No. 869,428. PATENTED OCT. 29, 1907.

J. T. FAGAN.

TUBULATING MACHINE.

APPLICATION FILED DEC. 20, 1905.

3 SHEETS—SHEET 1.

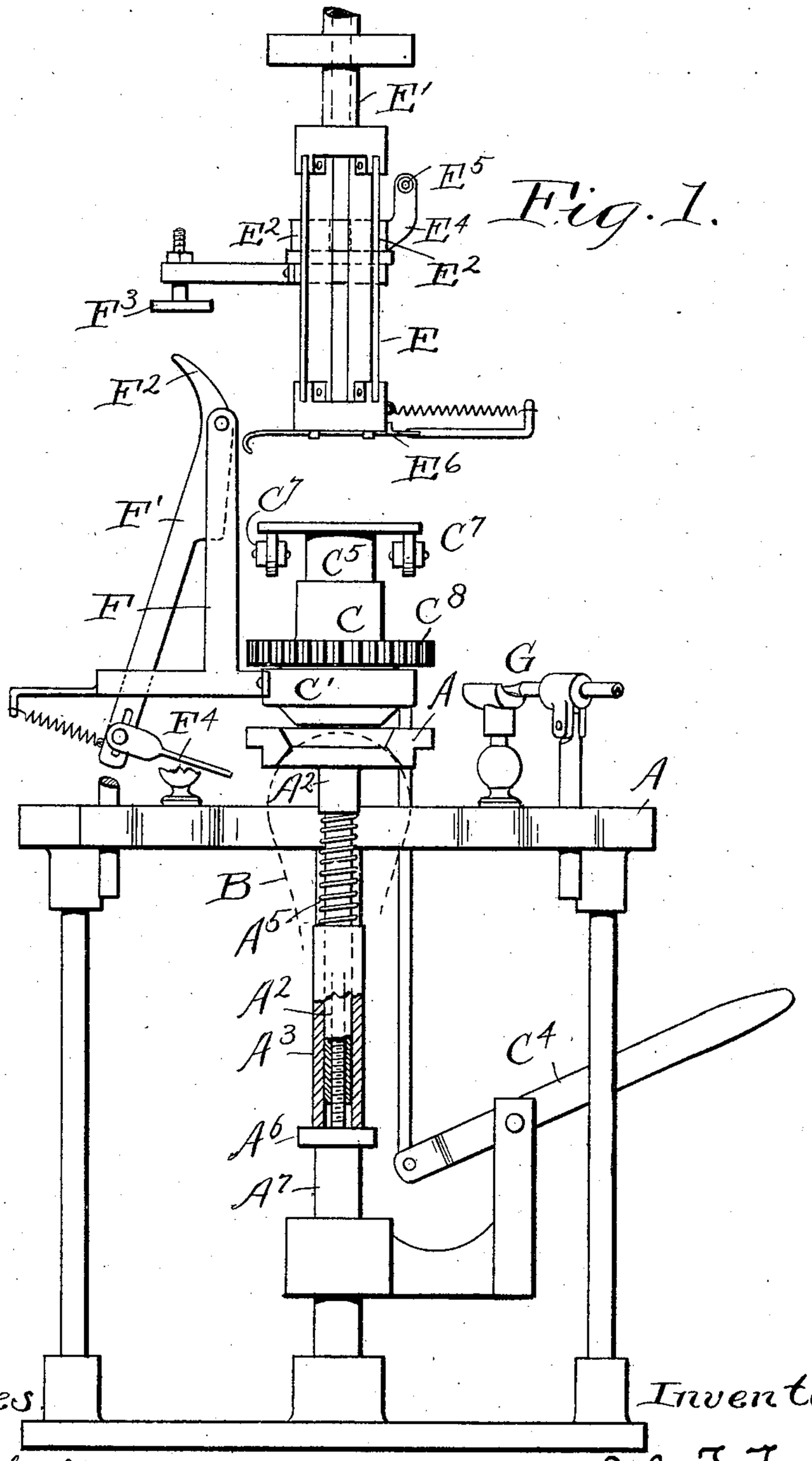

Fig. 1.

