954,901.

C. F. W. SUESS.

GLASS FORMING MACHINERY.

APPLICATION FILED MAR. 22, 1909.

Patented Apr. 12, 1910.

4 SHEETS—SHEET 1.

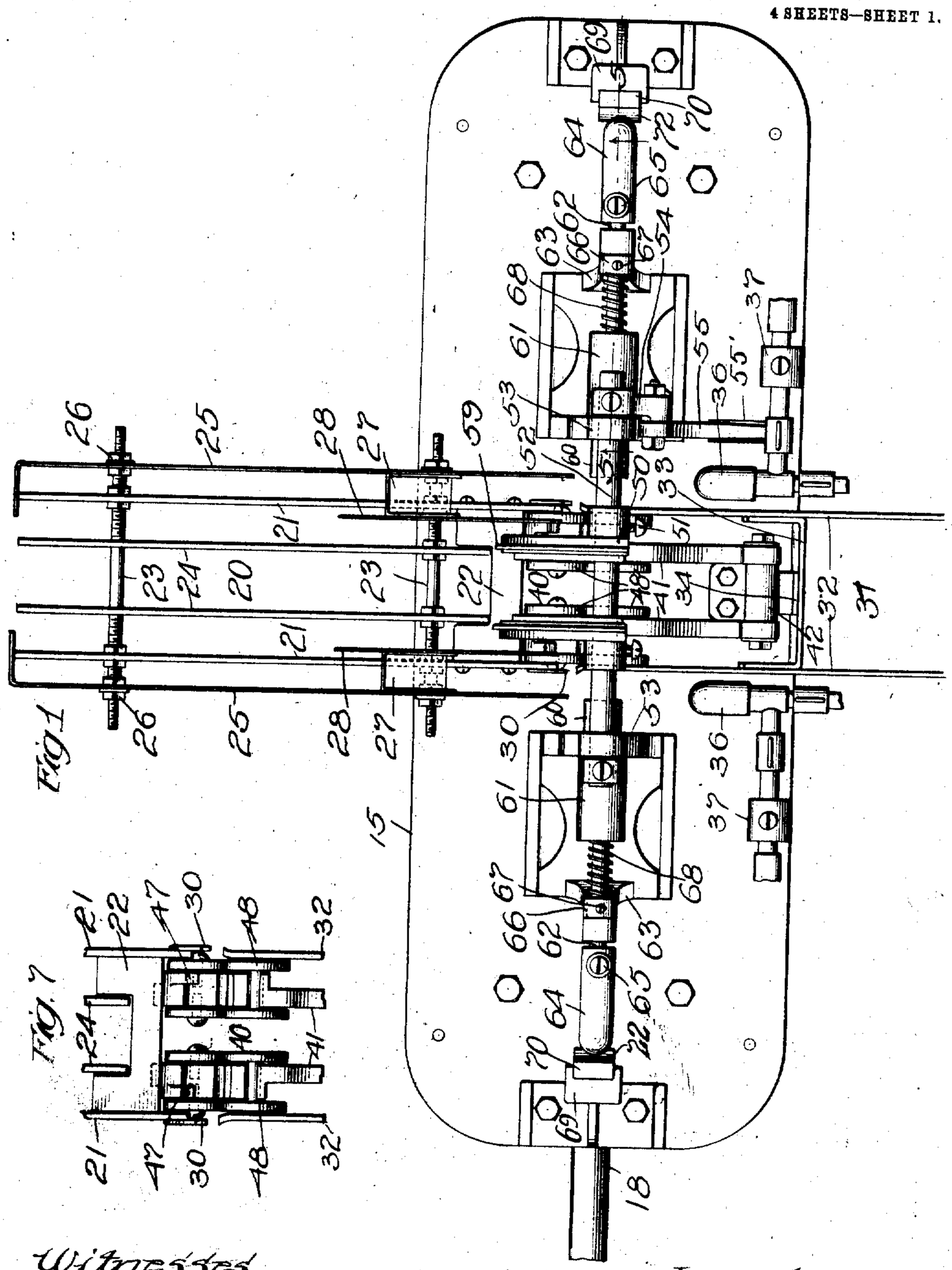

Fig. 1

Fig. 7

Witnesses:
R. A. White.
H. R. Lewis

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4 SHEETS—SHEET 2.

