March 26, 1940. A. O. ANDERSEN 2,194,780

POLISHING MACHINE

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Fig. 1

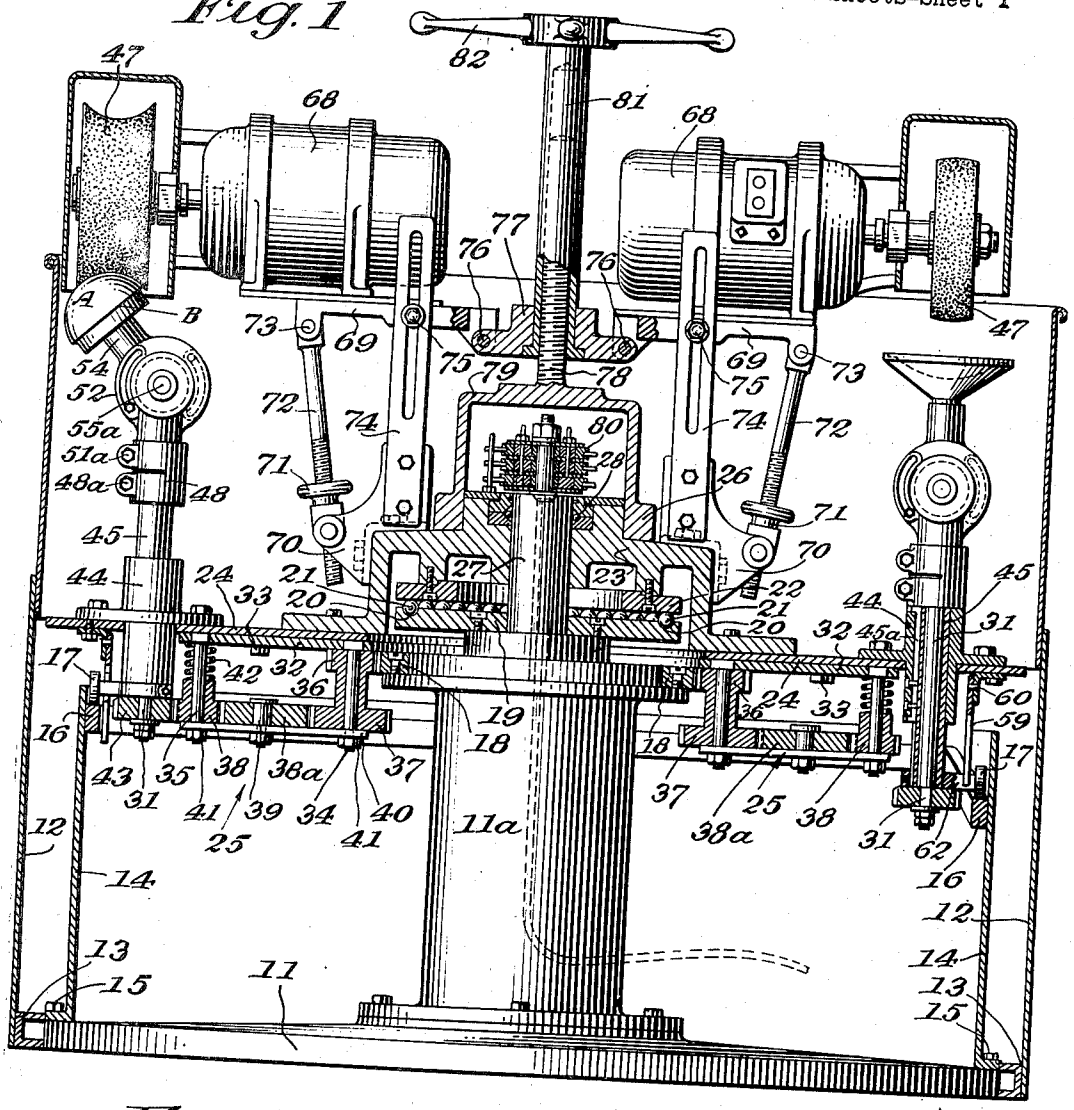
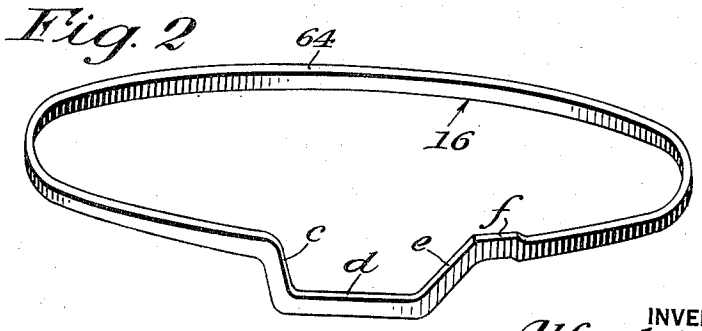