Witnesses.
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3 SHEETS—SHEET 2.

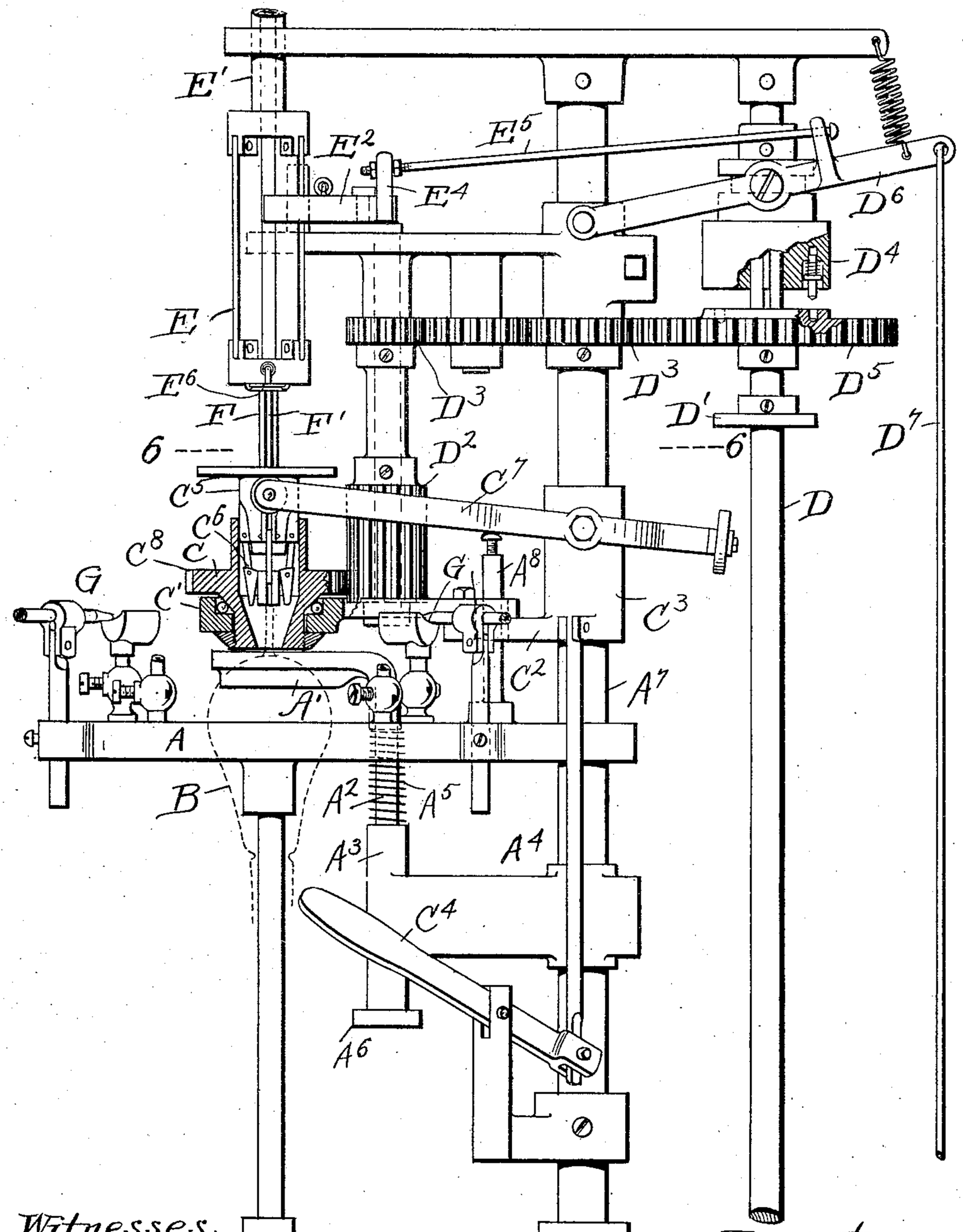

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Fig. 9.

