(No Model.) 6 Sheets—Sheet 1.

E. A. MARSH.

MACHINE FOR AUTOMATICALLY POLISHING BALANCE SCREWS.

No. 395,160. Patented Dec. 25, 1888.

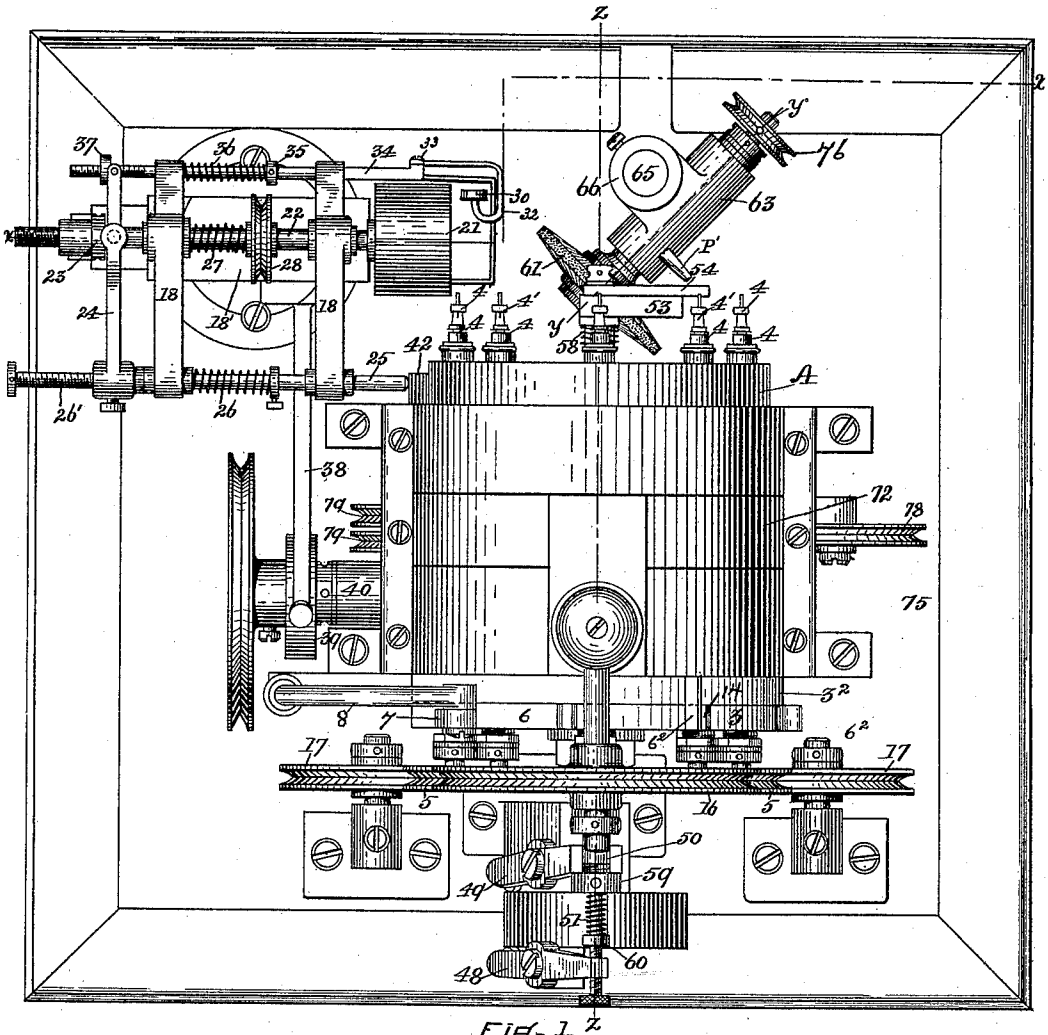


Fig. 1.

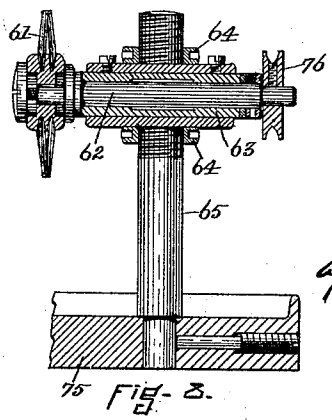


Fig. 2.

WITNESSES.
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(No Model.) 6 Sheets—Sheet 2.

E. A. MARSH.

MACHINE FOR AUTOMATICALLY POLISHING BALANCE SCREWS.

