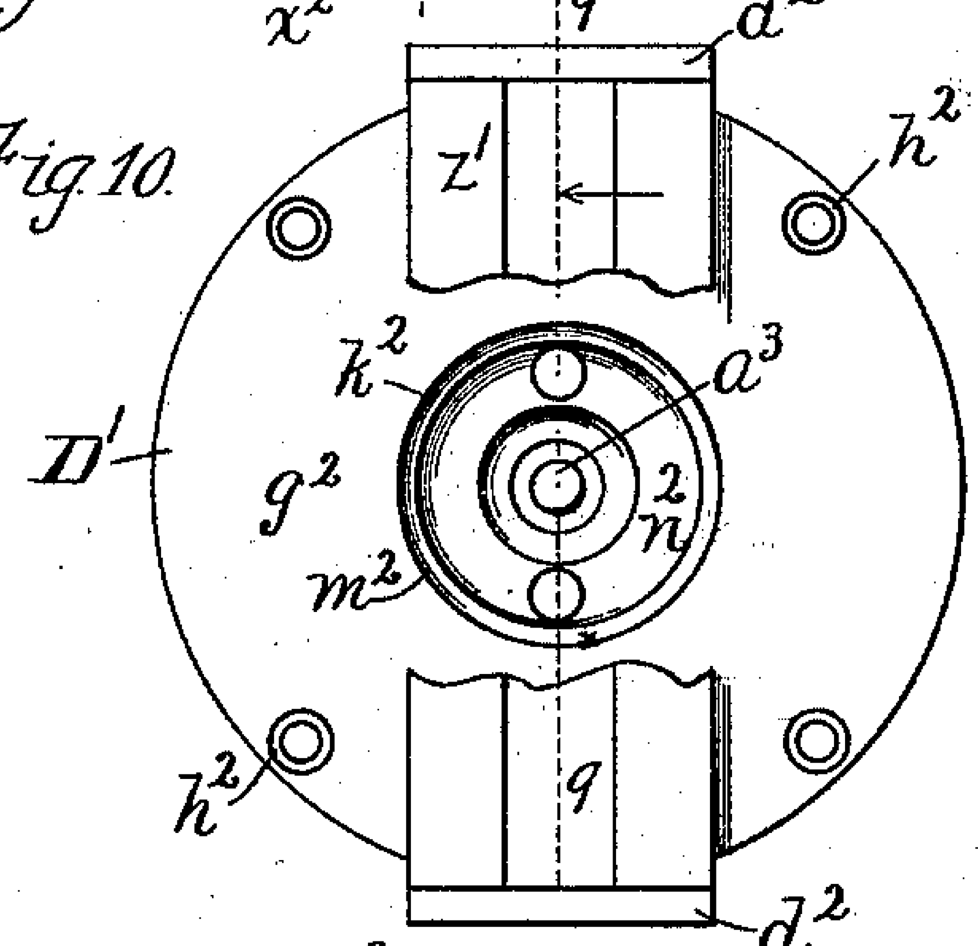


Fig. 12.

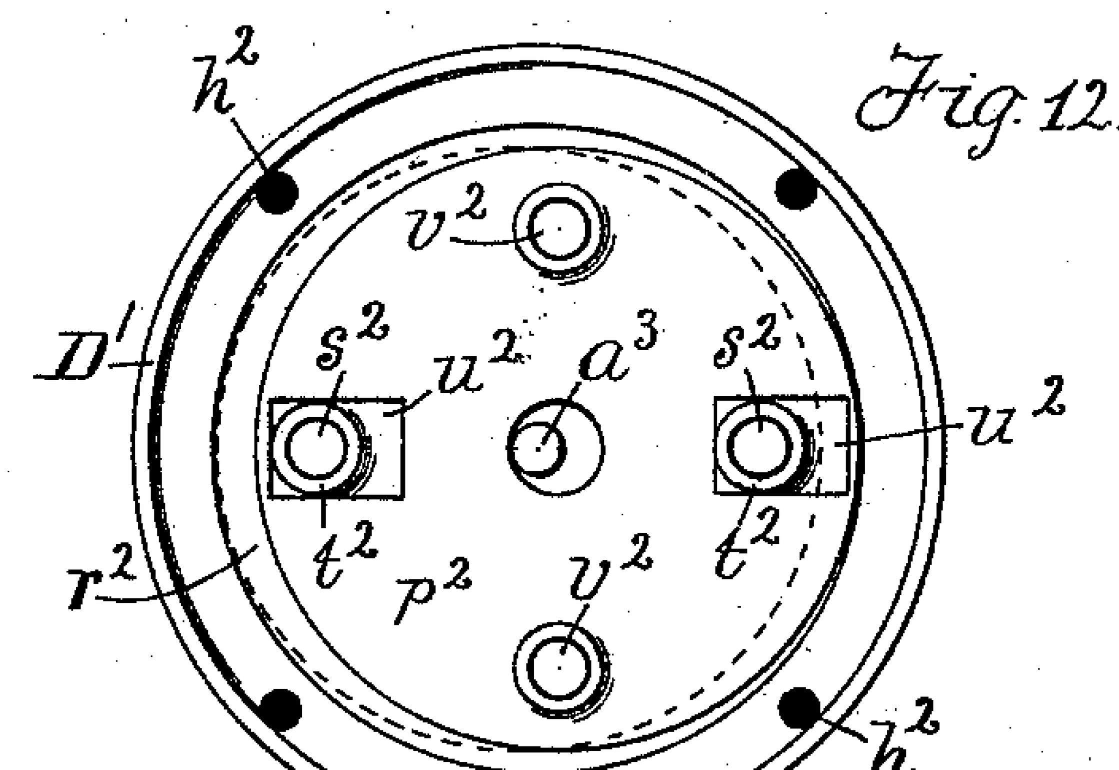


Fig. 11.

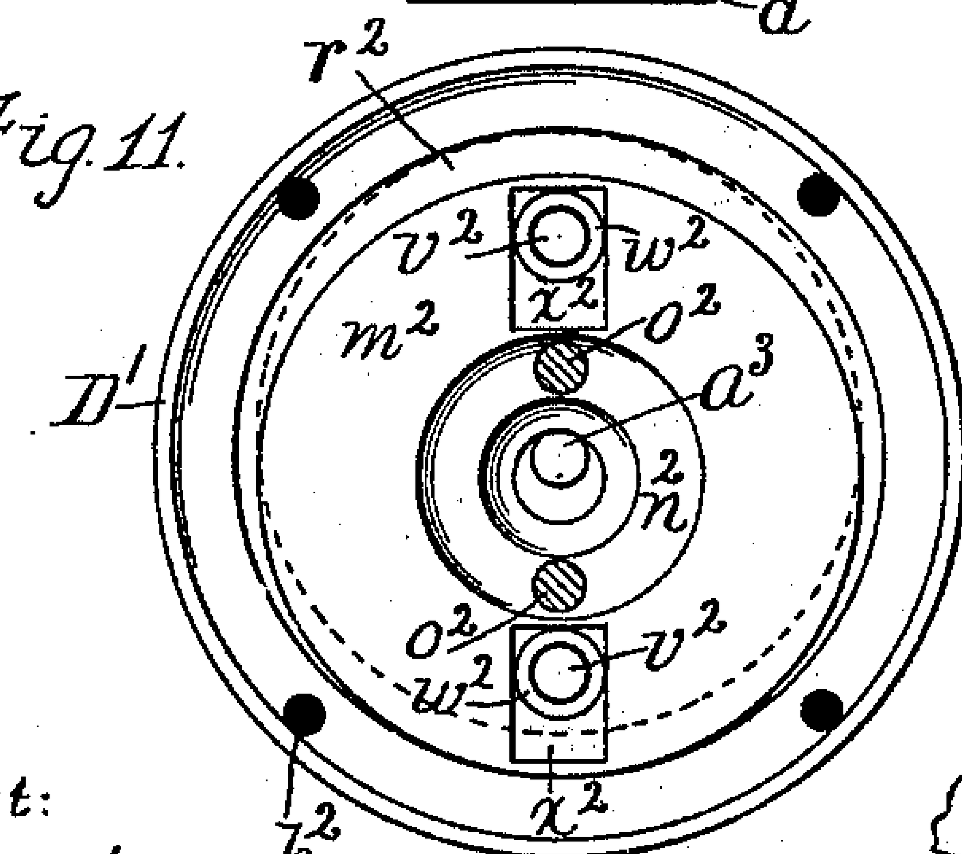


Fig. 13.

