(No Model.) 5 Sheets—Sheet 1.

A. JOHNSTON.

GRINDING AND POLISHING MACHINE.

No. 557,825. Patented Apr. 7, 1896.

Fig. I.

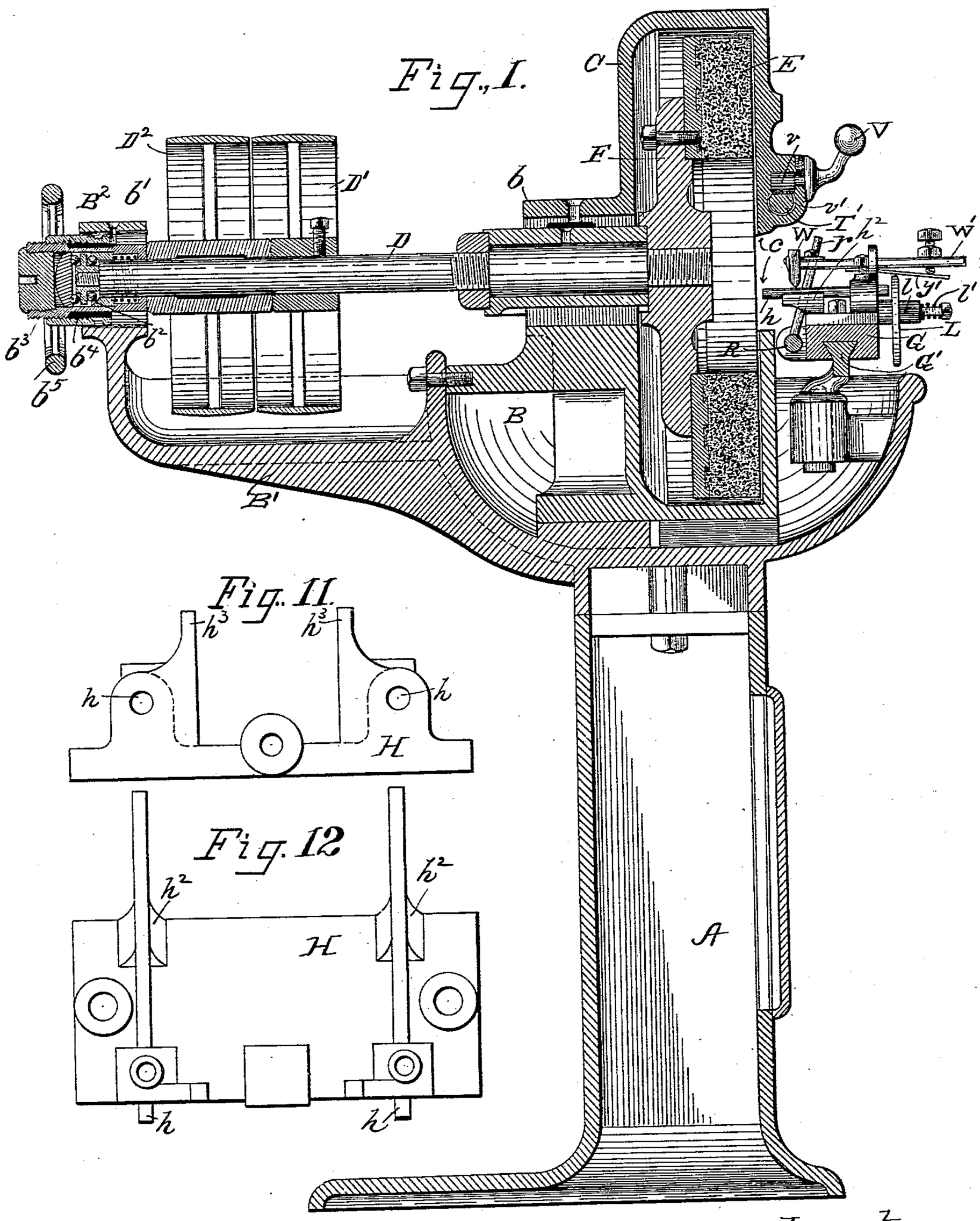

Fig. II.

Fig. 12

Witnesses
W. Rios Edelen.
Geo. Lewis

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by Pollock & Mauro,
his attorneys.

(No Model.) 5 Sheets—Sheet 2.

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Fig. 2.

