No. 859,343. PATENTED JULY 9, 1907.

C. I. SHIRLEY.

GRINDING MACHINE.

APPLICATION FILED FEB. 10, 1906.

4 SHEETS—SHEET 1.

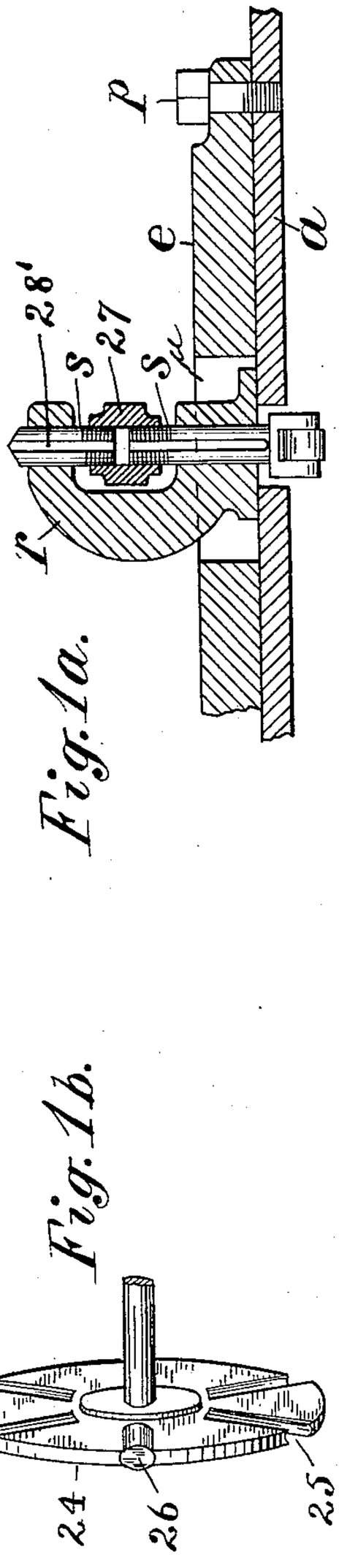

Fig. 1a.

Fig. 1b.