Fig. 2



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Fig. 3

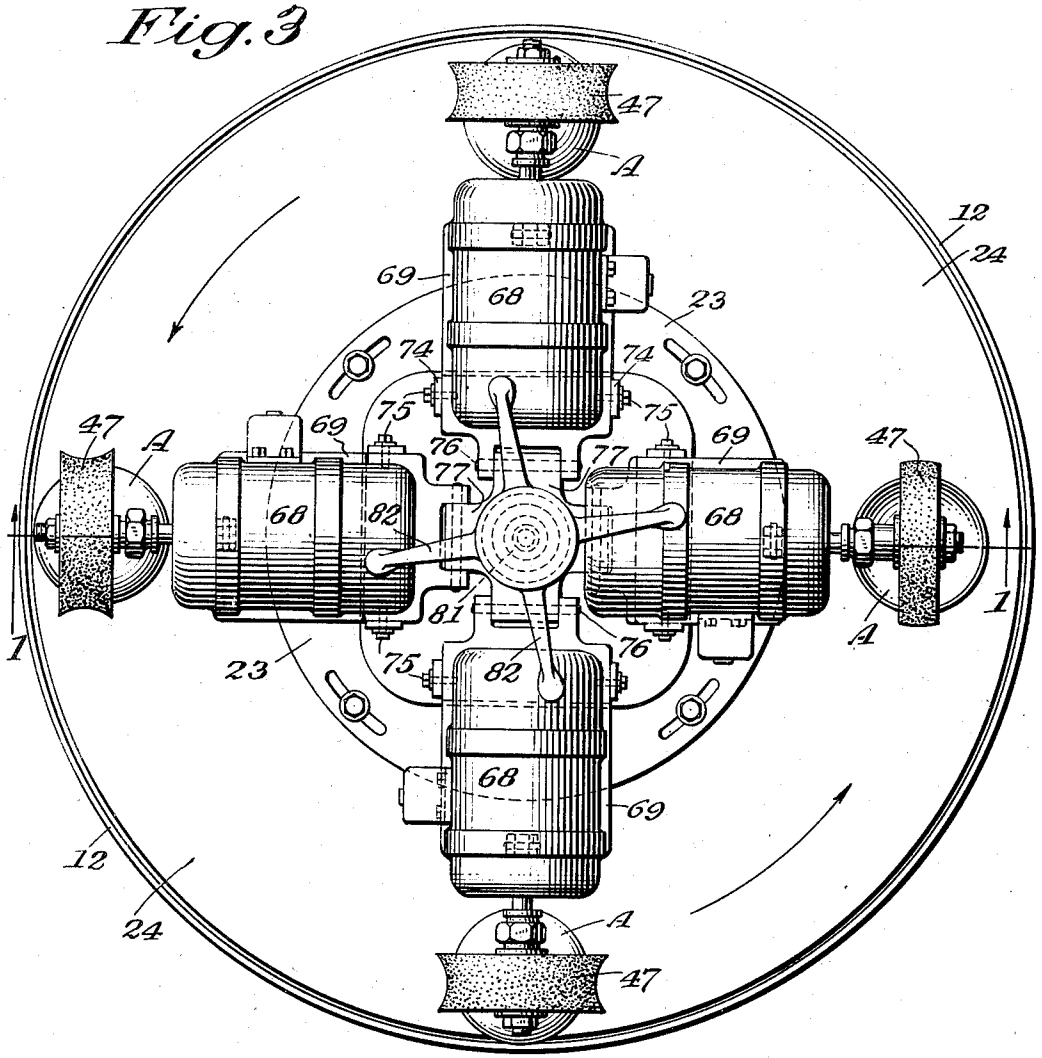
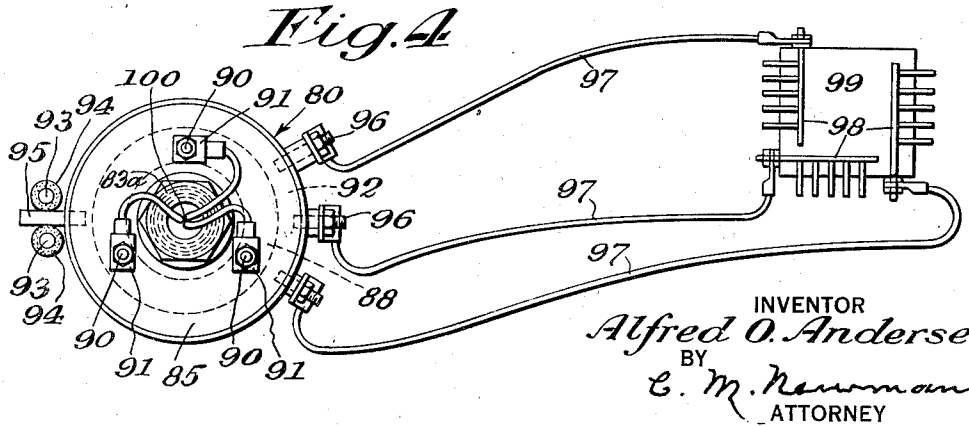