Fig. 9

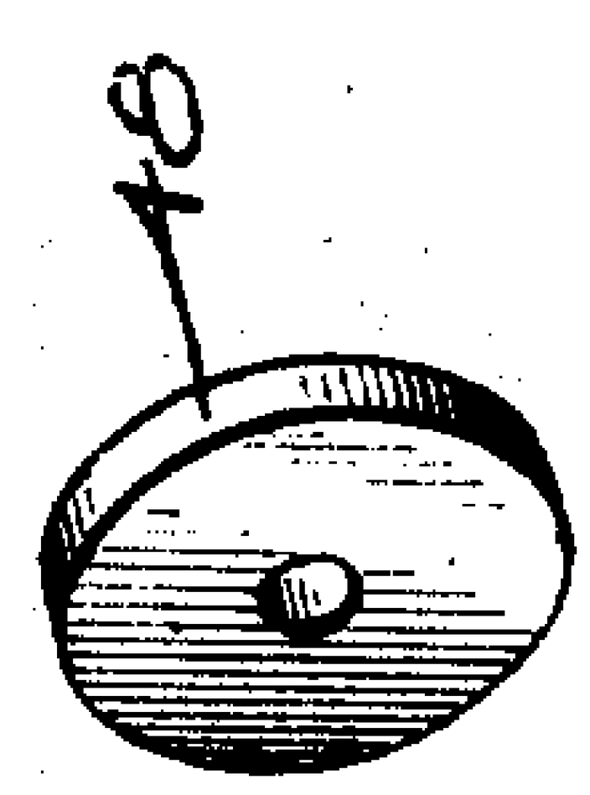


Fig. 2

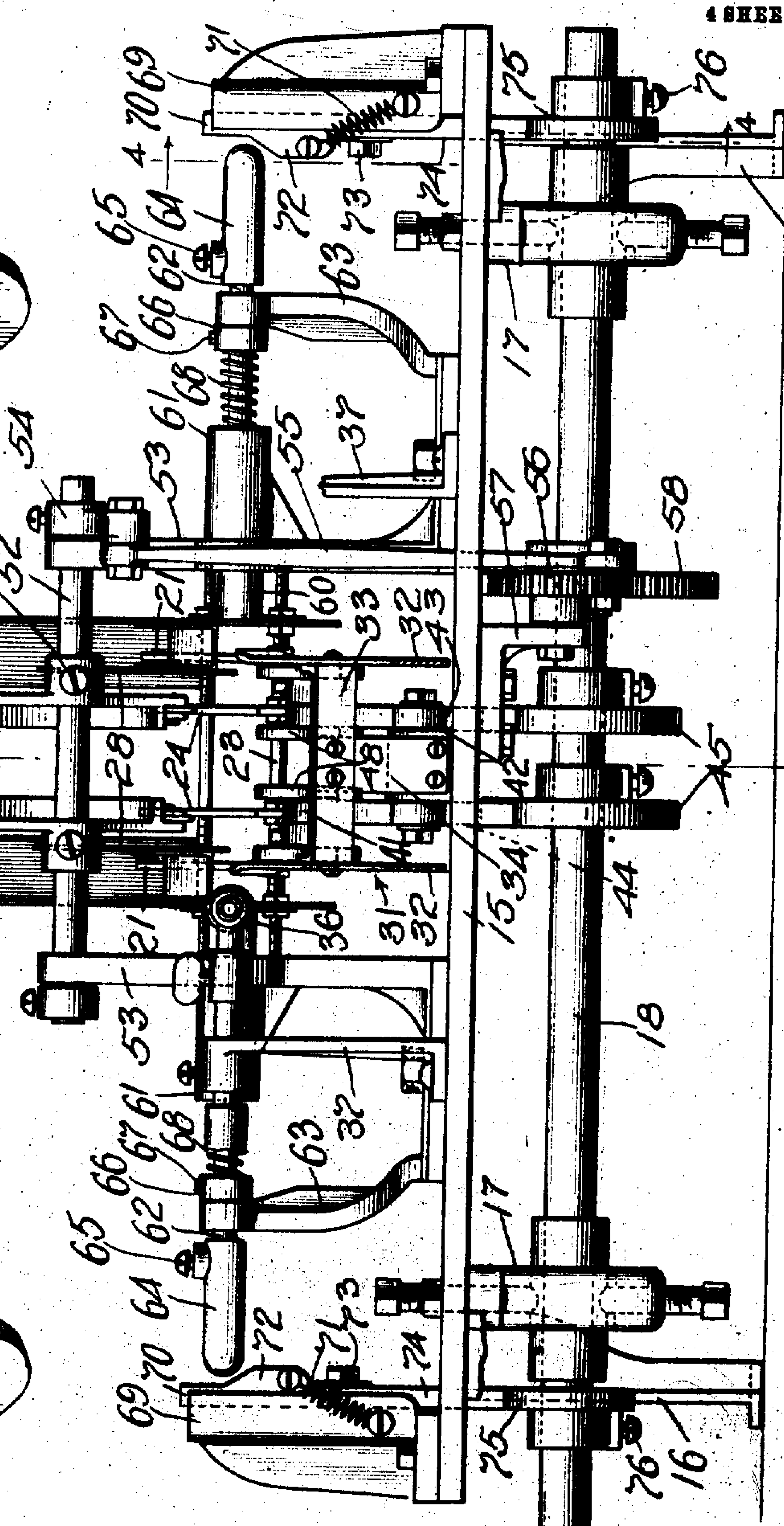
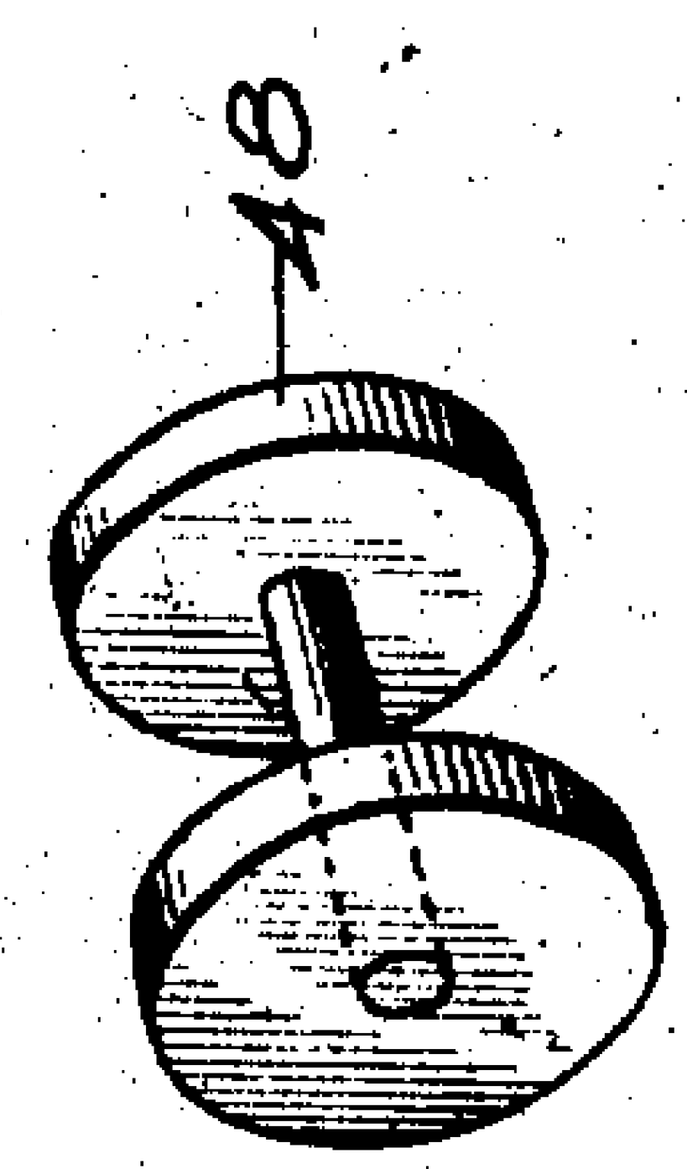