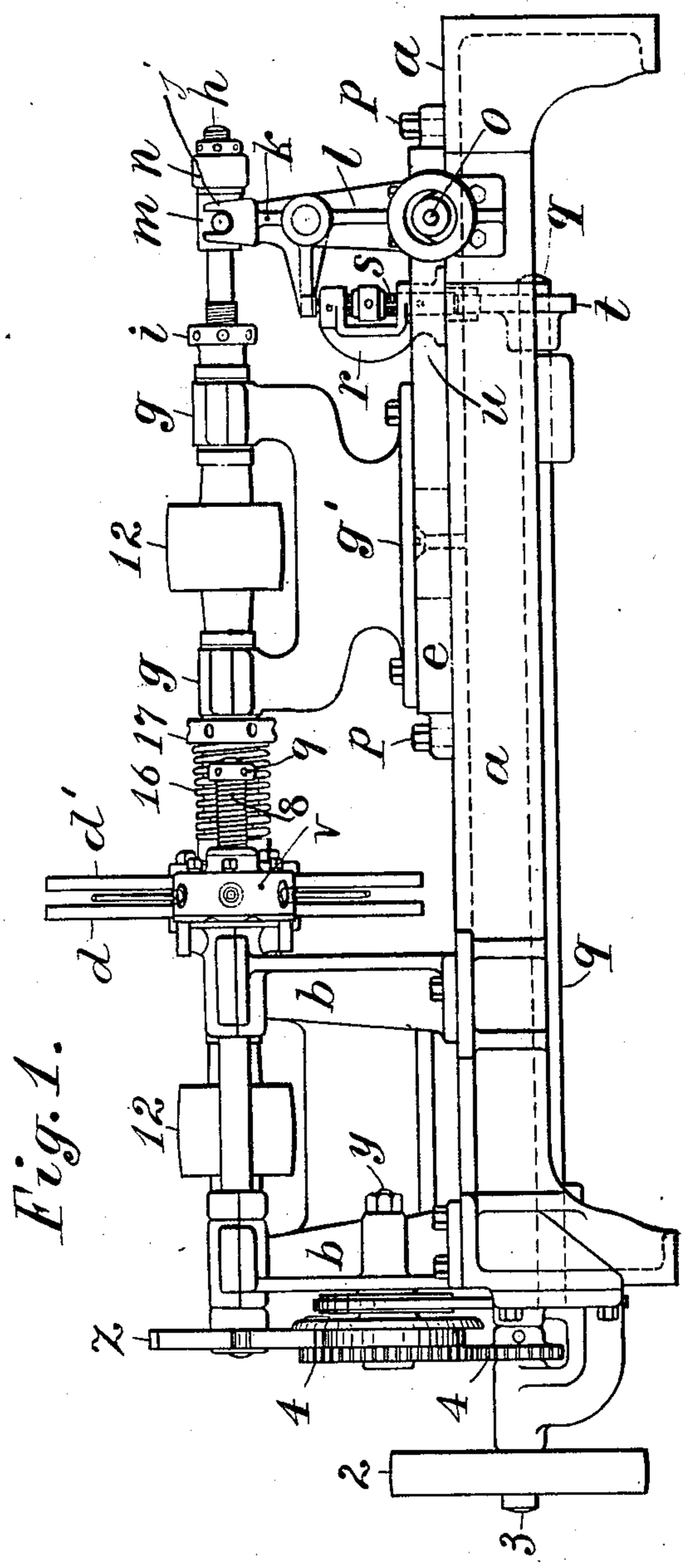

Fig. 1.

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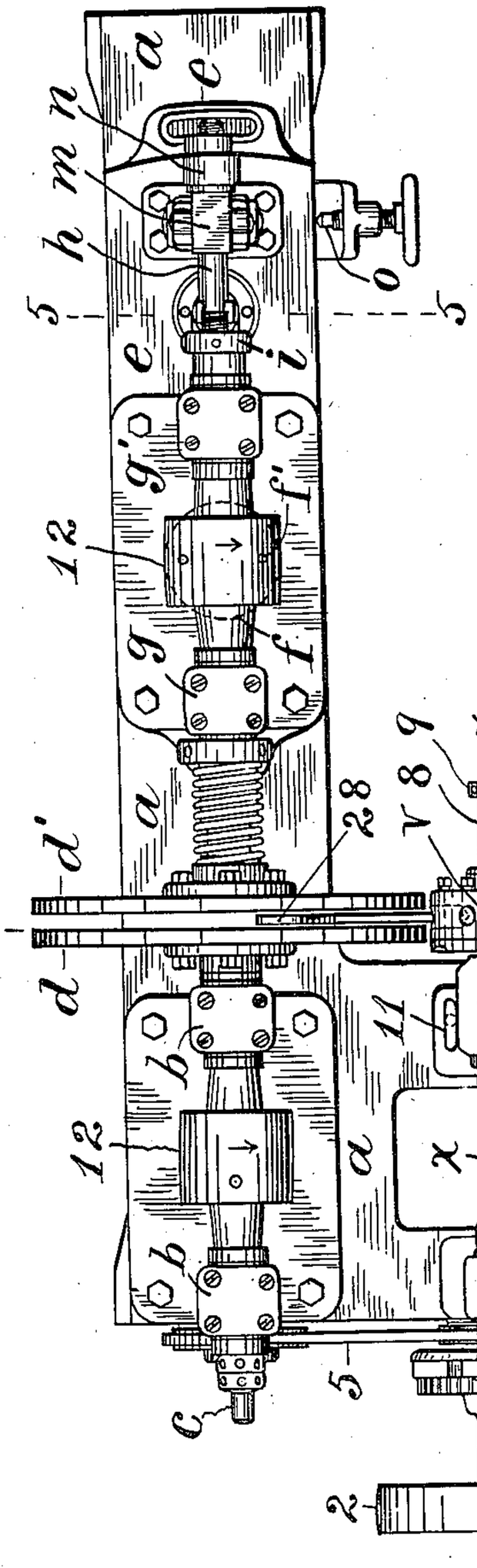
4 SHEETS—SHEET 2.

Fig. 2.



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4 SHEETS—SHEET 3.

Fig. 5.

