F. A. KERSHAW.

LAPPING MACHINE.

APPLICATION FILED APR. 10, 1919.

1,434,824.

Patented Nov. 7, 1922.

2 SHEETS—SHEET 1.

Fig. 1.

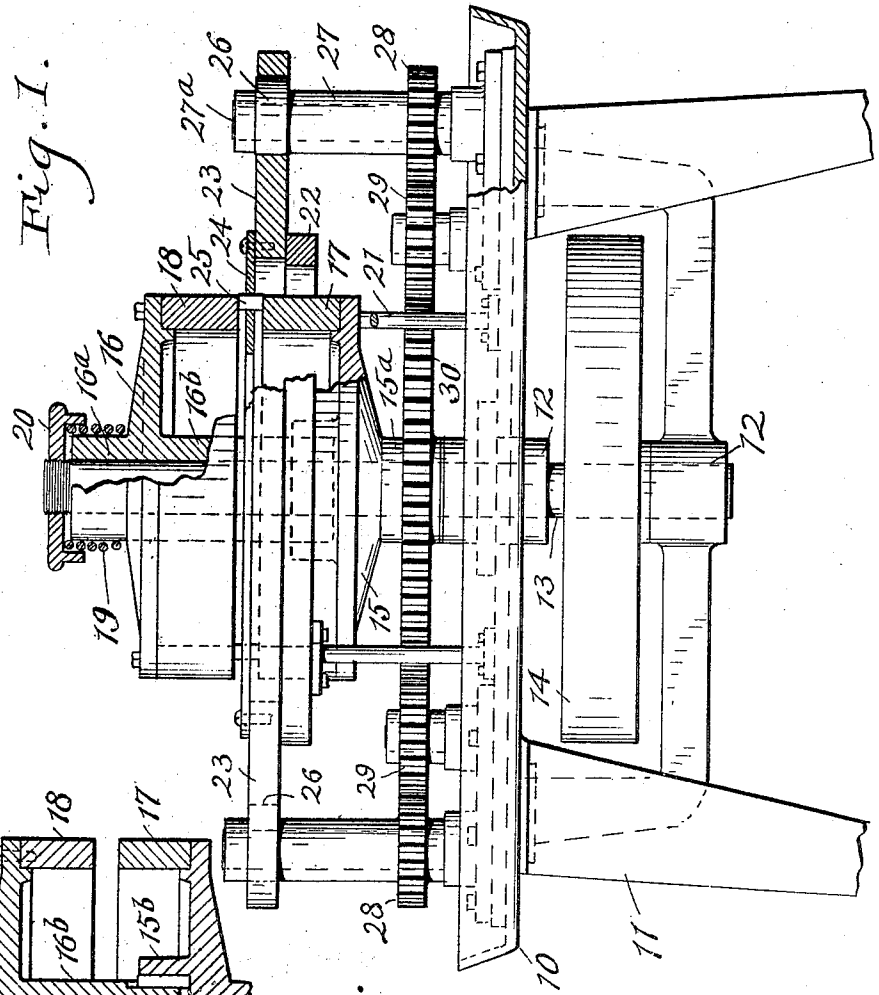


Fig. 3.

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2 SHEETS—SHEET 2.

Fig. 2.

