No. 846,496. PATENTED MAR. 12, 1907.

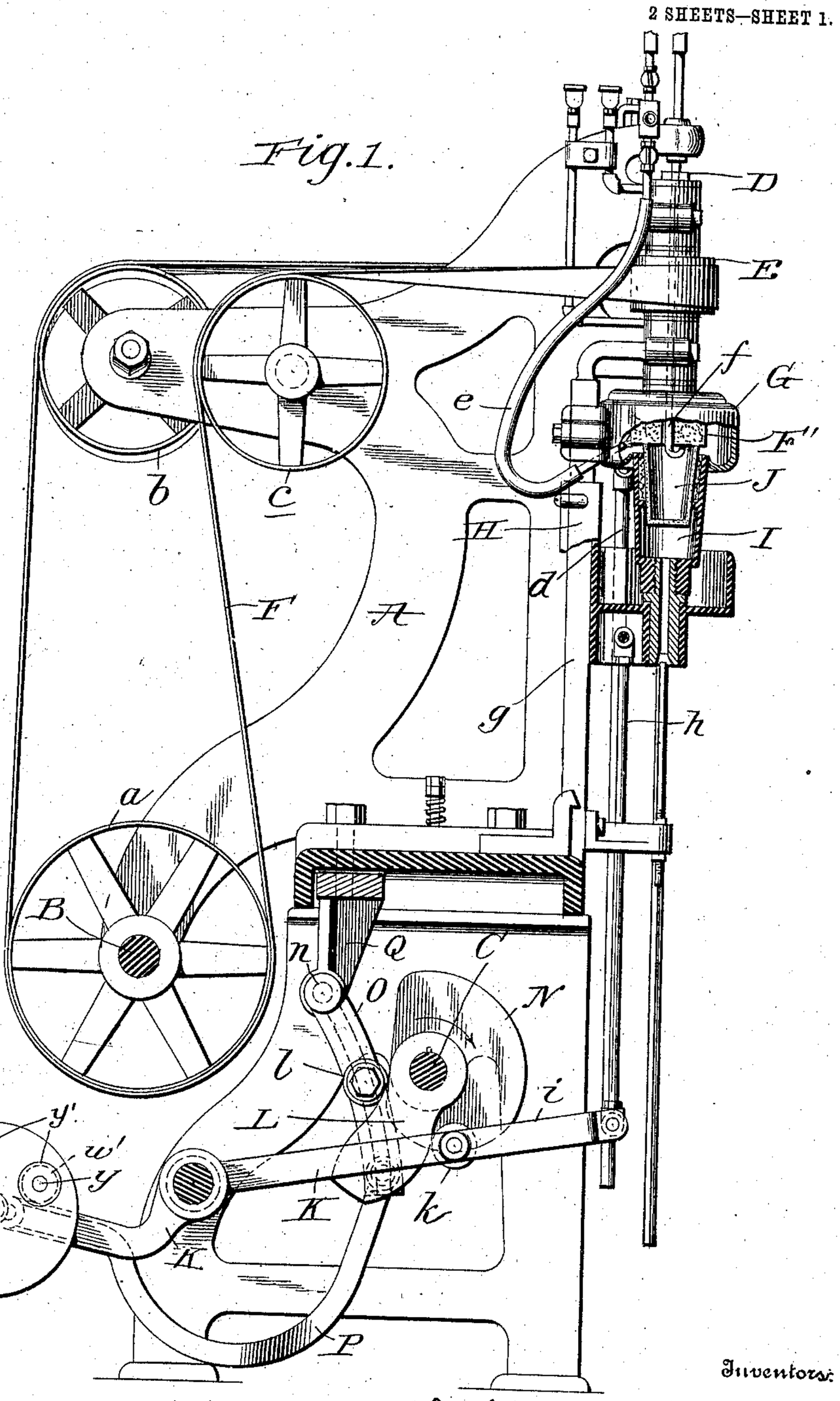
W. J. MUNCASTER & L. A. FLETCHER.

GRINDING MACHINE.

APPLICATION FILED OCT. 11, 1905.

2 SHEETS—SHEET 1.

Fig. 1.



Witnesses
J. Stewart Rice.
J. B. Malnati.

