

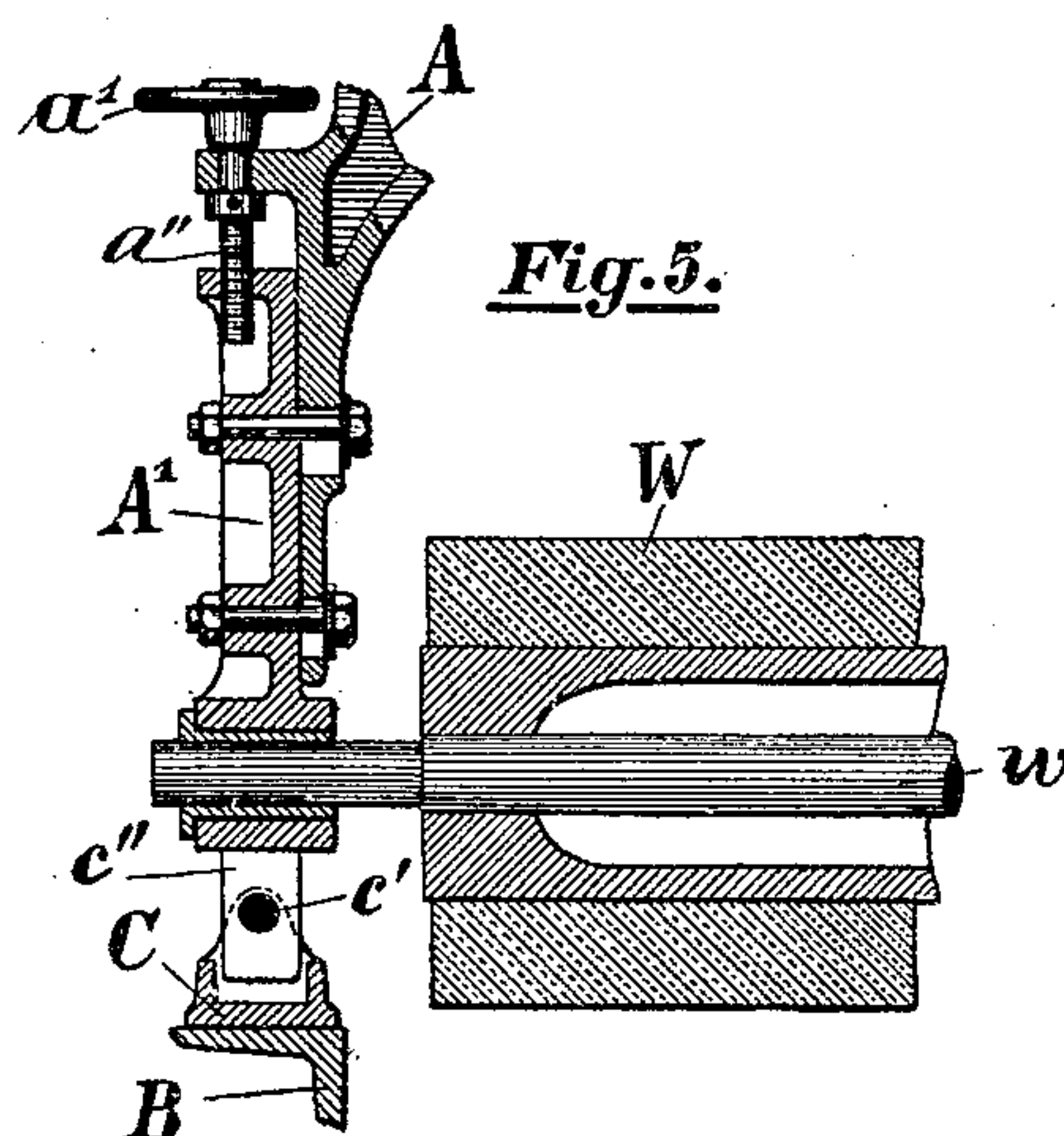
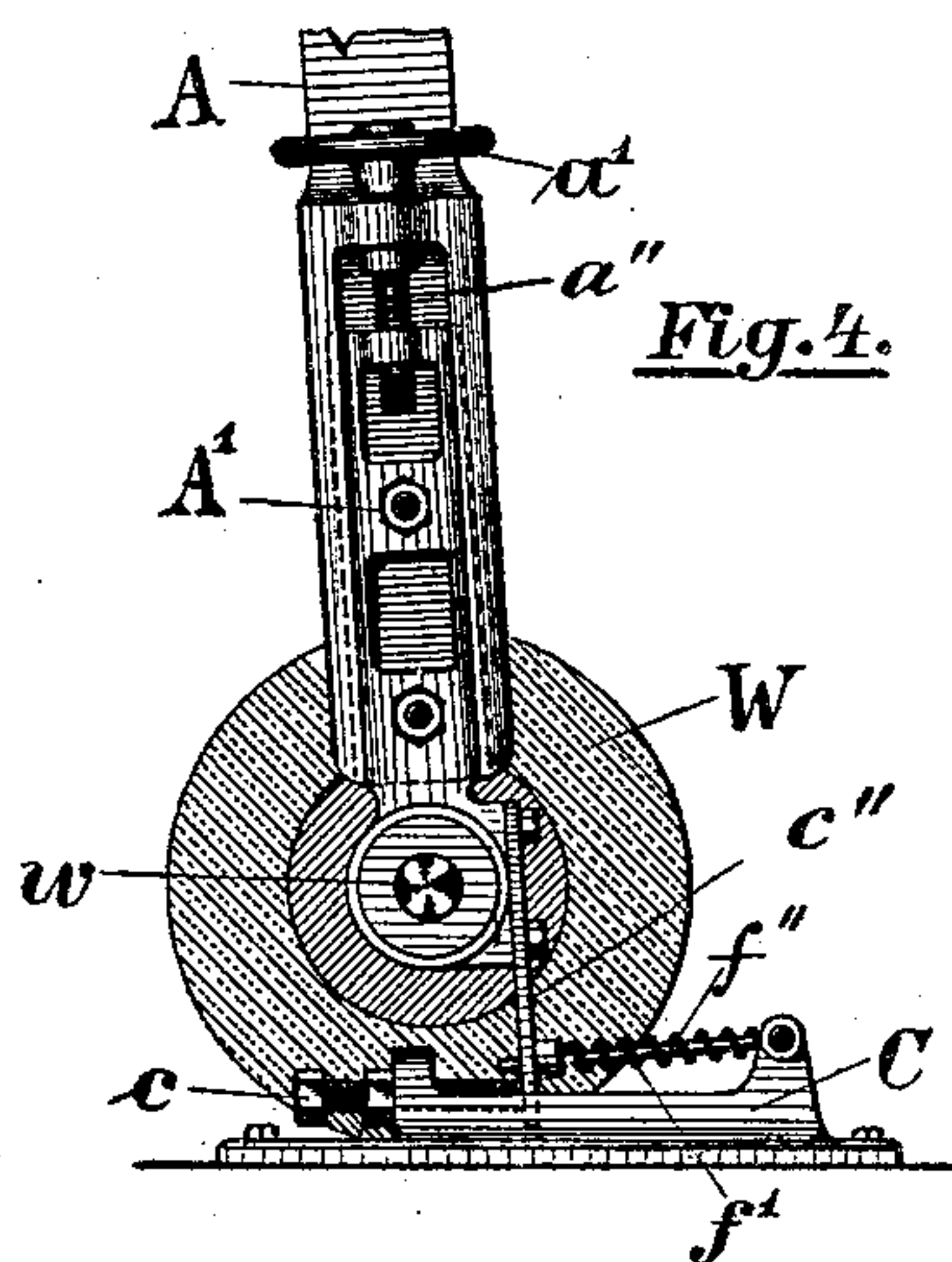
