

(No Model.)

4 Sheets—Sheet 1.

W. HILLMAN.
SCREW MAKING MACHINE.

No. 462,553.

Patented Nov. 3, 1891.

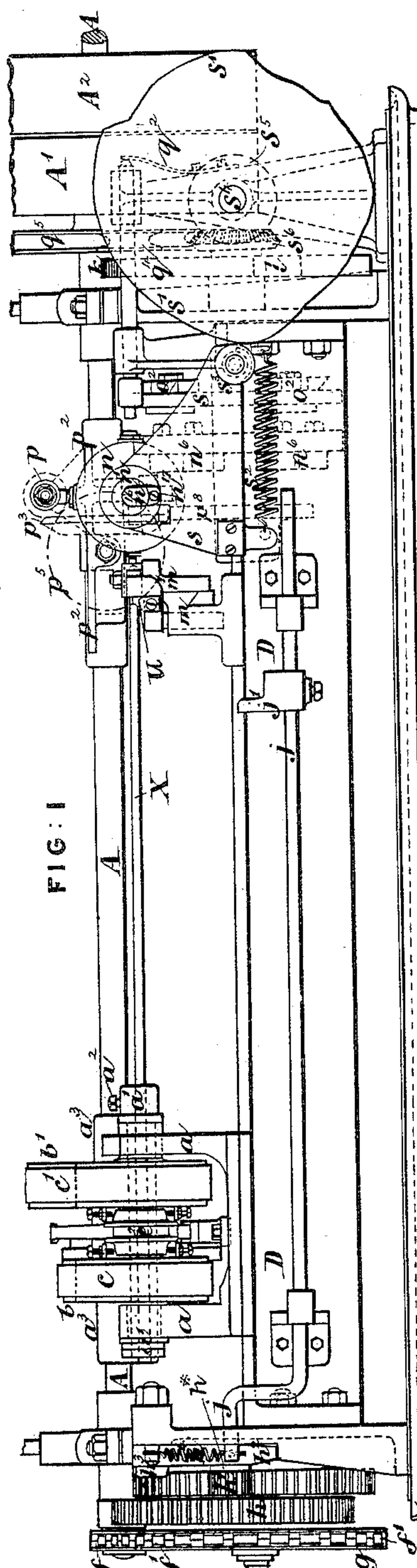


FIG. 1

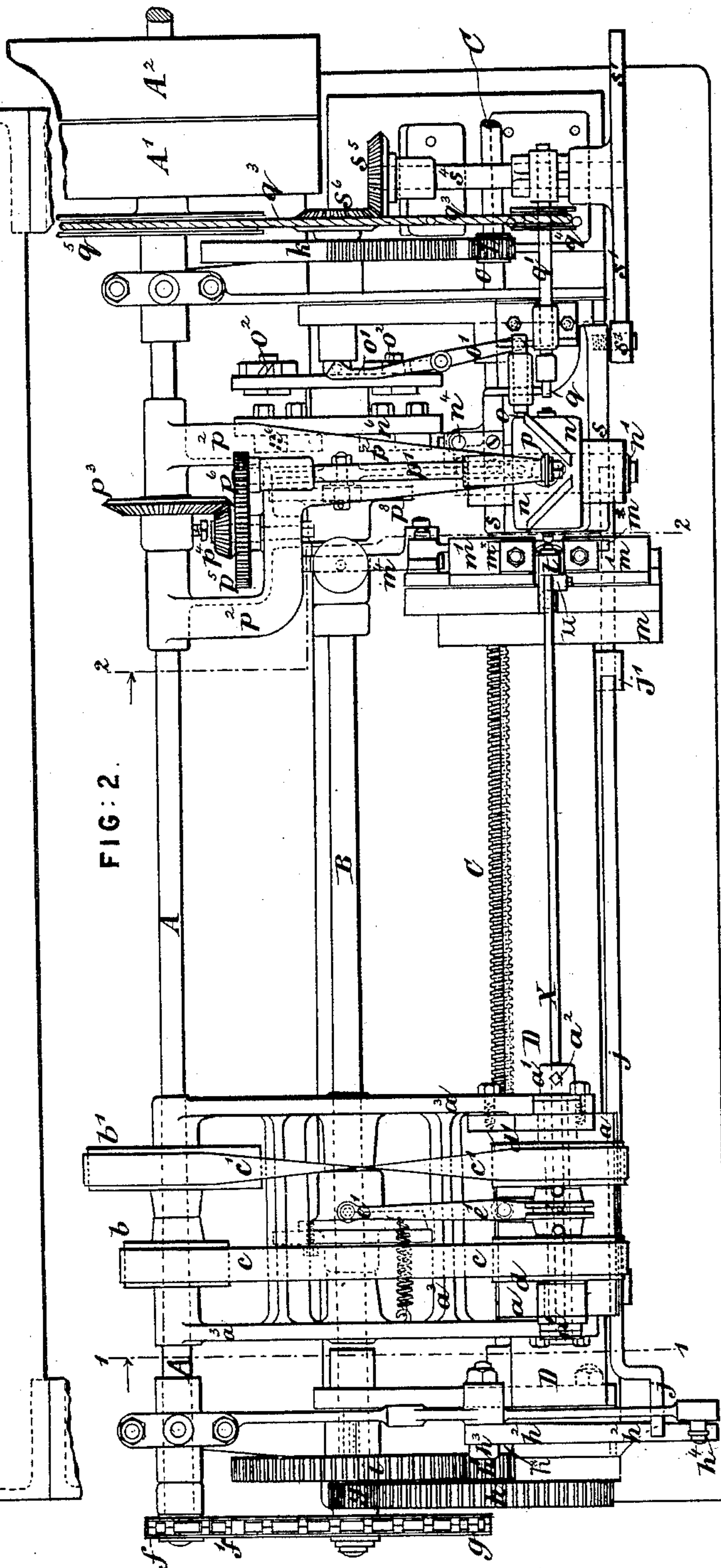


FIG. 2

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Inventor:
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by Knight & Bro. Attorneys

