No. 876,381. PATENTED JAN. 14, 1908.

F. MUELLER.

EQUALIZING MECHANISM.

APPLICATION FILED JAN. 14, 1905.

2 SHEETS—SHEET 1.

Fig. 2

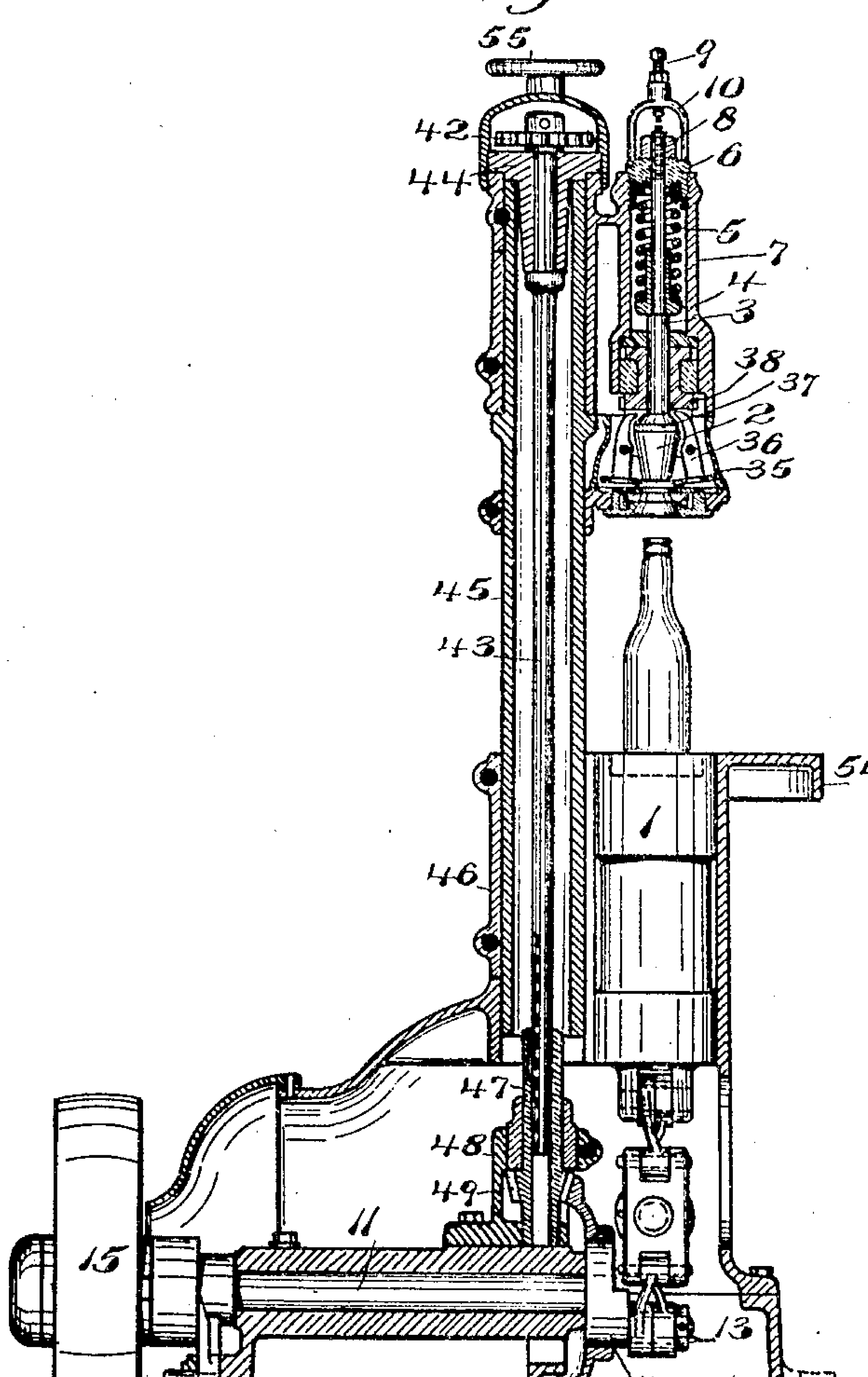
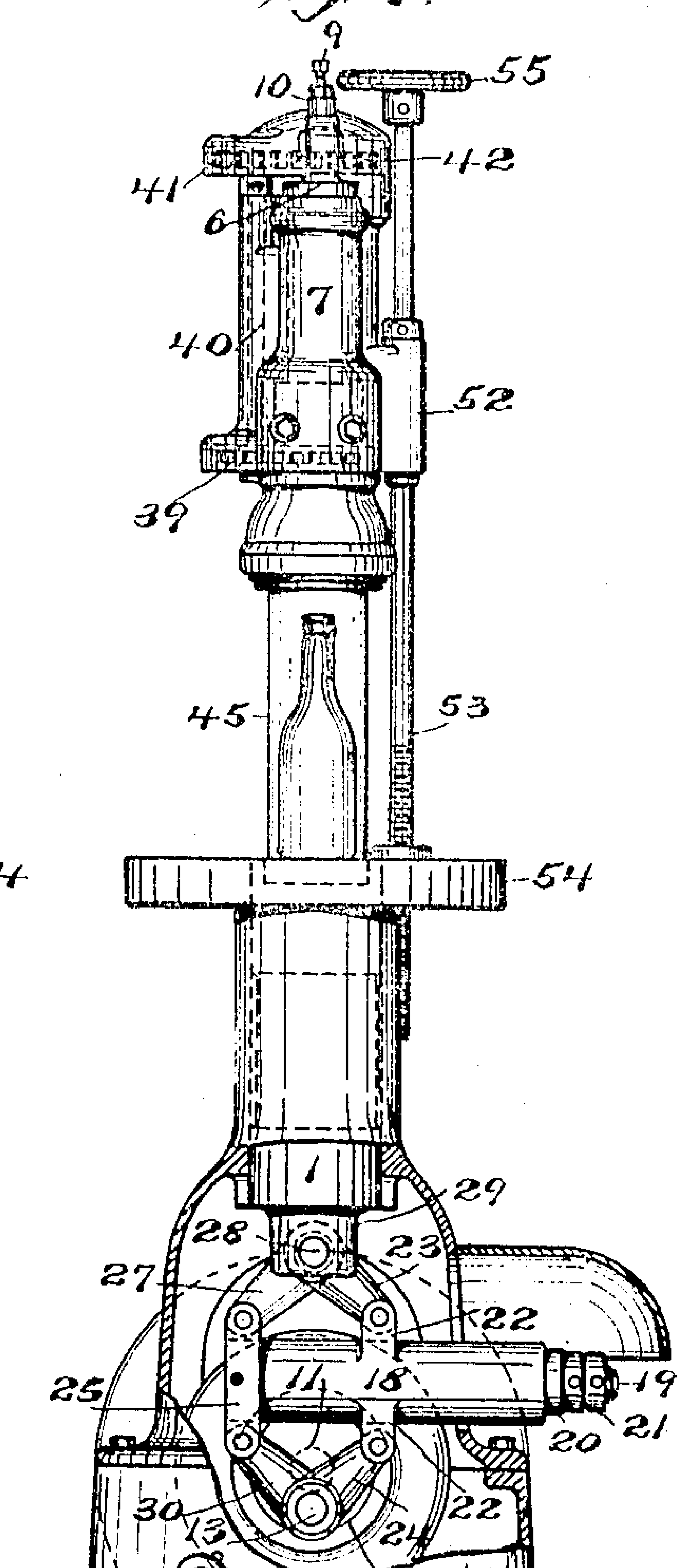


