(No Model.) 7 Sheets—Sheet 1.

N. MEYERS.

WOOD TURNING MACHINE.

No. 589,092. Patented Aug. 31, 1897.

Fig. 1.

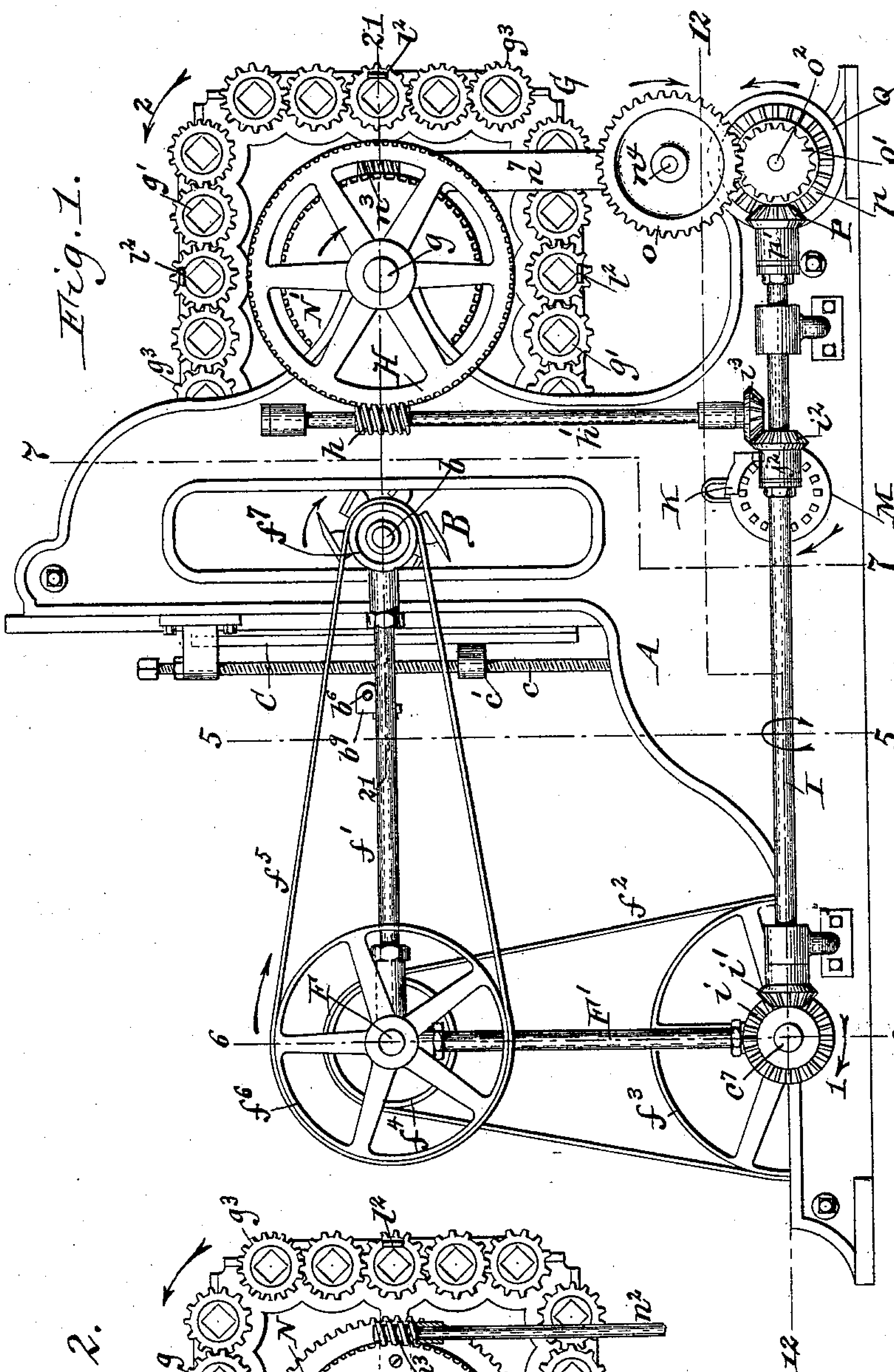
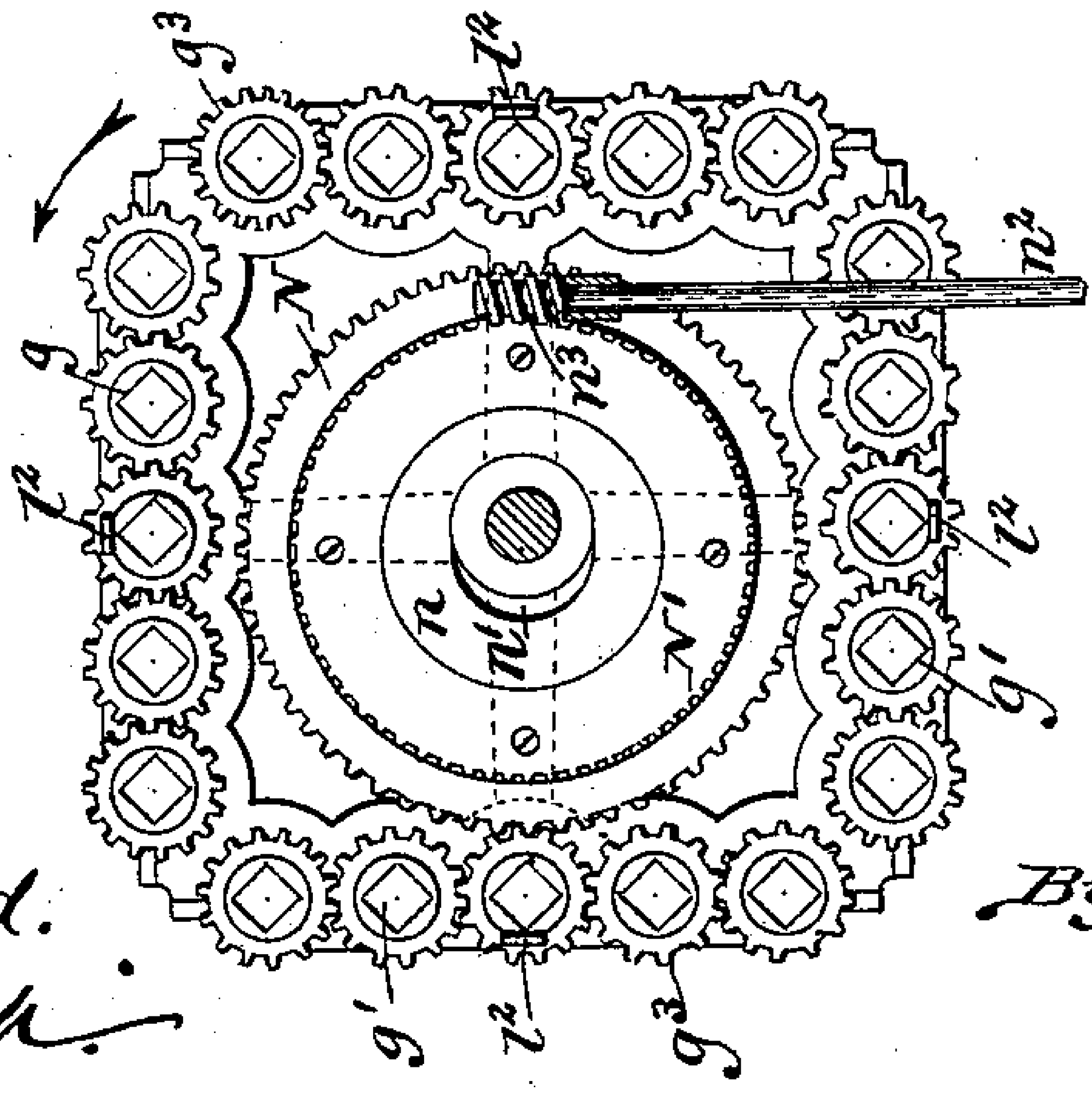


Fig. 2.