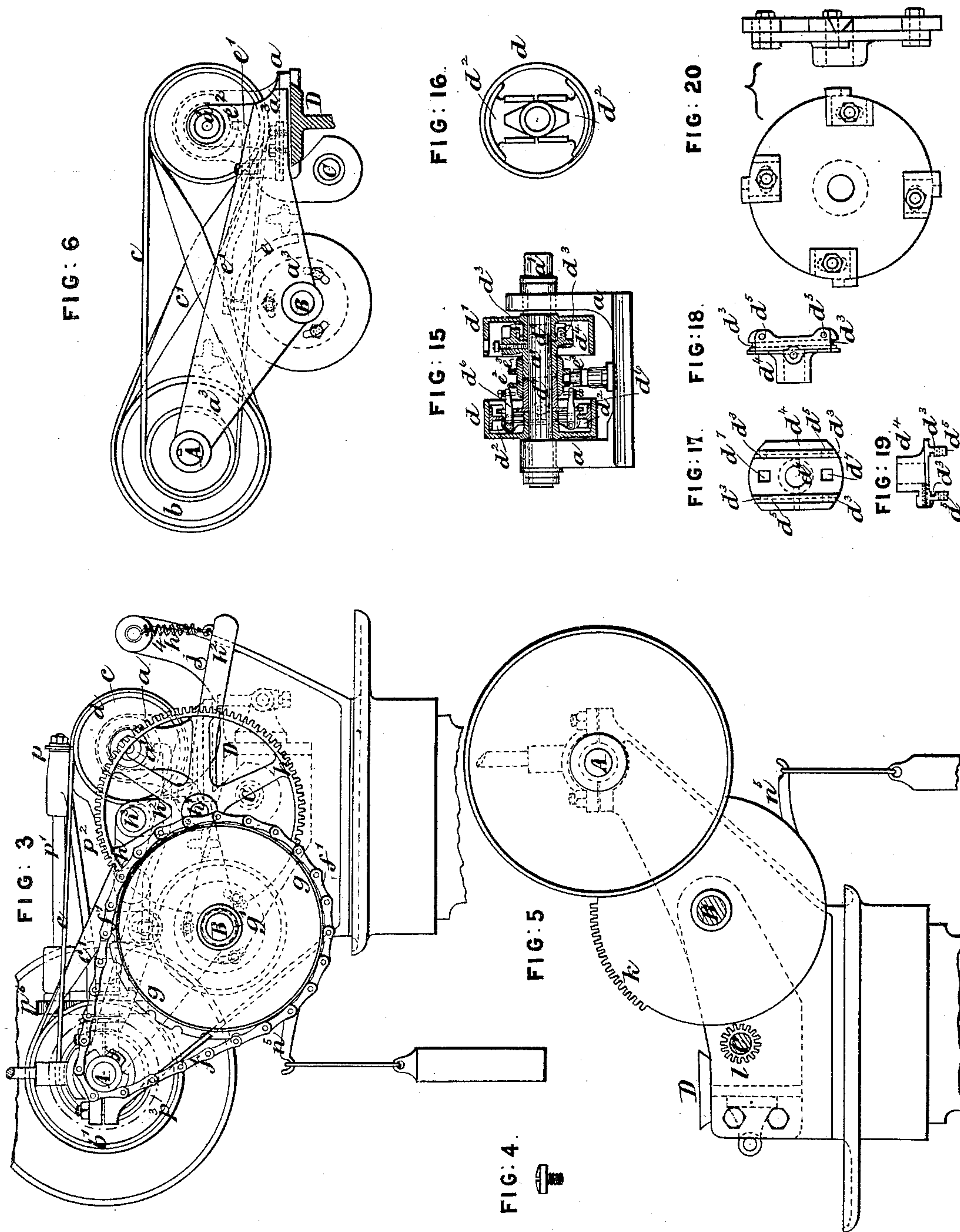
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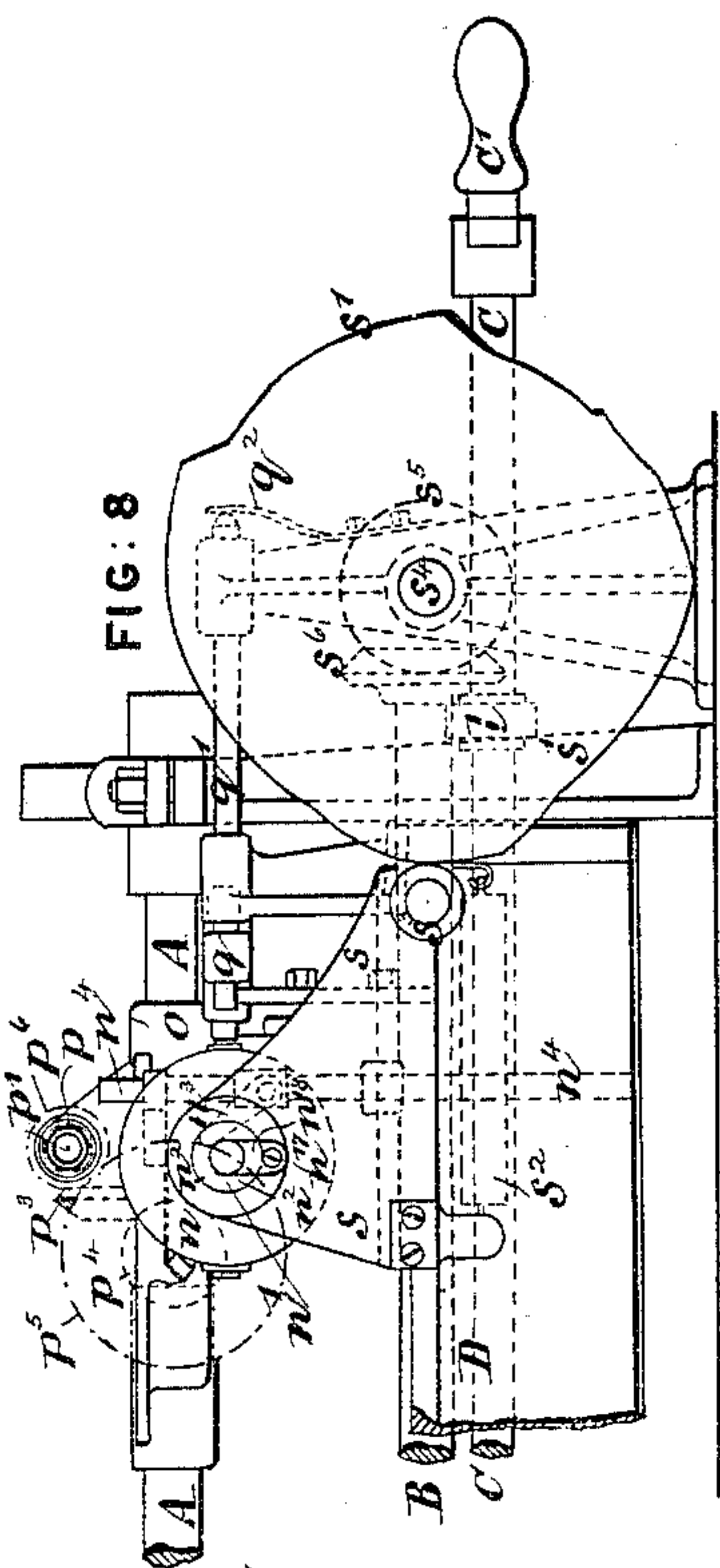


FIG. 8.