Fig. 1.



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2 SHEETS—SHEET 2.

Fig. 3

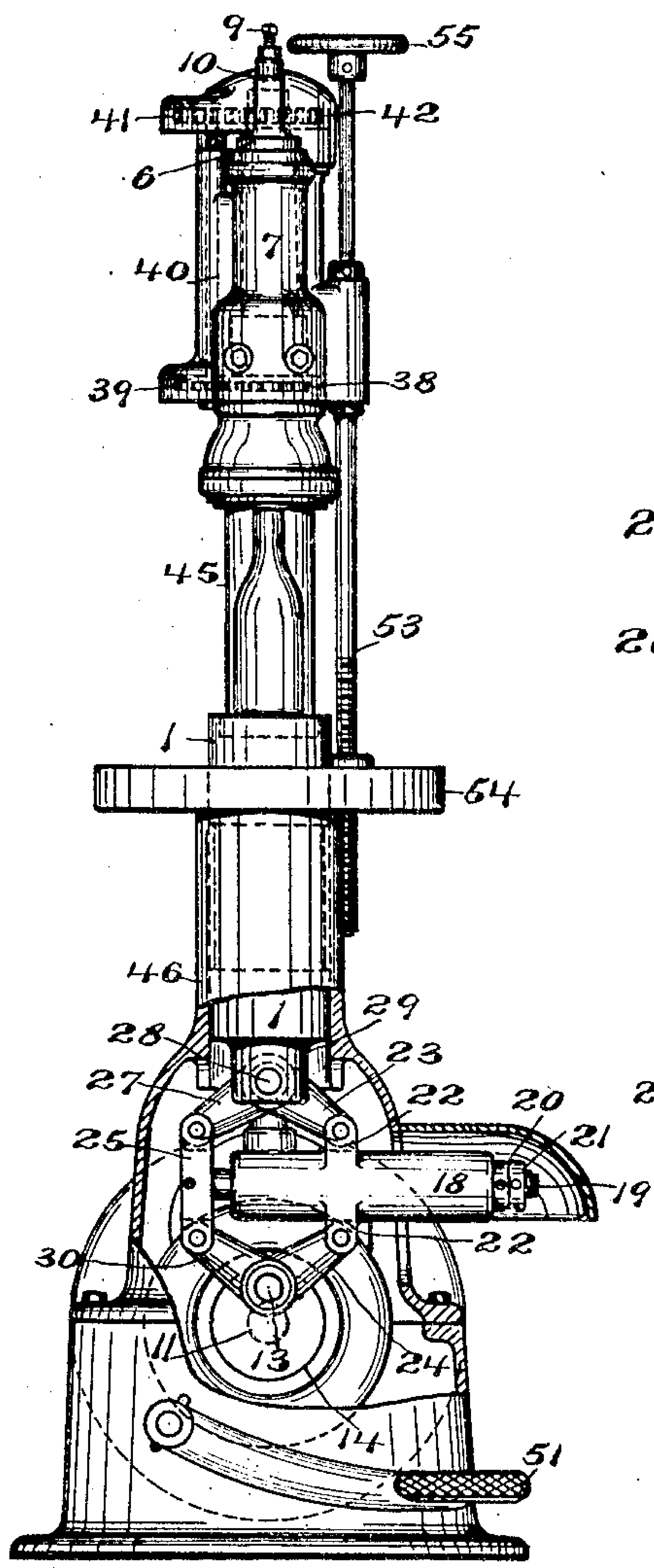


Fig. 4.

