

(No Model.)

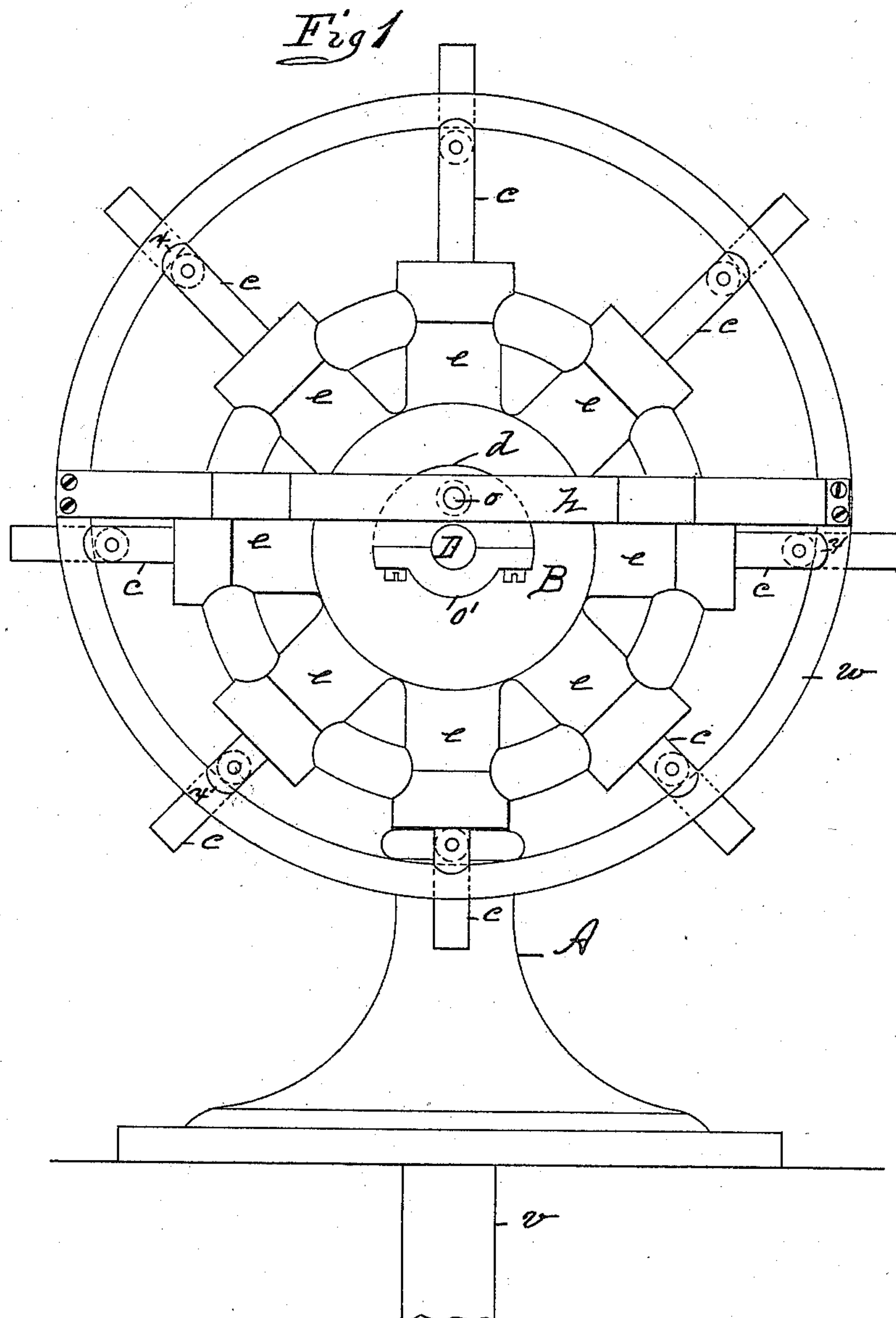
2 Sheets—Sheet 1.

E. B. BENHAM.

MOTOR.

No. 341,828.

Patented May 11, 1886.