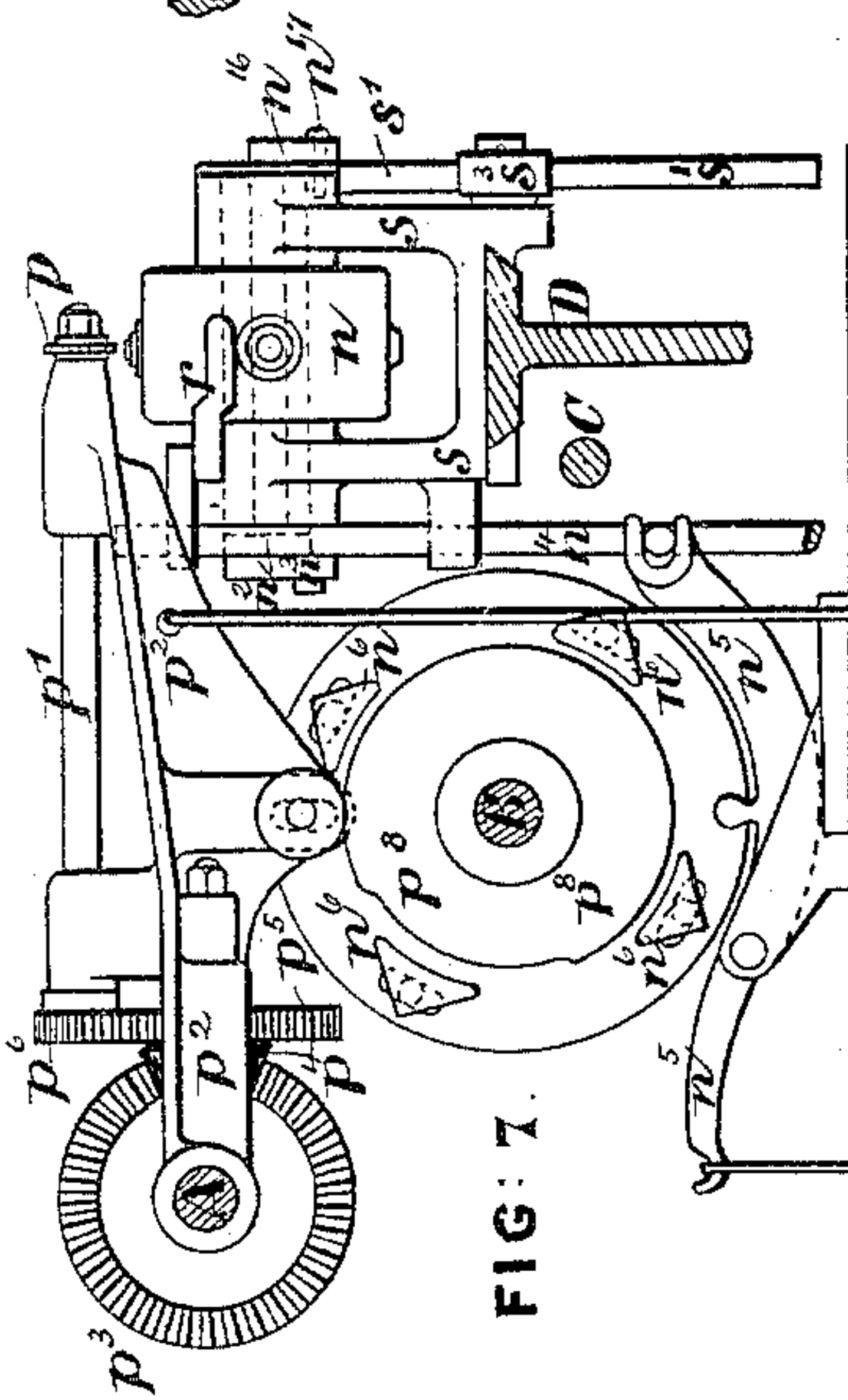
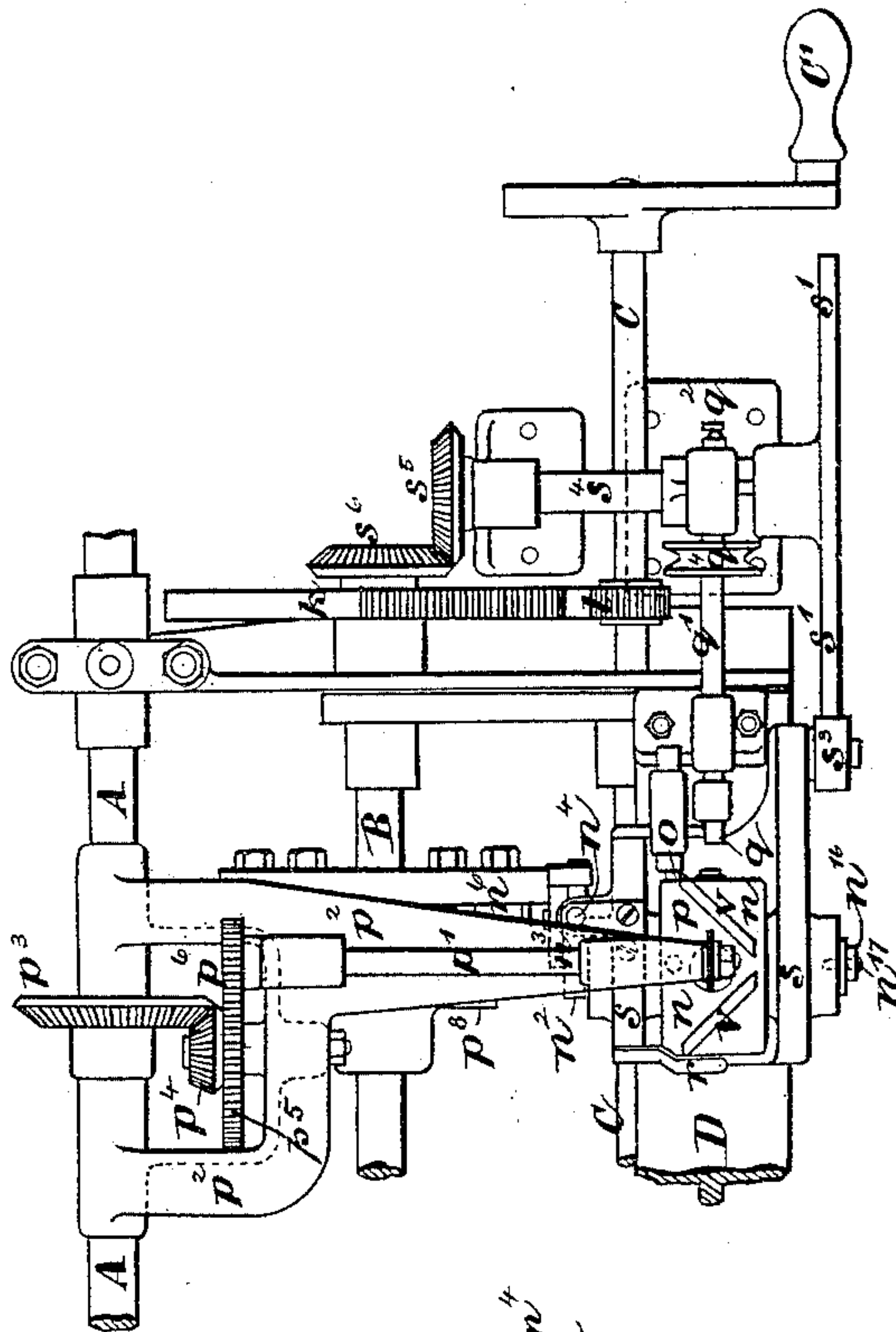