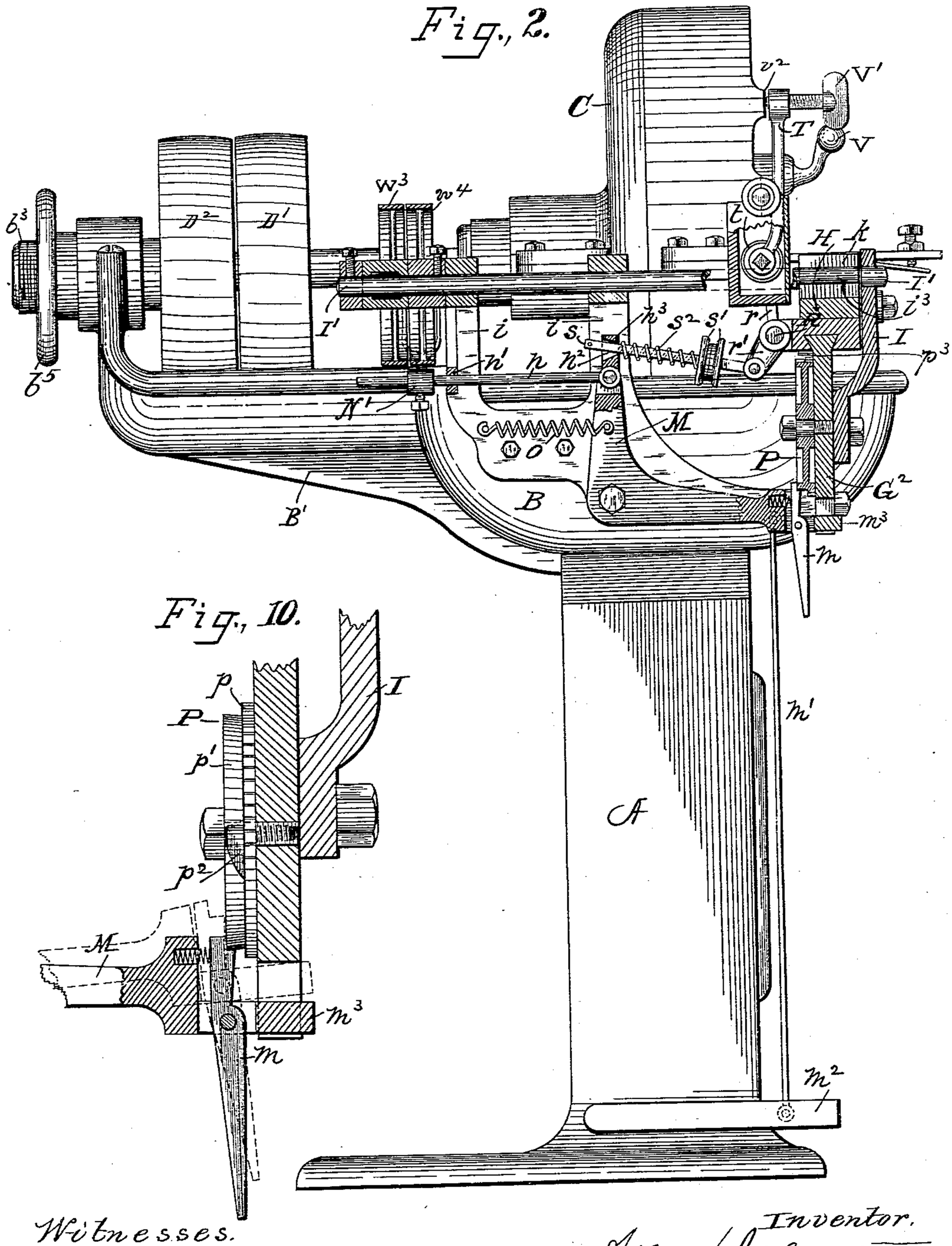

Fig. 10.

Witnesses.
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(No Model.) 5 Sheets—Sheet 3.

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GRINDING AND POLISHING MACHINE.

