UNITED STATES PATENT OFFICE.

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AUTOMATIC LATHE.

No. 926,737. Specification of Letters Patent. Patented July 6, 1909.

Application filed June 26, 1907. Serial No. 380,906.

To all whom it may concern:

Be it known that we, JOHN J. GRANT and JOSEPH F. FIEG, both citizens of the United States, residents of Cleveland, county of Cuyahoga, and State of Ohio, have jointly invented a new and useful Improvement in Automatic Lathes, of which the following is a specification, the principle of the invention being herein explained and the best mode in which we have contemplated applying that principle, so as to distinguish it from other inventions.

This, our present invention, relates to improvements in automatic turret lathes, and has particular regard to the perfection of that type of automatic screw machine described in a pending application of one of the present inventors, filed April 28, 1906, Serial No. 314,197.

The object of said invention is the provision of an improved indexing mechanism for indexing the revoluble multiple spindle stock-holding head of such machine, and of improved means for supporting the stock exterior of said revoluble head pending the rotation and reciprocation of the latter, such head, in the machine in question, being characterized by both the movements just named.

Said invention also comprehends the improvement of various other details connected with the lathe aforesaid.

To the accomplishment of the above and related objects, said invention consists of the means hereinafter fully described and particularly pointed out in the claims.

The annexed drawings and the following description set forth in detail certain mechanism embodying the invention, such disclosed means constituting, however, but one of various mechanical forms in which the principle of the invention may be used.

In said annexed drawings: Figure 1 represents a plan view of the feed end of an automatic screw machine, of the kind referred to above, in which has been embodied the several improvements constituting the present invention; Fig. 2 is a vertical, longitudinal, cross-section on the line 2—2, Fig. 1, of a detail of the turret head indexing mechanism; Fig. 3 is an end elevation of such detail showing the means whereby the same is actuated; Fig. 4 is a broken cross-sectional view of one of the cross slides together with certain appurtenant parts; Fig. 5 is a central longitudinal cross-section of the stock holding spindle head taken on the line 5—5, Fig. 1; Fig. 6 is a transverse cross section of the latter on the line 6—6, Fig. 5; Fig. 7 is a partial development of the cam whereby actuation of the turret head slide is had; and Fig. 8 being a section through the stockholding frame taken on the line 8—8 Fig. 1.

As has been indicated such parts of the lathe, or machine, proper, as appear in the several foregoing figures of the drawings are illustrative of the particular machine set up in the co-pending application named. It is not intended, however, to imply, by thus connecting our present invention with the machine just referred to, that the several features of the present invention are not equally adaptable for use in other machines of the same general type. Of such machine, moreover, only the feed end appears in Fig. 1, the bed of the machine being there designated by the letter A. Upon a slide-way *a* upon such machine bed, is reciprocably mounted a slide B within which in turn is revolubly mounted the turret head B′. The construction and general mode of actuation of such slide B and revoluble turret head B′ being fully disclosed in such other application need not be described here, other than to point out wherein variation has been made in the previous structure. With this limited object in view, attention is first directed to the driving mechanism for rotating the spindle head. The stock-holding spindles *b*, within such head, it should be noted, are designed to be driven through an elongated gear *d*, shown in dotted outline in Fig. 1. This gear slidably rests in a casing or housing *b′* that projects rearwardly from the slide B wherein the spindle head is secured. Such elongated gear constitutes in effect one end of a tubular back shaft D, and is obviously capable of driving the spindles *b* irrespective of the position of slide B. Mounted within tubular shaft D is another shaft D′ that is adapted to be driven independently thereof to intermittently rotate, or in other words to index, the spindle head. For the purpose of effecting such indexing operation, which it should be stated requires to be done only at intervals, that is when the turret is in its retracted or outermost position, a disk *d′* is mounted upon the

outer end of said inner indexing shaft D′, with which connection may be had by a driven member mounted on the turret slide as will presently appear. Disk d' is splined to shaft D so as to rotate therewith and yet have a longitudinal movement therealong, such longitudinal movement being regulated by means of a spring d^2 interposed between the outer face of the disk and a nut d^3 threaded to the extreme outer end of the shaft and thus adapted to vary the tension of the spring. The inward movement of the disk d' under the action of spring d^2 is designed to be limited by the engagement with the end of shaft D′ of the closed end of a tubular casing d^4, secured to such outer face of the disk. This casing serves the further purpose of inclosing the parts last described as also that of steadying the disk and maintaining the same in alinement. Rotation of the turret head is effected through a pinion d^5, rotatably mounted upon shaft D′ and longitudinally held in the housing b' before described as mounted on the rear side of turret head slide B, Fig. 2. This pinion constitutes the driven member above referred to for although it is not designed to be directly connected with index shaft D′, it is provided on its outer end with a friction disk d^6 disposed to contact with disk d'. Such contact, however, will obviously be effected only upon retraction of the turret slide and will continue only during the brief interval that such slide is in its retracted or rearmost position.