FIG. 7.

FIG. 9.



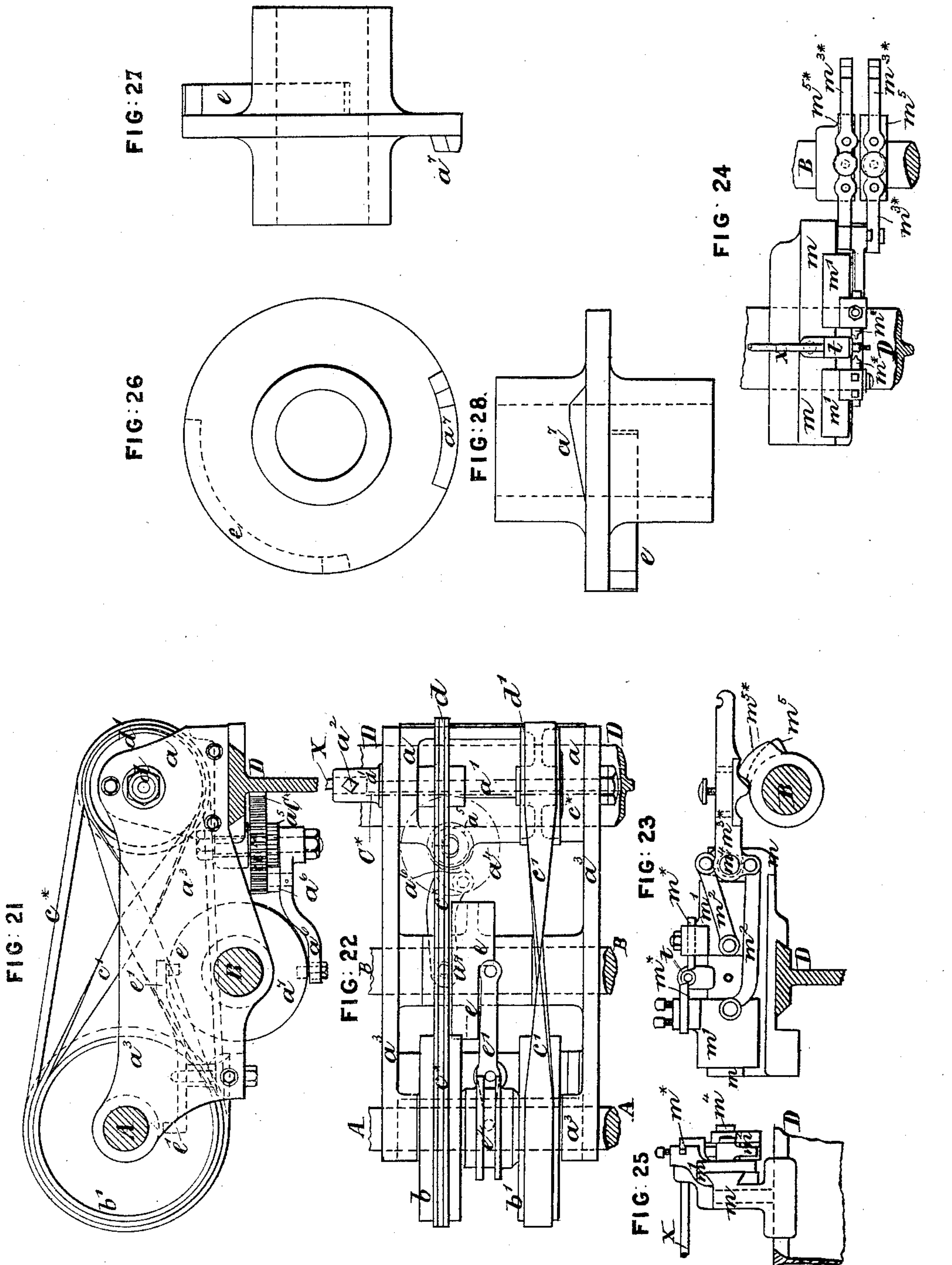
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Attest:
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Inventor:
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UNITED STATES PATENT OFFICE.

WILLIAM HILLMAN, OF COVENTRY, ENGLAND, ASSIGNOR TO THE AUTO MACHINERY COMPANY, LIMITED, OF SAME PLACE.

