(No Model.) 5 Sheets—Sheet 1.

C. L. GRIMES.

MACHINE FOR FORMING EYES, HOOKS, &c.

No. 582,283. Patented May 11, 1897.

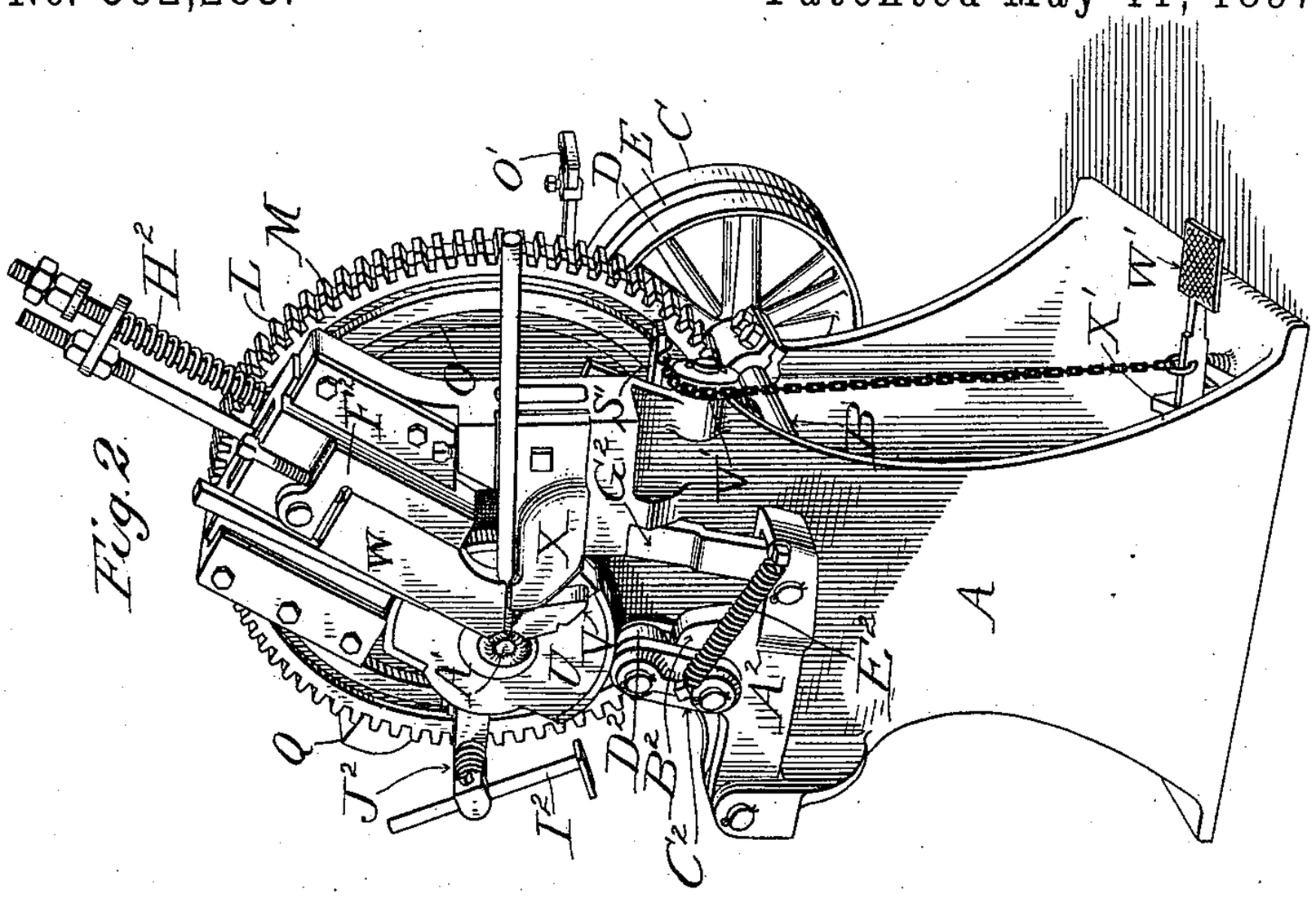

Fig. 2.

Fig. 1.

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Fig. 3.

