No. 618,951. Patented Feb. 7, 1899.

J. B. CLYNE.

AUTOMATIC LATHE.

(Application filed May 8, 1897.)

(No Model.) 6 Sheets—Sheet 1.

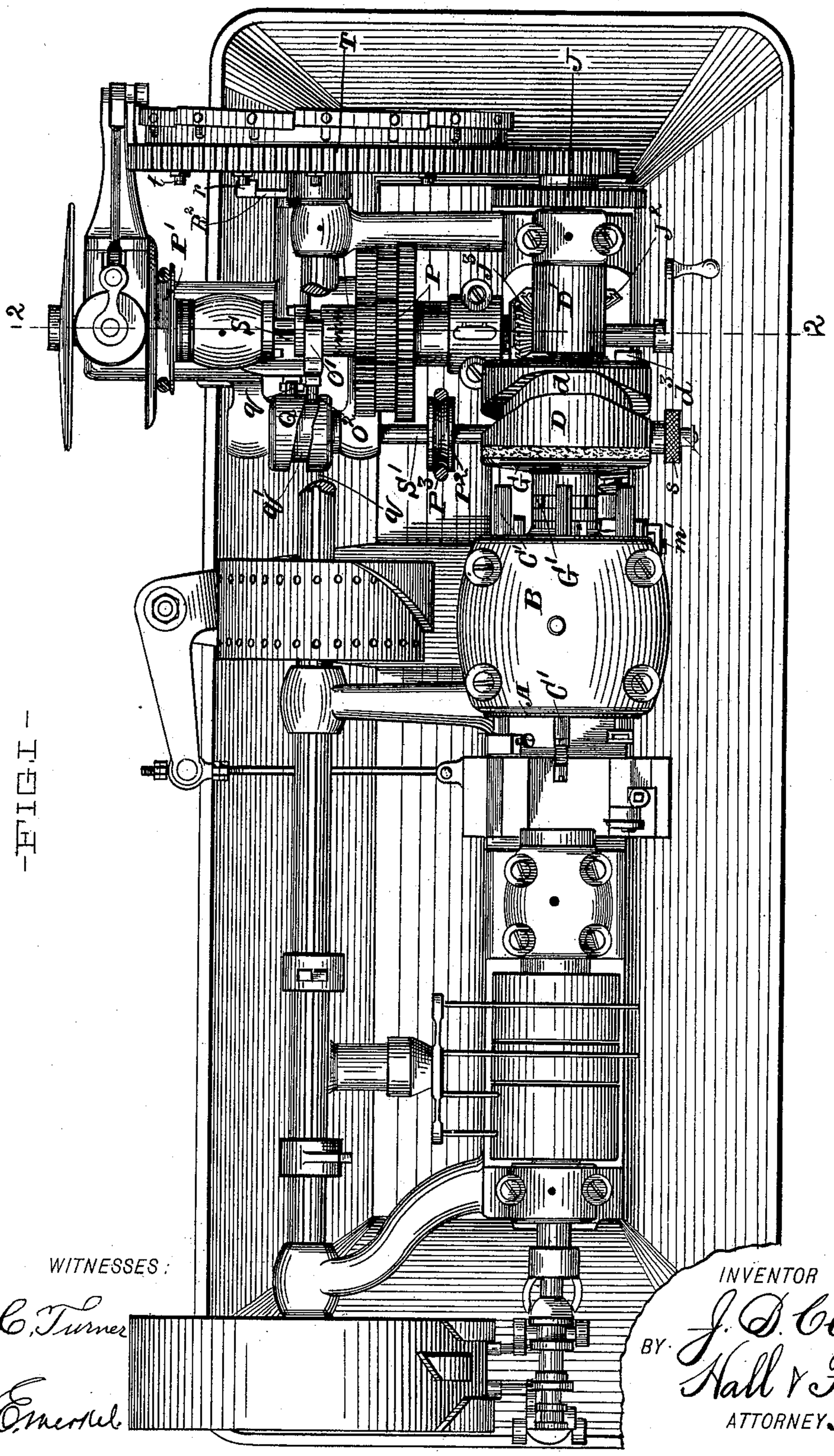

FIG. 1.

WITNESSES:

