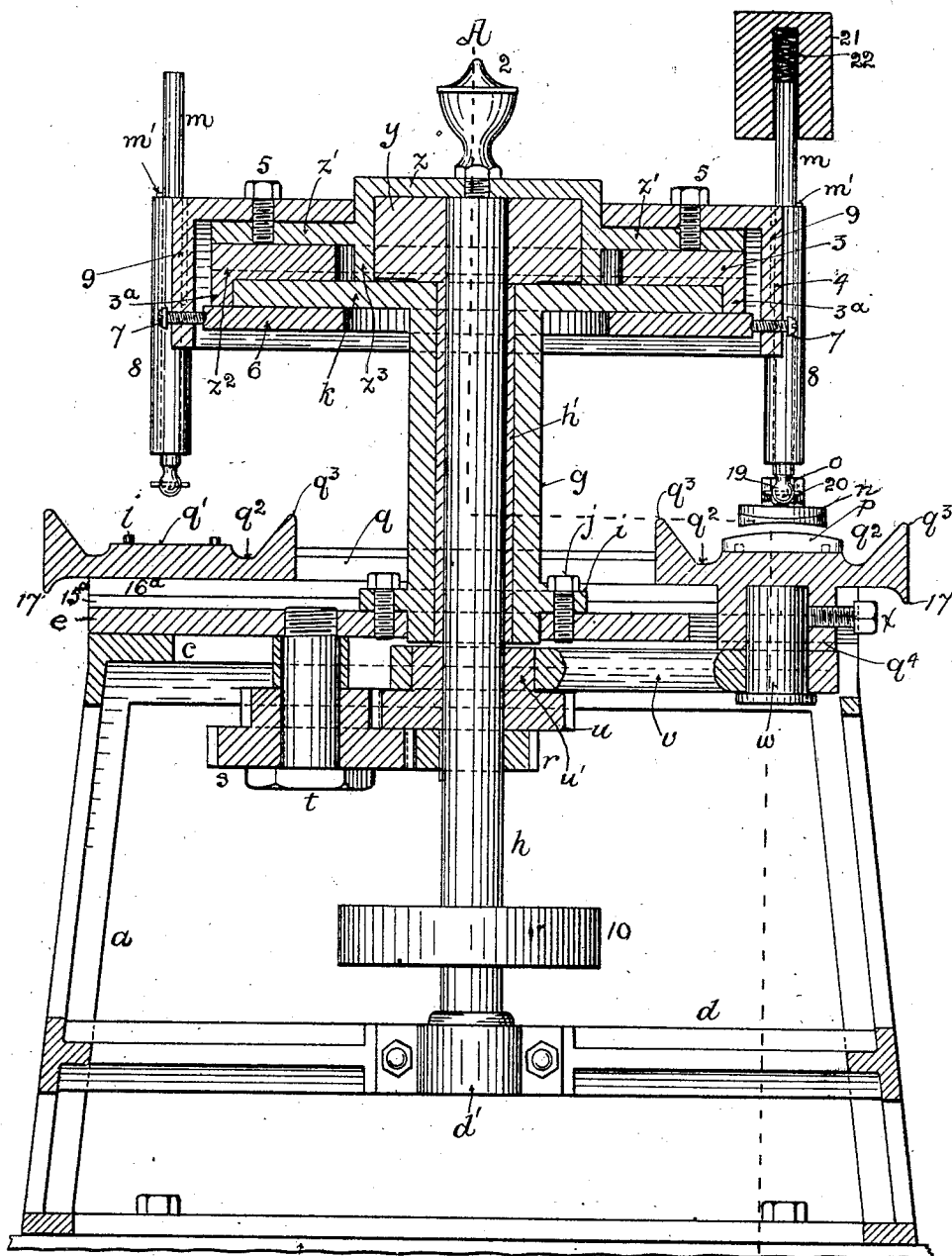


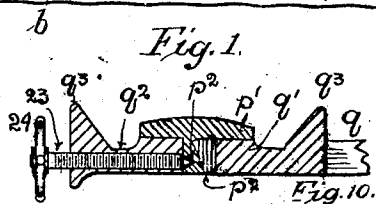
E. O. MATTERN.
 AUTOMATIC PRESCRIPTION LENS GRINDING MACHINE.
 APPLICATION FILED JUNE 27, 1908.

