March 1, 1927. 1,619,361

E. A. MOYER

THREAD CHASER GRINDING MACHINE

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Fig. 1.

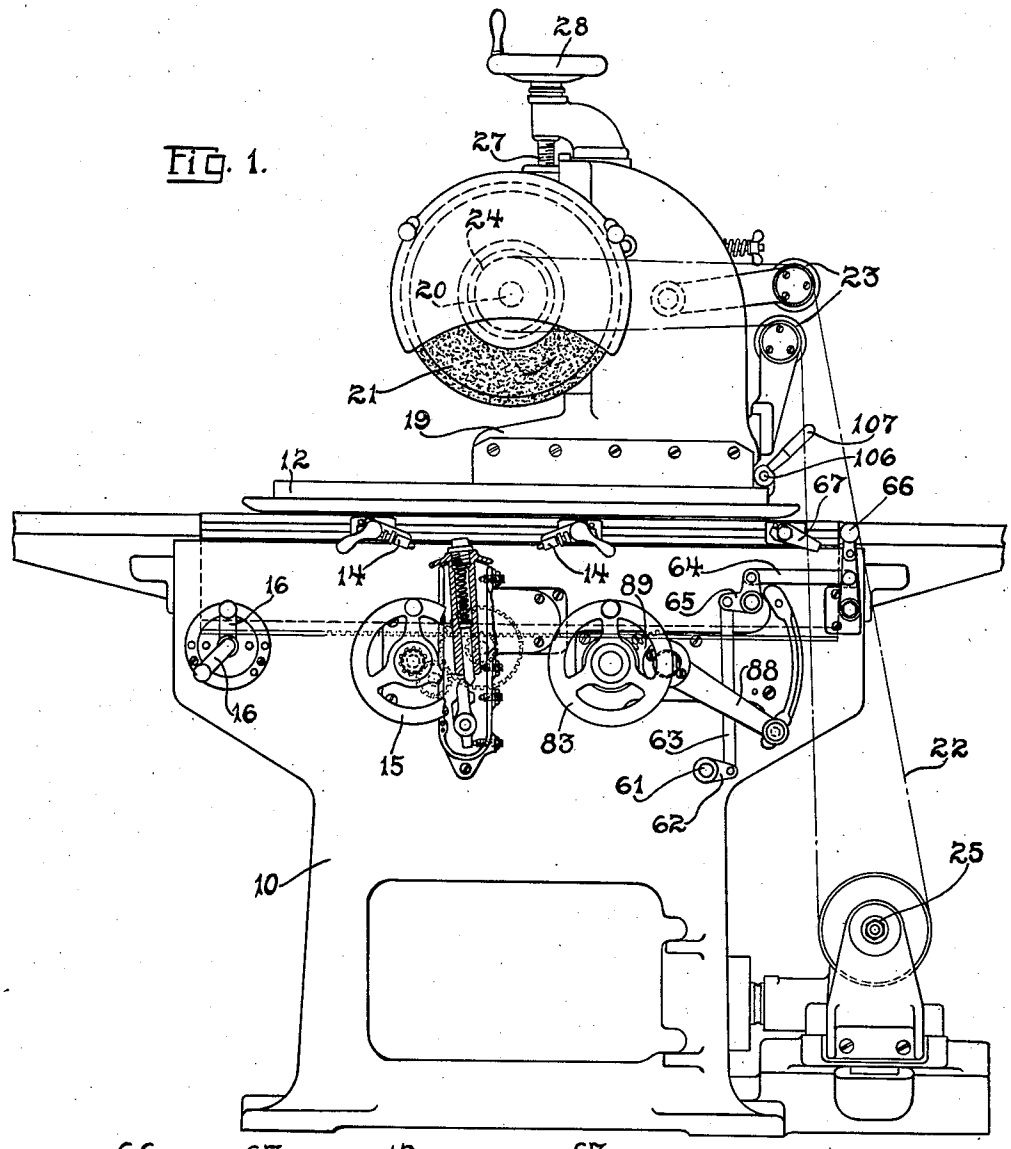


Fig. 12.

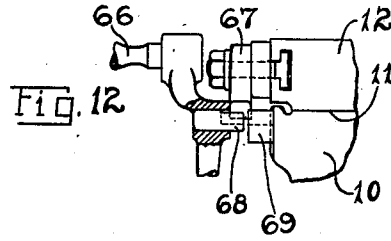
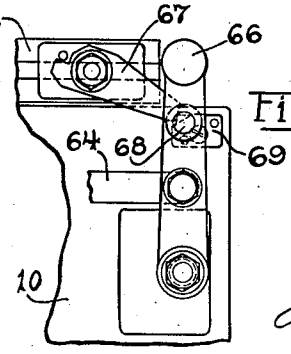


Fig. 11.



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Fig. 2.

