No. 631,640. Patented Aug. 22, 1899.

F. A. HUBBUCH.

GLASS GRINDING MACHINE.

(Application filed Dec. 31, 1897.)

(No Model.) 2 Sheets—Sheet 1.

Fig.1. Section A-B

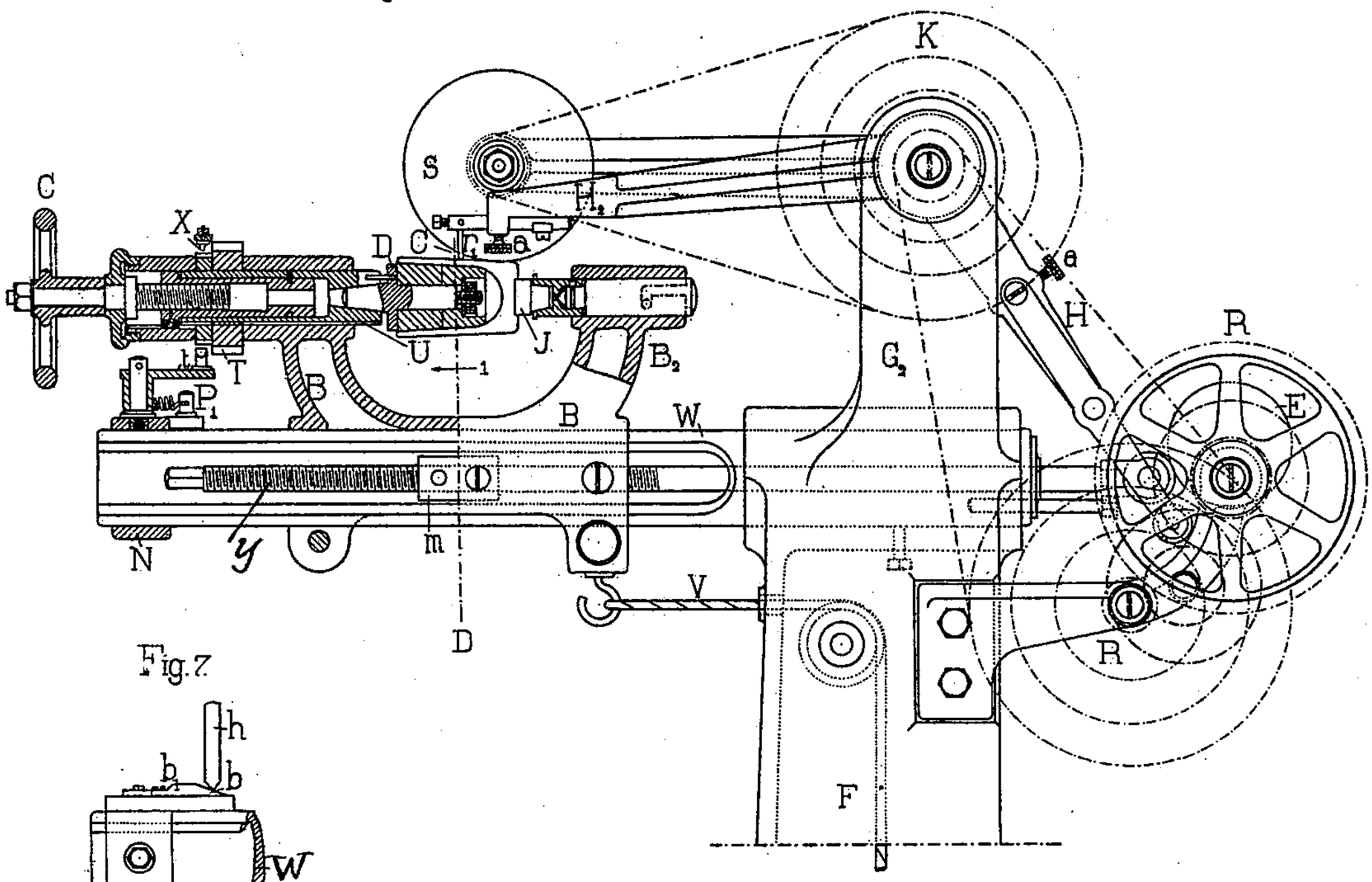

Fig.2

Fig.3

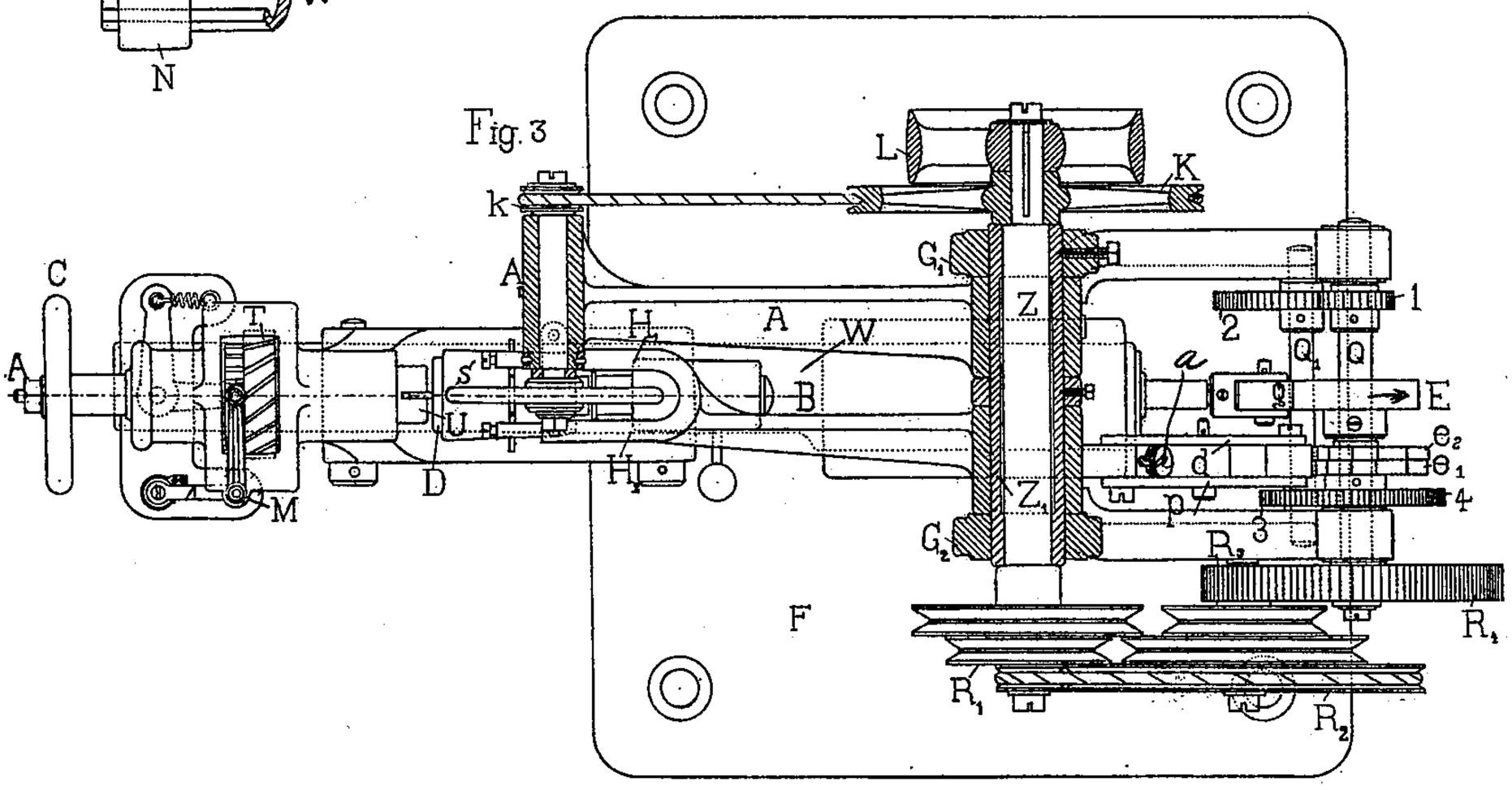

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Fig.2. Section C-D.

