No. 712,833. Patented Nov. 4, 1902.

E. Y. MOORE.

ENGINE BRAKE.

(Application filed Oct. 14, 1901.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1,

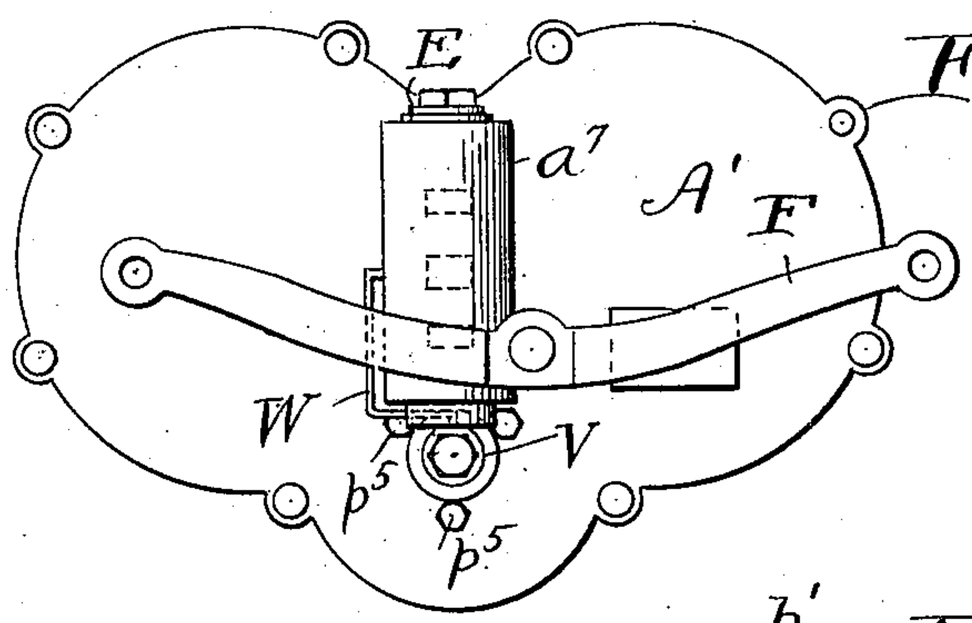


Fig. 2,

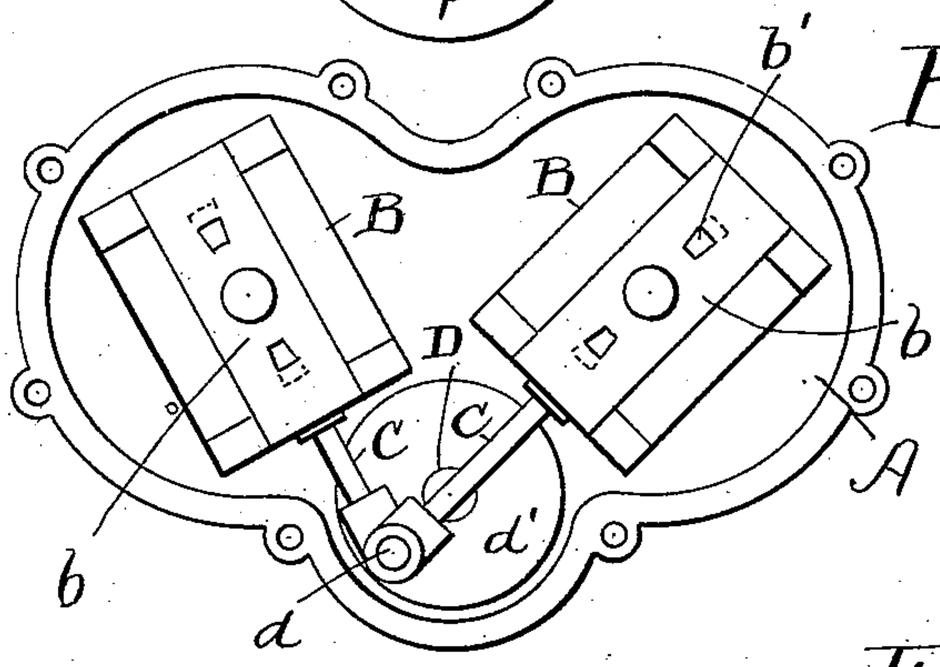


Fig. 3,

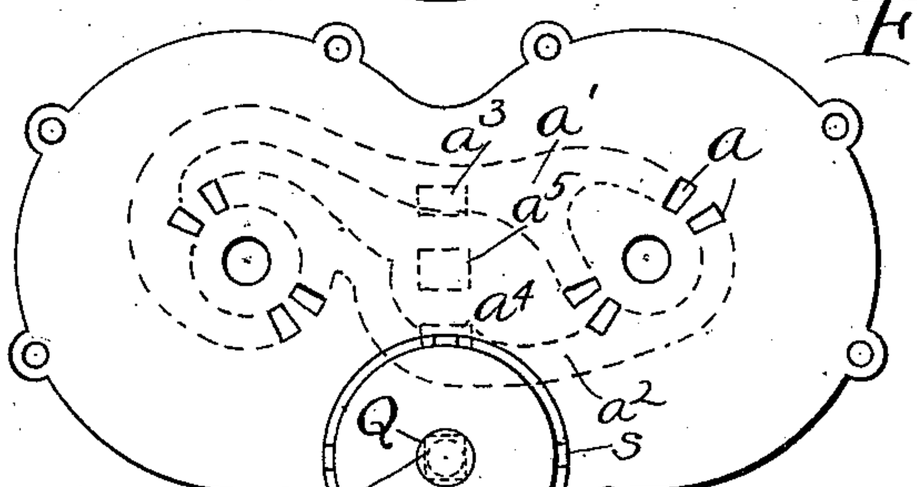
