

Sept. 30, 1924.

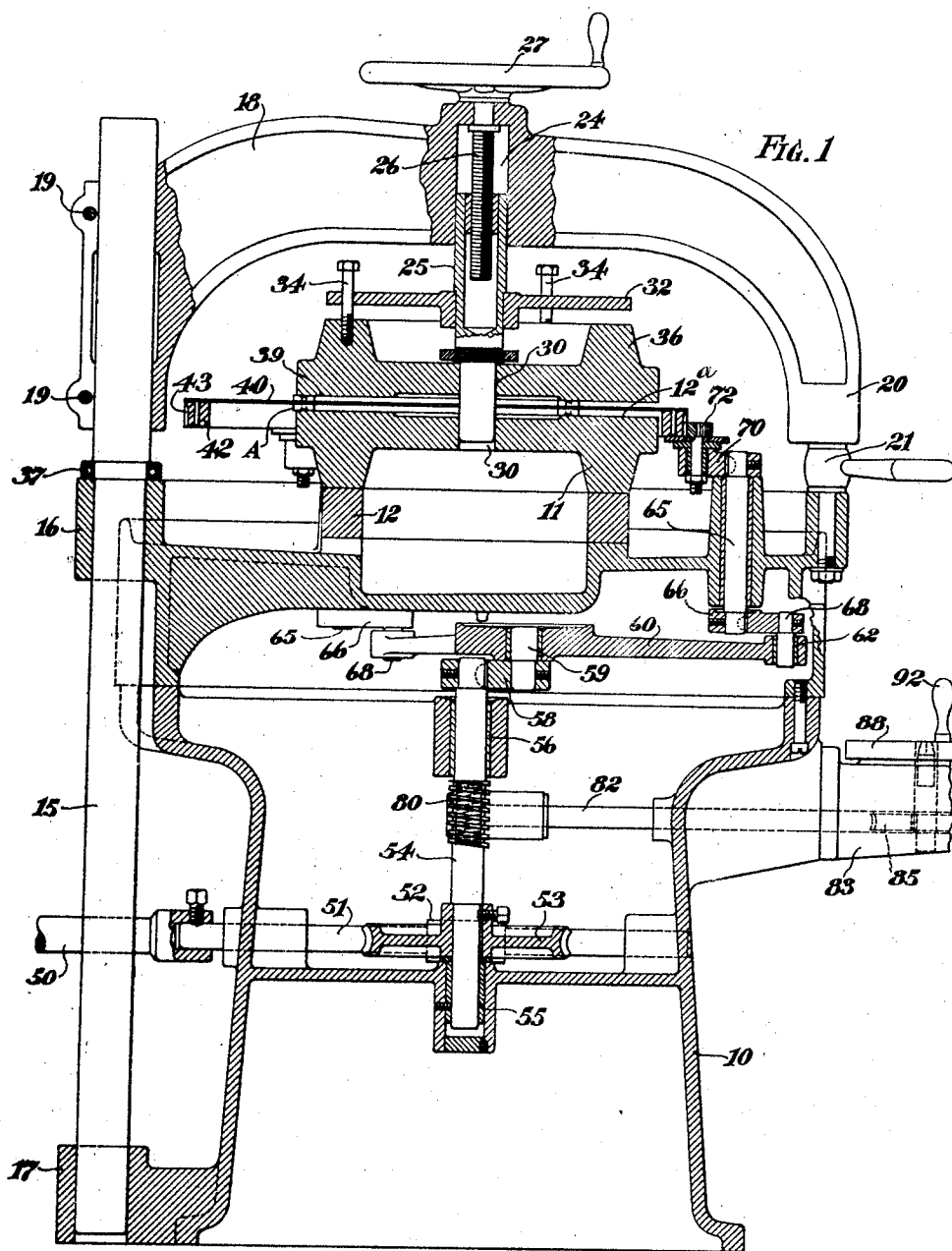
B. H. BLOOD

1,509,823

LAPPING MACHINE

Filed April 13, 1921

2 Sheets-Sheet 1



Inventor
B. H. Blood,
By Joseph V. Schofield
Attorney

Sept. 30, 1924.

