May 10, 1927. 1,627,983

J. MAICKEL

DEMOUNTABLE DRILL BIT GRINDER

Filed Jan. 14, 1926 4 Sheets-Sheet 1

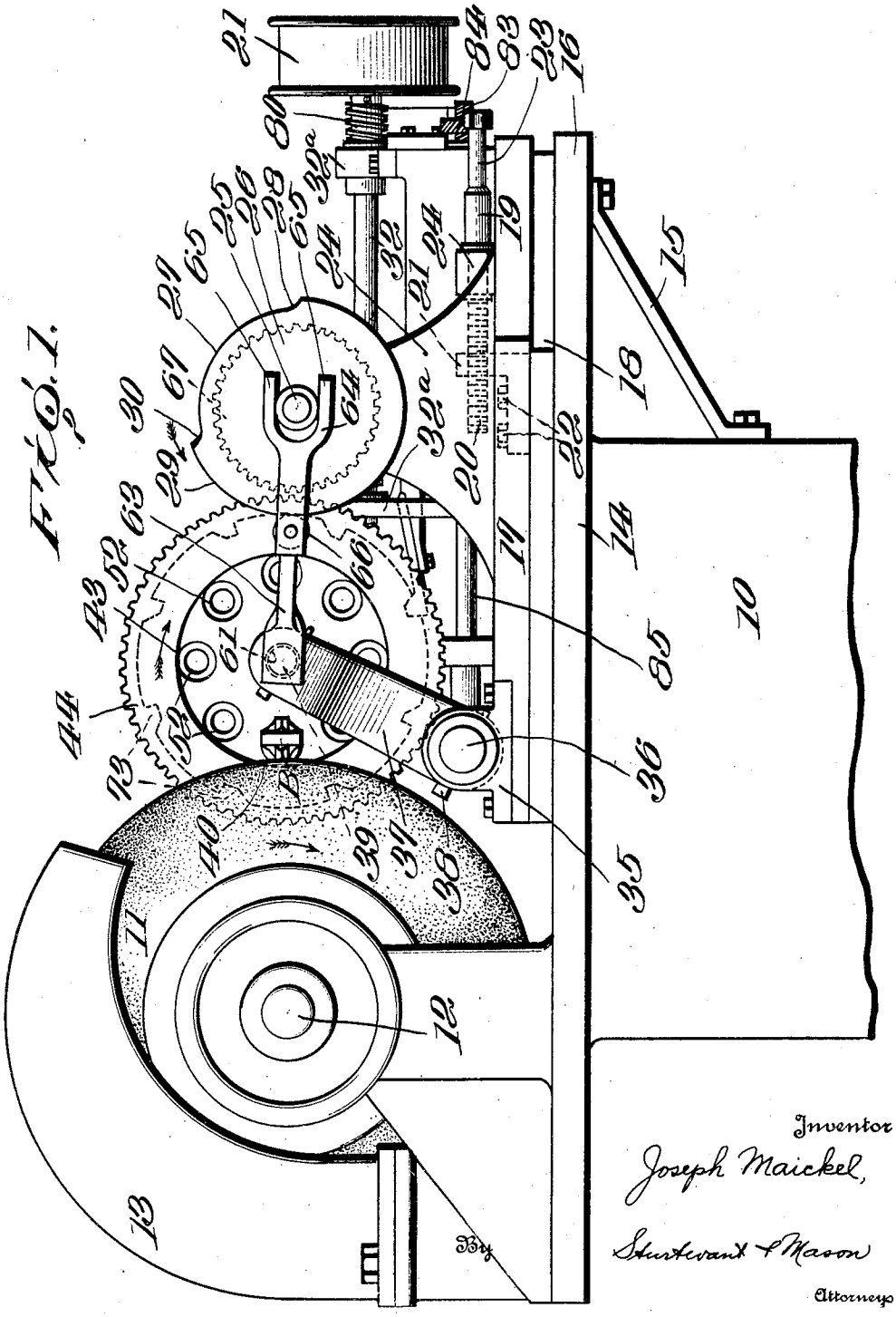


FIG. 1.