J. C. Turner

A. Emerson

INVENTOR

J. B. Clyne

BY Hall & Fay

ATTORNEYS

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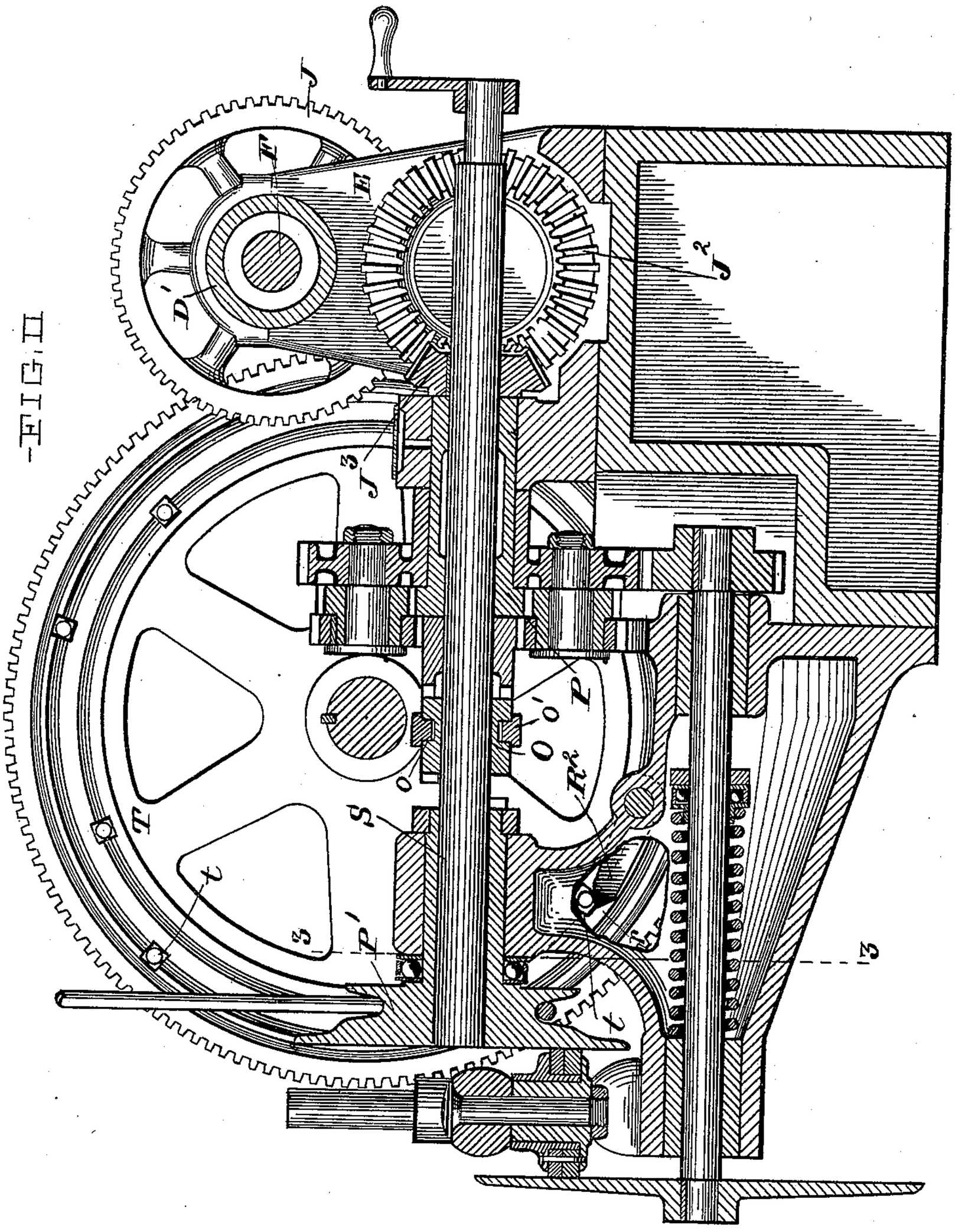
6 Sheets—Sheet 2.

FIG. II.



WITNESSES:

J. C. Turner

A. Emerkel.

INVENTOR

J. B. Clyne

BY Hall & Fay

ATTORNEYS

No. 618,951. Patented Feb. 7, 1899.

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(No Model.) 6 Sheets—Sheet 3.

FIG. IX

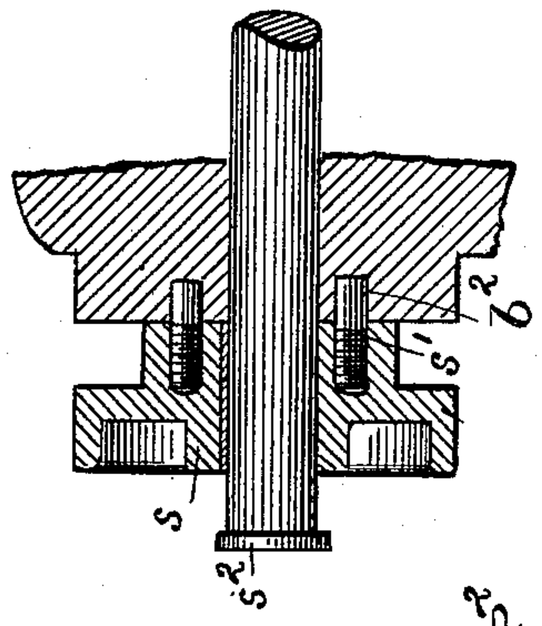
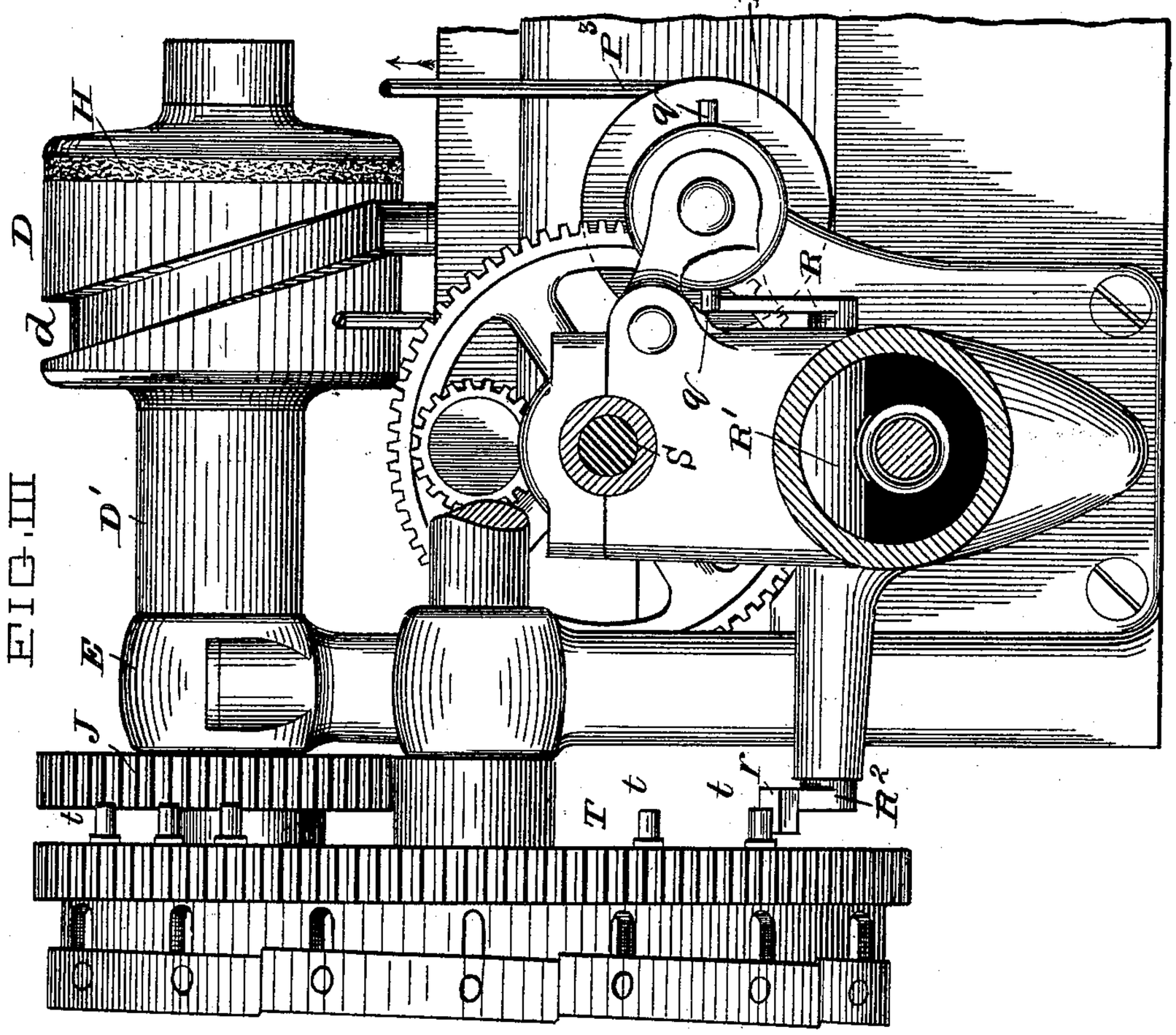


