J. G. SODERBERG.

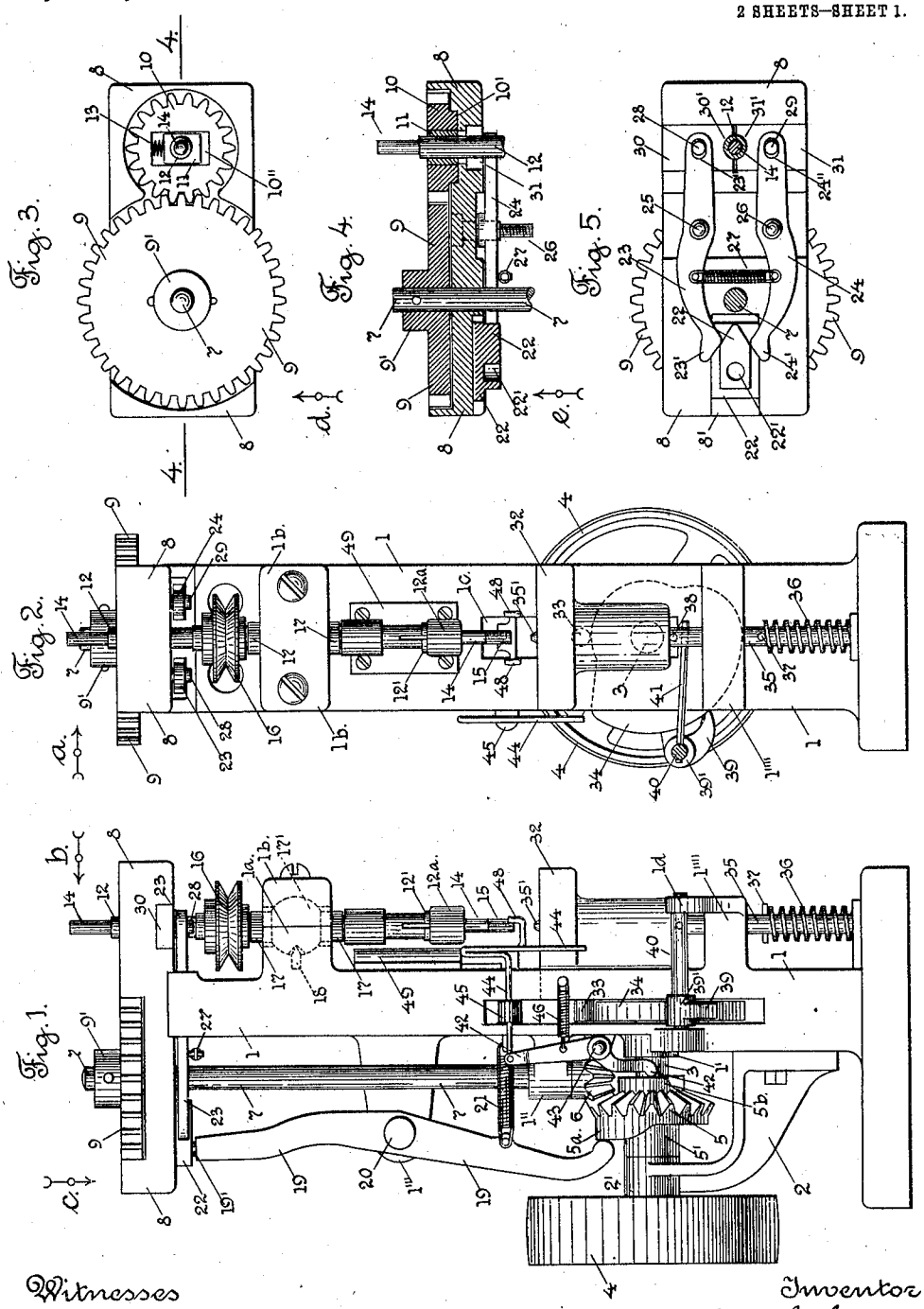
GRINDING MACHINE.

APPLICATION FILED NOV. 29, 1910.

1,003,532.

Patented Sept. 19, 1911.