Fig. 8



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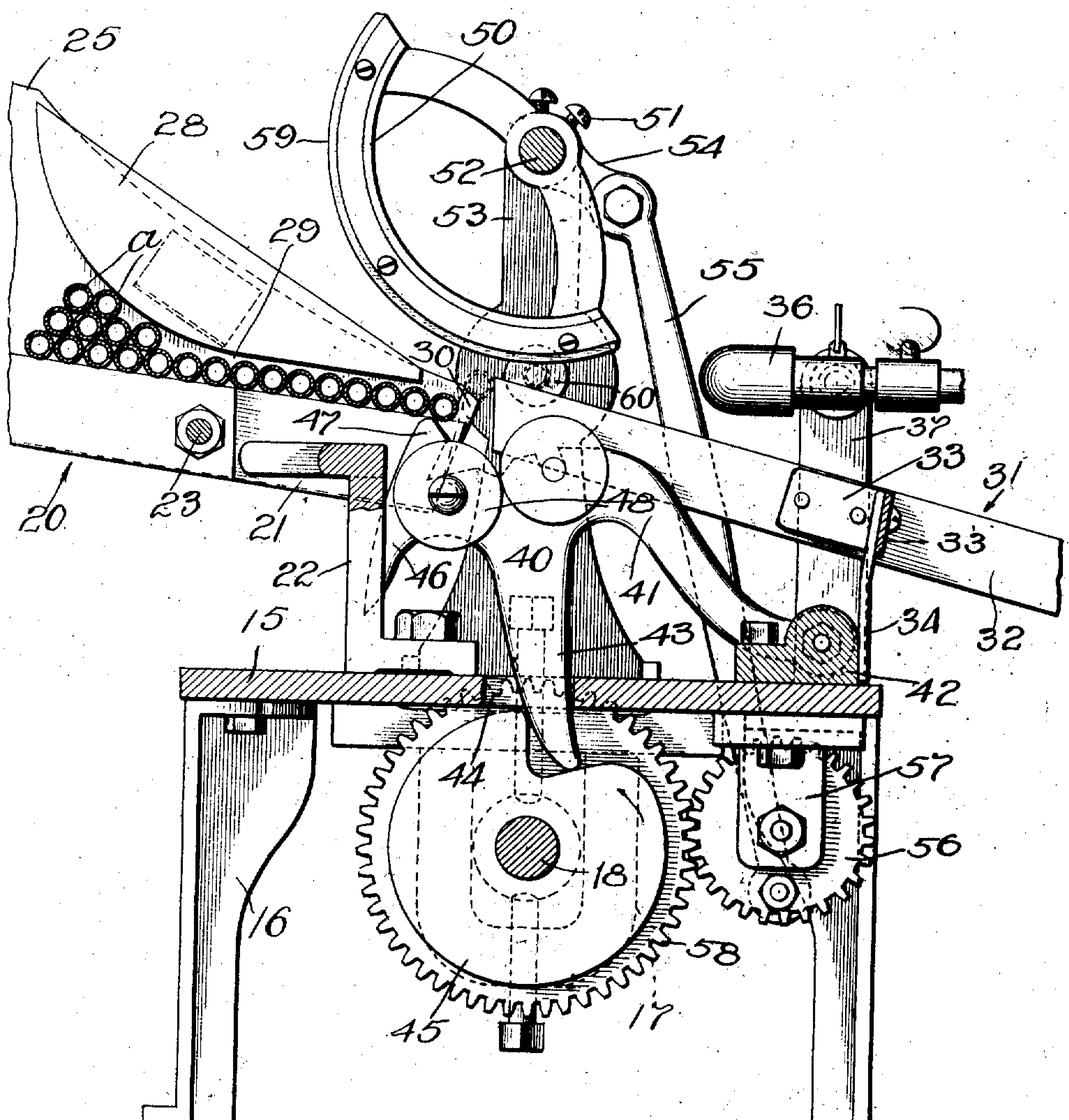
4 SHEETS—SHEET 3.

