No. 871,964. PATENTED NOV. 26, 1907.

G. F. STEWART.

BUFFING MACHINE AND DISK HOLDER THEREFOR.

APPLICATION FILED SEPT. 12, 1906.

3 SHEETS—SHEET 1.

Fig. 1.

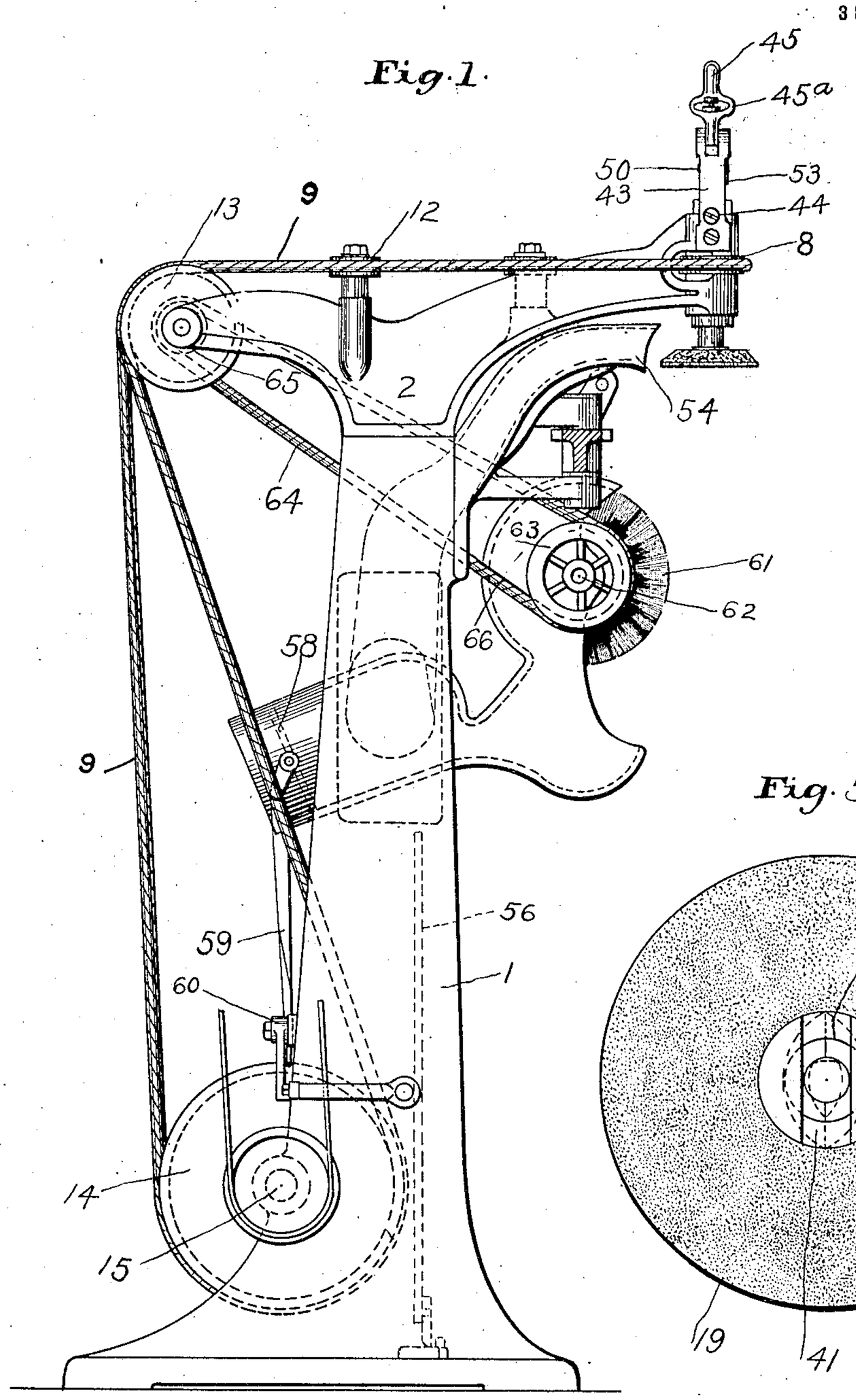

Fig. 5.

