2 Sheets—Sheet 1.

H. G. HOTCHKISS.

MACHINE FOR MILLING, POINTING, AND SHOULDERING KEYS.

No. 193,252. Patented July 17, 1877.

Fig. 1.

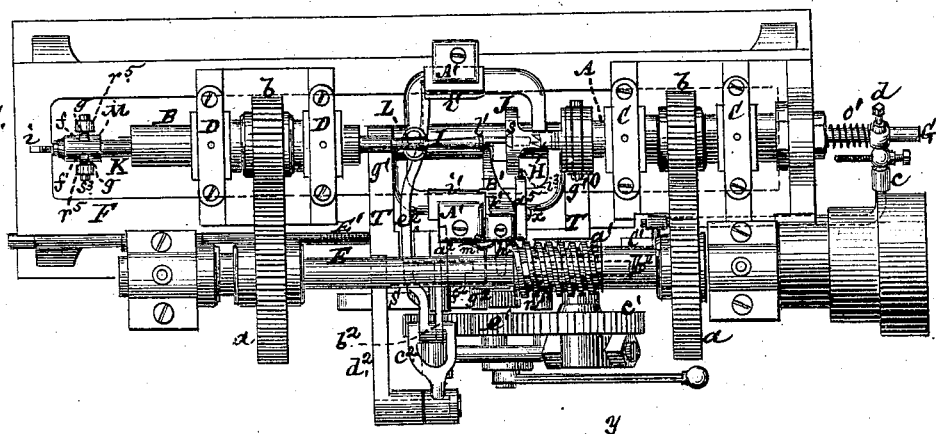


Fig. 2.

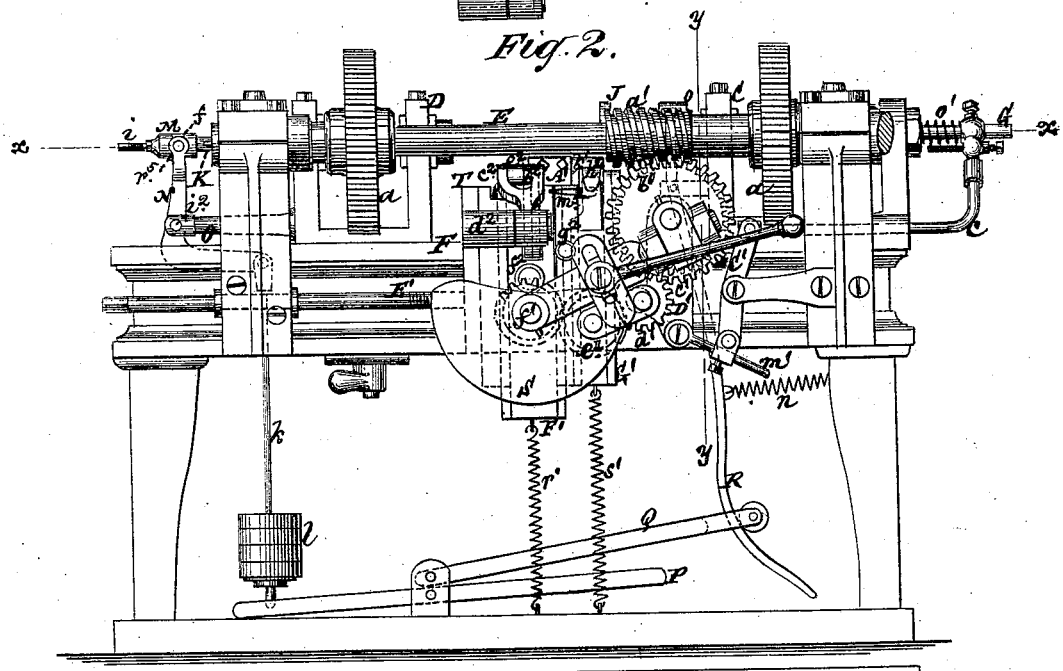
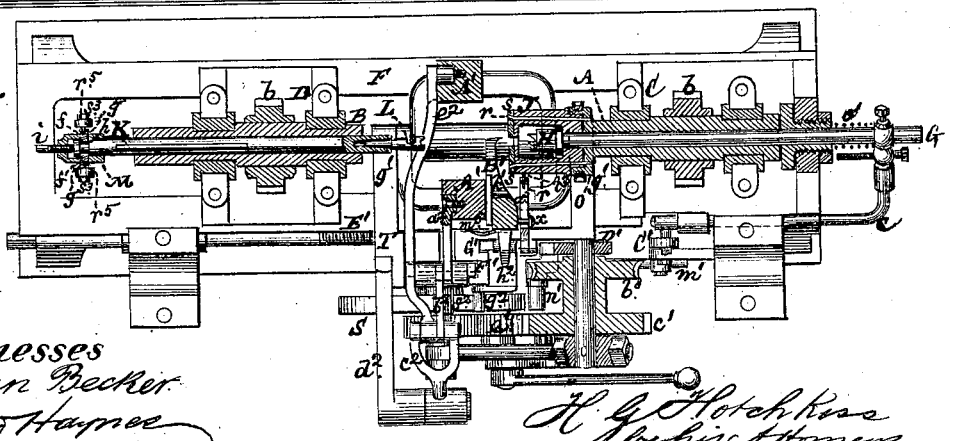