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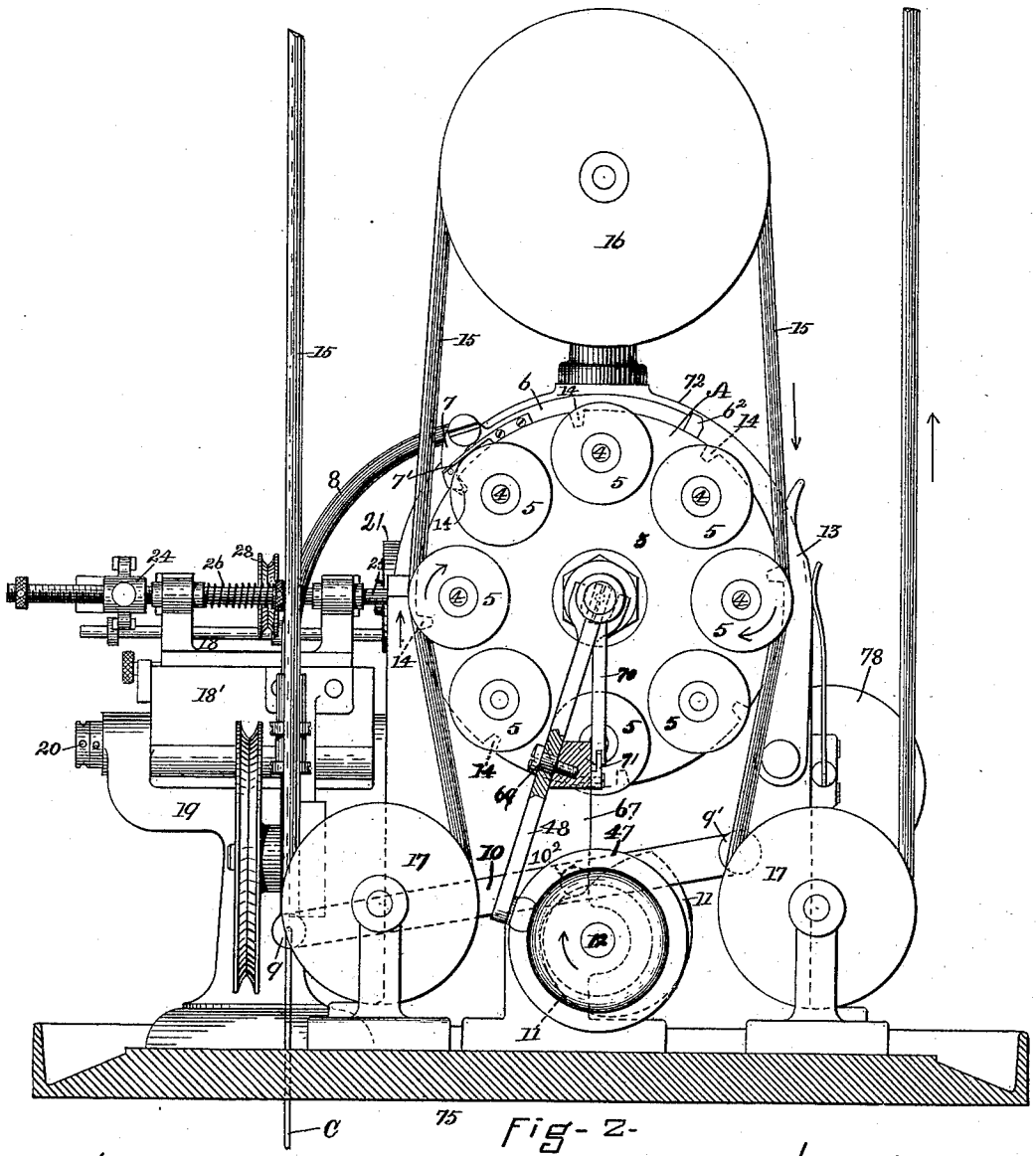


Fig- 2-

WITNESSES-
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(No Model.) 6 Sheets—Sheet 3.

E. A. MARSH.

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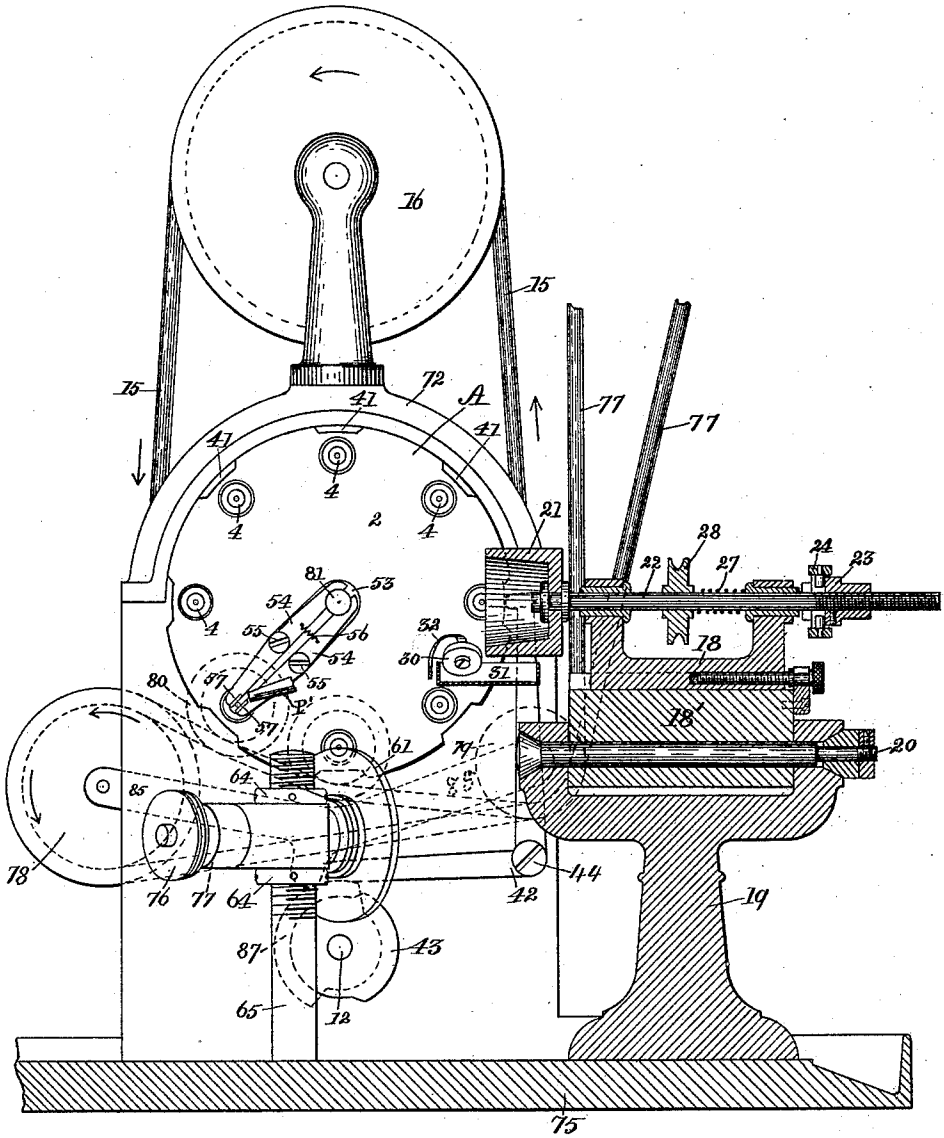


