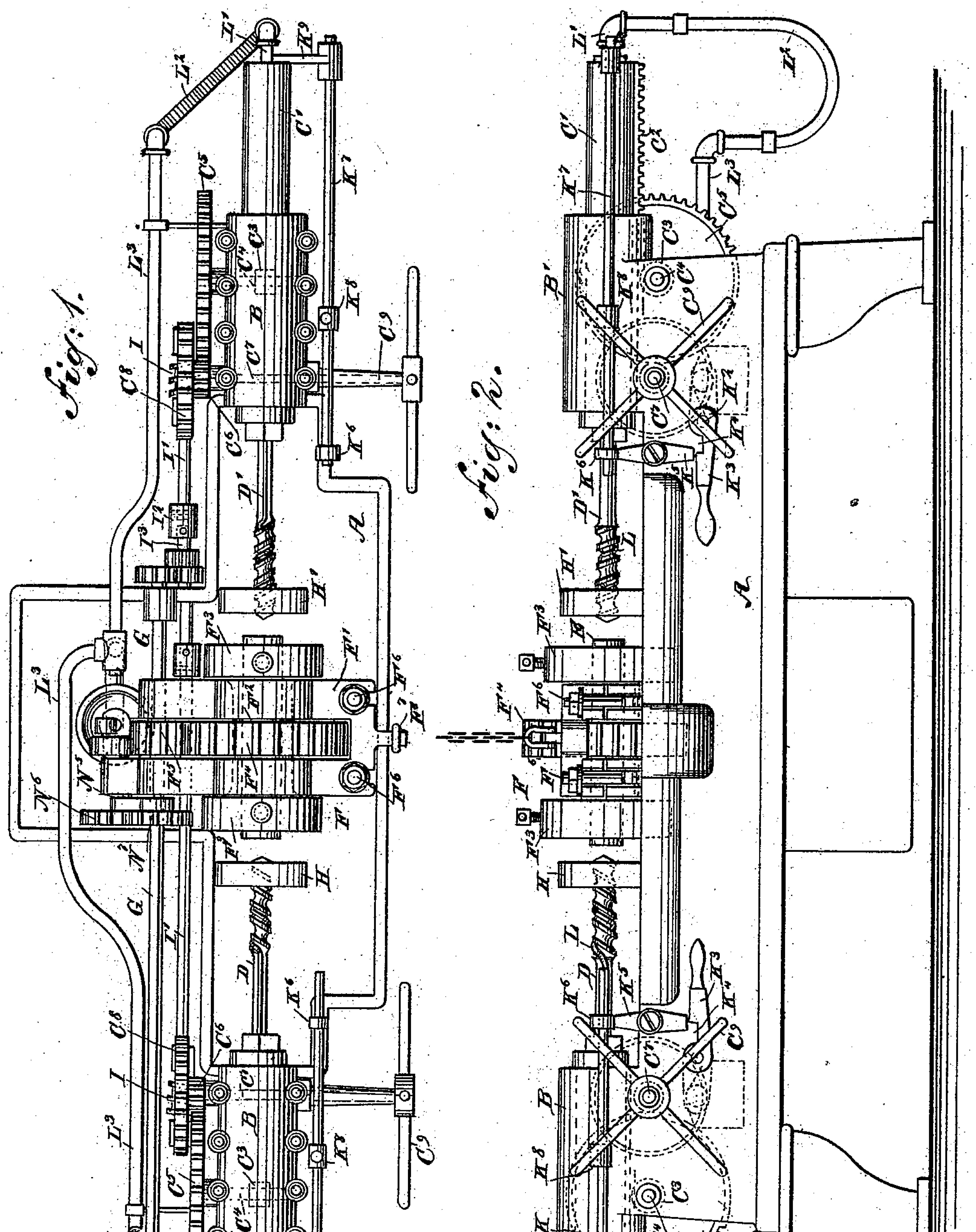
(No Model.)

4 Sheets—Sheet 1.

W. P. NORTON.

DRILLING MACHINE.

No. 528,381. Patented Oct. 30, 1894.



WITNESSES:

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ATTORNEYS.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.)

4 Sheets—Sheet 2.

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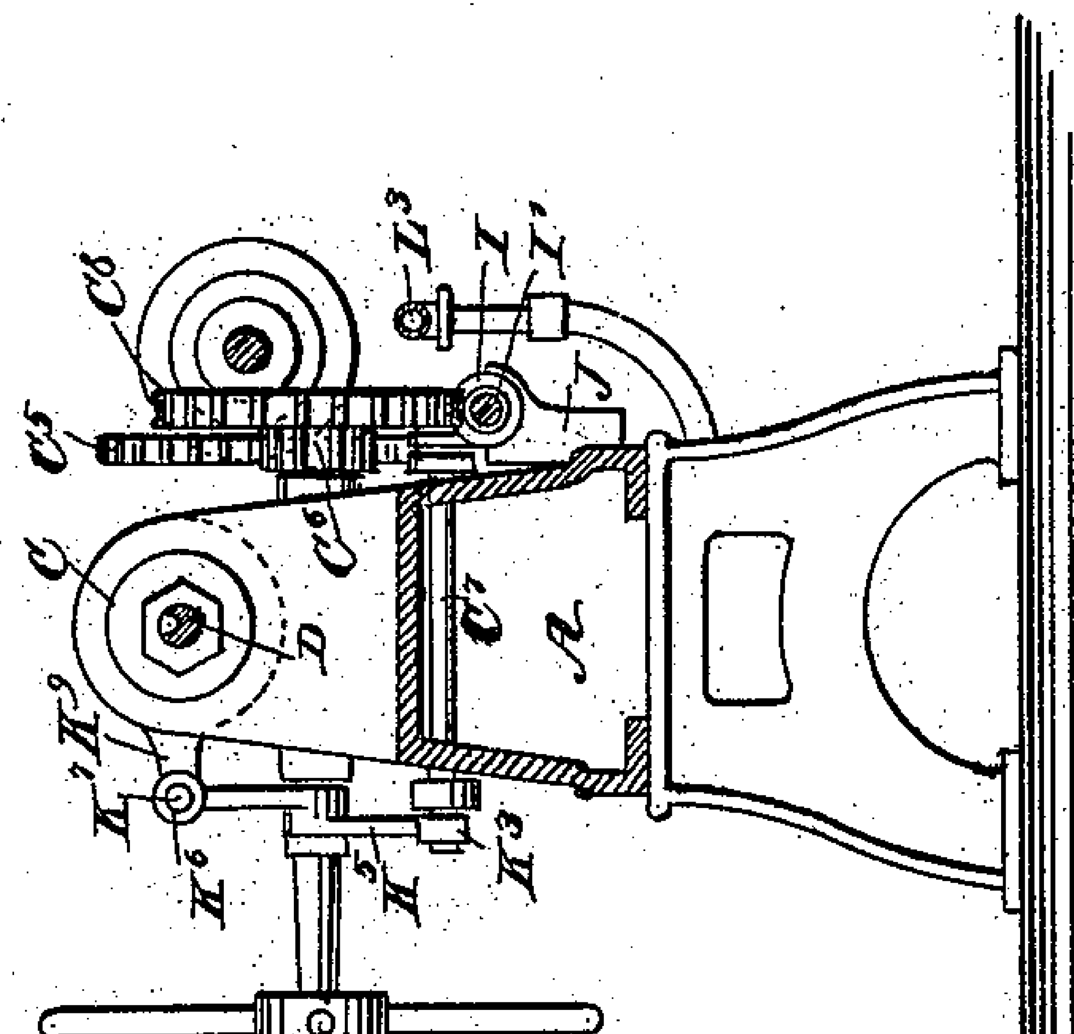

Fig: 5.

