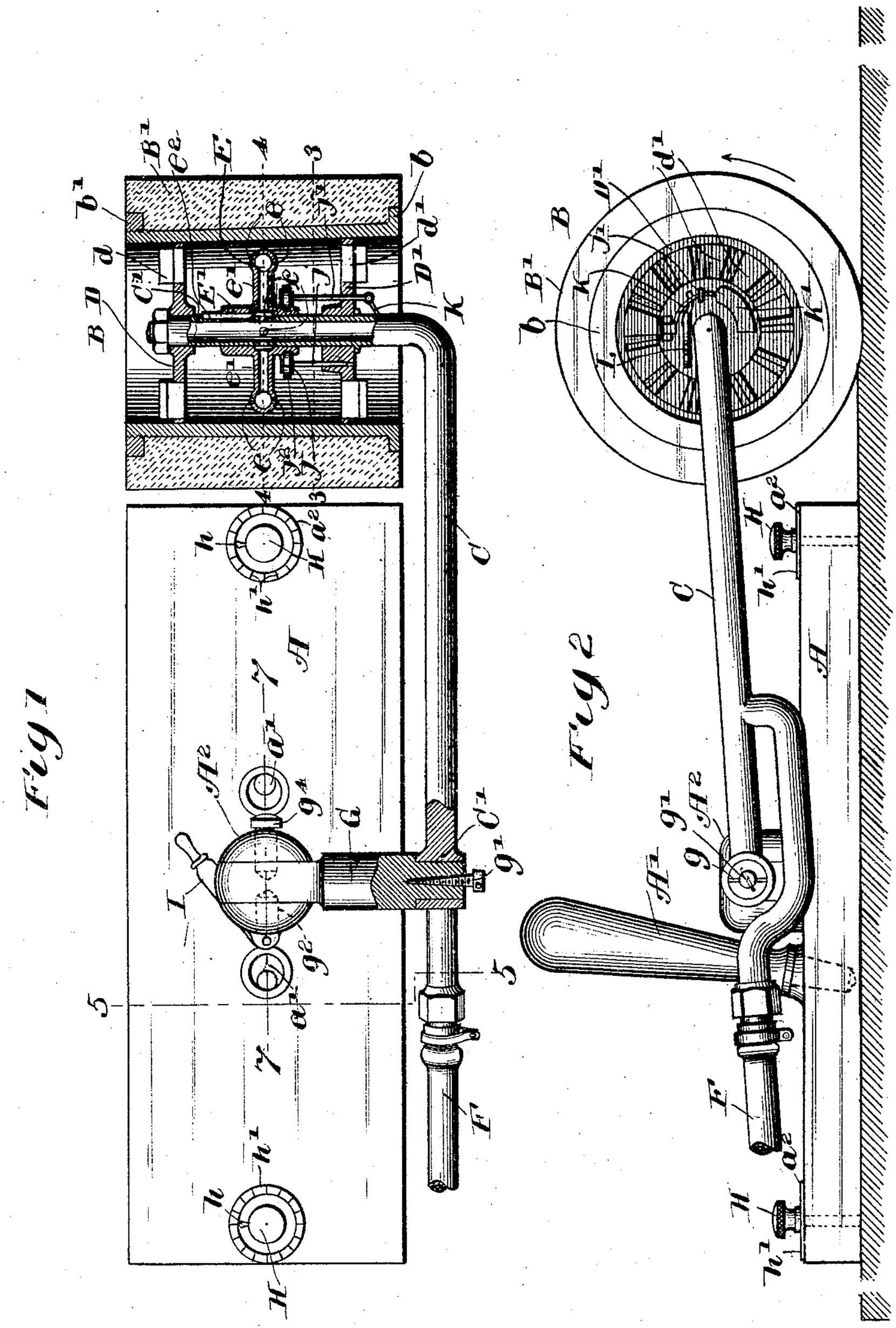
No. 765,421. PATENTED JULY 19, 1904.