Fig. 3.

WITNESSES—
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(No Model.) 6 Sheets—Sheet 4.

E. A. MARSH.

MACHINE FOR AUTOMATICALLY POLISHING BALANCE SCREWS.

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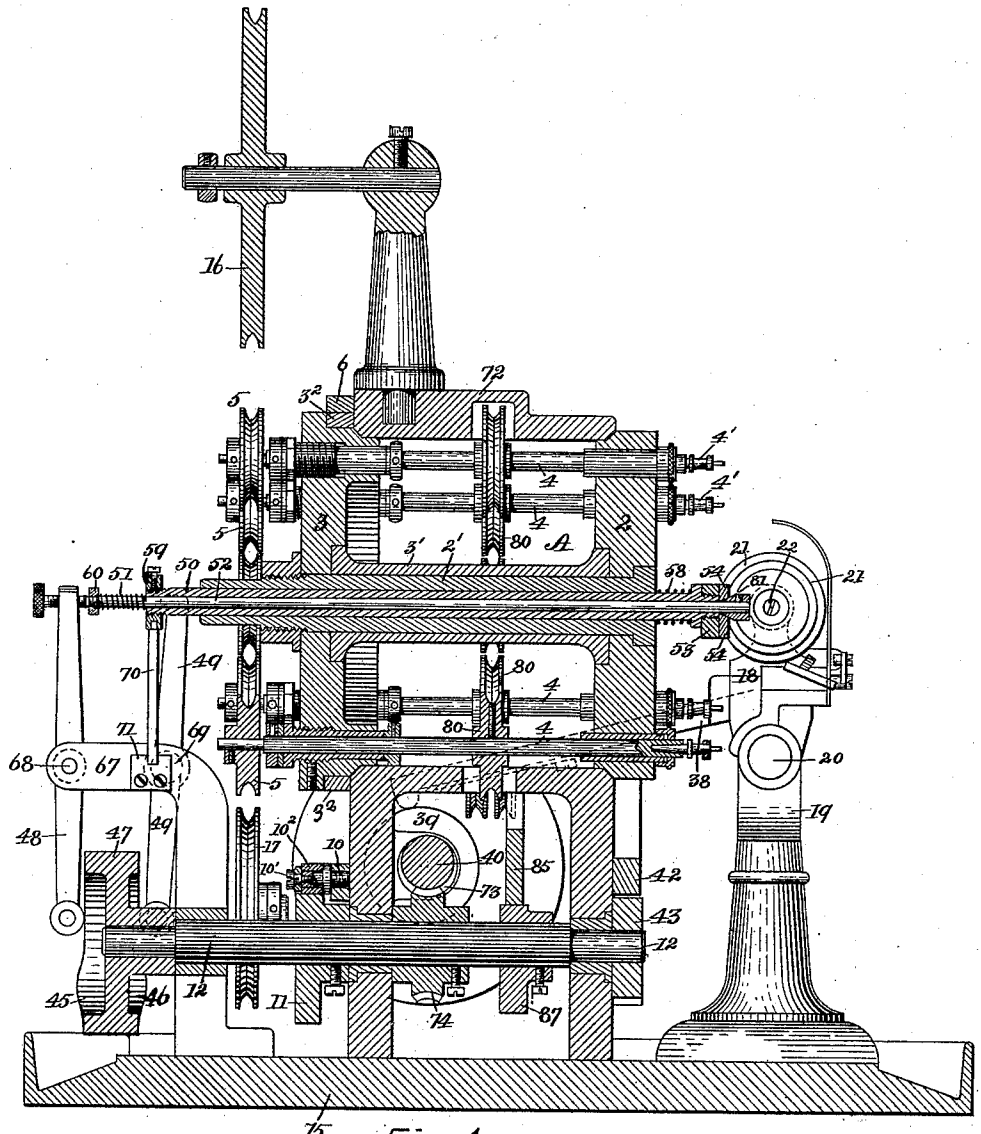


Fig-4-

WITNESSES.
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(No Model.) 6 Sheets—Sheet 5.

E. A. MARSH.

MACHINE FOR AUTOMATICALLY POLISHING BALANCE SCREWS.

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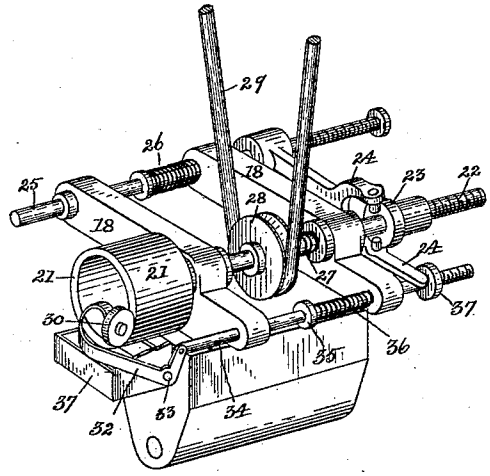


Fig. 5.