The amount of rotation imparted to the indexing pinion d pending the engagement of the two friction disks is accurately regulated by means of a lever D^2 pivotally mounted on the turret-slide and normally engaging a toothed disk d^7 mounted adjacent to said friction disk d^6, such engagement being temporarily interrupted at appropriate times by the outward actuation of its lower end by a rod d^9 having a roller engagement therewith. Such actuation is had through the agency of a cam B^2 mounted upon the cam shaft of the machine and carried back and forth along the same in unison with the turret slide, as will be readily understood. A spring d^8, Fig. 3, or equivalent resilient means, serves normally to position said lever to engage with disk d^7. By means of the mechanism just described it will be evident that we are enabled to utilize the friction drive, with its numerous well known advantages, in spite of the intermittent character of the operation to be performed. This for the reason that the engaging faces of friction disks d' d^6 are rotated in contact with each other at the most but a few turns, and no opportunity for their becoming heated thus presented.

To support the projecting portions of the rods forming the stock upon which the machine is designed to operate a stock rest or turret requires to be provided. To meet the conditions imposed by the novel mode of actuation of the stock holding spindle head, we have found it desirable to employ a stock turret consisting of annular frames E revolubly supported in suitable spaced stands E′, one of which is mounted upon the rear end of the machine, the other of which is supported some distance therefrom. Such two revoluble frames E are joined together by a tubular connecting rod or shaft e and the innermost then further joined with the turret head by means of a shaft e' rigidly mounted in the latter and having slidable engagement with said tubular shaft. By means of this arrangement, it will be seen, reciprocation of the turret head is not interfered with, but rotation of such head effects a corresponding rotation of the annular stock supporting frames constituting the stock turret. Such stock turret includes, in addition to these two revoluble frames connected in the manner set forth, a spider E^2 mounted on tubular connecting shaft e intermediate of said frames. This spider, together with the frames, are provided with apertures for the reception of the stock suitably alined with the spindles b of turret-head B, as will be readily understood. In the case of spider E^2 such apertures are furthermore fitted with elongated tubes e^2 disposed parallel with the axis about which the device as a whole rotates, and provided at their respective forward ends with bell mouths e^3. Similar bell mouths are also desirably provided in connection with the several apertures in the rearmost of revoluble frame E, their function being to properly guide the free ends of the pieces of stock as the latter are retracted along with the retraction of the turret head B′. Otherwise such ends are apt, particularly where the stock is light, to droop sufficiently to miss the appropriate apertures and jam into the frame with disastrous results.

The reciprocatory movement of the turret head B′ and turret slide B, to which repeated reference has been made, is imparted thereto as before by means of a cam B^3 mounted upon the cam shaft that is disposed in the machine frame below the slideway, whereon said slide rests. Among the several advantages in thus rendering the multiple stock holding turret head reciprocable as well as revoluble, is that of being able to employ a fixed stop as a^2, Fig. 1, against which the stock comes into contact, and its length thus gaged, upon its being fed forwardly. It has been found, however, that owing to the additional forward pressure on the stock occasioned by the closing of the chuck thereon, such stock is not always readily released upon the succeeding partial rotation of the spindle head. It accordingly has become desirable to modify

this construction by providing that portion of the face of cam B^3, see Fig. 7, whereby the turret head is actuated forwardly, with an offset b^4 that is adapted, once the stock has been once thus gaged and the chuck closed upon it, to retract the head a slight distance. Such stock may thereupon be moved into operative position by the succeeding partial rotation of the head without any liability of interference in the manner noted. The stock S, it will of course be understood, is advanced into contact with the stop by means of any suitable stock-feeding mechanism H, Fig. 5.