WITNESSES:

Henry A. Chapin
W. F. Rice

INVENTOR

Elijah B. Benham

BY

Henry A. Chapin
ATTORNEY

(No Model.)

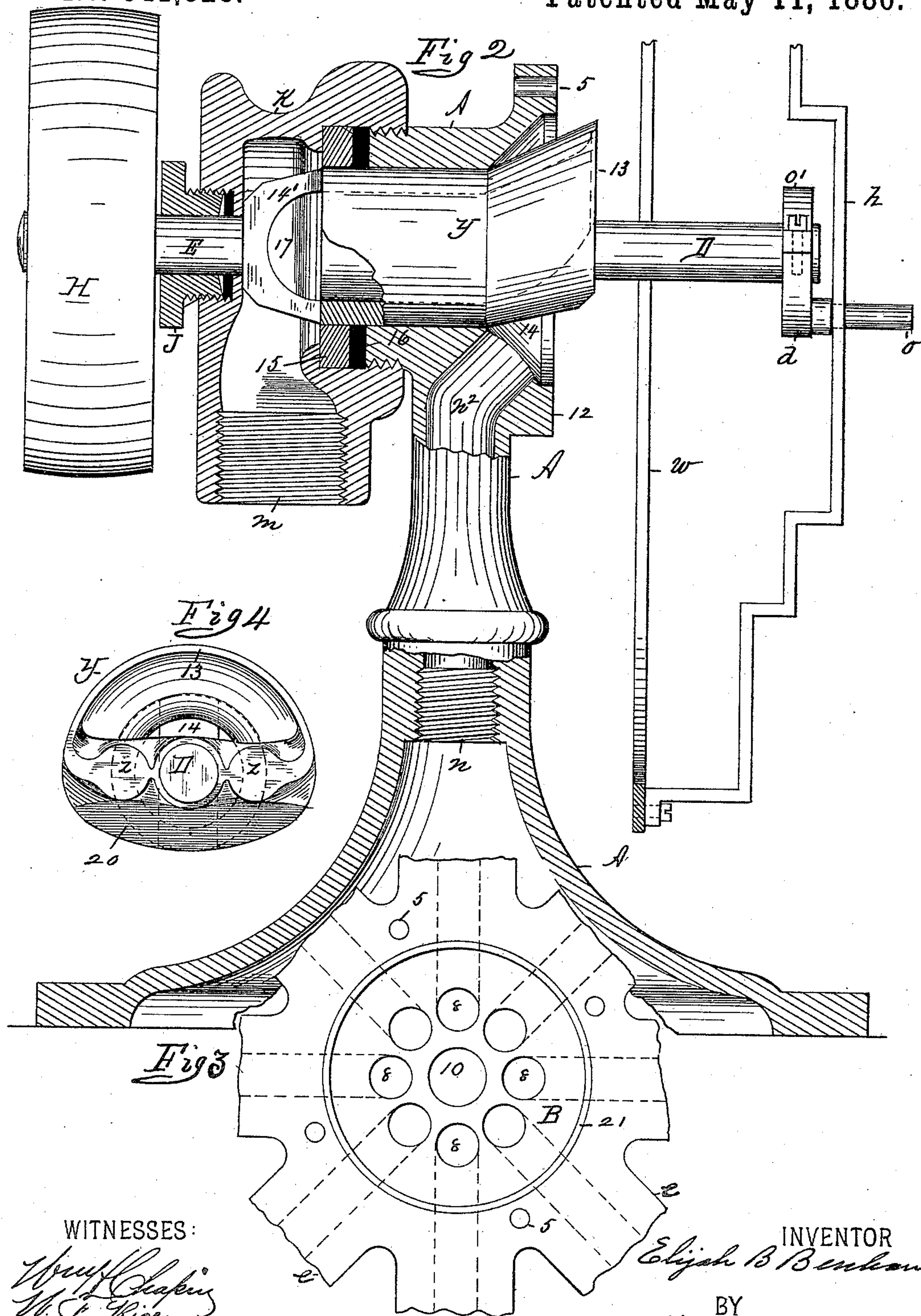
2 Sheets—Sheet 2.