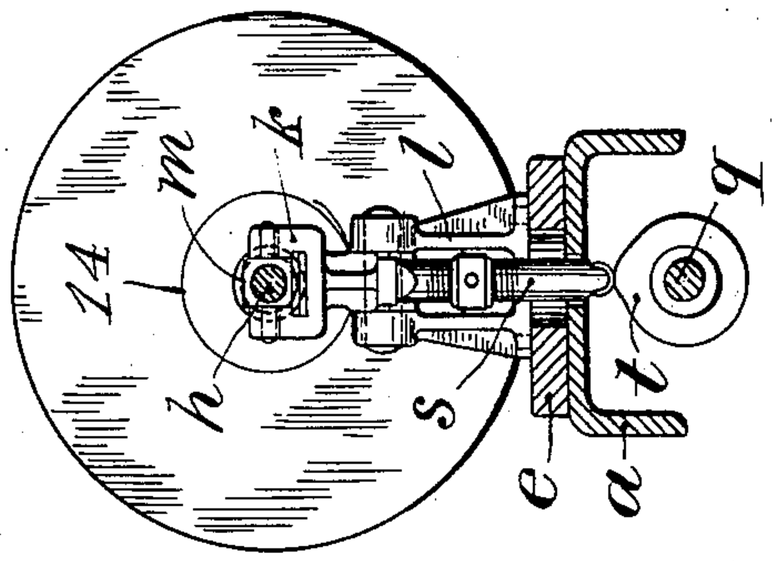


Fig. 4.

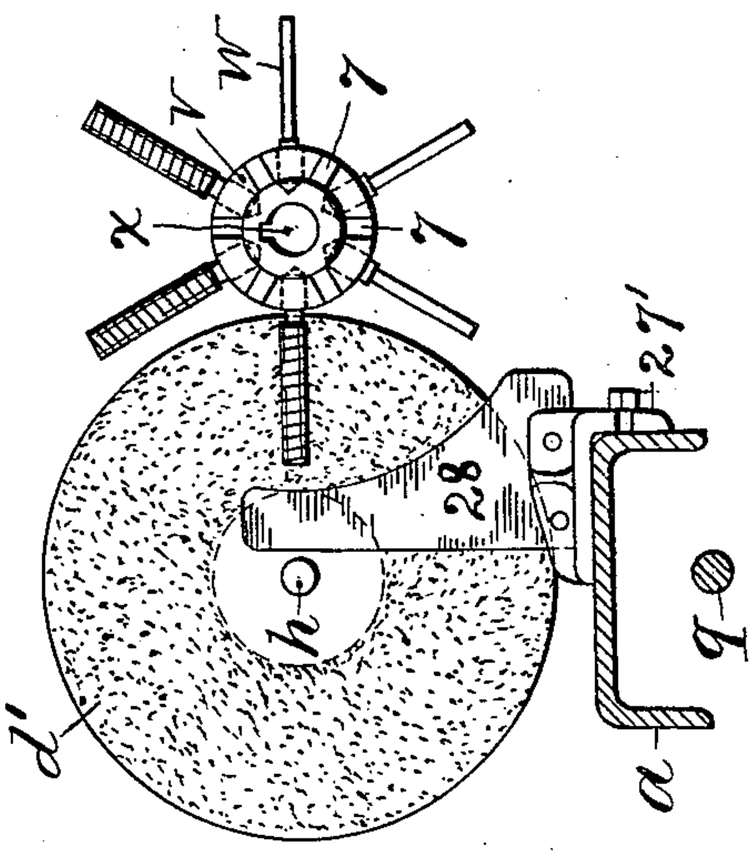
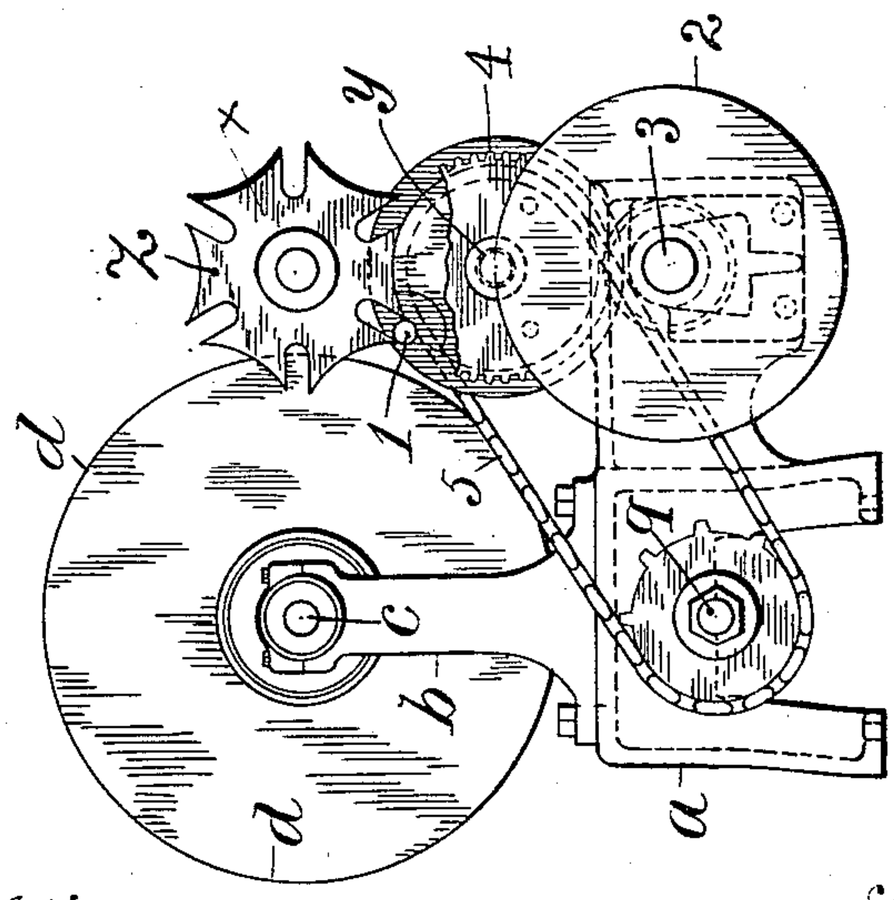


