

C. E. Rymes.
Valve Gearing.

N^o 93,125.

Patented Jul. 27, 1869.

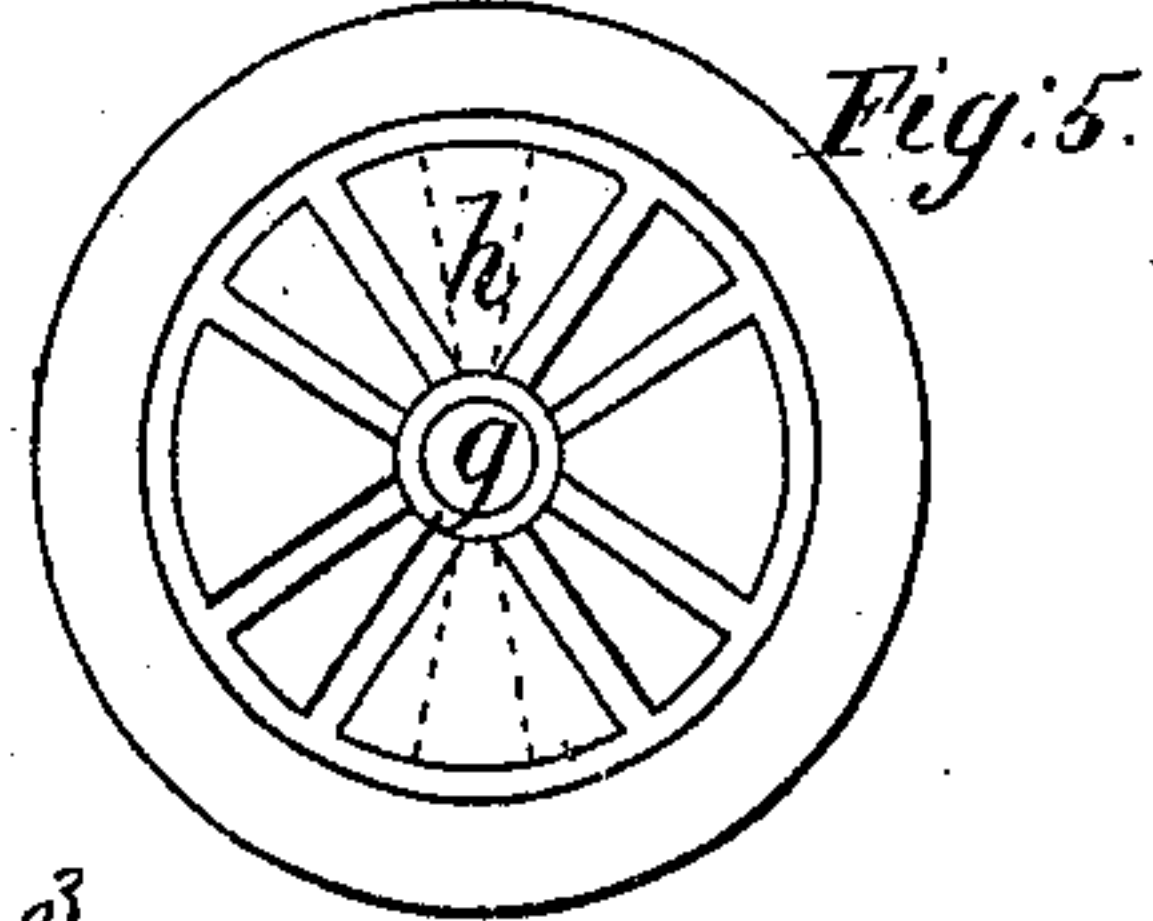