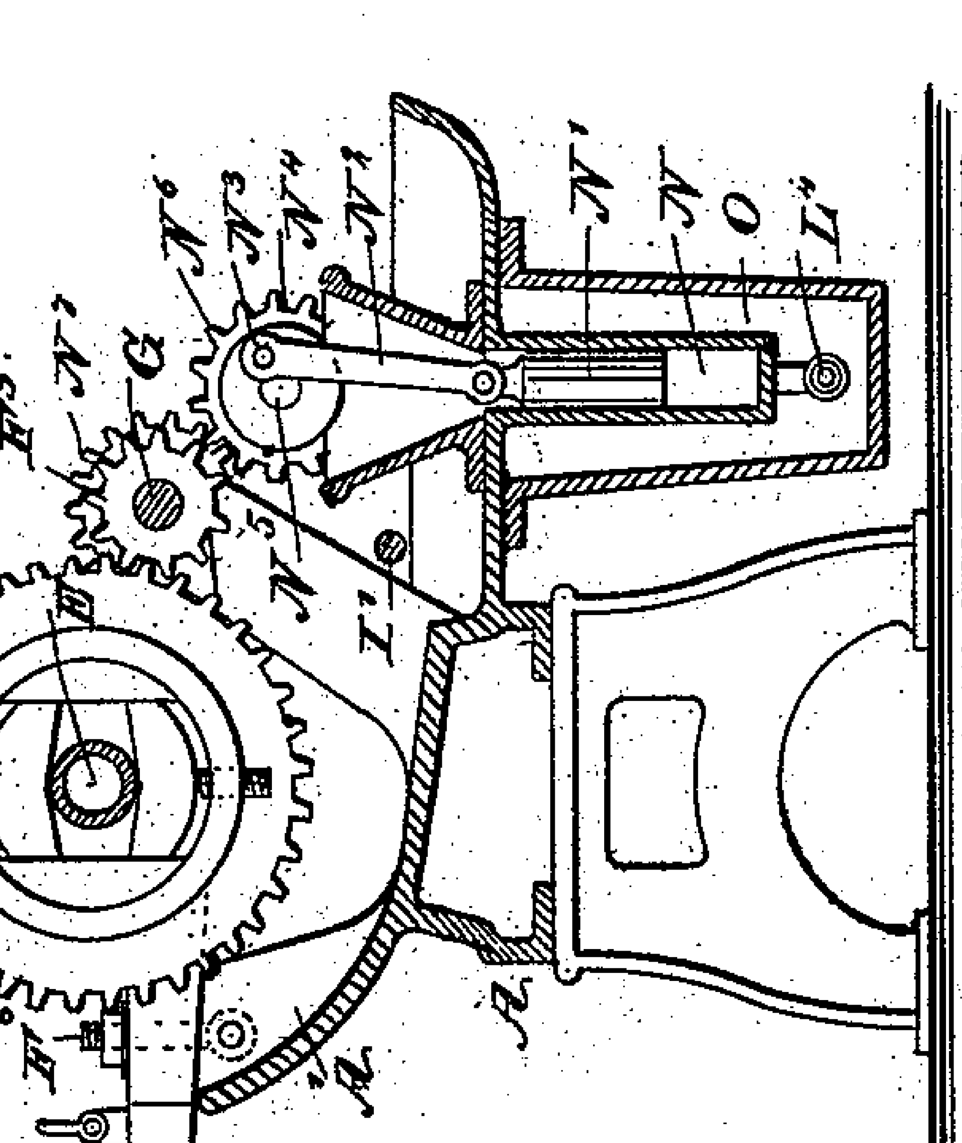

Fig: 4.

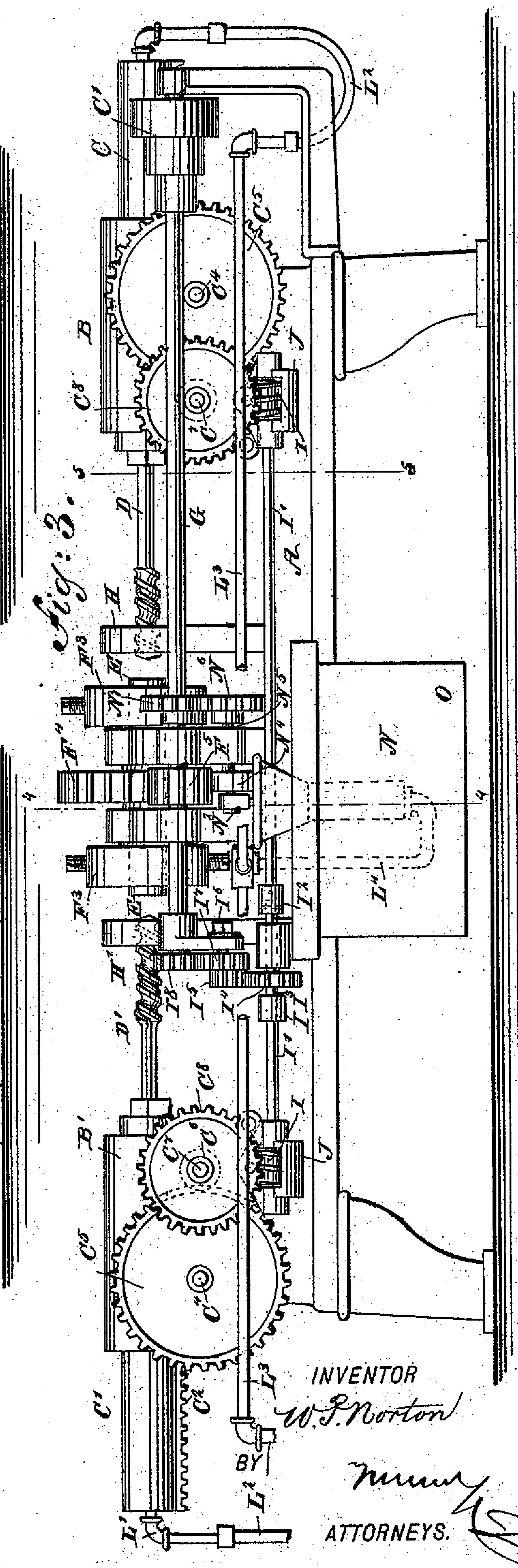

Fig: 3.

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(No Model.) 4 Sheets—Sheet 3

W. P. NORTON.

DRILLING MACHINE.