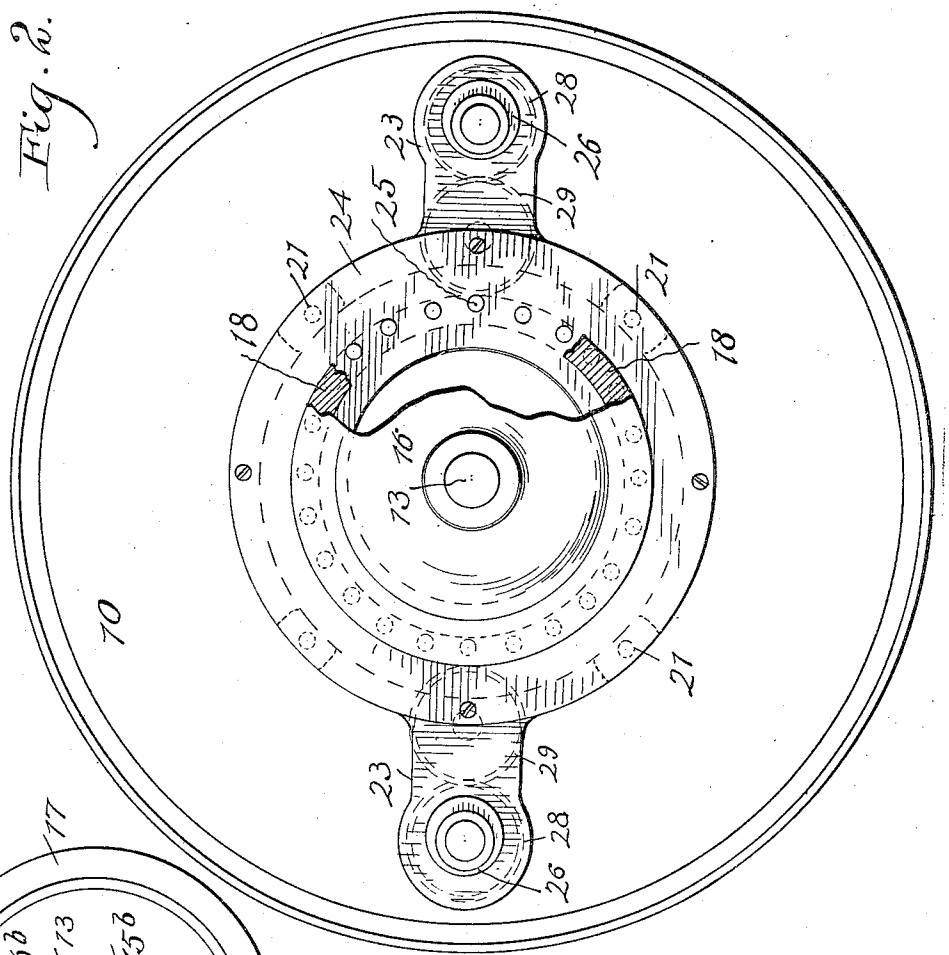
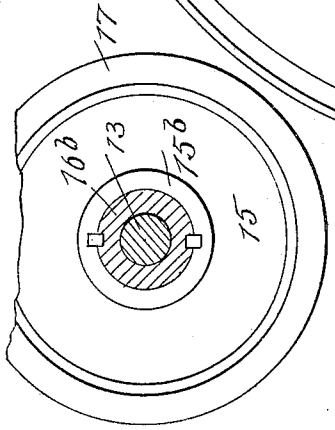


Fig. 4.



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UNITED STATES PATENT OFFICE.

FRANCIS A. KERSHAW, OF KENT, OHIO.

LAPPING MACHINE.

Application filed April 10, 1919. Serial No. 289,107.

To all whom it may concern:

Be it known that I, FRANCIS A. KERSHAW, a citizen of the United States, residing at Kent, in the county of Portage and State of Ohio, have invented a certain new and useful Improvement in Lapping Machines, of which the following is a full, clear, and exact description.

This invention relates to that type of apparatus known as a lapping machine, and has for its chief object to provide a machine so constructed and operated as to produce accurate parallel plane surfaces on the articles being lapped, especially gauges which are to have great accuracy, and are generally known to machinists as precision gauges.

A further object is to so mount and operate the laps and the holder for the work or gauge blanks that the blanks will be acted on by all portions of the lapping surfaces so as to maintain the latter in parallelism.

