(No Model.)

3 Sheets—Sheet 1.

C. SEYER & E. RICHARD.

MACHINE FOR GRINDING GLASS, &c.

No. 342,935. Patented June 1, 1886.

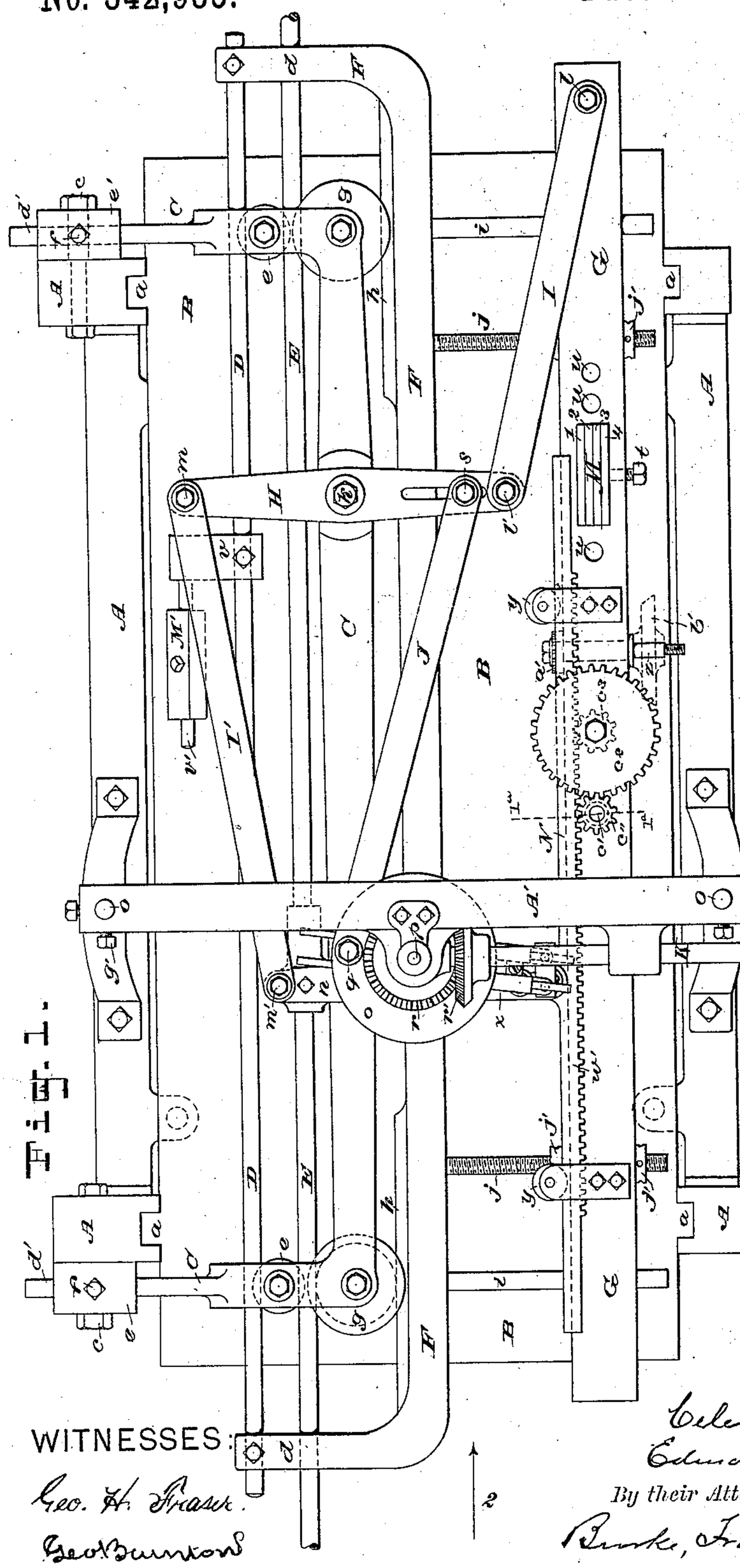

Fig. 1.

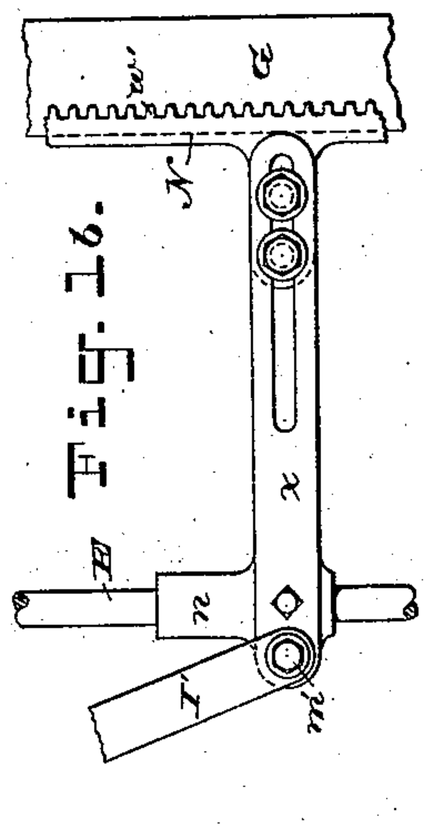

Fig. 1a.

