No. 696,387. Patented Mar. 25, 1902.

J. W. BIRKENSTOCK.

PNEUMATIC MOTOR.

(Application filed May 7, 1901.)

(No Model.) 2 Sheets—Sheet 1.

Fig: 1.

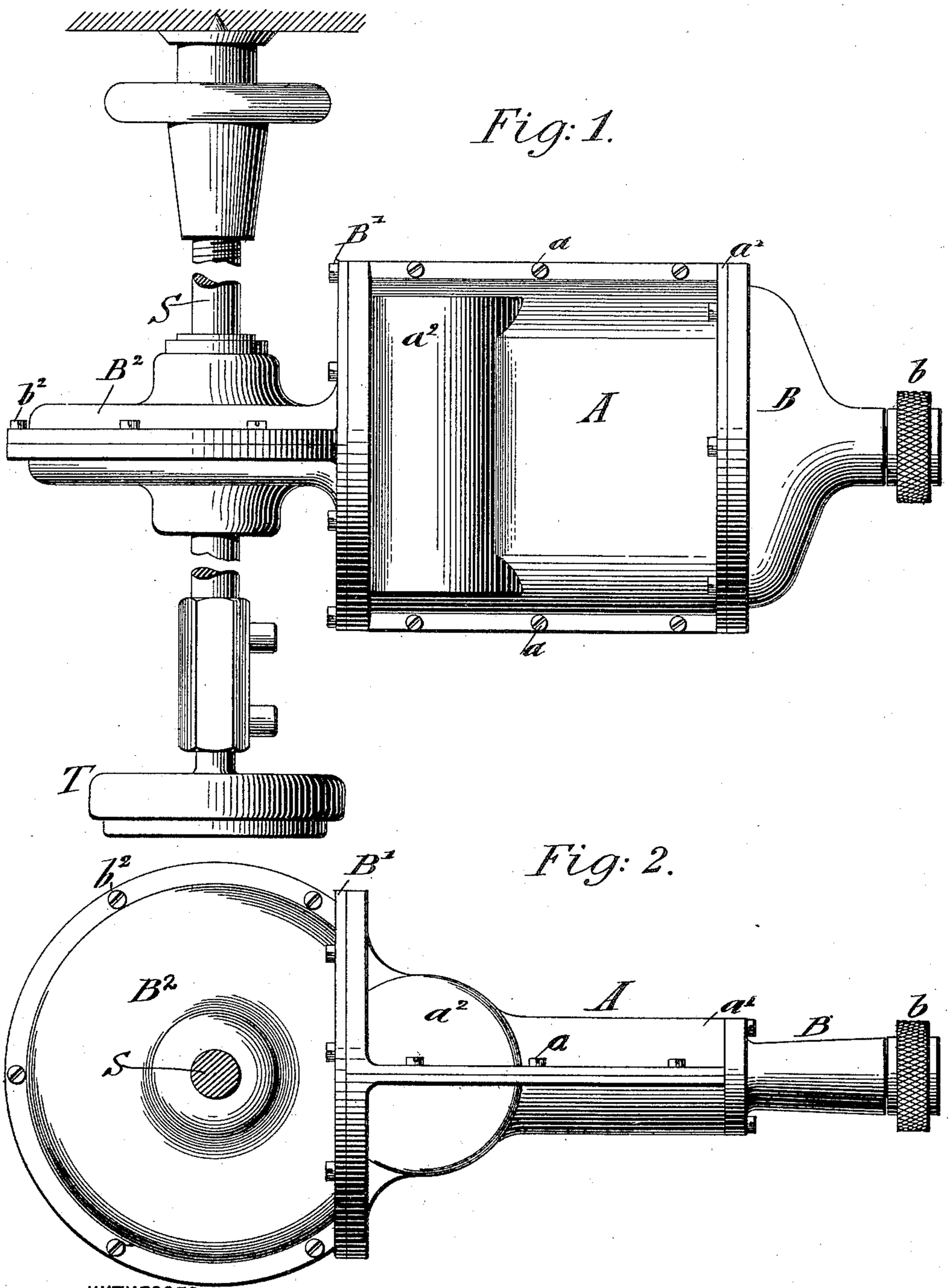

Fig: 2.