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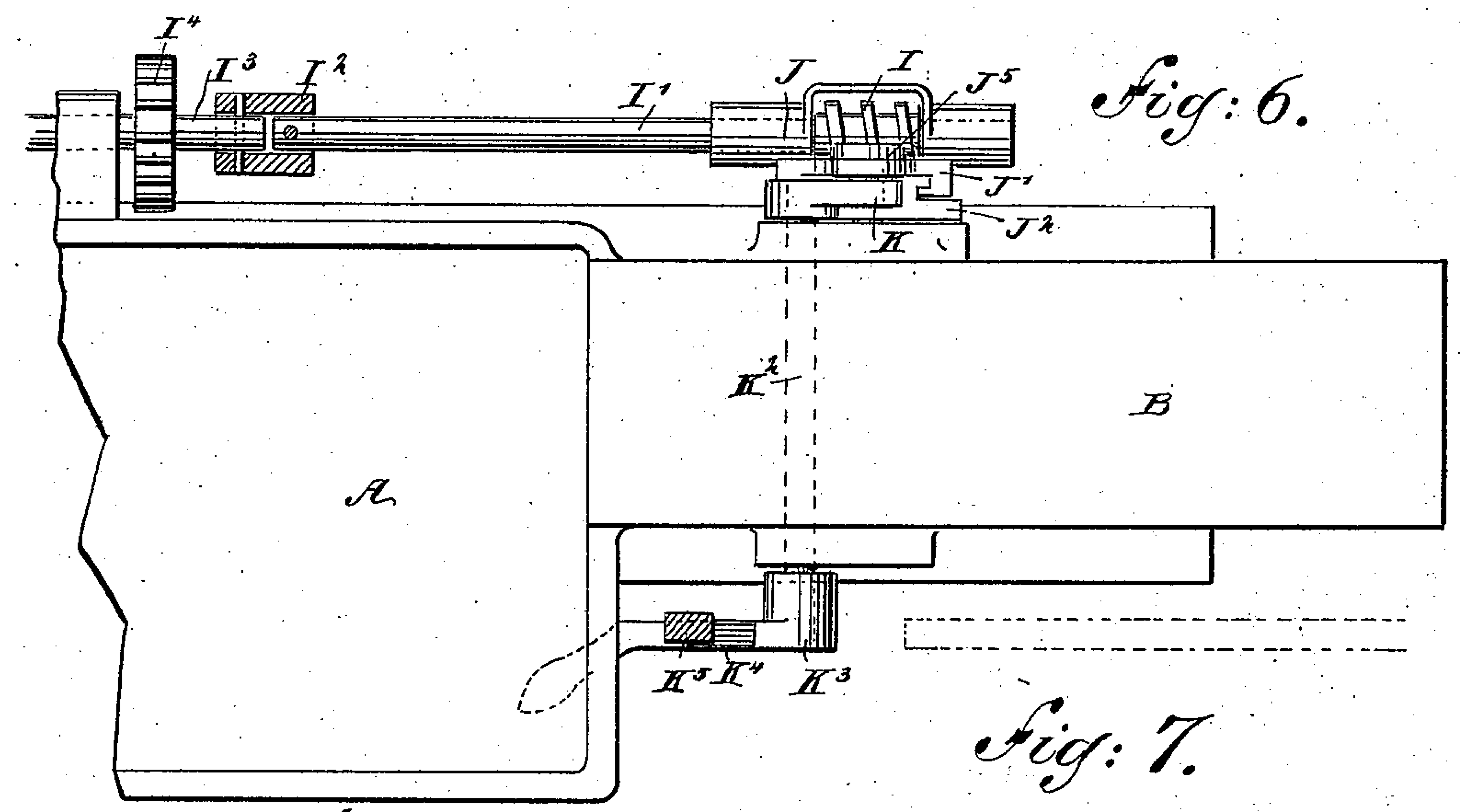

Fig: 6.

Fig: 7.

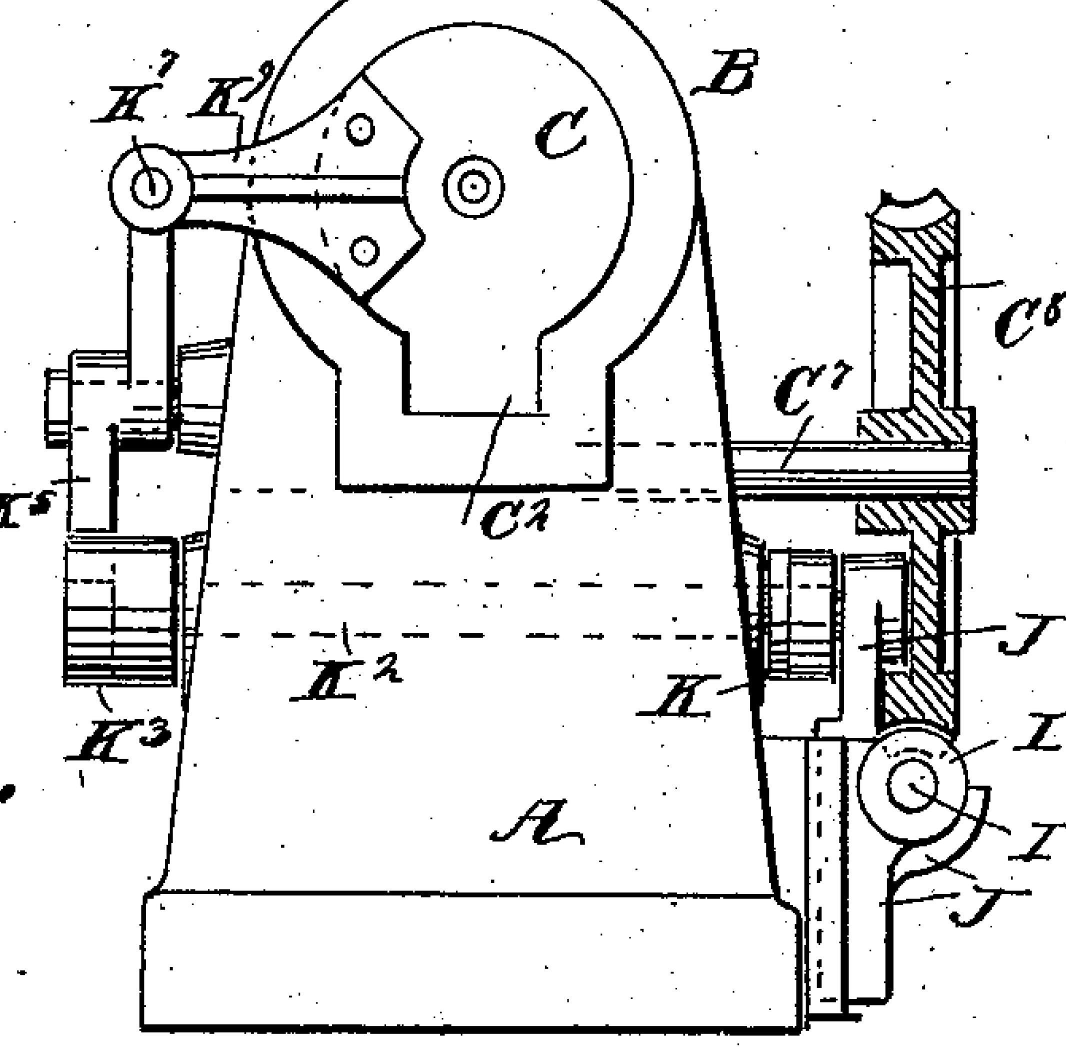

Fig: 8.