Inventors:
Walter J. Muncaster and
Lawrence A. Fletcher,
By Dodge and Sons, Attorneys.

No. 846,496. PATENTED MAR. 12, 1907.

W. J. MUNCASTER & L. A. FLETCHER.

GRINDING MACHINE.

APPLICATION FILED OCT. 11, 1905.

2 SHEETS—SHEET 2.

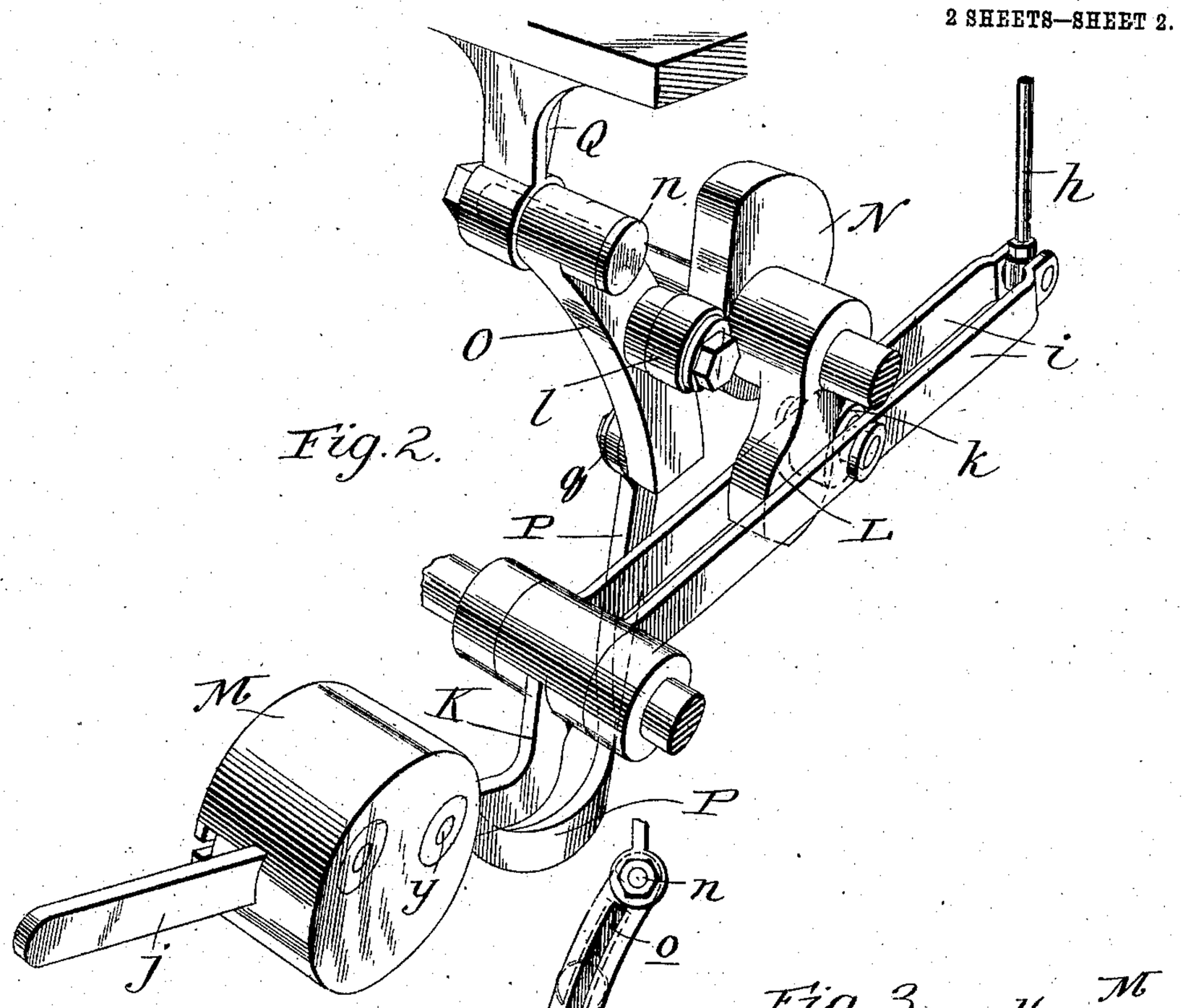


Fig. 2.

