2 Sheets--Sheet 1.

H. QUIGG.

Machines for Grinding and Polishing Stone, &c.

No. 157,759. Patented Dec. 15, 1874.

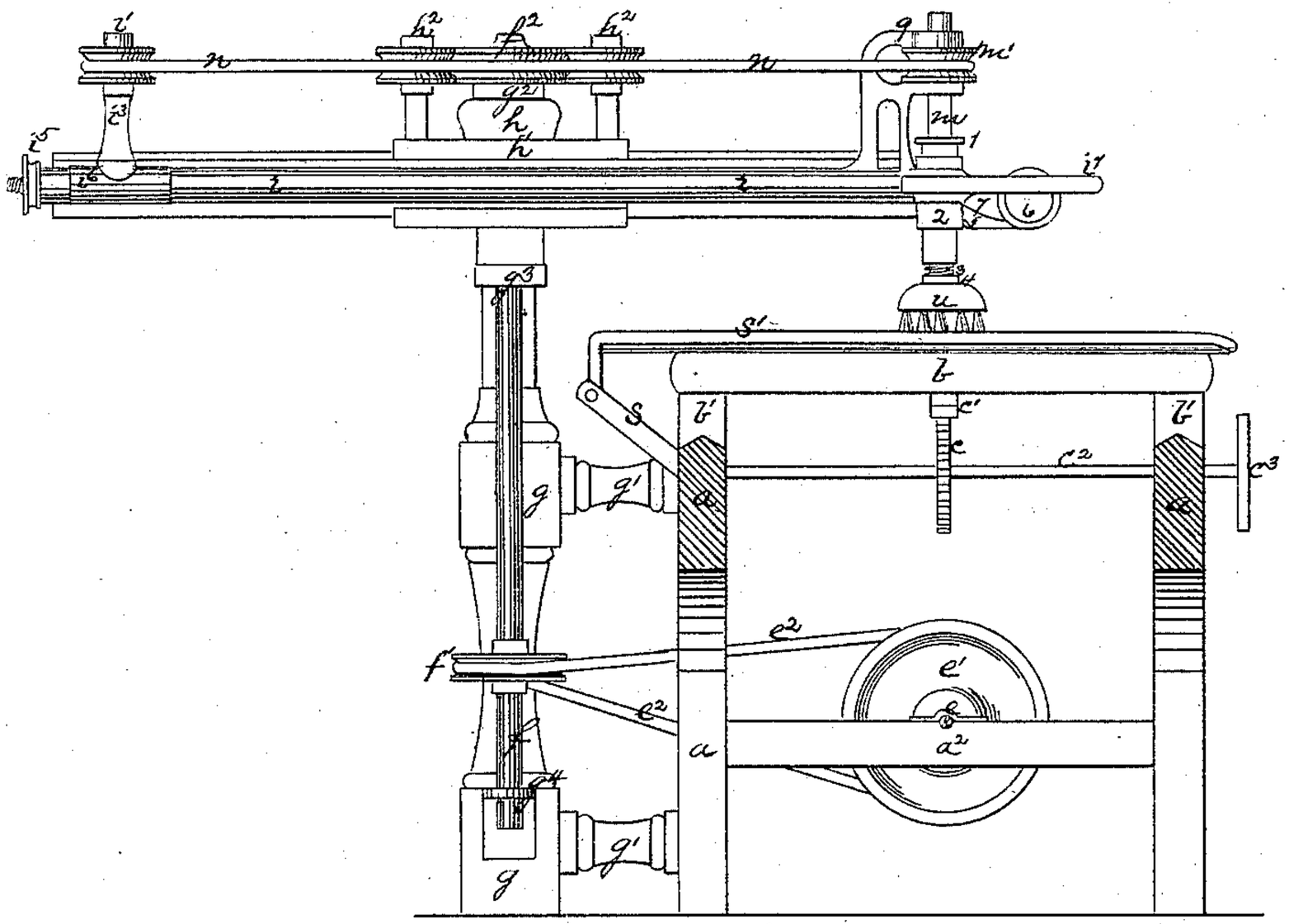

Fig. 1.