Fig. 3.



Witnesses
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by his Attorneys
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2 Sheets—Sheet 2.

H. G. HOTCHKISS.

MACHINE FOR MILLING, POINTING, AND SHOULDERING KEYS.

No. 193,252. Patented July 17, 1877.

Fig. 4.

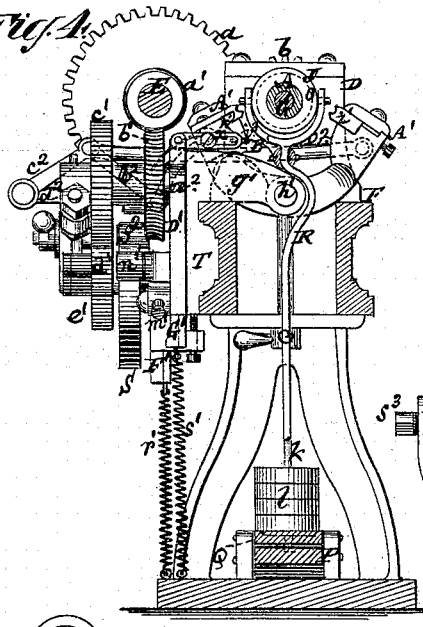


Fig. 5.

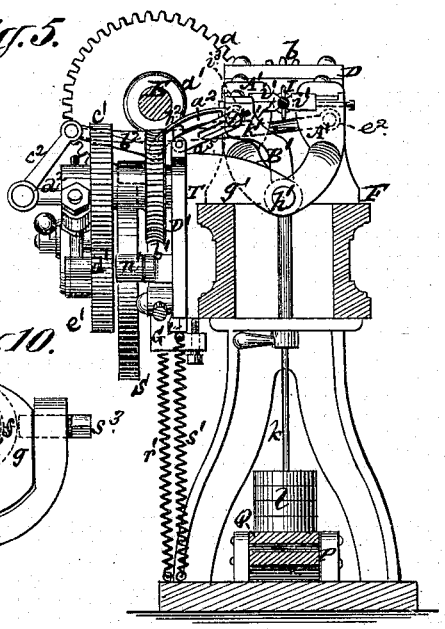
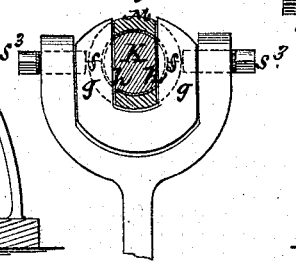
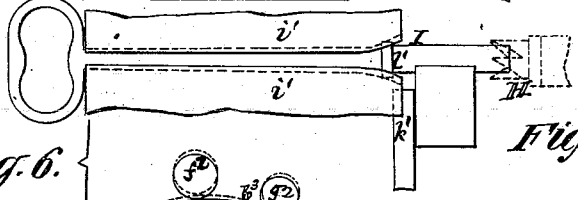


Fig. 10.