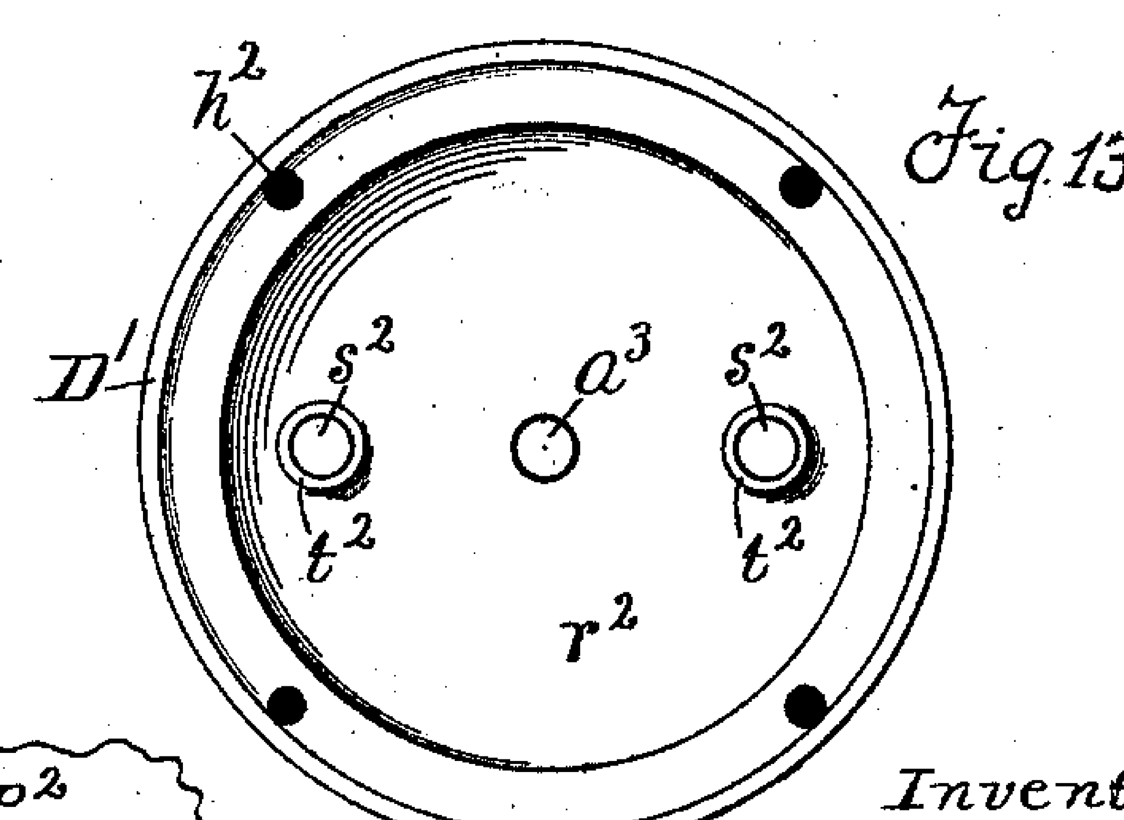
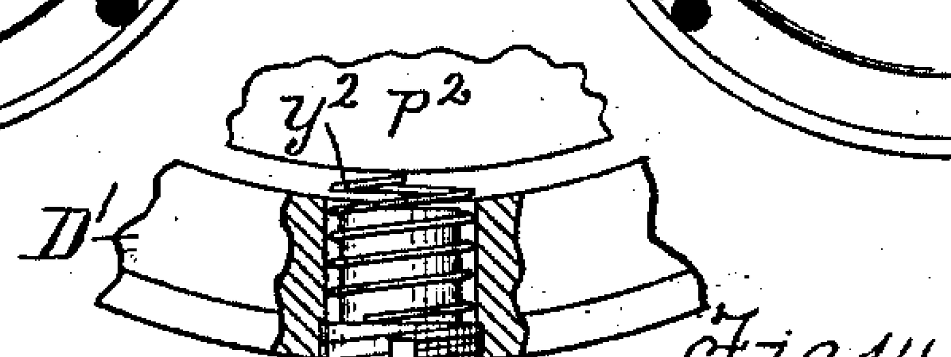


Fig. 14.



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J. H. BROWN & H. W. SMITH.

SCREW THREADING MACHINE.

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Fig. 15.

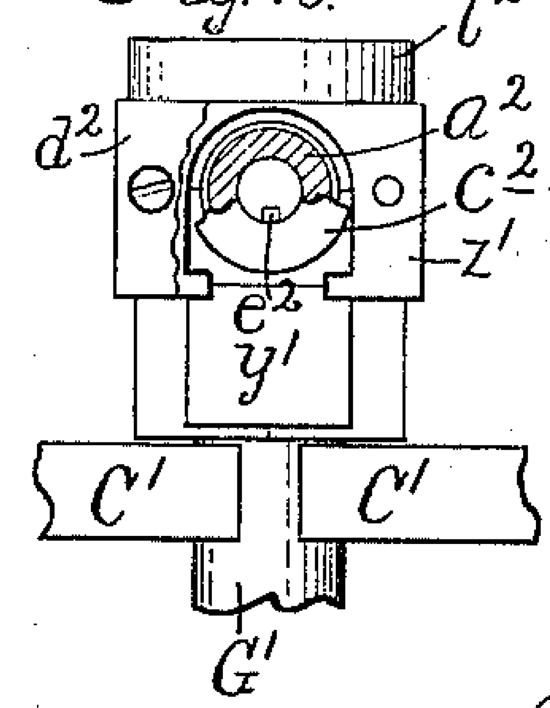


Fig. 16

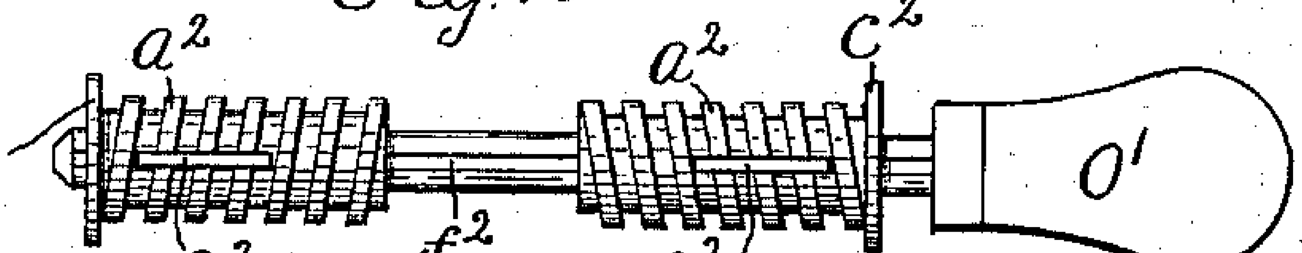


Fig. 17.

