To all whom it may concern:

Be it known that I, George W. Bowers, a citizen of the United States, and resident of Somerville, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Machines for Making Grinding-Laps, of which the following is a specification.

This invention relates to the manufacture of cylindrical abrasive tools, especially of the kind used in the grinding machine for which I am filing an application concurrently herewith, Serial No. 734,450. The abrasive tool is of a kind known as "diamond lap," and consists of a cylindrical piece of stock having a coating of diamond powder embedded in its surface. As the tools of this nature used for doing fine work in connection with the manufacture of watches are exceedingly small, it has been difficult heretofore to properly coat the surfaces of the stock with the abrasive material. By means of the machine such as illustrated in the accompanying drawings, I am able to apply the abrasive material and embed it in the cylindrical surface of the stock in a much less period of time than heretofore.

The object of my invention is to overcome the objection mentioned as to the saving of time in the production of the grinding laps, and to distribute the abrasive coat over the stock evenly.

A further object of the invention is to produce the grinding laps in absolutely true cylindrical form and in accurate duplication.

To these ends the invention consists in the improvements which I shall now proceed to describe and claim.

Of the accompanying drawings: Figure 1 is an elevation of the machine; Fig. 2 is an end elevation taken from the right of Fig. 1; Fig. 3 represents a section on line 3—3 of Fig. 2; Fig. 4 represents a section on line 4—4 of Fig. 3.

Similar reference characters indicate the same or similar parts in all of the views.

A suitable base 10 has standards 11 secured thereto, said standards being for the work bed, as hereinafter described. The standards are formed with inner horizontal recesses 12 (Fig. 4), and with openings 13 to permit the introduction of the work between the rolling members of the machine. Said standards are secured to the base by suitable means, as by screws 14 passing through lateral projections or feet of the standards which enter the recesses 15 of the standards. A rack 16 is secured to the under side of the bed 16, as by screws indicated by dotted lines in Fig. 3. The upper portion of the bed 16 is of slightly less transverse area than the intermediate portion thereof, and extending around said intermediate portion is a strip or series of strips 50 which project upwardly so as to form, between their inner faces and the outer wall of the upper portion of the bed 16, a channel to receive and avoid loss of abrasive material which might escape over the edge of the facing 17.

The bed 36 is made up of two standard toothed segments 21, as best illustrated by the full and dotted lines representation in Fig. 1. These segments engage the teeth of the rack 19 of the reciprocating bed. As shown by comparing the several figures of the drawings, the two segments 21 are not in alignment or in the same plane, but are mounted in advance of the other longitudinally of the machine, but they mesh with different lateral portions of the rack 19, the result of this mounting being to cause the upper surface of the bed 16 to occupy a true plane parallel with the plane of the upper coacting member described, under the influence of a cylindrical body inserted and rolled between the two surfaces as will be explained more fully hereinafter. Each segment 21 is pivoted at 22 to one end of a link 23 which is mounted upon a pivot pin 24 supported by the standard 11, a spacing collar 26 being upon said pin between the two links 25. As shown in Fig. 1, the two links 23 extend in opposite directions from the pivot pin 24.

A bracket 26 for the mechanism which reciprocates the bed 16 is secured to the base 10 as by screws 27 passing through lateral projections or feet of said bracket. As best shown in Fig. 2, the bracket is provided with ways 28 for a slide 29 having a vertical slot 30 (Fig. 3). The slide 29 is formed
or provided with an arm or lug 31 (Figs. 9 and 8) through which a screw 32 passes into the end of the bed 16. Another bracket 33, which however might be a portion of the bracket 26, is secured to the base 10 by screws 34 (Fig. 2). Mounted in said bracket 33 is a shaft 35 having a pulley 36 for a driving belt. The shaft 35 has secured to it a pinion 37 which meshes with a gear 38 mounted on a stud 39 having a crack pin 40 entering a block 41 fitted in the vertical slot 30 of the slide 28.

As will be obvious, the mechanism just described imparts reciprocating motion to the bed 16, the latter being supported upon the oscillating segments. Owing to the pressure required for the rolling operation as hereinafter described, the oscillating segments are necessary to support the reciprocating bed to avoid the friction that would result if said bed were mounted to slide in or on ways.

As has been mentioned the upper portions of the standards 11 are clamped together and the inner face of each is formed as the half of a female screw so that the two standards clamped together and threaded as described provide a threaded aperture for the screw post 42, which is provided with apertures 43 to receive any suitable implement for rotating the screw post. Said screw post is held in or formed with a vertical recess 44 for the stem 45 of the upper member or presser 46 of the machine, said upper member having a lower facing 47 of hardened steel or other suitable material. A screw 48 passing vertically through the head of the screw post 42 has its lower threaded end engaging a vertical threaded recess in the stem 45 of the member 46. Said screw 48 is provided with a head 49 between which and the top of the screw post 42 is a spring 50.