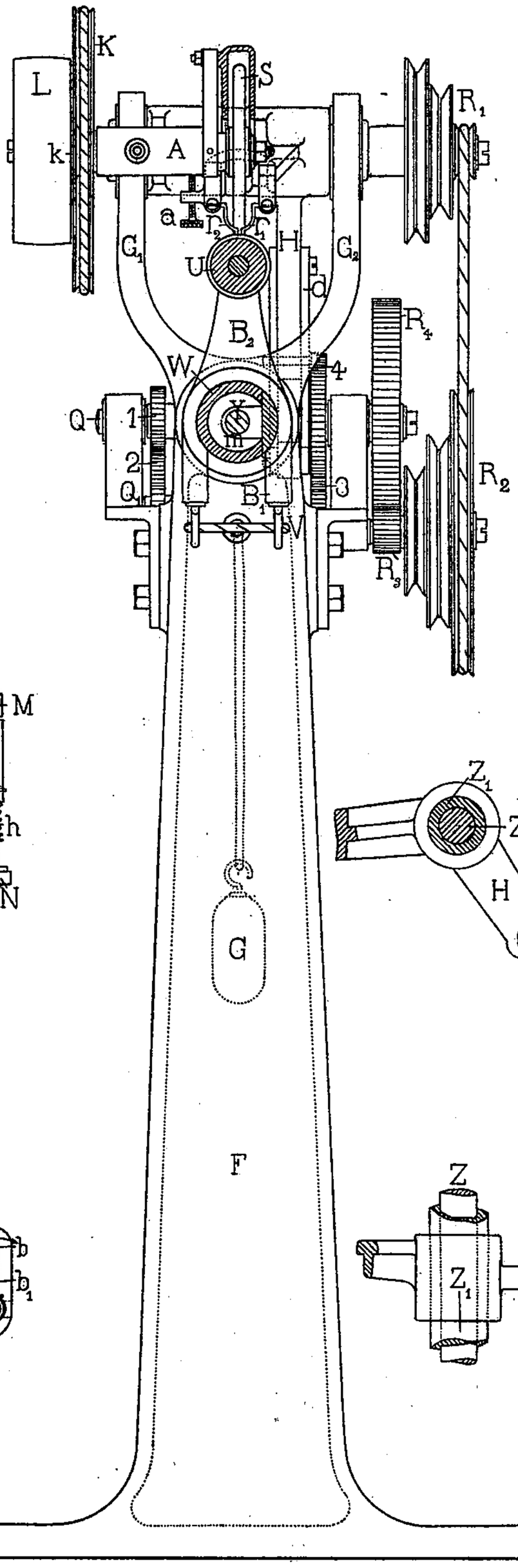


Fig.5.

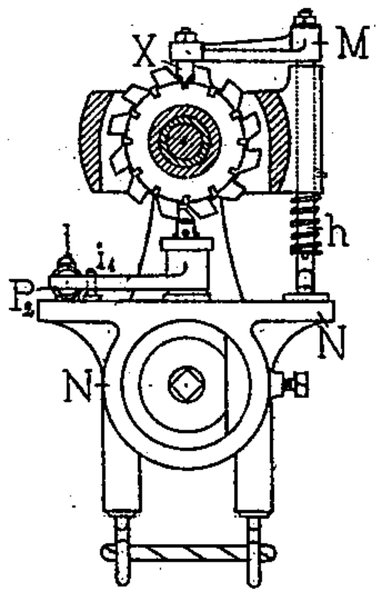


Fig.6.

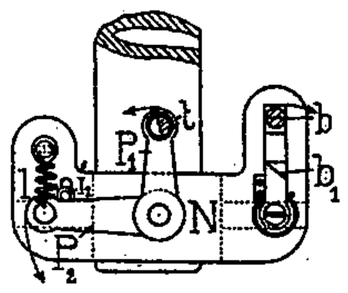
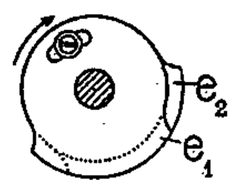