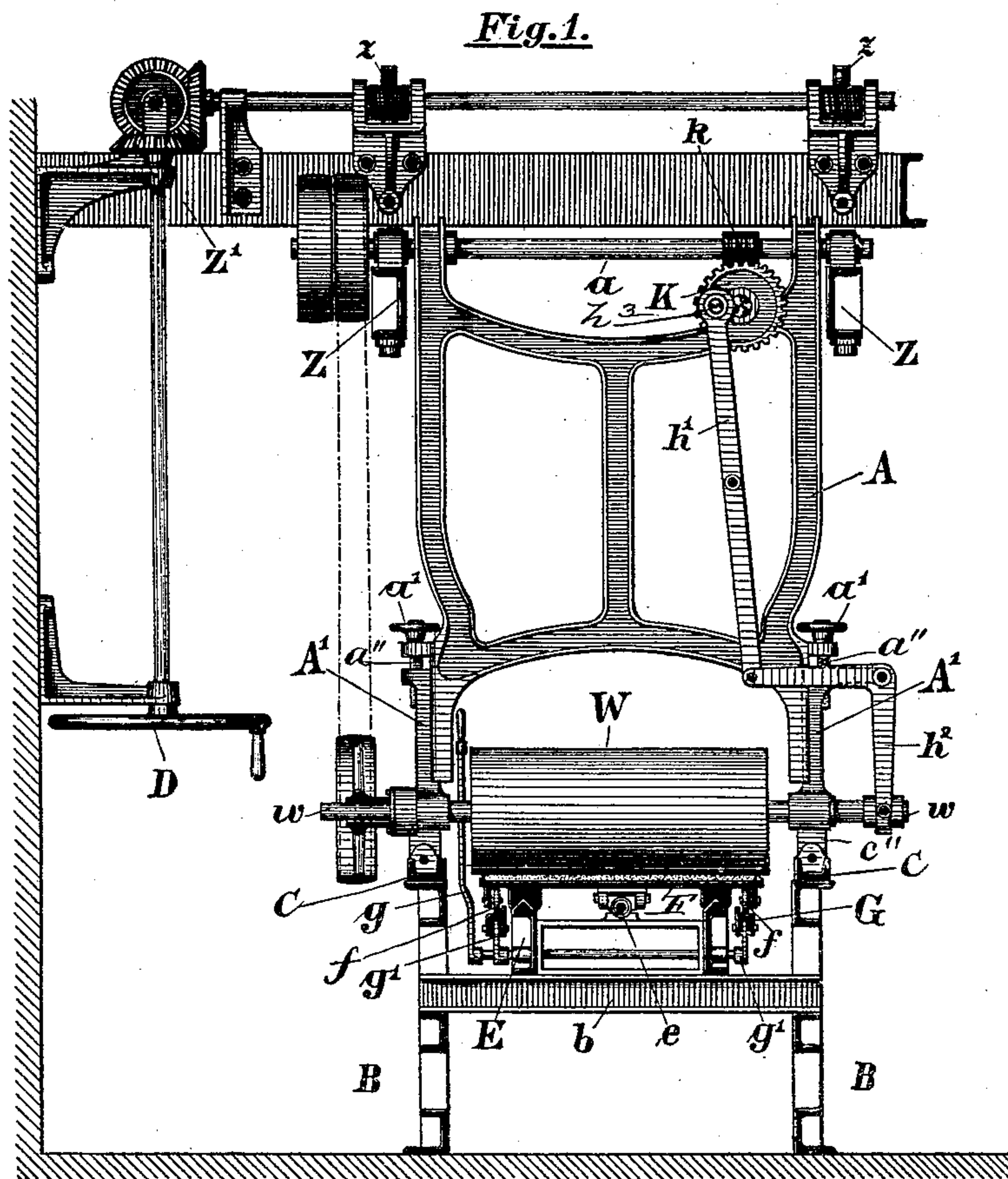
(No Model.)