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Fig: 3.

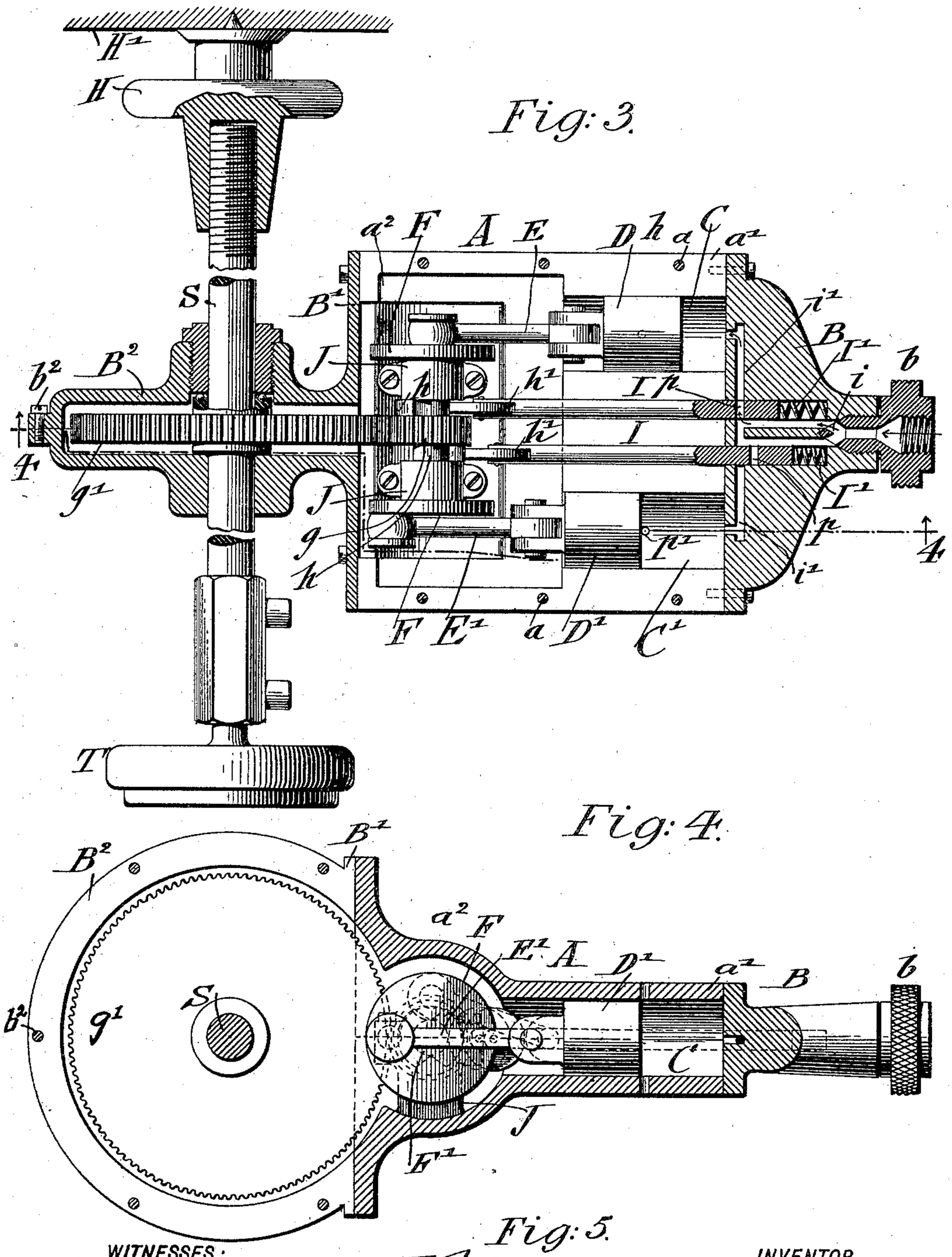
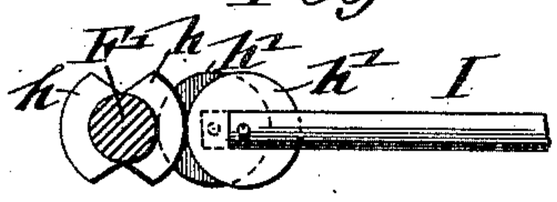