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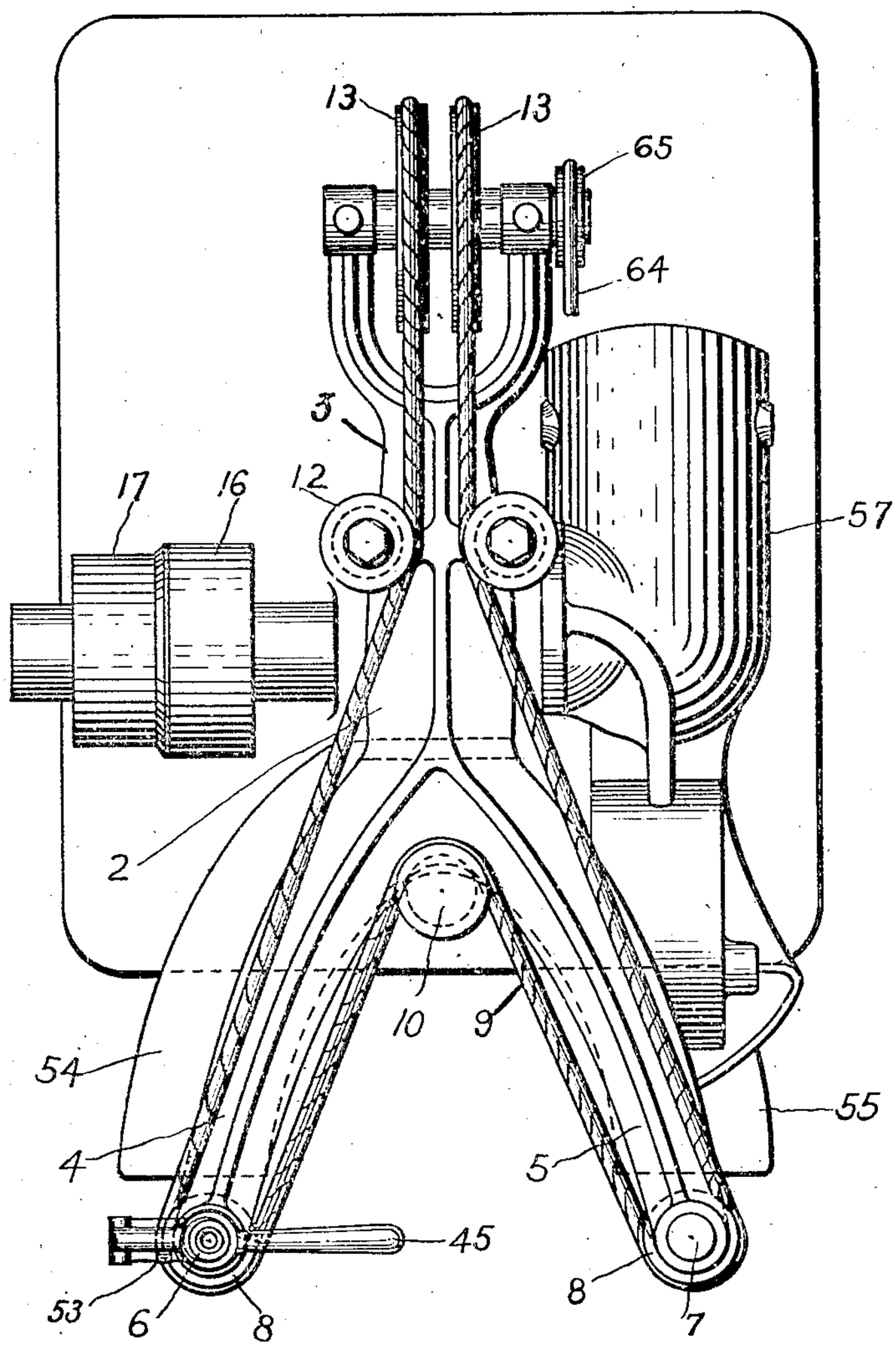
3 SHEETS—SHEET 2.

Fig 2



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3 SHEETS—SHEET 3.

Fig. 3.