Fig. 1b.

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(No Model.) 3 Sheets—Sheet 2.

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Fig. 4.

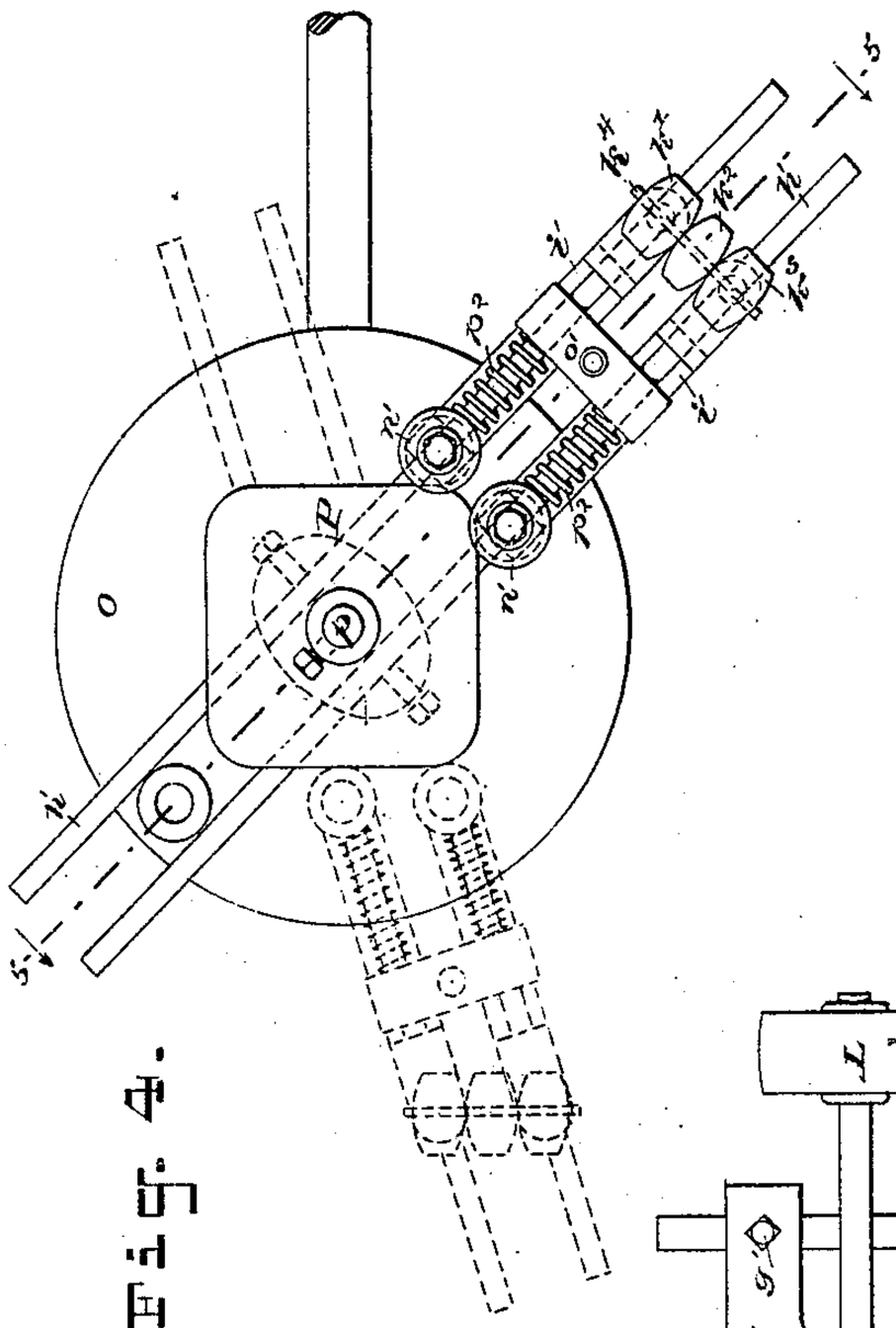


Fig. 5.