The construction just described enables the securing of an accurate adjustment of the upper member or presser relatively to the lower reciprocating member or bed so as to vary the space between them for rolling the cylindrical laps.

In Figs. 1, 3 and 4 the work is indicated at a. The portion thereof which to have the abrasive material applied is either made of relatively soft metal or coated with relatively soft metal, which may be tin. In operation a suitable quantity of diamond dust or other abrasive if desired is spread upon the facing of the reciprocating bed. The piece of stock is introduced through an opening 18, the screw 42 being then in such position that the upper member is sufficiently forced from the lower member to permit the introduction of the piece of stock. The screw 42 is then rotated to bring the upper member to proper position relatively to the lower member, the proper degree of movement of the screw 42 being gaged by suitable means, such as graduations upon the head of the screw 42, as indicated in Fig. 1, a suitable pointer being employed to facilitate the proper adjustment of the screw 42. The screw 48 simply preserves the proper relative positions of the screw 42 and the presser member 46, the spring 50 keeping the lower end of the screw 42 in contact with the surface of the upper member 46, as shown in Fig. 3. If the spring 50 were omitted and the head 49 of screw 48 arranged to bear directly upon the top of the head of screw 42, then adjustment of the screw 42 would be interfered with by the binding action of the head of screw 48, and rotation of said screw 42 would be liable either to loosen the screw 48 or cause it to bind. Hence the screw 48 and the spring 50 keep the upper member or presser 46 in proper position relatively to the adjusting screw post 42, while permitting the latter to be readily adjusted according to the diameter of the lap to be rolled.

Rising upwardly through the base 10 are two screws 52, the upper end of which bears against the under surface of the portion of link 23 which carries the pivot 29, so that by means of the two screws 52, the pivots of the two segments 21 may be altered in height to adjust the bed 16 or leveled so that the rolling action will result in a true cylindrical grinding lap.

After the bed 16 has received its supply of abrasive material, and the piece of work at has been inserted as hereinbefore described, the reciprocations of the bed 16 caused by the actuating gearing hereinafter described will be continued long enough to roll the piece of work back and forth between the two hard surfaces 17, 47, which surfaces will cause the abrasive material to be pressed into the relatively soft metal of the work so as to produce an accurate and truly cylindrical grinding lap.

Having described my invention, I claim:

1. A machine of the character described, comprising two flat, hard-surfaced members means for holding the upper member stationary, means for reciprocating the lower member in a plane parallel to the surface of the upper member, and adjusting devices for varying the space between the two hard-surfaced members.

2. A machine of the character described, comprising two flat, hard-surfaced members, means for holding the upper member stationary, means for reciprocating the lower member in a plane parallel to the surface of the upper member, and means for adjusting both of said hard-surfaced members relatively to each other.

3. A machine of the character described, comprising two flat, hard-surfaced members means for holding the upper member sta-
tionary, means for reciprocating the lower member in a plane parallel to the surface of the upper member, and independent adjusting devices for different portions of the lower reciprocating member.

4. A machine of the character described, comprising a hard-surfaced bed having a toothed lower surface, a pair of oscillating segments meshing with said toothed surface, said segments being supported one in advance of the other longitudinally of the machine but meshing with different lateral portions of said toothed surface, means for reciprocating the bed, and an adjustable hard-surfaced presser above said bed.

5. A machine of the character described, comprising a hard-surfaced bed having a toothed lower surface, a pair of oscillating segments meshing with said toothed surface, means for vertically adjusting said segments, means for reciprocating the bed, and an adjustable hard-surfaced presser above said bed.

6. A machine of the character described, comprising a hard-surfaced bed, a hard-surfaced stationary presser above the bed, a plurality of rolling supports for the bed, and means independent of the supports for reciprocating the bed on said supports.

7. A machine of the character described, comprising a hard-surfaced bed, means for reciprocating it, a hard-surfaced presser above the bed, said presser having a vertical stem, and a screw post having a recess to receive the stem of the presser, means being provided for yieldingly maintaining the relationship of the presser and screw post.

8. A machine of the character described, having two standards clamped together and having threaded recesses which together form a divided female screw, a screw post engaging said female screw, said post having a vertical recess, a presser having a stem entering said recess, means for yieldingly maintaining the relationship of said screw post and presser, a bed below said presser, and means for reciprocating the bed.

In testimony whereof I have affixed my signature, in presence of two witnesses.

GEORGE W. BOWERS.

Witnesses:

A. W. HARRISON,
P. W. PEZZETTI.