No. 881,935. PATENTED MAR. 17, 1908.

C. W. MANZEL.

MOTOR.

APPLICATION FILED AUG. 28, 1905.

5 SHEETS—SHEET 1.

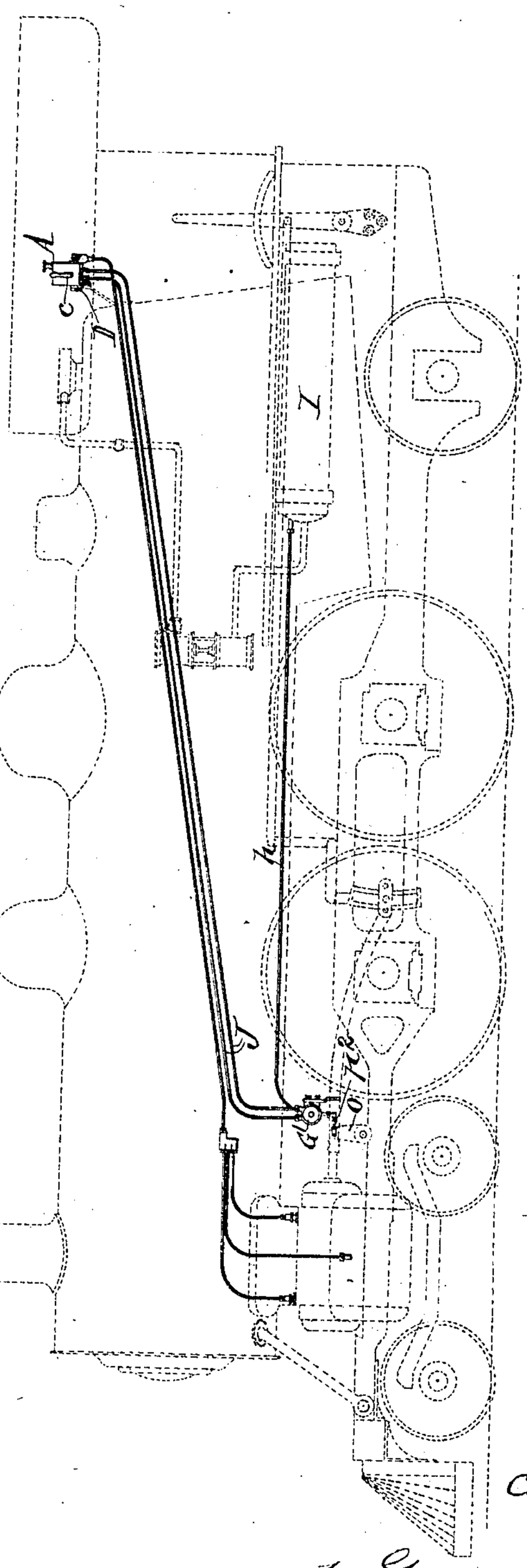


Fig. 1.

Witnesses:
Louis W. Gratz
Emma M. Graham

Chas. W. Manzel,
Inventor
by Cooper & Popp
Attorneys

No. 881,935. PATENTED MAR. 17, 1908.

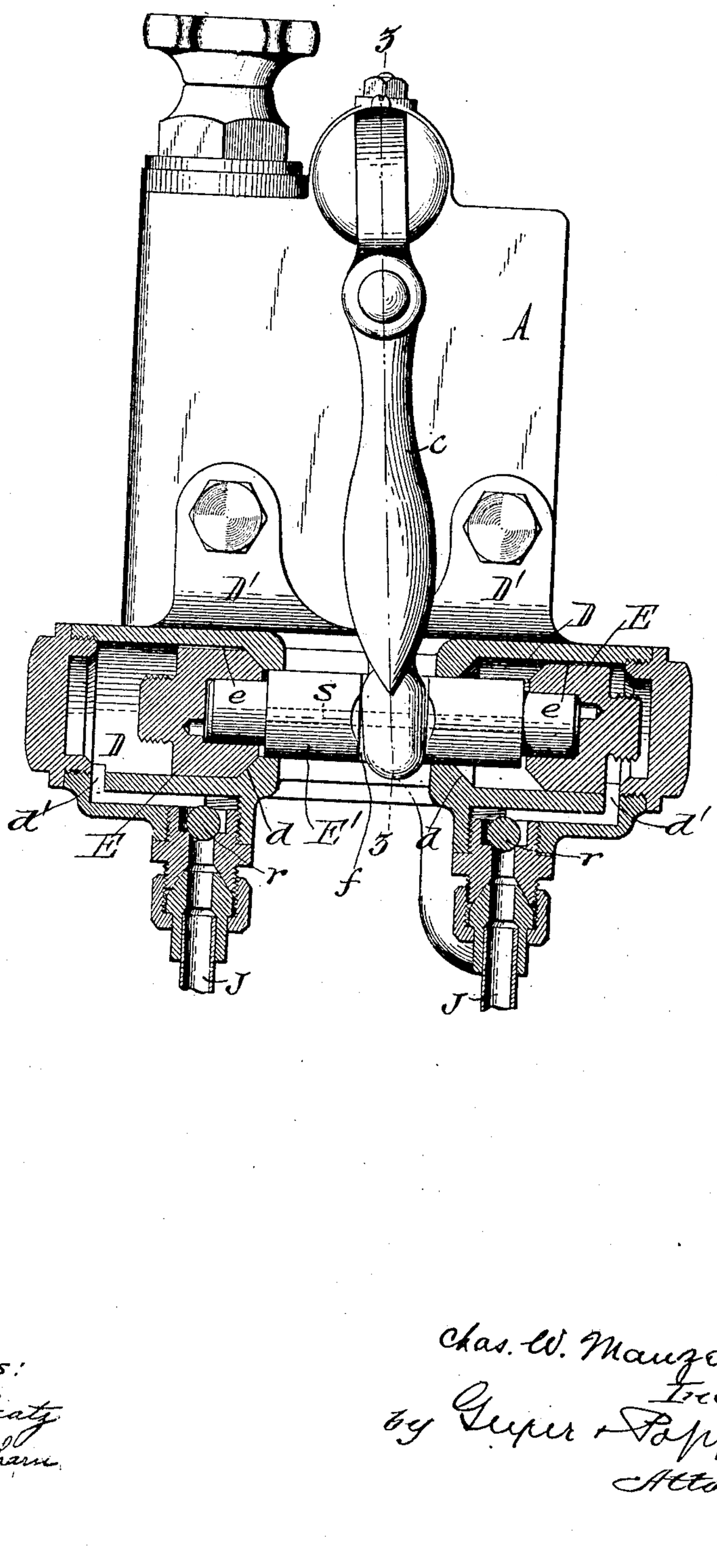
C. W. MANZEL.