In connection with the cross slide mechanism of the lathe, such cross slides F being mounted as before in transversely disposed slide-ways f, formed in the forward portion of the turret head slide B, Fig. 4, it has been found advantageous to provide means for preventing undue rotation of the worms f' that mesh with the segmental worm gears f^2 on the outer ends of the cam actuated levers f^3, adjustment of the movement imparted to said slides being regulated by this rotation. Such limitation of the rotation of the worms is had by mounting thereon a nut sector f^4 that is slidably held in a milled opening f^5 therefor provided in the slide immediately above the worm. By a proper proportion of the length of such opening and that of the nut segment it is obviously made impossible to rotate the worm so far as to endanger the breakage of the lever or other parts, a contingency that would otherwise be present.

Attention is finally directed to the interior construction of the turret head B′, Figs. 5 and 6, whereby certain and effective lubrication of the various parts therein contained is had. With this object in view the respective ends b^5 b^6 of said turret head are provided with central apertures into which fit the ends of an axially disposed pipe section or tube b^7. The aperture in forward end b^5 is exteriorly closed by a cap b^8, while that in rear end b^6 is utilized to receive the end of shaft e', whereby the rotative movement of turret head B′ is communicated to the stock turret. Said shaft e' is provided with a bore e^4 extending for some distance from its inner end and constituting, when taken in connection with tube b^7, an oil reservoir of considerable capacity. The lubricant is designed to be introduced into such reservoir through an opening in shaft e' that is ordinarily closed by a plug e^5. Communicating with the aperture in each turret end b^5 b^6, and so with the reservoir aforesaid, are passages b^9, that lead to the bearings in which are journaled stock-holding spindles b. The journal boxes b^{10} that form such bearings are of the usual construction, Figs. 5 and 6, being provided with recesses b^{11} for the reception of felt or like lubricant-retaining material.

Other modes of applying the principle of our invention may be employed instead of the one explained, change being made as regards the mechanism herein disclosed, provided the means stated by any one of the following claims or the equivalent of such stated means be employed.

We therefore particularly point out and distinctly claim as our invention:—

1. In mechanism of the class described, the combination with a reciprocatory slide, of a turret-head revolubly mounted therein, and means for indexing said head, such means comprising a drive shaft longitudinally fixed and slidably supported in said reciprocatory slide laterally of said turret-head, a driving member mounted upon said shaft, and a driven member borne by said slide and connected to rotate said head, said driven member being periodically brought into operative engagement with said driving member by the reciprocation of said slide.

2. In mechanism of the class described, the combination with a reciprocatory slide, of a turret-head revolubly mounted therein, and means for indexing said head, such means comprising a drive shaft longitudinally fixed, and slidably supported in said reciprocatory slide without the periphery of said head, a friction disk mounted upon said shaft, and a corresponding disk borne by said slide and connected to rotate said head, said second disk being periodically brought into engagement with said first disk by the reciprocation of said slide.

3. In mechanism of the class described, the combination with a reciprocatory slide, of a turret-head revolubly mounted therein, and means for indexing said head, such means comprising a drive shaft longitudinally fixed and slidably supported in said reciprocatory slide laterally of said turret-head, a driving member mounted upon said shaft, a driven member borne by said slide and connected to rotate said head, said driven member being periodically brought into operative engagement with said driving member by the reciprocation of said slide, and means independently controlling rotation of said driven member.

4. In mechanism of the class described, the combination with a reciprocatory slide, of a turret-head revolubly mounted therein, and means for indexing said head, such means comprising a drive-shaft longitudinally fixed and slidably supported in said reciprocatory slide without the periphery of said head, a friction disk mounted upon said shaft and resiliently held against longitudinal movement therealong, a corresponding disk borne by said slide and connected to rotate said head, said second disk being brought into operative engagement with said first disk upon retraction of said slide, a stop normally holding said second disk against rota-

tion irrespective of such engagement, and means adapted to periodically withdraw said stop.

5. In mechanism of the class described, the combination with a reciprocatory slide, of a turret-head revolubly mounted therein, a drive shaft longitudinally fixed and slidably supported in said reciprocatory slide, a member housed in said slide and rotatably mounted upon said shaft, said member being connected to rotate said spindle head and being provided with a friction disk, a corresponding friction disk mounted upon said shaft and resiliently held against longitudinal movement therealong, said first disk being brought into operative engagement with said second disk upon retraction of said slide, a stop normally holding said first disk against rotation irrespective of such engagement, and means adapted to periodically withdraw said stop.