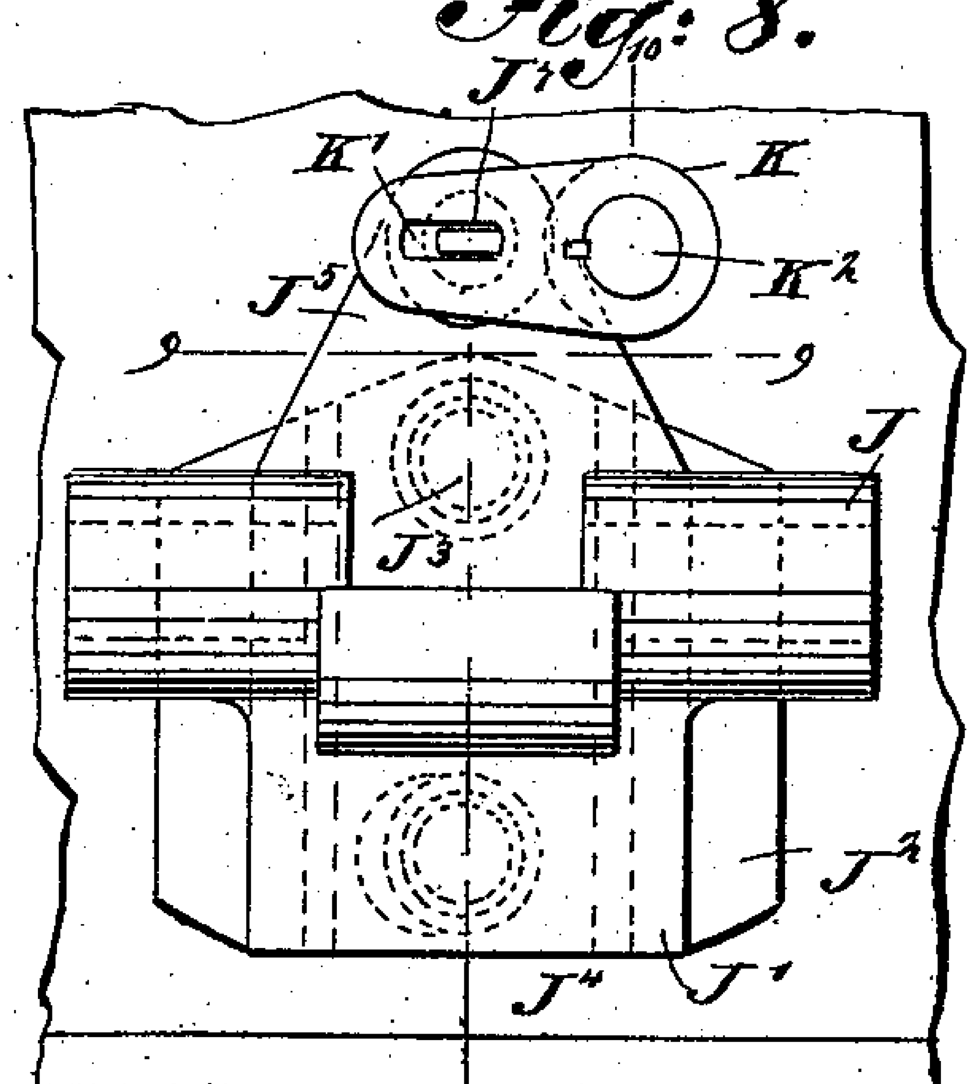

Fig: 11.

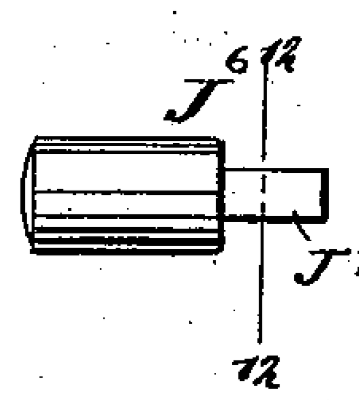

Fig: 12.

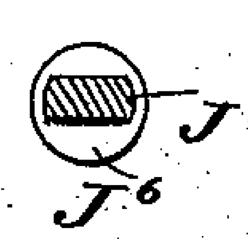

Fig: 9.

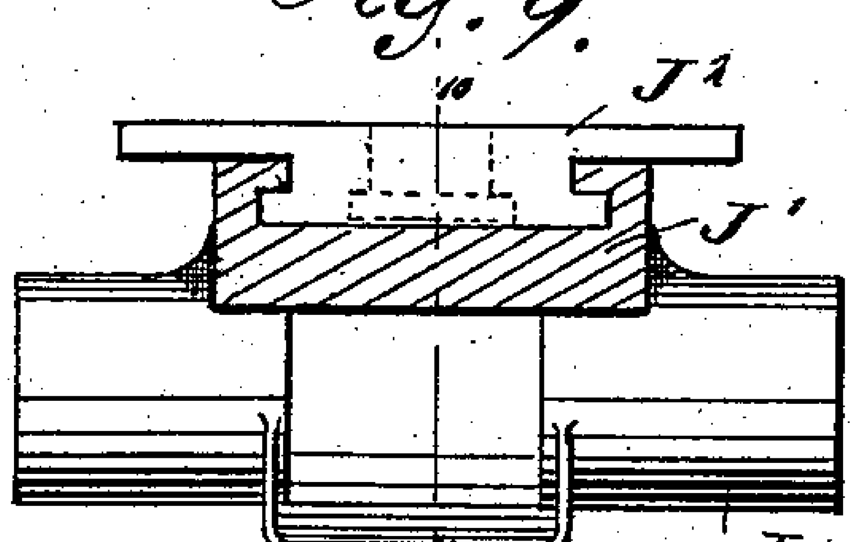

Fig: 10.