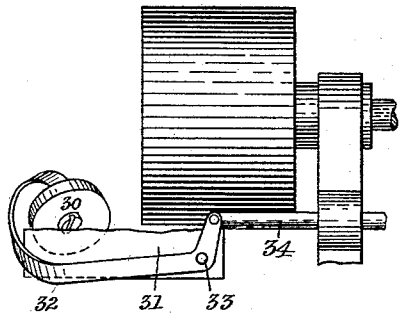


Fig. 6.

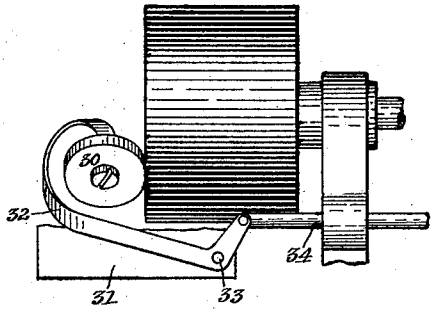


Fig. 7.

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A. D. Grover
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(No Model.) 6 Sheets—Sheet 6.

E. A. MARSH.

MACHINE FOR AUTOMATICALLY POLISHING BALANCE SCREWS.

No. 395,160. Patented Dec. 25, 1888.

FIG. 10.

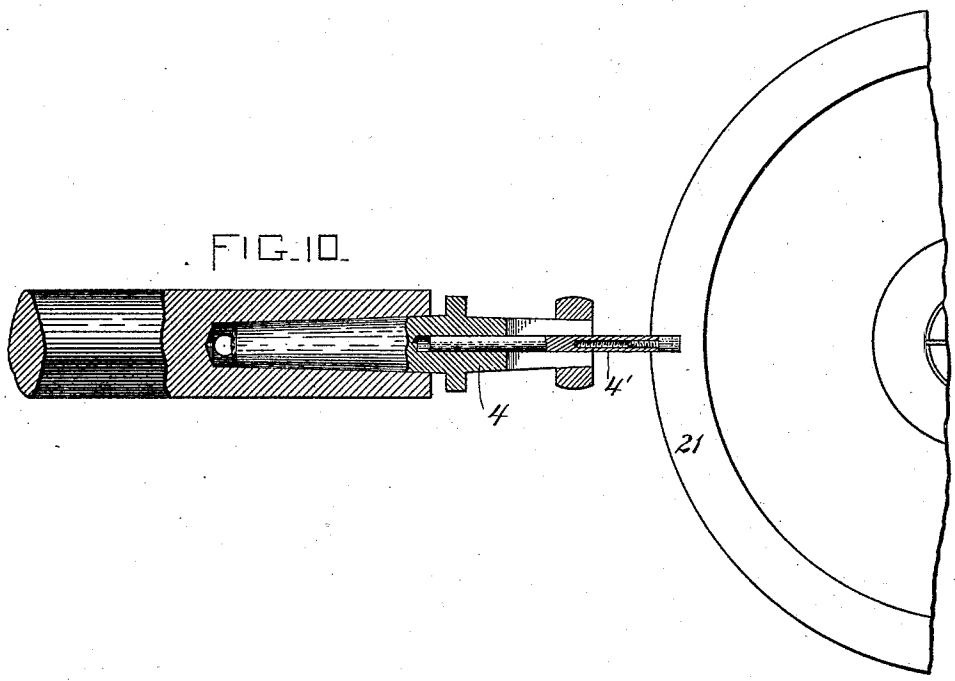
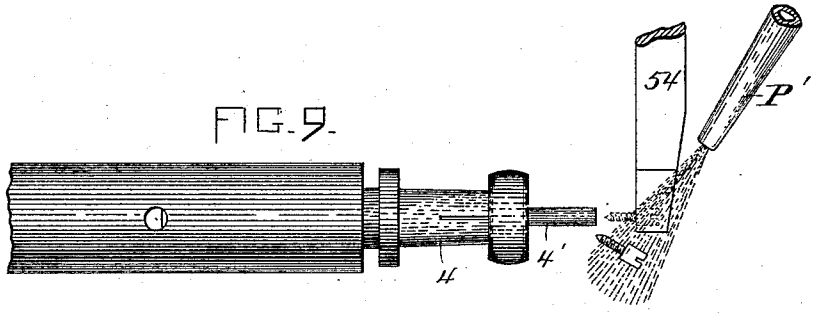


FIG. 9.



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M. C. Ramsay.

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UNITED STATES PATENT OFFICE.

EDWARD A. MARSH, OF NEWTON, MASSACHUSETTS.

MACHINE FOR AUTOMATICALLY POLISHING BALANCE-SCREWS.

SPECIFICATION forming part of Letters Patent No. 395,160, dated December 25, 1888.

Application filed October 10, 1887. Serial No. 251,940. (No model.)

To all whom it may concern:

Be it known that I, EDWARD A. MARSH, of Newton, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Machines for Automatically Polishing Balance-Screws, of which the following is a specification.