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3 SHEETS—SHEET 3.

Fig. 3.

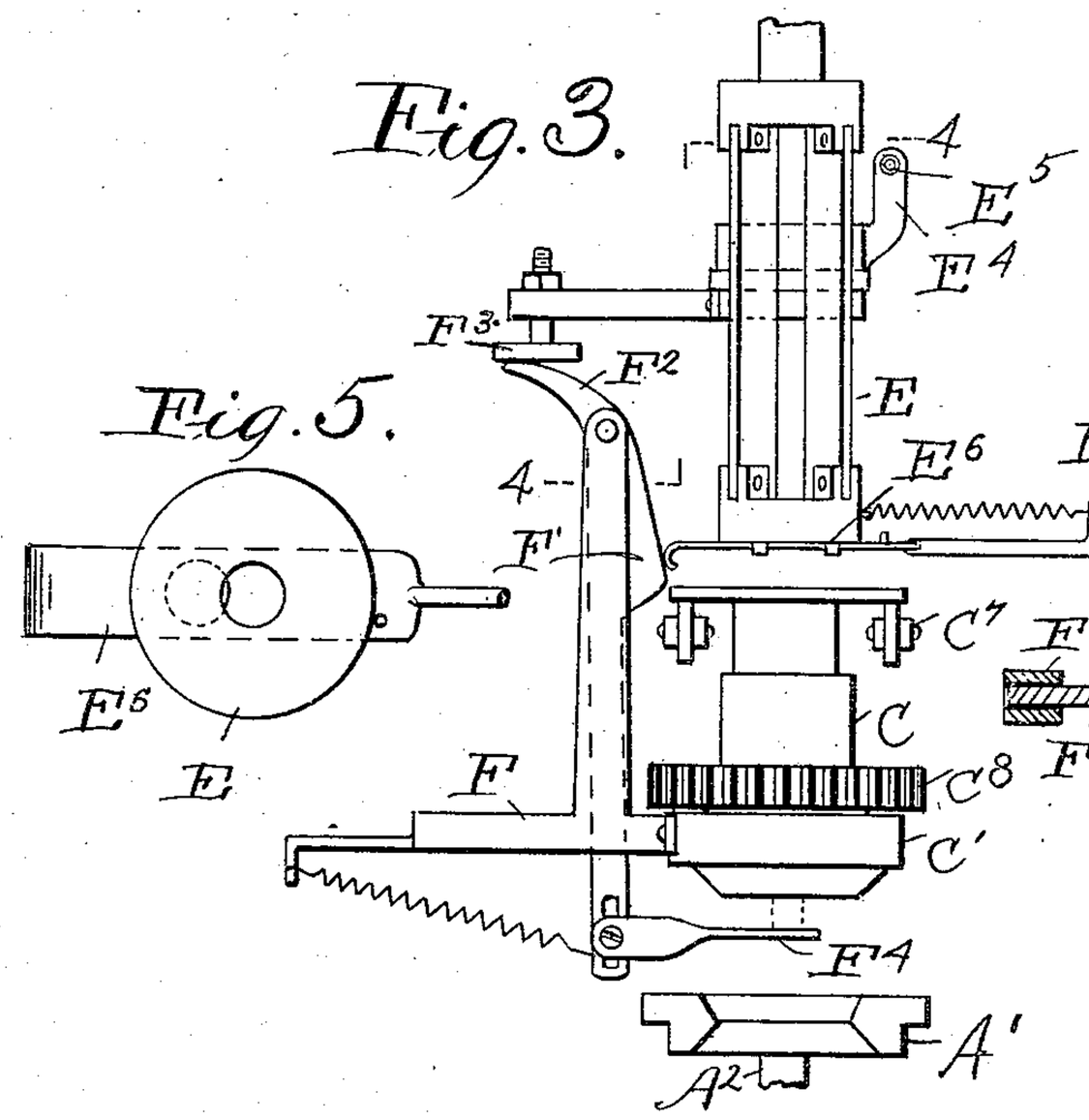


Fig. 5.