Fig. 4



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POLISHING MACHINE

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Fig. 5

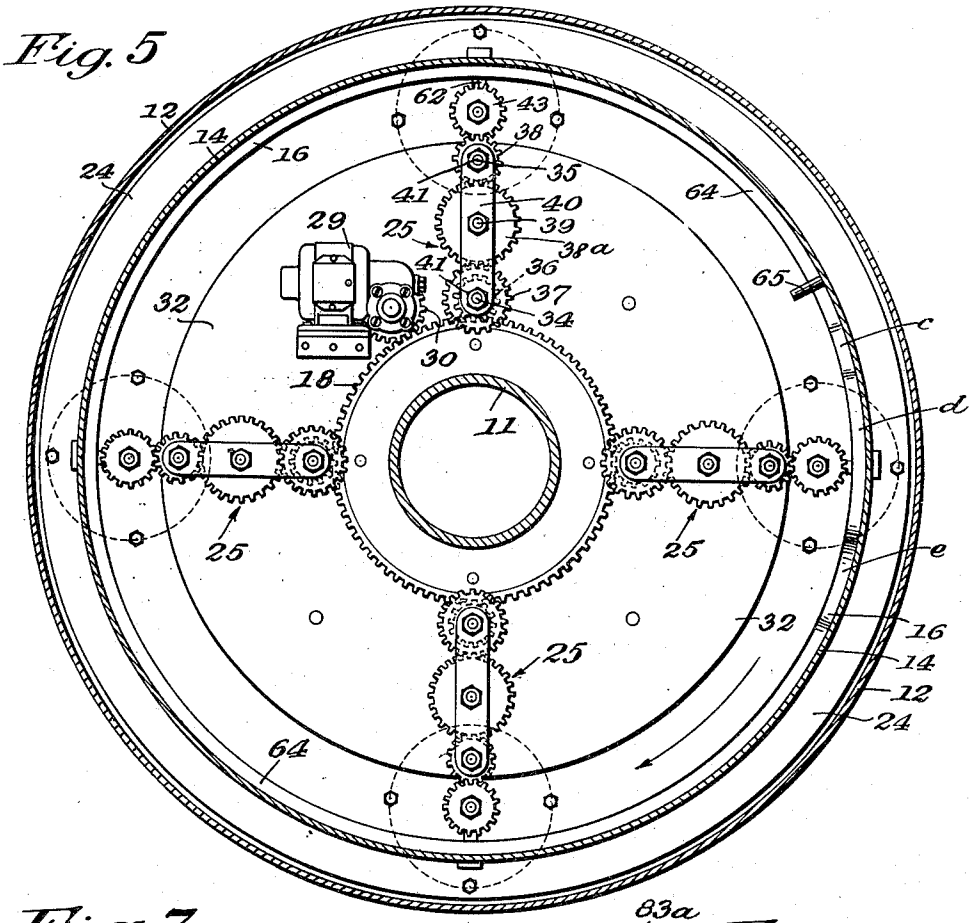


Fig. 7

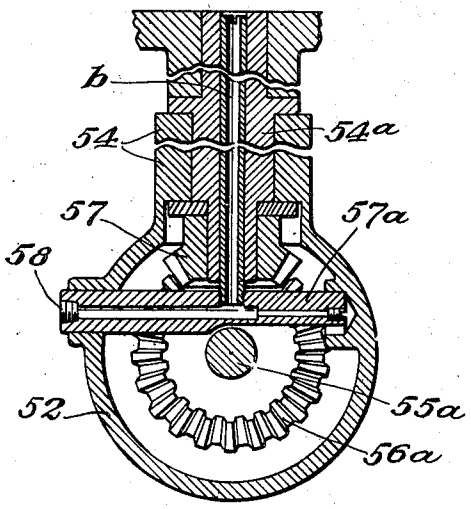
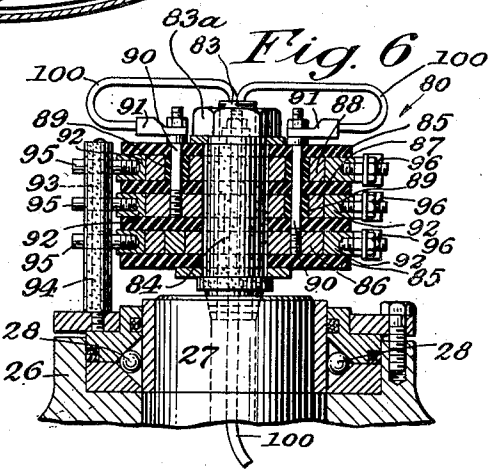