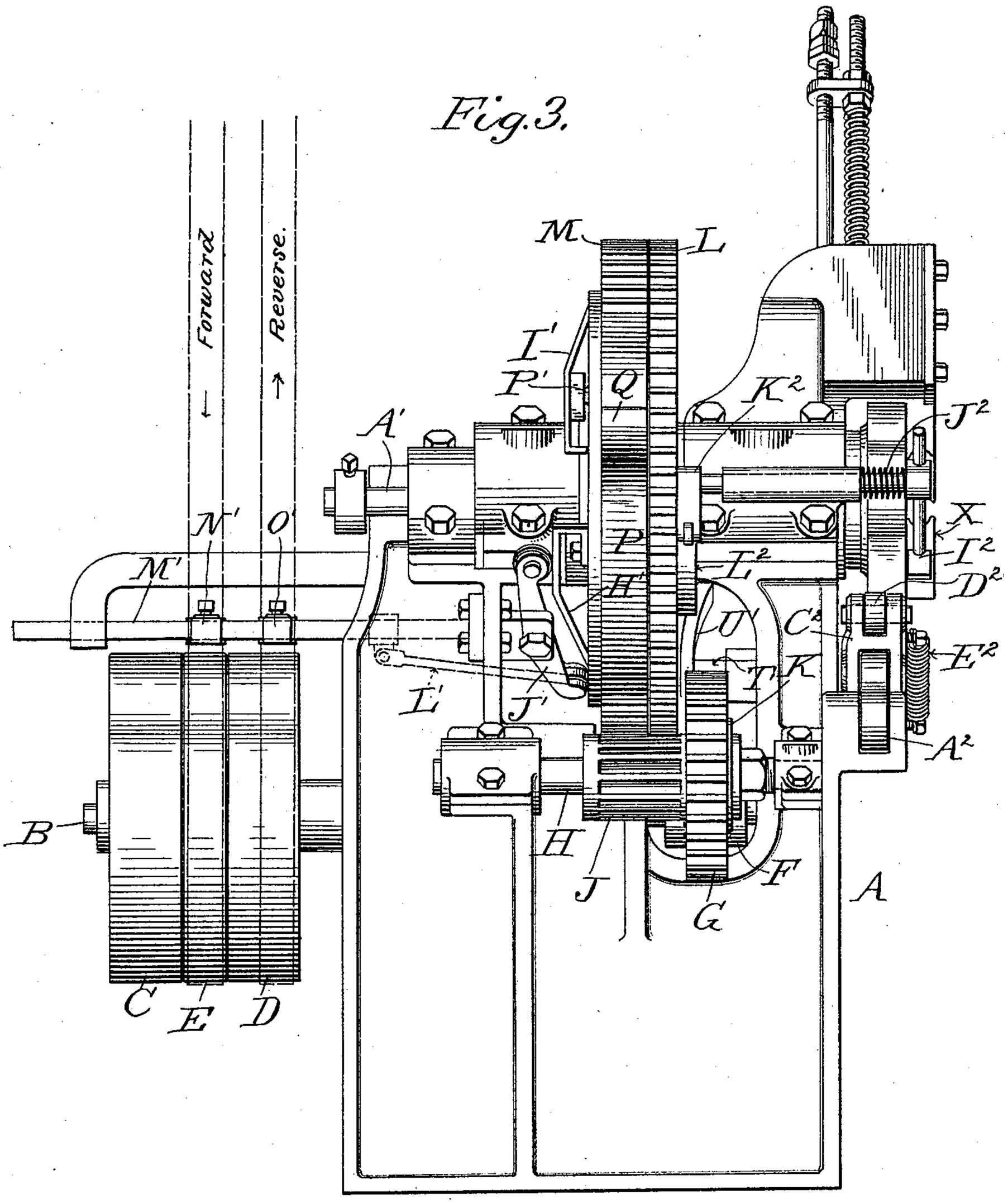

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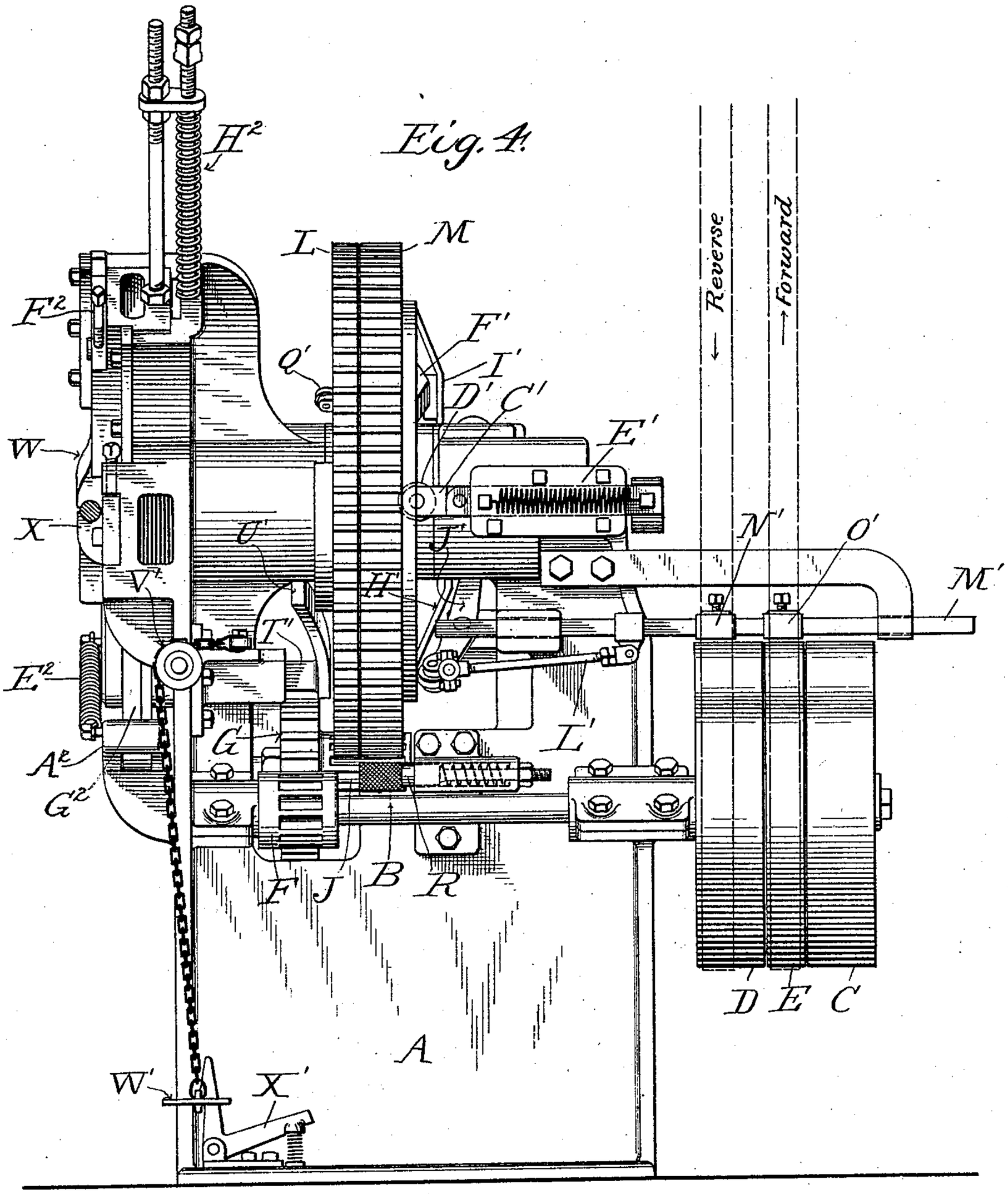
Fig. 4.



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C. L. GRIMES.

MACHINE FOR FORMING EYES, HOOKS, &c.

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Fig. 5.