939,845.

Patented Nov. 9, 1909.
 4 SHEETS—SHEET 1.



Witnesses:
 S. M. Philbrick
 Cecil Long



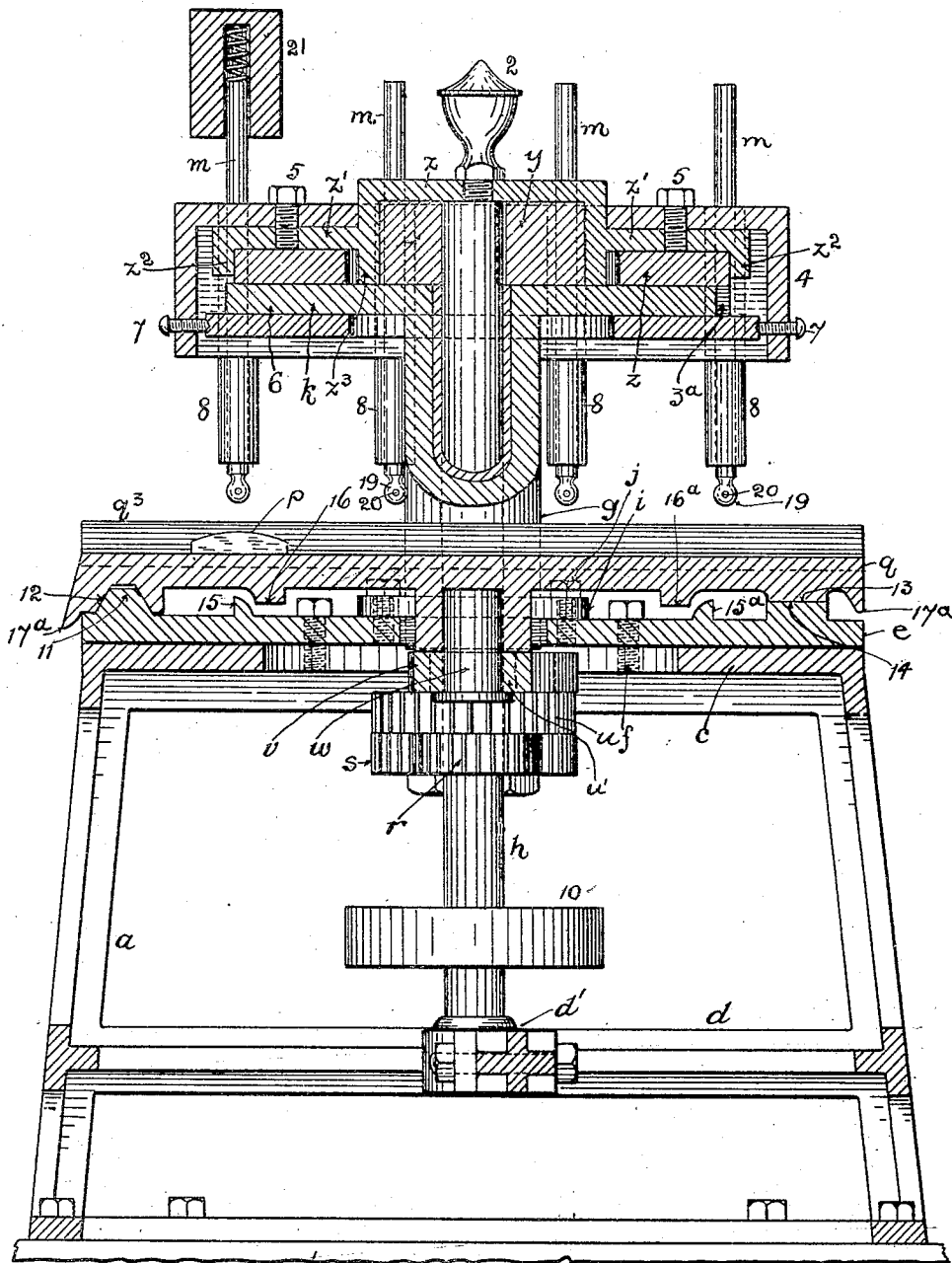
Inventor:
 Ernest O. Mattern
 by J. Heiler
 Atty.