Fig. 4.

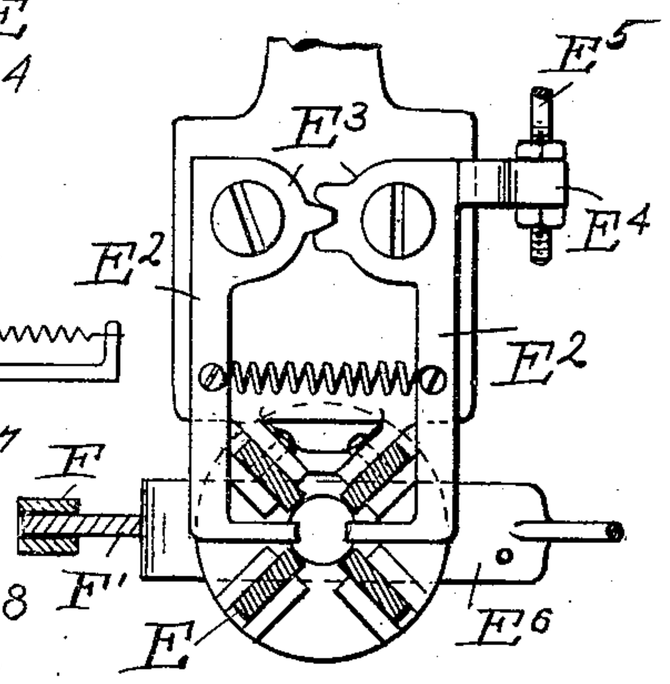
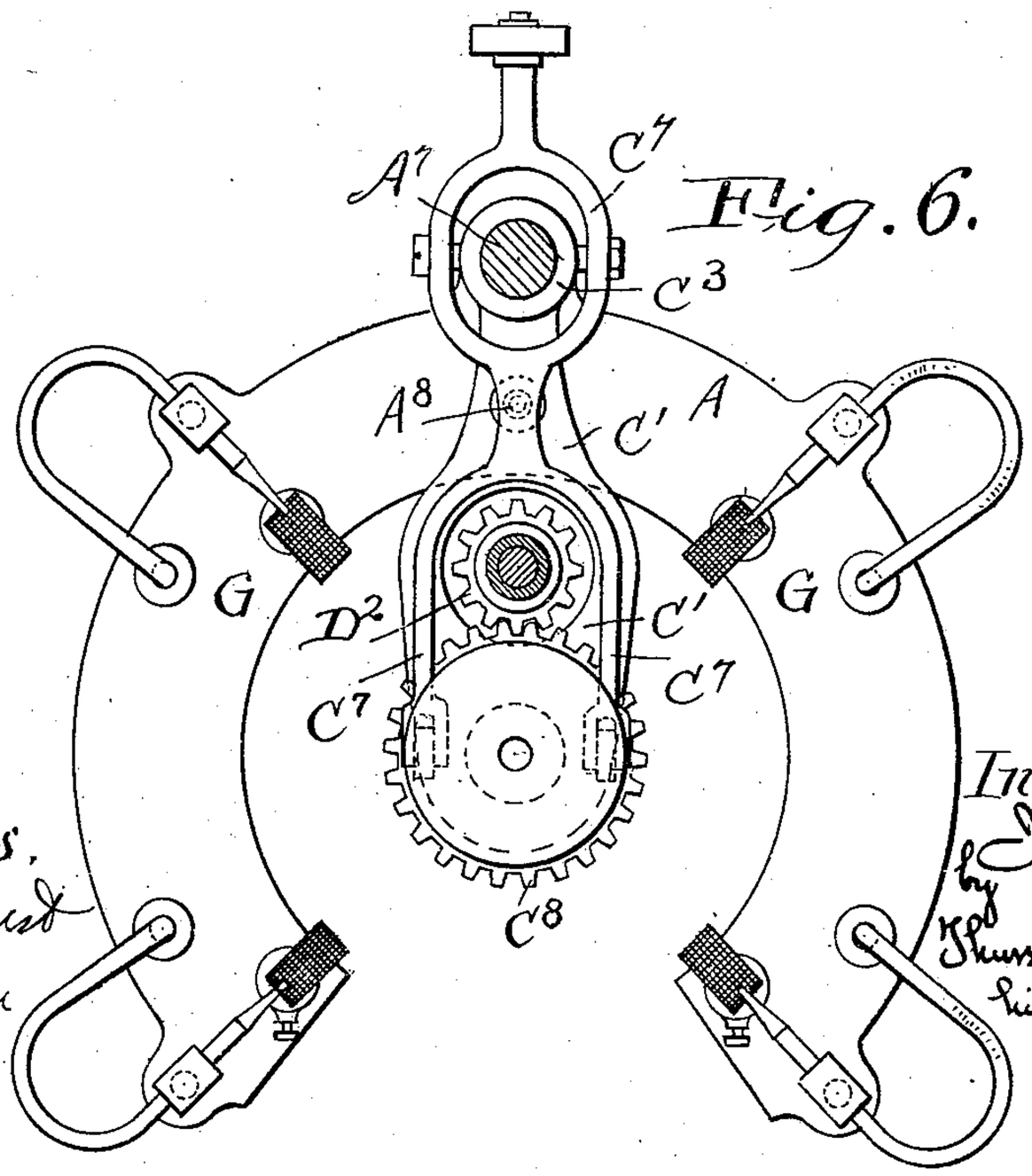