In the machine constituting the subject matter of this invention, the lapping surfaces are the opposing parallel faces of two lap rings which are rotated by a spindle, and the blanks to be lapped are in a holder which may be in the form of a ring or flat plate between the lapping surfaces, which holder is operated on by eccentrics or equivalent devices which give the holder a movement such that all the blanks of the holder will have a similar motion with respect to the rotating lapping surface, such that they travel back and forth, with an orbital movement from one edge or periphery of the lapping surfaces to the other.

The invention may be briefly summarized as consisting in certain novel combinations and arrangements of parts and details of construction which will be described in the specification and set forth in the appended claims.

In the accompanying sheets of drawings, Fig. 1 is a side elevation of my improved lapping machine, parts being broken away for the sake of clearness; Fig. 2 is a top plan view of the same; Figs. 3 and 4 are respectively a detail vertical and horizontal sectional view through the hubs of the lap holders.

The machine includes a base 10, which may, if desired, be in the form of an oil pan, but which will have sufficient rigidity to adequately support in proper relationship the working parts of the machine. The base which in itself may be mounted upon legs 11, has suitable journal bearings 12 for a vertical spindle 13, which may be driven by a belt pulley 14, or otherwise. Secured to the spindle above the base 10 is a lower lap holder 15, with a downwardly extending hub 15^a which may have a tight fit on the shaft, and is secured thereto by a key, set screw, or otherwise, and having an upper hub 15^b whose bore is somewhat larger than the diameter of the shaft.

Above the lap holder 15 is a second lap holder 16 with an upper hub 16^a and a lower hub 16^b which may have a close working fit on the spindle, and the lower hub has a close sliding fit in the hub 15^b of the lower lap holder 15. The two interfitting hubs are connected together by oppositely disposed feathers which allow the two lap holders to move axially on the shaft, one relative to the other, while at the same time constraining them to rotate in unison.

Secured to the upper side of the lower lap holder 15 and to the lower side of the upper lap holder are two laps or lap rings 17 and 18, whose opposing parallel faces constitute the lapping surfaces. The construction is such that both lap rings 17 and 18 will be rotated together with the opposing lapping surfaces traveling in true parallel planes, insuring that the gauge blanks or other articles placed between the laps and operated on simultaneously by the opposing lapping surfaces will have produced on their opposite surfaces parallel planes of great accuracy.

Gravity may be relied on to produce the lapping pressure, but if gravity is not sufficient, I may employ a spring such as shown at 19, and located between the upper lap holder 16 and an adjustable nut or hand-wheel 20 on the upper end of the spindle. From this it will be seen that the pressure exerted on the blanks being lapped can be varied as much as desired by adjusting the hand-wheel 20.

Supported from the base 10 by columns 21 or otherwise, is a horizontal ring 22 which surrounds the lower lap ring 17, and mounted to slide horizontally over the top surface of this ring is a flat circular plate 23 to which is secured the work or blank holding plate 24, in this case in the form of a ring or annulus, this blank holder extending inwardly between the lapping surfaces, as clearly shown in Fig. 1. This blank holder will have a number of openings spaced

around the same for blanks such as shown at 25, which as before, may be, and usually are gauge blanks. The shape of the openings will, of course, depend upon the shape or outline of the blanks, which may be circular, square, or other shape.

The work holder 24 is not stationary during the lapping operation, but is given a motion such that each blank, no matter where it is located in the blank holder, will have an orbit, in this case, a circular orbit which causes the blank to move inwardly and outwardly between the peripheries of the rotating lapping surfaces. In this instance the plate 23 which carries the blank holder 24, is actuated by two similar eccentrics 26 which are disposed on diametrically opposite sides of the machine, and are received in circular openings in extensions 23^a of the holders 23. These eccentrics are integral with sleeves 27 mounted on vertical studs 27^a, and each is rotated by a gear 28, integral with or fixed to the sleeve 27, and by idler gear 29, and a relatively large gear 30, the latter being secured so as to be rotated by the spindle 13. The spindle 27 and idler gears 29 are suitably supported from the base 10.