In the periphery of expansion or compensating balances for watches are inserted numbers of small screws. The purpose of these screws is to provide means for obtaining any desired weight of balance, and also for so adjusting the weight as to bring the balance into "poise," and to so locate the weight as to enable the balance to be self-compensating. For these purposes it is essential that all the screws should be of uniform size and weight, and it is desirable, moreover, that the heads of the screws should have a uniform and handsome finish. The ordinary method of finishing such screws has been to screw them one at a time in a chuck in a running spindle, then by means of a fine file to reduce the end of the head to the proper length, and then polish the same by a suitable block or stick of some hard wood on which was spread a paste of Vienna lime and oil; next, the periphery of the head was polished by means of a running lap or disk charged with lime and oil, the screw-holding spindle at the same time having imparted to it an endwise-reciprocating motion. After sufficient polishing, the spindle is stopped and the polished screw removed by means of a screw-driver, and the same operations are repeated on the next screw, &c.

The objections to the foregoing methods are, first, the cost, by reason of the limited number done in a given time; second, lack of uniformity in size and finish, and, third, inferiority of finish.

An improvement on the foregoing process has been made (so far as relates to the finishing of the face or end) by putting large numbers of screws in a block or disk and grinding the entire lot to a uniform thickness and then polishing them in the same manner; but as only the faces or ends can be done in quantities it remains to finish the sides or periphery one at a time; and to facilitate as well as to improve this latter operation is the object of my present invention, which consists in the several combinations and arrangements of parts hereinafter described and claimed, making up an organized automatic machine.

Of the accompanying drawings, forming a part of this specification, Figure 1 represents a top plan view of a machine embodying my invention. Fig. 2 represents a rear end view of the same, the supporting bed or base being shown in section. Fig. 3 represents a section on line $x\ x$, Fig. 1, looking toward the front end of the head-block. Fig. 4 represents a section on line $z\ z$, Fig. 1. Fig. 5 represents a perspective view of the lap, its supporting-frame, and the devices for applying polishing material or paste to its acting end. Figs. 6 and 7 represent side elevations of the lap and the paste-applying devices. Fig. 8 represents a section on line $y\ y$, Fig. 1. Fig. 9 represents a side view of one of the spindles and its screw-holding chuck with one of the screw-removing levers or jaws and the end of a pipe arranged to direct a jet of air on a screw in the jaws. Fig. 10 represents a sectional view of a spindle and its chuck and an end view of a part of the lap.

The same letters of reference indicate the same parts in all the figures.

In the drawings, A represents a head-block or carrier, which is fitted to rotate in bearings in a fixed supporting-frame, 72. Said head-block may be of any suitable construction; but the purposes for which it is intended are best subserved by the construction shown in the drawings—viz., two circular ends or heads, 2 3, which rest in bearings formed in the frame 72, and a cylindrical connecting-bolt, 2′, having at one end a head fitted in a recess in the outer side of the end or head 2 and at the other end a nut which bears against the outer side of the end or head 3. A sleeve, 3′, on said bolt has its ends fitted in recesses in the inner sides of the ends or heads 2 3, as shown in Fig. 4, so that when the nut is screwed tightly the two heads or ends 2 3 are drawn firmly into place, &c.

In the ends of the head-block or carrier are journaled a series of spindles, 4, placed at equal distances apart and in circular order. Said spindles are adapted to rotate freely on their own axes, but are prevented from moving endwise. Each spindle has at one end a chuck, 4′, which is internally screw-threaded

to receive the threaded portion of a balance-screw. The spindles are provided at their rear ends, or those opposite the chucks, with pulleys 5. A belt, 15, driven by a suitable motor, (not shown,) is so arranged and guided by idle-pulleys 16 17 17 that it bears against the pulleys 5 of two of the spindles at opposite sides of the head and rotates said spindles simultaneously, as indicated by arrows in Fig. 2, the pulleys 5 of the other spindles being unaffected by said belt. One of the spindles which is thus rotated is in position to present the periphery of the screw-head held by its chuck to the annular acting face of a lap, 21, affixed to a shaft, 22, which is arranged at right angles with the axis of the head-block A and is moved endwise by mechanism hereinafter described, so that it alternately approaches and recedes from the rotated screw-head. The other rotated spindle at the opposite side of the head is enabled by the direction of its rotation to draw into its screw-threaded chuck a screw presented to it by the attendant, the head of the screw being held by nippers while its threaded shank is entering the spindle last referred to. The head-block is rotated step by step by mechanism presently to be described, so that each spindle after receiving a screw is brought step by step into position to be a second time rotated by the belt 15, and at the same time to present its screw to the lap.

The devices for rotating the head-block step by step are a ring, 3^2, Figs. 1 and 4, fitted to slide or rotate around the rear end of head-block 3. At a suitable position on this ring is attached a supplemental ring-section, 6, to one end of which are jointed a connecting-rod, 8, and a pawl, 7, also a spring, 7′, which operates to cause the pawl 7 to enter a notch, 14, in head-block 3, there being a series of notches 14, corresponding in number and position to the spindles 4, as shown in Fig. 2. The opposite end of the supplemental ring has a projecting horn or arm, 6^2, which extends over the notched flange of head-block 3, and operates to lift the latch 13 from notch 14 by passing under the extended portion of the latch-arm. The lower end of connecting-rod 8 is jointed at 9 to a swinging arm or lever, 10, which arm is at its other end jointed to a fixed support at 9′. From a suitable point between the two ends of this swinging arm or lever projects a stud, 10′, carrying a roll, 10^2, which bears upon the periphery of a cam, 11, having a uniform slow rise reaching about five-sixths of its circumference and a rapid fall during the remainder of its circumference. A suitable weight attached to arm 10 by a cord, C, serves to hold the roll 10^2 in contact with cam 11.

Each movement of the ring 3^2 in one direction causes the dog 7 to engage a notch 14 and rotate the head-block one step or a distance equal to the space between each spindle and the next. The head-block is held after each movement by the spring-latch 13, which engages a notch 14 at the end of each partial rotation of the head-block, and is thrown out of said notch before the next partial rotation by the arm or horn 6^2, which strikes said latch and forces it back when the ring 3^2 is being moved to engage the dog 7 with another notch.

