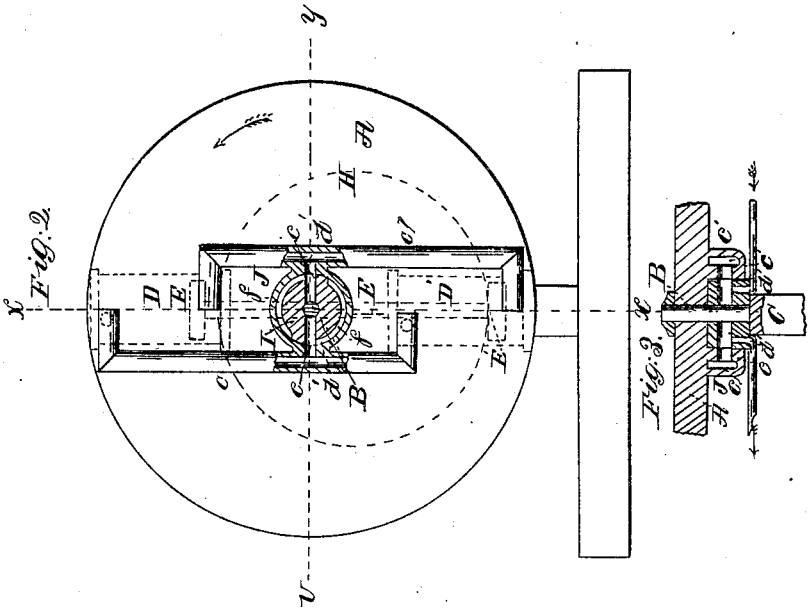
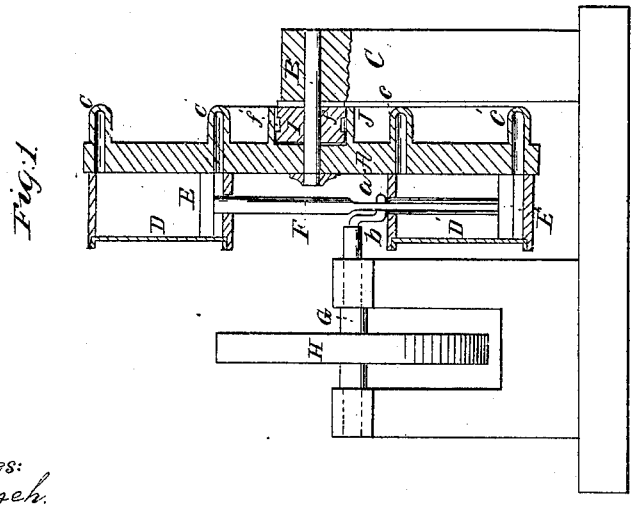
J. S. FOSTER.

REVOLVING CYLINDER ENGINE.

No. 51,166. Patented Nov. 28, 1865.





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UNITED STATES PATENT OFFICE.

JOSEPH S. FOSTER, OF VIRGINIA, NEVADA TERRITORY.

IMPROVEMENT IN REVOLVING-CYLINDER ENGINES.

Specification forming part of Letters Patent No. **51,166**, dated November 28, 1865.

To all whom it may concern:

Be it known that I, JOSEPH S. FOSTER, of Virginia, in the county of Storey, Nevada Territory, have invented a new and Improved Revolving-Cylinder Engine; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable those skilled in the art to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 represents a transverse vertical central section of this invention, the line *x x*, Fig. 2, indicating the plane of section. Fig. 2 is a sectional rear elevation of the same. Fig. 3 is a horizontal section of the same, taken in the plane indicated by the line *y y*, Fig. 2.

Similar letters of reference indicate corresponding parts.

This invention relates to an improvement in that class of steam-engines in which one or more cylinders are attached to a revolving disk, so that said cylinder or cylinders are carried round the crank-shaft, from which the motion is to be transmitted to the working machines.

In this new engine two cylinders are rigidly attached to the revolving disk, one opposite the other in radial directions. Both cylinders have a common piston-rod, which is provided with a hole or box to form a bearing for the crank-pin of the crank-shaft, to which motion is to be imparted. Steam is admitted to the cylinders and changed at the proper intervals by a stationary disk-valve, which works in a flanged seat on the back of the revolving disk, and the two parts of which connect by suitable pipes with the opposite ends of the two cylinders, so that both cylinders simultaneously take steam and exhaust at opposite ends, and both pistons are exposed to the continuous action of the steam.

A represents a disk, which revolves on the end of the fixed shaft B, which has its rigid bearing in the standard C; or, if desired, the disk may be firmly keyed to the shaft, and the latter made to revolve in suitable journal-boxes in one or more standards, C.