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Filed Jan. 14, 1926 4 Sheets-Sheet 2

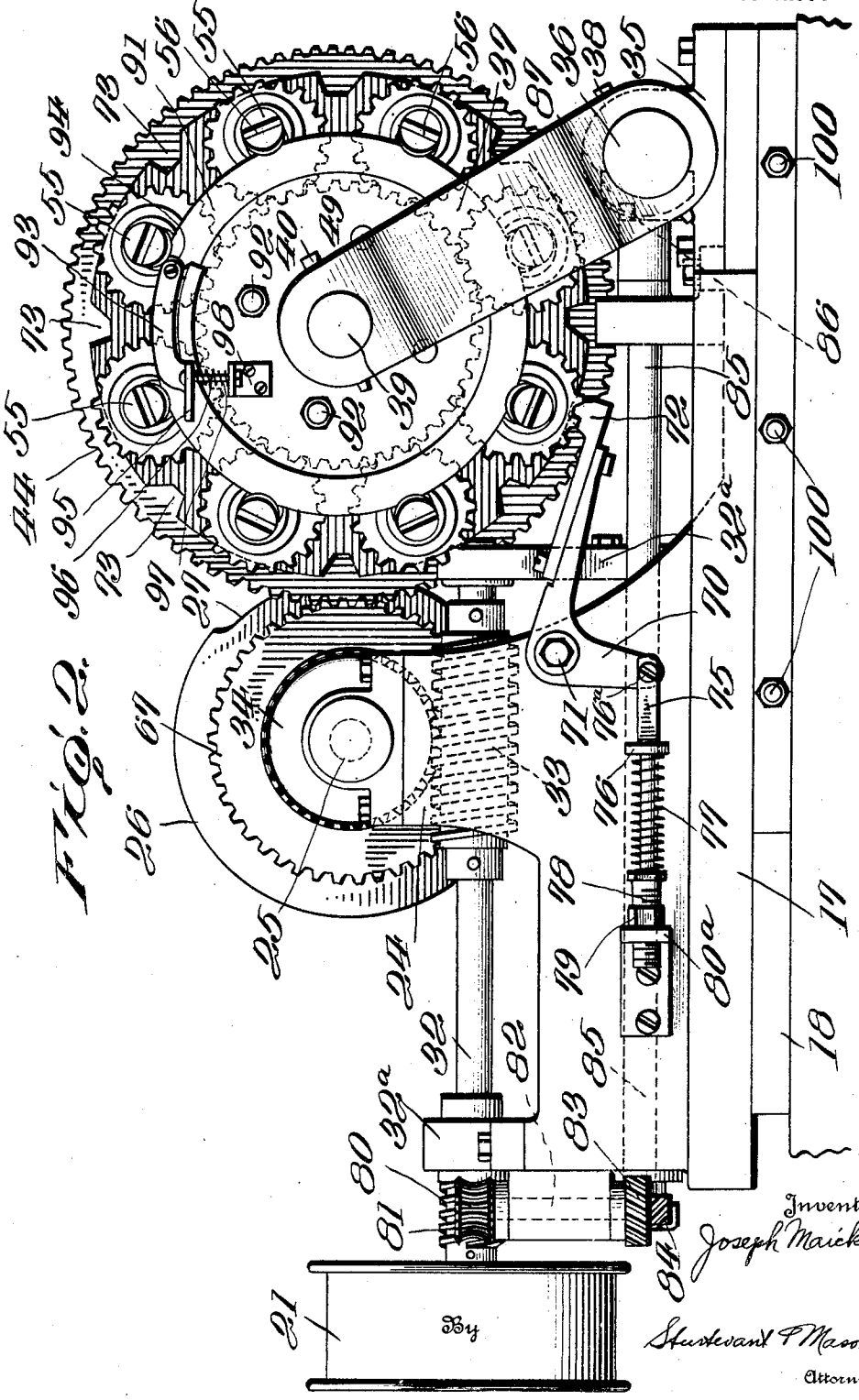


Fig. 2.

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May 10, 1927. J. MAICKEL 1,627,983

