No. 651,078. Patented June 5, 1900.

F. J. LEIBMAN.

COMPOUND ROTARY MOTOR.

(Application filed May 8, 1899.)

(No Model.) 3 Sheets—Sheet 1.

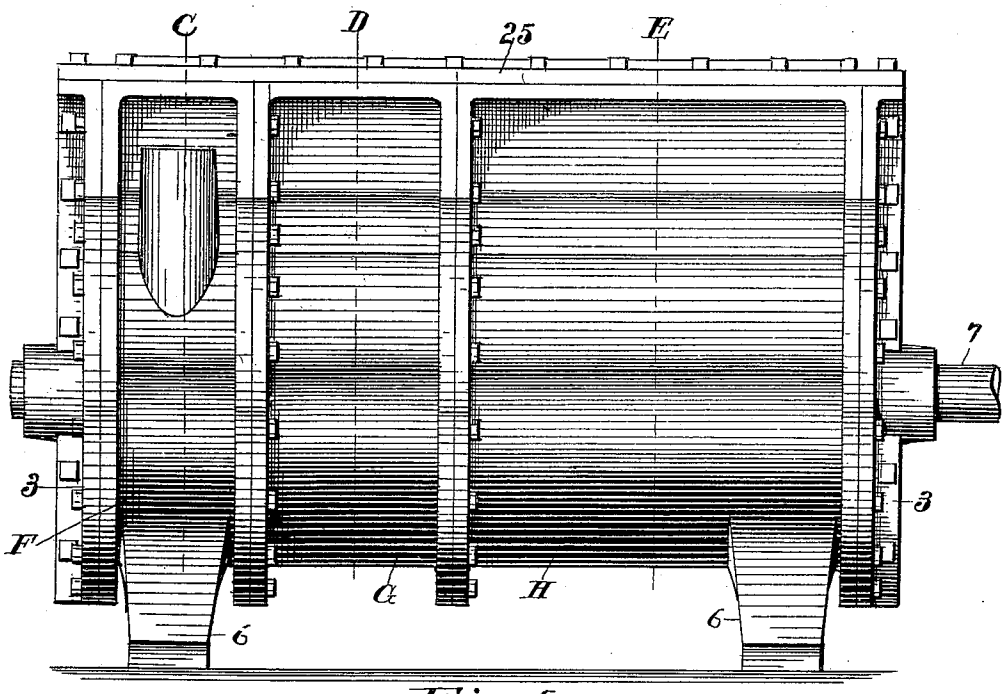



Fig. 1.

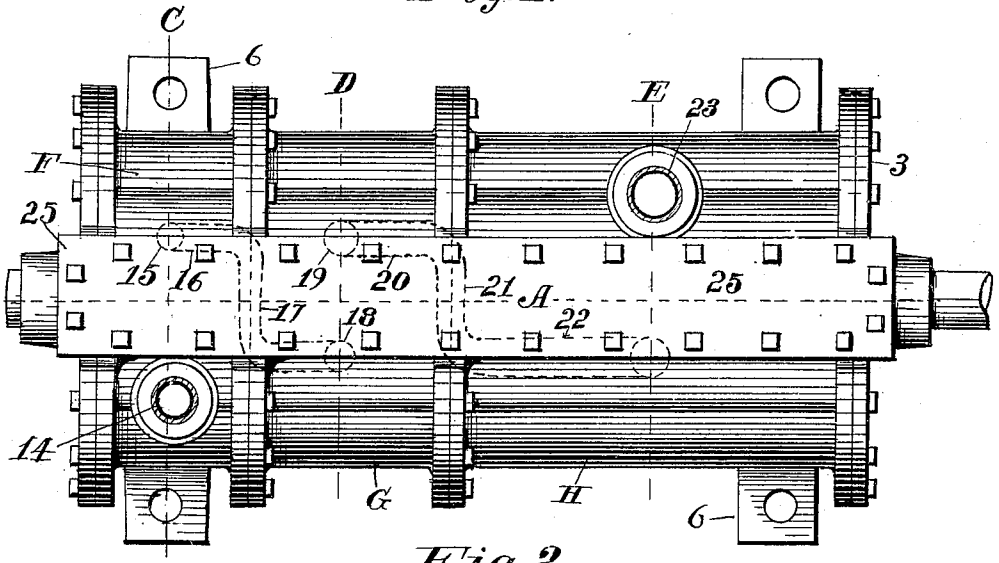



Fig. 2.