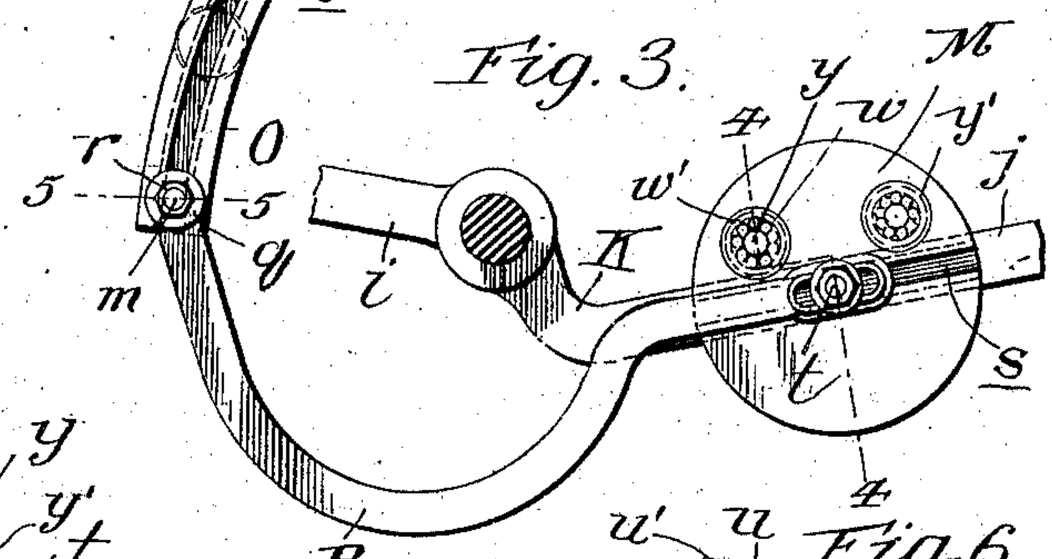


Fig. 3.

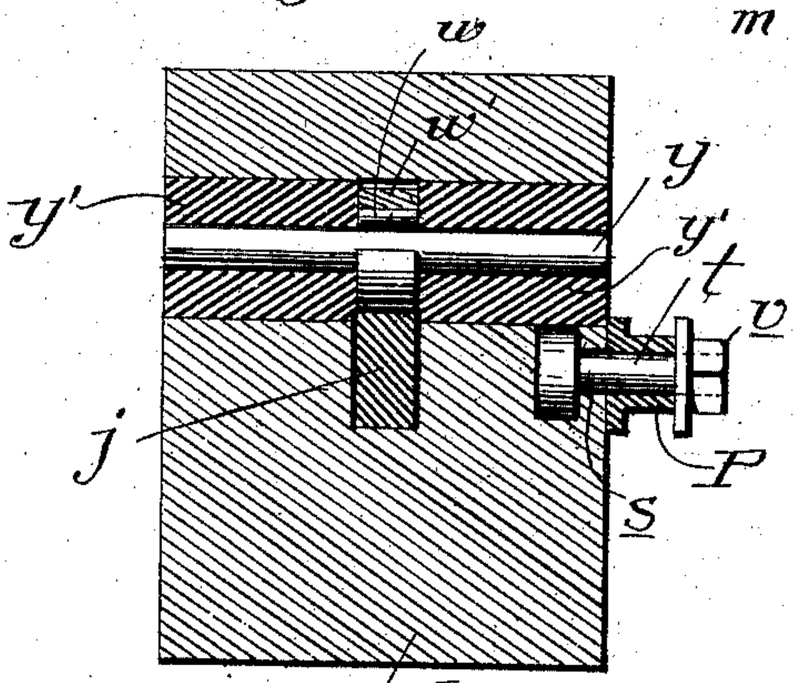


Fig. 4.

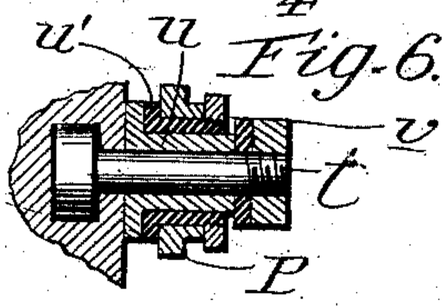


Fig. 6.