E. B. BENHAM.

MOTOR.

No. 341,828.

Patented May 11, 1886.



WITNESSES:

Henry A. Chapin
W. S. Rice.

INVENTOR

Elijah B. Benham

BY

Henry A. Chapin

ATTORNEY

UNITED STATES PATENT OFFICE.

ELIJAH B. BENHAM, OF HOLYOKE, MASSACHUSETTS, ASSIGNOR TO
ROSWELL M. FAIRFIELD, OF SAME PLACE.

MOTOR.

SPECIFICATION forming part of Letters Patent No. 341,328, dated May 11, 1886.

Application filed October 5, 1885. Serial No. 178,999. (No model.)

To all whom it may concern:

Be it known that I, ELIJAH B. BENHAM, a citizen of the United States, residing at Holyoke, in the county of Hampden and State of Massachusetts, have invented new and useful Improvements in Motors, of which the following is a specification.

This invention relates to improvements in motors, and is in the nature of an improvement upon the patents to Benham and Richardson, of April 24, 1883, No. 276,529, and July 28, 1885, No. 323,258, the object being to simplify the construction shown in said patents by materially reducing the operative parts thereof, as hereinafter fully set forth.

In the drawings forming part of this specification, Figure 1 is a front elevation, and Fig. 2 a side elevation, of the motor embodying my improvements, the latter figure showing the standard or frame parts partly in section, the cylinders and pistons removed, and the ring and its shaft-connecting bar partly broken away, and the side of the valve partly broken away also. Fig. 3 is a plan view of the cylinder-disk, the cylinders being broken off in part, showing its inner side. Fig. 4 is a front end elevation of the valve.

In the drawings, A is an iron standard, forming the sole support for the machine, having a laterally-spreading base, as shown, through which suitable bolts may be put to secure the machine in any desired place or position. Said standard is provided with a head, 12, which is perforated horizontally to form a valve-chamber therein, a portion of which chamber is cylindrical, as shown, and a portion of which, 14, is of enlarged concave form, and the latter-named part of said chamber receives the water or steam supply through the induction-passage n^2 , which is formed within standard A, its lower end, n , being suitably screw-threaded to provide for connecting a supply-pipe therewith, the latter being brought up under the base of the standard and completely concealed from view thereby.

The cylinder-disk B is secured to the front or face side of the head 12 by suitable bolts passing through bolt-holes in the latter, one of which, 5, is shown in Fig. 2, and like holes in said disk. The rear end of head 12 has se-

cured to it, by screwing or other suitable means, as shown, the cap K, a suitable packing-ring, 15, and packing 16 being interposed between said head and cap to make a tight joint. The cap K has a hole through its rear side to allow the shaft E to pass through it, and a stuffing-box nut, J, on the latter is screwed against suitable packing in a stuffing-box in said cap, thereby preventing leakage around said shaft. The eduction-passage from the cylinders e through valve y is provided by the chamber 17 in the cap K, the under side of the latter having a screw-threaded opening, m , therein, which communicates with said chamber, and a suitable pipe screwed therein carries off the exhaust-steam or water.

The valve y consists of a central cylindrical portion or shell having on its rear end the yoke 14', from which projects rearwardly the shaft E, above referred to, on which is fixed the pulley H, on which a belt is put to connect the motor with machinery which it is to drive.

The front end of valve y is made of the form shown in Figs. 2 and 4, or of an enlarged flaring shape, and the end thereof, 13, is finished true, with circular spots $z z$ thereon, to constitute a bearing-face for the valve, a diaphragm, 20, extending from one side of the latter to one side of the shaft D, and closing said front end of the valve partially, as shown in Fig. 4, the said shaft D extending from the front end of the valve in a line with the shaft E through the hole 10 in the cylinder-disk B, in which it has a suitable bearing; and when the latter is bolted to the head of the standard, as above described, the end of valve y , on which is the aforesaid bearing-face, is brought to a bearing against the inner side of said cylinder-disk within the circle 21. (See Fig. 3.) The said valve and the pulley H on the rear shaft thereof has a rotary motion imparted to it by its crank-connection with the ring w , through the intermediary of the cross-bar h , said ring being actuated by the successive reciprocating movements of the pistons c , with which it engages, and said valve alternately covers and uncovers the ports 8, through which water is admitted to and discharged from the cylinders e , the water in the valve-

chamber being free to enter such of said ports as are uncovered by the valve, and the water is discharged from the ports of such cylinders as are covered by the valve into the latter and escapes through it to the discharge-passage in the stand.

