No. 668,855. Patented Feb. 26, 1901.

J. F. W. KOETTER.

MOTOR.

(Application filed Dec. 5, 1898.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

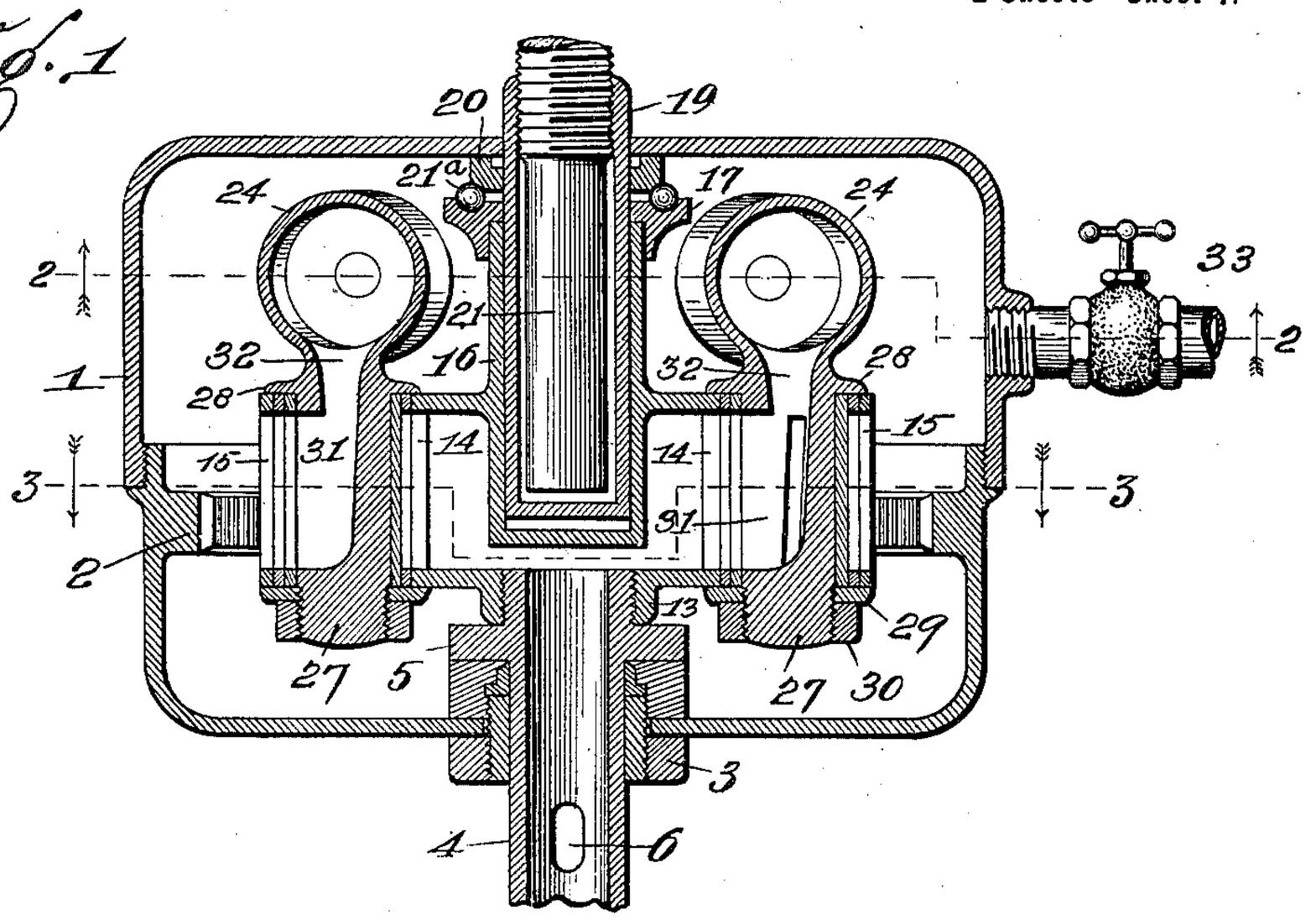

Fig. 2.

