No. 756,405. PATENTED APR. 5, 1904.

W. PORTEOUS.

MILLING MACHINE.

APPLICATION FILED DEC. 24, 1900.

NO MODEL. 5 SHEETS—SHEET 1.

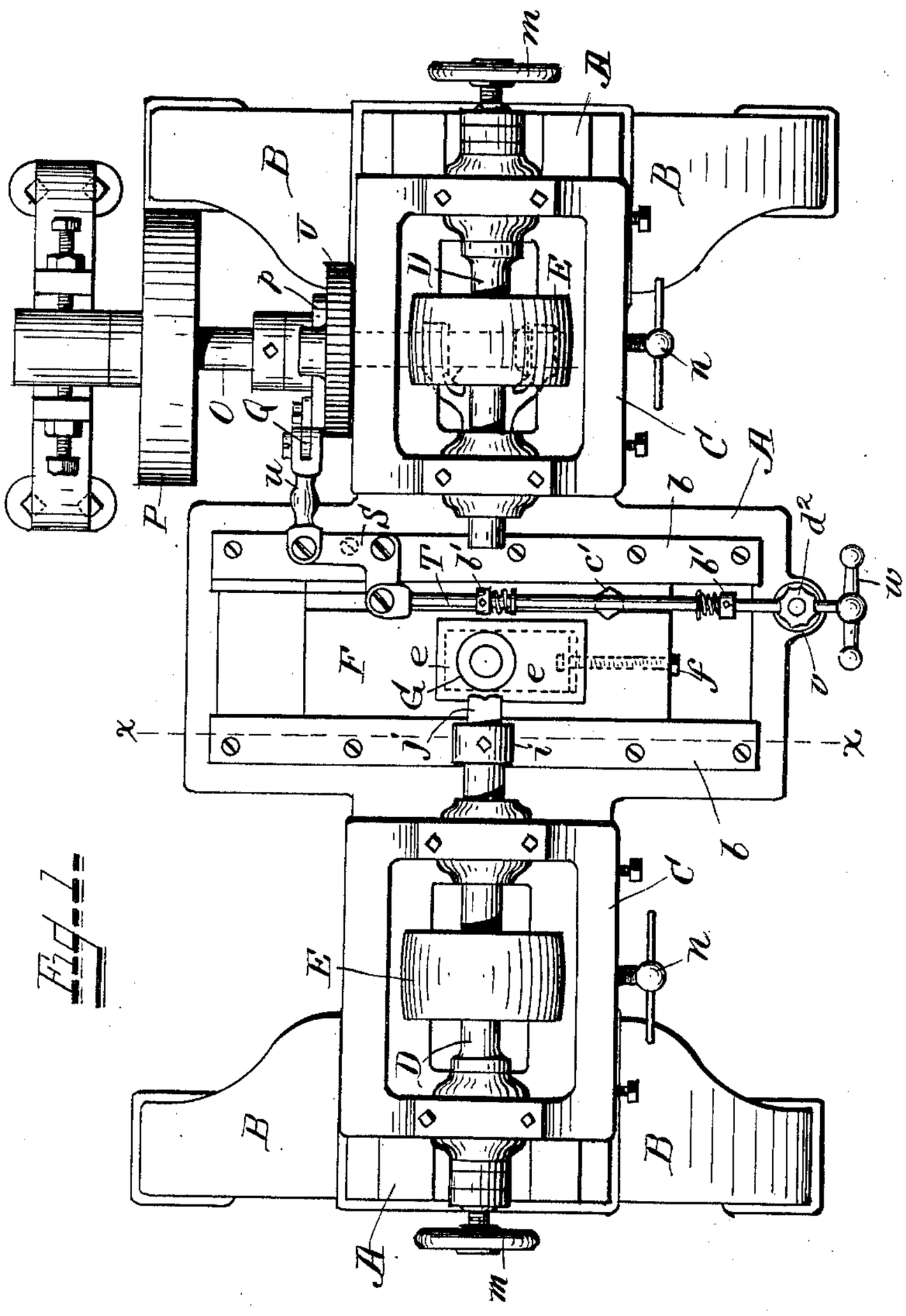

Fig. 1.