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Fig. 2.

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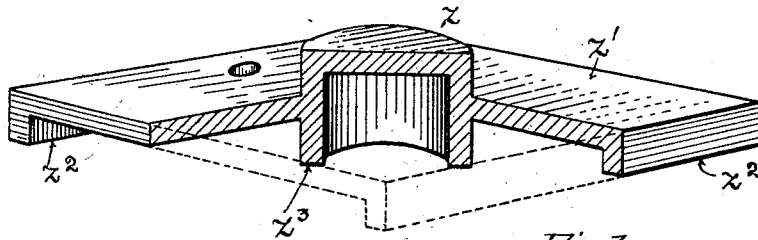


Fig. 3.

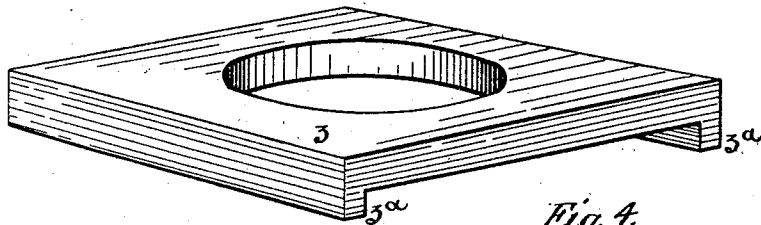


Fig. 4.

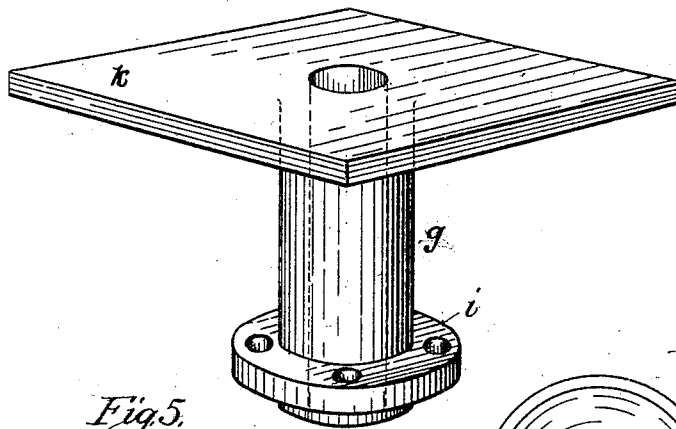


Fig. 5.

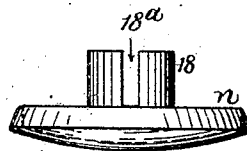


Fig. 8.

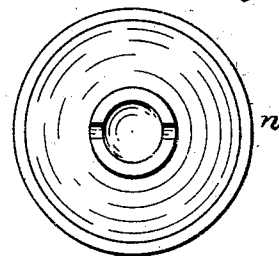


Fig. 9.

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4 SHEETS—SHEET 4.

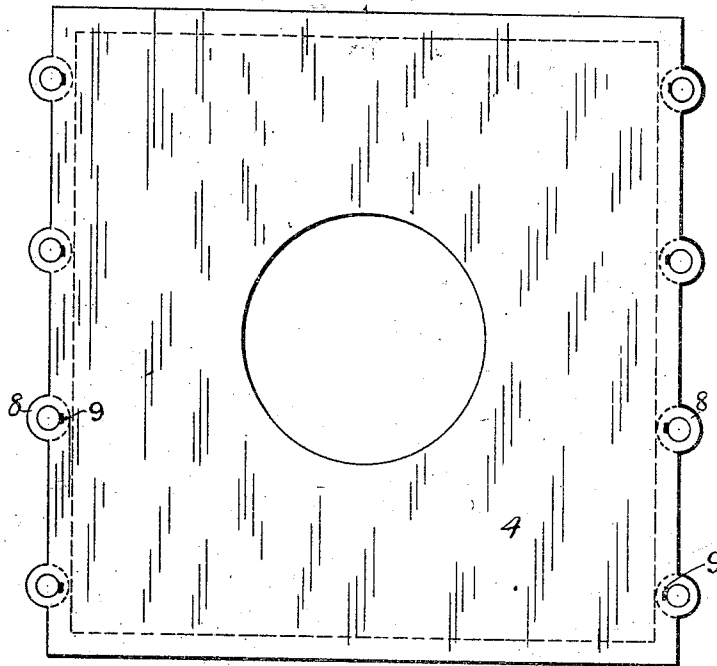


Fig. 6.