Fig. 6



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POLISHING MACHINE

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Fig. 10

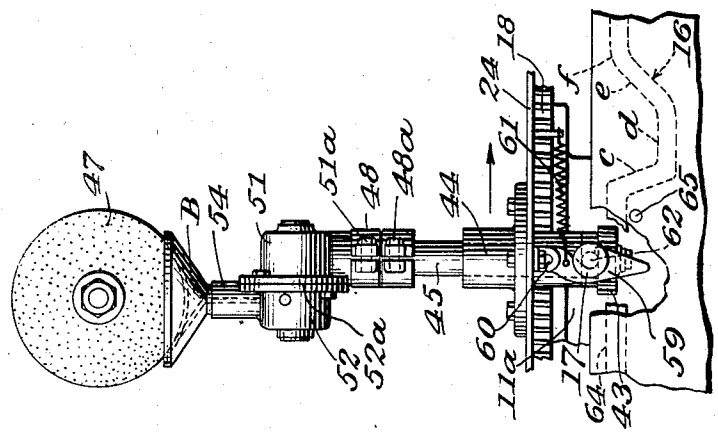


Fig. 8

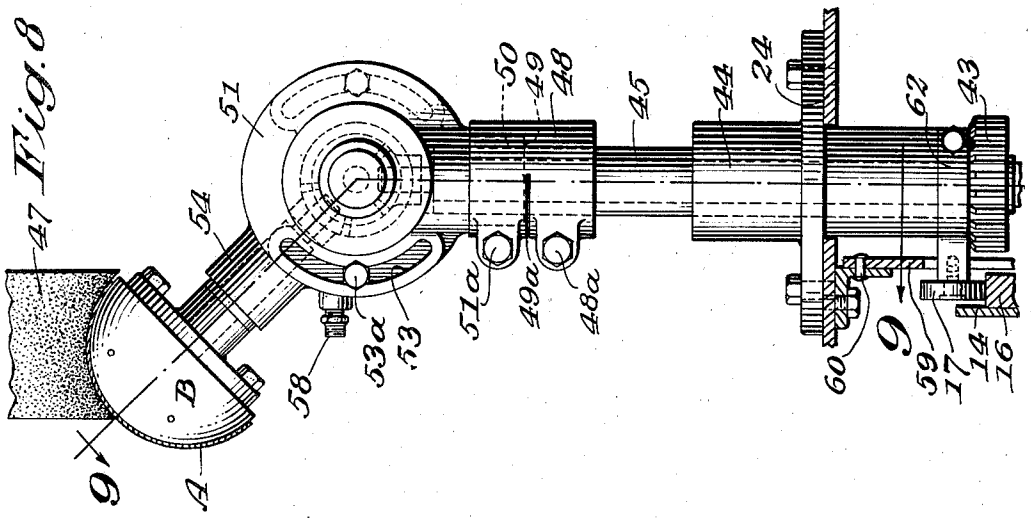
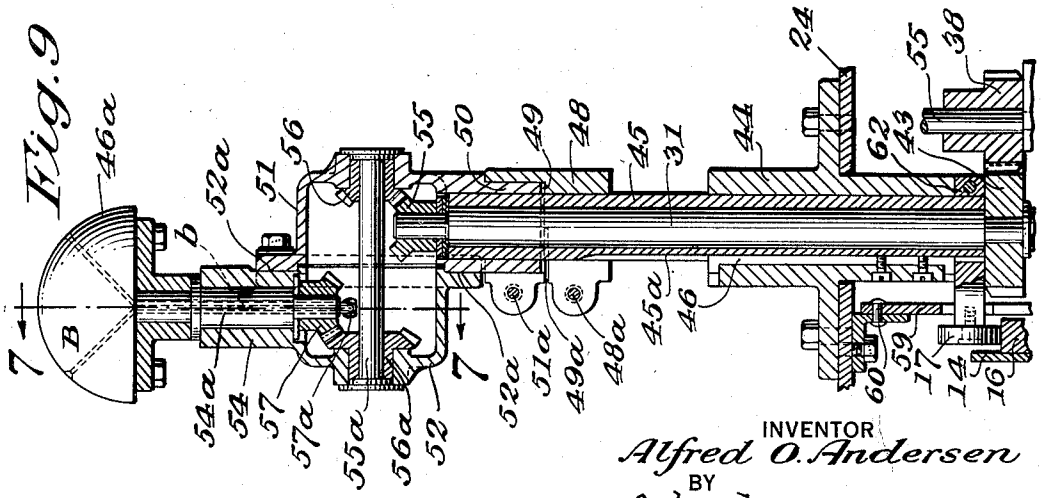


Fig. 9



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UNITED STATES PATENT OFFICE

2,194,780

POLISHING MACHINE

Alfred O. Andersen, Bridgeport, Conn.

Application February 3, 1939, Serial No. 254,361

17 Claims. (Cl. 51—105)

This invention relates to new and useful improvements in polishing machines such as are employed for polishing or buffing the surface of automobile light lenses, or other forms of sheet or cast metal or glass parts.

In this connection it will be understood that the polishing wheels and chucking means herein disclosed will necessarily vary in accordance with the shape and character of the work to be polished. As shown in the drawings, the chucks are especially designed for holding sheet metal concave and convex discs which require to be polished on both the inner concave and outer convex faces.

The machine is of a continuous rotating table type which carries and allows for the simultaneous and continuous rotary movement of a number of work carrying chucks which are carried around with the table, the work being placed in position by an operator standing in front of the machine, and by whom the finished work is removed and replaced by new work pieces while remaining in one position, and while the table is rotating. As soon as the work pieces to be polished are chucked, they are brought into engagement with the polishing wheels which polish the work when mounted in the rotating chucks while being carried around with the table.

The usual class of work polished on this machine, such as reflectors, are completely polished on one side during a single rotation of the table, yet if necessary two or more rotations may be made depending on the character of the work for the completion of the polishing operation.

The machine, as herein illustrated, is a four-spindle machine, it being obvious, of course, that the invention may be carried out in the construction of a machine having a greater or lesser nummer of work spindles as may be necessary.

In the drawings:

Fig. 1 shows a central vertical cross section through my complete machine showing two of the four chucking spindles.

Fig. 2 shows a detached perspective view of the annular tract for supporting the chuck spindles as they are moved around by the table for polishing operations.

Fig. 3 shows a top plan view of my improved polishing machine.

Fig. 4 shows a diagrammatical plan view of the distributor shown in Figs. 1 and 6, including electrical connections therefrom.

Fig. 5 shows an inverted sectional plan view on a slightly reduced scale, as seen from the bottom looking up under the machine, better to illustrate the drive means for the table and chucks.

Fig. 6 shows an enlarged vertical cross sectional view of the electric distributor seen in Figs. 1 and 4.

Fig. 7 shows an enlarged broken cross section taken on line 7 of Fig. 6 showing the vacuum pipe connections for the chucks.

Fig. 8 shows an enlarged detached front elevation of the chuck carrying means shown at the left in Fig. 1.

Fig. 9 shows a central vertical sectional view taken on line 9—9 of Fig. 8, showing the chuck supporting sleeve, the adjustable housing and gear drive mechanism for the chuck, and

Fig. 10 shows a detail side elevational view as seen from the outer side of the machine looking at the edge of the table, the chuck spindle and mechanism for raising and lowering the same.