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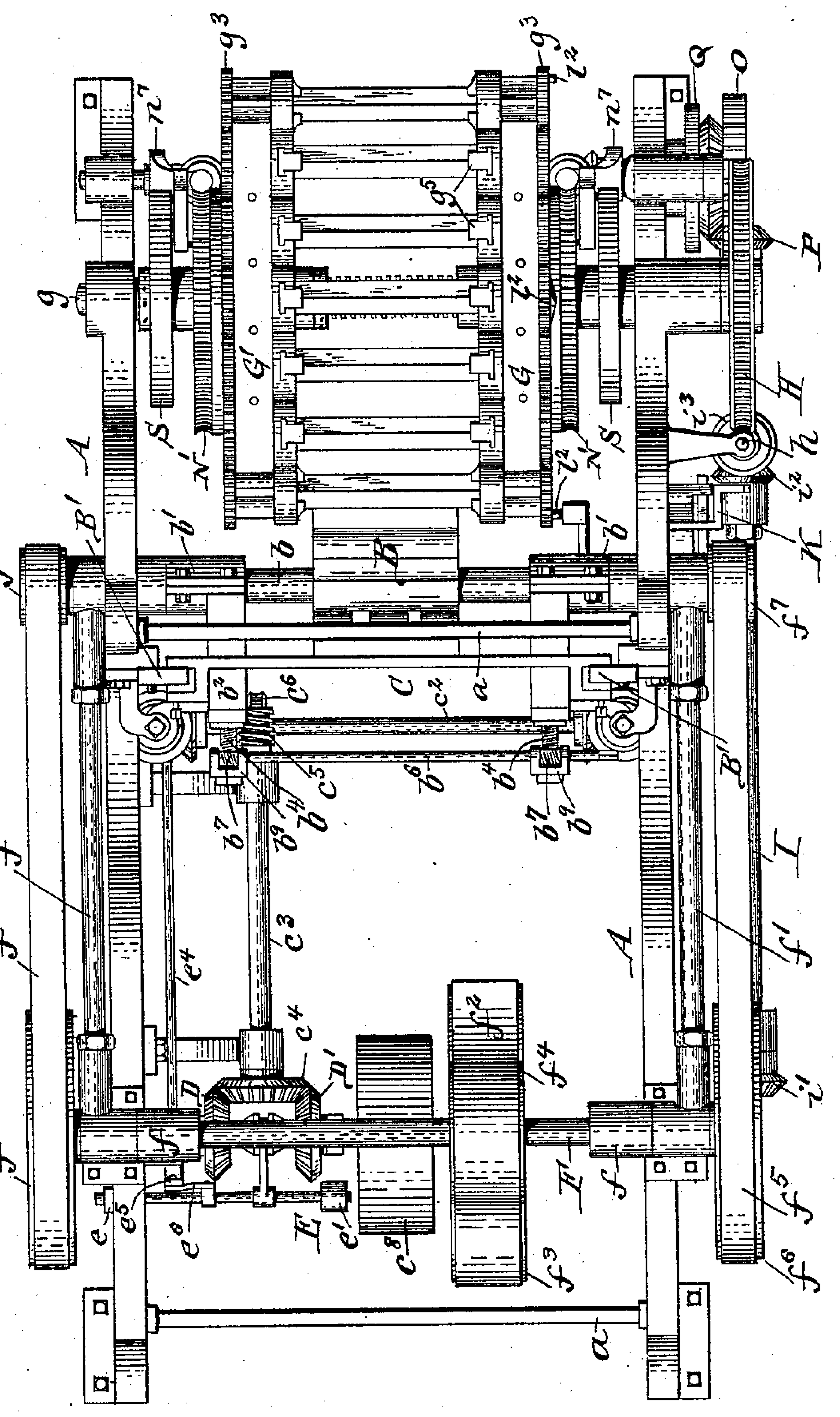

Fig. 3.

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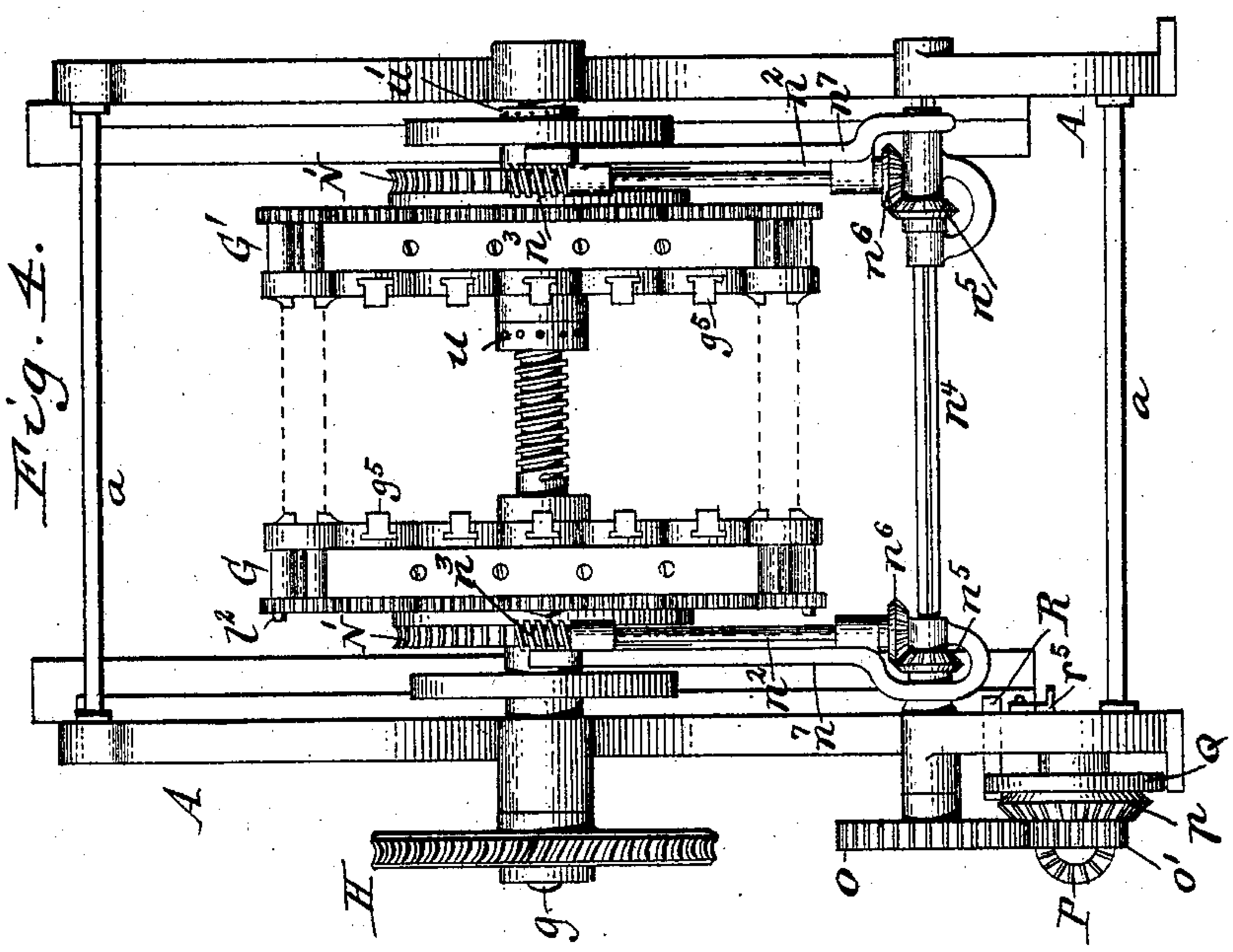

Fig. 4.

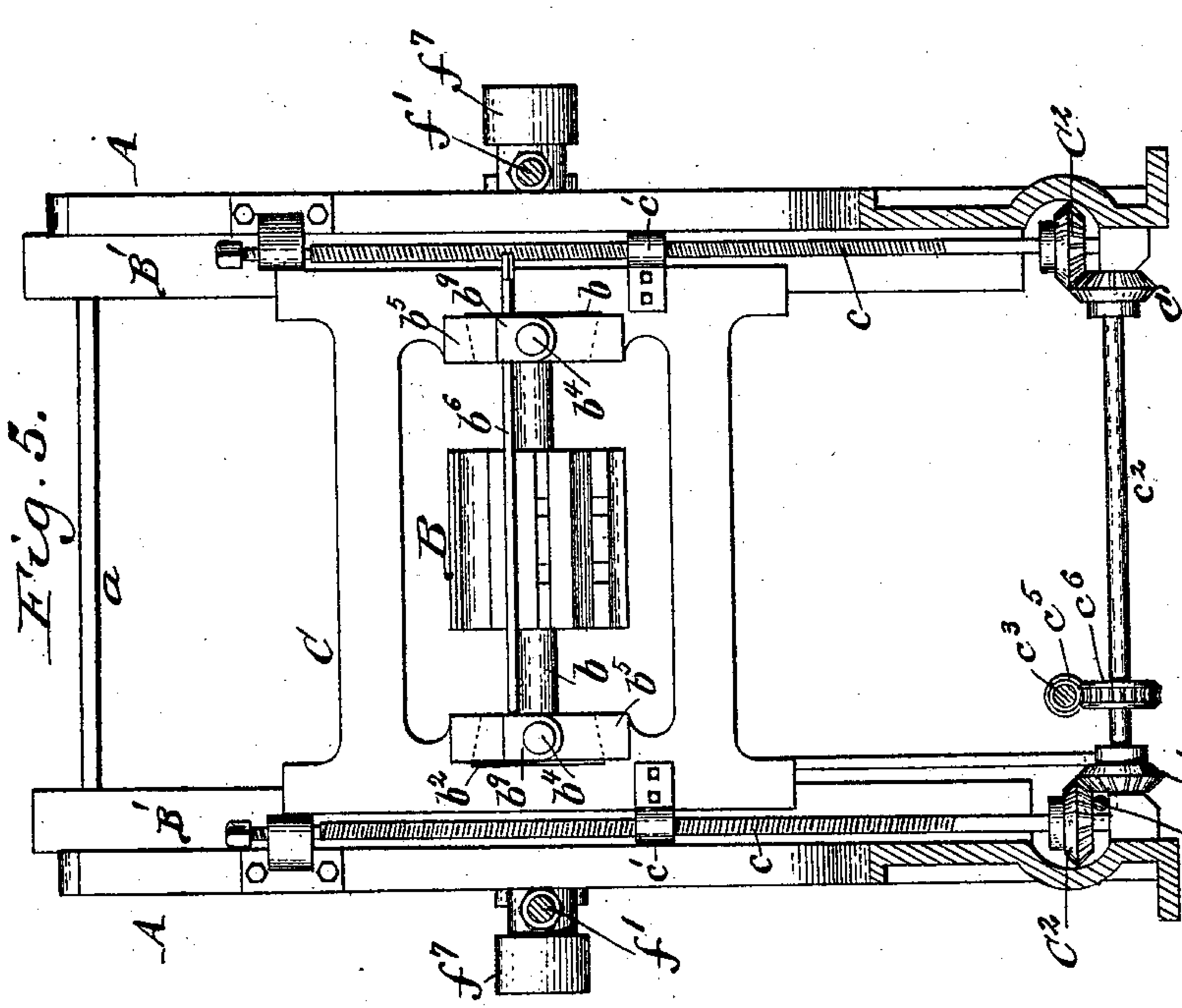

Fig. 5.