N. W. FLETCHER.

GRINDING OR POLISHING TOOL.

APPLICATION FILED DEC. 15, 1902.

NO MODEL. 2 SHEETS—SHEET 1.



Witnesses:
Earl S. Crawford
William Hall

Inventor:-
Nathan W. Fletcher
by Poole & Brown
his Attorneys

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NO MODEL. 2 SHEETS—SHEET 2.

Fig 3

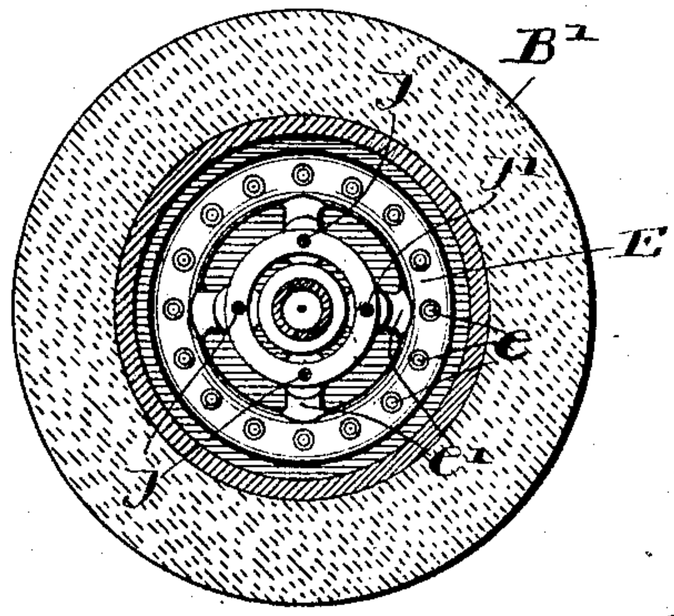


Fig 4

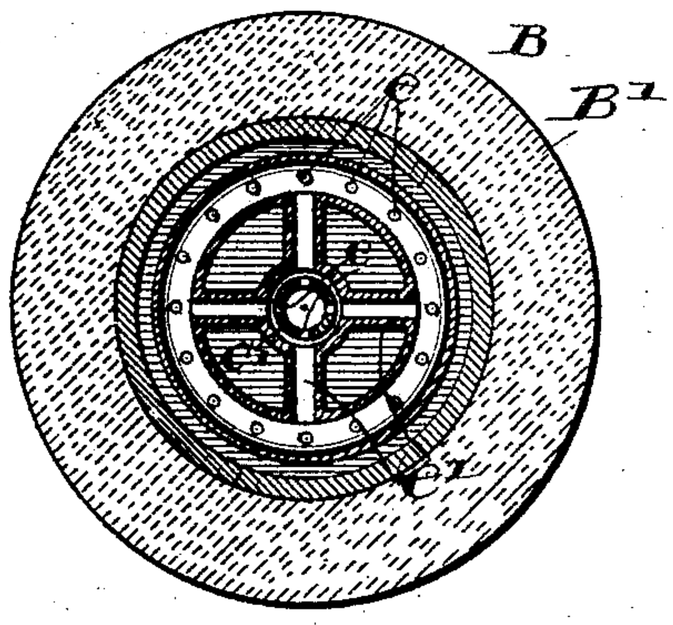


Fig. 7.

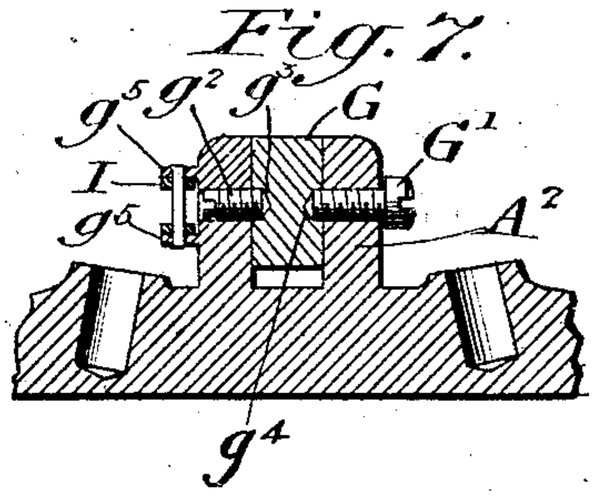


Fig. 5.