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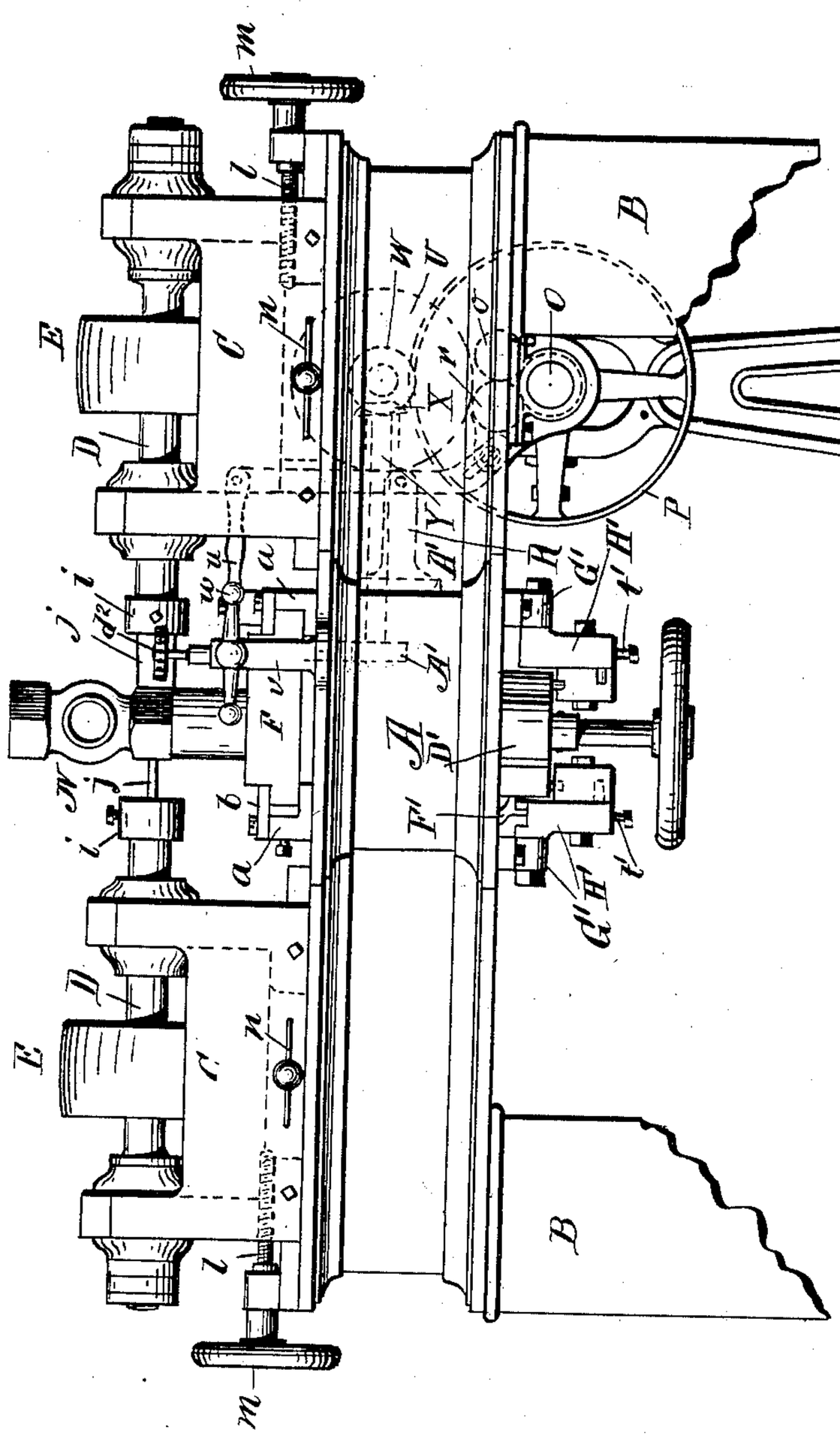
NO MODEL. 5 SHEETS—SHEET 2.

Fig. 2.



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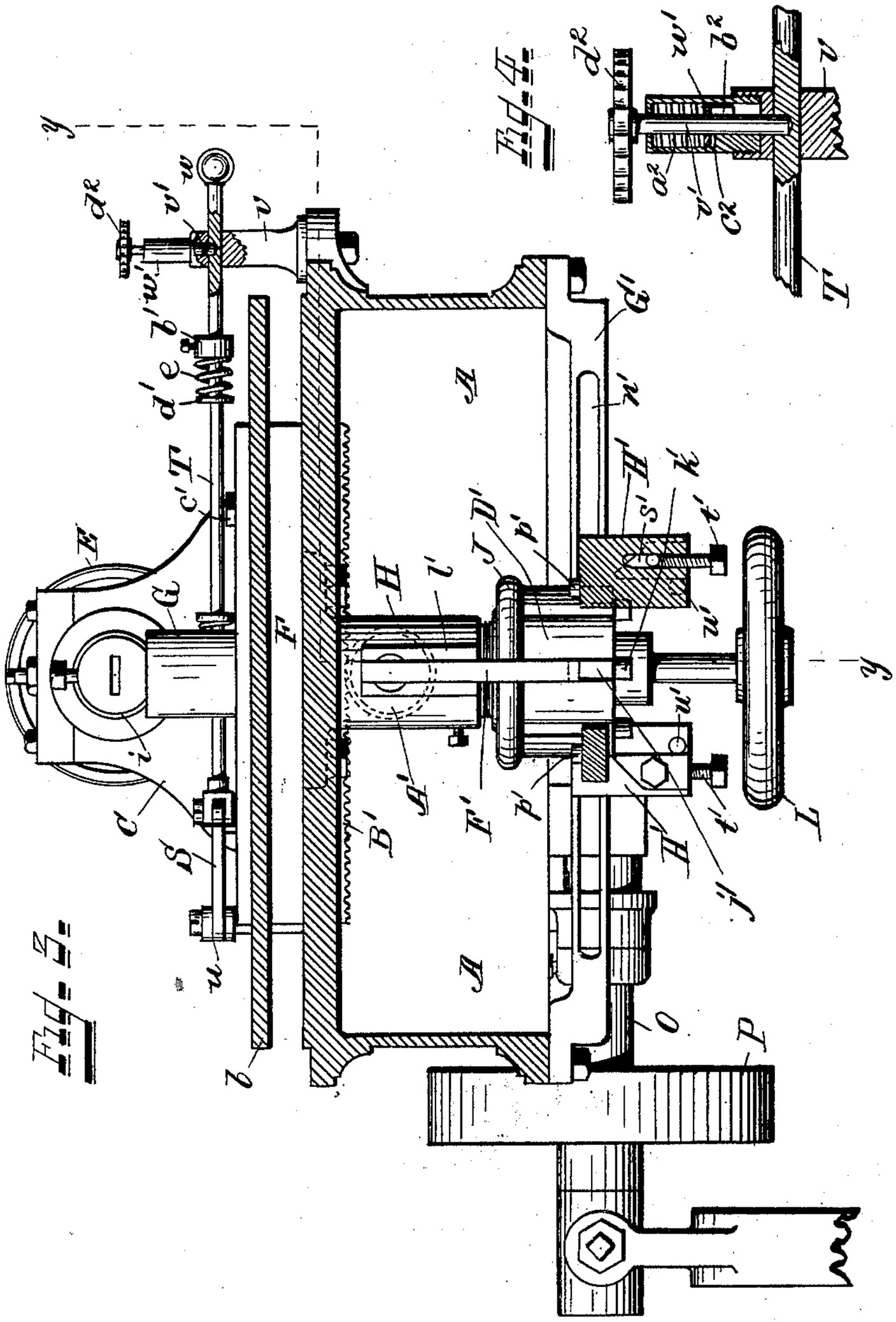
NO MODEL. 5 SHEETS—SHEET 3.