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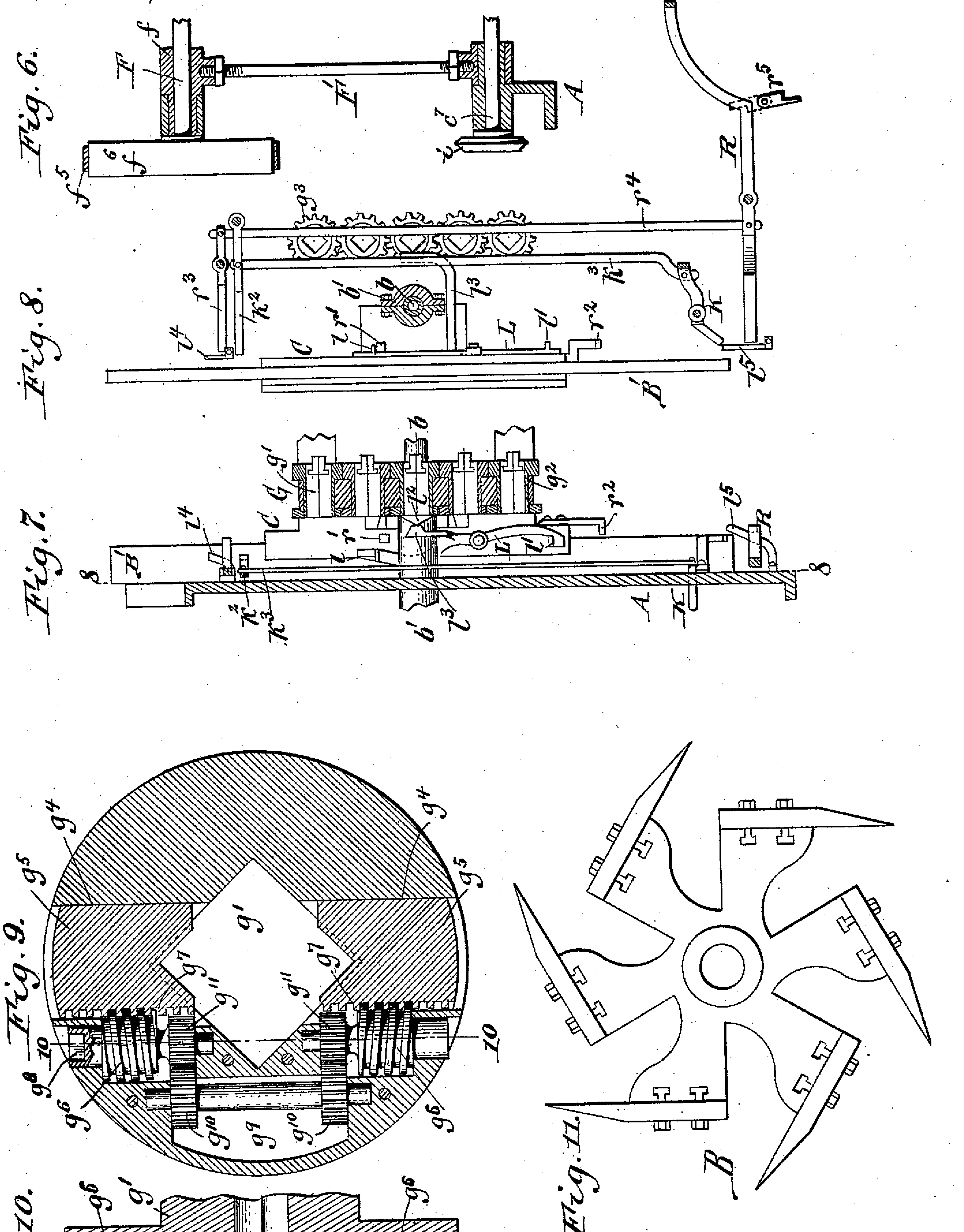

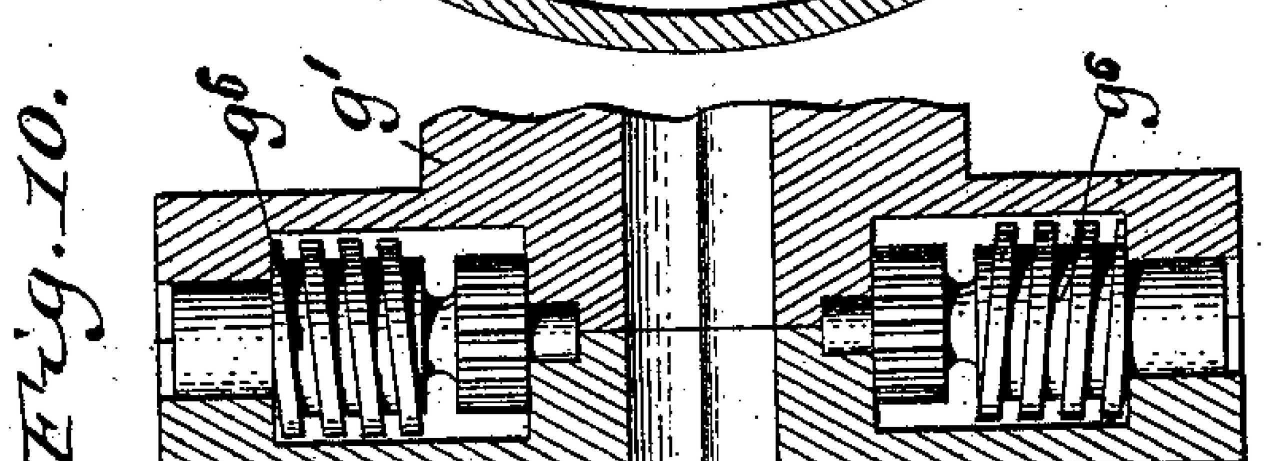

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} Witnesses.

(No Model.) 7 Sheets—Sheet 5.

N. MEYERS.

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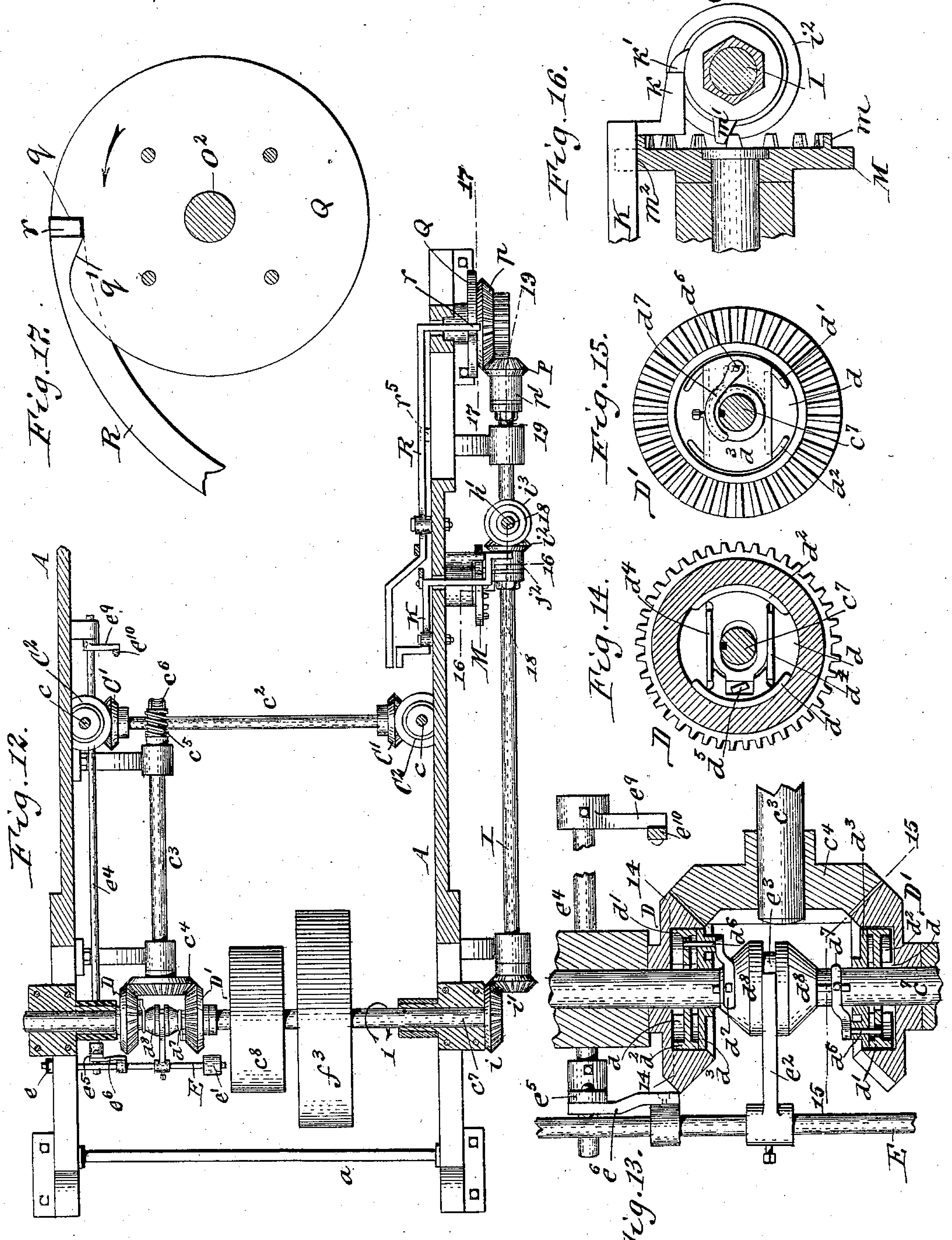