4 Sheets—Sheet 1.

R. FRIEDEL.  
MACHINERY FOR GRINDING GLASS PLATES.

No. 496,052.

Patented Apr. 25, 1893.



Witnesses.  
A. J. Schwarz  
E. Clark

Inventor  
Robert Friedel  
By Mayberry  
Jas. Atty.

(No Model.)

4 Sheets—Sheet 2.

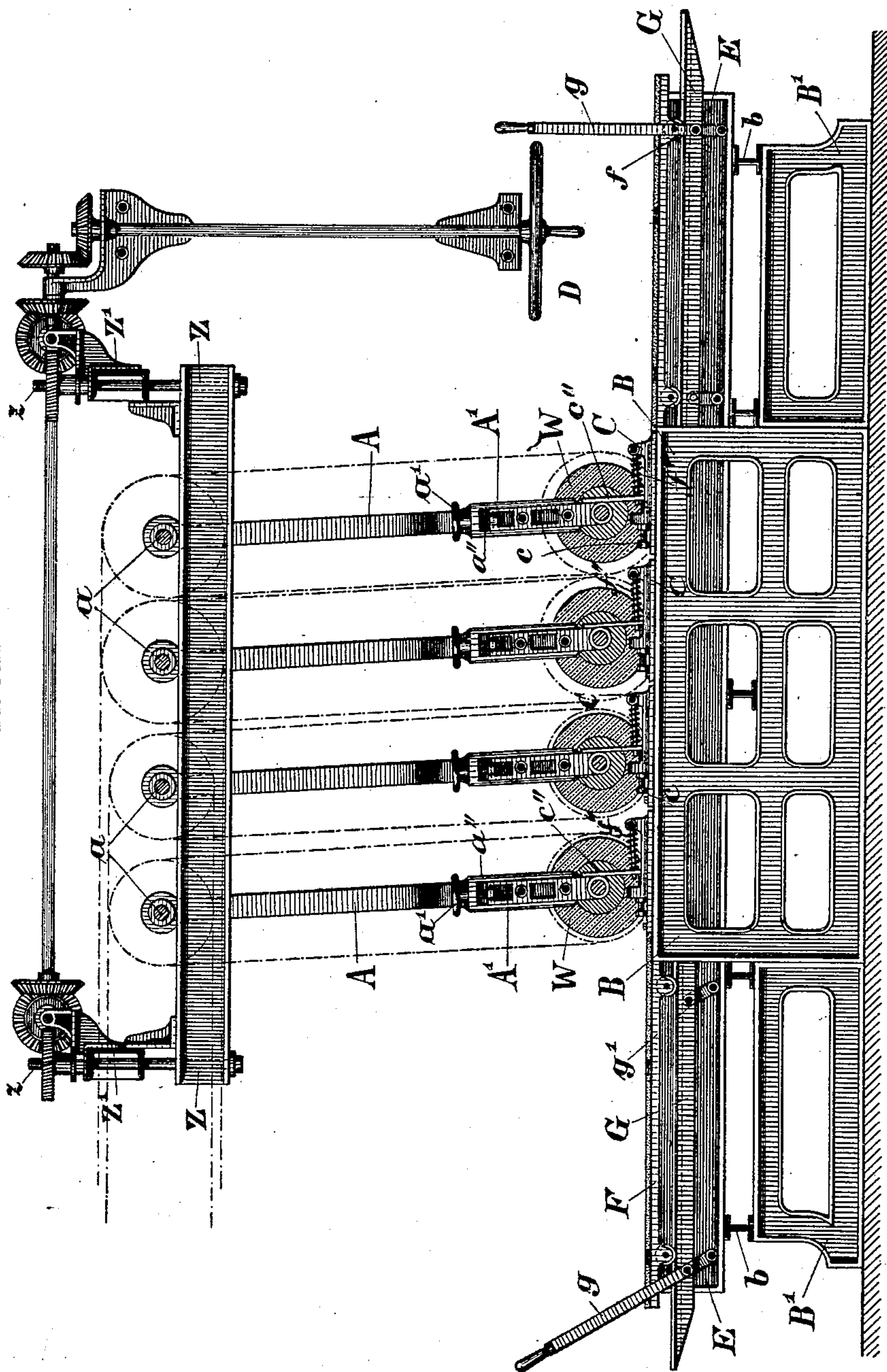
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Fig. 2.



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(No Model.)

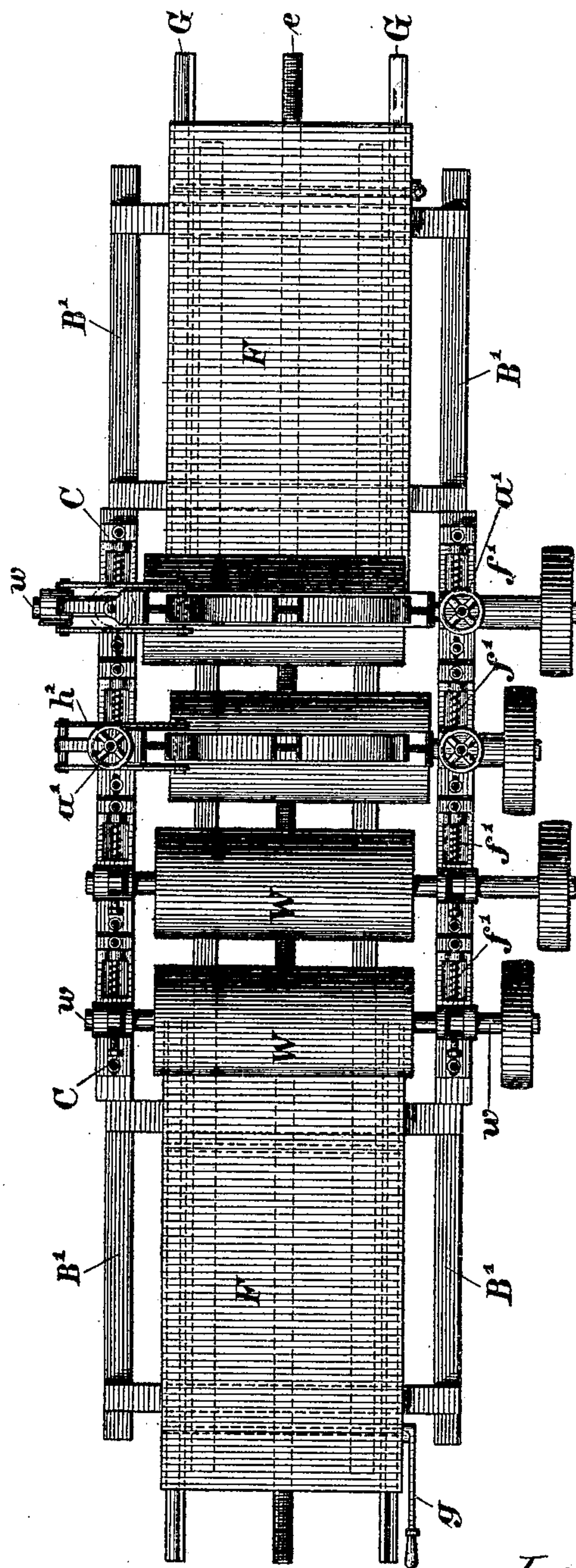
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Fig. 3.