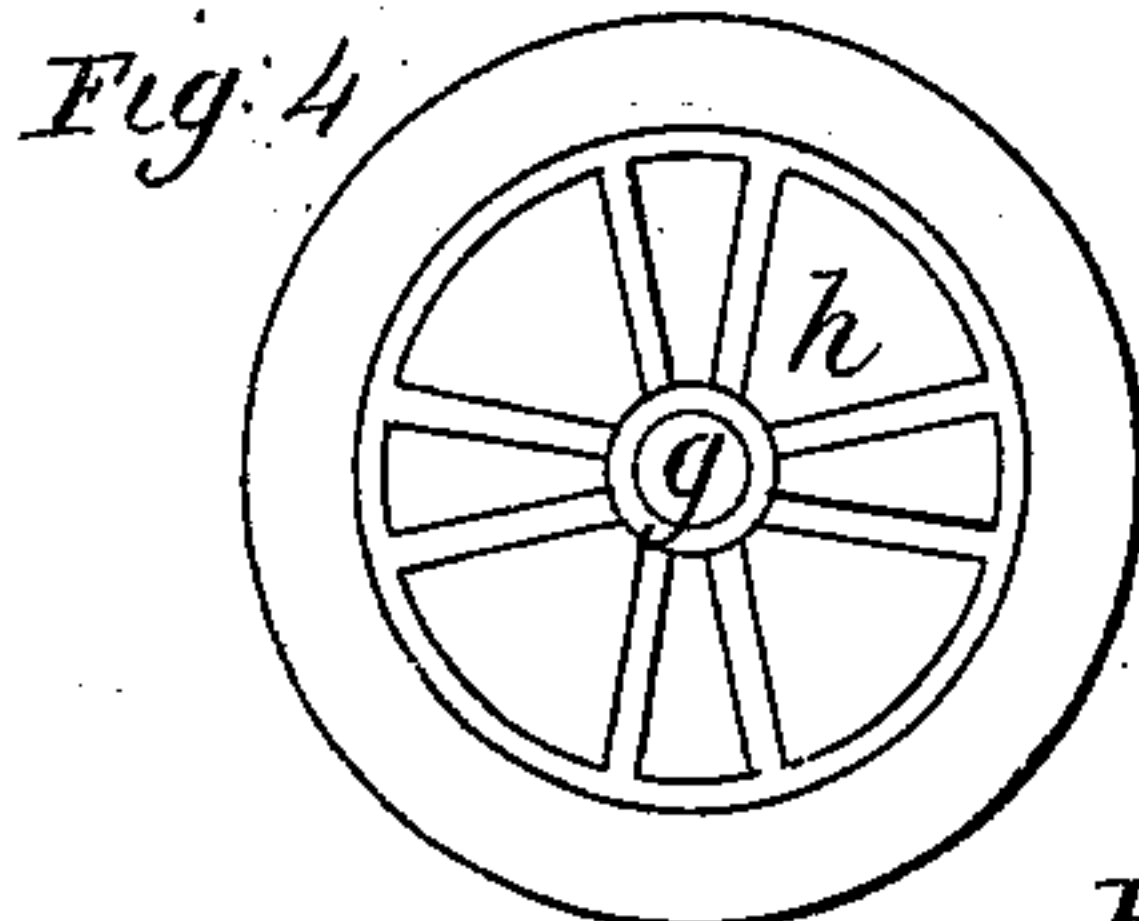
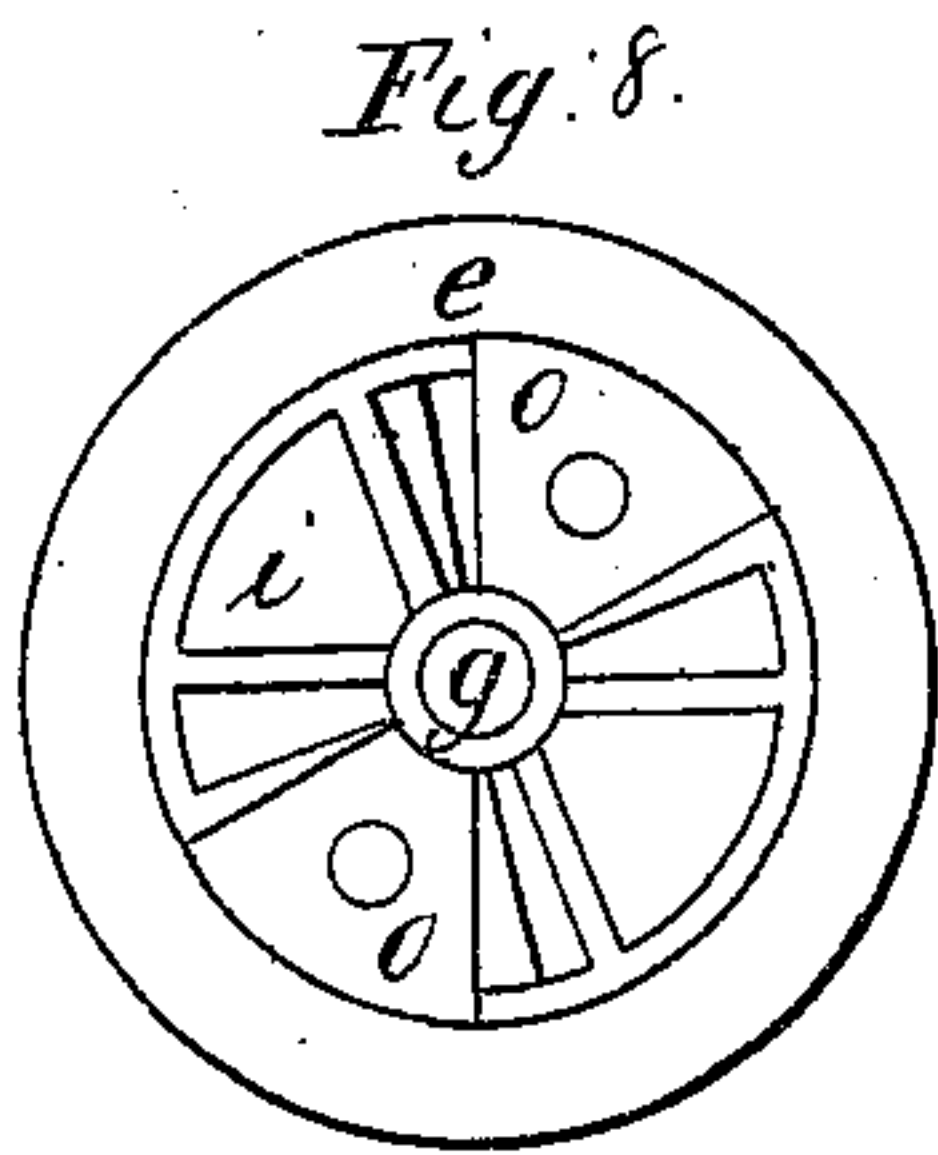