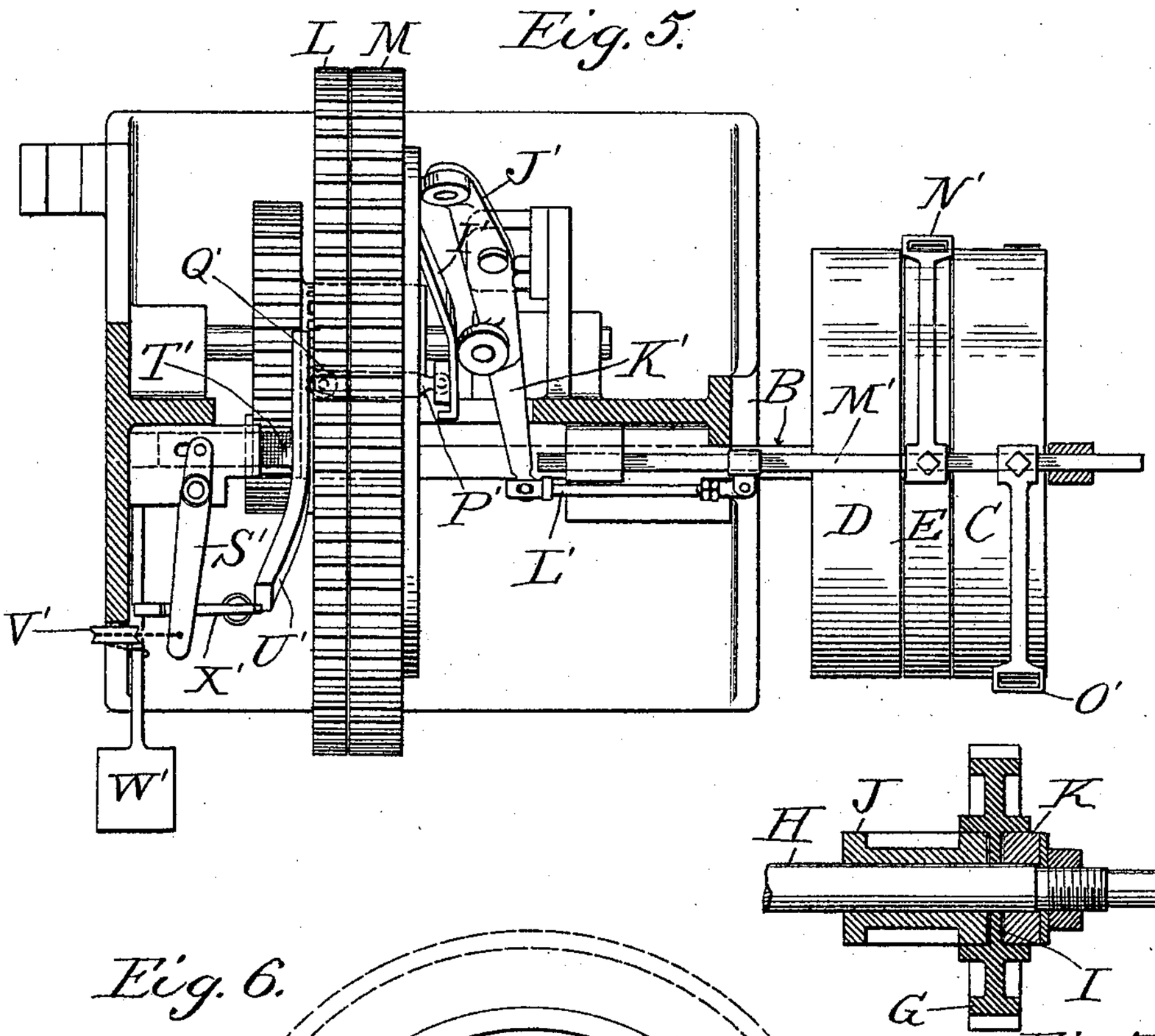

Fig. 6.

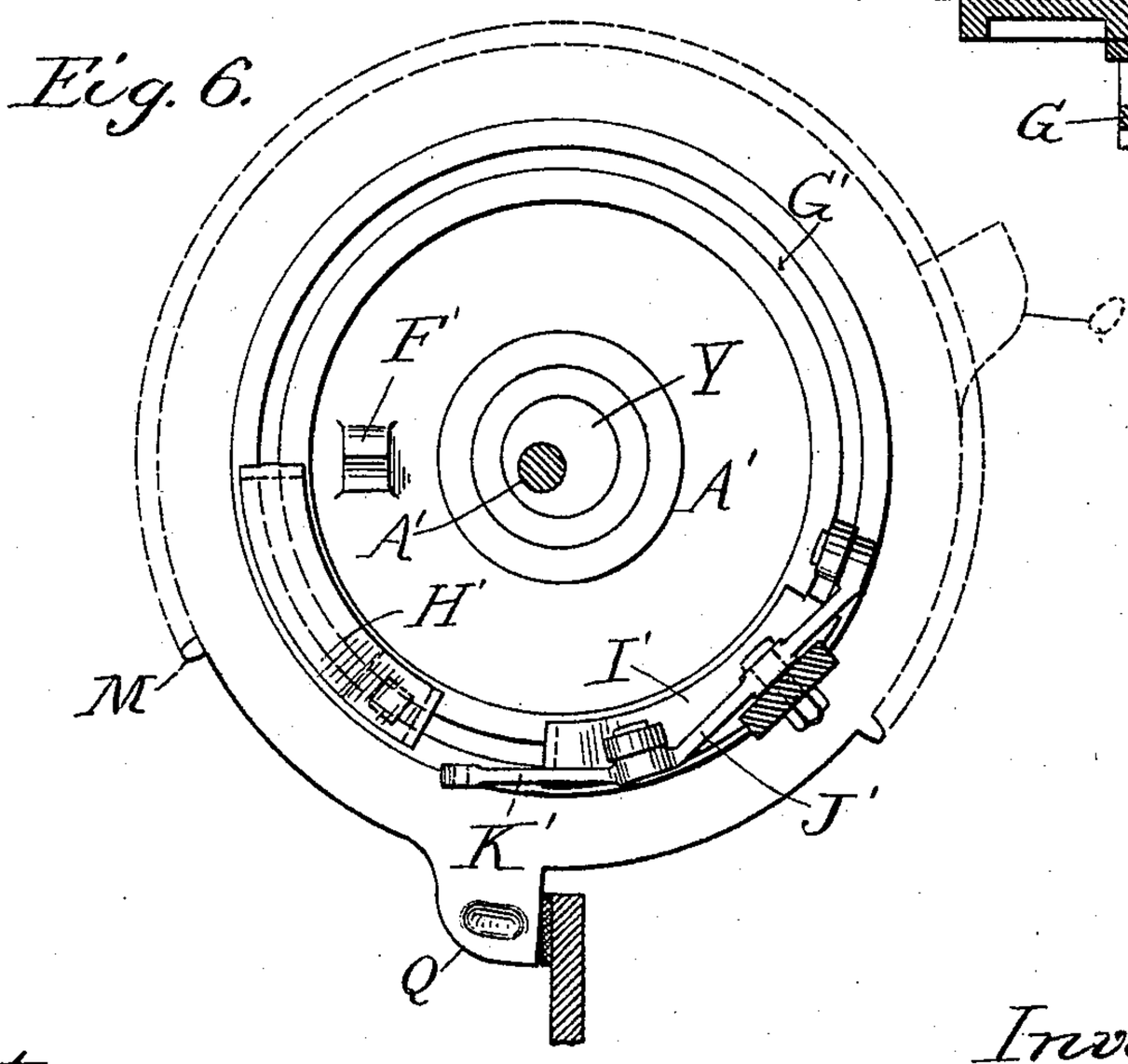

Fig. 7.

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No. 582,283. Patented May 11, 1897.

Fig. 8.