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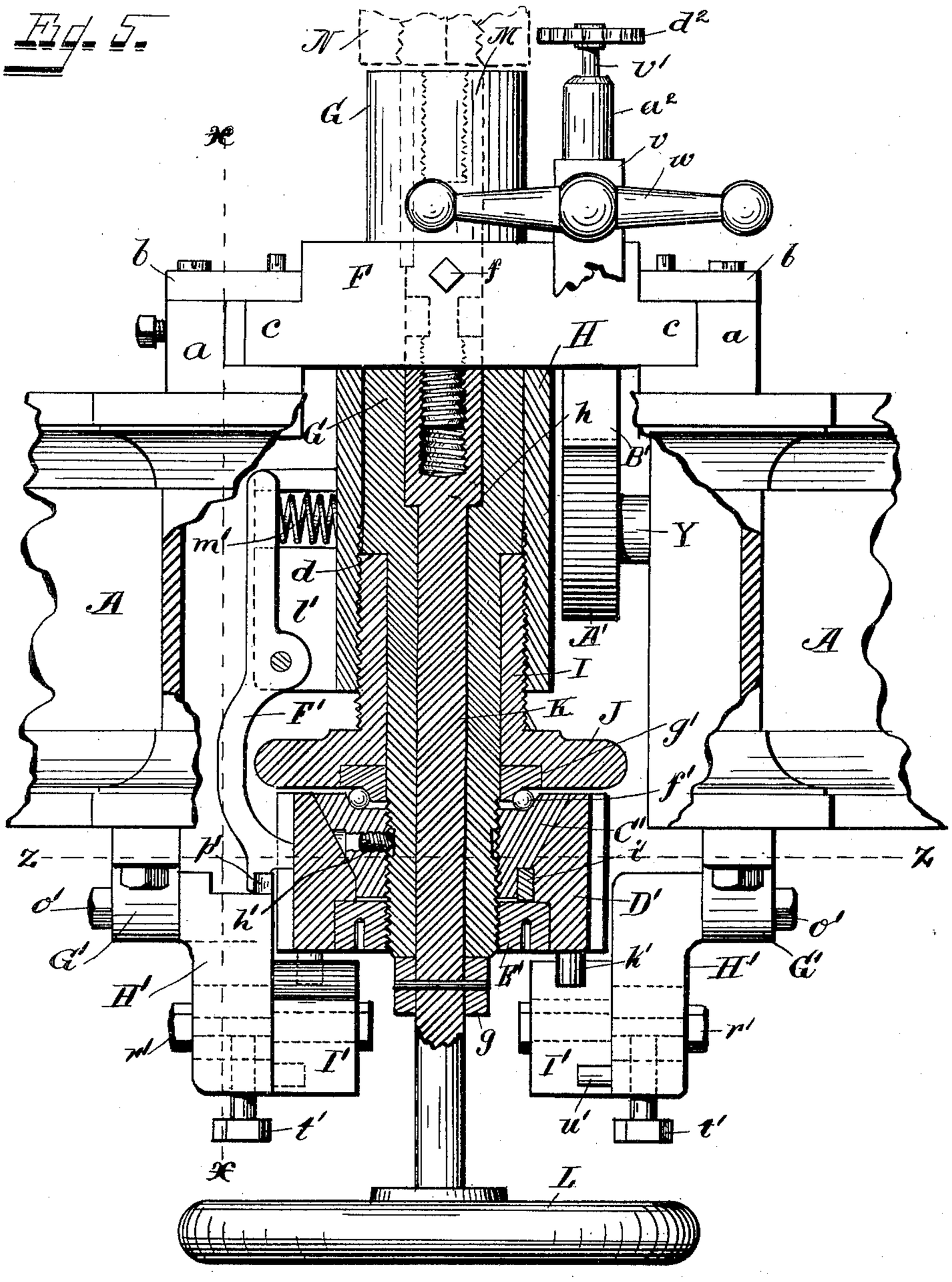
NO MODEL. 5 SHEETS—SHEET 4.