Fig. 3



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4 SHEETS—SHEET 4.

Fig. 4

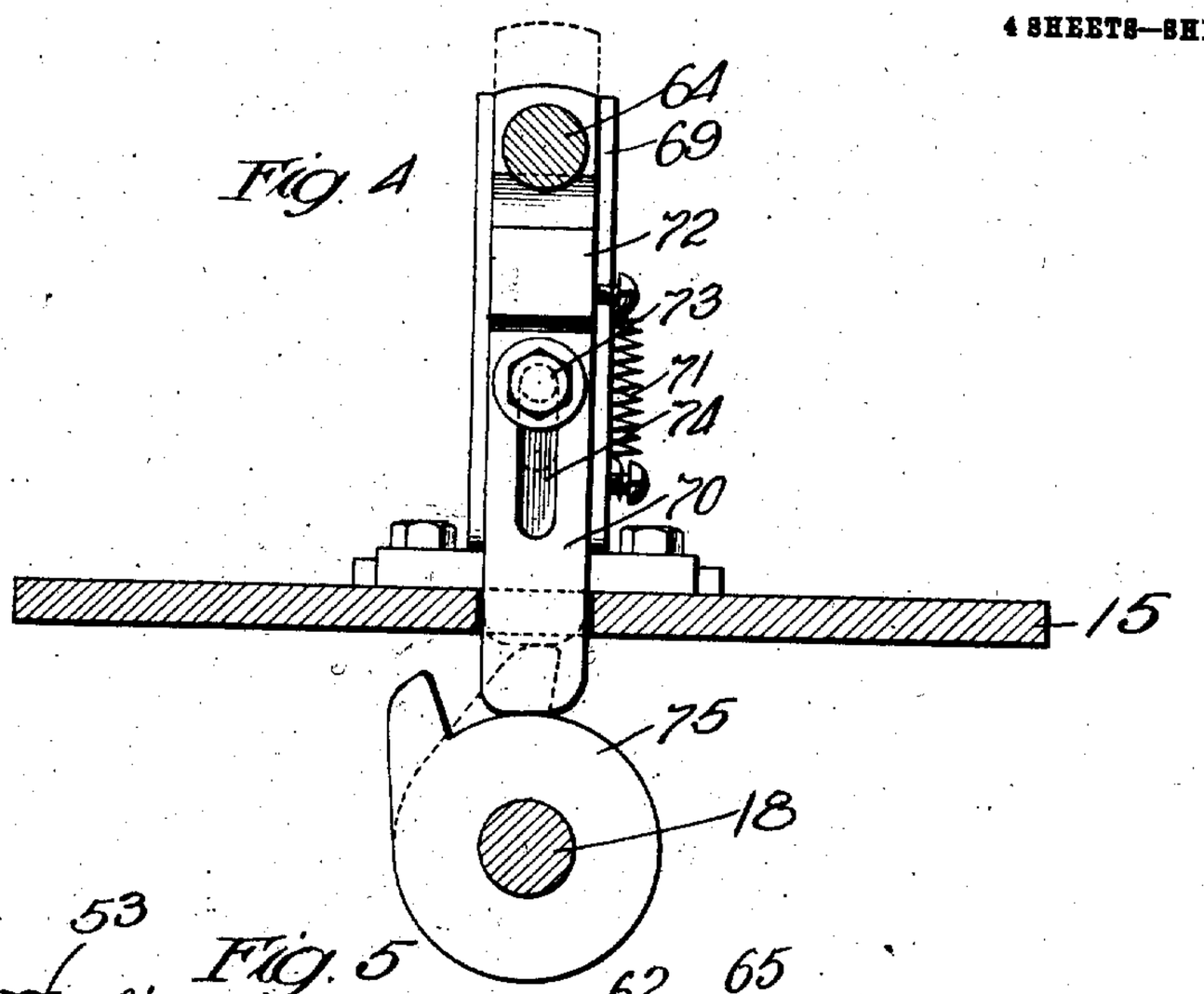

Fig. 5

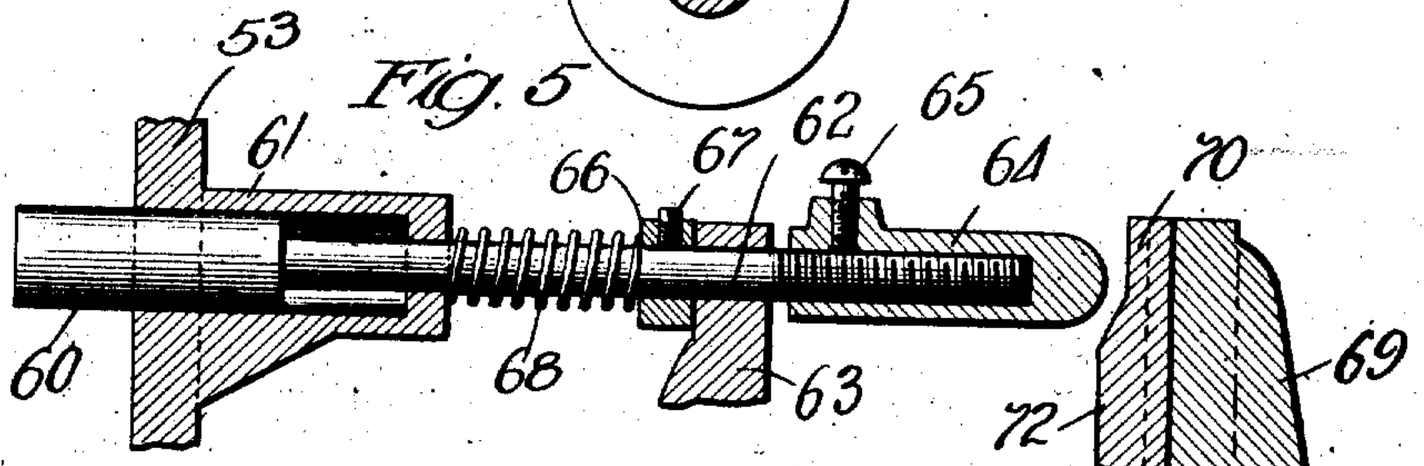

Fig. 6

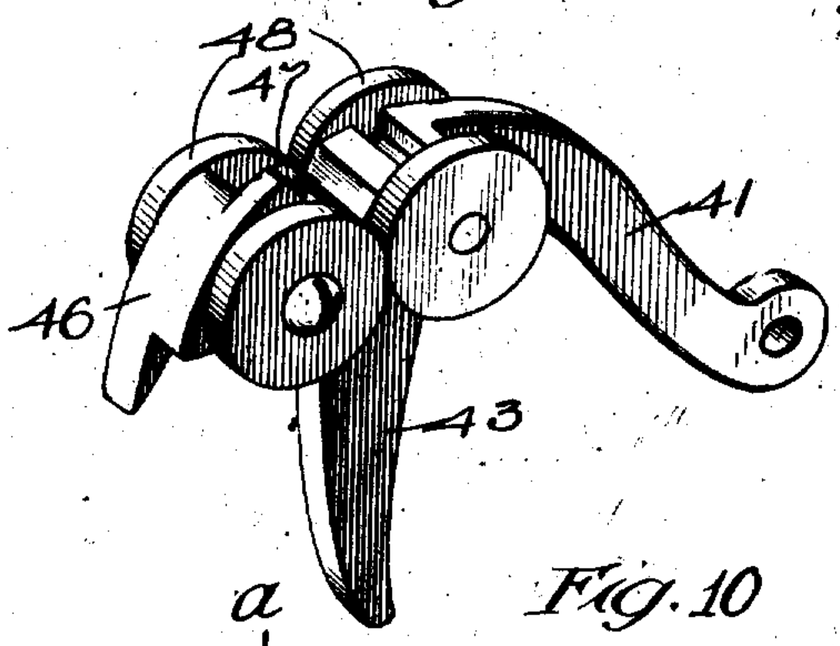

Fig. 10

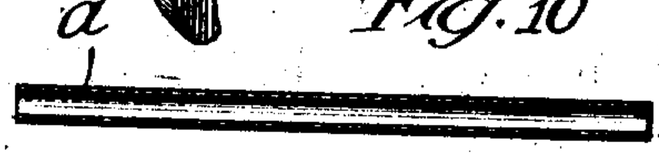

Fig. 11

Witnesses
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UNITED STATES PATENT OFFICE.

CHARLES F. W. SUESS, OF CHICAGO, ILLINOIS, ASSIGNOR TO JOHN R. NIGG, OF CHICAGO, ILLINOIS.

GLASS-FORMING MACHINERY.

954,901. Specification of Letters Patent. **Patented Apr. 12, 1910.**

Application filed March 22, 1909. Serial No. 484,896.

To all whom it may concern:

Be it known that I, CHARLES F. W. SUESS, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Glass-Forming Machinery, of which the following is a specification.

My invention relates to improvements in glass forming machinery, and more particularly to automatic machines for forming the ends of tubular glass structures or blanks.

In the manufacture of many articles of glass-ware it is necessary to form duplicate beads or projecting collars upon opposite ends of glass tubes, or blanks, and in the machines heretofore provided for that purpose it has been customary to operate upon one end of the tubular structures at a time, running the batch of blanks through the machine to form one end of each blank and then repeating the operation with respect to the opposite ends of the blanks.

One of the salient objects of my invention is to provide a machine which will operate upon opposite ends of the blank to form both ends of the blank simultaneously.

A further object of my invention is to provide a machine of generally improved character which is simple in construction, easy of manufacture and efficient and reliable in operation.

In the accompanying drawings; Figure 1 is a plan view of a machine embodying my invention; Fig. 2 is a side elevation thereof from the rear or delivery end; Fig. 3 is a section on line 3—3 of Fig. 2. Fig. 4 is an enlarged detail of a cam-operating construction; Fig. 5 is an enlarged sectional detail, on line 5—5 of Fig. 1; Fig. 6 is an enlarged perspective detail, of one member of the tube carriage; Fig. 7 is a plan view of a fragment of the tool carriage and appurtenant part. Figs 8 and 9 are details of the roller constructions of the tube carriage; Figs. 10 and 11 are sectional views of a tubular blank and beaded tube.