Witnesses  
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(No Model.)

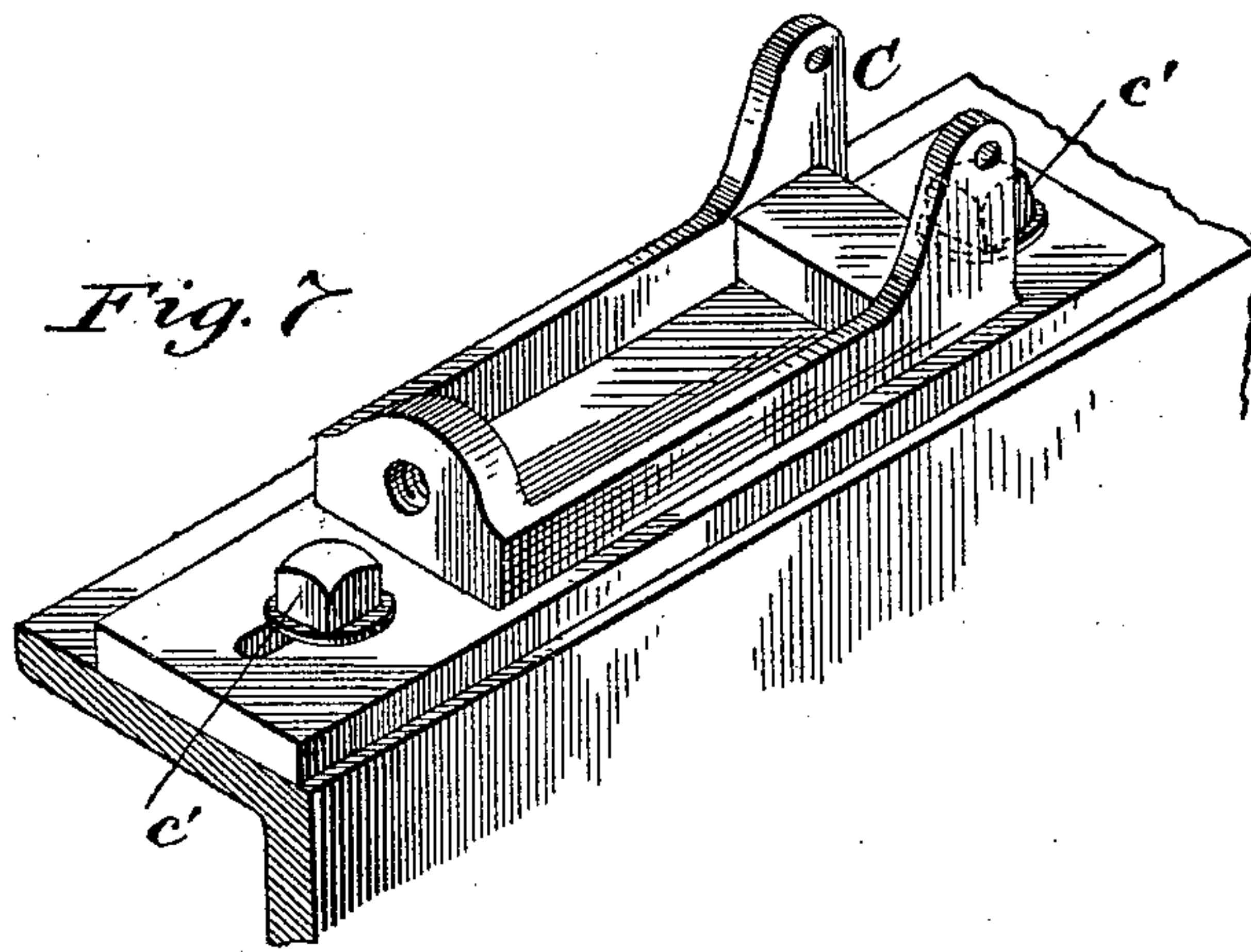
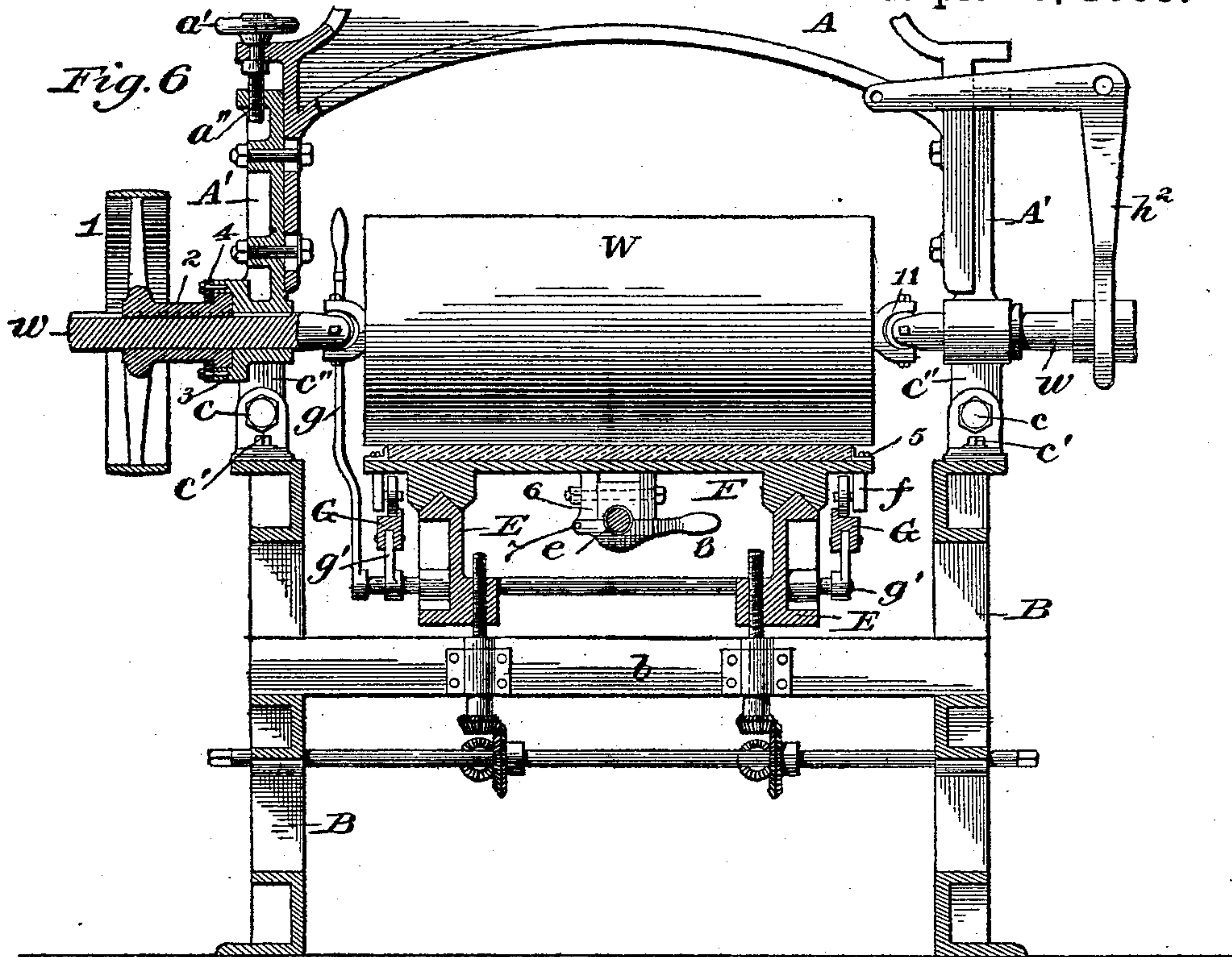
4 Sheets—Sheet 4.

