Aug. 19, 1924. 1,505,282

D. J. NEVILL

SURFACE GRINDER

Filed Jan. 3, 1921 3 Sheets-Sheet 3

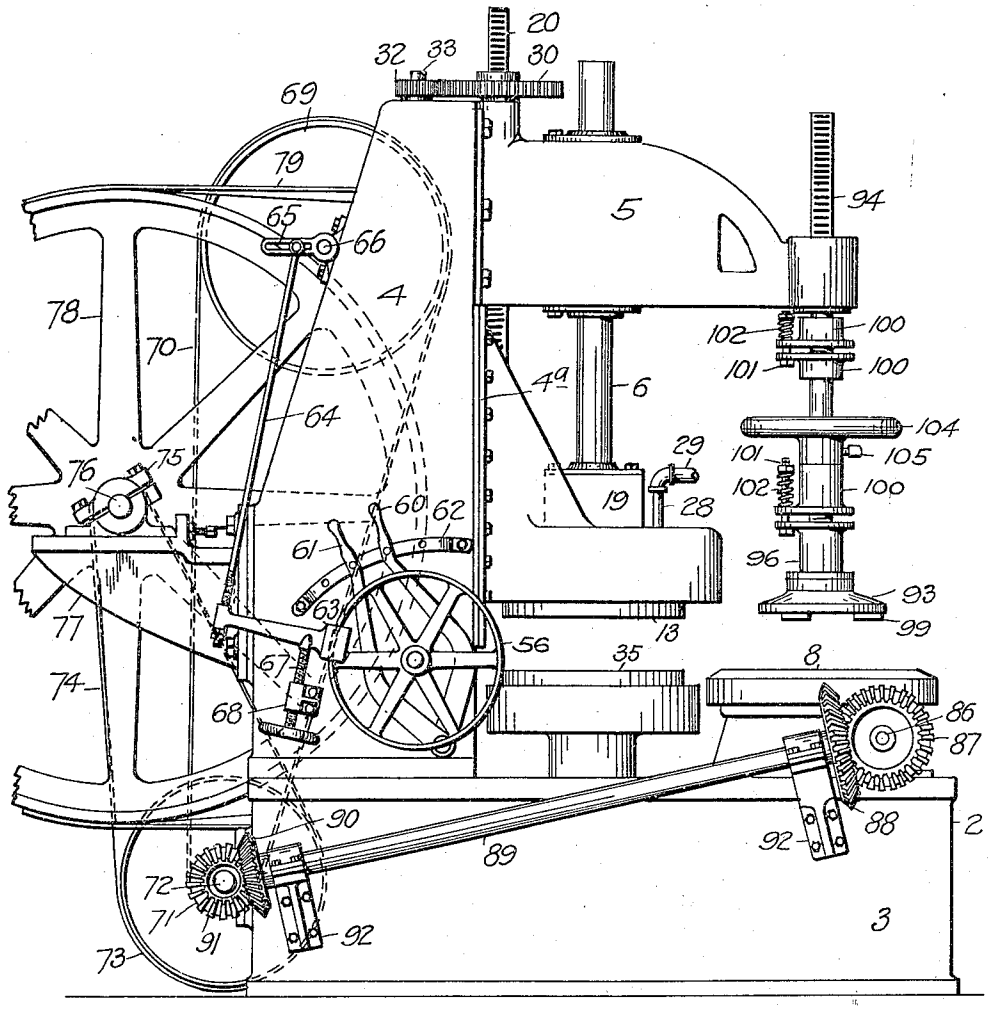

FIG. 4.

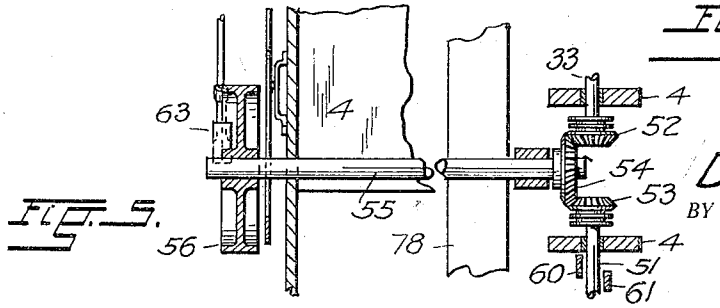

FIG. 5.