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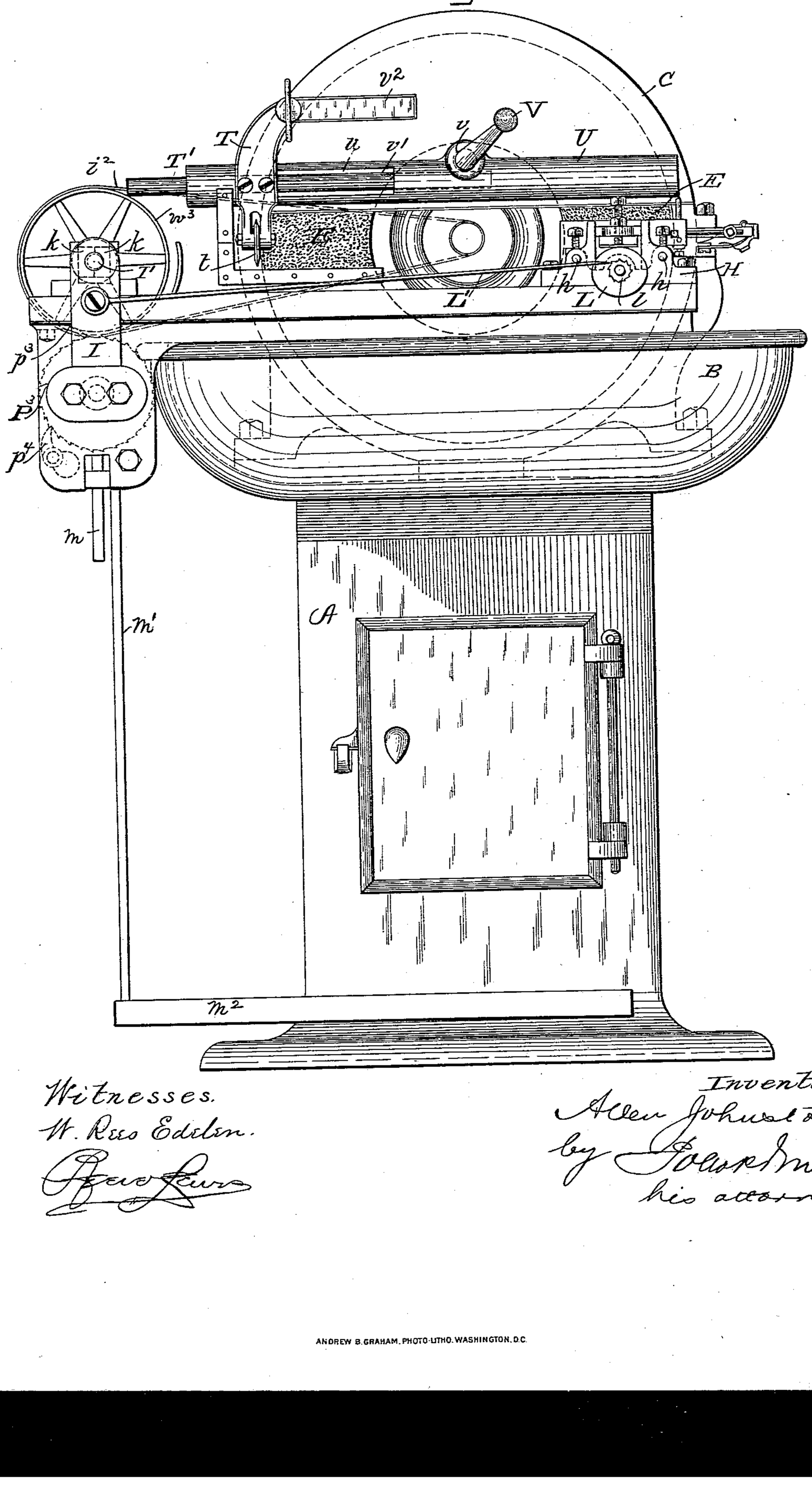
Fig. 3.



Witnesses.
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(No Model.) 5 Sheets—Sheet 4.

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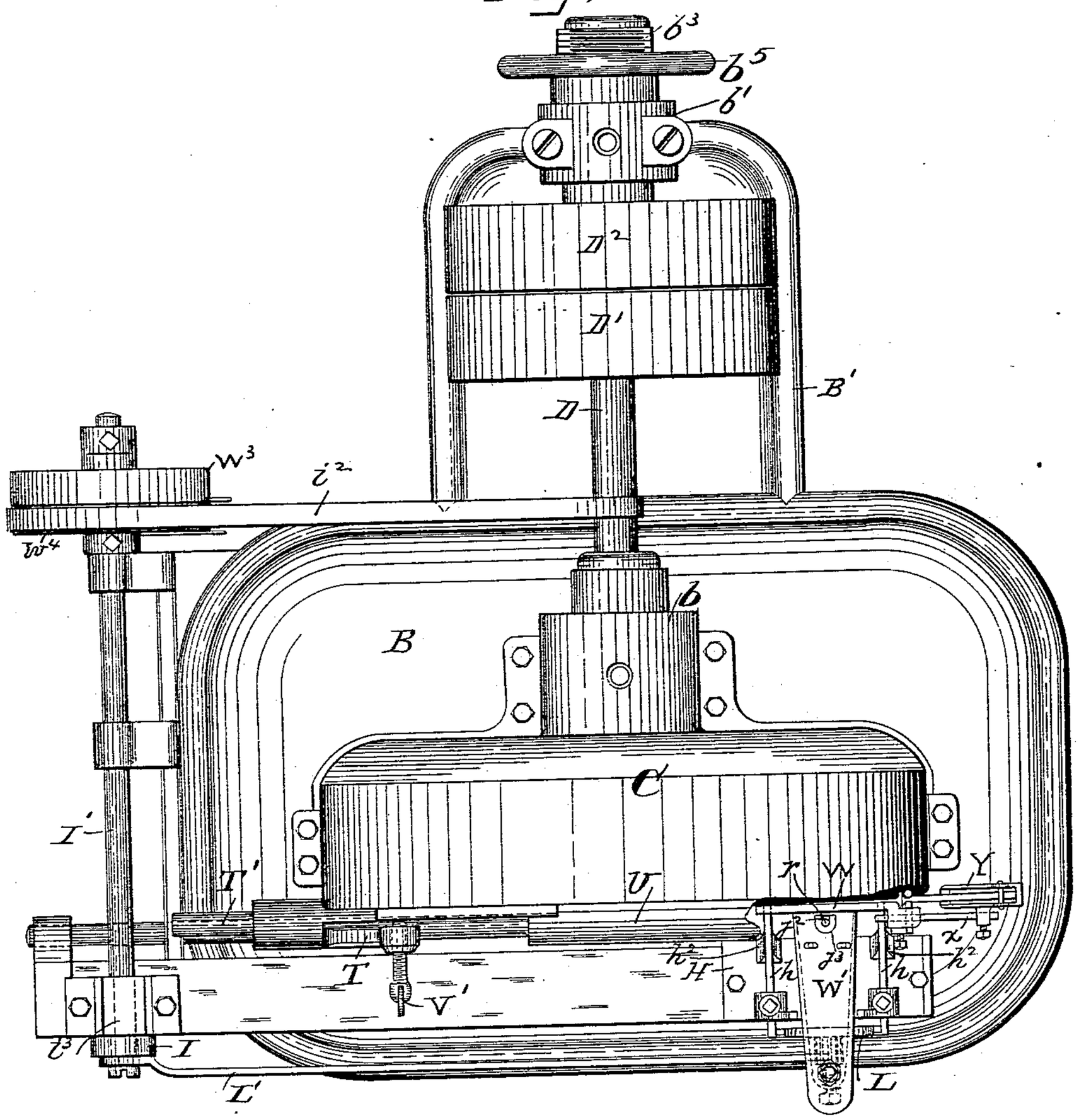
GRINDING AND POLISHING MACHINE.