SCREW-MAKING MACHINE.

SPECIFICATION forming part of Letters Patent No. 462,553, dated November 3, 1891.

Application filed March 9, 1891. Serial No. 384,390. (No model.) Patented in England March 28, 1889, No. 5,346.

To all whom it may concern:

Be it known that I, WILLIAM HILLMAN, of the AUTO MACHINERY COMPANY, LIMITED, a subject of the Queen of Great Britain, residing at Coventry, in the county of Warwick, England, have invented certain new and useful Improvements in Screw-Making Machines, also applicable for making nuts and other articles, (for which I have obtained a patent in Great Britain, No. 5,346, bearing date March 28, 1889,) of which the following is a specification.

The invention has for its object improvements in machinery or apparatus for making screws, nuts, and other articles automatically, and the invention is illustrated in the accompanying drawings, in which—

Figure 1 is a front view, Fig. 2 is a plan, and Fig. 3 is a left-hand end view, of a machine adapted automatically to make screws of the pattern represented at Fig. 4. Fig. 5 is a right-hand end view with some of the parts removed. Fig. 6 is a vertical cross-section on the line 1 1 of Fig. 2. Fig. 7 is a vertical cross-section on the line 2 2 of Fig. 2. Fig. 8 is a front view of the parts represented at Fig. 7, and Fig. 9 is a plan thereof. Figs. 10 and 11 are vertical sections of the "capstan" tool-holder, drawn at right angles to each other and to an enlarged scale. Fig. 12 is a cross-section. Fig. 13 is a plan, and Fig. 14 is a front elevation, of the slides, slide-rest, and parts for operating the cutting-off tools. Fig. 15 is a vertical longitudinal section of the head-stock frictional driving-gear. Fig. 16 is an internal view of one of the head-stock driving-wheels, showing the sliding friction-segments. Fig. 17 is a face view, Fig. 18 is a side view, and Fig. 19 is a plan view, of the driver and guides for the friction-segments; and Figs. 20 are an elevation and edge view of the cam for operating the capstan-stop. Fig. 21 is a cross-section, and Fig. 22 is a plan, of parts, showing a modification in the method of communicating motion to the traveling head-stock and in the spindle-driving arrangements. Fig. 23 is a cross-section, Fig. 24 is a plan, and Fig. 25 is a front elevation, representing a slight modification in the method of communicating motion to the cutting-off tools; and Figs. 26, 27, and 28 are re-

spectively an elevation, a vertical edge view, and a plan of the cams e and a' used with the modifications shown at Figs. 21 and 22.

In all the figures like parts are indicated by similar letters of reference.

In carrying my invention into effect I employ a machine fitted with a back or driving shaft A, an intermediate or cam shaft B, and a front or feed-screw shaft C, all parallel with each other and with the bed D. The bed D is fitted with a traveling head-stock a , the spindle a' of which is bored longitudinally to permit of the passage therethrough of the rod or wire X, from which the screws or other articles are to be made, and such head-stock a is provided with a set-screw a^2 for holding the blank rod or wire therein. The head-stock a has connected thereto a frame a^3 , through bearings in which the driving-shaft A and cam-shaft B freely pass, and within this frame on the driving-shaft are mounted two pulleys b b' , from which straps or chains c c' pass to two pulleys d d' on the head-stock spindle a' , one of such straps being crossed, or when employing chains as the driving means an intermediate wheel being employed in place of the crossed strap.

Within the head-stock frame a^3 on the cam-shaft B is mounted a cam e , which at the required times acts on a lever e' , operating a clutch e^2 to move it in one or the other direction to reverse the rotary motion of the head-stock spindle and wire or rod X, held therein. The mode in which this is preferably effected is as follows: Within each of the pulleys d d' are two sliding frictional segments d^2 , shaped to fit the interior of the rims of the said pulleys and fitted to slide in guides d^3 , formed in drivers d^4 , fixed to the head-stock spindle a' . These drivers d^4 are provided with lugs d^5 , to which are pin-jointed levers d^6 , which pass through the spaces between the webs of the segments d^2 and the head-stock spindle a' , and extend through holes d^7 in the drivers d^4 a short distance beyond the pulleys d d' in position for their outer ends to be acted upon by one or other of the cam-surfaces or circular inclines e^3 , formed at the ends of the sleeve of the sliding clutch e^2 . By these means when the cam e acts to throw the sliding clutch toward one or the other of the

pulleys d d' the levers d^6 of that pulley are caused to push the frictional segments d^3 forcibly against the rim of said pulley and thereby connect said pulley with the adjacent driver d^4 , which will drive the head-stock spindle a' in a certain direction, the reverse motion of the sliding clutch e^2 throwing the opposite pulley d or d' into connection with the head-stock spindle a' , and therefore driving it in the contrary direction.

The head-stock a is moved along the bed D by the feed-screw shaft C, and motion is communicated from the driving-shaft A to the cam-shaft B by suitable gearing, that represented in the drawings being arranged as follows: On the driving-shaft A is fixed a chain-wheel f , which, by a chain f' , communicates motion to the chain-wheel g , mounted loosely on the cam-shaft B, and which, by a toothed pinion g' , fixed thereto, communicates motion to the toothed wheel h , which by a toothed pinion h' , fixed thereto, gives motion to the toothed wheel i , fixed on the cam-shaft B; and in order that the motion of the cam-shaft B may be capable of being instantly stopped when desired, the toothed wheel h and pinion h' are mounted on a stud h^* , fixed at the angle of the L-lever h^2 , the short arm of which is mounted on the stud h^3 , while the long arm thereof is acted upon by a spring h^4 to raise it, and therefore to take the toothed wheel h and pinion h' out of gear with the pinion g' and wheel i , and is held down by the end of a rod j , so as to keep the toothed wheels and pinions in gear until such rod is moved endwise to release the L-lever h^2 therefrom. Motion is communicated from the cam-shaft B to the feed-screw shaft C by a segmental toothed wheel k , fixed thereon, and which acts upon a toothed pinion l , fixed on the screw-shaft C, so as to give rotary motion to the latter and consequently a forward motion to the head stock a at the required times.