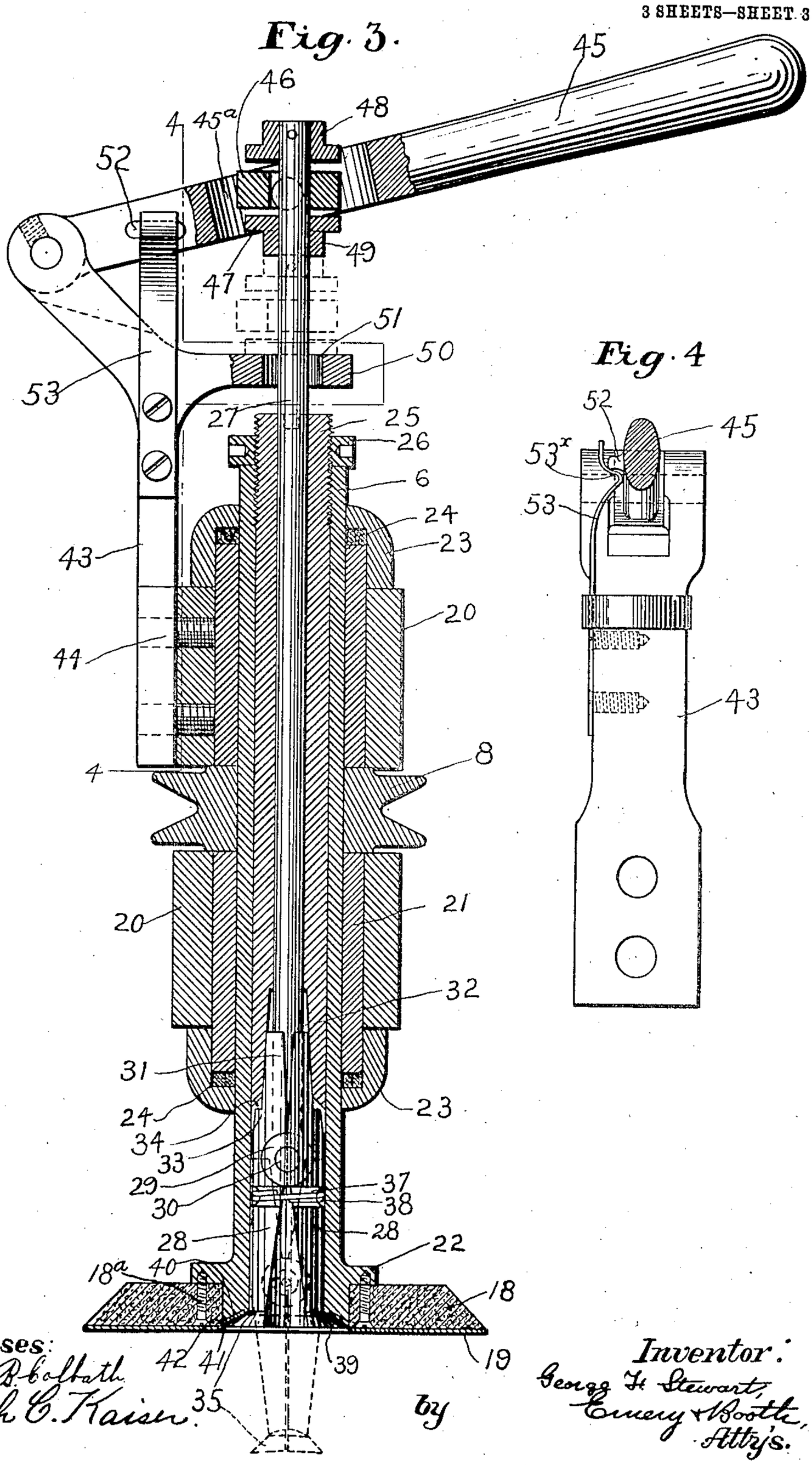

Fig. 4

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UNITED STATES PATENT OFFICE.

GEORGE F. STEWART, OF LYNN, MASSACHUSETTS, ASSIGNOR TO MANUFACTURERS MACHINE COMPANY, OF MONTCLAIR, NEW JERSEY, A CORPORATION OF NEW JERSEY.

BUFFING-MACHINE AND DISK-HOLDER THEREFOR.

No. 871,964. Specification of Letters Patent. Patented Nov. 26, 1907.

Application filed September 12, 1906. Serial No. 334,211.

To all whom it may concern:

Be it known that I, GEORGE F. STEWART, a citizen of the United States, and a resident of Lynn, in the county of Essex and State of Massachusetts, have invented an Improvement in Buffing-Machines and Disk-Holders Therefor, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

My invention relates to buffing machines of the type commonly known to the trade as Naumkeag machines, which are distinguished by the fact that the buffing pad is of approximate disk shape and rotated about a vertical axis at the center of the disk, contra-distinguishing these machines from those employing buffing rolls about which the abradant material is secured.

Roll machines are commonly employed to operate upon the bottoms of fore parts of boots and shoes, while the Naumkeag machine is more generally used for what is termed "shanking out", or finishing the shanks, for which it is better adapted owing to the fact that the disk pad employed permits the buffing to be carried down closer to the breast of the heel and into the concaved breast, whereas with the roll the buffing could be carried no nearer to the heel than the length of the radius of the roll.

My invention contemplates the use of a plurality of spindles upon which the abrasive pads or disks are mounted and an improved adjustable holding device for one of the disks which will permit the operative to remove a worn disk and apply a fresh one while the machine is in operation, so that the work of the operative is not delayed by his having to stop the machine in order to change the disks.

My invention also contemplates the use of an abradant disk having structural means to permit it to be easily and perfectly centered and secured by the holding device in operative position.

The above, however, with other features of my invention will be best understood and appreciated from a description of the same in connection with one embodiment thereof shown in the accompanying drawings.