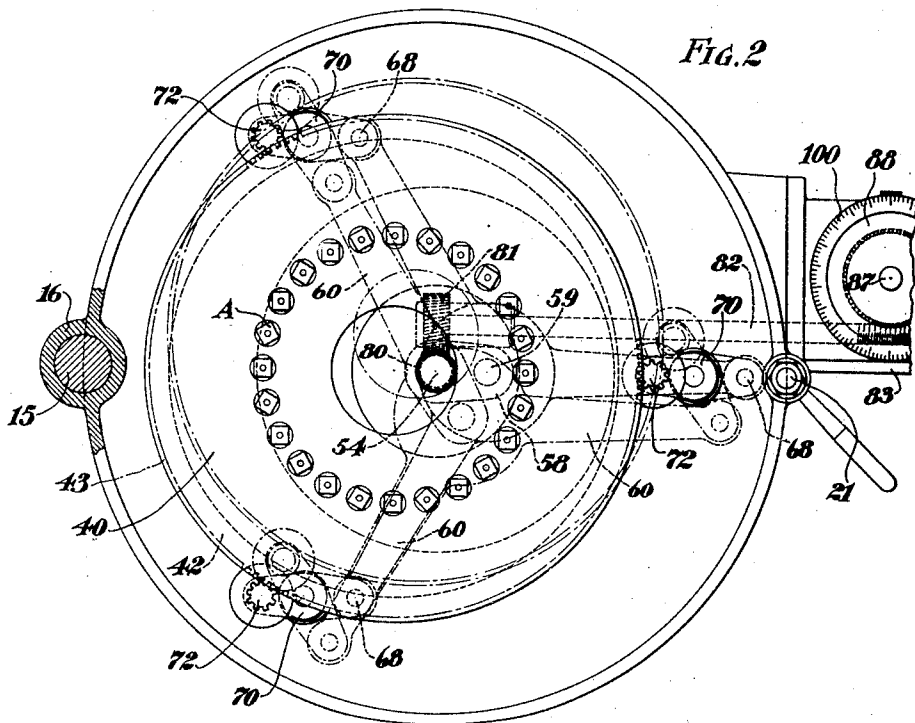
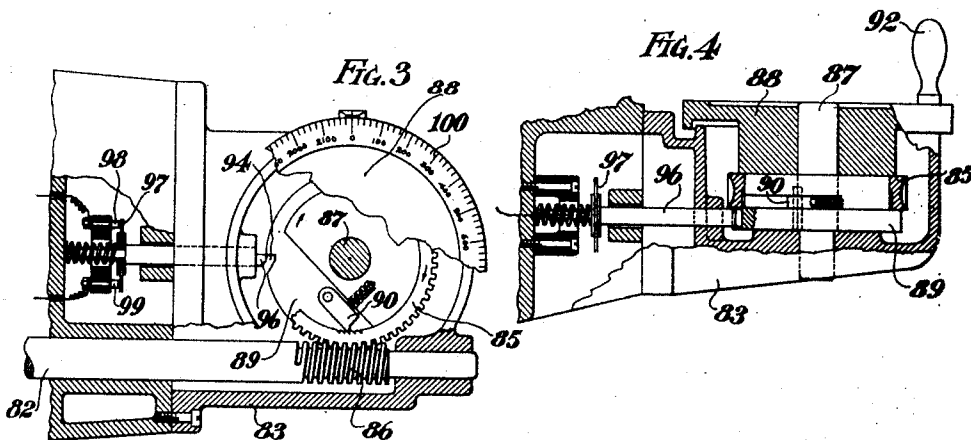
B. H. BLOOD

1,509,823

LAPPING MACHINE

Filed April 13, 1921

2 Sheets-Sheet 2



Inventor
B. H. Blood,
By Joseph H. Schofield
Attorney

UNITED STATES PATENT OFFICE.