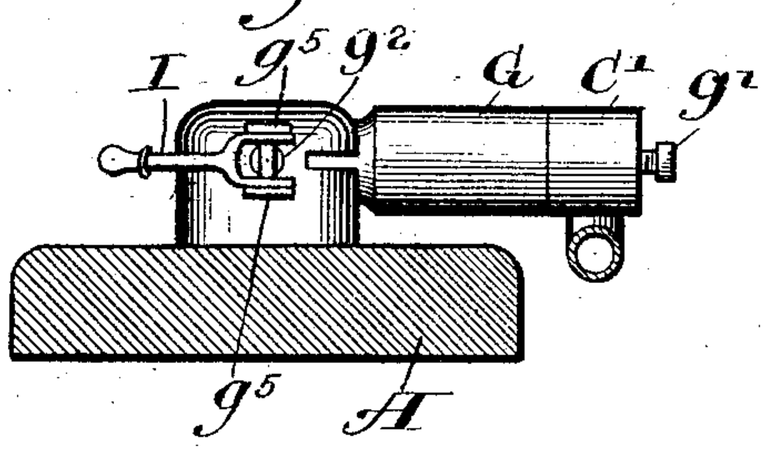
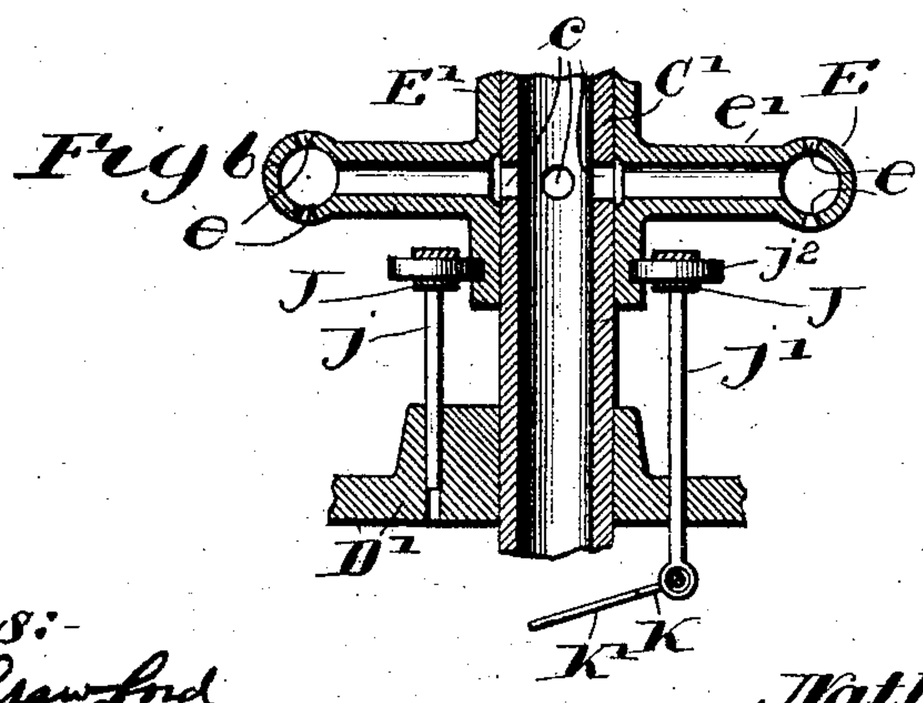


Fig 6



Witnesses:-
Carl H. Crawford
William L. Hall

by

Inventor:
Nathan W. Fletcher
Poole & Brown
his Attorneys

No. 765,421. Patented July 19, 1904.