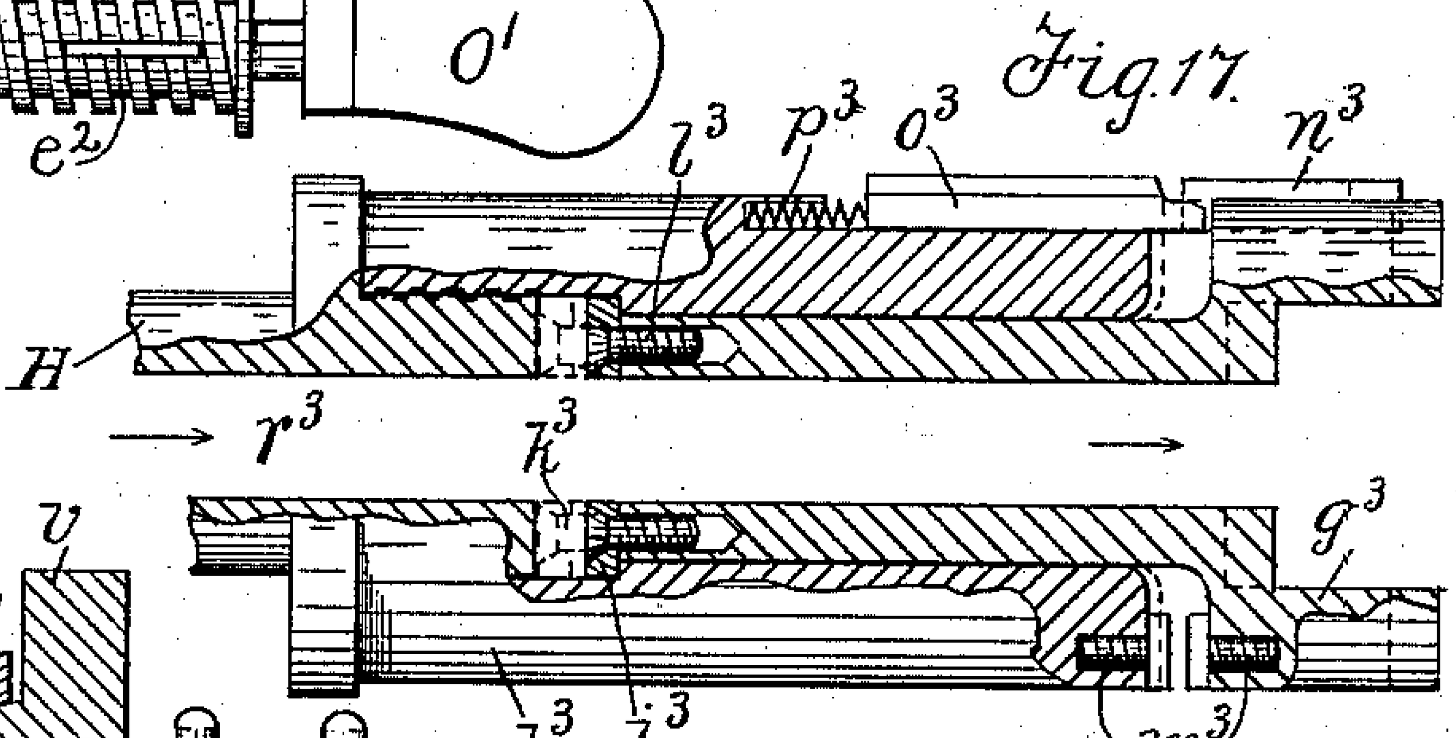
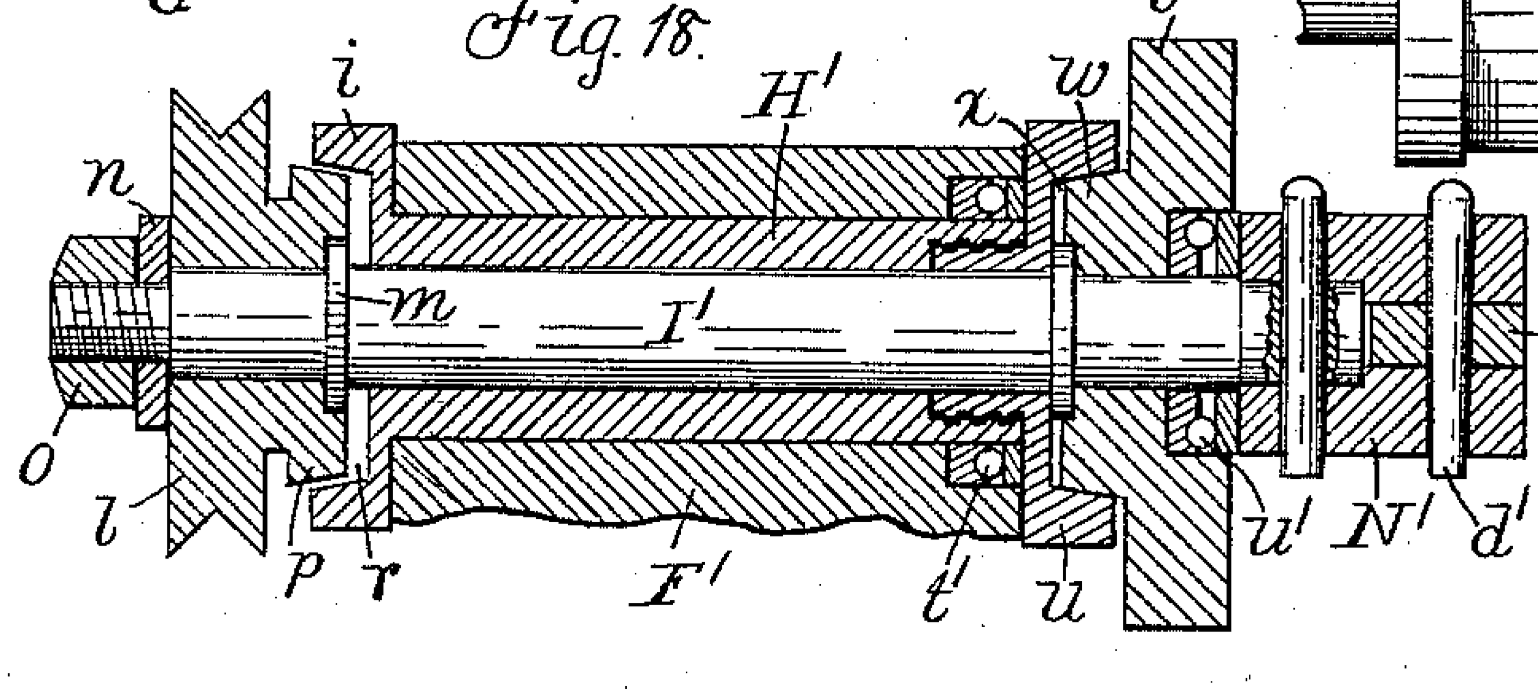


Fig. 18.



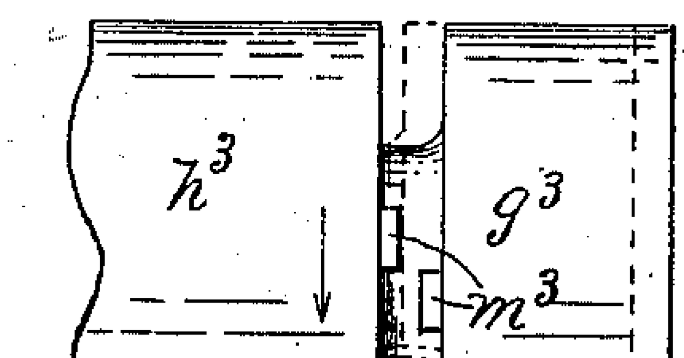
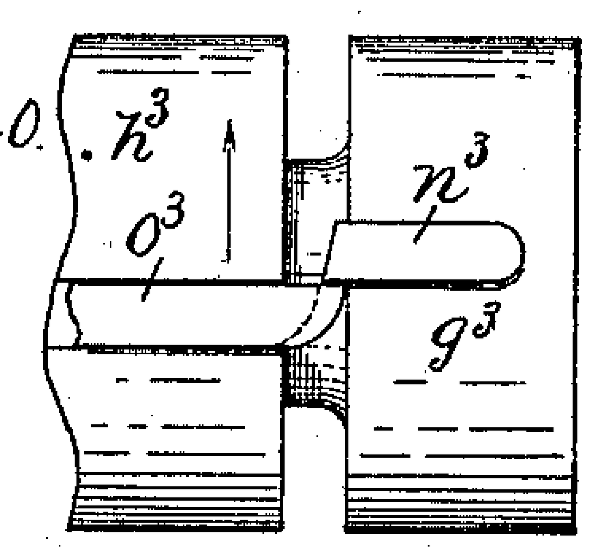


Fig. 19.

