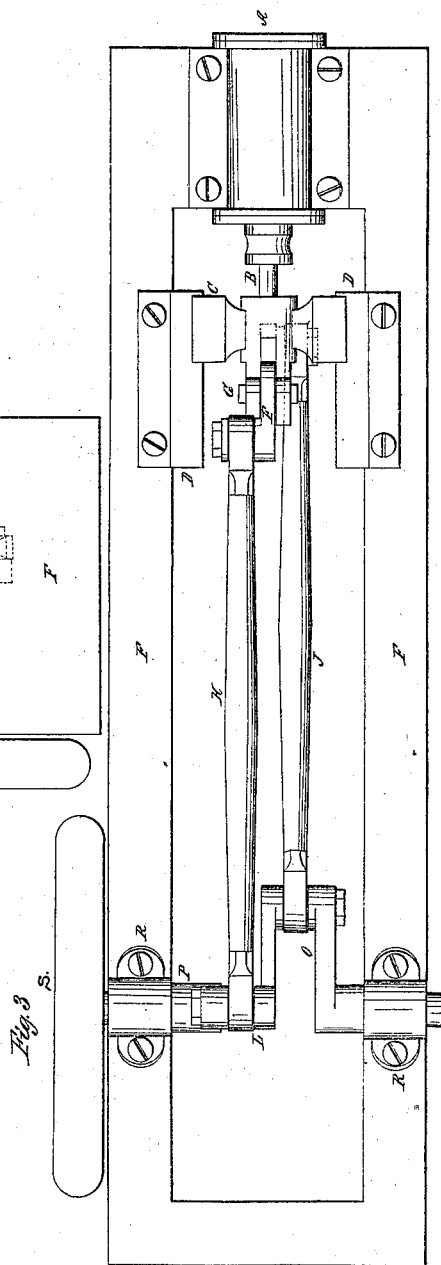
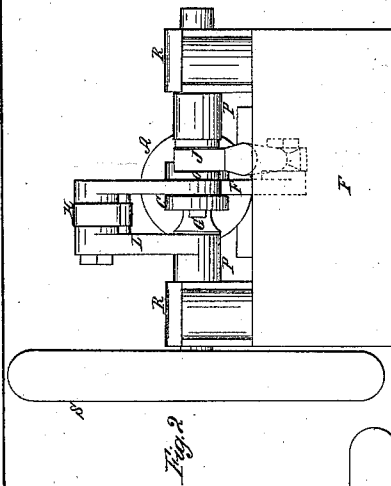
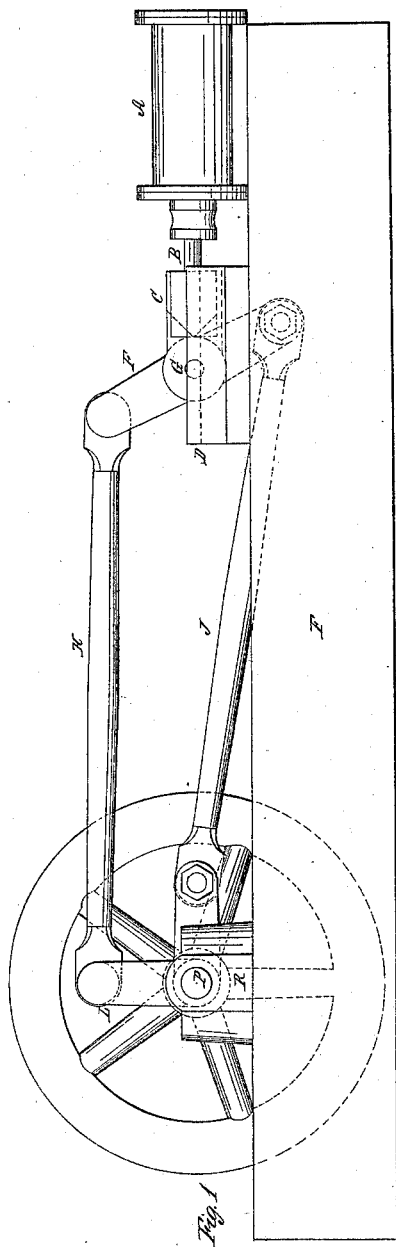


*J. Harris, Jr.,*  
*Converting Motion,*  
*N<sup>o</sup> 7,902,*  
*Patented Jan. 14, 1851.*



# UNITED STATES PATENT OFFICE.

JOSEPH HARRIS, JR., OF BOSTON, MASSACHUSETTS.

## CHANGING A RECIPROCATING INTO A ROTARY MOTION.

Specification of Letters Patent No. 7,902, dated January 14, 1850.

*To all whom it may concern:*

Be it known that I, JOSEPH HARRIS, JR., of Boston, in the county of Suffolk and State of Massachusetts, have invented a new and Improved Mode of Converting the Reciprocation of the Piston of a Steam or other Engine or Machine into Continuous Revolving Movement; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which represent the application of my improvement to an ordinary horizontal steam-engine.

Figure 1 is a longitudinal elevation, Fig. 2 is an end elevation, and Fig. 3 is a horizontal plan.

Similar letters refer to similar parts in each of the three figures.

A, is a steam cylinder.

B, is the piston rod, to which is attached the cross-head C.

D, D, are the parallel guides.

F, is an oscillating lever whose fulcrum

is the pin G in the cross-head C.

H and I are two connecting rods joining the ends of the vibrating lever F, with the cranks L and O, on the shaft P; the said points of connection with the cranks and lever being equidistant from their fulcrums, and the cranks forming a right angle.

R is a pillow block on which the shaft P, rests.

S is a fly wheel and T, the bed supporting the machinery.

The construction and operation of this engine is as follows: The engine is constructed in any of the usual forms, excepting the mode of communication between the crank shaft and the cross-head (or lever beam); in this the novelty of my invention consists. In the ordinary mode of producing a continuous revolving motion from a reciprocating one, a single crank and connecting rod are used; the effect of which is an unequal leverage at corresponding divisions of the outward and return strokes. To counteract the effect of this, a heavy fly is added, which diminishes the effective power of the

engine. These evils, I, in a great measure remedy, and at the same time produce a gradual check to the momentum of the piston by the use of two cranks placed at right angles to each other; the said cranks being connected, by means of rods, to the ends of an oscillating lever, whose fulcrum is a pin attached to, and traveling with the cross-head. At the commencement of the stroke, the crank pins stand at equal distances above and below the central line drawn between the cylinder and crank shaft; consequently no motion can ensue, and the cranks are on the "dead point"; now if the shaft be turned in either direction, on the admission of steam to the cylinder, the majority of the power will be communicated to the crank which has the greatest leverage and the shaft will revolve in that direction. When the cranks have made a "quarter" revolution the leverage is nearly equal on both cranks, and the piston has traveled over one half of its stroke; on continuing the revolution, the crank, which, at the commencement, had the greatest leverage, now has the least,—the majority of the power being transferred to the other crank, which continues to the end of the stroke, and the cranks assume their other "dead point." The office of the oscillating lever is to equalize or average the combined effects of the cranks on the piston.

What I claim as my invention and desire to secure by Letters Patent, is—

The application, to steam, or other engines, or machines, of a mechanical arrangement, whereby the effect of the applied power is rendered equal (or nearly so) both on the outward and return strokes, of any reciprocating or vibrating movement, using for that purpose the aforesaid combination of the cranks, connecting rods, and oscillating lever, or their equivalents, as described in the above specification, and shown in the accompanying drawings.

JOSEPH HARRIS, JR.

Witnesses:

CHARLES BRETT,  
MOSES SEVERY.