Fig. 5.



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NO MODEL. 5 SHEETS—SHEET 5.

Fig. 8.

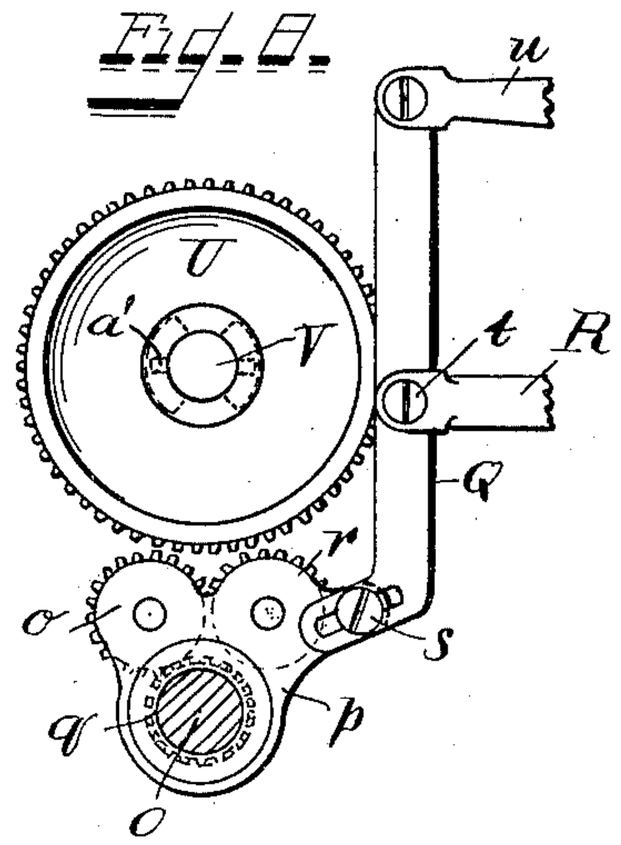

Fig. 7.

