J. E. GERMAIN & G. A. OSSART.

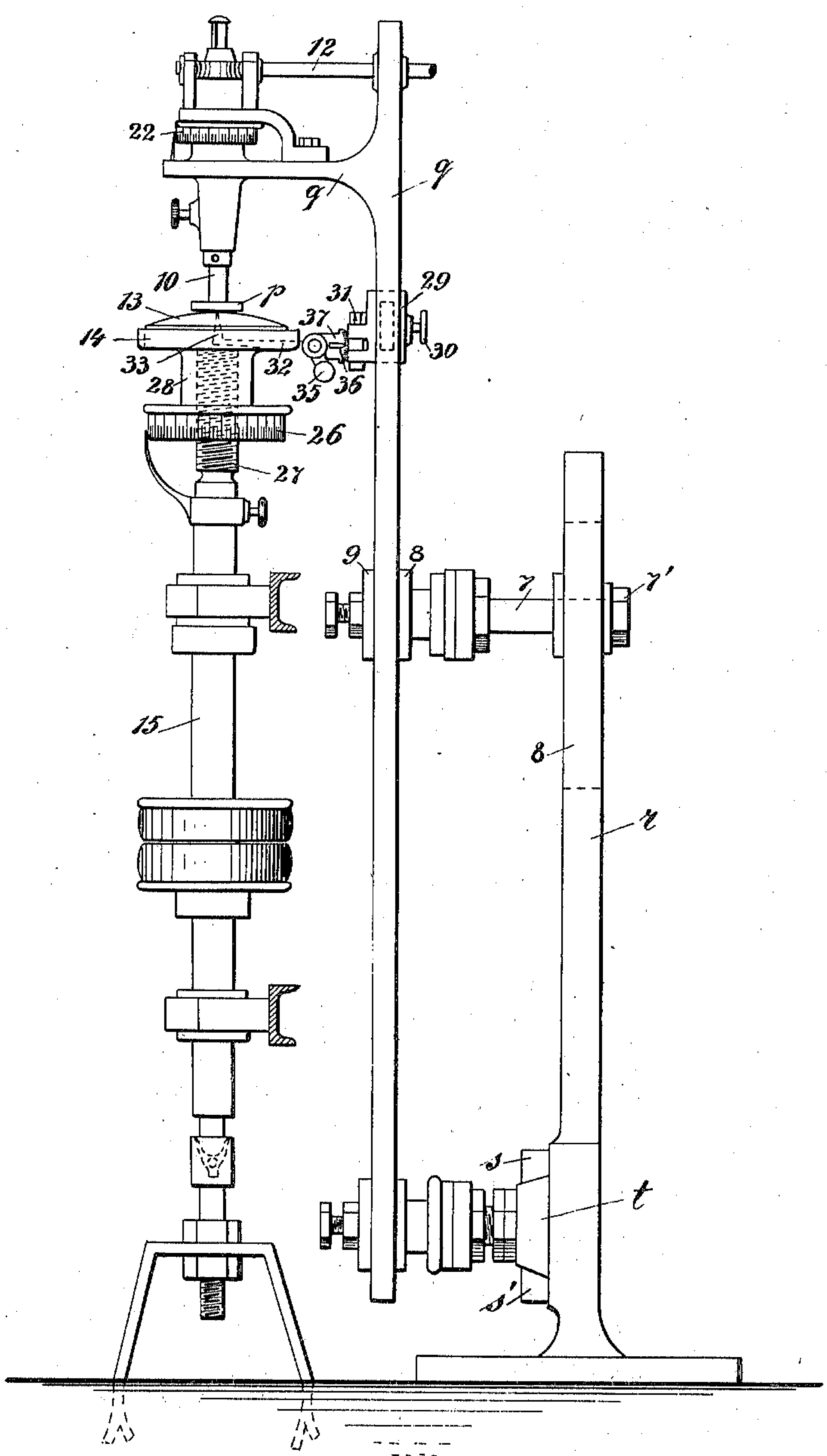
LENS SHAPING MACHINE.

APPLICATION FILED DEC. 18, 1907.

947,774. Patented Jan. 25, 1910.

3 SHEETS—SHEET 1.

Fig. 1.