Referring in detail to the characters of reference marked upon the drawings, 11 represents a flat base plate which may be formed of cast iron and which in practice would rest upon the floor of a shop or other place where the machine is set up for operation. 11*a* is a central hollow pedestal that is bolted to the base plate and serves to support the rotatable table and other operating features of the machine. 12 is an annular sheet metal closure or guard member that is attached to the edge portion of the base plate as at 13 and serves to enclose the side portions of the machine. 14 represents a cylindrical supporting member which is also attached to the base as at 15 and carries an annular track 16 upon which a roller 17 travels as in the lifting and supporting of the chuck as will later be described.

To the upper flanged portion of the pedestal 11*a* is secured a ring gear 18, its teeth being upon its outer periphery for the operation of gear connections for the several chucks of which but four are shown in the accompanying drawings. There obviously may be a greater or lesser number of these chucks, as may be required, for the particular class of work to be performed. To the upper end of the pedestal 11*a* is secured a supporting plate 19 in which is formed an annular groove forming a ball-race 20, in which suitable balls 21 are positioned for supporting the ring 22 secured to the closure member 23 that is fastened to the rotatable table 24, the said balls, race-way and bearing plates serving as the bearing upon which the table rotates, it being understood that with the rotation of the table, the train of gears 25 are caused to rotate and operate the several drive spindles as will be later described. The upper

dome portion 26 of the housing that surrounds the reduced end 27 of the column is provided with a ball bearing 28, see Figs. 1 and 6, that insure free rotary movement of the housing and table with respect to the supporting column.

The chuck units, driving gears, etc., as well as the buffing wheels and their mountings, are alike in each instance and as before intimated any desired number within reason may be employed, there obviously being a polishing unit for each chuck. The chucking units as well as the polishing units are carried upon the table which is designed to be continuously driven through the medium of an electric motor 29 secured to the underside of the table. This motor, shown in Fig. 5, includes a driving gear 30 that meshes with the beforementioned stationary ring gear 18 secured to the pedestal in a manner to rotate the table upon the pedestal.

Referring to Figs. 1 and 5, it will be seen that the drive spindles 31 are each rotated through separate gear trains 25 supported on the underside of the table. For this purpose a plate 32 is secured to the underside of the table by screws 33 which plates are disposed radially with respect to the axis of the table. These plates, there being one for each gear train, each support two depending bolts 34 and 35 which form bearings for the gears 36, 37 and 38. The gears 36 and 37 as shown are twin gears, the upper one of which is driven through its engagement with the ring gear 18 and the other one 36 serves to drive an intermediate idle gear 38*a* mounted on a stud 39 carried by a plate 40 which is positioned against the underside of the gears 37, 38 and 38*a* by means of nuts 41. The gear 38 is slidable vertically on its bearing 35, though is normally held down by a spring 42 mounted upon the bolt 35, thereby insuring meshing engagement with the gears 43 secured to the lower end portion of the drive spindles 31.

Each of the several polishing units, see Figs. 1, 8, 9 and 10, include a drive spindle, bearings and drive mechanisms, and are also otherwise alike in construction, as will be seen. Each unit includes a bearing 44 that is bolted to the table at equal distances apart and extends down through the table in a way to form an elongated bearing for a sleeve 45 in which the spindle 31 is mounted to rotate. These sleeves are each provided with a keyway 45*a* which is engaged by a spline 46 secured in the bearing 44 allowing the sleeve to be raised and lowered, against turning, but in a manner to form a bearing for the spindle whereby the same may be driven through the gear train before-mentioned.

Each of the several polishing units includes a chuck, universal driving means, as well as a polishing wheel, all of which are carried by the table. The form of the chuck 46*a* as well as the peripheral surface of the polishing wheels 47 may be varied to accommodate the particular shape of work piece A to be polished. By this means both the sleeve 45 and the spindle 31 may be raised and lowered to contact the work pieces A with the polishing wheels 47, as will be later more fully described.

A double-acting pinch collar 48 is secured to the supporting sleeve 45 by means of a clamping screw 48*a* and forms an annular bearing 49 which is partially severed as at 49*a* from the lower fixed part of the collar 48 and serves to adjustably support therein the depending hub portion 50 of the gear housing 51, to provide a horizontal rotary adjustment of the gear housing on the non-rotatable bearing 49, the said hub portion 50 being clamped or released in the bearing 49 by means of the clamping screws 51*a*. This obviously permits of a rotary adjustment of the housing 51 whereby it and the chuck can be turned completely around on the collar 48 or to any intermediate position to better accommodate concave, convex, flat, oval and fan-shaped surfaces to be buffed.

The gear housing as will be seen is formed of two parts 51 and 52 whose annular finished surfaces 52*a* are fitted for annular adjustment, one of said parts being provided with a slot 53 and a screw 53*a* which passes through the said slot and threadably engages the coacting member in a way to clamp the members of the box together after the same have been adjusted to the position desired. In this respect it will be seen that the member 52 of the housing includes a radially disposed hub portion 54 that forms a bearing for the chuck spindle 54*a*.