The shaft 22, carrying the lap 21, is journaled in bearings in a frame, 18, which is adjustably secured to a block, 18′, which block is pivoted by a pivot, 20, to a stand, 19, affixed to the base 75. From the block 18′ projects an arm, 38, which bears on a cam, 39, on the driving-shaft 40, and is oscillated with the block 18′ by the rotation of said cam, whereby the lap is oscillated laterally and is caused to move lengthwise of the screw-head on which it is operating. The shaft 22 is movable longitudinally in the frame 18, so that the lap can be moved away from the screw after the latter has been polished and while the next screw is being moved to position to receive the action of the lap. Said movement is effected by means of a rod, 25, which is parallel with the shaft 22 and is adapted to slide in the frame 18, a bell-crank lever, 42, which is pivoted at 44 to a fixed support and has an arm which bears on a cam, 43, on the shaft 12 and another arm against which the rod 25 is held by a spring, 26, an arm, 24, attached to the rod 25 at one end and forked at the other end, so as to partially embrace the lap-carrying shaft 22, and an adjustable collar, 23, on said last-mentioned shaft bearing against the forked end of the lever 24.

The cam 43 is so formed and timed that it moves the lever 42 so as to cause the latter to force back the rod 25 and the lap-shaft 22 just before each partial rotation of the head-block, and releases said lever and permits the spring 27 to force the lap forward after the rotary movement of the head-block.

The lap-spindle is adjustable to compensate for wear of the lap. To this end the collar 23 is made as a nut, which engages with a screw-thread on the spindle. The rod 25 is made adjustable for the same purpose by means of a screw, 26′, which is adjustable in a tapped sleeve in the lever 24. The lap is preferably made of wood or other material suitable for polishing, and is charged or coated with a polishing-paste composed usually of Vienna lime and oil or other liquid, which paste has to be applied to the lap at frequent intervals.

I find that it is desirable to automatically apply the polishing-paste to the lap, and to this end place a receptacle, 31, for the paste under the lap, said receptacle being suitably affixed to the frame 18, and provide a paste-applying roller, 30, which is mounted on an elbow-lever, 32, to which an oscillating motion is imparted, whereby the roll 30 is alternately inserted into the receptacle 31 to take up a portion of the paste, as shown in Fig. 6, and

raised and held in rolling contact with the acting end of the lap, as shown in Figs. 5 and 7, to deposit the paste on the lap. The elbow-lever 32 is pivoted at 33 to the side of the receptacle, and is jointed to a rod, 34, adapted to slide in guides in the frame in which the lap-spindle is mounted. Said rod is provided with a collar, 37, against which bears an extension of the arm 24, which moves the lap-spindle 22. It will be seen, therefore, that when the lap-shaft is moved back by the arm 24, as already described, the rod 34 is moved backwardly with said shaft, and is thus caused to turn the lever 32 so as to elevate the roll 30 and press the latter against the end of the lap. When the arm 24 is carried forward by the action of the spring 26, the rod 34 is also pressed forward by a spring, 36, thereon, and is thus caused to depress the paste-roll, as shown in Fig. 6, so that while the lap is operating on a screw the paste-roll is depressed, and when the lap is moved back the paste-roll is raised and caused to charge the lap. A continuously-running belt, 29, driven by a shaft (not shown) continuously rotates the lap-spindle, so that the lap is rotated when the roll 30 is presented to it.

61 represents a brush attached to a shaft, 62, which is journaled in a bearing, 63. Said bearing is provided with a socket, 66, through which passes a vertical screw-threaded standard, 65, affixed to the bed of the machine. Nuts 64 64 on said standard, bearing on the upper and lower sides of the socket 66, enable said socket and bearing to be adjusted vertically on the standard 65.

The brush is continuously rotated by a belt running on a pulley, 76, on the shaft 62. The brush is located in such relation to the head-block that it acts on the screw-heads after they have been acted on by and removed from the lap, the step-by-step rotation of the head-block carrying each screw from the lap to the brush. The spindle that presents the screw to the brush is rotated by a belt, 77, which runs on pulleys 78 79 and bears between said pulleys on pulleys 80, affixed to the spindles 4 between the heads 2 3 of the head-block. The screw-heads are therefore rotated while the brush is acting on them, so that the brush is enabled to act on all parts of their peripheries. The screws, after being polished and cleaned, are removed from the spindles by the devices next described.