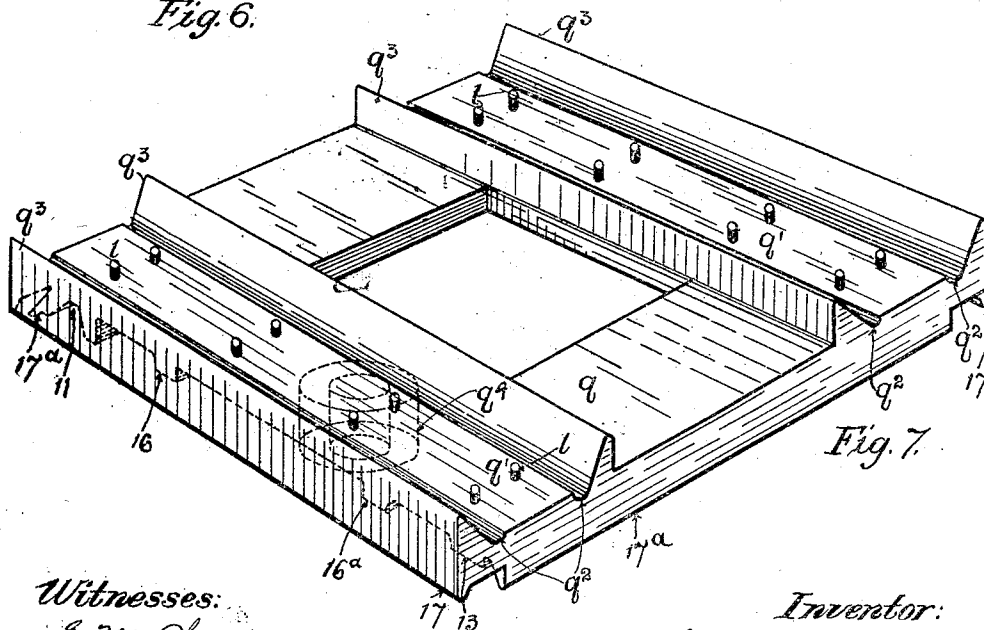


Fig. 7.

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UNITED STATES PATENT OFFICE.

ERNEST OTTO MATTERN, OF PORTLAND, OREGON.

AUTOMATIC PRESCRIPTION-LENS-GRINDING MACHINE.

939,845.

Specification of Letters Patent.

Patented Nov. 9, 1909.

Application filed June 27, 1908. Serial No. 449,749.

To all whom it may concern:

Be it known that I, ERNEST OTTO MATTERN, a citizen of the United States, and a resident of Portland, in the county of Multnomah and State of Oregon, have invented a certain new and useful Improvement in Automatic Prescription-Lens-Grinding Machines, of which the following is a specification, reference being had to the accompanying drawings as constituting a part thereof.

My invention has for its object to obtain an automatic machine by which disks of glass may be accurately and rapidly ground into lenses, especially such lenses as have radii or curvatures of a more complex nature, such as prescription lenses. The difficulty heretofore experienced with the machines designed for this purpose was, the movement of the lenses over the "lap" or grinding piece was not adapted to accomplish rapid work; for, by reason of the lens being moved substantially over the same path consecutively, the glass was frequently defectively ground, the wear on the grinding face of the lap was uneven, and the lap had soon to be discarded.

I accomplish my object by so arranging my mechanisms that the movement of the lens over the lap or grinding surface is constantly varied, relatively to the grinding surface of the lap. Furthermore, I have increased the life of my machine by rendering the operating parts practically emery proof; that is to say, providing means for preventing the emery solution, used in grinding the lenses, from getting into the working parts of the machine, which, in the machines heretofore in use, was a serious fault and shortened the life thereof. Incidentally my machine is so arranged that a number of lenses of different radii may be ground simultaneously; and my machine also embodies the specific features hereinafter more fully described.