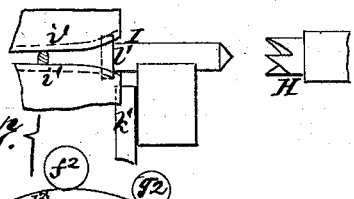


Fig. 6.

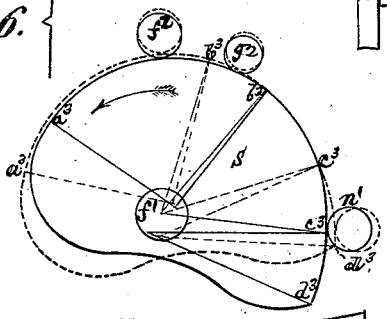
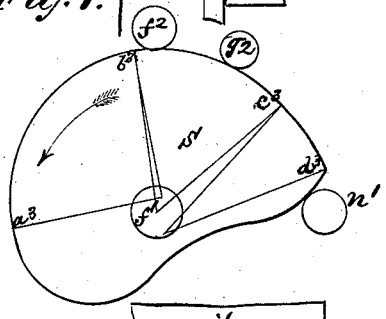


Fig. 7.



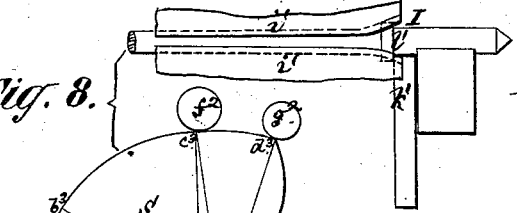


Fig. 8.

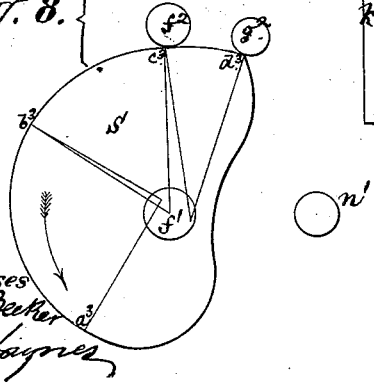
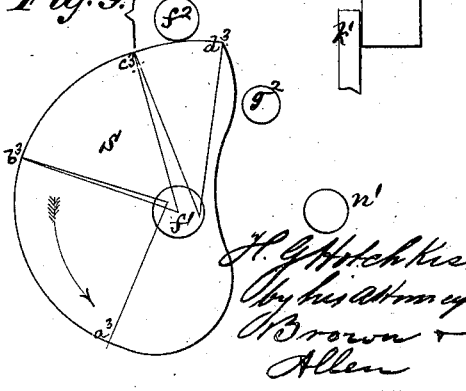


Fig. 9.



Witnesses
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UNITED STATES PATENT OFFICE.

HENRY G. HOTCHKISS, OF NEW HAVEN, CONNECTICUT.

IMPROVEMENT IN MACHINES FOR MILLING, POINTING, AND SHOULDERING KEYS.

Specification forming part of Letters Patent No. **193,252**, dated July 17, 1877; application filed March 8, 1877.

To all whom it may concern:

Be it known that I, HENRY G. HOTCHKISS, of the city and county of New Haven, in the State of Connecticut, have invented certain new and useful Improvements in Machines for Milling, Pointing, and Shouldering Keys, of which the following is a description, reference being had to the accompanying drawings, forming part of this specification.