DEMOUNTABLE DRILL BIT GRINDER

Filed Jan. 14, 1926 4 Sheets-Sheet 3

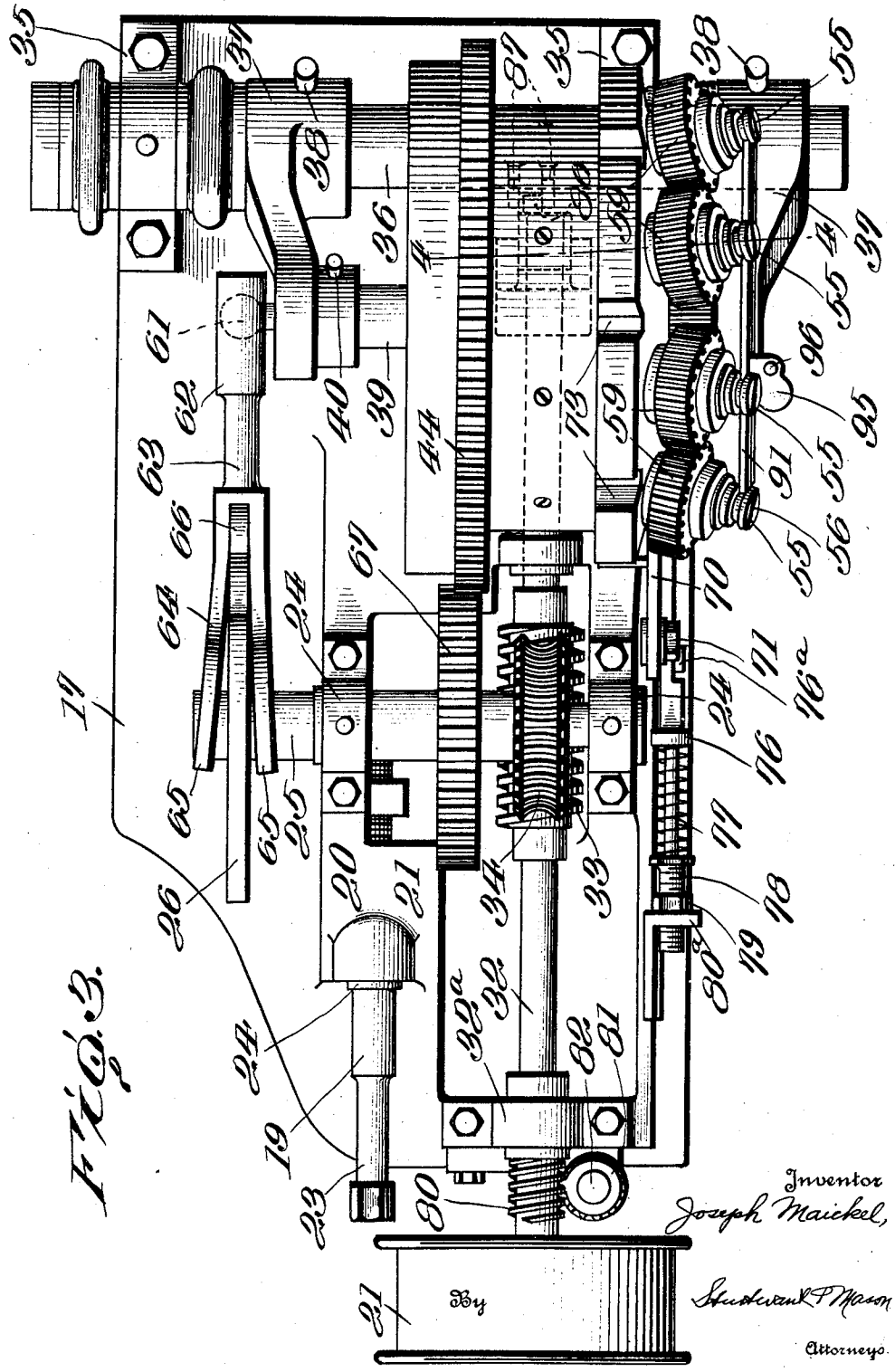


FIG. 3.

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DEMOUNTABLE DRILL BIT GRINDER