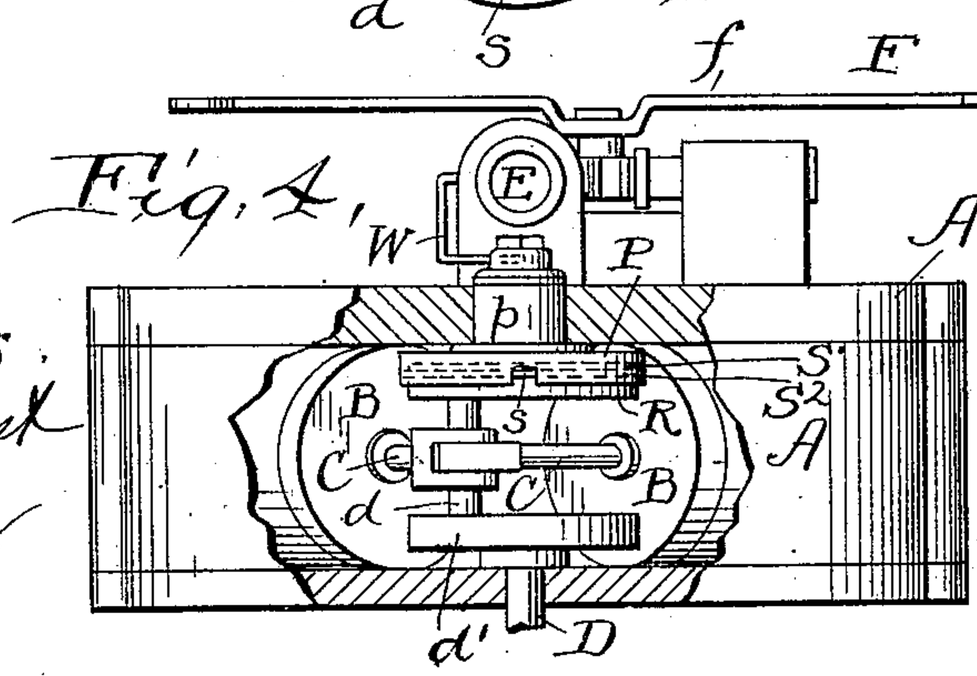


Fig. 4,



Witnesses.
E. B. Gilchrist
H. M. Wise.

Inventor.
Edward Y. Moore,
By his Attorneys,
Thurston & Bates

No. 712,833. Patented Nov. 4, 1902.

E. Y. MOORE.

ENGINE BRAKE.

(Application filed Oct. 14, 1901.)

(No Model.) 2 Sheets—Sheet 2.