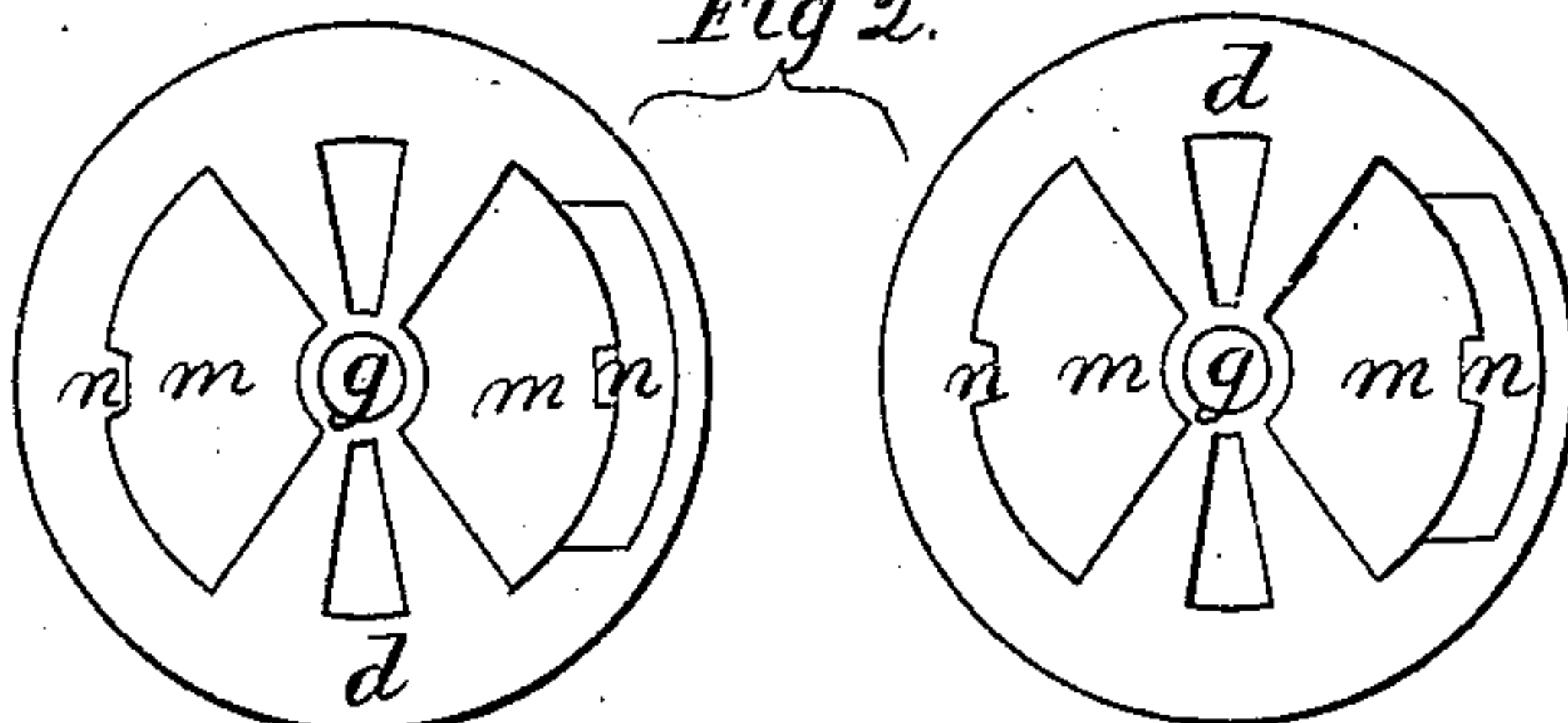
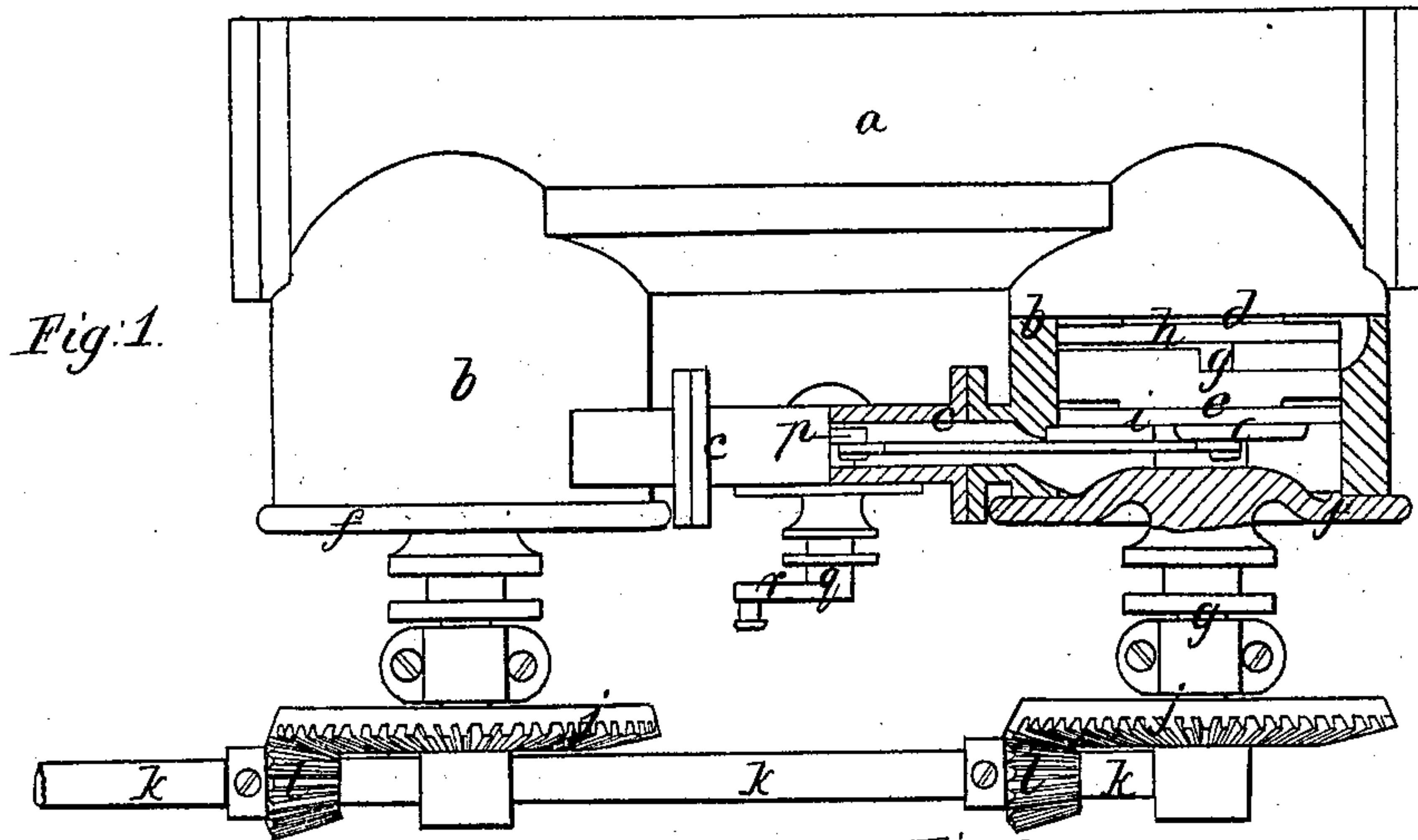