In the drawings 15 indicates a bed, or frame plate, horizontally disposed and supported at a suitable elevation upon legs 16, said bed having secured to its under side vertically adjustable shaft hangers 17, in which is supported the longitudinal power shaft 18, at one end projecting beyond the frame and provided with suitable means (not shown) for the application of power thereto. The shaft 18 carries mechanism for imparting movement in timed relation to the movable operating parts above the bed 15, such movable parts consisting generally, of a vertically movable carriage arranged in a cycle of movement to extract a blank from a suitable feed incline, to elevate the blank to the operating field and there hold it in a roller cradle in which the blank may be rolled or rotated about its own axis in successively reversed directions and then to deposit it in a delivery way; an oscillating mechanism for so reversely rotating the blank, while subjected to heat applied to the ends of the blank, and oppositely acting forming means timed to form the ends of the blank after the blank has been duly heated.

An important feature of the machine lies in the provision of an oscillating structure for rolling the tube while it is in the heated area, for such construction has much to do with making practical the simultaneous forming of both ends of the blanks.

It will be apparent that the tube blanks to be evenly formed on opposite ends must be centrally positioned when the pressure devices act against the heated ends of the blank, so that the forming devices will act equally at both ends of the blank. It will also be apparent that where a glass tube is cradled as in rollers, to be rotated or rolled by the engagement therewith of an arcuate part making contact with the glass between the ends of the blank, the slightest inequalities of the glass or in the set of the rollers or the arcuate member, will cause the blank to creep endwise or axially in its carriage in one direction or the other during unidirectional rotation of the blank, so that if after the unidirectional rolling movement of the blank under the influence of heat at both ends, opposite and equally movable pressure members contact with the ends to form them into beads one end will be beaded much deeper or with a much larger collar than the other end, in many instances. By the use of an oscillating blank-mover, however, motion may be imparted to the blank to rotate it first in one direction and then in the other so that however it may creep on its initial rotation it is brought back to original position upon the reverse rotation and the pres-

sure head may be caused to act when the blank is in approximately the position which it occupied when the blank rotating means commenced to operate thereon, thereby making the accurate positioning of the blanks in the machine dependent only upon accuracy of the guides and not upon precise regularity of contour in the blank and the contour and setting of the mechanism by which rotation is effected and permitted.

In the construction shown, 20 indicates in general the adjustable feed incline, preferably comprising bottom strips 21, 21, downwardly inclined from front to rear and secured to a bracket 22 mounted upon the table 15, said strips 21 carrying cross bolts 23, 23, near their opposite ends, for the support of intervening bottom strips 24 and side plates 25, the latter being laterally adjustable upon the threaded extremities of the bolts 23, and secured by suitable nuts 26. These sides are accurately adjusted to receive blanks of the desired length. The side plates 25 are deep enough vertically to afford an ample reservoir, and may have attached thereto braces 27 carrying vertically disposed spreading plates 28 the bottom edges of which parallel the bottom 21, for a distance from their rear ends and are curved upward toward their front ends so as to spread blanks in a single layer in the passage 29, through which the blanks must pass one at a time. At their lower extremities the rails 21 are provided with stop posts 30 beyond which a blank may not roll, said stops 30 being preferably rearwardly inclined and having their top surfaces beveled as shown in Fig. 3.

The lower end of the feed structure is below and in front of the point to which a blank must be brought to be formed, and from which the blank when formed is delivered to the delivery chute. Thus the delivery chute, generally indicated at 31, may comprise simply a pair of rails 32 inclined downwardly and rearwardly, suitably connected together by a tie bar 33 and supported on the bracket 34 from the bed of the machine, the upper front ends of the rails 32 terminating, as shown in Fig. 3, above and in rear of the end of the feed incline 20.

The heating means for softening the ends of the blank may be of any suitable construction and *per se* forms no part of my present invention, such heating means being indicated at 36, 36, as Bunsen gas burners, adjustably mounted in brackets 37 and arranged to direct their flames against the blank ends when a blank is appropriately positioned.

For selecting a single blank for the feed incline, elevating it, and holding it in proper position to receive its rotative impulses, I provide a carriage, generally indicated at 40, which in the construction shown comprises parallel levers 41, pivoted adjacent the rear edge of the table on a bearing bracket 42, and each provided with an arm 43, extending downward through an appropriate aperture 44 in the table 15, for cooperation with a cam 45 mounted upon the power shaft 18. The forward extremity of each lever 41 is enlarged into an arcuate head 46 extending above and below the general plane of the arm and terminating at its upper end in a finger or point 47. Each lever carries rollers 48, preferably four in number, preferably disposed in couples, in alinement longitudinally of the machine on opposite sides of the arm and with the couples disposed in pairs with their peripheries close together so that the upper, converging arcs of the several rollers form a cradle notch, the top line of the rollers being below the level of the point 47, as best shown in Fig. 3. The cam 45 is so shaped that in one position it will permit the carriage 40 to drop to the position shown in Fig. 3, and shortly thereafter in the rotation of the cam raises the carriage to bring the cradle notch between its rollers just above the top of the delivery incline 31, and then hold the carriage in such position during the balance of the revolution of the cam.