Fig. 6.



Witnesses,
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Inventor:
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UNITED STATES PATENT OFFICE.

JOHN T. FAGAN, OF CLEVELAND, OHIO, ASSIGNOR TO THE NATIONAL ELECTRIC LAMP COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF NEW JERSEY.

TUBULATING-MACHINE.

No. 869,428. Specification of Letters Patent. Patented Oct. 29, 1907.

Application filed December 20, 1905. Serial No. 292,592.

To all whom it may concern:

Be it known that I, JOHN T. FAGAN, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Tubulating-Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

The object of the present invention is to provide improved mechanism for applying exhaust tubes to bulbs for incandescent lamps and attenuating the tubes adjacent to the bulbs. Heretofore these tubes have been applied to the bulbs by means of a reciprocating holding clamp,—the said clamp being adapted to receive the tube between its jaws when inserted by hand. After the tube was so inserted the clamp was reciprocated up and down in such manner that the lower end of the tube was heated by means of fixed fires directing their flames horizontally across the path of the reciprocating tube. When the lower end of the tube reached the proper degree of plasticity, the holding clamp was lowered until the plastic end of the tube was brought against the perforated end of the bulb held immediately below the plane of the heating fires. A very serious defect in the use of this old form of apparatus arises from the inability to uniformly heat the entire circumference of the tube. While uniformity in the heating of the tube at the immediate point of joining to the bulb is, of course desirable, it becomes a matter of absolute necessity to have the heating uniform around that portion of the tube immediately above the joint, as the tube is drawn out at this point and the opening therethrough constricted immediately after the joint is made.

The purpose of the mechanism, which forms the subject of this application is to provide means whereby the heat is applied uniformly to the tube at the lower end and in the zone where the attenuation is to take place after the tube has been joined to the bulb.

Referring to the accompanying drawings, Figure 1 is a view showing the parts at the front of the machine as they appear to the operator, the adjusting mechanism for the bulb rest being shown in section. Fig. 2 is a side elevation of the machine, the chuck for holding the tubes and the clutch mechanism for throwing the rotating parts into operation being partly in section. Fig. 3 is a detail front elevation showing the means for controlling the feed of the tubes into the chuck. Fig. 4 is a cross section taken on the line 4—4 of Fig. 3, illustrating the structure of the jaws which retain the tubes in the feeding cage. Fig. 5 is a detail illustrating the structure of the sliding gate at the bottom of the feed cage. Fig. 6 is a cross section on the line 6—6 of Fig. 2, looking down.