The pistons *c* are of the ordinary construction, and are provided each with a friction-roll, as shown in dotted lines in Fig. 1, on which the ring *w* has a bearing, and a lip, *x*, projecting above said roll on each piston, behind which said ring is engaged, provides means for holding the latter in proper position on the pistons. The said ring performs substantially the same functions in this construction as in the above-named patents, but with less number of intermediate devices between it and the pulley H, as hereinafter described.

The crank-pin *o* is fixed in the side of a half-disk, *d*, and to the straight edge of the latter is bolted the strap *o'*, the end of shaft D being so clamped between said half-disk and strap as to firmly secure the crank-pin to the shaft. The bar *h* is bolted to the ring *w*, as shown, and the crank-pin *o* has a suitable bearing therein.

By means of the improved construction of the motor above described it is seen that the said intermediate devices that are shown in said patents between the ring *w* and the pulley through which the motor imparts movement to machinery are largely dispensed with, and the valve *y*, having the shaft D on one end and the shaft E on the opposite one, furnishes a direct means of transmitting the motion of the ring to the driving-pulley, thus obviating all other outside connections. As in said patents, rotary motion is given to the valve to cause it to control the proper entrance and discharge of water into and from the cylinders *c*, by means of the connection of the valve with the ring through the intermediary of the bar *h* and the crank-pin *o*, and substantially said connection is shown in said patent of 1885; but in the latter the ring has a connection separate from said bar with a crank-disk which is fixed on the end of the driving-shaft; but in this construction the ring rides on the pistons and has only one other connection—viz., with the valve, and by extending the rear end of the latter in the form of a shaft, E, through the cap *k* the valve becomes practically the driving-shaft of the machine.

What I claim as my invention is—

1. In a motor, a series of fixed cylinders radiating from a common center, a standard to which said series of cylinders are fixed, having therein a valve-chamber with which said cylinders communicate, induction and eduction passages, substantially as described, communicating with said chamber, a rotary valve located in said valve-chamber, having thereon a shaft extending rearwardly to receive a driving-pulley, and a second shaft in a line with the former extending forward between the converging ends of said cylinders, a series of pistons in the latter, a ring encircling the outer ends of said pistons, with which the latter engage, a bar secured to said ring and extending transversely across it, and a crank secured to the latter and to the end of said shaft which extends between the converging ends of the cylinders, combined and operating substantially as set forth.

2. In a motor, the standard A, having the head 12, in which is the valve-chamber, said standard having the induction-passage *n*² therein communicating with said chamber, the cap K, secured to said head and having a shaft-bearing therethrough, substantially as described, and the chamber 17 therein, having an eduction-passage leading therefrom, combined with the valve *y*, having a shaft on each end projecting through opposite sides of the machine, the series of pistons *c*, the ring *w*, engaging with the latter, and the bar *h*, having a crank-connection, substantially as described, with one of said valve-shafts, all as set forth.

3. In a motor, a standard having a suitable head, substantially as described, forming a support for the operating parts of the machine, and having a valve-chamber, and the induction-passage *n*² therein communicating with said chamber, the series of cylinders *c* and pistons *c*, secured to said standard-head, the hollow cap K, secured to the latter opposite said cylinders and having an eduction-passage therefrom, the ring *w*, engaging with said pistons, the bar *h*, secured to said ring, combined with the hollow valve *y*, provided with a shaft on its opposite ends, one of which passes through the cylinder-head and has a crank-connection with said bar, and the other extends through said cap and serves as the driving-shaft of the machine, substantially as set forth.

ELIJAH B. BENHAM.

Witnesses:

H. A. CHAPIN,
WM. H. CHAPIN.