Fig: 4.

Fig: 5.



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UNITED STATES PATENT OFFICE.

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PNEUMATIC MOTOR.

SPECIFICATION forming part of Letters Patent No. 696,387, dated March 25, 1902.

Application filed May 7, 1901. Serial No. 59,141. (No model.)

To all whom it may concern:

Be it known that I, JOHN W. BIRKENSTOCK, a citizen of the United States, residing in New York, borough of Manhattan, in the State of New York, have invented certain new and useful Improvements in Pneumatic Motors, of which the following is a specification.

This invention relates to an improved pneumatic motor which is intended to be used for the direct operation of polishing-tools, &c., used for working marble and the like; and the invention consists in the combination of a casing provided with an enlargement at one end, a head at the other end of the same provided with channels for supplying compressed air, a head at the enlarged end of the casing, cylinders in said casing, and provided with inlet and outlet ports, pistons in said cylinders, a crank-shaft supported in the enlarged end of the casing, piston-rods connecting the pistons with the cranks of said crank-shaft, cams on said crank-shaft, slide-valves actuated by said cams and guided in the channeled head of the casing, said slide-valves being provided with ports communicating with the supply-channels for compressed air, and means for transmitting the rotary motion of the crank-shaft to the tool to be operated.

In the accompanying drawings, Figure 1 represents a side elevation of my improved pneumatic motor, shown as connected with a polishing-tool. Fig. 2 is a plan view of Fig. 1. Fig. 3 is a vertical longitudinal section through the motor and the driving mechanism. Fig. 4 is a horizontal section on line 4 4, Fig. 3, taken in the direction of the arrows; and Fig. 5 is a detail of the cam motion for the slide-valves of the motor-cylinders.

Similar letters of reference indicate corresponding parts.

Referring to the drawings, A represents the casing of my improved pneumatic motor. The casing is made of two longitudinal sections, which are secured together by suitable bolts a. The casing is of oblong cross-section rounded off at the sides and cylindrical at its end a^2, so as to provide the necessary space at the interior of the casing for the crank-shaft. The casing A is closed at its end a' by a tapering head B, the end of which is connected with a coupling b for the supply-pipe for the compressed air. In the head B are arranged air-conducting channels and the valves by which the compressed air is supplied to the motor-cylinders arranged at the interior of the casing. The casing A is closed at the end a^2 by a disk-shaped head B′, which is made with a disk-shaped box B^2, that is arranged at right angles to the head B′, said box and head being made each of two longitudinally-divided integral sections that are connected by suitable fastening screw-bolts b^2, as shown in Figs. 1 and 3.

The interior of the casing A is provided with two carefully-bored cylinders C C′, in which are reciprocated the pistons D D′, which are connected by piston-rods E E′ with crank-disks F on the crank-shaft F′, said shaft being supported in suitable journal-bearings J, arranged at the interior of the enlarged or cylindrical end a^2 of the casing A, as shown in Fig. 3. The piston-rods are connected by wrist-pins with the crank-disks F, said wrist-pins being arranged at an angle of ninety degrees relatively to each other on the crank-disks, so as to bring the pistons over the dead-points. At the center of the crank-shaft F′ is arranged a pinion g, which meshes with a gear-wheel g' of larger size located in the box B^2, said gear-wheel being applied to a vertical shaft S, to the lower end of which the boring, polishing, or other tool T is applied in any approved manner. The hub of the motion-transmitting gear-wheel g' is preferably supported by suitable antifriction-balls in the box B^2, so as to reduce the friction of the hub with the box. The upper end of the shaft S is screw-threaded and connected with an interiorly-threaded socket of the hand-wheel H, by which the polishing-tool may be adjusted during the progress of the polishing operation. The adjusting hand-wheel H may be steadied in any suitable manner against any suitable support H′, so as to impart the desired degree of steadiness to the polishing-tool.