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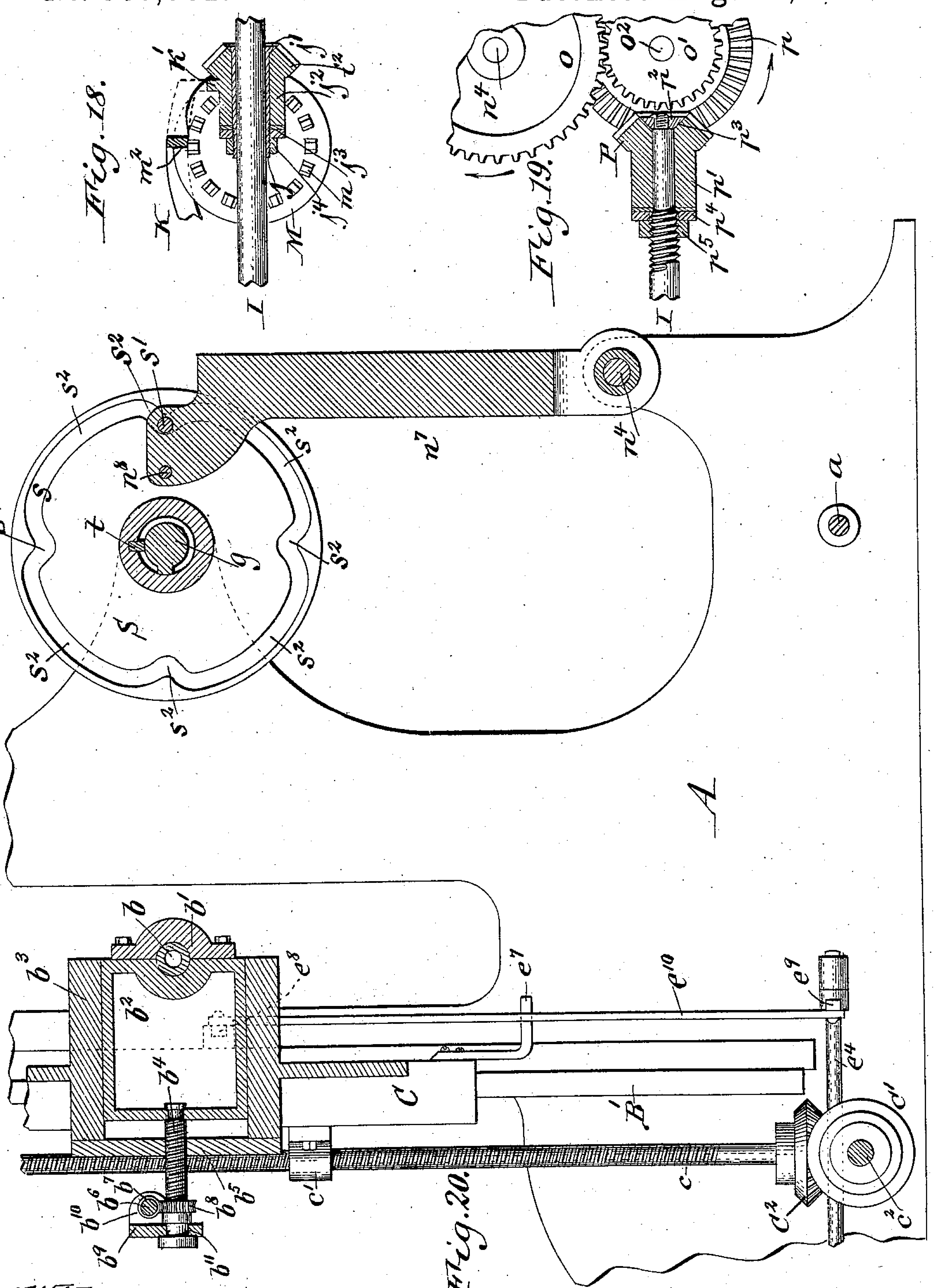

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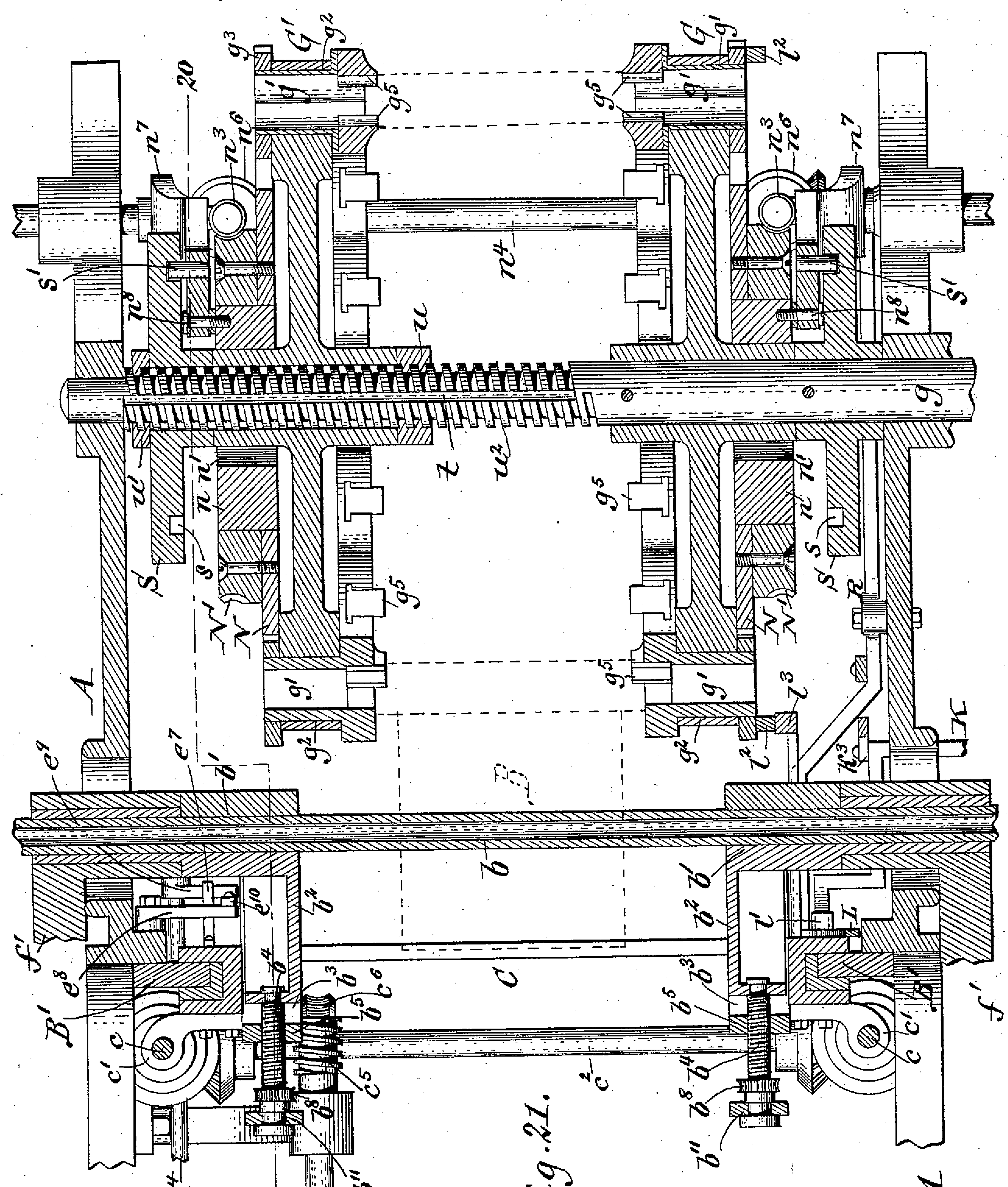

Fig. 21.