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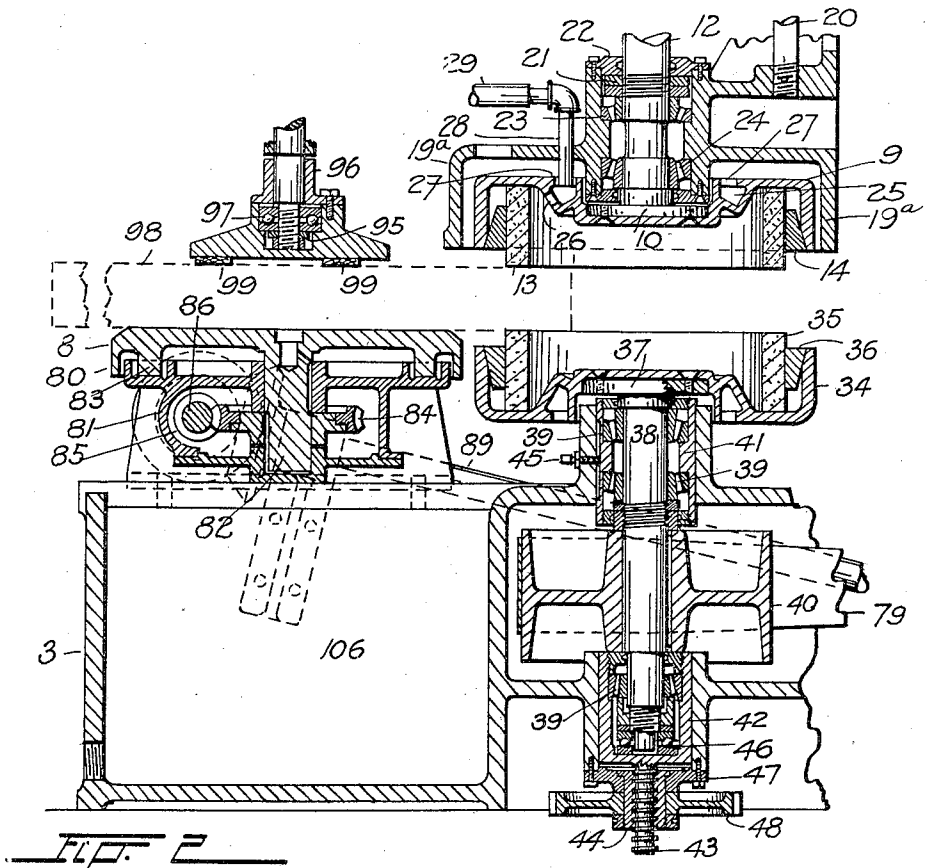

FIG. 2

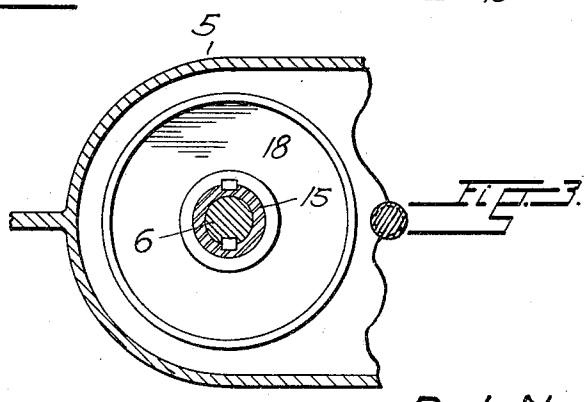

FIG. 3.