This invention consists in certain novel constructions and combinations of mechanism for milling or turning or finishing the stem or body of the key lying between the bow and the bit, for pointing the pin or portion of the stem in front of the bit, and for shouldering the collar on the stem of the key, in keys requiring to be thus finished, whereby said operations may be performed in a most perfect and expeditious manner, and whereby, when the several parts of the invention are all comprised in one and the same machine, these respective operations may be carried out in a continuous manner in proper consecutive relation, free from all springing or twisting of the key, and without disturbing or removing it, or necessarily arresting the motion of the machine till all of said operations are completed.

In the accompanying drawing, Figure 1 represents a plan of a machine constructed in accordance with the invention. Fig. 2 is a rear elevation of the same; Fig. 3, a horizontal section thereof, mainly on the line *x x;* Fig. 4, a vertical transverse section on the line *y y*, showing the milling-dies open; and Fig. 5, a similar section, with the chuck which holds the bit of the key removed, and showing the milling-dies closed. Figs. 6, 7, 8, and 9 are diagrams, showing upon a larger scale different relative positions of a cam which actuates the milling, pointing, and shouldering tools, with certain rollers or their equivalents, operated by said cam, and the key, with the tools which operate upon it. Fig. 10 is a transverse section, upon a larger scale, of a certain forked slide and devices pertaining thereto.

A B are two hollow spindles or mandrels in the same axial line, and arranged to rotate, respectively, within bearings in a head-block, C, and tail-block D, in like directions and at the same velocity by or through a driving-shaft, E, and gears *a b*.

F is the shears or bed of the machine, on which said head and tail blocks are secured.

Longitudinally through the hollow spindle A is passed a rod, G, which also passes through a bent arm or rod, *c*, at one end of the machine, and is prevented by a set-screw, *d*, from turning with the spindle A. On the inner end of the rod G is attached a socket, H, which carries a tool suitably constructed for pointing the pin or portion of the stem in front of the bit of the key I. On the inner end of the spindle A, through which the rod G passes, and revolving with said spindle, is attached a hollow chuck, J, containing the socket H within it, as seen in Fig. 3. On the face of this chuck J are fitted two sliding jaws or dogs, *s s*, which serve to receive between them the pin and bit of the key, as hereinafter described. Immediately under these jaws is a recess, fitted to hold interchangeable bushings, which are adapted to receive different-sized pins. These bushings serve as a stop-gage for the bit of the key to rest against while the key is held in position between the chuck J and an opposite chuck, L, and they are always made thin enough to allow the pin of the key to pass through to the interior of the chuck J.

Arranged to pass longitudinally through the hollow spindle B, and so as to revolve with it, but capable of longitudinal movement therethrough, is a rod, K, which is formed with a socket at its inner end for reception of different-sized slotted chucks L, to suit different-sized keys, each chuck L serving to hold and rotate the key by or at its bow or handle. Upon the outer end of this rod K (see Fig. 3) is loosely fitted a socket, M, having opposite side slots *f f*, to admit of a forked slide, *g g*, which enters a reduced annular portion or neck, *h*, in the rod K. In the end of the socket M is placed the pointed set-screw *i*, which acts as a center for the rod K to revolve against, and thus, when a forward longitudinal pressure is applied to the socket M, it is communicated, in a very direct and central manner, to the rod K in relation to the forked slide *g g*, by means of the set-screw *i*,

to meet the exigencies of wear. The forked slide $g\ g$ is attached, by the two pivot-screws $s^3\ s^3$, to the fork $r^5\ r^5$ on the upper end of the bent lever N, having its fulcrum i^2 on an arm, O, secured to the tail-block D. In vibrating the bent lever N the pivot-screws $s^3\ s^3$ move in the arc of a circle, causing a transverse motion of the forked slide $g\ g$ through the slots $f\ f^1$ in the socket M, thereby preventing all lateral strain. To the lower end of this lever N is attached a rod, k, which passes down to the lower section P of a compound treadle, P Q, and over this rod, and resting on the lower end of it, are one or more weights, l, which serve to keep the chuck L pressed forward. The upper section Q of the compound treadle is constructed so that when pressed downward it acts upon a bent lever, R, which is controlled by a spring, n, and which is forked at its upper end, to act upon a sliding collar, o, at the back of the hollow chuck J. This sliding collar has attached to it slides or sliding bars $r\ r$, Fig. 3, which pass longitudinally through the sides or arms of the hollow chuck J, and are bent outward at their outer ends to operate on sliding clamps or dogs $s\ s$, arranged in the face of the hollow chuck J, and serving to gripe or hold the key I at its forward end.