MOTOR.

APPLICATION FILED AUG. 28, 1905.

5 SHEETS—SHEET 2.

Fig. 2.



Witnesses:
Louis W. Gratz
Emma M. Graham

Chas. W. Manzel
Inventor
by Geper & Popp
Attorneys

No. 881,935. PATENTED MAR. 17, 1908.

C. W. MANZEL.

MOTOR.

APPLICATION FILED AUG. 28, 1905.

6 SHEETS—SHEET 3.

Fig. 3.

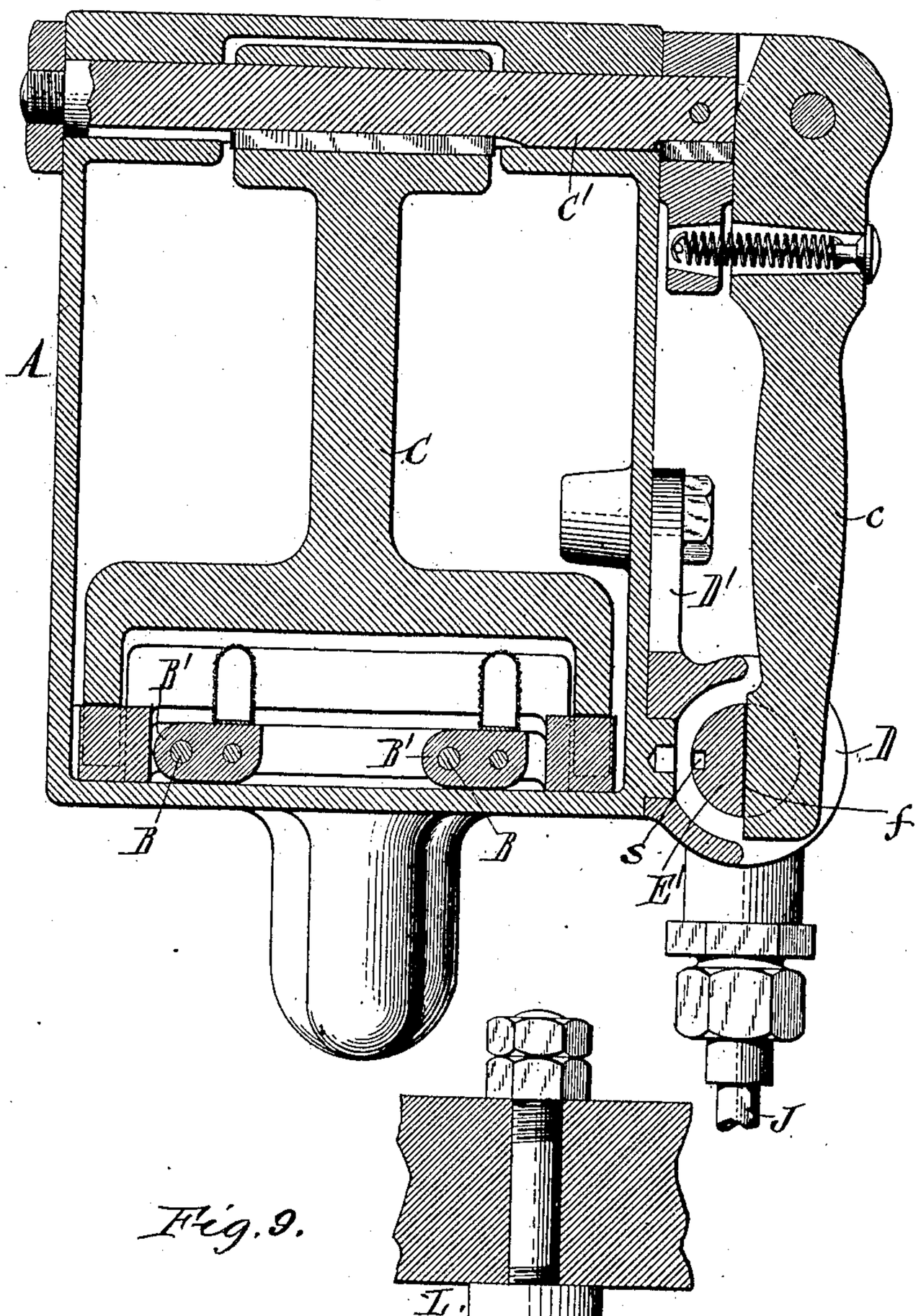
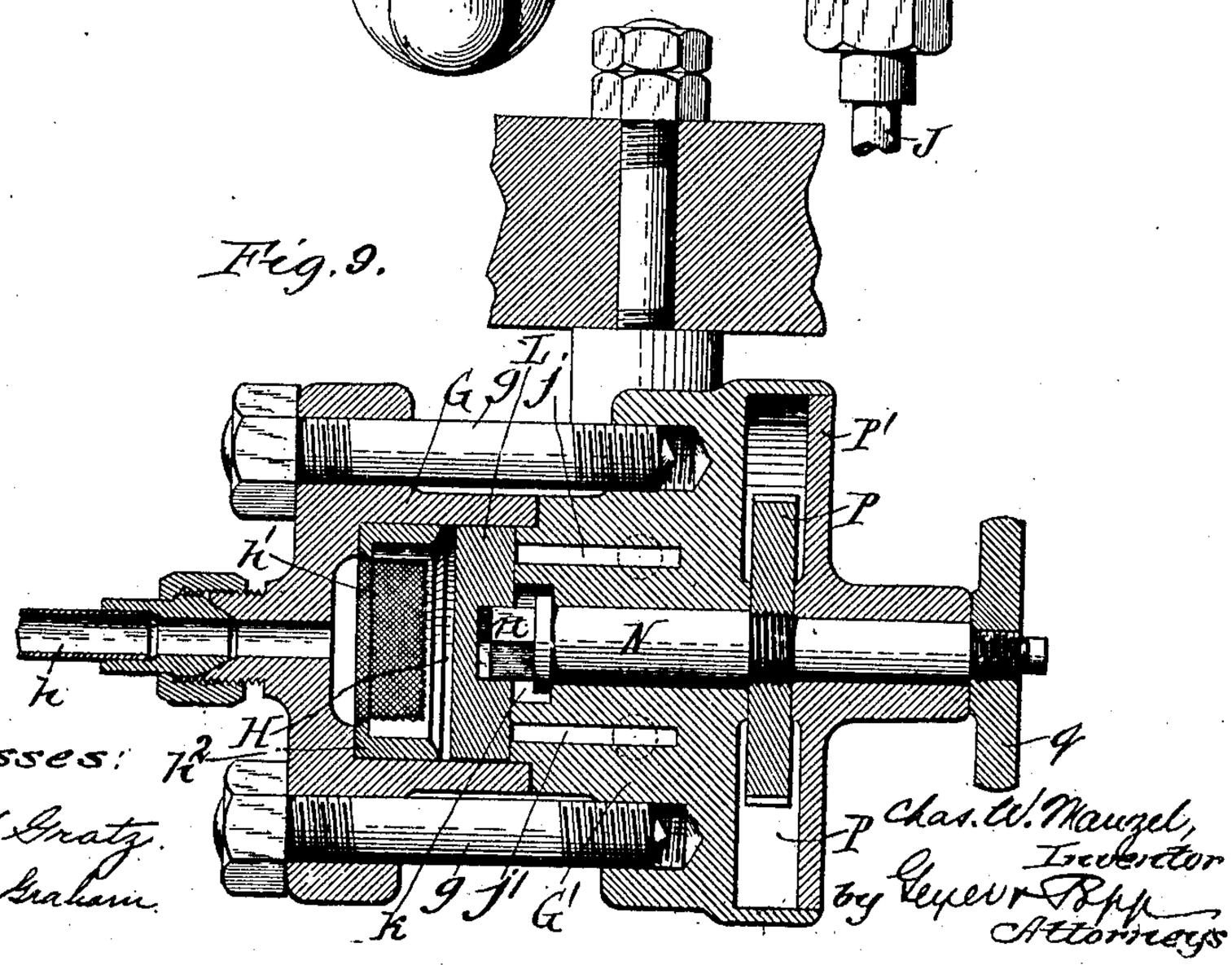


Fig. 2.



Witnesses:
Louis W. Gratz.
Emma M. Graham.