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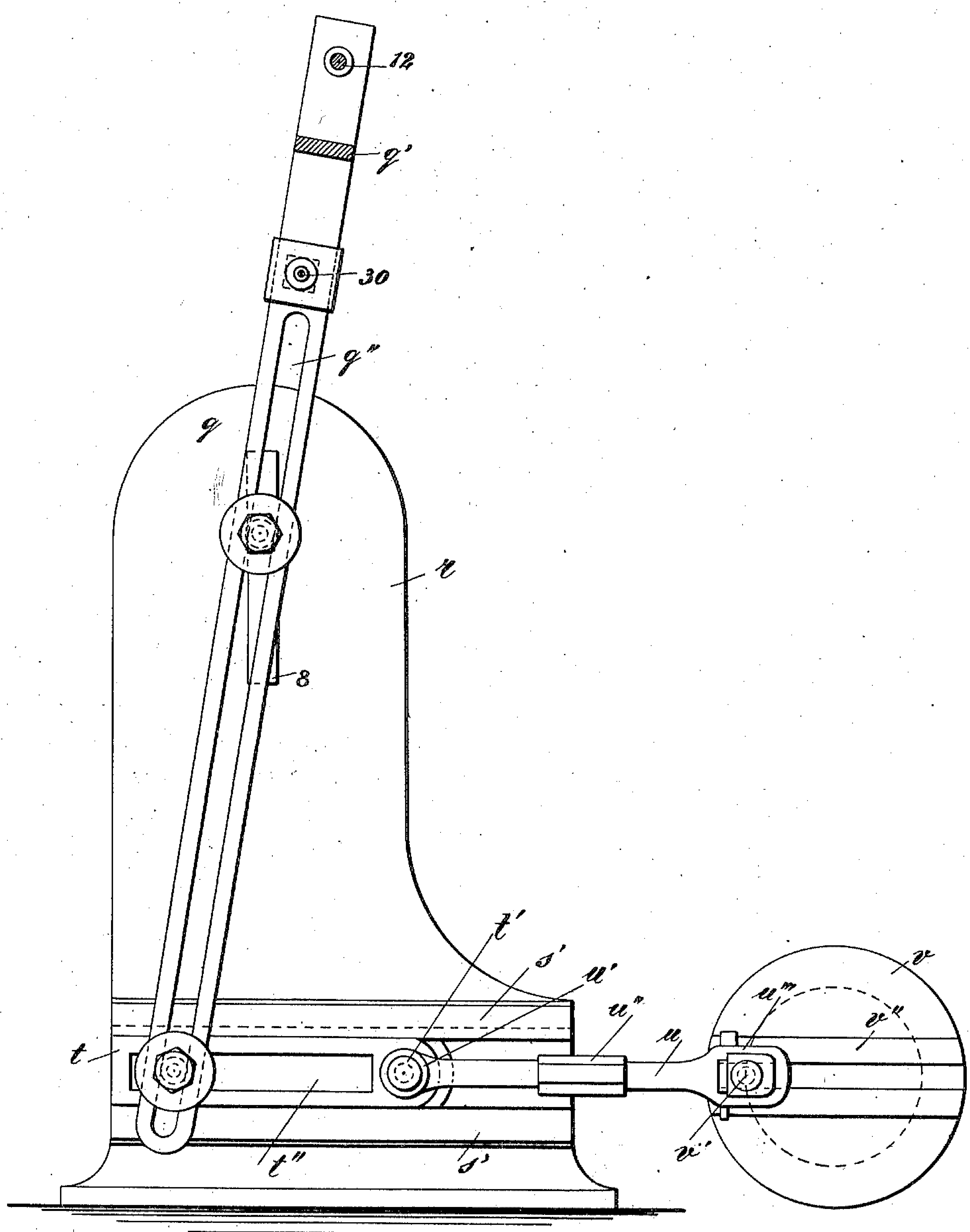
3 SHEETS—SHEET 2.

Fig. 2.



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3 SHEETS—SHEET 3.

Fig. 3.