The housing is mounted for rotary adjustment on the sleeve 45 and serves to enclose a bevel pinion 55 secured on the upper end of the spindle 31, which by the way extends through and into the housing member 51. This housing also encloses a cross shaft 55*a* that is arranged horizontally and at a right angle to the spindle 31 and carries upon one end a beveled pinion 56 that meshes with the beforementioned pinion 55 and carries upon its other end a beveled pinion 56*a* that meshes with and drives a fourth beveled pinion 57 upon the chuck spindle 54*a*. The cylindrical hubs of the two said beveled pinions mounted upon the cross shaft are keyed to the said cross shaft and their hub portions are fitted in bearings of the housing to permit free rotation of the shaft and pinions. From the foregoing it will be seen that the chuck is adapted for rotary, forward, backward and angular adjustment to meet all requirements, so that to it can be attached any form of work desired.

The form of chuck as well as the polishing wheels required therefore depends entirely upon the form of the work piece to be finished. Where concaved pieces such as an automobile head light lense is to be finished a form of chuck somewhat like that shown at the right in Fig. 1 and also in Fig. 10 would be employed. Whereas if it is a convex piece to be polished a form of chuck like that shown in Figs. 1, 8 and 9 would be employed. One can obviously be substituted for the other by disconnecting the shank of the chuck from the chuck spindle 54*a*. It will also be understood from Fig. 1 that one or more different types of chucks may be carried by the machine at the same time, as for instance two like that shown at the left of Fig. 1 could be employed along with two like that shown at the right. In this way one set of chucks could be used for buffing the outside of the discs and the other pair used to buff the inside of the work, thereby completing the operation of buffing both sides of a piece with each rotation of the table. The particular adjustment of the supporting means for the chucks, including the housing, would necessarily vary according to the size and shape of the work piece to be buffed. In most instances the resetting of the chucks would probably not be required very frequently since such work pieces as those above mentioned are produced by the thousands.

From the foregoing it will be understood that both the chuck and the polishing wheel are power driven to rotate in either direction, the polishing wheel being driven direct from the motor 68

while the chucks are driven through the gear train 25 from the ring gear, thence through the detachable gear 43 to the drive spindle 31, the beveled gears 55, 56, 56a and 57 to the chuck spindle 54a. The gear drive within the housing is, as will be seen, of such construction as will permit the chuck shaft to be deflected forward or backward to permit one section of the housing as well as the chuck shaft carried thereby to be deflected forward as shown in Figs. 1 and 8 or to be set back in a vertical position as shown in Figs. 1 and 10. This housing, as well as the parts carried thereby, are also free to be adjustably turned in the pinch collar 48 as may be necessary to provide a proper setting of the chuck to accommodate the work piece carried thereby.

The work is held on the chuck by a vacuum system which includes a perforated form of chuck B against which the work piece A is placed and held by suction, these perforations leading to a suitable passage b down through the chuck spindle 54a and is there coupled to a cross pipe 57a, see Figs. 7 and 9, secured in the housing 52 and having an outlet 58 for the attachment of a vacuum pipe. The pipes, not shown, from the several chucks may be connected in a manner to form a single pipe which can lead off to a vacuum tank or pump, not shown, as preferred. These individual pipe connections from the chucks may also be provided with suitable valves, not shown, which are turned off and on to release and clamp the work pieces.

The circular track 16 heretofore referred to, see Figs. 1, 2 and 5, is secured to the inner wall of the support 14 in any suitable manner and is level for a portion of its circumference but has a decided dip at the loading station. This dip includes a relatively sharp decline c, a comparatively level lower portion d and a gradual incline e better to allow of the rapid lowering of the drive spindles to permit the same and the chucks to cease rotation, while the spindles continue to move along with the table for a short distance so that the work piece can be removed and the chuck reloaded.

In order to best accomplish this I pivotally connect a spring actuated hook 59, see Figs. 1 and 10, as at 60 to the underside of the table and immediately above the rollers 17. A spring 61 normally holds the hook in a vertical position in a way to engage the bracket 62 secured to the sleeve 45, adjacent to the roller 17, and support the same and its chuck during the travel of the roller over the upper horizontal portion 64 of the track. In order to release this hook from the roller bracket as the chucks approach the loading station, I secure a knockout pin 65, see Fig. 5, to the inner wall of the support 14, which pin extends inward, in the line of travel of the hook so that the latter with the rotation of the table will strike the pin and become disengaged from the roller bracket and at the same time permit the gear 43 on the spindle 31 to become disengaged from the slip gear 38. This leaves the roller 17 free to ride down the decline, along the level portion and up the incline of the track thereby lowering the chuck and permitting the finished work piece to be removed and another piece placed in the chuck, to be finished. As the roller 17 reaches the high point f of the track it again engages the hook and becomes connected, whereupon they travel together to support the work piece in engagement with the polishing wheel 67, during the further travel of the table. The chuck spindle and its roller are supported by the hook slightly above the adjacent top surface of the track until its hook again strikes the knockout pin and releases the spindle.

The polishing wheels 47 are each driven by separate motors 68 which in turn are mounted on adjustable plates 69 whereby the axis of the motor spindles and polishing wheels may be adjusted at various angles better to perform the required polishing operations on various kinds of work, if desired. These several plates like the motors are alike in construction and are indirectly mounted upon the beforementioned closure member 23 which, as before stated, is secured to the table of the machine. This adjusting means for the several motors includes a fixed bracket 70 that is bolted to the closure housing in which a nut 71 is pivotally supported in an outwardly extended portion of the bracket 70, and threadably engages a screw 72 whose upper end is hingedly connected to an eye 73 on the underside of the plate 69. This bracket 70 serves also to support two pair of uprights 74 that are slotted to receive a rod 75 mounted in lugs of the plate 69 upon which the motor 68 is secured. Rods 76 are carried by the arms of a yoke-shaped end on each motor plate, and serve to pivotally connect said plates with a block 77 slidably mounted on one end of a threaded sleeve 81, which engages a vertically disposed screw 78 made integral with and forming part of a covering 79 secured to the hub portion 26 of the closure member 23 and covering the electrical distributor 80.