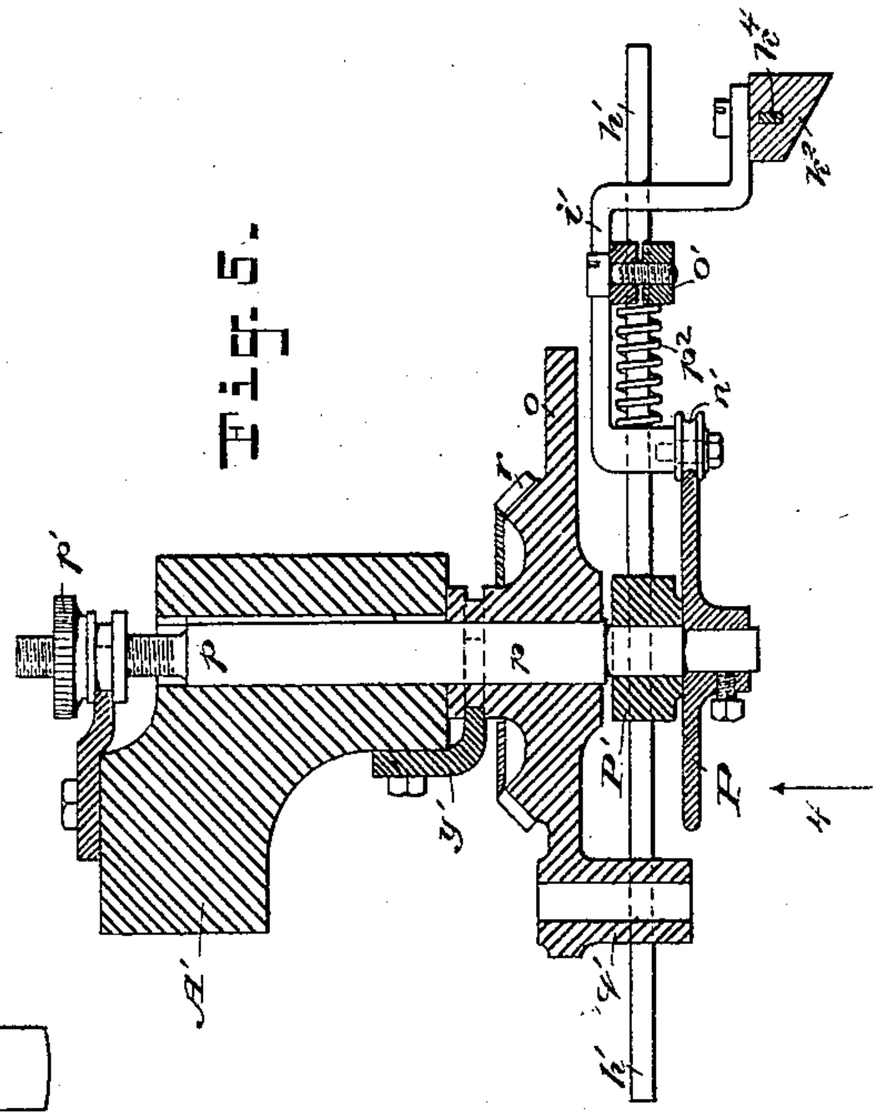
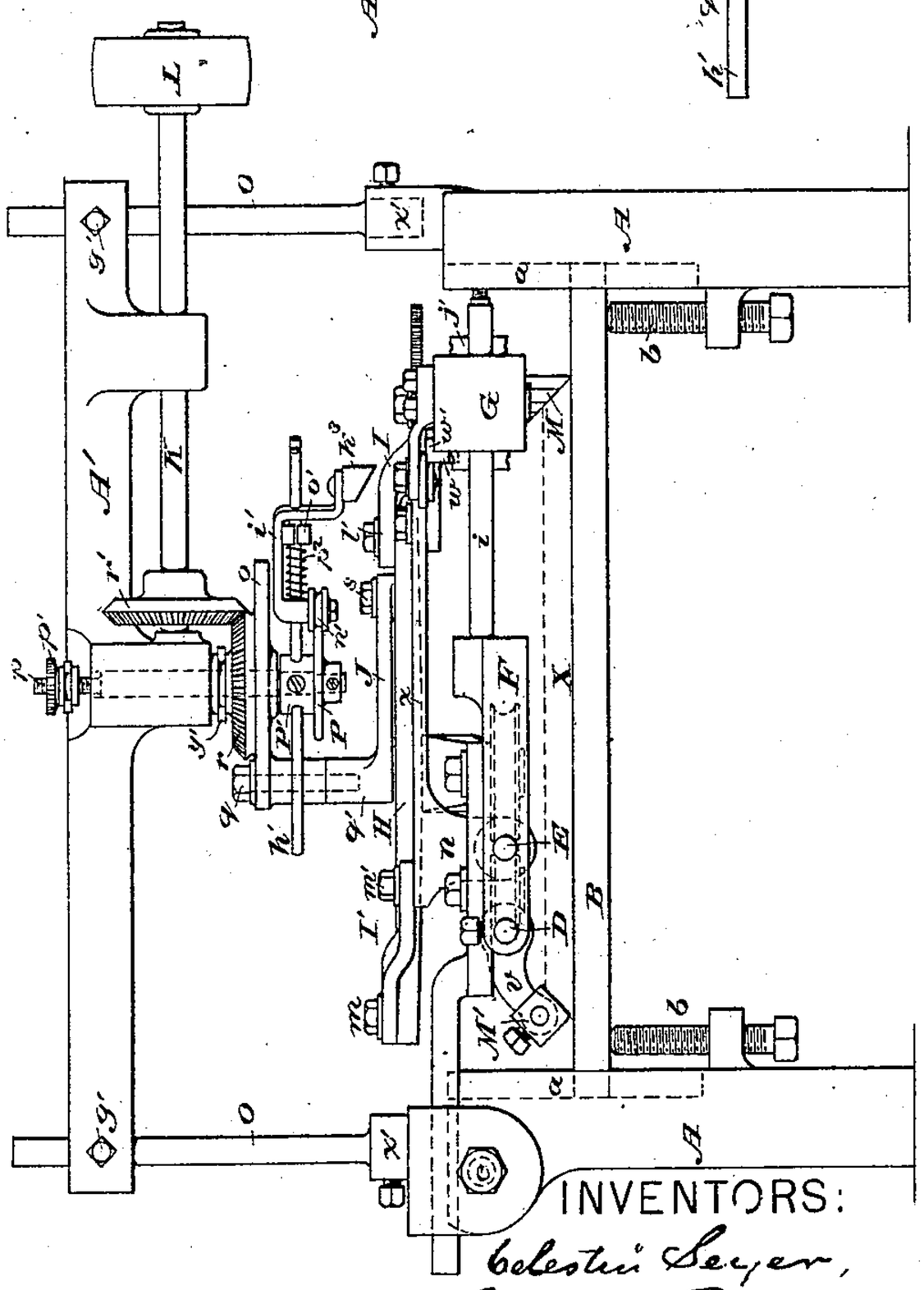