Fig. 3.



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4 SHEETS—SHEET 4.

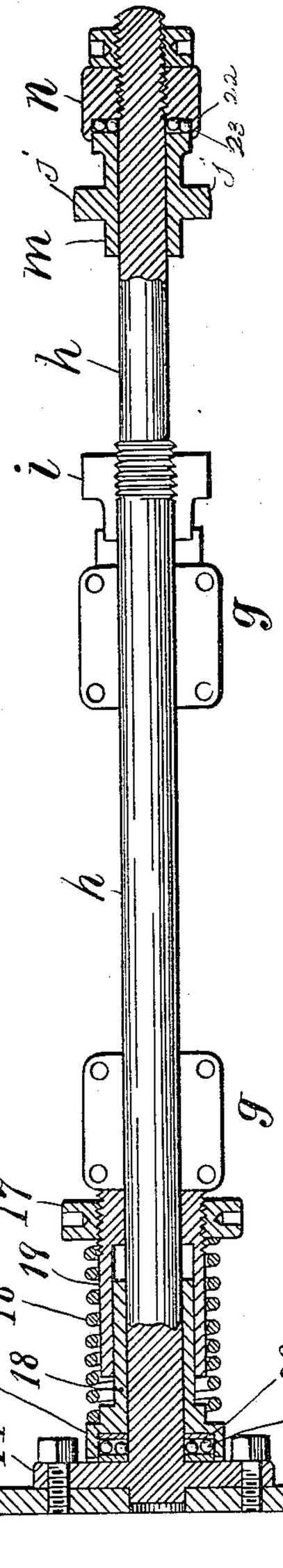

Fig. 6.