6. In mechanism of the class described, the combination with a reciprocatory slide, of a turret-head revolubly mounted therein, a drive-shaft longitudinally fixed and slidably supported in said reciprocatory slide, a member housed in such slide and rotatably mounted upon said shaft, said member being connected to rotate said spindle-head, and being provided with a friction-disk, a corresponding friction-disk longitudinally slidable, but rotatably fixed upon such shaft, said first disk being brought into operative engagement with said second disk upon retraction of said slide, a spring interposed between said second disk and the end of such shaft, and means adapted to limit the inward movement of said second disk.

7. In mechanism of the class described, the combination with a reciprocatory slide, of a turret-head revolubly mounted therein, a drive shaft longitudinally fixed and slidably supported in said reciprocatory slide, a member housed in said slide and rotatably mounted upon said shaft, said member being connected to rotate said spindle head and being provided with a friction disk, a corresponding friction disk longitudinally slidable but rotatably fixed upon said shaft, said first disk being brought into operative engagement with said second disk upon retraction of said slide, a spring interposed between said second disk and the end of said shaft, a tubular casing attached to the outer face of said second disk and inclosing said spring and shaft end and adapted by contacting with the latter to limit the inward movement of said disk, a stop normally holding said first disk against rotation irrespective of its engagement with said second disk, and means adapted to periodically withdraw said stop.

8. In mechanism of the class described, the combination of a stop, a reciprocable stock-holding spindle, means adapted to advance stock in said spindle into contact with said stop, and means adapted to retract said spindle upon the stock being thus advanced.

9. In mechanism of the class described, the combination of a fixed tool-head; a stop mounted in said head; a reciprocatory slide; a head revolubly mounted in said slide; a stock holding spindle rotatably mounted in said revoluble head, means adapted to reciprocate said slide; means adapted to rotate said head to periodically aline said spindle with such stop; and stock feeding means adapted to advance the stock in said spindle when thus alined, said slide-reciprocating means being arranged and constructed to retract said slide upon the stock being thus advanced into contact with such stop.

10. In mechanism of the class described, the combination of a fixed tool head; of a reciprocatory slide; a head revolubly mounted in said slide; a plurality of stock-holding spindles rotatably mounted in said revoluble head; a stock-rest disposed in line with said spindle-head, said rest comprising a suitable support and a frame revolubly mounted therein and adapted to receive the pieces of stock; and an axially disposed shaft fixedly attached at one end to said spindle-head and having the other in slidable engagement with said frame.

11. In mechanism of the class described, the combination of a fixed tool head; of a reciprocatory slide; a head revolubly mounted in said slide; a plurality of stock-holding spindles rotatably mounted in said revoluble head; a stock-rest disposed in line with said spindle-head, said rest comprising suitable supports, frames revolubly mounted in said supports, respectively, and adapted to receive the pieces of stock, and a tubular shaft axially connecting said frames; and an axially disposed shaft fixedly attached at one end to said spindle-head and having its other end extending within said tubular shaft and in slidable engagement therewith.

12. In mechanism of the class described, the combination of a turret head both reciprocably and rotatably mounted, a plurality of stock-holding spindles rotatably mounted in said head; a stock-rest disposed in line with said head, said rest comprising a suitable support, and a spider revolubly held therein, said spider being provided with a plurality of tubes alined with said stock-holding spindles and adapted to receive the pieces of stock, the ends of said tubes disposed toward said turret-head being provided with flaring mouths.

13. In mechanism of the class described, the combination of a turret head both reciprocably and rotatably mounted, a plurality of stock-holding spindles rotatably mounted in said head; a stock-rest disposed in line with said head, said rest comprising a suitable support, and a spider revolubly held therein, said spider being provided with a

plurality of tubes alined with said stock-holding spindles and adapted to receive the pieces of stock, the ends of said tubes disposed toward said turret-head being provided with funnel shaped mouths; and an axially disposed shaft fixedly attached at one end to said turret head and having the other in slidable connection with said spider.