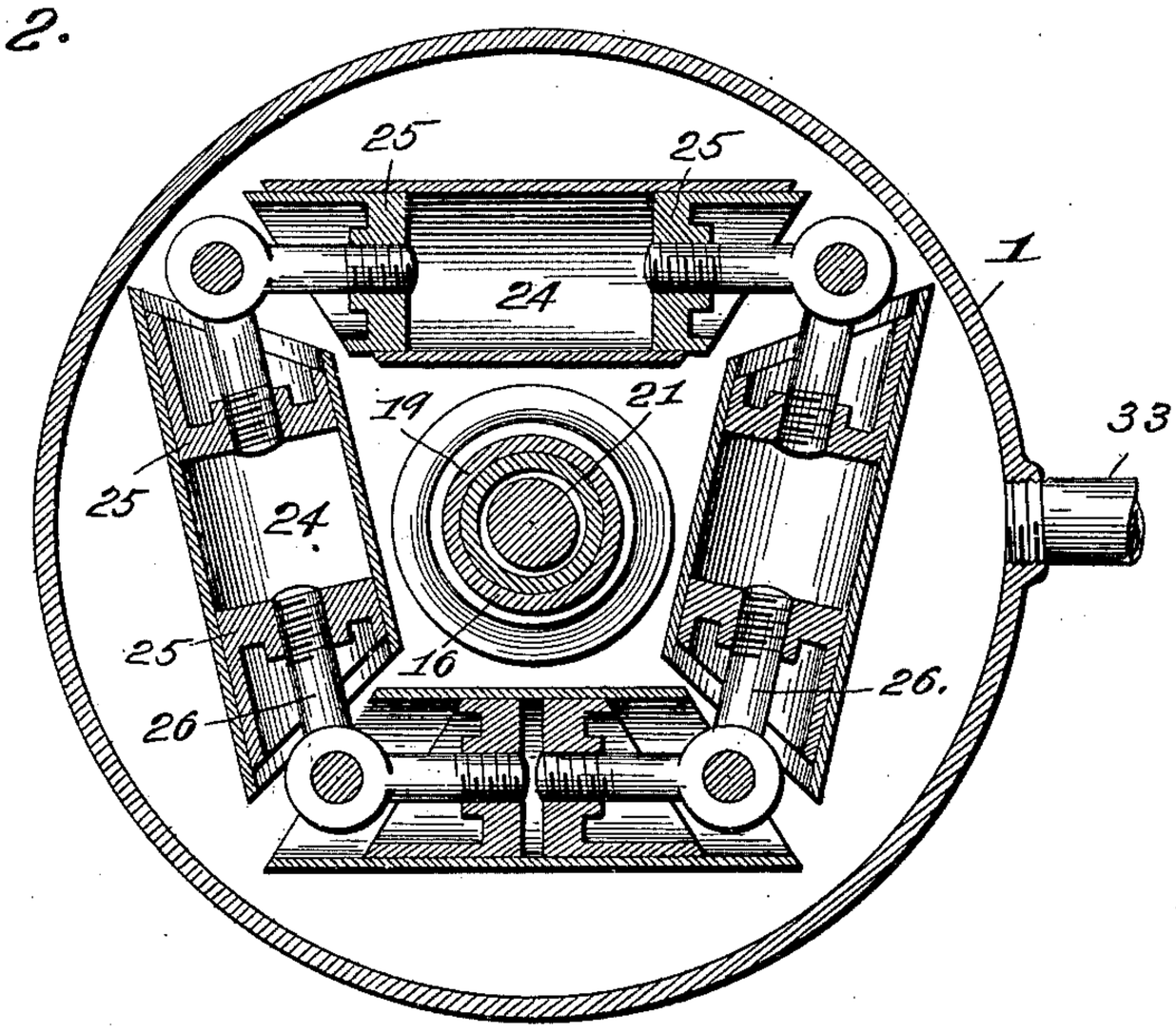

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Fig. 3.