Fig. 3.

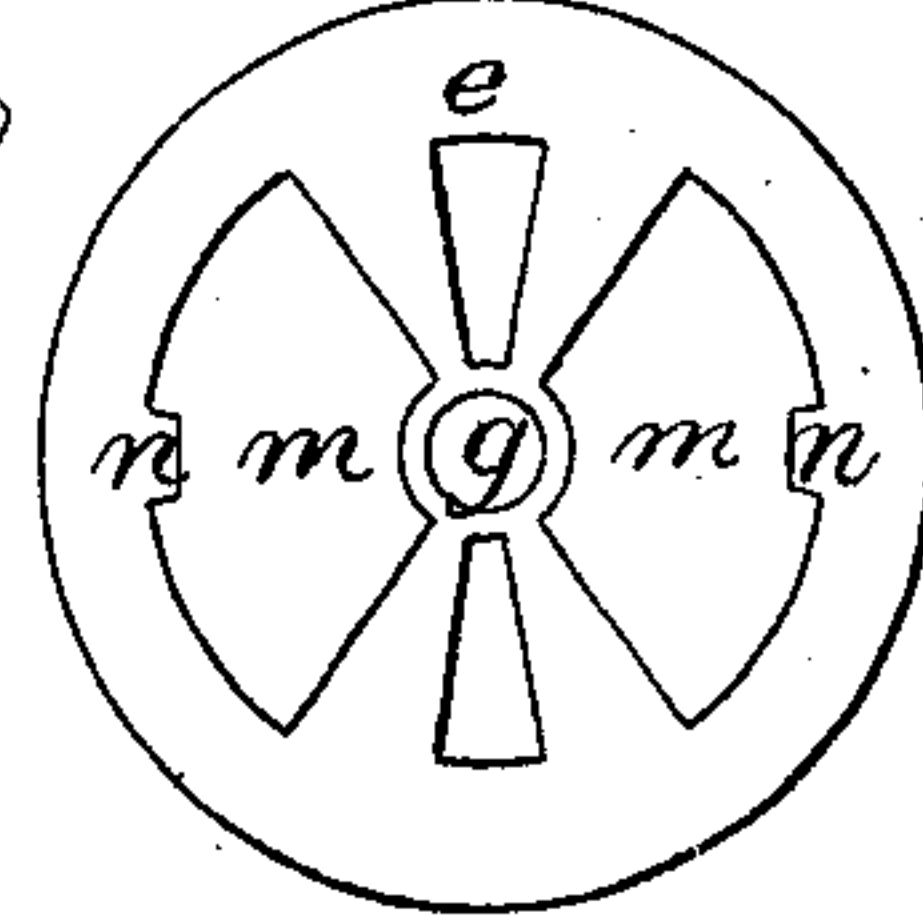
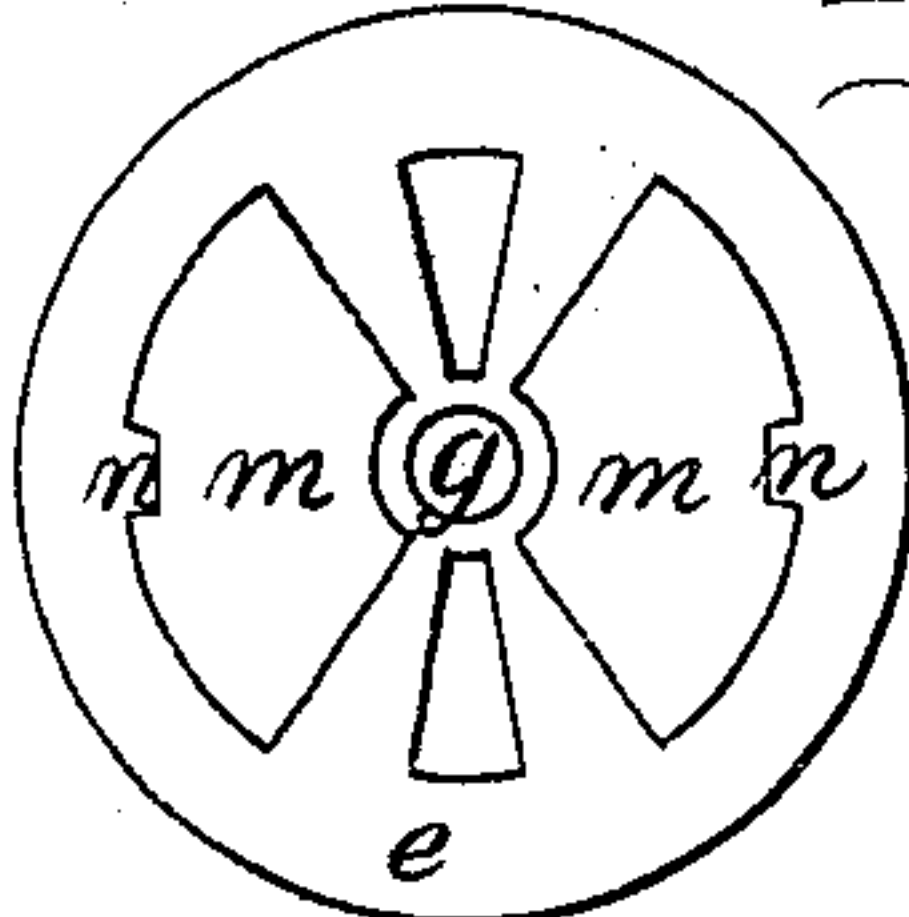