Fig. 20.



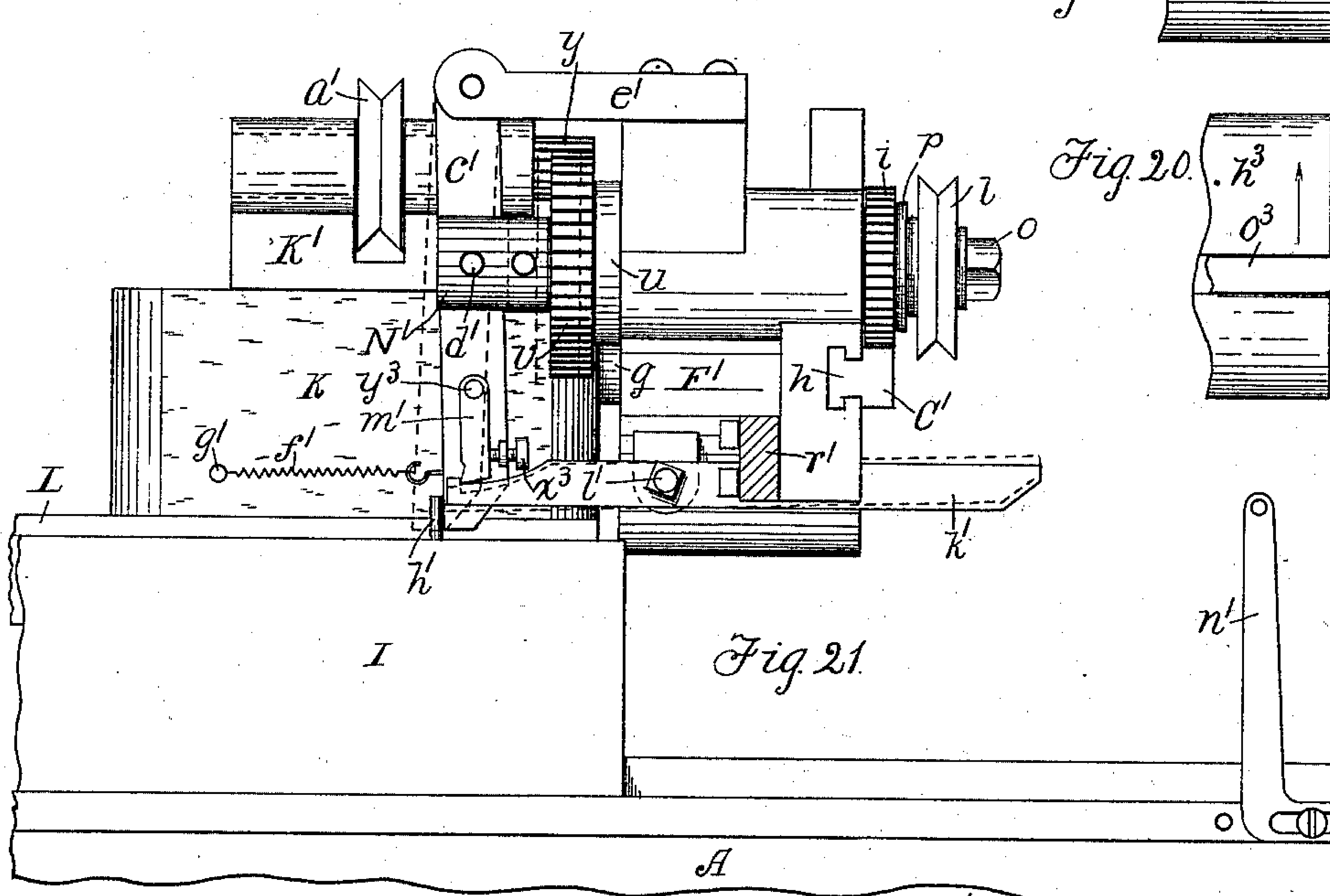


Fig. 21.

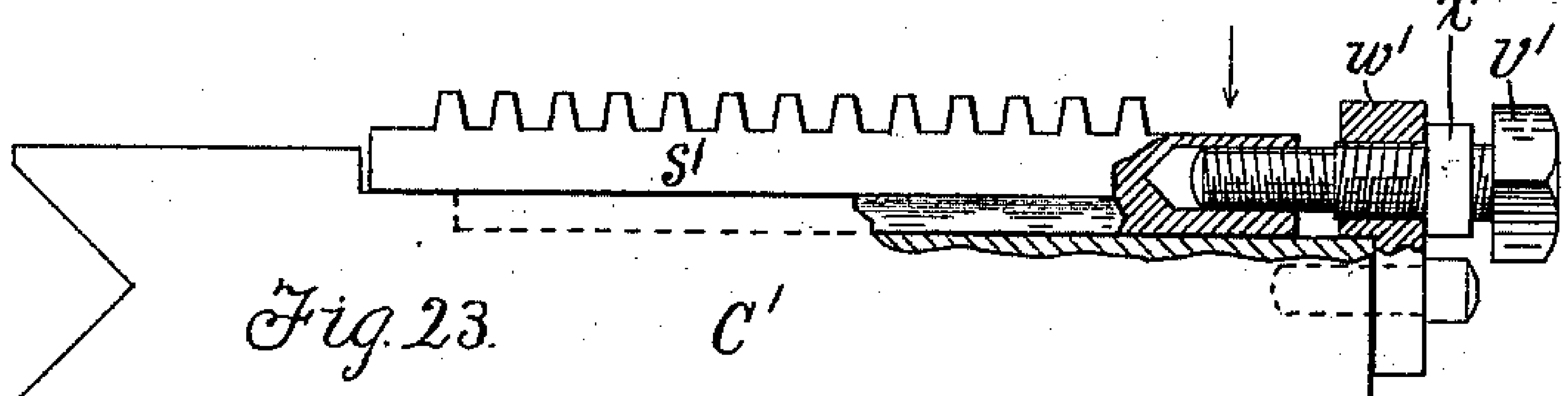


Fig. 23.

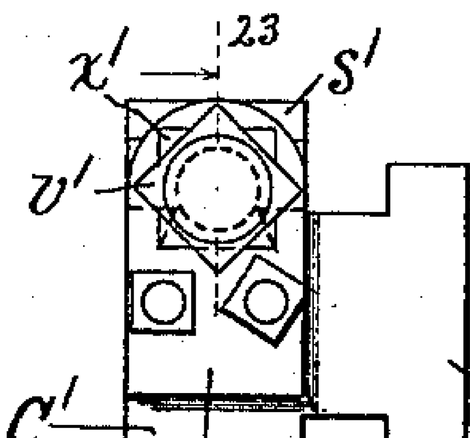
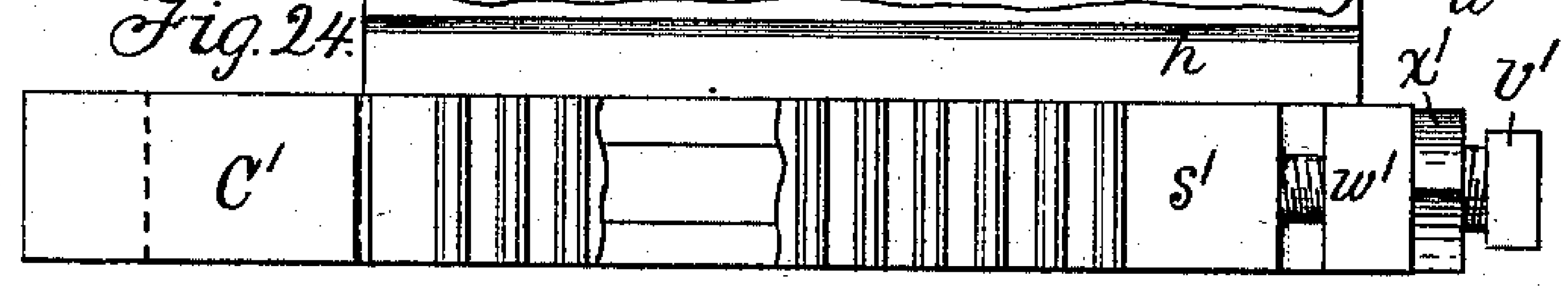


Fig. 22.