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UNITED STATES PATENT OFFICE.

NICHOLAS MEYERS, OF BUFFALO, NEW YORK, ASSIGNOR TO PETER C. MEYERS, OF SAME PLACE.

WOOD-TURNING MACHINE.

SPECIFICATION forming part of Letters Patent No. 589,092, dated August 31, 1897.

Application filed July 23, 1896. Serial No. 600,202. (No model.)

To all whom it may concern:

Be it known that I, NICHOLAS MEYERS, a citizen of the United States, residing at Buffalo, in the county of Erie, in the State of New York, have invented a new and useful Improvement in Wood-Turning Machines, of which the following is a specification.

This invention relates to a multiplex turning-machine or lathe whereby a number of wooden blanks are operated upon simultaneously.

The object of this invention is the production of a machine of this kind which is simple and durable in construction, easily operated, and not liable to get out of order, accurate and expeditious in operation, and which has a large capacity for producing articles of the desired form of superior quality or finish.

In the accompanying drawings, consisting of seven sheets, Figure 1 is a side elevation of my improved turning-machine. Fig. 2 is a detached side elevation of one of the chuck-carriers. Fig. 3 is a top plan view of my improved turning-machine. Fig. 4 is a front elevation thereof. Figs. 5, 6, and 7 are vertical cross-sections in lines 5 5, 6 6, and 7 7, Fig. 1, respectively. Fig. 8 is a longitudinal section in line 8 8, Fig. 7. Fig. 9 is a cross-section, on an enlarged scale, of one of the chucks, showing the means for adjusting the clamping-jaws. Fig. 10 is a longitudinal section thereof in line 10 10, Fig. 9. Fig. 11 is an end elevation, on an enlarged scale, of the rotary cutter. Fig. 12 is a horizontal section in line 12 12, Fig. 1. Fig. 13 is a fragmentary horizontal section, on an enlarged scale, of the reversing mechanism for alternating the direction of the movement of the carriage on which the cutter is mounted. Figs. 14 and 15 are vertical sections of one of the shifting clutches in lines 14 14 and 15 15, Fig. 13, respectively. Fig. 16 is a fragmentary vertical cross-section, on an enlarged scale, in line 16 16, Fig. 12. Figs. 17, 18, and 19 are longitudinal sections, on an enlarged scale, in lines 17 17, 18 18, and 19 19, Fig. 12, respectively. Fig. 20 is a vertical longitudinal section, on an enlarged scale, in line 20 20, Fig. 21. Fig. 21 is a horizontal section, on an enlarged scale, in line 21 21, Fig. 1.

Like letters of reference refer to like parts in the several figures.

The main frame of the machine consists, essentially, of two side pieces or standards A, which are connected by transverse bars a.

B represents a rotary cutter of any suitable form and construction, whereby the blanks are operated upon and which is reciprocated between the standards past the blanks and driven by the following mechanism:

b is a horizontal shaft which carries the cutter and which is journaled transversely in bearings b'. The latter are arranged on a vertically-movable carriage C, which is guided on vertical ways B' on the main frame. The bearings have a horizontal movement lengthwise of the machine or at right angles to the axis of the cutter for adjusting the cutter to the blanks, for which purpose the bearings of the cutter-shaft are mounted on slides b^2, which are guided in horizontal longitudinal ways b^3, formed on opposite sides of the central portion of the carriage.

b^4 are adjusting-screws, whereby the slides carrying the cutter-shaft bearings are adjusted horizontally forward and backward. Each of these screws engages with its central threaded portion in a threaded opening formed in a plate b^5, secured to the carriage, and is connected at its front end with one of the slides, so as to be capable of turning in the slide, but held against lengthwise movement with reference to the slide.

b^6 is a transverse adjusting-shaft provided with worms b^7, which engage with worm-wheels b^8, mounted on the rear portion of the screws, whereby the cutter-shaft is adjusted. One end of this adjusting-shaft is square, to permit of applying a hand-crank for turning the same in one or the other direction for moving the cutter-shaft bearings forward or backward. The adjusting-shaft is coupled by yokes b^9 with the adjusting-screws, so that this shaft, together with the worms, are carried backward and forward with the adjusting-screws as the latter shift their position lengthwise. Each of these yokes is provided with bearings b^{10} on opposite sides of each worm, in which the adjusting-shaft is journaled, and a depending bearing b^{11}, in which the rear end of the adjusting-screw is journaled, the latter being provided with shoulders on opposite sides of its bearing, so that the yoke is compelled to move lengthwise with the adjusting-screw.

c c represent two propelling-screws whereby the cutter-carriage is raised and lowered and which are arranged vertically adjacent to opposite ends of the carriage. Each of these screws is journaled with its upper and lower ends in bearings arranged on the main frame so as to be held against endwise movement and engages with its intermediate threaded portion in a screw-nut c', mounted on the carriage.

c^2 is a transverse coupling-shaft which is journaled with its ends in bearings on the main frame and which is provided with bevel gear-wheels C', which mesh with similar gear-wheels C^2 on the lower ends of the propelling-shafts.

c^3 is an intermediate longitudinal shaft journaled in bearings on the main frame and provided at its rear end with a bevel gear-wheel c^4 and at its front end with a worm c^5, which meshes with a worm-wheel c^6 on the transverse coupling-shaft c^2.

c^7 represents the main driving-shaft, which is journaled transversely in bearings on the lower rear portion of the main frame and which is turned constantly in the direction of the arrow 1, Figs. 1 and 12, by any suitable means—for instance, by a driving-belt passing around a pulley c^8, mounted on the central portion of the driving-shaft.

D D', Figs. 3, 12, 13, 14, and 15, represent two bevel gear-wheels which mesh with opposite sides of the bevel gear-wheel c^4 of the longitudinal shaft and which are mounted loosely on the driving-shaft, but are capable of being coupled alternately with the latter by a clutch mechanism, so as to permit of turning the longitudinal shaft in either direction from the driving-shaft.

The reversal of the movement of the longitudinal shaft may be effected in any suitable manner, the mechanism for this purpose shown in the drawings being constructed as follows:

The loose bevel gear-wheels on the driving-shaft are provided on their opposing sides with cylindrical recesses *d d*, and each of these recesses contains two radially-movable clutch-shoes d' d^2, which are adapted to bear with their segmental faces against the cylindrical inner side of the recess.

d^3 is a supporting-plate secured to the driving-shaft and provided with ways d^4, in which the shoes are guided and whereby the same are compelled to turn with the driving-shaft.

d^5 is a rotary cam interposed between two opposing bearings faced on the shoes and secured to the inner end of a rocking pin d^6, which is journaled in the supporting-plate. The outer end of the rocking pin is provided with a rock-arm d^7, which bears against a cone d^8, keyed to the driving-shaft, so as to be capable of longitudinal movement thereon, but compelled to turn therewith. Upon moving the cone toward the gear-wheel the rock-arm is thrown outwardly, thereby turning the cam in the proper direction for moving the clutch-shoes outwardly against the gear-wheel, whereby the latter is coupled with the driving-shaft and compelled to turn therewith. Upon moving the cone away from the gear-wheel the rock-arm, cam, and shoes are released and the gear-wheel is uncoupled from the driving-shaft. The cones of both clutches are arranged side by side on the driving-shaft and connected, so that when one cone is shifted for coupling its respective wheel with the driving-shaft the other cone is shifted into a position for uncoupling its gear-wheel from the driving-shaft.

E represents a transversely-movable shifting rod guided in ways *e* e' on the main frame and provided with a fork e^2, which engages with a groove e^3 between the clutch-cones, whereby the longitudinal movement of the shifting rod is transmitted to these cones.

e^4 is a longitudinal rock-shaft journaled in bearings on one side of the lower portion of the main frame and provided at its rear end with an upright rock-arm e^5, which is connected with the shifting rod by a link e^6.

e^7 is a tappet arranged on the front side of the cutter-carriage, and e^8 e^9 are rock-arms arranged, respectively, in the upper and lower portions of the path of the tappet as the latter reciprocates with the cutter-carriage. The lower rock-arm is secured to the longitudinal rock-shaft, while the upper rock-arm is pivoted to the main frame and connected at its free end with the free end of the lower rock-arm by a connecting-rod e^{10}. During the downward movement of the cutter-carriage the bevel gear-wheel D is coupled to the driving-shaft, as represented in Figs. 12 and 13, for producing this movement, and during the last portion of this downward movement of the cutter-carriage its tappet engages with the lower rock-arm and depresses the same, thereby turning the rock-shaft in the proper direction for uncoupling the gear-wheel D from the driving-shaft and coupling the gear-wheel D' with said shaft, thereby reversing the movement of the intermediate driving-gear and causing the cutter to be moved upwardly. During the last portion of the upward movement of the cutter-carriage its tappet strikes the upper rock-arm e^9 and raises the same, this movement being transmitted by the connecting-rod and lower rock-arm to the longitudinal rock-shaft and from the latter by the intermediate connection to the clutch mechanism, whereby the gear-wheel D' is uncoupled from the driving-shaft and the gear-wheel D is again coupled therewith, thereby automatically reversing the movement of the intermediate driving-gear for moving the cutter-carriage downwardly.