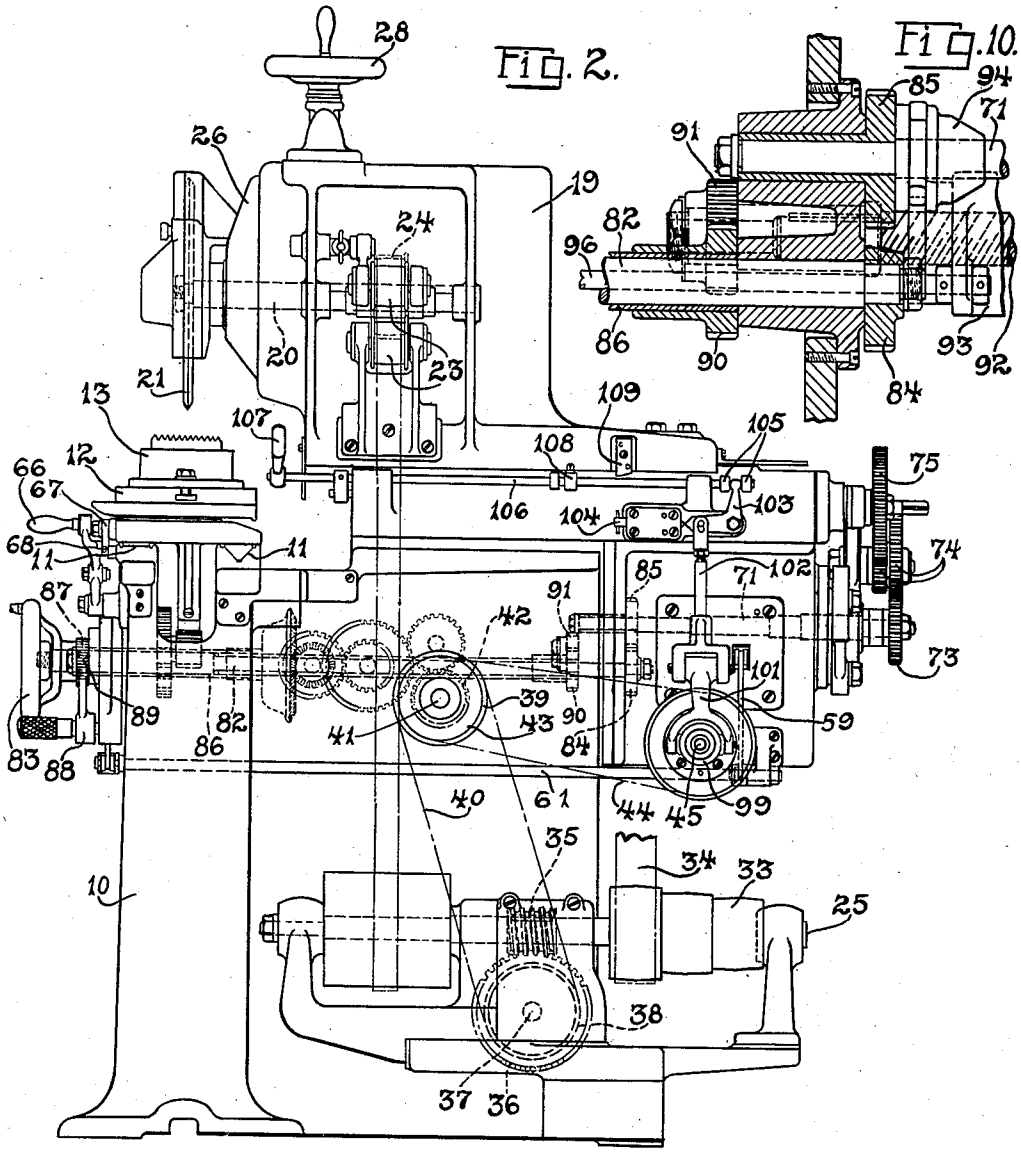


Fig. 10.

Fig. 8.

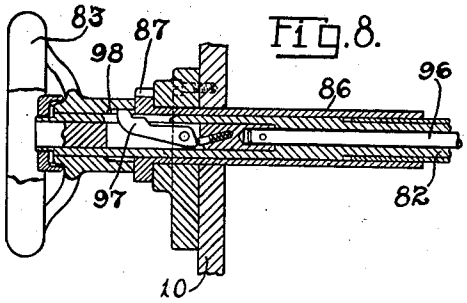
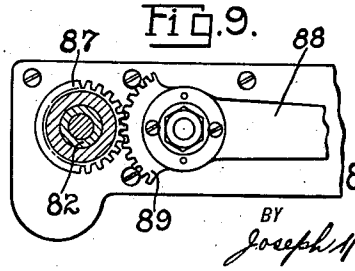


Fig. 9.



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THREAD CHASER GRINDING MACHINE

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Fig. 3.