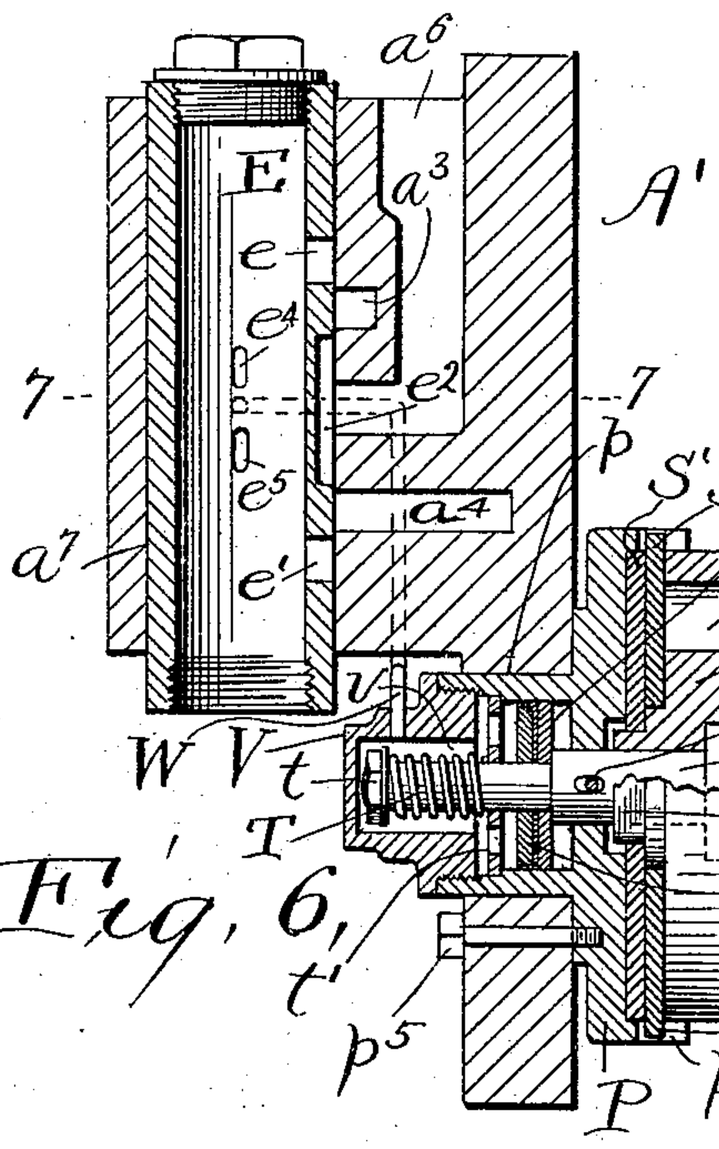


Fig. 6.