A slide-rest m is fixed on the bed D at the required place, and this rest carries two tool-holding slides m' m' , which are connected by links m^2 m^2 to the outer ends of the short arms of a weighted T-lever m^3 , which is mounted on an axis of motion m^4 , carried by the slide-rest m , the long arm of such T-lever being acted upon by a cam m^5 on the cam-shaft B, to cause the slides m' m' at the required times to approach each other for the purpose of causing the cutters m^* to cut off the screw or other article from the rod or wire X.

A capstan tool-holder n is mounted on a hollow horizontal axis n' and receives a step-by-step rotary motion by means of a ratchet-wheel n^2 , fixed thereon, which is operated by a driver n^3 , connected to a sliding rod n^4 , operated by a weighted lever n^5 , worked by a cam n^6 on the cam-shaft B. The capstan is thus partially rotated at the required times, and it is held fast in each position by a spring-stop o entering holes n^* therein, such stop be-

ing suitably guided and connected to a lever o' , worked by a cam o^2 on the cam-shaft B and so arranged as to withdraw the stop o from a hole n^* at the time when it is required to revolve the capstan.

A saw p for cutting the nicks in screw-heads is fixed to a spindle p' , supported in bearings carried by a lever p^2 , mounted loosely on the driving-shaft A, and such saw p receives rotary motion by means of a beveled toothed wheel p^3 , fixed on the driving-shaft, which gives motion to the beveled pinion p^4 and toothed wheel p^5 , which latter gives rotary motion to the toothed pinion p^6 , fixed on the saw-spindle p' . The saw p is brought into position for work and removed therefrom by the combined action of a weight p^7 and cam p^8 , on the cam-shaft acting upon the lever p^2 , carrying the saw-spindle p' . A tool q for finishing the head of a screw or other article is carried by a spindle q' in line with the head-stock spindle a' , and such finishing-tool is pressed up to its work by spring-pressure applied by a spring q^2 , and receives rotary motion by a strap or band q^3 passing round a pulley q^4 on the spindle q' and round a pulley q^5 on the driving-shaft A.

The capstan tool-holder n carries a roughing turning die or tool n^7 , a finishing turning die or tool n^8 , a screwing or tapping die n^9 , and a "gripper" n^{10} , which latter receives the shank of the screw or other article being made and carries it round to the nicking-saw p and finishing-tool q . This gripper consists of a die n^{10} , which is split for a suitable distance into three jaws and is formed conical on its outer surface to fit a conical recess in the carrying-chuck n^{11} , which is a fixture in the capstan, and the gripping-die n^{10} is formed with a screwed stem, around which is placed a strong spring n^{12} , which at one end acts on a shoulder in the carrying-chuck n^{11} and at the other on a nut n^{13} , screwed onto the stem of the gripping-die n^{10} . The end of said stem is cut half away, and the remaining portion is inclined on the outside and is acted upon by a fixed cam n^{14} , formed or fixed on a fixed spindle n^{15} in the center of the hollow axle n' of the capstan, such spindle n^{15} being held against rotation by an arm n^{16} , fixed at one end thereof and through which a pin n^{17} is passed into the casting carrying the capstan. The gripping-die n^{10} is thus at the required time forced forward by the fixed cam n^{14} and is thereby opened, in which position it receives the article as it is cut off from the rod X. It remains open for a certain time until in the revolution of the capstan the said article is pressed into the die n^{10} by a fixed wiper n , at which time the stem of the gripping-die n^{10} slips suddenly off the fixed cam n^{14} and is closed by the action of the spring n^{12} , thus securing a firm grip of the article with the latter properly in position therein, and it retains its hold until after the finishing operation is performed and it has arrived at a vertical position on the under side of the

capstan, at which time the gripping-die n^{10} is fully opened by the fixed cam n^{14} , and the article is released and dropped therefrom.

The screwing or tapping die or tool n^9 is capable of endwise but not rotary motion in its chuck n^{21} , and it is held therein by spring-pressure in the following manner: The cylindrical body n^{18} of the die n^9 is formed with slots n^{19} in its sides, and through these slots a cross-pin n^{20} is passed, which is fixed in the body of the chuck n^{21} . A spiral spring n^{22} , placed within the body n^{18} , bears at one end against the fixed pin n^{20} and at the other against the bottom of the body n^{18} . The said screwing or tapping tool n^9 is by the cam n^6 , acting on the capstan-slide n^4 , brought into position for acting on the article to be screwed or tapped, and the capstan is forced only a slight distance toward such article when it stops; but the screwing or tapping tool or die n^9 having commenced its work, the spring n^{22} , holding it in its chuck n^{21} , gives way and allows it to be gradually drawn forward by its work until the latter is completed.

The cam n^6 for effecting the step-by-step rotary motion of the capstan n and the cam o^2 for acting on the capstan stop or holder o are formed, as shown, of disks with slots in which suitable cam-projections are fixed according to the work to be done.

The axle n' of the capstan tool-holder n is mounted in bearings formed in a slide s , mounted on the bed D , and such slide s receives its necessary to and fro motions by the combined action of a cam s' and spring s^2 , a roller s^3 being mounted on the slide s to bear against the cam. The cam s' is mounted on the cross-shaft s^4 , to which motion is communicated from the cam-shaft B by the beveled toothed pinions s^5 s^6 .

The hollow spindle a' of the head-stock may be provided with means for firmly holding the blank rod or wire X centrally thereof; but as such rods or wires frequently slightly vary in size, and it is necessary that they should accurately fit the guide-bearing t , carried by the cutter-slide rest m , I prefer to adopt the arrangement represented in the drawings, in which the hole through the chuck or nozzle of the hollow spindle a' is large enough to accommodate slight differences in size of the rod or wire, and the latter is held securely therein by the set-screw a^2 , already referred to; but in order to enable such rod or wire accurately to fit the guide-bearing t I fix to the cutter-slide rest m , close to such bearing, a cutter u , which is so adjusted as to turn the blank rod or wire X to the exact size required to fit the bearing t .

The stop-rod j is provided with an adjustable arm j' , which is acted upon by the sliding head-stock a as the latter arrives toward the limit of its motion, by which means the said rod j is caused to slide in its bearings, so as to remove the left-hand end thereof from over the lever h^2 , which latter being then free is raised by the spring h^4 , so as to take the

toothed wheels h h' out of gear with the toothed wheels g' i , and thereby stop the motion of the cam-shaft B , capstan tool-holder n , and cross-shaft s^4 . When the sliding head-stock has traveled its full distance and acted upon the stop-rod j , and thereby stopped the motions of the various parts, as above described, the head-stock a is run back to its starting-point by means of a crank-handle C' on the end of the feed-screw C , the blank rod or wire X is again adjusted therein, the gearing again placed in gear by means of the lever h^2 and stop-rod j , and the machine thereby placed in operation. The work can be stopped at any time by the attendant sliding the rod j to the right hand.