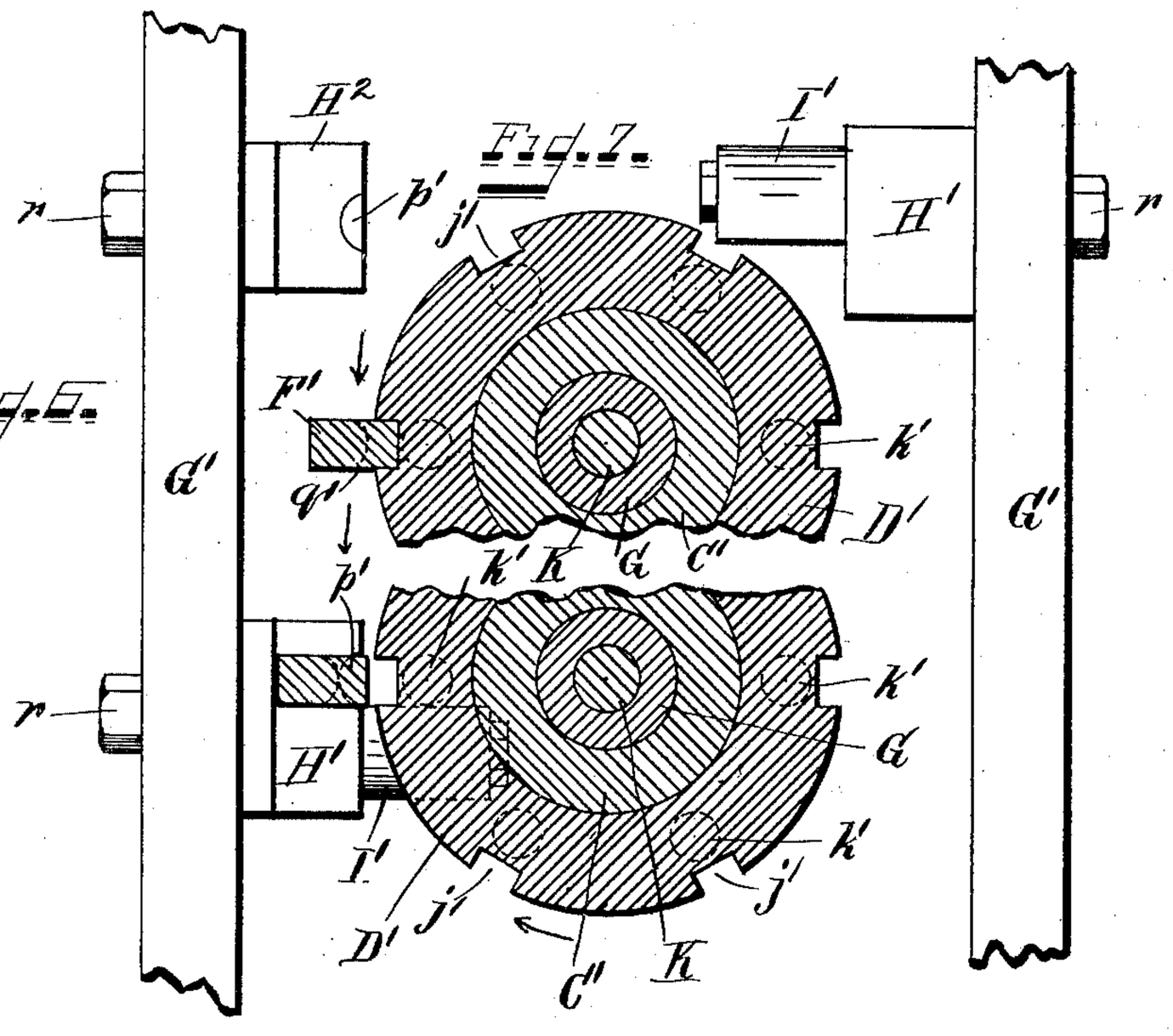

Fig. 6.

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No. 756,405. Patented April 5, 1904.

UNITED STATES PATENT OFFICE.

WILLIAM PORTEOUS, OF AVONDALE, OHIO.

MILLING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 756,405, dated April 5, 1904.

Application filed December 24, 1900. Serial No. 40,928. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM PORTEOUS, a citizen of the United States, residing at Avondale, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Milling-Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to that class of milling-machines especially designed for milling or dressing the nut-faces of brass valve-bodies and fittings of the like character; and it has for its object the production of a machine which can simultaneously mill or dress two opposite faces and which is simple and efficient in its action and automatic in its operation in causing the work-carrying table to travel back and forth between the cutters and to turn the work to present new faces to be cut.

The novelty of my invention consists in the construction and combination of the parts, all as will be hereinafter more fully set forth, and specifically pointed out in the claims.

In the accompanying drawings, Figure 1, Sheet 1, is a plan view of a milling-machine embodying my invention. Fig. 2, Sheet 2, is a side elevation of the same with the lower part of the framework broken away. Fig. 3, Sheet 3, is an enlarged sectional end elevation on the dotted line *x x* of Figs. 1 and 5 looking to the right. Fig. 4, Sheet 3, is an enlarged sectional detail of stop mechanism for the work-carrying table. Fig. 5, Sheet 4, is an enlarged sectional elevation on the dotted line *y y* of Fig. 3 looking to the left. Fig. 6, Sheet 5, is an enlarged detail section plan view on the dotted line *z z* of Fig. 5, showing the latch for the spindle disengaged. Fig. 7, Sheet 5, is a corresponding view of the dial, showing the latch engaged therewith. Fig. 8, Sheet 5, is a detail rear elevation of the reversing, stopping, and driving mechanism for the work-carrying table.

The same letters of reference are used to indicate identical parts in all the figures.

I provide any suitable horizontal bed A, supported on legs or other suitable supports B, which bed contains at each end guideways for head-stocks C, adjustable to and from each other on said ways and in perfect alinement, and in which head-stocks are suitably journaled two live-spindles D, whose axes are coincident and which are driven by belt-pulleys E, fast thereon and belted to pulleys on a line-shaft arranged conveniently near the machine and preferably just overhead. Also carried on the base A, between the head-stocks C and at right angles to the ways of the latter, are horizontal ways formed of L-plates *a*, Figs. 2 and 5, and cap-plates *b*, bolted thereto, containing in the way or mortise formed between them guide-ribs *c* on a head-block F, adapted to travel backward and forward automatically between the head-stocks, as hereinafter explained. There is an open space in the table A beneath the head-block F, and, in fact, the top of the table, as seen in Fig. 1, is cruciform in shape with the head-stocks at the two ends thereof and the head-block in its guides on the cross branch between them.

