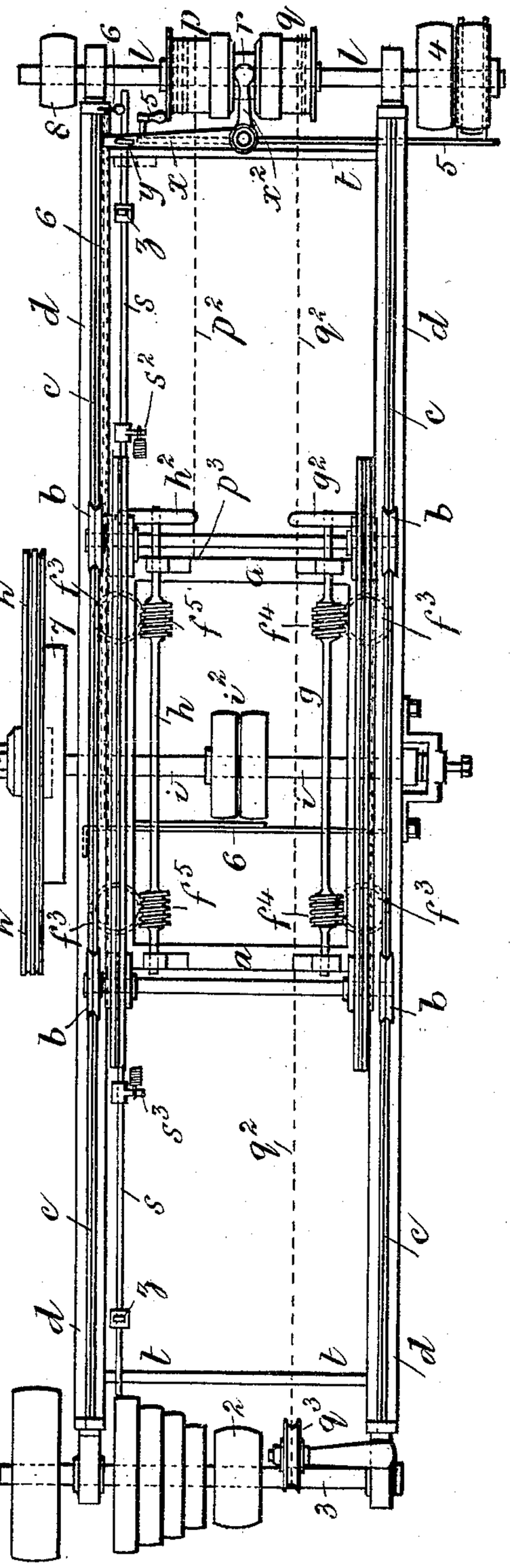
(No Model.) 3 Sheets—Sheet 1.

O. C. HAWKES.

MACHINERY FOR BEVELING THE EDGES OF PLATES OF GLASS.

No. 378,680. Patented Feb. 28, 1888.

Fig 1.



Witnesses
George Shaw
Richard Skerrett

Inventor;-
Obed Charles Hawkes.

(No Model.) 3 Sheets—Sheet 2.