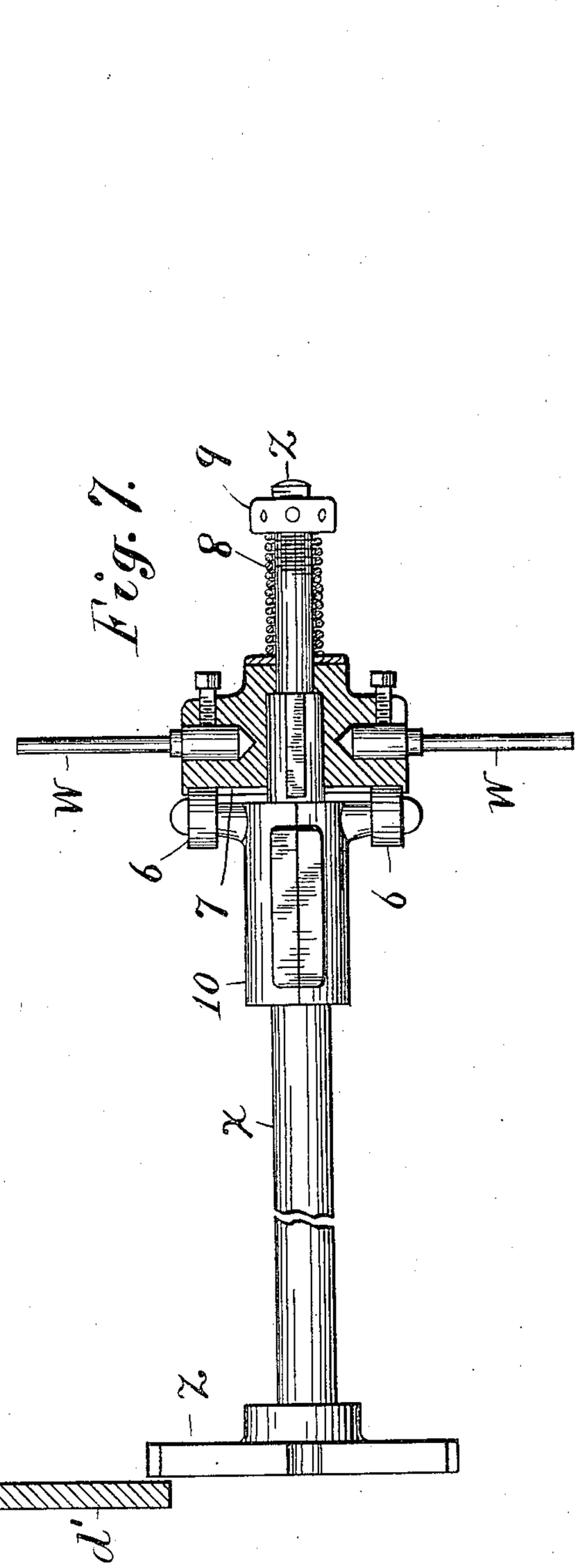

Fig. 7.

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UNITED STATES PATENT OFFICE.

CEPHAS I. SHIRLEY, OF NEWARK, NEW JERSEY, ASSIGNOR TO HYATT ROLLER BEARING COMPANY, OF HARRISON, NEW JERSEY, A CORPORATION OF NEW JERSEY.

GRINDING-MACHINE.

No. 859,343. Specification of Letters Patent. Patented July 9, 1907.

Application filed February 10, 1906. Serial No. 300,419.

To all whom it may concern:

Be it known that I, CEPHAS I. SHIRLEY, a citizen of the United States, residing at 114 Stone street, Newark, county of Essex, and State of New Jersey, have invented certain new and useful Improvements in Grinding-Machines, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

The grinding machine described herein is devised especially for grinding loose cylinders, but as its organization furnishes opposed grinding disks, means for separating the same, and means for inserting articles to be ground between the disks when separated, it is obvious that the machine may be used for other purposes.

The machine was designed especially for grinding, to uniform cylindrical shape, spirally wound cylindrical springs, which are used as antifriction rollers in a certain class of roller bearings.

With the machine shown herein, the hollow rollers are applied successively to radial mandrels upon an intermittently rotating carrier, by which they are placed between the opposed faces of two grinding disks.

To make the disks operate uniformly upon the rollers, it is found necessary to separate the disks during the placing of the rollers or cylinders between the same, and it is also desirable that the carrier for the rollers should be moved longitudinally to prevent the rollers from touching either of the disks during such placing operation.

When the roller or cylinder is in place, the movable disk is pressed by a spring toward the opposite disk, and a stop regulates the advance of such movable disk so that the operation of the grinders ceases when the rollers are reduced to a uniform size. The stop is adjustable, as well as the tension of the spring, to vary the operation of the grinding disks.