Journaled vertically through the head-block F is a tubular spindle G, having its bearing partly in a collar H, (see Fig. 5,) pendent from and secured to the under side of the head-block F, and which is preferably integral therewith. The diameter of the lower part of the spindle G is reduced to permit the introduction of a supporting-collar I, having an adjusting hand-wheel J on its lower end, which collar is screwed into the lower end of the collar H and serves, by means of the offset shoulder *d*, to support the spindle G and also to raise and lower the same when desired. That part of the spindle G which passes through the head-block F has its bearing in a two-part or divided journal-box *e*, suitably guided in the head-block, as indicated by the dotted lines, Fig. 1, and adjustable to take up wear by means of a lag-screw *f*. Journaled through the bore of the spindle G is a stem K, Fig. 5, having at its lower end an operating hand-wheel L for turning it. This stem is held from independent vertical movement by means of a nut or collar *g*, fast on its lower end and bearing against the under side of the spindle G, and by means of a shouldered offset *h* in the enlarged upper part of the bore through which the stem, correspondingly enlarged, passes. The upper end of the stem K

is bored and threaded to receive and engage the lower threaded end of a chuck-cylinder M, fitted and feathered in the upper end of the spindle G in such manner that upon turning the stem K by means of its hand-wheel the chuck-cylinder will be raised or lowered without turning, as will be readily understood. The upper end of the chuck-cylinder is bored and threaded to receive a projecting screw upon whose upper end is screwed the lower end of a valve-body, as indicated in Fig. 2, or any other fitting that has nut-faces needing to be milled. Of course the lower end of the screw-plug holding the fitting is of a constant size to engage the bore of the chuck-cylinder, while its upper threaded end is of varying sizes to receive the threaded part of the casting which is screwed thereon and which is to be milled. In other words, a number of these plugs of standard sizes are kept in stock for use with the machine. When the fitting represented by N, Figs. 2 and 5, is screwed upon the top of the plug, it is intended that it should also be absolutely tight against turning upon the top of the spindle G, in order that its faces to be dressed may be held true and rigidly to the action of the cutters. Now in applying the fitting to the plug the chuck-cylinder is first raised by properly turning the hand-wheel L, and then the fitting is screwed upon the upper end of the plug until its faces to be dressed are in proper line for the action of the cutters. Then by turning the hand-wheel L in the opposite direction the chuck-cylinder is drawn down and the bottom of the fitting is firmly clamped upon the top of the spindle G.

The live-spindles D are provided with suitable chuck-heads *i*, carrying proper-shaped cutters *j*, for milling off the nut-faces of the fitting, said cutters being of sufficient width that one traverse of the nut-faces between them will complete the work of milling the two opposite faces simultaneously, and to adjust the cutters to and from the work, so as to give the proper cut, each of the head-stocks C is adjustable on its ways by means of a screw *l* and hand-wheel *m* and when adjusted in or out to the proper position is locked by means of a set-screw *n*, bearing upon a gib engaging the ways after a manner well known in lathe construction.

The machine thus far described is capable of work in milling the two opposite sides of a nut or other nut-surface on a fitting, such as a valve-body, by merely adjusting the parts, putting the spindles D into action, and passing the head-block F, which carries the work, by hand between the cutters, which will mill the opposing surface; but my invention contemplates the automatic traversing of the head-block between the cutters first from one side to the other and also the automatic turning of the work to present new undressed surfaces to the cutters on each return stroke or passage of the head-block, and I will now describe the mechanism for these purposes.

Suitably journaled beneath the table at one end is a transverse counter-shaft O, Figs. 1 and 2, having fast thereon a pulley P, driven by a belt from the line-shafting in any suitable or convenient manner. Also fast on the shaft O is a small pinion *q*, constantly meshing with a similar small pinion *o*, journaled on an arm *p*, (see Fig. 8,) hung on the shaft O, and having also journaled thereon a small pinion *r*, constantly meshing with the pinion *o*, but never directly engaging the pinion *q*. The arm *p* is connected by a loose pivoted joint, as at *s*, to the lower end of a lever Q, pivoted, as at *t*, to a bracket-arm R, projecting from the table. The upper end of the lever Q is connected by a pivoted link *u*, Fig. 1, with the rear end of a horizontally-pivoted bell-crank S. The forward end of the bell-crank has pivoted to it the rear end of a rod T, which extends forward through a guide-bearing *v* at the front of the cross-section of the table, where it is provided at its end with a suitable push and pull handle *w*.

Just above the pinions *o r* is a larger gear U, secured with lost motion upon a counter-shaft V above and parallel to the shaft O and suitably journaled beneath the table. The manner of securing this connection between the pinion U and its shaft is by means of a pin *a'*, Fig. 8, passed through the shaft V, and whose projecting ends are confined in elongated slots in the bore of the gear U, said pin and the walls of the slots being indicated by dotted lines in Fig. 8. The inner end of the shaft V carries a beveled pinion W, Fig. 2, which meshes with a similar pinion X, fast on a counter-shaft Y at right angles to the shaft V, and whose inner end carries a pinion A', Figs. 3 and 5, meshing with a rack B', secured to the under side of the head-block F. Upon the rod T are two adjustable collars *b'*, between which is a nut or projection *c'*, Figs. 1 and 3, fast on the head-block F, which engages said collars alternately in the travel of the head-block backward and forward to cause the longitudinal movement of the rod T, as will be directly explained, and I preferably place cushions in front of the collars *b'* in the form of loose washers *d'* and coiled springs *e'*, so that the impact of the nut *c'* against the collars *b'* will be gradual and without shock or jar, as will be readily understood.