At each side of the motion-transmitting pinion g is arranged a sector-shaped cam h, said cams being arranged on the shaft diametrically to each other, one at each side of the pinion g, and each cam acting on an antifriction-wheel h', that is applied to the forked

end of the slide-rod I. The slide-rods I extend through the space between the cylinders and into the head B, the ends being guided in suitable sockets in said head and cushioned by means of helical springs I′, as shown in Fig. 3. The outer ends of the slide-rods I in the head B are provided with transverse ports *p*, said ends serving as slide-valves for supplying the compressed air to the cylinders C C′. For this purpose the coupling *b* is connected by a central channel *i* and lateral channel *i′* with the ends of the cylinders C C′. When the port in one of the slide-valves is placed in line with the channel *i′*, the supply of compressed air is supplied to one cylinder, so as to move the piston toward the opposite end of the same until it passes the outlet-port *p′* in the cylinder, through which the compressed air is exhausted. By the forward motion of one piston a turning action is imparted to the crank-shaft, and thereby the opposite piston returned toward the supply-port for the compressed air. As soon as the piston arrives near the inlet end of the second cylinder the port of the slide-valve of the said cylinder is placed in line with the inlet-channel, and compressed air is supplied to the second cylinder, so as to impart motion to the piston of the same. This is transmitted to the crank-shaft, so that the alternate forward and backward motions of the pistons impart rotary motion to the crank-shaft. The second cylinder is likewise provided with a similar exhaust-port *p*, through which the compressed air exhausts, so that the piston can be again returned for the next stroke, and so on. The reciprocating motion imparted to the pistons produces the continuous rotary motion of the polishing-tool operated by the crank-shaft.

The casing of the motor may be supported in any suitable manner and may be handled in any suitable manner, so as to direct the motion of the polishing-tool. The motor imparts continuous rotary motion to the polishing tool until the motion is interrupted, which is accomplished by interrupting the supply of compressed air.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. The combination of a casing provided with an enlargement at one end, a head at the other end of the same provided with channels for supplying compressed air, a head at the enlarged end of the casing, cylinders in said casing, and provided with inlet and outlet ports, pistons in said cylinders, a crank-shaft supported in the enlarged end of the casing, piston-rods connecting the pistons with the cranks of said crank-shaft, cams on said crank-shaft, slide-valves actuated by said cams and guided in the channeled head of the casing, said slide-valves being provided with ports communicating with the supply-channels for compressed air, and means for transmitting the rotary motion of the crank-shaft to the tool to be operated, substantially as set forth.

2. The combination of a casing of oblong cross-section and provided with an enlargement at one end, a head at the other end of the same provided with channels for supplying compressed air, a head at the opposite enlarged end of the casing provided with a suitable box, cylinders in said casing, pistons in said cylinders, inlet and outlet ports in said cylinders, for the compressed air, a crank-shaft supported in the enlarged end of the casing, piston-rods connecting the pistons with the cranks of said crank-shaft, cams on said crank-shaft, slide-valves guided in the channeled head of the casing, said slide-valves being provided with ports communicating with the supply-channels for compressed air, a motion-transmitting pinion on the crank-shaft, and a gear-wheel in said box, placed on the shaft of the polishing-tool, substantially as set forth.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

JOHN W. BIRKENSTOCK.

Witnesses:
PAUL GOEPEL,
GEO. L. WHEELOCK.