Witnesses:

E. Lovett.

Saml Wilson

Inventor:

F. J. Leibman

By A. F. Zerbe

Atty

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 651,078. Patented June 5, 1900.

F. J. LEIBMAN.

COMPOUND ROTARY MOTOR.

(Application filed May 8, 1899.)

(No Model.) 3 Sheets—Sheet 2.

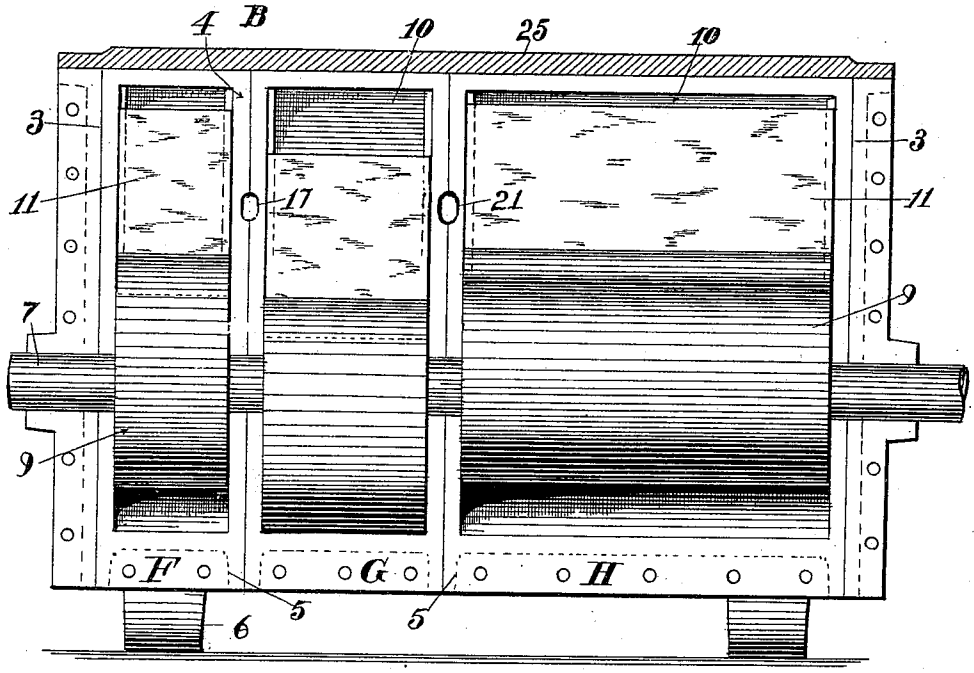



Fig. 3.

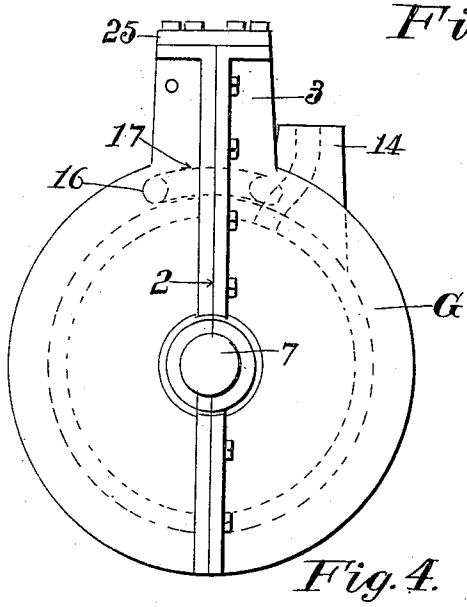



Fig. 4.