Referring to the drawings: Figure 1 is an elevation of the left side of a machine embodying one form of my invention and selected for illustrative purposes only; Fig. 2, a plan thereof; Fig. 3, a vertical sectional detail of the novel holding device, showing the annular abradant diaphragm secured in operative position with the means for operating said device; Fig. 4, a vertical sectional detail taken on the broken line 4—4 of Fig. 3; and Fig. 5 is a bottom view of the abradant diaphragm or "pin wheel" 19 in place upon its spindle and to show the clamping jaws spread apart in diaphragm securing position.

Referring to the drawings, in the particular embodiment of my invention selected for illustration herein and shown in said drawings, a column 1 (see Fig. 1), of suitable shape and construction to support the working parts, is provided at its upper end with a head 2 (see Fig. 2) of approximate **Y** shape, the stem 3 of said **Y** extending rearwardly and its two horizontal arms, 4, 5, extending forwardly toward the operative. In the present instance, a plurality of disk or pad spindles is employed, here shown as two, indicated by reference numbers 6 and 7 upon the drawing and respectively mounted at the outer ends of said arms 4 and 5, one of which may be of any desired or usual construction but the other, herein shown as the spindle 6, is preferably of a different construction presently to be described. Each of these spindles is driven by a grooved pulley 8, the two pulleys being driven by a common belt 9, passed around an idler 10 between the arms of said **Y**, about the two pulleys at the ends of said arms, thence rearward between two idlers 12, to go over a pair of vertically arranged idlers 13, journaled in the forked rear end of the stem 3 of said **Y** shaped head 2, and thence downward at the rear of the machine to and about a driving pulley 14 fast on a drive shaft 15 journaled in bearings at the base of said column. Said drive shaft 15 may be driven by any suitable means but preferably as herein shown by fast and loose pulleys 16 and 17, adapted to be suitably connected with any convenient source of power.

The spindle 7 is provided with the usual type of Naumkeag buffing pad (not shown) adapted to buff and finish the shank and also the ball, which latter has been previously grained upon the usual roller buffer.

The spindle 6, referred to, is provided with a pad having an abradant cover of what is known as the "pin wheel" type, that is, a flat annular disk or diaphragm having one of

its faces coated with abradant material, sandpaper or emery cloth usually being employed. This spindle 6, the pad 18 carried thereby, the diaphragm 19 and the holding device for retaining the latter in place upon the pad and spindle are shown in detail in Fig. 3, to which reference should now be made. As herein shown, said spindle 6 is mounted in brass bushings 21, secured in suitable bearings 20 formed at the front end of said arm 4, said spindle receiving intermediate said bearings and their bushings, the horizontal drive pulley 8 by which it is rotated and which also prevents vertical displacement of the spindle in its bearings. This spindle 6 is of tubular form and is provided at its lower end with a flanged disk 22 forming a seat concentric with the axis of the spindle to receive an annular frusto conical shaped pad 18, preferably of felt or like material, which is secured thereto by any suitable means as by screws 18ª (Fig. 3). By providing a pad of this shape its tapered or beveled edge being more resilient than the body of the pad, permits it to adapt itself to the variable contour of the shank or other portion of the sole operated upon, so that all portions thereof are abraded or buffed.

In order to make the spindle bearings dust proof, suitable sleeve like caps 23 are provided which are mounted on said spindle 6 to inclose the exposed ends of said bushings 21. Each of these caps, moreover, is provided interiorly with suitable packing material such, for example, as split rings or washers of felt or the like, these rings 24 filling the space between the spindle, the ends of said bushings, and said caps, and cooperating with the latter in preventing dust from reaching the bearing surfaces.

The annular disk pad 18 forms a yielding support for the annular abradant diaphragm 19, clamped against its lower face and to which the shoe bottom is presented to be buffed thereby. As this diaphragm wears out after a reasonable amount of use and as, furthermore, it is also desirable to change the quality of abradant material employed, as from coarse to fine or vice versa, said diaphragm is removably secured to its spindle, and that no time may be lost in changing the diaphragm, means are provided for clamping or unclamping it, so that it may be secured to and removed from the spindle without stopping the machine. To this end, the spindle is provided with an adjustable holding device easily operated by hand for clamping and releasing the diaphragm and the latter is also formed to adapt it to coöperate therewith in facilitating the operation of applying it to or removing it from said holding device.