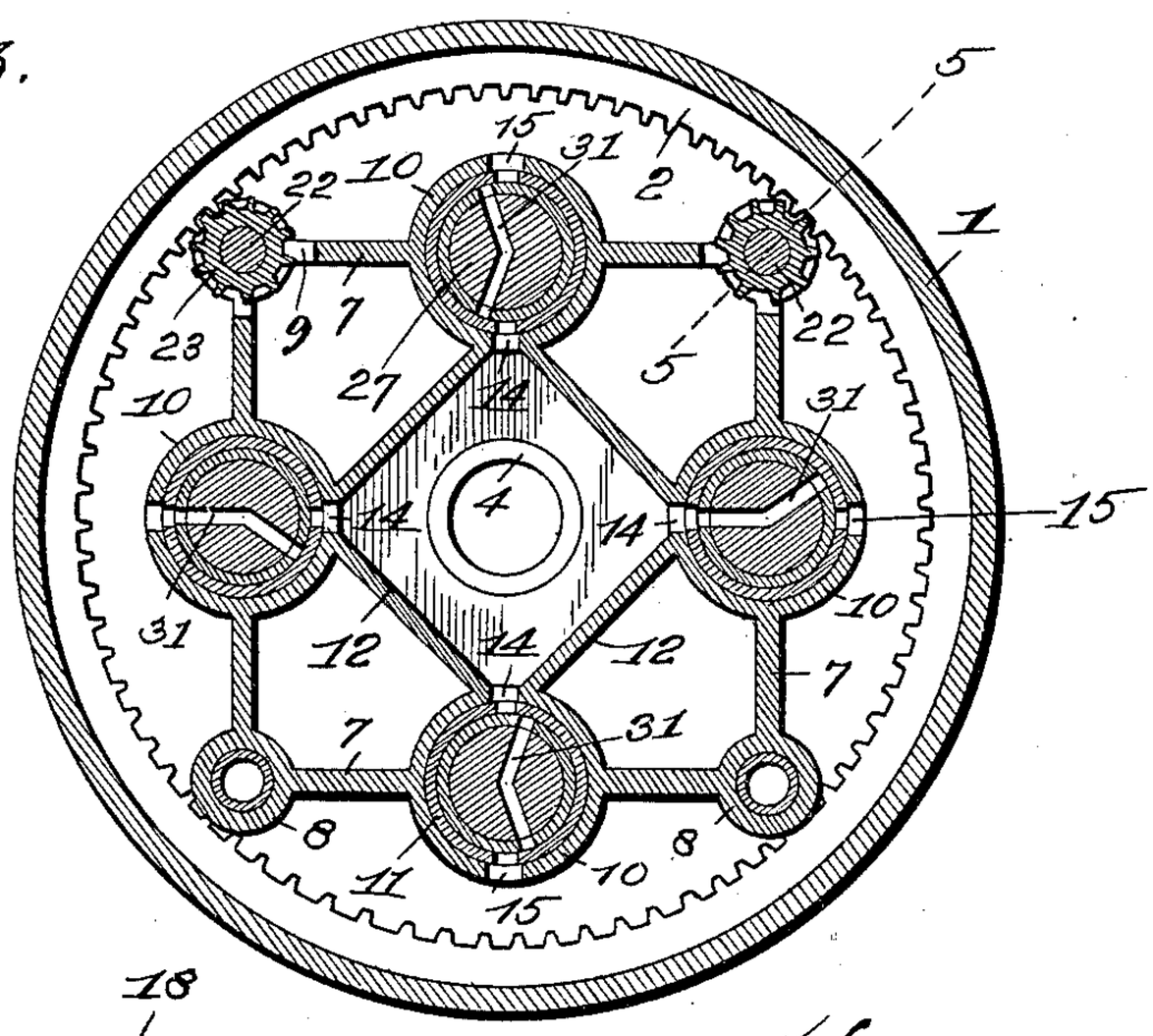


Fig. 4.