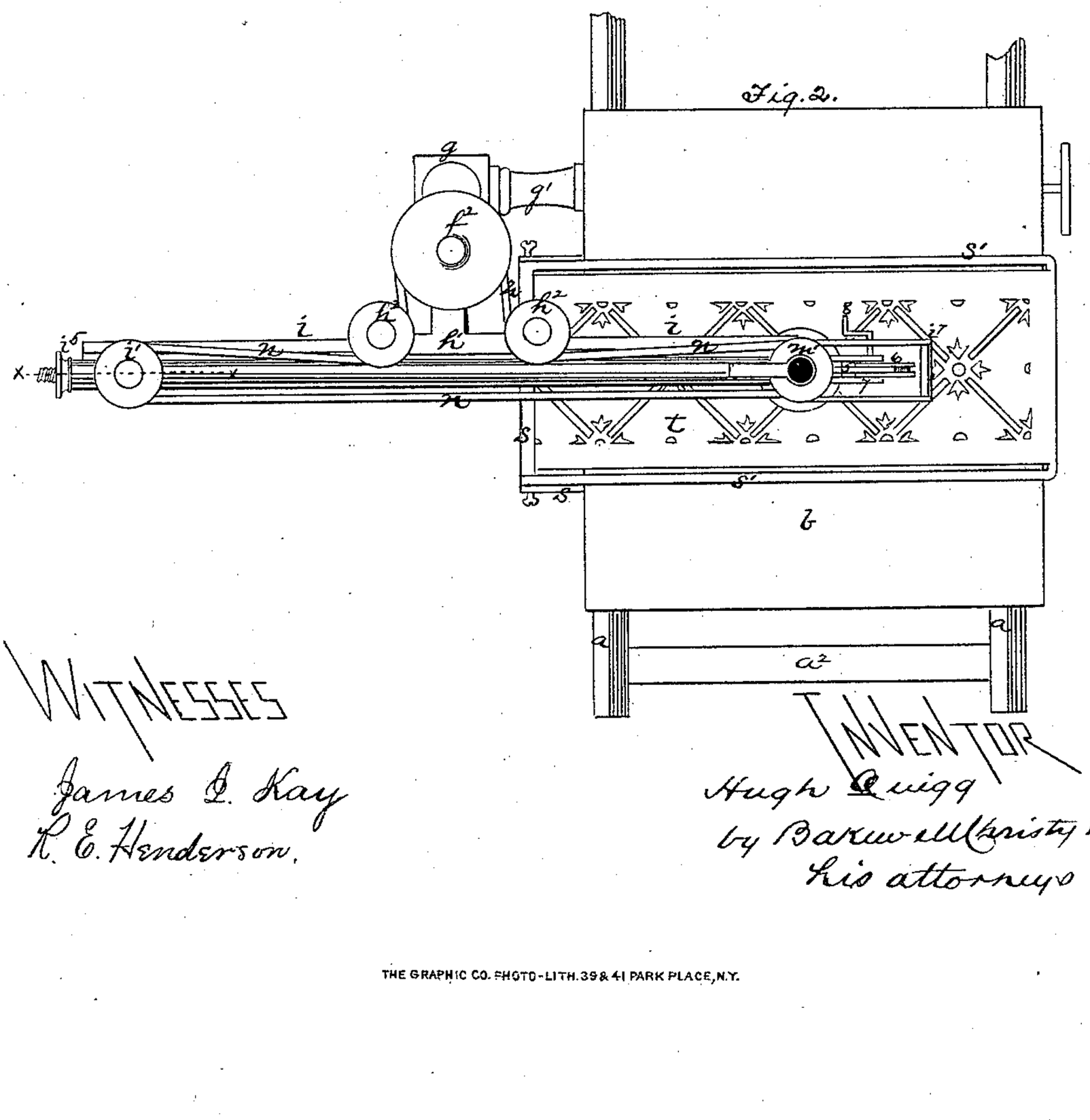

Fig. 2.

WITNESSES

James L. Kay
R. E. Henderson.

INVENTOR

Hugh Quigg
by Bakewell Christy & Kerr
his attorneys

2 Sheets--Sheet 2.

H. QUIGG.

Machines for Grinding and Polishing Stone, &c.

No. 157,759. Patented Dec. 15, 1874.

