Jan. 13. 1925. 1,522,523

H. M. JEROME

GRINDING MACHINE

Filed July 8, 1921 3 Sheets-Sheet 1

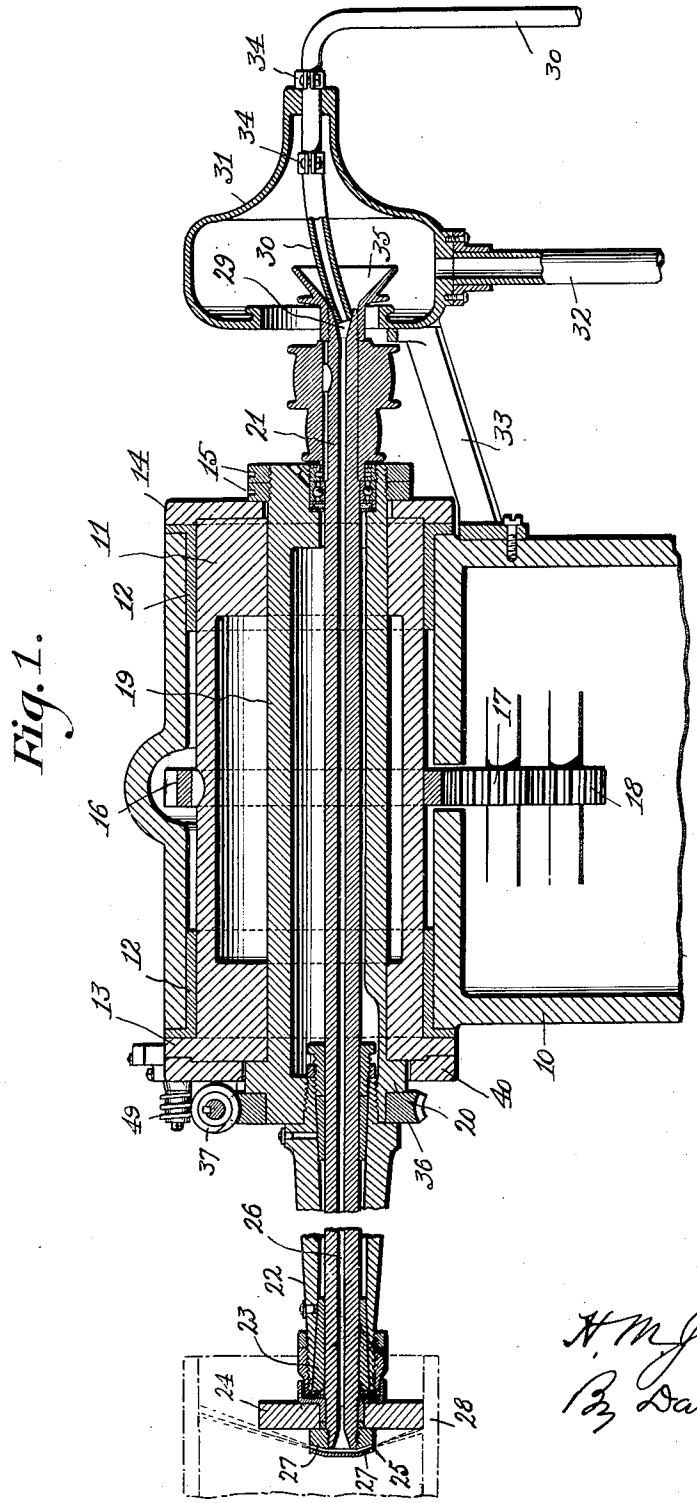


Fig. 1.

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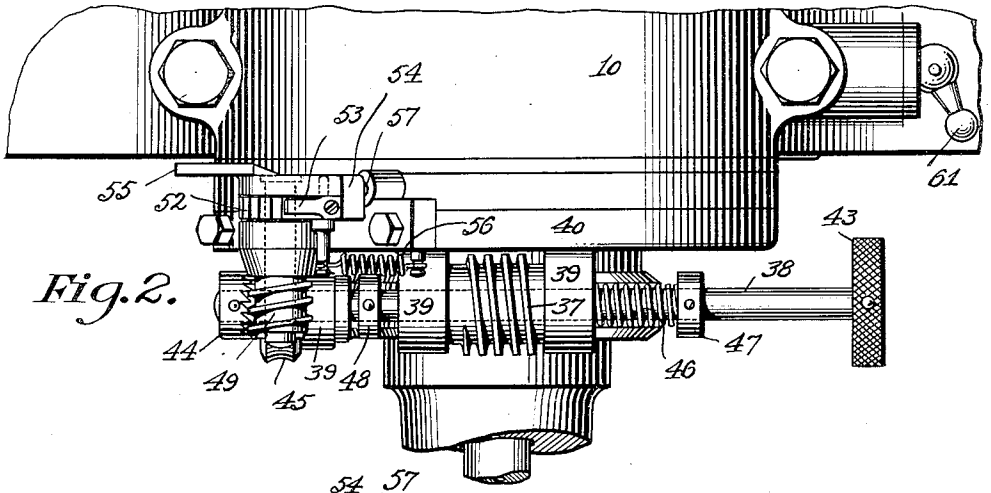