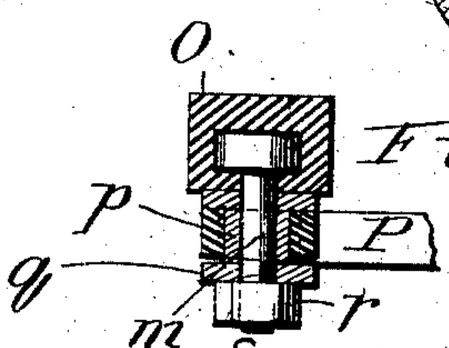


Fig. 5.

Witnesses
J. Stewart Rice.
J. B. Malnati.

Inventors,
Walter J. Muncaster and
Laurence A. Fletcher,
By Dodge and Sons,
Attorneys.

UNITED STATES PATENT OFFICE.

WALTER J. MUNCASTER AND LAWRENCE A. FLETCHER, OF CUMBERLAND, MARYLAND.

GRINDING-MACHINE.

No. 846,496. Specification of Letters Patent. Patented March 12, 1907.

Application filed October 11, 1905. Serial No. 282,338.

To all whom it may concern:

Be it known that we, WALTER J. MUNCASTER and LAWRENCE A. FLETCHER, citizens of the United States, residing at Cumberland, in the county of Allegany and State of Maryland, have invented certain new and useful Improvements in Grinding-Machines, of which the following is a specification.

This invention has reference to a machine for grinding the mouths or edges of tumblers and like objects, and is in the nature of an improvement upon the machine set forth in an application filed on the 20th day of December, 1904, in the joint names of Walter J. Muncaster and Lawrence A. Fletcher, and designated by Serial No. 237,697.

The primary object of the present improvements is to simulate as nearly as practicable the operation of hand-grinding or grinding the glass while held and pressed into contact with the grinding-wheel by the hand of the operator. The distinctive characteristics of such grinding are a light pressure at the outset and a progressively heavier pressure as the smaller protuberances or irregularities of the glass or other object are cut away and the object obtains a more extended bearing upon the grinder.

As the present invention is confined to mechanism for controlling the movements of the glass carrier or chuck, we have illustrated and shall describe only so much of the machine as is necessary to a clear comprehension of said devices. In fact, this feature may be employed in connection with any suitable grinding mechanism, and it is our purpose, therefore, to claim it quite broadly and without restriction to its combination with the specific grinding mechanism here shown.

In the accompanying drawings, Figure 1 is a side or end elevation of our machine with portions broken away or in section to better show their construction and arrangement. Fig. 2 is a perspective view of the mechanism by which the movements of the chuck or holder are produced and controlled. Fig. 3 is a side elevation of the same with portions broken away, the view being taken from the side opposite that from which Fig. 2 is taken. Fig. 4 is a section on the line 4 4 of Fig. 3, designed to show the manner of making the roller-bearing for the shifting weight and the adjustable connections between the weight and its actuating-link. Fig. 5 is a section on the line 5 5 of Fig. 3 through the adjustable pin connection between the said link and the slotted arm or lever which gives motion to it. Fig. 6 is a detail of a modification.

Referring first to Fig. 1, A indicates the general frame of the machine, B a driving-shaft mounted therein and receiving motion in any convenient manner from a suitable prime motor, and C a cam-shaft which in practice is preferably driven through suitable gearing connecting it with shaft B, though it may be independently driven, if preferred. In the previous application, above mentioned, a shaft carrying a worm or screw and receiving motion through beveled gearing from shaft B meshes with and turns a worm-wheel mounted upon the shaft C, thereby giving to said shaft a quite slow motion as compared with shaft B.