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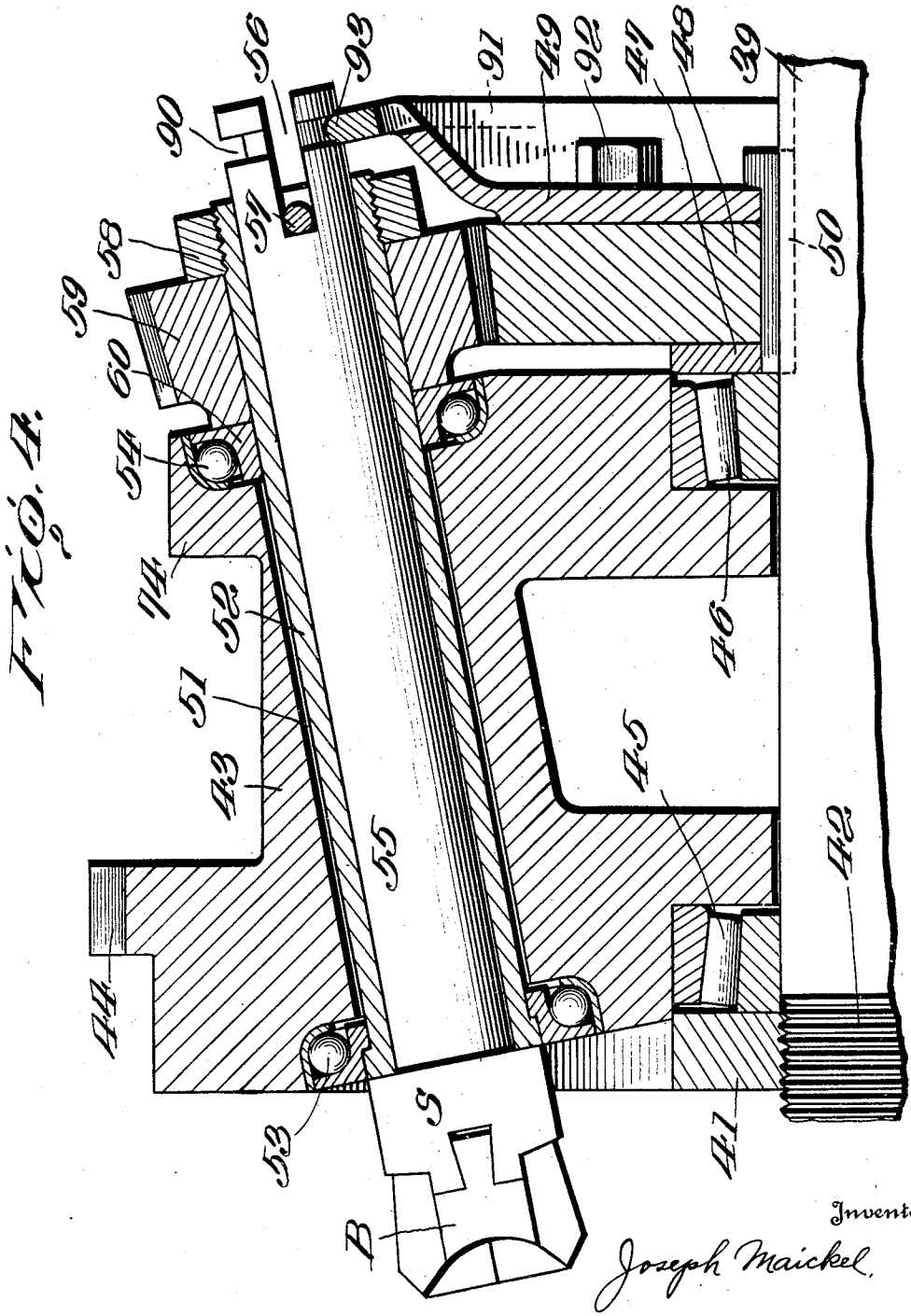


FIG. 4.

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Patented May 10, 1927. 1,627,983

UNITED STATES PATENT OFFICE.

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DEMOUNTABLE-DRILL-BIT GRINDER.

Application filed January 14, 1926. Serial No. 81,221.

This invention relates to improvements in grinding apparatus, and more particularly to turret machines for dressing demountable drill bits.

One of the objects of this invention is to provide an apparatus which is automatic in operation, and successively indexes or advances itself to present the drill bits in succession to the abrasive wheel for dressing. The power for such automatic indexing is derived from the same shaft which effects the feeding between the bit and the abrasive wheel when these are in dressing relation. The turret head is held in indexed position during such feeding and between indexing operations, to assure that drill bit is held in invariable position during dressing.

Another object is to provide a simple and effective work feeding and translating mechanism which moves the successive drill bits with regard to the abrasive wheel to assure a uniform dressing of the cutting edge of each bit as presented. An adjustment is provided so that the bits may be ground to any desired gauge; and so that the drill bits may be dressed at any desired angle.

A further object is to provide a simple mechanism for rotating the turret head for indexing, and simultaneously rotating the drill bit holders to present their edges to the abrasive wheel. This mechanism is controlled by a constantly rotating cam which at stated intervals causes the movement of the turret head, and between these intervals holds the turret head out of engagement with its indexing devices and effects the feeding of the positioned drill bit with regard to the abrasive wheel.

Another object is to provide drill holding devices which are automatically alined during insertion into the turret head, so that the apparatus may be attended by a relatively unskilled operator.

With these and other objects in view as will appear in the course of the following specification and on the accompanying drawings, there is illustrated therein one form of execution of an apparatus constructed and arranged according to the present invention.

In the drawings:

Figure 1 is a side elevation of the operative parts of the drill bit holding apparatus and abrasive wheel in position for grinding a demountable drill bit;

Fig. 2 is a side elevation of the drill bit holding apparatus from the opposite side than that shown in Fig. 1;

Fig. 3 is a plan view of the drill bit grinding apparatus, and

Fig. 4 is a partial section on an enlarged scale on the line 4—4 of Fig. 3.

The demountable drill bit grinder consists of a stand 10 for supporting the various elements, and having mounted thereon an abrasive wheel 11 of any suitable material, which is rapidly rotated with its shaft 12 by any suitable drive. A guard 13 is provided of the usual type. The upper part of the stand 10 has a horizontal table 14 thereon, and the supporting bracket 15 to carry the overhanging ledge 16.