R. FRIEDEL.

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No. 496,052.

Patented Apr. 25, 1893.



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Robert Friedel  
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# UNITED STATES PATENT OFFICE.

ROBERT FRIEDEL, OF STUTTGART, GERMANY.

## MACHINERY FOR GRINDING GLASS PLATES.

SPECIFICATION forming part of Letters Patent No. 496,052, dated April 25, 1893.

Application filed May 18, 1892. Serial No. 433,454. (No model.)

*To all whom it may concern:*

Be it known that I, ROBERT FRIEDEL, a subject of the King of Würtemberg, Germany, residing at Stuttgart, Würtemberg, Germany, have invented certain new and useful Improvements in Machinery for Grinding and Polishing Glass Plates; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to an improvement in apparatus for grinding or polishing glass plates.

The machines heretofore employed for that purpose, of which I have any knowledge, involved either a sliding reciprocation of the abrading device or grindstone, or the employment of a number of rotary disks arranged horizontally, their flat sides forming the abrading surfaces. Machines constructed on either of these principles are necessarily slow in completing the work.

It is the object of my invention to construct a machine which unites great accuracy with an enormous quantity of work, thereby reducing the cost of working to a minimum.

The invention will first be described in connection with the accompanying drawings, and then pointed out in the claims.

In the drawings, Figure 1 is a vertical transverse section. Fig. 2 is a longitudinal view, partly in section. Fig. 3 is a plan view. Fig. 4 is a detail view, in side elevation, on an enlarged scale, of the means for adjusting the abrading rollers on the suspended frame. Fig. 5 is a detail view, in vertical section, of Fig. 4. Fig. 6 is a transverse view of one modification of my invention. Fig. 7 is a detail view of the standard C.

Referring to the drawings, W are abrading-rollers, made of corundum, emery, stone, cast-iron, or other abrading material, and mounted on axles *w*, which are journaled in bearings A' held and guided in swinging frames A, the bearings A' being capable of adjustment up or down in the swinging frames through the medium of adjusting screws *a''*, threaded into the bearings and provided with hand-wheels, at their upper ends.

The swinging frames A are hung from over-

head shafts *a*, which are journaled at each end on bearing-girders Z, suspended from stationary girders *z'* by means of rods *z*, threaded at their upper ends and held by worm-wheels which are interiorly threaded to serve as nuts for the rods *z*. These worm-wheels serve to adjust the bearing-girders Z, and are turned in unison by means of a suitable train of gearing, as shown, actuated by a hand-wheel D located conveniently to the operator. It will be apparent that by this arrangement all the abrading-rollers W may be simultaneously adjusted for glass-plates of various thicknesses, thus obviating the necessity of adjusting each roller separately for this purpose.

Each abrading-roller *w* is shifted longitudinally by the following means: A worm *k*, fixed on shaft *a*, meshes with a worm-wheel K, which drives a pitman *h'* connected to the worm-wheel by a wrist-pin *h<sup>3</sup>*, as shown, the other end of the pitman being pivoted to one end of a bell-crank *h<sup>2</sup>*, which thereby imparts a slow reciprocating motion to the axle *w* of its respective roller W. To permit this longitudinal movement of the shaft, without at the same time moving pulley *l* laterally, the latter is provided with a flanged hub 2, revoluble in an extension 3 of the boxing, and is held by bolts, as clearly shown in Fig. 6.

The glass-plate is placed upon a bed or carriage F, provided with a thin intermediate layer of rubber or other suitable material, and is retained on the same by angle-jaws 5 bearing against its edges. This carriage, which slides on V-rails E, is adapted to be moved forward by a central screw *e*, which engages with a sectional nut 6 secured to the under side of the carriage, the lower half of the nut being pivoted to the upper half at 7 and provided with a handle 8, as will be understood from Fig. 6. The carriage F may be raised from or lowered onto its ways or rails E by means of two lifting-rails G, one on each side, so mounted on four cranks *g'* attached to cross-rods that they are simultaneously lifted or lowered by turning levers *g* attached to the cross-rods, the lifting-rails being adapted to engage, and form a track for, friction-rollers *f*, journaled on the under side of the carriage—F, raising the latter into such a posi-



tion as to permit it to be conveyed off with the glass-plate by means of a truck or otherwise, it being first necessary to disengage the carriage from the screw *e* by dropping the lower half of the sectional nut by means of a handle 8. By this construction the continuous operation of the machine is permitted as other carriages bearing new plates to be ground may be brought under the abrading-rollers as fast as finished work is removed.

The pressure of the rollers *W* is effected in two ways, viz: by the weight of the rollers, and by the springs *f'* acting on said rollers, the tension of which springs, and hence also the pressure of the rollers, may be regulated at pleasure. To adjust the pressure due to the weight of the roller I employ the set-screws *c* arranged in the standard *C*. By means of these set-screws the horizontal distance of the centers of the abrading-rollers from a vertical line dropped from the centers of the suspending shafts *a* may be varied. The standards *C* are, moreover, horizontally adjustable longitudinally on frame *B*, by slots and screw-bolts *c'*, as will be clear from Fig. 7. Pins or studs *f''*, are pivoted to the standards *C* for the purpose of regulating the yielding pressure of the rollers *W*, the studs *f''* having their free ends adapted to pass through and slide in slots in the tongues *c''* depending from the suspended frame *A*. Upon each of these studs *f''* is arranged a spring *f'*, the tension of which is adjustable by means of a collar 9 adapted to be secured to the stud at any desired point by a set-screw 10. Every abrading-roller therefore exerts a constant adjustable pressure and a varying or yielding adjustable pressure, both of which are increased with any increase in the deflection of the suspended frame *A* from a vertical line. The abrading-rollers are actuated by belts running from the journaled shafting. The rails *E* are supported upon the beams or girders *b* resting upon the frame *B*.