Fig. 24.



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Atty.

UNITED STATES PATENT OFFICE.

JESSE H. BROWN AND HIRAM W. SMITH, OF ROCHESTER, NEW YORK, ASSIGNORS TO THE ROCHESTER MACHINE SCREW COMPANY, OF SAME PLACE.

SCREW-THREADING MACHINE.

SPECIFICATION forming part of Letters Patent No. 547,417, dated October 8, 1895.

Application filed April 10, 1895. Serial No. 545,248. (No model.)

To all whom it may concern:

Be it known that we, JESSE H. BROWN and HIRAM W. SMITH, of Rochester, in the county of Monroe and State of New York, have invented new and useful Improvements in Screw-Threading Machines, which improvements are fully set forth in the following specification and shown in the accompanying drawings.

In cutting threads, as on cap-screws previously turned true by means of screw-machines in use, there has been difficulty in getting the spirals of the threads true or concentric with the bodies of the screws, particularly when the heads are rough or not milled accurately with the turned bodies—that is to say, in forming these screws the threads are liable to be cut deeper on one side than on the other at one end or at both ends of the screws, on account of which the threads are not full, but are imperfect at one side, while at the other side the stock is unnecessarily cut away. Such screws are objectionable not only because of the imperfect threads, but also on account of their being reduced and weakened by the cutting away of stock over and above what is necessary to form a perfect thread. Furthermore, the head of a screw thus imperfectly threaded will not draw down evenly all round against the work, on account of which the screw is subjected to a severe strain, making the head liable to break off when drawn tightly down; also, the wear brought upon the die in being forced to cut deeply into the body of the screw in places is serious.

The object of our invention is to produce a screw-threading machine for the purpose of overcoming these faults and objections and one that will form threads upon the bodies of screws accurately and evenly and exactly concentric with their axes.

The invention consists in the employment and arrangement of parts, all hereinafter fully described, and more particularly pointed out in the claims.

Referring to the drawings, Figure 1 is a plan of the screw-threading machine, some minor parts being broken away. Fig. 2 is a vertical cross-section of the body of the machine and some main parts, taken on the dotted line 2 2 in Fig. 1. Fig. 3 is an end view of the back shaft and associated parts, seen as indicated by arrow 3 in Fig. 1, parts being broken away. Fig. 4 is a vertical transverse section of the back shaft and other parts, taken on the dotted line 4 4 in Fig. 1, parts being broken away. Fig. 5 is a horizontal section of parts upon the back shaft, taken on the dotted line 5 5 in Fig. 6. Fig. 6 is a transverse section of the back shaft and associated parts, taken on the dotted line 6 6 in Figs. 1 and 5. Fig. 7 is a side elevation of the machine, seen as indicated by arrow 7 in Fig. 1, some minor parts being omitted and other parts centrally and longitudinally sectioned. Fig. 8 is a front elevation of the centering-jaws and actuating mechanism therefor, parts being vertically and transversely sectioned on the dotted line 8 8 in Fig. 1, parts being broken away. Fig. 9 is a side elevation of the upper part of the main carrying block or head and associated parts, many of the parts being sectioned upon a vertical plane common with the axis of the spindle, indicated by the dotted line 9 9 in Fig. 10. Figs. 10, 11, 12, and 13 are front views of the holding-head for the jaws and the jaw-controlling mechanism, seen in the direction indicated by arrow 10 in Fig. 9, parts being broken away and omitted, and other parts shown in two positions by full and dotted lines. Fig. 14 shows a part of the holding-head, in part vertically sectioned on the dotted line 14 in Fig. 9, to show the supporting-spring for the weight of some of the screw-controlling mechanism. Fig. 15 is an end view of the race-head with some associated parts, parts being broken away and transversely sectioned. Fig. 16 is a side elevation of the torsion-jaw screws and operating-key. Fig. 17 is a side elevation of the die-holding devices, mainly in longitudinal section, on the dotted line 17 in Fig. 1, parts being shown in two positions by full and dotted lines. Fig. 18 is a horizontal longitudinal section of the gear-sleeve and associated parts, taken on the dotted line 18 18 in Fig. 8. Figs. 19 and 20 show different parts of the die-holding devices. Fig. 21 is a rear elevation of the carrying-block and parts associated therewith, seen as indicated by arrows 21 in Figs. 1 and 8, parts being shown in two positions by full and dotted lines. Fig. 22 is an end view of a centering-jaw. Fig. 23 is a front elevation of the same, partly in vertical longitudinal section on the dotted line 23 in Fig. 22. Fig. 24 is a plan of the centering-jaw, seen as indicated by arrow in Fig. 23. Figs. 1, 2, and 7 are drawn to a scale one-sixth full size; Figs. 5, 6, 8, and 21 are drawn one-third full size; Figs. 3, 4, 9 to 13, inclusive, and 15 to 20, inclusive, are drawn to a scale one-half size; and Figs. 14, 22, 23, and 24 are drawn full size.

Referring to the parts shown, A, Figs. 1, 2, and 7, is the body of the machine supported by legs B, resting in an iron drip-pan C, the whole being supported by legs D, standing upon the floor E.

F is the head-block, G a step-pulley, H a hollow spindle, and I a tail-block, all substantially of common construction.

K is a main carrying-block for essential parts, formed with a part L fitted to slide longitudinally in the tail-block. The carrying-block is moved longitudinally in the tail-block by well-known means, involving a hand-lever R, with rack and pinion. (Not shown.)

N is an oil-tank, and O a rotary pump, connected, respectively, with the oil-tank and the hollow spindle by pipes P. A back shaft S, Figs. 1 and 2, is provided parallel with the spindle, held by arms T rigid with the body of the machine. This shaft is turned alternately by belts U and V, one leading from the step-pulley and the other from an overhanging pulley W on the spindle, onto pulleys Z and X upon the shaft. The spindle has a forward and a reverse motion, alternately, but on account of the belt U being crossed and the belt V being open the shaft always turns in one direction, the belt V turning it when the spindle runs forward, and the belt U turning it when the spindle turns backward. This is effected by means of ratchets *b e*, Figs. 3 and 4, rigid with the shaft, and pawls *a d* carried by the respective pulleys X and Z to engage the ratchets, springs *c* and z^3 serving to hold the pawls in engagement with the ratchets. The ratchets and pawls are housed by circular boxes Y and A′, forming parts of the respective pulleys X and Z. Now when the spindle turns forward the belt V will control and turn the shaft on account of the pawl *a* catching the ratchet; but when the spindle turns backward the pawl will be inoperative, and so will not affect the shaft; also, when the spindle turns backward the pawl *d* will catch the ratchet *e* and so turn the shaft, as before, this pawl idling while the spindle is turning forward. The pulleys occupied by the belt U are about equal in diameter, (see Figs. 1, 3, and 4,) while the pulley X is much smaller than the pulley W. The reverse motion of the spindle is more rapid than the forward motion, and the relative diameters of the pulleys occupied by the belts U and V are arranged so that the motion of the back shaft S shall be uniform.