Fig.4 a



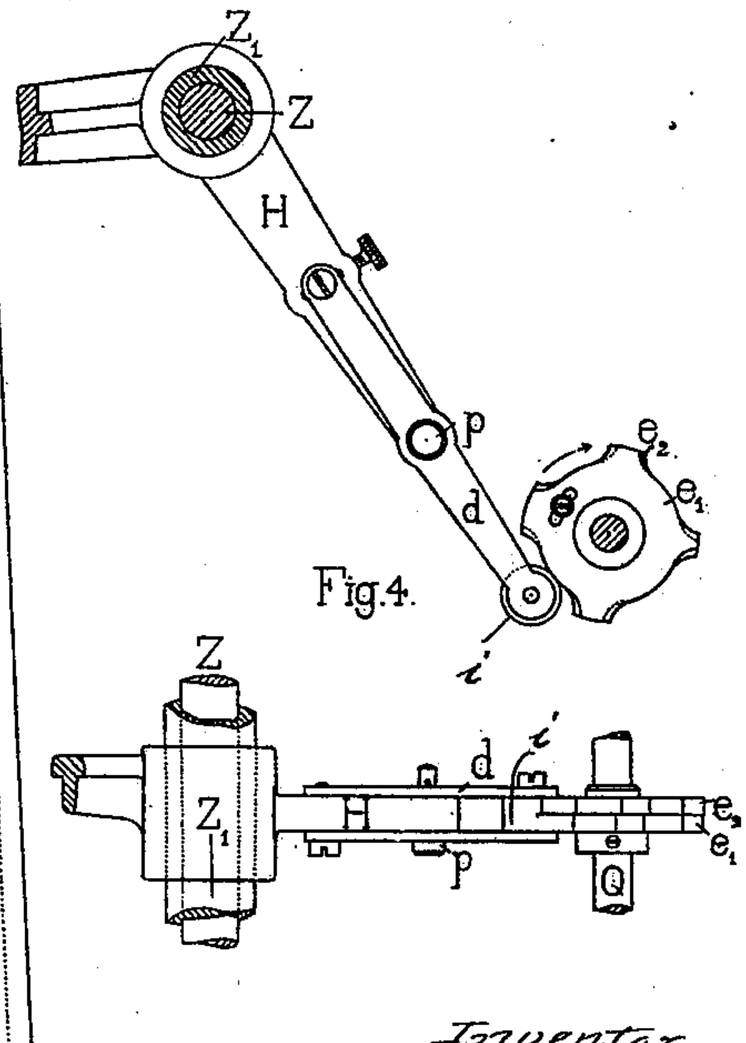


Fig.4.

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FRANZ ANTON HUBBUCH, OF FURTWANGEN, GERMANY.

GLASS-GRINDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 631,640, dated August 22, 1899.

Application filed December 31, 1897. Serial No. 664,928. (No model.)

To all whom it may concern:

Be it known that I, FRANZ A. HUBBUCH, professor, a subject of the Emperor of Germany, and a resident of Furtwangen, Baden, in the Empire of Germany, have invented Improvements in Glass-Grinding Machines, of which the following is a specification.

This invention relates to a machine by which drinking-glasses and glass vessels of any kind are ground by means of a grinding-stone the shaft of which is placed at right angles to and above the central line of the glass to be ground, and for which I have obtained Letters Patent as follows: in Germany, No. 90,706, dated December 6, 1895; in France, No. 26,033, dated September 28, 1896; in Belgium, No. 123,616, dated October 2, 1896; in England, No. 22,537, dated October 10, 1896; in Italy, No. 447/44,817, dated July 17, 1897, and in Austria, No. 47/3,595, dated September 26, 1897.

In the drawings, Figure 1 is a vertical longitudinal section on the line A B of Fig. 3. Fig. 2 is a vertical section on the line C D of Fig. 1. Fig. 3 is a top plan with parts in section. Fig. 4 is a detail in elevation and plan of the forked lever and eccentric. Fig. 4ª is a detail view of the eccentric. Fig. 5 is a detail more particularly hereinafter referred to. Fig. 6 is a plan of Fig. 5. Fig. 7 is a view at right angles to Fig. 6.

The whole machine is arranged on a pedestal F, Fig. 2, and the bearing-blocks G′ G² carry the driving-shaft Z, upon which the fixed pulley L is arranged, which pulley receives its motion from any suitable transmission-shaft.

In the frame, at the foot of the machine, there is situated a round cheek W, flattened at the side, Figs. 1 and 3, a shaft Q for the eccentric, and an auxiliary shaft Q′. On the cheek W is a movable slide for holding the glass U. On the shaft Q is mounted an eccentric E, which causes the backward and forward movement of the parts B′ B B². On the spindle *y* there is also a disk *e e*², which temporarily depresses the small roller *i* on the arm *d*, which causes the lifting of the horizontal lever H. The cheek W carries the mechanism for holding the glass in a fixed position, while upon the eccentric-shaft two eccentrics E and *e*′, Figs. 4 and 4ª, are arranged, which for a certain length of time at intervals hold the grinding-stone against the glass, remove the grinding-stone from the glass, and moreover impart a partial rotation to the latter.