No. 557,825. Patented Apr. 7, 1896.

Fig. 4.



Witnesses.
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(No Model.) 5 Sheets—Sheet 5.

A. JOHNSTON.

GRINDING AND POLISHING MACHINE.

No. 557,825. Patented Apr. 7, 1896.

Fig. 7.

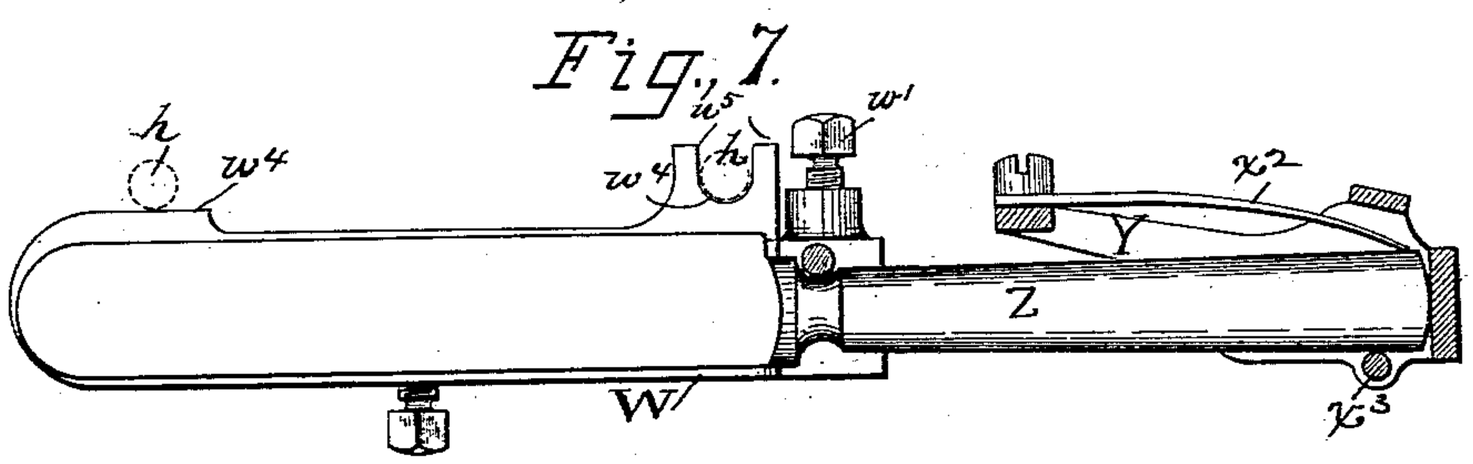

Fig. 6.

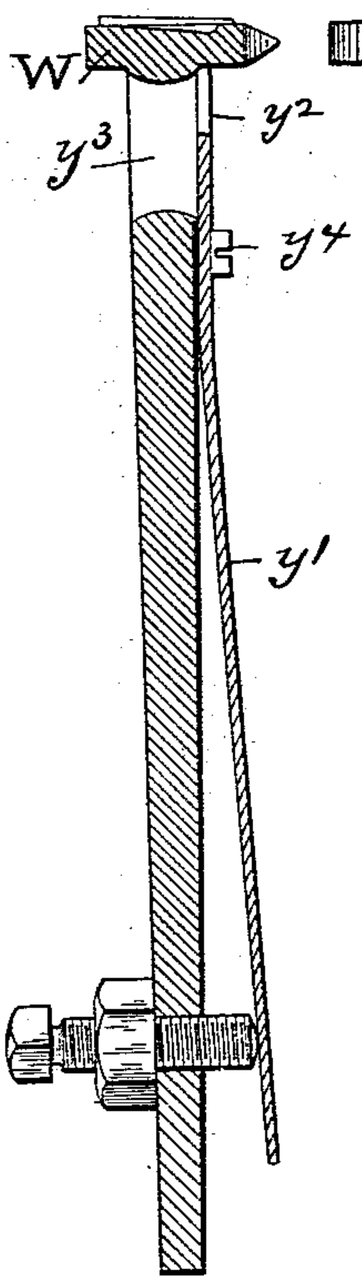

Fig. 5.