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SURFACE GRINDER

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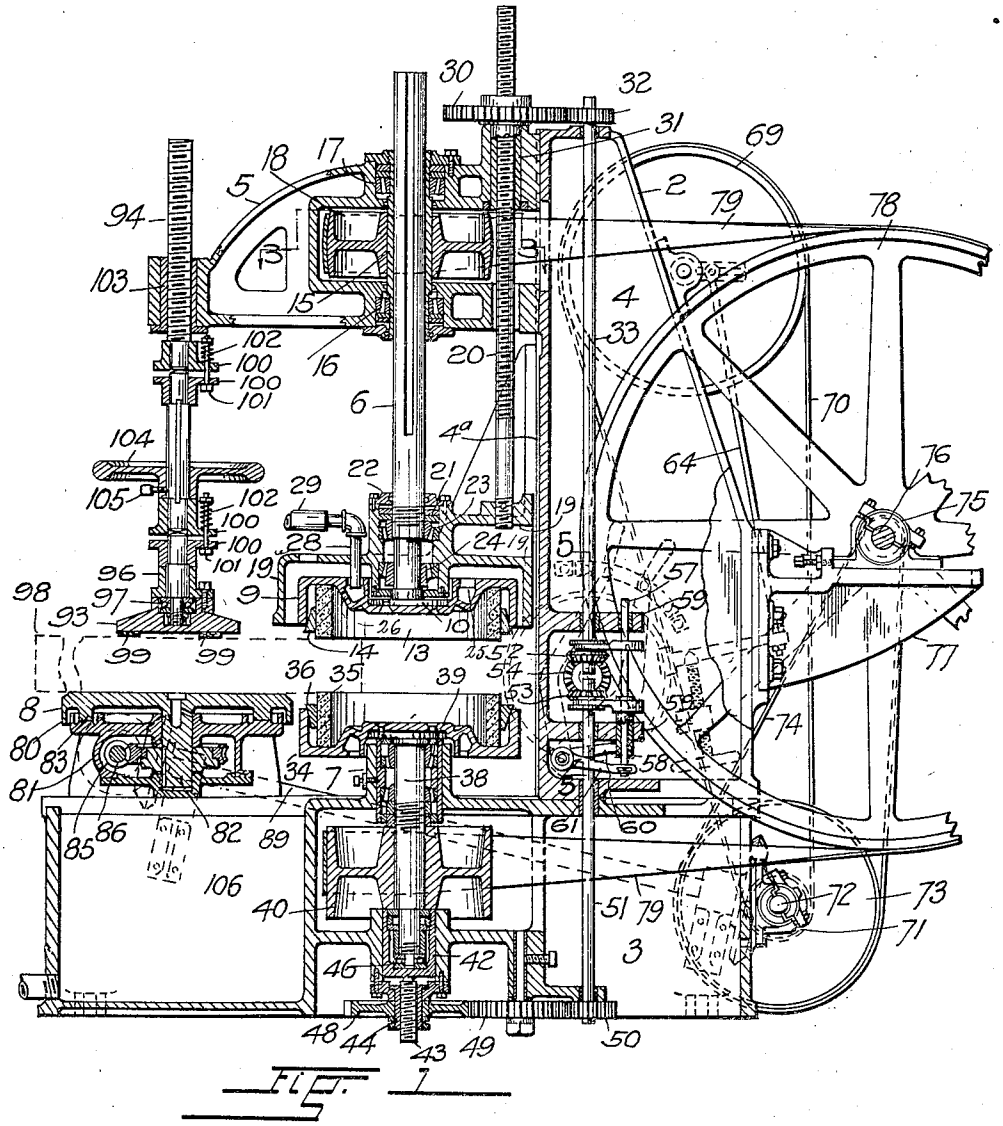

Fig. 1

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UNITED STATES PATENT OFFICE.

DAVID J. NEVILL, OF DENVER, COLORADO.

SURFACE GRINDER.

Application filed January 3, 1921. Serial No. 434,668.

To all whom it may concern:

Be it known that I, DAVID J. NEVILL, a subject of George V, King of England, residing at Denver, in the county of Denver and State of Colorado, have invented certain new and useful Improvements in Surface Grinders, of which the following is a specification.