To explain how the machine produces the simple equally high ground surfaces on the glass, we will suppose the auxiliary shaft Q′ to have been removed and the transmission that is formed by the wheels 1, 2, 3, and 4 to have also been taken away, but the disk *e*′ *e*², Fig. 4ª, firmly fixed on the shaft Q. The axis of the grindstone S has its bearing in the arm A′ of the movable lever A, so that it may be raised or lowered. For this purpose the arm A may turn around a fixed point Z, which connects the bearings G′ G², so that the arm A A′ does not press too firmly onto the glass. Its weight is counterbalanced by the spiral spring *f*, Fig. 1, or by a counterweight. In order to reduce this pressure and to cause the grinding-disk to clear the glass at times, the arm A′ bears against a set-screw *a*, which is firmly guided in the arm H′ of the fork-lever H, rotatable about the shaft-box Z′, and which bears at times against the periphery of the glass through the medium of the two "feelers" or contact-pins *r*′ *r*². The fork-lever H bears with its rear arm against the eccentric *e*′ *e*², Fig. 4ª, by the roll *i*, Fig. 4. In order that this part of the lever may be exactly adjusted relatively to its fork, it is provided with a displaceable link formed by joint-plates *d*, which can turn on the pin *p* and be fixed by means of a screw as soon as the stone cuts the glass to a sufficient depth. The exact adjustment is effected by the side of the set-screw *a*.

The travel of the glass, and therefore the extent of the grinding operation, can be adjusted by suitably exchanging the grinding-wheel S for another. Under these conditions, however, the time during which the grinding-tool is to be applied to the glass must likewise be varied, which variation is effected by means of the peculiarly-shaped eccentric *e*′ *e*². As is apparent from Fig. 3, this eccentric consists of two disks, one of which, *e*′, is fixed to the shaft, whereas the disk *e*² can be displaced relatively to *e*′. These disks may be so adjusted that the projecting and recessed surfaces thereof coincide, and under this condition the stone will remain the longest time in

contact with the glass. If, on the other hand, the disk e^2 is displaced relatively to the disk e, the projecting surface is extended and the recessed surface is shortened. Thus also the time during which the grinding-tool is in contact with the glass is reduced. If it be desired to produce facets of different lengths on the same machine, so-called "organ-pipes," in this case it is necessary to fix the eccentric e' fast on the wheel 4, which revolves loosely on Q', and is set in motion by the transmission 3 2 1. While Q' and E make one revolution, 4, with e', only moves around ninety degrees, and the unequal recessed surface of the eccentric causes a removal of the grinding-stone from the glass before the glass has come to the end of its travel, and in consequence a shortening of the facet. In regular succession one is able to obtain by the choice of the transmission and suitable divisions of the eccentric increasing and diminishing rows of unequal facets around the surface of the glass.

The device for inserting and fixing the glass to be ground in place is very simple in construction, owing to the fact that the glass only has to perform a reciprocating movement, which is produced by the aid of the eccentric E, the roll g, and the screw-threaded spindle Y, Fig. 1. When the eccentric E rotates in the direction of the arrow, (see Figs. 3 and 4^a,) the support B for the glass is moved toward the left, being actuated by the spindle Y by means of the screw-nut m. A weight, located within the pedestal of the machine and attached to the string v, is lifted, and as soon as the eccentric allows the support B to commence its movement toward the right this movement is continued by the then descending weight. The glass itself is placed on a mandrel D, of cork or soft india-rubber, and bears against a rest or presser F, which is so arranged in the arm B^2 of the support B as to be easily rotatable and slightly displaceable longitudinally. The mandrel D causes the glass to rotate as soon as a facet is completed and the grinding-stone has been lifted from the finished facet.

The movements for effecting the rotation are produced by the aid of the following mechanism: The mandrel D first of all is firmly fixed to a metal pin, the conical part of which is so attached to the interior of the cylindrical guide U that after the grinding operation of the glass is finished it can be taken out together with the said glass; but when the glass is fixed upon the mandrel D it is compelled to follow the movement of the latter. The guide U consists of two parts, one of which only executes a movement in a longitudinal direction produced by the hand-wheel C, while the other part, which carries the mandrel D, is compelled to execute this longitudinal movement as well as a periodical rotary movement. For this purpose this latter part is provided with a groove for receiving a short feather placed in the eye of a toothed wheel T, the front part of which serves to retain the glass in position while a facet is being ground. For this purpose its larger part is provided with angular teeth and its smaller part with straight radial teeth, Fig. 5.