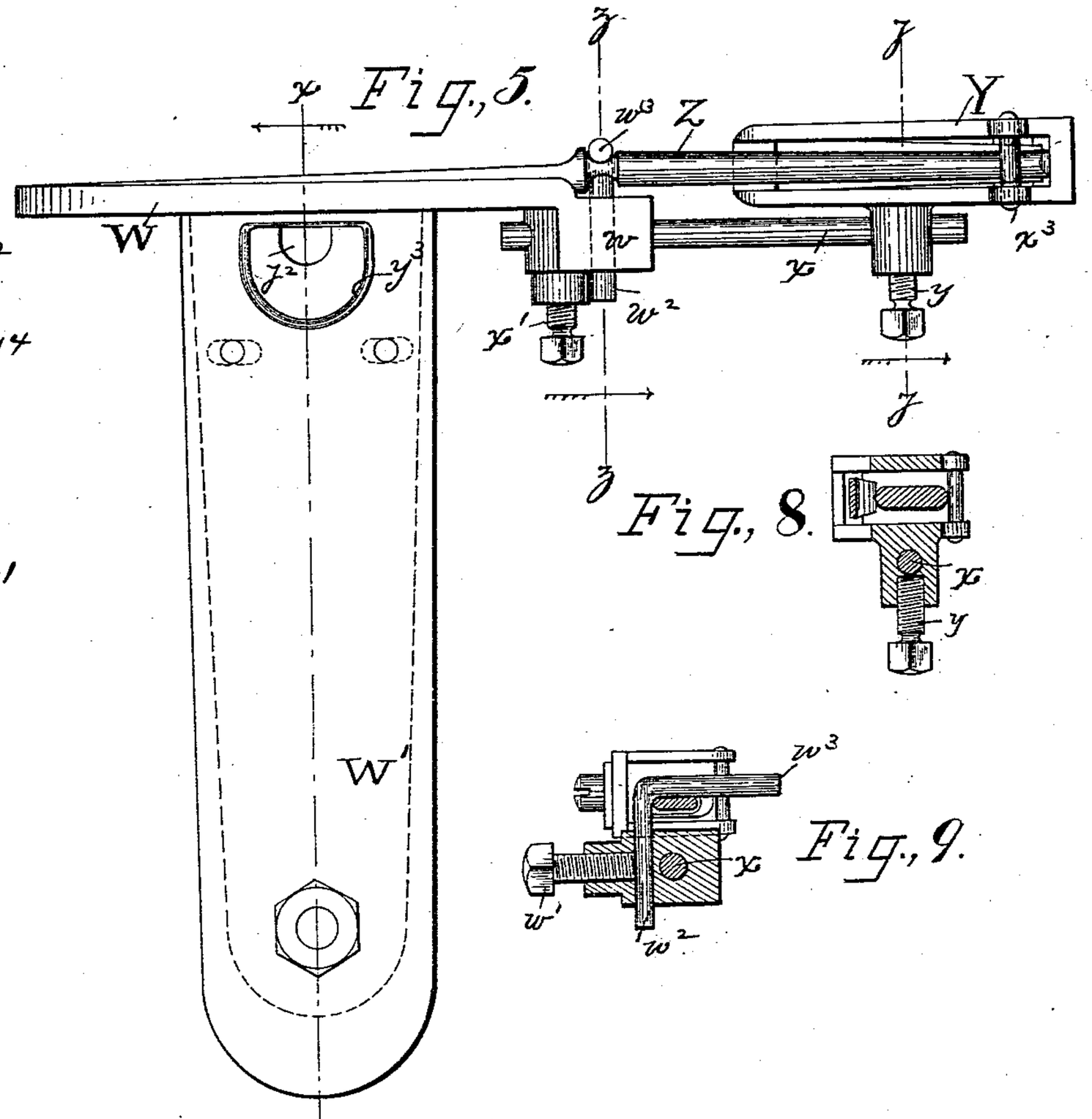

Fig. 8.

Fig. 9.

Witnesses.
W. Rees Edelen.
Geo. Lewis

Inventor.
Allen Johnston
by Pollock & Mauro.
his attorneys.

UNITED STATES PATENT OFFICE.

ALLEN JOHNSTON, OF OTTUMWA, IOWA.

GRINDING AND POLISHING MACHINE.

SPECIFICATION forming part of Letters Patent No. 557,825, dated April 7, 1896.

Application filed December 21, 1895. Serial No. 572,918. (No model.)

To all whom it may concern.

Be it known that I, ALLEN JOHNSTON, of Ottumwa, Iowa, have invented new and useful Improvements in Grinding and Polishing Machines, which are fully set forth in the following specification.

This invention relates to grinding and polishing machines, and particularly to such as are employed to operate upon knife-blades.

In the manufacture of table-knives (of a high grade) the forging or blank, which is more or less irregular, requiring more metal to be removed from one part of the blade than another, is first ground in a machine—such, for example, as those described in my Patents Nos. 377,201 and 377,202, dated January 31, 1888—designed to impart to it the proper shape. After this first grinding it is necessary, for best results, to give the blade a finishing cut or second grinding to remove the deep marking resulting from the coarser cutting done in the preliminary shaping of the blade, and also to remove irregularities that may result from or remain after the first grinding.