O. C. HAWKES.

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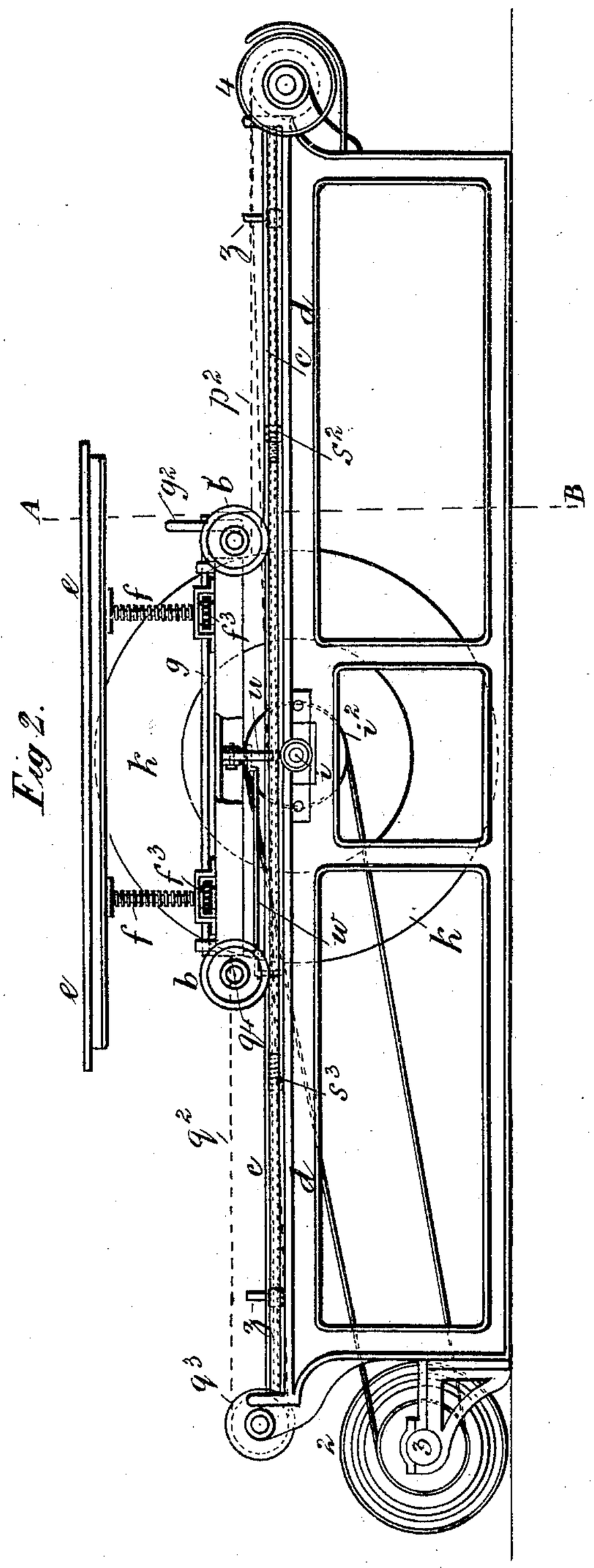
Fig 2.



Witnesses:—
George Shaw
Richard Skerrett

Inventor;—
Obed Charles Hawkes.

(No Model.) 3 Sheets—Sheet 3.

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Fig 4.

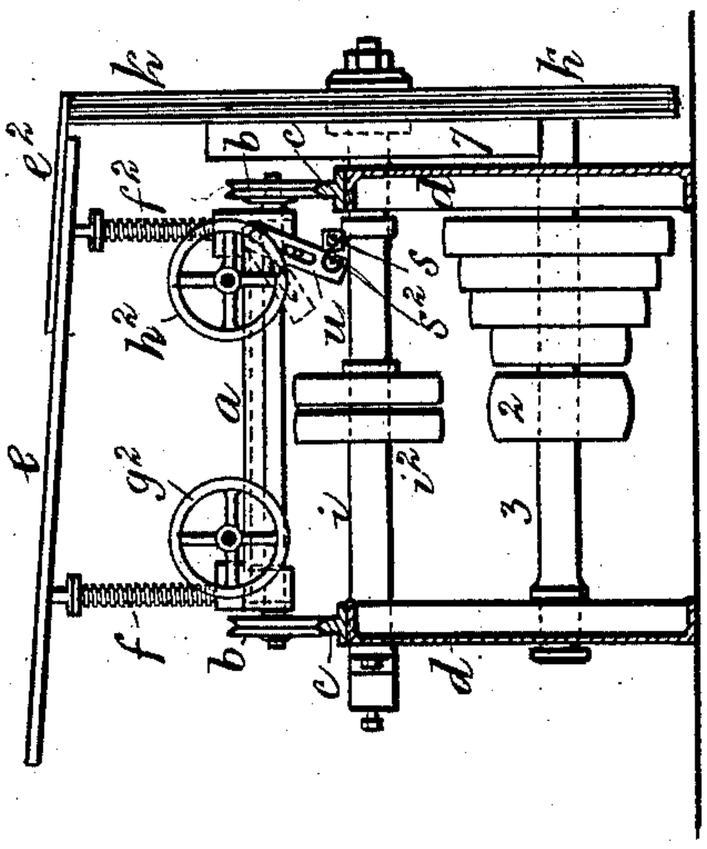


Fig 6.