Chas. W. Manzel,
Inventor
by Geyer & Ripp
Attorneys

No. 881,935. PATENTED MAR. 17, 1908.

C. W. MANZEL.

MOTOR.

APPLICATION FILED AUG. 28, 1905.

5 SHEETS—SHEET 4.

Fig. 4

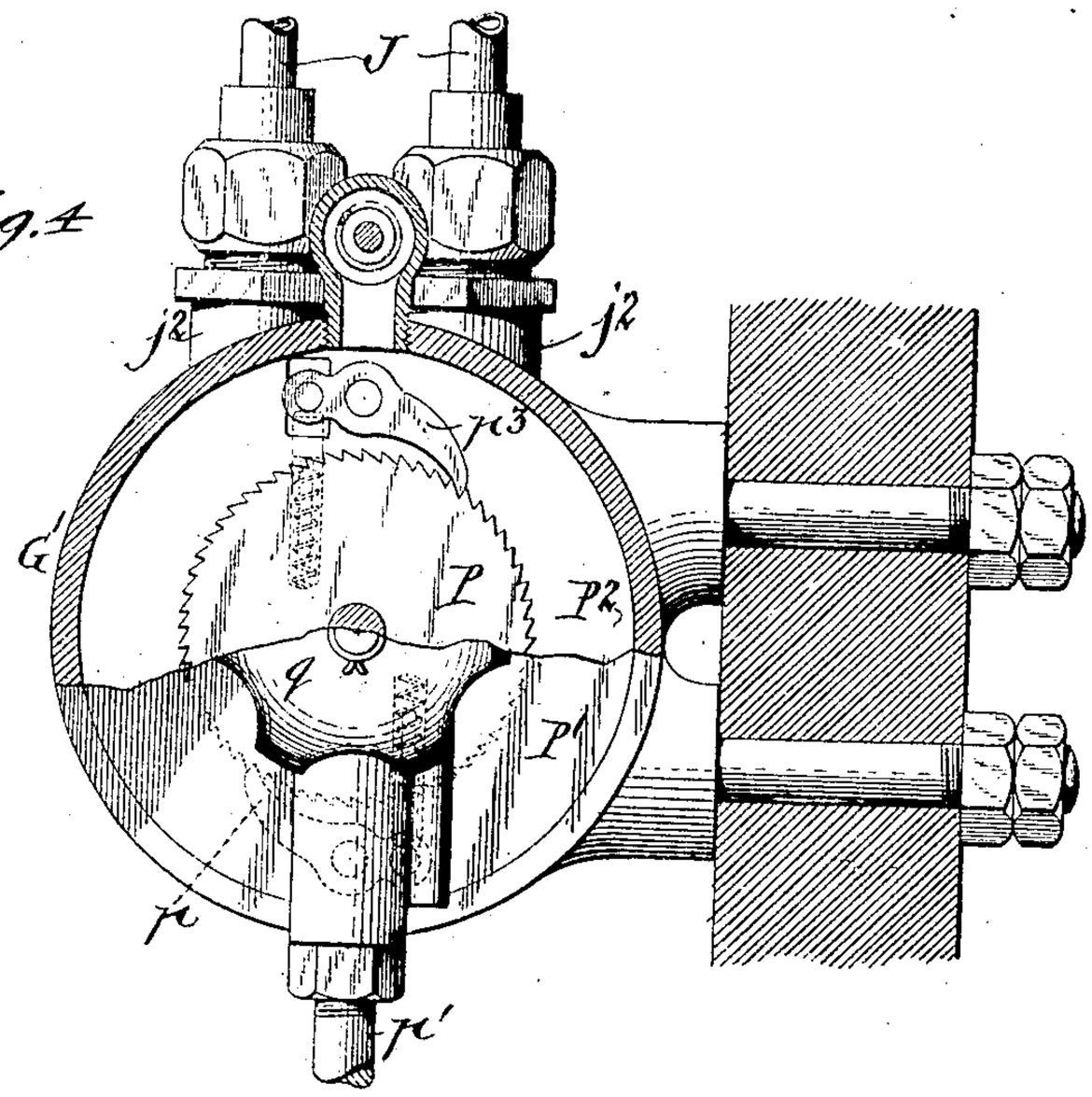
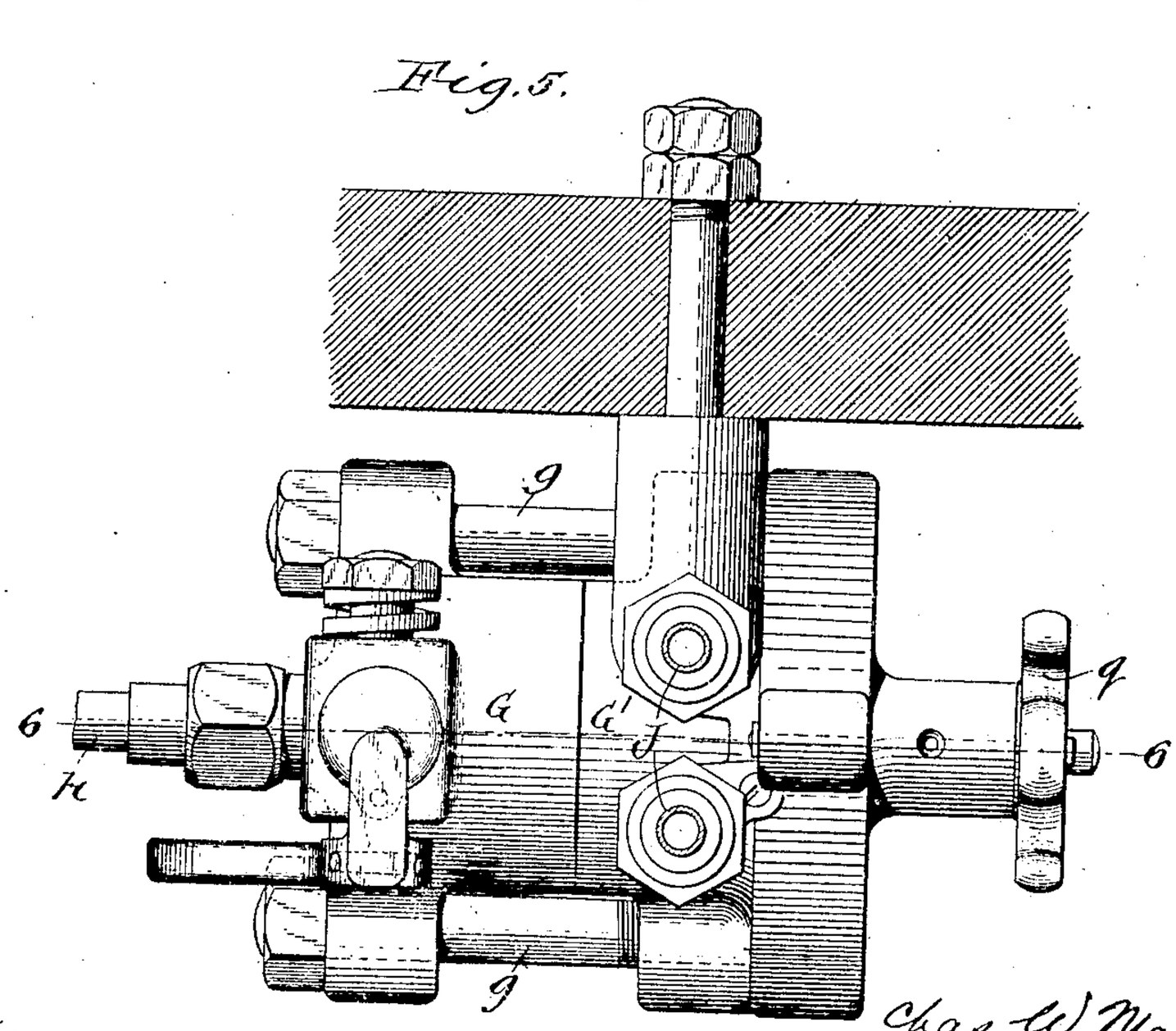


