

(No Model.)

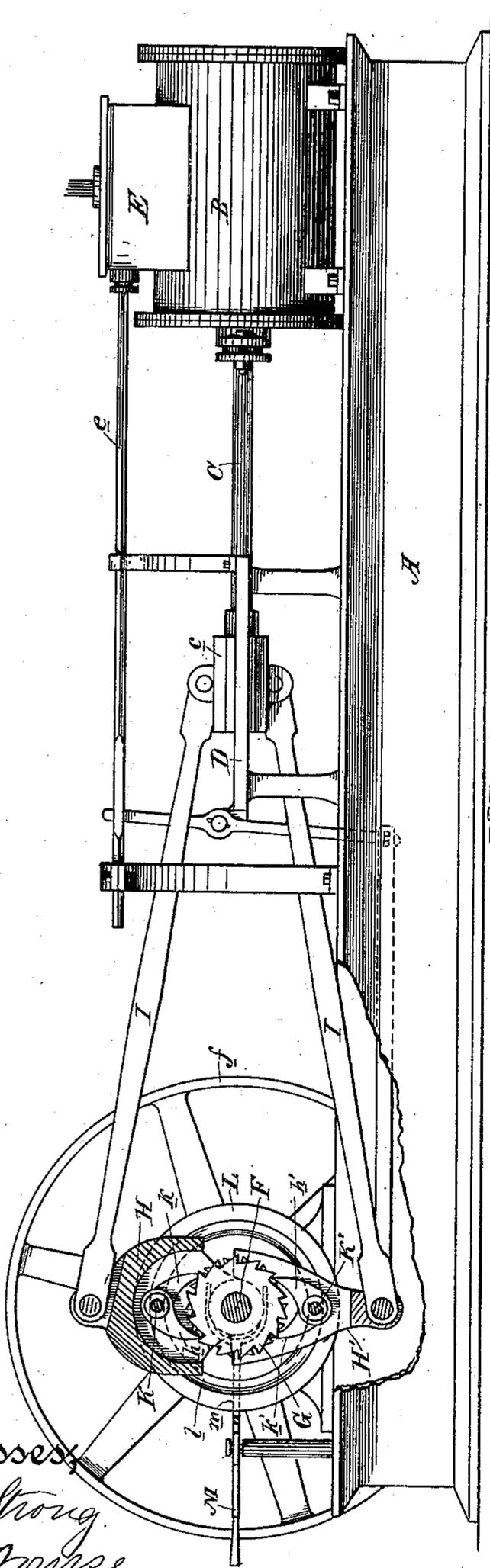
R. J. BALLEW.

PAWL AND RATCHET MECHANISM.

No. 376,467.

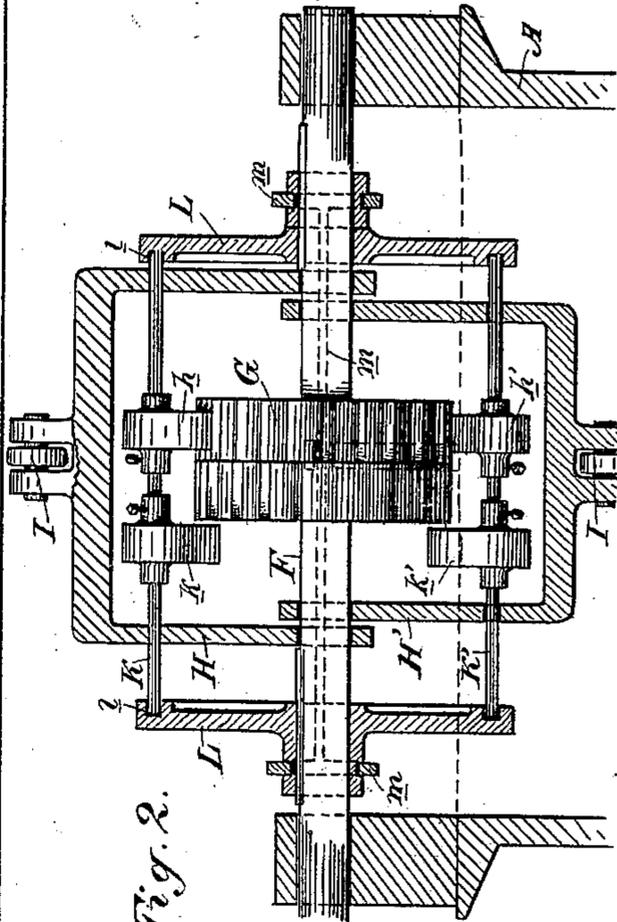
Patented Jan. 17, 1888.

Fig. 1.



Witnesses,  
Geo. Strong  
J. H. Morse.

Fig. 2.