2 SHEETS—SHEET 1.



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2 SHEETS—SHEET 2.

Fig. 10.

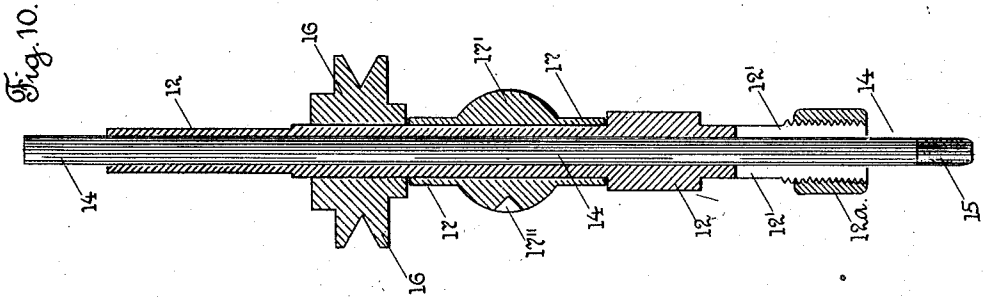


Fig. 7.

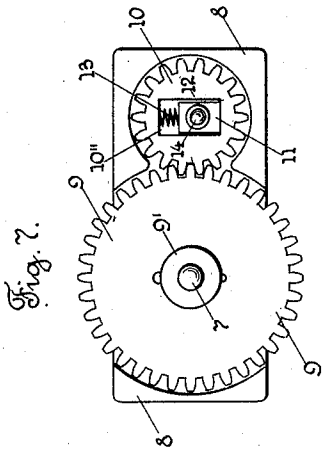


Fig. 8.

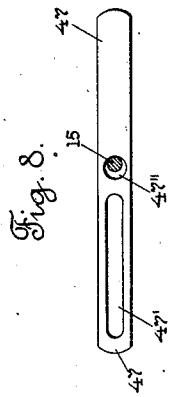


Fig. 9.

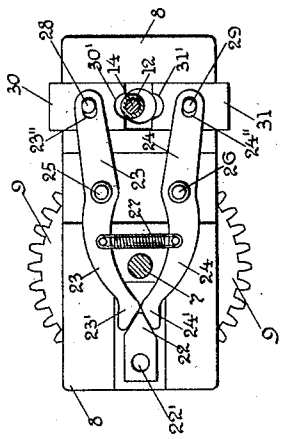
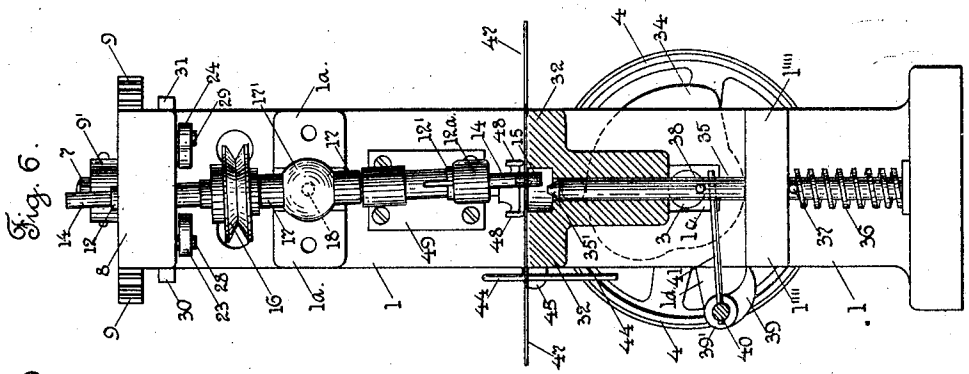


Fig. 6.



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UNITED STATES PATENT OFFICE.

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GRINDING-MACHINE.

1,003,532. Specification of Letters Patent. **Patented Sept. 19, 1911.**

Application filed November 29, 1910. Serial No. 594,627.

To all whom it may concern.

Be it known that I, JOHN G. SODERBERG, a citizen of the United States, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Grinding-Machines, of which the following is a specification.