Fig. 6.

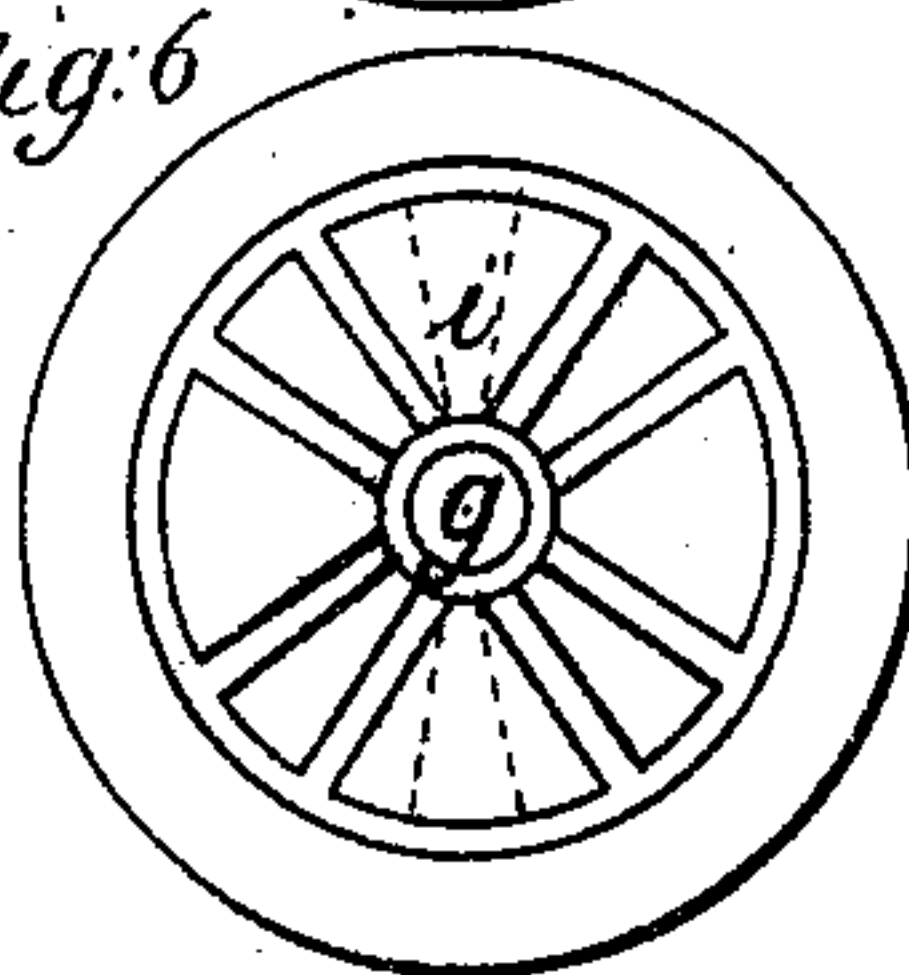