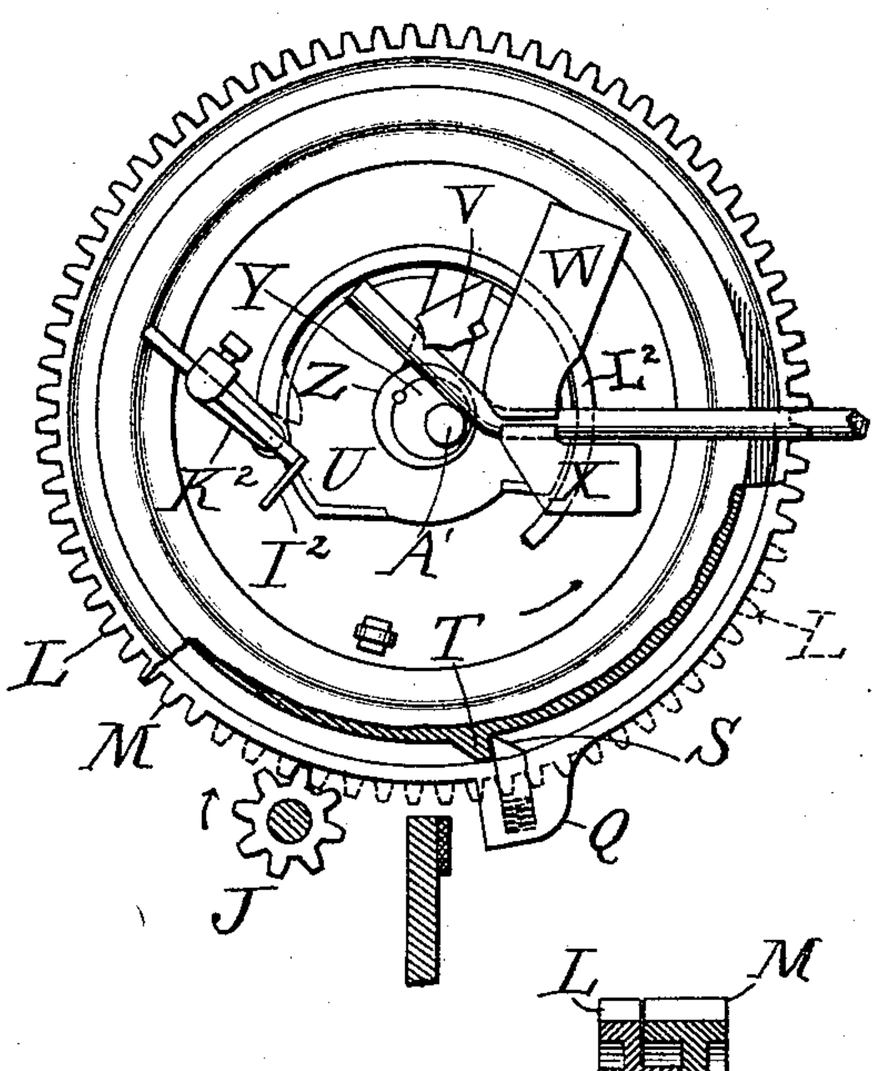


Fig. 9

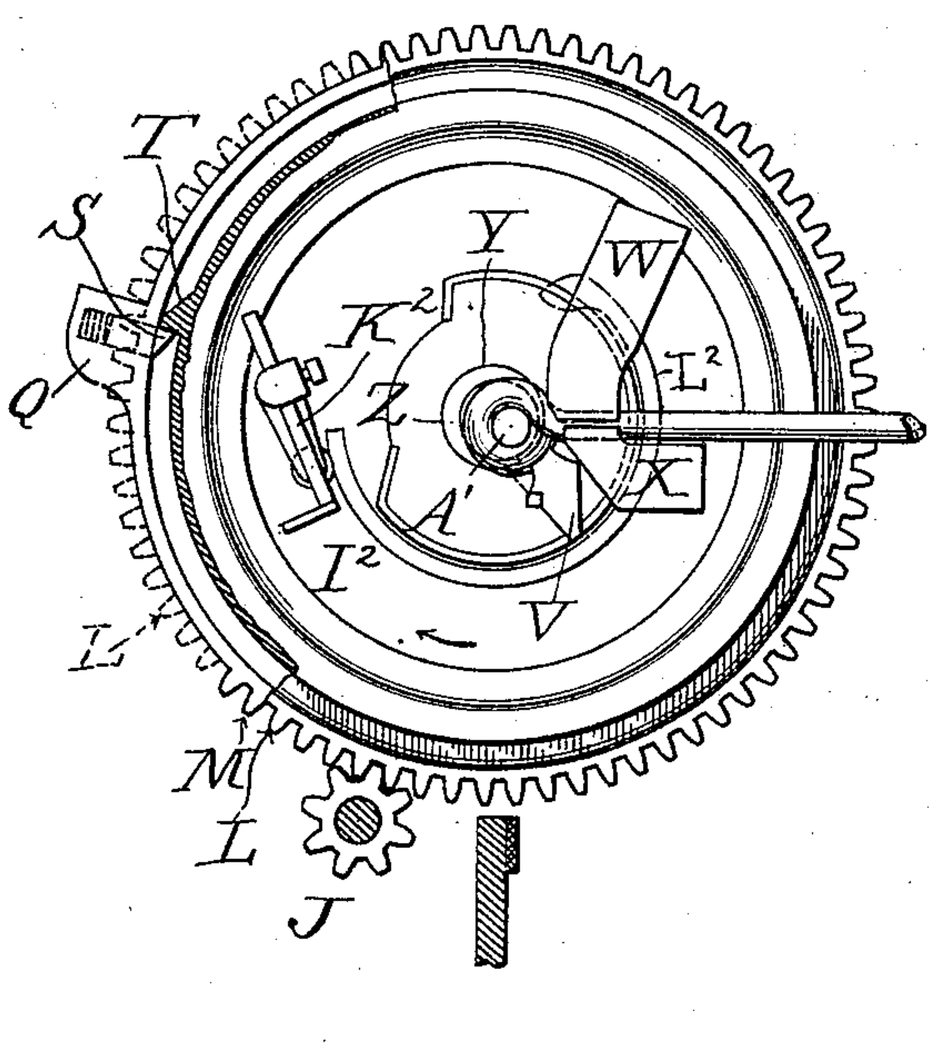


Fig. 10.