The shaft O is constantly rotated in one direction, and the pinions *o r*, Fig. 8, are constantly rotated in opposite directions therefrom. Under the middle adjustment of the rod T, as seen in Fig. 8, both the pinions *o r* are disengaged from the pinion U; but upon pulling or pressing forward the rod T the arm *p* is tilted and the pinion *o* is brought into mesh with the pinion U to cause its rotation in one direction, and thereby in this instance to cause the travel of the head-block F from

front to rear. When the nut c' in the backward travel of the head-block comes in contact with the cushion of the rear collar b', the bell-crank will be shifted by the backward throw of the rod T, and the pinion o will be thrown out of mesh with the pinion U and the pinion r into mesh with the pinion U, thereby reversing the direction of revolution of the pinion A', and thereby causing the head-block F to travel forward again. In this manner the head-block is caused to travel backward and forward automatically to carry the valve-body or other fitting between the revolving milling-cutters, which dress off its opposite sides. It is not necessary, however, that the head-block should travel backward and then forward to make one finishing cut on the two opposite sides of the valve-body or other fitting, for I intend that this shall be done completely by the traverse in one direction of the head-block and fitting carried thereby between the cutters, and I will now describe other automatic means for causing the work on the head-block (which hereinafter and in the claims I will designate the "work-carrying" table) to be turned to present new undressed surfaces to the action of the cutters on its reverse movements.

Referring to Figs. 5 and 6, the lower end of the spindle G, beneath the hand-wheel J, is threaded and there is first screwed up thereon a conical collar C', with a raceway on its upper face containing bearing-balls f', engaging with a chilled collar g', recessed in the under side of the hand-wheel J. The collar C' is made fast to the spindle G by a set-screw h', preferably engaging a circumferential groove in the spindle, as shown. Fitted to the cone-collar C' is a dial-disk D', whose interior bore coincides with the exterior shape of the collar C' and which is made fast thereto by a pin or key i'. The dial is held up in contact with the collar C' by means of a nut E', screwed upon the lower end of the spindle G, which nut is recessed in the bottom of the dial and serves to hold the pin i' in place. The nut has perforations on its under face for the engagement of a spanner-wrench in applying and removing it.

The outer face of the dial, as seen in Figs. 6 and 7, is provided with a series of vertical slots j', which for ordinary work on the nut-surfaces of valve-bodies and other fittings are six in number and equidistant apart, and directly beneath each of these slots and projecting from the lower face of the dial is a pin k'. A vertical latch F', pivoted in a housing l', projecting from the collar H, has a nose at its lower end engaging one of the slots j' of the dial to hold the same and the work-carrying spindle G rigid against turning while the cutters are in operation. A spring m', interposed between the upper end of the latch and the collar H, serves to hold the nose of the latch in engagement and to return it to engagement with the next notch when the dial and work-carrying spindle have been automatically rotated, as presently explained.

In horizontal slots n', Fig. 3, of guide-plates G', secured to the under side of the table on each side of the dial D' and in line with the path of travel of the work-carrying table F, are adjustably secured, by means of bolts or set-screws o', Fig. 5, pendent blocks H', on opposite sides of the dial and equally distant from a vertical plane through the live-spindle D, and a third block H^2, likewise adjustable on the same side as the latch F'. (See Fig. 6.) The two blocks H', on opposite sides of the dial, are diagonally set with reference to each other, as seen in Fig. 6, while the block H^2 is directly opposite the block H', which is on the opposite side of the dial from the latch F. Upon the tops of the blocks H' H^2, secured to the guide-plate G' on the latch side of the dial, are upwardly-projecting pins p', with their faces next to the guide-plate beveled or rounded, as shown, (see Fig. 6,) and there is a pendent part on the latch F' beneath its engaging nose whose inner face is similarly beveled or rounded, as indicated by the dotted line q', Fig. 7.

To the inner sides of the blocks H' are pivoted two dogs I', Figs. 5 and 6, on pivot-bolts r', which are vertically adjustable in slots s', Fig. 3, by means of set-screws t'. These dogs have inwardly-beveled noses in the paths of the pins k' on the under side of the dial and are held from tilting outwardly by stop-pins u', Figs. 3 and 5, carried by the blocks H' and engaging their lower ends.

It results from the construction above described that the work-carrying table, with all the parts secured thereto, including the fitting to be milled, the spindle G, to which it is clamped, collar H, in which the spindle is journaled, the raising and lowering hand-wheel J for the spindle, the clamping-stem K, the dial D', and the latch F' therefor, are automatically carried back and forth in a straight line, so that the fitting to be milled is carried between and subjected to the action of the cutters j in its passage in both directions, sufficient travel being given to the work-carrying table after the work has passed the cutters in each direction to permit the unlocking of the dial which holds the spindle, the turning of the same to present new uncut faces to the cutters, and the relocking of the dial and spindle before the return stroke of the work-carrying table in each direction, and to describe how this is done in detail I would refer to Figs. 6 and 7, where the arrows indicate the direction of travel of the work-carrying table. In Fig. 7 the latch is shown engaged with the dial to lock the spindle and work from turning and at a point just about midway between the cutters. In Fig. 6 the dial is shown to have come forward to a point just where the work has cleared the cutters and where the lower