Thus it will be seen that through the motion imparted by the eccentrics 26, every point of the blank holder 24 describes a circle or travels in a circular orbit whose diameter is equal to the throw of the eccentrics, which throw is sufficient to move the blanks entirely across the lapping surfaces. Preferably the inner portions of the blanks will when in their extreme innermost position extend slightly beyond the inner edges of the lapping surfaces, and the outer portions of the blanks will when in their outermost positions extend slightly beyond the outer edges of the lapping surfaces. Preferably the number of teeth of the gears 28 and 30 are so selected that a large number of revolutions of the lap rings will be required before a blank in the blank holder will occupy the same position relative to the lapping surfaces that it occupied at any previous instant. In any event, the relative angular speeds of the gears 28 and 30 will be such that in a predetermined interval of time each blank will be acted on by all parts of the lapping surfaces. This insures the maintenance of the original truly parallel relationship of the opposing lapping surfaces, and absolutely prevents the formation of grooves, shoulders, or irregularities in the lapping surfaces.

The blank holder need not be in the form of a continuous ring as shown, but in some instances the blank holding means may consist of a series of arms secured to and extending inwardly from the supporting and driving member, in which event the inner ends of the arms located between the lapping surfaces would have openings or compartments for the blanks.

While I have shown only the preferred embodiment of my invention, other ways of carrying out the principle of the invention may be employed as long as the means stated in the appended claims, or the equivalent of the same be employed.

Having described my invention, I claim:

1. In a lapping machine, a pair of opposing laps rotatably mounted and provided with parallel lapping surfaces, a blank holder extending between the laps and having means for receiving blanks, means for rotating the laps, and means for actuating the blank holder so that each point thereof is moved between and in a plane parallel to the lapping surfaces about a fixed axis different from the axis of movement of every point thereof and so that at least a part of each blank receiving means is at all times between the lapping surfaces.

2. In a lapping machine, a pair of opposing laps rotatably mounted and provided with flat parallel lapping surfaces, a blank holder extending between the laps, means for rotating the laps, and means for actuating the blank holder so that each point of the blank holder has a fixed orbital path between and in a plane parallel to the lapping surfaces different than the fixed orbital path of every other point, and sufficient in diameter to cause the blanks to be carried back and forth across the lapping surfaces without wholly passing from between the lapping surfaces at any point.

3. In a lapping machine, a pair of laps rotatably mounted and provided with opposing lapping surfaces, means comprising a shaft disposed centrally with respect to the laps for rotating the same, a work holder extending between the laps, and means operatively connected to the work holder independently of the bearing of the shaft for actuating the work holder so that each point thereof is given an orbital movement between the rotating lapping surfaces and in a plane parallel to the latter.

4. In a lapping machine, a pair of opposing laps rotatably mounted, means for rotating said laps, a work holder extending between the laps, and means operatively connected to the work holder laterally outside of the lapping surfaces for actuating the holder so that each point therof has an orbital movement sufficient to carry the work back and forth across the rotating lapping surfaces and in a plane parallel to the latter.

5. In a lapping machine, a pair of opposing laps rotatably mounted, means for rotating said laps, a work holder extending between the laps, and means comprising a plurality of eccentrics engaging the work holder for actuating the same so that each point thereof has an orbital movement suffi-

cient to carry the work back and forth across the rotating lapping surfaces and in a plane parallel to the latter.

6. In a lapping machine, a pair of opposing laps rotatably mounted, means for rotating said laps, a work holder extending between the laps, and means comprising a plurality of eccentrics engaging the work holder laterally outside of the lapping surfaces for actuating the holder so that each point thereof has an orbital movement sufficient to carry the work back and forth across the rotating lapping surfaces and in a plane parallel to the latter.

In testimony whereof, I hereunto affix my signature.

FRANCIS A. KERSHAW.