Fig. 5.



Witnesses
Louis W. Gratz
Emma M. Graham

Chas. W. Manzel,
Inventor
by Geyer & Popp
Attorneys.

No. 881,935. PATENTED MAR. 17, 1908.

C. W. MANZEL.

MOTOR.

APPLICATION FILED AUG. 28, 1905.

5 SHEETS—SHEET 5.

Fig. 6.

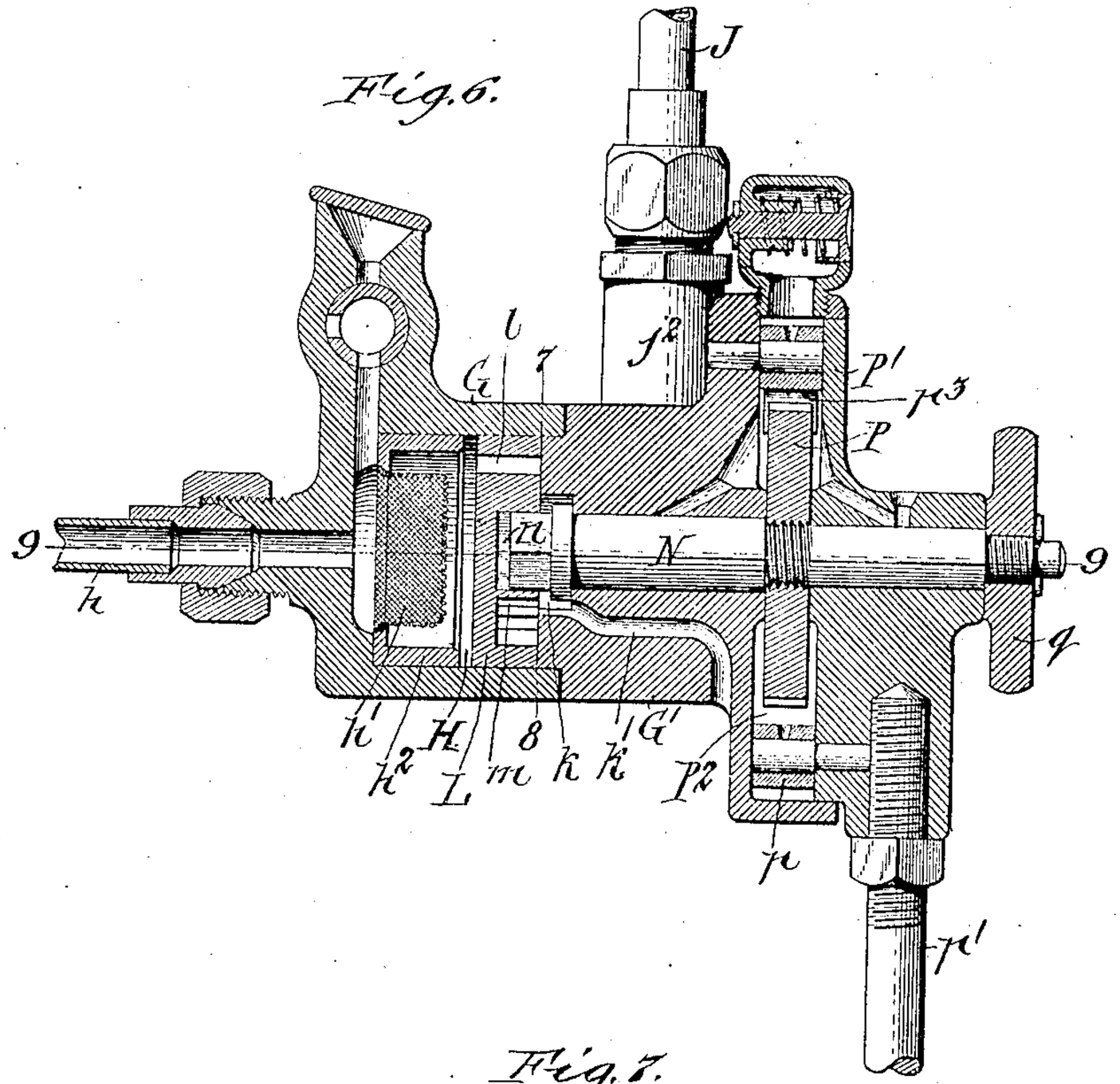


Fig. 7.

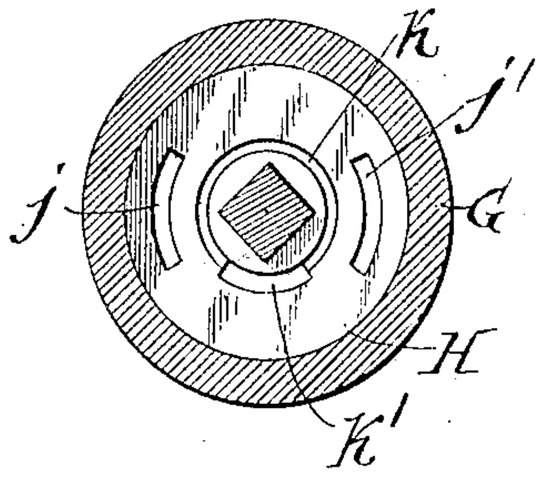
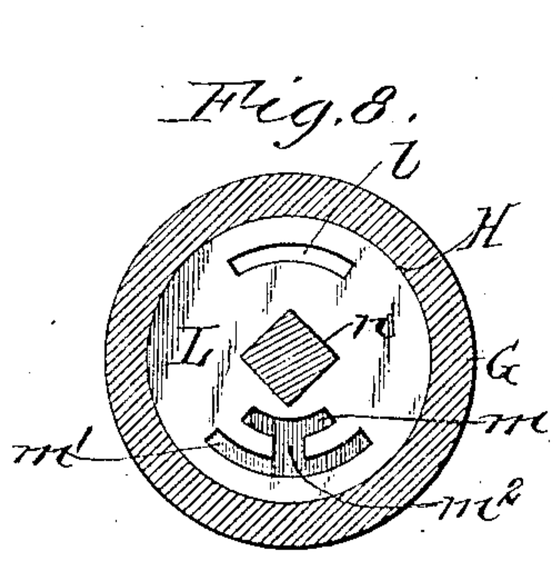


Fig. 8.



Witnesses:
Louis W. Gratz
Emma M. Graham

Chas. W. Manzel
Inventor
by Geyer & Popp
Attorneys

UNITED STATES PATENT OFFICE.

CHARLES W. MANZEL, OF BUFFALO, NEW YORK, ASSIGNOR TO STANDARD AUTOMATIC LUBRICATOR CO., OF BUFFALO, NEW YORK, A CORPORATION OF NEW YORK.

MOTOR.

No. 881,935. Specification of Letters Patent. Patented March 17, 1908.

Application filed August 28, 1905. Serial No. 276,035.