My invention relates to a grinding or polishing machine, and particularly to a grinding or polishing machine to smooth or polish the edges of punched holes in thin metal plates.

In the manufacture of woven fabrics, small metal plates are used, which are supported upon the warp threads, and on the breakage of a warp thread a plate drops, and through its interference with certain moving parts of a loom, the loom is caused to stop. These metal plates, which are commonly called "drop devices," or "drop bars," are made of thin sheet metal, preferably steel, with a hole punched therein, through which passes a warp thread, which supports the drop device in its normal position. The edges of the metal around the thread hole, by the punching operation, are left rough or ragged, and are not sufficiently smooth to prevent their chafing or injuring delicate or fine warp threads.

The object of my invention is to provide an automatic grinding machine, intended particularly to polish and smooth the edges of the thread hole in the drop device, after it has been punched in the punching machine.

My improved grinding machine is preferably provided with a vertically extending spindle, which carries an arbor, with a cylindrical portion, preferably having grinding material on its periphery at its lower end. A rotary motion, and a circular motion is communicated to the spindle and to the arbor, which causes the edges of the thread hole in the metal plate to be engaged, and smoothed and polished by the grinding material on the lower end of the arbor.

My invention consists in certain novel features of construction of my improvements as will be hereinafter fully described.

Referring to the drawings:—Figure 1 is a side view of my grinding machine, looking in the direction of arrow *a*, Fig. 2. Fig. 2 is a front view of the machine, looking in the direction of arrow *b*, Fig. 1. Fig. 3 is a plan view of the upper portion shown in Fig. 1, looking in the direction of arrow *c*, same figure. Fig. 4 is a section, on line 4, 4, Fig. 3, looking in the direction of arrow *d*, same figure. Fig. 5 is an underneath view of the parts shown in Fig. 4, looking in the direction of arrow *e*, same figure. Fig. 6 corresponds to Fig. 2, but shows some of the parts shown in Fig. 2 in a different position, and a steel plate or drop device on the table. The table is shown in section. Fig. 7 corresponds to Fig. 3, but shows the sliding block shown in Fig. 3 in its eccentric position. Fig. 8 is a plan view of a drop device, or drop bar, showing the grinding arbor in section. Fig. 9 corresponds to Fig. 5, but shows the parts shown in Fig. 5, in their opposite position, and, Fig. 10 shows, on an enlarged scale, a central vertical section of the spindle.

In the accompany drawings, 1 is the stand or frame of the grinding machine, 2 is a bracket secured to the frame 1, which has a boss 2′ thereon, forming a bearing for one end of the driving shaft 3; the other end of said shaft 3 is journaled in a bearing 1′ on the frame 1. A pulley 4 is secured on the outer end of the shaft 3, and is driven by a suitable belt, not shown, passing around the same. On the inner end of the shaft 3 is secured the hub 5′ of a bevel gear 5, which meshes with and drives a bevel pinion 6, secured on the lower end of a vertically extending shaft 7, which has a bearing at 1″ on the stand 1, and also in the cross head 8, see Fig. 4. The cross head 8 is suitably secured upon the upper end of the frame 1. The upper end of the upright shaft 7 has mounted thereon the hub 9′ of a gear 9, which meshes with and drives a smaller gear 10, which has its central portion 10′ loosely mounted in a recess in the cross head 8, see Fig. 4. A cover, not shown in the drawings, preferably extends over the gear 10, and acts to hold it in position. The gear 10 has a rectangular opening 10″ therethrough, to loosely receive a block 11, which holds and forms a bearing for the upper end of a spindle 12. A small helically coiled expansion spring 13 bears at one end against the opening 10″ in the gear 10, and at its other end against the block 11, and acts to move said block 11 out of its central posi-

tion, as shown in Fig. 7, if the spindle 12 is released from the mechanism to be hereinafter described.

The spindle 12, as shown in Fig. 10, consists of a tubular shaft, the lower end 12′ of which is adapted to adjustably hold the arbor 14, which extends through the tubular spindle 12 secured at its lower end by the chuck nut 12^a on the lower threaded and split end of the spindle 12. The lower end of the arbor 14 is provided with a suitable grinding or polishing material 15 on its periphery. A pulley 16, preferably made with a V groove therein, is secured upon the spindle 12 and is driven by a belt, not shown.