F represents a transverse counter-shaft arranged over the driving-shaft and pivotally connected therewith by rocking standards F'. Each of the latter engages with its lower screw-threaded end in a screw-threaded opening formed in a sleeve F^2, which is mounted concentrically on the adjacent bearing of the main shaft, while its upper screw-threaded end engages with a threaded opening in a bearing f, which supports the counter-shaft F, as represented in Fig. 6.

f' f' are horizontal connecting-rods which pivotally connect the counter-shaft with the cutter-shaft. Each of these rods is screw-threaded at its opposite ends the same as the rocking standards F' and engages with its rear end in a screw-threaded opening formed in a sleeve F^3, which is mounted concentrically on the adjacent bearing f and engages with its front end in a screw-threaded opening formed in a bearing or sleeve F^4, in which the adjacent end of the cutter-shaft is journaled, as represented in Figs. 3, 6, and 20.

f^2 is a main belt passing around pulleys f^3 f^4, secured, respectively, to the driving and counter shafts, and f^5 f^5 are intermediate belts, each of which passes around pulleys f^6 f^7, secured, respectively, to one end of the counter-shaft and the adjacent end of the cutter-shaft. As the cutter is raised or lowered the driving mechanism adjusts itself to the different positions of the cutter without producing any slack in the belts.

When the belts f^2 and f^5 become slack, they can be tightened by turning the screw-threaded rocking standards F' and the connecting-rods f', whereby the sleeves or bearings at the ends of the standards and rods are spread and the slack in the belts is taken up. After tightening these belts the rocking standards and connecting-rods are held in their adjusted position preferably by applying jam-nuts f^8 to these parts, as shown in the drawings.

The mechanism whereby the blanks are automatically presented to the cutter is constructed as follows:

G G' represent two carrier heads or wheels upon which the chucks for holding the blanks are mounted and which are arranged in front of the cutter and separated by a space across which the blanks extend. These heads are mounted on a transverse shaft or axle g, which is journaled in bearings on the main frame, and each head is provided with four sets of chucks, the chucks of each set on one head being in line with the chucks of one set on the other head, so as to permit each blank to be held parallel with the head-supporting shaft and with one end clamped in a chuck of one head and its opposite end clamped in a chuck of the other head. The chucks of each set, preferably five in each set, as shown, are arranged in a straight line, and when in their operative position they stand parallel with the path of the cutter. Each of these chucks may be of any suitable construction, the chuck shown in the drawings being constructed as follows:

g', Figs. 9, 10, and 18, represents the hollow body of the chuck, which is cylindrical on its exterior and journaled in a bearing g^2 in the chuck-supporting head. This body is provided at its outer end with a gear-wheel g^3, which meshes with the gear wheel or wheels of the adjacent chuck or chucks, so that upon turning one chuck the entire set will be turned simultaneously for presenting different portions of the blanks to the cutters. The inner enlarged end of the chuck-body is provided with two radial ways g^4 in diametrically opposite sides, in which a pair of clamping-jaws g^5 slide. Each of these jaws has a **V**-shaped gripping-face and is moved toward and from the center of the body by means of a screw-shaft g^6, journaled transversely in the body and engaging with its threads in a screw g^7, formed on one side of the jaw. The outer end of the screw-shaft is accessible from the exterior of the body and is provided with a flat-sided socket g^8 for the reception of a key or wrench, whereby the screw-shaft is turned for adjusting the jaw.

g^9 is a counter-shaft journaled in the body and provided with gear-wheels g^{10}, which mesh with gear-wheels g^{11} on the inner ends of the screw-shafts. This connecting-gearing causes the jaws to move inwardly and outwardly uniformly, so as to center the blanks properly by applying the key to only one of the screw-shafts. The chuck is held against lengthwise displacement in its bearing by the gear-wheel and the enlargement arranged on opposite ends of the body and bearing against opposite sides of the supporting-head. The chuck-supporting heads are turned intermittently in the direction of the arrow 2, and while the heads are at rest during the operation of turning the blanks in the rearmost set of chucks the finished work is removed by the attendant from the foremost set of chucks and replaced by another set of blanks.

After the turning of one set of blanks has been finished the carrying-heads are turned a quarter of a revolution, so as to remove the finished work from the path of the cutter and to carry the next set of blanks into the path of the cutter. This intermittent turning of the blank-carrying heads is automatically effected by the following mechanism:

H represents a worm-wheel which is secured to one end of the axle or shaft supporting the carrying-heads and with which a worm h engages, that is mounted on a vertical shaft or spindle h'.

I represents a longitudinal shaft which is journaled in bearings on the main frame and which is driven from the main shaft by intermeshing bevel gear-wheels i i', which are secured, respectively, to one end of the main shaft and the rear end of the longitudinal shaft. Motion is transmitted from the longitudinal shaft to the spindle h' for turning the chuck-supporting heads by a bevel-gear i^2, mounted on the longitudinal shaft and meshing with a bevel gear-wheel i^3 on the lower end of the spindle h'. The longitudinal shaft rotates constantly, but the movement of the spindle is arrested during the time that the cutter is operating on one set of blanks, and for this purpose the gear-wheel i^2 is frictionally connected with the longitudinal shaft, so that the latter can be turned independent of the spindle during the cutting operation. This frictional coupling may be constructed in various ways, the construction shown in the drawings consisting of a carrier-sleeve j, secured to the longitudinal shaft and provided at one end with a cone j', a frictional hub or driving-sleeve j^2, journaled on the carrier-sleeve and provided at its front end with the bevel gear-wheel i^2, iron and vulcanized fiber-washers j^3, arranged on the carrier-sleeve and bearing against the rear end of the rotary sleeve, and a screw-nut j^4, engaging with the screw-threaded rear end of the carrier-sleeve and engaging with the washers j^3. Upon turning the screw-nut j^4 in the proper direction the rotary sleeve can be clamped between the washers and the cone of the carrier-sleeve with sufficient friction, so that the bevel gear-wheel i^2, when otherwise unobstructed, will be coupled with the longitudinal shaft for turning the chuck-carrying heads and connecting parts.

K represents a trip-lever whereby the rotation of the bevel gear-wheel i^2 and the parts connected therewith is controlled, and which is pivoted on the inner side of the lower portion of the main frame. The front arm of this lever projects laterally through an opening in the frame and is provided with an outer stop k, which is adapted to engage with a radial stop-lug k' on the sleeve of the gear-wheel i^2 and hold the latter against turning. When the front arm of the trip-lever is raised and its outer stop is disengaged from the stop-lug of the gear-wheel i^2, the latter is turned by the longitudinal shaft I, owing to its frictional connection therewith.

k^2 is a trip-arm which is pivoted with its front end on the inner side of the upper portion of the main frame and which is connected with the front arm of the trip-lever by a connecting-rod k^3.

l l' represent upper and lower tappets whereby the frictional gear-wheel i^2 may be released at the end of either the upward or downward stroke of the cutter and which are arranged on the upper and lower arms, respectively, of a tappet-lever L, which is pivoted on the front side of the cutter-carriage so as to swing transversely.

When the particular form which it is desired to give the blanks requires more than one operation of the cutter, the chucks are turned so as to present a new surface to the cutter after each cut, but the carrying-heads are not disturbed. While the cutter is moving up and down to perform the several operations on one blank, the tappet-lever is turned so that its tappets clear the trip-lever and trip-arm, and therefore do not set in motion the mechanism which shifts the chuck-carrying heads.

l^2 are trip-cams whereby the tappet-lever is turned so that its tappets engage with the trip arm and lever and set the carrying-heads in motion. One of these trip-cams is arranged on the outer side of one of the chuck gear-wheels of each set of chucks on the carrying-head G, and is adapted to engage with a trip-finger l^3 on the upper arm of the tappet-lever. When a new set of blanks is presented to the cutter, the trip-cam of the respective set of chucks clears the path of the trip-finger, permitting the latter to be moved inwardly by turning the tappet-lever L into an inoperative position by the means hereinafter described, in which position the tappets are out of line with the trip-arm and trip-lever.