To all whom it may concern:

Be it known that I, CHARLES W. MANZEL, a citizen of the United States, residing at Buffalo, in the county of Erie and State of New York, have invented a new and useful Improvement in Air-Motors, of which the following is a specification.

This invention relates to an air motor designed more especially for actuating the pump of a force-feed locomotive lubricator, the motor being supplied with compressed air from the pressure tank of the usual air-brake system and the admission of the air to the motor being controlled by suitable valve mechanism actuated by a movable part of the locomotive.

The object of my invention is to produce an efficient motor of this kind which acts with comparatively quick impulses and which is at the same time noiseless in operation.

In the accompanying drawings consisting of 5 sheets Figure 1 is a side elevation of a lubricating system embodying my improved motor and applied to a locomotive which is shown by dotted lines. Fig. 2 is a longitudinal sectional elevation of the motor combined with a lubricator, on an enlarged scale. Fig. 3 is a transverse vertical section of the motor and the lubricator on line 3—3, Fig. 2. Fig. 4 is a front view of the air controlling valve, partly in section. Fig. 5 is a top plan view of said valve. Fig. 6 is a vertical longitudinal section on line 6—6, Fig. 5. Figs. 7 and 8 are transverse sections on line 7—8, Fig. 6, looking in opposite directions. Fig. 9 is a horizontal section on line 9—9, Fig. 6.

Similar letters of reference indicate corresponding parts throughout the several views.

A indicates a force-feed lubricator of any suitable construction. In that shown in the drawings, the plungers B of the pump cylinders B^1 are reciprocated by a vibrating rock arm C keyed to a rock shaft C^1 journaled in the top of the lubricator, this shaft being provided at one of its projecting ends with a depending arm *c* which is rocked by the improved air motor for operating the oil pumps. This motor consists of a pair of opposing horizontal cylinders D, D carried by a plate or bracket D^1 which is secured to the same side of the lubricator body at which the actuating arm *c* is located. These cylinders contain pistons E which are connected by a rod E^1 in such manner that when one piston is at the front end of its stroke the other is at the rear end of its stroke. The cylinders are closed at both ends, except that their front heads have central openings for the passage of the piston rod, and the front head of each cylinder is provided with a beveled inner side or seat *d* and the front end of the corresponding piston is correspondingly tapered and adapted to bear against said seat, in order to form a tight joint between the parts when the piston reaches the front end of its stroke. The piston rod is provided in its outer face with a recess *f* with which the lower end of the actuating arm *c* of the lubricator interlocks, whereby the reciprocating pistons impart a rocking motion to the shaft C^1. In the preferred construction shown in the drawings, the actuating arm *c* is pivoted to the rock shaft C^1 by a transverse pin, so that the arm can be swung out of engagement with the piston rod for operating the lubricator by hand, if desired.

Each cylinder D is provided with an inlet port d^1 leading to its rear end, and compressed air or other motive fluid is alternately admitted to the cylinders for reciprocating the pistons by any suitable valve mechanism, but I prefer to employ the controlling valve shown which is constructed as follows: The body or case of the valve is divided transversely into two cylindrical sections, G, G^1 which are secured together by tie bolts *g*. The case contains an inlet chamber H which is connected with the pressure tank I of the locomotive by a pipe *h*. In this chamber is preferably arranged a cup-shaped strainer h^1 which extends across the inlet thereof and intercepts any impurities in the air, the strainer being carried by a ring or cage h^2 fitted in the inlet chamber. Extending forwardly from the front end of this inlet chamber are two horizontal discharge ports *j*, j^1 leading to nipples or branches j^2 which are respectively connected with the inlet ports d^1 of the motor-cylinders D by pipes J. The discharge ports are curved concentrically with the inlet chamber and arranged on diametrically opposite sides of its center.

k indicates an exhaust cavity arranged axially in the front wall of the inlet chamber, and k^1 is an exhaust port extending forwardly from said cavity and opening laterally through the side of the front section G^1, so as to communicate with the atmosphere. This exhaust cavity is also concen-

tric with the inlet chamber, as shown in Fig. 7.

L is a rotary disk-valve arranged in the inlet chamber in front of the strainer cage h^2 and having its flat face seated against the front wall of the chamber, as shown in Fig. 6. This valve is provided on one side of its axis with an inlet port l extending through the same and adapted to register alternately with the discharge ports j, j^1 of the valve case for placing said ports in communication with the inlet chamber and admitting the pressure fluid to the pipes J and cylinders D. On the opposite side of its axis the valve has an exhaust port or cavity adapted to connect said discharge ports alternately with the exhaust cavity k for allowing the air to escape from said pipes. This exhaust port consists of an inner segmental portion m arranged to register constantly with the exhaust cavity k, an outer segmental portion m^1 which registers alternately with the discharge ports j, j^1, and a radial neck or channel m^2 connecting the portions m, m^1. The arrangement of the ports is such that when one of said discharge ports communicates with the inlet chamber H, the other communicates with the exhaust port k^1, in an obvious manner.