The blank moving means for imparting reverse rotation to the blank, in the embodiment shown, comprises a pair of sectors 50, adjustably secured by set screws 51 upon a rock shaft 52 mounted in bearing standards 53 secured to the bed of the machine, said shaft having likewise adjustably connected thereto a crank arm 54 having connection in turn to a pitman 55, which passes through a suitable aperture 55′ in the plate 15 and is connected pivotally to a pinion 56, mounted below the bed 15 in brackets 57 and is arranged in mesh with a gear 58 upon the power shaft 18. In the construction shown the pinion 56 is of one half the diameter of gear 58, so that two complete revolutions are imparted to the pinion during each revolution of the gear, and consequently two complete cycles of oscillation are imparted to the sectors 50 during each rotation of the power shaft but it may be otherwise proportioned. The outer edges of the sectors are shod with yielding material of good frictional qualities, such as rubber, the construction shown providing shoes 59 detachably secured to the sectors and so adjusted that when a blank stands in raised position in the roller cradle the shoes 59 may engage the upper surface of the blank, between the roller couples which support said blank.

In longitudinal alinement with the working area are arranged the forming devices each of which in the present embodiment, comprises a plunger 60 sliding in socket 61 upon the standard 53, and connected with

a slide rod 62, bearing in a bracket 63 and having mounted thereon, upon a threaded end projecting beyond such bracket, an adjustable head 64 adapted to be secured in any adjusted position as by a set screw 65. A collar 66 is adjustably mounted upon each rod 62 and affords bearing to a spring 68 coiled around the rod and at its other end abutting against the socket 61, said spring tending to force the sliding structure outward, but yieldingly permitting inward movement of the plunger until the inner end of the head 64 strikes the bearing 63. This particular construction is adapted to form a simple bead upon a blank but other forming devices might replace it.

For imparting movement to the sliding parts I provide at each end of the frame a guide bracket 69 having therein a vertical groove, in which is mounted for vertical reciprocation a slide 70 normally maintained in lowermost position by a spring 71 and having at a suitable point an inwardly facing cam or incline 72 arranged when the slide is elevated to engage the head 67 of the plunger structure or pressure member and move it inward in its guides. The slide 70 passes down through the bed 15 of the machine and is retained in position in its guide by a bolt 73 taking through an elongated slot 74, the lower end of the slide cooperating with a cam 75 upon the shaft 18, said cam having a single short projection arranged when it passes the slide to elevate the latter quickly and very shortly thereafter to permit the slide to drop again to normal or depressed condition. The cams 75 are adjustable upon the shaft 18, being held thereon by set screws 76.

The several operating parts upon the shaft are adjusted for such relation to each other that the cam 75 will elevate the slide 70 to operate the pressure members just as the gear 58 through its pinion and pitman connections throw the sectors 50 to the forwardmost position which they assume in their oscillation, and the cams 45 are arranged to permit the arms 43 of the carriage to drop into their recesses immediately after the cam 75 releases the slide 70 for descent.

In practice the operation of the machine is as follows, starting from the position shown in Fig. 3. The feed hopper is filled with blanks, which may be open-ended glass tubes, as shown at *a* in Fig. 10. The width of the feed hopper is adjusted to just accommodate the blanks, which are fed singly as shown in Fig. 3, to such position that the lowermost blank contacts with the stop 30, and stands above and in front of fingers 47 of the elevating carriage. As the cam 58 begins its rotation it forces the carriage upward, and the point 47 lifts the first-presented blank up over the stop 30 and over the forward extremity of the delivery way, against the shoes of the sectors, which are just beginning their rearward movement, and which aid in carrying the blank over the delivery chute ends. When the carriage is lifted home, or to its upper position it holds the blank in the roller cradle in axial alinement with the plunger heads 60, as indicated in dotted lines in Fig. 3. Now, as in the rotation of the large gear 58, two or more rotations are imparted to the pinion 56, a corresponding number of oscillatory cycles are effected by the oscillating sector 50. The yielding edges or shoes 59 of the sectors, engaging the blank between its ends, and at points where the blank is firmly supported by the companion roller couples, rotates the blank on its longitudinal axis first in one direction and then in the other according to the direction of movement of the sector, so imparting a series of reverse rotations to the blank during the single revolution of the power shaft and leaving the blank at the end of the cycle of rotation of the power shaft in approximately the same position, rotatively, that it occupied when first engaged by the sectors. Thus even if the blank is so irregular in contour as to have a decided tendency to creep in its cradle, its creepage in one direction under the first movement of the sector is compensated for upon the reverse movement of the sector and ultimately the blank is left in the position to which it is directed in the machine by the operation of the guiding feed mechanism. During the operation of the machine heat is constantly applied to the ends of each tube as it is presented by the cradle for rotation, and the machine is timed in its operation to allow a sufficient period for the blanks to become thoroughly heated at their ends to such a softened condition as to be ready for forming. As the sector completes its last forward throw the quick acting cams 75 on opposite extremities of the power shaft rise beneath the slides, forcing the plungers inward so that they strike the opposite ends of the blank *a* and form the softened ends thereof up into beads *b* as shown in Fig. 11. Almost instantly, however, the cams 76 release the slides 70 permitting them to drop so that the springs 68 force outward the plungers and thereupon the cams 45 come again to position to permit the frame 40 to drop to the position shown in Fig. 3. As the frame drops away from the blank the latter is left in position at the top of the inclined delivery way and rolls down said delivery way to be disposed of as desired. The machine is thus restored to its original position ready for another cycle of operation.

While for purposes of full disclosure I have shown in the drawings an operative embodiment of my invention, it will be understood by those skilled in the art that I

do not desire to be limited to the details of the construction shown in the broader aspects of my invention, as it will be apparent that many changes might be made in the mechanical structure without departure from the spirit and scope of my invention.