Mounted in suitable boxes or bearings in the upper part of the frame A and at the forward side thereof is a rotatable shaft D, provided with a band-wheel E, which is rotated by a belt F, passing about a band-pulley *a*, mounted upon shaft B, and about guiding and directing pulleys *b c*, suitably mounted upon the frame A. Shaft D carries at its lower end a grinding wheel or disk F′, which is provided with a shell or casing G to confine the water used upon the grinding-disk and to deliver the same to a suitable outlet-pipe *d*, water being supplied to the periphery of the stone by a pipe *e* and to the lower face of the stone by a pipe *f*, which latter passes centrally through the shaft D. Shaft D is under the construction shown held against longitudinal movement. Hence the stone F′ rotates in a fixed plane or at a constant height.

Mounted and guided upon ways *g* on the front of the frame A is a slide H, carrying a chuck I, in which is held the glass or object J to be ground, the chuck being preferably lined with cork or other relatively soft and elastic material to hold the glass with reasonable firmness, yet avoid breakage or injury thereof.

The slide H is connected by a rod *h* with the arm *i* of a lever K, fulcrumed at a point between said arm *i* and a rearwardly-projecting arm *j*, as best seen in Figs. 1 and 2. The arm *i* is preferably bifurcated or formed with

two parallel members, as plainly seen in Fig. 2, this construction permitting an antifriction-roller *k* to be mounted upon the pin or axle passing through and between the arms, said roller serving as a bearing-surface for the cam L, which actuates the lever K.

The rear arm *j* of lever K is weighted, as will be presently explained more in detail, to cause the elevation of the arm *i*, and consequently of the slide H and chuck I, and this weighting of the lever causes the roller *k* to be held constantly in contact with the operative face of cam L, or, in other words, to bear constantly against and follow the movements of said cam.

If the weight were fixed upon the arm *j* of lever K, it would exert a substantially constant lifting force upon the slide H, such force varying only as the curved path of movement of the weight carries said weight farther from the vertical plane of the axis of its fulcrum, a variation which with the actual movements of the lever would be relatively small. We therefore employ a shifting weight M for said lever K and control its movements in one direction by a cam N and in the opposite direction by giving to the arm *j* such a shape or inclination as causes the weight to tend constantly to move toward the fulcrum of lever K. As it is not entirely convenient in the type of machine here illustrated to place the cam N in position to act directly upon the shifting weight M, we employ between said weight and the cam connecting or actuating devices comprising a swinging lever O and a connecting-link P. In order to vary the range of movement of the weight, the connection between link P and swinging lever O is made adjustable toward and from the center or axis of motion of the lever, and in order to determine and vary the initial position or the point from which the weight begins to move outward upon the arm *j* of lever K an adjustable connection is provided between the weight and said link P. These features will be described in detail later on.

Referring again to Fig. 1, it will be seen that the swinging lever O is pivoted or fulcrumed at its upper end in or upon a bracket Q, secured to the frame of the machine, and hangs downward in rear of cam N, but out of line therewith, said arm or lever being provided with a laterally-projecting stud or pin carrying an antifriction-roller *l*, which is in vertical plane with the cam N and rests against the periphery of said cam. From the opposite side of the arm or lever O projects a second pin or bolt *m*, which forms a pivotal connection for the link P, and in order that this connection may be made nearer to or farther from the pivot-bolt or fulcrum *n* of arm or lever O said arm or lever is provided with a longitudinal T-slot *o*, (seen in Figs. 3 and 5 and indicated by dotted lines in Fig. 1,) a bushing *p* being placed upon the shank or stem of the pin *m*, so that the washer *q* may not be pressed into too close contact with and bind the link P when the nut *r* is screwed down upon the stem or bolt *m* to bind the head of the bolt in the slot of arm O. By loosening the nut *r* the bolt *m* may be moved lengthwise of said slot and tightened at any desired point; but the bushing *p*, serving as a spacing member, will prevent the link P from being bound or clamped and will leave it free to rock upon its pivot. Similarly, it is desirable to permit adjustment of the weight M relatively to the link, for which purpose said weight is provided with a T-slot *s*, and the connecting pin or bolt *t* has its head mounted in said slot and is provided with a bushing *u*, Fig. 4, which bushing is seated within the hole or opening in the rear end of link P and permits the latter to rock or pivot thereon, though the tightening of the nut *v* serves to clamp the bolt or pivot-pin at any desired point in the slot *s*. If preferred, however, the link may be slotted, as shown in Fig. 3, and the pin or bolt *t* made stationary in the weight, in which case the bolt will be shouldered to prevent the nut screwing down so far as to clamp the link P. If both the link and the weight be slotted, it will of course be necessary to employ two concentric bushings, the outer one, *u'*, shorter than the inner one, *u*, and to clamp the slotted end of the link P between the flanged end of its bushing and the clamping-nut, the inner bushing being constructed and arranged precisely as the bushing *p* of Fig. 5 and serving to clamp or bind the bolt in the slot *s* of the weight.