The object of the present invention is to drovide a machine for effecting this finishing cut or secondary grinding in the most perfect and accurate manner possible, in which connection I have found that the best results are attainable by grinding the knife on a wheel (either of a cup-shaped variety having the grinding-surface at the side of the wheel or the ordinary grinding-wheel having a peripheral grinding-surface) of a width of grinding-face about equal to the length of the knife-blade. In order to prevent grooving of the grinding-wheel and corresponding effects upon the blade due to revolving the wheel against the blade without change of position, and also in order to present every portion of the convex surface of the blade to the grinding-surface, the knife is given a small longitudinal reciprocation and a lateral oscillation. The means for imparting these movements constitute important features of my invention. Another valuable feature thereof is the mounting of the knife-holder in such manner that, while it holds the blade against the grinding-wheel with a yielding pressure and the movements above indicated can be imparted thereto, it is also free to follow the movements of the knife as the blade of the latter alines itself with the surface of the grinding-wheel, the position assumed by the knife under such circumstances being variable, owing to the tapering form of the blade.

The degree of finish given to the blade by a machine embodying the present invention is dependent upon the use of a finer or coarser grinding-wheel, and it is also obvious that such a machine could perform both the first and second grindings referred to above if the forgings or blanks were made accurately to the shape required. It has, however, been found more advantageous to effect accurate shaping by grinding than by forging.

Other features of the invention—such, for example, as means for automatically arresting the grinding after it has continued for a predetermined period of time—will be understood by reference to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a vertical section of a machine embodying my invention. Fig. 2 is a side elevation thereof, partly in section. Fig. 3 is a front elevation showing some of the parts in dotted lines. Fig. 4 is a plan view. Fig. 5 is a plan view of the knife-holder. Fig. 6 is a section on line $x\ x$, Fig. 5. Fig. 7 is an elevation of the knife-holder from the side adjacent to the grinding-wheel. Fig. 8 is a section on line $y\ y$, Fig. 5. Fig. 9 is a section of the knife-holder on line $z\ z$ of Fig. 5. Fig. 10 is a detail of a portion of the trip mechanism for throwing the knife-holding mechanism into and out of operation, and Figs. 11 and 12 are details of the block which is mounted on the slide or carriage.

In the drawings, A represents the base or pedestal upon which the cup-shaped main frame B of the machine is mounted.

C is a housing secured in the main frame and in which revolves the grinding-wheel E of the cup-shaped variety, which is exposed through a horizontal opening c in the front of the housing. (See Figs. 1 and 3.) Said wheel is secured to a face-plate F, carried at one end of shaft D, which has a bearing b in the housing and a bearing b' in a bracket B′ on frame B. The bearing b' is provided with balls b^2 to support the end of the shaft and to receive the end-thrust thereof and with screw-threaded sleeves b^3 b^4 and a hand-wheel b^5 for manipu-

lating the latter to adjust the shaft longitudinally to take up wear, &c., as will be fully understood from Fig. 1. Shaft D carries a fast pulley D′ and a loose pulley D^2, by means of the former of which motion is communicated to the shaft. As the disposition above described is the ordinary way of mounting such machinery, it is deemed unnecessary to describe it with particularity.

G is a slide located at the front of the grinding-wheel and is dovetailed on a rail G′, supported by brackets *g g* of the interior of main frame B. At one end the rail G′ projects beyond the framework and has a depending plate G^2, upon which parts of the mechanism are mounted, as will be hereinafter explained. Upon the opposite end of the slide is mounted a supplemental support or block H for the knife-holder, and upon which are adjustably secured two rods *h h*, disposed at right angles to the face of the grinding-wheel, resting in ways h^2 h^2 and forming a support for one end of the knife-holder.

h′ h′ are vertical projections on the support H, between which the knife-holder freely slides, but which limit to some extent the displacement of the holder during the operation of inserting or turning the knife in the holder.

The holder in which the knife is held as one face of the blade is presented to the grinding-surface comprises principally a plate W, against which the blade of the knife lies, and a tailpiece W′, connected at right angles to said plate at about its middle, and through which lateral oscillatory movements are received. One end of the plate W is rounded to fit the bolster of the knife Z and also has a block or enlargement *w* thereon, in which is adjustably secured (by a set-bolt *w′*) a cylindrical angular bar w^2, having a vertical portion w^3, which loosely fits the groove of the bolster of the knife. Another bar or rod *x*, extending longitudinally with plate W, is adjustably secured in block *w* by a set-screw *x′*. To the free end of bar *x* is slidingly secured by a set-bolt *y* a cage or skeleton cap Y, which embraces and holds the handle of the knife Z through the medium of a cross-pin x^3, bridging the top of the handle, and a spring-plate x^2, pressing the handle upwardly against said bar, but allowing lateral play.

The tailpiece W′ has an opening y^3 therethrough, adjacent to the plate W, and a flat spring-plate *y′* (having a smaller opening y^2 therethrough, coinciding with opening y^3) secured at one end to its under side by screws y^4. An adjustable screw-threaded bolt in the tailpiece W acts to hold the free end of spring-plate *y′* at the proper distance from said tailpiece for purposes hereinafter explained.