The drill holder proper is mounted upon a sliding bed 17 which has depending flanges to receive and be moved lengthwise upon a V-guide 18 on the table 14, and may be moved into any desired position thereon by the spindle 19, which at its threaded inner end 20, engages the upstanding nut 21 which is rigidly secured to the top of the V-guide 18 by the bolts 22. A suitable handle may be mounted on the outer end 23 of the spindle, and used to rotate the threaded portion 20, so that the intermediate collars 24 on the spindle cause the slide 17 to be moved back and forth. One side of the V-guide may be tightened by set screws 100 to lock the device in adjusted position.

Journalled in the upstanding brackets 24 of this sliding bed 17 is a shaft 25, which carries thereon a cam disk 26 having a circular low portion 27 on its periphery followed by a quick rise 28, then a slow rise 29 extending for a major portion of the periphery of the cam, and followed by a quick drop 30 back to the circular dwell 27.

The machine is driven by a belt passing over the pulley 21 which is mounted rigidly upon the rotating shaft 32 journalled at 32^a on the sliding bed 17, and which in turn has rigidly mounted thereon a worm 33 to drive the worm wheel 34 keyed to the shaft 25. As the pulley 21 rotates, the cam 26 is driven with a uniform unidirectional motion.

Mounted in the brackets 35 on the slide 17 is a sliding rock shaft 36 which extends substantially parallel to the shaft 12 of the abrasive wheel. This shaft has pinned thereto adjacent its ends the supporting arms 37 which are held rigidly to the shaft 36 by the pins 38. At their upper ends, these

arms 37 carry the spindle 39, which is pinned at 40 to move with the arms. The spindle 39 has a collar 41 thereon which is held in position by the threading 42 upon the spindle (Fig. 4).

The turret head comprising the body 43 having the peripheral gear teeth 44 thereon, is received over the spindle 39, and is journaled with regard to this spindle by the roller bearings 45 and 46. The turret body 43 is assured against longitudinal movement upon the spindle 39 by the spacing collar 47, the gear 48 and the bowl 49, which are tightly keyed by the feather 50 in a rigid position upon the spindle 39. It is apparent that the turret body 43 can rotate freely about this spindle, and is held in the invariable longitudinal position thereon which may be adjusted by the threaded engagement of the collar 41 with the threads 42.

Mounted in each of a plurality of inclined bore holes 51 in the spindle are the sleeves 52 which are carried for easy rotation within the body of the turret head by the ball bearings 53 and 54. Each of these sleeves 52 is convergent toward the axial line of the spindle 39 and is so arranged as to present the respective drill bits in proper position with regard to the grinding wheel 11, when one of these drill bits, for example, B in Fig. 4, is mounted upon a carrier S which is received tightly within the sleeve 52 by its stem portion 55. At the other end of the stem 55 is provided a longitudinal slot 56 opening from the end of the stem, which receives the pin 57 carried by the sleeve 52: the conjunction of the slot 56 and the pin 57 assures the proper alinement of the drill bit with regard to the turret head at all times. The nut 58 serves to clamp the sleeve tightly with regard to its individual gear 59 and the race 60 of the ball bearing 54. A suitable key may be provided between gear 59 and sleeve 52.

Each of the individual gears 59 meshes with the gear 48, which latter is held stationary, and hence the individual sleeves 52 and therewith the drill holder carriers S are given a partial rotation at each successive movement of the turret body 43.

At the outer end of the spindle 39 adjacent the carriers S is provided a universal pivot or ball head 61 to receive a sleeve 62 on the end of a control rod 63, which at its other bifurcated end 64, extends past the cam disk 26 and has the fingers 65, 65 received on either side of the shaft 25 to guide the control rod 63 in a substantially linear direction. A roller 66 is pivoted in this control rod 63 and rests against the periphery of the cam disk 26.

As the cam disk is rotated from the driving pulley 21 of the machine, as described above, and if the roller 66 is resting upon the edge of the cam in approximately the position shown in Fig. 1, the roller will hold the control rod 63 toward the left and present the drill bit B against the edge of the grinding wheel 11. As the cam 26 continues to rotate in the direction of the arrow in Fig. 1, the slight rise of the surface 29 of the cam will cause the control rod 63 to be moved gradually a slight distance toward the left in Fig. 1, and cause the grinding away of the edge of the drill bit. When the cam 26 has rotated so far that the roller 66 drops down the surface 30 of the cam, the turret head and therewith the drill bit B is withdrawn by gravity from the grinding wheel, and at the same time, the gear teeth 44 on the periphery of the turret head, are moved into engagement with the teeth 67 of a gear keyed on the shaft 25 driven from the pulley 31 of the machine. As the shaft 25 continues to rotate, the teeth 67 effect indexing by a partial rotation of the turret head which continues until the roller 66 and therewith the control rod 63 are forced toward the left by the quick-rise surface 28 of the cam 26. In this way, the teeth 67 and 44 are quickly moved out of mesh, and the next drill bit is indexed and presented to the grinding wheel and slowly moved inwardly toward this wheel by the slow-rise surface 29 of the cam. This action continues until all of the drill bits have been ground upon all their edges.