In the drawings: Figure 1 is a central, transverse, vertical section of my machine complete, parts, however, being shown in full; Fig. 2 is a vertical section taken approximately on line A-A of Fig. 1; Figs. 3 and 4 are perspective details of the vibrating-head of my machine; Fig. 5 is a perspective detail of the standard on which such vibrating-head is mounted; Fig. 6 is a top view of the case inclosing the vibrating-head; Fig. 7 is a perspective detail of the vibrating-plate supporting the laps of

my machine; Figs. 8 and 9 are respectively a side elevation and a top view of one of the "buzzers" to which the glass disk to be converted into a lens is cemented; and Fig. 10 is a sectional detail illustrating a modification in the means for securing the laps in place on the vibrating-plate.

The main parts of my machine comprise a table, on which is mounted a vibrating lap-plate, and over the latter is a vibrating-head, in which are secured the stems of the buzzers, the latter being the pieces to which the glass disks to be ground into lenses are cemented. The lap-plate is given a straight line, reciprocating motion, of approximately one-half inch throw in each direction, at the rate of 103 vibrations per minute. The center of the vibrating head is made to describe a circle whose diameter is a quarter of an inch at the rate of 300 cyclic motions per minute. In short the principle of operation of my device resides mainly in this, that motion is transmitted to the lap-plate and the vibrating plate by independent devices, operated through the medium of speed differentiating gearing. In other words, I have avoided a relative cyclic motion, that is, the repetition of identical relative movements of the lens and the grinding tool within short periods of time. If the face of the glass being converted into a lens in my machine be observed, during the grinding process, it will be seen that the resultant or relative movement of the lens and grinding tool upon each other—that is, the composite movement which is the product of the two independent movements of said parts—describes a figure 8, with the axes thereof constantly shifting, vertically and horizontally, over the whole face of the lens. The angles of intersection of the movements of said parts constantly change, the lens and grinding tool sometimes traveling in the same direction, and sometimes in opposed directions; and the final result obtained being that the grinding and polishing processes are perfectly and rapidly done.

Describing now the details of construction of my machine: The supporting frame or table, *a*, may be of any convenient construction, and is preferably so arranged that the same may be fastened to a floor base *b*, as shown. The table comprises a centrally apertured top *c*, the legs of which are connected by a member *d*. On the table top

is mounted a guide-plate *e*, said plate being secured in place by screws *f*, as shown in Fig. 2. On the guide-plate *e* is secured an upright hollow cylindrical standard *g*, providing the upper-end bearing for the vertical shaft *h*, the lower end of which has its bearing in a box *d'* on the member *d*. To provide for the rigid fastening of the standard *g*, the same is made with an integral flange *i*, through which are inserted screws *j*. The upper end of the standard *g* is provided with a wide integral flange-head *k*, constituting a support for the vibrating-head, in which the stems *m* of the buzzers *n* are movably secured. The buzzer *n*, as mentioned, being the piece to which the disk of glass to be ground into a lens is cemented. The connection between the buzzer and its stem is in the nature of an articulation, *o*, so as to allow the buzzer and grinding glass to follow freely the radii of the grinding face of the lap *p*, which is essential to obtain a perfect lens. The laps, as shown, are removably secured on the vibrating-plate *q*, either by means of pins *l*; or, as shown in Fig. 10, instead of pins and sockets, the channels *q'* may be made with circular apertures, the laps *p'* made with stud-pins *p''*, and the laps fixed in place by set-screws *23*, provided with hand-wheels *24*. The center of the vibrating-plate *q* is cut away to provide working space. In order to adapt my machine to simultaneously grind a number of lenses, the same is made of such proportions that a series of the laps *p* may be secured in the channels *q'* of the vibrating-plate *q*. To carry off waste emery-solution, I provide channel-grooves *q''*, and to prevent the emery-solution slopping over the ends of the vibrating-plate *q* during its vibration I provide projecting flanges *q'''*, along the sides of the channels *q'*.