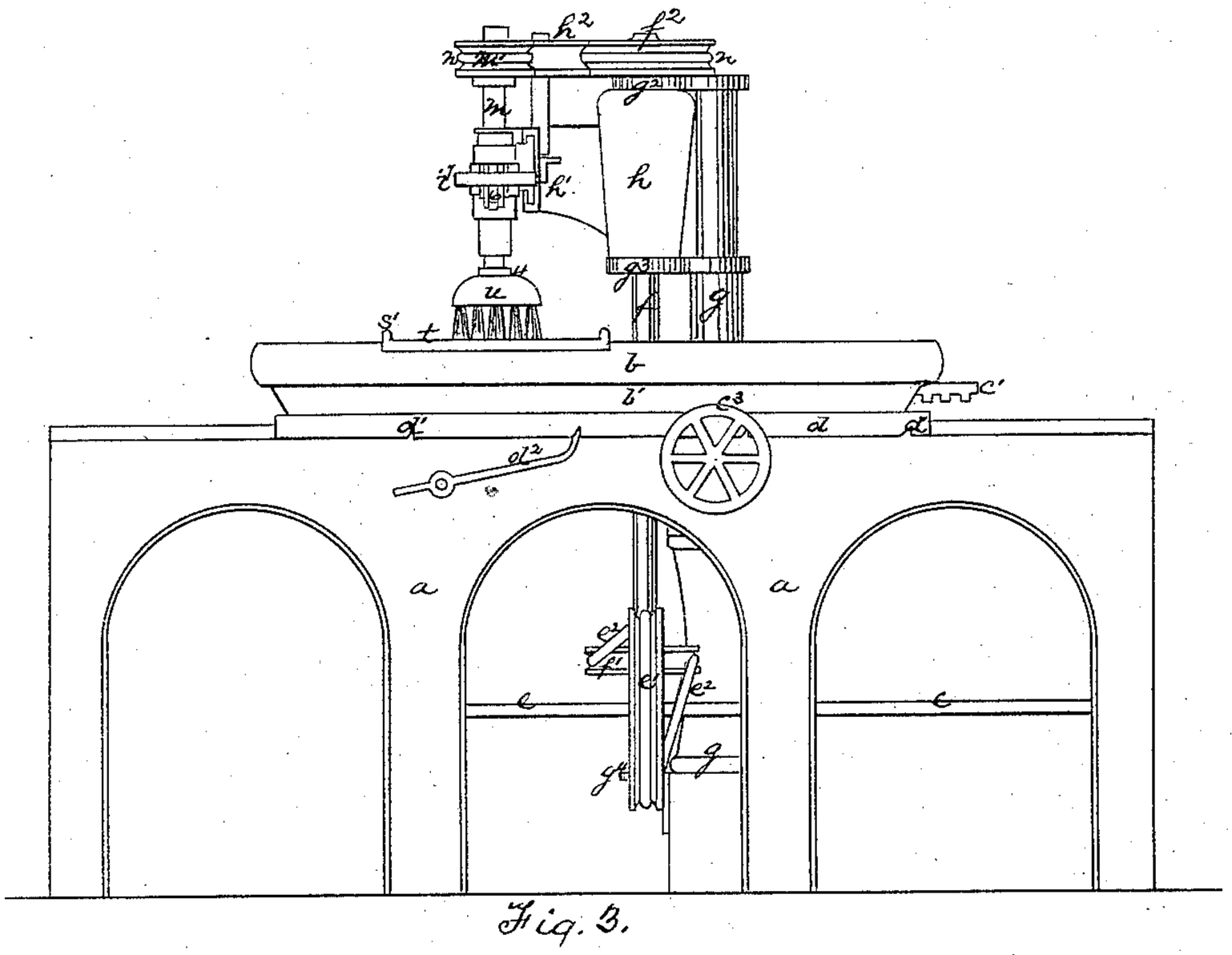

Fig. 3.

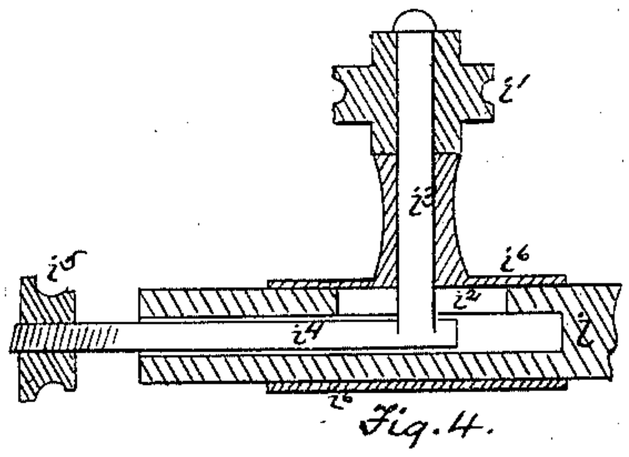

Fig. 4.