A curved bench A supporting the fires is mounted on fixed standards. This bench has an open center through which projects a bulb rest A′ carried by a bracket extending over a fixed standard. As will be seen from Fig. 1, the bulb rest is an annulus supported at the side by a depending hollow rod A^2 running through a sleeve A^3 on the end of the projecting bracket A^4. A spring A^5 surrounding the hollow rod and bearing against a shoulder thereon and the upper end of the hollow sleeve tends to throw the bulb rest upwardly. The lifting tendency of the spring is checked by a thumb-screw A^6 engaging within the lower end of the hollow rod and bearing against the lower end of the hollow sleeve A^3. The bulb rest is made thus adjustable in order to insure that the crest of the bulb B, when in place against the rest, as shown by dotted lines in Figs. 1 and 2, shall be in the proper plane relative to the horizontal fires.

The means which I have adopted for holding and manipulating the tubes to be affixed to the bulbs, comprises a chuck-head C having an interior cone and rotatably mounted in an opening of a horizontally disposed plate C′ which is vertically reciprocatable. This horizontal plate is carried by an arm C^2 projecting from a sleeve C^3 sliding over a fixed standard A^7, which sleeve is reciprocated by means of a hand lever C^4 located at the side of the machine. Loosely mounted in the chuck is a hollow chuck cylinder C^5 having a broad flange at its upper end and provided with chuck jaws C^6 adapted to be pressed together when advanced into the conical portion of the chuck, and serves as a holding means for the tube. Embracing this cylinder and bearing against the lower side of the flange at the upper end thereof, is a yoke C^7 pivotally mounted on the reciprocating sleeve C^3 which supports the chuck.

The weight of the cylinder C^5 is sufficient to keep the end of the yoke embracing it normally drawn down, but there are provided on the frame two stops A^8, D′, against which the yoke strikes at the extreme downward and upward movements of the sleeve carrying the chuck.

One of these stops D′ is shown in Fig. 2 as consisting of a flanged collar fixed to a rotating shaft D in such position as to be struck by a rearward projection of the yoke C^7, when the sleeve C^3 on which the latter is mounted, is elevated for the purpose of advancing the chuck to receive a tube from the feed cage E. The other stop A^8 is mounted on the frame work in such position as to throw the forward end of the yoke upward when the sleeve C^3 is brought to its lowermost position for the purpose of releasing the tube from the chuck.

For the purpose of rotating the chuck during its vertical reciprocation a gear C^8 is formed on the periphery of the chuck-head and is adapted to mesh with an elongated vertical gear D^2 mounted on the

frame, and adapted to be driven through a train of gears D^3 by the rotating shaft D, above referred to. Splined to this shaft is a clutch D^4, normally held up and out of engagement with the gear D^5, loosely mounted on the shaft, through the medium of a tension spring and clutch lever D^6. When it is desired to rotate the chuck-head, the clutch lever D^6 is drawn down by means of an engaging rod D^7 attached to a foot treadle,—not shown.

Supported from the upper part of the frame is a feed cage E adapted to receive and hold tubes dropped therein from a feed pipe E′. A pair of spring closed jaws E^2 E^2 partially embrace the cage and project through openings in the side thereof in such manner as to grip and retain the tubes which fall between the same. These jaws are each pivoted at their rear end and have bell crank projections E^3 E^3 which mesh after the manner of a spur gear, so that the outer or inward movement of one jaw may be attended by a corresponding movement of the other. Projecting to the side of one of said jaws is a short arm E^4 connected by means of a rod E^5 with the clutch lever D^6, above mentioned, in such manner that the movement of the clutch lever which throws the train of gears into operation will cause the two gripping jaws to open and permit the tube held thereby to fall.