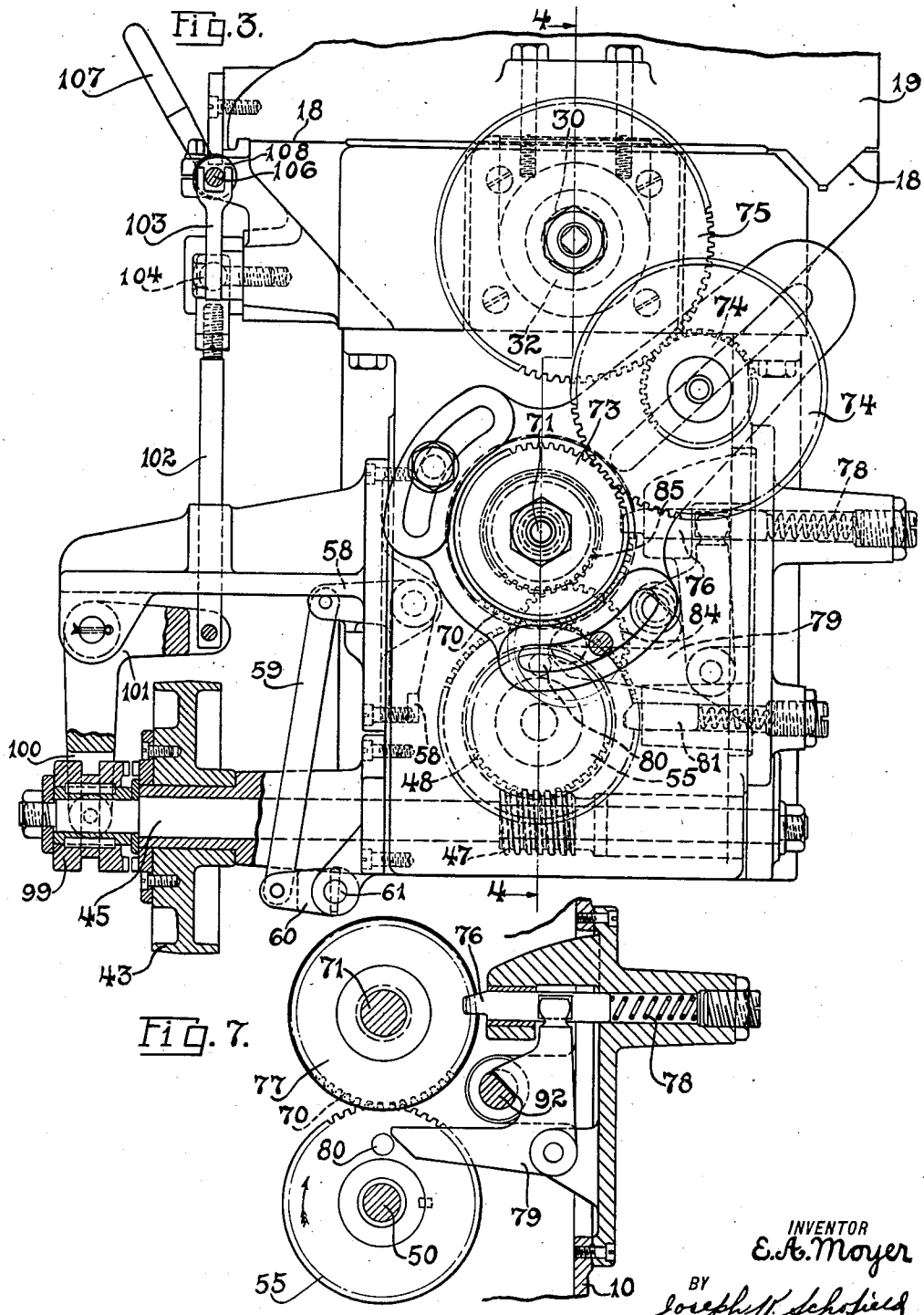


Fig. 7.

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THREAD CHASER GRINDING MACHINE

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Fig. 4.