When the holder is in position, the under edge of the plate W rests upon the rods *h h* at the points w^4, one of said rods being embraced by lugs w^5 w^5 on the plate, so that the holder will be moved with the slide in its reciprocation and also be free to slide along rods *h h*. The points w^4 w^4 act as a fulcrum for the holder when it is tilted by the cam-wheel, hereinafter referred to, engaging under the tailpiece W′ to impart a lateral oscillatory movement to the blade.

I will next describe the mechanism for effecting and controlling the movements of the knife-holder.

On the front face of depending plate G^2 of rail G′ is secured a bracket I, supporting at its upper extremity one end of a shaft I′, said shaft extending parallel with shaft D and being supported by arms *i i* on the frame W and carrying at its other end a loose and a fast pulley W^3 and W^4, respectively, through the latter of which it is driven from shaft D by a belt i^2. Adjacent to the bracket I shaft I′ is formed with eccentric portion i^3, which is inclosed between two recessed blocks *k k*, sliding between plates *k′ k′*, projecting upwardly from slide G, and whereby a small reciprocatory movement is imparted thereto, and consequently to the knife.

A cam-wheel L, carrying a ratchet-wheel *l*, pressed by a spring *l′*, is mounted on the supplemental support H and supports the tailpiece W′ of the knife-holder by engagement with spring-plate *y′*, the adjustment of which determines the vertical position of the blade, which should be such that the entire surface of the face thereof will be brought into contact with the grinding-surface by the lateral oscillation. Cam-wheel L is turned the distance of one or more teeth at each reciprocation of the slide G by means of a pawl L′, rigidly secured to the bracket I. Spring *l′* holds the cam in the position to which it is rotated.

The mechanism for holding the knife-blade against the grinding-surface with a yielding pressure while imparting thereto the movements above described, and for automatically throwing the knife away from the grinding-wheel and arresting the movements of the parts, is described as follows: A bell-crank lever M is pivoted to the left-hand end of the frame B, its horizontal arm carrying at its extremity a spring-actuated latch *m*, and being connected by a rod *m′* with treadle m^2. To the vertical arm is pivoted a horizontally-arranged rod *n* which slides in a lug *n′* and carries at its free end a belt-shifter N of the ordinary construction, adjustably secured thereto and embracing belt i^2. On the rod *n*, adjacent to its pivot-point, is an upwardly-projecting lug n^3, having a flared opening n^2 therethrough. A spring *o*, connected at one end to the frame and at its other end to the vertical arm of the bell-crank lever M, exerts its tension to tilt said lever, such movement being limited by a projection m^3 on the horizontal arm thereof. On the rear face of plate G^2 is mounted a wheel P, having peripheral ratchet-teeth *p*, engaged by a pawl p^3 on slide G to turn said wheel, which is held to the position to which it is rotated by dog p^4 on plate G^2, and a plain peripheral surface *p′*, upon which is located an inclined lug p^2. Extending along the rear of the slide G, parallel there-

to and in bearings thereon, is a rock-shaft R, carrying a finger r, which latter projects upwardly through the openings y^3 y^2 in the tail-piece W′ and plate y', respectively, and acts to move the knife-holder toward and away from the grinding-wheel. Shaft R also carries an arm r', to which is loosely pivoted a rod s, resting at its free end in the flared opening n^2 of lug n'. Encircling this rod between the lug n' and nuts s' s', screw-threaded thereon, is a spring s^2, which, through the mechanism above described, supplies the yielding pressure for holding the knife-blade in contact with the grinding-wheel.

A dresser is provided, operating upon the face of the grinding-wheel through the opening c to keep the same true. This device consists of a steel disk t, disposed at right angles to the face of the grinding-surface, and mounted to rotate on a carrier T, which latter is secured to a shaft T′, arranged to slide in a cylindrical casing U on the housing C just above opening c therein. Casing U is cut away at u to expose the shaft T′, allowing the carrier to be secured thereto, as before explained, and also permitting lateral movement thereof across the grinding-surface. This movement is effected by a crank V, carrying a pinion v, engaging a rack v' on the shaft T′. To provide for adjustment of the disk t to compensate for wear, a thumb-screw V′ is arranged on carrier T and bears at its end against a plate v^2 on housing C.

The operation of the machine is as follows: The knife Z having been properly secured or placed in its holder, as hereinbefore explained, and the various parts properly adjusted, the operator presses upon treadle m^2, drawing bell-crank lever M down to the position shown in Fig. 2 and engaging the latch m thereof under the plain peripheral surface p′ of wheel P. This movement actuates the belt-shifter N to throw the shaft I′ into motion, which in turn, through its eccentric portion i^3, communicates a reciprocatory movement to slide G, as already explained. The same movement of lever M also compresses spring s^2 on rod s, rocking shaft R through arm r', and by means of the finger r throws the knife-holder forward, bringing one face of the knife-blade into contact with the grinding-wheel and exerting yielding pressure thereon. The tail-piece W of the knife-holder being freely mounted between the projections h' h', the holder is, through the pressure exerted thereupon by the finger, practically self-adjustable, allowing the blade to aline itself against the grinding-surface. The reciprocation of the slide G causes the rotation of the cam-wheel L, and consequently the lateral oscillation of the knife-blade, thereby presenting every part of its convex surface to the wheel. The movement of slide G also rotates the wheel P step by step until it has made one complete rotation, and the inclined lug p^2 disengages latch m therefrom, allowing spring o to tilt the bell-crank lever M over to the left from the position it occupies in Fig. 2, thus withdrawing the knife from contact with the grinding-wheel and restoring all of the parts to a quiescent state, ready to be again put into operation by manipulating the treadle after the knife has been replaced by another to be ground. A separate holder is required to grind each side of the knife, owing to the fact that the edge has little or no taper from the handle to the point, whereas the back of the knife has quite an amount of taper, requiring the face of the holder to be shaped differently for the two sides of the knife; also the handle is not in the middle of the blade, and requires a different location of bar w^2.