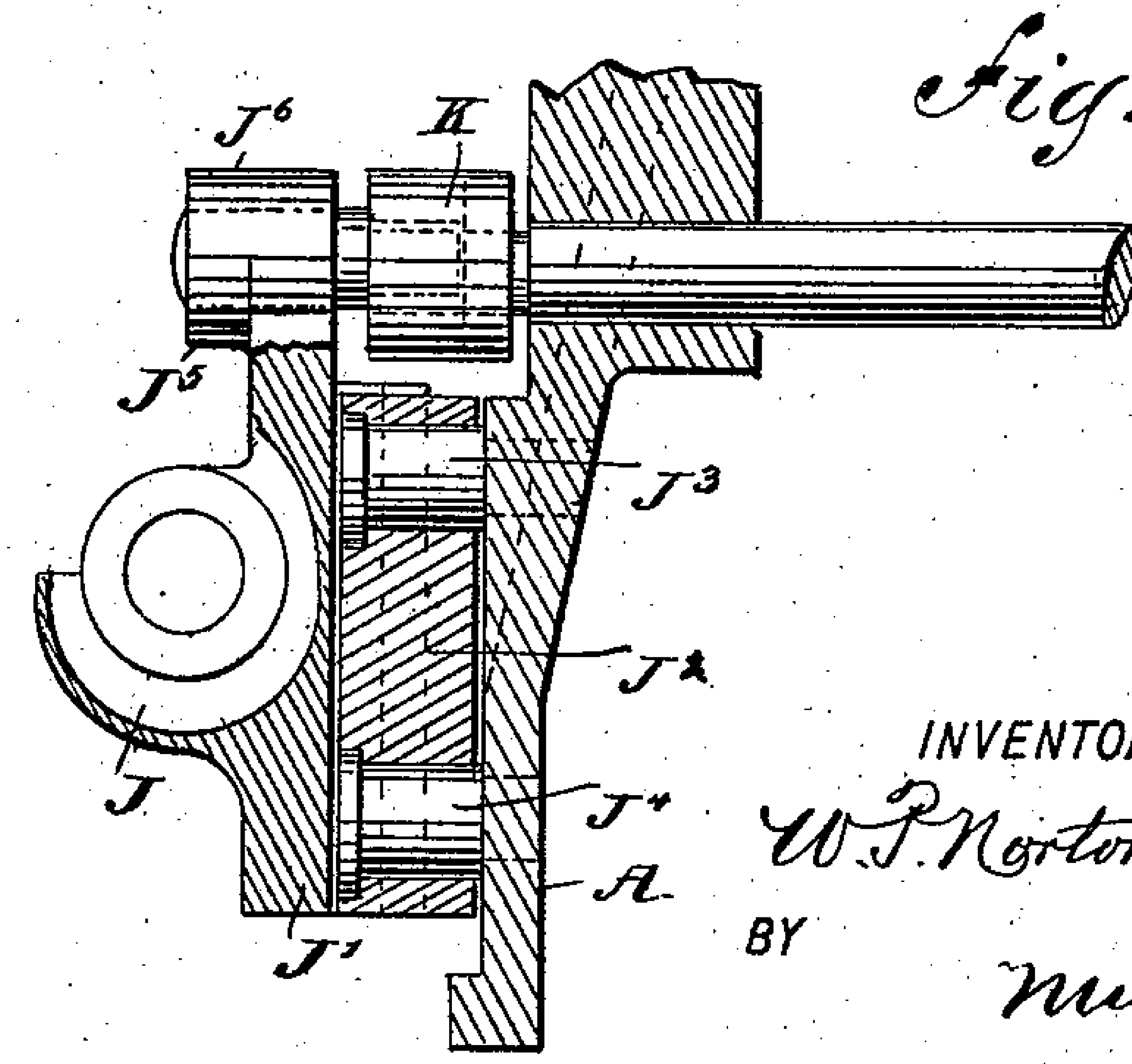

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Fig: 13.

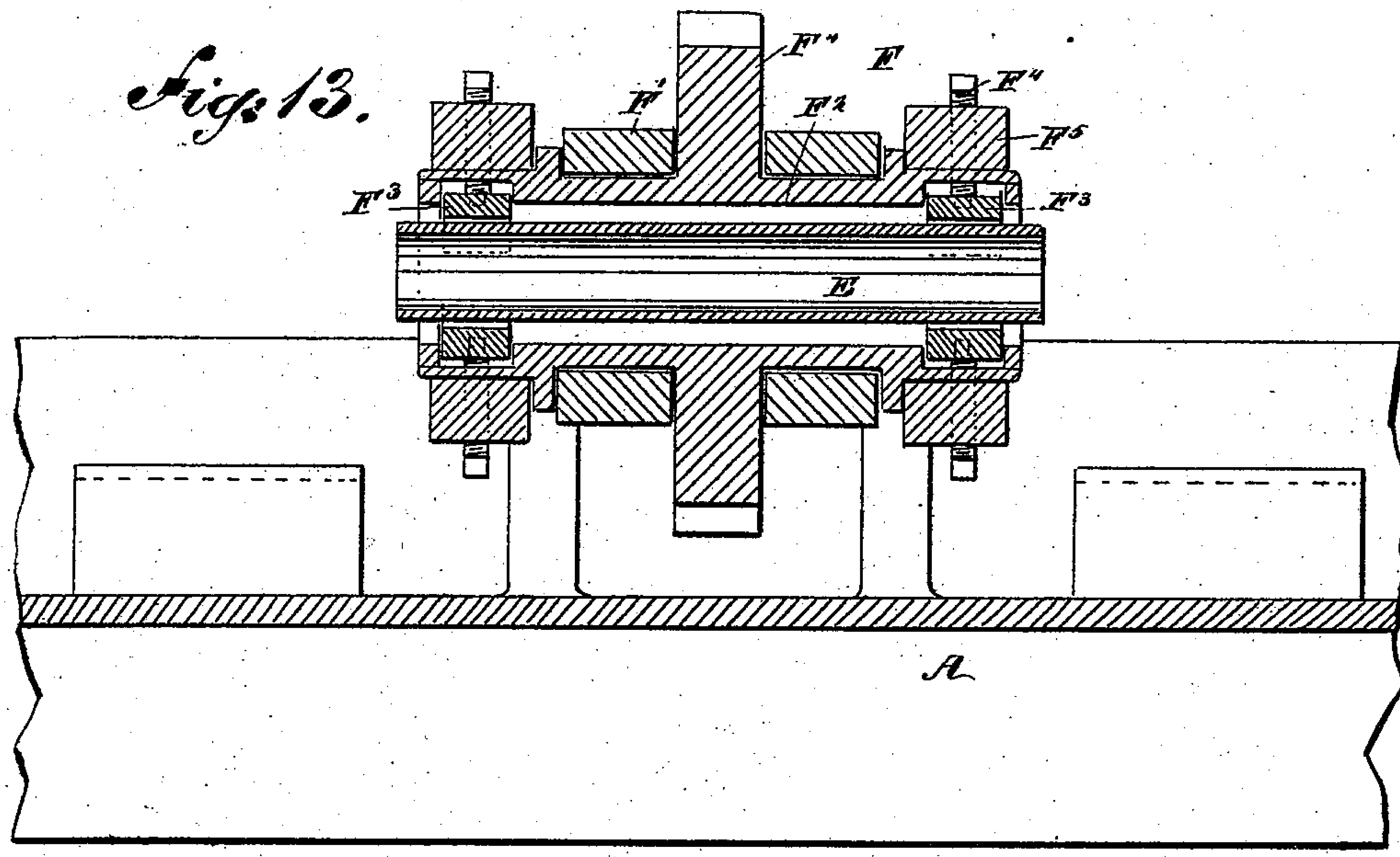
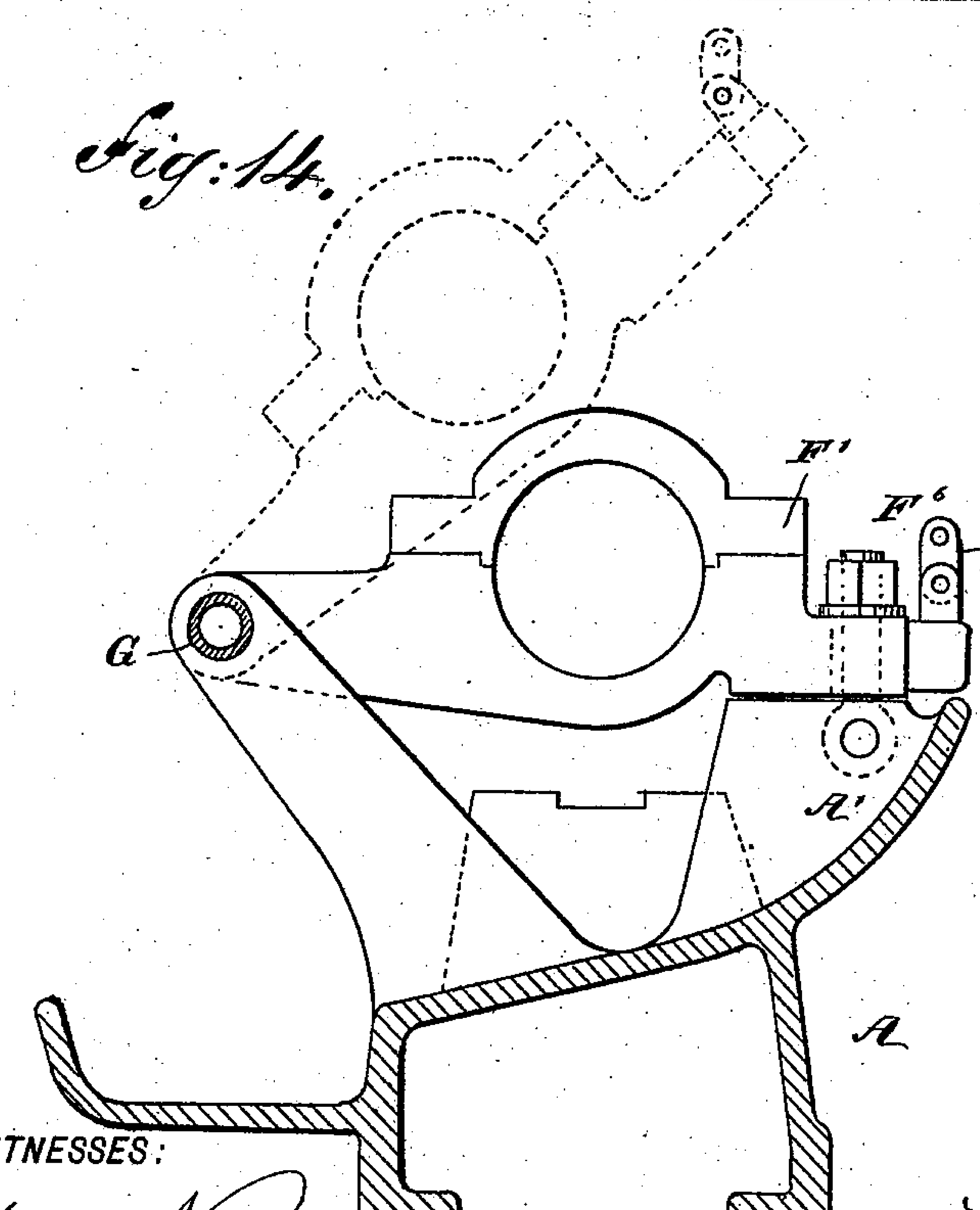