Fig. 2.



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(No Model.) 3 Sheets—Sheet 3.

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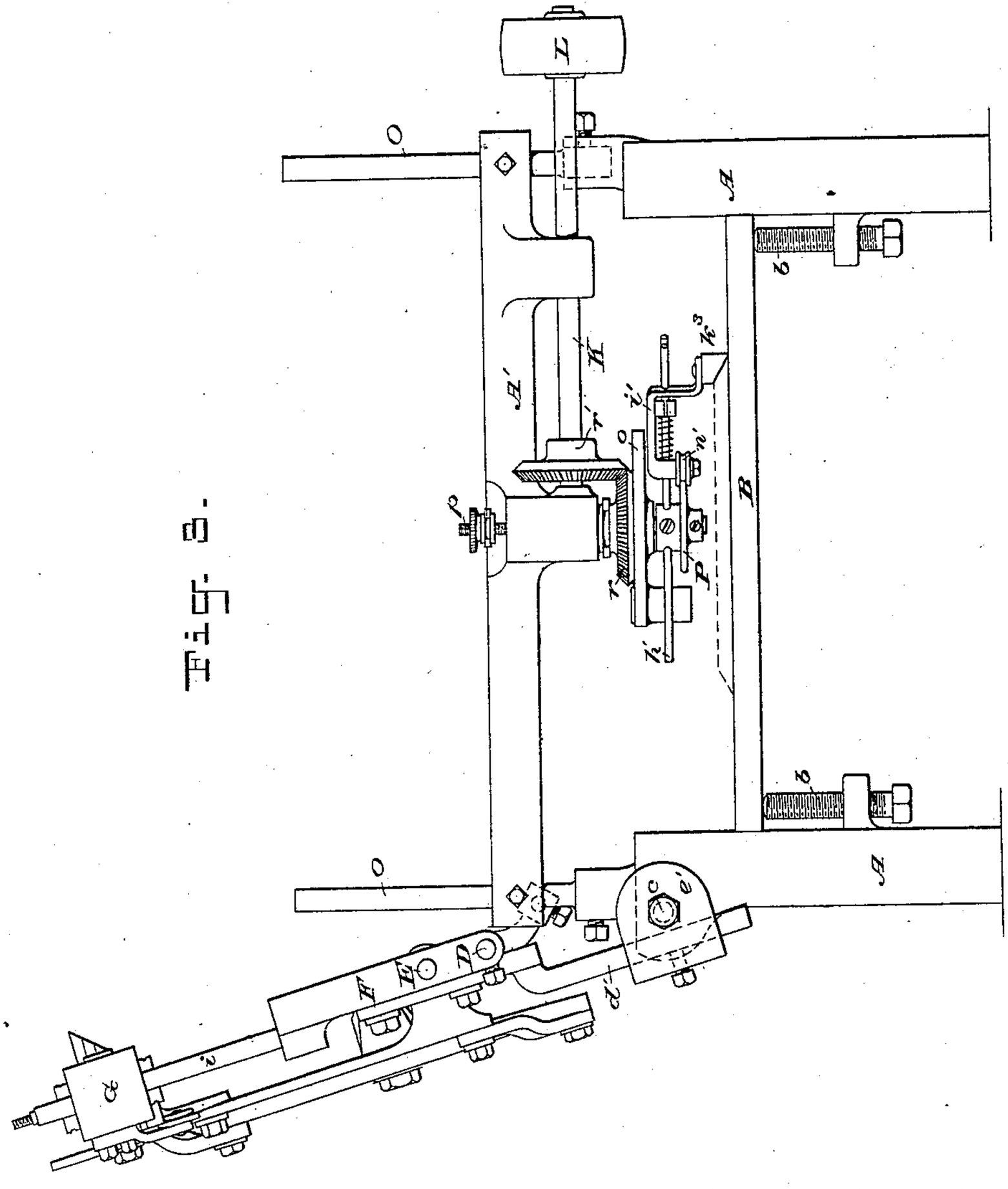
Fig. 3.