This invention relates to surface grinders and its main object is to provide a machine of simple construction in the operation of which opposite surfaces of filter plates or other machine parts are ground simultaneously by the cooperation of two opposed grinding members.

Other objects of the invention reside in the construction and relative arrangement of the element for holding the work in operative position with relation to the grinding members, the mechanism for feeding the members to the work, the system for supplying water to the grinding surfaces, and other parts of the machine, all of which will fully appear in the following description with reference to the accompanying drawings.

In the drawings in the several views of which like parts are similarly designated,

Figure 1 represents a vertical section through a duplex grinder embodying the novel features of my invention;

Figure 2, a vertical section through the grinding members and the work-supporting element of the machine, drawn to an enlarged scale;

Figure 3, an enlarged section on the line 3—3, Figure 1;

Figure 4, a side elevation of the machine, and

Figure 5, an enlarged section on the line 5—5, Figure 1.

Referring in detail to the drawings, the numeral 2 designates the supporting frame of the machine, consisting of a base 3, an upright column 4 at an end thereof, and a head 5 at the upper extremity of the column, which overhangs the base.

Mounted respectively on the base and the head of the supporting structure in axial alinement with each other, are upper and lower grinding members 6 and 7 which in the operation of the machine engage the opposite surfaces of a plate or other machine-part clamped upon a rotary table 8 which is supported on the base.

The upper grinding member comprises a cylindrical box 9 rigidly fastened to a flange 10 at the lower end of an upright spindle 12 and carrying an annular grinding wheel 13 of abrasive material which is removably held in place thereon by a wedge ring 14.

The upper portion of the spindle is slidably keyed inside a sleeve 15 which is rotatably mounted in roller bearings 16 and 17 in the head of the supporting frame and which between said bearings, carries a pulley 18.

The spindle is rotatably supported at its lower end in roller bearings 23 and 24 on a head 19 which is slidably fitted between guide wings 4^a on the column 4 of the supporting frame, in connection with the lower end of a vertical feed screw 20.

The head is provided with a mantle 19^a which loosely surrounds the box 9 at the lower end of the spindle and its connection with the spindle is established by a pair of nuts 21 screwed upon a threaded portion of the latter between a thrust plate 22 on the head and the upper bearing 23.

The box 9 at the end of the spindle has an annular water chamber 25 connected with its interior by a plurality of openings 26 and it has at the top of said chamber an annular slot 27 to receive a nozzle 28 at the end of a flexible conduit 29 which is connected with a conveniently located source of water supply.

The feed-screw 20 to which the head 19 is connected works in the correspondingly threaded elongated hub 31 of a gear wheel 30, which is rotatably fitted in a bearing on the head 5 of the supporting structure.

The gear-wheel meshes with a pinion 32 at the upper end of a vertical transmission shaft 33 which receives its motion from the driving element of the machine through the medium of a clutch-gear as will hereinafter be more fully described.

The lower grinding member 7 consists like the other, of a circular box 34 in which an annular grinding wheel 35 is concentrically fastened by means of a wedging ring 36.

The box is rigidly fastened to a flange 37 at the upper end of a vertical spindle 38 which is mounted in roller bearings 39 in the base of the supporting structure in axial alinement with the upper spindle.

The bearings are arranged at opposite sides of a pulley 40 which is keyed on the spindle, those above the pulley being con-

tained in the cylindrical casing 41 and that below the same being carried in the cup-shaped head 42 of a feed screw 43 which co-operates with a correspondingly threaded rotary nut 44 on the base of the machine.

The feed screw is held against rotation by a groove-and-key connection with the part of the base of the machine in which its head is vertically slidably fitted.

The casing 41 is slidably fitted in a bore of the base and it is held against rotation by a bolt 45 which projects into a longitudinal groove of its outer surface.

A ball-bearing 46 at the bottom of the cup-shaped head of the feed-screw, provides a support for the end of the spindle, and the nut 44 in which the feed-screw works is rotatably supported in a cap 47 which closes the end of the bore of the base in which the head of the screw is slidably fitted.