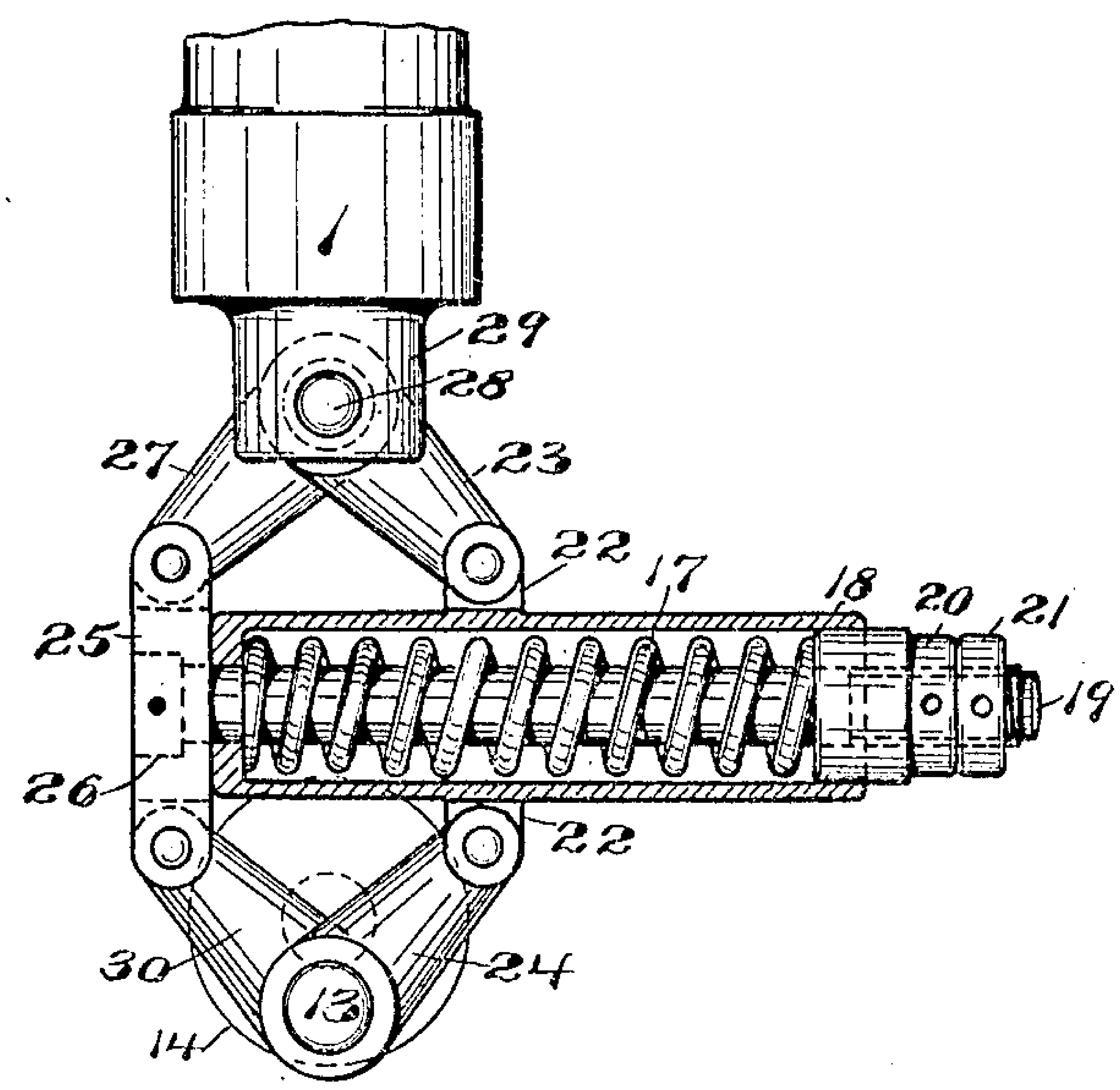
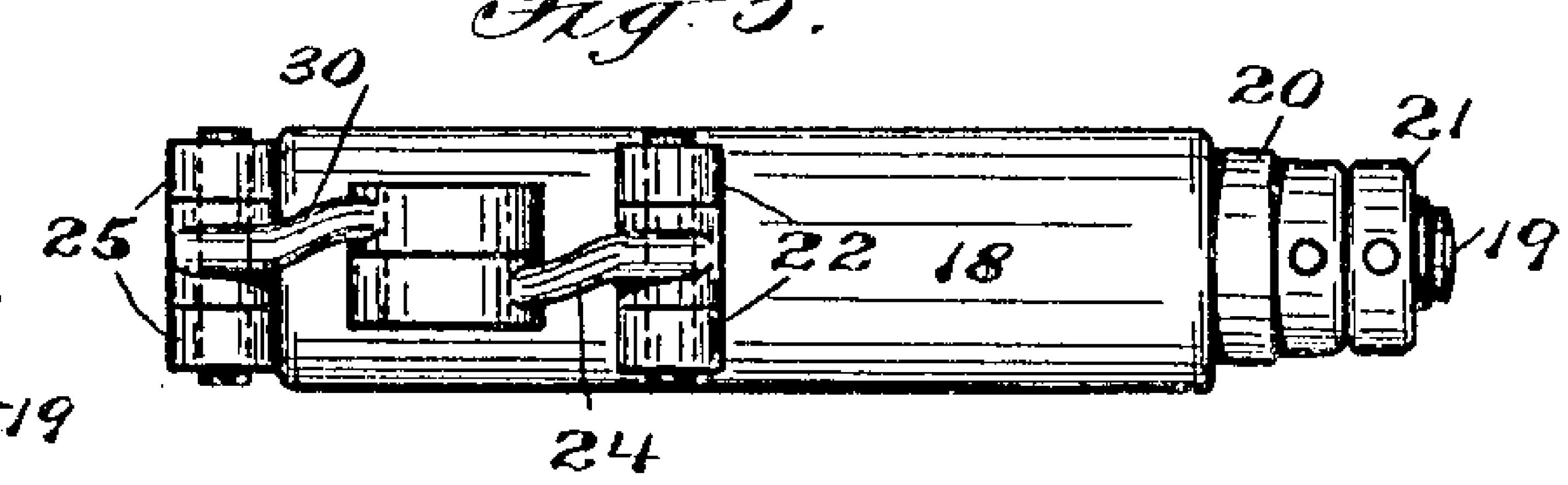