FIG. III



WITNESSES:

J. C. Turner

A. Merkel.

INVENTOR

J. B. Clyne

BY

Hall & Fay

ATTORNEYS.

No. 618,951. Patented Feb. 7, 1899.

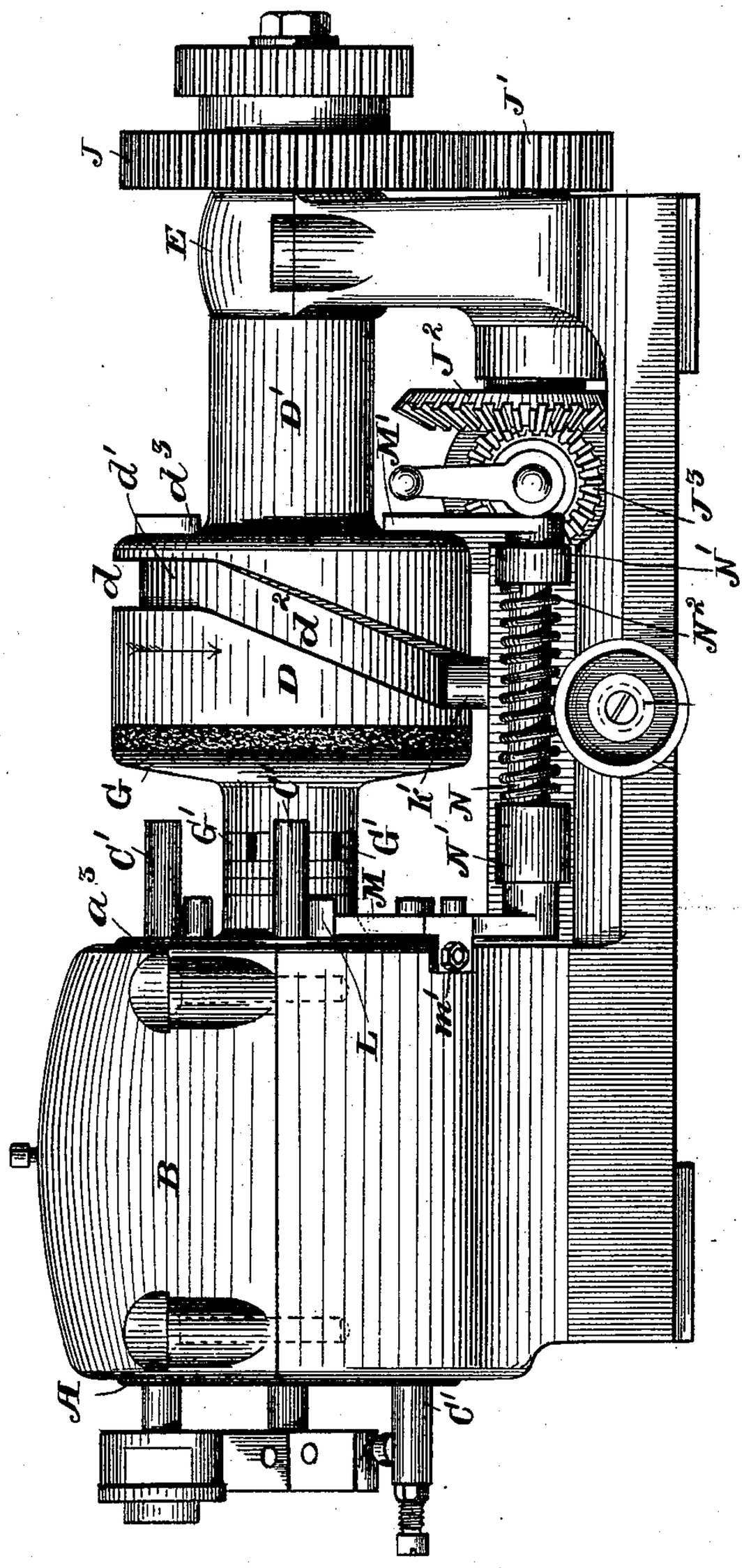
J. B. CLYNE.

AUTOMATIC LATHE.

(Application filed May 8, 1897.)

(No Model.) 6 Sheets—Sheet 4.

FIG. IV.



WITNESSES:

J. C. Turner

W. E. Merkel.

INVENTOR

J. B. Clyne

By Hall & Fay

ATTORNEYS

No. 618,951. Patented Feb. 7, 1899.