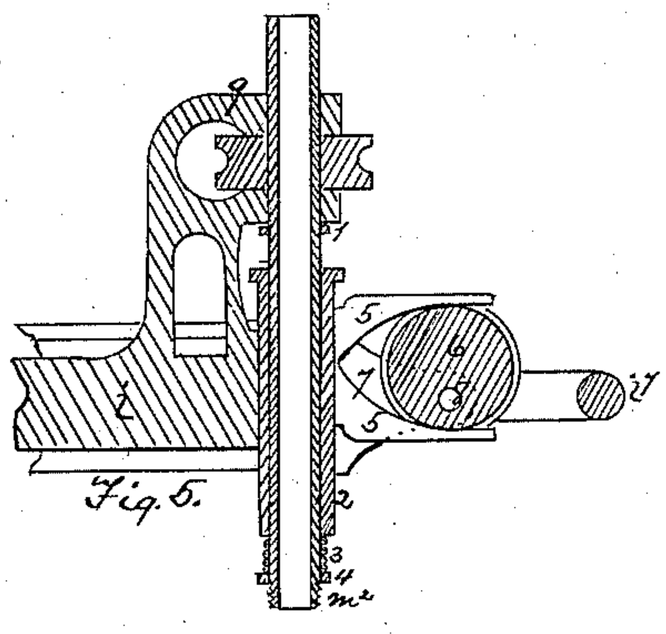

Fig. 5.

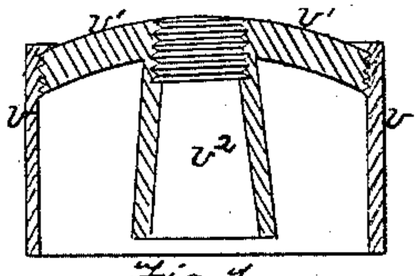

Fig. 7.

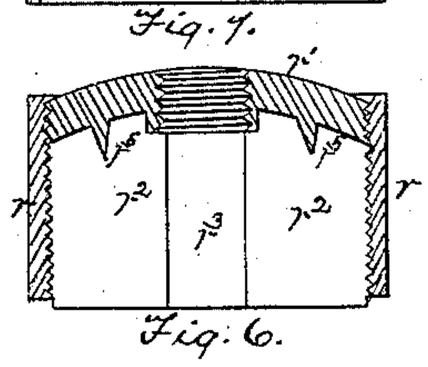

Fig. 6.

WITNESSES

James L. Kay

R. E. Henderson.

INVENTOR

Hugh Quigg

by Barnwell Christy & Kerr

his attorneys

THE GRAPHIC CO. PHOTO-LITH. 39 & 41 PARK PLACE, N.Y.

UNITED STATES PATENT OFFICE.

HUGH QUIGG, OF ALLEGHENY, PENNSYLVANIA.

IMPROVEMENT IN MACHINES FOR GRINDING AND POLISHING STONE, &c.

Specification forming part of Letters Patent No. **157,759**, dated December 15, 1874; application filed February 10, 1873.

To all whom it may concern:

Be it known that I, HUGH QUIGG, of Allegheny, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Machine for Stenciling, Grinding, and Polishing Marble, Glass, and other Surfaces; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings forming a part of this specification, in which—

Figure is a side elevation, partly in section, of my improved machine. Fig. 2 is a plan view, and Fig. 3 is a front elevation, of the same. Fig. 4 is a sectional view through *x x*, Fig. 2. Fig. 5 is a vertical section of the device for carrying the operating-tool; and Figs. 6 and 7 are, respectively, sectional views of the grinding and polishing tools.

Like letters of reference indicate like parts in each.

My invention relates to the construction of a machine for grinding and polishing marble and other surfaces, and for the purpose of stenciling glass; and it consists, first, of a rotating stem for carrying the operating-tool, sustained by an arm, movable horizontally in a hinged or swinging slide, so that the tool may be directed to any part of the polishing-bench; second, in the mechanism by which the stem is rotated, such mechanism being self-adjusting, so as to adapt itself to the constantly changed position of the rotating stem; third, in the construction of the grinding and polishing tools; and fourth, in the hollow stem, by which the requisite moisture is properly applied in the operations of grinding and polishing.