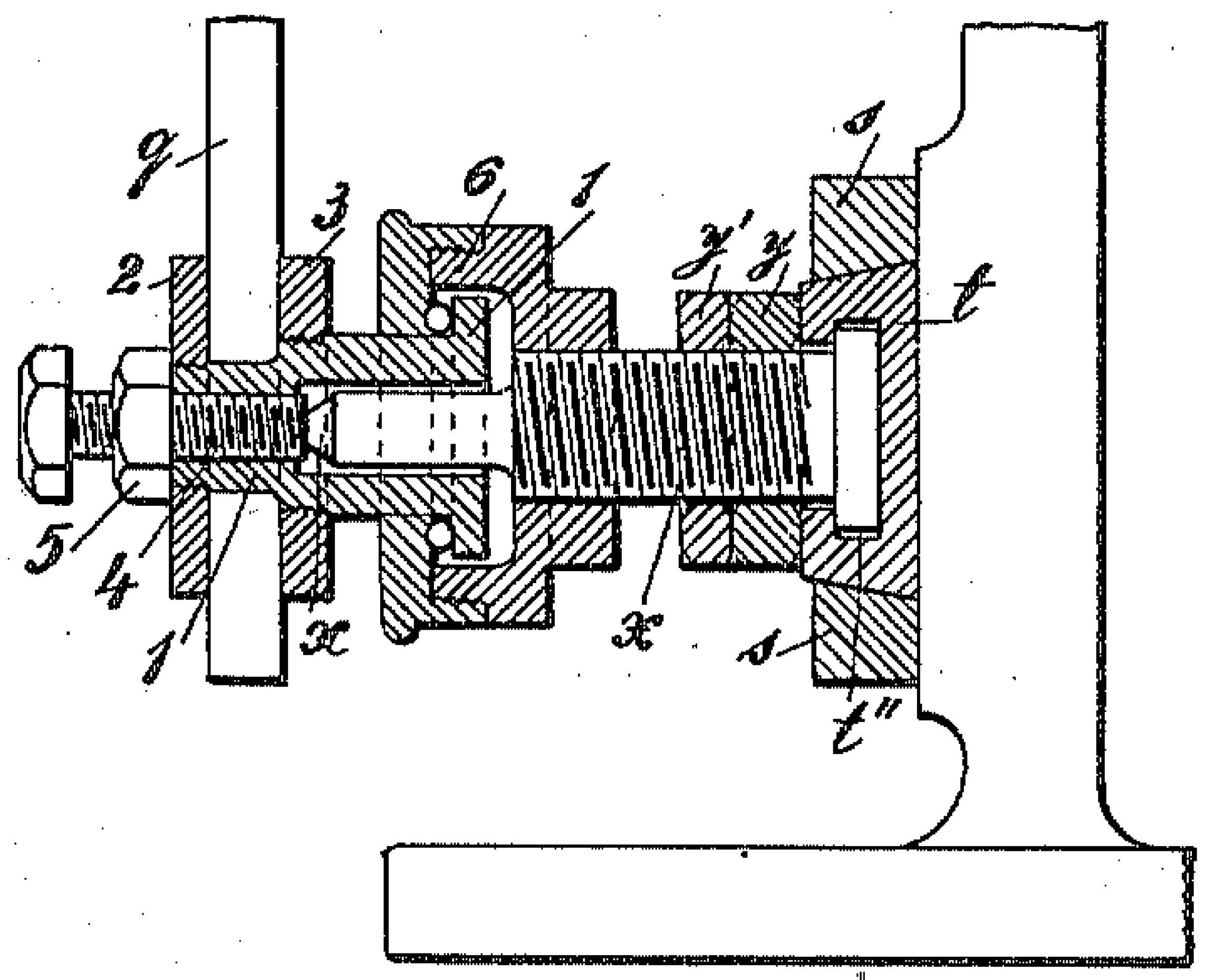


Fig. 4.