The glass is retained in position by means of a pin X, fixed to the lever M, and the said pin engages with the radial teeth on the smaller part of the wheel. The rotation of the angular toothed wheel is produced by a combination of mechanical parts arranged on the support N, Figs. 6 and 7, which is fixed to the front portion of the cheek. The stop-pin t, Fig. 6, is rigidly connected to the lever P', which is made in one piece with the lever P^2 and pivotally fixed to a vertical pin. The lever P^2 is forced against the head or stop i by means of a spiral spring l. While the support B, together with the wheel T, moves in the direction of the arrow l, an angular tooth is caused to engage with the pin t, which is suitably shaped for this purpose, and as the said pin t cannot turn aside the toothed wheel rotates to the extent of one tooth, if the distance traveled by B be so great that the wheel T passes beyond the pin t. During the return motion the stop-pin turns aside in the direction of the arrow, Fig. 6, and returns to its position of rest on leaving the wheel T. During the time that the wheel T is turned the catch X must be lifted out of engagement with the radial teeth, and this is effected by a lifting-pin h, which at the required times is forced upward by the incline at b, Fig. 6; but in order that it may be held immovable during the period of grinding the glass the pin h will resume its normal position on the bolt b, by sliding from its point b', Fig. 6, and returning to this normal position during the opposite movement, forcing the bolt b aside in the direction indicated by the arrow against the pressure of a spring, Fig. 6. The said bolt b does not resume its position of rest until the pin h has passed the projecting part of b, terminated each way by the two inclines. The lifting-pin h then again occupies such a position as to be ready to ascend when the machine again runs idle.

After these explanations the operation of the machine can be easily described.

The glass is so inserted and fixed in the apparatus that the grinding-stone hangs behind the bottom of the glass and only the two feelers or contact-pins r' r^2 rest upon the extremity of the glass, while the eccentric E occupies the position turned through an angle of one hundred and eighty degrees relatively to the position shown in the drawings. If the machine is started so that through the action of the rope-gear K the small grooved pulley k and thus also the grinding-tool are set in rapid rotary motion. Then through the medium of the step-pulleys R' and R^2 the eccentric-shaft is likewise slowly rotated, and thus the glass is traversed under the grindstone. As the feelers

or contact-pins r' r^2 stand upon the periphery of the glass, and thus offer to the grinding-stone a firm support, keeping the same continually equally distant from the periphery, the grinding is effected to a uniform depth. Shortly before the eccentric E moves the glass forward the disk e' raises the fork, and therewith the grinding-stone, and the machine then runs idle. During the operation of grinding a jet of water is of course applied in order to prevent the heating of the glass. While the glass and the grinding-stone run idle, the former is so turned that the grindstone is at the next working movement presented to a fresh working surface. When all the facets have been ground, which is effected in the time required by the wheel T to make one revolution, then the bolt can be thrown out of gear by any well-known means and the apparatus be brought to a standstill in order to allow the operator to remove the finished glass from the machine and to insert a fresh one to be ground in its place. According to the shape of the stone, the facets may be made flat or hollow. These facets may also be made to so alternate that the so-called "rows of olives" are produced upon the periphery, this ornamentation being effected by suitably modifying the shape of the eccentrics E' and e'.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is—

1. In an automatic grinding device the combination of an oscillating grinding-disk, means for holding the glass to be ground beneath the grinding-disk rectangularly to the axis of the latter, and two vibrating feelers or contact-pins adjustable between the shaft or hub of the disk and the glass whereby the grinding is effected at an equal depth upon the glass and exactly gaged to the profile of the generatrix line, as set forth.

2. The combination with a grinding-disk, of a two-armed lever carrying the disk, a forked lever for producing the periodical ascending and descending action of the said disk, and an adjustable eccentric against which the free end of the forked lever bears, as set forth.

3. The combination with the grinding-disk, of a toothed wheel with angular teeth, and a movable pin arranged as described whereby the reciprocating motion of the glass is utilized for displacing the surface of the glass, as set forth.

4. The combination with the grinding-disk and its supporting and actuating devices, of gearing, a cam-ring and means for producing unequal facets, substantially as specified.

5. The combination with a grinding-disk, of means for supporting a glass, contact-pins mounted to rest upon the glass, and forming a firm support therefor, means for adjusting the said pins and means for causing the glass to move under the grinding-disk, substantially as specified.

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