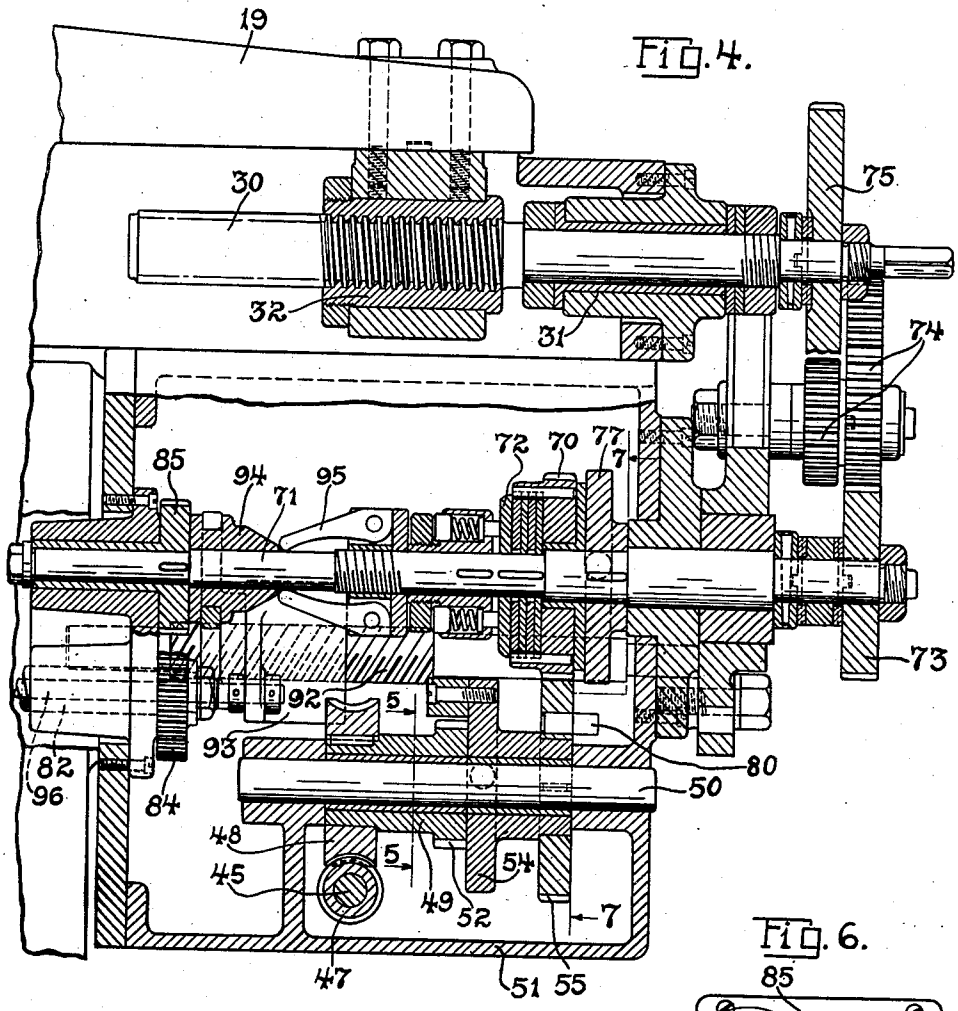


Fig. 5.

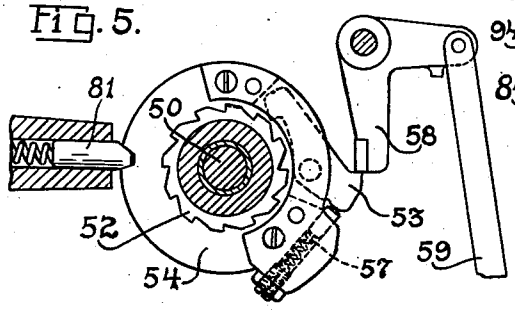
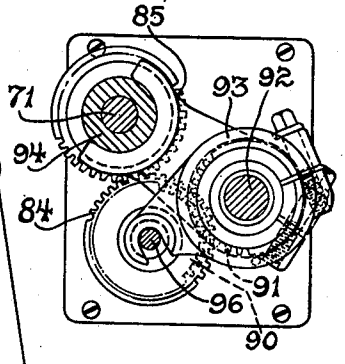


Fig. 6.



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UNITED STATES PATENT OFFICE.

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THREAD-CHASER-GRINDING MACHINE.

Application filed February 2, 1925. Serial No. 6,305.

This invention relates to grinding machines and in particular to a machine adapted to grind parallel grooves usually of V form in a surface of metal plates for thread chasers, or similar articles.

An object of the present invention is to provide a grinding machine designed especially for the above purpose which will be accurate and entirely automatic in its operation so that the operation of grinding the ridges or grooves in the chasers, or similar articles, can be expeditiously performed with a minimum of manual supervision.

One feature which enables me to accomplish the above named object is that I provide a grinding machine with a work supporting table which may be reciprocated back and forth past a grinding wheel rotating in a plane parallel to the direction of the table reciprocations, means being provided to adjustably limit the stroke of the table. Also to provide a support for the abrasive or cutting wheel slidable in a direction exactly normal to the direction of movement of the table and adapted to be indexed by being successively moved predetermined equal distances in a direction toward or from the table.

Another feature which is of advantage is that the indexing or predetermined spacing movement of the wheel support toward or from the table is controlled automatically by adjustable means preferably on the table so that the indexing movement of the wheel occurs after or at the end of each stroke of the table in one direction.

Another object of the invention is to provide a machine which will be simple, easily operated and having a work supporting table and operative means therefor of the type used in cylindrical grinding machines. The movements of the table are therefore simplified as it is moved in one direction only. Similarly the wheel and its support during operation are required to move in one direction only, namely in a direction normal to the direction of movement of the table.

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 the specification, I have shown my invention embodied in an automatic thread chaser grinding machine having a wheel with its periphery dressed to conform to the angle of the sides of the particular grooves being ground, 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 is a front elevation of the complete machine embodying the present invention.