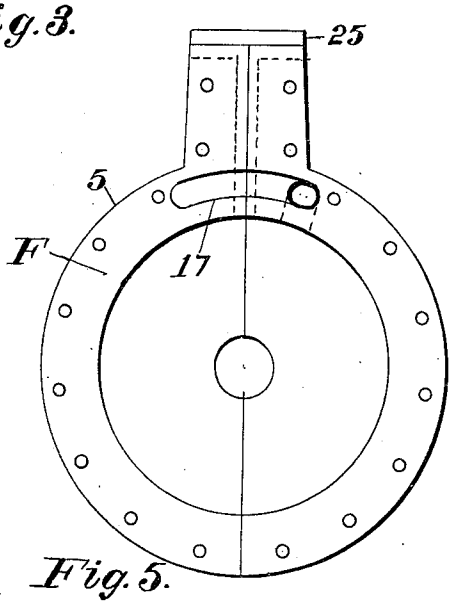



Fig. 5.

Witnesses:

E. Lovett.

Saml Wilson

Inventor.

F. J. Leibman

By A. F. Gerth

Atty.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 651,078. Patented June 5, 1900.

F. J. LEIBMAN.

COMPOUND ROTARY MOTOR.

(Application filed May 8, 1899.)

(No Model.) 3 Sheets—Sheet 3.

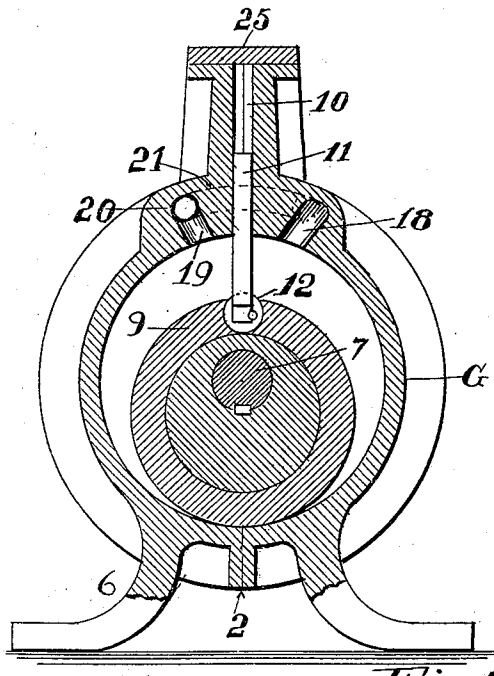



Fig. 7.

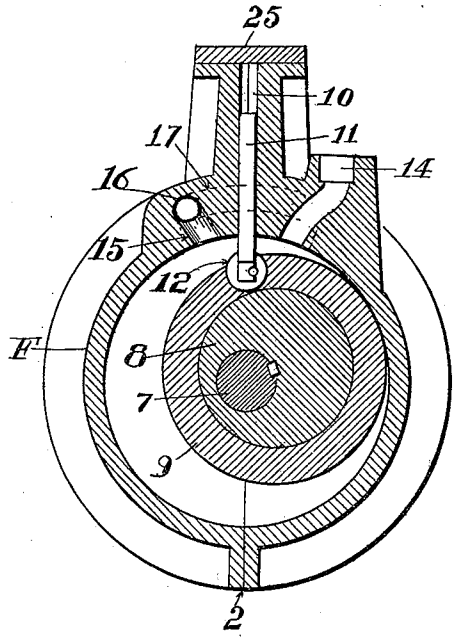



Fig. 6.

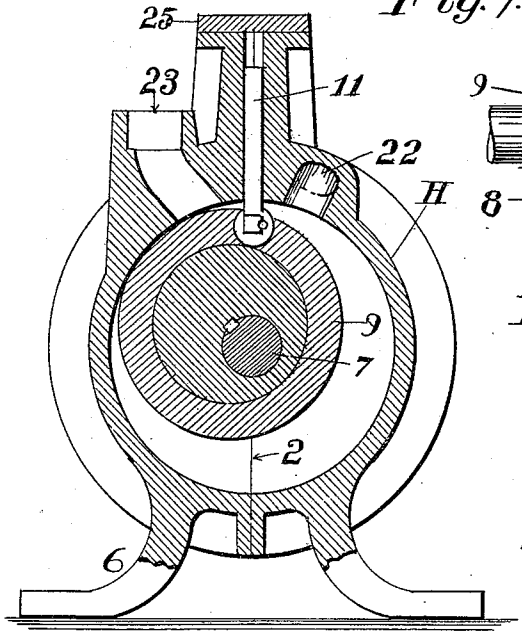



Fig. 8.