N is the shaft or spindle of the rotary valve journaled in an axial opening or bearing formed in the front section G^1 of the valve-case and provided with a square inner end seated in a corresponding socket n in the face of the valve, as shown in Figs. 6, 8 and 9. Rotary motion is imparted to this spindle by any suitable means, but the same is preferably actuated from the rocker arm o of the locomotive by an intermediate ratchet mechanism, as shown in the drawings. This mechanism comprises a ratchet wheel P secured to the valve spindle and an oscillating disk P^1 journaled on the front end of the spindle and carrying a feed pawl p which engages the ratchet wheel. This disk has an actuating arm p^1 which is connected with the rocker arm o by a link p^2. The ratchet-wheel is arranged in a recess or chamber P^2 which is formed in the front end of the section G^1 and closed by the oscillating disk P^1. p^3 is a detent pivoted in the chamber P^2 and engaging the ratchet wheel P.

The valve spindle may be provided at its outer end with a hand wheel q for manually operating the rotary valve, if desired.

r, Fig. 2, indicates check valves arranged in the inlet ports of the motor-cylinders D at their junction with the air pipes J and arranged to close toward the latter for preventing the return of the pressure fluid into the pipes.

The operation of the motor and its controlling valve is as follows: As the controlling valve is actuated from the rocker arm o of the locomotive, it operates and stops with the same and its speed varies with that of the locomotive. By the rotation of the controlling valve, compressed air is alternately admitted to the cylinders D behind their pistons, reciprocating the latter and rocking the actuating shaft C^1 of the pump plungers. As soon as air is admitted to one of the cylinders, its piston is rapidly driven forward until it nearly reaches the end of its stroke, when it is cushioned and retarded by the air previously admitted behind the other or retreating piston. This air is prevented from exhausting through the corresponding supply pipe J by the check valve r thereof but permitted to escape forwardly between the periphery of the piston and the wall of the corresponding cylinder. The pistons may be fitted with the requisite looseness for this purpose or the same may be provided in its periphery with a small escape channel e, as shown in Fig. 2. The air in front of the advancing piston is exhausted through a longitudinal port s formed in the periphery of the enlarged central portion of the piston rod on its rear side, as shown in Fig. 3, and by dotted lines in Fig. 2. Upon the return stroke of the pistons, the air in the supply pipes J between the check-valves r and the controlling valves G, G^1 is exhausted through the discharge ports j j^1 and the exhaust port m, m^1, m^2 of said valve and the exhaust cavity k and port k^1 of the valve-case, thereby allowing the check-valves to become seated.

By this improved construction, the motor, while practically noiseless in action, operates the pump-plungers of the lubricator with quick and sudden impulses, delivering the oil through the feed pipes with the necessary force to supply it, if desired, to a number of chest plugs connected with the same pipe. The exhaust groove s may also be employed as an oil duct for lubricating the motor cylinders by disengaging the actuating arm c from the piston rod and turning the latter in the cylinders, so as to bring the groove on the upper side of the rod.

I claim as my invention:

1. In a motor, the combination of a pair of opposing cylinders each having an inlet port and an exhaust port, connected pistons arranged in the cylinders, means independent of the inlet ports for permitting the pressure fluid to escape from the rear to the front side of each piston on its return stroke, and means arranged in said inlet ports for checking the return of the pressure fluid through the same, whereby the advancing piston is cushioned at the end of its stroke by the compression of the fluid behind the retreating piston, substantially as set forth.

2. In a motor, the combination of a pair of opposing cylinders each having an inlet port leading to its rear end and an exhaust port at its opposite end, a pair of connected pistons arranged in the cylinders, means independent of the inlet ports for permitting the pressure

fluid to escape from the rear to the front side of each piston on its return stroke, check valves in said inlet ports arranged to prevent the return of the pressure fluid through the same, and means for alternately admitting the pressure fluid to the inlet ports of the two cylinders, substantially as set forth.

3. In a motor, the combination of a pair of opposing cylinders each having an inlet port leading to the rear end thereof, pistons arranged in the cylinders, means for permitting the fluid to escape from the rear to the front side of each piston on its return stroke, a rod connecting the pistons and provided with a longitudinal exhaust port or channel which connects the front ends of the cylinders with the atmosphere, and check valves in said inlet ports arranged to prevent the return of the pressure fluid through the same, substantially as set forth.

4. In a motor, the combination of a cylinder having an inlet port and provided in its front end with an exhaust opening having a tapering seat, a piston arranged in the cylinder and having a tapering front end adapted to bear against said seat for tightly closing said opening, and means for actuating the piston, substantially as set forth.

5. In a motor, the combination of a pair of opposing cylinders each having an inlet port and provided in its front end with an exhaust opening having a tapering seat, connected pistons arranged in the cylinders and provided with tapering front ends adapted to bear against said seats for tightly closing said openings, means for permitting the fluid to escape from the rear to the front side of each piston on its return stroke and means in said inlet ports arranged to prevent the return of the pressure fluid through the same, substantially as set forth.

Witness my hand this 23d day of August, 1905.

CHARLES W. MANZEL.

Witnesses:
C. F. GEYER,
E. M. GRAHAM.