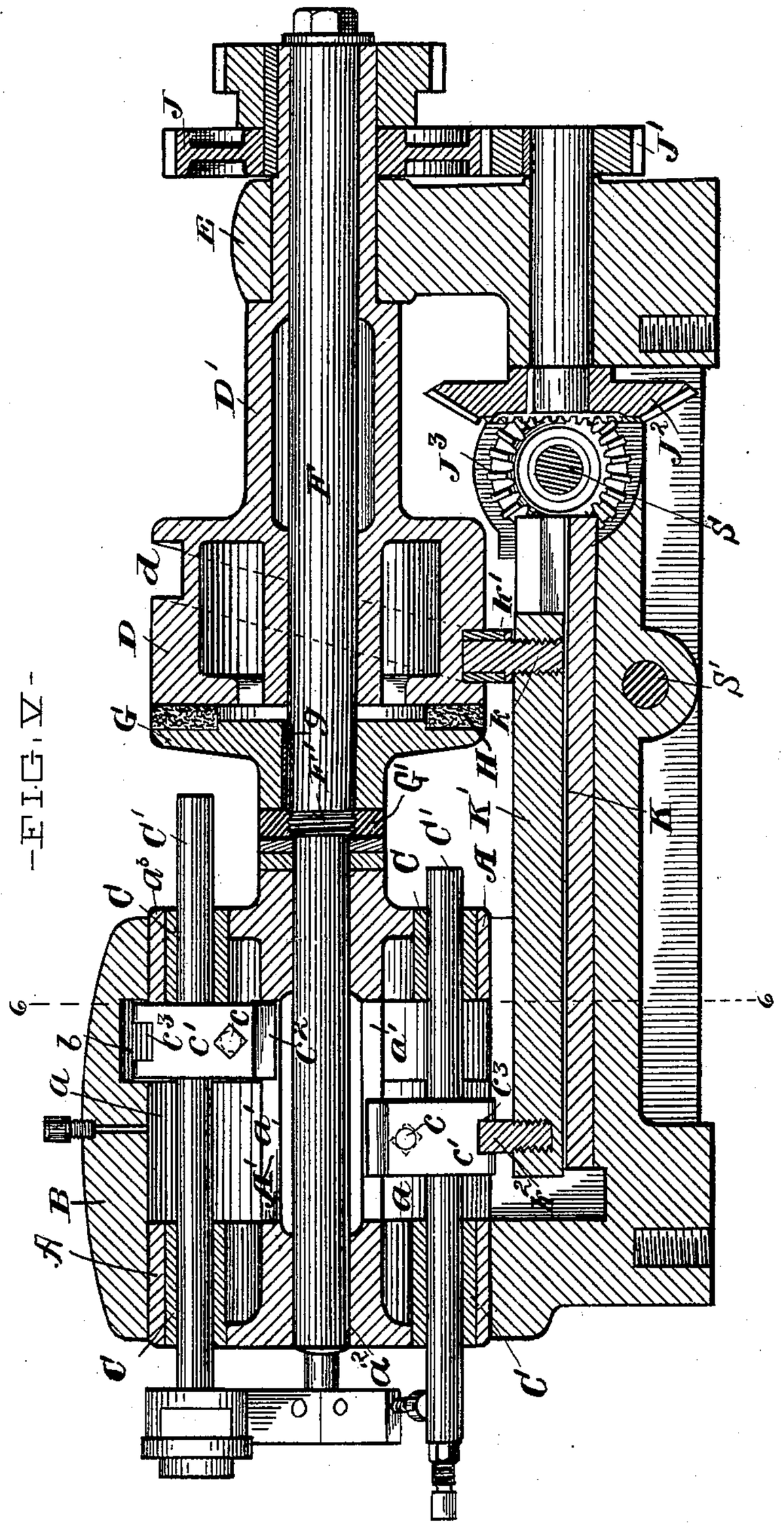
J. B. CLYNE.

AUTOMATIC LATHE.

(Application filed May 8, 1897.)

(No Model.) 6 Sheets—Sheet 5.

FIG. V.



WITNESSES:

J. C. Turner

A. E. Merkel.

INVENTOR.

J. B. Clyne

BY Hall & Fay

ATTORNEYS

No. 618,951. Patented Feb. 7, 1899.

J. B. CLYNE.

AUTOMATIC LATHE.

(Application filed May 8, 1897.)

(No Model.) 6 Sheets—Sheet 6.

FIG. VII.

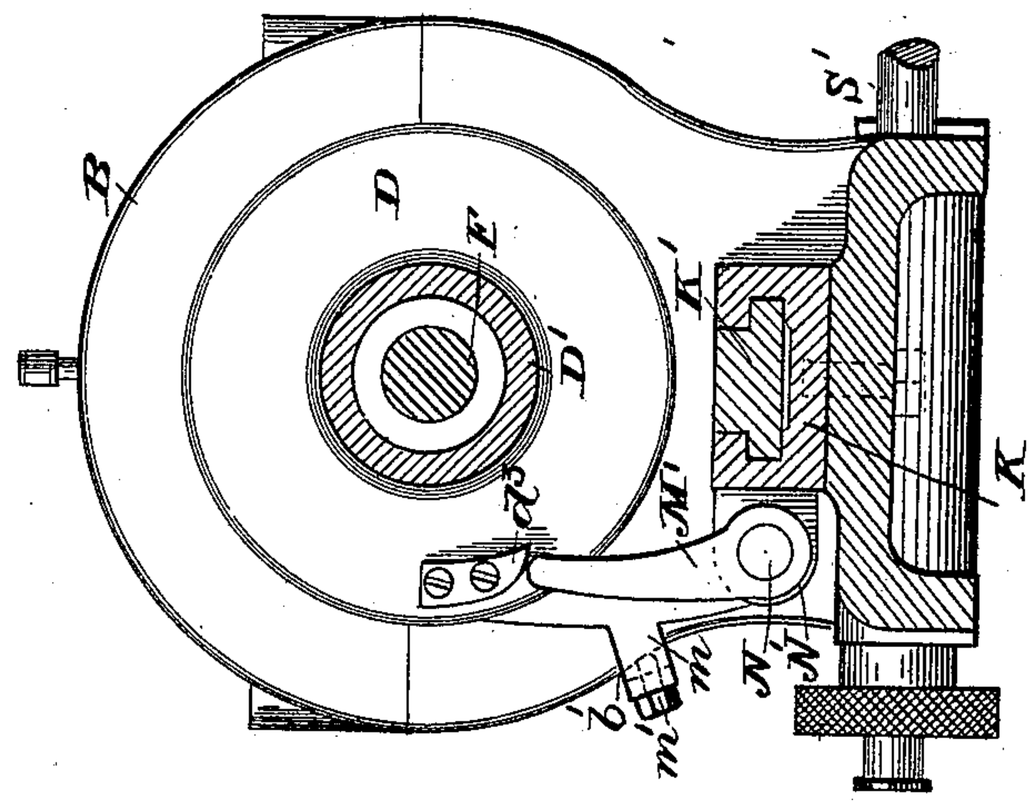


FIG. VIII.