To enable others skilled in the art to make and use my invention, I will describe its construction and mode of operation.

The frame *a* of the machine sustains a sliding or movable table, *b*, which is designed to carry the slab under the operating-tool. The upper edges a^1 of the frame *a* are provided with Λ-shaped tongues, which fit into corresponding grooves in the supporting sides b^1 of the table. The table is moved by means of the pinion *c*, which meshes into the rack c^1 on the under side of the table. The pinion *c* is rotated by means of the hand-wheel c^3 on the outer end of its shaft c^2. The outer edge of the table *b* is furnished with a rack, *d*, the notches d^1 of which are placed at certain determinate distances apart. This rack is designed to operate in connection with the spring-tongue d^2, to regulate and limit the movement of the table, and to act as a stop to hold it stationary at any desired point. Supported upon the cross-ties a^2 is a power-shaft, *e*, carrying a band-wheel, e^1, which, by means of the band e^2, is connected with the band-wheel f^1 on the upright shaft *f*. The shaft *f* is supported in its vertical position by the standard *g*, which is secured by the braces g^1 to the frame *a*. On the upper end of the shaft *f* is a band-wheel, f^2, which bears upon the collar g^2, and thereby sustains the weight of the shaft *f*. The shaft *f* is held in line by the collars g^3 and g^4, through which it passes. On the vertical shaft *f*, between the collars g^2 and g^3, is a sleeve, *h*, made loose, so that it may turn thereon, which supports a slide or sheath, h^1. In the slide h^1 is a sliding arm, *i*, which may be moved back and forth in the slide at pleasure. At the forward end of the arm *i* is a stem, *m*, the upper end of which is provided with a band-wheel, m^1, and the lower end of which is threaded, as at m^2. This stem extends down below the arm *i*, and is designed to carry the grinding or polishing tool. It is rotated by means of a belt, *n*, from the band-wheel f^2. The belt *n* is extended around the friction-wheels h^2 h^2 and i^1, and thence to the wheel m^1, so as to run parallel with the arm *i*, and to permit the arm *i* to be moved back and forth without interrupting the operation of the belt *n*, the wheels i^1 and m^1 keeping the belt *n* at full running tension, whatever may be the position of the arm *i*. At the rear end of the arm *i* there is a slot, i^2, Fig. 4, through which the stem i^3, which carries the friction-wheel i^1, extends down into the center or hollow part of the arm *i*. At this point the stem i^3 connects with a second stem, i^4, which extends out beyond the end of the arm *i*, and is threaded at its outer extremity, so as to accommodate the nut i^5. The object of this device is to tighten or loosen the belt *n* at pleasure. By screwing the nut i^5 up on the stem i^4 it encounters the end of the stem *i*, and being stopped in its

own advance draws the stem i^4 through itself, and thereby causes the belt n to be drawn tight. By reversing the motion of the nut the belt is loosened. In order to cover the slot i^2, and to hold the stem i^3 in a position to move easily, I secure it to a slide or sleeve, i^6. The arm i has a handle, i^7, at its front end, by means of which the operator is enabled to move the arm so as to bring the polishing or grinding tool to any desired part of the table b.

By means of the slide h^1 the arm may be moved forward or back across the table, and, by means of the loose sleeve h, by which it is hung or pivoted to the vertical shaft f, it may be swung around so as to reach all parts of the table. Thus the arm i is perfectly adjustable, and moves with so little friction that the operator may move the tool to any desired point with but little effort.

The stem m is supported by the collar 1, which rests upon the upper end of the guide 2, and, by means of the spiral spring 3, set between the lower end of the guide 2 and the collar 4, holds the tool against the surface to be operated upon by a firm and equal pressure. Extending forward from the guide 2 is a cam-yoke, 5, which operates in connection with the cam 6, hung in the bearing 7, and worked by the crank 8, to raise or depress the stem m. The stem m, by this device, may be raised so as to permit the operating-tool to be swung round to any part of the table b, clear of the surface which is being operated upon; or it may be depressed so as to cause the operating-tool to be pressed against the surface operated upon. This is frequently necessary where hard or heavy grinding is done. The stem m is made hollow, for the purpose of supplying water to the grinding-head in the operation of grinding, and liquid acid to the polishing-tool in the operation of polishing.