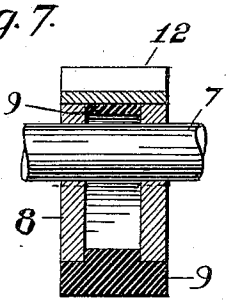



Fig. 9.

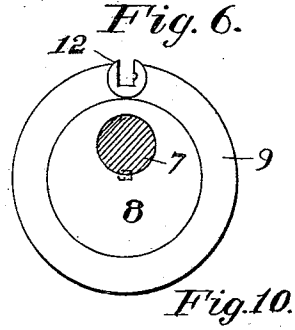



Fig. 10.

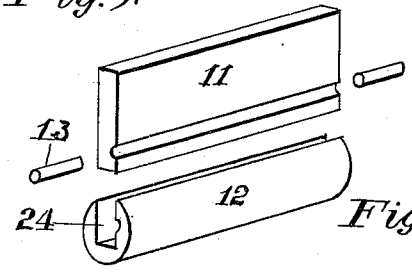



Fig. 11.

Witnesses.

E. Lovett.

Saml Wilson

Inventor:

F. J. Leibman,

By A. J. Burke

Atty.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

# UNITED STATES PATENT OFFICE.

FRANK J. LEIBMAN, OF NEW YORK, N. Y.

## COMPOUND ROTARY MOTOR.

SPECIFICATION forming part of Letters Patent No. 651,078, dated June 5, 1900.

Application filed May 8, 1899. Serial No. 715,977. (No model.)

*To all whom it may concern:*

Be it known that I, FRANK J. LEIBMAN, a citizen of the United States, and a resident of New York, (Brooklyn,) in the county of Kings and State of New York, have invented certain new and useful Improvements in Compound Rotary Motors, of which the following is a specification.

The object of the present invention is to provide a new and improved compound rotary motor adapted for steam, compressed air, or any of the available gases used for the production of power; and it consists, essentially, of a shell having centrally through the same a shaft on which is keyed an eccentric, and this eccentric carries thereon a sleeve within which the eccentric turns. The sleeve at one point is attached to a roller-bearing, which roller is secured to a vertical sliding gate, so that the point of the sleeve to which said roller-bearing is attached has a vertical motion limited in its action to the throw of the eccentric, so that as the eccentric turns within the sleeve the latter will oscillate, causing the outer surface thereof to creep around the inner surface of the shell or cylinder, thus constantly presenting a new surface contact between the sleeve and cylinder as the shaft turns. A suitable supply-port admits steam to one side of the vertical sliding gate, and a port on the other side of the gate serves as the exhaust. I use the steam expansively by mounting two or more similarly-constructed cylinders along on the same shaft, so that the steam passes from one to the other, the eccentrics being suitably arranged with reference to each other, so that the steam is fully utilized, as will now be set forth in detail.

In the accompanying drawings, Figure 1 is a side view of my improved compound rotary motor; Fig. 2, a top view of the same; Fig. 3, a central vertical longitudinal section along line A of Fig. 2; Fig. 4, an end view; Fig. 5, an end view of the second section at line B, Fig. 3; Fig. 6, a vertical cross-section through line C of Fig. 1 looking to the right; Fig. 7, a vertical cross-section through line D of Fig. 1 looking to the right; Fig. 8, a vertical cross-section through line E of Fig. 1 looking to the right; Fig. 9, a vertical longitudinal section of the eccentric, sleeve, and roller-bearing through a central line of Fig. 7; Fig. 10, an end view of same; and Fig. 11, a perspective view of the roller-bearings, a portion of the vertically-movable gate, and the pins for holding the parts together.

In describing the invention I shall first detail the construction of one of the cylinders, as the three cylinders herein shown are similar excepting in length. For convenience, however, I will designate the first or short cylinder F as the "high-pressure" cylinder, the second cylinder G as the "intermediate," and the third cylinder H as the "low-pressure."