In order to lock the turret head 43 in position during each individual grinding, a latch lever 70 is carried upon the slide 17 by a pivot bolt 71, and carries at its end opposite the turret head the locking pawl 72 which is received successively in the notches 73, 73 in the edge of the collar 74 on the turret head 43. In order to hold this pawl 72 in locking engagement, the link 75 is articulated at 76^a to the lower end of the rock lever 70. This link 75 has a collar 76 against which acts the coil spring 77, to force the link 75 toward the right in Fig. 2, and thereby to hold the pawl 72 in its designated position. The tension upon spring 77 may be adjusted by the threaded bushing 78 and lock nut 79 which are received in the supporting ear 80^a fastened to the slide 17, and which at the same time form a guide for the free end of the link 75. When the turret head is caused to rotate by the meshing of the teeth 44 and 67, the inclined surface at one side of the notches 73 causes the pawl 72 to ride out of the notch and slide along the periphery of the collar 74, and then drop into the next succeeding notch. Since, at this moment, the rise surface 28 of the cam engages the roller 66 and causes the gears to be moved out of mesh, the pawl 72 is again enabled to hold the turret head in its fixed position by engagement with the substantially radial surface of the notch.

In order to obtain the reciprocating movements of drill bits across the face of the grinding wheel 11, a worm 80 is provided upon the shaft 32 to drive the worm wheel 81 of a shaft 82, which carries at its lower end a skew gear 83 meshing with a skew gear 84 carried on the shaft 85 which runs parallel to the shaft 32, and is journalled on the sliding bed 17. At its end adjacent the shaft 36, this shaft 85 has a pin 86 which is offset from the axis of rotation of shaft 85, and engages between the cheek plates 87 carried upon the shaft 36. These cheek plates 87 are supported at a distance apart approximating the diameter of the pin 86, so that as the shaft 85 rotates, the shaft 36 is caused to slide back and forth in a direction at right angles to the axis of the shaft 85 by a distance approximating twice the eccentricity of the pin 86.

The stems 55 of the carriers S each have a groove 90, at their free end which, when the stem 55 is inserted within the turret head, engage around the edge 91 of the bowl 49. This bowl 49 is secured to the gear 48 by the cap screws 92, and in this way and by the feather 50 is held rigidly with regard to the arms 37, and against rotation. As the turret head 43 revolves about the spindle 39, the spindles 52 rotate, but the stems 55 are held in position since the edge 91 of the bowl engages in the grooves 90 of each of the stems. In order to enable the stems to be readily inserted in and withdrawn from the apparatus, a part of the edge 91 of the bowl is cut away, and the latch 93 is pivoted at 94 upon the bowl. The thickness of the latch is the same as the thickness of the edge 91 of the bowl, as shown in Fig. 4, so that the grooves 90 may slide freely upon it. The free end of the latch 93 carries a finger grip 95, which in turn carries a guide pin 96 for a coil spring 97, which by its reaction against the ear 98 fastened to the bowl 49, causes the latch 93 to be normally held in its upward or engaging position. If it be desired to remove a spindle, the finger grip 95 is depressed against the action of the coil spring 97, and the turret head is rotated until the stem 55 of one of the individual spindles is brought opposite the gap in the edge 91 of the bowl, whereupon the stem 55 may be forced forward and out of the sleeve 52.

It is apparent that by a proper design of the gear ratios between the gears 48 and 59, the apparatus may be adjusted for drill bits having different numbers of faces, and the amount of cut may be regulated by the slow rise 29 on cam 26. Furthermore, the angle of grinding the bit edge may be adjusted or established by determining the relative angles of the axis of the shaft 39 and the axes of the respective spindles 52; and different turret heads with different angles may be provided for the different cuts to be made. In the particular example shown in Fig. 4, the angle of the spindle is placed at approximately 10° with regard to the axis of the shaft 39, and the offset angle of the drill bit is approximately 10° likewise. It may be pointed out that it is not necessary that the spindles lie in a plane with the axis of the shaft 39.

In the particular example set forth, the spindle gears have 28 teeth and are in mesh with the fixed gear 48 which has 63 teeth. The spindle gears therefore rotate 2¼ times each time they revolve about the fixed gear 48, and in this wise the successive faces are presented in rotation to the abrasive wheel. By designing the gear transmission from gear 67 to gear 44, the turret head may be caused to rotate constantly, and a conical face be ground successively upon all of the bits, as the turret gear is then held in constant mesh with its driving gear.

Although the device has been illustrated as applied to drill bits of a particular shape, it will be understood that by a proper design of the spindles and the holding sleeves, drill bits having any number of facets and shape of face may be ground with this grinder.