Fig. 5.



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UNITED STATES PATENT OFFICE.

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EQUALIZING MECHANISM.

No. 876,381. Specification of Letters Patent. Patented Jan. 14, 1908.

Application filed January 14, 1905. Serial No. 241,133.

To all whom it may concern:

Be it known that I, FELIX MUELLER, a subject of the German Emperor, residing at New York, county of New York, and State of New York, have invented certain new and useful Improvements in Equalizing Mechanisms, fully described and represented in the following specification, and the accompanying drawings, forming a part of the same.

This invention relates to certain improvements in mechanism for producing equalized pressures.

In certain types of machines, the article to be operated upon is located between a pair of pressure producing heads, or a pressure producing head and an abutment, as, for instance, in certain styles of presses and in bottle capping machines. In these machines it is frequently desirable to operate one or both of the pressure producing heads by mechanism which has a constant stroke. If, however, the stroke of the mechanism is such as to produce a given pressure on the article when an article of a given length is between the heads, it follows that if a longer article is to be operated upon, either the stroke of the mechanism must be adjusted or some means be provided for permitting the mechanism to run without changing the relation of the heads. In some machines having such pressure heads which are designed for operating upon articles which vary in length, one or both of the heads are spring mounted, so that after the heads have been brought into a certain relation with each other by the stroke of the operating mechanism which will occur at varying points in the stroke of the mechanism according to the varying length of the articles, the springs will yield, thus permitting the driving mechanism to complete its stroke without changing the position of the heads. Inasmuch, however, as the force of a spring increases rapidly as its tension increases, mechanism of this character is not desirable for use where the articles to be operated upon by the pressure heads are of a breakable nature. Such machines demand a mechanism which will not only permit the pressure heads to retain varying relative positions determined by the length of the article to be operated upon as the driving mechanism continues its stroke, but also a mechanism in which, after the heads have been caused to exert a predetermined pressure on the article, this pressure will not be increased by the continued stroke of the driving mechanism. Mechanisms of the character referred to have accordingly been devised which produce what may be termed equalized pressures. These mechanisms in general, however, depend upon the use of fluid containing cylinders which are provided with proper relief valves or similar devices which, after a certain predetermined pressure has been exerted upon the fluid in the cylinder, open and the pressure is relieved. Such devices have been employed in connection with glass presses, for instance, and in presses operating upon ores and the like. Such mechanisms have also been employed in connection with bottle capping machines, that is to say, machines in which caps are applied to bottles and which necessarily operate upon bottles varying more or less in length. The use of mechanisms depending upon springs which are controlled by tripping devices has also been suggested. These pressure relieving mechanisms are cumbersome and expensive, and are, furthermore, more or less complicated in construction, and the spring controlled devices which have so far been suggested are open to the further objection that when the pressure relieving point is reached and the trip comes into action, the pressure of the springs is entirely relieved.