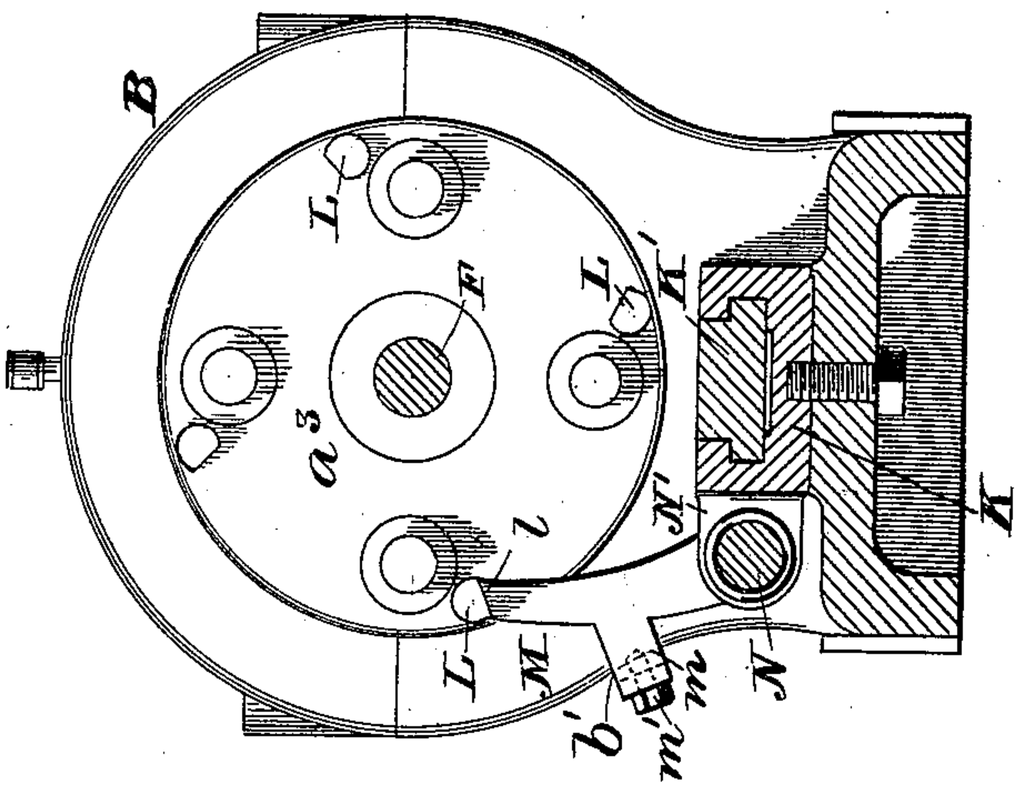
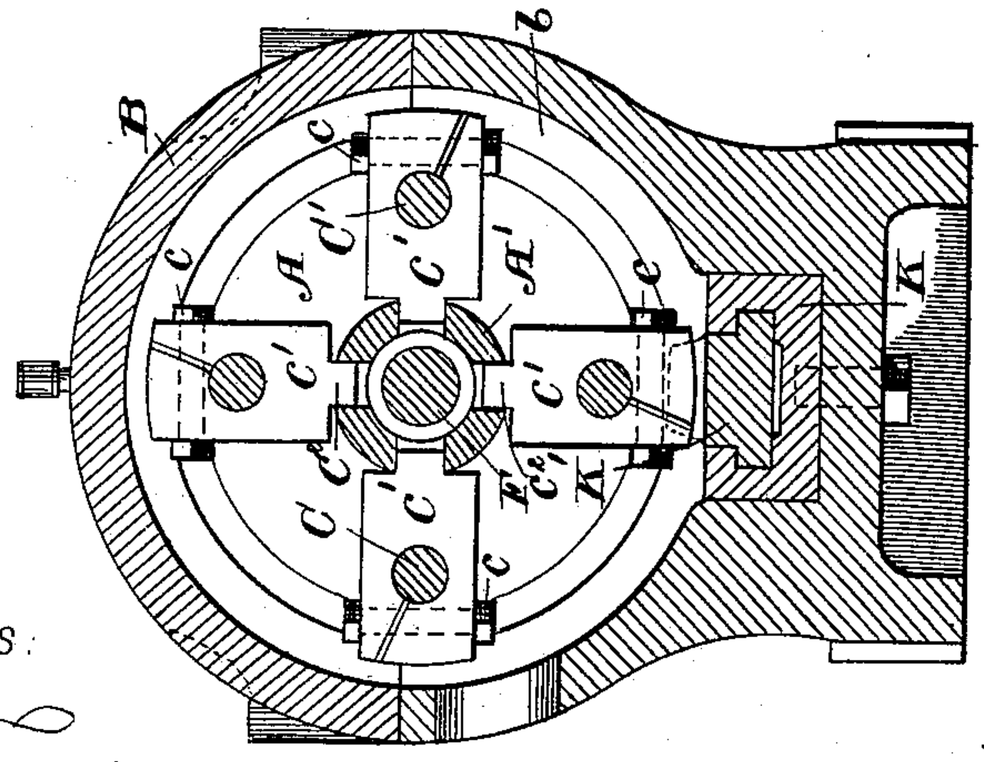


FIG. IX.