It is apparent that the apparatus is not limited to the specific arrangement, sizes and proportions illustrated, but may be modified within the scope of the appended claims.

I claim:—

1. The combination with an abrasive wheel, a plurality of work holders, means to successively present said holders individually to the abrasive wheel at a predetermined angle and thereafter to remove the same and present another said holder thereto, said means serving further to later represent said first holder to the abrasive wheel at a different predetermined angle, and means to advance said holders toward the surface of the wheel when presented thereto to effect a dressing of the presented article.

2. In combination with an abrasive wheel, a plurality of drill bit holders, means to successively present said holders individually to the periphery of the grinding wheel at a predetermined angle, means to advance said holders towards the surface of said wheel to effect a dressing of the presented bit, means to alternately and intermittently actuate said presenting and advancing means, and means to reciprocate said holders with regard to said wheel during the dressing.

3. In combination with an abrasive wheel, a turret head, a plurality of drill bit holders mounted in said head, means to index said turret head to successively present individual drill bits secured in said holders to said wheel at a predetermined angle, means to move said turret head towards said wheel

to effect a dressing of the presented bit, and means to alternately and intermittently actuate said presenting and advancing means.

4. In combination with an abrasive wheel, a turret head, a plurality of drill bit holders mounted in said head, means to index said turret head to successively present individual drill bits secured in said holders to said wheel at a predetermined angle, means to move said turret head towards said wheel to effect a dressing of the presented bit, means to alternately and intermittently actuate said presenting and advancing means, and means to reciprocate said turret head with regard to said wheel during the dressing.

5. In combination with an abrasive wheel, a turret head, a plurality of drill bit holders mounted in said head, means to index said turret head to successively present individual drill bits secured in said holders to said wheel at a predetermined angle, means to cause said turret head to move towards said wheel to effect a dressing of the presented bit and away from said wheel to effect the withdrawal of said bit after dressing is completed, and means to alternately and intermittently actuate said presenting and advancing means.

6. In combination with an abrasive wheel, a turret and an article holder rotatable therein, means to intermittently rotate said turret and therewith said holder to present the latter at successively varying predetermined angles to said wheel, and means to feed said holder toward and withdraw it from said wheel during the quiescent intervals of said turret.

7. In combination with an abrasive wheel, two drill holders each having a drill bit mounted thereon, means to present one of said holders and the drill bit thereon to said wheel at a predetermined angle, mechanism to move said holder and the drill bit thereon towards said wheel to effect dressing of one surface of said bit and to withdraw said bit and holder after such dressing, and devices coordinating the movement of said presenting means and moving mechanism to actuate said means after withdrawal of the bit and holder and to present said other holder and bit to said wheel at the same predetermined angle and thereupon to actuate said mechanism to move said other holder and bit to effect dressing thereof, said devices actuating said mechanism thereafter to withdraw said other holder and to cause presentation of said first holder to said wheel at a different predetermined angle and thereupon to actuate said mechanism to move said holder and bit to effect dressing of another surface of said drill bit.

8. In combination with an abrasive wheel, a turret head having a plurality of drill bit holders thereon, means to index said turret head to present a holder with the drill bit thereon to said wheel at a predetermined angle, means to move said turret head towards said wheel to effect dressing of the presented bit and to withdraw said turret head after completion of said dressing, and mechanism to coordinate said means whereby said indexing means effects presentation of another of said holders upon withdrawal of said head.

9. In a drill bit grinding device for abrasive wheels, a turret head, a plurality of drill bit holders mounted thereon, devices to rotate said holders during the indexing of said turret head, means to index said turret head to present said holders successively opposite said wheel, means to hold said turret head against rotational movement between indexing movements, mechanism to reciprocate said turret head with regard to the abrasive wheel, and means to feed said turret towards said abrasive wheel.

10. In a drill bit grinding device for use with abrasive wheels, a sliding shaft, rock arms carried with said shaft, a turret head journalled on said rock arms, a plurality of drill bit holders carried on said turret head, means to rock said shaft and arms at predetermined intervals toward and away from said wheel, and means operative in the position of said rock arms away from said wheel to index said turret head.

11. In a drill bit grinding device for use with abrasive wheels, a sliding shaft, rock arms carried with said shaft, a turret head journalled on said rock arms, a plurality of drill bit holders carried on said turret head, means to rock said shaft and arms at predetermined intervals toward and away from said wheel, and means to effect a lengthwise movement of said shaft.

12. In a drill bit grinding device for use with an abrasive wheel, a turret head and a plurality of drill bit holders mounted thereon, a cam, and devices actuated thereby to move said turret head towards said wheel and withdraw it therefrom, a gear rotated with said cam, gear teeth on said turret head and adapted to mesh with said gear in the withdrawn position for the indexing movement of said turret head.