Fig. 2.

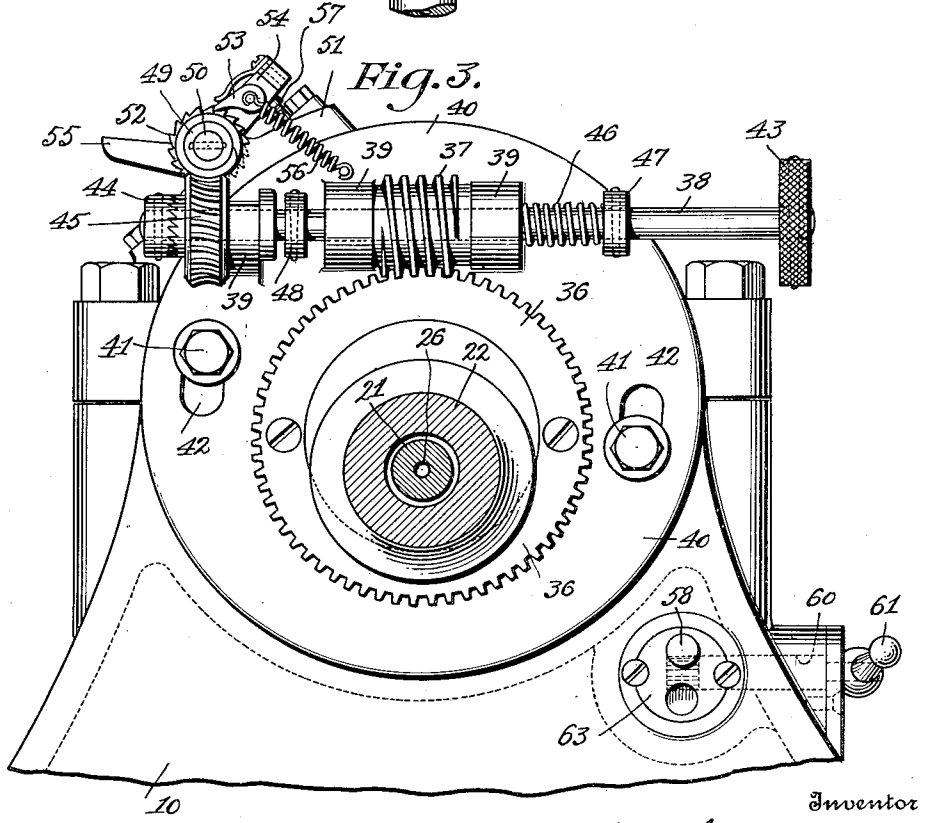


Fig. 3.

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Fig. 4.

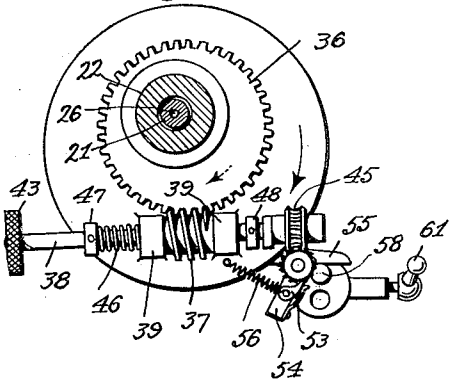


Fig. 5.