I will now describe the modifications represented at Figs. 21 to 28.

According to the modification of parts represented at Figs. 21 and 22, I dispense with the feed-screw C and employ in lieu thereof a toothed rack C^* , fixed to the bed D , toothed wheel a^4 , carried by the head-stock a , a ratchet-wheel a^5 , fixed on the axis of such toothed wheel a^4 , and a driver a^6 , acting upon the ratchet-wheel a^5 and operated by a cam a^7 on the cam-shaft, the thickness of which cam is in proportion to the length of screw to be made. By these means I am enabled readily to vary the amount of motion given to the head-stock. I also, according to said modification, apply the clutch e^2 and friction-driving segments to the shaft A and pulleys b b' , instead of to the head-stock spindle a' and pulleys d d' , and I arrange the cam e and lever e' accordingly. I also reverse the position of the pulleys b b' and d d' on their respective shafts, and I convert the pulleys b d into chain-wheels and give motion from one to the other by an endless chain c^* , so as to give a positive motion to the head-stock spindle when the rod or wire X is caused to revolve against and to be acted upon by the various tools.

In the modification of parts represented at Figs. 23 to 25, instead of connecting the tool-slides m' m' to the short arms of a single T-shaped lever operated by a single cam, I connect each tool-slide m' to the short arm of a separate L-shaped lever m^{3*} , and I operate each of said levers by a separate cam m^5 or m^{5*} , one of such cams m^{5*} being shaped and arranged to complete the to-and-fro motion of its slide a little before the other m^5 , which latter acts more slowly and completes its motion a little later than the former, at the same time causing its cutter to pass slightly beyond the center of the wire or rod X , and thereby take off the burr, which would be left if the cutting-off tools traveled exactly similarly to each other.

I will now describe the operation of producing a plain screw with a nicked head and the thread extending the full length of the shank up to the head, as represented at Fig. 4. The blank wire or rod X is first adjusted in the hollow spindle of the head-stock and

through the guide-bearing *t*. The head-stock, with the hollow spindle revolving, is caused to advance toward the capstan until the blank rod or wire *X* is carried forward the distance required. The capstan and the roughing tool or die are then advanced until the stem of the screw is roughly turned. The capstan and the roughing-tool then retire, the capstan is revolved, and the finishing turning-tool *n*⁸ brought into position and advanced for finishing the turning of the shank. The capstan again retires, is partially revolved, and again carried forward, with the screwing-die *n*⁹ in position to form the thread of the screw, as before explained. The motion of the head-stock spindle is then reversed to unscrew the screw from the die *n*⁹, the capstan again retires, and the cutters *m*^{*} begin the cutting-off operation. The capstan is again partially rotated, so as to bring the gripping-die *n*¹⁰ into position. The capstan then advances toward the partially-made screw, the screwed shank of which is received within the gripping-die, which has been protruded and opened for such purpose by the fixed cam *n*¹⁴, and the cutting-off operation is then completed. The capstan is again partially rotated, carrying the screw past the wiper *r*, which pushes the screwed shank fully into the gripping-die. The stem of the latter at the same moment slips off the fixed cam *n*¹⁴ and the jaws of the gripper are powerfully closed upon the screw, as before explained. The capstan continues its rotary motion until the screw arrives at the upper vertical position. The capstan-slide is then traversed under the nicking-saw *p*, the latter is lowered into position, and in the traverse of the screw past the same forms the nick in the screw-head. The screw is then carried round opposite the finishing-cutter *q* by a partial rotary motion of the capstan. The said cutter *q* then finishes the head, after which the capstan again partially rotates until the gripping-die arrives at the lower vertical position, when the said die is opened by the fixed cam *n*¹⁴ and the screw thereby released and allowed to fall into a suitable receptacle.

The operation of roughing the shank of one screw takes place at the same time as the nicking of the previously cut-off screw. The number of tools carried by the capstan and the succession of operations effected thereby will be regulated according to the article it is intended to produce. Fast and loose pulleys *A*¹ *A*² are mounted upon the driving-shaft *A* to receive a belt or strap by which the machine is driven. In order to prevent the particles of metal removed by the various tools from getting into the screw-die I apply to the capstan guides or guards *v*, which direct the soapy water used, so as to cause such metal particles to be carried away from said die.

Having fully described my invention, what I desire to claim and secure by Letters Patent is—

1. In machinery for making screws, nuts, and other articles, the combination, with parallel driving-shaft, cam-shaft, screw-feed shaft, and bed, of a traveling head-stock fitted with hollow spindle and with reversing-gear, a capstan tool-holder mounted on a horizontal axis carried by a traversing slide and acted upon by a cam and a spring-stop, a rotary nicking-saw, a pair of cutting-off tools, and a finishing-tool, all arranged and operated substantially as herein shown and described.

2. In machinery for making screws, nuts, and other articles, the combination of the cam-shaft carrying the cams for operating the machine, the toothed wheel *i*, fixed on said cam-shaft, the L-shaped lever *h*², pivotally supported at its short end *h*³, the pinion *h*¹, rotatably mounted at the angle of the lever *h*² and adapted to engage with the toothed wheel *i*, means for rotating said pinion *h*¹, and a longitudinally-movable rod *j* for holding the L-shaped lever in its lowered position and a spiral spring *h*⁴ for holding it in its raised position, whereby the pinion *h*¹ may be held into or out of engagement with the toothed wheel *i*, substantially as set forth.

3. In a machine for making screws, nuts, and other articles, the combination of the cam-shaft *B*, carrying the cams for operating the machine, the longitudinally-movable head-stock *a*, the toothed wheel *i*, fixed on the cam-shaft, the L-shaped lever *h*², pivotally supported at its short end *h*³, the pinion *h*¹, rotatably mounted at the angle of the lever *h*² and adapted to engage with the toothed wheel *i*, means for rotating said pinion *h*¹, a longitudinally-movable stop-rod *j*, adapted to hold the L-shaped lever in its lowered position, the arm *j*¹ on said stop-rod *j*, against which the longitudinally-movable head-stock *a* is moved for disengaging the rod *j* from the lever *h*², and the spiral spring *h*⁴ for raising the lever *h*² and disengaging the pinion *h*¹ from the toothed wheel *i*, substantially as set forth.