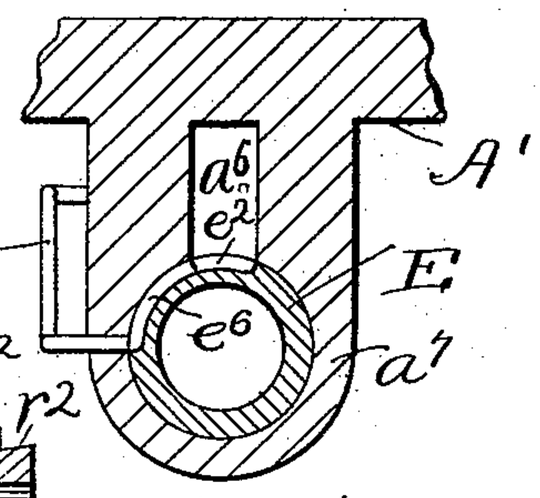
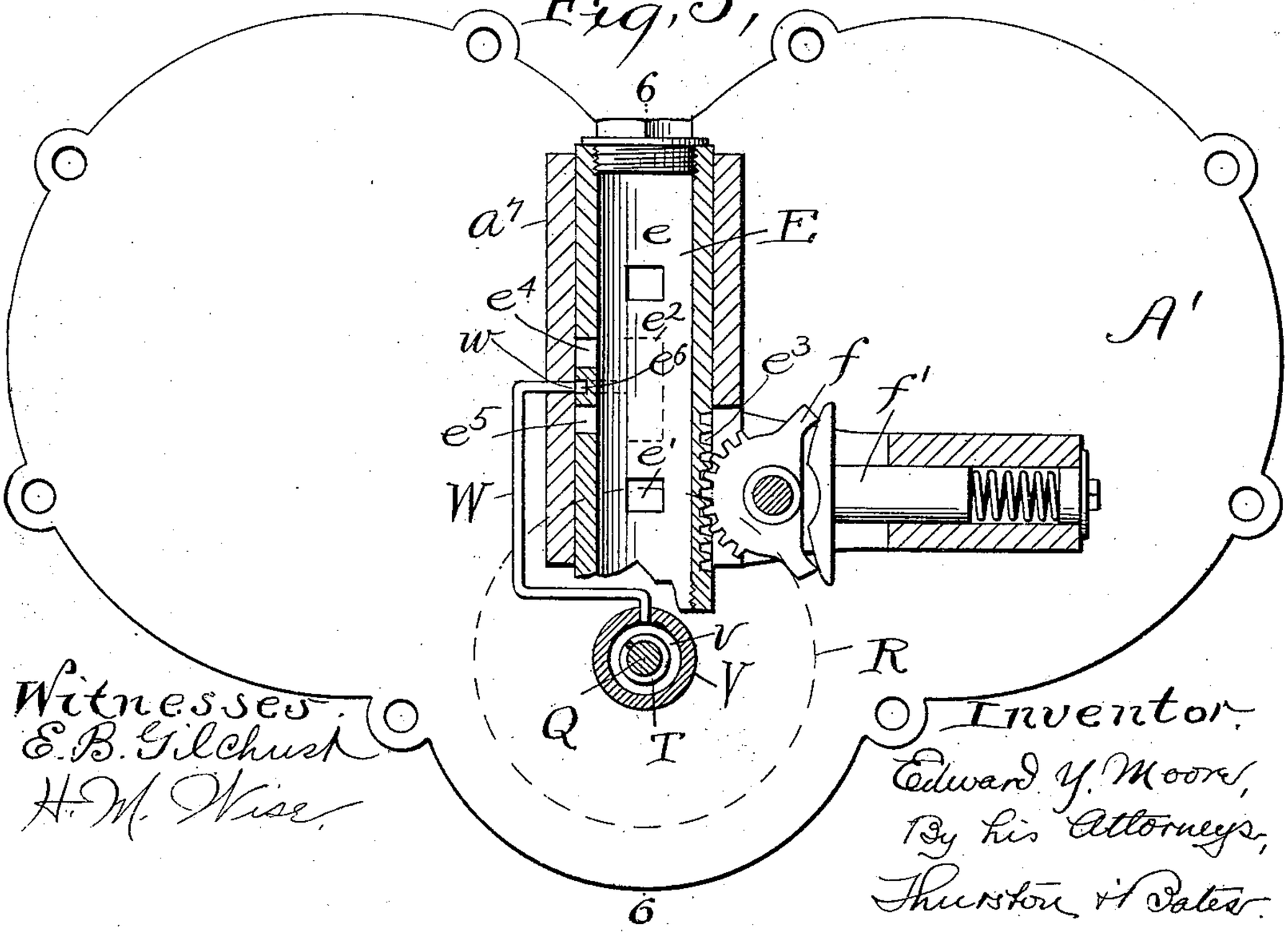


Fig. 7.

Fig. 8.

Fig. 5.



Witnesses.
E. B. Gilchrist
H. M. Wise.

Inventor.
Edward Y. Moore,
By his Attorneys,
Thurston & Bates.

UNITED STATES PATENT OFFICE.

EDWARD Y. MOORE, OF CLEVELAND, OHIO, ASSIGNOR, BY MESNE ASSIGNMENTS, TO CHICAGO PNEUMATIC TOOL COMPANY, A CORPORATION OF NEW JERSEY.

ENGINE-BRAKE.

SPECIFICATION forming part of Letters Patent No. 712,833, dated November 4, 1902.

Application filed October 14, 1901. Serial No. 78,542. (No model.)

To all whom it may concern:

Be it known that I, EDWARD Y. MOORE, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Engine-Brakes, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

In the operation of hoisting engines or motors driven by compressed air it is very convenient for the operator to maintain the load in its elevated position by shifting the reversing-valve to off position, thus entrapping the air within the motor-cylinder, which prevents the piston moving and sustains the load; but in practice it is found very difficult to prevent the air so entrapped from gradually leaking past the piston and permitting the load to sink.