54 54 represent two levers, which are pivoted at 55 55 to an arm, 53, affixed to a tubular rod, 50, which is adapted to slide lengthwise in a socket formed for it through the axis of the head-stock. Through the tubular rod 50 extends a rod, 52, to one end of which is affixed a conical collar, 81, which is interposed between the upper ends of the levers 54 and tends to press said upper ends apart and force their lower ends together and cause said lower ends, which are provided with jaws 57 57, of soft metal, to grasp the screw held by the spindle 4, which is in the position succeeding that occupied while the screw-head is being brushed. The tubular rod 50 is engaged at its rear end with one end of a lever, 49, which is pivoted at 69 to a fixed arm, 67, and is provided at its other end with a roll bearing against a cam, 46, formed on the edge of a disk, 47, on the shaft 12. A spring, 58, interposed between the head-block and a flange on the forward end of the tubular rod 50, forces the latter forward and keeps the lever 49 pressed against the cam 46. The tubular rod 50 and the arm 53 and levers 54 held thereby are normally forced outwardly by the spring 58, so that the levers 54 stand outside of the heads of the screws and do not interfere with the movement of the screws by the step-by-step rotation of the head. The cam 46 is timed to act through the lever 49 to move the tubular rod inwardly after each partial rotation of the head-block, and thus cause the jaws at the lower ends of said levers to move over the screw held by the spindle coinciding with said jaws. The jaws are meanwhile held separated by a spring, 56, connecting the upper ends of the levers 54, the rod 52 being at this time forced forward by devices hereinafter described, so that it permits the upper ends of the levers 54 to approach each other. When the jaws have been thus moved inwardly, the rod 52 is forced backwardly, thus inserting the conical collar 81 between the upper ends of the levers 54 and forcing the jaws 57 at their lower ends toward each other and causing them to grasp the screw between them. When the screw is thus grasped, the belt 77 is raised, by means presently described, and pressed against the pulley 80 of the spindle holding said screw. The direction of movement of the belt is such that the spindle is rotated backwardly, so that the screw which is prevented from rotating by the jaws 57 is fed out or unscrewed from the chuck of said spindle, the spring 58 forcing the tubular rod 50 and levers 54 54 forward as fast as the screw is fed until the screw is entirely removed from the spindle, after which the rod 52 is moved forward to remove the conical collar 81 from between the levers 54, whereupon the screw-grasping jaws of said levers are separated by the spring 56 and the screw is released and drops to the bed of the machine, or into a suitable receptacle thereon. Should the screws be caused by their lightness and the oil or paste that remains upon them to adhere to the jaws, they may be forced off by a blast of air directed upon the jaws by a pipe, P′, Fig. 9, which may be connected with any suitable air-forcing device. The described movements of the rod 52, having the conical jaw-controlling collar 81, are effected by a cam, 45, on the disk 47, and a lever, 48, pivoted at 68 to the fixed arm 67 and bearing at one end against said cam and at its other end against the rod 52, and a spring, 51, interposed between the rear end of the

tubular rod 50 and a nut, 60, on the rod 52. The cam and lever force the rod forward and the spring 51 forces it backward.

The means for raising the belt 77 and giving the spindle its backward rotation are a lever, 85, which is pivoted at one end to a fixed support and carries the pulley 78 at its free end, and a cam, 87, which supports the lever 85 and is formed to alternately raise and lower the same. When the lever is lowered, the belt is removed from the pulley 80 of the spindle, so that the screw held by the spindle cannot be rotated while the jaws are grasping it, injury to the head of the screws being thus prevented.

The tubular rod 50 is provided at its rear end with an arm, 70, which is slotted at its lower end and engages a fixed guide, 71, on which it is adapted to slide. Said arm and guide prevent the rod 50 from turning and hold the arm 53 and levers 54 in their proper position. The shaft 12, carrying the several cams, is rotated by the driving-shaft 40, which has a worm, 73, engaging with a worm-gear, 74, on the shaft 12.

It will be observed by reference to Figs. 2 and 3 that the spindles which are rotated by the belt 15 are rotated in a forward direction, so that the screw held by the operator and presented to the empty chuck of the rotated spindle, which is not in position to co-operate with the lap, will be fed into said chuck, while the spindle which is intermittingly rotated by the belt 77 is rotated backwardly, so that the screw held by the jaws 57 will be fed out of the chuck containing it, as already explained.

I claim—

1. The combination, with the intermittingly-rotated head-block or carrier having the series of intermittingly-rotated screw-carrying spindles journaled therein, of the longitudinally-movable rotating lap or polishing-tool carried forward and held in position to engage the screws presented thereto by said spindles by spring-pressure, and a cam for automatically withdrawing the lap before the presentation of the screw held by the next spindle, substantially as described.

2. The combination, with the rotary head-block or carrier and a rotating lap or polishing-tool to which the screws are successively presented, of the rotary screw-threaded screw-carrying spindles journaled in the head-block or carrier and rotating during and prior to their presentation to the lap or polishing-tool in a direction to cause the engagement of a screw therewith, whereby a screw presented by the attendant will be engaged with a spindle and its disengagement prevented during its contact with the lap or polishing-tool, substantially as described.

3. The combination, with the rotating head-block or carrier having the series of rotating screw-carrying spindles journaled therein, of the spring-pressed rotating lap movable in a plane parallel with the axis of the screw when acting on said screw, substantially as described.

4. The combination, with the intermittingly-rotated head-block or carrier having the series of intermittingly-rotated screw-carrying spindles journaled therein, of the longitudinally and horizontally movable lap or polishing-tool held in position to engage the screw presented thereto by the spindles by spring-pressure, and a cam for automatically withdrawing the lap before the presentation of the next screw, and a rod connecting said lap and the driving mechanism for oscillating the lap when in position to engage the screw, substantially as described.

5. The combination, with the rotary head having the forward step-by-step movement, the series of screw-carrying spindles journaled therein, having the pulleys thereon, and the rotary lap to which the screws held by the spindles are successively presented, of a belt engaging the pulleys and rotating the spindles successively as they are in position to present their screws to the lap, and also engaging another pulley removed from the lap and rotating it in a direction to cause the engagement of a screw presented to its spindle, substantially as described.

6. The combination, with the rotary head-block or carrier and a rotary lap or polishing-tool to which the screws are successively presented, of the rotary screw-threaded screw-carrying spindles journaled in the head-block or carrier and rotated during the presentation to the lap or polishing-tool in a direction to cause the engagement of a screw therewith, and subsequently rotated in the opposite direction to cause the disengagement of said screw, substantially as described.