Fig: 14.



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UNITED STATES PATENT OFFICE.

WENDELL PHILLIPS NORTON, OF TORRINGTON, CONNECTICUT.

DRILLING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 528,381, dated October 30, 1894.

Application filed April 22, 1893. Serial No. 471,391. (No model.)

To all whom it may concern:

Be it known that I, WENDELL PHILLIPS NORTON, of Torrington, in the county of Litchfield and State of Connecticut, have invented a new and Improved Drilling-Machine, of which the following is a full, clear and exact description.

The object of the invention is to provide a new and improved drilling machine which is simple and durable in construction, very effective in operation, adapted for use as a single or duplex drilling machine and more especially designed for drilling and reaming lathe spindles, billets, ingots, bars and other bodies requiring a comparatively long but straight and true hole throughout their length.

The invention consists principally of a hinged work-supporting head adapted to swing in or out of alignment with the drill or drills, the said head carrying a revoluble chuck head.

The invention also consists of certain parts and details, and combinations of the same, as will be hereinafter described and then pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a plan view of the improvement arranged as a duplex drilling machine. Fig. 2 is a front elevation of the same. Fig. 3 is a rear elevation of the same. Fig. 4 is a cross section of the same on the line 4—4 of Fig. 3. Fig. 5 is a similar view of the same on the line 5—5 of Fig. 3. Fig. 6 is an enlarged sectional plan view of part of the tripping device for the feed mechanism. Fig. 7 is a cross section of the same. Fig. 8 is an enlarged side elevation of the box for one of the shafts for the tripping device. Fig. 9 is a sectional plan view of the same on the line 9—9 of Fig. 8. Fig. 10 is a transverse section of the same on the line 10—10 of Fig. 9. Fig. 11 is an enlarged side elevation of one of the studs for the tripping device. Fig. 12 is a cross section of the same on the line 12—12 of Fig. 11. Fig. 13 is an enlarged sectional side elevation of the work-supporting head; and Fig. 14 is a transverse section of part of the same, the chuck head being removed.

As illustrated in the drawings, the machine is arranged as a duplex machine with two drills in alignment with each other, and fed toward each other to bore or ream the article from both ends, but the machine may be made with a single drill for boring the article through from one end only.

The drilling machine is provided with a suitably-constructed frame A on the ends of which are secured the tool heads B, B′, in which are mounted to slide longitudinally, the slides C, C′, respectively, carrying at their opposite ends, the drills D and D′, adapted to engage the body or article E to be drilled from both ends, it being understood that the drills and slides are in alignment with each other. The body or article E is revolved and supported in a work-supporting head F hinged on the main driving shaft G for the machine, the said driving shaft being journaled in suitable bearings arranged on the main frame A (see Fig. 3), the said shaft carrying the usual cone pulleys G′ connected by a belt with pulleys on a counter-shaft for imparting a rotary motion to the said shaft G. The drills D and D′, before entering the body E pass through and are guided in the drill guides or standards H erected on the frame A on opposite sides of the work-supporting head F.