14. In mechanism of the class described, the combination of a turret head both reciprocably and rotatably mounted, a plurality of stock-holding spindles rotatably mounted in said head; a stock-rest disposed in line with said head, said rest comprising suitably spaced supports, a frame revolubly mounted in each of said supports and provided with apertures alined with said stock-holding spindles and adapted to receive the pieces of stock, a tubular shaft connecting said frames, and an axially disposed shaft fixedly attached at one end to said turret-head and having the other in slidable engagement with said tube.

15. In mechanism of the class described, the combination of a turret head both reciprocably and rotatably mounted, a plurality of stock-holding spindles rotatably mounted in said head; a stock-rest disposed in line with said head, said rest comprising suitably spaced supports, a frame revolubly mounted in each of said supports, a tubular shaft connecting said frames, a spider mounted on said shaft intermediate of said frames, said spider and frames being provided with apertures alined with said stock holding spindles and adapted to receive the pieces of stock, tubes fitted to the apertures in said spider, the ends of said tubes disposed toward said turret-head, as also the apertures in the rearmost of said frames, being provided with flaring mouths, and an axially disposed shaft fixedly attached at one end to said turret-head and having the other in slidable engagement with said tube.

16. In mechanism of the class described, the combination with a revoluble turret-head, of a plurality of spindles rotatably mounted in said head, said head being provided with a central reservoir for lubricant having connection with the respective spindle bearings.

17. In mechanism of the class described, the combination with a revoluble turret-head, of a plurality of spindles rotatably mounted in said head, said head being provided with a central reservoir for lubricant having connection with the respective spindle bearings, and an exterior axially extending tubular member communicating with said reservoir for supplying lubricant thereto.

18. In mechanism of the class described, the combination with a revoluble turret-head comprising two end portions provided with central apertures, spindles rotatably mounted in said end portions, a tubular member joining said apertures, a cap exteriorly closing one of said apertures and a shaft the other, said shaft having a bore communicating with said tubular member and forming along therewith a reservoir for lubricant, and the end portions of said turret-head being provided with radial passages connecting the respective spindle bearings with such central apertures and thus with such reservoir.

Signed by me, JOHN J. GRANT, this 19th day of March, 1907.

JOHN J. GRANT.

Attested by—
E. R. RODD,
JNO. F. OBERLIN.

Signed by me, JOSEPH F. FIEG, this 15th day of June, 1907.

JOSEPH F. FIEG.

Attested by—
E. R. RODD,
MARY ISRAEL.

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AUTOMATIC LATHE.

APPLICATION FILED JUNE 26, 1907.

926,737.

Patented July 6, 1909.

3 SHEETS—SHEET 1.

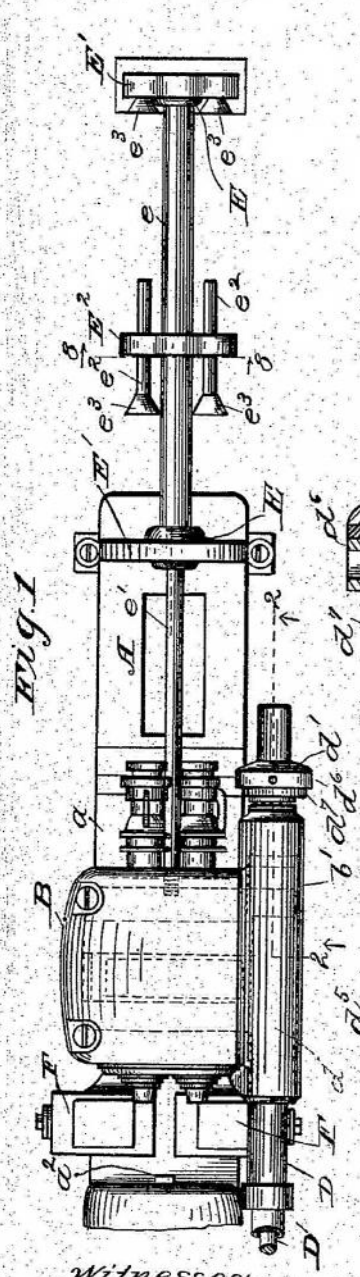

Fig. 1.