D′, Fig. 9, is a holding-head for other parts of the device, cylindrical in form and provided with an axial shank *g* to enter a cavity E′ in the carrying-block K, with which it is made rigid by simple means, the axis of said head coinciding with the axial line of the spindle. The head holds rigidly a frame F′, Figs. 1, 7, 8, and 21, formed with two horizontal oppositely-extended slotted arms, in which are held centering jaws or holders C′ C′ for the screw G′ to be threaded. These jaws are adapted to slide in radial directions toward or from each other in a plane at right angles with the axial line of the spindle. The jaws are notched at their ends to adapt them to seize the body of the screw, previously turned true, next to the head; but independent of the latter, as clearly shown in Figs. 8 and 9. These jaws are accurately formed and adjusted, so as to hold the screw in such position that the axis of its body will coincide with the axial line of the spindle. These centering-jaws (more fully shown in Figs. 22, 23, and 24) are formed with T-shaped ribs or parts *h*, which accurately fit corresponding seats or grooves in the frame F′. The centering-jaws are operated by means of a series of gears, (shown in Figs. 1 and 8,) consisting of four uniform spur-gears $i\ i'\ i'\ i^2$, turning together and connecting the jaws. The gears $i'\ i'$ are idlers, and with the gear i^2 turn on horizontal studs *k*, rigid in the frame, the plane of the gears coinciding with the plane of the jaws. The gear *i*, which is the driving-gear of the series, is formed with a sleeve H′, Fig. 18, resting in a horizontal bearing in the frame. The train of gears is turned alternately in opposite directions to move the centering-jaws toward and from the screw by means herein described. I′, Figs. 8 and 18, is a non-rotating axial shaft in the gear-sleeve, adapted to have a slight endwise motion therein. *l* (see also Figs. 1 and 21) is a cord-pulley adapted to turn upon the shaft and held in place by a rigid collar *m* and a washer and nut *n* and *o*. The pulley is formed with a conical friction part *p* in position to enter a conical cavity *r* in the gear *i* and drive the latter by means of a friction-contact. The pulley is turned by a cord *s*, leading from a similar pulley *t* upon the shaft S. At its opposite end the gear-sleeve is provided with a rigid collar *u*, Figs. 18 and 21, (which is practically a part of the sleeve,) serving to prevent endwise motion of the sleeve in the frame.

v is a spur-gear adapted to turn upon the shaft I′ and formed with a friction part *w*, adapted to engage the sleeve by a friction-contact. The gear is turned by means of a pinion *y*, Figs. 1, 7, and 21, driven by a cord *z*, leading from a pulley *b′* on the shaft S. The shaft of the pinion is provided with a pulley *a′* for the cord, the whole being held by a hanger K′, secured to the carrying-block K.

Now it will be understood that if the shaft I′ be moved to cause the pulley *l* to engage the sleeve H′ the cord *s* will control the series of gears and the centering-jaws; but if the shaft be moved to bring the gear *v* into engagement with the sleeve the cord *z* will control the gears and the jaws, moving them all in a direction opposite to that in which the cord *s* moved them. The parts are so arranged that the cord *z* drives the jaws against the body of the screw to be cut and the cord *s* acts to move them back and release the screw. When either cord is acting, the other one, although moving, effects nothing. The jaws seize and hold the screw during all or most of the time the thread is being cut, during which time the cord *z* slips upon its pulleys, but serves continually to urge the jaws firmly against the screw. After the thread upon a screw is completed the shaft I′ is again shifted (by means described further on) to bring the cord *s* into action, which serves to withdraw the jaws from the screw while the die is being backed off, the direction of motion of the spindle being reversed in the meantime by the attendant. When the jaws are thrown back, the right-hand one, as appears in Fig. 8, encounters a buffer or stop L′, held by the frame, the cord *s* slipping upon its pulleys thereafter until again thrown into action.

To shift the shaft I′ endwise there is employed a vertical lever *c*′, Figs. 1, 8, 18, and 21, in a slit in the end of a coupler N′, secured to the end of the shaft. This lever is held in the coupler by a pin *d*′, it being fulcrumed in an arm *e*′, rigid with the frame F′. The carrying-block K, cylindrical in form, is cut away at the rear side to form a flat vertical surface, as appears in Figs. 1 and 2, to make way for the lever and other parts. By swinging the lower end of the lever through short distances, one way or the other, the shaft I′ will be moved to bring one or the other of the friction-surfaces at *p* or *w* into action. A spring *f*′, connected with the lever, and a pin *g*′, rigid in the carrying-block, tend, normally, to hold the friction at *p* into action, giving the control of the centering-jaws to the cord *s*; but when the carrying-block is moved back from the die the lever encounters a pin *h*′ in the tail-block I and brings the friction at *w* into play, giving the control of the jaws to the cord *z*.

k′, Figs. 1, 7, 8 and 21, is a detent-lever fulcrumed at *l*′ to the frame F′ in position to catch a pendent latch *m*′, pivoted at y^3 to the side of the lever *c*′, when the latter encounters the pin *h*′. *n*′ is a trip secured to the body of the machine in position to tilt the detent-lever, so as to release the latch and give the lever *c*′ up to the control of the spring *f*′. Now, when the carrying-block is moved back to cause the pin *h*′ to throw the gear *v* into action the detent, catching the latch, will hold the gear active until a forward movement of the carrying-block brings the detent against the trip and releases the lever. The trip is longitudinally adjustable on the body of the machine and it is set in any given case, so as to trip the parts and cause the centering-jaws to be withdrawn out of the way of the advancing die in case the thread is to be cut nearly to the head of the screw. The detent *k*′ acts from gravity to engage the latch on account of the preponderance of weight at its free end. The latch *m*′ is made adjustable by means of a thumb-screw x^3, threaded through a part of the lever and bearing against the edge of the latch. By means of this adjustment the friction at *w* may be regulated. When the die is being backed off of a screw the carrying-block is gradually pushed back, but the lever *c*′ does not encounter the pin *h*′ until the threaded screw has been removed and another one put in place. This being done the attendant, by using the lever R, moves the carrying-block farther back, causing the lever *c*′ to strike the pin *h*′, which causes the centering-jaws to advance against and hold the screw, as above stated. The jaws are driven firmly against the screw on account of the difference in the diameters of the pinion *y* and the gear *v*, thus serving to hold the screw in place with a rigid grip.

Ball-bearings, as shown at *t*′ and *u*′, Fig 18, are provided between the collar *u* and the frame F′, and between the coupling N′ and the gear *v* to lessen the friction at those points.

The pulleys *t* and *b*′ on the back shaft S, Fig. 1, are held by a sleeve *o*′, Figs. 2, 5, and 6, provided with a spline to travel in a groove *p*′ in the shaft. The pulleys are rigid with the sleeve and turn with the shaft, and the distance between them corresponds with the longitudinal distance between the pulleys *l* and *a*′, carried by the carrying-block K, the opposite pulleys constituting pairs for the cords *s* and *z*. Upon the sleeve is placed a traveling arm *r*′, connected with the frame F′, by means of which the pulleys *t* and *b*′ are caused to move with the carrying-block to preserve the oppositeness of the pulleys forming pairs.