It is the object of this invention to produce a new and improved pressure equalizing device for use in pressure producing machines, which is simple in construction, positive in its operation, and by which a certain predetermined pressure can be produced and maintained without danger of having the pressure rise above the predetermined point.

With this and other objects not specifically referred to in view, the invention consists in certain constructions, and in certain parts, improvements and combinations as will be hereinafter fully described and specifically set forth.

Referring to the drawings—Figure 1 represents a front elevation of a construction embodying the invention. Fig. 2 is a side elevation, partly in section, of the machine illustrated in Fig. 1. Fig. 3 is a view similar to Fig. 1, showing the parts in different positions. Figs. 4 and 5 are detail views on an enlarged scale.

The particular embodiment of the invention which has been chosen for the purpose

of illustration, is a bottle capping machine, but it is to be understood that the invention may be embodied in machines of varying types or kinds.

The particular machine selected to illustrate the invention embodies a pair of pressure producing heads 1 and 2, one of which, in the machine shown, serves as a support or rest on which the bottle to be capped is placed, and the other which serves to force the cap, which is thereafter locked upon the bottle by a suitable mechanism, down to its seat preparatory to the operation of the cap locking devices. While the head 2 might be stationary, in the particular construction shown, it has a limited movement. As shown, this head is mounted upon a stem 3, said stem being provided with a collar 4 which serves as a support for a spring 5, the other end of which bears against the under side of a cap 6. This cap 6, in the machine shown, is threaded in a casing 7 which serves to contain the head, stem and other operating parts of the machine. The upper end of the stem projects through the cap 6, the stem being maintained in position by a suitable adjusting nut 8. The upper end of the stem is arranged to strike a stop screw 9 tapped into a bracket 10 rising from the cap 6, said screw serving to limit the upward motion of the stem.

Machines embodying the invention may have either or both of the pressure heads moved by the driving mechanism. In the construction shown, however, the head 1 upon which the bottle rests is thus moved.

The operating or driving mechanism from which the head receives its movement may be of any desired character, but it will preferably be a mechanism which has a constant stroke. In the construction shown, the driving mechanism embodies a shaft 11 having a crank thereon, the crank in the construction shown being formed by a pin 13 mounted on a disk 14. The crank shaft, when a crank shaft is employed, may be driven in any suitable manner, as, for instance by a driving pulley 15. Inasmuch as the crank has a constant stroke, it would tend to produce, and, if directly connected to the head or part which is operated, by connections of an ordinary character, would produce a movement of that part which would be of a constant or predetermined extent, the extent of stroke bearing a determined relation to the eccentricity of the crank. It will be readily understood, however, that if the crank and connections were designed to impart to the movable member, or to both members, of the pressure producing pair of heads, a constant stroke which is adapted to produce a predetermined pressure on a bottle of given length, which pressure would be the pressure required to seat its cap thereon, the insertion in the machine of a longer bottle would result in crushing or breaking the bottle. To adapt the machine, therefore, to the capping of bottles varying in length, a pressure equalizing device is employed.

In the machine which has been selected to illustrate the invention, the equalizing device forms the connection between the crank and the movable part 1, though it might be otherwise located. Where, as in the present construction, the equalizing device forms the connection between the operating or driving mechanism and one of the pressure heads, it will be of such a character that the full force of the stroke of the driver will be transmitted to and operate to produce a movement of the head of sufficient extent to produce a pressure upon the bottle sufficient to effectually seat the cap thereon, after which the continuance of the driving stroke will not change the relative position of the heads or materially increase the pressure upon the bottle.

The particular construction of equalizing device may be varied within wide limits. As shown, the equalizing device embodies a spring 17 which, in the construction illustrated, is contained in a casing 18. This casing 18 has a rod 19 running through it, the rod being provided with an adjusting nut 20 and a locking nut 21. In the preferred construction, the adjusting nut 20 will be arranged so as to keep the spring constantly under tension.