From the foregoing, it will be seen that the motor base plates 69 can readily be adjusted to change the angle of the motor spindles first by the adjusting of the nut 71 which serves to raise and lower the outer end portions of the said motor base plates. Further adjustment of these base plates can be obtained through the raising and lowering of the block 77, which as before stated is pivotally connected through rods 76 with said plates 69. As stated, the block 77 is operated through the sleeve 81 that threadably engages the threaded stem 78 and is rotated by a handle 82 mounted upon the upper end of the sleeve 81 whose lower end portion is slidably connected with the beforementioned block 77 so that with the turning of the sleeve by the handle 82, the block will be raised or lowered for the adjustment of the motor plates and motors.

The distributor 80, as shown in Figs. 6 and 4 comprises a hollow post 83 that is mounted on the reduced upper end portion 27 of the column 11a and is surrounded by an insulating sleeve 84 made of fiber. There are also four fiber washers 85 mounted on this sleeve, that are secured as by means of a washer and nut 83a on the end of the post 83. Three or more bronze plates 86, 87 and 88 are positioned between the fiber washers 85 and are provided with a series of tubular insulators 89 which are positioned in round holes through the bronze plates and serve to accommodate three or more contact rods 90 one of which is imbedded in the lower bronze plate 86, another in the intermediate bronze plate 87 and the third in the top bronze plate 88 so as to provide an electrical contact for each plate. The upper ends of these rods serve as binding posts 91 to which the feed wires 100 are connected. Slip rings 92 that are positioned between the fiber washers 85, surround these bronze plates. These rings are connected by two posts 93 which are carried with the turret table and are covered by fiber sleeves 94 and serve to engage pins 95 seated in the peripheral por-

tion of the several bronze plates to insure the turning of the same with the table. 96 represents binding posts that are also carried by the said bronze plates and are electrically connected by wires 97 to distributor plates 98 of the outlet box 99 by wires 100 there.

The distributor plate obviously serves to supply electric current to the several motors 29 and 68, each motor being provided with a separate connection from each one of the three plates. The supply wire 100 which, in the present instance, is in the form of a cable, is brought up through the column 11 and post 63, shown more clearly in Fig. 6, and each of the several wires of this cable are connected to binding posts 96 that supply current to the distributor 80 whereas the wires 97 connect the several binding posts 96 to the several plates of the outlet box 99 from which connections are made to the respective motors.

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

1. A polishing machine of the class described, comprising in combination, a central column, a table rotatably mounted thereon, means for rotating the table, a series of rotatable chuck carrying spindles mounted in the table, gear drive means as between the column and the spindles for rotating the same, means for raising and lowering the spindles and chucks for engaging and disengaging said gear drive means, and a series of polishing wheels carried by the table and adapted to operate upon work carried by the chucks while in a raised position.

2. A polishing machine of the class described, comprising in combination, a central column, a table rotatably mounted thereon, means for rotating the table, a series of rotatable chuck carrying spindles mounted in the table, gear drive means as between the column and the spindles for rotating the same, means for engaging and disengaging said gear drive means, a series of polishing wheels carried by the table and adapted to operate upon work carried by the chucks while in a raised position, and an annular track beneath the table adjacent the line of travel of the spindles, and a supporting roller carried by each spindle to engage the track.

3. A polishing machine of the class described, comprising in combination, a central column, a table rotatably mounted thereon, means for rotating the table, a series of rotatable chuck carrying spindles mounted in the table, gear drive means as between the column and the spindles for rotating the same, an annular track beneath the table adjacent the line of travel of the spindles, a supporting roller carried by each spindle to engage the track, said track having a downwardly looped portion to guide the rolls and spindles down and up to disengage and engage the spindles from the drive, and a series of polishing wheels carried by the table and adapted to operate upon work carried by the chucks while in a raised position.

4. A continuous turning polishing machine comprising a central column, a table rotatably mounted thereon, means for rotating the table, a series of rotatable chuck carrying spindles carried by the table, adjustable motor supporting means carried by the table, a series of motors each bearing a polishing wheel carried by said supporting means and means for operating the said adjusting means to change the angular position of the motors and polishing wheels to better operate on work carried by the chucks.

5. A continuous turning polishing machine comprising a central column, a table rotatably mounted thereon, means for rotating the table, a bearing plate mounted on the column, a closure member secured on the table and carrying a bearing plate and balls to form a ball bearing for the table, a series of rotatable chuck carrying spindles mounted on the table, gear drive means as between the column and the spindles for rotating the same, a series of polishing wheels carried by the table adapted to operate upon work carried by the chucks and means for raising and lowering the spindles and chucks to be engaged and disengaged by the polishing wheel.

6. A polishing machine comprising a column, a table mounted thereon, means for rotating the table, a drive spindle, a chuck, a chuck spindle, chuck drive gearing, a ring gear secured to the column, a gear train connecting the ring gear and the chuck drive gearing, means to engage and disengage the gear train, chuck and chuck spindle, drive gearing connecting the drive spindle and the chuck spindle, means for adjusting the chuck and its spindle in various angular positions with respect to the drive spindle.