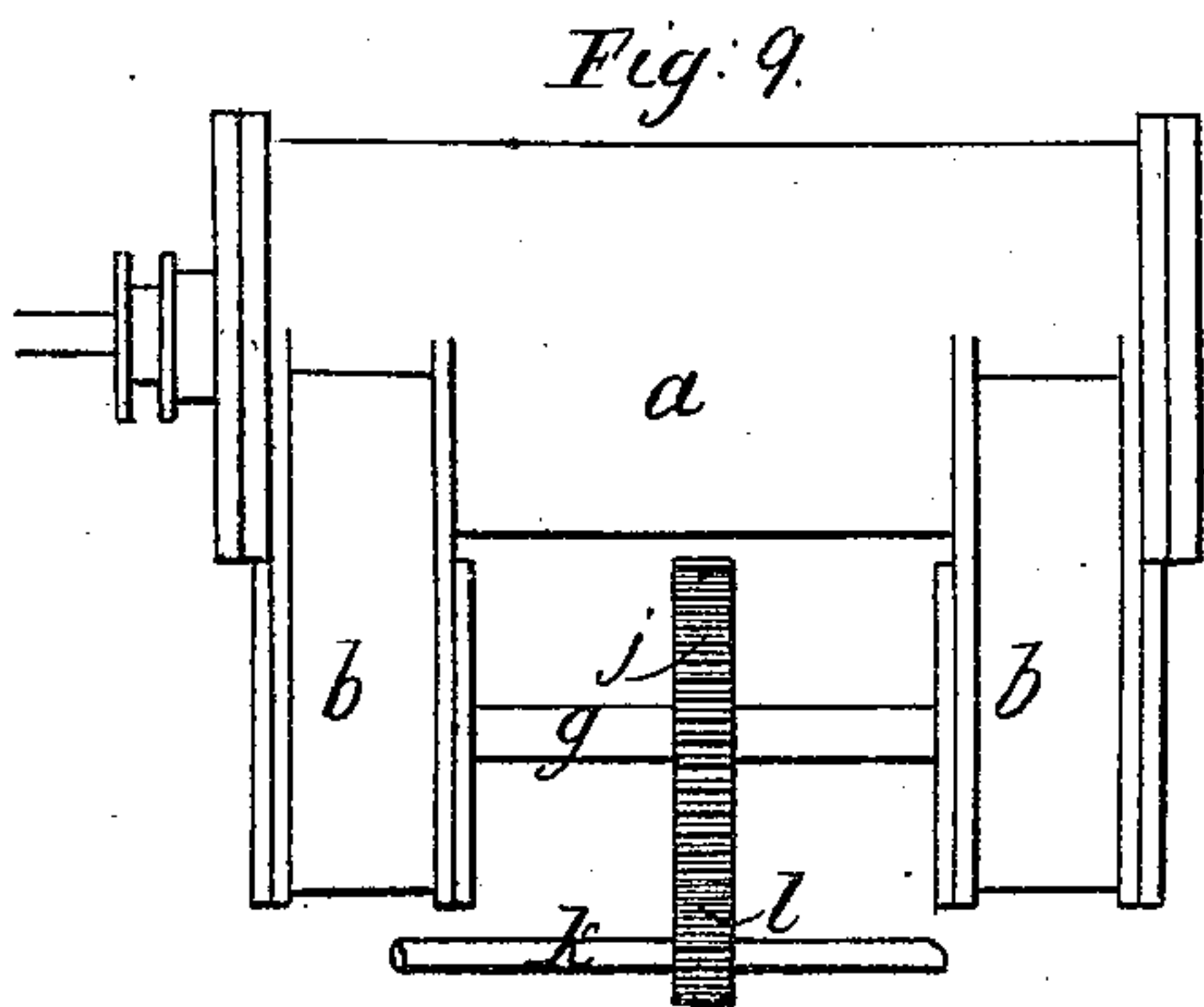
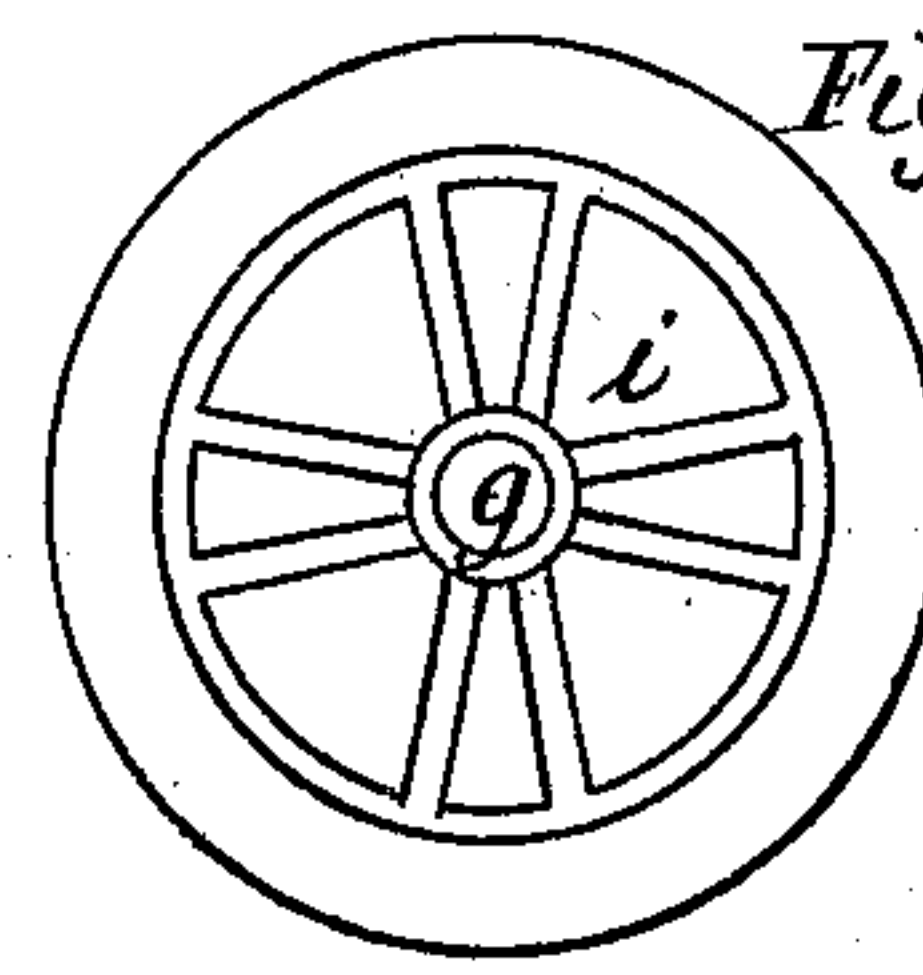