The object of this invention is to provide simple automatic means to assist the air in such motors in holding the load and prevent such sinking. This I accomplish by providing a brake governed by the air from the supply and acting automatically when the reversing-valve is at the off position to prevent the rotation of the crank-shaft, even though there should be leakage within the cylinder.

The invention resides in the construction and combination of parts to this end, as more fully hereinafter described. Such embodiment I have found to be very efficient in service and possessed of the further advantage that no additional room is required for it, the brake occupying space which would otherwise be wasted.

In the drawings, Figure 1 is a front elevation of a pneumatic motor suitable for hoisting and embodying my invention. Fig. 2 represents the same with its cover-plate removed. Fig. 3 is an elevation of the inner side of the cover-plate. Fig. 4 is a bottom plan of the motor, the casing being partly broken away to disclose the interior. Fig. 5 is an enlarged front elevation of the motor sectioned through the longitudinal center of the reversing-valve on a plane parallel with the cover-plate. Fig. 6 is a transverse vertical section through the reversing-valve and the pneumatic brake, being on the line 6 6 of Fig. 5. Fig. 7 is a horizontal section on the line 7 7 of Fig. 6. Fig. 8 is a detail in vertical section showing a modified form of brake members.

As shown in the drawings, A represents a suitable box-like casing having a cover-plate A′. Within this casing are mounted a pair of oscillating cylinders B, whose piston-rods C engage a common crank-pin d upon the disk-crank d' on the crank-shaft D. These cylinders are shown as provided with finished flat faces b, containing ports b', which coöperate with corresponding ports a in the cover-plate A′, which latter ports are connected in groups by the passage-way a' a^2, as shown in dotted lines in Fig. 3, with the ports a^3 and a^4 in a tubular valve-seat a^7. Between these ports a^3 and a^4 is another port a^5, communicating through the exhaust-passage a^6 to the outer air.

The valve shown consists of a hollow tubular body E, sliding within the tubular seat a^7. This body is closed above by a suitable plug and receives the air from below, as by a flexible hose screwed into it. It is provided with a pair of ports e e', cut through its wall, which may communicate, respectively, with the ports a^3 and a^4. On the outer surface of the body E is a recess e^2, which when either of the ports e or e' is open to its corresponding port in the valve-seat connects the other port in the valve-seat with the exhaust-port a^5. The valve is shown as provided on one side with rack-teeth e^3, with which engage a segmental gear f, adapted to be oscillated by a lever F to shift the valve in either direction, as desired. A spring-pressed plunger f', having a head engaging toes on the segment f, gives the latter, and hence the valve, a tendency to return to its intermediate or off position.

The motor, as above described, is independent of the present invention, but is thus fully set out to illustrate the operation of my brake and also because the brake is particularly advantageously applied to such style of motor.

I will now describe the brake itself and its operation.

On the inner side of the cover-plate A′ is a housing P, which is placed concentrically

with the axis of the crank-shaft and has a hub portion p projecting through the cover-plate and is rigidly held to the cover by bolts p^5 or otherwise. Along the axis of this housing is an axle Q, which has a limited longitudinal movement, but is prevented from rotating by a pin p', secured to the housing and projecting through a slot in the axle. On this axle is rotatably journaled the disk R. This disk has an opening r for the reception of the crank-pin d. The disk is thus an additional crank-disk for the motor and rotates with the crank-disk and shaft D. This disk R, however, is capable of a slight longitudinal movement. This movement may bring into engagement coöperating rubbing-surfaces carried by the housing and disk, respectively, and thus causing frictional braking.

The friction-surfaces carried by the housing and disk R may be conical surfaces, as shown at p^2 and r^2 in Fig. 8; but they are preferably flat surfaces, as shown in Fig. 6. Here a disk S' rotates with the disk R by engaging the squared hub r' thereof, and a disk S^2 is prevented from rotating by having ears s extending into notches p^3 in the wall of the housing. In this case both flat surfaces of the two disks S' S^2 and the outer surface of the housing and the inner surface of the disk R supply the friction. The two disks S' S^2 are illustrative of any number which may be employed, as most convenient, the disks being rotating and non-rotative alternately.