The means for revolving the central screw *e* is not indicated in the drawings; it is, however, arranged so that the advance of the carriage *F* may be regulated at pleasure.

In the machine represented in the drawings, four rollers are shown, one behind the other, and these may be of the same or of different degrees of abrading quality—that is, for instance, the first two rollers may be adapted to make a rough cut and the other two adapted to polish the work, or the abrading qualities may be otherwise graded, as desired.

Instead of using the overhead synchronous adjusting mechanism for the rollers *W*, the ways *E* may be made vertically adjustable by elevating-screws provided with suitable operating mechanism, as will be fully understood from Fig. 6.

The pivotally suspended rollers *W* may be employed, also, for grinding straight bevels by raising one end of each roller-shaft *w*, higher than the other end by means of its vertical independent adjusting screw *a''*, it

being necessary in a machine adapted for this class of work that the shaft *w* be provided with universal joints 11 to permit an inclination of the axis of the roller while the axis of the pulley 1 is horizontal, such an arrangement being shown in Fig. 6.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a plate-glass grinding apparatus, the combination, with a swinging frame, a shaft journaled in the frame, and an abrading cylinder fixed on the shaft, of a bell-crank pivoted on the frame and attached to the shaft, and means for oscillating the bell-crank, substantially as set forth.

2. In a plate-glass grinding apparatus, the combination, with a swinging frame, a shaft journaled therein, an abrading cylinder fixed on the shaft, and a bell-crank pivoted to the frame and engaging one end of the shaft, of a wheel journaled in the frame, and a pitman-rod connecting the wheel to the bell-crank, whereby the latter is oscillated, substantially as set forth.

3. In a plate-glass grinding apparatus, the combination, with an overhead power-shaft, a frame swinging from said shaft, a roller-shaft journaled in said frame, an abrading-roller fixed on the roller-shaft, and a bell-crank pivoted to the frame and adapted to engage one end of the roller-shaft, of a worm on a power-shaft, a worm-wheel provided with a wrist-pin engaging the worm, and a pitman-rod attached to the wrist-pin and to the bell-crank, whereby the latter is oscillated, substantially as set forth.

4. In a plate-glass grinding apparatus, the combination, with a vertically-adjustable bearing-girder, an overhead power-shaft journaled therein, and a frame swinging from said power-shaft, of a roller-shaft journaled in said frame and deriving motion from the power-shaft, and an abrading-roller mounted on the roller-shaft, substantially as set forth.

5. In a glass-grinding machine, a swinging frame, a revoluble abrading roller mounted therein, a glass-supporting apparatus, and means for adjusting the swinging frame at an angle to the vertical, substantially as set forth.

6. In glass-grinding machines, the combination with a glass-supporting bed of an abrading roller mounted in a pivotally suspended frame, and a spring as *f'*, for yieldingly bearing against the pivotally suspended frame, substantially as set forth.

7. In glass-grinding machines, the combination of a pivotally suspended frame, and an abrading roller mounted in the same with an adjusting screw, as *c*, bearing against the pivotally suspended frame, substantially as set forth.

8. In a plate-glass grinding apparatus, the combination, with a glass supporting bed, a swinging frame, and a revoluble abrading cylinder journaled in the frame, of an adjust-



able standard, and a spring between the standard and the swinging-frame, substantially as set forth.

5 9. In a plate-glass grinding apparatus, the combination, with a glass-supporting carriage, and way on which said carriage is adapted to move, of rollers secured to each side of the carriage, and a pair of lifting-rails adapted to engage the rollers and lift the carriage from  
10 the ways, substantially as described and for the purpose set forth.

15 10. In a plate-glass grinding apparatus, the combination, with an abrading roller, a pair of V-shaped ways, a revoluble screw, and a glass supporting carriage adapted to be moved on the ways by means of the screw and provided on each side with a series of friction-rolls, of a pair of lifting-rails hung on rock-shafts, and means for rotating the rock-shafts,  
20 whereby the carriage may be lifted from the ways.

11. In a plate-glass grinding apparatus, the combination, with a series of vertically-adjustable swinging frames, of an abrading roller for each frame and means for vertically-ad- 25 justing each roller in its respective frame, substantially as set forth.

12. In a plate-glass grinding apparatus, the combination, with a series of vertically-adjustable swinging frames, and means for syn- 30 chronously adjusting said frames, of a series of abrading rollers, one for each frame, and means for vertically adjusting each roller in its respective frame, substantially as described and for the purpose set forth. 35

In testimony whereof I affix my signature in presence of two witnesses.

ROBERT FRIEDEL.

Witnesses:

AUGUST B. DRAUTZ,  
CARL DUSSMANN.