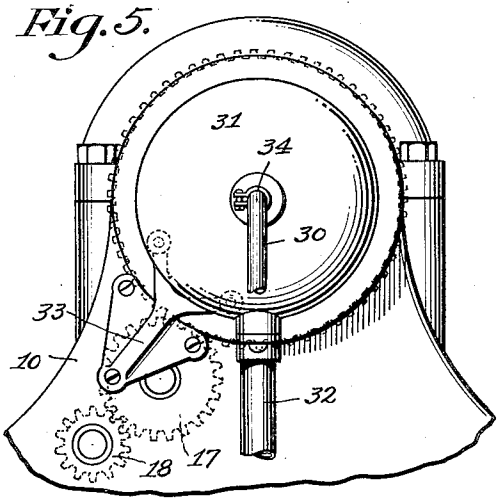


Fig. 6.

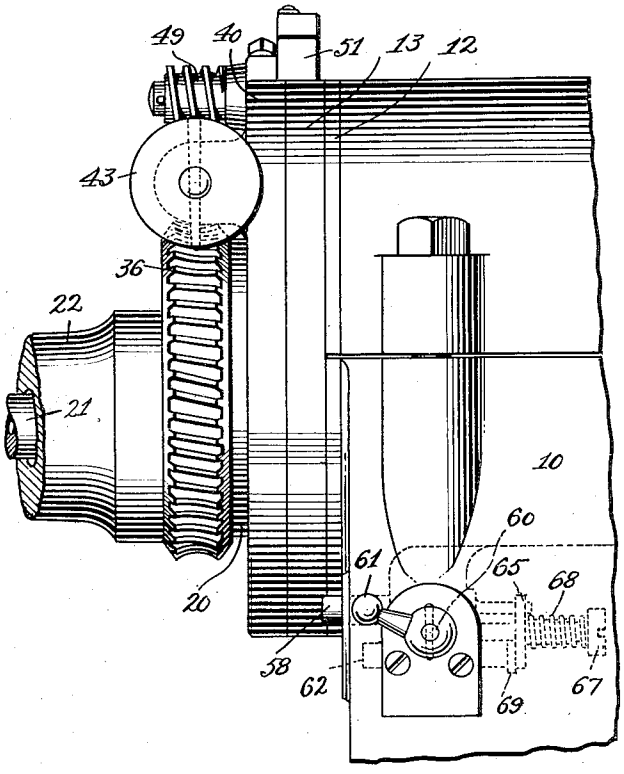


Fig. 7.

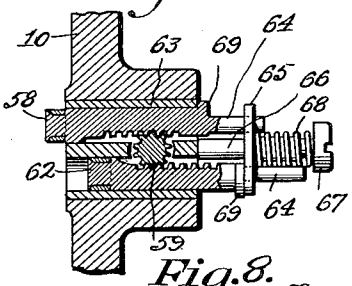


Fig. 8.

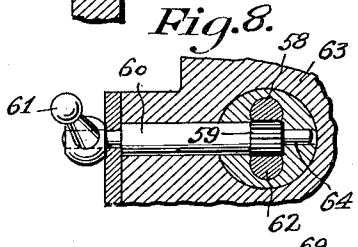
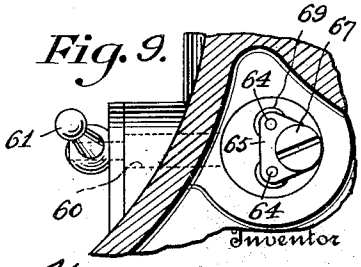


Fig. 9.



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Patented Jan. 13, 1925. 1,522,523

UNITED STATES PATENT OFFICE.

HORACE M. JEROME, OF DAVENPORT, IOWA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO MICRO MACHINE COMPANY, OF BETTENDORF, IOWA, A CORPORATION OF IOWA.

GRINDING MACHINE.

Application filed July 8, 1921. Serial No. 483,195.

To all whom it may concern:

Be it known that I, HORACE M. JEROME, a citizen of the United States of America, and a resident of Davenport, county of Scott, and State of Iowa, have invented certain new and useful Improvements in Grinding Machines, of which the following is a full and clear specification.

This invention has relation to that type of grinding machines in which the spindle is carried by a rotating cylinder, means being provided for eccentrically adjusting the spindle relative to the cylinder to thereby give to the grinding-wheel a planetary movement, adapting it especially to the work of grinding the interior of cylinders and other hollow objects, and one of the objects of the present invention is to provide improved mechanism for varying the eccentricity of the grinding-spindle to thereby vary the depth of the cut, this mechanism being operable either while the machine is running or when it is at rest, as more fully hereinafter set forth.

In the drawings—

Fig. 1 is a vertical longitudinal sectional view taken through the spindle and the adjusting mechanism;

Fig. 2 is a plan view showing the adjusting mechanism;

Fig. 3 is an end view of the adjusting mechanism, the spindle and its housing being shown in cross-section;

Figs. 4 to 9, inclusive, are views of details hereinafter fully described.