BRYANT H. BLOOD, OF HARTFORD, CONNECTICUT, ASSIGNOR TO PRATT & WHITNEY COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY.

LAPPING MACHINE.

Application filed April 13, 1921. Serial No. 460,903.

To all whom it may concern:

Be it known that I, BRYANT H. BLOOD, a citizen of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Lapping Machines, of which the following is a specification.

This invention relates to a lapping or abrading machine and particularly to a machine for simultaneously lapping a plurality of gages to a predetermined identical dimension.

One of the objects of the present invention is to provide a machine in which a plurality of gages or other articles may be simultaneously ground on their opposite end faces to predetermined identical dimensions, the opposite end surfaces being flat and parallel to each other.

Another object of the invention is to mount the gages or other articles to be ground in a holder or spider between adjacent surfaces of a pair of laps and simultaneously rotate and reciprocate the holder or spider containing the articles to be ground between the laps.

A further object of the invention is to provide a convenient means for removing the upper lap from operative position to examine or remove the articles to be ground and also to provide pressure against the upper surface of the upper laps to force the upper lap against the articles grouped in the spider or holder.

Another object of the invention is to provide a convenient and simple means for obtaining the lapping movements of the holder containing the articles to be ground whereby the surfaces being lapped are brought into contact with the entire surfaces of the laps.

A still further object of the invention is to provide automatically operating means to stop the lapping action after a predetermined variable number of lapping movements.

With these and other objects in view, my invention consists in the features of construction and operation set forth in the following specification and illustrated in the accompanying drawings.

In the accompanying drawings annexed hereto and forming a part of this specification, I have shown my invention embodied

in a gage lapping machine, but it will be understood that the invention can be otherwise embodied and that the drawings are not to be construed as defining or limiting the scope of the invention, the claims appended to this specification being relied upon for that purpose.

In the drawings:

Figure 1 shows a central vertical sectional view of the complete machine.

Fig. 2 shows a plan view of the machine with the upper lap and its supporting means removed.

Fig. 3 is a plan view of the automatic stopping device forming a part of the machine, the control switch being shown in its closed position.

Fig. 4 is a vertical sectional view of the same with the switch in its open position.

In the above mentioned drawings, I have shown but one modification of the invention which is now deemed preferable, but it is to be understood that changes and modifications may be made within the scope of the appended claims without departing from the spirit of the invention.

Briefly, my invention in its broadest aspect comprises the following principal parts: first, a base; second, a lap stationarily mounted thereon; third, an upper lap non-rotatably mounted above the lower lap and adapted to adjust itself relative to the articles being lapped; fourth, a spider or other holding means for the articles to be ground disposed between the laps; fifth, operating means for simultaneously reciprocating and rotating said spider to cause lapping movement between the articles and laps; sixth, automatic means for stopping the movements of said spider after any predetermined number of lapping movements; and seventh, means to conveniently position and remove the upper lap.

Referring more in detail to the figures of the drawings, at 10 is shown the base of a lapping machine on which is centrally mounted a lap 11. As shown in Fig. 1, the lap 11 rests upon an annular member 12 which in turn rests upon the central upper portion of the base 10 and is non-rotatably held in that position by any suitable means (not shown). The upper surface 12^a of lap 11 is very carefully finished to a smooth and perfect plane to which abrasive material is adapted to be supplied.