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UNITED STATES PATENT OFFICE.

CELESTIN SEYER, OF WEST HOBOKEN, N. J., AND EDMOND RICHARD, OF NEW YORK, N. Y.; SAID RICHARD ASSIGNOR TO SAID SEYER.

MACHINE FOR GRINDING GLASS, &c.

SPECIFICATION forming part of Letters Patent No. 342,935, dated June 1, 1886.

Application filed July 16, 1885. Serial No. 171,760. (No model.)

To all whom it may concern:

Be it known that we, CELESTIN SEYER and EDMOND RICHARD, both citizens of the United States, and residents, respectively, of West Hoboken, Hudson county, New Jersey, and of New York city, New York, have invented certain Improvements in Machines for Grinding, Polishing, and Ornamenting Glass, of which the following is a specification.

Our invention relates to machines for grinding bevels and moldings on the edges of glass plates, for grinding grooves or lines in the faces of said plates, for producing ornamental designs on the faces of same by grinding or abrading, and for polishing glass.

Our object is to produce a convenient machine for this purpose, which may be operated by hand or other power, and wherein the rotary motion of the power-shaft may be converted into double alternate reciprocating motion, so as to operate both rotary and reciprocating grinders simultaneously, and wherein rotary motion of said shaft may be made to produce a continuous motion of the grinder through a circular or variable path, whereby plates having ornamental contours may be ground or beveled to pattern, or ornamental figures may be produced on the face of the glass in the same manner.

Our machine will be hereinafter fully described, and its novel features particularly defined in the claims.

In the drawings, which serve to illustrate our invention, Figure 1 is a plan of the machine, and Fig. 2 is an elevation of the end at the left in Fig. 1. These views show the machine when adapted for grinding in straight lines and with rotative and non-rotative grinders. Fig. 1^a is a detached cross-section on line 1^a 1^a in Fig. 1, and Fig. 1^b is a plan view of the slotted coupling to the rack. Fig. 3 is an elevation of the left-hand end with the upper hinged part thrown back and the machine adapted for grinding or ornamenting in irregular or curved lines. Figs. 4 and 5 are views of the rotary continuous grinders and its operative mechanism detached, and on a larger scale. Fig. 4 is a plan of the under side, and Fig. 5 a section on line 5 5 in Fig. 4.

Referring particularly to Figs. 1 and 2, A is the substantial frame or table, and B is the bed of same, upon which the plate of glass X is placed to be ground or ornamented. The glass may be fixed in position on the bed in the usual or any way. The bed is constructed to be moved up and down in the frame A, upon suitable guides at *a a*, and adjusting-screws *b b* are employed to support, move, and level the bed.

C is a frame, which is hinged to the frame A at *c c*, and is capable of being turned back, as seen in Fig. 3.

D and E are two reciprocating bars, usually cylindrical, the former being secured at its ends in a frame, F, with which it moves, and the latter being mounted to play in bearings at *d d* in the said frame F.