WITNESSES:

J. C. Turner

A. E. Merkel.

INVENTOR

J. B. Clyne

BY Hall & Fay

ATTORNEYS

UNITED STATES PATENT OFFICE.

JAMES B. CLYNE, OF CLEVELAND, OHIO, ASSIGNOR TO THE CLEVELAND MACHINE SCREW COMPANY, OF SAME PLACE.

AUTOMATIC LATHE.

SPECIFICATION forming part of Letters Patent No. 618,951, dated February 7, 1899.

Application filed May 8, 1897. Serial No. 635,637. (No model.)

To all whom it may concern:

Be it known that I, JAMES B. CLYNE, a citizen of the United States, and a resident of Cleveland, county of Cuyahoga, and State of Ohio, have 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 I have contemplated applying that principle, so as to distinguish it from other inventions.

The object of my invention is to make certain improvements in automatic lathes, and especially in the automatic lathe described in my Letters Patent No. 554,814, of February 18, 1896.

The improvements consist of certain mechanism hereinafter fully described.

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

In said annexed drawings, Figure I represents a top plan view of my improved lathe; Fig. II, a vertical cross-sectional view on the line 2 2 of Fig. I; Fig. III, a vertical cross-sectional view of one end of the lathe, taken on the line 3 3 of Fig. II. Fig. IV represents a side elevation of the turret and turret mechanism; Fig. V, a central vertical longitudinal cross-sectional view of said turret and turret mechanism; Fig. VI, a vertical transverse cross-sectional view of the turret, taken on the line 6 6 of Fig. V; Fig. VII, an end elevation of the turret; Fig. VIII, an end elevation of the cam-drum, and Fig. IX a detail view of a stopping mechanism.

The general operation and arrangement of my improved lathe are the same as are shown in my above-mentioned Letters Patent, which describe a lathe having a feed driving-shaft alternately engaged through the medium of a shifting clutch by a quick-driving mechanism and a slow-driving mechanism and means adapted to vary the speed of the slow-driving mechanism during its operation. Said driving mechanisms are alternately applied to operate a cam-drum, which in turn actuates a turret carrying a plurality of tools adapted to form the particular kind of article desired, such as machine-screws, nipples, rings, and various other forms.

My improvements are directed to the turret and turret mechanism and to the shifting-clutch-actuating means.

I will first describe the improved turret and turret mechanism.

The turret A consists of a casting formed with a reduced portion A′, whereby an annular space *a* is formed within the turret-housing B, in which housing the said turret is journaled. The said portion A′ is formed with longitudinal guide-slots *a*′, as many in number as there are tools to be used. In this case I have shown four, the turret being arranged to accommodate four tools. The turret is further formed with a central bore a^2.

Arranged concentrically around the axis of the turret are the four sets of bearings C, which receive the longitudinally-movable tool-carriers or tool-spindles C′. Each spindle has fastened upon it by means of a set-screw *c* a tool-clamp *c*′, the outer part of which is made of sufficient length to extend into a groove *b*, the said groove being at right angles to the axis of the turret. The inner portion of each clamp is formed with a tongue c^2, which extends into one of the guide-slots *a*′. Each clamp is further formed at its outer portion with a slot c^3 at right angles to the tongue c^2. The groove *b* terminates at each side of the bottom of the turret-housing, whereby the outer part of each clamp when in the lowermost position is free, and the clamp may be reciprocated in the annulus *a* along with its spindle.

A cam-drum D, formed with a sleeve D′, the end of which is journaled in a journal-box E, is rotatively mounted upon a turret-shaft F, which extends through the bore a^2 of the turret. A friction-disk G is mounted upon the said shaft F between the turret and the cam-drum and is operatively connected with said shaft by means of a feather *g*. A friction-washer H is interposed between the said friction-disk and the opposing face of the drum, by means of which operative connection is established between the drum and the disk and shaft. A regulating-nut G′ and a threaded portion F′ of the shaft serve

to regulate the amount of friction between the disk and drum and washer. The turret-shaft is suitably keyed or otherwise fastened to the turret A.

The cam-drum D is formed with a circumferential groove d, having a straight portion d' and an inclined portion d^2.

At the journal end of the sleeve D' is keyed a spur-gear J, which is driven by the pinion J'. The pinion J' is driven by the beveled gears J^2 and J^3, the gear J^3 being keyed onto the driving-shaft S of the lathe, which shaft is subject to variations in velocity, as above stated.

Directly beneath the middle of the turret and extending along the lathe-frame and beneath the middle of the cam-drum is a feed-slide-bar bearing K, into which fits a feed slide-bar K'. A pin k is screwed into the upper side of one end of said slide-bar and carries a small horizontal roller k', which fits snugly in the slot d of the drum D. The opposite end of the said bar is provided with a stud k^2, which fits into the slot c^3 of the tool-clamps c'. It is thus seen that the rotation of the drum D produces a reciprocating motion in the slide-bar.

The distance between the center of the pin k and the stud k^2 is such that when the pin is farthest from the turret—that is, when it is traversing the straight part d' of the drum D—the center of the stud is in the vertical plane of the middle of the groove b in the turret-housing.

The inner end face a^3 of the turret is provided with as many studs L as there are tool-spindles—in this case four. These studs are arranged concentrically with the axis of the turret.

An unlocking-dog M is secured at the end of a shaft N, journaled in suitable bearings N'. A spring N^2, suitably attached to the shaft and bearing, actuates the dog M toward the axis of the turret. A stop-lug m, formed on the dog, is pierced by a set-screw m', which abuts a lug b' on the housing B and limits the throw of the dog. The limit of the throw is so arranged that the end of the dog lies in the path of the studs L. The studs are so disposed on the face of the turret that one of the tool-spindles is nearly in its exact lowermost position when a stud is resting upon the unlocking-dog. The lower face of the stud when so resting is formed with an inclined plane l, the end of the dog being similarly formed with a plane of substantially the same inclination. By varying the position of the screw m' it is seen that the point of interruption of the turret may be varied within the limits of the throw of said screw m'. By this means the tool may be adjusted and given exactly its required position. At the opposite end of the unlocking-shaft N is formed or fastened a trip-lever M', the end of which lies in the path of a cam-segment d^3, fastened upon the side of the cam-drum D. The said segment d^3 on passing engages the end of the said trip-lever, throwing it outwardly. The unlocking-dog is at the same time thrown outwardly out of the path of the studs L and leaves the turret free to turn during such time. The cam-segment having passed, the spring N^2 causes the shaft, dog, and trip-lever to resume their original positions.