The casing 18, when such a casing is employed, may be supported in various ways. As shown, it is provided with ears 22 which are connected to pivoted arms 23 and 24. The casing is further secured to a link 25 by means of the rod 19, this rod being provided with a head 26 which fits in a socket or recess in the link. The link 25 is pivoted to an arm 27. The arms 23 and 27 are pivoted on a pin 28 which passes through a bracket 29 fastened in any suitable manner to the under side of the head 1. The lower end of the link 26 is pivoted to an arm 30.

When, as in the construction shown, the equalizing device forms the connection between the driver and one of the heads, the connection between the driving mechanism and the equalizing device may be widely varied, and will be varied according to the type of driving mechanism employed. In the construction shown, the connection is effected by pivoting the arms 24 and 30 directly on the crank pin 13.

The construction being as before described, it will be understood that as the crank revolves, the system of arms and links will remain in the same relative position to each other during the upward movement of the crank until the pressure between the heads 1 and 2 has reached a certain definite limit, which limit is determined by the original resistance of the spring 17. When the force developed between the heads tends to in-

crease beyond an amount equal to the original resistance of the spring, the spring will yield, allowing the arms 23 and 27 to spread, and likewise the arms 24 and 30 to spread, or, in other words, permitting the upward movement of the crank to continue without further moving the head upward. Inasmuch, however, as the resistance of a spring constantly increases as the spring compresses, it is apparent that unless means is provided for taking care of the increased power produced by the increased resistance of the spring 17 when thus compressed, the pressure developed between the heads 1 and 2 will increase as the spring is compressed. In the particular construction illustrated, the increase in power due to the increased resistance of the spring 17 is taken care of by the angular disposition of the arms 23, 27, 24, 30 before referred to. The arms 23 and 27 are angularly disposed with relation to the line of movement of the head, the angle of these arms with relation to this line of movement being other than a right angle. In a similar manner, the arms 30 and 24 are angularly disposed with relation to the line of movement of the head, the angle being also other than a right angle.

As the crank or driver begins to move, the forces developed will be resolved into two components, one of which will tend to raise the head 1 and exert a pressure on any article between the heads, and the other will tend to compress the spring. Until, however, a resisting force is developed between the heads which is sufficient to overcome the resistance of the spring, there will be no compressing of the spring, so that the only work done by the movement of the crank is expended in lifting the head and in developing a force on the article between the heads. As soon as the spring begins to compress, however, the arms 23 and 27, 24 and 30 begin to change their angular relation with respect to the line of movement of the head, the link 25 moving, of course, away from the end of the casing 18 and away from the line of movement of the head, see Fig. 3. When this occurs that component of the force which tends to compress the spring increases due to the change in leverage of the arms, and it continues to increase with the change in the angular relation of the arms until, in the particular construction shown, the arms 23, 27, 24 and 30 reach a position at right angles to the line of movement of the head, at which time the greatest compression of the spring occurs. It follows, therefore, that as the spring compresses and its resistance increases the power transmitting connection varies. By this variability of the power transmitting connection, in the particular construction shown the leverage applied to the spring increases, the ratio of increase being equal, in the particular construction shown, to the calculated increase in the force of the spring due to its compression. If the angular arrangement of the levers and the resistance of the spring be properly calculated, the components of the force resulting from the driving power of the crank and the spring will be divided in such a ratio that the force developed between the pressure heads is a substantially constant force, that is to say, a predetermined pressure may be maintained between the heads. In the practical application of the mechanism for capping bottles, therefore, it will be seen that when a bottle of any given length, within the limits for which the machine is calculated, be inserted between the heads, and the crank revolves, it will happen, in the first instance, that the head will be lifted, in the particular construction shown until the cap is forced against the other head and by it pressed down upon the bottle. The pressure upon the bottle will continue to increase until a predetermined limit of pressure is reached, after which the pressure upon the bottle will remain substantially constant, the force developed by the further revolution of the crank being expended in the compression of the spring.