The invention includes the special mechanism for retracting one disk from the other and for moving the carrier longitudinally while placing the rollers between the disks, and the details of the invention will be understood by reference to the annexed drawing, in which

Figure 1 is a side elevation of a machine embodying the invention; Fig. 1^a is a vertical section of the thrust-bar *s* for the bell-crank, and its guide upon the bed; Fig. 1^b an alternative form of carrier; Fig. 2 is a plan of the machine; Fig. 3 is an end view showing the feed-gearing; Fig. 4 is a cross section where hatched, on line 4—4 in Fig. 2; Fig. 5 is a cross section where hatched, on line 5—5 in Fig. 2; Fig. 6 is a longitudinal section of the movable disk and its attachments; Fig. 7 is a longitudinal section of the carrier and its spindle.

a designates a bed having at one end a fixed head provided with bearings *b* mounted thereon for the arbor *c* of one of the grinding disks *d*.

A plate *e* is swiveled upon the bed by a pivot-block *f* and sustains a head *g'* having the bearings *g* for the movable arbor *h*, which carries the opposed movable disk *b'*. The disk is attached to a hub 14 upon the arbor *h*, which is projected beyond the nearest bearing *g* sufficiently to introduce an anti-friction collar 15, a spring 16 and an adjusting-nut 17, as shown in Fig. 6.

The anti-friction collar has a hub 18 which is extended within a sleeve 19 in contact with the bearing *g*, and has a thread next the bearing to which the nut 17 is fitted. The spring 16 is fitted over the sleeve into contact with the collar 15, and the thrust of the spring against the nut holds the sleeve against the bearing so that the spring presses the disks normally together.

The anti-friction collar has a socket containing steel disks 20 between which balls 21 are fitted, so that the grinding pressure upon the disk is transmitted by the balls to the spring 16.

The arbor *h* is extended beyond the rear bearing *g* and is provided with an adjusting-nut *i*, a swivel-block *m* and an adjusting-nut *n* in the rear of said block. The block has pins *j* fitted to the vertical arm of a bell-crank *k*, and the plate *e* is extended beneath the arbor to support a standard *l* for such bell-crank. A set-screw *o* is supported upon the bed to adjust the plate *e*, with the arbor *h* and the disk *d'*, at a slight angle to the disk *d*; and bolts *p* are provided to lock the plate to the bed when adjusted.

A thrust-bar *s* is mounted in a guide *r* upon the bed under the horizontal arm of the bell-crank, and a cam *t* is rotated by a cam-shaft *q* beneath the bed to raise the thrust-bar when the rollers are placed between the disks, and thus retract the disk *d'* through the agency of the bell-crank; which prevents any grinding of the roller until placed, as shown in Fig. 4.

A hole *u* is formed through the adjustable plate *e* to clear the stationary guide *r*, and the arm of the bell-crank moves slightly over the head of the thrust-bar whenever the plate *e* is adjusted. A thrust-collar consisting of a ring 22 and a series of balls 23 is interposed between the swivel *m* and the nut *n*, to reduce the friction during the retraction of the arbor *h* and disk *d'*, in opposition to the spring 16, during the placing of each cylinder.

A carrier suited for hollow cylinders is formed with hub *v* having radial mandrels *w* and mounted upon a spindle *x* which is driven, as shown in Fig. 3, by a Geneva stop connection with feed-gearing mounted upon a stud or shaft *y*. The toothed wheel *z* for the Geneva stop is attached to the spindle *x*, and a notched disk

carrying the driving-pin 1 is attached to the feed-shaft, and operates to turn the spindle x at intervals, to place the rollers successively between the disks, as shown in Fig. 4; and to lock the spindle while the disks are being ground, as is well understood with the Geneva stop mechanism.

A pulley 2 is mounted upon a stud 3 below the feed-shaft and connected by gears 4, and the cam-shaft is driven from the feed-shaft by chain-gearing 5, which turns it in unison with the feed-shaft and thus rotates the cam t once for each movement of the carrier.

To clear the rollers from the disk d when the disk d' is retracted therefrom, the carrier may be moved longitudinally in any suitable manner, as by the rollers 6 mounted upon one bearing of the spindle and fitted to notches 7 in one side of the carrier-hub v.

The carrier is shown splined upon the spindle x (see Fig. 7) and the spindle extended beyond the carrier to receive an adjusting-nut 9 and a spring 8 which operates to press the carrier normally toward the roller 6.

As the roll cannot yield, it operates to force the carrier longitudinally upon the spindle when the notches 7 are turned past or away from the surface of the roll, during the placing of each cylinder between the disks; the succeeding notch then coinciding with the roll when such cylinder is properly placed, and permitting the spring to press the carrier back to its initial position.