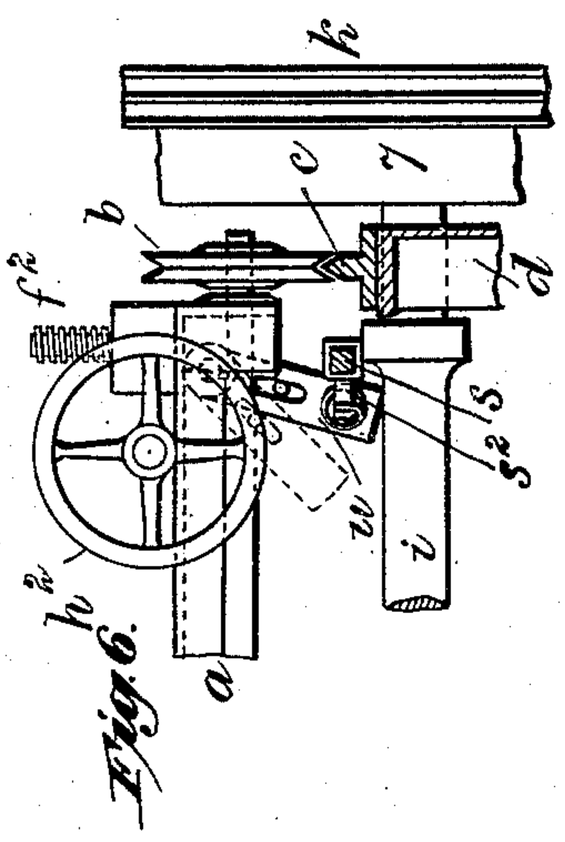


Fig 3.