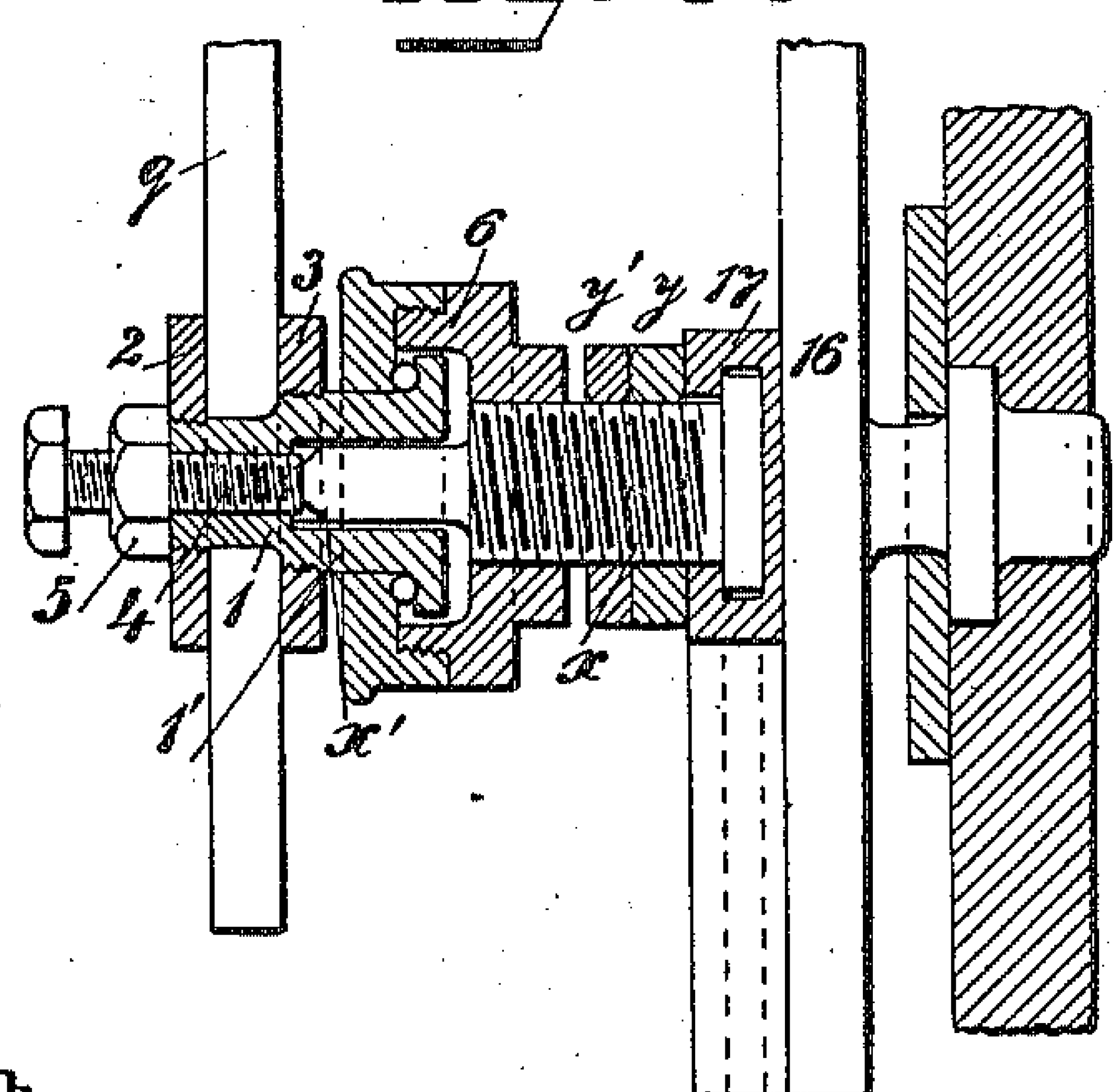


Fig. 5.