To compensate for the wear between the teeth of the train of gears *i* to i^2, Fig. 8, and the centering-jaws, the teeth of the right-hand jaw are made upon a rack *s*′ (see also Figs. 22, 23, and 24) independent of the jaw. This rack is adapted to have a slight longitudinal motion along a dovetail bearing in the jaw, and it is controlled by an adjusting-screw *v*′. *w*′ is a bracket secured rigidly to the jaw to hold the adjusting-screw, in which the latter is threaded, a reduced part being also differentially threaded into the end of the rack. The rack may be thus longitudinally adjusted and will be held rigidly in any position of adjustment. A set-nut *x*′ on the adjusting-screw holds the latter to place in the bracket. A wearing of the gear-teeth would tend to cause the right-hand jaw to lag and hold the screw at the right of the axial line of the spindle; but by drawing the rack slightly back the jaw would be brought up accurately to place, and so hold the screw exactly in line with the spindle. The function of the jaws C′, as stated, is to hold the screw accurately in place while receiving the thread, but not to prevent its turning on account of the action of the die upon it. To hold the screw from turning, there is provided a set of torison-jaws y', Figs. 8, 9, and 15, adapted to move in vertical directions in a race-head z', inside or back of the jaws C′, in position to engage the head of the screw. These jaws are controlled by cylinders a^2 a^2, Fig. 16, formed, respectively, with right and left hand threads, to move simultaneously toward or from each other to act upon heads of different sizes. These jaws are notched at their adjacent ends to cover opposite edges of the head, as shown. The threaded cylinders engage threaded parts of the jaws, and they are formed with heads c^2, which, resting in cavities in the respective ends of the race-head, prevent endwise travel of the cylinders. The latter are also in part confined by caps d^2, covering the ends of the race-head. (See Fig. 9.)

The threaded cylinders are provided with longitudinal splines e^2, which adapt them to be turned to set the jaws by a key O′, Fig. 16, formed with a groove f^2 to engage the splines. When a blank screw is put into the machine to be threaded, the attendant, by using the key, brings the torsion-jaws loosely against the head of the screw, the key being then withdrawn, the jaws not needing to be again disturbed until different-sized screws are to be threaded. The centering-jaws and the torsion-jaws, respectively, move in parallel transverse planes at right angles with the axis extended of the spindle, and also in planes at right angles with each other, the longitudinal plane of the torsion-jaws being normally common with the axis of the spindle.

The holding-head D′ is formed with a concentric cylindrical cavity r^2, Figs. 9 and 13, which is covered by a plate g^2, Figs. 1, 8, 9, and 10, held in place by simple screws at h^2. This plate is formed with a central opening k^2 to receive a hub l^2, Figs. 9 and 15, of the race-head, the hub being smaller in diameter than the opening, so as to have free lateral motion therein. Within the holding-head is a circular knock-about disk or plate m^2, Figs. 9 and 11, less in diameter than that of the cavity r^2. This plate has a shallow circular cavity n^2 in which to receive snugly the inner end of the hub l^2, the plate and the race-head being held rigidly together by clamping-screws o^2. A second plate p^2, similar to m^2, is also provided in the head D′. The head is provided with two rigid longitudinal studs s^2, Fig. 13, at equal distances from the center and on opposite sides thereof, the studs being provided with antifriction bushings or rollers t^2. The plate p^2 is formed with radial slots u^2, Fig. 12, in which to receive the studs s^2, of sufficient length to admit of the plate being shifted laterally in the head, as indicated by the full-line and dotted-line circles. This plate p^2 is similarly provided with longitudinal studs v^2, Figs. 9 and 12, and antifriction-rollers w^2, placed equally on opposite sides of the axis of the plate and in a plane at right angles with the plane of the studs s^2. The plate m^2 is likewise formed with radial slots x^2, Figs. 9 and 11, in place to receive the studs v^2, which admit of the plate being shifted vertically, as indicated by the full and the dotted line circles, the planes of the plates m^2 and p^2 being at right angles with the axis of the head D′. From this construction and relation of the parts it will be understood that the race-head may be moved or shifted in any direction laterally within and upon the head D′; or, in other words, the torsion-jaws are adapted to have a universal movement upon the holding-head in a plane at right angles with the axis of the head. Now should the axis of the head of the blank screw be at one side of or eccentric with the axis of the body of the screw the torsion-jaws will readily adjust themselves to this irregularity, and so hold the screw from turning without interfering with the action of the centering-jaws in accurately determining the position of the screw. The plates m^2 and p^2 are adapted to move freely upon each other, so the torsion-jaws may always bear equally on opposite sides of the screw-head; and to aid in causing an easy action of the torsion-jaws upon the screw-head a spring y^2, Fig. 14, is provided to support the weight of the parts. As a matter of convenience, the spring is placed to press upward against the plate p^2 to support the weight of the torsion-jaws, including therewith the weight of the race-head, screw-cylinders, knock-about plates, and other minor parts moving with the jaws. This spring is coiled upon a radial screw-plug z^2, inserted vertically in the lower part of the head D′, as shown.

To further aid in insuring an easy action of the torsion-jaws upon the screw there is provided a thrust-rod a^3, Figs. 9 to 13, in position to bear centrally against it to receive the longitudinal pressure of the die when started upon the screw. This rod occupies axial openings in the holding-head and other parts and enters at its outer end an opening in a post b^3, rigid with the slide L, Figs. 1 and 7. This rod is controlled by a screw c^3, threaded in the post, and it is adjusted endwise, so as to hold the blank screw in such position that the centering-jaws will seize it close under the head, as appears in Fig. 9. A rubber or fibrous diaphragm d^3, Fig. 9, is provided in the plate m^2 to encircle the thrust-rod, and held in place by a metal ring e^3, confined by the hub l^2 of the race-head. This diaphragm hugs the rod closely and serves to prevent chips or extraneous matter entering the head D′ to interfere with the free action of the plates therein. The central openings in the movable parts through which the rod passes are large enough in diameter to admit of a free motion of the parts, while the yielding and elastic nature of the diaphragm enables it to keep in contact with the rod all round during slight lateral changes of the plate m^2.

The die f^3, Figs. 1 and 7, is carried by a holder consisting of a chuck g^3 and a sleeve h^3, threaded upon a hub of the spindle H. (Better shown in Fig. 17.) The chuck is adapted to both turn and move longitudinally in the sleeve, it having a ring i^3 in an enlarged cavity k^3 in the sleeve secured by threaded fasteners l^3. The cavity being larger longitudinally than the ring allows the chuck to move endwise in the sleeve. The chuck and the sleeve are both provided with rigid studs m^3, Figs. 1, 17, and 19, in position to engage each other when the chuck is pushed into the sleeve by the blank screw pressing it when the die is starting the thread. When in this position, the stud in the sleeve encounters the stud in the chuck and turns the die forward. While a thread is being formed on a screw the carrying-block K will be drawn gradually toward the die, but an adjustable stop-screw b^2, Figs. 1 and 7, in the slide L, encountering the tail-block I, arrests this forward motion of the block. This stopping of the carrying-block causes the chuck to be drawn outward from the sleeve, which releases the studs, and the die stops cutting. A reversal now of the motion of the spindle by the attendant turns the die backward off of the screw.

To enable the sleeve to turn the die backward, the chuck is provided with a rigid catch or finger n^3, Figs. 17 and 20, and the sleeve with a similar but movable catch o^3 to engage the catch n^3. The catch o^3 is arranged to move in a longitudinal race in the side of the sleeve and it is urged forward by a slender spring p^3, held in a cavity in the sleeve. The adjacent ends of these catch-pieces are beveled, as shown, so as to catch and hold only when the spindle is turning backward. The driving-catch o^3 projects sufficiently to engage the rigid catch n^3 when the chuck is at its outermost position. Thus the sleeve is enabled to turn the die backward after its forward motion has been stopped, as above described.

The pump O, Fig. 7, serves to convey oil from the tank N to the die through the axial opening r^3 in the spindle, Fig. 17, said opening continuing through the chuck. The oil-pipe P is connected with the spindle by an ordinary stuffing-box s^3, Figs. 1 and 7. The pump is operated by a belt B′, leading from a pulley f on the back shaft S. The oil dripping from the die flows into an inclined pan P′, which discharges into an oppositely-inclined pan t^3 at the bottom of the main drip-pan C. Overflowing from the latter pan the oil falls into the pan C, thence into a pocket u^3, whence it escapes through a perforated tube v^3 into the tank. This arrangement of parts is to separate the oil from the chips, which also fall from the die. These chips lodge in the pans P′ and t^3, out of which latter the oil flows sluggishly, the force of the earlier flow of the oil being broken when it encounters the pan t^3. Furthermore, the pocket u^3 is formed with a bead w^3, over which the oil has to rise, it being finally strained through the pipe v^3, as shown.