Fig. 7.



Witnesses:
W. B. Smith
E. Warren Brown.

Inventor
C. E. Rymes

United States Patent Office.

C. E. RYMES, OF SOMERVILLE, MASSACHUSETTS.

Letters Patent No. 93,125, dated July 27, 1869.

IMPROVEMENT IN STEAM-ENGINE-VALVE GEAR.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern:

Be it known that I, C. E. RYMES, of Somerville, in the county of Middlesex, and State of Massachusetts, have invented certain new and useful Improvements in Steam-Engine-Valve Gearing; and I do hereby declare that the following, taken in connection with the drawings which accompany and form part of this specification, is a description of my invention, sufficient to enable those skilled in the art to practise it.

My invention consists primarily in such an arrangement of rotary valves and valve-seats as enables me to control the entrance and exhaust-passages properly, by continued rotations of the valves, instead of by giving to them the vibratory or oscillating movements which have hitherto been employed for that purpose, by which invention I am enabled to simplify the valve-gearing of steam-engines, to render it noiseless in its operation, and to keep the faces of the valves and valve-seats in good order; and by which I am enabled to dispense with the eccentrics, cams, rocker-shafts, and slide-bearings, usually found in steam-engine gearing, substituting therefor ordinary gear-wheels and rotating shafts.

In the drawings—

Figure 1 shows in sectional plan so much of a steam-engine as is necessary to illustrate my invention, *a* denoting part of the steam-cylinder, and *b b*, valve-chests, one at each end of the cylinder.

The valve-chests shown are cylinders with their axes at right angles to the axis of the steam-cylinder, the chests being united by a connecting-passage, *c*, into which the direct steam is introduced from the boiler.

One part of each chest, on the face of which is made the exhaust-valve seat, is cast with the steam-cylinder, and the outer portion of each chest is fixed upon the part integral with the steam-cylinder; said outer part having within it a partition-diaphragm or head, forming the seat for the steam-valve. These seats are shown in elevation in Figures 2 and 3, fig. 2 showing the exhaust-valve seat, and fig. 3 showing the steam-valve seat; said seats being also respectively marked *d* and *e*.

The outer end of each chest *b* is closed by a head, *f*, through a suitable packing or stuffing-box, in which passes the valve-stem or shaft *g*, on which are fixed the exhaust-valve *h*, steam-valve *i*, and bevel-gear *j*.

Elevations of the exhaust-valves are shown in Figures 4 and 5, the exhaust-valve being shown in fig. 4 as on its seat, and uncovering the exhaust-ports, and in fig. 5 as on its seat covering the exhaust-ports.

Elevations of the steam-valves are shown in Figures 6 and 7, the steam-valve being shown in fig. 6 as covering the steam-ports, and in fig. 7 as uncovering the steam-ports.