The water or acid may be supplied to the hollow stem m by means of a flexible tube, leading from a suitable tank or reservoir to the upper end of the stem. However, as the supply of liquid which is necessary is comparatively small, I prefer to place a small vessel containing such liquid upon the bracket 9, which sustains the stem m, so that, by means of a suitable opening in it, the liquid shall drip therefrom into the hollow stem.

When used for grinding marble and other like surfaces, I make use of a tool or head, such as is shown in Fig. 6, which is composed of an internally-threaded ring or flange, r; a disk, r^1, which is threaded around its outer edge, so that it will screw into the shell r, and is tapped and threaded in its center so that it will screw onto the threaded end m^2 of the stem m; and a filling, r^2, of grinding material, having an opening, r^3, through its center. The filling r^2 I generally compose of fragments of stone or other granular material used for this purpose and cement.

The method of filling the head is as follows: I grease the inside of the shell, so as to prevent the cement from adhering to the screw-head, and place a core, likewise greased, in the center to form the opening r^3. Then I take the pounded or fragmentary stone, mix it with plaster-of-paris and water or other suitable cement, and fill the shell with the mixture. When it has set, which is generally in a few minutes, I withdraw the center core, and grind the lower surface of the filling smooth, and it is ready for use.

When the filling wears off to the edge of the flange r, I unscrew it from the stem m, take hold of the filling r^2 and disk r^1 by my thumb and finger, and with the other hand screw up the ring r until the filling r^2 again projects below the edge of the ring the required distance.

The grease upon the screw-threads prevents the filling r^2 from adhering to the shell, and causes it to unscrew easily.

The under face of the disk r^1 is roughened, or provided with projections r^5, so that the filling shall adhere to it. This is necessary to the perfect operation of the grinding-head. The object of the center opening r^3 is twofold: First, to destroy what is known as the "dead-point," viz., the center point of the rotating head, for if this was not done the head would grind unevenly and would not travel over the surface of the stone; second, to supply water to the center of the grinding-head from the hollow stem m. The water must be supplied to the head from the inside to secure its perfect operation. This head, on the practically-operating machine which I now have in use, runs at a speed of fifteen hundred revolutions per minute, and if water is supplied from the outside alone it throws it aside and becomes very highly heated, and has a tendency to burn and spoil the marble. When water is supplied through the opening r^3 the surface of the marble under the rotating head is always wet and the head is kept cool. The brush which is used in the operation of stenciling glass, and the other tools which may be used in the various operations of this machine, when in use, are screwed or otherwise secured to the rotating stem m.

In the operation of stenciling glass the color is first laid on the plate or pane of glass regularly by passing a brush back and forth over its surface. Then a sheet of brass, having a design or pattern, is laid on the painted surface of the glass. The operator then, by means of a dry bush, scrubs out or rubs off the paint or coloring matter which is exposed through the open parts of the pattern. After this the glass is removed to a furnace and the colored pattern, which has been formed upon it, is burnt in.

The operation of scrubbing out the pattern is necessarily a slow one when done by hand, a good operator only scrubbing out about two hundred feet per day.

On the inner side of the frame a I place a bracket, s, to which I hinge a frame, s', which

extends at right angles across the table *b*. This frame is meant to carry a stencil-plate or pattern, *t*. In place of the grinding-tool *r*, I put a brush, *u*, on the rotating stem *m*. A plate of glass already prepared is placed on the table *b*, which is moved up so as to bring the plate under the pattern *t*. The brush *u* is then passed over the surface of the pattern once or twice, and the coloring matter is brushed off the exposed parts of the glass almost instantaneously. The plate, if a wide one, is moved up until the edge of the finished pattern on the glass just touches the edge of the pattern of the stencil-plate *t*. The operation is then repeated again and again until the whole plate has passed, when it will be seen that one continuous pattern has been formed on the glass. The stops on the rack *d* are so arranged as to move the table *b* just the width of the pattern, so that the pattern shall be repeated on the glass with mechanical exactness. By the use of this machine, the brush *u* revolving at the rate of about fourteen hundred times per minute, I have frequently stenciled eight hundred feet of glass in one day. This gain is not greater than that made in grinding and polishing stone and marble on this machine over the old hand method, and such gain is not attended by any deterioration in the quality of the work, but on the other hand by a gain almost commensurate with the gain in quantity.