By pressing the foot down on the upper section Q of the compound treadle, or releasing the foot from pressure thereon, the operator can open or close the sliding dogs $s\ s$, to relieve said dogs of gripe on the key, or to allow them to bite thereon. Likewise, when the upper treadle-section Q is sufficiently depressed, the operator is enabled, by continuing to press with his foot down thereon, or by releasing his foot from such continued pressure, to withdraw or advance the rod K with its attached chuck L, whereby provision is made for a rapid and easy adjustment of the key in the chucks J and L.

Upon the driving-shaft E is a screw or worm, a^1, which communicates motion, by or through a worm-wheel, b^1, to a train of gears, $c^1\ d^1\ e^1$, and these, in turn, impart rotary motion to a main actuating-cam, S, which revolves upon a stud, f^1, arranged to project from the back of a carriage, T, which is capable of adjustment along the bed F of the machine.

The object of the adjustment of the carriage T along the bed F of the machine is to adapt the latter to different lengths or sizes of keys, or to keys having different widths or bits, the projection of the bits from the chuck J being greater or less according to their width; and in order to adjust the shouldering-tool, hereinafter described, to the right position for cleaning or dressing the shoulder or collar of the key, it is necessary that said carriage should be adjustable along the bed F, so as to bring the shouldering-tool nearer to or farther from the chuck J, according to the width of the key's bit.

Attached to the carriage T by rods or arms $g^1\ g^1$ and a shaft or fulcrum-rod, h^1, connecting the forward ends of said arms, are the vibrating milling-jaws A A′, which approach or recede from each other simultaneously, and relatively to the body-portion of the stem of the key I, on or from the rod h^1 as a center of motion. Secured to the upper and forward ends of these jaws by means of clamps and rabbets in the jaws are dies $i^1\ i^1$, constructed to mill the body of the key between the bow and bit thereof. Arranged closely beside one of the jaws A′, and vibrating on the same axial rod or fulcrum h^1, is an arm, B′, (see more particularly Figs. 1, 3, and 4,) which carries a turning chisel, k', suitable for shouldering or turning to an exact gage the collar l' of the key on the stem of the latter in rear of its bit. The die i' of that one of the jaws A′ which has the arm B′ arranged on one side of it is rabbeted to allow the shouldering-chisel k' to project laterally beyond said die on its under side, thus preventing the milling-dies and shouldering-chisel from leaving a burr or ridge upon the edge of the shoulder or collar l'. The arm B′, which carries the shouldering-chisel k', is hung so as to be capable of vibrating entirely independent of the milling-jaws A′ A′.

The bent arm or rod c, which carries the outer end of the chuck-rod G, is connected at its inner end to a beam or double-armed lever, C′, which, in its turn, is connected in an adjustable manner, by means of a sliding rod, m^1, and set screw, with a swinging arm or lever, D′, having a stud or roller, n', against which the cam S operates to force the socket H, which carries the pointing-tool, up against the pin or forward end of the stem of the key, as against the action of a retiring-spring, o', on the rod G.