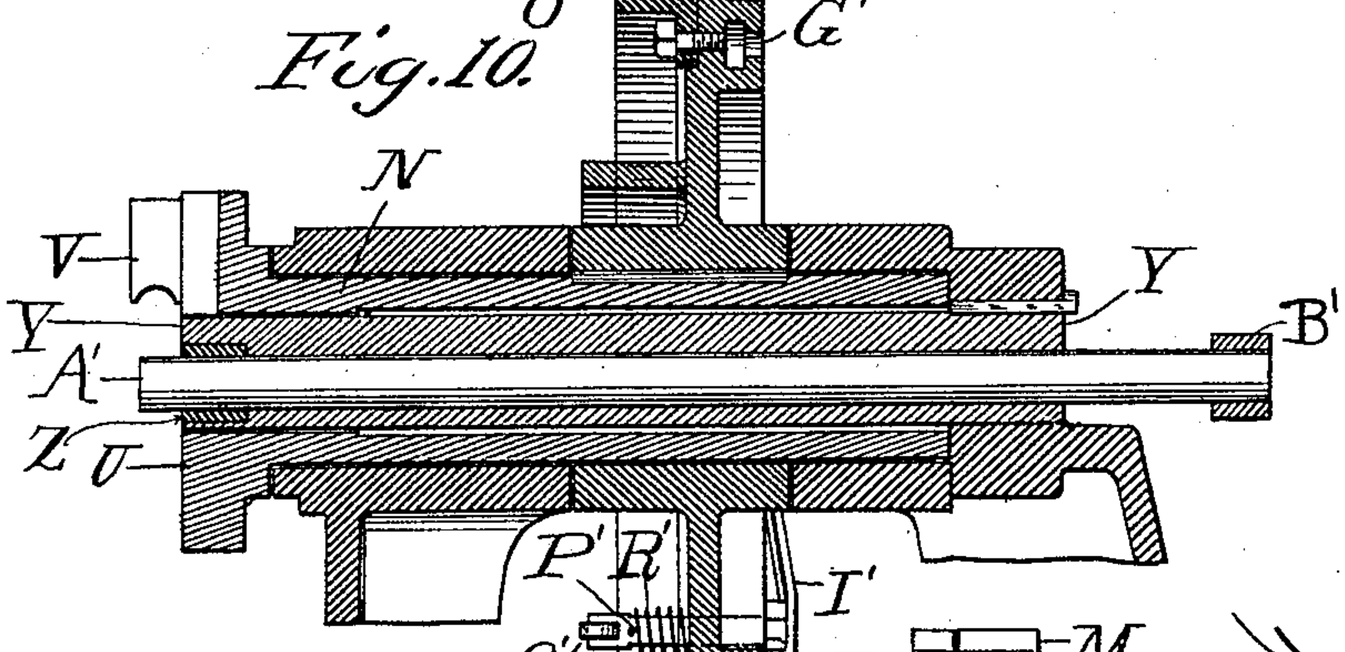
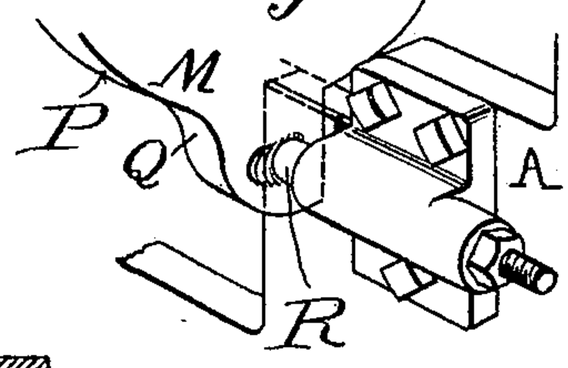


Fig. 11.

Fig. 12.

Fig. 13



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UNITED STATES PATENT OFFICE.

CHARLES LOOMIS GRIMES, OF MOLINE, ILLINOIS, ASSIGNOR TO THE WILLIAMS, WHITE & COMPANY, OF SAME PLACE.

MACHINE FOR FORMING EYES, HOOKS, &c.

SPECIFICATION forming part of Letters Patent No. 582,283, dated May 11, 1897.

Application filed November 27, 1896. Serial No. 613,606. (No model.)

To all whom it may concern:

Be it known that I, CHARLES LOOMIS GRIMES, a citizen of the United States, residing at Moline, in the county of Rock Island and State of Illinois, have invented certain new and useful Improvements in Machines for Forming Eyes, Hooks, and the Like, of which the following is a specification.

My invention relates to machines for forming or bending eyes, hooks, and the like; and the advantages and construction of the structure will be hereinafter more fully set forth, reference being had to the annexed drawings, in which—

Figures 1 and 2 are perspective views of my improved machine; Fig. 3, a side elevation; Fig. 4, an elevation of the machine viewed from the opposite side; Fig. 5, a horizontal sectional view showing the details of the belt-shifting mechanism; Fig. 6, a rear face view of the power-gears, illustrating the relation of the belt-shifting mechanism thereto; Fig. 7, a sectional view setting forth the connection and arrangement of certain pinions whereby too great a strain upon the dies may be avoided; Figs. 8 and 9, face views, partly in section, of the power-gears, the dies, and other attendant parts, showing their relation to one another and to the material being operated upon; Fig. 10, a vertical sectional view taken through the mandrel and the power-gears; Fig. 11, a horizontal sectional view taken through the gears and mandrel, and Figs. 12 and 13 perspective views illustrative of certain details of construction.

The object of the present invention is to construct a machine to form eyes upon metal bars or rods and to provide adjustments in said machine whereby a full eye may be formed or only a portion of an eye made without the necessity of changing the dies and mandrel.

A further object of the invention is embraced in the idea of providing means whereby the work is released the instant the operation is complete and the dies thereupon thrown wide apart.

A still further object is to provide means whereby the machine may be made to operate continuously or be made to stop at the completion of each piece of work.

Other objects and advantages are present and will present themselves in the following description.

Referring to Figs. 1 to 5, inclusive, A denotes the base of the machine; B, a shaft mounted in suitable bearings thereon and provided at its end with two loose band-pulleys C and D and an intermediate fast pulley E. To the inner end of shaft B is affixed a pinion F, which is in gear with a gear G, mounted, as shown in Fig. 7, upon a shaft H. Gear G is formed with an internal flange I, having a central opening through which shaft H passes, the flange being embraced between a pocket-pinion J and a collar K, held up against flange I with the desired pressure by a suitable washer and jam-nut. Pinion J, keyed to shaft H, is directly in gear at all times with a large gear-wheel L and at times, as will afterward appear, in gear with a second large gear-wheel M.

Mounted in suitable bearings on the frame, as will be clearly seen in Figs. 10 and 11, is a sleeve N, and to this sleeve is keyed the gear M. Gear L has its bearing formed by a collar O, directly bolted to gear M, said gear L being free to rotate or move on said collar under certain conditions. Gear L is always in mesh with pinion J, but the larger gear M is mutilated—that is, it has a space P upon its periphery which has no teeth, and consequently when this portion of the gear comes into line with the pinion said pinion and gear become disconnected so far as any direct connection is concerned. This blank portion P will be seen upon reference to Figs. 3, 8, 9, and 10.

Upon the periphery of the gear M within the blank space P is formed a stop or lug Q, which projects some little distance beyond the face of the gear, being designed to abut against a portion of the frame or bed of the machine, as is indicated in Figs. 3, 6, 8, 9, 10, and 13. The point or face of the frame against which the lug or stop strikes is faced with rubber or the like in order to absorb any jar or concussion that would otherwise be imparted to the frame. A slight depression or recess is formed in the side face of the lug or stop, and a spring-bolt R, Figs. 4 and 13, is so

placed that it enters the recess when the stop is in engagement with the frame and holds the stop and gear, preventing any rebound. The engagement is simply a frictional one, and no manipulation of the bolt is necessary to disengage it when the gear begins its return movement.