Figs. 5 and 7 show the exhaust and steam-valves at one end of the steam-cylinder, the steam-valve being

open, and the exhaust-valve closed; and figs. 4 and 6 show the exhaust and steam-valves at the other end of the steam-cylinder, the exhaust-valve being shown open, and the steam-valve closed, so that when the valves are in the relative position shown, the piston is moving from right to left, or from the back to the front end of the steam-cylinder; figs. 5 and 7 showing the valves pertaining to the rear end of the cylinder, and figs. 4 and 6 showing the valves pertaining to the front end of the cylinder.

Two ports are shown in each of the exhaust and steam-valve seats, and four corresponding openings in each of the disk, exhaust, and steam-valves, so arranged that both exhaust-ports are opened and closed at the same time, as are also the ports in the steam-valve seats.

The shaft *k*, which is located parallel with the piston of the steam-cylinder, is driven by gears from the main shaft of the engine, so as to have the same number of revolutions with the main shaft.

On shaft *k* are fixed bevel-pinions *l*, as shown, having one-fourth the number of teeth in the gears *j*, with which the pinions *l* mesh, so that for each stroke of the piston, the valve-shafts *g* and the valves *h* and *i* will make one-eighth of a complete revolution, or a fourth of a complete revolution for each double stroke of the piston, and one complete revolution of the main shaft of the engine, so that it will be seen that the steam-ports are opened and shut at one end of the cylinder by a single piston-stroke making an eighth of a revolution of the valve, and a half a revolution of the main shaft, and that the exhaust-ports at the opposite end are also opened and closed in the same time by the same movement of the piston, thus letting the steam-cylinder receive steam at one end, and exhaust at the other, which operations will be repeated at opposite ends of the cylinder for the return-stroke of the piston, the operations described being repeated continuously by the repeated strokes of the piston, and the continued rotation of the valves.

The faces of the valve-seats are recessed, as seen at *m*, the object of this being to admit steam to both sides of the valves to partially balance them, to reduce the friction which would result if the valves were forced upon their seats with the pressure of the steam upon their entire area.

Bearing-faces *n* in the plane of the valve-seat surfaces around the ports, are located, as shown, to prevent deflection of the disk-valves.

The cut-off valves *o* are made each as two opposite sectors of a disk, fitting against the face of the steam-valve opposite to that which bears upon the steam-valve seat *e*.

The cut-off valves are pivoted on the valve-shafts *g*, and are connected, each with the other, and to an arm, *p*, on a rocker-shaft, *q*, on which is a rocker-arm, *r*, which

is worked by a regulator, so that the position of the cut-off valves is regulated with reference to the openings through the steam-valve, so that the steam is cut off sooner or later at any part of the piston-stroke, according to the location at which the cut-off valve is placed by the regulator.

The face of the steam-valve, against which the cut-off valve works, is recessed, as shown, so as to admit steam under the cut-off valve, except where it bears against the projections surrounding the openings in the steam-valve, this reducing the pressure and friction on the cut-off valve.

The valve-cases may be arranged with their axes parallel to the axis of the steam-cylinder, the cases then having each two removable heads, which would facilitate getting at the valves, to inspect and adjust them.

In such an arrangement there would be but one valve-stem shaft, which would be parallel with the axis of the steam-cylinder, and would have upon it one spur-gear, into which would mesh a spur-pinion on the shaft *k*, having one-fourth of the number of the teeth on the spur-gear. This arrangement is indicated in the diagram, Figure 9.

Experienced machinists will recognize the fact that valves made to turn continuously in one direction, will wear themselves, and their valve-faces, much more uniformly than they do when they have a movement back and forth, as in reciprocating, or in vibrating or oscillating.

The valve-seats and valves may be constructed so as to give any desired lap, and the valves may be adjusted to give any desirable lead, according to the circumstances of any case, and to conform to the best engineering theories and practice.

By preference I make the faces of the valves and valve-seats as planes, but they may be dished, without departure from my invention, or the valves may be made as cylindrical or conical plugs, or parts thereof, or as cylindrical or conical tubes, or parts thereof, without departure from my invention, so long as the valves are continuously rotated in one direction, and are not moved back and forth by vibration or oscillation. But in practising my invention, I greatly prefer to employ flat disk-valves or portions of flat disks, as they can more readily be adjusted to compensate for wear of their faces, and the wear of their seats, than can be dishing valves or cylindrical or conical valves. Indeed, cylindrical valves cannot be adjusted to compensate for wear, and new valves or new seats must be provided, or one or the other covered or lined.

I claim, in a steam-engine, in which the piston reciprocates, the combination of four valves, two steam, and two exhaust, when all are arranged to rotate continuously in one direction, synchronously with each other, and with the main crank-shaft of the engine, substantially as described.

Also, in a steam-engine, in which the piston reciprocates, the combination with each of two steam-valves, arranged to rotate constantly in one direction, and synchronously with each other and the main crank-shaft, of a backer cut-off valve, arranged to be vibrated by connection with a regulator, to cut off steam at variable parts of the piston-stroke, substantially as described.

C. E. RYMES.

Witnesses:

J. B. CROSBY,

C. WARREN BROWN.