Referring to the drawings annexed by reference numerals, 10 designates the pedestal or other supporting structure in which is journaled a horizontal cylinder 11, this cylinder being rotatable upon bush-bearings 12 suitably supported in the upper part of the pedestal, said cylinder being held against endwise movement in the pedestal structure by an annular flange 13 formed on one end of the cylinder and a removable disk-flange 14 removably clamped against the opposite end of the cylinder by means of a pair of nuts 15 hereinafter referred to; this cylinder 11 may be constantly rotated during the operation of the apparatus by any suitable means, preferably by a gear 16 affixed to the cylinder midway its length and meshing with a train of gearing, two gears of which, 17 and 18, are shown.

Extending through the rotatable cylinder 11 and journaled eccentrically therein is an inner cylinder 19 whose ends project beyond the ends of the cylinder 11, one projecting end being externally threaded for the reception of the stop-nuts 15 heretofore referred to, and the other end being radially flanged at 20 to abut against the forward end of the cylinder 11. Extending through this inner cylinder 19 and eccentrically journaled in suitable bearings at the ends thereof is the grinding-wheel-spindle 21 whose forward end extends through the forwardly-projecting housing extension 22 threaded into the forward end of the cylinder 19 and provided with a bearing 23 at its forward end for the forward end of the spindle. The grinding-wheel 24 is fastened in any suitable manner to the projecting end of the spindle, a clamp-nut 25 being employed to removably fasten the grinding-wheel in place. The spindle is bored out axially to provide a passage 26 for fluid, the forward end of this passage 26 being in constant communication with lateral nozzles 27 formed in or upon the nut 25, these nozzles being inclined backwardly at such an angle as to direct the streams of fluid directly to the point of contact between the wheel and the interior of the cylinder 28 being ground. The water or grinding-compound will be forced through the bore-passage 26 with more or less pressure, but this pressure will be increased by centrifugal action, it being understood that the grinding-wheel is rotated at a very rapid speed. In this way, the débris will be flushed out of the work-cylinder as fast as it is formed and thus conduce to speed and accuracy of work and also tend to keep the wheel and the cylinder cool, thereby further contributing to accuracy of work by preventing distortion by heat; this continuous supply of liquid also tends to keep the bearings of the spindle from overheating.

The flushing-and-cooling-liquid may be supplied to the rear end of the spindle in any suitable manner. I prefer the following devices: I flare the rear end of the bore-passage 26, at 29, and extend into said flared-end cavity the forward end of a flexible tube 30 supported slidingly in a hole in the rear wall of a cup-like hood 31 surrounding the rear end of the spindle in such manner as to catch all leakage and return the same to a suitable tank through a drain-pipe 32. The hood 31 is supported on the pedestal by a

bracket 33, and the supply-pipe 30 is provided with a pair of stop-collars 34 which limit the sliding movement of the supply-pipe in the rear wall of the hood 31. By sliding the flexible tube 30 forwardly in such manner that its forward end will fit into the flaring cavity 29 and by supplying water under pressure to the inlet-end of tube 30 or its metallic extension, it will be seen that a constant supply of liquid will be delivered into the bore of the spindle during the rotation thereof. When dry grinding is performed, the tube 30 is simply slid backwardly until its forward collar 34 abuts against the rear wall of the hood, to thereby take the flexible tube 30 out of contact with the spindle. When the flexible tube is pushed forwardly for wet grinding, the forward end of the tube is directed into the flaring cavity 29 by means of a funnel-guide 35 secured to the rear end of the spindle and so arranged as to deliver the leakage-water into the hood.

It will be observed that the rotation of the outer cylinder 11 during the rotation of the grinding-wheel-spindle gives to the grinding-wheel a planetary movement, as is usual in this class of machines. In order to increase or decrease the depth of the cut, I provide mechanism for rotating the inner cylinder 19 on its axis to thus bring the axis of the spindle farther away from or nearer to the axial center of the cylinder 11, which mechanism is automatically operated but is capable of manual operation. This mechanism embodies a worm-gear 36 affixed to the forward end of the arbor-carrying cylinder 19 and meshing with a worm 37 slidingly keyed on shaft 38 journaled in three lugs 39 formed on a ring-plate 40 fastened by bolts 41 to the face of the larger cylinder 11, the ring 13 being circumferentially slotted at 42 to permit of a limited rotative adjustment to accurately mesh the gears 36 and 37.