A spring-dog S is mounted within the stop Q and takes against a stop T, secured upon or formed integral with gear L, as is clearly shown in Figs. 8 and 9. In said figures, for the purpose of illustration, the smaller gear L is broken away in part, but the teeth of said broken part are shown in dotted lines in order that its connection with pinion J may be clearly understood.

So long as both gears L and M are in mesh with pinion J they will be rotated thereby, but it is desirable, for a reason that will appear later on, that the gear M, which in effect is the one which does all of the work, should be freed from the driving action of the pinion, and for this reason the blank space P is provided.

In Fig. 8 the machine is just starting forward and parts moving in the direction indicated by the arrows. Before reaching this position, however, pinion L will have rotated a short distance independent of gear M, and not until the stop T engages the dog S does gear M move. So soon as this engagement takes place the gears move together, and the space P of gear M is moved past pinion J, and the teeth of said gear then come into mesh with the pinion, from which time forward during the balance of the movement power is applied directly to said gear from the pinion J. In Fig. 9 the machine is supposed to have completed its operation, and the belts are, by a mechanism to be hereinafter described, automatically shifted and the movement of the parts reversed. Gear M being still in mesh with pinion J will be returned thereby until said pinion comes to the space P, when of course it becomes disengaged, and the pinion, by its own momentum and the friction of gear L, will continue to revolve until stop Q engages the frame and bolt R enters the recess in the stop. Gear M is then at rest, but pinion J will continue to revolve gear L until the driving mechanism is stopped or reversed. The stop Q is placed or formed in the space P in order that the gear M may not by any possibility be carried around too far on the forward stroke, and should gear L continue to revolve in the direction noted by the arrow, Fig. 9, dog S will retreat into its recess as the stop T passes.

Referring now more particularly to Figs. 10 and 11, it will be seen that the sleeve N is formed with a face-plate U, said face-plate having a seat or way formed therein for the reception of a die V, held in place by a key. The edge of the face-plate is given a particular configuration, as will be seen in Figs. 1, 2, 8, and 9—that is, it is formed with a cam-face designed to operate a second die W through certain connections, as will presently appear. The die W is movable toward and from a fixed die X, carried on the frame. In practice the cam-face of the face-plate is provided with a steel shoe for obvious reasons.

Seated within the sleeve N is a second sleeve Y, keyed fast to the frame. In the outer end of this sleeve there is provided a socket or recess designed to receive and hold a bushing Z, which may be removed when occasion requires, but is held against movement by a key. A longitudinal opening extends through this sleeve Y to one side of the axial line, and the bushing Z is also provided with an eccentric opening which registers with that in the sleeve. These openings are designed to receive and support a mandrel A′, which is simply a bar of steel of the required diameter. Should it be desired to change the size of the mandrel, it is necessary only to remove the mandrel, put in another of the requisite diameter, and use a bushing having an opening corresponding to the size of the new mandrel. The opening in the sleeve Y is of course of maximum size.

In the operation of the machine it will be seen that the mandrel and its support remain stationary while the die V describes an eccentric path therearound.

To the rear end of mandrel A′ is secured an L-shaped arm B′, which works in a suitable bearing in the frame. The inner end of this arm is provided with a rule or knuckle joint C′, and in the end of this jointed member is mounted a small wheel or roller D′. A spring E′, connected to the frame and to the arm B′, tends to hold the roller up against the rear face of gear M and to keep the mandrel in its projected position.

A cam F′, Figs. 4 and 6, is formed on the rear face of gear M and takes against wheel or roller D′ and forces the arm B′ and the attached mandrel A′ back, causing the working end of the mandrel to retreat back into the bushing and to release the completed eye therefrom. It is of course to be understood that the cam comes into action just at that moment when the work is completed, and so soon as the cam passes the roller the spring protrudes the mandrel into working position. As the gear M returns the cam will simply lift the pivoted member and will not cause the retraction of the mandrel, and as the cam moves on the pivoted member with its roller will fall by gravity into a position to be again positively operated.

Coming now to the mechanism for shifting the belts and causing the reversal or stoppage of the machine, it will be seen that gear M is formed with a raised portion or rim within which is formed a T groove or channel G′. A cam H′ (shown in detail in Fig. 12) is secured to the rim by inserting the T-head of said cam in the channel G′ and securing its opposite end by a bolt. From this

it will be seen that this cam may be placed at any point around the gear. A second cam I′ is also secured to the rim in substantially the same manner, but its high end is free and may be raised to an elevation higher than the position which it normally occupies. A rocker-arm J′, carrying upon each end a roller, is pivoted to the frame in line with the cams, and an arm K′, extending therefrom, is connected by a link L′ to a sliding bar M′, carrying at its outer end the belt guides or shifters N′ and O′.

Mounted in gear M and working therethrough is a bar P′, one end of which is provided with a block or shoe designed to fit beneath the free end of cam I′ and elevate the same under certain conditions. Upon the opposite end is a roller Q′, and a spring R′, encircling the bar, tends to keep the bar in the position shown in Fig. 10 and the cam I′ in its lowermost position. A lever S′, pivoted to the frame, is connected at one end to a slide T′, carrying or having formed integral therewith a shoe U′, said shoe being in line with roller Q′ and designed to act thereon. It will be noticed upon reference to Figs. 3, 4, and 5 that the shoe has a cam-face. To the opposite end of lever S′ is connected a chain V′, which passing down over a pulley is in turn connected to a treadle W′. A spring-actuated hook X′ is provided to be used when it is desired to hold the treadle down. The operation of these parts will be described hereinafter in connection with other operative mechanism.

To the front of the frame and at one side is pivoted an arm A^2, said arm being beneath and in line with the face-plate U. It is provided with an upright projection or stud B^2, and in front of this stud is pivoted a short arm C^2, carrying at its upper end a hard-steel roller D^2. A spring E^2 tends to hold said arm C^2 up against the stud. The pivotal point of this arm and the pivot of the roller D^2 are in alinement with the axis of the sleeve N when the short arm is up against the stud.

The die W is adjustably secured within a ram F^2, which is connected to the free end of arm A^2 by means of a link G^2. The ram is mounted in suitable bearings and is designed to be held in an elevated position by a counterbalance-spring H^2, which is of sufficient strength not only to sustain the weight of the ram and die, but also the arm B^2 and its attendant parts.

I^2 denotes an adjustable gage for insuring the proper length of material being inserted into the machine. It is supported upon a shaft mounted in a suitable bearing, and a spring J^2 tends to hold it up in the position indicated in Fig. 1. Upon the inner end of the shaft is secured an arm K^2, which is acted upon by a cam L^2. This cam comes into operation as soon as the machine starts forward and, acting on the arm K^2, throws the gage I^2 down out of the way.