The operation of the turret and turret mechanism is as follows: The shaft S being driven, as before mentioned, at a variable speed imparts its motion to the cam-drum D, which reciprocates, as was explained, the feed slide-bar K'. When the pin k is traversing the end of the straight portion d' of the groove d, the feed slide-bar is about to begin its stroke—that is, the said pin is about to enter the inclined portion of said groove. The unlocking-dog is engaging at the same time one of the studs L, thereby preventing the rotation of the turret, turret-shaft, or friction-plate G, thereby rendering the friction-washer inoperative. The tool and tool-spindles now being advanced subject to the changes in speed experienced by the driving-shaft S return, and at the instant the pin k reënters the straight groove portion d' the cam-segment d^3 trips the trip-lever, throws the unlocking-dog out, and removing the resistance against the friction between the cam-drum face and the friction-washer and the friction-washer and the friction-plate thereby renders the friction-clutch operative, whereupon the disk, turret-shaft, and turret rotate. Before, however, the succeeding stud L is permitted to pass the cam-segment d^3 releases the trip-lever and the unlocking-dog resumes its position and interrupts the rotation of the turret by engaging the succeeding stud. The rotation of the turret has now brought a second tool around into position, its tool-clamp slot c^3 engaging the stud k^2 on the feed slide-bar, which has during the rotation of the turret remained stationary, the roller k' having been traversing the straight portion d' of the cam-drum groove. As soon as the dog is again in its locking position the roller reënters the inclined portion d^2 of the groove, and the reciprocation of the feed slide-bar is repeated. The different tools are thus caused to successively assume their operative positions.

I will now describe my improved shifting-clutch-actuating means which operate the clutch that changes the rotation of the shaft S from a rapid rotation during the return stroke of the feed slide-bar and the rotation of the turret to a slow and varying rotation during the advance of said slide-bar.

The clutch O, Fig. II, is feathered on the shaft S and engages on the one hand the system of differential gearing P and directly with the driving-pulley P' on the other in a manner substantially as shown and described in my above-mentioned Letters Patent. A shifting cam-drum Q, Fig. I, is fixed upon a shaft S' parallel with the shaft S and has fixed on opposite sides projecting studs q. The said clutch O is formed around its pe-

riphery with a groove *o*, in which fits and slides the yoke *o'*. A projecting lug is formed on the yoke and carries a roller o^2, which fits and slides in the groove *q'* of the shifting cam-drum Q.

An unlocking-dog R, shaft R', and trip-lever R^2, Fig. III, are provided, the said shaft being journaled transversely of the shaft S in suitable bearings. The end of said dog is so arranged that it may be moved by rocking the shaft R' into the path of either of the studs *q*. The rocking is performed at suitable required intervals by studs *t*, arranged on the inner face of the regulating-drum T to successively engage the upper and lower inclined surfaces *r* at the end of the trip-lever R^2.

On the shaft S' is keyed a pulley P^2, driven by a round belt P^3, the said pulley and belt forming the cam-actuating means. The end of the said shaft S' projects beyond the frame of the lathe and has feathered upon said end a hand-wheel *s*, provided with two studs *s'*, Fig. IX, adapted to fit into two small holes b^2, drilled into the lathe-frame. A nut s^2 prevents the dislocation of said wheel. The said holes are so placed that when the hand-wheel is drawn outwardly and against the nut s^2 and rotated in a direction opposite to that which it receives when the shaft is free to be rotated by the friction of the belt P^3, running upon the friction-pulley P^2, and the studs *s'* inserted in said holes, and shaft S' is thus rotated in a direction opposite that of the rotation of the shifting cam-drum Q, the clutch will be in a position midway between the differential gearing and the driving-pulley clutch-engaging means—that is, in an inoperative position, engaging neither the one nor the other of the driving mechanisms. The belt P^3 is kept running continuously in the direction indicated by the arrow in Fig. III, and so long as the locking-dog R engages one of the studs *q* and thus renders the cam-drum inoperative it slips around said pulley; but as soon as the said dog is shifted by means of one of the studs *t* and the trip-lever R^2 the belt moves the pulley, shaft, and cam-drum until the rotation of the said drum is again interrupted by the locking-dog R. The studs *t* are so arranged that the trip-lever is operated in such a manner that the cam-drum may be permitted to make successive half-revolutions and that the dog engages each stud *q* alternately. The clutch is thus reciprocated to engage alternately the differential gearing and the driving-pulley.

When it is desired to stop the machine without stopping the driving-pulley, the hand-wheel *s* is actuated to render the clutch inoperative, as above described.

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

I therefore particularly point out and distinctly claim as my invention—

1. In an automatic lathe, the combination of a turret journaled in a housing, tool-spindles mounted in said turret and provided with projecting means, a reciprocating feed slide-bar adapted to engage said projecting means and means adapted to rotate said turret whereby said reciprocating bar is caused to successively engage with and reciprocate each spindle, said turret-housing provided with a transverse and longitudinal guideway, said projecting means adapted to travel in said ways, substantially as set forth.

2. In an automatic lathe, the combination of a turret journaled in a housing, tool-spindles mounted in said turret and provided with projecting means, reciprocating means adapted to engage said projecting means and means adapted to intermittently rotate said turret whereby said reciprocating means is caused to successively engage with and reciprocate each spindle, said turret-housing provided with a transverse and a longitudinal guideway, said projecting means adapted during the rotation of the turret to travel in said transverse way and during the non-rotative period, to travel in said longitudinal way, substantially as set forth.