In order to give the disk R a tendency to approach the housing and establish braking-friction, I extend outward the axle Q and surround it by a helical spring T, compressed between a nut t, screwing onto the axle, and an open bridge-plate t', extending crosswise within the hub p of the housing and bearing against a shoulder therein. The operation of the spring, whose force is adjusted by the nut t, is to cause as much frictional resistance to the movement of the disk R as will prevent its rotation, due to the leakage of air in the driving-cylinders when the load is elevated. It is necessary, therefore, to provide means for automatically overcoming the action of the spring when the motor is operated. This is accomplished by the following mechanism: Within the hub p of the housing is a cylindrical axial chamber p^4, and in engagement with the walls of this chamber is a piston U, secured to the axle Q. Screwing into the outer end of the hub is a cap V, which has a central cavity v loosely inclosing the end of the axle and the spring and communicating with the cylinder p^4. A small pipe W leads from this cavity v to a port w in the side of the tubular valve-seat a^7. The valve E has a pair of openings e^4 and e^5 through it, either of which is adapted to communicate with the port w when the valve is in an operative position, while on the exterior of the valve is a recess e^6, connecting with the exhaust-recess e^2 and at the off position communicating with the port w.

From the above construction it results that as soon as the valve E is shifted in either direction to an operative position the compressed air within the valve, entering the pipe W through either port e^4 or e^5, as the case may be, acts on the piston U and forces the axle Q inward, relieving the frictional engagement of the disk R and allowing it to freely rotate with the crank-shaft, which is rotated by the engines, being thus simultaneously turned on. When, however, the reversing-valve is brought from either operative position to its off position, the cylinder p^4 and cavity are thus put in communication with the outer air through the recesses e^6 and e^2 and the exhaust-passage a^6, and the spring T thereupon draws the axle outward, causing the binding engagement of the disk R.

It will be noticed that all the parts of the friction-brake are self-contained within the housing P, so that the brake may be very conveniently assembled separately and tested or removed from the cover-plate for cleaning or repairing.

I claim—

1. An engine having a crank-pin, crank and crank-shaft combined with an extra disk journaled axially with the crank-shaft and loosely engaging the crank-pin, and means for moving said disk parallel with the axis of the crank-shaft to cause braking, substantially as described.

2. The combination with a pneumatic motor, of a brake and a pneumatic mechanism for operating it, said brake including a non-rotatable member and a coöperating rotatable disk loosely engaging a crank-pin of the motor and located axially with the crank-shaft and movable longitudinally thereof to apply or relieve the brake, substantially as described.

3. An engine having a cylinder, piston, crank-pin, crank and crank-shaft, combined with a disk journaled axially with the crank-shaft and loosely engaging the crank-pin, and pneumatically-governed mechanism for moving said disk parallel with the axis of the crank-shaft to cause braking engagement, and a valve for simultaneously controlling both the engine and said mechanism, substantially as described.

4. The combination of a motor-casing, a motor within the same, a reversing-valve for operating the motor, said motor including a crank-shaft, crank and crank-pin, a rotatable disk within the casing journaled axially with said crank-shaft, said disk having an opening for the free reception of the end of said crank-pin, and pneumatic means for moving said disk laterally to govern a frictional engagement thereof, substantially as described.

5. The combination of an incased motor and a pneumatically-governed brake within the casing carried by a housing removably carried by the casing, substantially as described.

6. A casing consisting of a box and cover therefor, an engine within the casing, a hous-

ing carried by the cover, and a pneumatically-governed brake carried by the housing and having one of its members connected with the crank of the motor, substantially as described.

7. A casing consisting of a box and cover therefor, a pair of pneumatic engines within the casing having their pistons taking onto a single crank-pin, a crank within the casing, and a crank-shaft extending from said crank, combined with a housing removably carried by the cover axially with the crank-shaft, a disk carried by said housing axial with the crank-shaft and rotatably journaled, said disk loosely engaging the crank-pin, and mechanism for moving said disk toward or from the housing to cause a braking engagement between it and the housing, substantially as described.

8. The combination, with an engine having a crank, crank-pin and crank-shaft, of a housing having a friction-surface and a cylindrical cavity, a rotatable disk loosely engaging the crank-pin, an axle supporting said disk, and a piston on said axle within said cavity, substantially as described.

9. The combination of a housing having a friction-surface on the inner side thereof and a cylindrical cavity in the outer side, a rotatable disk on said inner side having an opening in it for the reception of a crank-pin, an axle supporting said disk, and a piston on said axle within said cavity, substantially as described.