At one side of the machine, I provide a vertical support 15 which rests in suitable bearings 16 and 17 provided at one side of the base 10. The column or support 15 has attached thereto at its upper portion an over-hanging arm or bracket 18 which may be adjustably mounted on the upright support 15 and secured thereto by clamping screws 19. The arm 18 extends directly over the central portion of the base 10 and at its outer or free end 20 is provided with a clamping screw 21 by means of which this outer end may be secured to the base 10 in its operative position. Midway of the arm 18 is a hole 24 through which a plunger 25 projects. This, at its upper end is in threaded connection with a screw 26. The screw 26 may be rotated by hand wheel 27 thus raising or lowering the plunger 25. Plunger 25 extends to and enters orifices 30 provided centrally in the lower lap 11 and upper lap 36. Secured to the plunger 25 is a plate 32 which is provided with holes through which bolts 34 may freely extend. The bolts 34 are threaded securely into the upper lap 36 so that by rotation of the hand wheel 27 the plunger 25 and plate 32 may be raised thus elevating the upper lap 36 and permitting its removal from operative position. To permit free rotation of the support 15, a ball bearing 37 is provided which carries the weight of the arm 18 and parts connected thereto.

From the above description it will also be seen that by means of the hand wheel 27, the plunger 25 and plate 32 may be lowered thus forcing the upper lap 36 downward with any amount of pressure desired. I prefer, however, to lower the plunger 25 to such a position that the upper lap 36 rests freely upon the upper surfaces of the articles being lapped and depend upon the weight of the lap 36 for sufficient pressure for lapping. The lower surface 39 of the upper lap 36 is finished to a smooth and perfect plane which is adapted to be charged with any suitable kind of abrasive material. In operative position the lap 36 is held from rotating by the plunger 25 and bolts 34.

The machine in Fig. 1 is shown adjusted for a relatively small size of gage block A or other article being lapped. To adjust the machine for different lengths of blocks, it is only necessary to remove the annular member 12 and substitute a thinner one and to elevate the arm 18 relative to the vertical support 15 so that the surfaces 12 and 39 may be more widely spaced.

Extending between the adjacent surfaces 12 and 39 of the laps 11 and 36 is a plate 40. This is provided with a series of openings 41 adapted to loosely contain the articles to be ground. The plate 40 at its periphery is preferably secured to a ring 42 having gear teeth 43 on its outer circumference. By

means of this plate 40 and the gear teeth 43, the articles to be ground, which are placed in the openings 41, are moved about between the adjacent surfaces of the laps 11 and 36 in a manner presently to be described.

In order to operate the plate 40 to give it the proper reciprocatory and rotary movements so that the entire surfaces 12^a and 39 are passed over by the articles being lapped the following mechanism has been devised: At 50, is shown a driving shaft which may be rotated by any suitable means, preferably by an electric motor, which may be readily stopped or started by the making or breaking of a single contact in its circuit. The shaft 50 is attached to a short shaft 51 provided with suitable bearings in the base 10 of the machine and having a worm 52 thereon in engagement with the worm wheel 53. Rotation of the shaft 50 therefor rotates the worm wheel 53. Worm wheel 53 is mounted on and rotates with a vertical central shaft 54 which is provided with vertical bearings 55 and 56. At the upper end of shaft 54 is a short crank 58 which at its outer end carries a crank pin 59. Resting upon the upper surface of the crank 58 and in engagement with the crank pin 59 is a three-armed member 60. This member 60 has bearings 62 at the extremity of each of its three arms which are equidistant from the central orifice in which the pin 59 rotates.

Vertically mounted in the base 10 are three shafts 65 spaced equidistantly apart, which at their lower ends, are provided with short cranks 66 suitably fastened thereto. The outer or free ends of these cranks are provided with pins 68 which are adapted to enter respectively the three bearings 62 at the extremities of the limbs of member 60. At the upper ends of shafts 65 are short cranks 70 which carry at their outer end small gears 72 fixed thereto and adapted to engage the gear teeth 43 on the annular gear member 42. As the gears 72 are fixed to the crank 70 near their outer or free ends, the gears 72 have a planetary movement about the axes of shafts 65.