The bottom of the feed cage is normally closed by a perforated gate E^6 which is held by a tension spring in such position that its perforation or port is out of alinement with the opening in the bottom of the cage. For the purpose of throwing the gate into such position as to allow a tube to fall from the feed cage, there is affixed to the horizontal plate C′, supporting the chuck-head, a bracket F, carrying a pivoted swinging lever F′ having a toe F^2 positioned to strike against a stop F^3 carried by the upper portion of the frame.

When the supporting plate C′ is elevated so that the toe of the swinging lever strikes against the stop, a portion of the lever is moved over against the end of the sliding gate, pushing the latter back against the tension of its spring until the perforation therethrough registers with the opening in the bottom of the feed cage,—thus allowing the tube previously released by jaws E^2 to drop therefrom into the chuck below. Secured to the lower end of the swinging lever is a gage plate F^4 so positioned as to project under the chuck head simultaneously with the swinging movement of the lever which opens the sliding gate. The gage plate receives the tube that drops from the feed cage and holds it in such position that its lower end is a fixed distance below the chuck head. The spring attached to the lower end of the swinging lever and to the bracket on which the lever is supported tends to hold the latter in such position that the gage plate is drawn back so as not to intervene between the chuck head and the bulb rest.

The operation of the machine is as follows: Upon placing a bulb against the under side of the rest A′, the operator throws down the hand lever C^4, elevating the sliding sleeve which supports the chuck-head. During this movement, the clutch controlling the rotating gears is out of operation, and the chuck-head consequently does not rotate, but slides upwards with its gear C^8 in mesh with the elongated gear D^2. As the sliding sleeve C^3 reaches the upper limit of its movement, the rear end of the yoke C^7, strikes against the stop collar D′ fixed on the operating shaft. Thereupon the yoke is tilted, and the cylinder in the chuck-head is elevated so that the chuck jaws are withdrawn from the cone of the chuck-head and allowed to hang loosely. Simultaneously with this action, the swinging lever F′ strikes against its stop and moves the sliding gate under the feed cage until the port therethrough registers with the bottom of the cage,—the gage plate at the same time swinging underneath the chuck-head. At this point, the operator throws the clutch D^4 on the operating shaft into engagement with the gear wheel loosely mounted thereon, and motion is transmitted through the train to the shaft bearing the elongated gear D^2 with which the gear C^8 on the chuck-head is in mesh. As above pointed out, the movement of the clutch lever opens the gripping jaws E^2 which retain the tube in the feed cage and the tube which is released thereby drops from the cage, through the open gate, into the chuck head, and is held therein by the gage plate below. The operator now shifts the hand lever so as to move the chuck-head downward, during which movement the yoke, engaging the chuck cylinder, moves away from the upper stop and allows the separate chuck jaws to drop downward into the cone and engage the tube. While this action takes place, the gage plate is withdrawn and the slide at the bottom of the feed cage is permitted to close. The tube, now being held in its chuck, will receive a rotary movement through the gears, and the operator maintains the lower end of the tube in such position that it is properly heated by the horizontal fires G. When this heating is properly accomplished, the rotating gears are thrown out of operation by the release of the foot treadle, the same action allowing the gripping jaws in the feed cage to grip the next succeeding tube. A further lowering of the chuck brings the heated plastic end of the tube in contact with the crest of the bulb, and after a moment, the tube becomes sealed thereon, whereupon, the operator again elevates the chuck somewhat, thus drawing out and attenuating the tube at that portion where it has been softened, reducing the interior diameter to a degree suitable for the exhaustion of the bulb and forming the tip. The bulb is now lowered and the chuck is allowed to drop simultaneously until the yoke C^7 strikes the lower stop A^8, thus throwing the front end of the yoke up and releasing the jaws in the chuck, so that the bulb and its attached tube may be withdrawn.