4. In machinery for making screws, nuts, and other articles, the combination of the driving-shaft *A*, the cam-shaft *B*, the screw-shaft *C*, and the bed *D*, arranged parallel to each other, the traveling head-stock fitted with a hollow blank-holding spindle and loosely-mounted reversing-pulleys *d* *d*¹, the pulleys *b* *b*¹, mounted upon the shaft *A* and geared to the pulleys *d* *d*¹ by belts *c* *c*¹, a sliding clutch *e*², adapted to be thrown into gear with either one of the pulleys *d* *d*¹, a cam *e*, mounted upon the shaft *B*, a pivoted lever *e*¹, operated upon by the cam *e* and engaging with the clutch *e*² for controlling its position, means for operating said shafts *A*, *B*, and *C*, and suitable tools for forming the article from the blank, substantially as set forth.

5. In combination with a drive-shaft *A*, a cam-shaft *B*, a screw-shaft *C*, a bed *D*, and an intermittently-traveling head-stock *a*, reversing-pulleys *d* *d*¹, carried by said head-stock and operated through suitable gearing from

the shaft A, and a sliding clutch c^2 , adapted to be thrown into gear with either one of the pulleys d d' by a suitable cam carried by the shaft B, said clutch gearing with said pulleys through suitable mechanism, consisting, essentially, of drivers d^4 , fixed to the spindle a' and provided with guides d^3 and holes d^7 , frictional segments d^2 , fitting in said guides d^3 , and levers d^6 , pivoted to lugs formed on the drivers d^4 and passing through the holes d^7 and having projecting ends with which the sliding clutch-block engages, substantially as set forth.

6. The combination of the slide-rest m , supported on the bed D, the tool-holding slides $m' m'$, carrying suitable cutters, the weighted T-shaped lever m^3 , pivotally supported upon the rest m , the links $m^2 m^2$, connecting the slides $m' m'$ to the outer ends of the short arms of said T-lever m^3 , and the shaft B, carrying the cam m^5 for operating said T-lever, substantially as set forth.

7. In machinery for making screws, nuts, and other articles, the combination, with an intermittently-sliding head-stock fitted with hollow spindle and reversing-gear, of a rotating and traversing capstan tool-holder mounted on a horizontal axis and fitted with the required cutting tools or dies and a gripping-die and fixed wiper, all arranged and operated substantially as herein shown and described.

8. In combination with machinery for making screws, nuts, and other articles, the rotating traversing capstan tool-holder mounted on a horizontal axis and fitted with the necessary cutting tools or dies and with a gripping-die, arranged and operated substantially as herein shown and described.

9. In machinery for making screws, nuts, and other articles, the combination of a rotary traversing capstan tool-holder mounted upon a horizontal axis and provided with a ratchet-wheel n^2 , a driver n^3 , connected to a sliding rod n^4 , a weighted lever n^5 , engaging said sliding rod, and a suitable cam-wheel for operating said lever, substantially as set forth.

10. In machines for making screws, nuts, and other articles, the combination of a rotary traversing capstan tool-holder mounted upon a horizontal axis and provided with means for intermittently rotating it, a series of holes n^* in the surface of said tool-holder, a stop-pin o , adapted to enter said holes and hold the tool-holder in the desired position, a lever o' , connected to said stop-pin, and a cam o^2 , mounted on the shaft B, for controlling said lever, substantially as set forth.

11. In machines for making screws, &c., the combination of a suitable feeding mechanism and a rotary capstan-holder adapted to receive and hold a screw-blank, with the rotary saw p , adapted to cut the nicks in the screw-heads, substantially as set forth.

12. In machines for making screws, &c., the combination of a suitable blank-feeding mechanism and a rotary capstan-holder adapted

to receive and hold a screw-blank, with the rotary nicking-saw p , mounted upon the spindle p' , which is supported in suitable journals in the lever p^2 , means for rotating said spindle p' , and means for vibrating the lever p^2 upon its pivot for alternately throwing it into and out of operative position, substantially as set forth.

13. In a machine for making screws, &c., the combination of a suitable blank-feeding mechanism and a rotary capstan-holder adapted to receive and hold a screw-blank, with the rotary nicking-saw p , mounted upon the spindle p' , which is supported in suitable journals in the lever p^2 , said lever being loosely mounted upon the shaft A, suitable gearing between said shaft A and the spindle p' for rotating the latter, a weight p^7 , attached to the lever p^2 , for holding the saw p to its work, and a cam-wheel p^8 , engaging with a projection on said lever p^2 , for raising the saw from its work, substantially as set forth.

14. In machines for making screws, &c., the combination of a suitable blank-feeding mechanism, an intermittently rotatable capstan tool-holder, and means for operating said parts in proper relation to each other, said rotary capstan tool-holder being provided with a roughing turning die or tool n^7 , a finishing turning die or tool n^8 , a screwing or tapping die n^9 , and a gripper n^{10} , substantially as set forth.

15. The combination of the rotary capstan tool-holder n , its stationary supporting-spindle n^{15} , provided with the cam n^{14} , the gripping-die n^{10} , formed with suitable gripping-jaws having conical outer surfaces and a screw-threaded stem and seated in the carrying-chuck n^{11} , fixed to the capstan and having a conical recess, and the spiral spring n^{12} , seated on the stem of the gripping-die and retained between the shoulder of the carrying-chuck n^{11} and the screw-nut n^{13} , substantially as herein set forth.

16. The combination of the rotary capstan tool-holder n , the chuck n^{21} , fixed to the capstan, the cylindrical body n^{18} , formed with slots n^{19} , the cross-pin n^{20} , the spiral spring n^{22} , confined between the bottom of the cylindrical body n^{18} and the cross-pin n^{20} , and the screwing-die n^9 , secured in said cylindrical body, substantially as set forth.

17. In machinery for making screws, nuts, and other articles, the combination of a suitable blank-feeding mechanism, a rotary capstan tool-holder mounted upon a horizontal axis on the slide s and a cam s' for moving said slide in one direction and a spring for moving it in the opposite direction, substantially as set forth.

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