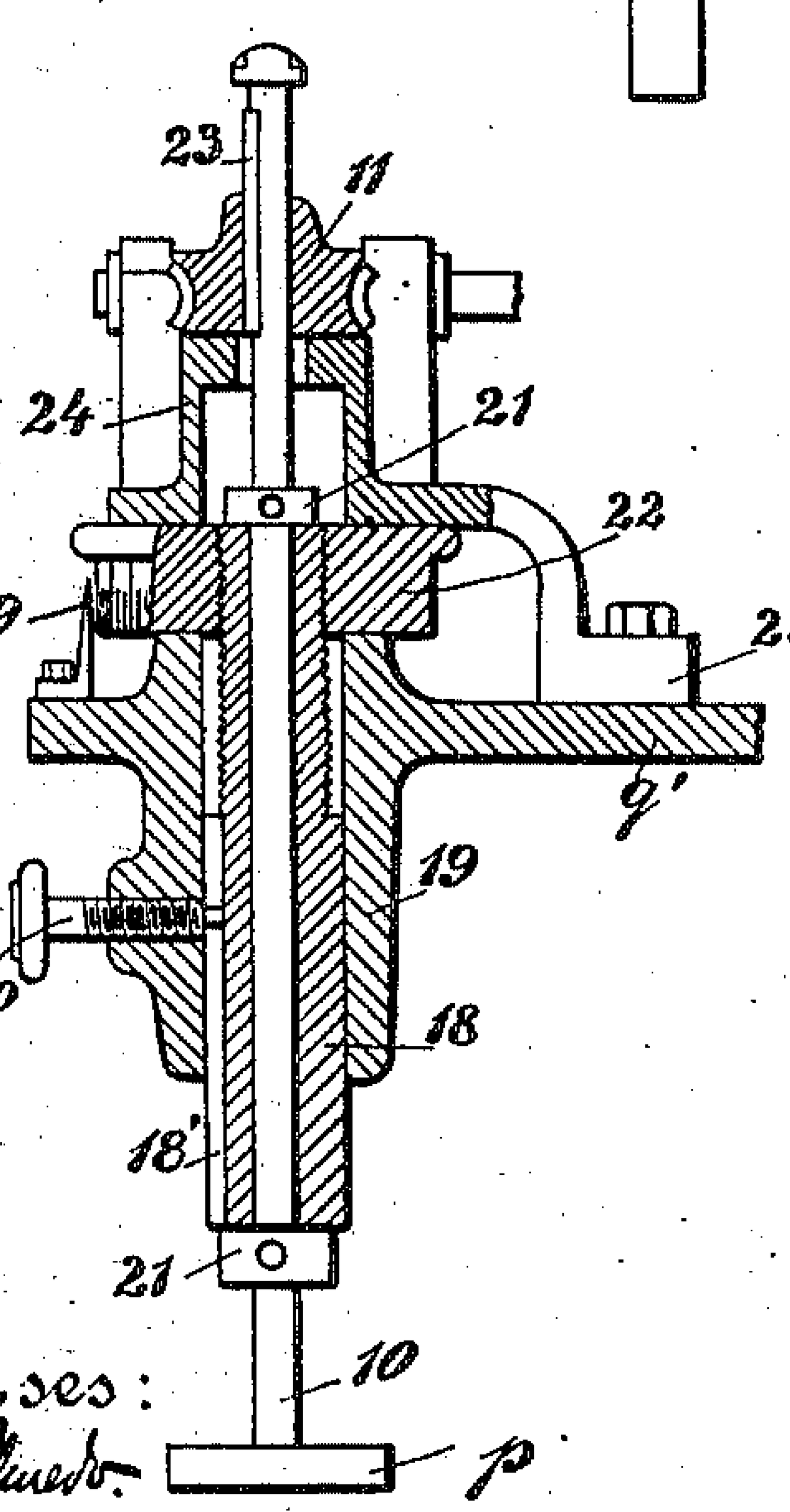
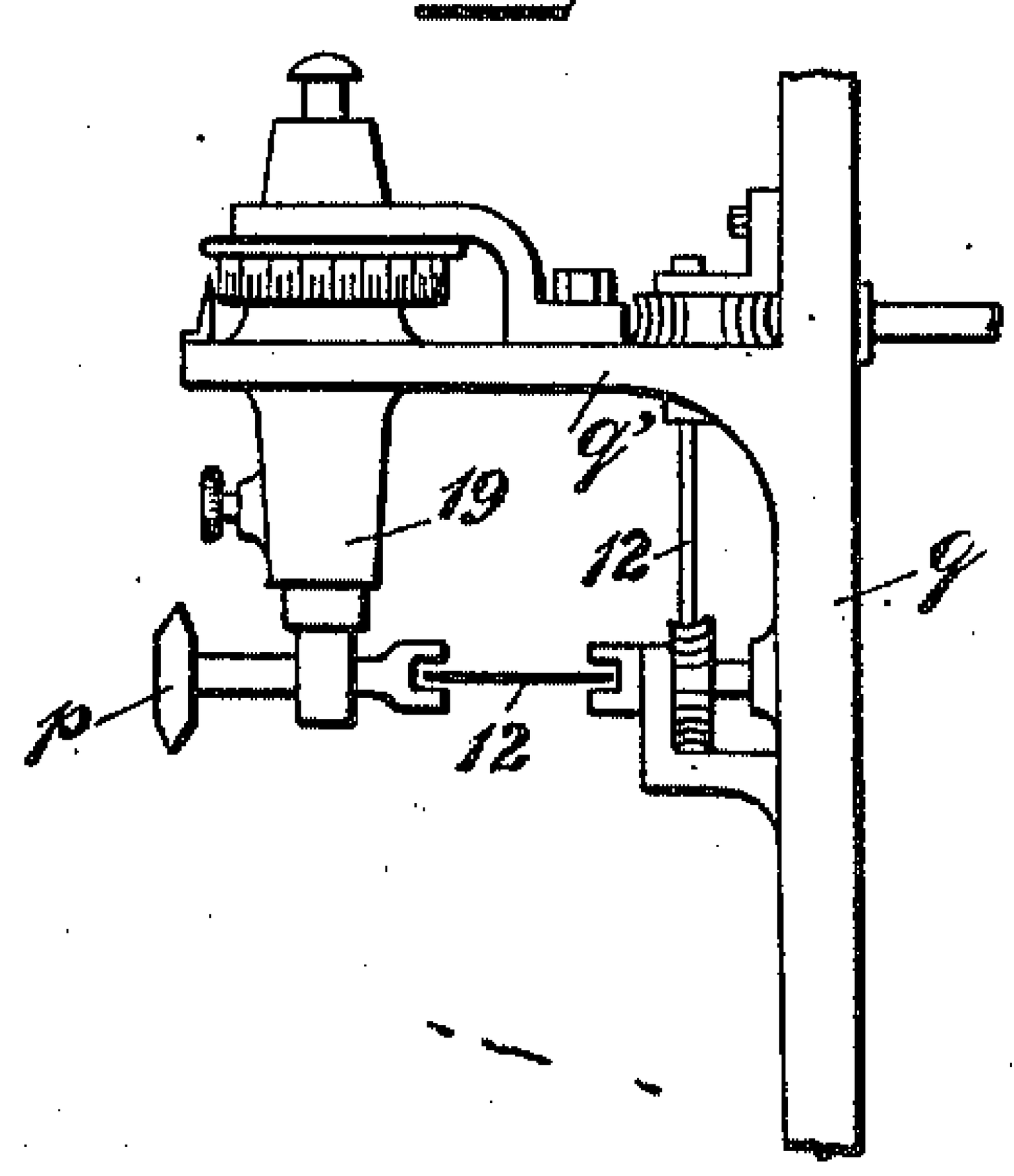


Fig. 6.



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UNITED STATES PATENT OFFICE.

JULES EUGÈNE GERMAIN AND GEORGES ARSÈNE OSSART, OF RUEIL, FRANCE, ASSIGNORS TO JULES ALPHONSE GUSTAVE ROUSSET, OF VINCENNES, FRANCE.

LENS-SHAPING MACHINE.

947,774. Specification of Letters Patent. **Patented Jan. 25, 1910.**

Original application filed March 8, 1907, Serial No. 361,403. Divided and this application filed December 18, 1907. Serial No. 406,995.

To all whom it may concern:

Be it known that we, JULES EUGÈNE GERMAIN and GEORGES ARSÈNE OSSART, citizens of the Republic of France, residing at Rueil, in said Republic, have invented certain new and useful Improvements in Lens-Shaping Machines, of which the following is a specification.

This invention relates to machines for shaping lenses, and particularly lenses of the type described in our application for Letters Patent Serial No. 361,403, filed March 8, 1907, of which this is a divisional application. In the application referred to there is described an improved lens in which the meridian curves of both the admission and discharge surfaces are non-spherical and generated geometrically in the form of conchoids.