In order to mount the holding device, referred to, within the spindle, the latter is provided, in the present instance, with an adjustable sliding tubular shaft 25, screw threaded at its upper end to engage corresponding screw threads formed interiorly at the head of said spindle 6. For convenience in turning this shaft 25 to move it vertically in said spindle 6, its head is provided with a lateral opening or pin hole, Fig. 3, to receive a key or pointed instrument by which it may be adjusted to a desired vertical position, for a purpose presently made more clear. To lock it firmly in adjusted position said shaft 25 projects above the upper end of said spindle 6 and receives on its threaded end the clamping nut 26, the periphery of which also is provided with usual pin hole openings for rotating it and clamping or locking the slidable shaft 25 in any desired adjusted position. This shaft 25 receives within its central bore a slidable rod 27, pivotally carrying at its lower end a pair of vertical clamping jaws 28, the upper ends of which together embrace said rod 27. In the present embodiment of my invention and as herein shown (see Fig. 3), each of these jaws is provided intermediate its ends and at one side with a laterally and inwardly extending ear or hub 29 fitting with a recess of corresponding shape in the edge of the adjacent jaw, said ears receiving a horizontal pivot stud 30 carried at the lower end of said rod 27 and by which said jaws are pivotally connected therewith. These jaws operate as levers adapted to swing back and forth on their pivot pin 30, the inner opposing faces being inclined outwardly both above and below the pivot point so that either the upper or lower arms of said lever jaws may be swung toward one another until limited by engagement with said rod 27 at their upper ends, or by the opposing faces of said levers being brought together below said pivotal point. The outer and inner faces of both of these levers are provided with curvilinear or semi-cylindrical surfaces adapting them to embrace or receive the lower end of said rod 27 between them and to slide freely in the lower end of said spindle 6. The upper arm of each of these levers is tapered as at 31 (Fig. 3) and the lower end of said shaft 25 is centrally provided with a tapered recess 32 of converse shape to receive said arms and acting to force them together as said rod 27 and the levers carried thereby are elevated. In the upward vertical movement of said levers within the tubular shaft 25, the tapered ends of their upper arms first engage the bottom opening at the lower end of said shaft 25, which has an inwardly inclined wall 34, so that as said arms slide upward in said recess said ends will strike against said wall 34 and be moved toward one another thus to separate the clamping ends of the lower arms for forming an inturned lip on said diaphragm, to be described later. For clamping the diaphragm in position the lower arms of these levers 28 are provided at their outer or lower

ends with segmental shaped laterally extending heads 35 (Figs. 3 and 5), forming the clamping jaws proper, which with said levers constitute a spreading head for the rod 27 for centering and holding the abradant diaphragm 19 in operative position on its supporting pad 18. These clamping jaws are brought together or separated to expand or collapse said head by moving said rod 27 in opposite directions. The annular diaphragm 19, best shown in Fig. 5, is provided with a central opening 36 of sufficient diameter to permit said segmental shaped heads 35 to pass through when they are brought together in depressing said rod 27. For bringing these clamping jaws together, or to express it differently, for collapsing the spreading head, the lower arms of the levers 28 are provided with a circumferential or peripheral groove 37, to receive a coiled spring 38 which normally acts to swing said arms toward one another. This movement, however, is only permitted by depressing the said levers sufficiently, through the depression of their carrying rod 27, to bring the upper tapered arms of said levers into the lower and larger end of the tapered recess, which permits said arms to separate. When thus depressed (see dotted lines bottom of Fig. 3), the said heads 35 together form a button of approximate elliptical shape (see dotted lines Fig. 5) the minor axis of which is substantially of the same diameter as the opening in said diaphragm 19, so that the latter can be placed and centered thereon and said clamping jaws 35 operated within the annulus of said diaphragm. The outer lateral edges of said heads 35 are inclined or beveled inwardly as at 39 (Fig. 3) and the shouldered flange 22 of said spindle 6 is provided with a tapered bottom recess of converse shape to receive said heads and to constitute a seat for the inner edge of said diaphragm.

The thickness of the annular pad 18 adjacent its central opening is such that the lower end of the spindle does not extend below the surface of the pad, so that the latter forms a yielding support for the inner edge of the active face of the pad. The lower arms of said levers 28 and the clamping jaws proper at their lower ends are adapted to be separated to engage the inner edge 41 of the annular diaphragm 19 and draw and bend it inwardly into contact with the inner lower edge 42 of said pad 18 and clamp it against the inclined face 40 of the spindle recess or seat, said yielding edge 42 coöperating with the clamping action of said heads 35 in preventing rotation of the diaphragm independently of its spindle.