The milling-jaws A′ A′, and the arm B′, which carries the shouldering-tool, together with their immediately-pertaining working-parts, are sustained by the carriage T, of which the arms $g^1\ g^1$ form a part, and which carriage is adjustable along the bed F by means of a screw, E, to adapt the milling or shouldering tools to different lengths or sizes of keys, or to different widths of key-bits, as hereinbefore described. This carriage T is fitted with independent upright slides F′ G′, held down by springs $r'\ s'$. The one, F′, of these slides is connected, by a pivoted rod, a^2, with one of the vibrating jaws A′, and is further connected, by a rod, b^2, with a lever, c^2, having its fulcrum on a bracket or arm, d^2, fast to the carriage T, which lever is in its turn connected, by a rod, e^2, with the other vibrating milling-jaw A′. By this construction or combination of parts, whenever the slide F′ is raised against the downward pull of the spring r' by the action of the cam S upon a stud or roller, f^2, attached to said slide, the milling-jaws A′ A′ are worked toward each other to act upon the stem of the key I between the bow and the bit, and as the cam S recedes from action on the roller f^2 the spring

r' causes the jaws A′ A′ to separate or work backward. The other slide G′ serves, when raised by the action of the cam S on a roller or stud, g^2, against the downward pull of the spring s', to move forward the arm B′ and its attached shouldering-tool k' by means of a very stiff spring-arm, h^2, which is attached to the back of the arm B′, to cause said tool to act upon the shoulder or collar of the stem, and when the cam recedes from action on the roller g^2 the spring s' causes the slide G′ to return to its original position, relieving the spring-arm h^2 from pressure, and thus allowing a spring, m^5, to move the arm B′ and its attached shouldering-tool k' backward or away from the key. Attached to the side of the arm B′ is a projecting stud, x, Fig. 4. To a projecting end of the gib which receives the slide G′ on one side, is attached, by a hinge-joint, the link a^5, the stud x working through the slot in this link. Through the end of the link a^5 passes the set-screw i^3, which acts as a gage or stop for the stud x to work against. Thus, when the arm B′ is thrown forward by the upward thrust of the slide G′, it continues to move forward until the stud x strikes the gage-screw i^3. The gage is so arranged that the stud x will strike the gage-screw i^3 just before the cam has forced the slide G′ to its extreme upward position, the spring-arm h^2 yielding enough to allow the slide to move upward very slightly, thus allowing the cam to pass the roller g^2, which is attached to the slide without straining any part of the machine, and as the stud x is thus held very firmly for an instant against the gage screw i^3, perfect regularity of work performed by the shouldering-tool is always insured.

The cam S is not only cut away on one side of its axis, as shown in Figs. 2, 6, 7, 8 and 9, to provide for the withdrawal of the milling-jaws, the shouldering-tool, and the pointing-tool from the work after they have performed their respective duties, but it is constructed on its acting edge or surface of different curvatures, as shown in Figs. 6, 7, 8, and 9. Thus, from a^3 to b^3 is of eccentric curvature, from b^3 to c^3 of concentric curvature, and from c^3 to d^3 of a different eccentric curvature. The object of this construction is to obtain such a relative action of the irregular cam S on the rollers f^2 n' g^2, which, respectively, communicate motion to the pointing-tool of the socket H, to the milling-jaws A′ A′, and to the shouldering-tool k', that, in the operation of these several tools on the key, the work of milling, pointing, and shouldering will be performed in a continuous manner and more or less consecutively, whereby all springing of the key is prevented, and the work is done both perfectly and expeditiously. Thus, in the general operation of the machine, the key I or casting of which the same is composed is properly placed in the chucks J and L, and as the eccentric surface from a^3 to b^3 of the revolving cam S passes under the roller f^2 on the slide F′, it lifts said slide, as shown by the different positions of the roller f^2 and cam in full and dotted lines, Fig. 6, thereby closing the jaws A′ A′ so that they commence to mill the stem of the key I. As the cam S continues to revolve its eccentric portion from c^3 to d^3 (shown by full lines in Fig. 6) strikes the roller n' of the pointing-tool mechanism, and, as said eccentric portion passes said roller, causes the latter to be forced outward, and the rod G carrying the pointing-tool in the socket H to be forced forward, thereby pointing the pin or forward portion of the stem of the key, which, during such pointing operation, is firmly held in place by the milling-dies. When the cam S has reached the position shown for it by dotted lines in Fig. 6 the pointing of the key is about or nearly completed, after which the cam S clears the roller n' and allows the pointing-tool to be worked back by its controlling-spring to its original position, and the concentric portion from b^3 to c^3 of the cam comes under the roller f^2, all as shown in Fig. 7. During this travel of the concentric portion of the cam under the roller f^2 of the milling-jaws mechanism said jaws simply continue their hold on the key, and while such concentric portion of the cam is acting upon the roller f^2 the eccentric portion of the cam from c^3 to d^3 strikes and operates on or against the roller g^2 of the slide G′, and, forcing said slide upward, causes the arm B′ to press the shouldering-tool k' to act upon the shoulder l' of the key, as shown in Fig. 8. During this shouldering operation the milling-dies continue their hold on the key and only exert a slow milling operation while the shouldering is being finished. As the cam S still continues to revolve, its eccentric portion, from c^3 to d^3, passes the roller g^2, after which the shouldering mechanism is returned by the spring s' to its normal position, and said eccentric portion of the cam next acts under the roller f^2 to complete the milling, as shown in Fig. 9. The acting portion of the cam S then passes from under the roller f^2 and the jaws are retired by the action of the spring r', when the milled, pointed, and shouldered key may be withdrawn and another key casting put in its place between the chucks J and L.