Having thus described my invention, I claim:

1. Mechanism adapted for affixing glass tubes to other articles comprising a rest for the article to which the tube is to be affixed, holding means for the tube, means for rotating the holding means so connected therewith as to permit movement of the latter toward the rest, and means for releasing the tube from the holding means as said holding means is advanced toward the rest.

2. Mechanism adapted for affixing glass tubes to other articles comprising a supporting plate, a rotatable chuck mounted thereon, a holding means within the chuck, means for reciprocating the chuck, and means for throwing the holding means out of operation at either extremity of its movement.

3. Mechanism adapted for applying glass tubes to other articles comprising a reciprocatable chuck, a holding means within the chuck, means for throwing the holding means out of operation, and means adapted to move a gage plate underneath the chuck.

4. Mechanism adapted for affixing glass tubes to other articles comprising a reciprocatable chuck, a feed cage hav-

ing a closure at its delivery end, means adapted by the advance of the chuck toward the feed cage to open the closure thereof and holding means adapted to retain a tube in said cage when the closure is opened.

5. Mechanism adapted for affixing glass tubes to other articles comprising a rotatably mounted reciprocatable chuck carrying a holding means, means for reciprocating said chuck, means for rotating the same located so as to be in operative engagement with the chuck throughout its reciprocation, means adapted to loosen the holding means at two points in its reciprocation, said points being spaced apart so as to allow reciprocation throughout a certain distance within which the holding means may be tight.

6. Mechanism adapted for affixing glass tubes to other articles comprising a rotatable chuck, means for reciprocating the chuck, means positioned to feed tubes to said chuck by gravity and means adapted to release the tubes from the chuck at their extreme position away from the feeding means.

7. Mechanism adapted for affixing glass tubes to other articles comprising a movable chuck, and means for opening said chuck to receive a tube at a given point in its movement, means adapted to feed tubes to said chuck by gravity when the chuck is at said point and means adapted to release the tubes from the chuck at their extreme position away from the feeding means.

8. Mechanism adapted for affixing glass tubes to other articles comprising a movable chuck, means for feeding tubes to said chuck, and means adapted to be operated simultaneously with the feeding mechanism and to fix the position of the tube in the chuck and means adapted to release the tube from the chuck by movement of the latter away from the feeding means.

9. Mechanism adapted for affixing glass tubes to other articles comprising a movable chuck, means for opening the chuck, means for feeding a tube thereto while open, means for holding the tube in a predeterminable position in the open chuck means for releasing the tube from the chuck by movement away from the feeding means.

10. Mechanism adapted for affixing glass tubes to other articles comprising a reciprocatable chuck, means for reciprocating the chuck, tube feeding mechanism situated above said chuck, means whereby said tube-feeding mechanism is operated by reciprocation of the chuck and means for releasing the tubes by movement of the chuck away from the feeding means.

11. Mechanism adapted for affixing glass tubes to other articles comprising a movable chuck having a holding means, means for moving the chuck, means for releasing the holding means at a given position of the chuck, tube-feeding mechanism positioned to feed tubes into said chuck, means whereby said tube-feeding mechanism may be operated when the holding means is released a means for releasing the tubes from the chuck as the latter is moved away from the feeding means.

12. Mechanism for affixing glass tubes to other articles comprising a holding rest for the article to which the tube is to be attached, a rotatable chuck, means for reciprocating the chuck, and means adapted to release the tube from the chuck by movement toward the rest.

13. Mechanism for holding glass tubes in a heating flame comprising a rotatable reciprocatable holding means, means positioned to feed tubes to said holding means, and means adapted to release the tubes from said holding means at their extreme position away from said feeding means.

14. Mechanism for holding glass tubes in a heating flame comprising a rotatable reciprocatable holding means, means positioned to feed tubes one by one to said holding means by gravity, and means adapted to release the tubes from said holding means at their extreme position away from said feeding means.

In testimony whereof, I hereunto affix my signature in the presence of two witnesses.

JOHN T. FAGAN.

Witnesses:
B. L. BROWN,
M. F. BURNS.