10. The combination of a housing having a friction-surface on the inner side thereof and a cylindrical cavity in the outer side, a rotatable disk on said inner side, an axle supporting said disk, a piston on said axle within said cavity, a spring surrounding said axle within said housing, a cap secured to the housing and covering the end of said axle and having a cavity communicating with said cylindrical cavity in the housing, a pipe leading to the cavity in said cap, and a valve for governing said pipe, substantially as described.

11. The combination of a motor-casing, a cylinder, piston, crank and crank-pin within said casing, a crank-shaft extending through the casing, a cover for the casing having passages leading to said cylinder, a valve for controlling said passages, a housing secured to the cover in the axial line of said crank-shaft, an axle carried by said housing, a disk carried by said axle and loosely engaging said crank-pin, said housing and disk carrying coöperating frictional surfaces, said housing having a hub with a cylindrical cavity in it, and said axle extending into said cavity, a piston on said axle, a spring surrounding the axle and tending to cause engagement of such frictional surfaces, a pipe leading from the valve-seat to the outer side of said piston, said valve having also openings for governing said pipe, substantially as described.

12. An incased engine having a crank-shaft, crank and crank-pin, a housing carried by the casing, a disk carried by said housing axial with the crank-shaft and rotatably journaled, said disk loosely engaging the crank-pin, and a plurality of plates between said disk and housing said plates being alternately rotative with the disk and non-rotative, a spring tending to move said disk toward said housing and frictionally bind said plates, and means for overcoming the action of the spring, substantially as described.

13. A housing having a hub with a cylindrical cavity, an axle slidable centrally through said housing, a piston on said axle occupying said cylindrical cavity, a disk supported by said axle, there being frictional braking-surfaces carried by the disk and housing, and a cap closing the cavity in the hub, there being a passage-way leading to the interior of said cavity, substantially as described.

14. The combination with a motor-casing and cover-plate, of a driving mechanism within the casing, a valve for governing the same on the outer side of the cover-plate, there being passage-ways through the cover-plate leading from the seat for said valve, a brake carried by a housing, said housing being secured on the inner side of said plate axial with the crank-shaft of the motor and projecting through said plate, and a pipe on the front side of the plate communicating with the housing and with the valve-seat, substantially as described.

15. A motor-cylinder, a valve-seat having ports communicating with said motor-cylinder and an exhaust-port, said valve-seat being tubular, a tubular valve within the valve-seat having at its inner face openings through its wall adapted to communicate with said ports, and a recess in its wall adapted to connect either of said ports with said exhaust-port, said valve having another pair of openings through it at another portion of its periphery and intermediately of these another recess in its outer side communicating with an exhaust-port, the valve-seat having a port adapted to communicate with either of said last-mentioned openings or said exhaust-recess, combined with a brake, pneumatic mechanism for governing it, and pipe establishing communication between said pneumatic mechanism and said last-mentioned port in the valve-seat, substantially as described.

16. The combination of motor-cylinder, a valve-seat having ports communicating with said cylinder, and an exhaust-port, a brake, pneumatic mechanism for governing the same, there being a passage-way connecting said pneumatic mechanism with another port in said valve-seat, and a valve adapted to uncover to the operating fluid either of the passages to the cylinder and the passage to the pneumatic mechanism, said valve having exhaust-recesses in its outer surface adapted to couple either of said cylinder-passages or said passage to the pneumatic mechanism with

the same exhaust-passage leading from the valve-seat, substantially as described.

17. The combination of a motor-cylinder, a valve-seat having ports communicating with said cylinder, and an exhaust-port, a brake, a spring tending to set the same, pneumatic mechanism for releasing the same, there being a passage-way connecting said pneumatic mechanism with another port in said valve-seat, and a valve adapted to uncover to the operating fluid either of the passages to the cylinder and the passage to the pneumatic mechanism, said valve having a main exhaust-recess in its outer surface adapted to couple either of said cylinder-passages with an exhaust-passage leading from the valve-seat, said valve having also a smaller recess leading to said main exhaust-recess and adapted to communicate with said passage to the pneumatic mechanism when the valve is at the off position, substantially as described.

In testimony whereof I hereunto affix my signature in the presence of two witnesses.

EDWARD Y. MOORE.

Witnesses:
ALBERT H. BATES,
E. B. GILCHRIST.