When the invention is employed in connection with a capping machine in which the cap is first seated upon the receptacle to be capped and then locked in position by forcing the flange of the cap under a shoulder on the receptacle, the particular means employed for forcing the flange of the cap underneath the shoulder on the receptacle may be of any desired character. As shown, the forcing of the flange of the cap under the shoulder of the receptacle is effected by means of spinning wheels 35 mounted on pivoted arms 36, the upper ends of these arms bearing on a cone 37 carried above the head 2. As the head 2 moves up, therefore, the spinning wheels will be thrown into operative relation with the flange of the cap. The spinning wheels may be driven in any suitable manner. As shown, there is provided a gear 38 which is connected to the part on which the spinning wheel carrying arms are pivoted. This gear 38 (see dotted lines in Fig. 1) meshes with a gear 39 mounted on a vertical shaft 40 which has at its upper end a gear 41 in mesh with a gear 42 mounted on a long vertical shaft 43. This long vertical shaft 43 has its upper end mounted in a bearing 44 which is connected to a long tubular casing 45. The lower end of this tubular casing is supported in a sleeve 46 forming a part of the general casing of the machine. The lower end of the shaft 43 is splined to a sleeve 47, said sleeve being supported in a bracket 48. This sleeve 47 is provided with a bevel gear 49 which meshes with a bevel gear 50 mounted on the crank disk 14.

The machine is preferably operated by the pulley 15 through a single revolution clutch which may be of any well-known description. Inasmuch as there are various forms of single revolution clutches well-known in the art which are applicable to the present use, and as a description of such a clutch will not in any way conduce to an understanding of the present invention, a description thereof is omitted.

The machine is or may be provided with a treadle 51 by which the clutch is controlled.

The particular machine selected to illustrate the invention is provided with an adjusting device by which the head may be positioned for variations in size of the bottles which are greater than would be taken care of by the equalizing device. This adjusting device, where one is employed, may be of any suitable character. In the particular construction shown, the casing 45 has connected to it a tubular boss 52 through which passes a screw 53, the screw being passed through a threaded opening in the machine table 54 and being provided with a hand wheel 55. By turning the screw in one direction or another, the casing 45, the pressure head and parts connected therewith and the shaft 43 will be moved in one direction or the other, the splined connection of the shaft 43 with the sleeve 47 permitting this movement.

While the construction illustrated embodies the invention in the best form now known, the invention may be embodied in constructions which differ widely therefrom. The invention is not, therefore, to be limited to the specific construction herein shown and described.

What is claimed is:—

1. In a bottle capping machine, the combination with a driving mechanism having a constant stroke, of a pair of pressure heads, connections whereby the driving mechanism produces a relative movement between the heads, a pair of arms pivoted at their inner ends, the inner ends of the arms lying nearer the line of movement of the heads than the outer ends and the arms being disposed at an angle to said line of movement which is other than a right angle, means whereby more than a predetermined pressure exerted between the heads causes a spreading movement of the arms, and means for opposing an increasing resistance to the movement of the arms.

2. In a bottle capping machine, the combination with a driving mechanism having a constant stroke, of a pair of pressure heads, connections whereby the driving mechanism produces a relative movement between the heads, a pair of arms pivoted at their inner ends, the inner ends lying nearer the line of movement of the heads than the outer ends and the arms being disposed at an angle to said line of movement which is other than a right angle, links pivoted to the outer ends of the arms, a spring connected to one of the links, and supporting means for the spring carried by the other link, whereby when more than a predetermined pressure is exerted between the heads a spreading movement of the arms and links is effected, said movement being increasingly resisted by the spring.

3. In a bottle capping machine, the combination with a driving mechanism having a constant stroke, of a pair of pressure heads, connections whereby the driving mechanism produces a relative movement between the heads, two pairs of arms pivoted at their inner ends, the inner ends of the arms lying nearer the line of movement of the heads than the outer and the arms being disposed at an angle to the line of movement which is other than a right angle, a pair of links, said links connecting the outer ends of corresponding arms, a spring secured to one of the links, and supporting means for the spring carried by the other link, whereby when more than a predetermined pressure is exerted between the heads a spreading movement of the arms and links is effected, said movement being increasingly resisted by the spring.

In testimony whereof, I have hereunto set my hand, in the presence of two subscribing witnesses.

FELIX MUELLER.

Witnesses:
J. A. GRAVES,
A. WHITE.