Fig. 2 is an end elevation taken from the right end of the machine as viewed in Fig. 1.

Fig. 3 is an elevation in rear of the machine showing the wheel support indexing mechanism.

Fig. 4 is a sectional view taken substantially upon line 4—4 of Fig. 3.

Fig. 5 is a detail of the index actuating mechanism taken on line 5—5 of Fig. 4 and looking in the direction of the arrows.

Fig. 6 is another detail of the means for operating the indexing mechanism.

Fig. 7 is a sectional view taken upon line 7—7 of Fig. 4.

Fig. 8 is a detail sectional view of the hand wheel for operating the wheel advancing mechanism.

Fig. 9 is a detail view of the mechanism for changing from manual to automatic operation of the indexing mechanism.

Fig. 10 is a detail of parts of the means for manually operating the wheel advancing mechanism.

Fig. 11 is a fragmentary front elevation of the means for actuating the indexing mechanism at the end of the stroke of the table in one direction; and

Fig. 12 is an end view of the same parts.

In the above mentioned drawings I have shown but one embodiment 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 and in its broadest aspect my invention comprises the following principal parts: first, a base; second, a work supporting table adapted to be reciprocated predetermined variable distances in a straight line thereon; third, a wheel support having a

cutting wheel rotatably mounted therein; fourth, means for moving said support and its wheel toward and away from the table; fifth, automatic indexing means for controlling the movements of the wheel support, the distances moved by the wheel being variable by means of suitable change gears; sixth, actuating means for the indexing mechanism adapted to move the wheel support at the end of each stroke of the table in one direction.

Referring more in detail to the figures of the drawing, I provide a base 10 having suitably disposed ways 11 thereon upon its upper horizontal surface. On these ways 11 is mounted a table 12 upon which may be attached fixtures 13 for carrying the work pieces W to be ground. In order to reciprocate this work supporting table 12 along the ways 11, means are provided which are, or may be, similar in every way to the mechanism disclosed in the patent to Hanson 955,642 for the same purpose. For this reason a detail description of this mechanism will not be required. It may be stated, however, that by means of dogs 14 adjustably mounted upon the table 12, this table 12 may be horizontally moved distances determined by the distance between the dogs 14. Also, this reciprocatory movement of the table 12 will normally be continued so long as the machine is in operation. Manual means for moving the table 12 actuated by rotation of the hand wheel 15 are provided for preliminary adjustments and setting up of the machine. Also, by means of suitable change gears controlled by suitable levers 16 the speed of reciprocation of the table 12 may be widely varied.

Mounted upon horizontal ways 18 upon the base 10 which extend in a direction normal to the ways 11 for the table 12 is a wheel head or support 19 having a wheel spindle 20 rotatably mounted thereon carrying at its forward end an abrasive wheel 21. This is clearly shown in Fig. 2. A belt 22 passing over suitable idlers 23 and over a pulley 24 or drum on the wheel spindle 20 provides means for rotating the wheel 21 at a high speed from a main driving shaft 25. Preferably, and as shown in Figs. 1 and 2, the wheel spindle 20 is carried upon a small head 26 adjustable vertically along vertical ways on the bracket or support 19. The vertical position of this spindle 20 may be adjusted by rotation of a screw 27 by hand wheel 28 shown in Figs. 1 and 2.

In order to move the support 19 and its wheel 21 along ways 18 so that the wheel 21 may engage successively different portions of the work pieces W being ground, a screw 30 is rotatably mounted in a portion of the base 10 and maintained against axial movement in a suitable bearing 31. This screw 30 and its mounting is shown clearly in Fig. 4. A nut 32 engaging the screw 30 and attached to the rear end of the bracket or support 19 forces the bracket to be moved toward or away from the table 12 by rotation of the screw 30. Special means are provided for successively rotating this screw 30 predetermined amounts to index or space the wheel 21 to engage adjacent parallel ridges or grooves in the work W being ground. These means are shown clearly in Figs. 3 and 4, detail mechanisms associated therewith being shown also in Figs. 5, 6 and 7. This indexing mechanism for the wheel, as well as the table reciprocating and wheel rotating means, is driven from main shaft 25 preferably and as shown, positioned horizontally of and adjacent the base 10. A cone pulley 33 on the shaft 25 may be driven by a belt 34 from any suitable power means. On this shaft 25 also is a worm 35 in mesh with a worm wheel 36 on one end of a transverse shaft 37 extending into the base 10 of the machine. A pulley 38 on the opposite end of this shaft 37 drives a pulley 39 through a suitable belt 40. Pulley 39 is on a short shaft 41 having a gear 42 thereon for driving the table reciprocating mechanism. Another pulley 43 by means of a suitable belt 44 drives a worm shaft 45 for the wheel support indexing mechanism. This shaft 45 over which the belt 44 runs has a worm 47 thereon in mesh with a worm wheel 48 on a sleeve 49 rotatably mounted on a short shaft 50. This sleeve 49 is rotatably mounted on shaft 50 preferably in a gear box 51 attached to the rear of the machine. The worm wheel 48, at one end, is suitably keyed to the sleeve 49 and a ratchet wheel 52 may be formed integrally thereto at its opposite end. By means of the worm 47 which may be constantly rotated by rotation of its driving shaft 25 this ratchet wheel 52 is constantly rotated and, when a pawl 53 carried upon an adjacent member 54 is engaged therewith, serves to rotate the member 54. This member 54 is mounted on or forms a part of a short sleeve and has a gear 55 keyed thereto. The pawl 53, shown most clearly in Fig. 5, is mounted on the member 54 so that it may oscillate to engage over one of the teeth on the ratchet wheel 52. From the above description it will be seen that when the pawl 53 engages the ratchet 52 the member 54 and its gear 55 will be rotated until the pawl 53 is disengaged. Means are provided for automatically disengaging this pawl 53 after each revolution of the member 54.