7. A continuous turning polishing machine, comprising a column, a table rotatably mounted thereon, means for rotating the table, a series of rotatable chuck bearing spindles carried by the table, a motor and polishing wheel for each chuck, an adjustable motor supporting means comprising a bracket carried by the table, a motor supporting plate, an adjustable screw means for raising and lowering one portion of the motor supporting plate, guide posts carried by the table, a yoke in engagement with the said supporting plates, and a screw and nut for raising and lowering the yoke to raise and lower the supporting plates and motors.

8. A continuous turning polishing machine, comprising a central column, a table rotatably mounted thereon, means for rotating the table, a series of rotatable chuck carrying spindles carried by the table, a series of motors each bearing a polishing wheel carried by the table, one for each chuck, means for changing the relative position of the chucks and polishing wheels to bring the wheels into and out of operative engagement, means for simultaneously changing the angular position of the motors with respect to the chucks, means for rotating the chuck spindles simultaneously with the rotating of the table.

9. A polishing machine of the class described comprising a column, a ring gear positioned thereon, a table rotatably mounted on the column and having means to engage the ring gear to rotate the table, a gear train supported by the table, one gear of each train being normally in engagement with the ring gear, chuck carrying spindles mounted in the table and adapted to be raised and lowered and having a gear normally connected with the gear train, means for engaging and disengaging said spindle gear from the gear train to stop and start the rotation of the spindle, means for holding a work piece in the chuck, motor driven polishing wheels carried by the table in a position to operate on work mounted in the chucks.

10. A polishing machine of the class described, comprising a column, a ring gear positioned thereon, a table rotatably mounted on the column and having means to engage the ring gear to rotate the table, a gear train supported by the

table, one gear of which is normally in engagement with the ring gear, a chuck carrying spindle mounted on the table and adapted to be raised and lowered and having a gear normally in engagement with the gear train, a hook carried by the table to engage and support the spindle motors and polishing wheels carried upon the table, means secured to the table for engaging the hook to disconnect it from the spindles at the loading station to disengage the chuck from the polishing wheel.

11. A polishing machine of the class described comprising a central column, a table rotatably mounted thereon, means for rotating the table, a series of rotatable chuck carrying spindles slidably mounted in the table, gear drive means as between the column and the spindles to rotate the same, an annular track beneath the table in the path of travel of the spindles, a supporting roller carried by each spindle to run upon the track, motor driven polishing wheels carried by the table, hook means secured to the table for supporting the chucks in engagement with the polishing wheel, means to engage and disengage the spindle from the drive means and polishing wheels to permit loading of work pieces.

12. In a polishing machine of the class described, the combination of a rotary table, a motor and polishing wheel mounted thereon, a spindle and chuck rotatably mounted in the table beneath the polishing wheel, means for driving the spindle, means for raising and lowering the spindle and the chuck with respect to the polishing wheel, the chuck including vacuum means for clamping a work piece thereon.

13. In a polishing machine, a rotary table, a polishing wheel and means for rotating the same, chuck supporting and driving means comprising a vertically movable support mounted in the table, a driving spindle journaled in the support, means for driving the spindle, a chuck and chuck spindle carried on the support, drive gearing connecting the drive spindle and the chuck spindle, means for adjusting the chuck spindle angularly with respect to the driving spindle and means for rotatably adjusting the chuck upon the support.

14. In a polishing machine, a rotary table, a polishing wheel carried thereby and means for rotating the same, chuck supporting and driving means comprising a vertically movable support mounted in the table, a driving spindle journaled in the support, means for driving the spindle, an adjustable gear housing carried by the support, a chuck and chuck spindle carried by the housing, drive gearing within the housing connecting the drive spindle and the chuck spindle, and means for rotatably adjusting the gear housing upon the supporting sleeve.

15. In a polishing machine, a rotatable table, rotatable polishing wheels carried thereby, means for driving the brushes, means for rotating the table, chuck supporting and driving means comprising a vertically movable support, a gear housing adjustably mounted on the support, a drive spindle journaled in the support, means for operating the spindle, a chuck and chuck spindle carried by the housing, means for adjusting the housing at different angles with respect to the vertical support, drive gearing within the housing connecting the drive spindle and the chuck spindle, and vacuum means for the chuck whereby work pieces may be secured thereon.

16. In a polishing machine of the class described the combination with a rotatable table and means for rotating the same, of a series of rotatable polishing wheels with individual means for driving the same, a work holding chuck for each of the polishing wheels, means for rotating the chucks through the movement of the table, the said chucks each comprising a support vertically movably mounted in the table and means for raising and lowering the same with respect to the polishing wheels, a chuck spindle carried on the support, driving connections from the driving spindle to the chuck spindle for operating the latter and means to permit adjustment of said driving connections to permit the chuck and spindle to be set at various angles with respect to the said support.

17. In a polishing machine, the combination of a fixed column carrying a ring gear, a table rotatably mounted on the column, means for rotating the table, gear trains carried by the table and connected with the ring gear whereby the rotation of the table will cause to drive the gear train, a series of polishing wheels carried by the table, a series of chuck supports adjustably mounted in the table, a driving spindle for each support having gear connections with the said gear train for rotating the spindle, a chuck and chuck spindle, a flexible gear drive from the drive spindle to the chuck spindle means for adjustably positioning the last mentioned gear drive on the support and means for angularly positioning the chuck with respect to the said support.

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