The general operation of the machine is as follows: Assuming that the parts are in the position shown in Fig. 1 and the shifting-cams are so regulated or adjusted that the machine will make a full stroke and form a complete eye, the operator places the bar or rod to be bent over the mandrel and against the adjustable stop or gage I^2. The treadle W′ is then depressed and, acting through the lever S′ and sleeve U′, forces bar P′ against cam I′, lifting said cam, which in turn moves the rocking arm J′ and shifts the forward driving-belt onto pulley E. Motion is transmitted from shaft B to gear L through pinion F, gear G, and pinion J, and said gear moves forward, or in the direction indicated in Fig. 8, and in so doing stop T comes into engagement with dog S, and gear M is then carried forward and comes into mesh with pinion J. Sleeve N and face-plate U of course revolve with gear M, and the cam edge of the face-plate acting on roller D^2 forces the arm A^2 downward, causing the upper die W to descend, clamping the work and also giving it its initial bend, as shown in Fig. 8. At the same time cam L^2 turns the gage I^2 down out of the way. Gear M continues to rotate until die V completes the eye, at which point cam H′ comes into action and shifts the belts into the position indicated in Fig. 5—that is, throws the reversing-belt onto the fast pulley E and the forward belt onto loose pulley D. It is to be noted that the elevation of the working face of cam H′ is the same as that of cam I′ when the latter is elevated or raised—that is to say, cam H′ is high enough to move the rocker-arm J′ to such an extent that the belts will always be shifted into such position that the machine will reverse. The difference in elevation is shown in Fig. 4. Immediately the gears begin their reverse movement arm or link C^2 is thrown away from the lug or stud B^2 and spring H will elevate the die W. At the same time, or approximately so, cam F′ will, acting on roller D′, force the arm B′ back, causing the mandrel to retreat from the eye and permitting it to drop into a receptacle or to be removed by the operator. From this it will be seen that the work is completely released so soon as the machine begins its reverse movement, and thus a maximum space of time is secured to insert and adjust the new blank. This is of great importance where the machine runs continuously. When the cam F′ passes roller D′, the mandrel is again projected by spring E. Gears L and M continue to revolve together until the blank space P of gear M comes over pinion J, when said gear M will gradually slow down, stop Q coming into contact with the frame, arresting its motion entirely, and spring-bolt R, entering the recess in the stop, holding the gear against any rebound. Cam I′ will meanwhile have shifted the belts so that each will run on a loose pulley and the machine will be brought to a stop. If, however, it be desired to run

the machine continuously, it is only necessary to hold the pedal permanently down by the latch X′, which acting through the connections above set forth will elevate cam I′ and cause rocker-arm J′ to completely shift the belts, imparting to the gears a forward movement.

It will be readily understood that by shifting the position of cam H′ around on gear M it will cause the machine to reverse at any desired point, so that a full or partial revolution will be made and a full eye or a slight bend be secured.

The friction device shown in Fig. 7 permits the gears to slip provided too great a strain is placed upon the machine.

The dies are adjustable and interchangeable.

The belts employed in actual use are comparatively narrow and are run at a high rate of speed, and as the machine is double geared a high degree of power and efficiency is obtained.

Under certain conditions and working upon certain classes of material the lower stationary die is not employed, and hence I do not desire to restrict myself in the claims to the combination of the movable die carried by the face-plate, the stationary die, and the movable clamping-die. The lower fixed die may be entirely dispensed with under the conditions above stated.

Having thus described my invention, what I claim is—

1. In an eye-bending machine, the combination of dies for holding and bending the material to be operated upon; a mandrel; power-driven mechanism for operating said dies; and means for determining the range of movement of said operating power-driven mechanism, whereby a full or partial eye may be formed.

2. In an eye-bending machine, the combination of dies for holding and bending the material to be operated upon; a mandrel; power-driven mechanism for operating said dies; and adjustable means for determining the range of movement of said operating power-driven mechanism, whereby a full or partial eye may be formed.

3. In an eye-bending machine, the combination of clamping-dies; a bending-die; means for first causing the clamping-dies to approach and clamp the work; then to move the bending-die; a mandrel; and adjustable means for causing the machine to stop and then reverse.

4. In an eye-bending machine, the combination of clamping-dies; a bending-die; means for causing said clamping-dies to approach and recede, said means being so arranged and connected that as the movement of the bending-die is reversed the clamping-dies will be automatically and immediately separated to their greatest extent.

5. In an eye-bending machine, the combination of a bending-die and means for operating the same; clamping-dies movable in relation to each other; and connections between the movable clamping-die and the means for operating the bending-die, for causing the said clamping-die to instantly recede so soon as the bending-die reverses.

6. In an eye-bending machine, the combination of a bending-die; means for causing said die to travel a greater or less distance; clamping-dies movable in relation to each other; and connections between the movable clamping-die and the means for operating the bending-die, for causing the said clamping-die to instantly recede so soon as the bending-die reverses.

7. In an eye-bending machine, the combination of a rotatory face-plate; a bending-die mounted thereon; a driving-gear connected with said face-plate; and adjustable devices carried by the gear for shifting the power device and determining the point at which the face-plate shall change its direction of movement.

8. In an eye-bending machine, the combination of a stationary and a moving clamping-die; a rotatory face-plate carrying a bending-die; a gear connected to said face-plate; and means for moving the gear a predetermined distance.

9. In an eye-bending machine, the combination of the clamping-dies; a face-plate carrying a third die; a gear connected to said face-plate, said gear having a blank space upon its periphery; and means for moving said gear, whereby it is thrown into and out of mesh with the power mechanism.

10. In an eye-bending machine, the combination of the clamping-dies; a face-plate carrying a third die; a gear connected to said face-plate, said gear having a blank space upon its periphery and a stop or lug in said space; and means for moving said gear whereby it is thrown into and out of mesh with the power mechanism.

11. In an eye-bending machine, the combination of clamping-dies; a face-plate carrying a third die; a gear connected to said face-plate; a second gear; and means carried by said gears for positively connecting them while rotating in the same direction.

12. In an eye-bending machine, the combination of clamping-dies; a face-plate carrying a third die; a gear connected to said face-plate, and having on its periphery a blank space, and a stop; a second gear; and means carried by said gears for positively connecting them while rotating in the same direction.

13. In an eye-bending machine, the combination of clamping-dies; a rotatory face-plate carrying a bending-die; a gear connected thereto; a power mechanism; a shifting device for the power mechanism; and cams secured to the gear for operating the shifting mechanism.

14. In an eye-bending machine, the combi-

nation of clamping-dies; a rotatory face-plate carrying a bending-die; a gear connected thereto; a power mechanism; a shifting device for the power mechanism; and adjustable cams secured to the gear for operating the shifting mechanism.