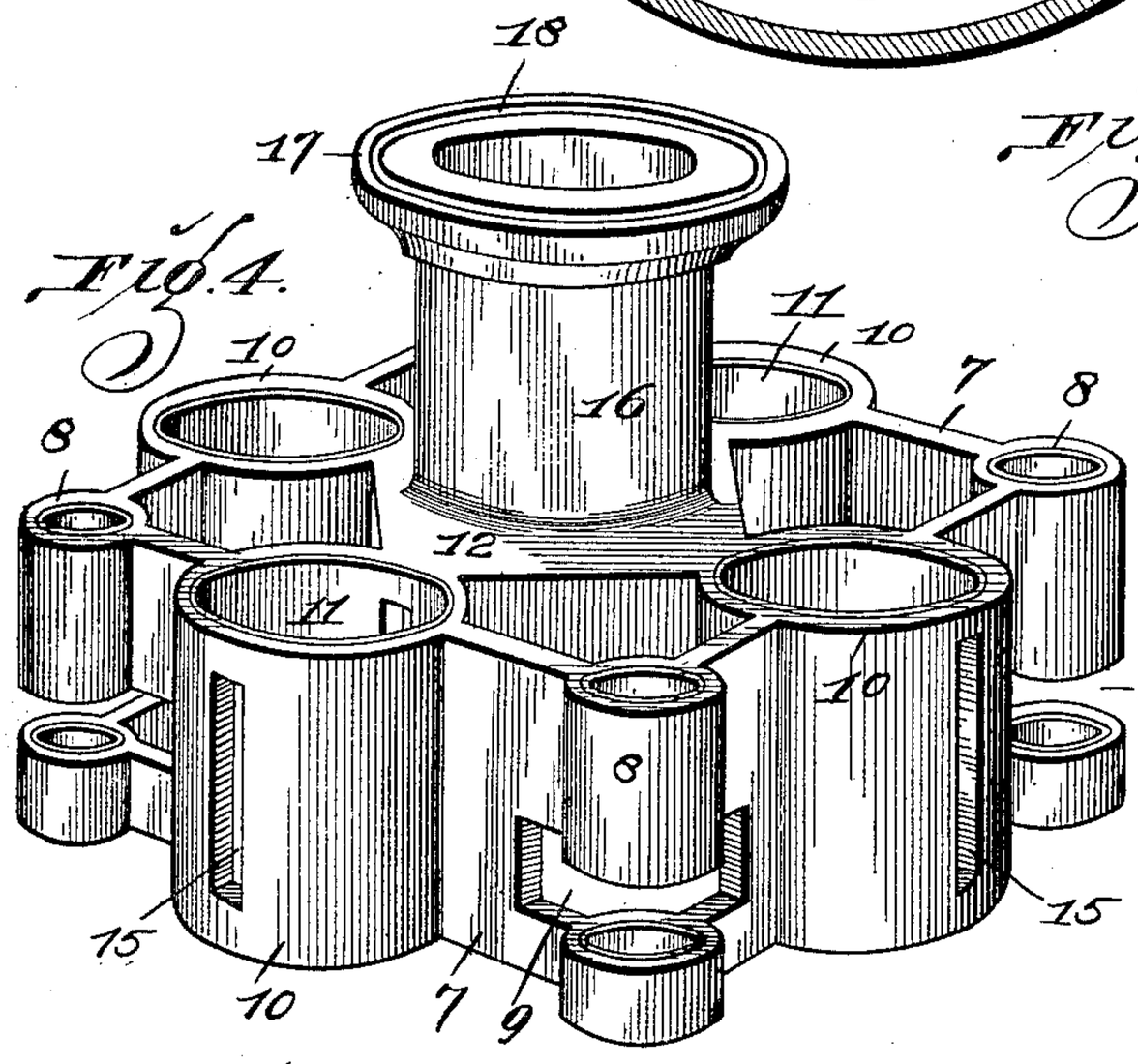
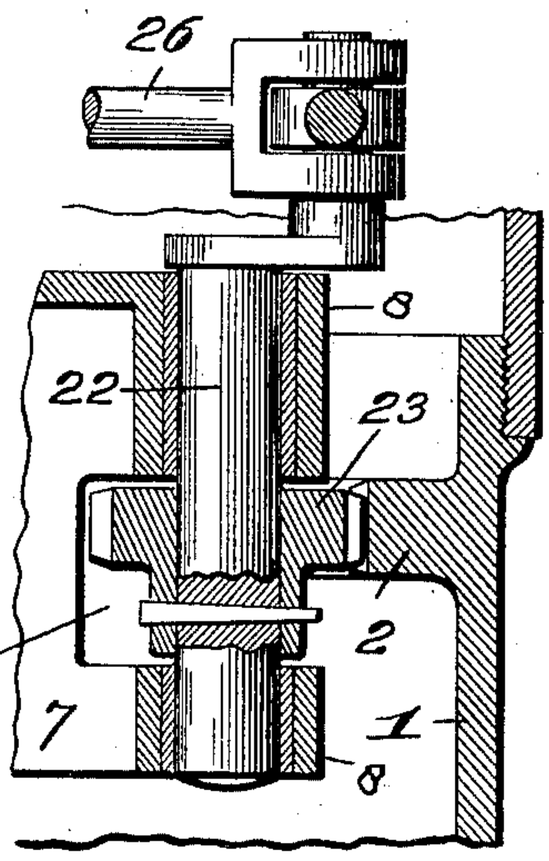


Fig. 5.



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UNITED STATES PATENT OFFICE.

JOHN F. W. KOETTER, OF ST. LOUIS, MISSOURI.

MOTOR.

SPECIFICATION forming part of Letters Patent No. 668,855, dated February 26, 1901.

Application filed December 5, 1898. Serial No. 698,311. (No model.)

To all whom it may concern:

Be it known that I, JOHN F. W. KOETTER, of the city of St. Louis, State of Missouri, have invented certain new and useful Improvements in Motors, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

My invention relates to motors; and it consists of the novel construction, combination, and arrangement of parts, hereinafter described and claimed.