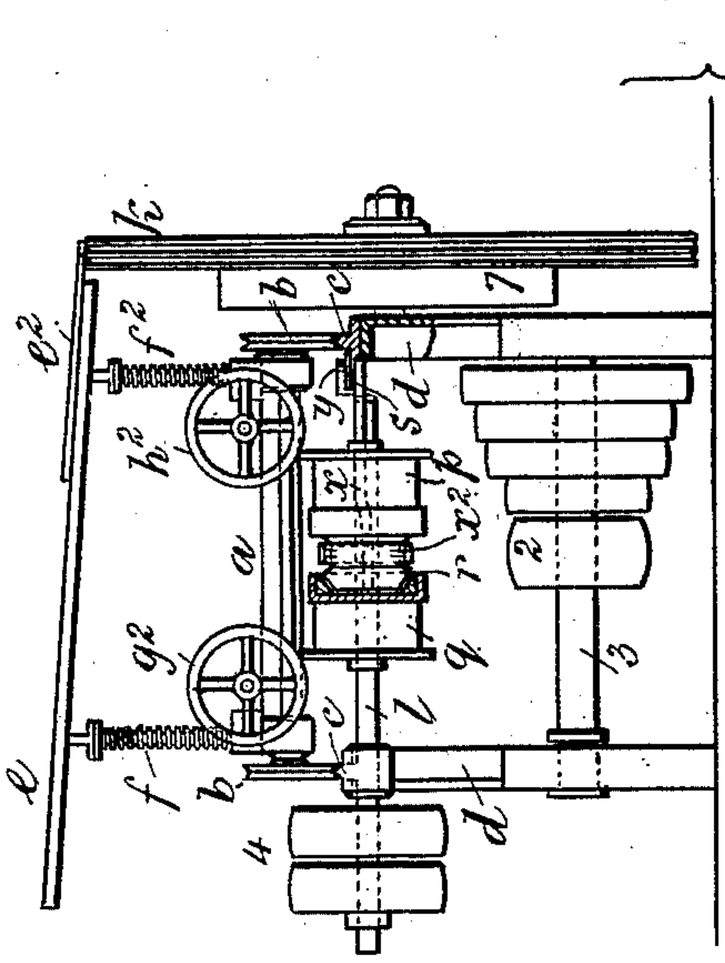
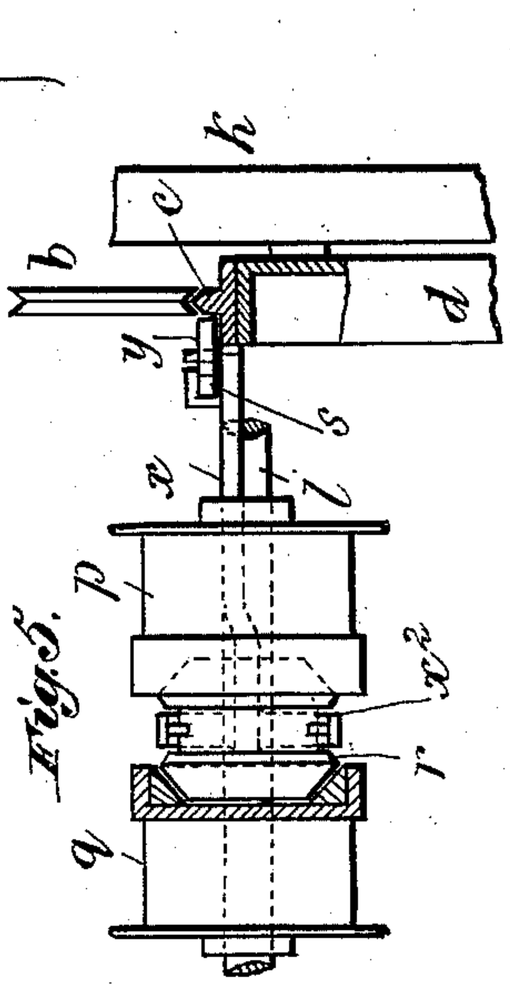


Fig 5.



Witnesses:—
George Shaw.
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Inventor:—
Obed Charles Hawkes.

UNITED STATES PATENT OFFICE.

OBED CHARLES HAWKES, OF BIRMINGHAM, COUNTY OF WARWICK, ENGLAND.

MACHINERY FOR BEVELING THE EDGES OF PLATES OF GLASS.

SPECIFICATION forming part of Letters Patent No. 378,680, dated February 28, 1888.

Application filed July 12, 1887. Serial No. 244,107. (No model.) Patented in England February 10, 1887, No. 2,114; in France July 2, 1887, No. 184,584, and in Belgium July 6, 1887, No. 78,065.

To all whom it may concern:

Be it known that I, OBED CHARLES HAWKES, of Birmingham, in the county of Warwick, England, a subject of the Queen of Great Britain, have invented new or Improved Machinery for Beveling and Molding the Edges of Plates of Glass and for Ornamenting the Surfaces of Plates of Glass, (for which I have obtained patents in Great Britain, dated February 10, 1887, No. 2,114; France, dated July 2, 1887, No. 184,584, and Belgium, dated July 4, 1887, No. 78,065,) of which the following is a specification.

My invention consists of machinery the parts of which are constructed and arranged in the manner hereinafter described, which said machinery effects rapidly and economically the beveling and molding of the edges of plates of glass, and may also be employed for ornamenting the surfaces of plates of glass.