In the operation of polishing marble the old method has been to cover the surface of the slab with dry acid and then wet the same with liquid acid. The operator then rubs or scours the surface with cloths until the requisite polish has been attained. This operation is, like the others spoken of in this specification, very slow and laborious. In addition to this the polished slab is liable to be full of scratches and other like defects, which are produced by the direct forward and back scrubbing motion necessarily practiced by the workman. This motion causes any rough place in the polishing-cloth to travel over the same course many times, so that a groove or scratch is worn thereby.

The tool I make use of in the operation of polishing in my machine is shown in Fig. 7. This tool or head is in many respects similar to the head *r*. It consists of an internally-threaded ring or shell, *v*, similar to the shell *r*, a disk, *v'*, threaded around its outer edge so that it will screw into the shell *v*, and tapped and threaded in its center so that it will screw onto the threaded end m^2 of the stem *m*, similar to the disk *r'*. In connection with this the disk v^1 has a rigidly-fastened hollow cone-shaped stem or core, v^2, extending down to the lower edge of the shell *v*. The disk v^1, with its stem v^2, is unscrewed from the shell *v*, and the stem v^2 is tightly wrapped with cloth suitable for polishing purposes. When wrapped sufficiently to fill the shell *v*, the disk v^1 is screwed into the shell *v*, so as to allow the lower edge of the wrapped-cloth filling to project the desired distance from its lower edge. When this tool is used, the liquid acid is supplied through the hollow stem *m*, in the same manner as water, as hereinbefore stated, is supplied to the grinding-tool *r*, to the hollow stem v^2, and by it to the surface of the marble in the center of the polishing-cloth. This polishing-tool rotating over the surface of the marble with immense rapidity, subjecting no one portion to the continued action of any one portion of the polishing-cloth, obviates the danger of producing scratches or defects in the manner above stated, and gives a polish of much greater brilliancy and perfection than can possibly be obtained by the old method.

The operative power is applied to the power-shaft *e*, which, by means of the band-wheel e^1, band e^2, wheel f^1, shaft *f*, wheel f^2, and band *n* rotates the stem *m*.

The slab of marble to be ground is placed on the table *b*, and the operator, guiding the tool *r*, causes it to grind off the rough surface of the slab. For the sake of regularity, I generally grind the slab in the line of the movement of the sliding arm, when at right angles with the table *b*, beginning at one end and advancing the slab by a regular movement of the table under the tool, until the other end is reached.

By the use of this machine I am enabled to give a more even surface to the slab than is possible to do by hand, and to effect a very great saving in time and labor.

The operation of the machine in polishing and in stenciling has been fully mentioned herein.

Other known and suitable mechanical devices for transmitting power to rotate the stem *m* may be used to produce this result.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The rotating stem *m*, carried by and in combination with the arm *i*, having a forward-and-back motion in the slide *h'*, and a swinging motion on the hinge *h*, so that the tool may be moved freely to all parts of the table, substantially as described.

2. The rotating stem *m*, for carrying the operating-tool, provided with a center opening for conducting water or other liquid to the center of the rotating tool, substantially as and for the purposes described.

3. The cam 6, operated by a crank, 8, in combination with the cam-yoke 5, for raising or depressing the rotating stem *m*, substantially as described.

4. The adjustable freely-moving arm *i*, susceptible of a straight motion by means of the slide or sheath *h'*, and the reciprocating pulleys or friction-wheels h^2 h^2 i^1 *m'*, by which the belt *n* is adjusted to the position of the arm, and of a circular or swinging motion by means of the sleeve *h*, by which the sheath *h'* is hung on the shaft *f*, substantially as and for the purposes described.

5. The slot i^2, stems i^3 and i^4, and nut i^5, in combination with the arm i, to tighten or loosen the belt n, substantially as hereinbefore described.

6. The pattern-frame s', secured in the bracket s, in combination with the movable table b, substantially as and for the purposes described.

7. The grinding-tool, consisting of the internally-threaded flange r, the tapped and threaded disk r^1, and a hollow adjustable filling, r^2, substantially as described.

8. The polishing-tool, consisting of the internally-threaded shell v, the tapped and threaded disk v^1, provided with a downward-extending hollow cone-shaped stem, v^2, and a filling of cloth or other like suitable polishing material, substantially as described.

In testimony whereof I, the said HUGH QUIGG, have hereunto set my hand.

HUGH QUIGG.

Witnesses:

W. N. PAXTON,

THOS. B. KERR.