When the chucks have made one complete revolution and all sides of the blanks have been cut, the trip-cam of the working set of chucks engages with the trip-finger and forces the same outwardly, thereby turning the tappet-lever so that its tappets stand in line with the upper trip-arm and the lower trip-lever. If the cutting of the blank has been completed during the downward stroke of the cutter, the lower tappet just after the cutting is completed engages with the rear arm of the trip-lever and lifts the stop on the front arm thereof out of engagement with the stop-lug on the sleeve of the gear-wheel i^2. The instant this takes place the latter is turned by the longitudinal shaft I and the carrying-heads are turned by the intermediate gear for removing the finished blanks from the cutter and bringing a new set of blanks into the path of the cutters. If the final cut on the blanks takes place during the upward movement of the cutter, the upper tappet strikes the upper trip-arm and lifts the same after the cutting operation has been completed, which movement is transmitted to the trip-lever by the connecting-rod k^3 for releasing the bevel gear-wheel i^2 and permitting turning of the chuck-carrying heads.

l^4 l^5 represent upper and lower restoring-inclines, whereby the tappet-lever is automatically turned into an inoperative position, so that its tappets clear the trip arm and lever after having shifted these parts into an operative position. These restoring-inclines are secured to the main frame adjacent to the path of the upper and lower tappets. After the lower tappet engages with the trip-lever the lower arm of the tappet-lever engages with the lower restoring-incline l^5, thereby shifting the tappets so that they are out of line with the trip arm and lever, and the same effect is produced by the upper arm of the tappet-lever striking the upper restoring-incline after the upper tappet engages the trip-arm. The timing of the gearing shown in the drawings intermediate the longitudinal shaft and the chuck-carrying heads requires sixteen revolutions of the longitudinal shaft for the purpose of turning the chuck-carrying heads one-quarter of a revolution after each cut. For this purpose the front arm of the trip-lever is held in an elevated position after its outer stop is released from the stop-lug of the friction-sleeve by a controlling or locking wheel M until the longitudinal shaft has made the required number of revolutions. This controlling wheel or disk is journaled on the main frame at right angles to the longitudinal shaft and is provided on its face with an annular row of sixteen spurs or gear-teeth *m*, with which a gear-tooth *m'* on the friction-sleeve engages. The periphery of the controlling-wheel is provided with a notch m^2, which receives the front arm of the trip-lever while the stop on the same is in engagement with the stop-lug on the friction-sleeve. When the trip-lever is raised and disengaged from the stop-lug of the friction-sleeve and the latter is turned by the longitudinal shaft, the tooth of the sleeve during the first portion of its rotary movement engages with one of the teeth of the controlling-wheel and turns the same so that its notch is out of register with the front arm of the trip-lever. The trip-lever is held in this position by resting on the periphery of the controlling-wheel until the friction-sleeve has made sixteen revolutions, during which time its tooth engages successively with the teeth of the controlling-wheel and turns the same intermittently. At the end of the last revolution of the friction-sleeve the controlling-wheel has been turned so that its notch stands underneath the front arm of the trip-lever, which permits the latter to drop with its stop into the path of the stop-lug on the friction-sleeve, thereby preventing the same from continuing its rotation with the longitudinal shaft and bringing the carrying-heads to a standstill with a new set of blanks in the proper position before the cutter. The movement of the gearing which rotates the carrying-heads is sufficiently rapid so that the shifting of the same takes place from the time the cutter leaves the finished set of blanks and returns to the new set of blanks, a sufficient dead movement of the cutter-carriage being provided for this purpose at each end of the stroke of the cutter.

For the purpose of turning the blanks into polygonal form an intermittent rotary motion is imparted to the chucks while they hold the blanks against the cutter by a driving-gear, which is constructed as follows:

N N represent two master gear-wheels, which are arranged adjacent to the outer sides of the chuck-carrying heads and which are adapted to engage with the gear-wheels of the middle chucks of both sets. Each of these master-wheels is journaled on a cylindrical bearing or bushing *n*, provided with a slot *n'*, through which the hub of the adjacent supporting-head passes and upon which the bushing is capable of transverse movement for engaging the master gear-wheel with the respective chuck gear-wheel or to disengage the same therefrom. Each of the master-wheels is provided on its outer side with a worm-wheel N' and is turned by a vertical shaft or spindle n^2, arranged in front of the axle and provided at its upper end with a worm n^3, engaging with the rear portion of the worm-wheel, as shown in Figs. 1, 2, 3, 4, and 21.

n^4 is a transverse shaft journaled in bearings on the rear portion of the main frame and provided with bevel gear-wheels n^5, which mesh with similar wheels n^6 at the lower ends of the spindles, which operate both master-wheels.

Each of the spindles n^2 is journaled in bearings arranged on a rocking standard n^7, which is mounted loosely with its lower end on the transverse shaft n^4, so as to swing at right angles to the axis of the carrying-heads, and is connected at its upper end with the bearing or bushing of the adjacent master-wheel by a pin n^8.

o represents a gear-wheel secured to one end of the transverse shaft n^4 outside of the main frame and meshing with a gear-wheel *o'*, mounted on a transverse arbor o^2, secured to the main frame below the transverse shaft n^4.

The front end of the longitudinal shaft I is provided with a bevel gear-wheel P, which meshes with a corresponding gear-wheel *p*, secured to the inner side of the gear-wheel *o'*. During the latter portion of each stroke of the cutter and after the same has completed its work on the blanks, when moving in either direction, the intermediate driving-gearing between the longitudinal shaft and the working chucks is free to turn for shifting the chucks so as to present a new surface on the blanks for the cutters to operate upon during the next stroke.

While the cutting of the blanks is taking place, the gearing intermediate the working chucks and the longitudinal shaft I is held against movement, but the latter is permitted to turn by means of the following mechanism:

The rearmost gear-wheel P is connected with the longitudinal shaft I by a frictional coupling shown in Figs. 1 and 19, and consisting of a friction sleeve or hub *p'*, mounted loosely on the longitudinal shaft and carrying the bevel gear-wheel P, a screw-nut p^2, secured to the front end of the longitudinal shaft and provided with a conical face p^3, which bears against a corresponding face on the front side of the sleeve, washers p^4, of iron and vulcanite, bearing against the rear end of the sleeve, and a screw-nut p^5, arranged on the screw-threaded portion of the longitudinal shaft and bearing against said washers. By turning the rear screw-nut in the proper direction the grip of the washers and the conical screw-nut against opposite ends of the sleeve can be regulated to produce the required friction between these parts, so that they will turn together when not otherwise obstructed.

Q, Figs. 12 and 17, represents a locking or controlling plate or disk whereby the operation of the friction gear-wheel P and the parts connected therewith is controlled. This disk is secured to the inner side of the bevel gear-wheel *p* and is provided with a notch having an abrupt rear side or shoulder *q* and an inclined front side *q'*.

R is a trip-lever pivoted lengthwise to the inner side of one of the frame-standards and provided on its front arm with a stop *r*, which projects laterally through an opening in the frame and which is adapted to engage with the shoulder on the locking-plate for holding the latter against turning.

r' r^2 represent upper and lower tappets which are arranged on the cutter-carriage and which are adapted to disengage the trip-lever at the end of each upward and downward stroke of the cutter to permit the shifting devices to turn the blanks preparatory to effecting the next cut. The lower tappet r^2 is adapted to engage with the rear arm of the trip-lever R and depress the same during the last portion of the downward movement of the cutter-carriage, thereby lifting the stop on the front arm of the lever out of engagement with the notch of the locking-plate. During the last portion of the upward movement of the cutter-carriage the upper tappet r' engages with and lifts the rear arm of a rock-lever r^3, which is pivoted to the main frame and which is connected with its front arm to the rear arm of the trip-lever by a connecting-rod r^4, whereby the stop of the trip-lever is disengaged from the locking-disk at the end of the upward movement of the cutter-carriage in the same manner in which this stop is disengaged from the locking-plate at the end of the downward movement of the cutter-carriage.

The instant the trip-lever is disengaged from the notch of the locking-plate the bevel gear-wheel P is rotated by the longitudinal shaft, owing to its frictional connection therewith, and the chucks are turned by the intermediate gearing. After the trip-lever has been lifted out of the notch of the locking-plate and the latter has started to turn the notch in the plate is moved from underneath the lever and the latter is supported in its elevated position on the periphery of the locking-plate. When the latter has made one complete revolution and its notch registers with the front arm of the trip-lever R, its stop drops into the notch and arrests the movement of the locking-plate, the chucks and the intermediate gearing connecting the same with the friction gear-wheel P, while the longitudinal shaft continues to rotate independent of these parts. The extent which the chucks are rotated during each revolution of the locking-plate can be varied by changing the relative sizes of the intermeshing gear-wheels *o o'*, so that the blanks can be turned with any desired number of flat sides. By reducing the size of the driving bevel-gear *o'* and increasing the size of the driven bevel-gear *o* the number of intermittent rotary movements imparted to the blanks during one complete revolution of the same is increased, thereby increasing the number of flat sides on the same, while by reversing this order of the gear-wheels the number of flat sides that are cut on the blank is reduced.

When it is desired to turn the blanks perfectly round, a continuous rotary movement is imparted to the working chucks by holding the trip-lever R out of engagement with the locking-plate Q, whereby the latter, together with the driving mechanism between the longitudinal shaft I and the master gear-wheels, can turn continuously. A simple means for this purpose consists of a catch r^5, arranged on the main frame and engaging the trip-lever R for holding its front arm out of engagement with the locking-plate. In this arrangement of the machine the master-wheels are disengaged from the driving gear-wheels of one set of chucks and engaged with the driving gear-wheels of the next set of chucks while the master-wheels are rotating continuously.

Although the gearing connecting the blank-holding chucks is such that some of the blanks are turned in the same direction as the cutter and some in the opposite direction, the turning operation is not affected thereby, because the cutter rotates at a very high speed, while the blanks rotate at a comparatively slow speed, so that the effect of the cutter upon the blanks is practically the same whether the blanks are turned in one direction or the other.

S S represent two cams whereby the master gear-wheels are moved laterally into and out of engagement with the gear-wheels of the central chucks during the time that the carrying-heads are turned for removing the turned set of blanks from the cutter and replacing them by a new set. One of the cams is arranged on the head-supporting shaft or axle adjacent to the outer side of each master-wheel and rocking standard and is provided with a cam-groove *s*, which receives a pin *s'* on the upper end of one rocking standard. This cam-groove consists of four like sections, each of which is composed of a concentric portion s^2 and a cam portion s^3, connecting adjacent ends of the concentric portions.