Rotatively mounted on the frame C are two grooved pulleys or sheaves, *e e*, the grooves in which are engaged by the bars D and E on the opposite sides of the sheaves. As these bars always move (as will be described) in opposite directions and at the same speed, it will be seen that the sheaves *e e* provide rolling anti-friction bearings for the said bars. In the same manner two sheaves, *g g*, rotatively mounted on frame C, are arranged between the bar E and the rounded edge *h h* of frame F for the same purpose.

G is a bar arranged parallel with frame F, and mounted on parallel guides *i i*, fixed in said frame F. Thus the bar G is capable of being moved laterally toward or from frame F, the adjustment being effected by the screws *j j* and their nuts *j' j'*. G of course reciprocates with F, being attached thereto.

It will be seen that the hinged frame C carries the several parts D, E, F, and G, and they can all be turned back together on the hinges *c*, as seen in Fig. 3. When down in place, as in Fig. 1, this hinged part, taken collectively, rests with its weight on the bed B, or the glass plate, and, if desired, it may be weighted to cause the grinders to press more or less heavily on the glass.

The bars D G and frame F are all connected together, and may be designated, when considered collectively, as the "reciprocating frame." This frame bears the reciprocating grinders, both rotative and non-rotative, as will be explained.

H is a rocking lever, which is fulcrumed at *k* on the frame C.

I is a link, one end of which is coupled at *l*

to the bar G, and at its other end it is coupled at *l'* to one end of lever H.

I' is a link, one end of which is coupled at *m* to the opposite end of lever H, and the other end at *m'* to a sleeve or collar, *n*, secured to bar E. When the lever H is rocked on its fulcrum *k*, the bar E moves in one direction, and the reciprocating frame, comprising bar D, frame F, and bar G, in the other direction. The lever H is rocked and the parts above described given a reciprocating motion in opposite directions by means of a crank-wheel, *o*, mounted rotatively on a stud or spindle, *p*, mounted in a cross-beam, A'. The crank is coupled by a wrist-pin, *q*, to a link, J, the other end of which link is coupled at *s* to the end of the rocking lever H. The rotation of the crank-wheel *o* is effected through a bevel-wheel, *r*, fixed to crank *o*, which intermeshes with another bevel-wheel, *r'*, on a cross shaft, K, rotatively mounted on the beam A', and provided with a driving-pulley, L, or a crank, to which power is applied.

In the bar G are fixed by a set-screw, *t*, a non-rotative grinder, M, made up of several plates or parts, (numbered 1 2 3 4 in Fig. 1,) so that they may be set to suit the bevel or mold on the glass plate. This grinder is fixed in a mortise in the bar G. Holes *u u* are also formed in said bar to receive non-rotative grinders of various kinds or forms—that is to say, having their ends formed to correspond with the molding or grooving required in the glass. These grinders I usually make of steel, as such grinders are customarily made, and I employ emery and other gritty substances ordinarily used as an abrading material.

On the bar D is also mounted a grinder, M', to grind the other edge of the glass plate. This grinder is mounted on a bracket, *v*, constructed to be set at any point along bar D, and the grinder itself may be also adjusted on the arm *v'* of said bracket. The grinder M is merely a cast-iron block with a steel face of the proper shape, and emery, &c., is used as the abrading material. In Fig. 2 the grinders M and M' are shown in position as when grinding a bevel on the edge of a glass plate.

In order to provide for the mounting of rotary grinders on the bar G, I mount on said bar an angle-rack, N, provided with two rows of teeth, *w* and *w'*, as best seen in Fig. 1[a], and connect this rack with the bar E by an arm, *x*, extending to it from sleeve *n*. The rack is thus caused to reciprocate with bar E, and in an opposite direction to bar G. The rack is kept up to bar G by keepers provided with rollers *y y*.

In order to allow for the adjustment of the bar G toward or from the frame F, the arm *x* has a slotted attachment to the rack N, as seen best in Fig. 1[b]. From this rack N rotary motion is given to the grinders, as will be now described. A shaft, *z*, is mounted horizontally in bar G, and on its inner end is fixed a pinion, *a'*, which meshes with the teeth *w* of the rack.

On the outer end of shaft *z* may be mounted any kind of rotary grinder or cutter, *b'*, as seen in Fig. 1[a]. This grinder *b'* is reciprocated bodily by the movement of bar G, and also rotates with shaft *z* very rapidly and in a direction opposite to that it would have if rolling along a plane.

Mounted to rotate vertically in bar G is a tubular socket, *c'*, which bears a pinion, *c''*, on its upper end, which meshes with a spur-wheel, *c²*, rotatively mounted on bar G.