Inventor,  
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By Dewey & Co.  
attys

# UNITED STATES PATENT OFFICE.

RICHARD J. BALLEW, OF MAGALIA, CALIFORNIA, ASSIGNOR OF ONE-THIRD  
TO SAMUEL STEVENS AND JOHN W. HALL, BOTH OF SAME PLACE.

## PAWL-AND-RATCHET MECHANISM.

SPECIFICATION forming part of Letters Patent No. 376,467, dated January 17, 1888.

Application filed April 28, 1887. Serial No. 236,531. (No model.)

*To all whom it may concern:*

Be it known that I, RICHARD J. BALLEW, of Magalia, Butte county, State of California, have invented an Improvement in Pawl-and-Ratchet Mechanism; and I hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to the class of steam-engines; and it consists of a novel connection between the piston-rod and the driving-shaft, whereby the dead-center is obviated and the rotation of the shaft is continuous, as I shall hereinafter fully describe.

Referring to the accompanying drawings for a more complete explanation of my invention, Figure 1 is a vertical cross-section of the pawl-and-ratchet connection, the remainder of the engine being shown in elevation. Fig. 2 is a cross-section through the pawl-and-ratchet connection.

A is the bed of the engine.

B is the cylinder containing the piston, of which C is the rod, the cross-head *c* of which slides on guides D, supported above the bed.

E is the valve-chamber having the valve-rod *e* operated by suitable connections from the driving-shaft.

F is the driving-shaft having a fly-wheel, *f*. On this driving-shaft is fixed a ratchet, G.

Pivoted on the driving-shaft are oppositely-extending independent cranks H H', each of which carries a pawl, *h* and *h'*, respectively, the former engaging the ratchet on the forward stroke and the latter engaging it on the return-stroke, the pawls being reversed so as to turn the ratchet in the same direction. Connecting-rods I join each crank with the cross-head. It will now be seen that as the piston-rod moves forward the pawl *h* of the crank H engages the ratchet and turns the shaft, the pawl *h'* meanwhile slipping the teeth of said ratchet. Upon the return-stroke of the piston-rod the pawl *h'* of the crank H' engages the ratchet and turns the shaft in the same direction, while the pawl *h* slips the teeth of the ratchet. The rotation of the driving-shaft is thus a continuous one, while the cranks have an oscillating movement, avoiding a dead-center.

In order to reverse the motion I have the

following construction: The ratchet G is made with a double face, the teeth of one face being reversed to those of the other. In addition to the pawls *h h'* there are two other pawls, *k k'*, the reverse of the first-named and adapted to operate on the other face of the ratchet. All the pawls are fixed on cross-pins K K', mounted in their respective cranks and adapted to slide longitudinally in their bearings, this movement being accomplished by means of end disks, L, feathered on the drive-shaft and provided with annular grooves *l*, into which the ends of the pawl-pins fit, thereby permitting the rotation of the disks with the shaft without interfering with the oscillating movement of the cranks. The disks are moved to one side or the other by means of a yoke, *m*, the arms of which are grooved on the hubs of the disks L, said yoke being operated by a pivoted lever, M, with suitable connections. The shaft is therefore rotated in one direction by the pawls *h h'*, as heretofore described, while the reverse movement is accomplished by the other pawls, *k k'*, each set being thrown into or out of engagement with the respective faces of the ratchet by moving the disks L over to one side, thereby carrying the sliding pins K K' and their pawls with them.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In combination with a reciprocating piston-rod and a driving-shaft, a double-faced ratchet upon said shaft, the teeth on said faces being reversed, oppositely-extending cranks pivoted upon the shaft and carrying pawls for engaging oppositely each face of the ratchet, mechanism for moving said pawls so as to throw one set into engagement with one face of the ratchet and the other set out of engagement with the other face of the ratchet, to reverse the motion of the driving-shaft, and connecting-rods between the cranks and the head of the piston-rod, substantially as herein described.

2. In combination with a reciprocating piston-rod and a driving-shaft, the double-faced ratchet on said shaft having teeth oppositely arranged, oppositely-extending cranks pivoted on said shaft, sliding pins mounted in said

cranks, each pin carrying two pawls for en-  
gaging oppositely the faces of the ratchet,  
grooved disks feathered on the shafts and re-  
ceiving the ends of the pawl-pins, a pivoted  
5 lever and yoke for moving sidewise the feath-  
ered disks and throwing the pawl-pins over,  
whereby one set of pawls are thrown into en-  
gagement with one of the faces of the ratchet  
while the other set are thrown out of engage-  
10 ment with the other face of the ratchet, and

connecting-rods between the cranks and the  
piston-rod head, all arranged and adapted to  
operate substantially as herein described.

In witness whereof I have hereunto set my  
hand.

RICHARD J. BALLEW.

Witnesses:

LYMAN STEPHENS,  
JOHN W. MANN.