Preferably the pawl 53 is normally pressed by a small spring 57 toward its engaging position. A detent 58 pivotally mounted is provided adjacent the pawl 53 so that with each revolution of the member 54 the pawl 53 is engaged by this detent 58 and withdrawn from the ratchet wheel 52. To

move this detent 58 to disengage the pawl 53, which may, as shown, be in the form of a bell crank, a reach arm 59 is provided. This reach arm is attached at one end of one of the arms of the bell crank, the opposite end being attached, as shown in Fig. 3, to a short lever 60 on an oscillatable shaft 61. This shaft 61 extends forwardly through the base 10 and at its forward end is provided with a short lever 62. By means of reach arms 63 and 64 and a bell crank 65, the detent may be actuated by oscillation of a hand lever 66 mounted for convenient operation upon the front surface of the base 10. By means of this hand lever 66 the detent 58 may be withdrawn from its operative position, thus permitting the pawl 53 to engage the ratchet 52 and rotate the index driving gear 55. By holding the lever 66 toward the right the member 54 and gear 55 will be continuously rotated. The normal indexing motion of the support is completed by one complete rotation of the gear 55 so that the lever 66 should be promptly released as soon as the indexing movement is begun.

By means of a dog 67 mounted on the table 12 this hand lever 66 will be oscillated each time the table 12 moves to its extreme right hand position. This dog 67 is so mounted and actuated that it becomes disengaged from the lever 66 as soon as the lever 66 is moved to actuate the indexing mechanism. The dog 67, when the table is toward the end of its stroke in one direction, contacts with a pin 68 outstanding rearwardly from the lever 66. Simultaneously it engages a bevelled plate 69 fixed to the front of the base 10 so that as the table 12 continues to move toward the right it oscillates the dog 67 and disengages the lever 66. The lever 66 and the detent 58 may therefore move immediately back to their original position. By means of this construction the detent 58 will be momentarily withdrawn from engagement with the pawl 53, thus allowing the pawl 53 to engage the ratchet 52 and rotate the member 54 and gear 55. By the time the pawl 53 has rotated a complete turn with the ratchet wheel 52 the detent 58 has returned to its normal position and withdraws the pawl 53 again from the ratchet 52. This member 54 and gear 55 will therefore be rotated to actuate the wheel indexing mechanism each time the table 12 moves to one end of its stroke. Also by means of the hand lever 66 the workman can actuate the indexing mechanism at any time.

The gear 55 rotated by the member 54 carrying the pawl 53 is in mesh with a gear 70 on a second shaft 71, the gear 70 on this shaft 71 being frictionally mounted upon a suitable clutch 72 preferably of disc form. Rotation of this second shaft 71 serves to rotate the driving gear 73 of a train of change gears 74, the members of which may be so chosen that with one rotation of the driving gear 73 gives any predetermined rotative movement to a gear 75 mounted on the screw 30. Therefore, by choosing the proper members for this change gear mechanism 74, the wheel support 19 and wheel 21 may be moved any predetermined distance with each indexing movement. As the shaft 71 carrying the driving gear 73 is always rotated exactly one revolution, the indexing movements of the wheel support 19 are always equal and may be of any predetermined amount for the particular work pieces W being operated on.