UNITED STATES PATENT OFFICE.

NATHAN W. FLETCHER, OF BATAVIA, ILLINOIS.

GRINDING OR POLISHING TOOL.

SPECIFICATION forming part of Letters Patent No. 765,421, dated July 19, 1904.

Application filed December 15, 1902. Serial No. 135,184. (No model.)

To all whom it may concern:

Be it known that I, NATHAN W. FLETCHER, of Batavia, in the county of Kane and State of Illinois, have invented certain new and useful Improvements in Grinding or Polishing Tools; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to a novel pneumatic tool adapted for grinding, dressing, smoothing, polishing, or otherwise finishing wood or metal; and it consists in the matters herein described, and pointed out in the appended claims.

My invention is illustrated in the accompanying drawings, in which—

Figure 1 is a plan view of a tool or implement embodying the same, parts thereof being shown in section. Fig. 2 is a side elevation of the implements shown in Fig. 1. Fig. 3 is a sectional view taken upon line 3 3 of Fig. 1. Fig. 4 is a sectional view taken upon line 4 4 of Fig. 1. Fig. 5 is a detail section taken upon line 5 5 of Fig. 1. Fig. 6 is an enlarged detail section of the governing devices shown in Fig. 1. Fig. 7 is a cross-section taken on line 7 7 of Fig. 1.

As shown in said drawings, A indicates a plate or block which is adapted to carry or support the working part of the tool and which is adapted to rest or slide upon the surface of the article to be operated upon by the implement, said block being provided with a flat lower surface and having an upwardly-projecting handle A′ to be grasped by the operator in the act of moving or sliding the block over the work during the operation of the tool.

B indicates as a whole a rotative cylinder which is provided on its outer surface with means for cutting, dressing, grinding, or polishing the surface of a wooden or metal article. Said cylinder B is carried by the rotative part of a rotative motor or turbine of that class in which the impact of air-jets moving at a high velocity is utilized as a means of producing rotary motion.

C is an arm by means of which the cylinder A is connected with the block A and to the outer end of which is attached at right angles thereto a shaft C′, which constitutes a journal upon which the said cylinder B rotates. The arm C is parallel with the longer sides of the block A, and its outer end or extremity extends beyond the end of the block, and the shaft C′ and the cylinder B thereon are located parallel with and extend across the end of the block. Said cylinder B is supported from the shaft C′ by means of two parallel disks D D′, arranged at a considerable distance apart upon the said shaft and provided each with a series of annularly-arranged oblique blades *d d′*. Surrounding the shaft C′ between the disks D and D′ is an annular air-tube E, which is provided with opposite jet-orifices *e*, which are adapted to direct a series of air-jets toward and against the annularly-arranged series of blades on the disks D and D′, said blades forming oblique surfaces against which the air-jets act. The annular air-tube E is non-rotative with respect to the shaft C′ and is supported concentrically on said shaft by means of tubular radial arms *e′ e′*. Said arm C and the shaft C′ are hollow or tubular and afford an air-passage by means of which air is conducted from an air-supply pipe F, which is attached to said arm C, to the tubular arms *e′ e′* of the air-tube F. These parts are so arranged that air under pressure supplied through the pipe F passes through the arm C, the shaft C′, and arms *e′ e′* and is delivered to the tube E, from which it is forced through the jet-openings *e e* in jets which impinge upon the annularly-arranged oblique blades *d d′* and by their impact against the oblique surfaces of said blades act to turn or drive the said disks and the cylinder B, to which they are attached. Said cylinder B is shown in the drawings as provided with an outer cylindric shell or covering B′, made of emery, corundum, or other abrasive material, such as is used for grinding or polishing metal or wood surfaces. Said shell B′ is shown as

adapted to slip endwise over the tube B, which latter is provided at one end with an outwardly-extending flange *b* and at its opposite end with an external nut *b'*, said flange and nut engaging outwardly-facing annular shoulders on the ends of the shell to hold the same in place on the said cylinder.