The machinery constituting my invention is constructed essentially as follows: On the bed of the machine is a pair of parallel rails, on which rails the carriage travels, to which the plate of glass to be operated upon is clamped. The said carriage is capable of being raised and lowered by means of worms and worm-wheels actuated by hand-wheels. Crossing the bed of the machine at its middle and working in bearings carried by the framing is a shaft or axis, the end of which protruding from the side of the framing carries a cutting-mill or circular grinder, by which the edge of the plate of glass is ground. The said shaft carries at or near its middle a fast and loose pulley for throwing the said shaft into or out of gear with the driving-power by means of gearing of the ordinary kind. A to-and-fro motion is given to the table carrying the plate of glass to be operated upon by means of two winding-drums carried by a horizontal shaft at one end of the machine. These winding-drums are provided with ropes or bands, one of the said ropes or bands being connected directly to one end of the traveling table. The other rope or band extends to the other end of the machine, and, passing over a pulley, returns and is connected to the opposite end of the traveling table. These winding-drums rotate loosely upon their shaft, and between them a sliding pulley or friction-clutch works, the said pulley or clutch being connected to the shaft by a sliding key. By means of a bell-crank lever operated automatically from the reciprocating carriage, the sliding pulley or friction-clutch can be made to press against the end of either of the winding-drums, so as to give rotation to it. When one of the drums is driven by the sliding pulley or clutch, the band is wound upon that drum and the carriage is moved in one direction, the other drum, which is now loose upon the shaft, unwinding and paying out its band. When the other drum is driven by the sliding pulley, the carriage is moved in the opposite direction. By the alternate gearing of the two winding-drums with the rotating shaft through the sliding pulley or friction-clutch, the bands are alternately wound upon and unwound from the drums and a reciprocating motion given to the carriage and to the table supporting the glass being operated upon. The periphery of the grinding-mill or rotating cutter has the figure necessary for grinding the required bevel or beading on the edge of the plate of glass. The glass operated upon is lowered as the rotating cutter operates upon it by the action of the worms and worm-wheels hereinbefore referred to. The grinding-mill or rotating cutter is supplied with the usual grinding and polishing material. The four or required number of edges of the plates to be operated upon are preferably ground before any of them are polished.

When it is desired to operate on the surface of the sheet of glass so as to produce moldings thereon, the said sheet of glass is so clamped on the traveling table that the part of the sheet on which the molding is to be made is brought over the grinding-mill or rotating cutter.

I will now proceed to describe with reference to the accompanying drawings the manner in which my invention is to be performed.

Figure 1 represents in plan, (the table being removed,) and Fig. 2 in side elevation, machinery constructed according to my invention for molding and beveling the edges and ornamenting the surfaces of plates of glass. Fig. 3 represents an end elevation, partly in section, of the same, taken at the right-hand end

of Fig. 1. Fig. 4 represents a cross-section of the same, taken on the line A B, Fig. 2; Figs. 5 and 6, enlarged detail views of the mechanism employed for reversing the carriage carrying the glass plate to be operated upon.

The same letters of reference indicate the same parts in the several figures of the drawings.

a is the traversing carriage of the machine, the supporting-wheels *b b* of which carriage work upon the V-shaped rails or guides *c c*, fixed on the bed or uprights *d d* of the machine. Upon the said rails or guides *c c* the carriage *a* and parts supported by it can travel from end to end. Supported upon the said traversing carriage *a* is the wooden table *e*, on which the plate of glass e^2 to be operated upon is fixed or clamped. The table *e* is capable of a vertical adjustment, so as to bring the under side of the plate of glass fixed to it under the operation of the rotating cutter or mill.