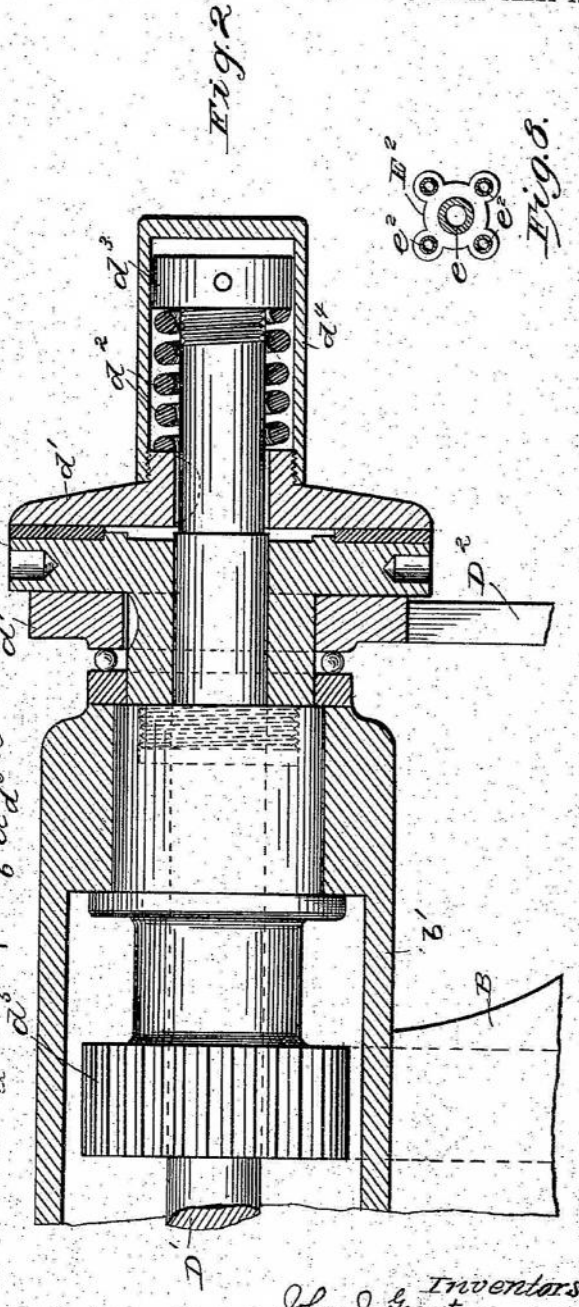

Fig. 2.

Fig. 3.

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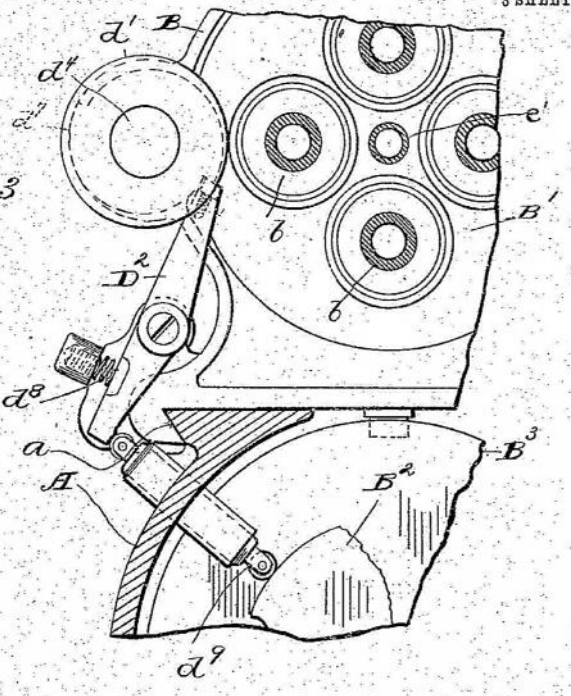
3 SHEETS—SHEET 2.