The arm C may, so far as the general operation of the tool is concerned, be attached to the block A in any desired manner; but as a further improvement I provide an adjustable connection of said arm with the block A, permitting its free end, which carries the grinding or abrading cylinder, to be raised and lowered for the purpose of adjusting the position of the said cylinder with respect to the surface on which it acts and on which the block A rests. Various forms of adjustable connection between the arm C and the block A may be employed to produce the result stated; but the drawings illustrate certain details of construction in means for adjustably connecting the arm with the block, which constitutes a part of my invention. Now referring to these features of details the same are made as follows: Attached to and rising from the block A is a standard A^2, and mounted on said standard is an arm G, which projects horizontally from the said standard past the side face of said block. Said arm C is connected with the arm G by means of a head C^2 on the inner end of the arm, which is provided with a circular aperture adapted to receive the cylindric end of the arm G. This construction permits the arm C to swing in a vertical plane on the arm G and enables said arm C to be raised and lowered for the purpose of adjusting the cylinder vertically and also enables the arm to be swung through an arc of about one hundred and eighty degrees, and thus reversed in position to bring the cylinder to either end of the block. Provision is made for rigidly clamping the arm G from movement on the supporting-arm C, the clamping means illustrated consisting of a longitudinal cut or slit *g*, which extends inwardly from the outer end of the arm, G and a conical set-screw *g'*, which is inserted in a conical hole which extends inwardly from the outer end of the arm and which is adapted when inserted in the said hole or aperture to expand the arm, and thus tighten the same within the aperture of the head G'. From the construction described it will be manifest that by loosening the screw *g'* the free end of the arm G, with the cylinder B, may be raised or lowered to the desired extent, and the screw *g'* may be tightened to hold said arm in its adjusted position.

The purpose of adjusting the arm C in the manner described is to bring the grinding or abrading surface on the cylinder to a greater or less extent below the level of the bottom surface of the block A, so that when said block rests upon and in close contact with the surface to be dressed or finished the said grinding-surface of the cylinder will project below the bottom surface of the block A to an extent required in the particular operation which is to be performed and in accordance with the amount or thickness of material it is desired to remove in the operation—as, for instance, in case a cylinder B is employed as a grinding-cylinder for the purpose of dressing the surface of a piece of metal, if a very light cut is required the cylinder will be adjusted so that it will project only slightly below the bottom surface of the block A; but if a greater thickness of metal is to be removed the cylinder will be adjusted to bring it a still greater distance below the said block.

In connection with means for vertically adjusting the supporting-arm of the cylinder with respect to block A, I provide means for facilitating the vertical adjustment of the cylinder, as follows: At each end of block A is arranged a vertical set-screw H, which passes downwardly through the block and is adapted to project from the lower surface thereof or to be turned backwardly, so as that its lower end will come above the said bottom surface. Each set-screw is preferably provided with a pointer or index-finger *h*, which is adapted to move over a circular scale *h'*, formed or marked on the top surface of the block A, or, as herein shown, upon a disk a^2, attached to said block. The divisions on the scale *h'* may represent thousandths of an inch or other units of measure, and said scale enables the set-screw to be projected below the bottom surface of the block A a distance corresponding with the amount which it is desired to remove in dressing the surface and also enables both of the set-screws to be adjusted alike. In adjusting the cylinder by the use of the said set-screws both screws are projected the same distance below the bottom of the block, the devices which hold the arm C rigid with respect to the block are released, the block is then placed upon a flat surface, the cylinder permitted to rest on said flat surface, the arm C then rigidly secured in position, and the set-screws H then retracted, so as to permit the bottom of the block itself to rest upon the surface of the work. The cylinder B will then project below the lower surface of the block A a distance corresponding to the elevation at which the block was held by the set-screws above the surface on which it rested at the time of adjustment, and when the block is moved or slid along the surface of the work with the block in advance of the abrading-cylinder the cylinder will then remove or cut away a desired thickness of the metal.