To positively limit the rotative movement of the shaft 71 to one revolution and to stop it in the exact position, after each indexing movement, a plunger 76 is mounted adjacent the shaft 71 and is adapted to enter a notch in a disk 77 keyed to the shaft 71. A spring 78 in rear of the plunger 76 normally forces it toward its engaged position. To disengage the plunger 76 from the disk a bell crank 79 is mounted adjacent the shaft, one arm of which engages a notch in the plunger 76 and the other arm is adapted to engage a pin 80 outstanding from the gear 55 or the first shaft 50. As soon, therefore, as the pawl 53 engages the ratchet 52 and starts rotation of the gear, the friction 72 slips until pin 80 engages the arm of the bell crank 79 and disengages the plunger 76 from its disk 77. The gear 55 then rotates the second shaft 71 by gear 70 until the shaft 71 and disk 77 make one complete revolution, the plunger 76 then re-engages its slot in the disk 77 and stops further rotation of the second shaft 71 and consequently of the indexing screw 30. The member 54 and gear 55 continue to rotate during which the friction clutch 72 again slips until the pawl 53 is disengaged from the ratchet 52 by the means above described. The gears connecting the first and second shafts 50 and 71 through the friction clutch 72 are of approximately 9:8 ratio so that the gear 55 on the first shaft 50 in rotating one turn rotates the frictionally mounted gear 70 on the second shaft 71 slightly more than one revolution. By means of the plunger 76 the shaft 71 is prevented from rotating more than exactly one turn at each indexing movement so that the friction clutch 72 is compelled to slip during a portion of the rotative movement of the gear 55 on the first shaft 50. A spring pressed plunger 81 may also be provided adjacent the member 54 so that it may engage a notch cut therein. The end of this plunger 81 is so bevelled that it may be forced outward by the rotative movement of the member 54.

Means are also provided for rotating the index mechanism driving shaft 71 manually so that the support 19 for the wheel 21 may be positioned transversely of the work

supporting table 12. For this purpose a shaft 52 is provided extending forwardly through the base 10 and having a hand wheel 83 on its forward end. Rotation of this hand wheel 83 and shaft 82 rotates a gear 84 on the rear end of the shaft 82 which is in mesh with another gear 85 keyed directly to the shaft 71. It will be seen, therefore, that by rotating this hand wheel 83 the index mechanism driving shaft 71 may be rotated in either direction. First, however, the friction clutch 72 must be in its released position and for this purpose I provide a sleeve 86 extending forwardly through the base 10 and preferably closely surrounding the shaft 82. This sleeve 86 is provided with a gear 87 at its forward end which may be oscillated by the lever 88 shown in Figs. 1 and 9. This lever 88 is provided with a segmental gear 89 in mesh with the gear 87 on the sleeve 86 so that by oscillating the lever 88 from one operative position to the other the sleeve 86 is rotated. On the rear end of the sleeve 86 is a gear 90 in mesh with another gear 91 keyed directly to a screw 92. This screw 92 is rotatably mounted within the base and as shown in Figs. 4 and 10, has a long lead. A nut 93 engaging this screw 92 may therefore be traversed back and forth by rotation of the screw. Movable with this nut 93 is a friction operating member 94 having a conical surface at one end engaging fingers 95 forming a part of the friction clutch 72 previously described. It will be seen, therefore, that by oscillating the lever 88 mounted on the forward surface of the base 10, this friction actuating member 94 will be moved to oscillate the fingers 95 on the friction clutch 72, thus moving the clutch to clamping or unclamping position.

The plunger 76 must also be removed from the recess in the disk 77 so the screw 92 near one end is cut away as shown in Fig. 7. Within this cut away portion fits a part of the bell crank 79. Rotation of the screw 92 therefore will oscillate the bell crank and therefore withdraw the plunger 76 from the disk 77 and permit rotation of the shaft 71.

As it is not desirable to have the hand wheel 83 rotate during the automatic indexing movement of the wheel 21, a long rod 96 is attached to the nut 93 on the screw 92 having a finger 97 oscillatably mounted at its forward end. This is shown in Fig. 8. In the position of the nut 92 for automatic indexing, during which the friction clutch is engaged, the rod is pulled toward the right as seen in Fig. 8 to withdraw the finger 97 from a spline or key-way 98 in the hub of the hand wheel 83. Movement of the clutch actuating member 94 to disengage the friction clutch 72 moves the rod 96 to the left and permits the finger 97 to enter the key-way in the hand wheel 83 and thus permit rotation of the shaft 82 thereby.

Means are also provided to permit the operator to quickly disengage the indexing mechanism at any time during operation and also to automatically discontinue further indexing motions when the wheel 21 and wheel support 19 have reached any predetermined adjustable position over the table 12. For this purpose the pulley 43, instead of being directly keyed to the worm shaft 45, is rotatably mounted relative thereto and may be coupled to the shaft through a clutch 99 keyed at the outer end of this shaft. This clutch 99 is adapted to be moved from one to the other of its positions by means of a yoke 100 forming a part of a bell crank 101 which may be oscillated by a vertically disposed rod 102. This rod 102 is normally held in its uppermost position to engage the clutch 99, at which time one arm of a second bell crank 103 (see Fig. 2) is above the spring detent 104. The other arm of the bell crank 104 is disposed between collars 105 on a forwardly extending rod 106. A handle 107 at the forward end of this rod 106 enables the operator to oscillate the bell cranks 101 and 103 to positions so that the rod 102 will be moved downward and the clutch 99 moved to its inoperative position. Simultaneously the spring detent 104 will be forced above the arm of the bell crank 103, thus resiliently holding the clutch 99 in this inoperative position. By moving the handle 107 or rod 106 rearwardly, the bell crank 103 is again oscillated and the clutch 99 moved to operative position. By means of an adjustable stop 108 on the rod 106 adapted to engage the lowermost end of a finger 109 positioned on the support 19, the rod 106 may be forced forwardly by movement of the support 19 to move the index operating clutch 99 to inoperative position. By positioning this stop 108 at any point along the rod 106, the indexing movements of the support 19 may be discontinued with the support in any predetermined position relative to the table 12.