To adapt the levers 28 to receive on their lower ends, constituting the collapsed clamping head of said rod 27, a diaphragm having a somewhat smaller central opening than that shown in Fig. 5 and for properly centering the same thereon during the clamping action, their lower ends are notched or cut away at one side. To depress the rod 27 and thereby said levers 28, to move them and the clamping jaws proper into the position indicated in dotted lines Fig. 3, in which a diaphragm may be easily removed or applied, the upper bearing 20 of said spindle 6 is provided with a bracket 43 (see Figs. 3 and 4) secured thereto by any suitable means, as by screws 44. At its head this bracket is provided with a rearwardly extending yoke 44, upon which is pivoted a suitable operating lever 45, the opposite end of which extends forwardly into a convenient position for manipulation by the operative. This lever is provided with a longitudinal recess 45[a] to receive a block 46 pivotally mounted therein by inwardly projecting pivot screws or studs 47. At its center this block is provided with a vertical recess to receive and permit the rod 27 to slide freely therein. To limit the vertical movement of this operating lever and said block 46 so that the latter will elevate or depress the rod 27 with it, the upper end of the rod is provided with a collar 48 secured thereto, which is adapted to be engaged by said block 46 when said block is elevated. Immediately below said block, said rod is similarly provided with a collar 49 to be engaged by said block when the lever is depressed, thereby to depress the rod 27 and the clamping levers 28 carried at the lower end of said rod, so that their upper ends may be slid downwardly in the tapered recess 32 at the end of the shaft 25 to permit them to separate under the action of their spring 38 for bringing said heads 35 together which, as described, permits the diaphragm 19 to be removed or applied. The bracket 43 is also provided with a forwardly extending arm 50 having a vertical opening 51 therein, to receive the lower end of the collar 49 when it is depressed by the downward movement of said rod and guiding said collar and its shaft vertically to center it relatively to the shaft 25. The flanged head of said collar 49 is adapted to engage the upper face of said arm 50, to limit the vertical depression of the rod and its jaw levers 28 so that said collar cannot be brought into contact with the head of the shaft 25, to interfere with its rotation. By this arrangement said rod is always in position to be acted upon by the operating lever when it is desirable to change the diaphragm.

As the outer end of the operating lever 45 would normally fall by its weight until its block 46 is rested upon the collar 49 carried by said rod 27, and, hence, by the rotating spindle 6, means are provided for normally maintaining it in a position between the upper collar 48 and the lower collar 49 so that it normally engages neither and thereby

does not operate to interfere with the rotation of said collars or to produce unnecessary wear thereof. While any suitable means may be employed for this purpose, I preferably provide the left side of said handle with a laterally projecting lug 52 (see Figs. 3 and 4) and the corresponding side of said bracket 43 with a vertical spring 53, having an inwardly bent end portion $53^{\times}$ adapted to engage said lug 52 and prevent further depression thereof except when sufficient force is applied to the lever to positively depress the same when operated in removing or applying new or different diaphragms to the holder. This arrangement furthermore permits the operating lever to be again elevated for clamping a new diaphragm in place, the lug 52 on said arm bending the holding spring 53 outwardly until the engaging lug 52 of said lever is elevated above the inwardly bent portion of the spring, when the spring immediately springs in to its normal position. The operating lever may then be released and permitted to fall by its own weight until arrested by the engagement of said lug 52 with said spring and is normally supported in the intermediate position referred to.

When the operating lever is depressed, in applying or removing a diaphragm, the block 46 frictionally bears upon or engages the collar 49 and as the clamping jaws simultaneously release the diaphragm 19 rotation of the rod and of said jaws is ordinarily prevented during this operation.

To provide for slight variations both in the thickness of the pad 18 and said diaphragm 19 and also to provide for varying the clamping action or spread of the clamping jaws, the tubular shaft 25 may be adjusted vertically as described. By raising or lowering this shaft, the action of the tapered recess on the tapered arms of the levers 28 respectively produces less or greater separation of the clamping faces of said heads 35 thus to vary the clamping action on the interposed inner edge of the diaphragm.

Any suitable means may be employed for conducting away the dust produced by the abrading action of said pin wheel disk 19 and the buffing disk mounted upon the opposite spindle 7, but in the present instance, I preferably provide conduits or suction flues 54, 55, respectively, the inlets or mouths of which stand directly in the rear of the spindle disks and as close thereto as possible without interfering with the presentation of the work thereto. At their inner ends these two conduits join or merge into a single conduit 57, which (see Fig. 1) extends down within the column and its outlet at the side of the column, being controlled by a damper 58 (see dotted lines Fig. 1), shown as connected by a rod 59 and bell crank 60 to the shipper rod 56 (Fig. 1). As here shown, this shipper is pivotally mounted adjacent the base of the column and controls the belt that runs upon the fast and loose pulleys 16 and 17, and by which they are operatively connected with a convenient source of power. The outlet of this suction flue is adapted to be connected with a central exhaust fan (not shown) adapted to operate a large number of machines so that upon opening the damper in the outlet the suction flues of each machine are operatively connected with this central fan, thereby to remove the dust produced in the buffing operation. By connecting the damper with the shipper the damper is respectively closed and opened upon starting and stopping the machine. Referring to Fig. 1, the machine is shown as also provided with a cleaning brush 61, mounted upon its shaft 62, journaled at its ends in the sides of a protecting hood 66 extending from said column 1 and connected with the main suction 57 of the machine. This shaft and the brush carried thereby are rotated through a pulley 63 secured exteriorly upon said shaft and connected by a belt 64 with a pulley 65 on the shaft of the idlers 13.