It will be necessary in the use of the tool made as above described to reverse the position of the arm C both endwise and laterally with respect to the block A, so as to enable the said block and the abrading-cylinder to be carried close to an elevated part or shoulder

located at either side of the flat surface on which the implement is working when the tool is moved in either direction along such elevated part or shoulder, it being obvious that if such elevated part or shoulder on the work were at the same side of the block as the arm C the arm would strike against such elevated part or shoulder. To provide for the lateral reversal of the arm, I employ the construction illustrated in Figs. 1 and 5—that is to say, I connect the arm C by a pivotal connection with the standard A^2 and provide means for rigidly connecting the arm with the standard in either position of the arm. These devices, as shown in the drawings, are made as follows: The standard A^2 has formed in it a transverse recess having opposite flat sides in which the inner end of the arm G is located, said inner end of the arm having flat vertical faces. On one side of the said recess in the standard A^2 is inserted a screw-stud g^2, adapted to engage a bearing-socket g^3, in one face of the arm G. In the opposite face of said arm is a like bearing-socket g^4. A pivot-screw G′ passes through the opposite side of the standard A^2 and is adapted to engage at its inner end the socket g^4, these parts being so arranged that when the said screw G′ is tightened it will press the inner end of the arm G against the opposite side of the recess and clamp the arm firmly in place, while by loosening the screw G′ the arm may be turned to bring its free end to the opposite side of the block A. In order to permit the removal of the arm from the recess, the screw-stud g^2 may be turned backwardly until its inner end is free from the socket and the screw G′ is backed out, after which the arm may be disengaged from the standard. As a means of positively locking the said arm G in its horizontal position a horizontally-swinging latch-lever I is pivoted to the standard on lugs g^5 g^5, located at a point between the side faces of the same above and below the stud g^2. Said latch-lever is adapted to enter a groove or recess formed in the adjacent part of the standard and also a notch formed in the end of the arm G. Said latch-lever I is clearly shown in Fig. 1 and is adapted to be swung at either side of the standard A^2, so that it may be engaged with the end of the said arm G in either position of said arm. Manifestly the latch-lever I serves to hold the arm rigidly in its horizontal position, while the tightening of the pivot-screw G′ against the inner end of the arm clamps the same firmly against the standard A^2 and prevents any looseness whatsoever in the pivotal joint during the operation of the implement.

The handle A′ is removably connected with the block A and is adapted to be secured thereto at either side of the standard A^2, according to the location of the grinding or abrading cylinder at one end or the other of the block. The said handle is shown as adapted to fit in either of two sockets a' a', formed in the block at either side of the standard A^2. Said handle will be removed when the arm G is swung laterally, so as to allow the arm C to pass over the block in its sidewise movement.

As a further improvement in motor-driven tools of the kind described I have provided an improved construction in the motor whereby the quantity of air delivered to the air-pipe E, and consequently the speed of the driven part of the motor or turbine, may be controlled or governed in order to maintain a desired speed of rotation in the cylinder B according to the power required in doing the work or to check its speed when the rotative cylinder is released from the work and is turning freely. For this purpose I have provided a construction as follows: The radial supporting-arms e' of the air-tube E are attached at their inner ends to a hub or sleeve E′, which surrounds and is adapted to slide endwise upon the hollow shaft C′, the said sleeve being connected with the arm by means of a spline e^2 or other device to prevent the sleeve from turning on the arm while permitting free endwise movement of the sleeve. Such sleeve E′ is provided with an annular interior enlargement or passage e^3, which is in communication with the hollow arm e' and which fits over or around a series of radial openings c in the tube C′. As seen in the enlarged sectional view, Fig. 6, these parts are so arranged that when the sleeve E′ and the air-tube E, carried thereby, are slid or moved endwise on the arm C′ the ports or openings c will be fully opened or partially closed, according to the position of the sleeve.