A sleeve 17 is loosely mounted upon the spindle 12, and has the ball-shaped portion 17′, loosely journaled in the bearing 1^a, see Fig. 6, which is covered by a cap 1^b, see Fig. 1. A recess 17″ in the rounded portion 17′, has a pin 18 secured in the frame 1, extending loosely therein, to prevent the ball-shaped sleeve 17 rotating on the spindle 12.

The bevel gear 5 has a cam-shaped projection 5^a thereon, which is adapted to operate an upright lever 19, which is pivotally mounted on a stud 20 on a bracket 1‴. A helically coiled contraction spring 21, secured at one end to the lever 19, and connected at its other end to the frame 1, acts to hold the lower end of the lever 19 in engagement with the cam surface 5^a on the bevel gear 5. The upper end 19′ of the upright lever 19 extends within a bore or recess 22′ in a sliding block 22, see Fig. 4, which is suitably guided in a recess 8′ in the lower side of the head 8, see Fig. 5. The inwardly extending portion of the block 22 is beveled on each side, as shown in Fig. 5, and is adapted to engage the ends 23′ and 24′ of two levers 23 and 24, which are pivotally mounted on bolts 25 and 26.

A helically coiled contraction spring 27, attached at one end to the lever 23, and at its other end to the lever 24, acts to yieldingly hold the engaging ends 23′ and 24′ of said levers 23 and 24 in engagement with the sliding block 22. The other ends of the levers 23 and 24 have elongated holes 23″ and 24″ respectively therein, into which extend pins 28 and 29 on the two slides 30 and 31. Said slides 30 and 31 are loosely guided in a recess in the underside of the head 8, and have half rounded recesses 30′ and 31′ therein, on their contiguous edges, see Fig. 9. The recesses 30′ and 31′ are adapted to centrally locate the spindle 12, as long as the block 22 is moved inwardly, as shown in Fig. 5.

On the outward movement of the block 22, as shown in Fig. 9, through the movement of the lever 19, the slides 30 and 31, through the movement of the levers 23 and 24, by the action of the spring 27, are moved outwardly and disengaged from the spindle 12, as shown in Fig. 9, to allow said spindle 12, through the action of the spring 13, to move out of its central position, as shown in Figs. 6 and 7.

Through the rotation of the gear 10, a circular motion is imparted to the spindle 12, and the grinding arbor 14, with the grinding material 15 thereon at its lower end, and through the pulley 16, a rotary motion is imparted to said spindle and arbor.

The frame 1 has a vertically extending opening 1^c therein, which guides a table 32. A stud 33 extends out from the table 32, and is adapted to engage, in this instance the periphery of a cam 34, which is fast on the inner end of the driving shaft 3. The rotation of the cam 34 will communicate an up and down movement to the table 32, as shown in Figs. 1 and 6. A rod 35 extends upwardly, and through the center of the table 32, and has its upper end pointed and adapted to center or locate the metal plate or piece to be ground, which is laid upon the table 32 by the operator.

A helically coiled expansion spring 36 encircles the lower part of the rod 35, and bears at its lower end against the frame 1, and at its upper end against the pin 37, in this instance extending transversely through the rod 35. The spring 36 is adapted to move upwardly the rod 35 until a pin 38, extending transversely through said rod, see Fig. 2, engages the under part of the table 32. In the upward movement of the table 32, the pin 37 engages the projection 1⁗, see Fig. 1, on the frame 1, to limit the upward movement of the rod 35, and to cause the withdrawal of the point 35′ on said rod 35 from the opening in the steel plate or piece on the table, as shown in Fig. 6.