During the operation of turning the blanks the pin of each rocking standard engages with a cam portion in each one of the cam-wheels, whereby the master-wheels are held in engagement with the driving gear-wheels of the two operative sets of chucks. Upon rotating the carrying-heads one-quarter of a revolution after the turning of the blanks has been finished for bringing another set of blanks into place the cam portions of the cam-wheels move the rocking standards forwardly sufficiently to disengage the master-wheels from the driving gear-wheels of the operative chucks, and the following concentric portions of the respective cam portions hold the master-wheels in this retracted position until the chuck-carrying heads have been turned one-quarter of a revolution and have presented the new set of blanks to the cutter, after which the rocking standards are again moved backward by the next following cam portions of the cam-wheels, whereby the master-wheels are engaged with the driving gear-wheels of the new sets of chucks, when the rotation of the carrying-heads and cam-wheels is again arrested to permit of turning the new set of blanks.

In order to permit blanks of different length to be turned, the carrying-heads are so mounted that the space between the same can be reduced or increased. This is preferably accomplished by permanently securing one of the carrying-heads and connecting parts to the axle and connecting the other carrying-head and the adjacent cam-wheel with the axle by a longitudinal spline or key t, which permits the parts to slide lengthwise on the axle, but compels them to turn therewith. The movable carrying-head and cam-wheel are shifted on the axle and held in their adjusted position by means of inner and outer clamping-nuts $u\ u'$, which bear, respectively, against the inner side of the adjustable carrying-head and the outer side of the adjustable cam-wheel and which engage with a screw-threaded portion u^2 of the axle. Upon loosening one of these screw-nuts and tightening the other the adjustable carrying-head and cam-wheel can be adjusted lengthwise on the axle, after which these parts are securely held in position by tightening both screw-nuts. The lower end of the rocking standard which carries the spindle operating the adjustable master-wheel is capable of sliding lengthwise on the transverse shaft n^4, and the bevel-gear which operates this spindle is keyed on said shaft, so that these parts can be adjusted transversely in the machine, together with the adjustable carrying-head and connecting parts.

I claim as my invention—

1. In a turning-machine, the combination with the driving-shaft and the cutter, of a rotary carrier, a rotary blank-holding chuck journaled on the carrier outside of the pivot of the latter, intermediate driving-gearing connecting said shaft and chuck and provided with a clutch, and a cam arranged on said chuck and adapted to uncouple and couple said clutch during each revolution of the chuck, substantially as set forth.

2. In a turning-machine, the combination with the driving-shaft, the reciprocating cutter and the rotating blank-carrier, of a carrier-sleeve secured to said shaft and provided at one end with a cone, a friction driving-sleeve mounted on the carrier-sleeve and bearing with one end against said cone, a screw-nut arranged on the opposite end of the carrier-sleeve and bearing against the opposite end of the driving-sleeve, an intermediate gearing connecting said driving-sleeve with the blank-carrier and a controlling mechanism which permits said sleeve to rotate intermittently with said shaft, substantially as set forth.

3. In a turning-machine, the combination with the driving-shaft, the reciprocating cutter-carriage and the rotating blank-carrier, of a driving-sleeve frictionally connected with said shaft, an intermediate gearing connecting said sleeve with the blank-carrier, a controlling-disk geared with said sleeve, a trip-lever adapted to engage with said controlling-disk, and a tappet arranged on said carriage and adapted to engage with said lever, substantially as set forth.

4. In a turning-machine, the combination with the driving-shaft, the reciprocating cutter-carriage and the blank-carrier of a driving-sleeve frictionally connected with said shaft and provided with a stop, an intermediate gearing connecting the driving-sleeve with said blank-carrier, a controlling or locking disk provided with a notch in its periphery and geared with said sleeve, a trip-lever adapted to engage with one arm in said notch and provided with a stop adapted to engage with the stop of the friction-sleeve, a trip-arm connected with said trip-lever and upper and lower tappets arranged on the cutter-carriage and adapted to engage respectively with the trip-arm and trip-lever, substantially as set forth.

5. In a turning-machine, the combination with the driving-shaft, the reciprocating cutter-carriage and the carrier, of a blank-holding chuck journaled in said carrier, a controlling mechanism whereby said carrier is connected with and disconnected from the driving-shaft, a trip-lever adapted to engage with said controlling mechanism, a tappet-lever arranged on said carriage and provided with a tappet, and a cam arranged on said chuck and adapted to shift said tappet-lever for bringing its tappet into engagement with said trip-lever, substantially as set forth.

6. In a turning-machine, the combination with the driving-shaft, the reciprocating cutter-carriage and the carrier, of a blank-holding chuck journaled in said carrier, a controlling mechanism whereby said carrier is connected with and disconnected from the driving-shaft, a trip-lever adapted to engage with said controlling mechanism, a tappet-lever arranged on said carriage and provided with a tappet, a cam arranged on said chuck and adapted to shift said tappet-lever for bringing its tappet into engagement with said trip-lever, and an incline adapted to engage with the tappet-lever and move its tappet out of line with the trip-lever, substantially as set forth.

7. In a turning-machine, the combination with the cutter having a forward-and-backward movement and the rotary carrier, of blank-holding chucks arranged in sets on said carrier, each set being adapted to present a number of blanks for the cutter to operate

upon during each stroke, substantially as set forth.

8. In a turning-machine, the combination with the reciprocating cutter and the rotary carrier, of blank-holding chucks arranged in sets on said carrier, the chucks of each set being arranged in a straight line, substantially as set forth.

9. In a turning-machine, the combination with the cutter and the rotary carrier, of blank-holding chucks journaled in the carrier and arranged in sets and gearing connecting the chucks of each set, substantially as set forth.

10. In a turning-machine, the combination with the cutter and the rotary carrier, of blank-holding chucks journaled in the carrier and arranged in sets, intermeshing gear-wheels arranged on the chucks of each set, and a movable driving gear-wheel adapted to to be engaged with and disengaged from the gear-wheels of each set of chucks, substantially as set forth.

11. In a turning-machine, the combination with the cutter and the rotary carrier, of blank-holding chucks journaled in the carrier and arranged in sets, intermeshing gear-wheels arranged on the chucks of each set, a movable driving gear-wheel adapted to be engaged with and disengaged from the gear-wheels of each set of chucks and shifting mechanism connecting said driving-wheel with the carrier for shifting the driving-wheel simultaneously with the carrier, substantially as set forth.

12. In a turning-machine, the combination with the cutter and the rotary carrier, of blank-holding chucks journaled in the carrier and arranged in sets, intermeshing gear-wheels arranged on the chucks of each set, a driving gear-wheel adapted to be engaged with and disengaged from the gear-wheels of each set of chucks, a movable bearing supporting the driving gear-wheel and a cam connected with the carrier and adapted to shift said bearing, substantially as set forth.

13. In a turning-machine, the combination with the cutter and the rotary carrier, of blank-holding chucks journaled in the carrier and arranged in sets, intermeshing gear-wheels arranged on the chucks of each set, a driving gear-wheel adapted to be engaged with and disengaged from the gear-wheels of each set of chucks, a movable bearing supporting the driving gear-wheel, a rocking standard pivoted with its lower end on a horizontal shaft and connected at its upper end with said bearing, gearing mounted on said standard and connecting the said shaft with the driving gear-wheel and a cam connected with the carrier and engaging with said rocking standard, substantially as set forth.

14. In a turning-machine, the combination with the cutter, the movable carrier and a rotary chuck journaled in said carrier, of a driving-shaft, a driving-sleeve mounted on said shaft, a cone secured to the shaft and bearing against one end of the sleeve, a screw-nut arranged on the shaft and bearing against the other end of the sleeve, intermediate gearing connecting said driving-sleeve with the rotary chuck and a controlling mechanism which permits said sleeve to rotate intermittently with said shaft, substantially as set forth.

15. In a turning-machine, the combination with the cutter-carriage, the movable carrier and a rotary chuck journaled on said carrier, of a driving-shaft, a driving-sleeve frictionally connected with said shaft, intermediate gearing connecting said sleeve with the rotary chuck, a locking or controlling disk arranged in said intermediate gearing, a trip-lever adapted to engage with the controlling-disk and a tappet arranged on the cutter-carriage and adapted to engage with said lever, substantially as set forth.

16. In a turning-machine, the combination with the cutter-carriage, the movable carrier and a rotary chuck journaled on said carrier, of a driving-shaft, a driving-sleeve frictionally connected with said shaft, intermediate gearing connecting said sleeve with the rotary chuck, a locking-disk arranged in said intermediate gearing and provided with a notch, a lower trip-lever adapted to engage with said notch, an upper trip-lever connected with the lower trip-lever and upper and lower tappets arranged on the cutter-carriage and adapted to engage respectively with the upper and lower trip-levers, substantially as set forth.

Witness my hand this 17th day of July, 1896.

NICHOLAS MEYERS.

Witnesses:
THEO. L. POPP,
CARL F. GEYER.