15. In an eye-bending machine, the combination of a bending-die; a power-gear for operating the bending-die; power mechanism; power-shifting mechanism; and cams secured upon the power-gear designed to act upon the shifting mechanism.

16. In an eye-bending machine, the combination of a bending-die; a power-gear for operating the bending-die; power mechanism; power-shifting mechanism; and cams adjustably secured upon the power-gear designed to act upon the shifting mechanism.

17. In an eye-bending machine, the combination of a power-gear; a reversing-cam fixed thereto; a second cam also mounted on said gear, said cam being susceptible of elevation; and means for causing said elevation substantially as and for the purpose described.

18. In an eye-bending machine, the combination of a power-gear; a reversing-cam adjustably secured thereto; a second cam also mounted on said gear, said second cam being susceptible of elevation; and means for elevating said cam, substantially as and for the purpose described.

19. In an eye-bending machine, the combination of a sleeve and a face-plate; a gear secured upon the sleeve, and provided with a blank space and a stop upon its periphery; a second gear mounted upon and free to move on said first gear; and means carried by said gears for directly connecting them while moving in one direction.

20. In an eye-bending machine, the combination of the frame; a sleeve journaled thereon; means for rotating said sleeve; a second sleeve mounted within said first sleeve and secured to the frame; and a mandrel mounted in said second sleeve.

21. In an eye-bending machine, the combination of the frame; a sleeve journaled thereon; means for rotating said sleeve; a second sleeve mounted within said first sleeve and secured to the frame; and a mandrel eccentrically mounted in said second sleeve.

22. In an eye-bending machine, the combination of the frame; a sleeve journaled thereon; means for rotating said sleeve; a second sleeve mounted within said first sleeve and secured to the frame; a bushing mounted in the outer end of said second sleeve; and a mandrel mounted in said bushing and the inner sleeve.

23. In an eye-bending machine, the combination of the frame; a sleeve journaled thereon; means for rotating said sleeve; a second sleeve mounted within said first sleeve and secured to the frame; a mandrel mounted within said inner sleeve; and means for moving said mandrel lengthwise in said inner sleeve.

24. In an eye-bending machine, the combination of the frame; a sleeve journaled thereon; a gear connected to and designed to rotate said sleeve; a second sleeve mounted within said sleeve and secured to the frame; a mandrel slidably mounted within said inner sleeve; connections between the gear and the mandrel for retracting the mandrel; and a spring for projecting the same.

25. In an eye-bending machine, the combination of a gear provided with an annular slot or channel formed upon its side face, and a cam secured therein, said cam being capable of adjustment about said slot and also capable of elevation with reference to the side face of said gear.

26. In an eye-bending machine, the combination of the frame; a face-plate rotatably mounted thereon; a fixed die; a movable die; and means controllable by the movement of the face-plate for causing the movable die to approach said fixed die immediately the face-plate begins to revolve and to hold said movable die in its adjusted position until the movement of the face-plate is reversed.

27. In an eye-bending machine, the combination of the frame; a face-plate rotatably mounted thereon; a fixed die; a movable die; and connections between said movable die and the face-plate whereby said die is immediately brought to its adjusted position and held there as the face-plate revolves in a forward direction, and releases the same immediately said motion is reversed.

28. In an eye-bending machine, the combination of the frame; a cam-shaped face-plate rotatably mounted thereon; a fixed die; a movable die; and a connection between said movable die; and the face-plate designed to be positively operated when the face-plate revolves in one direction and to be thrown out of action when it reverses.

29. In an eye-bending machine, the combination of the frame; a cam-shaped face-plate rotatably mounted thereon; a fixed die; a movable die; an arm pivoted to the frame and provided with an upright lug or projection; a link connecting said arm and the movable die; and a spring-controlled link pivoted to the arm in front of the lug, and bearing at its upper end against the cam edge of the face-plate.

30. In an eye-bending machine, the combination of the frame; a cam-shaped face-plate rotatably mounted thereon; a fixed die; a movable die; an arm pivoted to the frame beneath the face-plate, and provided with a lug or projection; a link pivoted to the arm in front of the lug; a spring for holding said link against the lug; and a second spring connected to the movable die for elevating the same.

31. In an eye-bending machine, the combination of a power-gear, substantially as described; a fixed and an adjustable cam carried thereby; belt-shifting mechanism designed to be operated upon by said cams; and

means controllable by the operator for elevating the adjustable cam.

32. In an eye-bending machine, the combination of a power-gear, substantially as described; a high and a low cam carried thereby; and belt-shifting mechanism designed to be operated upon by said cams, substantially as described, whereby the gears will make a full forward stroke, reverse, return to their original position and stop.

33. In an eye-bending machine, the combination of a power-gear, substantially as described; a fixed and a movable cam carried thereby; belt-shifting mechanism designed to be operated upon by said cams; a bar mounted in said gear; a treadle; and connections between said treadle and the bar for elevating the movable cam, substantially as and for the purpose described.

34. In an eye-bending machine, the combination of a power-gear substantially as described; a fixed and a movable cam carried thereby; belt-shifting mechanism designed to be operated by said cams; a bar mounted in said gear beneath the movable cam; a cam-faced shoe acting upon said bar; a treadle; and connections between said treadle and the shoe.

35. In combination with shaft B carrying the fast and loose band-pulleys; pinion F mounted thereon and meshing with gear G carried by a shaft H; pinion J also mounted on said shaft H; and gears L and M meshing with pinion J, said gear M being mutilated and provided with a stop T, substantially as and for the purpose described.

36. In an eye-bending machine, the combination of a work-holding die; a bending-die; and means for moving said bending-die, said means being adjustable, whereby a full or partial eye may be formed.

37. In an eye-bending machine, the combination of a clamping-die; a bending-die; means for causing the clamping-die to approach and hold the work; then to move the bending-die; a mandrel; and adjustable means for causing the machine to stop and then reverse.

38. In an eye-bending machine, the combination of a clamping-die; a bending-die; means for causing said clamping-die to approach and recede from the work, said means being so arranged that as the movement of the bending-die is reversed the clamping-die will assume its highest elevation.

39. In an eye-bending machine, the combination of a bending-die and means for operating the same; a movable clamping-die; and connections between the movable clamping-die and the means for operating the bending-die, for causing the said clamping-die to instantly recede so soon as the bending-die reverses.

40. In an eye-bending machine, the combination of a bending-die; means for causing said die to travel a greater or less distance; a movable clamping-die; and connections between the movable clamping-die and the means for operating the bending-die for causing said clamping-die to instantly recede so soon as the bending-die reverses.

In witness whereof I hereunto set my hand in the presence of two witnesses.

CHARLES LOOMIS GRIMES.

Witnesses:
C. F. HUNT,
JAS. F. WARREN.