One end of the shaft 38 is provided with a milled thumb-disk 43, and at the other end of the shaft it is provided with a toothed clutch-member 44 which is adapted to engage a companion clutch-member on a smaller worm-gear 45 idly journaled on said shaft 38. A coil-spring 46 arranged between one of the lugs 39 and a stop-collar 47 on shaft 38 holds these clutch-members in normal engagement, but by pressing endwisely against the shaft 38, through the medium of the thumb-disk 43, the spring 46 may be compressed and the clutch-member 44 disengaged from the worm-gear 45, thereby permitting the shaft 38 to be freely rotated manually for the purpose of backing the grinding-wheel off the work or obtaining the larger adjustments. The shaft 38 is provided with a stop-collar 48 to limit the endwise movement of the shaft 38 when thus manually adjusting the grinding-wheel.

The running adjustment of the spindle is made through the worm 37 and the gear 36 by the following devices which operate the worm-shaft 38 through the worm-gear 45 heretofore referred to, which worm-gear is in constant mesh with the worm 49 journaled on a stub-shaft 50 affixed to a bracket 51 which in turn is affixed to the rotating disk 40, it being obvious that these parts, including the worm-gear 45, rotate with the disk 40, which disk 40, as heretofore described, is affixed rigidly to the forward end of the constantly-rotating cylinder 11. The small worm 49 is rotated intermittently by a ratchet appliance which operates upon the shaft 50 to thus intermittently rotate the main driving worm 37. This ratchet mechanism consists of a ratchet-wheel 52 affixed to the hub or worm 49, a pawl 53 pivotally mounted upon an oscillating lever 54 which in turn is pivoted upon the aforesaid shaft 50 and is provided with a tappet-finger 55 projecting outwardly in a substantially radial direction. A coil-spring 56 normally holds the oscillating lever 54 against a stop-pin 57.

Suitably mounted on the pedestal of the apparatus is a trip-pin 58, this pin lying in the path of the tappet 55 so that as the tappet is carried around it will strike said pin 58 and thus cause an actuation of the ratchet mechanism, thereby imparting a rotary movement to the driving worm 49. After the tappet passes the pin 58, the spring 56 restores the ratchet devices to normal position, ready for another operation when the tappet is again carried around past said pin 58. In this manner, the depth of the cut is slightly increased from time to time as the machine operates.

I provide devices for manually putting the pin 58 into and out of active position so that the attendant will be able to control the depth of cut without stopping the machine. In the present construction, I project and withdraw the pin 58 by means of a pinion 59 which engages a rack formed on the pin 58, this pinion 59 being carried by a shaft 60 whose outer end carries a handle 61. By throwing the handle 61 over to the left, the pin 58 will be projected into active position, and by throwing it into the opposite position the pin will be withdrawn out of the path of the tappet 55. It will be obvious that I may provide additional trip-pins for the purpose of varying the feed, it being obvious that the farther away the trip-pins are located from the center of rotation of the parts, the smaller will be the feed action. In the present construction, I have shown one additional feed-pin at 62 and have geared this pin 62 in such manner to the pinion 59 that the rotation of the pinion in opposite directions will alternately project and withdraw the pins or will ad-

just both pins to neutral, inactive, position. The trip-pins 58 and 62 are arranged in parallel relation and are slidable in holes formed in a plug 63 removably fastened in a hole in the pedestal wall. The rear ends of the trip-pins are reduced to form guide-pins 64 which are adapted to slide through holes in an abutment-plate 65 slidably mounted upon a stationary pin 66 carried by the plug 63. The stationary pin 66 is provided with a head 67 at its outer end, and between this head and the abutment 65 is arranged an expansible coil-spring 68 which normally tends to force the abutment-plate 65 toward the adjacent ends of the trip-pins. The trip-pins are provided with shoulders 69 against which the abutment-plate 65 normally presses, so that the action of the coil-spring 68 is to press with equal force against the shoulders 69 and thus maintain both trip-pins in inactive position so that, unless either of said trip-pins is held in active position manually by holding the handle 61 in one position or the other, the trip-pins will be held entirely out of action. It will be understood, therefore, that by simply throwing the small hand-lever 61 toward the right or toward the left, one or the other of the trip-pins may be brought into active position, and that when the handle 61 is released the spring 68 will instantly restore the trip-pins to normal, inactive, position.