The table *e* is connected to and adjusted on the carriage *a* by the following arrangement of parts: On the under side of the table are two pairs of vertical screws, *f* and f^2, which work in screw-boxes made in the bushes of the worm-wheels f^3 f^3, turning on the traveling carriage *a*. The pair of screws at one side of the carriage *a* is operated by the worms f^4 f^4 on the axis *g* gearing with the worm-wheels f^3 f^3, carrying the screw-boxes, and the pair of screws at the other side of the carriage *a* is operated by similar worms, f^5 f^5, on the axis *h* gearing with the worm-wheels f^3 f^3, carrying the screw-boxes. By turning the shafts or axes *g h* in one or other direction by means of their hand-wheels g^2 h^2, the two pairs of screws *f* f^2 can be raised or lowered in their screw-boxes and the height of the table *e* adjusted. As the arrangement of gearing at each side of the carriage is independent of the other, the table *e* can either be placed horizontally or in an inclined position, as required by the work to be performed by the machine.

i is the cross-shaft at the middle of the machine, the end protruding from the side of the framing carrying the rotating cutting-mill or circular grinder *k*, for operating upon the under side of the edge of the plate of glass to be molded or beveled or the surface of the plate of glass to be ornamented. Over the periphery of the cutting-mill or circular grinder *k* the under side of the edge or surface of the plate of glass to be operated upon is carried by the traversing motion of the table *e*. On the shaft *i* are fast and loose pulleys at i^2, for driving it and throwing it out of gear.

The to-and-fro or traversing motion of the carriage *a* and the table *e* supported by it is effected in the following manner: At one end of the machine is a shaft, *l*, on which two winding-drums, *p* and *q*, turn loosely, the said loose drums being prevented from sliding outward on the shaft by the flanges represented. The winding-drums *p q* are provided with ropes or bands p^2 q^2. The band p^2 is connected directly to one end of the carriage *a* at p^3, and the other band, q^2, extends to the other end of the machine, and, passing over a pulley, q^3, returns and is connected at q^4 (see Fig. 2) to the opposite end of the carriage *a*. Between the winding-drums *p q* is a double conical pulley or sliding clutch, *r*, (see Fig. 3,) connected to the rotating shaft *l* by a sliding key. The inner end of each winding-drum is hollow, and has a conical seat of wood for the conical end of the sliding clutch *r* to seat itself upon and by frictional contact to communicate its rotary motion to the drum.

When the sliding frictional clutch *r* is pressed against the end of the drum *p*, the rotatory motion of the said clutch is communicated to the said drum *p*, and when the said clutch is moved in the opposite direction it no longer presses upon the drum *p*, but presses against the end of the other drum, *q*, and communicates by frictional contact rotary motion thereto. When the drum *p* is driven by the clutch *r*, the traversing carriage *a* and its table *e* move from left to right, the band p^2 being wound upon the said drum *p*, the other drum, *q*, being now loose on its shaft, unwinding and paying out the band q^2. When the drum *q* is driven by the clutch *r*, the reverse action takes place, the carriage *a* being moved from right to left by the unwinding of the band p^2 from off the drum *p* and the winding of the band q^2 upon the other drum, *q*. At the end of each traversing motion or stroke of the carriage *a* its motion is automatically reversed in the following manner: *s* is a rod parallel with the sides of the machine and sliding in bearings in the end cross-bars, *t t*. The said rod *s* may also be supported at one or more intermediate points. The said rod *s* carries adjustable tappets s^2 s^3. The horizontal projecting arm of each tappet supports a spring or buffer for reducing the shock of the rocking arm hereinafter described upon it.

On the under side of the carriage *a* is a rocking arm, *u*, the lower end of which can be brought into the path of the tappets s^2 s^3 on the rod *s*, as shown in continuous lines in Fig. 4, or raised out of the path of the said tappets, as indicated in dotted lines in the said Fig. 4. When in the former position, the rocking arm *u* strikes one or other of the tappets s^2 or s^3 on the sliding rod *s* and gives motion in one or other direction to the said rod. The arm *u* is put into its acting position or into its non-acting position by hand by means of the hand-lever *w*, (see Fig. 2,) the cranked inner end of which works in a slot in the said arm *u*. By the motion of the sliding tappet-rod *s* in one or other direction the motion of the traveling carriage and table *a e* is reversed in the following manner:

x x^2 is a bell-crank lever, the forked inner arm, x^2, of which works in a collar at the middle of the sliding frictional clutch *r*. The long arm *x* of the bell-crank lever *x* x^2 is connected to the end of the sliding tappet-rod *s* by means of a pin on the cross-piece *y* of the rod *s* taking into a slot in the end of the said