J indicates a rotative ring which is connected and turns with the rotative part of the turbine, but which is movable endwise with respect to the same. Said ring J is engaged with the sleeve E′ by means of a plurality of antifriction-wheels j^2, which are mounted on the ring and engage an annular groove in the sleeve, so that the ring turns freely and at the same time gives endwise movement to said sleeve. Said ring is shown as provided with guide-rods j, arranged parallel with the axis of the cylinder and adapted to slide in guide-apertures formed in the disk D′ of the cylinder. One of said guide-rods j' extends through the disk D′ and is connected at its outer end with an actuating-lever K. Said lever is pivoted at one end to the outer face of the disk E′ and is connected between its ends with the rod j' by means of an eye on the rod, which surrounds and is adapted to slide endwise on the lever. Said lever, moreover, is provided on its outer end with a fan-blade K′, which is preferably curved concentrically with the axis of the cylinder. These parts are, moreover, placed or arranged in such relation that when the lever K, with the fan-blade K′, are parallel with the disk the sleeve E′ and tube E will be in posi-

tion to nearly or entirely close or cut off the passage of air from the shaft C′ to the tube E, and when said sleeve E′ is in position for full admission of air to the tube E the free end of said lever K and its fan-blade will be thrown outwardly away from the head D′. When the said fan-blade is thrown outwardly into an angular position, it encounters the resistance of the air in the rotation of the cylinder, and the air-pressure thus generated tends to force or press the fan-blade inwardly and to thereby shift the sleeve E′ in a direction to cut off the air-supply to the tube E; but when the fan-blade is parallel with the head no such air resistance will be developed. For throwing the lever K and its fan-blade to their outwardly-inclined positions and to hold the sleeve E in position to admit air from the ports *c* to the air-tube E a spring L is employed, which, as shown in the drawings, consists of a leaf-spring attached to the outer face of the disk D′ and arranged to press outwardly at its free end on the lever K. The spring thus arranged acts to normally hold said lever at the outward limit of its movement and to also normally hold the sleeve E′, which is connected and moves with the lever, in position to permit the passage of air from the ports *c* to the tube E. As a result of this arrangement of parts the sleeve E′ will be held by the spring normally in position for a maximum supply of air to the tube E. When the cylinder is turning at its usual speed of rotation, such as will result from resistance produced by the work being done, the lever K will remain in its outward position, and a full supply of air will be admitted to the air-tube; but should the desired speed of rotation be exceeded air-pressure acting on the fan-blade K′ will force inwardly said fan-blades and the lever K, and thus move or shift the sleeve D′, so as to reduce the air-supply to the tube E. An automatic governing device is thus provided for controlling the speed of rotation of the cylinder or rotative part of the motor.

By the employment of a fan-blade arranged to govern or control the position of the sleeve E′, as described, an important advantage is gained, for the reason that inasmuch as the action of the governor depends upon air-pressure and not upon the centrifugal action and as the fan-blade and lever are relatively light in weight the gravity of the said fan-blade and lever will not be sufficient to overcome the tension of the spring L, so that the governing device will work equally well in any position of the motor.

The disks D D′ in the mechanism illustrated constitute rotative members and the air-tube E the non-rotative member of a motor or turbine of that class in which the impact of air-jets delivered at great velocity from the non-rotative member and acting on the rotative member is utilized for producing motion, and manifestly such rotative and non-rotative members of the motor or turbine may be made according to well-known prior forms or modified variously, and the form and arrangement of the air-jet orifices and of the blades or buckets, on which are formed the annularly-arranged surfaces against which the air-jets impinge, may be variously modified without departure from my invention.

I claim as my invention—

1. A tool for the purpose set forth comprising a movable plate or block, an abrading or polishing cylinder, and a rotative impact-turbine associated with the cylinder, said cylinder and turbine being mounted on a horizontal shaft which is supported on and is adjustable vertically with respect to the said block.