Rigid on the shaft *h* is a gear *r*, meshing with a loose duplex reducing gear *s*, journaled in place by a screw-pin *t*; and the gear *s* meshes with a loose gear *u* (compare Figs. 1 and 2) also arranged to reduce the speed transmitted by the gear *s*. The gear *u* is provided with an integral eccentric hub *u'*, to which is connected one end of the pitman *v*, the opposite end of which is connected by a pin, *w*, with the under side of the vibrating lap-plate *q*; said pin *w* being inserted in a boss *q''* and secured in place by a set-screw *x*. On the upper end of the shaft *h* is rigidly secured an eccentric disk *y*, which operates the vibrating-head of my machine.

The vibrating-head, holding the stems of the buzzers, is mounted on the flange-head *k* of the standard *g*. The vibrating head comprises a top piece or cap *z* (see also detail Fig. 3) made with a peripheral square flange-head *z'*, having downwardly extending rim-flanges *z''* on two sides and a central

downwardly extending cylindrical piece *z'''* fitting over the eccentric disk *y*. The cap *z* rests on the flange-head *k* of the standard *g*. In the space intermediate the flange-head *k* of the standard *g* and the flange-head *z'* of the cap *z* is a centrally apertured square plate *3*, made with flanges *3''* on two sides (see also detail Fig. 4) whereby this plate is reciprocally held in place on the flange-head *k* of the standard *g*. The flanges *z''* of the top piece *z* hold the cap-piece reciprocally in place on said apertured plate *3*, and thus the cap-piece *z* and the plate *3* are arranged to be reciprocated at right angles to each other by the revolving of the eccentric *y*. Inclosing all the parts of the vibrating-head is a case *4*, having an apertured top which is seated on the peripheral flange *z'* of the cap *z*; and under the flange-head *k* of the standard *g* there is fastened to the perpendicular walls of the case, *4*, a bottom piece *6*, secured in place by screws *7*; said bottom piece holding the case *4* against vertical displacement and incidentally holding the operating parts of the vibrating head together. The case *4* is also secured in place on the peripheral flange *z'* of the cap *z* by screws *5* inserted in screw holes *5''*. The described arrangement of the parts of the vibrating-head is designed to allow the latter to be operated by, and to follow the rectilinear motion incidental to the revolution of the eccentric disk *y*. The vibrating-head, as apparent, travels in a circular path.

Along the two sides of the case *4*, parallel to channels *q'* of the vibrating lap-plate *q*, are provided a series of sockets *8* (see Fig. 6) in which to receive the stems *m* of the buzzers *n*; see detail Fig. 6. The sockets are made with vertical key-ways *9*, and the stems with ribs *m'*, so that the stems *m* may be secured against rotation and confined to a vertical movement in their sockets while the glass being ground is following the curves or radii of the lap. When any one of the buzzer-stems *m* is not to be used, the same may be lifted and so arranged as to be held uplifted by the rib *m'*.

The shaft *h* has rigidly mounted thereon a speed-wheel or pulley *10*, and the operating parts are supplied with lubricant introduced through an oil cup *2*. To confine the vibrations of the lap-plate *q* to a straight line, reciprocating motion, one side of the guide-plate *e* is made with a guide-rail *11*, and the corresponding under face of the reciprocating plate *q* is made with a channel *12*; and the opposite side of the reciprocating plate *q* has a bearing face *13*; riding on a bearing rail, *14*, of the guide-plate *e*. To prevent the slopping-over emery-solution from working into the operating parts, the upper face of the guide-plate *e* is provided with ribs *15*, *15''*, and the under face of the reciprocating plate *q* is provided with pro-

tuberances 16, 16^a. For the same purpose the reciprocating plate *q* is made at its rim with an overhanging flange 17, 17^a. See detail Fig. 7.