It will be observed that, by reason of the construction of the cam S and arrangement of the rollers for operating the shouldering and pointing tools, said tools cannot operate together, thus preventing any tendency to spring the stem of the key outside of the milling-dies, and also that the shouldering-tool does not perform its work until the milling is nearly completed and the key-casting well rounded, thus insuring more perfect work than if the shouldering was performed at an earlier stage in the milling operation.

I claim—

1. The combination, with the rocking milling-jaws A′ A′, of their closing-slide F′, the rod a^2, connecting said slide with one of said

jaws, the rod b^2, connecting the slide F′ with a lever, c^2, and the rod e^2, connecting said lever with the other milling-jaw, A′, essentially as described.

2. The combination of the spring h^2 with the slide G′ and rocking-arm B′, which carries the shouldering-tool, essentially as described.

3. The rocking-arm B′, which carries the shouldering-tool, arranged to one side of one of the milling-jaws A′, in combination with the die i^1 of said jaw, rabbeted to receive within and under cover of its one side the shouldering-tool k^1, whereby burr upon the edge of the shoulder of the key is prevented, substantially as specified.

4. The combination of the gears c^1 d^1 e^1, with the revolving cam S, and the slide F′, with its attached stud or roller, f^2, for operating the milling-jaws, essentially as described.

5. The revolving cam S of irregular construction on its acting surface, in combination with the studs or rollers f^2 g^2 and the slides F′ G′, by which the milling-jaws and shouldering-tool are operated, essentially as specified.

6. The irregularly-constructed revolving cam S, in combination with the studs or rollers f^2, n', and g^2 of the mechanism, by which the milling-jaws, the pointing-tool, and the shouldering-tool are operated, substantially as specified.

7. The combination of the socket H, which carries the pointing-tool, the sliding rod G, the bent rod or arm c, the lever C′, the adjustable rod m^1, and the swinging arm D′, for feeding the pointing-tool to its work, essentially as described.

8. The combination, with the rotating hollow chuck J and its hollow mandrel A, of the longitudinally-adjustable inner tool-socket H, and the tool therein, substantially as and for the purposes herein set forth.

9. The combination of the slotted chuck L on the sliding rod K, the forked lever N, the rod k, the weight l, the compound treadle P Q, the bent lever R, the spring n, and the sliding collar o, by which the chuck J is opened and closed, essentially as described.

10. The slotted socket M on the sliding chuck-rod K, in combination with the forked slide g g, the fork r^5 r^5 of the lever N, the set-screw i, and the hollow mandrel B, substantially as specified.

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