2. A tool for the purpose set forth comprising a supporting plate or block, an abrading or polishing cylinder, a horizontal shaft supported on said block on which said cylinder is mounted, and a rotative impact-turbine associated with the cylinder, the stationary part of which is secured to said shaft and the rotative part of which is attached to and turns with said cylinder.

3. A tool for the purpose set forth comprising a movable supporting plate or block, an abrading or polishing cylinder, a non-rotative shaft on which said cylinder turns, a supporting-arm rigidly connecting the said shaft with the said block and a motor for driving the cylinder the rotative member of which is mounted on the shaft and supports the cylinder.

4. A pneumatic tool comprising a rotative abrading or polishing cylinder, a shaft on which the same turns, and a turbine embracing a central stationary member which is mounted on the shaft and two connected rotative members which are located at either side of the central member and which support said abrading-cylinder on said shaft, said stationary part being adapted for the delivery of air in opposite directions outwardly from both sides thereof to act on the said rotating members.

5. A pneumatic tool comprising a movable supporting plate or block, a rotative abrading or polishing cylinder, a shaft on which said cylinder turns, an arm for supporting said shaft from the block or plate, said arm being located outside of one side margin of the block and at one end of the cylinder, and being connected with the block by means permitting its reversal and the turning of the cylinder end to end to bring said arm at the opposite side of said block.

6. A pneumatic tool comprising a movable supporting plate or block, a rotative abrading or polishing cylinder, a motor for actuating the same, and an arm which supports said cylinder upon the block and which is located outside of one of the margins of the block, said arm being connected with the block by means permitting the cylinder to be turned end for

end to bring the arm placed at either side of the block and also permitting the arm to be reversed in position to bring the cylinder at either end of said block.

7. The combination with a movable, supporting plate or block, of a rotative abrading or polishing cylinder, a shaft on which the same is supported, means for driving the cylinder, an arm for connecting said shaft with the block, a second arm pivotally connected with the block and to which the first-named arm is pivoted, means for rigidly securing the said supporting-arm to the arm which is pivoted to the block, and means for rigidly securing to the block said arm which is pivoted to the latter.

8. The combination of a movable supporting plate or block, a rotative abrading or polishing cylinder, a horizontal shaft on which said cylinder is mounted, means for driving the cylinder, an arm by which the said shaft is supported from the block, said arm being connected with the block by a pivotal connection permitting the arm to swing in a vertical plane, and clamping means for rigidly securing said arm in position with respect to the block.

9. The combination of a movable supporting plate or block, a rotative abrading or polishing cylinder, a shaft on which said cylinder is mounted, which is rigidly and adjustably connected with said block, and vertically-adjustable means on the block adapted to be projected below the bottom surface of the same to sustain said block above a horizontal supporting-surface in effecting adjustment of the said supporting-shaft with respect to the block.

10. The combination of a movable supporting plate or block, a rotative abrading or polishing cylinder, a horizontal shaft on which said cylinder is mounted, means affording rigid and vertically-adjustable connection of said shaft with said block, and set-screws inserted through the block and adapted to project at their lower ends below the same.

11. The combination of a movable supporting plate or block, a rotative abrading or polishing cylinder, a shaft on which said cylinder is mounted, means affording rigid and vertically-adjustable connection of said shaft with said block, and set-screws inserted through the block and adapted to project at their lower ends below the same, said set-screws being provided with index arms or fingers, and the block with circular scales.

12. A rotative abrading or polishing tool comprising a movable supporting plate or block, a rotative abrading or polishing cylinder mounted on said block and a motor for actuating the cylinder the rotative part of which supports the said cylinder said cylinder comprising a cylindric metal body portion which is rigidly attached to the rotative part of the motor, and an outer shell which fits over and is secured to the metal body portion and is provided with an external abrading or polishing surface.

In testimony that I claim the foregoing as my invention I affix my signature, in presence of two witnesses, this 11th day of December, A. D. 1902.

NATHAN W. FLETCHER.

Witnesses:

C. CLARENCE POOLE,

WILLIAM L. HALL.