The nature and scope of the invention having been thus indicated and its preferred embodiment having been specifically described, what is claimed as new is:

1. In a grinding machine, means for feeding the grinding-wheel embodying a manually - controlled intermittently - operating mechanism the manually-controlled elements consisting of a plurality of pins located at different distances from the center of rotation of said grinding-wheel.

2. In a grinding machine, a support, a cylinder rotatably supported thereon and means for rotating this cylinder, an inner cylinder journaled eccentrically in said cylinder and means for rotating it, a grinding-wheel-spindle eccentrically journaled in said inner cylinder said means for rotating the inner cylinder embodying a pair of pins located at different distances from the center of rotation of the cylinder.

3. In a grinding machine, a support, an outer cylinder journaled therein and means for rotating this cylinder during the operation of the machine, an inner cylinder eccentrically journaled in said outer cylinder and means for rotating it during the operation of the machine, and a grinding-wheel-spindle journaled eccentrically in said inner cylinder, said means for rotating the inner cylinder embodying a worm and gear mechanism and a ratchet mechanism rotatable with the inner cylinder, and a plurality of pins on an adjacent part of the support located at different distances from the center of rotation of the cylinder.

4. In a grinding machine, a support, an outer cylinder journaled therein and means for rotating this cylinder during the operation of the machine, an inner cylinder eccentrically journaled in said outer cylinder and means for rotating it during the operation of the machine, and a grinding-wheel-spindle journaled eccentrically in said inner cylinder, the means for rotating the inner cylinder embodying feed-devices rotating therewith and a stationary device on the support adapted to intermittently operate said feed-devices, said device on the support embodying a pair of pins and manually-operable means for simultaneously shifting said pins alternately into action or both out of action.

5. In a grinding machine, a support, an outer cylinder journaled therein and means for rotating this cylinder during the operation of the machine, an inner cylinder eccentrically journaled in said outer cylinder and means for rotating it during the operation of the machine, and a grinding-wheel-spindle journaled eccentrically in said inner cylinder, the means for rotating the inner cylinder embodying a worm gear affixed to the inner cylinder, a worm mounted to rotate with the outer cylinder, and devices for rotating said worm embodying a ratchet device and a shiftable trip device on the support for intermittently operating the ratchet device, said shiftable trip device embodying a pair of parallel pins each provided with a rack, a common pinion for said racks, and a manual device for rotating said pinion in either direction.

6. In a grinding machine, a support, an outer cylinder journaled therein and means for rotating this cylinder during the operation of the machine, an inner cylinder eccentrically journaled in said outer cylinder and and means for rotating it during the operation of the machine, and a grinding-wheel-spindle journaled eccentrically in said inner cylinder, means being provided on the support for intermittently operating the feed-means on the inner cylinder during the operation of the machine, this latter means consisting of a pair of pins slidably mounted in the support, manual means for simultaneously shifting these pins alternately into and out of active position, and spring means for normally tending to force both pins into neutral.

7. In a grinding machine, feed-means rotatable with the grinding-spindle and embodying a ratchet mechanism, and trip-means on an adjacent stationary part for intermittently operating said ratchet during the running of the machine, said trip means

embodying a pair of parallel pins, manual means for shifting the pins alternately into and out of action, and devices for normally tending to force both pins into neutral, said devices consisting of a plate engaging the outer ends of the pins, a spring pressing this plate toward the pins, and a thrust-pin for said spring.

8. In a grinding machine, feed-means rotatable with the grinding-spindle and embodying a ratchet mechanism, and trip-means on the adjacent stationary part for intermittently operating said ratchet during the running of the machine, said trip-means consisting of a plurality of devices adapted to be made alternately operative for giving different feeds.

9. In a grinding machine, feed-means rotatable with the grinding-spindle and embodying a ratchet mechanism, and trip-means on the adjacent stationary part for intermittently operating said ratchet during the running of the machine, said trip-means embodying a plurality of pins located at different distances from the center of rotation of the spindle and adapted to impart different feed movements.

10. In a grinding machine, feed-means rotatable with the grinding-spindle and embodying a ratchet mechanism, and trip-means on the adjacent stationary part for intermittently operating said ratchet during the running of the machine, said trip-means embodying a pair of trip-pins located at different distances from the center of rotation of the spindle and means for simultaneously putting one into action and the other out of action.

In testimony whereof I hereunto affix my signature.

HORACE M. JEROME.

Witnesses:

CHAS. F. WOLF,

H. STAAK.