Secured to the front side or face of the disk, and on opposite side of its center, are two steam-cylinders, D D′, in radial directions, as clearly shown in Figs. 1 and 3, and these cylinders are provided with pistons E E′, attached to the common piston-rod F. This piston-rod is perforated at the middle of its length to receive the eccentric wrist-pin *a* of the crank *b*, which is rigidly connected to the end of the shaft G. A pulley or band-wheel, H, mounted on this shaft serves to transmit the motion imparted to the same by the action of the piston-rod to the working machines.

The cylinders D D′ are supplied with steam through pipes or channels *c c′*, applied to or arranged on the rear surface of the disk A, as clearly shown in Fig. 2 of the drawings. The pipe *c* communicates with the outer end of the cylinder D and with the inner end of the cylinder D′, and the pipe *c* communicates with the outer end of the cylinder D′ and with the inner end of the cylinder D, and said pipes are alternately brought in communication with the steam-port *d′* and exhaust-port *d* in the stationary disk-valve I. This disk-valve is rigidly attached to the standard C, and it works in a flanged seat, J, which is formed by a circular flange rising from the rear surface of the disk A.

Two channels, *e e′*, which lead from the pipes *c c′* through the flange J, and which pass the steam and exhaust ports *d′ d* as the disk A revolves, at certain intervals form the communication between the pipes *c c′* and ports *d d′*. In Fig. 2 of the drawings the channel *e′* has arrived opposite the steam-port *d′*, the pistons E E′ having arrived at the lowest point of their stroke, and the channel *e* is opposite the exhaust-port *d*.

Steam is admitted through the pipe *c′* to the outer end of the cylinder D′ and to the inner end of the cylinder D, and at the same time the outer end of the cylinder D and the inner end of the cylinder D′ are brought into communication with the exhaust-port. As the disk revolves in the direction of the arrow marked on it in Fig. 2, the channels *e′ e* pass the ports *d′ d*, and, in order to prevent said ports being closed, semicircular grooves *f f′* are cut in the circumference of the valve I. The cylinders continue to take steam through the pipe *c′* as long as the channel *e′* is opposite the groove *f′*, and they continue to exhaust through the pipe *c* as long as the channel *e* is opposite the groove *f*. The groove *f′* extends to within a short distance from the port *d*, and the groove *f*, on the opposite side of the disk-valve, to within a short distance of the port *d′*, so that the cylinders continue to take steam and to exhaust

for the entire stroke of their pistons, or nearly so. When the disk A has completed one-half a revolution, the channel e' is opposite the port d and the channel e opposite the channel d', and the motion of the pistons in the cylinders is reversed.

The bearing of the eccentric wrist-pin a in the piston-rod must be so arranged that the same stands opposite the center of the fixed shaft B on which the disk A revolves whenever the pistons arrive at half-stroke, and when the pistons have completed their stroke their position in relation to the crank b and fixed shaft B is that shown in Fig. 1.

It will be easily seen that the center of the shaft G must be placed at a distance from that of the fixed shaft B equal to the throw of the crank b, and by the double motion of the pistons—viz., the reciprocating motion in the cylinders and the circular motion with the disk A—the dead-points are completely avoided, and the engine begins to move at whatever position it may be started, provided there is steam enough to overcome the resistance.

By changing the ports the motion of the disk A and of the whole engine is reversed. This object can be effected in a simple way by having two openings from the steam-pipe, one leading to each port, and fitted with a sliding valve, so that when one opening is open the other is closed, and the same with the exhaust-pipe.

When it is not desired to make the engine reversible, the groove f', emanating from the steam-port d' in the edge of the valve I, may be shortened, and thereby the steam cut off at any desired point of the stroke.

It will be seen that every revolution of the disk or fly-wheel A caused by the action of the steam in the cylinders D D′ produces two revolutions of the crank. When, however, the steam is shut off and the crank-pin a is placed in the line of center with the fly-wheel, the fly-wheel may be turned by hand in either direction without producing any effect upon the crank.

I claim as new and desire to secure by Letters Patent—

1. The fly-wheel A, with two rigidly-attached cylinders, D D′, placed opposite each other in a radial direction, having a common piston-rod, F, attached at the center to a crank-pin, a, in such a manner that every revolution of the fly-wheel caused by the action of steam in the cylinders produces two revolutions of the crank, substantially in the manner as herein set forth.

2. The stationary disk-valve I, with ports d d' and grooves ff', in combination with the revolving fly-wheel A, carrying the cylinders D D′ and pipes or channels e e', in the manner and for the purpose substantially as herein described.

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