From the above description, it will be seen that rotation of the vertical central shaft 54 will move the center of the member 60 about in a circle and, by means of the cranks 66, the vertical shafts 65 will be rotated. Rotation of the vertical shafts 65 rotates the gears 72 about the axes of shafts 65, and, as the three gears 72 are in engagement with equidistantly spaced points on the ring 42, the ring 42 is reciprocated a distance equal to the diameters swept out by rotation of gears 72 about the axes of the shafts 65. By engagement of the teeth on gears 72 and 43, a slow precessional movement is given to the ring 42 and the holder or spider 40 so that as the spider 40 recip-

rocates back and forth it slowly rotates about its own axis. Also, as the movements of the spider are induced by the cranks 58 and 66 and the intermeshing action of gears 72 and 43 both the reciprocatory and rotary movement of the spider 40 are positive.

In order to discontinue the lapping operation after a predetermined time or after a predetermined number of lapping movements have been accomplished, the following device is utilized: On the central vertical driving shaft 54, a worm 80 is provided which is adapted to mesh with a worm wheel 81. Worm wheel 81 is mounted at the inner end of a horizontal shaft 82 which extends laterally through the base 10 and passes through a bracket member 83 provided on the side of the machine as shown in Fig. 1. Mounted in the bracket member 83 is a worm wheel 85 meshing with a worm 86 formed on the outer end of the shaft 82. Worm wheel 85 is mounted to rotate about a central vertical shaft 87 suitably mounted in the bracket member 83. Also mounted to rotate about the central shaft 87 is a dial plate 88 and a plate 89 carrying a ratchet pawl 90. Preferably the ratchet pawl 90 engages teeth provided on an internal surface of the gear 85 as shown in Fig. 3. By means of handle 92, the dial plate 88 may be rotated to any given position and, when the lapping operations are begun, rotation of the shaft 82 rotates the gear wheel 85, this also rotates the plate 89 through the ratchet pawl 90. Plate 89 has a notch 94 cut in its periphery for a purpose presently to be described. Rotation of the handle 92 and the rotation of this plate 89 thus rotates a notch 94 away from a stationary finger 96, and, when a certain number of lapping movements have taken place, the plate 89 is rotated by means of the gear wheel 85 to the position shown in Fig. 3 so that the finger 96 will drop into the notch 94.

The finger or plunger 96 is spring-pressed in a direction to force it into the notch 94 and is at all times pressed toward the plate 89. Mounted on the plunger 96 is a switch member 97 which is held in engagement with contact members 98 and 99 so long as the notch 94 is not in line with the plunger 96 so that the circuit for the motor operating the driving shaft is normally closed. As soon, however, as the plate 89 is rotated to a position permitting the finger or plunger 96 to enter the notch 84, the switch member 97 is removed from the contacts 98 and 99 thus opening the motor circuit and stopping further rotation of the shaft 54 and the spider 40.

The upper surface of dial plate 88 is graduated as shown at 100. These graduations correspond to the number of lapping movements which will take place before the lap-

ping movements are stopped by movement of plunger 96 into notch 94 and opening of the switch 97. By first manually rotating the dial member 88 by means of the handle 92, the machine may be set to operate for any predetermined number of lapping operations after which it will be automatically stopped by opening of switch 97.

What I claim is:

1. A lapping machine comprising in combination, a base, a lower lap mounted thereon, an upper lap, means to non-rotatably support said laps in operative position relatively to each other, a spider adapted to hold a plurality of articles disposed between said laps, and positive means to simultaneously rapidly reciprocate and slowly rotate said spider between said laps whereby lapping movements between the articles and laps are accomplished.

2. A lapping machine comprising in combination, a base, a lower lap mounted thereon, an upper lap adapted to rest upon and adjust itself as to parallelism relative to the lower lap, means to non-rotatably support said laps in operative position relatively to each other, a spider adapted to hold a plurality of articles disposed between said laps, and positive means to simultaneously reciprocate and rotate said spider between said laps whereby lapping movements between the articles and laps are accomplished.

3. A lapping machine comprising in combination, a base, a lower lap mounted thereon, an upper lap, means to non-rotatably support said laps in operative position relatively to each other, a spider adapted to hold a plurality of articles disposed between said laps, and geared means operatively connected to said spider to simultaneously reciprocate and rotate said spider between said laps whereby lapping movements between the articles and laps are accomplished, the rotary movement of said spider being relatively slower than its reciprocatory movement.