In constructing the motor I prepare a shell of suitable length and diameter, which is made up, preferably, in halves 1, divided—as shown, for instance, at 2—for ease of construction. This cylinder has a head at each end—as shown, for instance, at 3—or when used in connection with a train of cylinders it may have one end closed, as at 4, and provided with a flange 5 for the purpose of bolting it to the next cylinder. I do not, however, confine myself to this longitudinal and transverse division, as it is obvious that the cylinders, for instance, may be cast together, suitably bored out, and provided with reversible partition-walls to form two or more cylinders. Suitable legs or bases 6 are provided for the cylinders, as shown. A shaft 7 passes centrally through the ends or heads of the cylinder, and keyed to this shaft are eccentrics 8. These eccentrics, as shown in Fig. 9, carry a sleeve 9, which is loosely mounted thereon, so that the eccentric will turn freely within the sleeve. On the upper side of the cylinder is a narrow vertical opening 10, extending up a suitable distance from the interior of the cylinder, this opening being approximately the same length as the bore of the cylinder, and within this opening is placed a sliding gate 11. The ends of the gate rest in grooves, so as to prevent binding when it passes down into the bore of the cylinder, and the lower end of this gate rests within a longitudinal groove 24, formed in a roller 12, this roller being so placed through the perimeter of the sleeve that only approximately one-third of its surface is exposed, and the gate 11 is held to the roller 12 by means of a pin or key 13 at each end. It will be seen, therefore, that when the eccentric 8 revolves it turns within the sleeve,

the latter being held by the roller 12 and gate 11, so that this fixed point has a vertical motion only, and the body of the sleeve oscillates on, but does not turn, with the eccentrics. The supply-port 14 is located on the right side of the gate in this instance and the exhaust-port 23 on the left side, so that when the steam enters—as shown, for instance, in the position Fig. 7—it acts against the projecting side of the eccentric, or rather the sleeve thereon, and thus turns the same. In order now to use the steam expansively, I prepare two or more of these cylinders and arrange them so that the flanged heads are bolted together. I then core the exhaust side of, say, the first cylinder F, so that there will be a longitudinal duct 16, Fig. 2, which connects at the flanged end of the cylinder with a transverse grooved channel 17, extending across or around to a duct 18 in cylinder G, which duct becomes the supply-port for cylinder G. The discharge-port 19 of cylinder G has a duct 20, which extends to the rear end of this cylinder, terminating in a channel 21, which extends transversely across to the supply-port 22 of cylinder H, the latter cylinder having a discharge-port 23, as shown, on the opposite side of the gate. In practice I may make the top or cap 25, which covers the gates, in one piece, as shown herein, or it may be made of separate plates each the length of the corresponding cylinder. By the construction herein shown I can utilize the steam expansively, the wearing of the parts is reduced to a minimum, and every wearing portion is capable of being packed with suitable packing to prevent loss of steam, and all these features are important considerations in engines of this class.

What I claim as new is—

1. A rotary motor composed of a high and low pressure cylinder with an intermediate pressure-cylinder bolted therebetween, ports connecting the said cylinders, a shaft through the said cylinders, and within each cylinder an eccentric carrying a sleeve which oscillates on said eccentric, said sleeve having formed in its outer surface a transverse groove adapted to receive a horizontal roller, which roller is grooved to receive the lower end of a vertically-sliding gate held therein by a pin or pins in the said roller, the ends of the said gate running in grooves or recesses formed in the heads of the cylinders, the exhaust-port of the high-pressure cylinder discharging into the intermediate cylinder and the intermediate cylinder discharging into the low-pressure cylinder, substantially as set forth.

2. A compound rotary motor composed of a high and low pressure cylinder with an intermediate pressure-cylinder bolted therebetween, a shaft through the said cylinders and within each cylinder an eccentric carrying a sleeve which oscillates on said eccentric, said sleeve having formed in its outer surface a transverse groove adapted to receive a horizontal roller, which roller is grooved to receive the lower end of a vertically-sliding gate held therein by a pin or pins in the said roller, the ends of the said gate running in grooves or recesses formed in the heads of the cylinders, each cylinder having a longitudinal steam-port with a transverse channel at the flanged end or ends, whereby the steam is diverted from the discharge-port of one cylinder across to the supply-port of the next cylinder, substantially as set forth.

Signed at New York, in the county of New York and State of New York, this 17th day of April, A. D. 1899.

FRANK J. LEIBMAN.

Witnesses:

H. Y. CUMMINS,

A. J. ZERBE.