Below and on the same axis with wheel *c²* is a pinion, *c³*, indicated by dotted lines in Fig. 1, which meshes with the teeth *w'* of rack N. Thus rotary motion is imparted to the socket *c'* by the reciprocation of the rack, and any desired form of cutting-tool may be set in said socket to operate on the glass below. The tool I usually employ is rounded or conical on its lower or operative end, and is made of steel. It is designed to "rough out" the heavier portion of the cut, and the usual abrading material is employed.

The coupling of the link J to the lever H by a slot, as shown, enables the extent of reciprocatory movement of the parts to be regulated.

The frame C, and with it the parts it carries, may be set out or in over the bed by means of the attaching-arms *d' d'* of said frame, which may slide through apertures in the hinging-blocks *e' e'*, wherein they are secured by set-screws *f f*, as shown.

In sockets *x'* in frame A are set standards O O, which may be secured in said sockets by set-screws, as shown. These standards form a support for the cross-beam A', which has eyes in its ends, through which said standards pass. The beam may be set any convenient height on the standards, and secured in place by set-screws *g' g'*, as shown, or by some other convenient means. When the frame C and its attachments are to be turned back, as in Fig. 3, the standards O may be lifted out of their sockets, and when said frame is turned back the standards are replaced.

I will now describe the grinding apparatus for grinding the edges of glass plates having any contour of curved lines, whether regular or irregular, and for grinding lines of curved contour on the faces of such plates.

Referring to Figs. 3, 4, and 5 most particularly, the stud *p* is mounted in the cross-beam A', and splined so as to play endwise, but not rotate. Its upper end is screw-threaded to receive a collared nut, *p'*, whereby the stud *p* is given a longitudinal movement. The crank-wheel *o* is rotatively mounted on the stud *p* and a fork, *y'*, on the beam A', engages a circumferential groove in the boss of *o*, and prevents it from slipping down on stud *p*.

Fixed on the lower end of the non-rotative stud *p* is a pattern-plate, P, of any desired contour; but having a contour corresponding to the path in which it is desired the grinding-tools shall travel. Fig. 4 shows this plate in the form of a square with rounded corners.

Loosely mounted on the stud *p*, between plate P and crank *o*, is a boss, P′, in which are adjustably mounted guide-rods *h′ h′*, usually fixed in place by set-screws, as indicated by dotted lines in Fig. 4. These rods embrace the boss *q′* on crank *o*, which receives the crank-pin *q*. This boss *q′* serves as a driver for boss P′ through rods *h′ h′*. On these rods are mounted slides *i′ i′*, to the outer ends of which are fixed the compound grinder *k′ k² k³*. On the inner end of each slide is mounted an anti-friction roller, *n′*, and on the rods between the inner end of the slide and bridge-clamp *o′* are arranged springs *p²*. The bridge-clamp serves as an abutment for the springs, and enables their tension to be regulated by the adjustment of said clamp along the rods *h′*. The rollers *n′* bear against the edge of the plate P, and they are usually grooved to engage the edge of the same, as shown, to retain them in position. The springs *p²* keep the rollers up to the plate P, and when the crank-wheel *o* is rotated, and the grinders *k′*, &c., carried around, the contour of the plate P will govern and determine the path that the compound grinder will follow.

In order to allow the compound grinder to assume the proper relative positions at all times, we make it up of parts, as shown, and connect these parts by a flexible strip, *k⁴*.

In practice the elements of the grinder will usually be quite small, as will also be the rollers *n′*, and more than two rollers and guide-rods will usually be employed. The parts *k′ k² k³* of this grinder will be made of metal, usually steel, and connected by a steel strip, and emery will usually be employed as abrading material. The form given to the faces of these parts will of course depend on the form of mold or bevel to be given to the glass. In Figs. 4 and 5 I have supposed this to be a plain bevel. The elevation in Fig. 5 shows the form clearly.

Fig. 3 shows how this grinder is operated. The hinged upper part having been turned back and the standards *o o* again set in place, the beam A′ is adjusted to the proper height for the grinders to operate on the glass plate X on the bed B. It is now only necessary to impart rotation to shaft K in order to effect the grinding.

By changing the character of the grinding-tool, in a manner well understood by those skilled in the art, lines may be ground in the face of the glass plate, following the form determined by the pattern P. The parts *k′ k²*, &c., of the compound grinder rest by their weight on the glass, and may be fed down by means of the nut *p′*, as will be obvious.

We may say that, in order to effect the change of parts above described, the link J must be uncoupled from the crank-wheel *o* by removing the coupling or wrist-pin *q*, as will be understood.

For polishing glass with our machine it will only be necessary to substitute polishing material for abrading material.

We do not limit ourselves to the precise details of construction herein shown, as these may be varied to some extent without materially departing from our invention.