4. A lapping machine comprising in combination, a base, a lower lap mounted thereon, an upper lap, means to non-rotatably support said laps in operative position relatively to each other, a spider adapted to hold a plurality of articles disposed between said laps, and driving means comprising a plurality of cranks and gears operatively connected to said spider to simultaneously reciprocate and rotate said spider between said laps whereby lapping movements between said articles and laps are accomplished.

5. A lapping machine comprising in combination, a base, a lower lap mounted thereon, an upper lap adapted to rest upon and adjust itself relative to the articles being lapped, means to non-rotatably support said laps in operative position relative to each

other, a spider adapted to hold a plurality of articles disposed between said laps, and driving means comprising a plurality of cranks and gears operatively connected to said spider to simultaneously reciprocate and rotate said spider between said laps whereby lapping movements between said laps and articles are accomplished.

6. A lapping machine comprising in combination, a base, a lower lap mounted thereon, an upper lap, means to non-rotatably support said laps in operative position relatively to each other, a spider adapted to hold a plurality of articles disposed between said laps, and means to operate said spider between said laps whereby said articles pass over the entire lapping surfaces of said laps, said means comprising a central shaft, a crank thereon, a three armed member operated thereby, cranks engaging bearings at the extremities of said arms, gears eccentrically rotated by said cranks, said gears engaging said spider whereby said spider is positively reciprocated and rotated between said laps.

7. A lapping machine comprising in combination, a base, a lower lap thereon, an upper lap cooperating therewith, a spider adapted to hold a plurality of articles disposed between said laps, means to move said spider relative to said laps to produce lapping movements on articles mounted in said spider, and means to stop said lapping movements after any predetermined number of movements.

8. A lapping machine comprising in combination, a base, a lower lap thereon, an upper lap adapted to rest upon and adjust itself relative to the articles being lapped, a spider adapted to hold a plurality of articles disposed between said laps, means to move said spider relative to said laps to produce lapping movements on articles mounted in said spider, and means to stop said lapping movements after any predetermined number of movements.

9. A lapping machine comprising in combination, a base, a lower lap thereon, an upper lap cooperating therewith, a spider adapted to hold a plurality of articles disposed between said laps, means to move said spider relative to said laps to produce rotary and reciprocatory lapping movements

on articles mounted in said spider, and means to stop said lapping movements after any predetermined number of movements.

10. A lapping machine comprising in combination, a base, a lower lap mounted thereon, an upper lap, means to non-rotatably support said laps in operative position relatively to each other, a spider adapted to hold a plurality of articles disposed between said laps, means to operate said spider between said laps, said means comprising a central shaft, a crank thereon, a three armed member operated thereby, cranks engaging bearings at the extremities of said arms, gears eccentrically rotated by said cranks, said gears engaging said spider whereby said spider is positively reciprocated and rotated between said laps, and means to stop the movement of said central shaft after any predetermined number of lapping movements.

11. A lapping machine comprising in combination, a base, a lower lap thereon, an upper lap cooperating therewith, a spider mounted between said laps, means to move said spider relative to said laps, means permitting movement of said upper lap toward said lower lap, and means to elevate and laterally move said upper lap.

12. A lapping machine comprising in combination, a base, a lower lap thereon, an upper lap cooperating therewith, a spider mounted between said laps, means to move said spider relative to said laps, a bracket rotatably mounted in said base, means connecting said bracket with said upper lap whereby said upper lap may be moved toward said lower lap or elevated and removed from operative position.

13. A lapping machine comprising in combination, a base, a lower lap thereon, an upper lap cooperating therewith, a spider mounted between said laps, means to move said spider relative to said laps, a bracket rotatably mounted in said base, means to lock said bracket in operative position, means connecting said bracket with said upper lap whereby said upper lap may be moved toward said lower lap or elevated and removed from operative position.

In testimony whereof, I hereto affix my signature.

BRYANT H. BLOOD.