The machine is operated as follows: The operative will usually present the bottom of a shoe to the action of the pin wheel or abrading diaphragm 19 and clean out and grain the shank and heel of the shoe to preliminarily buff the same, after which the buffing operation is completed by presenting the shoe to the rotary pad on the opposite spindle 7 and subsequently cleaning and dusting it by means of the rotary brush 61. When a new or different diaphragm is to be applied, the operating lever is depressed, stopping the rotation of said rod 27 and depressing it to cause its collapsible head to contract to form the button like head shown by dotted lines in Fig. 3. In this position the old diaphragm may easily be removed over said head and a new one placed upon it. The operative next raises the handled end of the operating lever to bring the tapered portions of the levers 28 into operative contact with the recess 32 causing them to move toward one another and to separate the clamping jaws at their opposite ends. By this movement the diaphragm is properly centered and its inner edge bent inwardly to form a central lip clamped by said jaws into the seat at the lower end of the spindle which forms a stationary coöperating clamping member for said jaws to clamp against for securing the diaphragm firmly in position and so that it will be rotated positively with said spindle. As the diaphragm is secured in place it is rotated by and with said spindle, when the operating lever may be released and held out of contact with the rod 27 which is rotated with the diaphragm as the latter is clamped in operative position.

By my invention a machine is produced

which provides a plurality of pads arranged to permit of different grades of work and which may be operated with the greatest facility and least inconvenience on the part of the operative.

My invention also advantageously provides novel means for removing or changing and applying the diaphragms or pad covers of the pin wheel type to a spindle adapted to receive them, the operation being greatly facilitated thereby and avoiding the loss of time usually required to stop the machine, remove the worn and applying a fresh cover thereto and again to start the machine.

Furthermore, my invention provides a holding device that so far as I am aware is the first instance in the art of the use of a spreading or expansible head to clamp a disk in place.

While my invention is perhaps most applicable to the type of machine herein shown, it is, however, applicable to any machine having a pad or operative support for the abradant covering, in which my invention might be found useful.

While in the foregoing description I have described a particular embodiment of my invention, my invention obviously is not limited to such embodiment which was selected for description and illustration only, nor to the specific arrangement of parts and terms employed, the latter being used in a broad or general sense and not in their specific nature, and I wish it to be understood that my invention is not limited to the exact construction herein shown and described but that minor changes may be made without departing from the spirit and scope of my invention.

Having thus described one embodiment of my invention, I claim and desire to secure by Letters Patent:—

1. In a machine of the type described, a spindle, an annular diaphragm having an abrasive surface at one side, and a laterally expansible and collapsible clamping device carried within said spindle and operable within the annulus of said diaphragm, and operating means for collapsing the same to receive said diaphragm and for expanding it to clamp the same to said spindle.

2. In a machine of the type described, a spindle having a longitudinal recess with an inwardly tapered opening communicating therewith at one end of said spindle, a holding device movable within said spindle having a plurality of laterally movable members each provided with clamping faces to fit within the tapered opening at the end of said spindle, an annular diaphragm having an abrasive surface and a central opening to receive the clamping faces of said members, and means for operating said members for clamping or removing said diaphragm.

3. In a machine of the type described, a buffing device comprising a spindle having a central lip receiving recess at one end, the wall of which constitutes a clamping member; means slidably mounted within said spindle having a spreadable clamping head to coöperate with said recess wall, an annular diaphragm having an abrasive face and receiving the clamping head within its central opening, and means for operating said means to spread said head to form an inturned lip at the inner edge of said diaphragm and clamp the same against said clamping member.

4. In a machine of the type described, a buffing device comprising a spindle having a central lip receiving recess at one end, the wall of which constitutes a clamping member; means slidably mounted within said spindle having a spreadable clamping head to coöperate with said recess wall, an annular pad surrounding the recessed end of said spindle and projecting below the same, an annular diaphragm having an abrasive face and receiving the clamping head within its central opening, and means for operating said means to spread said head to form an inturned lip at the inner edge of said diaphragm and clamp the same against said clamping member.

5. In a machine of the type described, a spindle having laterally separable clamping members at one end thereof, an annular diaphragm having its inner edge portions inturned by and forming a lip clamped by said spindle members, and means for moving said members from or toward one another respectively to form said lip and clamp the same or to release said lip and thereby said diaphragm.

6. In a machine of the type described, a spindle having an axial recess, a rod slidably mounted therein and provided with clamping members at its lower end, a handle adapted to be operatively connected with said rod, and means for normally maintaining it out of contact therewith.