The arm *j* of lever K is inclined upward from a point near the fulcrum of the lever toward its rear end, the inclination being such that when the slide H is at its highest elevation there shall still be a considerable tendency of the weight to slide or move inward toward the fulcrum of the lever. To make this movement easier and more certain, the weight is preferably furnished with antifriction-sleeves to bear upon the upper edge of the arm *j*. These sleeves may be arranged as shown in Figs. 1, 2, 3, and 4. By referring to the last-mentioned figure it will be seen that two tubular plugs or cylinders *y'* are driven or forced into a circular opening extending from face to face of the weight, the conjoint length of said plugs being somewhat less than the measurement of the weight from face to face. These plugs being made flush with the outer faces of the weight, there is left between them a space equal to or slightly greater than the thickness or edge face of the arm *j* of lever K, and within this space or cavity is arranged a circular series of rollers *w*, which encircle a pin or rod *y*, the rollers in turn being encircled by a collar or sleeve *w'*. (See Fig. 4.) The sleeve *w'*, resting directly upon the upper face of the arm

j and being free to circle about the rod *y*, will roll upon the arm *j*, thus giving an easy rolling friction upon the arm *j* instead of a sliding or rubbing friction. Two such roller-supported sleeves *w'* are employed, so that the weight has proper bearing and support upon the arm *j* of the lever K and may ride freely back and forth.

The parts being thus constructed and motion being imparted to shafts B and C, the operation is as follows: At the outset of the operation the slide H is depressed or lowered, the outer extremity of cam L at such time standing directly over and bearing upon the roller *k*, and thereby holding the slide momentarily depressed. In the machine as actually constructed provision is made for locking down this slide; but this may be used or omitted, as preferred, and as it constitutes no part of the present invention is not here illustrated. The glass J being introduced into the chuck or holder I and shaft C continuing to rotate, the end portion of the cam L rides off the roller *k* and brings that portion of its edge or periphery extending from the end inward toward the hub opposite the roller, which roller, as before mentioned, is kept normally in contact with the peripheral face of the cam by the weight M, tending to elevate the arm *i* of the lever K. This permits the slide H to rise somewhat quickly; but as the weight M is at such time relatively near the fulcrum of the lever K it exerts slight upward pressure upon the slide, sufficient only to overcome the weight of the slide and attendant parts and the glass carried thereby. The grinding begins under this light pressure, and the rough edges and slight projections or irregularities are rapidly ground away with such light pressure. The cam L continuing its movement in the direction indicated by the arrow in Fig. 1, leaves roller *k*, so that the glass may rise under the influence of weight M to whatever extent the grinding of its edge necessitates. This action continues under the light pressure until sufficient time having elapsed to remove the smaller projections and to grind the edge down to a comparatively regular face capable of withstanding without injury further pressure and harder grinding, the cam N comes into play, and its periphery, which is of gradually-increasing radius, bears against the roller *l* of arm or lever O and moves the same rearwardly. This movement of the arm O, by reason of the interposed or connecting link P, moves weight M rearwardly upon the arm *j* of lever K, giving to said weight increased leverage, and consequently increased efficiency or lifting effect, upon the slide H and the glass J, carried in the chuck or holder. The curvature of the cam N is such as to cause this movement of the weight M to take place somewhat gradually and to increase the pressure of the glass against the stone progressively and in proportion to the increasing contact-surface of the glass upon the stone. This progressive increase continues or may continue through from, say, a fifth to a quarter of a revolution of the cam N, from which point the peripheral face of the cam is made concentric with the axis of the shaft C, so as to maintain from there to the end of its action in pressing back the arm O a constant effect. When the cam N has turned a predetermined distance in contact with roller *l*, an approximately radial portion of the cam N is brought in front of roller *l* and permits the arm O to swing forward, the weight M rolling or sliding downward or forward upon the arm *j* of lever K and, through the connecting-link P, serving to swing or press the lever O forward and to maintain the roller *l* in contact with the periphery of cam N. By this time cam L again comes into contact with and presses down the roller *k*, thereby lowering the slide H, with its chuck I and contained glass J, whereupon the whole cycle of operation is repeated.