Fig. 3



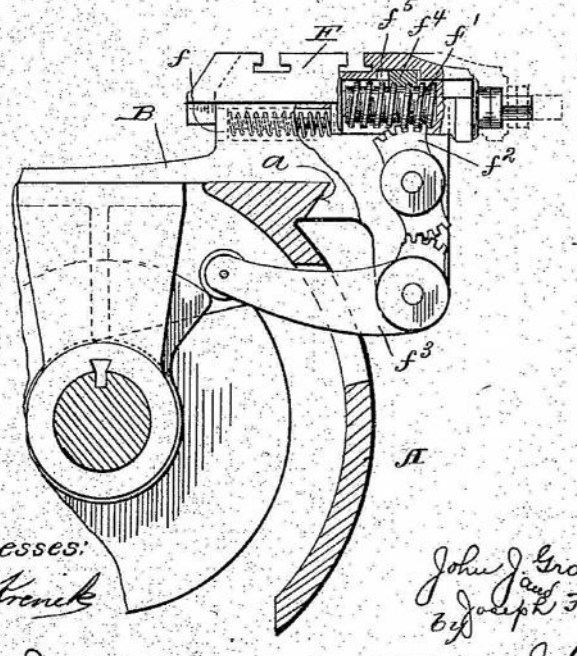


Fig. 4

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3 SHEETS—SHEET 3.

Fig 5

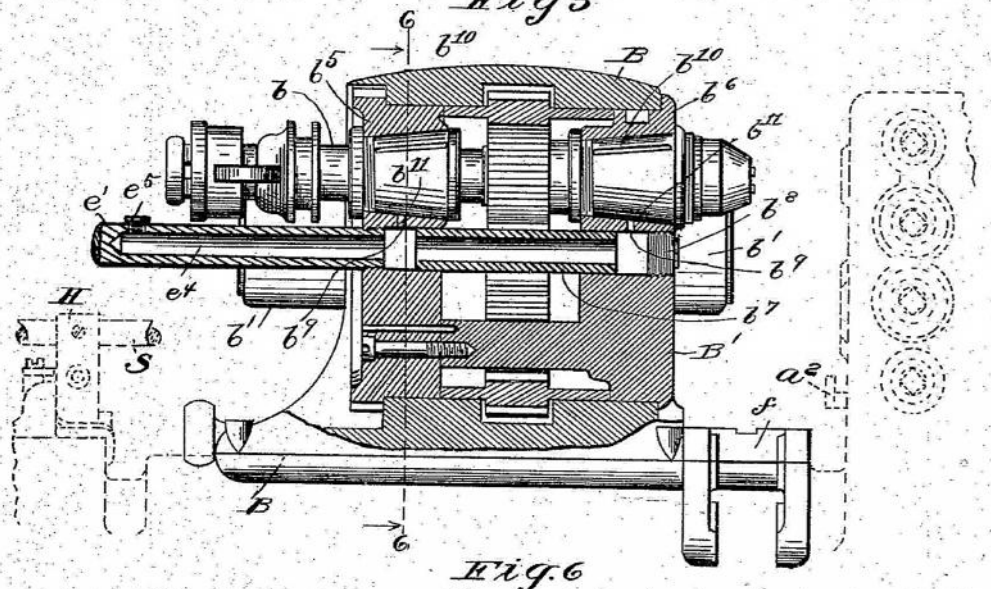

Fig. 6

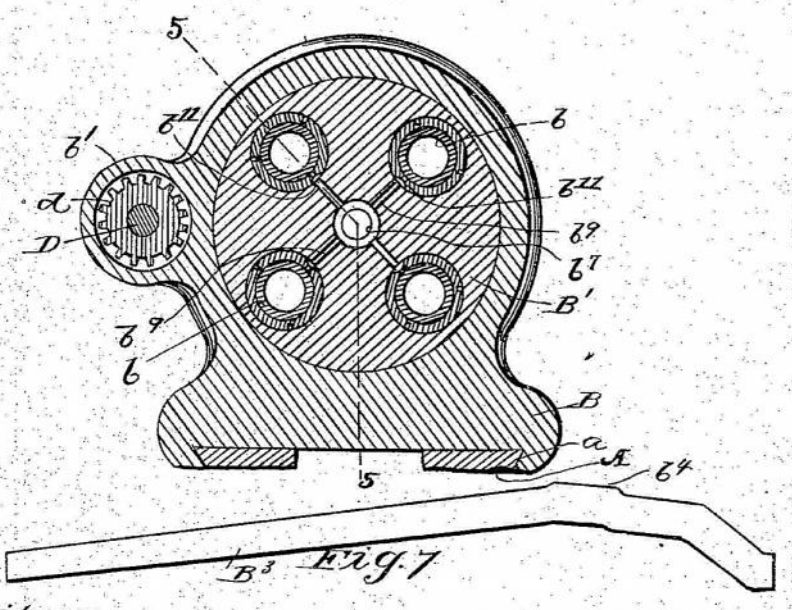

Fig. 7

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