The nut i is adjusted to set the disks d, d', at a suitable distance apart for grinding the cylinder or roller to the required size, and the mandrel w must be adjusted to stand centrally between the disks, so that the roller may be evenly ground; and in practice, the mandrel is made smaller than the bore of the roller to permit the latter entire freedom of movement. It is found that this construction will grind the rollers cylindrical, if they are close to the cylindrical form before grinding.

The bearings 10 for the carrier-spindle are mounted upon an extension of the bed a, and the bearing nearest the carrier is mounted adjustably by means of bolts fitted in slots 11, and the bearing carrying the roller 6 may thus be adjusted toward or away from the carrier, so that the mandrels w may set centrally between the disks when adjusted. Such adjustment of the disks and carrier enables the movable disk d' to clear the rollers or cylinders as they are placed in position, and clears such rollers or cylinders from the other disk d during the placing movement.

The arbors of the disks are shown provided with pulleys 12 which are driven by bolts from a countershaft in the same direction, but at varying speeds, it being found in practice that a speed of 800 revolutions per minute for the disk d can be advantageously employed with a speed of 900 revolutions for the disk d'. The variation in the speed of the disks causes the roller or cylinder to turn upon the mandrel during the grinding operation and thus expose all parts of its surface uniformly to the grinding action. Such disks are commonly made of cast iron with emery cloth glued upon the grinding surface, which is indicated by the dots 13 in Fig. 4, and means for turning the disk d' at a slight angle is provided to compensate for any unequal wear of the grinding surface which is due to its higher velocity near the periphery than near to the center of the disk. Such wear is slight, and is obviated by loosening the screws p (Fig. 1) and turning the screw o until the disk d' is shifted sufficiently (as may be determined by trial) to grind the cylinders true and uniform. The bolts p are then firmly tightened until another adjustment is required.

The plate e is shown in Figs. 1 and 2 swiveled upon a block f which is attached to the bed by two screws f'. The plate may be pivoted in any other manner.

Fig. 1^a shows provision for varying the length of the thrust-bar s, by which the extreme movement of the disk d' may be varied, although the cam t has a positive throw. Such variation is effected by dividing the thrust-bar and forming the adjacent ends with right and left hand screw-threads, to which a nut 27 is applied. Grooves or keyways 28′ are shown in the two parts of the thrust-bar to hold them from rotation, and the turning of the nut thus serves to vary the length of the bar as desired.

Fig. 4 shows that the centrifugal force would tend to hold the hollow cylinders or rollers upon the mandrels, but a guard 28 is shown in this figure and in Fig. 2, having a curved edge concentric with the carrier-spindle, and serving to positively prevent the rolls from any material displacement between the grinding surfaces. The guard is shown supported upon the bed a by a foot 27′.

Fig. 1^b shows a modification of the carrier adapted to place and sustain solid cylinders or rollers between the grinding disks, the carrier consisting of a circular plate 24 with radial notches 25 having their edges concave to approximately fit the periphery of the solid roller 26. Such carrier operates precisely the same as the mandrel-carrier shown in Fig. 4, in placing the cylinders and holding them between the grinding disks. The carrier is arranged with the organization shown in the drawings, to hold the work-piece horizontally, which permits the work-pieces to be applied to the top of the carrier by hand, or by a suitable feeding-device, and to be discharged automatically from the bottom of the carrier as the pieces are turned away from between the grinding disks. It is not essential, however, to the operation of the machine, that the carrier should hold the work-pieces horizontally during the grinding operation, nor discharge them automatically, as such an arrangement is not essential to the operation of the parts in the manner described herein.

Having thus set forth the nature of the invention what is claimed herein is:

1. In a grinding machine, the combination, with two opposed grinding disks, of a carrier for placing the work-pieces between the disks, means for separating the disks during the placing of the work-pieces, and means for shifting the carrier to clear the work-pieces from the disks.

2. In a grinding machine, the combination, with two opposed grinding disks, of a carrier for placing the work-pieces between the disks, means for separating the disks during the placing of the work-pieces, means for giving the carrier a partial rotation to place the work-piece, and means for holding the carrier stationary during the grinding of each work-piece.