The rotary nut carries a gear-wheel 48 which through the medium of an intermediate gear 49 is operatively connected with a pinion 50 at the lower end of a vertical transmission shaft 51 rotatably mounted in bearings on the supporting frame in axial alinement with the first-mentioned shaft 33.

Loosely mounted on the shafts 33 and 51 at their adjacent ends, are beveled gear wheels 52 and 53 which mesh with a driving gear wheel 54 on a shaft 55 which carries the driven wheel of an intermittent friction feed hereinafter to be described.

Each of the gear wheels 52 and 53 is connected with a clutch by means of which its rotative continuity with the respective transmission shaft may be secured or broken.

The actuating member of the clutch of the gear wheel on the upper shaft is connected with a vertically extending rod 57 and that of the clutch on the lower gear is attached to a sleeve 58 through which the rod loosely passes.

The rod and the sleeve are slidably supported in brackets 59 of the column of the supporting frame, which also provide bearings for the inner ends of the transmission shafts, and they are respectively connected with shift levers 60 and 61 fulcrumed to move about coincident axes and associated with a segment 62 and suitable means to secure them in their adjusted positions thereon.

The intermittent friction feed hereinbefore referred to comprises a wheel 56 mounted on the shaft 55 of the beveled gear 54, and a friction clutch 63 adapted to impellently grip the rim of the wheel.

The clutch is attached at the end of a rod 64 which connects with a longitudinally slotted crank 65 on a shaft 66 mounted in bearings on the column of the supporting frame, and it rests normally in a seat at the extremity of a hand screw 67 which extends through a threaded nut 68 on the column.

The crank-shaft is rotated through the medium of a pulley 69 and a belt 70 connecting it with a pulley 71 of smaller diameter on a countershaft 72 supported in bearings on the base of the frame, and the countershaft is driven by means of a pulley 73 and a belt 74 which connects it with a smaller pulley 75 on the driving shaft 76 of the machine which is supported in boxes on brackets 77 which project rearward from the column of the frame.

The driving shaft is furthermore provided with fixed and loose pulleys 78 of large diameter to impart movement to an endless belt 79 which passes around the pulleys 18 and 40 of the grinding members.

The table 8 upon which the work to be ground is fastened through the medium of a superposed clamping member, consists of a circular top 80 rotatably supported on a pedestal 81.

The top of the table has a central stem 82 rotatably fitted in a central bearing of the pedestal, and in concentric relation thereto, a circular ridge 83 which rests upon a correspondingly formed rail of the same.

A worm gear wheel 84 keyed to the stem of the table in a recess of its pedestal meshes with a worm 85 on a rotatably supported shaft 86, and a beveled gear-wheel 87 at an end of this shaft is in operative engagement with a similar wheel 88 on a rotary shaft 89 which receives its movement from the countershaft 72 through the medium of beveled gear-wheels 90 and 91.

The pedestal of the table rests upon the base of the supporting frame to which it is rigidly secured and the shaft 89 is supported in boxes 92 at a side of the base as best shown in Figure 4 of the drawings.

The clamp member by which the work is secured upon the rotating table consists of a block 93 rotatably suspended at the lower end of a vertical shaft 94 through the medium of a nut 95 screwed upon a threaded extension thereof.

The block is fastened to a collar 96 which loosely surrounds the shaft and which rests upon a ball-bearing 97 supported on the nut.

The block engages the work which in the drawings is indicated by broken lines 98, through the medium of three contact pieces 99, preferably made of wood and equidistantly arranged to provide a three-point bearing.

The shaft 94 to which the clamp block is connected is composed of three axially alined sections which are yieldingly connected by flanged collars 100.

Bolts 101 pass through alined openings in the flanges of each pair of collars, and nuts at the ends of the bolts bear upon

coiled springs 102 placed in engagement with one of said flanges.

A screw-thread on the upper section of the shaft cooperates with a correspondingly threaded bearing 103 on the head of the supporting frame to vertically adjust the clamp block and this adjustment is effected through the medium of a hand-wheel 104 which is keyed to the middle section of the shaft.