Figure 1 is a vertical sectional view taken through the center of my improved motor. Fig. 2 is a horizontal sectional view taken approximately on the line 2 2 of Fig. 1 and looking in the direction indicated by the arrows on said dotted line. Fig. 3 is a horizontal sectional view taken approximately on the line 3 3 of Fig. 1. Fig. 4 is a view in perspective of the motor-frame of which I make use in carrying out my invention. Fig. 5 is an enlarged vertical sectional view taken approximately on the line 5 5 of Fig. 3.

The primary object of my invention is to construct a light, simple, and inexpensive motor for operating drills, boring-machines, &c., though with slight variations in construction my improved motor may be used for imparting motion to any shaft which it is desired to rotate.

In the construction of my improved motor I make use of a hollow cylindrical casing 1, the same being composed of mating halves, one of said halves being removably located upon the other, and formed integral with the inner face of the upper end of the lower half of the casing is an internal gear 2. Arranged in the center of the bottom of the lower half of the casing is a suitable bearing 3, in which is rotatably arranged a tube 4, the same being provided with a flange 5 adjacent its upper edge, which flange operates directly upon the bearing 3, and the end of the tube 4 above this flange 5 is exteriorly screw-threaded. Formed in the tube 4 immediately below the bearing 3 is an aperture 6, and said tube 4 may be extended downwardly a suitable distance below the casing 1 and constructed or fitted to receive a drill point or bit.

The frame of my improved motor, which is removably located upon the screw-threaded upper end of the tube 4, is cast in a single piece and is constructed as follows: A rectangular wall 7 is provided at each corner with a vertically-arranged bearing 8, and each bearing is separated by a horizontally-arranged slot or cut-away portion 9, the same extending a slight distance into the wall 7. Formed in the wall 7, midway between the corner-bearings 8, are the vertically-arranged bearings 10, the same being somewhat larger than are the bearings 8, and all of the bearings 8 and 10 are provided on their interior surfaces with hardened-steel sleeves 11. Located within the center of the wall and connecting with the inner portions of the bearings 10 is a rectangular hollow casing 12, and extending downwardly from the center of said casing 12 is an interiorly-screw-threaded flange 13 and into which the exteriorly-screw-threaded upper end of the tube 4 is seated. Formed through each corner of the casing 12 and communicating with the interior of each of the bearings 10 is a port 14, and formed through the outside of each of the bearings 10 directly opposite this port 14 is a port 15. Formed integral with the top of the casing 12 is a vertically-arranged sleeve 16, the same being surmounted by a hardened-steel ring 17, in the top surface of which is formed a groove 18.

Passing downwardly through the aperture formed through the center of the top upper portion of the casing 1 is a sleeve 19, the same extending downwardly into the sleeve 16, and arranged around said sleeve 19, on the under side of the top of the upper half of the casing 1, is a packing-ring 20, the lower outer corner of which is grooved, and a plurality of balls 21^a is located in the groove 18, thus forming a ball-bearing between the rings 17 and 20. A vertically-arranged rod 21 is screw-seated in the upper end of the sleeve 19, which rod carries a handle, (not shown,) which handle is manually engaged while the motor is being operated.

Rotatably arranged in each of the bearings 8 is a crank-shaft 22, and upon each crank-shaft within the horizontally-arranged slot 9 is located a pinion 23, the same being keyed upon the crank-shaft and meshing with the internal gear 2.

The cylinders 24 of my improved motor are arranged one above each of the bearings 10, and in each end of each of said cylinders is arranged a piston-head 25, and seated in each of the piston-heads and extending outwardly through the ends of the cylinders 24 are the piston-rods 26, the same being journaled upon the outer ends of the crank-shafts 22. In order that said piston-rods may be properly journaled upon the ends of said crank-shafts, one of each pair of piston-rods must be bifurcated at its outer end, this construction being clearly illustrated in Fig. 5.

The cylinders 24 are provided on their under sides with trunnions 27, said trunnions being provided with hardened-steel bearing-sleeves, and said trunnions are rotatably arranged in the bearings 10. Each of said trunnions is provided on its upper end adjacent the cylinder with a laterally-projecting flange 28, that rests directly upon top of the bearing 10, and the lower end of each of the trunnions is exteriorly screw-threaded and is provided with a bearing-plate 29 and nut 30. Formed through the body of each of the trunnions is a passage 31, and communicating with said passage and leading upwardly to the interior of the cylinder is a passage 32. The passages 31 are so formed through the trunnions 27 as that during the oscillation of said trunnions in the bearings 10 when one end of said passage 31 coincides with either one of the ports 14 or 15 the opposite passage will be cut off.