3. In a machine for grinding loose cylinders, the combination, with two opposed grinding disks, of a carrier having radial mandrels to place hollow cylinders between the disks, and a curved guard fixed between the disks to hold the cylinders upon the mandrels during the grinding operation.

4. In a machine for grinding loose cylinders, the combination, with two opposed grinding disks, of a spindle with carrier movable longitudinally thereon and having mandrels to carry hollow cylinders, a spring to hold the mandrels normally midway between the disks, and means for shifting the carrier in opposition to the spring to clear the cylinders from the disks when placing them between the same.

5. In a machine for grinding loose cylinders, the combination, with two opposed grinding disks, of a spindle with carrier movable longitudinally thereon and having mandrels to carry hollow cylinders, a spring to hold the mandrels normally midway between the disks, a feed-shaft rotated continuously and a Geneva stop mechanism connecting the feed-shaft with the carrier-spindle to turn and lock the same at intervals.

6. In a machine for grinding loose cylinders, the combination, with two opposed grinding disks, of a spindle with carrier movable longitudinally thereon and having mandrels to carry hollow cylinders, a bearing upon the spindle adjacent to the carrier with roll projected toward the same, with notches in the side of the carrier to engage the roll, a spring to press the carrier normally toward the roll, and means for turning the carrier intermittingly, whereby the carrier is shifted to clear the cylinders from the disks when placing them between the same.

7. In a machine for grinding loose cylinders, the combination, with a bed, and suitable bearings, of two opposed grinding disks having arbors fitted to the said bearings, one of the arbors and disks being movable longitudinally, a spring to press such disk toward the other, and a stop to limit the movement of the disk under the pressure of such spring, and thereby limit the grinding operation.

8. In a machine for grinding loose cylinders, the combination, with a bed and suitable bearings, of two opposed grinding disks having arbors fitted to the said bearings, one of the arbors and disks being movable longitudinally, a spring upon said arbor to press such disk toward the other, a stop to limit the movement of such arbor, a camshaft rotated continuously and a cam with connections for retracting the arbor to admit each cylinder between the disks before grinding.

9. A machine for grinding loose cylinders, the combination, with a bed and suitable bearings, of two opposed grinding disks having arbors fitted to the said bearings, one of the arbors and disks being movable longitudinally, a spring upon said arbor to press such disk toward the other, a stop to limit the movement of such arbor, a collar upon the arbor with swivel-block next the same, a bell-crank connected to such swivel-block, a cam-shaft rotated continuously upon the bed, and an adjustable thrust-bar transmitting the movement of the cam to the bell-crank for retracting such arbor.

10. In a machine for grinding loose cylinders, the combination, with a bed, and suitable bearings, of two opposed grinding disks having arbors fitted to the said bearings, and one of said arbors movable longitudinally, the threaded sleeve between such movable disk and its bearing with adjusting-nut 9 thereon, the anti-friction thrust-collar upon the back of the movable disk, and a spring fitted between such thrust-collar and the adjusting-nut, whereby the disk may be retracted to introduce the cylinders for grinding and the pressure of the disks toward one another by the spring 16 may be adjusted at pleasure.

11. In a machine for grinding loose cylinders, the combination, with a bed, of a disk with arbor mounted in fixed bearings upon the bed, and an opposed disk movable to and from the first disk and having arbor with bearings attached to a pivoted plate, the plate being adjustable upon the bed to vary the inclination of the disks toward one another, as and for the purpose set forth.

12. In a machine for grinding loose cylinders, the combination, with a bed, of a disk with arbor mounted in fixed bearings upon the bed, and an opposed disk movable to and from the first disk and having arbor with bearings attached to a pivoted plate, and the plate and arbor projected beyond the rear bearing, a swivel upon the projecting end of the arbor, a standard fixed to the plate with bell-crank jointed to the swivel, whereby the bell-crank is moved with the plate when adjusted, a cam with camshaft beneath the bed, and a thrust-bar extended upward through the bed and operating upon one arm of the bell-crank in its various adjustments, to retract the movable disk from the other.

13. In a machine for grinding loose cylinders, the combination, with two opposed grinding disks, of means for rotating them in the same direction at materially different speeds, and means for holding the cylinders loosely and rotatably between the disks during the grinding operation.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

CEPHAS I. SHIRLEY.

Witnesses:
ALBERT WARD,
B. G. KOETHER.