The work-supporting head F, shown in detail in Fig. 13, is provided with a frame F′ hinged on the shaft G and formed in its forward end with suitable bearings for a chuck head F^2, mounted to revolve in the said frame and carrying on its ends, chucks F^3 of any approved construction, for securing the work E in place in the said chuck head. The chuck head F^2 is formed at its middle between the bearings of the frame F′ with a gear wheel F^4 in mesh with a pinion F^5 secured on the main driving shaft G, so that when the latter is rotated the said pinion F^5 imparts a rotary motion to the gear wheel F^4, whereby the chuck head F^2 and the work held therein are rotated at the desired rate of speed.

The free end of the frame F′ rests on a suitable offset A′ on the main frame A, (see Fig. 14,) and this free end is adapted to be locked in place by means of bolts F^6, pivoted on the said offset A′ and engaging slots in the free end of the frame F′. (See Figs. 1 and 14.) When the nuts of the bolts F^6 are loosened the said bolts can be swung downward to unlock the frame F′, to permit of swinging the latter upward and rearward out of alignment with the drills D, D′, to permit of conveniently removing the drilled body or article and to insert another one to be drilled.

In order to conveniently swing the head F upward and support it in such a position, I connect the free end of the frame F′ with a chain F^7 connected with a suitable hoisting mechanism located overhead. Now, by manipulating this hoisting mechanism, the head F can be swung upward and supported in this position for the purpose above described. After a new body is inserted the head is again permitted to swing downward into its normal position and then locked in place by the bolts F^6 to hold the work in alignment with the drills D and D′. The latter, as well as the slide C′ supporting the drills, do not revolve, but have a longitudinal sliding motion, each of the slides C or C′ being provided for this purpose at the under side with a rack C^2, fitting into a correspondingly longitudinally-extending groove in the respective tool head B or B′. The mechanism for imparting a feed movement to the tool heads C and C′ and the drills D, D′, carried thereby, are alike in construction, so that it suffices to describe but one. Each of the racks C^2 is in mesh with a pinion C^3 secured on a transversely-extending shaft C^4 mounted to turn in suitable bearings in the main frame A directly under the tool head B or B′. One outer end of this shaft C^4 carries a gear wheel C^5, (see Figs. 1, 3 and 5,) in mesh with a pinion C^6 secured on the rear end of a transversely-extending shaft C^7 also journaled in the main frame A under the respective tool head B or B′. On the rear end of this shaft C^7 is secured a worm wheel C^8 and on the front end of the said shaft is secured a four-armed handle C^9 to enable the operator to impart a feed motion to the respective slide C or C′, by hand, whenever desired. The worm wheel C^8, however, is connected with and driven from the main driving shaft G, and for this purpose, the said worm wheel meshes into a worm I secured on a longitudinally-extending shaft I′ connected by a universal joint I^2 with short shaft I^3 journaled in suitable bearings on the main frame A parallel to the main driving shaft G. On this shaft I^3 is secured a small gear wheel I^4 in mesh with a pinion I^5 mounted to rotate on a stud I^6, held adjustably in a bracket projecting from the main frame A, (see Fig. 3,) and this pinion I^5 carries on its inner face, a gear wheel I^7 in mesh with a gear wheel I^8, held on the main driving shaft G. Thus, when the latter is rotated, the said gear wheel I^8 rotates the gear wheel I^7, which rotates the pinion I^5, and the latter drives the gear wheel I^4 thus imparting a rotary motion to the shaft I^3, which, by the universal joint I^2, revolves the worm shaft I′, so that the worm I rotates the worm wheel C^8 and the latter transmits its rotary motion by the pinion C^6, to the gear wheel C^5, held on the shaft C^4, which, by the pinion C^3, engaging the rack C^2, imparts a sliding motion to the corresponding slide C or C′. By this arrangement a longitudinally-forward feed is given to the two drills D and D′ simultaneously, so that the said drills enter the body or article E from opposite ends, and as the said body is revolved, the aperture is drilled therein.

Now, in order to automatically stop the feed of one of the drills D or D′, previous to the two drills meeting in the middle of the body E, I provide tripping devices arranged as follows: The outer end of the shaft I′ is journaled in a journal box J formed at its inner face with a slide J′ fitted to slide in a guideway J^2 hung on pivots J^3 and J^4, secured to the main frame A, the lower pivot J^4 engaging a longitudinal elongated slot in a guideway J^2, to permit a slight swinging motion of the latter from the pivot J^3, as a center. The upper end J^5 of the slide J′ carries a pin J^6; (see Figs. 8, 11 and 12,) formed with a flattened offset J^7 extending into an elongated slot K′ formed on a crank arm K, secured on the rear end of a transversely-extending shaft K^2 mounted to turn in suitable bearings on the main frame A. On the forward end of this shaft K^2 is secured a latch lever K^3 (see Fig. 2) abutting with its top edge on the under side of a trip lever K^5, fulcrumed on the front side of the frame A, as plainly shown in the said Fig. 2. The lower end of the trip lever K^5 is adapted to pass into a notch K^4 formed on the latch lever K^3 at the time a swinging motion is given to the trip lever K^5, to permit an upward swinging of the lever K^3 or turning of the shaft K^2, and a downward swinging of the crank arm K, caused by the weight of the journal box J and the shaft I′ journaled therein, it being understood that the latter swings from the universal joint I^2, as the center. This movement takes place whenever the lower end of the trip lever K^5 moves off the top edge of the latch lever K^3 and into the notch K^4, so that the worm I held on the shaft I′ moves out of mesh with the worm wheel C^8, thus stopping the feeding of the slide C or C′ and consequently that of the drill D or D′ respectively. A swinging motion is given to the trip lever K^5 from the respective slide C or C′ and for this purpose the upper end K^6 of the said lever engages loosely a longitudinally-extending rod K^7 provided with an adjustable stop or collar K^8, and screwed on a bracket K^9 on the rear end of the corresponding slide C or C′, as plainly shown in Figs. 1, 2, 3 and 7. Now, the collar K^8 is adjusted on the rod K^7 a distance from the end K^6 of the trip lever K^5 to correspond with the distance the drill D or D′ is to enter the body E, so that when the respective drill has moved about half-way into the body, its further feed is stopped by the tripping device above described.

When the feed of one of the drills D or D′ has been stopped by the automatic tripping device, as above described, then the other drill is still fed forward to complete the aperture in the body E. As soon as this is done, the respective tripping device of this drill will be actuated, to stop the forward feed of the last drill. The operator then turns the handles C^9 so as to move the slides C and C′ outward to disengage the drills D and D′ from the body E after which the bolts F^6 are disengaged from the frame F′ and the head F is swung upward and the chucks F^3 loosened, to permit of removing the drill body E. A new body is then inserted. The head is again swung downward and locked in place, after which the operator swings the latch lever K^3 downward to again set the trip lever K^5 on the top edge of the said latch lever K^3 at the same time moving the worms I into contact with their worm wheel C^8. A forward feed of the slides C and C′, then again takes place, to cause the drills D and D′ to enter the revolving body E for boring a longitudinal aperture therein.