In practice we provide a plurality of chucks or glass-holders, with their controlling-levers, weights, cams, &c., arranging the cams to permit the chucks to rise to working position in regular succession. The attendant can by acting promptly remove finished glasses and supply others as fast as the chucks are depressed; but to guard against interruptions or inattention on the part of the operator catches will preferably be provided to hold the levers and chucks in their lowered positions, as in our former application, to be released by the operator.

Mention has been made above of the slotting of both the weight and the link through which it is shifted. This provision is made in order that the initial position of the weight M and the setting of bolt *m*, by which the effective length of lever O is determined, may each be determined without disturbing the other, as will now be explained.

Assuming that lever O be at its extreme forward throw, its roller *l* resting against the circular or hub portion of cam L, link P may be swung about bolt *t* as a pivot without swinging or moving lever O, the slot *o* in said lever being an arc of a circle of which the axis of bolt *t* is the center. It will likewise be seen that by adjusting bolt *m* in slot *o* of arm or lever O the effective length of said lever may be varied as desired without shifting the initial position of weight M. Finally, it will be apparent that by varying the adjustment of bolt *m*, and thus determining the effective length of lever O, the extent of movement of weight M on arm *j* of lever K, and consequently the pressure exerted by said weight, will be determined and controlled.

Glasses vary in thickness, diameter, hardness, &c., and a pressure suitable for one lot

or grade of glasses will be unsuitable for another. It is therefore necessary or at least desirable to vary the initial position of the weight M as well as the range of its movement, the latter being proportionate to the effective length of lever O, as above indicated. It is for the purpose of varying this initial position of weight M that the slot *s* is provided, the weight being thus rendered adjustable without changing the position of bolt *t*. In order to facilitate the initial setting of link P and give the precise distance required between the bolts *m* and *t*, the link is slotted at its rear end, as shown in Figs. 1 and 3, and, as above mentioned, a double bushing *u u'* is employed, permitting the requisite swiveling or pivotal action without allowing lost motion between the weight and link.

Having thus described our invention, what we claim is—

1. In a machine of the character described, the combination of a grinding-wheel; a chuck or work-holder movable toward and from said wheel; a lever connected with and serving to move the chuck; a cam for moving said lever in one direction; a weight for moving the lever in the opposite direction; and means, substantially such as shown and described, for varying the position of said weight relatively to the fulcrum of the lever as the grinding progresses.

2. In combination with a grinding-wheel, a chuck or work-holder, and mechanism for automatically moving the chuck toward the grinding-wheel and gradually or progressively increasing the pressure of its contained work against said wheel.

3. In combination with a grinding-wheel, a chuck or work-holder; a lever connected with said chuck and serving to move the same toward the grinding-wheel; a weight carried by said lever and serving to move its chuck-carrying arm toward the grinding-wheel; and means for automatically moving said weight to increase its effect upon the lever as the chuck approaches the grinding-wheel.

4. In combination with a grinding-wheel, a chuck or work-holder; means for causing one of said members to approach the other at predetermined rate; and automatic mechanism for positively increasing the pressure of one of said members toward the other in definite and fixed relation to the rate of approach of one of said members toward the other.

5. In a grinding-machine, the combination of a grinding-wheel; means for rotating said wheel; a chuck or work-holder; a lever fulcrumed between its ends; a connection between one arm of said lever and the chuck; a weight carried by the other arm of said lever; and a cam, serving to move said weight relatively to the fulcrum of the lever, whereby its effectiveness is varied as the grinding operation proceeds.

6. In a grinding-machine, the combination of a grinding-wheel; a chuck or work-holder; a lever connected with and serving to move said chuck; a cam for moving said lever in one direction; a weight for moving the lever in the reverse direction; and a cam for moving the weight relatively to the fulcrum of the lever on which it is mounted, substantially as set forth.