In the modified construction shown in Fig. 1 the compressed air or steam used to operate my improved motor is taken into the casing 1 through a pipe 33, in which is located a suitable throttle-valve.

In the operation of my improved motor the air or steam is admitted to the interior of the casing through the tube 33. Owing to the arrangement and location of the passages 31 and ports 14 and 15 one of the cylinders is always taking air or steam, while the opposite cylinder is exhausting and the ports to the two remaining cylinders are cut off. Air or steam within the casing 1 will pass through the inlet-ports 15, with which the passage 31 coincides, and from thence said air will pass upwardly through the passage 32 to the interior of the cylinder 24, between the pistons therein. Said pistons will be forced apart, and in so doing the crank-shafts 22 will be rotated, and as the adjacent piston-rods 26 are connected to the crank-pins of said cranks said adjacent piston-rods will be moved in an opposite direction to the first-mentioned piston-rods, thus causing the remaining cylinders and trunnions to oscillate in their respective bearings. As the crank-shafts 22 rotate, the pinions 23, carried by said crank-shafts, will engage the teeth of the rack 2, and the entire frame of the motor, with the cylinders 24 and the tube 4, will be rotated within the casing 1. During the rotation of the frame the trunnions of course change their positions in the bearings 10, and when the inner ends of the passages 31 coincide with the exhaust-ports 14 the air or steam exhausts through said passages and ports to the interior of the casing 12, and from thence said exhaust air or steam passes downwardly through the tube 4 and out through the aperture 6 therein. During the operation of the motor the air or steam within the casing exerts a considerable pressure upon the pistons that are moving toward each other, and as the pistons in either of the cylinders move toward each other at the same time it will be seen that considerable pressure is utilized upon the exterior of said pistons in connection with the force of the air or steam that is being admitted between the pistons of the remaining cylinder.

A motor of my improved construction possesses superior advantages in point of simplicity, durability, and general efficiency, is especially applicable for use in connection with internal gear-wheels, and may be advantageously used wherever a compact and powerful motor is desired for imparting rotary motion to a shaft.

I claim—

1. A motor, comprising a casing, a removable frame mounted in said casing and having integral trunnion-bearings 10 and crank-shaft bearings 8, a plurality of cylinders arranged radially relative a given point, two pistons operating in each of said cylinders, piston-rods for said pistons, the end of each piston-rod being connected to an adjacent piston-rod, means whereby fluid under pressure is introduced between said pistons, and means whereby fluid under pressure is introduced into said casing, substantially as specified.

2. A motor, comprising a casing, a removable frame mounted in said casing and having integral trunnion-bearings 10 and crank-shaft bearings 8, an air-tight casing, an internal gear formed on the inside of said casing, a tube rotatably arranged in the bottom of said casing, trunnions rotatably arranged in said bearings, cylinders integral with said trunnions, pistons operating in each end of each of said cylinders, piston-rods for said pistons, the end of each piston-rod being connected to the next adjacent piston-rod, crank-shafts mounted in said crank-shaft bearings and to which the ends of the piston-rods are connected, pinions fixed upon said crank-shafts and meshing with said internal gear, and means whereby fluid under pressure is introduced between the two pistons of each cylinder, substantially as specified.

3. In a motor, an air-tight casing, a bearing formed in the lower end of said casing, an internal gear formed on the inside of said casing, a tubular shaft rotatably arranged in the bearing in the lower end of said casing, a frame removably mounted in said casing, bearings 10 formed in the sides of said frame, bearings 8 formed in the corners of said frame,

trunnions rotatably arranged in the bearings formed in the sides of said frame, cylinders integral with the upper ends of said trunnions, pistons operating in each end of each of said cylinders, piston-rods for said pistons, crank-shafts rotatably arranged in the bearings at the corners of the motor-frame, to the crank-pins of which crank-shafts are connected the meeting ends of the adjacent piston-rods, pinions fixed upon said crank-shafts and meshing with the internal gear, a sleeve passing through the top of the casing and rotatably arranged in the upper end of the said frame, means whereby fluid under pressure is introduced into the casing, and means whereby the fluid under pressure is introduced between the pistons, substantially as specified.

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

JOHN F. W. KOETTER.

Witnesses:
EDWARD E. LONGAN,
M. P. SMITH.