arm x of the bell-crank lever. (See Fig. 3.) By the traverse of the carriage a in one direction the rocking arm u strikes the tappet s^2, and the rod s is moved in one direction, and by the traverse of the carriage a in the other direction the rocking arm u strikes the other tappet, s^3, and moves the rod s in the same direction as the carriage is moving. By the motion of the tappet-rod s, acting through the bell-crank lever x x^2, the clutch r is frictionally geared to one or other of the winding-drums p or q, and the reversal of the motion of the traversing carriage and table is thereby effected in the manner before described.

Near each end of the tappet-rod s is a safety-tappet. These safety-tappets are marked z z. By the use of these safety-tappets the motion of the traversing carriage a is reversed should the rocking arm u not have been put into its acting position by the attendant. The safety-tappets consist of vertical rods which are struck by the ends of the carriage a as it approaches the end of its stroke in either direction.

The shaft i, carrying the cutting-mill or circular grinder k, is driven by a band passing over the pulley 2 on the end shaft, 3, and over the fast pulley at i^2. The said shaft 3 is driven in any convenient way, and the reversing-shaft l is driven by a band passing over the fast pulley at 4. The driving-band for working the reversing-shaft l is operated by the band-fork and handle at 5, and the driving-band for working the shaft i of the cutting-mill or grinder k is operated by the band-fork and handle at 6.

In order to return or renew the shape of the cutting-mill or circular grinder k without removing it from the machine, the shaft i carries a large pulley, 7, at the side of the said cutting-mill, and the shaft l a pulley, 8. The traversing and reversing mechanisms of the carriage a having been thrown out of gear, a driving-band is passed over the pulleys 8 and 7, and, the shaft l being driven, the cutting-mill is rotated and can be returned.

The plate of glass e^2, the edge of which is to be molded or beveled, is so clamped to the table e that the edge to be operated upon projects beyond the edge of the table and over the acting part of the cutting-mill k, as seen in Figs. 3 and 4, and as the molding or beveling of the edge of the glass proceeds by the action of the mill upon the under side of the edge of the glass the table a, and with it the plate of glass, is lowered by acting upon the hand-wheels g^2 h^2 until the required molding or bevel has been ground or formed upon the said plate of glass. After one edge of the plate of glass has been operated upon the plate is unclamped from the table and another edge brought into position to be operated upon on its under side by the mill or cutter k.

In ornamenting the surfaces of plates of glass by producing thereon moldings by the use of the rotating mill or cutter k and traversing carriage and table described and illustrated, the plate of glass is so clamped on the traveling table that the part of the plate on which the moldings are to be made is brought over the grinding-mill or rotating cutter in the manner described when forming moldings on the edge of the plate of glass. After the edges or other parts of the plate of glass have been ground they are polished in the ordinary way and by the use of the ordinary materials.

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

1. In combination with the reciprocating carriage a, carrying the adjustable table e, the rotating grinding-wheel k, the rod s, provided with adjustable tappets, the reversing mechanism r, actuated by the rods s, and the arms u, secured to the reciprocating carriage and adapted to be moved into or out of the path of the tappets on the rod s, substantially as described.

2. In combination with the rotating grinding-wheel k, the reciprocating carriage a, carrying an adjustable table, e, the winding-drums p q, the bands p^2 q^2, and mechanism, such substantially as described, for automatically throwing said winding-drums alternately into and out of gear with the shaft they are mounted on, for the purpose specified.

3. In combination with the reciprocating carriage a, the table e, supported by adjusting-screws f f^2, provided with gear-wheels f^3 f^3, and the shafts g h, carrying the worms f^4 f^5, all constructed and arranged to adjust the table e in both a vertical and horizontal plane, substantially as shown and described.

OBED CHARLES HAWKES. [L. S.]

Witnesses:
GEORGE SHAW,
RICHARD SKERRETT.