Having described my invention, what I claim is;

1. In a machine of the character described, the combination of positioning means for a blank, means for heating both ends of the blank, means for imparting a succession of reverse rotary movements about its longitudinal axis to said blank, and forming means for simultaneously operating on both ends of the blank.

2. The combination of a roller cradle for positioning a blank, heating means for heating the ends of said blank, an oscillating part for engaging the blanks to impart a succession of reverse rotations thereto, and forming means for simultaneously operating on both ends of the blank.

3. In a machine of the character described, the combination of a gaged feed incline for blanks, a delivery incline alining therewith, with its receiving end above the adjacent end of the feed incline, a carriage vertically reversely movable to receive blanks from the supply chute, elevate them above the receiving end of the delivery incline and deposit them thereon, oscillating means for imparting reverse rotary movement to blanks elevated by the carriage, means for heating opposite extremities of the blank while so being rotated, means for forming the ends of said blanks when heated, and means for imparting the functional movements to said parts.

4. In a machine of the character described, means for supporting a blank for rotary movement in either direction, means for imparting successive reverse rotations to a blank so supported, means for heating both extremities of the blank so rotated, and means for forming the heated extremities simultaneously.

5. In a machine of the character described, the combination of a blank feed incline, a movable carriage for receiving blanks singly from the feed incline and elevating the same, said carriage comprising a cradle for supporting a blank for rotation in either direction, means for imparting successive reverse rotation to a blank while so supported, means for heating the rotating blank at its extremities, and means for forming the ends of said blanks when heated.

6. In a machine of the character described, the combination of a bed, a power shaft below said bed, and above the bed blank feeding means, delivery means, a carriage movable up and down arranged to receive blanks singly from the supply means, transport them to the delivery means, said carriage being arranged to support a blank for rotation about its axis, oscillating means for imparting successive reverse rotation to a blank positioned in the carriage, means for heating the extremities of the rotating blank, and means for forming the end of said blank, the carriage, oscillators and forming means being operatively connected with the shaft.

7. In a machine of the character described, the combination of blank feeding means, a carriage mounted for up and down movement arranged to receive a single blank from the feeding means during each movement, and elevate it, said carriage providing means for supporting a single blank for rotation upon its axis, means for rotating a blank in said carriage, means for heating the end of a blank while so rotating, and means for forming the end of said blank.

8. In a machine of the character described, the combination of a bed, a power shaft below said bed provided with a cam, a carriage mounted above the bed for reciprocation and provided with a part extending through said bed for engagement with the cam, means for supplying blanks to said carriage in arrangement to deliver blanks singly thereto, means on the carriage for supporting a blank for rotation, means for rotating a blank so supported, means for heating the end of a rotating blank, and means for forming said heated end.

9. In a machine of the character described, the combination of a feed incline arranged to present blanks singly at its delivery end, a carriage mounted to work reciprocatingly in a single line past said delivery end provided with means for selecting a single blank and positioning it for rotation upon its axis, delivery means for receiving the blank from the carriage when the latter is depressed, means for rotating a blank when positioned in the carriage, means for heating the end of a rotating blank, and means for forming said end.

10. In a machine of the character described, the combination of a bed, a shaft below the bed, above the bed a feed incline and a delivery way, having their adjacent extremities at different elevations, a carriage mounted for vertical displacement, providing means for selecting blanks singly from a supply chute, and a roller cradle to position the selected blank for rotation upon its longitudinal axis, after elevating the blank above the receiving extremity of the delivery way, an oscillating sector for engaging the blank and imparting thereto successive reverse rotations, means for heating the ends of the blank, parts movable to form the ends of the blanks when heated, and means upon the shaft for operating said moving parts in suitable timed relation to occasion a blank

to be elevated, rotated, formed and delivered to the delivery way.

11. In a machine of the character described, the combination of a feed incline providing means for presenting blanks at its delivery end in a single layer, and having stops adjacent its end, a carriage mounted for reverse vertical displacement traversing the end of the supply chute from a point below said supply chute to a point thereabove, and back in the same line selecting fingers on said carriage for lifting a blank from the incline over the end stop, and parts on said carriage forming a cradle wherein the blank may be rotated on a longitudinal axis, means for rotating a blank so elevated, means for heating an end of the rotating blank and means for forming its end.

12. In a machine of the character described, the combination of blank-positioning means, blank-feeding means, blank-forming means, and means for imparting a succession of reverse rotary movements about its longitudinal axis to said blank, while within the field of operation of the heating means.

13. In a machine of the character described, the combination of a frame, a blank-carriage mounted for up-and-down movement; means for feeding single blanks to said carriage during each upward movement and receiving it from said carriage on its downward movement, said carriage providing means for supporting the blank for rotation upon its axis; and means for rotating a blank in said carriage.

14. In a machine of the character described, the combination of a blank carriage mounted for up-and-down movement in a single line, means for feeding single blanks to said carriage during each upward movement and receiving the blanks from the carriage on their return movement, said carriage providing means for supporting a blank for rotation upon its axis, means for imparting reverse rotation to a blank in said support, means for heating a portion of a blank while so rotating, means for forming the heated portion of said blank, and means for imparting power to said operating parts.

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

CHARLES F. W. SUESS.

In the presence of—
GEO. T. MAY, JR.,
MARY F. ALLEN.