7. In a grinding-machine, the combination of a suitable frame; a shaft mounted and rotatable in bearings in said frame; a grinding-wheel carried by said shaft; a slide movable upon ways on the frame, toward and from the grinding-wheel; a chuck or work-holder carried by said slide; a lever fulcrumed in the frame; a connection between said lever and the slide; a cam for moving the lever in one direction; a weight carried by the lever and serving to move it in the opposite direction; and a second cam for moving the weight toward and from the fulcrum of the lever.

8. In combination with a suitable frame, and with a shaft D mounted in bearings in said frame and provided with a grinding-wheel F', a slide H guided upon ways on the frame and provided with a chuck I; a lever K fulcrumed in the frame; a rod *h* connecting one arm of said lever with the slide H; a cam N serving to depress said arm of the lever; a weight M carried by the other arm of said lever; a swinging arm or lever O; a link P connecting lever O and weight M; and a cam L serving to move the lever O and through it to shift the weight M relatively to the fulcrum of lever K.

9. In combination with the grinding-wheel and chuck or work-holder of a grinding-machine, a lever K connected with and serving to move the chuck toward and from the grinding-wheel; a shiftable weight carried by said lever; a swinging lever having a slot curved in an arc of a circle from the axis of a stud or bolt carried by the weight; a link extending from said bolt to the slotted lever; and a bolt connecting the lever and the link and adjustable in said slot toward and from the fulcrum of the lever, as and for the purpose set forth.

10. In a grinding-machine, the combination of a grinding-wheel; a chuck or work-holder movable toward and from said wheel; a lever having one arm connected with and serving to move the chuck, and having a second arm inclining downward toward its fulcrum; a weight movable upon said inclined arm of the lever; a swinging lever; a link connecting the weight and said swinging lever; and a cam serving to move the swinging lever and through it and the link to move the

weight, the inclination of the lever-arm causing the weight to hold the swinging lever in contact with its actuating-cam.

11. In a grinding-machine, the combination of a grinding-wheel; a chuck or work-holder movable toward and from said wheel; a lever fulcrumed between its ends, having one arm connected with and serving to move the work-holder; means for actuating said lever; a weight carried by the other arm of the lever; a swinging arm or lever; a link connecting the weight with said swinging arm or lever; a connection between said link and swinging arm or lever, adjustable toward and from the fulcrum of the latter to vary the movement of the weight; and a cam serving to move said swinging arm or lever.

12. In a grinding-machine, the combination of a grinding-wheel; a chuck or work-holder movable toward and from said wheel; a lever for moving said work-holder; means for actuating said lever; a weight carried by said lever and serving to urge the chuck toward the grinding-wheel; antifriction-rollers for said weight; and a cam serving to shift the weight upon the lever, relatively to the fulcrum of the latter.

13. In a grinding-machine, the combination of a grinding-wheel; a chuck or work-holder movable toward and from the grinding-wheel; a lever connected with and serving to move the work-holder; a weight carried by and serving to move in one direction said lever; means for moving said lever in the opposite direction; a lever for shifting the weight; a link connecting said lever and weight; and means for initially adjusting the weight relatively to the fulcrum of its supporting or carrying lever.

14. In a grinding-machine, the combination of a grinding-wheel; a chuck or work-holder movable toward and from the grinding-wheel; a lever connected with and serving to move the work-holder; a weight carried by and serving to move in one direction said lever; means for moving said lever in the reverse direction; a lever for shifting the weight upon its lever; a link connecting said weight and its shifting-lever; means for initially adjusting the weight relatively to the fulcrum of its supporting or carrying lever; and means for varying the effective length or throw of the weight-shifting lever.

15. In a grinding-machine, the combination of a grinding-wheel; a chuck or work-holder movable toward and from the grinding-wheel; a lever connected with and serving to move the work-holder; a weight carried by and serving to move in one direction said lever; means for moving said lever in the opposite direction; a lever for shifting the weight upon its carrying or supporting lever; and means for initially setting or adjusting the weight upon said lever

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

WALTER J. MUNCASTER.
LAWRENCE A. FLETCHER.

Witnesses:
J. F. STARK,
PAUL T. MENZEL.