The object of this invention is to provide a machine by which lenses of this character may be accurately shaped, polished and finished.

In the accompanying drawing, Figure 1 is a side-elevation of a machine constructed according to the invention, Fig. 2 is an enlarged front-elevation of a part of the machine, Fig. 3 is a detail section through the connection between the sliding bar on which the tool is mounted and its slide, Fig. 4 is a similar view showing the sliding bar differently connected, Fig. 5 is a vertical section showing the manner in which the grinding tool is mounted, and Fig. 6 is a detail elevation of a modified arrangement of the means for mounting and driving the tool.

Similar reference characters indicate corresponding parts throughout the several figures.

Broadly speaking, the machine comprises a tool p, which will be described in detail later on, mounted by means of a movable shaft 10 at the end of a sliding and oscillating rod or bar q which is capable of sliding on and turning around a fixed point while the extremity of the bar opposite to the tool describes either a straight line or a curve of any kind. Under these conditions the tool describes a conchoidal curve, the nature of which depends upon the position of the fixed point and upon the nature of the movement of the end of the rod opposite the tool. The movement of the tool takes place while the piece of glass to be shaped rotates around an axis which is located and remains during the entire treatment of the lens in line with the symmetrical axis of the curve described by the tool.

The machine comprises a vertical standard r fixed by any appropriate means to a bracket or to a foundation-plate. On this standard r there is mounted a horizontal slideway which is either cut in the standard itself or constituted by two beveled bars s s'. A bar t, the sides of which are likewise beveled, is capable of displacement in this slideway. The bar t is provided with a stud t' on which the head u' of a connecting rod u may be mounted; this rod is variable in length by means of a sleeve u'' provided with a right and left hand screw-thread. This rod terminates in a head u''' which is engaged upon a stud mounted on a disk v which may be given a movement of continuous rotation.

By means of the arrangement described the continuous movement of rotation of the disk v is converted into a reciprocating movement of the bar t. The amplitude of the reciprocating movement of the bar t depends upon the position occupied by the stud v' on the disk v. In order to facilitate the displacement of this stud, it is engaged in a slot v'' arranged along a diameter of the disk v, and the stud may be fixed at any suitable part of this slot.

The bar t is formed with a slot t'' (Figs. 2 and 3) in which a pivot x terminating in a tapered point x' is able to move (Fig. 3); this pivot may be fixed at any suitable part of the slot formed in the bar t by means of a nut y and counter-nut y'; the enlarged part of the pivot x is screw-threaded for this purpose. The bar q, which, as above stated, carries the tool p at its upper part, is arranged parallel with the standard r. This bar is formed with a slot q'' for the greater portion of its length. Through this slot there passes (Fig. 3) a socket 1 upon which there are fixed two cheeks 2 and 3 which are arranged on either side of the bar. A rod 4 in one of the extremities of which a cup is formed for the reception of the tapered point x' of the pivot x, is screwed into the socket 1. By turning the cheek 2 right home the bar may be rendered solid with the two cheeks 2 and 3; by screwing in the rod 4 to a greater or less extent, the position

of the cup may be regulated, the nut 5 serving to maintain the position given to the rod.

Onto the enlarged portion x of the pivot there is screwed a cap 6, made in two parts to facilitate mounting, and of which the bottom constitutes to a certain extent a cup for balls against which the reinforced portion 1′ of the socket 1 rests. The adjustment of the ball cup is effected by screwing the cap 6 onto the enlarged portion x of the pivot to a greater or less extent; displacement of this cap may be prevented by a locknut. It will be understood that with this method of mounting it is possible: (1) to regulate the position of the pivot x on the bar t movable in the slot s s'; (2) to render the socket 1 and its cheeks 2 and 3 solid with the bar q, which consequently is able to turn about the point x' of the pivot x, while at the same time participating in the rectilinear displacements of this pivot solid with the bar t movable in the slot s s'. It will be seen that under these conditions, if a reciprocating movement be imparted to the bar t, the lower extremity of the bar q will be given this same reciprocating movement. During this displacement, as above stated, the bar q will turn about the fixed point while at the same time sliding over it. This fixed point is constituted by the pivot 7, Fig. 1. This pivot is arranged like the pivot x, but the mounting of the cheeks 8 and 9 arranged on either side of the bar 2 is such that these cheeks cannot press against the bar so that this latter, while turning about the fixed pivot 7, is also able to move along this pivot. The pivot 7 is mounted by means of a bolt 7′ in a slot 8 formed in the standard r of the machine.