13. In a turret head for a drill bit grinding device, a body, a plurality of rotatable sleeves mounted therein, means for individually rotating said sleeves during the indexing of said turret head and holding such sleeves against rotation except during such indexing movement of the turret head, a drill bit holding spindle having a lengthwise slot in one end and a peripheral groove, a pin in each of said sleeves to engage said slot to determine the alinement of said spindle with regard to said sleeve, and means to engage said slot to hold said spindle in said sleeve.

14. In a turret head for a drill bit grinding device, a rotatable body, a plurality of rotatable sleeves mounted therein, a gear on each of said sleeves, a stationary gear meshing with said sleeve gears, a drill bit holding spindle having a peripheral groove and adapted to be received in any of said sleeves, a stationary bowl having a rim to engage said groove and thereby hold said spindle against removal.

15. In a turret grinding device for use with an abrasive wheel, a turret head and a plurality of work holders thereon, a constantly rotating cam, a gear driven with said cam, gear teeth carried by said turret head, and devices actuated by said cam to bring said gear teeth at intervals into mesh with said gear to effect an indexing of said turret head and to move said gear teeth out of mesh after such indexing.

16. In a turret grinding device for use with an abrasive wheel, a turret head and a plurality of work holders journalled thereon, means to support said turret head for movement toward and from said wheel, a constantly rotating cam, a gear driven with said cam, gear teeth on said turret head, and devices actuated by said cam to withdraw said turret head from said wheel at intervals and bring said teeth into mesh with said gear to index said turret head and to move said turret head toward said wheel after indexing and to move said gear teeth out of mesh with said gear.

17. In a turret grinding device for use with an abrasive wheel, a turret head and a plurality of work holders journalled thereon, means to support said turret head for movement toward and from said wheel, a constantly rotating cam, a gear driven with said cam, gear teeth on said turret head, devices actuated by said cam to withdraw said turret head from said wheel at intervals and bring said teeth into mesh with said gear to index said turret head and to move said turret head toward said wheel after indexing and to move said gear teeth out of mesh with said gear, and thereafter to feed said turret head towards said wheel for dressing said work.

18. In a turret grinding device for use with an abrasive wheel, a turret head and a plurality of work holders journalled thereon, a gear on each of said work holders, a gear held relatively stationary with regard to said turret head and meshing with each of said work holder gears, and devices to effect an indexing of said turret head at intervals and thereby rotate said work holders to successively present different surfaces of the work to said wheel.

19. In a turret grinding device for use with an abrasive wheel, a main shaft, a cam shaft driven from said main shaft, a cam on said cam shaft, a work traversing shaft driven from said main shaft, a rock shaft and rock arms carried thereby, a turret head carried on said rock arms, devices on said traversing shaft to effect a longitudinal movement of said rock shaft and the elements carried thereon, and devices actuated by said cam to feed the turret head toward and away from the wheel.

20. In a turret grinding device for use with an abrasive wheel, a main shaft, a cam shaft driven from said main shaft, a cam and a gear on said cam shaft, a work traversing shaft driven from said main shaft, a rock shaft and rock arms carried thereby, a turret head carried on said rock arms, devices on said traversing shaft to effect a longitudinal movement of said rock shaft and the elements carried thereon, gear teeth on said turret head, and devices actuated by said cam to move said gear teeth into mesh with said gear to index the turret head and thereafter to move said gear teeth out of mesh with said gear.

21. In a turret grinding device for use with an abrasive wheel, a main shaft, a work traversing shaft driven from said main shaft, a turret head, means to support said turret head for movement toward and from said wheel, means actuated from said main shaft to move said turret head toward and from said wheel, and devices actuated from said work traversing shaft to move said turret head longitudinally.

22. In a turret head, a plurality of sleeves journalled for rotation therein, a plurality of work holder spindles adapted to be received in said sleeves, each of said spindles having a peripheral groove therein, and a retaining bowl held stationary relatively to said turret head and having its rim adapted to project into each of said grooves to hold said spnidles against withdrawal.

23. In a turret head, a plurality of sleeves journalled for rotation therein, a plurality of work holder spindles adapted to be received in said sleeves, each of said spindles having a peripheral groove therein, a retaining bowl having its rim adapted to project into each of said grooves, and having a portion of said rim cut away, and a latch member to fill said cut-away portion and complete the said rim.

24. In a turret head, a plurality of sleeves journalled for rotation therein, a plurality of work holder spindles adapted to be received in said sleeves, each of said spindles having a longitudinal slot at its end, and a pin in each of said sleeves to be received in one of said slots to aline the respective spindle in said sleeve.

In testimony whereof, I affix my signature.

JOSEPH MAICKEL.