Having thus described our invention, we claim—

1. A machine for grinding and polishing glass, comprising a frame, A, and bed B, to support the glass plate, a frame, C, hinged to frame A, and provided with means, substantially as described, for adjusting it laterally over the bed B, and a reciprocating frame bearing the grinders and mounted to reciprocate in the frame C, substantially as set forth.

2. A machine for grinding and polishing glass, comprising a main frame, a bed to support the glass, mounted adjustably in said main frame, as set forth, an adjustable hinged frame, C, arranged to turn down on the glass-supporting bed, and a reciprocating frame bearing the grinders mounted to reciprocate in the frame C, substantially as set forth.

3. A machine for grinding and polishing glass, comprising a main frame, a bed to support the glass, mounted in said main frame, a frame, C, hinged to said main frame and arranged to turn down on the glass-supporting bed, as described, and a reciprocating frame mounted to reciprocate in the frame C, and provided with a bar, G, with lateral adjustment, substantially as described, said reciprocating frame bearing the grinders, as set forth.

4. A machine for grinding and polishing glass, comprising a main frame, a bed to support the glass plate, a hinged frame, C, a reciprocating frame bearing the grinders, mounted to reciprocate in frame C, and means, substantially as described, for reciprocating said frame, substantially as set forth.

5. The combination, with the frame C, of the bars D and G, and frame F, connected together, the bar E, mounted to slide endwise in frame F, the sheaves *e e* and *g g*, mounted on frame C to form rolling bearings for the reciprocating parts, and the mechanism, substantially as described, for imparting an alternate reciprocating motion to the bars D and G and frame F in one direction and the bar E in the opposite direction, substantially as set forth.

6. The combination, with the frame F, of the bar G, connected to the frame F by the guides *i i*, the screws and nuts *j* and *j′*, arranged, as shown, for adjusting the bar G toward and from the frame, the grinder M, mounted in the bar G, and the mechanism, substantially as described, for imparting a reciprocating movement to the said bar and frame, substantially as set forth.

7. The combination, with the main frame A and bed B, of the frame C, provided with sliding bearings in the hinging-blocks for its arms *d′ d′*, the said hinging-blocks *e′ e′*, hinged to the main frame and provided with set-screws *f*, whereby the frame C and the parts borne

thereby may be adjusted laterally on the bed B and be turned back, substantially as set forth.

8. The combination, with the frame C, the connected bars D and G, and frame F, of the rocking lever H, mounted on frame C, and connected at its ends, respectively, with bar G and bar E, the angle-rack N, mounted to slide on bar G and rigidly connected to bar E, the tool-socket c' and the train of gears by which it is driven from rack N, the spindle or shaft z, pinion a' thereon, and the grinding-wheel b', all arranged to operate substantially as set forth.

9. The combination, with the frame A and bed B, of the removable standards O O, the cross-beam A′, mounted on said standards, the spindle p, mounted vertically in said beam, the crank-wheel o and its bevel gear-wheel r, the shaft K and its bevel-gear wheel r', to form a mechanism for converting rotary motion of shaft K into reciprocating motion of the grinders, substantially as set forth.

10. A machine for grinding and polishing glass, comprising the main frame and bed to support the glass plate, the hinged frame C, the reciprocating frame mounted to reciprocate in frame C, the bar E, mounted to reciprocate in frame C, the mechanism, substantially as described, for imparting a reciprocating motion in opposite directions to bar E and the said reciprocating frame, the rack connected with and reciprocating with bar E and the rotary grinder mounted on bar G of the reciprocating frame and driven from the rack, substantially as set forth.

11. The combination, with the reciprocating bar G, of the tool-socket c', rotatively mounted therein, and the mechanism, substantially as described, for simultaneously reciprocating said bar and rotating said socket, as set forth.

12. The combination, with the reciprocating bar G, of the rotary grinder b' and its shaft mounted on bar G, and the mechanism, substantially as described, for simultaneously reciprocating said bar and rotating said grinder, substantially as set forth.

13. A machine for grinding glass, comprising the main frame and bed for supporting the glass, the non-rotative stud p, mounted in the frame, the pattern-plate fixed on said stud, the grinders k' k^2, &c., and their slides and guide-rods, the rollers n', that bear on the pattern-plate, the springs p^2, which keep the rollers pressed up elastically to the pattern-plate, and the mechanism, substantially as described, for rotating the grinders around the pattern-plate, substantially as set forth.

14. The grinder made up of several parts or elements, k' k^2 k^3, connected by a flexible strip, k^4, substantially as and for the purposes set forth.

In witness whereof we have hereunto signed our names in the presence of two subscribing witnesses.

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EDMOND RICHARD.

Witnesses:
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ARTHUR C. FRASER.