7. In a machine of the type described, a spindle having an axial recess extending therethrough, a rod slidably mounted therein having clamping means at its lower end, a pivoted lever having a longitudinal slot, a block movably connected therewith having an aperture through which said rod extends, means on said rod both above and below said block to be engaged by the latter in elevating and depressing said lever correspondingly to move said rod, and means normally to hold said lever elevated with said block out of said rod means.

8. In a machine of the type described, a hollow rotary spindle having a dish shaped recess at its end communicating with the interior of said spindle, a holding device slidably mounted in said spindle having a spreadable head adapted to engage the walls of said

recess, an annular diaphragm adapted to be centered on said head and clamped thereby against the wall of said recess by spreading said head, and means for operating said holding device to spread its head to clamp said diaphragm.

9. In a machine of the type described, a pad spindle having a conical recess at one end, an annular diaphragm provided with an abrasive surface, laterally separable clamping members slidably mounted in said spindle and operating through the annulus of said diaphragm, and means for separating said clamping members to clamp the inner edge portions of said diaphragm against the walls of said recess or for moving said clamping members toward one another to unclamp said diaphragm and permit its removal.

10. In a machine of the type described, a spindle, an annular diaphragm having an abrasive surface and adapted to be secured thereto, a holding device therefor having a collapsible and expansible head operating within the annulus of said diaphragm adapted when collapsed to permit the diaphragm to be centered thereon and when expanded to bend the inner edge portions of said diaphragm inwardly and clamp the same against said spindle, and means for collapsing and expanding said head for the purpose described.

11. In a machine of the type described, a spindle having a recessed seat at one end, an annular diaphragm having an abrasive surface, a holding device slidably mounted in said spindle having a split button-shaped head the parts of which are relatively and laterally movable within the annulus of said diaphragm for expanding or collapsing said head, and means for collapsing or expanding said head respectively to permit applying said diaphragm thereto or to clamp the inner circumferential portions of said diaphragm against the seat of said spindle.

12. In a machine of the type described, a spindle having a flanged disk at one end forming a pad seat concentric with said spindle, an annular pad mounted on said seat, an annular diaphragm having an abrasive surface at one side thereof, means mounted in said spindle comprising a laterally spreadable head operating within the annulus of said diaphragm, adapted to be projected below said spindle and collapsed to receive said diaphragm and to be elevated and spread to clamp the inner circumferential edge portions of said pad against the annulus of said pad, and operating means therefor to collapse or spread said head for removal from or application of a diaphragm thereto and for clamping the same to said pad.

13. In a machine of the type described, a spindle having laterally spreading clamping jaws at its lower end, an annular diaphragm having an abrasive surface and a circular opening to receive said jaws, and means for spreading said jaws for clamping said diaphragm to said spindle.

14. A machine of the type described comprising in combination a spindle having a central opening extending therethrough and carrying an annular pad at one end, a clamping device mounted to slide vertically in said recess and the opening in said pad and provided with an expansible head, an annular diaphragm having an abrasive surface and receiving said head within its annulus, and means for sliding said clamping device and expanding its head to clamp said diaphragm.

15. In a machine of the type described, a tubular spindle having an inwardly tapered opening at its lower end, a rod slidably mounted in said spindle, and a plurality of vertical levers pivoted at the lower end of said rod and having their upper arms tapered to engage the wall of said recess.

16. In a machine of the type described, a rotary spindle having an axial recess, a flanged disk at one end of said spindle forming a seat for a pad and having an end recess communicating with that of the spindle, a holding device slidable in said recesses having a spreadable head, an annular pad seated and centered on said flanged disk, an annular diaphragm having an abrasive surface adapted to be placed on said spreadable head and clamped thereby against the wall of the end recess, and means for operating said holding device to spread its head to clamp the inner edge portions of said diaphragm against the wall of said end recess.

17. In a machine of the type described, a holding device for an abrading disk, comprising a rotary spindle provided with laterally separable clamping means for holding the disk in operative position thereon.

18. In a machine of the type described, a holding device for an abrading disk, comprising a rotary spindle provided with laterally separable clamping means for holding the disk in operative position thereon, said means including a plurality of levers, 28, provided with clamping jaws, 35.

19. In a machine of the type described, a spindle having a tapered recess, 32, adjacent one end, a longitudinally movable member provided with clamping jaws, 35, and clamping levers, 28, slidably mounted in said spindle to coöperate with said recess for separating said jaws.

20. In a machine of the type described, a holding device provided with a clamping means having segmental clamping jaws 35 and means for operating said jaws.

21. In a machine of the character described, the combination of a pad carrying spindle, means to rotate said spindle, a member movable longitudinally with respect to

said spindle and provided with clamping means for a diaphragm, means for moving said member longitudinally of the spindle, and means for stopping rotation of said member when in position for a change of diaphragms.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

GEORGE F. STEWART.

Witnesses:
MERTON D. PHELAN,
SIDNEY F. SMITH.