In order to feed the necessary lubricant to the forward ends of the drills D and D′, I provide each of the latter with a small pipe L terminating near the cutting edge of the drill at the front end thereof, and extending in the twist of the drill along the shank thereof, to finally connect with an oblique aperture formed in the butt end of the drill, and leading to a longitudinal aperture opening into the hollow slide C or C′ respectively, connected at its outer end with a pipe L′ connected by a flexible pipe L^2 with a stationary pipe L^3 supported from the main frame A in suitable brackets, as plainly indicated in Fig. 1. The two pipes L^3 from the two slides connect with a short pipe L^4 leading to the lower end of a cylinder N, of a suitable pump connected with a lubricant supply, and containing a plunger N′ pivotally-connected by a pitman N^2 with a wrist pin N^3 held on a crank disk N^4 secured to a short shaft N^5 journaled in suitable bearings on the main frame A. (See Figs. 1 and 4.) On this shaft N^5 is secured a gear wheel N^6 in mesh with a gear wheel N^7 held on the main driving shaft G, so that when the latter rotates a rotary motion is imparted by the gear wheels N^7 and N^6, to the shaft N^5 which, by the crank disk N^4 and pitman N^2 causes the plunger N′ to reciprocate and thus pump lubricant through the pipe L^4 into the pipes L^3. The lubricant passes along these pipes into the flexible pipes L^2 and to the pipe L′ connected with the outer end of the respective slide C or C′, through the central bore of which passes the lubricant to the apertures in the drill butts to finally pass into the pipe L and to the cutting edge of the drill in the body E. Thus, as long as the driving shaft is rotating, oil is fed to the drills by the action of the pump driven from the said main driving shaft. A flexible connection between the pipes L^3 and L′ is necessary, owing to the sliding movement of the slides C and C′. As illustrated in Fig. 4, the pump cylinder N is set in a lubricant receiving vessel O attached to a partition extending from the main frame A.

It will be seen that the feed of either of the slides C and C′ can be stopped at any time by the operator shifting the trip lever K^5 by hand, so that the lower end of the lever drops into the notch K^4 to permit an upward swinging of the latch lever K^3 as previously described, so that the worm wheel I is moved out of contact with its respective worm wheel C^8.

Having thus fully described my invention, I claim as new and desire to secure by Letters Patent—

1. In a drilling machine, the combination of a drill slide having a cog rack and a pinion engaging said rack, with a worm-gear on the transverse shaft of said pinion, and a device for operating said worm-gear consisting of a longitudinal shaft having a corresponding worm-gear, a vertically adjustable journal box for said longitudinal shaft, a supplemental shaft having a crank arm on one end pivotally-connecting said journal box, a latch lever on the other end, a trip lever for engaging said latch lever, and suitable means connected with the drill slide for tripping said trip lever, for the purpose stated.

2. In a drilling machine, the drill slide having a parallel rod provided with an adjustable stop in combination with a trip lever, loosely engaging said rod, a latch lever engaging said trip lever, a rack and pinion connection for said slide, a crank arm on the crank of said latch lever, a vertically-adjustable box, pivotally-connected to said crank arm, a longitudinal shaft, having a worm gear, journaled in said box, suitable means for operating said shaft, and a corresponding worm-gear on the rack engaging pinion shaft, for operation in the way described.

3. In a drilling machine, the combination of the duplex drill slides, each having an operating rack and pinion connection, a worm-gear on each rack engaging pinion shaft, a longitudinal shaft of jointed sections having a worm-gear, a vertically-adjustable journal box on the outer ends of said jointed shafts, and suitable means for operating said jointed shafts, with trip mechanism connecting said adjustable journal boxes with the drill slides, whereby the movements of the latter toward each other will automatically operate to disengage the said jointed shaft worm-gear to stop the operation of the slides in the way and for the purpose stated.

4. In a drilling machine, a duplex chuck head consisting of a tubular cylindrical body having a chuck at each end, and a circum-

ferential driving gear mediately of its ends, in combination with a bearing for supporting said chuck, duplex drill slides, and mechanism for operating the chuck and the drill slides, substantially as described.

5. In a drilling machine, the combination of the duplex drill slides each having an operating rack and pinion connection, with a duplex work-supporting chuck, a hinged supporting head forming journal bearing for said chuck and means for rotating the latter within said hinged head, substantially as described.

6. In a drilling machine, the combination of duplex drill slides each having an operating rack and pinion connection, with a duplex work-holding chuck having a gear wheel mediately of its chuck heads, a hinged supporting head forming a journal for said chuck and a shaft on which said chuck bearing head is hinged having a pinion engaging said chuck gear, substantially as described.

7. In a drilling machine, the combination of duplex drill slides each having an operating rack and pinion connection, with a rotating duplex work-holding chuck and a hinged bearing therefor adapted to be supported in alignment between said drill slides and to be turned over out of the way at the side of the machine, substantially as described for the purpose stated.

8. In a drilling machine, the combination of duplex drill slides with a rotating duplex chuck having an axial bore, a swinging bearing head for said chuck, and a gear on the latter between its heads for rotating said chuck, substantially as described.

9. In a drilling machine, the combination of duplex drill slides, mechanism for connecting them for automatic operation, and a rotating duplex work-holding chuck, with a trip device for connecting and disconnecting the drill slides with their operating mechanism consisting of transverse shafts each having a crank arm connecting and engaging and disengaging said operative mechanism, rods on the drill slides each having an adjustable stop, a trip lever pivoted on the frame for each slide rod and a latch lever on each shaft, and mechanism for operating said drill slides by hand whereby both drill slides may be operated together and one of them stopped and drawn out from the work while the other continues to operate for the purpose stated.

10. A duplex drilling machine, consisting essentially of two drill slides, a shaft at the back of the machine formed of three jointed sections the two end sections whereof are mounted in vertically adjustable boxes at their outer ends and provided each with a worm-gear, a driving shaft above said jointed shafts and geared to the middle section thereof, a transverse shaft beneath each drill slide having a worm-gear engaging the worm-gear of the jointed shafts and a pinion engaging a rack on the drill slide, a supplemental shaft beneath each drill slide having a crank arm pivotally-connecting said boxes, and a latch lever at its front end, a horizontal rod attached to the outer end of each drill slide, and a trip lever on the frame connecting said rod and latch lever, a swinging head, mounted on the power shaft between the drills, a duplex hollow chuck mounted in said head having a gear mediately of its ends, and a pinion on said power shaft engaging said chuck gear for operation substantially as described.

11. A drilling machine provided with a hinged work-supporting head, comprising a frame mounted to swing on the main driving shaft, a chuck head journaled in the said frame and carrying chucks at its ends, a gear wheel secured on the said chuck head between the said chucks, and a pinion in mesh with the said gear wheel and secured on the main driving shaft forming the pivot for the said frame, substantially as shown and described.

12. In a drilling machine, the combination with a driven shaft, a worm shaft carrying a worm, a universal joint connecting the said worm shaft with the said driven shaft, a journal box for the outer end of the said worm shaft and formed with a slide, a guideway mounted to swing and engaged by the said slide, a crank arm pivotally-connected with the said journal box, and a tripping mechanism, substantially as described, and connected with the said crank arm, as set forth.

WENDELL PHILLIPS NORTON.

Witnesses:
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WILLARD A. RORABACK.