The upper part of the bar q ends in an arm q' bent at right angles. As hereinafter explained, this arm q' serves to support the shaft 10 (Fig. 5) which carries at its lower part the tool p. This shaft 10 is given a continuous movement of rotation by means of a helicoidal gear 11 meshing with a tangential screw mounted on a rod 12 actuated by a flexible shaft. The tool turns about itself in a continuous manner; it is in contact with the lens 13 to be worked and which is mounted in an appropriate support 14, which under the influence of a vertical shaft 15 likewise rotates in a continuous manner, but in the opposite direction to the tool. The axis of the shaft 15, which is the axis of rotation, during the whole period of the operation remains in a plane parallel with the plane of the bar q and in line with the shaft 10 of the tool p; by adjustment it is also caused to coincide with the symmetrical axis of the curve described by the tool.

The cup 14 being furnished with a lens to be shaped, the respective positions of the tool and of the lens having been regulated in the manner hereinafter appearing, and the lower extremity of the bar q having been mounted upon the pivot x fixed at an appropriate point on the bar t, the lens is finished by starting the machine, that is to say, by giving a continuous movement of rotation to the disk v, likewise by transmitting a movement of continuous rotation to the shaft 10 of the tool p, but in the opposite direction, and finally by giving a movement of continuous rotation to the lens-holder 14 also. In these conditions, the tool p will describe, in a plane parallel with the standard r and with the bar q, a curve, the form of which will depend upon the amplitude of the displacements of the lower extremity of the bar q, upon the position of the oscillation shaft or pivot 7 of the said bar q and upon the distance of the tool from the pivot 7. This curve will be a meridian curve which will generate the surface of the lens to be shaped owing to the movement of rotation of the lens around a vertical axis situated exactly in line with the tool-holder located in a plane parallel with the bar q and coinciding with the symmetrical axis of the curve described by the tool.

As stated above, the lower extremity of the bar q, instead of being given a reciprocating movement, might be given an alternating rocking movement around an axis. In order to obtain this other displacement at the lower extremity of the bar, a plate 16 is provided in the machine; as shown in Figs. 2 and 4, this plate 16 carries a slideway 17, similar to the slideway t already described. In this slideway there may be fixed a pivot x terminating in a point x', and by means of the same parts as those represented in Fig. 3 the bar q may be caused to follow the displacements given to the pivot x while at the same time being capable of turning around the tapered point of this pivot. It will of course be understood that under these conditions connection between the bar q and the bar t will no longer be effected. The bar q being mounted upon the pivot x of the plate 16, an alternating movement of rotation is transmitted to this plate 16, which communicates this same movement to the pivot x and consequently to the bar q. In this case the tool describes a curve as before, but a curve of a different nature, and, as in the case of transmission by the bar t, the position of the pivot x upon the plate 16 may be regulated in the same manner as the position of the pivot x upon the bar t was regulated; it is only necessary to loosen the nuts y and y' to alter the position of the pivot x in the slideway 17 at will.

The tool is regulated relatively to the lens to be shaped in the following manner (Fig. 5): The rod or shaft 10, which is terminated by the tool p, passes through the sleeve 18 mounted in a socket 19 supported by the

arm q'. The sleeve 18 is externally screw-threaded at its upper part, and at 18′ carries a groove in which the extremity of a screw 20 is engaged for the purpose of preventing the sleeve 18 from turning, while at the same time permitting it to move upward and downward vertically. The rod 10 is provided with shoulders 21 which fit against the sleeve 18; on the outer upper screw-threaded portion of this sleeve an internally screw-threaded and externally graduated nut or nurl 22 is mounted; by means of the rotation which may be given to this screw-threaded nut it is possible to cause the sleeve 18, and consequently the shaft 10 of the tool p, to ascend or descend. The helicoidal gear does not oppose vertical displacements of the shaft 10 owing to the key 23, which is the only means of fixing the rod 10 and driving it by the helicoidal gear 11. This helicoidal gear is supported by a bridge 24 which is fixed at 25 on the arm q'.

The cup 14, which supports the lens 13, may likewise be given upward and downward vertical movements by means of an internally screw-threaded nut 26. This nut, which is screwed upon a screw 27, is solid with a sleeve 28 which supports the cup 14.

Upon the bar q there is mounted a part which may be termed a testing or gaging device; it consists broadly of a slide 29 movable along the bar q, and which may be fixed in any appropriate position by means of a screw 30. Upon this slideway there is mounted a hinge 31 around which a rod 32, bent at 33 and ending in a point, is able to turn. This rod 32 is jointed at 34 in a plane perpendicular to that of the hinge 31. It is subjected to the action of a counter-weight 35 and carries an index 36 able to move over a graduated dial 37.