A finger 39 has its hub 39′, in this instance fast on a shaft 40, mounted in bearings 1^d on the frame 1, see Fig. 3. The finger 39 engages the periphery of the cam 34. A wire 41 is secured to the shaft 40 at one end, and in this instance extends through a hole in said shaft, and at its other end extends through a hole in the rod 35, and on the downward movement of the table 32, acts to move downwardly the rod 35, and causes the centering point 35′ thereon to clear the metal plate or piece on the table, after it has been ground, and leave it free to be removed from the table by mechanism to be hereinafter described.

The bevel gear 5 is provided on its inner side with a cam surface 5^b, which is adapted to operate a lever 42, which has its hub pivotally mounted on a stud 43, see Fig. 1. The upwardly extending end of the lever 42 has pivotally connected thereto one end

of a wire 44, which wire is loosely guided in a boss 45, and extends horizontally and toward the front of the machine. The other end of the wire 44 is preferably bent or shaped, as shown in Fig. 1. A helically coiled contraction spring 46, secured to one end of the lever 42, and at its other end to the frame 1, acts to move forwardly the wire 44, according to the shape of the cam 5^b.

In Fig. 8 is shown a drop device or drop bar 47 of ordinary shape and construction, having an elongated opening 47′ therethrough for the guide rod, and a circular opening 47″ therethrough for a warp thread.

From the above description in connection with the drawings, the operation of my improvements will be readily understood by those skilled in the art, and briefly is as follows:—The drop device or drop bar 47, see Fig. 8, is placed upon the table 32, when it is in its lowered position, as shown in Figs. 1 and 2, and is centrally located thereon by the point 35′ on the rod 35, and extends through the circular opening 47″ in the plate 47. When, through the rotation of the cam 34, the table 32 continues to rise, through the engagement of the pin 33 on said table with said cam 34, the plate 47 engages a holding device 48. The holding device 48 is suitably guided in a bracket 49 on the frame 1, and acts to hold the device 47 in position on the table 32, after the point 35′ on the rod 35 is withdrawn. The grinding arbor 14, which has a continuous rotary motion communicated thereto through the belt driven pulley 16, enters the hole 47″ in the device 47, and through the operation of the lever 19, as above described, the upper end of the spindle 12 is released, and allowed to occupy an inclined position, as shown in Fig. 6, which causes, through the rotation of the gear 10, a circular movement as well as a rotary movement to be imparted to the arbor 14 at its lower end, and the grinding material 15 thereon engages the edges of the thread hole 47″, as shown in Fig. 8, and acts to grind and smooth said edges. On the downward movement of the table 32, and after the device 47 is disengaged from the holder 48, the locating spindle 35 is lowered, to leave the device 47 free, and through a quick motion of the lever 42 and the wire 44, the device 47 is engaged and pushed from the table, to clear it for a new device to be placed thereon.

It will be understood that the details of construction of my improvements may be varied if desired. They may be used for grinding and polishing the inner edges of any opening.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. In a grinding and polishing machine for the inner edges of an opening, automatic means for centering the device, and holding it in position to be operated upon, a pivotally supported spindle having a grinding surface at one end to enter the opening in said device, and automatic means for causing said spindle at its grinding end to have a rotary motion and a circular motion.

2. In a grinding and polishing machine for the inner edges of an opening, automatic means for centering the device, and holding it in position to be operated upon, a pivotally supported spindle having a grinding surface at one end to enter the opening in said device, and automatic means for causing said spindle at its grinding surface end to have a rotary motion and a circular motion, and automatic means for removing said device from said spindle, after the opening therein is ground.

3. In a grinding and polishing machine for the inner edges of an opening, automatic means for centering the device, and holding it in position to be operated upon, a pivotally supported spindle having a grinding surface at one end to enter the opening in said device, and automatic means for causing said spindle at its grinding end to have a rotary motion and a circular motion, and automatic means for removing said device from said spindle after the opening therein is ground, and automatic means for removing said device from its support.

4. In a grinding and polishing machine for the inner edges of an opening, a table or support for the device to be operated on, automatic means for raising and lowering said table, automatic means for centering the device to be operated on, on said table or support, and holding it in position to be operated on, a pivotally supported spindle having a grinding surface at one end to enter the opening in said device, automatic means for causing said spindle, at its grinding end, to have a rotary motion, and a circular motion.

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