5 As shown in the detail Fig. 8, the buzzer *n* comprises a disk or head provided with a central socket 18, open at the top and having vertical slots, 18^a, at opposite sides to receive the globular-head 19 and transverse
10 bar 20 on the bottom end of the stem *m*. The lap and buzzer shown are the type for grinding double concaved lenses. For other types of lenses of course corresponding types of buzzer and lap-plate will be used. An efficient pressure of the buzzer upon the grinding
15 lap-face is obtained by means of a weight 21; a six-pound weight being generally used for this purpose by me. The advantage of a weight over a spring is, the
20 former assures an even pressure of the lens upon the grinding face of the lap, while a spring would more or less vary its pressure with the rise and fall of the buzzer while the glass is following the curves of the lap.
25 To guard against the weight being thrown up and falling back upon the stem with a blow of such force as to have a tendency to shatter the lens being ground, I seat the weight upon a coil-spring 22.

30 My machine is so arranged that eight lenses of different radii may be ground at the same time, and substantially automatically; for all the attention required, after the glass disks have been arranged, is to apply
35 the emery-solution on the grinding face of the lap. The machine is then started and allowed to grind for a given time, approximately ten minutes, after which the lens face is ready for polishing, which is accomplished
40 by my machine in the same manner as the grinding, substituting for the emery-solution one of the well known polishing materials.

45 It will also be observed that the parts are so arranged that my machine is very compact; a full-sized machine requiring but a space twenty-four inches square, and enough additional room on each side for the attending workman. It is also arranged so as to
50 be simple in construction, very easy to operate, and that it will not get out of order, except by the unavoidable wear in a prolonged use.

55 In Fig. 10 I have illustrated a modification of the means provided for holding the lap in place on the vibrating lap-plate. As apparent from said figure, the modified means consist in making the lap *p'* with a central stem *p''*, and the channel *q'* of the
60 lap-plate is made with a corresponding aperture. The stem *p''* is made with a concavity *p'''*, and in the lap-plate *q* is inserted the set-screw 23, provided with a hand-wheel 24.

I claim:

65 1. In a surface-grinding machine, the

combination of a frame, a guide-base, a lap-plate mounted thereon, a vibrating-head mounted above the lap-plate, a buzzer secured dependent in said vibrating-head, operating means including a speed differ- 70
entiating element, and independent connections arranged to impart a rectilinear movement to one and a circular movement to the other of said lap-plate and vibrating-head.

2. In a lens-grinding machine, the combination of a frame, a guide-base, a lap-plate 75
mounted thereon, a vibrating-head mounted above the lap-plate, a buzzer and means including a universal joint holding such buzzer dependent in said vibrating-head, operating 80
means including a speed differentiating element, and independent connections arranged to impart a reciprocating movement to the lap-plate and a circular movement to the vibrating-head. 85

3. A machine of the character described comprising a table, a guide-plate on the table, a lap-plate mounted thereon and reciprocable in a straight line, a hollow stand- 90
ard mounted on the table, a quadrilateral flange-head rigid on the upper end of the standard, a vertical shaft journaled in said standard, an eccentric disk rigid on the upper end of the shaft, a vibrating-head mounted on said flange-head of the standard and 95
said eccentric disk, said vibrating-head comprising a centrally apertured plate slidably seated on the flange-head of the standard, means restraining said plate to a straight line reciprocation, a cap inclosing said eccentric disk, means restraining the cap to a 100
straight line reciprocation at right angles to said plate, and a case inclosing said movable parts of the buzzer-head, means for removably securing a buzzer to the vibrating-head, 105
and means whereby said lap-plate and said buzzer are operated simultaneously but at unequal speed.

4. A machine of the character described comprising a table, a guide-plate on the 110
table, a lap-plate mounted thereon and reciprocable in a straight line, a hollow standard mounted on the table, a quadrilateral flange-head rigid on the upper end of the standard, a vertical shaft journaled in said 115
standard, an eccentric disk rigid on the upper end of the shaft, a vibrating-head mounted on said flange-head of the standard and said eccentric disk, said vibrating-head comprising a centrally apertured plate slidably 120
seated on the flange-head of the standard, means restraining said plate to a straight line reciprocation, a cap inclosing said eccentric disk, means restraining the cap to a straight line reciprocation at right angles to 125
said plate, and a case inclosing said movable parts of the vibrating-head, a series of vertical sockets on the sides of the case, stems vertically movable in said sockets, means restraining said stems against rotation, means 130

for jointly connecting a buzzer to the lower end of the stem, and means whereby said lap-plate and said buzzer are operated simultaneously but at unequal speed.