The grinding-wheel employed is preferably of emery, and grinds on its side; but an ordinary disk-wheel, grinding on its periphery, may, with slight variations in the mechanism, be employed.

It will be understood that, while I have in the foregoing specification made special reference to grinding, polishing effects are equally attainable. Metal surfaces other than knife-blades can also be operated upon, and the terms "knife" and "knife-blade" are used in the claims in a generic sense and embrace such other articles or surfaces as may be ground or polished in a machine embodying my invention. Other modifications and changes can be made without departing from the principle of the invention.

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

1. In a machine for grinding knives, the combination with the grinding-surface of a width approximating the length of the knife-blade, of a holder in which the knife is secured, said holder being loosely mounted permitting the knife to longitudinally aline itself with the grinding-surface, and means for actuating the holder to present the knife to the grinding-surface with a yielding pressure, substantially as described.

2. The combination with the grinding-wheel having a grinding-surface of a width approximating the length of the knife-blade, of a spring-actuated holder in which the knife is secured and whereby it is presented to the grinding-surface with a yielding pressure, said holder being loosely mounted permitting the knife-blade to longitudinally aline itself with the grinding-surface, and means for rocking the holder to impart a lateral oscillation to the blade and thereby present every portion of its convex surface to the grinding-wheel, substantially as described.

3. The combination with the grinding-wheel having a grinding-surface of a width approximating the length of the knife-blade, of a spring-actuated holder in which the knife is secured and whereby it is presented to the grinding-surface with a yielding pressure, said holder being loosely mounted permitting the knife-blade to longitudinally aline itself with the grinding-surface, means for rocking

the holder to impart a lateral oscillation to the blade and for reciprocating the holder to longitudinally move the blade across the grinding-surface, substantially as described.

4. The combination with the grinding-wheel, of a reciprocating slide or carriage parallel to the grinding-surface a holder, in which the knife is secured, sliding transversely on said carriage and loosely mounted permitting the knife-blade to longitudinally aline itself with the grinding-surface, means for imparting such transverse movements to the holder and for presenting the knife to the grinding-surface with yielding pressure, and means for rocking the holder to impart a lateral oscillation to the blade whereby every portion of its convex surface is presented to the grinding-surface, substantially as described.

5. The combination with the grinding-wheel, of a knife-holder loosely mounted to slide at right angles to the grinding-surface and permitting the knife-blade to longitudinally aline itself with the grinding-surface, and a finger for reciprocating said holder and for presenting the blade to the grinding-surface with a yielding pressure, substantially as described.

6. The combination with the grinding-wheel, of a reciprocating slide or carriage parallel to the grinding-surface, a holder for securing the knife arranged to slide transversely and loosely mounted permitting the knife-blade to aline itself with the grinding-surface, a finger on the carriage engaging the holder, means for actuating said finger to cause the holder to approach and recede from the grinding-surface and when in operative position holding the knife-blade against the grinding-surface with yielding pressure, a cam-wheel upon which the knife-holder rests at one end for rocking the same to present every portion of the convex surface of the blade to the grinding-surface, and means for reciprocating the slide or carriage and for rotating the cam-wheel, substantially as described.

7. The combination with the grinding-wheel, of a slide or carriage reciprocating parallel with the grinding-surface, a holder for securing the knife adapted to slide on the carriage and being loosely mounted permitting the knife-blade to longitudinally aline itself with the grinding-surface, a finger on the carriage engaging the holder, means for tilting the holder to laterally oscillate the knife-blade and present every portion of the convex surface thereof to the grinding-surface, means for throwing the parts into operation and for actuating the finger to move the holder toward the grinding-wheel, and for presenting the blade thereto with yielding pressure, and means for automatically withdrawing the knife from contact with the wheel and for restoring the parts to a quiescent state after the operation has progressed for a predetermined period of time, substantially as described.

8. The combination with a slide or carriage, and a holder for the knife mounted to slide thereon, of a finger engaging the holder, a rock-shaft on the carriage carrying said finger, a rod connected with said rock-shaft, a spring encircling said rod and means for compressing the spring and actuating the rod to move the holder toward the grinding-surface to present the knife thereto with yielding pressure, substantially as described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

ALLEN JOHNSTON.

Witnesses:
J. T. HACKWORTH,
A. G. HARROW.