7. In a screw-polishing machine, the combination, with the rotating head-block or carrier having the series of screw-threaded screw-carrying spindles journaled therein and the polishing-tool or lap, of a driving-belt engaging said screw-carrying spindles and rotating them in a direction to cause the engagement of a screw presented thereto, rotating them in the same direction during their presentation to the polishing-tool or lap, and finally rotating them in the opposite direction to cause the disengagement of the screws held thereby, substantially as described.

8. In a screw-polishing machine, the combination, with the rotating head-block or carrier having the series of screw-carrying spindles journaled therein, the polishing-tool or lap, and the driving-belt for successively rotating said spindles, of the screw-grasping jaws engaging the screws carried by the spindles after being acted on by the polishing-tool or lap and causing their disengagement from their respective carrying-spindles, substantially as described.

9. In a screw-polishing machine, the combination, with the rotating head-block or carrier having the series of screw-threaded screw-

carrying spindles journaled therein, the polishing-tool or lap, and the screw-grasping jaws for engaging the screws carried by the spindles, of a driving-belt engaging said spindles and rotating them in a direction to cause the engagement of the screws therewith prior to and during their presentation to the polishing-tool or lap and rotating them in the opposite direction when the screws held thereby are in engagement with said jaws, whereby the screws are released from their respective spindles, substantially as described.

10. In a screw-polishing machine, the combination, with the rotating head-block or carrier having the screw-carrying spindles journaled therein and the polishing-tool or lap, of jaws for removing the screws from the spindles, a cam for moving said jaws toward and away from the spindles, and a cam for closing said jaws when in proximity to the spindles and permitting them to open when removed from the same, substantially as described.

11. In a screw-polishing machine, the combination, with the rotating head-block or carrier, having the screw-threaded screw-carrying spindles journaled therein, the polishing-tool or lap, and gearing for belts engaging the spindles and rotating them forward during and prior to their presentation to the lap and then in the opposite direction, of grasping-jaws engaging the screws while the spindles are rotating backwardly to remove the same, a cam for moving said jaws toward and away from the spindles, and a cam for closing said jaws when in proximity to the spindles to engage a screw and permitting the same to open when removed from the spindles to release the screw held thereby, substantially as described.

12. In a polishing-machine, the combination, with the rotating polishing-tool or lap having the paste-receptacle beneath the same, of a roller for applying paste from the receptacle to the face of the lap, carried by an arm pivoted to a fixed support and connected to the driving mechanism, whereby it is applied to the face of the lap while removed from the work and removed from the same upon the presentation of the work, substantially as described.

13. In a polishing-machine, the combination, with the longitudinally-movable rotary polishing-tool or lap adapted to be moved forward to engage the work and having the paste-receptacle beneath the same, of a roller for applying paste from the paste-receptacle to the face of the lap, carried by an arm pivoted to a stationary support and connected to the lap-operating mechanism, whereby it is applied to said face when the lap is retracted and returned to its place in the paste-receptacle when said lap is moved forward, substantially as described.

14. In a polishing-machine, the combination, with the movable head-block carrying the work, the longitudinally-movable rotary polishing-tool or lap having the paste-receptacle beneath the same, and the roller for applying paste from the receptacle to the face of the lap, of a cam operating upon the forward movement of the head-block to retract the polishing-tool or lap and move the paste-wheel into contact with its face, as set forth.

15. The combination, with the rotary head-block or carrier having the series of screw-carrying spindles journaled therein, of the gripping-jaws for engaging the screws carried by said spindles to remove them, consisting of the two pivoted jaws mounted on a plate movable toward said head to carry the jaws around the screw, and the block for causing said jaws to close and grasp the screw, substantially as described.

16. The combination, with the rotary head-block or carrier having the series of screw-carrying spindles journaled therein, of the gripping-jaws for engaging the screws carried by said spindles to remove them, consisting of the two jaws pivoted on a plate mounted on a shaft passing longitudinally through the head and movable to bring said plate nearer to the head for carrying the jaws around the screw, and a rod, also passing through said head, having inclines on its end for causing said jaws to close and grasp the screw, as set forth.

17. In a screw-polishing machine, the combination, with the intermittingly-rotated head having the series of screw-threaded screw-carrying spindles journaled therein, the rotary polishing-tool or lap, and the gripping-jaws for removing the screws, of belts engaging said spindles while the head is stationary, one in position to present its screw to the lap and the other removed therefrom, and rotating them in a direction to cause a screw to be engaged therewith, another in position to present its screw to the gripping-jaws and rotating it in a direction to cause the release of a screw held thereby, substantially as described.

18. In a screw-polishing machine, the combination, with the intermittingly-rotated head having the series of screw-threaded screw-carrying spindles journaled therein, the longitudinally-movable rotary polishing-tool or lap, the cleaning-brush, and the gripping-jaws for removing the screws, operating on the screws held by the spindles when the head is stationary, of a belt engaging the spindle in position to present its screw to the polishing-tool, and also engaging another spindle removed therefrom and rotating them in a direction to cause the engagement of a screw therewith during the time said head is stationary, a belt for driving the spindle in position to present its screw to the cleaning-wheel and also engaging the spindle in position to present its screw to the gripping-jaws and rotating them in a direction to cause the disengagement of the screws, also operating when said head is stationary, and a cam moved

by the driving mechanism for moving the polishing-tool or lap up to and away from the screws as they are presented to and taken away from the same, substantially as described.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 5th day of October, A. D. 1887.

EDWARD A. MARSH.

Witnesses:
C. F. BROWN,
A. D. HARRISON.