A set screw 105 on the hub of the hand-wheel serves to secure it at any desired elevation on the shaft section with which it is connected.

Having thus described the mechanical construction of the duplex grinder its operation is as follows:

The work is clamped upon the table by means of the superposed clamping member, so that its portion to be ground will pass through the space between the grinding members when the table is rotated by the operation of its worm movement.

The grinder is particularly adapted for use in refinishing the marginal surfaces of filter plates which when centrally positioned on the work table move continuously between the grinding members.

After the work has thus been adjusted, the two grinding members are moved in engagement with the opposite surfaces thereof by the clutch controlled feed mechanism, it being apparent that by adjustment of the clutch members through the medium of their respective shift levers, the grinding members may be moved toward each other to any desired extent.

After the grinding members are adjusted so that their abradant wheels engage the opposite surfaces of the work, their feeding movement is automatically continued through the medium of the friction clutch 63 which by rotation of the crank shaft intermittently grips the rim of the wheel on the gear shaft 55 and imparts a rotary movement thereto.

The extent of the intermittent movements of the wheel is readily varied by adjustment of the end of the rod 64 in the slotted crank and by varying the elevation of the seat at the end of the hand-screw 67, with which the clutch engages, and the feed velocity of the grinding members may thus be regulated to suit different conditions.

The grinding members are rotated at equal velocities by the movement of the endless belt upon their pulleys. The pulley of the upper member has no vertical displacement during the feeding movement of the member, but that of the lower grinding member which has a comparatively limited feeding action, is made sufficiently wide to maintain its operative connection with the belt during its upward movement with the shaft on which it is mounted.

Overheating of the contacting surfaces of the work and the grinding wheels is prevented by a constant supply of water which enters the box of the upper grinding member through the nozzle and passes along the interior surface of the respective grinding wheel to the surface of the work.

The water fills the space inside the grinding wheel of the lower member and overflowing at the upper edge of the same simultaneously wets the lower surface of the work.

The overflowing water passes into a tank 106 in the base of the supporting frame and is removed therefrom by means of a pump to be again supplied to the upper grinding surface through the nozzle.

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

1. In a grinder of the character described, opposed grinding members, a table adapted to support the work to be ground for the simultaneous action of the grinding members upon opposite surfaces thereof, and hand-controlled, power-driven mechanism for feeding the members simultaneously or separately to the work.

2. In a grinder of the character described, upper and lower grinding-members, feed screws operatively connected with said members, and mechanism connected with both screws for their simultaneous automatic operation.

3. In a grinder of the character described, opposed grinding-members, feed-screws operatively connected with said members, mechanism connected with the screws for their simultaneous operation, and a clutch controlling said mechanism to operate either screw separate from the other.

4. In a grinder of the character described, opposed grinding-members, feed-screws operatively connected with said members, an operating mechanism having a driving connection with said screws, and means to control said connection with each screw separate from the other.

5. In a grinder of the character described, rotary grinding members, mounted to be fed to the work, a rotary table adapted to support the work to be ground for the simultaneous action of the grinding members at opposite surfaces thereof, power-driven mechanism for the operation of the members and the table, and hand-actuated means controlling the feeding movement of the grinding members by said mechanism.

6. In a grinder of the character described, grinding members having opposite working faces one above the other in substantially parallel planes, a support for work between said faces, and power-driven mechanism to feed the members simultaneously to the work.

7. In a grinding machine, the combination of a rotary element adapted to carry a machine part so as to expose marginal portions of opposite sides thereof for grinding, exclusive of the middle portions of said sides, and rotary grinding members relatively disposed to act simultaneously upon said marginal portions.

8. In a grinding machine, the combination of a rotary element adapted to carry a machine part so as to expose marginal portions of opposite sides thereof for grinding, exclusive of the middle portions of said sides, rotary grinding members relatively disposed to act simultaneously upon said marginal portions and mechanism for feeding the grinding members toward each other.

In testimony whereof I have affixed my signature.

DAVID J. NEVILL.