3. In an automatic lathe, the combination of a turret journaled in a housing, tool-spindles mounted in said turret and provided intermediately of the extremities with projecting means, reciprocating means adapted to engage said projecting means, and means adapted to intermittently rotate said turret, said housing provided with transverse and longitudinal guideways, said projecting means adapted, during the rotation of the turret to travel in said transverse way and during the non-rotative period to travel in said longitudinal way, substantially as set forth.

4. In an automatic lathe, the combination of a turret formed with a reduced portion whereby an annular space is formed, tool-spindles mounted in said turret and traversing said space, each of said spindles provided with projecting means and means adapted to rotate said turret whereby said projecting means are caused to successively engage said reciprocating means, whereby said spindles are caused to successively reciprocate in said annulus, substantially as set forth.

5. In an automatic lathe, the combination of a plurality of tool-spindles, means for intermittently revolving said spindles about an axis so as to successively bring each tool into operative position, a guideway arranged transversely of the axis of revolution of the spindles, a second guideway arranged longitudinally with respect to said axis, said spindles provided with means adapted to traverse said guideways and means for reciprocating said means in said longitudinal way, substantially as set forth.

6. In an automatic lathe, the combination of a plurality of tool-spindles, means for in-

termittently revolving said spindles about an axis so as to successively bring each tool into operative position, a guideway arranged transversely of the axis of revolution of the spindles, a second guideway arranged longitudinally with respect to said axis and joining said transverse guideway, said spindles provided with means adapted to traverse said guideways and means for reciprocating said means in said longitudinal way, substantially as set forth.

7. In an automatic lathe, the combination of a plurality of tool-spindles, means for intermittently revolving said spindles about an axis so as to successively bring each tool into operative position, a guideway arranged transversely of the axis of revolution of the spindles, a second guideway arranged longitudinally with respect to said axis and joining said transverse guideway, said spindles each provided with a tool-clamp secured thereto, said clamp adapted to traverse said guideways, and means for reciprocating said means in said longitudinal way, substantially as set forth.

8. In an automatic lathe, the combination of a turret, a cam-drum adapted to rotate said turret, tool-carriers mounted in said turret, and a reciprocating feed slide-bar adapted to successively actuate said carriers, said cam-drum adapted to actuate said slide-bar, substantially as set forth.

9. In an automatic lathe, the combination of a turret, means adapted to rotate said turret, and means adapted to interrupt the rotation of said turret, said interrupting means provided with adjusting means adapted to vary the point of interruption, substantially as set forth.

10. In an automatic lathe, the combination of a turret, means adapted to rotate said turret, and means adapted to interrupt the rotation of said turret with respect to said rotating means, and provided with adjusting means adapted to vary the point of interruption, substantially as set forth.

11. In an automatic lathe, the combination of a turret provided with projecting means, means adapted to rotate said turret, and means adapted to periodically engage said projecting means, whereby said turret is held stationary with respect to said rotating means, said engaging means provided with adjusting means adapted to vary the point of interruption, substantially as set forth.

12. In an automatic lathe, the combination of a turret, rotating means, clutch mechanism adapted to establish operative connection between said turret and said rotating means, and means adapted to interrupt the rotation of said turret and disestablish connection between said turret and rotating means, said interrupting means provided with adjusting means adapted to vary the point of interruption, substantially as set forth.

13. In an automatic lathe, the combination of a turret, rotating means, a friction-disk operatively connected with said turret, a friction-washer adapted to establish operative connection between said disk and rotating means and means adapted to periodically interrupt said turret whereby said washer is periodically rendered inoperative, said rotating means adapted to actuate said interrupting means, substantially as set forth.

14. In an automatic lathe, the combination of a turret provided with projecting studs, rotating means, a friction-disk operatively connected with said turret, a friction-washer adapted to establish operative connection between said disk and rotating means, and a dog adapted to periodically engage said studs, whereby said washer is periodically rendered inoperative, said rotating means adapted to actuate said dog, substantially as set forth.

15. In an automatic lathe, the combination of a rotatable turret, a dog adapted to periodically engage said turret, and means adapted to actuate said dog, said dog provided with means adapted to vary the throw whereby the point of interruption of said turret may be varied, substantially as set forth.

16. In an automatic lathe, the combination of a rotatable turret, a dog adapted to periodically engage said turret and provided with means adapted to engage a stationary portion of the lathe and vary the throw of said dog, whereby the point of interruption of said turret may be varied, and means adapted to actuate said dog, substantially as set forth.

17. In an automatic lathe, the combination of a rotating turret, a dog adapted to periodically engage and interrupt said turret, and means adapted to actuate said dog, the engaging portions of dog and turret being formed with inclined engaging surfaces, whereby the point of interruption may be varied, substantially as set forth.

18. In an automatic lathe, the combination of a rotatable turret provided with projecting studs, a dog adapted to engage said studs, means adapted to periodically actuate said dog to successively engage said studs, the engaging portion of dog and studs being formed with inclined engaging planes, said dog provided with adjustable means adapted to engage a stationary portion of the lathe, whereby the throw of said dog may be varied and whereby the relative positions of said engaging planes at the point of interruption may be varied whereby said point may also be varied, substantially as set forth.

19. In an automatic lathe, the combination of a shifting clutch, means adapted to operate said clutch, means adapted to actuate said operating means, and means adapted to periodically render said actuating means inoperative whereby said operating means may be periodically interrupted, substantially as set forth.

20. In an automatic lathe, the combination of a shifting clutch, a clutch-cam adapted to operate said clutch, means adapted to actuate said cam, and means adapted to periodically

interrupt said cam-actuating means, substantially as set forth.

21. In an automatic lathe, the combination of a shifting clutch, a clutch-cam adapted to operate said clutch, means adapted to actuate said cam, a dog adapted to engage said cam, and means adapted to periodically actuate said dog, substantially as set forth.

22. In an automatic lathe, the combination of a shifting clutch, a clutch-cam adapted to operate said clutch, a friction-pulley adapted to actuate said cam, a dog adapted to engage said cam, and means adapted to periodically actuate said dog, substantially as set forth.

Signed by me this 3d day of May, 1897.

JAMES B. CLYNE.

Attest:
A. E. MERKEL,
DAVID T. DAVIES.