In order to regulate the treatment of the lens, the following method is adopted: The pivot of oscillation of the bar q having been fixed at the appropriate place, and the attachment of the bar to the plate 16 or to the bar t as the case may be having likewise been adjusted, the testing device 29 is slid along the bar q until the guide-mark of the slide 29, which indicates the exact height of the point 33, comes opposite the previously selected division of the bar q; it will of course be understood that at this moment the lens 13 is depressed, that is to say, the cup 14 has been lowered by means of the screw-threaded nut 26. The screw-threaded nut 22 is then acted upon in such a manner as to lower the tool p until it rests upon the point 33, and the exact position of the tool p is regulated in such a manner that the index 36 of the rod 32 is exactly opposite the zero of the scale marked upon the graduated sector 37. At this moment it is certain that the plane face of the tool is situated precisely at the desired distance from the center of the fixed pivot 7. The index 39, which is movable over the graduation of the nut 22, is displaced until it comes opposite the zero of this graduation. When this has been done, the point 33 is separated from the tool by causing the testing or gaging device to rock around the hinge 31 and the lens 13 is raised by acting upon the screw-threaded nut 26 until the summit of the lens comes into contact with the tool. The tool is raised by an indefinite amount by turning the nut 22; then the bar q is displaced by hand, being caused to rock around the pivot 7 in such a manner as to bring the tool p to the right or left extremity of the meridian curve that it describes. When the tool has thus reached the left-hand extremity, for example, of the meridian curve that it is describing, the bar q is stopped, and by acting upon the screw-threaded nut 22, the tool p is lowered until it comes into contact with the edge of the lens to be shaped. The machine is then ready for action. The disk v, the shaft 12 and the shaft 15 are started; the tool p continues to describe the same curve successively while it is turning on itself, as does also the lens 13, and this lens is worn down gradually. In proportion as the lens is worn down, the height of the tool p is adjusted by acting upon the nut 22 in such a manner as to lower this tool p constantly, and notification is afforded when the operation is terminated when by the successive actions upon the nut 22 the index 39 comes opposite the zero of the scale marked on the periphery of this nut.

It will be understood that during the operation the grinding materials, such as emery and the like, generally employed in grinding lenses are caused to fall onto the face of the lens under treatment by any appropriate means.

The polishing and finishing of the lenses is effected on the same machine merely by changing the tools for tools of a different character.

The foregoing description, as will be apparent, relates to the shaping of lenses having a convex surface.

In the case of concave lenses the arrangement is modified in the following manner: The machine is identical with that which has just been described except that it is turned through 180° in the vertical plane and that all the parts are arranged above the lens-holder instead of being beneath it. The head of this machine is arranged as shown in Fig. 6; the tool p is then vertical; it is able to ascend and descend as before in the socket 19 supported by the arm q' solid with the bar q, for the purpose of adjustment; the rotation of the tool p is obtained by means of a flexible shaft 12 and a transmission-guide 12′. Instead of employing tools for cutting the lenses of the form of those pre-

viously described, their shaping surface may be spherical convex or concave. Under the influence of the movement imparted to them by the machine and of the wear, this shaping surface assumes, at the same time as the lens, the final form that it is desired to obtain. The diameter of the shaping surface may be one-third of the diameter of the lens to be shaped. In this manner, instead of shaping the lens along a line, it is shaped, by grinding it, along a surface. Although it appears to be preferable to maintain the axis of the lens-holder shafts in a vertical plane, they may be arranged in horizontal planes by making the machine itself horizontal.

Having thus described our invention, we claim:

1. In a lens-shaping machine, the combination of a bar mounted to turn about a fixed point and to slide longitudinally with respect to said point, a tool carried by the bar at one end, and mechanism at the opposite end of the bar positively constraining said opposite end to move in a predetermined path.

2. In a machine for shaping lenses, the combination of a support, a substantially upright bar having a slot, a device on said support projecting through said slot and on which said bar is mounted to slide and turn, a tool carried by the bar at its upper end, and means for reciprocating the lower end of the bar horizontally in a straight line.

3. In a machine for shaping lenses, the combination, with an upright support for the lens and means whereby it may be rotated, of a bar mounted to turn ad slide in a vertical plane, a tool carried at the upper end of said bar and overhanging said support, means for rotating said tool, and means for actuating said bar.

4. In a lens-shaping machine, the combination of an upright support, a bar arranged in an upright plane and having a slot therein, a device projecting laterally from said support through said slot and about which said bar is mounted to turn and slide, a slide to which one end of the bar is connected, means for operating said slide, a tool at the other end of the bar, means for rotating said tool, and a rotating holder for the lens.

5. In a machine for shaping lenses, the combination, with the sliding and turning bar, of a tool mounted thereon and having a rotary shaft, and means for rotating said shaft.

6. In a machine for shaping lenses, the combination, with a rotating lens-support, of a sliding and turning bar, a tool mounted on said bar, and means to adjust the tool toward and away from said support.

7. In a machine for shaping lenses, the combination, with a sliding and turning bar, of a tool mounted thereon and adjustable longitudinally with respect to the same.

8. In a lens-shaping machine, the combination, with a sliding and turning bar and a tool mounted thereon and adjustable longitudinally with respect to the same, of a gage slidable longitudinally of said bar and adapted to move into and out of contact with said tool to indicate the position thereof.

In testimony, that we claim the foregoing as our invention, we have signed our names in presence of two subscribing witnesses.

JULES EUGÈNE GERMAIN.
GEORGES ARSÈNE OSSART.

Witnesses:
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DEAN B. MASON.