What I claim is:

1. A grinding machine comprising in combination, a base, a table slidably mounted thereon, a wheel support having a cutting wheel rotatably mounted therein, said wheel support being movable toward and from the table, automatic means to move the support predetermined distances to index the wheel relative to the table and means to feed said wheel in a direction normal to its indexing movement.

2. A grinding machine comprising in combination, a base, a table slidably mounted thereon, a wheel support having a cutting wheel rotatably mounted therein, said wheel support being movable toward and from the table in a direction parallel to the axis of rotation of the wheel, automatic means to move the support predetermined distances to index the wheel transversely of the table, and means

to feed said wheel normal to the movement of the table and indexing movement of the wheel.

3. A grinding machine comprising in combination, a base, a table slidably mounted thereon, a wheel support having a cutting wheel rotatably mounted therein, said wheel support being movable toward and from the table in a direction normal to the direction of movement of the table, automatic means to move the support predetermined distances transversely of work on said table to index the wheel relative to the table, and means to manually feed said wheel during operation.

4. A grinding machine comprising in combination, a base, a table slidably mounted thereon, means to reciprocate the table, a wheel support having a cutting wheel rotatably mounted therein, said wheel support being movable toward and from the table, automatic means to move the support predetermined distances, and means on the table to actuate the said moving means at the end of the stroke of the table in one direction.

5. A grinding machine comprising in combination, a base, a table slidably mounted thereon, means to reciprocate the table variable distances, a wheel support having a cutting wheel rotatably mounted therein, said wheel support being movable toward and from the table, automatic means to move the support predetermined distances in a direction normal to the direction of movement of the table to index the wheel, means on the table to actuate the said moving means at the end of the stroke of the table in one direction, and means to feed the wheel in a direction normal to the movement of the table and indexing movement of the wheel.

6. A grinding machine comprising in combination, a base, a table slidably mounted thereon, means to reciprocate the table, a wheel support having a cutting wheel rotatably mounted therein, means to move the wheel support toward and from the table predetermined variable distances in a direction normal to the direction of movement of the table, means on the table to actuate said moving means at the end of each stroke of the table in one direction, means to continuously move the support in a direction normal to the movement of the table, and means to feed said wheel during operation.

7. An indexing mechanism for grinding machines comprising in combination, a driving shaft, a member adapted to be rotated thereby, means limiting the rotative movement of the member to one turn, a second shaft driven by said member, an indexing screw, means connecting said second shaft and said screw whereby one rotation of the second shaft is adapted to rotate the screw any predetermined amount, a locking pin engaging the second shaft, and means to withdraw the pin from operative position.

8. An indexing mechanism for grinding machines comprising in combination, a driving shaft, a member adapted to be rotated thereby, means limiting the rotative movement of the member to one turn, a second shaft adapted to be frictionally driven by said member, an indexing screw, change gears between said second shaft and said screw whereby one rotation of the second shaft is adapted to rotate the screw any predetermined amount, a locking pin engaging the second shaft and means on the driving shaft to withdraw the pin from operative position.

9. An indexing mechanism for grinding machines comprising in combination, a driving shaft, a member adapted to be rotated thereby, a second shaft adapted to be frictionally driven by said member, supplemental manual driving means for said second shaft, means to disengage the frictional means for driving the second shaft when the manual driving means are engaged, an indexing screw, and change gears connecting said second shaft to said indexing screw.

10. An indexing mechanism for grinding machines comprising in combination, a driving shaft, a member adapted to be rotated thereby, a second shaft adapted to be frictionally driven by said member, means to limit the rotative movement of the second shaft, supplemental manual driving means for said second shaft, means to disengage the frictional means for driving the second shaft when the manual driving means are engaged, an indexing screw, and means connecting said second shaft to said indexing screw.

11. An indexing mechanism for grinding machines comprising in combination, a driving shaft, a member adapted to be rotated thereby, means limiting the rotative movement of the member to one turn, a second shaft adapted to be frictionally driven by said member, means limiting the rotative movement of the second supplemental manual driving means for said second shaft, means to disengage the frictional means for driving the second shaft when the manual driving means are engaged, an indexing screw, and change gears connecting said second shaft to said indexing screw.

In testimony whereof, I hereto affix my signature.

EDWARD A. MOYER.