In manufacturing cap-screws several operations have to be performed upon them, among which is the cutting of the threads, and usually in the way heretofore pursued one or more of these operations are performed after the threads are cut. In handling the screws necessary in performing these subsequent operations the threads are apt to be marred and disfigured, and so rendered imperfect and objectionable.

In using the threading machine herein described in the manufacture of cap-screws the cutting of the thread is the last operation performed upon them, and on this account the threads cut full and sharp remain perfect and ready to enter the packing-boxes.

What we claim as our invention is—

1. In a machine for threading screws, the combination, with two sets of jaws, one in front of the other, of means for causing one set to engage with the screw for centering it, and means for causing the other set simultaneously to engage with and automatically adjust itself to the position of the screw head for holding it against rotation, substantially as set forth.

2. In a machine for threading screws a set of movable centering jaws for holding the screw, adapted to bear upon its body under the head, in combination with a second set of jaws to engage the head of the screw independent of the centering jaws, and means for holding both sets of jaws in engagement with the screw at the same time, and during a predetermined portion of the time it is being operated upon, substantially as described.

3. A machine for threading screws, having a rotary spindle for carrying the die, and a set of movable centering jaws adapted to bear upon the body of the screw, in combination with a second set of jaws to engage the head of the screw independent of the centering jaws, said two sets of jaws occupying planes at right angles with the axis extended of the spindle, said jaws being permanently located, substantially in line with each other, in the line with the axis, and means for holding both sets of them in engagement with the screw at the same time and during the time the screw is being operated upon, substantially as shown.

4. A machine for threading screws, having a set of centering jaws actuated to bear upon the body of the screw, in combination with a second set of jaws to engage the head of the screw, and means for permanently holding said second set of jaws to have free lateral

motion in all directions in a plane at right angles with the axis of the screw, substantially as and for the purpose specified.

5. In a screw-threading machine having a die-carrying spindle, a set of centering jaws to seize the body of the screw, in combination with a second set of jaws to engage the head of the screw, and means for moving said jaws in planes one back of the other and perpendicular to the axis extended of the spindle and in directions at right angles with each other.

6. A screw-threading machine having a set of movable centering jaws to bear upon the body of the screw, and a second set of jaws to engage the head of the screw, adapted to have free lateral motion in a plane about the axis of the screw, in combination with a supporting spring to overcome the weight of said second set of jaws, substantially as and for the purpose set forth.

7. In a screw-threading machine, centering jaws to bear upon the body of the screw and torsion jaws to engage the head of the screw, in combination with a thrust rod to hold the screw, substantially as and for the purpose set forth.

8. In a screw-threading machine, centering jaws to bear upon the body of the screw and torsion jaws to engage the head of the screw, adapted to move laterally about the axis of the screw, in combination with a thrust rod to hold the screw, and means to adjust the thrust rod longitudinally, substantially as described.

9. A machine for threading screws, having a rotary spindle and a holding frame concentric with the axis extended of said spindle, and movable toothed centering jaws for the screws, held by the frame, in combination with a series of gears held by the frame to connect and operate the centering jaws, and means to turn said gears alternately in opposite directions, substantially as described.

10. A screw-threading machine having a spindle, a back shaft turned by the spindle, and a pulley on the back shaft, in combination with a holding frame, toothed centering jaws held by the frame, a series of gears on the frame to actuate the centering jaws, a pulley *l* adapted to engage and turn a gear of said series, a driving cord on said pulleys and means for controlling the action of the pulley *l* upon the gear, substantially as described.

11. A screw-threading machine having a rotatory spindle, a back shaft turned by the spindle, and pulleys on the back shaft, in combination with a frame opposite the spindle, toothed centering jaws held by the frame, a series of gears held by the frame connecting said jaws, a pulley *l* adapted to engage a gear of said series, said gear having a sleeve, a gear *v* to engage said sleeve, a pinion to turn the gear *v*, a pulley *a′* for the pinion, and driving cords connecting said pulleys on the back shaft with the pulleys *l* and *a′* respectively, substantially as shown and described.

12. A screw-threading machine having a spindle, a back shaft turned by the spindle, and pulleys *t* and *b′* adapted to move longitudinally upon the shaft and to turn therewith, in combination with a holding frame concentric with the axis extended of the spindle, a series of gears held by the frame, a pulley supported by the frame opposite the pulley *t*, adapted to engage with said gearing, a second pulley opposite the pulley *b′* adapted to actuate said gearing, driving cords on the pulleys and a traveling arm carried by the frame for controlling the pulleys *t* and *b′*, substantially as described.

13. A screw-threading machine having a holding frame, two centering jaws in the frame, and a series of gears on the frame to actuate said jaws, one of said gears having a sleeve resting in the frame, in combination with a non-rotating shaft in the sleeve, a pulley on said shaft adapted to turn said sleeved gear, a gear on the shaft adapted to turn the sleeve, and means to move said shaft endwise in the sleeve, substantially as described.

14. A screw-threading machine having a holding frame, toothed centering jaws held by the frame, and a series of gears on the frame to actuate the jaws, one of the gears having a sleeve, a non-rotating endwise moving shaft in the sleeve, a driving pulley on the shaft adapted to engage a gear of the series, and a gear on the shaft adapted to engage the sleeve, in combination with a coupler on the shaft, a lever in the coupler to control the shaft, held by the frame, and a spring and a stop pin to control the lever, substantially as shown.

15. A screw-threading machine having a spindle, and a step pulley and a single pulley on the spindle, in combination with a rotatory shaft parallel with the spindle, pulleys adapted to turn on the shaft, belts connecting the step pulley and the single pulley respectively with the pulleys on the shaft, the belts being adapted to turn the pulleys on the shaft in opposite directions, centering and holding jaws and means for actuating the same from the shaft, substantially as shown and described.

16. A screw-threading machine having a screw-holding mechanism, in combination with a spindle adapted to turn at intervals in opposite directions, a back shaft and cord pulleys thereon to turn with the shaft, driving cords on said pulleys for the screw-holding mechanism, a step pulley and a single pulley on the spindle, belt pulleys adapted to turn on the shaft, belts connecting the step pulley and the single pulley respectively with said belt pulleys on the shaft, the belts being adapted to turn said latter pulleys in oppo-

site directions, ratchets rigid with the shaft adjacent to the respective belt pulleys, and pawls held by the belt pulleys to engage the respective ratchets whereby the shaft is turned in only one direction whichever way the spindle may turn, substantially as shown and described.

17. A machine for threading screws, having a holding mechanism for the screws, in combination with a rotatory spindle adapted to turn at different velocities, a rotatory shaft adjacent to the spindle having cord pulleys adapted to turn with the shaft, driving cords on the cord pulleys for said screw-holding mechanism, a step pulley and a single pulley on the spindle, belt pulleys adapted to turn on the shaft, belts connecting the step pulley and the single pulley with said belt pulleys respectively, ratchets rigid with the shaft adjacent to said respective belt pulleys, pawls held by the belt pulleys to engage the respective ratchets, the belts being adapted to turn the shaft at a uniform velocity, as and for the purpose specified.

18. A machine for threading screws, having screw-holding mechanism, in combination with a spindle adapted to turn in either direction, and a die-carrying sleeve secured rigidly thereto, a chuck for the die adapted to turn in the sleeve, a rigid catch piece in the chuck, and a movable spring-pressed driving catch in the sleeve to engage the rigid catch piece, the two catch pieces being adapted to pass each other when the spindle is turning forward but to engage when the spindle is reversed, substantially as described.

In witness whereof we have hereunto set our hands, this 23d day of March, 1895, in the presence of two subscribing witnesses.

JESSE H. BROWN.
HIRAM W. SMITH.

Witnesses:
ENOS B. WHITMORE,
M. L. WINSTON.