end of the latch has been engaged by the pin p' on the block H′ and the latch thereby disengaged from the dial, and just at this moment a pin k' on the under side of the dial comes in contact with the dog I, carried by said block H′, and arrests the dial, or rather as the table F continues its forward movement turns the dial until the next slot j' to the right and forward is brought opposite the engaging nose of the latch, and just at this moment the pin k' will have slipped past the end of the dog and the latch will, by the action of its springs m', become reëngaged with the slot j' opposite it. The spindle and work will have thus been given a sixth of a turn to present new uncut faces on the work to the line of cutters, and as the table starts back again the pin on the under side of the dial trips and rides over the nose of the dog I′ without turning the dial, and although the latch is again disengaged in passing the pin p' it instantly snaps back into engagement therewith before the work reaches the cutters. The table then continues backward and the work of cutting is done until the latch reaches the pin on the block H^2 and is again disengaged from the dial, whereupon the diagonally opposite dog I′ is brought in contact with a pin k' on the under side of the dial and another turn is given to the work, as will be readily understood, and in this way the dial and work-carrying spindle are intermittingly rotated partially and in a continuous direction at each end of the stroke of the work-carrying table.

If at any time it is desired to stop the travel of the work-carrying table without stopping the rotation of the live-spindles D, it is only necessary to take hold of the handle w and operate the rod T so as to disengage both of the gears o r from the gear U, Fig. 8; but that this may be done in an automatic manner and with certainty I have provided a stop-pin v', Figs. 3 and 4, guided in a housing w', carried upon the guide v. The rod T has a notch on its upper side to be engaged by the lower end of the pin v when lowered, so disposed as to lock the rod T in a position to hold the two gears o r out of mesh with the gear U, as seen in Fig. 8. The pin v' is depressed by a coiled spring a^2 in the housing w' and is held up by a bayonet-joint lug b^2, Fig. 4, which when the pin is pulled up and partially turned rests on a shoulder c^2 in the housing w'. The pin v' is provided with an operating-handle d^2 on its upper end, by which it can be raised and turned, and when raised and turned, so that the lug b^2 engages the shoulder c^2, the lower end of the pin is disengaged from the rod T to permit the shifting of said rod back and forth under the action of the nut c', as before described, thereby causing the reversing of the travel of the work-carrying table through the medium of the gears o r, which are alternately engaged with and disengaged from the gear U.

The purpose in making the dial D′ removable is to enable a number of these dials to be kept in stock which differ from each other only in having a different number of pins k' on their lower sides. For instance, for a fitting having but four sides to be dressed there would be but four equidistant pins on the under side of the dial, for a fitting with six sides, as illustrated in the drawings, there would be six pins, for one with eight sides the dial would have eight pins, and so on. Each dial of course would have as many slots j' as it had pins k', and in this way the machine is rendered in a sense universal as to the number of sides upon the fitting to be dressed. To effect this change in the dials, it is only necessary to remove the hand-wheel L, which is held by a set-screw, (not shown,) remove the collar g, and then unscrew the nut E′ and remove it while the spindle G is standing midway between the cutters, whereupon one dial may be taken off and another substituted in its place and reclamped, all without the loss of much time and with very little trouble, as will be readily understood.

The spindle G is vertically adjustable by means of its hand-wheel J to bring the middle horizontal line of the work on the axial line of the cutters, and the collar C′ and dial are likewise both vertically adjustable to follow the raising and lowering of the spindle G. So, also, are the dogs I′ vertically adjustable, by means of the set-screws t', to follow the adjustment of the dial and bring them in proper working relation with the pins k', all as will be readily understood.

Having thus fully described my invention, I claim—

1. In a milling-machine of the character described, the combination of an automatically-operated work-carrying table, means for reciprocating said table back and forth between a pair of revoluble cutters, a work-carrying spindle journaled in said table, and means for automatically indexing and locking said work-carrying spindle at the end of the stroke of the table and holding the same locked until it reaches the opposite end of its stroke, substantially as described.

2. In a milling-machine of the character described, the combination of oppositely-set revolving cutters, a work-carrying table having a path of travel between and at right angles to said cutters, a work-carrying spindle journaled in said table, a removable dial on said spindle, dogs on opposite sides of the spindle for turning the same, and a lock for said dial and spindle during the passage of the work between the cutters, substantially as described.

3. In a milling-machine of the character described, the combination of oppositely-set revolving cutters, a work-carrying table having a path of travel between and at right angles to said cutters, a work-carrying spindle journaled in said table, a removable dial on said

table, dogs on opposite sides of the spindle for turning the same, a lock for said dial and spindle during the passage of the work between the cutters, and means for vertically adjusting said dial and dogs, substantially as described.

4. In a milling-machine of the character described, the combination of the work-carrying table F, the spindle G journaled therein, the chuck M feathered in said spindle, the stem K for operating said chuck, the screw-collar I for adjusting said spindle vertically, the latch F′ carried by the work-carrying table, the slotted removable dial D′ secured to the lower end of said spindle, pins p' for disengaging the latch from the dial, and the adjustable dogs I engaging pins on the under side of the dial for turning the same, substantially as described.

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