- 5 5. A machine of the character described comprising a table, a guide-plate on the table, a lap-plate mounted thereon and reciprocable in a straight line, a hollow standard mounted on the table, a quadrilateral
10 flange-head rigid on the upper end of the standard, a vertical shaft journaled in said standard, an eccentric disk rigid on the upper end of the shaft, a vibrating-head mounted on said flange-head of the standard
15 and said eccentric disk, said vibrating-head comprising a centrally apertured plate slidably seated on the flange-head of the standard, means restraining said plate to a straight line reciprocation, a cap inclosing
20 said eccentric disk, means restraining the cap to a straight line reciprocation at right angles to said plate, and a case inclosing said movable parts of the vibrating-head, a series of vertical sockets on the sides of the case,
25 stems vertically movable in said sockets, means restraining said stems against rotation, means for jointly connecting a buzzer to the lower end of the stem, a weight on said stem, and means whereby said lap-plate
30 and said buzzer are operated simultaneously but at unequal speed.

6. A machine of the character described comprising a table, a guide-plate on the table, a lap-plate mounted thereon and reciprocable in a straight line, a hollow standard mounted on the table, a quadrilateral
35 flange-head rigid on the upper end of the standard, a vertical shaft journaled in said standard, an eccentric disk rigid on the upper end of the shaft, a vibrating-head mounted on said flange-head of the standard and said eccentric disk, said vibrating-head
40 comprising a centrally apertured plate slidably seated on the flange-head of the standard, means restraining said plate to a straight line reciprocation, a cap inclosing said eccentric disk, means restraining the
45 cap to a straight line reciprocation at right angles to said plate, and a case inclosing said movable parts of the vibrating-head, a series of vertical sockets on the sides of the case, stems vertically movable in said sockets,
50 means restraining said stems against rotation, means for jointly connecting a buzzer to the lower end of the stem, a spring-seated weight on said stem, and means whereby said lap-plate and said buzzer are operated simultaneously but at unequal
55 speed.

- 60 7. A machine of the character described comprising a table, a guide-plate on the table, a lap-plate mounted thereon and re-

ciprocable in a straight line, a hollow standard mounted on the table, a quadrilateral flange-head rigid on the upper end of the
65 standard, a vertical shaft journaled in said standard, an eccentric disk rigid on the upper end of the shaft, a vibrating-head mounted on said flange-head of the standard and said eccentric disk, said vibrating-head
70 comprising a centrally apertured plate slidably seated on the flange-head of the standard, means restraining said plate to a straight line reciprocation, a cap inclosing said eccentric disk, means restraining the
75 cap to a straight line reciprocation at right angles to said plate, and a case inclosing said movable parts of the vibrating-head, a series of vertical sockets on the sides of the case, stems vertically movable in said sockets, means restraining said stems against rotation, means for jointly connecting a buzzer to the lower end of the stem, a spring-seated weight on said stem, means whereby said lap-plate and said buzzer are operated
85 simultaneously but at unequal speed, and means arranged to prevent the emery solution working into the operating parts.

8. A machine of the character described comprising a table, a guide-plate on the
90 table, a lap-plate mounted thereon and reciprocable in a straight line, a hollow standard mounted on the table, a quadrilateral flange-head rigid on the upper end of the
95 standard, a vertical shaft journaled in said standard, an eccentric disk rigid on the upper end of the shaft, a vibrating-head mounted on said flange-head of the standard and said eccentric disk, said vibrating-head
100 comprising a centrally apertured plate slidably seated on the flange-head of the standard, means restraining said plate to a straight line reciprocation, a cap inclosing said eccentric disk, means restraining the
105 cap to a straight line reciprocation at right angles to said plate, and a case inclosing said movable parts of the vibrating-head, a series of vertical sockets on the sides of the case, stems vertically movable in said sockets, means restraining said stems against rotation, a spring-seated weight on said stem, means whereby said lap-plate and said buzzer are operated simultaneously but at unequal speed, protuberances on the opposite bearing faces of the guide-base and the lap-plate, flanges inclosing the surface of the
115 lap-plate, to which the lap is secured, and overhanging flanges on the four sides of the lap-plate.

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